GLOBEPROGRAM®

A Worldwide Science & Education Program

Annual Review

2024–25

Sponsored by: NASA Supported by: NSF NOAA

Foreword

The GLOBE Program is a long-standing citizen science initiative that brings together volunteer observers, students, educators, and scientists from around the world to understand and advance Earth system science through data collection and analysis.

GLOBE is sponsored by the National Aeronautics and Space Administration (NASA); supported by the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), and the United States Department of State. GLOBE is implemented by Education Development Center (EDC) and the City University of New York (CUNY).

This Annual Review reports on the activities of the GLOBE Program between May 1, 2024, and April 30, 2025.

GLOBE Implementation Office: A Transition

The GLOBE Implementation Office (GIO) was established to manage the GLOBE Program under NASA's leadership. The University of Colorado Atmospheric Research (UCAR) ran the GIO from 2014 to 2024. Thank you to the UCAR team for their many years of dedicated service to the GLOBE Program.

Beginning in May 2024, the work of the GIO transitioned from UCAR to EDC and CUNY and was divided into two large bodies of work:

- **Community Engagement and Support (CES)**, under the leadership of Rebecca Lewis at EDC, manages GLOBE's dissemination and communication with participants. CES also works with regional coordination offices to manage the implementation of GLOBE across the world.
- **Science Training Education and Public Engagement (STEPE)**, under the leadership of Rebecca Boger at CUNY, is responsible for overseeing and improving GLOBE's training programs, scientific integrity and data quality, and education outreach.

CUNY and EDC work together as one GIO to oversee and improve GLOBE's reach and impact.

A Message from the GLOBE Implementation Office

To the GLOBE Community,

In this time of global uncertainty and change, one thing remains constant: the strength and spirit of the GLOBE Program. Your continued commitment to science, STEM education, and collaboration reminds us of what's possible when we work together across borders to make science available to all.

We are immensely grateful for each of you—GLOBE citizen scientists of all ages (from kindergarten to gray!)—who make GLOBE thrive. Whether you're collecting data in your backyard or school, leading regional initiatives, or guiding others through scientific research, your contributions are laying the foundation for a brighter, more informed future.

We extend our heartfelt appreciation to:

- **Our sponsors** at NASA, NOAA, NSF, and the Department of State for their continued support and belief in the power of science, scientific diplomacy, and collaboration.
- **Our Working Groups**, whose expertise and dedication help guide the program forward with integrity and purpose.
- **Our regional leadership and supporters**, including the Regional Coordination Offices, Country Coordinators, U.S. Partners, and the many embassies and ministries around the world who amplify GLOBE's impact in their communities.
- And to **you—scientists, learners, educators, and inspired volunteers—**who embody the spirit of GLOBE every day through observation, inquiry, and connection.

Each of you plays an essential role in advancing science, fostering connection, and nurturing the next generation of global stewards. We are inspired by your impact.

Thank you for walking this path with us. Here's to the discoveries still to come—and to the bright future we continue to build, together.

With gratitude and hope,

Rebecca Boger
Director, GIO Science and Training, Education, and Public Engagement

Rebecca Lewis
Director, GIO Community Engagement and Support

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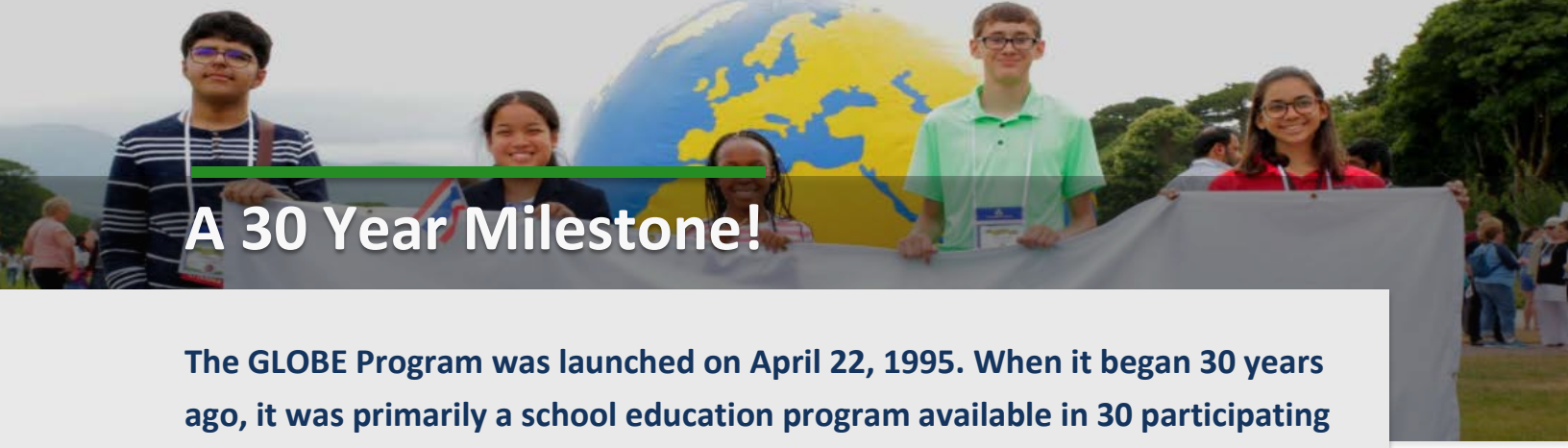


A 30 Year Milestone!

The GLOBE Program was launched on April 22, 1995. When it began 30 years ago, it was primarily a school education program available in 30 participating countries. Since then, GLOBE has expanded to become a large citizen science effort. Participants of all ages in 127 countries now engage in collecting data for the GLOBE Program. Since GLOBE began, more than a million people have collected data and submitted it to GLOBE's open-source database.

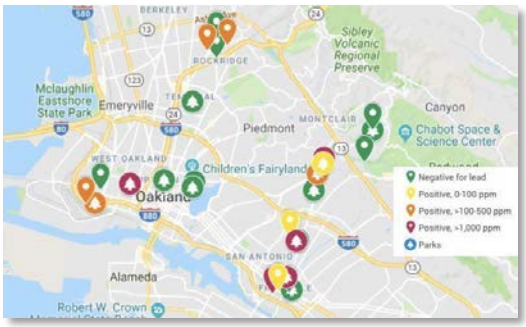
Throughout its history, GLOBE has helped communities better understand and improve local environmental conditions.

In **Senegal, West Africa,** students measured the amount of rainfall every day at noon in a graduated rain gauge from 2004 to 2024. The 20-year time series of rainfall data showed that the start of the rainy season had shifted by an entire month—from June to July. Students are now using these data to inform agricultural and livestock farming practices in their local community.

In **Santiago, Chile**, black coal is used for transport and home heating and is a major source of pollution in the area. GLOBE students installed a weather station and made atmospheric observations in 2016 to study local pollution (particulate matter) under the guidance of Professor Nicolás Huneeus (University of Chile) and their teacher, Hernán Costabal. Particle sizes of 10, 2.5, and 1 microns were found during the experiment period. The students from one participating school went on to build a low-cost solar photometer under the technical supervision of Professor Roberto Rondanelli, PhD (Massachusetts Institute of Technology) which can be used for atmospheric research such as measuring aerosols.

In **Oman,** students investigated the capacity of lemon peels and ground moringa to purify greywater in 2025. Their initial exploration revealed that lemon peels help absorb odors and kill organic compounds while moringa helps kill bacteria and reduces particle suspension. In addition, their results showed an improvement in water quality after treatment, including lower pH (8.5 to 7.1), lower salinity, increased dissolved oxygen, increased transparency, and lower coliform bacteria levels.

In **Oakland, California (USA),** students collected soil samples in 2019 from 10 different playgrounds in Oakland to determine the level of lead pollution in different neighborhoods within their community. The findings revealed that 6 out of 10 playgrounds tested positive for lead.



In **Croatia**, students participating in the GLOBE at Night campaign beginning in 2000 shared their analysis of the effects of city light pollution with local representatives, and in 2007, a Law on Protection Against Light Pollution was passed by the Croatian Parliament.

In **Thailand,** students found that plant pot saucers were a common site for mosquito breeding and developed and tested different mosquito trapping plant pot designs in 2023. The pots were printed using a 3D printer.

These are a few of the inspiring ways GLOBE has advanced science and made a lasting impact on participants and their local communities since the program began in 1995. Read about recent accomplishments throughout this report.

In 2025, the GLOBE Program was recognized as an example of a long-standing STEM innovative program in the National Academies of Science, Engineering, and Mathematics (NASEM) report "Scaling https://nap.nationalacademies.org/catalog/27950/scaling-and-sustaining-pre-k-12-stem-education-innovations-systemicand Sustaining PreK–12 STEM Education Innovations" (see page 165 of the report).

