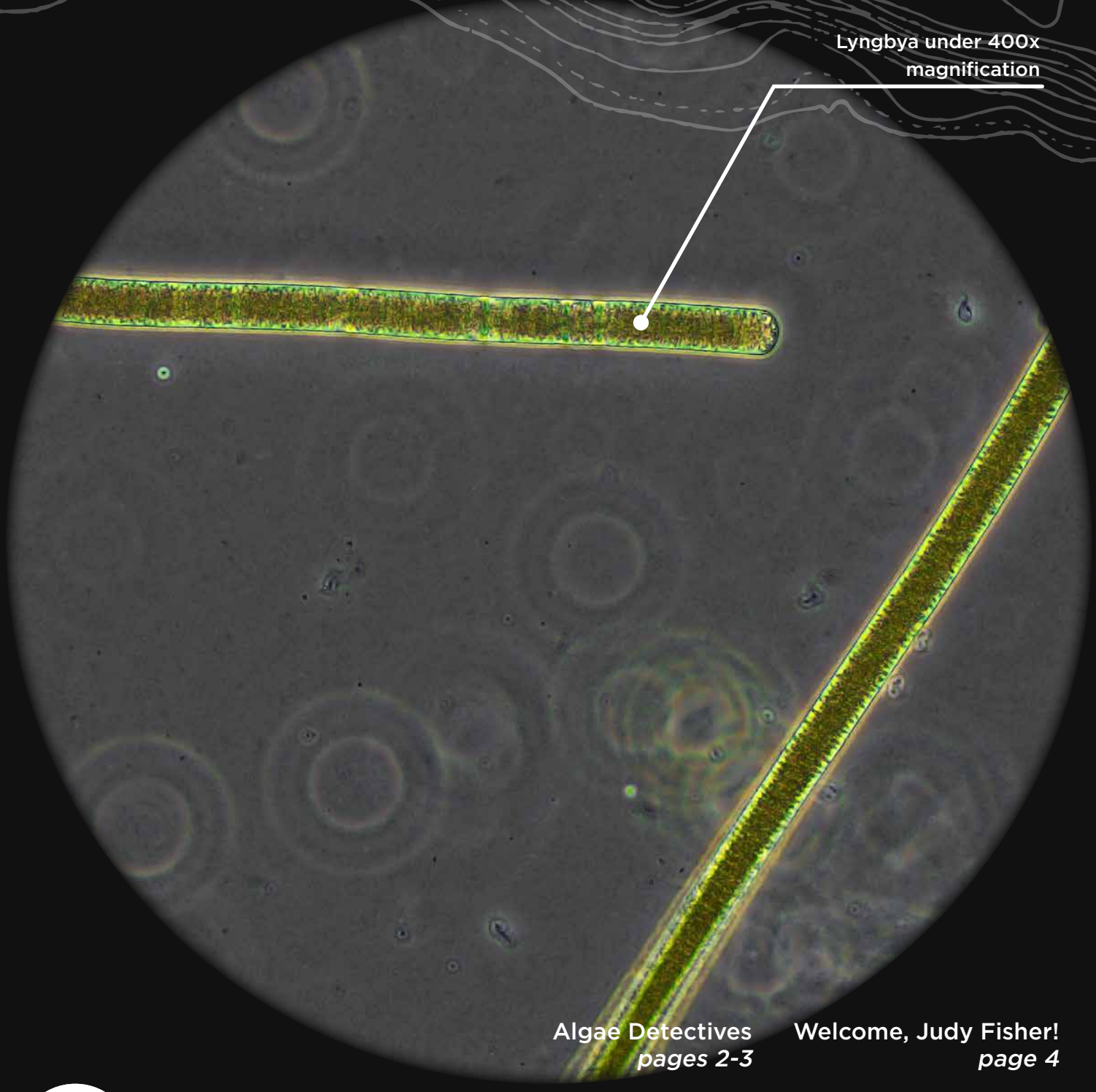
HEADWATERS

A core publication of the Lilly Center for Lakes & Streams | Winter 2024



Lyngbya under 400x magnification

Algae Detectives *pages 2-3*

Welcome, Judy Fisher! *page 4*

Zoom in on your lake with educational events *page 4*

Comparing and contrasting lake clarity and oxygen *page 5*

LILLY CENTER FOR LAKES & STREAMS

ZOOM IN WITH US

An integral part of the Lilly Center's research, **counting algae**, requires professional-grade microscopes. You can see a microscope in use in the image to the left. These high-powered microscopes use lenses (silver cylinders) to magnify miniscule algae 20, 400, or even 1,000 times their actual size.

