

Lake Level Monitoring

Emily Heald



By Emily Heald, Water Program Coord., North Lakeland Discovery Center

It's a crisp, cool morning in May (or October). I am wearing my usual lake level monitoring outfit – long underwear, field pants, fleece pants (yep – three pairs of pants), long sleeves, a fleece jacket (oversized, so I can roll the sleeves up to get my hands in the water), all topped off with waders and a stocking cap. I take a few hand warmers out of their packaging, shake them, and toss them down into my waders. Getting in and

out of cold spring/fall lakes is no joke. Once my uniform is ready, I set off to the lakefront with my trusty volunteers, Al and Paul. Honestly, this ritual is one I look forward to every spring and fall, despite the cold water. This project is one of my favorite parts of my job.

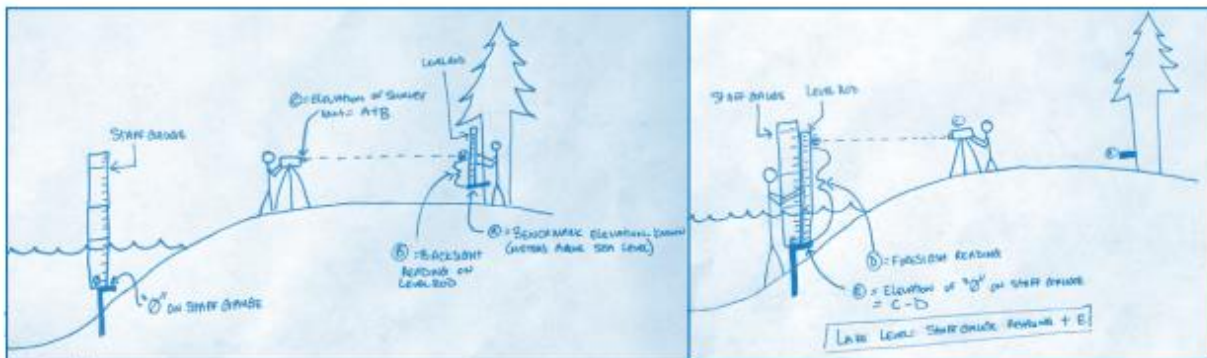
Lake monitoring enhances volunteers' knowledge of their lake, and often encourages participation in other citizen science programs such as water clarity and chemistry, loon activity, and aquatic invasive species monitoring.

Since 2010, the North Lakeland Discovery Center (NLDC) has coordinated a lake level monitoring project on 22 lakes in Vilas County. The project formed as a partnership between UW Trout Lake Station, the Wisconsin DNR, and NLDC

after concerned citizens and scientists began noticing very low lake levels around 2008 in northern Wisconsin. Each organization has different roles. Trout Lake Station and DNR helped us to create the monitoring protocols, and they are also the folks who analyze the data. But, I think I have the best role – I get to coordinate all of the wonderful volunteers, do the spring and fall field work, and (less fun) manage the data. I encourage you to check out the article Katie Hein wrote for the Spring/Summer 2019 *Lake Tides* titled "Lake Highs and Lows." She does a magnificent job of describing trends in lake levels throughout the state. To keep it short, our program collects long-term data required to compare how different lake types respond to precipitation events spatially and temporally.

Most of the lakes we monitor here in Vilas County are in Winchester and Presque Isle, but we do have a few "out east" in Phelps. We monitor big lakes (maximum 1,165 acres) and small lakes (minimum 21 acres), seepage lakes and drainage/drained lakes, lakes with and without public landings, and deep lakes (maximum depth 105 feet) and shallow lakes (maximum depth 16 feet). Each lake has a citizen scientist volunteer to record the lake level weekly during the ice-free season, but the action really starts right after ice out.

