Citizen Science at Home: Public Libraries and Family Science

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Summary:

The NASA Earth Science Education Collaborative (NESEC) is enabling broad participation in NASA Earth Science, including citizen science as part of the international GLOBE Program. Using the free GLOBE Observer mobile app, volunteers contribute to monitoring clouds, water (as a habitat for mosquitoes), plants (trees and other land cover), and help identify change over time. These openly available data can be used to help interpret and augment NASA satellite data. GLOBE Observer partners include Los Angeles Public Library, which engages public participation in science through its Neighborhood Science Program. COVID-19 has required adapting and emphasizing ways to participate in citizen science from home. Learn how this partnership is fostering activities and programs to support remote learning and citizen science from home. These include emerging best practices for building engagement and curiosity, support for parents and caregivers, and participation of subject matter experts.

Above: Video demonstration from home by the North Hollywood Branch of Los Angeles Public Library. The librarian is demonstrating an activity from the GLOBE Observer Toolkit for Informal Educators: Cloud in a Jar.

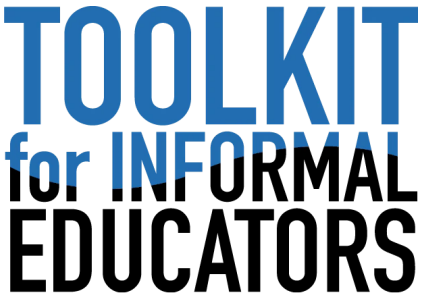
Sections

1. Introduction

Community building through partnerships with informal science education organizations has been a significant focus for GLOBE

Observer (https://observer.globe.gov), including libraries, camps, museums, parks, scouts. In 2020, many of our partners were closed to the public and pivoted to virtual programs and supporting their visitors with online resources.

The GLOBE Observer team equipped partners with electronic content, including toolkits for informal educators well as new and adapted resources - to enable their online outreach to audiences.

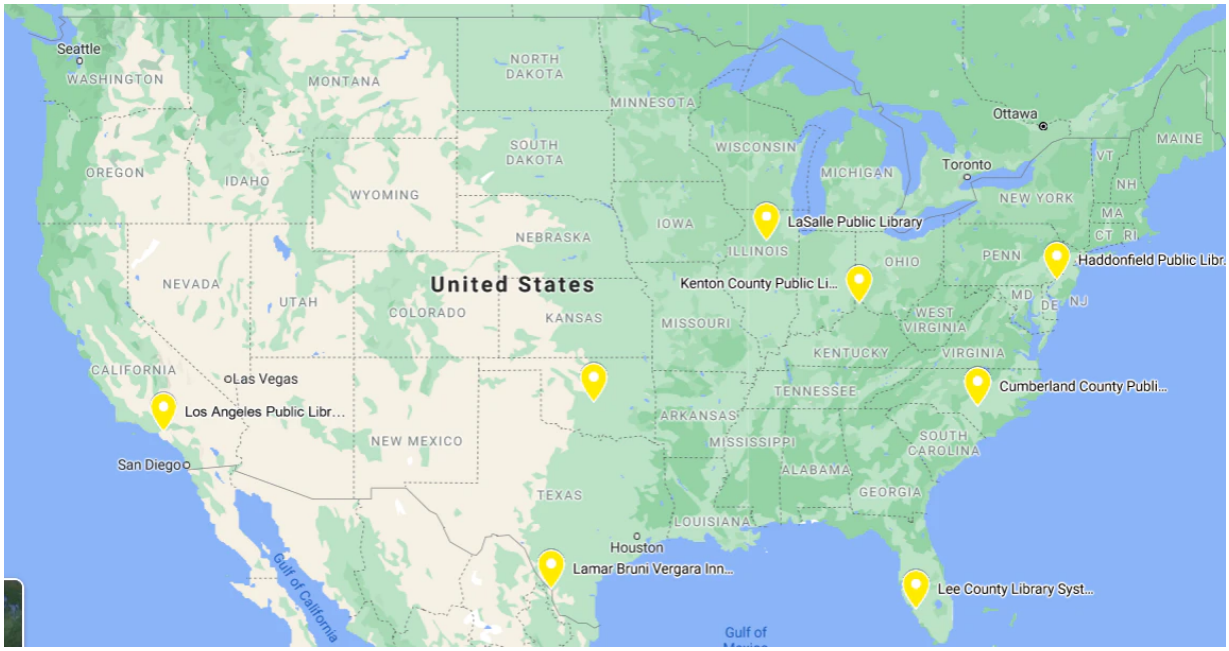


Left: https://observer.globe.gov/toolkit was initially developed in 2019 and includes hands on activities and digital resources for informal educators to engage out-of-school audiences.