Coming Together to Celebrate 30 Years of GLOBE

In April, the GLOBE community came together to share their stories and photos on Facebook and join a live 46 minute broadcast featuring GLOBE's impact and highlights from the past 30 years.

As part of this celebration, the GLOBE community was invited to contribute to a community poem and participate in GLOBE's air temperature data challenge, held from April 22 to May 6. The challenge was launched with a video by GLOBE students from Shishmaref High School in Kigiqtaq, Alaska. The goal of the challenge was to compare "temperatures across the world to see how the temperatures are different in different environments and locations." The Air Temperature Challenge was intended to (1) stimulate interest and engagement in the collection of GLOBE's atmospheric protocols—data that are now being added to NOAA's Meteorological Assimilation Data Ingest System (MADIS) for use by scientists, and (2) reinforce the importance of thermometer calibration when conducting the air temperature protocol. The data challenge received an enthusiastic response. Participants from 151 sites submitted more than 3,100 measurements across all six GLOBE regions (view locations). With additional data from approximately 166 weather stations, the total number of submitted temperature measurements reached nearly 500,000 between April 22 and 30, 2025.

GLOBE also launched a new interactive timeline on globe.gov to highlight key moments in the 30-year history of the GLOBE Program.

With this anniversary milestone, the GLOBE database has reached more than 270 million data points and offers 30 years of open-source environmental data.

Advancing Earth System Science and Its Applications

GLOBE's primary goal is to advance understanding of Earth system science and its real-world applications. This is accomplished through wide-spread data collection and analysis.

From 2021 to 2025, there was a 30% increase in field data collection, a 21% increase in use of the GLOBE database, and a 50% increase in quantitative data analysis. We attribute these gains to campaigns and Intensive Observation Periods (IOPs) that successfully engaged the community.

Field Measurement Campaigns & Intensive Observation Periods

Field measurement campaigns and IOPs are designed to bring together volunteer observers, students, educators, and researchers for specific challenges or to collect focused data during specific time periods. Since May 2024, GLOBE has organized five campaigns and IOPs.

30 Years of GLOBE: Comparing GLOBE Data Past and Present

In anticipation of GLOBE's 30th anniversary, the 2025 GLOBE field measurement campaign was launched in September 2024. It encouraged students to explore environmental changes in their local ecosystems by taking a deep dive into the past 30 years of GLOBE data, paired with recently collected data.

Thirty-six students participated in the "30 Years of GLOBE" student logo design contest, and their entries were used to inspire the official campaign logo. See the student's designs.

The campaign's theme was intentionally aligned with the International Virtual Student Symposium (IVSS) so that students participating in the campaign could present their research at IVSS. To support participating educators and students, the GIO held two to four webinars each month, on topics including accessing data from the GLOBE

database, analyzing data over time, transforming data into visual stories, using the GLOBE surface temperature protocol, and reviewing GLOBE land cover.

Snow View IOP

In February, the GIO launched an IOP that was co-planned with the NASA Terrestrial Hydrology Program. The IOP resulted in more than 60,000 total land cover observations and 5,000 discrete measurements of solid precipitation collected from over 3,500 locations. View the locations of these observations in this animation from the GLOBE Visualization System.

Photos of blowing snow submitted via Land Cover, plus daily data on new snow and snow water equivalent were shared with remote sensing meteorologists.

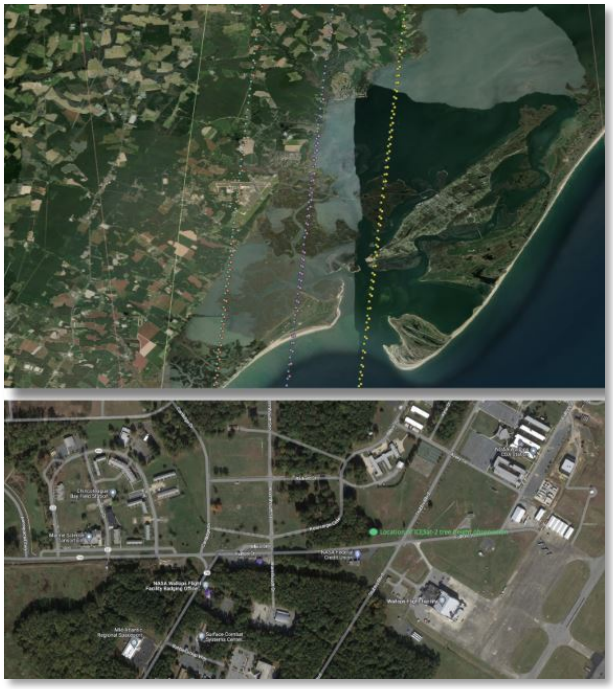
Urban Heat Island IOP

GLOBE Mission Earth invited educators, citizen scientists, and students worldwide to participate in the Urban Heat Island Intensive Observation Period (UHI-IOP) from October 2024 to May 2025. The UHI-IOP was supported by a series of three informational webinars designed to help GLOBE students, teachers, and citizen scientists engage with and develop UHI projects. These webinars covered topics including Science of the Surface Temperature IOP, Where You Come in as Participants, and What to Do with Your Data. More than 90 people attended the webinars, with participants from all GLOBE regions. Students entered surface temperature data from 1,088 sites—250 more than last year. In total, more than 12,000 hand-recorded observations were collected from around the world, showing continued interest in urban heat islands.

Trees Around the GLOBE Campaign

The Trees Around the GLOBE Student Research Campaign is in its seventh year. Between May 1, 2024, and April 30, 2025, there were more than 41,000 observations of tree height, land cover, and green-up/green-down from over 11,000 locations in 69 GLOBE Program countries participating in the campaign. There were also 12 monthly campaign webinars featuring GLOBE students, educators, and GLOBE International STEM Network presenters, along with both internal and external NASA researchers.

From May 1, 2024, to April 20, 2025, 123 students from 11 GLOBE countries presented their research projects during campaign webinars. The campaign team also continued developing online tutorials to support investigations comparing GLOBE and NASA satellite data using tools, such as Open Altimetry, Collect Earth, My NASA Data, Google Earth Engine, and ArcGIS Story Maps.



This past year, there have been new and sustained collaborations with several NASA missions, including Ice, Cloud, and land Elevation Satellite-2 (ICESat-2), Global Ecosystems Dynamics Investigation (GEDI), Surface Water and Ocean Topography (SWOT), NASA-ISRO Sar (NISAR), Delta-X, Landsat, Global Precipitation Measurement (GPM), and Artemis (NASA Moon Trees). The campaign continues its partnership with the United States Department of Agriculture Forest Service's Geospatial Technology and Applications Center using GLOBE Trees observations in its outreach to schools. There have been several highly active spinoff campaigns from the Trees Around the GLOBE Student Research Campaign, including "Trees Within Latin America and Caribbean (LAC)," "Trees Around Israel," and "Trees Across Ireland."

The campaign team includes Campaign Lead Brian Campbell (NASA Wallops Flight Facility, Wallops Island, Virginia, USA), GLOBE U.S. Partner Peder Nelson (Oregon State University, Corvallis, Oregon, USA), and GLOBE U.S. Partner Peter Falcon (NASA Jet Propulsion Laboratory, Pasadena, California, USA).

An April 2025 article published by NASA describes the impact of the Trees Around the Globe campaign on a math educator and her students: "New York Math Teacher Measures Trees & Grows Scientists with GLOBE." The educator's involvement in GLOBE led to an invitation to co-author a peer-reviewed research paper that included the tree height data collected by her students.

Mission Mosquito Campaign

The Mission Mosquito Campaign supports citizen scientists around the world who are interested in reducing the burden of vector-borne disease by conducting mosquito larvae surveillance and mitigation in their communities. As of July 2025, GLOBE Observer citizen scientists have contributed more than 43,000 observations to the GLOBE database using the Mosquito Habitat Mapper tool.

The GLOBE Observer Mission Mosquito team supports the GLOBE community through monthly webinars, in-person and virtual workshop trainings, and mentorship for students conducting their own research using GLOBE Observer Mosquito Habitat Mapper data. All educational materials are available on the GLOBE Mission Mosquito website.

The GLOBE Observer Mosquito Habitat Mapper has generated international interest as a tool not only for collecting scientific data, but also for empowering communities in active mosquito surveillance and mitigation. In response to the dengue pandemic in Central and South America, Dr. Rusty Low, science lead for GLOBE Observer Mosquito Habitat Mapper, was sponsored by the U.S. Department of State Speaker Program and the Regional ESTH Hub for Central America and the Caribbean to tour Costa Rica and Jamaica. From August to September 2024, she met with vector control agencies and public health officials to share GLOBE's work supporting the GLOBE Observer Mosquito Habitat Mapper app.

Mission Mosquito has also been collaborating with Dr. Di Yang at the University of Florida on the EMERGE (Earth observations and citizen science for Mosquito-borne disease risk GEomapping and pRediction) project. This dengue risk model downscaling project is integrating GLOBE data with NASA satellite-derived data to develop precise models that predict mosquito species distribution.