"Zooming in" on algae species through the counting process allows our team of five researchers to look at what goes on beneath the surface of the lake. Connecting algae populations to the presence of toxins will give us tools to **predict and prevent** harmful algae blooms (HABs).

Our mission— making Kosciusko County's lakes & streams clean, healthy, safe, and beautiful— allows us to "zoom in" on more than algae. This year, you can look forward to more stories and events like those in this issue that **give you the tools to focus on protecting your lake**. How will you "zoom in" with us in 2024? •

Read these stories and more on our website by visiting lakes.grace.edu/field-notes.

CONTENTS

2-3 Algae detectives

4 2024 Event calendar

4 Welcome, Judy Fisher!

5 Comparing and contrasting clarity and dissolved oxygen

Cover: Lyngbya, a toxic blue-green algae, under a microscope at 400 times its real size.

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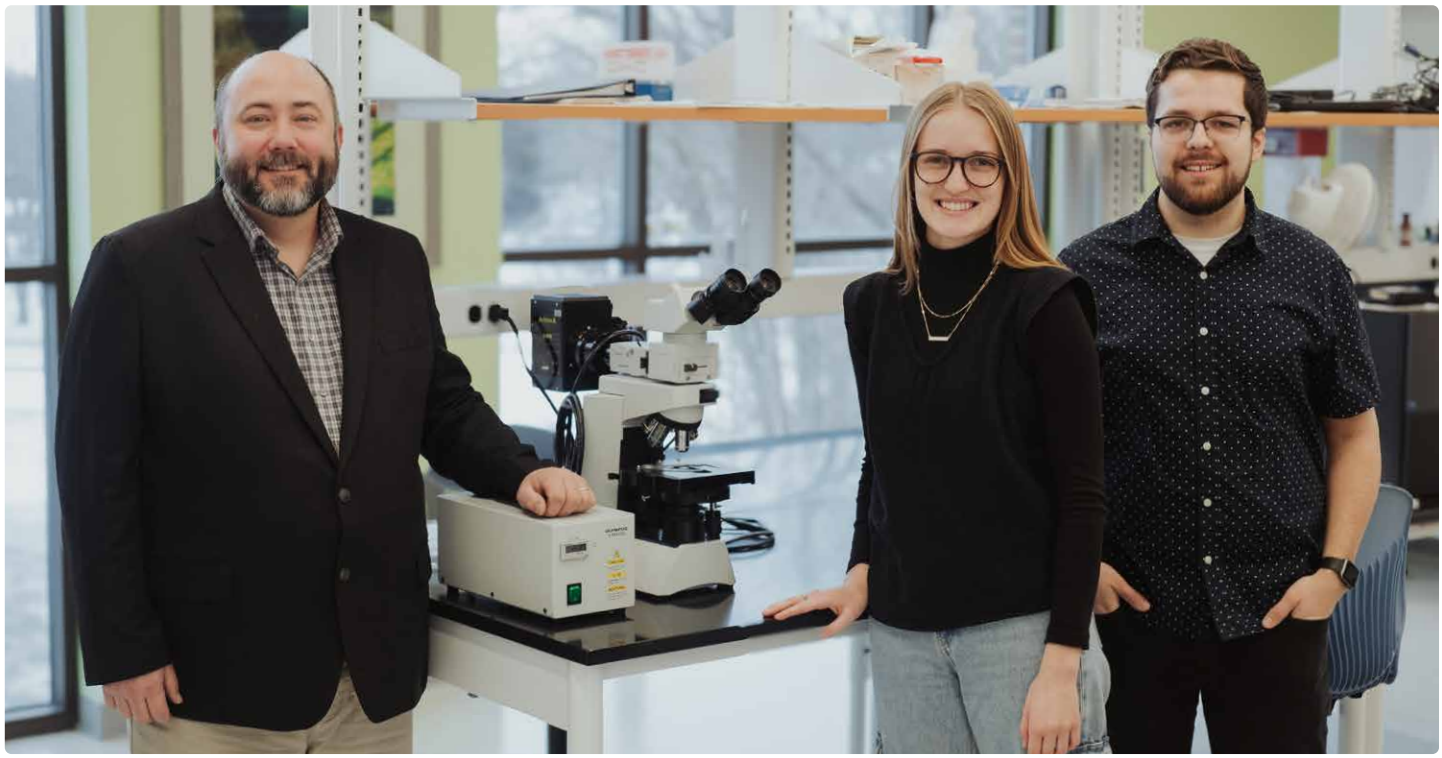


