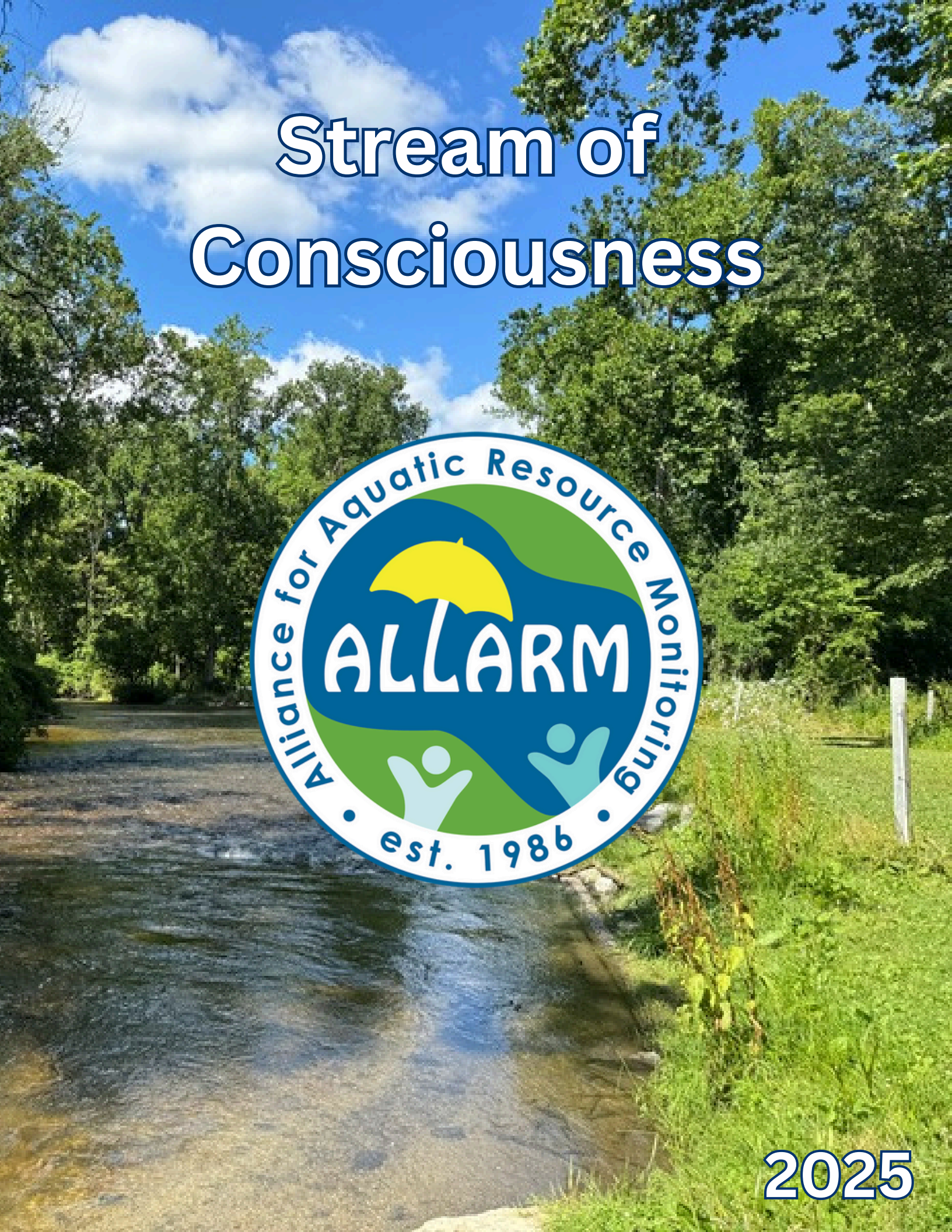
Stream of Consciousness



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Alliance for Aquatic Resource Monitoring

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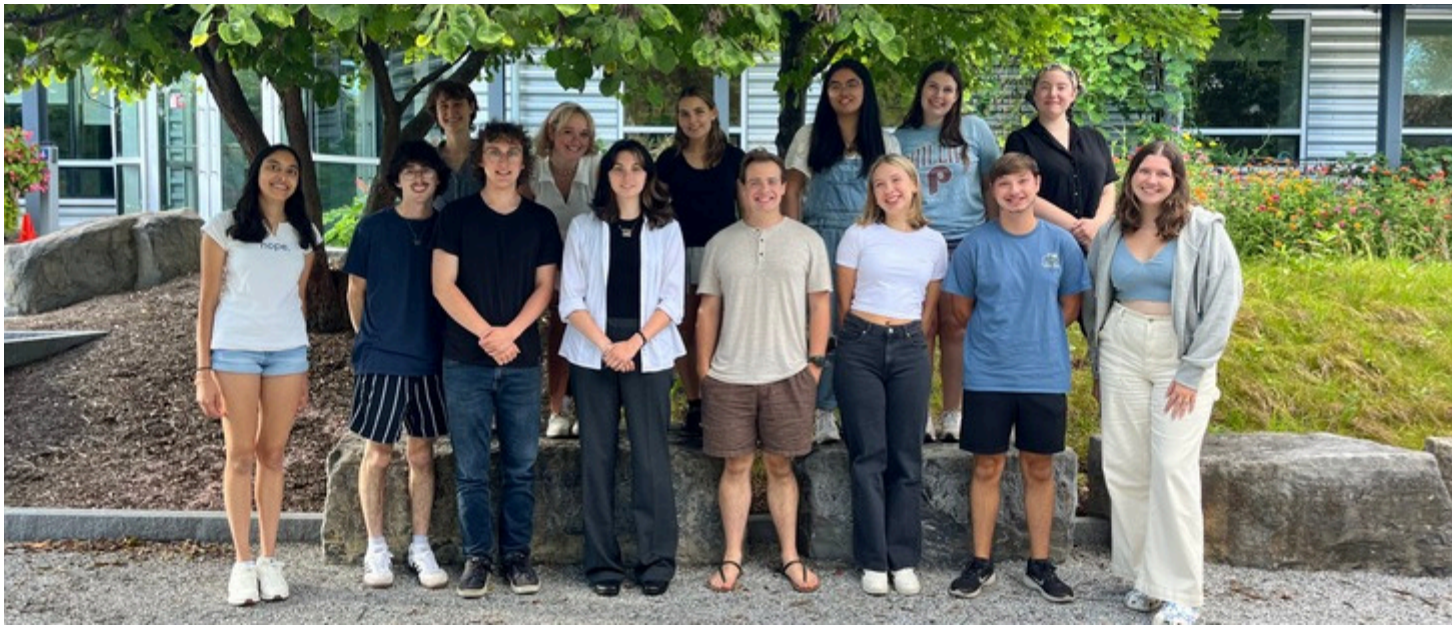

ALLARM Group Photo, Fall 2024.

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A Bend in the Stream.

Stream of Consciousness has been a part of ALLARM since 1988. As we approach ALLARM's 40th anniversary in 2026, we'll be looking back at the history of ALLARM as well as looking forward to the next 40 years. With this in mind, some changes will be coming to Stream of Consciousness. This will be the final written issue. Beginning in the spring of 2026, Stream of Consciousness will be a podcast. Both the staff and student employees at ALLARM are excited for this format change and we hope that this new media format will reinvigorate Stream of Consciousness by offering a wider variety of information and help us reach a broader audience.

In the meantime, we hope you enjoy our final written publication, and we hope you listen-in this spring to our first series of podcasts, available wherever you find podcasts.

Lane Whigham
Director of the Alliance for Aquatic Resource Monitoring (ALLARM) at Dickinson College

ALLARM Welcomes New Director: Lane Whigham

By: Ayako Ogawa '28

In March 2025, the Alliance for Aquatic Resource Monitoring welcomed Lane Whigham as their new Director.

Lane grew up in Blue Ridge Summit, Pennsylvania, where he was surrounded by nature. He spent a large part of his childhood exploring the forest and playing in the creeks, and this developed his interest in aquatic life. After graduating high school, Lane worked as a contractor for the Federal Emergency Management Agency (FEMA) where he designed training materials. After seven years of work experience, he went to school to study music and English at Wilson College. During his time at Wilson College, he focused on technical writing and applied these writing skills in an internship where he wrote training manuals at Letterkenny Army Depot.

Lane speaking at the Cumberland County Trout Unlimited Banquet.

Post graduation, Lane worked as an English teacher at Yellow Breeches Educational Center. He often brought his love of nature into the classroom by planning adventurous field trips for the students, such as rock climbing or kayaking. In order to spend more time with his family, Lane eventually decided to shift the focus of his career to environmental advocacy. He started at the Chesapeake Bay Foundation (CBF) in 2015. He combined his love for the outdoors and educational experience to become an educator for their student leadership program. Lane, along with student leaders, advocated for the awareness of clean water to protect Hellbender salamanders. They obtained support from state legislation, and the Hellbender salamander became the official amphibian of the Commonwealth of Pennsylvania. As he moved through his career, he took several roles managing fundraising and grants for environmental organizations such as DCNR and CBF.

As he has experienced many career shifts throughout his life, Lane advises students that they shouldn't "get too locked in", and that they should always "look at the opportunities that present themselves along the way, because there could be paths to explore that you haven't thought about". He is always open to new insights and chances to grow.

In his new role as the Director of ALLARM, Lane supports the organization and the staff by managing funds and grants and determining the direction of ALLARM. Since Lane has always loved working with students, he values empathy and the ability to put yourself into someone else's shoes. He emphasizes the importance of being able to identify what each individual needs to learn. Lane is excited to work with the students to grow their knowledge of water-quality protection work, but he is also determined to provide students with the support they need when it comes to their own professional development.

As we head into ALLARM's 40th year, he is looking forward to celebrating ALLARM, working with a full team, and sharing the new Stream of Consciousness podcast with a broader audience. "It is going to be a year of change. It is a little scary, but it's just as exciting."

ALLARM is excited to work with Lane to enhance our local communities.

Lane Whigham, Director of ALLARM.

Saying Goodbye to Jules Vastine

By: Michelle Cao ‘25

With 17 years as director, two as the assistant director, and three years as a student watershed coordinator, ALLARM and participatory science are no strangers to Jules Vastine. Even as a seasoned practitioner, Vastine says that there is “no one way to do participatory science”, and most importantly at ALLARM, they have learned to “walk with communities, in every step of the process” from study design to data use and when a volunteer retires from a project. Their intimate, yet supportive mindset has been an integral part of ALLARM’s mission and has led to productive collaborations and partnerships with volunteer scientists, grassroots environmental organizations, the larger Chesapeake Bay community, and state/federal partners throughout the country.

Born and raised on the Eastern Shore of Maryland, Jules Vastine developed a deep environmental and community-centered ethos as a result of their Chesapeake Bay roots – from necking for crabs to engaging in water sports. After taking the introductory environmental science course with Dr. Candie Wilderman (ALLARM’s founder and science advisor) at Dickinson, they discovered that they could major in a subject that meant a lot to them on a personal level. During the fall of 2000, they joined ALLARM as a watershed coordinator and transitioned into the assistant director role after graduating in 2003. In 2005 they became EarthRights International’s development coordinator in Washington DC. The ALLARM director position opened just as Vastine had received an offer to serve as EarthRights's assistant director in their Thailand office for a six-month trial. After going through the ALLARM search process and receiving the position offer, they were faced with a tough choice. However, after a conversation with EarthRights former executive director, Ka Hsaw Wa about doing work that calls to your heart and where your impact relates to your connections with your community, the decision was clear. Vastine returned as the ALLARM director in February 2007, where they felt they could make a positive impact in the Chesapeake Bay watershed.

Jules Vastine, Director of ALLARM from 2007-2024.

Under Vastine's leadership, ALLARM fostered collaborations with Pennsylvania, New York communities, Chesapeake Bay partners, and state/federal partners across the country. When Vastine returned to ALLARM in 2007, the watershed movement in Pennsylvania was shifting. After an incredible effort supported by the PADEP Growing Greener Grant program, which resulted in over 500 watershed organizations forming and the creation of the Consortium for Scientific Assistance to Watersheds (CSAW) the funding began to wane in 2007. Vastine helped ALLARM add programmatic tools to its CSAW offerings – strategic planning and volunteer engagement planning. In 2009, the PA environmental field began hearing about a new form of gas development – called hydraulic fracturing. In December 2009, ALLARM was called by 25+ community and grassroots organizations in Pennsylvania asking what role volunteer stream monitoring could play in assessing potential impacts from shale-gas extraction.