In addition, GLOBE was represented at the expert roundtable hosted by the Wilson Center in partnership with Malaria No More and the President's Malaria Initiative to explore innovative solutions to the malaria crisis in Africa.

Collaborations with NASA Scientists

NASA and Bhutan Conclude Five Years of Teamwork on STEM and Sustainability

A NASA article from November 2024 describes how NASA and the Kingdom of Bhutan have been working together to improve environmental conservation through community-based natural resource management and remote sensing tools. Bhutan "now uses NASA satellite data in its national land management decisions and plans to foster more geospatial jobs to help address environmental issues" and more than 650 students have participated in the GLOBE Program.

NASA Scientist Collaborates with GLOBE for Wildflower and Tree Bloom Research

Dr. Yoseline Angel, a scientist at the University of Maryland-College Park and NASA's Goddard Space Flight Center, is leading NASA research on wildflower and tree flower blooms and is hoping that GLOBE land cover observations will help her identify blooms in satellite data. By analyzing how the blooms look in the uploaded data, scientists can track seasonal flower cycles.

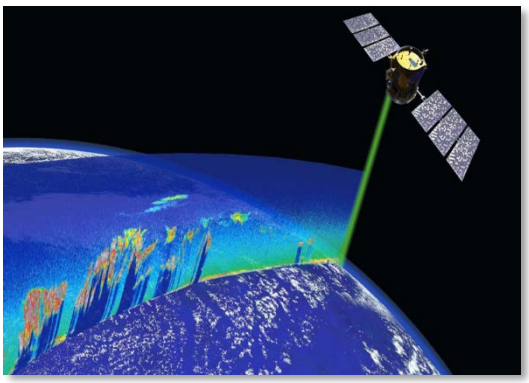
Wildflower Blooms

To help Angel's research, GLOBE Observer asked the community for GLOBE land cover observations of wildflowers from **March 24, 2025, to June 1, 2025, in parts of California, Arizona, and Nevada.** Land cover observation will help scientists look back in time through the satellite record to identify the timing and extent of blooming events and understand change. Learn more about her request and read an article about the research.

Flowering Trees

In April, Dr. Angel asked GLOBE participants in Mexico, Central America, and parts of western South America to use the GLOBE Observer Land Cover and Trees tools to find and document Tabebuia trees. Tabebuia is a genus of flowering plants, and Dr. Angel and her team are seeking photos of *Guayacan amarillo* (Central and South America), *Arbol de la primavera* (Mexico), *Cañaguate* (Colombia), *Araguaney* (Venezuela), and *Roble amarillo* (South America) during two data collection phases: April 1–May 30, 2025, and August 1–October 31, 2025.

GLOBE Clouds: 1.5 Million Geostationary Satellite Comparisons



At the end of April 2025, the GLOBE Clouds team at NASA met a significant milestone. They matched 1.5 million GLOBE Clouds observations to geostationary satellite data! You can help the team get to 2 million by downloading the GLOBE Observer app and observing the clouds near you. Learn more about the NASA GLOBE Clouds protocol and how researchers are matching GLOBE Clouds observations with satellite data to create a deeper understanding of clouds.

GLOBE Clouds: Aviation Weather Mission

The GLOBE Clouds team and GLOBE Observer supported a partnership with Civil Air Patrol in which squadrons of cadets (teens and adults) across the United States used GLOBE Clouds to track aviation weather in support of science at NASA's Langley Research Center. The Aviation Weather Mission continues through July 2025.

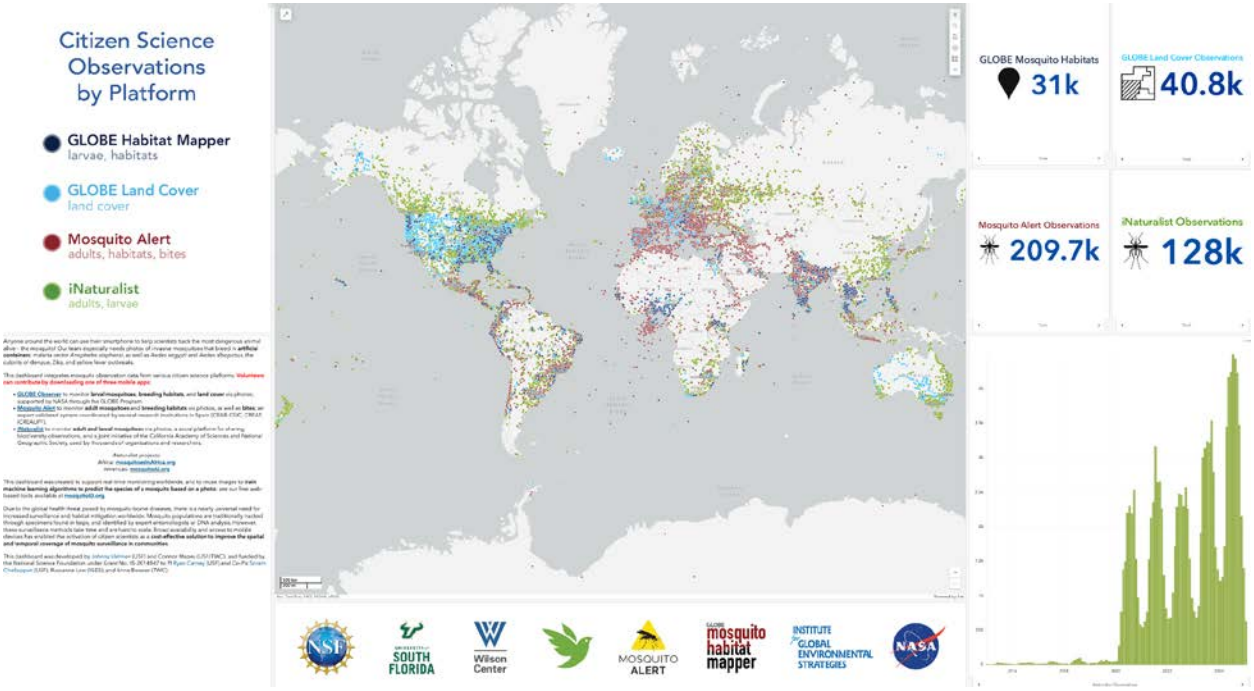
GLOBE Publications and Presentations

Over the reporting period, GLOBE staff, educators, and students dedicated significant effort to promoting the work of GLOBE and sharing its impact on the collection of worldwide environmental science data. This was accomplished through formal and informal presentations as well as a range of publications. A sample of the varied topics covered includes:

- Building resilience to dengue: A multidisciplinary approach including citizen science
- Data sovereignty and ethics
- Don't look up, look down! A free mosquito surveillance mobile app and fun educational resources to support your local community outreach
- Exploring the effects of leaf damage to the production of *rubus idaeus* fruit
- GLOBE eclipse workshop engages educators in Earth science research
- GLOBE Observer: A case study in advancing Earth system knowledge with AI-powered citizen science
- How urbanization affects water temperature in the Chena River in interior Alaska
- Sailing to the future with GLOBE on the tall ship MIRAIE
- Soil and water tents combine science, art, inquiry, and data

For more presentations and publications, see the Appendices.

In August 2024, the authors of the 2022 paper "Integrating Global Citizen Science Platforms to Enable Next-Generation Surveillance of Invasive and Vector Mosquitoes," published in the *Insects* special issue "Citizen Science Approaches to Vector Surveillance," were awarded the "Insects 2022 Best Paper Award" for research and review articles.



Global Mosquito Alert: Screenshot of Mosquitodashboard.org, July 3, 2025.

STEM Skill Development

STEM skills are inherently developed through the GLOBE Program and are showcased during events such as the International Virtual Science Symposium, where students present their own research projects and earn digital badges for the scientific skills they applied during their research.