Dr. Joe Frentzel, Anna Crawford, Ethan Buller

ALGAE DETECTIVES

Uncovering clues to predict toxic algae blooms

"I remember when I started counting algae, I was dumbfounded," said Anna Crawford, algae team student leader at the Lilly Center. "We only see a mere fraction of the species. But they are beautiful, and their complexity is incredible."

Anna and her teammate Ethan Buller, a senior algae team member, spend their hours at the Lilly Center peering into microscopes. Thanks to training and supervision by Dr. Joe Frentzel, Anna and Ethan collaborate with the rest of their team to **identify** new and mysterious algae species in Kosciusko County lakes. Their aptitude for being algae detectives puts them at the forefront of a new process for counting algae: **biovolume counting**.

Traditionally, scientists counted individual cells to **investigate the relationship** between blue-green algae populations and the toxins they produce. Scientists thought that a large population of toxic blue-green algae would produce more toxin. New research at the Lilly Center and elsewhere however, shows that using algae counting to predict and prevent toxic algae blooms is more complex than thought!

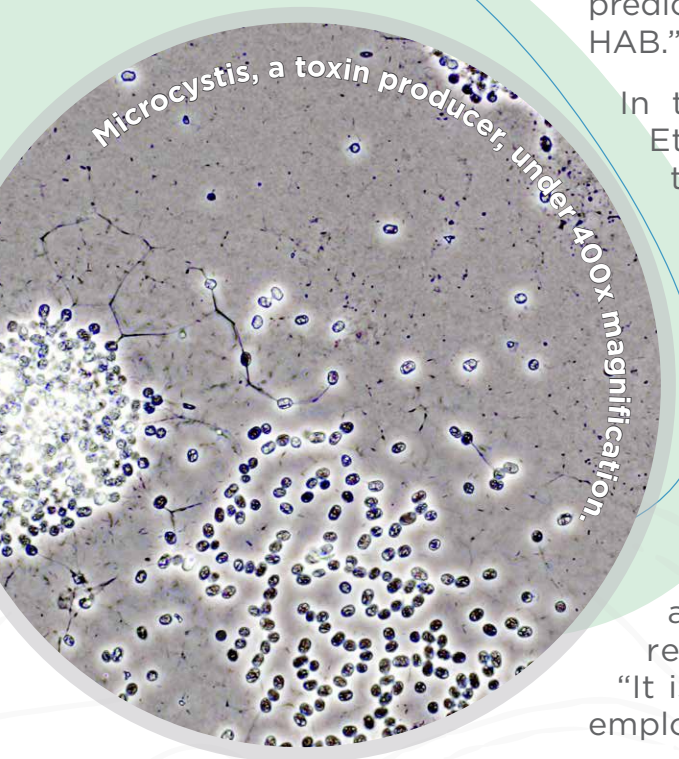
Dr. Frentzel, a cell and molecular biologist and professor at Grace College, explains biovolume counting this way: each blue-green algae unit is like a vehicle in a parking lot. The number of people each vehicle can hold is similar in concept to how much toxin an algal unit possesses. Although small sedans are popular, they only seat four. A school bus, on the other hand, can accommodate 48. In this analogy, past counting practices only *counted* the number of vehicles. Through biovolume counting, the algae team will study vehicle *capacity*, or in this case, the **volume of a cell capable of possessing toxin**.

continued on page 3...

Blue-green algae (also called cyanobacteria) that produce toxins act similarly. By understanding the capacity each cyanobacteria cell has to produce toxins, the Lilly Center can better **predict and prevent harmful algae blooms** (HABs).

Together, Anna and Ethan are spearheading this transition in the algae lab. Anna's leadership skills ensure that every team member knows their role and how to do it. Ethan's vast knowledge of algae helps provide quality checks on algae counting. Ethan also designs the counting sheets that integrate the complex equations necessary for biovolume counting.