This call for help resulted in a collaboration between Jinnie Monismith (interim director, assistant director at the time) and Dr. Candie Wilderman to develop a pollution reporting protocol. When the protocol was ready, the team partnered with Trout Unlimited to train their chapters in 2011 and then Vastine began the process of rolling it out in PA, NY, and WV. In between 2010-2020 (the duration of the program) ALLARM conducted ~80 workshops, training 2,000+ people, Jules helped with 60+ of those workshops and went on to support 13 states and 2 Canadian provinces to explore the use of the protocol. Also, during this time, Vastine was able to raise additional grant funds to hire additional full-time staff. Although this work was emotionally taxing

Jules at Out on Britton, an event hosted by Dickinson College.

and did not result in long-term water quality data collection, the program was immensely valuable to travel throughout the region to support local communities. The ALLARM team was able to "show up for people when no one else was listening ".

Throughout ALLARM's history, the organization has always collaborated with volunteer and community scientists to answer water quality questions in the Chesapeake Bay tributaries. In 2015, when the Alliance for the Chesapeake Bay reached out to ALLARM to be a part of a team (funded by Chesapeake Bay Program – EPA) to help integrate data from communities and help train new volunteers to do water quality data collection throughout the Bay watershed, it was a quick yes! The team, which became the Chesapeake Monitoring Cooperative (CMC) – began creating the building blocks for the first multi-jurisdictional community-based aquatic data collection effort in the country. The CMC was an incredible opportunity for

ALLARM (and Vastine) to sharpen its quality assurance and quality control program, learn from other partners working in the Bay states, and develop something unique and useful that leveraged the incredible on-the-ground data collection efforts. This effort led to the launch of Stream Team to help support data collection efforts in areas with spatial and temporal data gaps in 2018 (with the support of the Lower Susquehanna Riverkeeper, the Middle Susquehanna Riverkeeper, County Conservation Districts, and Penn State's Master Watershed Stewards program). ALLARM was able to grow its team again with the ability to hire its first community science coordinator. At this time, Vastine helped to raise grant funds to support increase the ALLARM team to 4 full-time and 2 part time staff in addition to funding a regional equipment loan program (thank you Campbell Foundation, Chesapeake Bay Program, and PADEP funded CSAW!). Vastine's work on shale gas monitoring and the Chesapeake led to their appointment in 2019 as the Volunteer Monitoring Representative to the National Water Quality Monitoring Council where they launched the national volunteer monitoring network – and collaborated with

Jules answering questions about ALLARM during an interview.

practitioners at non-profits, academic institutions, as well as state/federal government across the country.

In 2020, in collaboration with the Alliance for Chesapeake Bay's Liz Chudoba (Jules's "Bay Bestie"), the two facilitated CMC's involvement to tackle a new idea (funded by the National Fish and Wildlife Foundation (NFWF)) to develop the first-ever community-based restoration monitoring protocol that tracks progress before and after best management practices (BMPs) and restoration projects are implemented. Vastine describes this opportunity as a "unique challenge" and appreciated the opportunity to learn, ask questions, and "be a kid in science again."

Beyond the impressive partnerships and national attention, Vastine's "human first" approach has driven their leadership and the way they show up for people. They describe their "school of thought" and integral value system as "human centric," allowing organizers to "show up for people with the tools we have." At the end of the day, volunteers share their time, or "most precious commodity" with us, and we need to find a way to celebrate and ensure their experiences are meaningful and worthwhile.

Vastine's "human centric" value bleeds beyond partnerships – it influences the internal team at ALLARM as well. When I joined ALLARM during my first year, I was met with immense support, connection, and a sense of pride. Both offices were decked out with colorful artwork, pride flags, affirmation notes, warm and fuzzies (launched by 2014 ALLARMie, Shanice Grant), a tea cabinet – you name it! The warmth and coziness of the office truly embodies Vastine as a human. Their energy and willingness to check in with full-time employees and students alike, build their

capacities, and see people as human first is incredible. This space has equipped me with the confidence to ask questions, broaden my understanding of aquatic science, and to ultimately be proud of the work we have done together. Vastine says they are proud to have crossed paths and mentored over 150+ watershed coordinators and employees thus far – truly a remarkable feat on its own!

Although Vastine's journey at ALLARM was impressive, they experienced several challenges along the way – namely, the Dickinson community's perception of ALLARM and community-based/ participatory science. Regardless of people's perception, Vastine is proud of ALLARM's dedication to helping volunteers and communities to do science to answer questions about water quality. "It is a unique privilege to work with volunteers who are dedicated to making a positive change in their community and environment."

Vastine describes their time at ALLARM as immensely rewarding and "an incredible space for [them] to grow up in and establish [their] footing in the field." They learned through the years "to be open to mirrors" and "be humble enough to accept feedback." They learned that "hard conversations don't need to be toxic nor personal," and that it is important to approach [people] with "calm[ness] and compassion."

At the end of our conversation, Vastine mentioned that they did not "leave [ALLARM] because they were unhappy or burnt out," they left a job they loved because they were offered a unique opportunity to help the EPA develop its participatory science architecture and to leverage the incredible work by volunteer and community scientists to implement its vision. They wanted to help the "EPA do it right." This driving mission is inspiring, and we wish them the very best moving forward!

Volunteer Spotlights: Jeff Gleim & Greg John

By: Amelia Harper '25

An essential part of effective stream monitoring is creative problem-solving. Every site has its own unique characteristics, and the same site can differ drastically from season to season or even month to month! The ability to adapt to different monitoring conditions and solve problems as they arise requires a fair amount of ingenuity; in response to these site-specific issues, some Stream Team volunteers have created DIY tools to streamline their monitoring processes. We at ALLARM would like to showcase their scientific creativity.

Jeff Gleim, a Master Watershed Steward through Penn State Extension who monitors Bermudian Creek and Doe Run in York County with Stream Team, has created several DIY tools in response to issues he noticed at his sites. I had the opportunity to talk with Jeff about his designs.

Jeff's monitoring site on Bermudian Creek requires taking a water sample from a bridge about 25 feet above the water. When using a simple sampling bucket attached to a rope, aerodynamics dictates that the bucket will tend to land in the water with the open end facing upwards, making

it extremely difficult to fill the bucket with water (ALLARM's protocol involves rinsing three times and then taking the water sample, which means the bucket needs to be filled up a total of four times). After noticing this during his first time monitoring Bermudian Creek, instead of continuing to fight against physics, Jeff created a new method. He attached a steel band to the rim of a bucket to help the mouth sink into the water, and a wooden float to the bottom of the bucket to prevent it from hitting the streambed and getting sediment in the water sample. He then attached an additional rope to the bottom of the bucket, allowing the rinses to be dumped out by pulling on the bottom rope to tip the bucket over without hauling it all the way back up to the bridge. This design allows for sampling even in shallow streams, and greatly reduces the time and effort needed to sample from a bridge!

Jeff has also dealt with seasonal challenges to monitoring. One winter, his site at Doe Run was mostly frozen over, making it necessary to walk out into the middle of the frozen stream to access running water for sampling. Jeff had previously collected data on how long ALLARM's temperature probes take to reach a stable reading and found that it can take several minutes when the water is near freezing temperatures. Having to crouch down in the middle of the stream for several minutes to hold the temperature probe in the water was not ideal, so he built a wooden float for the temperature probe using wooden pieces he already had lying around. The float consists of a wooden disc that fits snugly around the temperature probe to hold it steady in the water without sinking, and two strings: one attached to the top of the temperature probe and the other attached to the center of the disc. Holding the bottom string keeps the setup from floating away in the stream, and the top string allows the electronic temperature probe to be quickly pulled away from the water if it begins to tip over! Jeff likens using the float to "walking the dog" because the probe/float setup can be put together and then set down in the water, with the monitor standing comfortably and holding the strings to keep it from floating away. This setup makes taking temperature readings quite a bit more accessible.

Before Stream Team officially started measuring stage (a proxy measurement of water depth), volunteers would note the depth of their streams from month to month as "negligible," "low," "medium," or "high." Since Jeff's monitoring site on Bermudian Creek requires monitoring from a bridge, categorizing the stream depth by looking down into the water was not very effective. In order to get a more accurate depth measurement, Jeff built a clever measuring staff which uses a strip of gray fabric attached to a wooden staff—as anyone who's ever been rained on in a gray T-shirt knows, gray fabric turns dark when it gets wet! The staff is teardrop-shaped and has a weight (filled with leftover metal clippings from wire fencing) and a hydrodynamic stabilizer fin at the bottom, features which allow it to remain stable when lowered into moving water. It also has a hinge built into the middle so that it can be folded up for easy storage and transportation. The staff is lowered down on a rope from the bridge, and once it hits the streambed, lifted back up. The part of the fabric that was submerged in the stream is then easily visible and can be measured to get a very accurate assessment of stream depth.

fabric that was submerged in the stream is then easily visible and can be measured to get a very accurate assessment of stream depth.

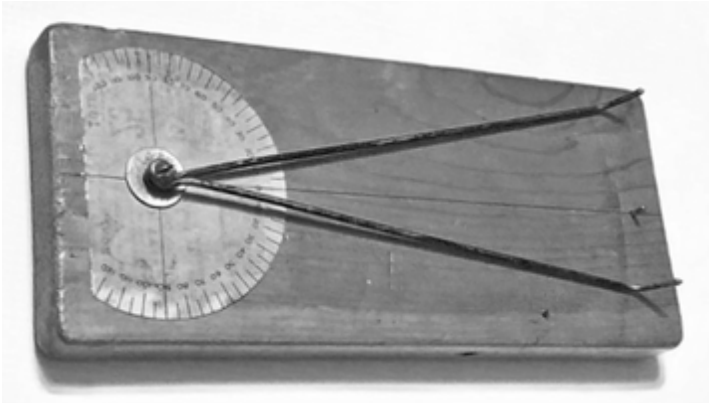
Jeff has presented his designs at the 2022 Chesapeake Watershed Forum and the 2023 Mid-Atlantic Volunteer Monitoring Conference (MAVMC) held at Dickinson College . Also presenting DIY equipment at the MAVMC was Greg John, who monitors two sites in Cumberland County: one on Conodoguinet Creek and the other on a small unnamed stream that feeds into the Conodoguinet. When measuring stage, it is important to measure in the exact same spot each time, which can be difficult in a stream that can look drastically different from month to month. Originally, Greg used two pieces of bedrock that sit a few feet apart in his Conodoguinet site in order to find the same spot each time. However, if the water was cloudy or if there was a lot of submerged aquatic vegetation, the two rocks were not easy to find. To combat this issue, Greg dug into his camping supplies and found a location finder tool that he had built with his father back when he was a Cub Scout with instructions taken from Boy's Life magazine. The tool consists of a wooden block equipped with a stationary pin, two movable metal arms, and a built-in protractor to measure the angles of the two arms; by triangulating using three stationary reference points around the stream site, it is possible to easily return to the same spot in the stream from month to month even if the stream looks very different!

Additionally, Greg attached a cheap extendable pole from the hardware store to the top of his temperature/conductivity meter and drilled a hole in the handle of the pole to attach a carabiner. This allows him to take temperature readings at the stream by clipping it to his person and extending the pole so that the probe hangs in the water, without having to squat down in the stream for an extended period of time. Additionally, since the probe can take a long time to stabilize when measuring

Jeff's handmade staff for measuring stream depth from a bridge. Image courtesy of Jeff Gleim.

conductivity, this setup also allows him to hang the pole from a cabinet handle with the end of the probe dipping into his water sample and go do something else while the conductivity measurement stabilizes.

Jeff and Greg have both generously put together instructions for building and using most of their creations. If anyone reading this thinks these tools might be useful for them, please contact ALLARM and we can share those instructions. We look forward to seeing what Stream Team volunteers come up with next!



Greg's location finder tool. Image courtesy of Greg John.

A Half Decade of Stream Team: Its Progression and Importance

By: Emma Spinelli '25

This year we are celebrating the 5th anniversary of ALLARM's Stream Team Program! While ALLARM's origins started in 1986, this program was created in 2019 out of partnerships between the Lower and Middle Susquehanna Riverkeeper Associations, County Conservation Districts, and Penn State Extension Master Watershed Stewards. The idea started from a desire for a standardized program to help organize volunteer water quality monitoring in the Susquehanna River Basin and more largely add to data collected in the Chesapeake Bay Watershed.