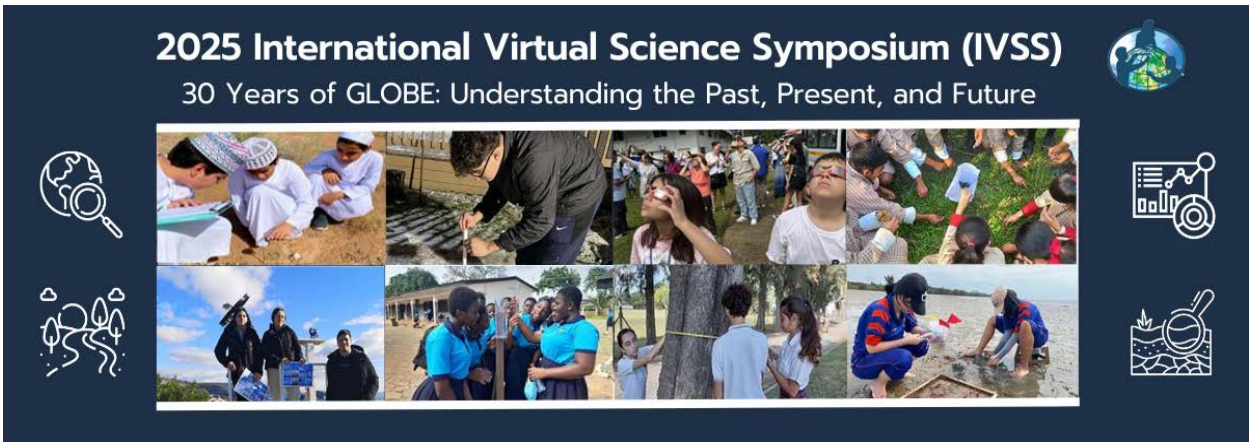
To support science, technology, engineering, and mathematics (STEM) skills development, GLOBE engages STEM professionals through the GLOBE International STEM Network (GISN). GISN members not only mentor students and educators but also benefit from professional learning and networking opportunities through the network.

The GLOBE Student Vlogger program supports selected students as they explore science while learning video and storytelling skills. The students discover and document different biomes, capturing them on film and sharing stories about their local environments. And in the process of showing others how to conduct a GLOBE protocol, they deepen their own understanding of the protocols.

In addition, whenever possible, the GIO collaborates with NASA and others to expand the reach and scope of the GLOBE Program. Two examples of this were the GLOBE Protocol Games and a data internship, “Hack the GLOBE.”

These initiatives and their accomplishments are described in more detail below.

Encouraging and Supporting Student Research



International Virtual Science Symposium

A record number of volunteer judges reviewed an unprecedented number of student submissions at the 2025 IVSS. In fact, the number of STEM professionals who served as judges more than doubled between 2024 and 2025.

Students submitted more than 400 projects (a 40% increase from last year), and 200 students earned the "I am a Data Scientist" badge! In addition, 176 projects earned a top rating of 4 stars, and 125 projects met the eligibility criteria for the randomized drawing to attend the Annual Meeting's Student Research Experience. To qualify for the drawing, students needed to earn a 4-star rating and at least two badges, including the "I am a Data Scientist" badge. See a preview of the topics explored in the 2025 IVSS.

Recognizing that, as a global community, the start and end of the school year vary across countries and regions, the IVSS planning team opened the project submission system earlier in 2025. They also announced the 2026 IVSS theme in April 2025 to help educators better prepare to support student research projects. The 2026 IVSS theme is GLOBE Data Detectives: Using Data to Explore Change in Your Local Environment.

A Growing Network of STEM Professionals

Expanding and improving the GLOBE International STEM Network (GISN) has been a key focus for GLOBE this year. The goal is to build an active community of practice for STEM professionals and to increase participation, especially in GLOBE regions where participation has been historically low. We are pleased to report that GISN has increased by 33% this year!

GISN meet-ups are now networking sessions rather than social hours. The meetings offer opportunities for members to advance their professional careers, for example, through sessions on Fulbright opportunities. GLOBE is also drawing on the expertise of GISN members to revise and enhance GLOBE materials and resources, such as through community workshops focused on updating the biosphere learning resources. Additionally, GISN members provide feedback on student research projects by serving as judges during Student Research Symposia and IVSS. If you are a STEM professional interested in participating, new members are always welcome.

Inspiring the Next Generation of Scientists via the GLOBE Student Vlogger Program

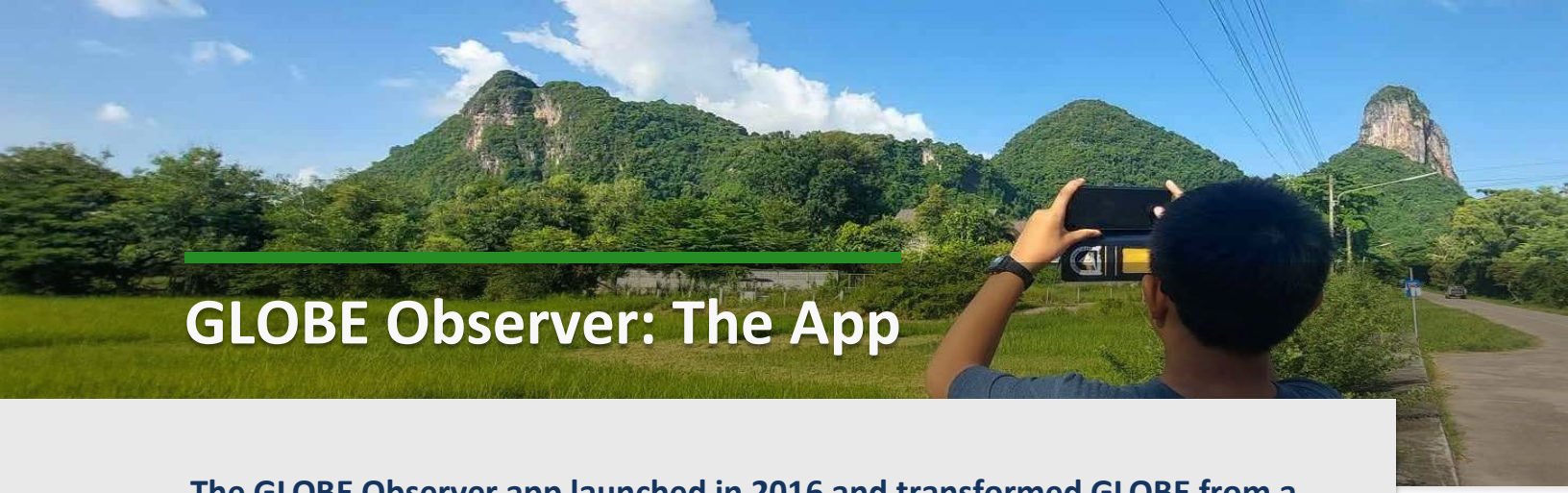
The 2024–25 GLOBE student vloggers shared their passion for science and the GLOBE Program through a series of vlogs that showcased their local biomes and offered a student perspective on using the GLOBE protocols.

GLOBE Protocol Games

In 2024, the GIO designed a challenge for the NASA International Space Apps Challenge. A record-breaking 411 teams from 54 countries submitted ideas in response to the GLOBE Protocol Games, a challenge to create a game that integrates GLOBE protocols.

Hack the GLOBE!

In June 2025, the GIO STEPE team, in conjunction with GLOBE Mission Earth and the NASA Student Enhancement in Earth Sciences (SEES) program, piloted Hack the GLOBE!, a data science internship for high school students. Hack the GLOBE! engaged eight high school interns in deep exploration of data in the GLOBE database. Their work—which included developing code products and applying statistical processes—is now being integrated into STEPE's ongoing GLOBE data quality review. The interns' collaborative project will also be submitted to the 2026 IVSS.



GLOBE Observer: The App

The GLOBE Observer app launched in 2016 and transformed GLOBE from a science education initiative into a citizen science initiative. Since its launch, more than 290,000 volunteer observers have submitted over 2 million observations through the app.

The app welcomed 16,489 new volunteers to the GLOBE community as citizen scientists between May 1, 2024, and April 30, 2025, and these volunteers submitted more than 143,000 observations to the GLOBE database.

To support the citizen scientist community, the GLOBE Observer team hosted 14 GLOBE Observer Connect conversation events. All GO Connect events are recorded and most are available on the GLOBE YouTube channel and on the GLOBE Observer website Events page.

For anyone using GLOBE in a camp setting, the GLOBE Observer team released new camp programming guides that offer activities and support.

The GLOBE Observer app features four main data observation tools: Clouds, Mosquito Habitats, Land Cover, and Trees. The app also offers an Eclipse observation tool to document air temperature and clouds during a solar eclipse.

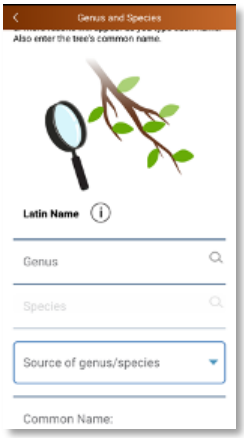
App Updates

GLOBE participants are proud of their contributions to science, and the app now offers new achievement notifications to inform users when they reach a milestone or set a new streak. Milestone badges are awarded for the first, fifth, tenth, twenty-fifth observation, and so forth. A streak tells a volunteer how many consecutive days they have submitted observations.

For trained users, the app offers data entry opportunities beyond the four main data observation tools. With the recent addition of the Soil Characterization protocols, measurements for most active GLOBE

protocols can now be entered via the app. In the future, the app will allow participants to record soil moisture, soil temperature, and frost tube.