> **We eventually want to be in the position of offering predictions.** Dr. Joe Frentzel



"**The goal is accuracy**," said Dr. Frentzel. "By following protocols laid out by the World Health Organization, we eventually want to be in the position of offering predictions in advance of an HAB."

In the meantime, Anna, Ethan, and Dr. Frentzel train algae team members monthly. They pass on information, but more importantly, they also help new students understand how beneficial algae counting is to their future careers.

"This experience prepares me really well and looks good on my resume," said Ethan. "It is unique to tell future employers I have four years of experience with such detail-oriented microscope work."

Dr. Frentzel agrees, "When students end their time at the Lilly Center, they are often more skilled in microscopy than second-year graduate students. Although it can seem like a niche skill, they can work in hospitals and laboratories or go on to graduate school."

Thanks to this **strategic research** by our algae detectives, they are continuously peeling back the mystery of Kosciusko County's lakes. As we understand what is happening in the lake, we can **make our communities safer** through the prediction and prevention of HABs. •

Learn more about toxic blue-green algae by visiting the Lilly Center's expert guide at lakes.grace.edu/blue-green-algae.

Ensure your lake legacy.

Join the Lilly Center Legacy Society by making a gift through several estate options with tax advantages. Talk to Dr. Nate Bosch about how you can join the Founders Circle and become part of an initial group of 20 members today:

574.372.5282 | boschns@grace.edu

ZOOM IN ON YOUR LAKE THIS YEAR

ALL YEAR

The Lilly Center Art Contest
4th-12th grade Kosciusko County students submit creative depictions of local waterways. Artists with winning entries receive cash prizes.

MARCH

Expedition: Wetland & Tree ID Hike
Join Scott Fetters and Jade Stuber for an enlightening walk around the Lilly Center's wetland area.

Workshop: The Small Farm of the Future
Guest presenter Dan Perkins will discuss how to incorporate cover crops and intercrop, and how to seed your garden.

MAY

Growing Together Part III: Rain Barrels
Rain barrels are a great addition to an earth-friendly garden. Make a rain barrel alongside other women with an interest in horticulture.

Family Fishing Weekend
This family-friendly event will introduce beginners to angling. The first 30 attendees will receive a free fishing license.

ALL SUMMER

Stories & STEM
Bring your family to the Warsaw Public Library for a nature story accompanied by a hands-on project. This event is offered weekly.

JUNE

Expedition: Learning on the Water
Paddle your way through lake history and science. Events are planned from kayak and from the shore.

JULY

Critter Encounters
Bring the family to meet multiple aquatic critters and participate in hands-on activities, including games, storytime, and art projects. You will get to touch, hold and/or feed the animals.

AUGUST

Growing Together Part IV: How to Save Seeds
Complete your women's gardening journey by learning how to save seeds from the Lilly Center's native landscaping for use in your own garden.

SEPTEMBER

Workshop: Save the Monarch
Monarchs are headed home; come say farewell with art projects, snacks, and educational talks for all ages.

OCTOBER

Expedition: Tree Hike
Join Dr. Bosch and Heather Harwood, Wawasee Area Conservancy executive director, on this hike and enjoy the beautiful fall colors in Kosciusko County.

Treats on the Trail
Come walk the Winona Lake trails, collect candy, and learn more about the amazing world of native aquatic critters.

Event details are subject to change. Most events are free but require RSVP.

Learn more about specific events and RSVP by scanning this QR code or by visiting lakes.grace.edu/events. •

MEET JUDY FISHER

Originally from Florida, Judy is a Grace College alum and studied business administration. Before joining our team, she excelled in various roles as an administrative assistant. As stewardship coordinator, Judy will curate materials for and communicate regularly with Lilly Center supporters.

Judy loves summer on Chapman Lake and she has lived lake-side for over 30 years! Her hobbies range from walking trails, boating, and reading. She also loves spending time with her four children and two grandchildren. •

Glad you're here, Judy!

2023 KOSCIUSKO COUNTY LAKES

WATER CLARITY

Water clarity is an important metric to understand the health of a lake. Generally, lakes that are clearer have fewer nutrients and, by extension, less algae. However, a clear lake **may be hiding bacteria, pesticides, or toxins,** like the ones algae produce. Read the full blog post at *lakes.grace.edu* or scan the QR code. •

Data by the Lilly Center for Lakes & Streams. Lake sizes not to scale.

Clarity
The average clarity of a lake in 2023.

Dissolved Oxygen
The average depth of fish habitat in 2023.