Discussions began in 2018 and our efforts to start up the program were very intentional, making sure to rely on engaging and recruiting interested volunteers via Master Watershed Stewards that have a requirement of volunteer hours per year. In this way, we knew that this program would get real, tangible use and we could expand from there. Additionally, ALLARM focused on creating a study design for Stream Team that allowed volunteers to have a set protocol for base water quality monitoring, upload of their data to a database and analysis of their data.

Picture taken from Middle Susquehanna Stream Team Celebration.

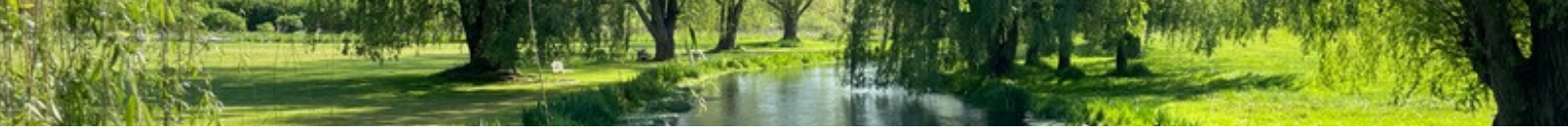
Our Stream Team model takes part in multiple steps when a cohort joins:

1. Facilitating an information session and workshop to train volunteers.
2. Holding a monthly monitoring workshop to do in-stream training, including testing for our water quality parameters (water temperature, conductivity, nitrate-nitrogen, stage, turbidity, and pH).
3. Holding follow-up meetings, one after their first month of monitoring and a second one after six months of monitoring. At both, we collect Quality Control (QC) samples and for the second one specifically we hold a data upload training.
4. Holding a macroinvertebrate workshop to train volunteers on our protocol for biological monitoring in the stream.
5. Hosting office hours and an eventual meeting for volunteers to share their findings from their individual Stream Team data information packets we give them. The packets include graphs, statistical summaries, discussion questions, and parameter information that are specific to their stream's trends.

Once our foundations were set, we were able to start holding workshops in 2019. The first pilot workshop for Stream Team took place in York County with the help of Ted Evgeniadis and Jodi Sulpizio (representatives of local riverkeeper and watershed steward networks). The training workshop was a success and because of that, we decided to expand to work next with a cohort in Cumberland County in 2019. In that year, Columbia County became involved and second cohorts in Both York and Cumberland County joined. Helen Schlimm, ALLARM's first community scientist specialist, helped to lay so much of the foundation for Stream Team and facilitate its beginnings alongside director Jules Vastine. The support Helen offered to volunteers included being their main point of contact, helping to organize meetings, and sending out newsletters with information about upcoming monitoring.

However, when COVID-19 hit ALLARM temporarily stopped monthly Stream Team monitoring, supplementing this shift with webinar sessions called Creek Courses to talk about water quality and water policy specific to the Chesapeake Bay watershed. Even though ALLARM was quick to adapt, our staff and volunteers were eager for more chances to connect again. As 2020 drew closer, ALLARM decided to facilitate more open call meetings to also maintain connections with our volunteer network. After waiting about 5 months, we also rolled out new COVID protocols and monitoring guidelines to allow for monitoring with reduced interaction with other volunteers. Another big milestone was that by August, virtual workshops started up and Lackawanna-Luzerne's cohort finally was able to start the procedure to join Stream Team. Around this time was when Stephanie Letourneau stepped up to the plate as Stream Team Coordinator.

In researching for this article, I had the pleasure of getting to speak to Stephanie about her time with Stream Team and her contributions to the program. During her



time, she organized and streamlined a lot of Stream Team processes and resources for volunteers. For example, she created a survey early on for volunteers to give her feedback and out of this she found many people wanted more connection to volunteers in other areas, leading her to create a cross-county Facebook group for volunteers to communicate. Additionally, she created a Stream Team email and worked with Jules to review Stream Team's study design at the time. After their review, they decided to add stage and water clarity as parameters, launching mini trainings on protocol and additionally decided to shift data interpretation workshops to a virtual setting permanently after its success during COVID. It was these kinds of adjustments that only helped the program to grow stronger. As for her thoughts overall, what stuck out to me most was her saying that "Stream Team volunteers are unlike any other volunteers I've met... What Stream Team volunteers can do and what they want to do—their drive to do more, their drive to make their own scientific discoveries—just amazes me."

Helen Schlimm leads Cumberland County Stream Team Information Session.

Since then, Stream Team has expanded to cover cohorts in eleven counties including Dauphin-Lebanon in 2021 with most recent additions in Lycoming-Clinton and in cohorts spanning Susquehanna, Wyoming, and Bradford counties. By late 2022, in-person workshops slowly started to be resumed with the first in-person macroinvertebrate monitoring taking place in that September. Since COVID, we utilize a hybrid model, balancing which format is best for each specific event and group we are working with. More in-person events have taken place with the introduction as Isabel Ruff has taken on the role. As of January 2023, she has been overseeing Stream Team as ALLARM's Volunteer Monitoring Specialist. In her time, she has been "making sure every monitor has everything they need, from equipment to trainings, to tools for data interpretation". Isabel's experience previously as a student watershed coordinator and invaluable knowledge has made Stream Team what it is today. In her own words, "It's been cool for me because as the third person in this role, I got to plug into something that was already moving and incredible, and so it's been more of a matter of making sure things are going smoothly, while finding more ways to grow and put my own spin on things. From building partnerships in new counties, to finding ways to celebrate Stream Team monitors and the program's history, it's cool to see what's next."

Today, with a total of 17 cohorts and roughly 130 active volunteers, Stream Team is as strong as ever. Our program design facilitates the training and utilization of chemical monitoring (pH, conductivity, and nitrate-nitrogen testing) and biological monitoring (macroinvertebrate collection) within our federally approved parameters.

ALLARM's work with the Chesapeake Monitoring Cooperative (CMC) in maintaining and adding to our Chesapeake Explorer Database then allows volunteers to put their work to use and have their findings recognized by the state. So much of the volunteers' work then helps to paint a greater picture of general water health in the Susquehanna tributaries through this.

Volunteers taking part in the first Macroinvertebrate Workshop since COVID.

To honor all the volunteers that have joined Stream Team and all their accomplishments, Isabel has planned, organized, and held a number of celebrations. In later September, we had two events celebrating volunteers from Lackawanna-Luzerne cohorts and the next day celebrating our Middle Susquehanna groups. Finally, we had our Lower Susquehanna celebration on November 16th. We have also been compiling different sites' milestones and accomplishments, keeping track of their number of monitoring events, volunteer hours, and dishes acid washed. We took this task on to compile this information as well as their starting point and 2024 benchmarks have then been put to use reminding volunteers of how far they have come and all that they have accomplished. More than anything, the significance of the five-year anniversary of Stream Team is that volunteers have been able to build successful programs through the Stream Team model and support system. Congratulations to all of you on all of your hard work!

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Chesapeake Bay Report Card C+

By: Kailey Sipe '25

History of Report Card Rankings

The Chesapeake Bay, a 64,000 square mile watershed spanning 6 states (PA, MD, DE, NY, VA, WV, AND D.C.), recently received its latest report card ranking for the year 2023-2024 (Bay Journal, 2024). Since 1998, the State of the Bay Report Card has assessed the health of the Bay, evaluating progress over time (Chesapeake Bay Foundation, n.d.). It focuses on a variety of indicators that assess both ecological (watershed indicators) and societal conditions (bay-specific indicators), from aquatic ecosystems to the economic impacts on surrounding communities (Vargas-Nguyen, 2024).

One of the most interesting aspects of the State of the Bay Report is its historical context. The overall health of the Bay is based on John Smith's observations from the 1600s, which serve as a historical benchmark for evaluating the Bay's condition (Chesapeake Bay Foundation, n.d.). Consequently, the State of the Bay Report serves as a benchmark for evaluating our progress in relation to Smith's initial observations of the Chesapeake Bay (Chesapeake Bay Foundation, n.d.). By evaluating progress against these early benchmarks, the State of the Bay Report not only reflects current conditions but also helps highlight the effectiveness of conservation efforts and the challenges that remain in restoring the Bay to its original state.

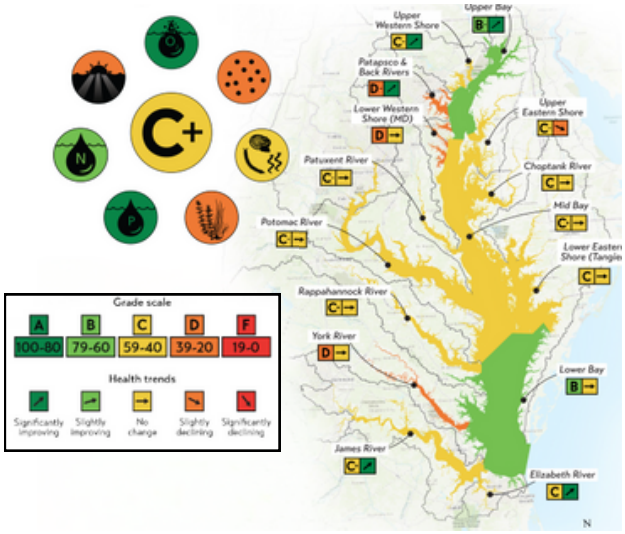

Image Credit: UMCES Chesapeake Bay & Watershed Report Card 2023/2024.

What made this year (2024) different?

The University of Maryland Center for Environmental Science gave the Chesapeake Bay an overall report card rating of a C+, its best health status in 20+ years (Bay Journal, 2024). The report card rating integrates scores from all regions of the Bay, based on nineteen indicators and health trends, which are categorized as "significantly improving, slightly improving, no change, slightly declining, and significantly declining" (Vargas-Nguyen, 2024). Out of 15 regions located within the Chesapeake Bay, eleven regions have increased their health score, while only 4 have decreased from previous scores (Vargas-Nguyen, 2024). The highest-scoring region was the lower bay (VA) earning a B, followed closely by the upper Bay (NY, PA) with a B-, while the mid-Bay (DE, VA, WV, D.C., MD) received the lowest score, a C+. There are several factors that can be attributed to these resulting scores

which include, but are not limited to, weather and biological monitoring parameters.

In the year 2023-2024, weather can be credited to general improvements within the Bay (Bay Journal, 2024). For example, 2023 was a "dry year" causing a "lack of rainfall and snowmelt," in turn reducing the amount of nutrient pollution and agricultural runoff into the Bay (Bay Journal, 2024). Additionally, the lower Bay saw improvements in phosphorus and dissolved oxygen levels likely due to 2023 being the "smallest dead zone on record," (Felver, 2024). A dead zone occurs when algal blooms die due to nutrient pollution, resulting in decreased oxygen (The Dead Zone, n.d.). The improvement in dead zone coverage can be attributed to reduced pollutant runoff entering the water due to this year's drought, which in turn would inhibit algal blooms that limit oxygen uptake in the Bay. However, even with these improvements, elevated concentrations of Chlorophyll a were observed in certain areas of the lower Bay (Felver, 2024). According to US EPA (2013), Chlorophyll a is a type of Chlorophyll found in algae and other vegetation, and it is used as an indicator of algal concentration in water, which directly affects water clarity. A high amount of Chlorophyll a within a water body presents low water clarity, preventing the growth of underwater grasses which are important in aquatic ecosystems (Submerged Aquatic Vegetation) (Felver, 2024).

The mid-Bay region, however, remains on a "no change trend," with underwater grasses showing no improvement, even following significant rainfall (Felver, 2024). As a result, the mid-Bay exhibits the clearest water due to the low levels of Chlorophyll a, which coincides with the decline of underwater grasses (Felver, 2024). This decline may be attributed to the ongoing drought conditions. Since this region of "no change trends" also lacks data in general, we hope to see more data exhibiting a positive trend in the next report card.