New Tree Genus/Species Added to the GLOBE Trees Tool



The GLOBE Observer app is supported and maintained by the Data and Information System (DIS) team. This year, they made several improvements to the app to support tree observations. More than 30,000 genus/species of trees were added as options in the app, and the app now allows users to specify tree genus and species and add common names to tree height measurements submitted to GLOBE Observer.

Results from the GLOBE Eclipse Challenge

In 2024, the Eclipse Challenge—held between March 15 and April 15—focused on documenting changing cloud conditions at different times of the day, from day to day, and during an eclipse. The results were shared in May. Volunteers from over 90 countries collected more than 23,000 GLOBE Clouds observations, generating 25,444 satellite matches. Volunteers in the United States submitted more than 13,900 cloud observations, making it the most active country in the challenge. Saudi Arabia, Croatia, Israel, Mexico, and Thailand were the next most active.

GLOBE partnered with the Civil Air Patrol in April 2024 to design a mission for cadets to collect atmospheric data using the GLOBE Eclipse tool. Read more in this October 2024 Science.NASA.gov article, "GLOBE Eclipse and Civil Air Patrol: An Astronomical Collaboration." Additional eclipse collaborators included Texas Master Naturalists, libraries nationwide, GLOBE educators, NASA Eclipse Ambassadors, NASA Eclipse Soundscapes, and NASA Sunspot events.

The GLOBE Community

GLOBE brings people together from 127 countries through science. This global community forms the foundation of the GLOBE Program, offering input, support, mentorship—and most importantly, scientific observations.

The 2024 GLOBE Annual Meeting

The 2024 GLOBE Annual Meeting was an exciting opportunity to bring together more than 200 GLOBE community members from over 30 countries. Highlights included a keynote by Dr. John Francis (also known as the Planetwalker), student research presentations, a GLOBE community poem performed by students, a visit to the Cave of the Winds at Niagara Falls, and a lively series of talks and workshops. Thank you to UCAR for organizing and to SUNY Fredonia for hosting the meeting!

Working Groups (WGs)

The GLOBE community plays an active role in improving the GLOBE Program. Through four WGs—Science, Education, Evaluation, and Technology—a subset of community members advise the GLOBE Program. Each WG includes representatives from every GLOBE region, as well as a GIO liaison to ensure alignment with and support from GIO priorities.

We would like to thank the following community members for their invaluable input as WG members this year:

Education Working Group

- Rod Allan de Lara (Philippines), *Chair*
- Gillian Bayne (GIO Liaison)
- Ngosse Fall (Senegal)
- Dario Victor Greni Olivieri (Uruguay)
- Nahid Nail Jamil Ajluni (Jordan)
- Dorian Janney (USA)
- Ulle Kikas (Estonia)
- Yupaporn Laplai (Thailand)
- Yogendra Chitrakar (Nepal)*

Evaluation Working Group

- Magdalena Waleska Aldana Segura (Guatemala), *Chair*
- Neil Chen (Taiwan Partnership)
- Reem Dahnous (Jordan)
- Jackie DeLisi (GIO Liaison)
- Kevin O'Connor (Canada)
- Michael Odell (USA)
- Paul Randrianarisoa (Madagascar)

Science Working Group

- Josephine Joy Tolentino-Antalan (Philippines), *Chair*
- Badar Salim Al Maamari (Oman)
- Rafaela Babish (Israel)
- Dr. Shaikha BuAli (USA)
- Claudia Cecilia Caro Vera (Peru)
- Marilé Colón Robles (Contractor) (USA)
- Marta Kingsland (Argentina)*
- Rusty Lowe (GIO Liaison)
- Peter Rugano (Kenya)

Technology Working Group

- Laura Altin (Estonia), *Chair*
- Ghadeer Abdulaziz Khudadah (Kuwait)
- Joan Callope (Philippines)
- Eslam Khair (GIO Liaison)
- Sara Mierzwiak (USA)
- Ana Beatriz Prieto (Argentina)
- Buba Tamba (The Gambia)
- Kristen Weaver (USA)

* Members of the former Evaluation WG who have contributed evaluation expertise to the Science and Education WGs this year

Awards & Fellowships

Congratulations to the following GLOBE community members who were recognized for their work in science and education.

Dr. Elena Bautista Sparrow was awarded the Youth Environmental Science (YES) Medal, presented by Youth Learning as Citizen Environmental Scientists (YLACES).

Dr. Charles Vörösmarty was selected as 2024 American Geophysical Union Fellow.

Brian Campbell received NASA Wallops Distinguished Public Service Award for NASA Contractors.

Dr. Katie Spellman (University of Alaska, Fairbanks) was named the **2024 Usibelli Award winner**.

GLOBE Malta's **Professor Paul Pace** received the National Order of Merit during Malta's 2024 Republic Day Award Ceremony on December 13, 2024.

Laura Altin, GLOBE Croatia country coordinator, **Christine Cote**, GLOBE United States educator **Elida Moreno**, GLOBE Paraguay country coordinator, and **Mariana Savino**, GLOBE coordinator for the Latin America and Caribbean region (shown above, left to right) were accepted into the Global Diplomacy Initiative (GDI) Fellowship program in 2025 at the United Nations Institute for Training and Research (UNITAR).

Ylliass Destin Lawani, GLOBE country coordinator from Benin, was accepted into and participated in the UNITAR Global Diplomacy Fellowship program in 2024.

Dr. Michael Notaro received the Public Science Engagement Award from the University of Wisconsin-Madison.

GLOBE in Action Around the World

From cruise ships to tall ships, from New York, USA, to Senegal, West Africa, GLOBE participants are using science to monitor their local environments and share their data with the world!

Between May 2024 and April 2025, more than 200 news articles and Stars Stories (stories featuring exemplars of GLOBE in action) highlighting the work in 72 countries were published on the globe.gov. In this report, we share a few highlights from around the world.

GLOBE Observations from the Sea!

GLOBE receives many observations from sea—citizen scientists are collecting data even while on cruises or private boats.

In March 2024, however, we received our first observations from a tall ship! GLOBE alumna Ashlee Wells and a group of fellow students from around the world sailed on the tall ship *MIRAIE* across the western Pacific Ocean, from Yokohama, Japan, to the Micronesian Republic of Palau—a journey of approximately 2,000 nautical miles. The students were immersed in learning about, and doing, marine science with guidance from GLOBE's Christina Buffington, a science education director and program manager at the University of Alaska Fairbanks at the time, and GLOBE's Cheryl Williams, a recently retired teacher at Palmer High School, Palmer, Alaska. Read about their journey and check out the inspiring story map, Sailing for a Sustainable Ocean.

Highlights from Africa

GLOBE Senegal: Teachers and Students Use Soil Protocols to Help Local Farmers

Students in Senegal use soil protocols to conduct soil characterization activities and to measure soil pH and fertility. The findings were shared with local farmers to help them identify steps they could take to increase their crop yield. Read the full story.

GLOBE Africa Students Participate in Second Annual December Data Push/Challenge

With schools in Africa closed during December, the number of data submissions tends to plummet. GLOBE Africa has found a great way to keep students involved in the program. Students compete to see which country's students can upload the most data points during the month. Only manually generated data are considered (automatically generated data, such as from a weather station, are not allowed). A total of 1,579 manually generated datapoints were submitted during the December holiday, with Ghana winning the 2024 challenge with 551 data points. Read the full story.

Highlights from Asia and Pacific

Exploring the Health of the Suriname River

Students in Suriname have been examining the impact of urban development on the water quality of the Suriname River. Using GLOBE methodologies and their own knowledge of hydrometeorology, the students investigated various hydrological parameters for the river, such as nitrate, temperature, pH, dissolved oxygen, conductivity, transparency, and turbidity. The findings from the students' research indicated that urbanization significantly impacts the water quality of the Suriname River, evidenced by higher turbidity and conductivity, as well as lower dissolved oxygen and transparency in urban areas. Read the full story.

Tackling Microplastic Pollution in Taiwan

In Taiwan, student researchers observed the presence of microplastics in the Xinjian River. Their investigation culminated in the proposal of three innovative solutions aimed at mitigating plastic pollution and raising public awareness. This project exemplifies the proactive role youth can play in addressing global environmental challenges. Read the full story.

Highlights from Europe and Eurasia

GLOBE Czech Republic: Students Reveal Significant Pollution in Their Local Water Stream

Three students noticed a significant decline in the aquatic life of a local water stream and wanted to find out why. With the help of modern sensors and the guidance of their teacher, they began researching the conductivity, pH, temperature, and nitrate concentrations at multiple sites along the 7-km-long stream that crosses three villages using GLOBE Hydrosphere Protocols. Their research revealed high levels of contaminants around certain pipes, indicating sewage discharge from households, with conductivity levels measuring up to 30 times higher than normal. The students used their research to jump into action, creating an interactive map of pollution sources and bringing their findings to residents and local authorities, leading to a potential solution. Read the full story.