2. Field Testing Citizen Science with Libraries

Beginning in 2017, the GLOBE Observer team has collaborated with the **STAR Library Network (*STAR Net*)** to support Earth Day events and citizen science in libraries. STAR Net is a hands-on learning network that focuses on helping library professionals build their STEM skills by providing "science-technology activities and resources" (STAR) and training to use those resources. STAR Net is built upon a strong network of collaborators and partners, led by the Space Science Institute's (SSI) National Center for Interactive Learning (NCIL).

During 2019, NESEC collaborated with STAR Net to recruit public libraries to field test GLOBE Observer and activities in the Toolkit for Informal Educators with 8 public libraries across the U.S. Libraries were selected based on factors including **geography** (to include libraries across the U.S.), **audience served** (to include urban, rural, and suburban), and based on their description of **programs where they planned to use GLOBE Observer** (to ensure a range of programming). Libraries were selected that had experience with citizen science, as well as those new to citizen science, but had a strong interest to engage their patrons in community science.



Above: Locations of libraries field testing GLOBE Observer and hand-on activities. These included: Los Angeles Public Library (CA), Lamar Bruni Vergara Public Library (TX), Pioneer Library system, Oklahoma City (OK), LaSalle Public Library (IL), Kenton Public Library (KY), Haddonfield Public Library (NJ), Cumberland Public Library (NC), and Lee County Public Library (FL).

The table below was shows a subset of activities and resources that were field tested, and information that the libraries were given showing how

these connect to the citizen science ("What Observers are doing"). Activities help prepare or support making the citizen science activities, or provide science background.

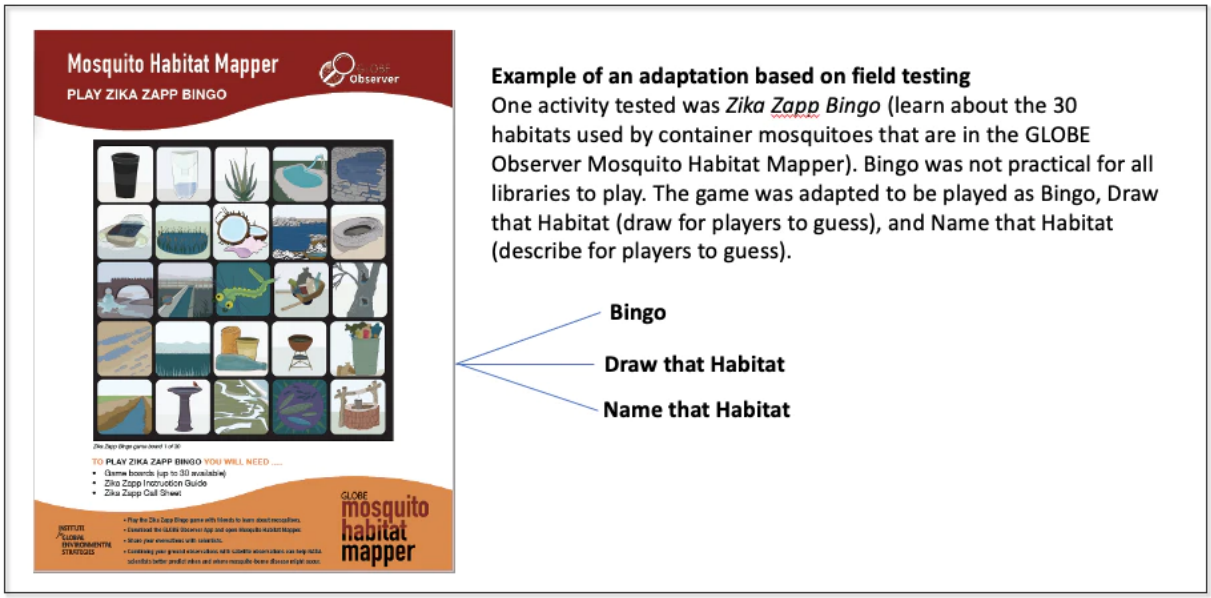
GLOBE Observer Tool	What Observers Are Doing	Activity or Resource that Prepares/Supports Observers	Comments
Clouds	Estimating % of the entire sky covered with clouds	**Activity 1: Estimating Cloud Cover** Make simple models of cloud cover using blue and white paper to practice estimating the percentage of cloud cover.	Time: 15-30 minutes Level: All ages (school-aged children, families, adults) Watch short video clip of Jessica Taylor walking librarians through why and how to do this activity: https://youtu.be/ve_LEMg9lN0
	Identifying sky color and Visibility	**Activity 2: Sky Conditions** – Using the "Sky Condition" chart and plastic cups of water, participants add drops of milk (representing aerosols) to see how that changes the sky color.	15-30 minutes, relevant for school-aged children (up to ages 14) and families.
	Identifying cloud type and height	**Activity 3: My Cloud Clues and Cloudscape** Instructions are provided for conducting an activity that combines these two existing activities. Note – This activity is in two files.	45 - 90 minutes Level: School-aged children (upper and lower elementary) and families
		Review and Provide Feedback **GLOBE Clouds: Citizen Science Guide for Libraries.** Provides information and resources to help libraries planning GLOBE Clouds citizen science programming. It includes suggested timeline, step-by-step guide, related activities and resources, FAQ, books, and more.	Please read and fill out the evaluation form with comments related the guide's usefulness for planning and implementing library programming. How might this be improved or refined to better support library programing? One change that we're considering is aligning the table of resources to steps in the app (similar to this table).
	Supplemental Clouds Resources		
		Elementary GLOBE Books: Clouds and Air Quality (Aerosols) **GLOBE Cloud Window and GLOBE Cloud ID Chart**	UCAR has shipped copies of each book (35 copies of each) to each library pilot test site. These are yours to keep.