Most of the lakes in Vilas County are frozen until late April or early May. Once I have heard



Photos provided by Emily Heald



from volunteers that their lakes are ice free, AI, Paul, and I set out to each lake to install the gauges into the lake beds. It's a bit more complicated than simply pounding a fence post with a ruler into the lake, though that's definitely a piece of the puzzle. I drew a little diagram of how this works – try to follow along as you read this. At each volunteer's home, we installed a lag bolt into the base of a tree. We call it the benchmark. The benchmark does not move as the tree grows, it stays right at the base of the tree at the same level (trust me). A couple years ago, DNR came out and tied all of the benchmarks to sea level, so we know their exact elevations. The math was a little more complicated before we did this! Then, we use survey equipment like you see during road work. We know the elevation of the benchmark, so by surveying the level rod (it's just a big ol' ruler) we can determine the elevation of the survey equipment. Then we carefully turn the survey equipment towards the lake. We place the level rod at the bottom of the gauge in the lake at the "0" mark and take another survey reading. The elevation of the survey equipment minus the reading of the level rod tells us the elevation of the "0" mark on the gauge. So, to get the lake level, all you need to do is add your lake level reading from the gauge (just read the gauge marking where the water level is hitting) to the elevation of "0." Voila! We survey the gauges in the spring during installation and again in the fall before we remove them, to make sure the gauges haven't moved around.



My favorite part of this whole process is interacting with our volunteers. Our volunteer turnover rate is close to 0%! Folks have only "quit" volunteering if they move, and in those cases, a neighbor takes over pretty quickly. Our volunteers share their lake level data with their lake organizations for discussion. Lake monitoring enhances volunteers' knowledge of their lake, and often encourages participation in other citizen science programs such as water clarity and chemistry, loon activity, and aquatic invasive species monitoring. This connection of people to the natural world is invaluable to the program, as well as the ecology of the entire region. Not-so-coincidentally, connecting people to the natural world is also the mission of the North Lakeland Discovery Center. 🌊

North Lakeland Discovery Center (DiscoveryCenter.net) is a 501(c)(3) not-for-profit environmental education center located in Manitowish Waters, Wisconsin. Our mission is to enrich lives and inspire an ethic of care for Wisconsin's Northwoods through the facilitation of connections among nature, people, and community. Our education programming offers a variety of community programs throughout the year for all ages, as well as free drop-in activities including the Nature Center and guided nature hikes. Member activities include free onsite use of our canoes, kayaks, and snowshoes. Our water program works with local towns and lake associations on lake management planning projects and aquatic invasive species education, prevention, and management.



Emily Heald





North Lakeland Discovery Center added an event.

September 2, 2020 · 🌐



FRI, SEP 18, 2020

Full-Wait List-Palmer Tenderfoot Nature Conservancy Canoe & Hike

Manitowish Waters

0 Went · 7 Interested



North Lakeland Discovery Center added an event.

September 3, 2020 · 🌐



FRI, SEP 11, 2020

Bog Exploration and Hike

Manitowish Waters

0 Went · 6 Interested



North Lakeland Discovery Center

Published by Anne McDonnell · September 9, 2020 ·



Registration is still available for our upcoming Bog Hike and Exploration - this Friday, 10am-noon.

One of the most intriguing landscapes in Wisconsin, the northern bog is home to unique plants and trees, some of which are carnivorous. Learn about their amazing adaptations as we hike and experience this incredible wetland. This will be a quite the sensory experience! Taste, touch, smell, see, and hear all the bog has to offer. Register by 9/10. \$10 (\$7 members), all partici... [See More](#)



463
People Reached

19
Engagements

Boost Post

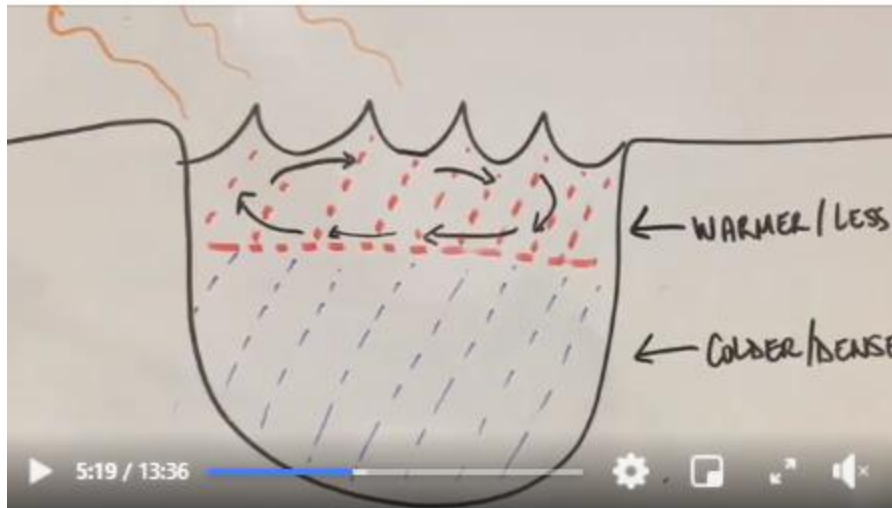


North Lakeland Discovery Center

Published by Emily Heald · October 8, 2020 ·



Hoo-wee! We have another interesting Discover for Home for you today! Join Emily on an exploration of the thermal layers of lakes. Trust us, it's more interesting than it sounds right off the bat.