GLOBE Estonia: GLOBE Students Develop a Unique Board Game to Promote GLOBE and Science Research

The Estonian GLOBE community has developed a board game to promote the GLOBE Program and the world of research through various science questions. The GLOBE board game is based on the four spheres studied in the program: atmosphere, biosphere, hydrosphere, and pedosphere. The game includes questions that test players' knowledge of science, the environment, and the GLOBE Program in general. Read the full story.

Welcoming Montenegro

In June 2024, the Montenegro Minister of Education, Science, and Innovation and the U.S. Ambassador to Montenegro signed the GLOBE Agreement between the Ministry and NASA at a signing ceremony in Montenegro's capital city of Podgorica, making Montenegro an official GLOBE country. Read the full story.

Highlights from Latin America and Caribbean

Connecting GLOBE Activities in Uruguay, Peru, and Argentina to Learning About Butterflies

The project "Butterflies and the Environmental Variables" started at the beginning of the COVID pandemic and has since expanded to six schools in three GLOBE countries: Uruguay, Peru, and Argentina. Through this project, students learn about butterflies using the GLOBE Land Cover and (modified) Phenology protocols. Read the full story.

GLOBE Brazil and Chile: Students Engage in Research on Climate, Trees, and Water Scarcity

Students in southeastern Brazil initiated an investigative project focused on evapotranspiration—studying the moisture generated by the respiration and transpiration processes of large trees. They conducted detailed observations and collected data to analyze whether a single tree could affect the surrounding air temperature and humidity. Through this hands-on research, they learned how these trees acted as natural climate regulators, especially during hot, dry periods. The students' research yielded surprising results, showing that even a single tree can significantly influence local air temperature and humidity. Their findings highlighted the importance of trees in maintaining environmental balance.

In Chile, two primary schools participated in GLOBE research on rainwater filtration as part of the water scarcity campaign. They also monitored a lentic water body and collaborated on a rainwater campaign. Read about GLOBE Brazil and Chile in the full story.

GLOBE Dominican Republic: Students' Research on Microplastics Highlighted at 2024 Events

GLOBE Dominican Republic students presented their research on microplastics at World Water Day (Giornata Mondiale Dell'Aqua) in Mantua, Italy, on March 22, 2024. Organizers Sandro Sutti and Lorella Rigonat were impressed by the outcome of the Dominican students' investigations, which influenced a new law in the Dominican Republic (Law 2025-20). Among other measures, the law will require importing companies and plastic manufacturers to use a biodegradability certificate issued by a laboratory accredited in the corresponding standard. Read the full story.

Highlights from Near East and North Africa

GLOBE Oman: GLOBE Students Paint the Road Blue to Gather Data About Surface Temperatures

GLOBE Oman students ran an exciting experiment to see if the color of the road in front of their school would affect the temperature of and around that road. With the support of their teacher, and approvals from local authorities, the students painted the street blue to help them research surface temperatures using the GLOBE Surface Temperature Protocol. Once the paint dried, students measured the surface temperature in two places: the normal black areas of asphalt and the areas painted blue. By analyzing the data, the students found a noticeable difference in temperature between 5°C and 6°C, with blue painted surfaces being lower in temperature. Read the full story.

GLOBE Jordan: Engaging Parents in GLOBE Through the GLOBE Observer App

GLOBE Jordan organized a workshop aimed at training parents on the Clouds Protocol using the GLOBE Observer app. This collaborative learning experience enabled parents to understand and participate alongside their children in future GLOBE Program activities. Read the full story.

GLOBE Qatar: GLOBE Primary School Educators Find Smart Solution for Urban Flooding

In response to the impacts of severe rainstorms across Arabian Gulf countries, GLOBE educators from Moza Bint Mohammed primary school developed Rain Rescue—an Internet of Things (IoT) and solar-powered system that monitors water levels, clears blocked drains, and alerts drivers of flood risks. Read the full story.

Highlights from North America

Berks Nature Partners with GLOBE to Bolster Community Science Efforts!

GLOBE Partnership Berks Nature (Reading, PA, USA) uses the GLOBE Program as a central part of its community science efforts. Berks Nature trains adult volunteers, known as "community scientists," to collect GLOBE data. In 2024 alone, these community scientists have logged over 2,000 volunteer hours! The community scientists use GLOBE to monitor water quality and atmospheric conditions. These data have allowed the organization to investigate the effects of a local dam removal, conduct a temperature snapshot to assess areas needing tree planting for trout protection, and identify pollution sources from rock salt use along the local riverbanks. Read the full story.

Results from the North American Phenology Campaign

Observers measured leaf green-down using the GLOBE Color Guide and GLOBE Observer app and entered 1,695 measurements into the GLOBE database. As of April 30, 2025, observers measured leaf budburst and green-up and entered 764 measurements into the GLOBE database. Read the full story.

GLOBE United States: Students Enhance Their Existing Research Project with GLOBE Protocols

Students from Parish, NY, first started collecting water-quality data during their geology class in 2023. They enjoyed the experience so much that they decided to continue their research on their own time over the next 2 years. Using GLOBE protocols for dissolved oxygen, nitrates, pH, water temperature, and water transparency, they expanded their research and found that the water quality in four local rivers was better than they expected, although salt levels were high at certain times of the year. Read the full story and their GLOBE research report.

Exciting GLOBE Initiatives on the Horizon

This past year, GLOBE has been establishing deeper connections between GLOBE and NASA science at multiple levels—including individuals, projects, institutions, and NASA missions. In the coming year, GLOBE has several exciting opportunities to collaborate with NASA scientific initiatives, using citizen science to augment their work.

The NASA Disaster Response Coordination System (DRCS) is teaming up with GLOBE to see how citizen science data can support disaster relief efforts. Satellite data—while critical to response operations—is limited by cloud cover, orbital timing, and latency in data availability. Ground-based observations through GLOBE may be able to augment these sources to provide localized, timely, and geolocated photos that capture land cover changes before and after hurricanes and other severe weather events. From August 1 to October 31, 2025 (also known as hurricane season in the U.S. and Latin America), GLOBE citizen scientists will be asked to use the existing GLOBE Observer mobile app to gather recurring observations of land cover in hurricane-prone areas of the southeastern United States on a weekly/monthly basis. (Note: Participants should not take observations during or directly after storms when it might be unsafe to do so.) DRCS will evaluate the utility of GLOBE land cover data for disaster response based on this pilot collaboration.

NISAR is a joint NASA-ISRO (USA and India) mission set to launch in 2025. This satellite mission will monitor Earth's changing ecosystems, surfaces, and ice masses—providing data to support agriculture, disaster management, water monitoring, and more. GLOBE is collaborating with Dr. Erika Podest, Jet Propulsion Laboratory (JPL), and Dr. Kyle MacDonad (joint appointment JPL and CUNY) to outline ways GLOBE can provide ground validation of data for the upcoming NISAR mission. GLOBE will encourage participants to take ground-based measurements including soil moisture, biometry, and phenology to contribute to the many research applications that NISAR data will support.

The Earth Works Hub is interested in marshalling the GLOBE community to collect data for a pilot project on Smallholder Agriculture Monitoring and Condition Assessment in Alabama, which could lead to similar citizen science efforts in other locations.

The GLOBE Program Office at NASA has been working with NOAA's Meteorological Assimilation Data Ingest System (MADIS) team to ingest GLOBE weather observations and expect to establish a connection between GLOBE and MADIS in the summer of 2025. MADIS is a comprehensive system that passes data through various quality checks before making them widely available to the meteorological community, universities and research institutions, federal and local government agencies, the public, and more.

In addition to inspiring the next generation of scientists and fostering 21st century skills such as critical thinking and problem solving, GLOBE has the potential to augment other workforce development skills such as data literacy. Many GLOBE educators have connected GLOBE materials with education programs for skilled trade jobs in vocational agriculture, aquaculture, and electrical and plumbing technologies. Building on these efforts, the GLOBE Implementation Office will develop new educational resources focused on agriculture and technology, such as data harvesting, coding, and the use of small sensors. Additionally, we will create a guide to help Career Technical Education (CTE) and vocational training educators implement GLOBE in their classes. This guide will be similar to other guides on the GLOBE Observer website (observer.globe.gov/toolkit/guides). GLOBE is working with Ricardo Toledo-Crow who oversees the Next Generation Sensor Lab at the CUNY Advanced Science Research Center. Ricardo, who is also the rotating lead scientist, runs a summer Do It Yourself CTE program for high school students. In the fall, we will be running a workshop for CTE educators where we will pilot our draft materials before making the guide available for other educators.

GLOBE Mission EARTH hosted the NASA/GLOBE PM 2.5 Low-Cost Sensor Workshop, held virtually May 7–9, 2025. The goal of the workshop was to facilitate a dialogue between scientists and practitioners using PM2.5 Low-Cost Sensor (LCS) data in their research and the learning science communities utilizing localized networks. As a result of the workshop, both the organizers and participants strengthened collaborations and understanding of how PM2.5 LCSs are used by the broader scientific community.