The photos below show the range of library programs that have used GLOBE Observer citizen science and activities. These programs covered all ages (children, families, teens, adults), formats (story time, hands-on activities, nature walks, science clubs, book clubs, etc.) and settings (e.g., inside the library, outdoors, online).

Photos courtesy Los Angeles Public Library, CA; LaSalle Public Library, IL; and Lee County Public Library, FL

Results from field testing in libraries included:

- Generally, libraries found the activities easy to prep for and set up, and gave positive rankings.
- Libraries also developed extensions and adaptations.
- Data from field testing shows how the libraries can implement GLOBE Observer, challenges, what worked well, questions from patrons, and new resources that are needed.



3. Pre-COVID Vs Post-COVID Citizen Science in Libraries

Los Angeles Public Library (LAPL) is a GLOBE Partner, and a key collaborator with NESEC. Following are examples from the LAPL Neighborhood Science (NeiSci) and what citizen science programming looked like in a pre-COVID world and adaptations to continue engagement virtually.

a. Pre-COVID

Through it's Neighborhood Science Program, LAPL has engaged its communities through free in-person workshops and events at library branches; patrons could also borrow DIY kits circulating citizen science kit from participating library branches.

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Neighborhood Science

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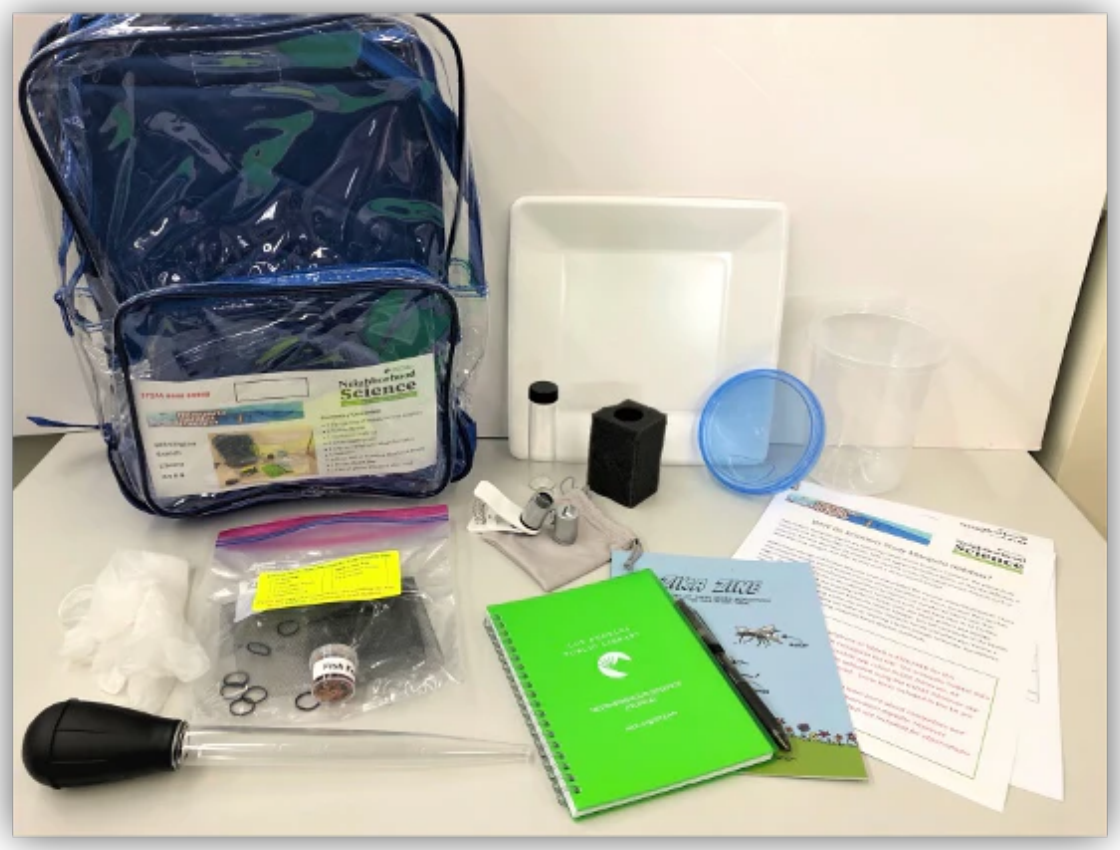