749
People Reached

100
Engagements

Boost Post



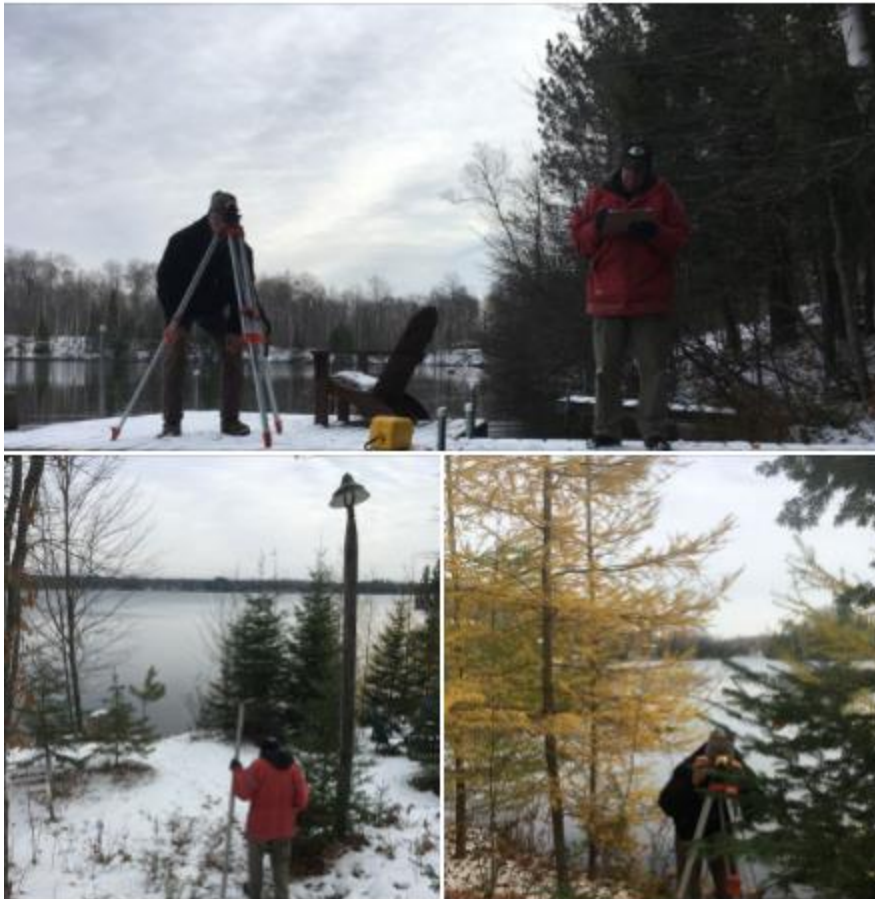
North Lakeland Discovery Center

Published by Emily Heald · November 3, 2020 ·



Neither rain nor snow nor sleet... wait that's the Post Office.... but wait, it applies to Emily, Al and Paul, too!

Last week was lake gauge removal week. Emily and her trusty volunteers (with social distancing, masks in enclosed spaces, separate vehicles, etc. Dont worry! We were very safe!) did a final calibration of the gauges and then pulled them out for the winter. This is part of our lake level monitoring program here at the Discovery Center. We monitor 22 lakes in Vilas County to see how their lake levels change over time. The data are used by researchers for all kinds of things - groundwater studies, precipitation studies, and climate change.





North Lakeland Discovery Center

Published by Emily Heald · November 6, 2020 ·



Hot off the press - another episode of Discover at Home. Time to have a serious chat with Emily.