The upper Bay exhibited overall improving trends, which can be attributed to a reduction in nutrient pollution in Pennsylvania. Within the upper Bay, the Susquehanna River "has the second highest score in bay health," according to Bill Dennison, Vice President for Science Application at the University of Maryland Center for Environmental Science's Integration and Application Network. He added that the reductions in nutrient pollution in the region "underscore[s] the hard work in Pennsylvania on nutrient pollution and riparian buffers." The reduction in nutrient pollution in the upper Bay can be attributed to two key factors: 1. Watershed Implementation Plans (WIPs) and 2. the Conowingo Dam (Pennsylvania

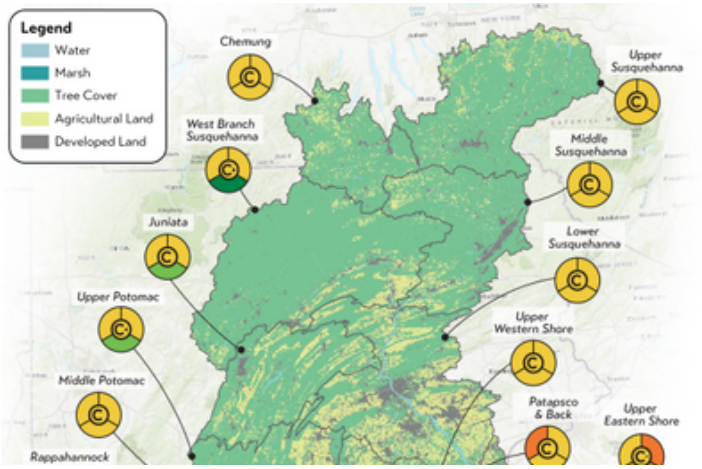

Image Credit: UMCES Chesapeake Bay & Watershed Report Card 2023/2024.

PA & NY Map of the Chesapeake Watershed.

Farm Bureau, 2021). The development of Watershed Implementation Plans (WIPs) in the upper Bay takes a "ground-up approach," that establishes “action plans for implementing farm conservation measures and other practices to achieve water quality goals" (Pennsylvania Farm Bureau, 2021). By involving county stakeholders in the process of reducing nutrient pollution, WIPs foster engagement and accountability, ultimately contributing to healthier water systems and reduced nutrient loading in the bay. Furthermore, the accumulation of sediment in the Conowingo Dam has likely contributed to the reduction of nutrient pollution in the upper Bay (Pennsylvania Farm Bureau, 2021). The dam has been effective in "trapping nutrients and sediment before they reach the bay"; however, research indicates that "it is reaching its capacity to trap pollution" (Pennsylvania Farm Bureau, 2021).

With these improvements in mind, it is imperative to support more effective efforts to restore the Chesapeake Bay’s health. Looking ahead, the Chesapeake Bay Foundation is launching a Beyond 2025 initiative to progress these restoration efforts past the original 2014 Chesapeake Bay Watershed Agreement. Beyond organizational initiatives, there are also meaningful efforts that individuals and communities can take to contribute to the Bay’s recovery.

What can we do to improve?

To advance progress in achieving the goals and outcomes outlined in the 2014 Chesapeake Bay Watershed Agreement, the Chesapeake Bay Program partnership formed a Beyond 2025 Steering Committee. The committee comprises of advisory committees, the commission, representatives of all jurisdictions, the EPA and other federal agencies, goal implementation teams, and 2 non-voting members (Chesapeake Bay Program, 2024a). The committee’s purpose is to “recommend a path forward that prioritizes and outlines steps for meeting goals and outcomes of an agreement beyond 2025” (Chesapeake Bay Program, 2024a).

Convening to draft a preliminary report, released on July 1st, the Steering Committee outlined a critical pathway and recommendations for the Chesapeake Bay watershed’s future. Specifically, the committee recommends: 1) adherence to the 2014 Chesapeake Watershed Agreement, 2) foster partnerships to ensure commitment fulfillment, and 3) advancing scientific research, restoration efforts, and partnerships. The final version of the draft report is scheduled for release in early 2025 (Chesapeake Bay Program, 2024b). In the meantime, there are several recommendations that can be implemented now to enhance the health of the Chesapeake Bay.

One significant factor affecting the health of the Chesapeake Bay is nutrient pollution, particularly from agricultural practices in Pennsylvania. Reducing this pollution can be achieved by minimizing fertilizer use on farms and implementing effective manure management strategies. To achieve this, farmers and homeowner can adopt effective nutrient management practices to prevent excessive fertilizer application on crops, plants, or grasses (US EPA, 2022). Additionally, restricting farm and domesticated animal access to streams can help minimize the runoff of excess nutrients from manure into the stream (US EPA, 2022).

The adoption of best management practices in our daily lives can significantly benefit the Chesapeake Bay. The Chesapeake Bay Program offers a list of these practices that individuals can implement to help protect the bay's health. Additionally, monitoring streams through baseline water quality monitoring and getting involved with local watershed organizations can further promote efforts to improve the bay's health. For more information, see Naisha's article on page 30.

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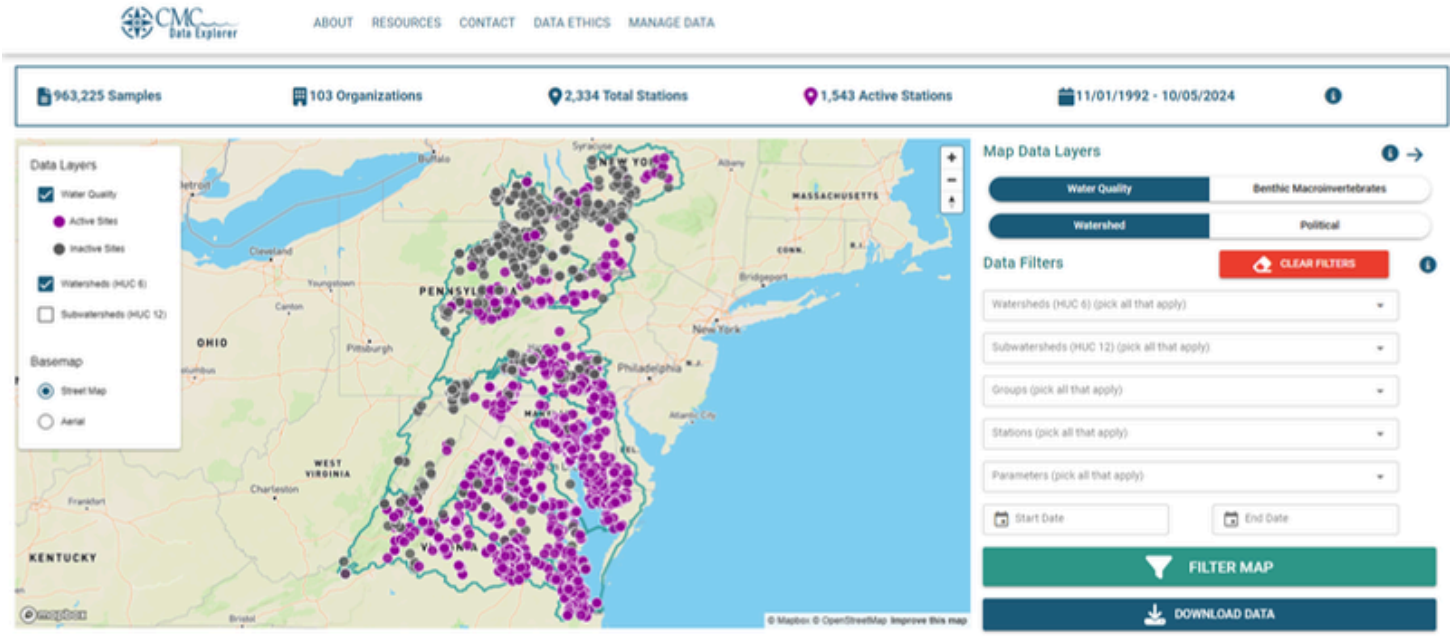
New Updates to the Chesapeake Data Explorer

By: Ben Connors '27

ALLARM's volunteers collect amazing data that can be used in a wide variety of ways, but in order for the data to be usable, it has to be stored somewhere public and accessible. The Chesapeake Data Explorer is an online tool that is used by data collection groups all over the Chesapeake Bay Watershed. ALLARM has been using this tool to store the data that is collected by volunteers in one cohesive and public place. Recently, ALLARM has begun to host workshops for groups of volunteers to teach them how to enter their own data straight into the database. For example, I previously helped with a workshop teaching the data upload process to volunteers on the Johnson's Run Revitalization Council. In this workshop the volunteers got a step-by-step walkthrough of the data upload process, were given a space to ask questions and try it themselves. They concluded that the upload process was very easy to understand. Previously, the volunteers would enter their data into a google sheet, and ALLARM would go through the data and bulk upload into the data explorer. However, now that volunteers are beginning to learn how to enter their own data, they are becoming even more empowered and gaining more autonomy over the volunteer monitoring process. ALLARM will offer guidance or assistance when required, but the volunteers are getting increasingly involved in a larger portion of the volunteer monitoring process. The Data Explorer recently received some updates to its homepage that are making it much more user-friendly. Anyone interested in using data collected by ALLARM volunteers should be aware of how these changes are



The New homepage of the Chesapeake Data Explorer.

improving the accessibility of the data.

The Chesapeake Data Explorer contains 5 pages that are easily navigable. Two of these are the “About” and “Contact” pages. The “About” page provides a brief description of the data explorer and the associated groups including ALLARM. The “Contact” page provides contact information for when a user is having issues with the database. These two pages did not receive any significant changes besides being adjusted to look more polished and welcoming.

There is also the “Resources” page which provides manuals and tutorials for assistance with navigating the database. All of the previous resources remain but were updated to account for the big changes which have yet to be discussed. Some images have been added, and the page has been modified to look more aesthetically pleasing. The page is now easier to navigate, and less overwhelming when a volunteer is searching for help. There is also the new “Data Ethics” page which answers questions regarding the integrity of the data.

The last page on the website is the “Manage Data” page. When this tab is clicked on, the website directs to the old version of the Chesapeake Data Explorer where data can be uploaded exactly as it was before. Since the uploading process was working as intended before the updates, there was no need to make changes to potentially complicate the process. This was a good decision, because it is beneficial to keep the process of data entry simple. Changing it drastically could cause confusion amongst volunteers and create the need for more trainings. Linking the old version of the data explorer to the updated version offers a familiar data entry process that prevents confusion.

The page undergoing the biggest changes is the home page of the database. Previously, the home page consisted of two parts: a map section and a query section. The map section provided an outline of the Chesapeake Bay Watershed with green dots on the map indicating sampling sites. The green dots varied in hue to represent how many sampling events took place at each site. There was also an option on the map to look at water quality sampling events or macroinvertebrate sampling events. The other section was the query section which allowed you to search for a specific site by county, subwatershed, monitoring site, parameters and more. This provided a way for volunteers to search up data for any water body they would potentially be interested in.

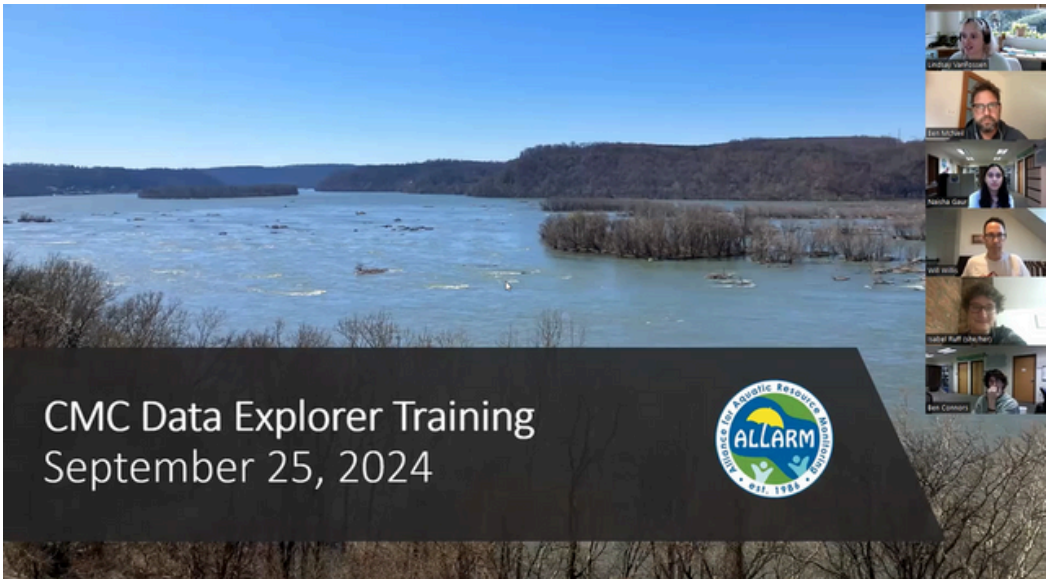
The updated Chesapeake Data Explorer home page combines the map and query pages into one that will be easier for volunteers to navigate. The query search bars are all directly to the right of the map, and when a filter is searched for, the map will adjust and zoom in or out to fit the sites that fall within the search filters. It is very important that when trying to search under multiple filters, click the “Filter Map” button after each filter to ensure that the search is done correctly. When looking for parameters at a certain sampling site, the database also provides graphs, which it did before, but now the graphs are bigger and easier to digest compared to the older version. There are still dots on the main map representing sampling locations, but instead of being measured by the quantity of sampling events, they are now categorized as either an active site or an inactive site. An inactive site means no sampling event has occurred in the past 5 years. The inactive sites appear on the map as gray dots, but the active sites are now a

vibrant purple. This helps make the active sights stand out more than in the old version. This method of characterization is more user-friendly and makes the map an even more useful tool for people searching for data.