Following are photos from programs: both inside library buildings, as well as outdoors and in neghborhoods.



Above: LAPL GLOBE Mosquito Habitat Mapper DIY circulating kit. The Mosquito Habitat Mapper science lead (Dr. Rusty Low, IGES) helped review introductory information and create text in response from a request from LAPL to show how this issue is relevant to Angelenos (below).

Why do scientists study mosquito habitats?

Two invasive mosquito species are spreading rapidly across Southern California- *the yellow fever mosquito and the Asian tiger mosquito. Both are aggressive daytime biters, so they are definitely a nuisance. But they also have the potential to transmit viruses that cause serious diseases such as West Nile virus, dengue, and Zika, so they pose a serious health hazard.*

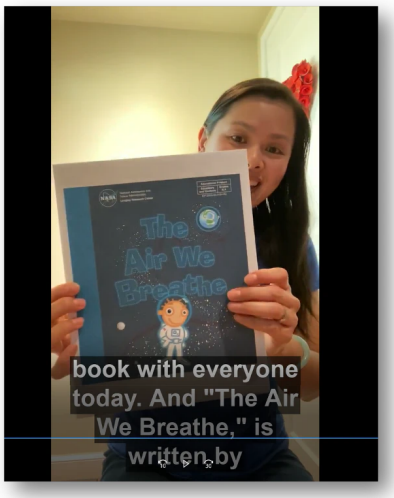
Both climate change and human behavior have exacerbated the invasive mosquito problem. These two mosquito species are not reliant on moist climate conditions to thrive, because they lay their eggs in containers, and manufactured containers by humans are a preferred site to rear their young. ***That means that even in dry subtropical conditions such as we have here in LA County, these mosquitoes can seek out standing water in flowerpots, pet bowls, gutters and storage containers.*** *Using the GLOBE Observer Mosquito Habitat Mapper,* ***you will contribute to the health of your community*** *by reporting where you encounter mosquito larvae and when you remove a breeding site from use by dumping out water or covering a water storage container. Surveillance and mitigation are key to preventing mosquito borne disease outbreaks.*