Remember this new lake level project from a post back in June? Now that winter is here and the equipment is removed from the lake, we have some interesting results to share. As a reminder, we were monitoring evaporation, changes in lake level, and precipitation out on Statehouse Lake. Statehouse is a seepage lake, meaning it has no inlet or outlet.

- Statehouse Lake received about 550mm (21.7in) of rain from 6/2-10/5.
- About 250mm (45%) of that evaporated
- About 250mm (45%) of that seeped out of the lake into the groundwater
- About 50mm (10%) stayed in the lake and appeared as an increase in lake water level.

So, 10% of the precipitation that came into Statehouse Lake between 6/2 and 10/5 stayed in the lake. The remaining 90% seeped out or evaporated. We also found that more water flowed out than in. Which could indicate that we are sitting above the water table. Make sense? Because, gravity.

The lake responds quickly to rain storms (typical of a seepage lake), but sometimes the water level rises more than the rainfall amount. That could indicate a secondary source of water into the lake during rainstorms (groundwater, if the water table raised), or maybe from the adjacent bog. When rain stops, the level quickly declines due to evaporation and seepage. It's a dynamic little system!

Here's a fun graph below. Delta S is change in lake stage aka change in lake level (green line) as it responds to daily rain (black line)





North Lakeland Discovery Center added an event.

November 16, 2020 · 🌐



TUE, DEC 1, 2020

Discover on Demand: The Wonderful World of Wild Rice

1 Went · 21 Interested



North Lakeland Discovery Center

Published by Emily Heald 🌐 · November 19, 2020 · 🌐



Are you sick of hearing about lake level monitoring yet? No? Good, because here is another little tidbit for you, by golly. Check out the article about our lake level monitoring program in this season's Lake Tides: <https://www.uwsp.edu/.../vol41-vol45/vol45-4fall2020web.pdf> page 4.

Oh, you haven't heard of Lake Tides? Let's change that. It's one of the best newsletters out there for information on our precious water resources here ... [See More](#)

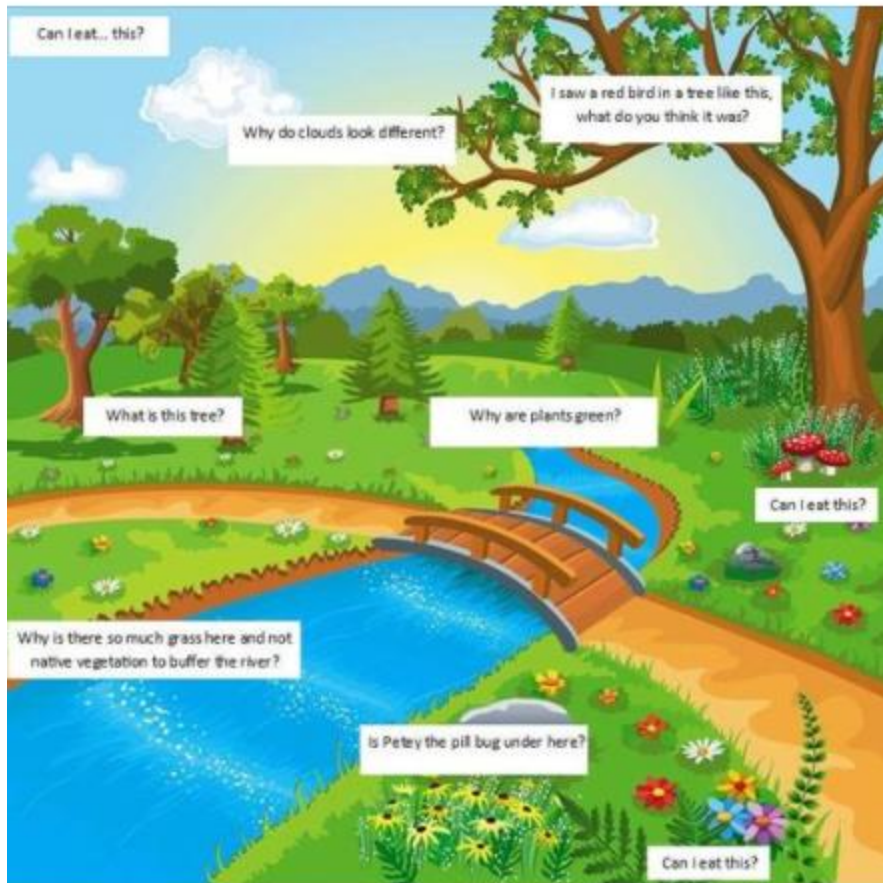
UWSP.EDU

www.uwsp.edu



Whose track is that? What are those lines of bubbles in my lake? Is this plant edible? Got questions about the natural world? Try to stump our staff with your inquiries and questions that you have pondered for years or a new puzzling observation from your own backyard. No question is too silly, all questions are welcome! We will do our best to demystify the mysterious ways of our wildlife, plants, waters and all things natural!