I talked to ALLARM's Volunteer Monitoring Specialist, Isabel Ruff, who was a big contributor to the beta testing of the new updates. Isabel set up the beta testing with the idea of making it similar to a lab class or a training workshop to see how people interact with the database. This provided feedback from the beta testers that would be similar to the volunteers' interactions with the database, which allowed for a greater understanding of what changes needed to be made.

When asked about any particular strengths of the new updates, Isabel immediately cited the updated graphs on the home page. She thinks that the extra detail added to the graphs make it easier to digest, and the ability to add multiple parameters to a graph will help people explore and learn more about how certain parameters can influence others, which gives them a greater understanding of how their stream functions.

With all these fantastic updates to the Chesapeake Data Explorer, ALLARM is hoping to introduce more volunteers to this website to put more power in their hands. These updates to the homepage make the website more friendly to first-time users and make it easier for community members to access any water quality or macroinvertebrate data that they would like. All of this supports ALLARM's mission of empowering communities through data and community science.



Lindsay VanFossen leads the Chesapeake Data Explorer training for the Johnson's Run Revitalization Council.

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ALLARM and the Southern Tier New York Susquehanna Basin Monitoring Program

By: Crosby Wilkin ‘26

ALLARM, as experts in community science and water quality monitoring in The Chesapeake Bay, is often asked to help other organizations or groups with their own monitoring programs and grant writing. ALLARM has been involved in tons of these different grants and monitoring projects all across PA, but we have rarely dipped our toes outside of our PA waterways. However, that is changing soon, as ALLARM will be heavily involved in a new grant in New York! Specifically, ALLARM has been asked to assist with the Southern Tier New York Susquehanna Basin Monitoring Program.

It all started when ALLARM contacted the Upper Susquehanna Coalition— or the USC—which is one of our partner organizations working to improve the Upper Susquehanna River Basin. Since the USC is one of the only partners we have that operate in New York, ALLARM reached out to ask about New Yorks state goals for the Susquehanna, to compare them to state goals for PA. There was a general lack of water quality data in NY, and the USC was unsure of how much water quality monitoring was happening even happening. ALLARM and the USC collaborated to make a survey to gage community involvement in monitoring which found that there was very little water quality monitoring in NY. This survey got the attention of the Susquehanna River Basin Commission—or SRBC—who asked for ALLARM’s help in applying for a new grant to start a more in-depth monitoring program.

The SRBC will be the primary recipient

Taken by Isabel Ruff at the Upper Susquehanna Watershed Forum.

of the grant and leading the program. All other assisting groups, including ALLARM, will function as contracted helpers. ALLARM will be primarily helping the SRBC with the community outreach aspect of this project, although much of the specific aspects of ALLARM’s role is yet to be determined. The stated goal of the program “… is to coordinate surface water monitoring activities among numerous entities that work throughout the Susquehanna and Chemung River watersheds in New York State”. The SRBC has 4 main tasks they would like to complete in a 5-year timeframe. USC—which is one of our partner organizations working to improve the Upper Susquehanna River Basin. Since the USC is one of the only partners we have that operate in New York, ALLARM reached out to ask about New Yorks state goals for the Susquehanna, to compare them to state

goals for PA. There was a general lack of water quality data in NY, and the USC was unsure of how much water quality monitoring was happening even happening. ALLARM and the USC collaborated to make a survey to gage community involvement in monitoring which found that there was very little water quality monitoring in NY. This survey got the attention of the Susquehanna River Basin Commission—or SRBC—who asked for ALLARM's help in applying for a new grant to start a more in-depth monitoring program.

The SRBC will be the primary recipient of the grant and leading the program. All other assisting groups, including ALLARM, will function as contracted helpers. ALLARM will be primarily helping the SRBC with the community outreach aspect of this project, although much of the specific aspects of ALLARM's role is yet to be determined. The stated goal of the program "... is to coordinate surface water monitoring activities among numerous entities that work throughout the Susquehanna and Chemung River watersheds in New York State". The SRBC has 4 main tasks they would like to complete in a 5-year timeframe.

SRBC Main Tasks

Task 1:

The first task of the grant is to support New York state integrated reporting goals. The main components of this task are:

- Collecting and compiling water quality data.
- Analyzing and displaying this data online.
- Coordinating meetings with stakeholders to convey these results and to determine new monitoring sites.
- Developing a monitoring plan and implement it.

Collecting the data will take place in the first two years of the plan. Developing and implementing a monitoring plan will take place after the first year. Analyzing the data will take place in year two and year three. The meetings with stakeholders will take place throughout the entire plan. ALLARM will be supporting the SRBC throughout all aspects of this plan in some capacity. This will most likely consist of community outreach work to help coordinate the stakeholder meetings.

Task 2:

The second task of this grant is to coordinate activities to address stakeholder concerns. Completing this task consists of:

- Compiling the other concerns of stakeholders which may require action.
- Providing stakeholders with the appropriate technical assistance and contacts to develop action plans to address their concerns.

Both aspects of this plan will take place after the second year of the plan. ALLARM will also be heavily involved in this task. However, our main role will be providing support in the form of training volunteers and providing technical assistance to volunteers who will be carrying out the action plan.

Task 3:

The third task is to collect more data in order to help support progress on the Chesapeake Bay restoration goals. This will include:

- Using nitrate sensors to collect data on nutrient pollution at 5 locations.
- Analyzing the data collected by the sensors.
- Analyzing the biological data compiled in Task 1.
- Developing an action plan on how to better meet bay goals.
- Providing technical support for these new action plans.

The nitrate sensors will be running throughout the 5-year plan. Sediment and nutrient data analysis, as well as the biological data analysis, will take place in the first two years of the plan. The action plan will begin development after the first year, and it will be implemented after the second year. Like task two ALLARM will primarily be assisting with the creation and implementation of the action plan. ALLARM will be leading training and providing technical support to volunteers in order to help them carry out the action plan.

Task 4:

The fourth task is to create a monitoring plan to evaluate the effectiveness of at least one of the Stormwater Best Management Practices found in the Department's Stormwater Management Design Manual. Completing this task will involve:

- Identifying significant BMPs and consider candidates for study.
- Conducting a study to determine effectiveness of the chosen BMP.
- Summarizing the results in a variety of ways.

The monitoring plan will begin development in year two. The study itself will take place in year three and year four. The data presentation will take place in the 5th year of the study. ALLARM will be less involved in this aspect of the grant, as outreach isn't a large part of conducting this study.

Isabel standing at the confluence of the Susquehanna River and the Chenango River.

Overall, I found learning about this grant super interesting, as I got to learn about partner groups I was unaware of, as well as the grant writing process, which I had never been exposed to before. It is undeniable that this is an exciting time for ALLARM and our partners in New York. It is not only a great opportunity to spread our wings outside of PA but also to help the Chesapeake Bay as a whole. While it is only in its infancy, I see a lot of potential for this grant to help make a big difference for Chesapeake Bay.

The Watershed Alliance of Adams County: Community and Continuity

By: Marja Barrett ‘26

The Watershed Alliance of Adams County (WAAC), founded in 2000, has now been around for twenty-five years – making it one of the oldest monitoring groups that ALLARM is involved with. From its inception to today, even as it has grown and evolved as an organization, WAAC’s priority has remained the same: the protection and improvement of Adams County’s watershed. To better understand WAAC and the people behind its mission, I interviewed Vice President Pat Naugle, Secretary Lesa Bird, Lab Coordinator GailAnn Rickert, and Master Watershed Steward Coordinator Karen Kaslow.

WAAC’s methods for protecting their water resources are numerous: they engage in stream monitoring, pathogen testing, tree planting, and community education and advocacy (“Watershed Alliance of Adams County”). These efforts both involve the community and gather data on local waterways, which can then be provided to townships to help them improve their watershed.

WAAC measuring stage using the in-stream protocol during a workshop with ALLARM.

WAAC and ALLARM measuring stage using the bridge protocol.

Their stream monitoring program is one of WAAC’s “foundational initiatives.” Volunteers collect and test water samples monthly for nitrates, phosphates, sulfates, acidity, conductivity, and temperature (“Watershed Alliance of Adams County”). Pathogen testing is a newer addition to this initiative, where volunteers test for E. Coli in recreational areas to ensure the safety of those swimming and fishing there. In 2022, the first year of testing, WAAC tested 21 sites and found pathogens to be above acceptable levels at 16 of them. After some investigation, WAAC found that human DNA comprises most of the pathogens – leading to questions about wastewater treatment

and septic systems. I asked Pat if this data has led to changes in community wastewater management to which he responded with the importance of understanding data before communicating it with others. This typically occurs over a long-term period of regular data collection, so WAAC is hoping to continue monitoring pathogens in waterways – while researching codes around private septic systems – before communicating findings to townships.

Another major component of WAAC is the Adams County Planting Partnership. Pat explained WAAC's transition in 2017 from stream cleanups to tree planting as a way of receiving greater lasting benefits for their efforts. This partnership is a component of the Chesapeake Bay Foundation's Keystone 10 Million Trees Partnership, and since WAAC has been involved this effort, they have grown from distributing 500 trees in 2018 to planting more than 22,000 trees in 2024 ("Watershed Alliance of Adams County"). Not only does this promote a healthy watershed, but this program also aims to educate citizens on how trees benefit waterways, a part of which involves working with local schools in planting and education efforts.

WAAC's relationship with ALLARM started before they were their own organization, back when they were a part of the Environmental Alliance for Senior Involvement. Although this relationship has changed over time, ALLARM has provided WAAC with assistance in creating a study design, technical training, and helping volunteers maintain credible results. Lab Coordinator GailAnn emphasized that WAAC is currently looking to ALLARM to standardize their process of water monitoring. This will help them thoroughly understand their measurements to better share data outside of Adams County so individuals throughout the Chesapeake Bay watershed can access it – something Karen noted was their biggest challenge as an organization.

Community response to WAAC has been well-received, as there is evident enthusiasm in workshop attendance, tree planting, and volunteer engagement. Lesa mentioned that WAAC has also earned a respectable reputation in the community and their suggestions are taken seriously by townships. Pat noted how proud he was of the organization for maintaining a strong presence in the community for a quarter-century.

WAAC volunteers testing for orthophosphate.

Given this, I asked all interviewees what advice they would give to communities who are concerned about their waterways. The resounding response was that people must become educated on the important issues facing their waterways – and then take action. It is crucial for individuals to cultivate a deeper

understanding of these issues to understand why they occur and how they impact them. There are also many nonprofit watershed groups individuals can become involved in, especially throughout the Chesapeake Bay Watershed. WAAC champions a powerful lesson: education and involvement create community and continuity. Looking to the future, as Adams County faces new challenges, WAAC will be there to respond and work with the community.

ALLARM leading a monthly monitoring training with WAAC.

The Importance of Collecting Baseline Water Quality Data

By: Naisha Gaur '27

At ALLARM, our Stream Team volunteers and partner organizations regularly monitor their local stream health, collecting what is known as baseline water quality data. They monitor chemical parameters such as pH, water temperature, conductivity, and nitrate nitrogen in order to better understand the normal, or baseline, conditions for their stream. One might wonder, why collect data regularly, when the stream looks to be in good health? Why not just save the time, money, and energy, and only run tests if there looks to be something wrong with the stream? The best way to understand the importance of collecting this baseline data regularly is by comparing it to your annual health checkup (Wilson, 2004). Most people go to the doctor's office every year for their annual physical, even if they feel healthy. Annual checkups allow for early detection of health problems, such that the treatment of those issues takes less time, is more effective, and costs less. The same goes for stream health — Stream Team volunteers are conducting the "bloodwork" for the stream! This allows for early detection of any pollution within the stream (Lynde, 2004).