b. Post-COVID

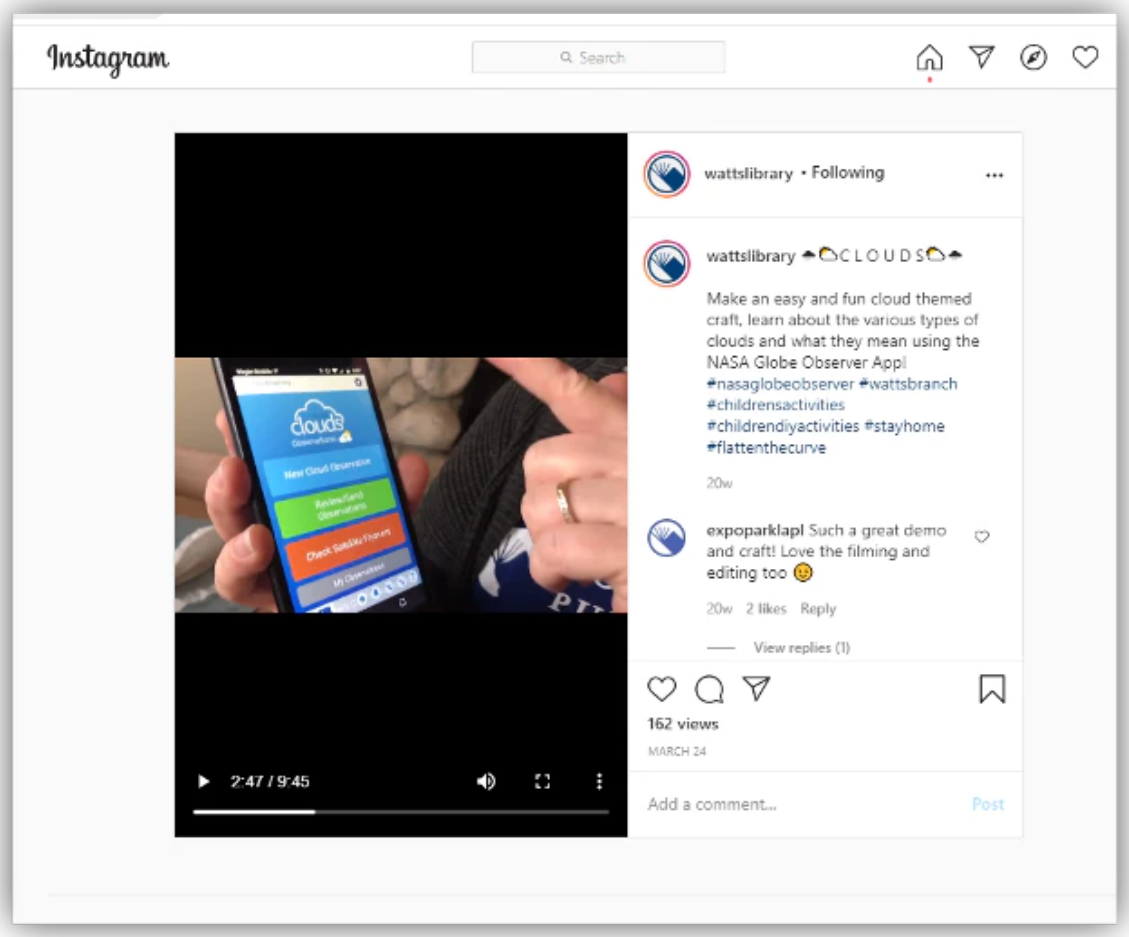
LAPL programs post-COVID required going virtual. Here's what this looked like:

Above: The North Hollywood Branch of the Los Angeles Public Library created a video demonstrating the GLOBE Observer Cloud in a Jar activity that was posted on the library's social media. LAPL also printed copies of the activity, which were distributed in 4,000 created "grab and go" science kits for curbside pickup. Printed materials are particularly important to households with limited access to Internet and printers.

Below: Virtual storytime on the library's social media, with a hands-on activity: *The Air We Breathe* book and making a gas from a liquid activity).



Above: Social media shareable and recording of a recent collaborative webinar by LAPL and GLOBE Observer for the 2021 GLOBE Community Trees Challenge. Below: Instagram post by LAPL.



Going virtual enabled the following opportunities:

- Broadened audience beyond local communities. For example, an April 16 webinar on the 2021 GLOBE Community Trees Challenge included participants from several US states and other countries.
- Ability to connect with subject matter experts beyond the local Los Angeles community. Not requiring travel to the library for a live event opened up access to much broader expertise.