Total Depth

WAUBEE LAKE — 16.7 ft. / 27.2 ft. / 50.5 ft.
Highest average clarity

SHOCK LAKE — 14 ft. / 15.4 ft. / 59.1 ft.

SHOE LAKE — 14 ft. / 15.4 ft. / 28.9 ft.

KUHN LAKE — 11.5 ft. / 17.4 ft. / 27.9 ft.

LAKE WAWASEE — 11.1 ft. / 32.5 ft. / 81 ft.

SYRACUSE LAKE — 10.6 ft. / 19.7 ft. / 34 ft.

BIG CHAPMAN LAKE — 10.2 ft. / 20 ft. / 39 ft.

SECHRIST LAKE — 10.2 ft. / 24 ft. / 63 ft.

PAPAKEECHIE LAKE — 8.9 ft. / 16.4 ft. / 40 ft.

SPEAR LAKE — 8.8 ft. / 9.8 ft. / 27.9 ft.

DEWART LAKE — 8.7 ft. / 22 ft. / 82 ft.

STANTON LAKE — 8.5 ft. / 12.1 ft. / 29.9 ft.

IRISH LAKE — 8.3 ft. / 13.1 ft. / 36.1 ft.

LAKE TIPPECANOE — 8.2 ft. / 59.1 ft. / 122 ft.
Highest average fish habitat

CAMELOT LAKE — 7.9 ft. / 17.4 ft. / 31.2 ft.

HILL LAKE — 7.7 ft. / 16.4 ft. / 35.1 ft.

WEBSTER LAKE — 7.7 ft. / 18 ft. / 52 ft.

CENTER LAKE — 7.5 ft. / 17.7 ft. / 43 ft.

CRYSTAL LAKE — 7.5 ft. / 16.4 ft. / 48.9 ft.

OSWEGO LAKE — 7.2 ft. / 12.5 ft. / 37.1 ft.

BONER LAKE — 7.2 ft. / 10.8 ft. / 25.9 ft.

JAMES LAKE — 6.4 ft. / 19.7 ft. / 62 ft.

SAWMILL LAKE — 6.1 ft. / 10.8 ft. / 26.9 ft.

BIG BARBEE LAKE — 5.7 ft. / 20 ft. / 44.9 ft.

GOOSE LAKE — 5.5 ft. / 10.8 ft. / 53.1 ft.

WINONA LAKE — 5.5 ft. / 21.3 ft. / 79.1 ft.

LITTLE CHAPMAN LAKE — 5 ft. / 14.1 ft. / 32.2 ft.

CALDWELL LAKE — 4.9 ft. / 17.4 ft. / 40 ft.

BANNING LAKE — 4.3 ft. / 7.5 ft. / 17.1 ft.

LITTLE BARBEE LAKE — 3.9 ft. / 8.9 ft. / 25.9 ft.

YELLOW CREEK LAKE — 3.8 ft. / 13.1 ft. / 66.9 ft.

BEAVER DAM LAKE — 3.5 ft. / 9.5 ft. / 61 ft.

HOFFMAN LAKE — 3.4 ft. / 9.8 ft. / 29.9 ft.

RIDINGER LAKE — 3.2 ft. / 9.8 ft. / 42 ft.

PIKE LAKE — 3.1 ft. / 9.8 ft. / 35.1 ft.

DIAMOND LAKE — 3 ft. / 8.9 ft. / 35.1 ft.

ROCK LAKE — 2.7 ft. / 3.9 ft. / 15.1 ft.

LOON LAKE — 2.2 ft. / 7.5 ft. / 41 ft.

SILVER LAKE — 2.1 ft. / 7.5 ft. / 30.8 ft.

BACKWATERS LAKE — 2.1 ft. / 4.9 ft. / 6.9 ft.

CARR LAKE — 2.1 ft. / 8.9 ft. / 35.1 ft.

SELLERS LAKE — 2 ft. / 5.6 ft. / 21 ft.

MUSKELLUNGE LAKE — 1.5 ft. / 5.6 ft. / 21 ft.

PALESTINE LAKE — 1.4 ft. / 4.3 ft. / 26.9 ft.

MCCLURE'S LAKE — 1.4 ft. / 4.3 ft. / 29.9 ft.

2023 AVERAGES

Average clarity: 6.7 ft.

Average fish habitat: 14.4 ft.

Scan me!