Share your questions on this post or send questi... [See More](#)





North Lakeland Discovery Center

Published by Emily Heald · December 11, 2020 ·



Here's the link to obtain your very own Salt Watch kit:

<https://www.iwla.org/.../stream-monitoring/winter-salt-watch>

Excuse my use of the words "sodium" and "chloride" interchangeably.

We are testing for CHLORIDE as a proxy for salt. -Emily





North Lakeland Discovery Center

Published by Licia Kuckkahn Johnson · December 19, 2020 ·



It's not a secret the lakes here in the Northwoods have been amazingly smooth and perfect for ice skating. While skating at a Northwoods lake, Naturalist Licia found this amazing pattern in the ice. We asked our water expert on staff, Emily, what might cause this incredible pattern, and here is what she had to say:

Early ice formation will get broken up (the lighter pieces) and then those pieces reformed together forming new ice. The whiter pieces seem to have more air bubbles in them, and when you see whiter ice like this, it can indicate that it formed more slowly. When you have the clear ice, or black-ice (the darker lines between the white ice) this ice formed more quickly and before air bubbles could get into it.

Fascinating, thanks Emily!!





North Lakeland Discovery Center

Published by Emily Heald · December 30, 2020 ·



Do the activities in these pictures look fun to you? That's because they ARE! We are pleased to announce we are accepting applications for summer water program positions. Check out our website for job descriptions and information on how to apply:

<https://discoverycenter.net/about-discovery.../employment/>

Our summer workers are KEY members in the water program, and help us to complete all of our fun projects such as aquatic invasive species surveys, plant surveys, Clean B... See More





North Lakeland Discovery Center

Published by Emily Heald · February 12 at 9:42 AM · 🌐



Thanks again to everyone who joined us for our 7th annual (but FIRST virtual!) Secret Love Lives of Animals program. And a very special thanks to the wonderful folks at the Koller Library for lending us the space, reliable internet, and emotional support.

Sarah at the library captured this very special moment of the three program staff as neotropical spiders. Annie (middle) is choosing Licia's (left) larger gift over Emily's (right) smaller gift. Masks hide emotions - Licia is reveling that Annie chose her pumpkin. Emily is so, so sad that her orange just wasn't good enough.





North Lakeland Discovery Center

Published by Emily Heald · February 19 at 9:00 AM · 🌐

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While it may seem like aquatic invasive species (AIS) aren't a concern during cold temperatures, all you have to do is pull up a line on some lakes to discover plants like curly-leaf pondweed are growing just fine under the ice.

Inspect sleds, buckets, and lures for AIS hitchhikers and remove them. That goes for even the tiniest plant fragment or animal like a zebra mussel. If you added water to a minnow bucket, that bait can only be used on the same waterbody. Always dump leftover bait you won't end up using into the trash; never on the ground or into the water.

Remember to follow state law:

INSPECT: all of your equipment for clinging plants and animals

REMOVE: anything you find. Throw it in the trash.

DRAIN: all water from your gear, including buckets and live wells

NEVER MOVE: live plants and animals away from a waterbody. Fish are considered dead if they are transported on ice.





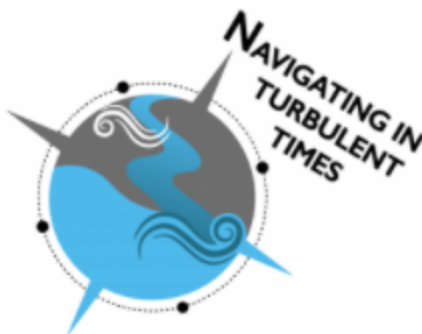
North Lakeland Discovery Center

Published by Emily Heald · February 22 at 9:00 AM ·



Are you registered for Wisconsin Water Week yet? If not, what are you waiting for?! It's an entire week of AWESOME presentations about water quality, invasive species, shoreline restoration, fish and other aquatic animals, stewardship, and more! And no, we aren't biased just because our water program coordinator is giving two presentations and moderating a few others... it truly is one of the best line ups we have seen!