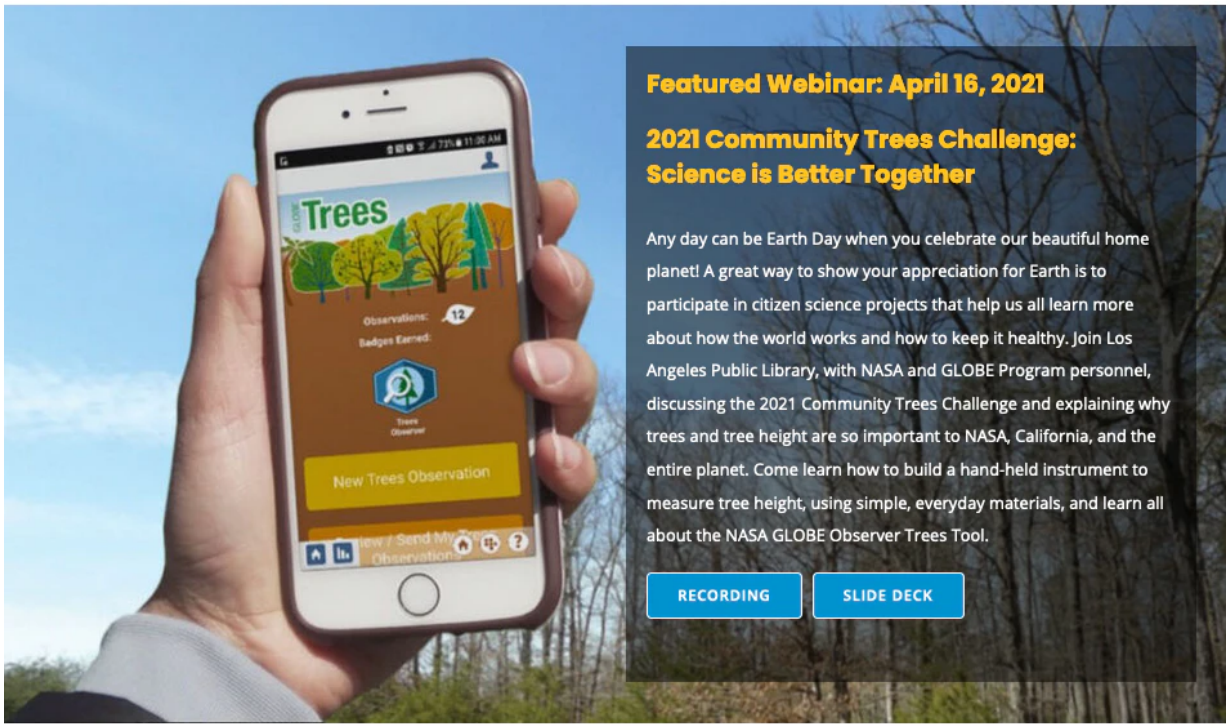
- Increased parent/intergenerational participation.
- Enhanced school's curriculum (LAPL works with Los Angeles Unified School District).
- Increased participants' willingness to search for and try out other citizen science projects.
- Increased willingness of patrons to turn their smart device into a convenient and effective scientific device.

4. Making Broader Library Connections

In 2019, the American Library Association (ALA) adopted sustainability as a core value of librarianship and established an ALA Roundtable on this topic: Sustain RT.

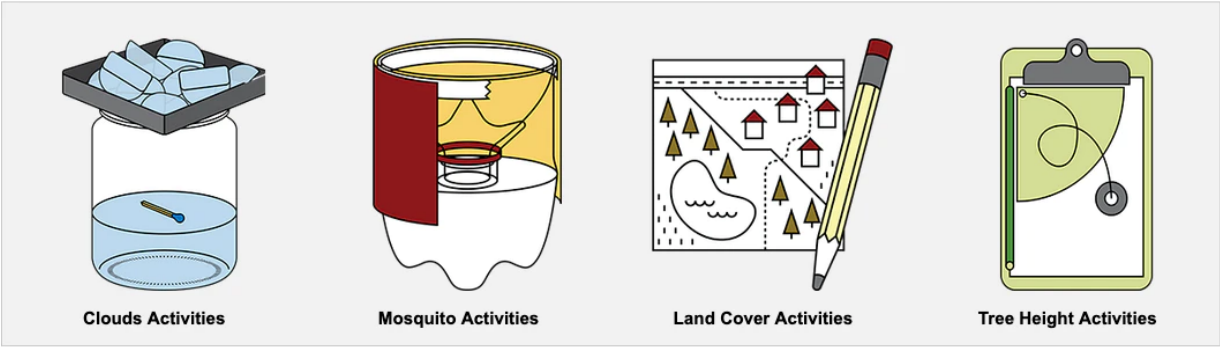
To support libraries, in 2020 STAR Net established the **Our Planet: EARTH campaign**, which focuses on Earth citizen science opportunities and resources to coincide with Earth Day, Citizen Science Month and the continued impact of the COVID-19 pandemic. STAR Net and its partners, including GLOBE Observer and SciStarter, have been reaching out to libraries across the U.S. to encourage their patrons to participate in Earth-related citizen science activities that they can safely do, both inside and outside of their homes.