When we wait to conduct testing until there are apparent signs of pollution, we might have trouble identifying the cause of the issue. One pollutant can cause a multitude of effects, which can lead to changes in a variety of parameters. Additionally, it is much more expensive and difficult to restore the stream back to its original state. Speaking of which, without baseline water quality, we would not even know what this original state is! Baseline data serves as an important comparator to see if any parameter values are changing significantly (Merritt, 2018).

Baseline water data is not only critical for scientific reasons, but also for legal reasons as well. For cases of contamination by large companies, the burden of proof is most frequently put on residents living in the area. Communities must organize on their own and hire a lawyer to defend them, which takes time and money that community members often lack, putting them at a disadvantage in these cases. However, having credible baseline data can give communities a leg up in these confrontations (Mall, 2011). For example, baseline data was used to confront the government and oil companies during the well-known water contamination incidents due to hydraulic fracturing, or fracking, in Pennsylvania. Starting in 2004, Range Resources began drilling for natural gas in the Marcellus shale region. The company disposed of their wastewater by treating it and releasing it into nearby streams. Residents started to complain about their water quality, but both the state government and company dismissed them, stating that there were always small amounts of toxic chemicals in the water. The Harry Enstrom Chapter of the Izaak Walton League (a national community science and conservation organization that also monitors water quality similar to ALLARM) was able to use baseline water quality testing to prove to the government that action needed to be taken to prevent Range Resources from continuing their practices (Merritt, 2018). Many environmental groups are starting to push for requiring baseline well water testing prior to any oil and gas drilling, which goes to show the importance of this type of data collection (Mall, 2011). In this way, baseline data can be leveraged as a tool for community advocacy and empowerment.

Cumberland County Stream Team volunteer performing baseline water quality testing even in the winter! (Photo taken by Don Horn, 2024)

This is not to say that baseline data is only necessary when oil drilling is occurring. The 2015 Gold King Mine chemical spill in Colorado is another great example of the importance of baseline water quality data. Colorado has many historic mines from the Gold Rush period in the late 1800s. The EPA was looking into the Gold King Mine in particular to see if it qualified for aid under the Superfund Act, a law passed in 1980 that provides funding for the cleanup of abandoned hazardous waste sites ("Superfund: CERCLA Overview," 2024). During the investigation, despite the attempt to reduce the leaking of toxins out the mine, the EPA contractors accidentally

caused a major spill of hazardous chemicals into Cement Creek, which flows into the Animas River, eventually making its way to the Colorado River. The EPA vowed to return the stream back to its original state, but that was an ambiguous marker considering the EPA had not been monitoring the stream previously. Thanks to the Colorado River Watchers, a local volunteer water monitoring collective that had been collecting baseline water quality data in the area, the EPA was able to know exactly what "normal" conditions looked like for the Animas River (Merritt, 2018). An example like this goes to show that even when oil and gas companies are not involved, dangers to water quality are always present, and thus baseline water quality data is always helpful to have on hand. If the Colorado River Watchers had not been collecting this baseline data prior to the spill, the EPA would not have been held to any sort of standard with regards to the river's healthy state, which might have allowed them to make some cost-saving compromises.

In order for baseline water quality data to be reliable, there are a few measures that should be taken. Firstly, consistent data collection is key. Collecting data at least every month creates a clear picture of the stream's attributes. Year-round monitoring, if weather permitting, is very helpful to have so that we can see trends in the parameters across seasons; that way, we can distinguish between regular, natural changes versus abnormal changes to water quality. Additionally, it is important to collect data around the same time every month, so that there is an equal length of time between each collection, minimizing the effects of confounding factors. Finally, this quality of data should be acquired for a few years so that a representative average of each of the parameters can be assessed.

All of this, along with many more specifications about how data is to be collected and processed, is encapsulated in a Quality Assurance Project Plan, or QAPP. In collaboration with our partners in the Chesapeake Monitoring Cooperative (CMC), we co-created a QAPP to document all volunteer monitoring procedures and the quality assurance/quality control (QA/QC) measures for all of the methods that the CMC uses. QA/QC aspects of ALLARM protocol range from replicate steps in data collection and testing procedures to additional reviews done by ALLARM staff on the backend. For example, volunteers measuring multiple replicates and triple rinsing all equipment, as well as ALLARM staff double checking data entries and conducting annual sample data verifications using our benchtop laboratory equipment. Additionally, the QAPP is federally approved, which allows ALLARM volunteers to widely use the data they collect within the scientific community and beyond.

Members of Northern Tier Stream Team conducting baseline water quality monitoring. (2022)

In short, collecting reliable baseline water quality data is investing in the future (Onifade et al., 2023). Taking time to regularly test local stream health can help drastically if any problem arises later on. Thus, the work being done by ALLARM volunteers, as well as all other citizen scientists doing similar work such as the members of the Colorado River Watchers, allows for much more time, energy, and money to be saved in the future. Just as we thank our doctors for keeping us healthy, we can thank our water quality monitors for keeping our streams healthy!

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Science Communication: Equipment Videos

By: Max Carfrey '26

Introduction to the Importance of Scientific Communication

Bridging the gap between science and volunteers is a necessity, especially here at ALLARM when it comes to making our protocols accessible to volunteers who are completing water quality monitoring. Historically speaking, volunteers have not been considered "scientists" because they volunteer their time to assist scientists who are educated in the field. Therefore, there are gaps in scientific knowledge that need to be filled for our volunteers who are actively participating in and doing science. Utilizing technology, we have found various ways of communicating this scientific knowledge—allowing our volunteers to employ specific tools to aid them in monitoring the health of their local streams. In the past, ALLARM has created equipment videos to walk our volunteers through the protocols so they can collect the most

accurate and effective data. By creating these walkthroughs, we facilitate environments where volunteers feel confident in their collection because ALLARM is there for each step of the scientific process and assists in any way based on volunteer needs.

The Process:

In the Spring of 2024, I had the opportunity to add our Colorimeter(measuring nitrate/nitrogen and orthophosphates in a sample) and Stage(water level of a stream) protocols to our list of equipment videos on ALLARM's YouTube channel. Previously, Hayat Rasul '19, had created a playlist of equipment videos and I was tasked alongside fellow ALLARMie, Whimsy Mark-Ockerbloom '24, with continuing this process to create helpful tools for our volunteers. We began the pre-production process with creating scripts for the Colorimeter and Stage protocols based on our stream team manual. This entailed us referencing the protocols to come up with a written dialogue for when voice overs would be added in and notes on what types of footage we wanted to incorporate into specific parts of the video. After completing the script, storyboarding was the next step in the process to plan out more clearly the camera shots, angles, focuses, etc. so that it would be representative of the protocol and helpful to those watching. This process was completed by examining the written dialogue and breaking down what text needed to match up with what camera angle so the scenes could be created. Then, we would sketch out a basic overview of what we imagined the scene to look like in our heads and add notes to them for when filming would take place.

After pre-production had concluded, we were ready to move into the actual production process! I borrowed a Canon SL3 SLR camera, tripod, and lapel microphone to film and got to work alongside my colleague. We started with the colorimeter video; I directed, cinematographed, and edited the video, with Whimsy acting in the video as well as helping me out with anything else needing to be completed. In terms of timeline, it took a handful of Wednesdays to complete the introductory filming, and then weeks of editing to get it in shape for the first draft. To try and break things up, we would choose specific sections to film in the middle of the week, and then I would spend my other shifts editing, piecing the shots together to create a cohesive narrative. While feeling daunting at times, this process was incredibly fun and rewarding because it allowed for a lot of creativity to show through while creating useful tools for volunteers!

Struggles Along the Way:

Creating this sixteen-minute colorimeter video was no easy task, and Whimsy and I worked extremely hard to ensure that the video had everything it needed to be useful to our volunteers. During our process, we ran into many different issues that kept pushing us back and delaying the video from being uploaded. Filming ran relatively smoothly besides a couple of retakes for camera shots, but the real difficulties began during the editing process. After each day of shooting, I would upload the footage to an ALLARM hard drive where are the files could be kept organized and safe. However, some of the permissions on the Dickinson computers would not let me put the downloaded files directly on the hard

drive so I would have to ask the FTE to use their computers to transfer the files. Complicating the process further, uploading a sixteen-minute video to share with those who were reviewing it for edits was tricky because the file was too big to send through many platforms. Slowly but surely, I worked through the rest of the necessary changes to finalize the video. After months of edits, reshoots, time-off during summer, helpful feedback from FTE + our staff scientist, the colorimeter video is finally posted!

Strong Takeaways from This Project:

Talking again with Whimsy after completing the project, he told me that "the colorimeter video is important because ALLARM is focused on accessible community research and science. We author and produce these videos so that they can be understood by anyone that wants to take part in studying and conserving their waterways, no matter their familiarity with the technology." By creating these equipment videos, our shared hope is that we can begin to bridge knowledge gaps and foster environments where there is a shared environmental understanding. "Everything we do is for the volunteers! We're here to help them help the world and the waterways," Whimsy exclaims to me. Lindsay VanFossen, our incredible Water Quality Technician at ALLARM, reflected on the process saying "I was thrilled when Max and Whimsy took on the colorimeter video project, as it's something we have been wanting to create for a long time. The meticulous behind-the-scenes work involved in collecting a single data point—such as triple rinsing, reagent blanks, and routine equipment maintenance—often goes unappreciated. Having a well-crafted video to highlight these critical QA/QC processes is a great step toward enhancing the clarity and accessibility of our protocols! As a visual learner myself, I found the video incredibly helpful to contextualize the written protocols. I know many of our volunteers and partners can relate to being visual learners which brings to light the importance of educational videos for both ensuring quality and improving accessibility."

Overall, this has been my favorite project to work on at ALLARM so far because it allowed me to indulge in my passion for film while creating a beneficial tool for our volunteers. I think it's extremely important to educate everyone on the importance of keeping our local waterways healthy because we rely on them and cannot live without them. All of our volunteers are scientists, whether they have the official title or not, and it is integral that we all have the same scientific knowledge and communication so that we can work together.

Mid-action shot during one of our film shoots for the Colorimeter video!

The Science behind pH Analyses

By: Uyen Bui '27

Colors make the world we are living in wonderful, and they can also inform us of the characteristics of nature around us. In water quality monitoring, colors play an important role in measuring the pH level in streams. At ALLARM, pH level is a crucial parameter that is regularly monitored with varying equipment such as the LaMotte Precision pH Kit, Fisherbrand Accumet XL200 pH/Conductivity meters, and ColorpHast pH Strips. With each method, a different type of pH Indicator is provided to help express color or a data point that correlates with the pH level of the water sample. In this article, we are going to explore the chemistry behind these three types of pH analyses.

What is pH?

Before digging into how the pH analyses work, let's remind ourselves about what pH is. pH helps us determine how acidic or basic a water sample is. From 0 to 14, pH is measured on a scale—with 0 being most acidic, 7 being neutral, and 14 being most basic. To put this into perspective, limes are acidic with a pH ranging from 2-3 pH units, water is neutral with a pH of 7, and baking soda is basic with a pH of 9. The pH scale is logarithmic; this means that as the pH drops per one unit, the acidity will increase in a ten-fold unit. In pH testing, hydrogen (H+) and hydroxide (OH-) ions are important components. The concentration of these ions in water samples is what decides the pH level. If H+ and OH- ions are equal in concentration, the pH level is neutral. However, if the H+ ion concentration is larger than that of OH-, the water is acidic and if the H+ ion concentration is less than that of OH-, the water is basic. Understanding the concept of pH is important to better understand the mechanism of pH Indicator and the ways we measure pH.

FUN FACT:
What is basicity?

- Basicity refers to the ratio of hydrogen ions (H+) and hydroxide (OH-) ions that make up water.

Why Do We Do pH Testing?