This year is totally online, so you can view the sessions from anywhere. Check out their website for more information and details on how to register: <https://www.uwsp.edu/.../programs/convention/default.aspx> See you there!



North Lakeland Discovery Center

Published by Emily Heald · 3d ·



The Discovery Center, with the assistance of the UW Trout Lake Research Station in Boulder Junction, hosts one of the largest and longest running effort in Wisconsin to monitor lake water levels.

The project has monitored about 20 lakes for over 7 years, creating a unique data set used by scientists to create predictive models. UW Trout Lake and Wisconsin DNR scientists are using these data to predict effects of precipitation on lake levels, and to predict effects of changing lake levels on ground water flow.

Learn more about lake level monitoring, and if your lake is monitored, on our website:

<https://discoverycenter.net/.../citizen-science/lakelevels/>

Recently WXPR completed an article about water levels in Wisconsin as well: <https://www.wxpr.org/post/whats-wisconsins-water-levels...>

Interested in learning more? Contact our Water Program Coordinator at water@discoverycenter.net

DISCOVERYCENTER.NET

Lake Level Monitoring – Discovery Center

Lake Level Monitoring HomeLake Level Monitoring What is the lak...



 **northlakelanddiscovery**
North Lakeland Discovery Center

 **northlakelanddiscovery** Happy first day of fall, y'all 🍁
#NLDC #northlakelanddiscoverycenter
#fallleaves #optoutside
#winteriscoming
24w

👍 💬 📌 🏷️
Liked by [julie.e13](#) and 46 others
SEPTEMBER 22, 2020



 **northlakelanddiscovery**
North Lakeland Discovery Center

 **northlakelanddiscovery** Well this is a first! Yesterday we had TEN trumpeter swans land on Statehouse Lake. None of our staff have seen this happen before, so we were pretty thrilled!
#NLDC #northlakelanddiscoverycenter
#optoutside #birdingisforeveryone
#swan
21w

 **elizabethmstone5** Wow! Hopefully, they'll hang around. ❤️
21w 1 like Reply

 **jewelre15** Cool! ❤️
21w 1 like Reply

👍 💬 📌 🏷️
Liked by [riversedgemw](#) and 79 others
OCTOBER 9, 2020



northlakelanddiscovery



northlakelanddiscovery Cheers to the end of Lake Gauge Removal week! Emily and her faithful volunteers, Al and Paul, recalibrated lake level monitoring gauges and removed the gauges from 22 lakes this week. 'Twas a bit chilly, but we were in good company! Bonus points if you can figure which lake this is from the cryptic picture 🤔 #NLDC #northlakelanddiscoverycenter #science #wintercameearly

18w



sandkstevermer Island?



18w Reply

View replies (1)



Liked by abmcd2 and 24 others

OCTOBER 30, 2020



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northlakelanddiscovery Picture it: You're on a mission to link the Manitowish River with Mercer Lake. The only way to get there? Through a series of grueling portages. It's just you, your team, and hundreds of pounds of gear to paddle and portage across miles of undeveloped northern Wisconsin landscape. The only way to make it through is with a series of food caches and resting points strategically placed along the way. Settlers many years ago made this historic journey, and now you can, too. Only this time, the work has already been done and there is nothing to carry. Join a historian and naturalist on December 30 as they lead you on a hike through this incredible journey



Liked by julie.e13 and 29 others

DECEMBER 22, 2020





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North Lakeland Discovery Center



northlakelanddiscovery Do the activities in these pictures look fun to you? That's because they ARE! We are pleased to announce we are accepting applications for summer water program positions. Check out our website for job descriptions and information on how to apply: <https://discoverycenter.net/about-discovery-center/employment/> Our summer workers are KEY members in the water program, and help us to complete all of our fun projects such as aquatic invasive species surveys, plant surveys, Clean Boats Clean Waters interviews, and much much more! Please share with anyone you think would be interested. A great opportunity for college



Liked by [julie.e13](#) and 31 others

DECEMBER 30, 2020