The GLOBE Implementation Office also plans to increase efforts to engage with GLOBE alumni—students, educators, and scientists who have previously participated in GLOBE but have moved on to other endeavors—to offer them opportunities to network and engage with current citizen science efforts.

Appendix: Presentations

Bourgeault, J., Carlson, A., Wicklein, H. F., & Cox, S. (2024, November). *Soil and water tents combine science, art, inquiry, and data*. NAAEE Annual Conference, Pittsburgh, PA.

Bourgeault, J., Carlson, A., Wicklein, H. F., & Jabot, M. (2024, May). W*elcoming the GLOBE to your world.* PLT-WET-WILD Annual Conference, San Antonio, TX.

Bourgeault, J., Notaro, M., Lewis, A., Wicklein, H. F., & Carlson, A. (2024, December). *"For my audience, it looks like this…" The foundations of environmental data collection and student research through a variety of GLOBE programming.* AGU Fall Meeting Abstracts, 2024:ED42B-03.

Bourgeault, J., Wicklein, H. F., Carlson, A., Rose Cunningham, R., Cox, S., & Colter, R. (2024, December). *Scientists, educators, students, and artists collaborate to create" Earth around us" tents to support learner skills in inquiry, data visualization, science, and art.* AGU Fall Meeting Abstracts, *2024*(2633), SY53C-2633.

Buffington, C., Osborne, M., Sparrow, E., Glade, S., Veenstra, G., House, M., Parsley, R., Faulkner, S., & Scharfenberg, J. (2023, December). *Connected habitat and learning for juvenile salmon in Cripple Creek in Fairbanks, Alaska.* American Geophysical Union Annual Meeting. San Francisco, CA.

Buffington, C., Sparrow, E., Chase, M., Veenstra, G., House, M., Krauss, T., Faulkner, S., & Scharfenberg, J. (2024, April). *Connected habitat and learning in Cripple Creek and across the Yukon River Watershed.* American Water Resources Association, Alaska Section Annual Meeting. Fairbanks, AK.

Carlson, A., Young, B., & Wicklein, H. F. (2024, November 1). *Get started with GLOBE: Green-up/green-down.* Upper Valley Teaching Place Collaborative Fall Conference, Fairlee, Vermont, USA.

GLOBE Representatives. (2024, December 9–13). GLOBE work was shared through 35 presentations, including several student presentations. AGU 2024, Washington, DC.

Kirn, S., Severino, M. K., Ogiemwonyi, L., Chambers, L., & Low, R. (2025, May 28). *Bridging science and learning outcomes in the participatory sciences.* Conference for Advancing Participatory Sciences, Portland, OR.

Low, R. (2024, May 2). *GLOBE Africa Mission Mosquito surveillance and mitigation campaign*. (2024). GLOBE Africa Regional Meeting, Yaoundé, Cameroon (Virtual).

Low, R. (Keynote). (2024, August 7). *Aumenando la resiliencia frente al dengue: Un enfoque multidisciplinar a la ciencia ciudadana.* Annual Conference of the Doctoral Program in Natural Sciences for Development, San José, Costa Rica.

Low, R. (2024, August 12–16). *Building resilience to dengue: A multidisciplinary approach including citizen science.* U.S. Department of State Speaker Program, Jamaica.

Low, R. (2024, August 21). *Mosquito Habitat Mapper and the GLOBE Program*. World Mosquito Day, Ghana Education Service, Accra.

Low, R. (2024, September 1–7). *Aumentando la resiliencia frente al dengue: Un enfoque multidisciplinario a la ciencia ciudadana. Building resilience to Dengue—A multidisciplinary approach with citizen science.* U.S. Department of State Speaker Program, Costa Rica.

Low, R. (2024. September 3). *Embatalk: El Programa GLOBE: Una herramienta de Eco diplomacia & el enfoque «Una sola salud» para la seguridad sanitaria mundial.* (2024). U.S. Department of State Speaker Program, U.S. Embassy, Costa Rica.

Low, R. (Panel Moderator) (2024, September 17). *Fostering global engagement: Leveraging the NASA GLOBE International STEM Network* (Session ID 2157411). United Nations General Assembly Science Summit, New York.

Low, R. (2024, October 22). *The GLOBE Program: Aumenando la resiliencia frente al dengue: Un enfoque multidisciplinar a la ciencia ciudadana.* The GLOBE Program: Latin American and the Caribbean Regional Meeting.

Low, R. (2024, October 25–26). *Fulbrighters: Leverage the GLOBE Program to expand your international network and impact.* Fulbright Association Annual Meeting, Washington, DC.

Low, R. (Facilitator) (2024, December 9). GLOBE Surface Temperature Teacher Workshop. Gulf Coast Ocean Observing System Education and Outreach Committee, New Orleans, LA.

Low, R. (2024, December 11). *Community driven science for policy solutions. Science policy and government relations, AGU, and thriving Earth exchange* (Panel Discussion). AGU Annual Meeting, Washington, DC. https://agu.confex.com/agu/agu24/meetingapp.cgi/Session/241083

Low, R. (2024, December 12). *GLOBE Program: Community science and policy. panelist, community science and policy.* AGU Annual Meeting, Washington, DC.

Low, R. (2025, January 23). *The GLOBE Program. Community-driven science training.* Voices for Science Webinar. American Geophysical Union.

Low, R. (2025, 19 March). *Harnessing the power of citizen science for climate action.* (2025). European Climate Pact: Together in Action 2025, Brussels (Virtual).

Low, R. (discussant). (2025, April). *Celebrating the South American Network for One Health (SANO).* South America Regional Office for Environment, Science, Technology, and Health, Embajada de los Estados Unidos en Lima (Virtual).

Low, R. (2025, April 11). *GLOBE Observer Mosquito Habitat Mapper: Data to fight dengue.* LAC RCO Science Subcommittee Meeting (Virtual).

Low, R. (2025, April 25). *Opportunities for Costa Rican high school science institutes: Classroom partnership opportunities with NASA-funded dengue research.* Virtual meeting coordinated by U.S. Department of State, Regional ESTH Hub for Central America and the Caribbean.

Low, R. (2025, May 6–14). *GLOBE Mission Mosquito Africa: Responding to the impending malaria crisis on the continent.* GLOBE Africa RCO Meeting.

Low, R. (2025, May 16). *Mosquito Habitat Mapper training, Mobile app surveillance and mitigation of larval habitats by citizen scientists: Tools to support community based action research and public outreach.* GLOBE Africa Train the Trainer Workshop (Virtual).

Low, R. (2025, May 19). GLOBE Observer Mosquito Habitat Mapper: A citizen science project connected to GeoHealth and NASA Science. AAAS Fellows Professional Development Workshop, Crowdsourced Science: Citizen Science in Federal Agencies, AGU Conference Center, Washington, DC.

Low, R. (Panelist) (2025, May 29). *GLOBE's 30 year legacy. School-based citizen science panel.* Conference for Advancing Participatory Sciences, Portland, OR.

Low, R. (2025, June 6). *Promoting civic engagement and environmental action through school-based citizen science.* Seminários Permanentes do PPGECEM Ciclo Online, Pós-Graduação en Educação em Ciências e Educação Matemática, Unioeste. Mediador Dr. João Fernando Christofoletti.

Low, R. (2025, June 25). *Global mosquito alert: A citizen science project connected to GeoHealth.* CGSP/Aurora Working Group, EU Citizen Science and Climate Change Mitigation Programmes (Virtual).

Low, R. (2025, June 25). *GLOBE Observer Mosquito Habitat Mapper: USG tools to leverage action.* Global Health Diplomacy Course (PE152). Foreign Service Institute, Washington, DC.

Low, R., Boger, B., Jabot, M., Schelkin, L., & Vörösmarty, C. (2024, December 11). *Research and broader impact opportunities for scientists supported by participation in the GLOBE International STEM Network. SY31D: Sharing their Science: Enabling scientists in public engagement and communication efforts.* AGU Annual Meeting, Washington, DC. https://agu.confex.com/agu/agu24/meetingapp.cgi/Paper/1697137

Low, R., Boger, B. & Schneider, J. (2024, November 8). *Broaden your host country networks and impact through the GLOBE Program.* Fulbright Association Annual Meeting.

Low, R., McAuliffe, C., & Fischer, H. (2025, February 17–19). *Pictures to numbers: A pedagogical approach to building data analytics skills in HS students.* DSE–12 Inaugural Conference San Antonio, TX. https://easychair.org/cfp/DSE_K12

Low, R., Nelson, P, & Thodati, A. (2024, July 15). *Community Climate Chronicles: A catalyst for meaningful change and collective climate resilience.* The GLOBE Program Annual Meeting 2024, Fredonia, NY.