According to US EPA water quality criteria for pH in freshwater, it is suggested that the range for these bodies of water is 6.5 to 9 (PH | US EPA, 2024). Additionally, aquatic organisms prefer an environment with an optimal pH range to thrive in, which can be from 6.5 – 8.0 (Addy, K., Green, L., Herron, E., 2004). Outside of this range, these organisms are impacted physiologically, resulting in problems with reproduction and other bodily functions, causing some species to die out which decreases biodiversity. Changes in pH levels can also lead to consequences for aquatic resources. When the water is too acidic, some metals can change their chemical state such as solubility and bioavailability (PH | US EPA, 2024). This phenomenon can affect aquatic organisms negatively as they are more likely to be exposed to an environment with higher dissolved metal concentrations. When the pH level is too

basic, stream health can be impacted by the changes in the water's chemical state. Most importantly, this drastic increase in pH can disrupt the nitrogen cycle chemically as nitrogen-fixing microorganisms convert atmospheric nitrogen into ammonia. This phenomenon can result in the unionized form of ammonia (NH3) dominating the ionized form of ammonia (NH4+) (PH | US EPA, 2024). Since NH3 is more toxic to aquatic organisms than NH4+, the stream can potentially suffer from ammonia toxicity. As a result, changes in pH level can lead to negative impacts on aquatic life, resulting from the changes in the stream water chemistry.

Due to these issues, ranging from decrease in biodiversity to the chemical state of the stream being negatively affected, it is essential to consider pH levels when it comes to aquatic resources monitoring! Thanks to equipment like the LaMotte Wide Range pH kit and the ColorpHast pH strips, in addition to participatory science involvement, monitoring pH is as accessible as ever!

Mechanism of pH Indicators.

At ALLARM, we use different methods to measure the level of pH in streams that we monitor. Although these are differing methods with vastly different equipment, they all have one goal of accurately capturing the pH levels in water samples we collect. In this section, we will explore the mechanisms behind the pH indicators of each method listed earlier.

The LaMotte Precision pH Kit is used by ALLARM's Stream Team as well as several of ALLARM's external watershed partnerships. This pH kit can measure pH levels in a range from 3.0 to 10.5 with color expression. Shades of red and yellow indicate the level of acidity of water samples while shades of green and blue indicate the level of alkalinity, the ability of water to neutralize acids. Inside each pH kit, a Wide Range pH Indicator is provided.

FUN FACT:
What is alkalinity?

- Alkalinity refers to the capability of water to neutralize acids. Measuring alkalinity is important as it tells us about how well the streams can handle acid pollutants—if it has an alkalinity level that is too low, the stream is at risk of not being able to neutralize the acid inputs.

As this solution is made from multiple ingredients, it can capture and express colors on a wide range of pH levels. For this formula of the solution we use, the pH indicator includes Ethyl alcohol, Methyl alcohol, Dinitrophenol, Potassium hydroxide, and Phenolphthalein. While the LaMotte Precision pH kit measures the amount of hydrogen (H+) and hydroxide (OH-) ions which make up water (H2O), the indicator itself reacts with water in the sample to form the hydrogen ions H+ and hydronium ions H3O+ (which are rarer). Through this reaction, molecules in the indicator express colors to indicate different levels of pH based on the amount of hydrogen ions that interact with the Wide Range pH indicator. As a result, the pH indicator can display the colors violet, blue, green, yellow, orange, and red—informing us of the pH levels of the water samples.

Pictured Above: Octa-slide 2 viewer.

For Quality Control analysis at ALLARM, we use the Fisherbrand Accumet XL200 pH/Conductivity Meters for pH testing.

FUN FACT:

At ALLARM, monitoring pH of streams includes a vigorous round of quality control (QC), which is a process of measuring pH levels from our volunteers' QC samples and compare with the pH results measured from water samples they collected to ensure the quality of data collected.

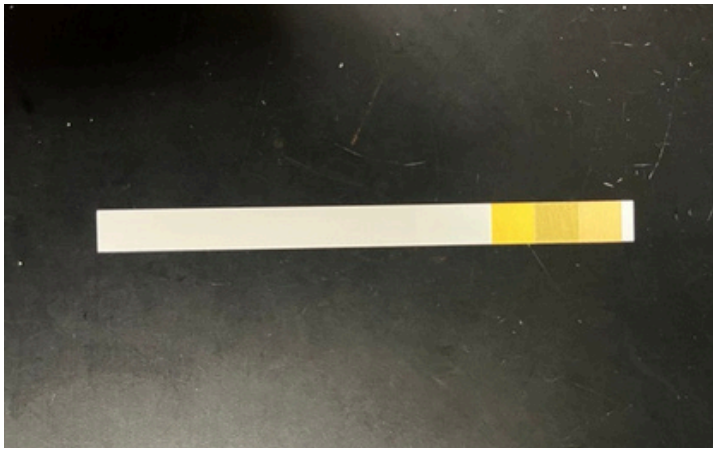
This method is used in the lab by our incredible ALLARM watershed coordinators to quality control the samples collected by volunteer scientists and additional statewide partnerships. Contrary to the previous method, we do not have to rely on comparing the color of the solution to a standard pH bar. The meter would then help us calculate the pH level through a process of conversion with the potential measured from the pH indicating electrode and the constant potential measured from the reference electrode. The basis of the Accumet's mechanism is that the electrode is sensitive to H+, helping both electrodes work in harmony to give us a pH result. To stabilize the electrodes, when they are not being used, they are usually submerged in a buffer solution, which is a pH 4.0 solution for the meter at ALLARM. This helps the electrodes resist pH change when there is contamination with acidic or alkaline solutions. Overall, the Fisherbrand Accumet XL200 pH/Conductivity Meters is a powerful tool for watershed coordinators working in a lab as ALLARM puts a strong emphasis on Quality Control/Quality Assurance!

Pictured Above: pH Electrode Accumet.

The last pH method we use at ALLARM is the colorpHast pH strips. This method is primarily used by our regional partners for their own volunteer monitoring programs. This method is similar to the LaMotte Wide Range pH Indicator as the strips work by changing color to express pH level and were made from different chemical ingredients

that help indicate pH levels. These ingredients differ on the squares that can be seen on each strip, and they are unique as they contribute to the wide range of pH levels and colors the strips can express. To dive deeper into the chemistry of the changing-color phenomenon of the ColorpHast strips, they can express colors because of the chemical interaction of the

Pictured Above: ColorpHast pH testing strip box.



Pictured Above: ColorpHast pH testing strip.

H+ ions or H3O+ ions in the sample water and the pH indicators that differ in each square of the strip. This interaction occurs as a proton exchanging process. So where does this proton come from? As the above-mentioned hydrogen ions have a positive charge, the protons (positively charged particles located in the nucleus of an atom!) come from these ions. Since acid donates protons and base takes up protons, depending on the type of pH indicator in the strip, the color of the strip will change based on this chemical interaction. As a result, the strip can change into different colors; we would then compare it with the color legend to get the final answer.

These methods of pH testing have been used extensively by our amazing scientists and Stream Team volunteers at ALLARM . For each piece of equipment, they have a different accuracy rate because of their unique designs catered towards different purposes. For our volunteers, the LaMotte precision pH kit and colorpHast pH strips are accessible, cost-effective, and easy to carry around. For our scientists in the lab, the Fisherbrand accumet XL200 pH/Conductivity meters, for Quality Assurance/Quality Control purposes, they have a higher accuracy rate. Having a wide range of pH indicating tools have allowed folks to use what works best for their monitoring program and data use goals. Thanks to them, we have been able to monitor the health of our streams and help inform our communities of our progress towards the goal of reducing pollution throughout the entire state of Pennsylvania!

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ALLARM's Vibrant Engagement with Dickinson's Campus

By: Katelyn Pequeno '27

ALLARM has a very vibrant and diverse community that cares a lot about improving our impact within our local and broader aquatic community. We work hard to connect with our community to not only share some of our current projects, events, and data but also to educate others on important practices and information regarding aquatic health. We care a lot about sharing and connecting with our partners and volunteers who directly work with us on a daily basis, but we also

prioritize connecting with the campus around us to give back and connect with our Dickinson community on a deeper level.

Hints of ALLARM can be found all across Dickinson College's campus. We can often be seen tabling at a campus wide event, taking over a class, and hanging up Water Facts around campus.

Water Facts

On a monthly to bimonthly basis, the ALLARM crew will write up a poster with some fun and important facts about our local aquatic resources to be hung up around campus. The topics for these sheets often come from our volunteers, ALLARMies, or hot topics within the Chesapeake Bay. We think it is important to not only touch on important topics but also on the topics that our partners find interesting and most valuable to their everyday lives. These topics have ranged from the health of the bay to community member spotlights. In the past year we have distributed three different water facts sheets across campus including facts on “PFAS” and “The Bay and Beyond”.

To write these Water Facts posters, we often ask a Watershed Coordinator interested in the topic to research, gather information from interviews or ALLARM’s resources, and write a brief one-page informational summary based upon the information found. We find that these posters are incredibly important for our campus outreach and overall aquatic health education. It allows our campus to get to know us, our partners, and a bit about the work we do and its importance in the aquatic resource realm.

Student Watershed Coordinators teaching Riparian Ecology students how to measure alkalinity on the Letort.

Class Visits

ALLARM often partners with Dickinson classes within the Environmental departments to provide field expertise and insight on course concepts in a professional setting. To prepare for class visits, our ALLARMies do extensive research, review, and creation of worksheets, presentations, and more. During a recent Entomology class visit, ALLARM was asked to present Macroinvertebrate sampling protocols as well as identification information. ALLARMie David Marsh did significant research on how to Identify Macroinvertebrates, collected information from ALLARM’s manuals, and reviewed videos from past trainings to prepare for this guest lecture. This is often how preparation goes for any given class visit.

Each semester, we visit an average of 2-3 classes and labs. Last semester, we visited Integrative Environmental Science, Practical Ethics, Body and Place, and Radical Hope in the Age of the Anthropocene. This semester we have been able to visit Riparian Ecology and Entomology. These visits give us the opportunity to discuss what we do as an organization with our campus and help students understand the connections between their class and professional applications.

Events

Throughout the academic year, Dickinson and Carlilse often host various campus and community wide events. We love getting involved in every event we can to be engaged community members and to continue to promote the work that ALLARM does.

Student Watershed Coordinators running the ALLARM table at Out on Britton.

This year, we had the opportunity to get involved with many on campus events like "Out on Britton", Pre-Orientation, and more! At "Out on Britton", we helped celebrate National Coming Out Day with over fifteen other campus organizations by having students create affirmation cards using watercolors. We also had the opportunity to teach a mini macroinvertebrate class at Dickinson's sustainability focused Pre-Orientation. This event was unique in that it was geared to our new first-year students and not only allowed us to teach them some new concepts but also allowed them to get to know us as an on-campus organization.

Social Media

Our social media presence is also a large way for us to connect with our on-campus community. We are incredibly active on our Instagram (@ALLARMWater) and are often posting highlights from our recent work, event reminders, or even reposting items from our campus partners. On average we have about 30 posts per year and reach over 1000 individuals over that time, many of which come from our campus community. We find social media to be a key opportunity to reach our campus as we can give important updates on what we are up to in a quick and fun way!

ALLARM truly values our campus outreach as a tool to give back, collaborate, and educate the community we are a part of. We enjoy every opportunity we get to engage with Dickinson and find that doing so not only benefits us but benefits our broader community as well. We are glad we have such a vibrant campus that we can interact with!

Meet Our New Staff Scientist, Jill Arriola!

By: Kristin Houston ‘27

During the fall of 2024, the Alliance for Aquatic Resource Monitoring (ALLARM) welcomed Jill Arriola as the organization’s new Staff Scientist. Settling into her new position, she has quickly made herself an invaluable member of our team with her compassion and enthusiasm for monitoring and community science.

Growing up in Littleton, Colorado, Jill was always curious about the environment around her and held a deep fascination for nature, which would later inspire her to study environmental science. Oceanography was of particular interest to her because of its unfamiliarity; after spending much of her life in a landlocked state, she was drawn in by these vast bodies of water full of diverse ecosystems and organisms. Her interest in the subject was sparked by a course called Introduction to Oceanography, which left a deep impression on her. Jill went on to study environmental science at the University of Massachusetts in Boston, where she acquired hands-on experience working with monitoring equipment before earning her bachelor's degree. She then earned her PhD in Marine Science at UNC Chapel Hill and completed her postdoctoral fellowship at Penn State University. During her time at Penn State, she began working in the Chesapeake Bay and Susquehanna Watershed and would collaborate with many different organizations from states near the water. These collaborations were particularly fulfilling experiences for her, as she enjoyed being able to share her work and research with others.