Low, R. & Soeffing, C. (2025, March 4–7). *Don't look up, look down! A free mosquito surveillance mobile app and fun educational resources to support your local community outreach.* American Mosquito Control Association, Puerto Rico.

Low, R. & the GLOBE Implementation Office (2024, October 22). *Puesta al día de la Oficina de Aplicación de GLOBE.* The GLOBE Program: Latin American and the Caribbean Regional Meeting.

Low, R., Yang, D., & Huang, X. (2025, March 4–7). *Engage communities in mosquito surveillance and mitigation using NASA's GLOBE Observer Mosquito Habitat Mapper citizen science tool for vector control and research.* American Mosquito Control Association, Puerto Rico.

Mason, M., Vuyovich, C., Joseph, A., Montgomery, C., Moore, K., Kowalczak, C., Sack, C., Sandal, J., & Buffington, C. (2023, December). *NASA MAIANSE SnowEx Interns: Three years of minority serving higher education institution internship experiences.* American Geophysical Union Annual Meeting, San Francisco, CA.

Schiller, A. & Low, R. (2025, March 4–7). *Using mosquitoes in NASA science as theme, we built a new collaborative program with big science partners to bring master naturalist-level environmental education to all ages and incorporating reciprocity through participatory citizen science*. American Mosquito Control Association, Puerto Rico.

Schiller, A., Low, R., & Soeffing, C. (2024, June 3–6). *Texas model: Empowering communities with citizen science.* Annual Conference for Advancing the Participatory Sciences (Virtual).

Sousa, E. (2024, October). *NASA UNBOUND: Broadening access to and use of geospatial data and tools for Tribal food, energy, and water priorities.* UAF Geospatial Alliance Quarterly Meeting, Fairbanks, AK.

Sousa, E., Dowty, S., Banner, M., Spellman, K., Buurman, H., Chase, M., Heeringa, K., Pittas, M., Bostwick, S., & Sparrow, E. (2024, September). *UNBOUND: Broadening the use of and access to NASA data for Tribal food, energy, and water priorities*. National Tribal and Indigenous Climate Conference, Anchorage, AK.

Sparrow, E. (2024, April). (Invited Keynote). *From the tropics to the Arctic: My journey to community and citizen science in the Far North*. Annual Community and Citizen Science in the Far North Conference, Arctic Research Consortium of the United States.

Sparrow, E. (2024, April). *Multiple knowledge learning framework for youth-led research.* Annual Community and Citizen Science in the Far North Conference, Arctic Research Consortium of the United States.

Sparrow, E. (2024, February). *Data sovereignty and ethics.* Global Learning and Observations to Benefit the Environment. (Virtual)

Sparrow, E., Chase, M., Spellman, K., Buffington, C., Shaw, J., Roach, S., & Sousa, E. (2023, December). *Applying a multiple knowledge system framework for respectful and equitable collaborations with Indigenous communities and action-oriented STEM engagement with Indigenous youth in Alaska and beyond*. American Geophysical Union Annual Meeting, San Francisco, CA.

Sparrow, E., Spellman, K., Itchoak, R. & Scott, A. (2024, February). *K–12 student-led research panel.* Tundra Tales Series. Arctic Research Consortium of the United States (Virtual).

Spellman, K. V., Sparrow, E. B., Temte, J., & Lewis-Nicori, J. (2024, February). *Arctic together showcase.* Alaska Forum on the Environment, Anchorage, AK.

Spellman, K. V. (2024, March). *Turning citizen science data into youth climate action during the GLOBE Year of Climate and Carbon.* Texas STEM Conference (Virtual).

Spellman, K., & Robbins, K. (2024, February). *NASA Science Live: What does it mean to be cool? Fresh eyes on ice GLOBE Observer feature.* Sci Starter National Event (Virtual).

Spellman, K. V., & Crump, S. (2023, December). *Observing river and lake ice with GLOBE and SIKU.* Fresh Eyes on Ice international training webinar (Virtual). https://media.uaf.edu/media/t/1_73k4do4n/252210103

Spellman, K. V. (2024, February). *GLOBE Year of Climate and Carbon Campaign in Alaska-Imagining the future using GLOBE data*. GLOBE Year of Climate and Carbon Webinar Series (Virtual).

Spellman, K., Sparrow, E., Villano, C., Spellman, I., & Spellman, S. (2024, July). *GLOBE Year of Climate and Carbon: Past, present, and future of GLOBE climate change research and action.* GLOBE Annual Meeting, Fredonia, NY.

Wells, A., & Buffington, C. (2024, July). *Sailing to the future with GLOBE on the tall ship MIRAIE.* GLOBE Annual Meeting, Fredonia, NY.

Young, B. (2024, October). *Earth around us tent program*. New Hampshire Science Teachers' Association (NHSTA) Fall Conference.

Student and Educator Participant Presentations

Aeo, L., Pridemore, C. J., & Villa, J. (2024, August). *Permafrost and roads: The recurring climate challenge.* Climate Research Intensive Mini-symposium, Fairbanks, AK.

Berbe, A., Nguyen, B., & Vanegas, S. (2024, August). *Exploring the effects of leaf damage to the production of* rubus idaeus *fruit.* Climate Research Intensive Mini-symposium, Fairbanks, AK.

Boelens, J., Steeves, R., & Smith, G. (2024, July). *Dissolved oxygen and fish and wildlife habitat in gravel pit ponds.* GLOBE Annual Meeting, Fredonia, NY.

Brannan, T. (2024). *Water temperature and pH measurements on Gulkana Glacier and Phelan Creek, Alaska.* GLOBE International Virtual Student Symposium.

Brannan, T. (2024, April). *Water temperature and pH of Gulkana Glacier and Phelan Creek, Alaska.* American Water Resources Association – Alaska Section Annual Meeting, Fairbanks, AK.

Brannan, T. (2024, July). *Water temperature and pH of Gulkana Glacier and Phelan Creek, Alaska.* GLOBE Annual Meeting, Fredonia, NY.

Calderon, J., Flores-Diaz, H., & Fouche, J. (2024, August). *Exploring the connection between soil thermodynamic parameters and* Vaccinium uliginosum (Ericaceae) *leaf pathogenesis in subarctic boreal forest.* Climate Research Intensive Mini-symposium, Fairbanks, AK.

Diaz, V., Mendoza,Y., & Torok, M. (2024, August). Equisetum arvense *along a permafrost thaw and canopy cover gradient.* Climate Research Intensive Mini-symposium, Fairbanks, AK.

Finnesand, K., Acquah, B., & Hoover, A. (2024). *Insulating effects of ground cover on soil temperature at Cripple Creek Diversion, Fairbanks, AK.* GLOBE International Virtual Student Symposium.

Knapp, E., & Morris, M. (2024). *Temperature and relative humidity: Cripple Creek and Chatanika River, Interior Alaska.* GLOBE International Virtual Student Symposium.

Krauss, T. (2024, April). *Assessing salmon habitats on the banks of the Chena River in Fairbanks, Alaska.* GLOBE International Virtual Student Symposium, and UAF Undergraduate Research Day, Fairbanks, AK.

Krauss, T., & Whiteley, C. (2024, April). *Assessing salmon habitats on the banks of the Chena River.* American Water Resources Association – Alaska Section Annual Meeting, Fairbanks, AK.

Nguyen, B., Berber, A., Vanegas-Fararra, S., & Spellman, K. V. (2024, November). *Exploring the effects of leaf damage to the production of* Rubus idaeus *fruit.* Southern California Conference for Undergraduate Research, San Bernardino, CA.

Northcutt, A., & Wells, K. (2023, December). *Haa Aani: Stewards of our place – Arctic and Earth SIGNs project 2019 and beyond.* American Geophysical Union Annual Meeting, San Francisco, CA.

Northcutt, A., Wells, K., Buffington, C., & Sparrow, E. (2024, August). *Climate change and your community: Weaving knowledge to honor your place.* Culturally Responsive Education Conference, Juneau, AK.

Skalisky, J., Spellman, K. V., Seitz, T., & Mulder, C. (2024, April). *Invasive plant seedbank development after wildfire in Alaska's boreal forest.* UAF Undergraduate Research Day, Fairbanks, AK.

Smith, C., & Lobato, J. (2024). *How does urbanization affect water temperature in the Chena River in interior Alaska?* NRM 370 Final Presentations, Fairbanks, AK.

Vanegas-Farrara, S., Spellman, K., Berber, A., Nguyen, B., & Sparrow, E. (2024, August). *Diverse habitats support resilience in* Rubus idaeus *pollination and fruit production*. Climate Research Intensive Mini-symposium, Fairbanks, AK.

Veenstra, G., Buffington, C., Peterson, E., Kehoe, P., & Johnston, S. (2024, April). *Under the ice: Winter conditions of Happy Creek following restoration.* American Water Resources Association – Alaska Section Annual Meeting, Fairbanks, AK.

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Appendix: Publications

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