ALLARM Staff Scientist, Jill Arriola, PhD.

Jill’s interest in community science in the realm of water-monitoring is what led her to ALLARM. While attending the Chesapeake Bay Community Research Symposium in June, she had the opportunity to connect with nonprofit, university, and local government organizations from across the bay, where she learned about ALLARM’s work and collaboration with local communities and students. ALLARM’s mission of fostering lasting relationships with the community through science encouraged her to apply. Now, as an integral part of ALLARM’s staff, she enjoys the community-engagement aspect of her work and seeing students’ involvement in outreach. She hopes to continue building networks, creating partnerships, and meeting new people.

As ALLARM's Staff Scientist, Jill takes on a variety of responsibilities that support both the organization and its volunteers. During a typical day in the office, she can be found providing technical assistance to ALLARM staff members, Watershed Coordinators, community monitors, and volunteers, as well as corresponding with ALLARM's partner organizations about various projects. The NFWF Restoration project, for example, is one such project that Jill has recently been involved in; overall, their goal is to "monitor restoration projects funded by NFWF along streams in the Chesapeake Bay Watershed so we can see if those efforts are improving water quality and how effective they are, which ultimately will help lead to better water quality in the Bay" (J. Arriola, private interview, 2024). In addition to these duties, she collaborates with our partners about their manuals, ensuring that their guidelines correspond with ALLARM's and are easy to understand. She also participates in lots of fieldwork and Tier 2 macroinvertebrate monitoring.

Jill scouting for Macros at Laurel Lake.

Jill and caddisflies in Lancaster County.

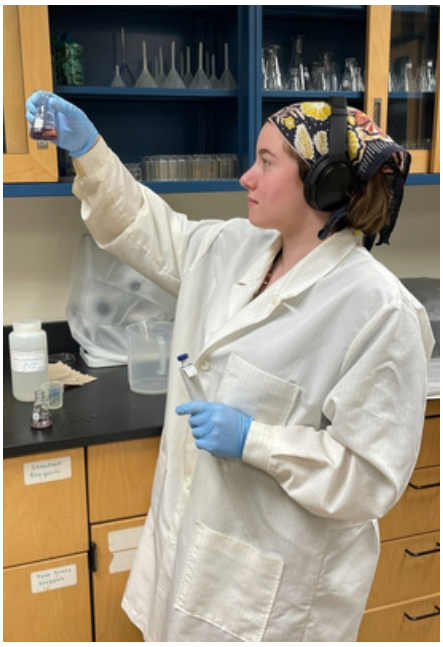
Outside of ALLARM, Jill enjoys hiking and hopes to explore more of the mountains around Carlisle. When she isn't exploring a trail, she likes to paint as a hobby and plans to decorate the walls of her home in the near future. She is also a big fan of movies and has been enjoying fantasy films as of late. We are thrilled to have such an incredibly compassionate and talented person join our team, and we look forward to what Jill achieves with ALLARM!

Senior Reflections from the class of 2025!

Amelia Harper

Before I started working with ALLARM, I had never heard of community science. Over the last three years, I've gained an immense amount of experience and knowledge, and being involved in community science has given me a unique perspective and shaped the way that I approach science in general. As a Biochemistry & Molecular Biology student, I was originally attracted to ALLARM's Community Aquatic Research Laboratory (CARL), and although I have spent the majority of my time here working on the lab team, I've also had opportunities to work directly with the community in training workshops and check-ins. These pushed me out of my comfort zone in valuable ways and allowed me to really see the people behind the sample bottles that I was testing in the lab.

Working in the lab, and particularly taking on the responsibility of performing quality control, has complemented my other lab experiences at Dickinson and given me a lot of confidence as I move forward in molecular biology labs. When I joined the Roberts Lab for student-faculty research after my first year at ALLARM, I felt well prepared thanks to my experience in ALLARM's lab and was able to get started quickly, improving the quality and quantity of my work. Performing quality control at ALLARM as well as the technique research project on nitrate-nitrogen testing methods that I've been working on for the past year has helped me learn to place trust and confidence in the quality of my work. Most importantly, I've gained professional skills in teamwork and leadership. This past year in particular, I've moved into more of a leadership role in the lab, training new ALLARM students in lab procedures. Although I've chosen to pursue a career in biomedical research, the professional skills, leadership, and perspective I've gained from working in community science will be incredibly valuable to me going forward.



Michelle Cao

Even after 7 semesters and a summer experience under my belt, I can reassure you that the list of questions never ends and that I am learning and pushing bounds every day. It's been an absolute privilege getting to work at ALLARM and wearing many hats - as a budding scientist, a perpetual water penny seeker, a too-many question asker, a clumsy water collector, a proud data nerd - you name it! I've enjoyed indulging in my 'just do it' mentality and getting to soak in the numerous opportunities for growth, experiences to reminisce, stories to tell, and most importantly, the countless lessons learned. From co-facilitating a summer experience for the local CONNECT camp to my first in-person training (and ALLARM sleepover) at Susquehanna County and getting to see the Yellow Breeches every August, I enjoyed marking many firsts and developing a sense of camaraderie and connection to PA and the people who live here. As I reflect on my time here, I am reminded of the remarkable individuals who make the organization what it is today, like the way you've all shaped me into the student and person I am today. The warm and supportive environment at ALLARM has made me hungry to learn, never afraid to experiment, and quite frankly, willing to try anything. I am so thankful for the way you all listen to my never-ending tangents, honor my ideas and work, and encourage me on the not-so-sunny days. Your support and care have allowed me (that naive city girl) to realize that I too, have a spot in the environmental field. While it's mostly scary, part of me is excited to chart out my path post-Dickinson. One thing I know for sure is that I will find a way to bring and integrate my passions and excitement for science education wherever life takes me. Signing off with love and reflection!

Kailey Sipe

Since starting at ALLARM in 2022, I have had the opportunity to create meaningful change within local communities through the many diverse experiences provided for me. I have not always known (and am still working through) what my peak interests were within my Environmental Science degree. The only aspect of my college journey that I truly cared about was being able to make a difference – however that might've looked. That is when I discovered ALLARM. Yes, engaging with water is super cool, but what interested me the most about being part of ALLARM was the impact the organization made within C-science efforts. When starting at ALLARM, my journey began with outreach, from creating infographics to helping with the college's campus events - where I then transitioned to GIS/data. Since then, I have attended various community workshops, developed meaningful relationships with volunteers, and worked two summers with the ALLARM team. Out of all my ALLARM experiences these past three years, my favorite memory while working at ALLARM was attending the Collaborative Learning School (CLS) event – my first in-person training! Through this event, I truly saw the engagement that ALLARM aims to foster, and I enjoyed having the opportunity to connect with the early career researchers in attendance, learning about the different perspectives they bring to the field. From then on, I have had the ability to attend other in-person events with volunteers, allowing me to make the difference I have always cared about. I am incredibly grateful to all the full-time staff and my fellow ALLARMies for the support and guidance they have given me throughout these three years. We all have created such a special bond that you could never replicate anywhere else. After all, stream team makes the dream team!

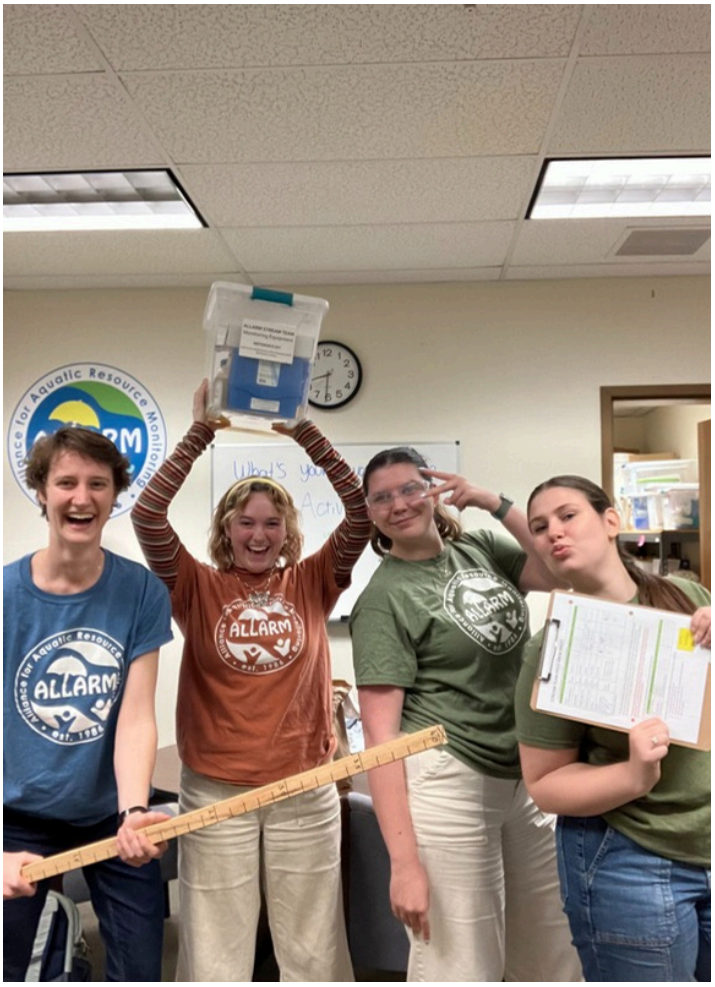
Emma Spinelli

I joined ALLARM my junior year at Dickinson, not knowing quite what to expect. Even applying seemed out of my comfort zone since I was not an environmental studies or STEM major on campus. Luckily, former Stream Team Coordinator Stephanie Letourneau (my cheer coach at the time) encouraged me to join this amazing team, and I could not be more thankful for making that choice. Working at ALLARM, I have had the opportunity to dive into so many components of the work we do. The environment here truly enabled me to gain tons of hands-on experiences with volunteers, field work, and policy research. Some of my favorite memories at ALLARM have been events. I have loved getting to be a part of monthly refresher meetings, data interpretation meetings, and class visits along with field work opportunities like macro collection and restoration monitoring! What I will miss most about ALLARM is definitely the people here that have made the experience so worthwhile. The mentorships, friendships, and learning during my time as Watershed Coordinator have made my time at Dickinson so much more fulfilling and allowed me to be much more confident in what I bring to the table. Looking to post-grad, I know I will carry so many of the lessons and skills I learned from ALLARM with me into my next steps. This organization is so unique in its commitment to its mission of supporting community science, giving me a new appreciation for nonprofit work and an opportunity to be part of a cause I am so passionate about.

ALLARM in Photos!

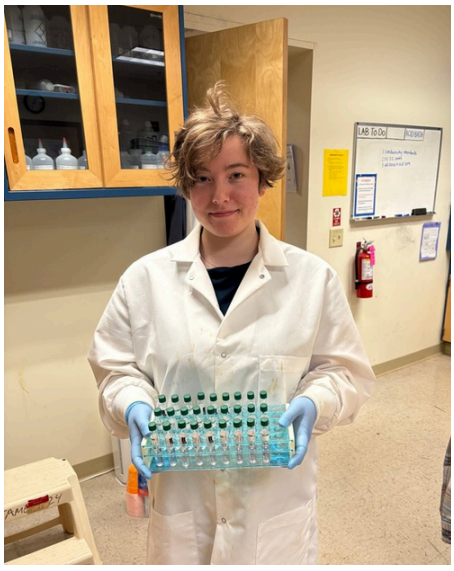
Two members of ALLARM full-time staff pose with the seniors for an end of year photo! From left to right: Lindsay VanFossen, Michelle Cao ‘25, Kailey Sipe ‘25, Emma Spinelli ‘ 25, Amelia Harper ‘25, and Isabel Ruff.

Left: Kailey Sipe ‘25 presents a poster created with Michelle Cao ‘25, at CCLA’s Civic Engagement Symposium.
Right: Katelyn Pequeno ‘27 and Emma Spinelli ‘25 pose for a photo while collecting Macroinvertebrates.



Above: LeTort Spring Run monitoring with Ben Connors ‘27, Naisha Gaur ‘27, and Kailey Sipe ‘25!

Right: Isabel Ruff, Lindsay VanFossen, Katelyn Pequeno ‘27, and Emma Spinelli ‘25 conduct a virtual Stream Team monitoring training!



Above: In the Lab with Ben Connors ‘27, Amelia Harper ‘25, and Kristin Houston ‘27!