The Our Planet Earth campaign page includes several resources and events from GLOBE Observer, including a section of hands-on activities that have been used in libraries, links to resources supporting taking GLOBE Observer observations by library staff and patrons (e.g., video demonstrations and science background information), and examples of library programs that can serve as models and inspiration for other libraries.



Above: Link to the recording of an April 16 Webinar that was a collaboration between LAPL and GLOBE Observer team. LAPL hosted and promoted the event; GLOBE Observer team members presented how to participate in the challenge, the science behind why tree height matters and why NASA wants this data, with a hands-on make along activity: building a paper clinometer to measure tree height.

5. Engaging Families in Science from Home



To engage families and support their participation, the GLOBE Observer team developed a collection: **Our Favorite GLOBE Observer Activities for Families.** These include hands-on activities corresponding

to GLOBE Observer tools for observing clouds, mosquito habitats, land cover, and trees.

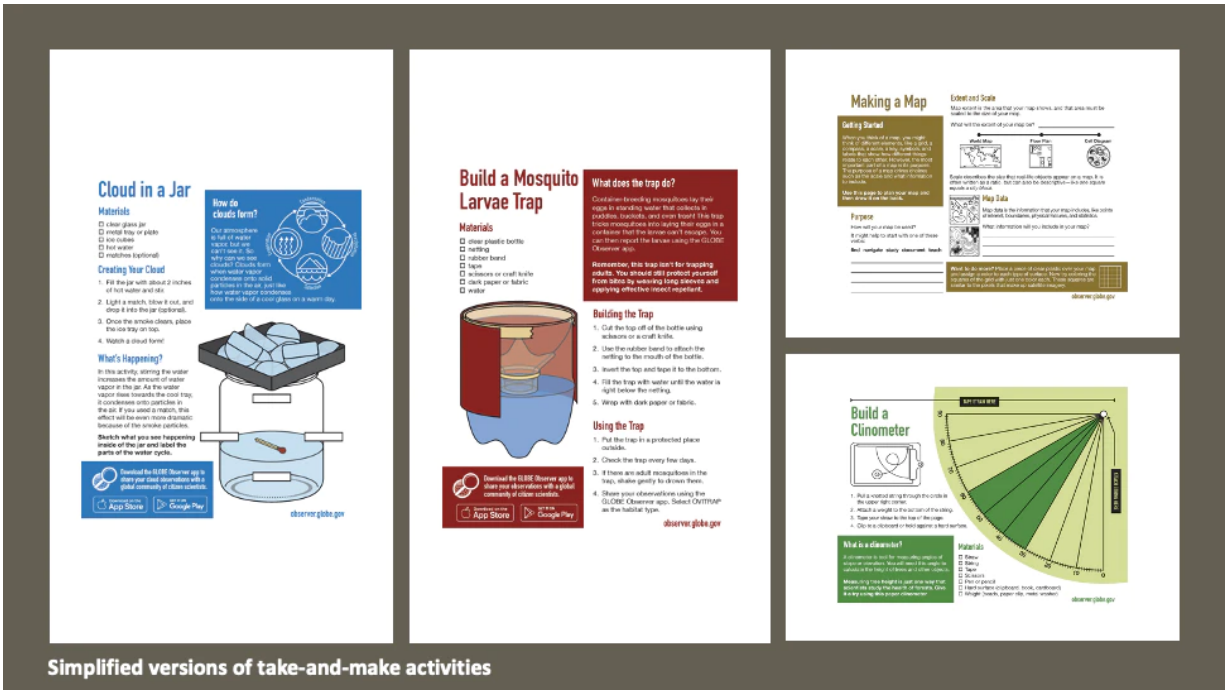
- Create a ***Cloud in a Jar*** using simple household materials and explore how clouds form.
- ***Build a Mosquito Larvae Trap*** out of recycled materials and monitor mosquitoes in your community.
- ***Make a Map*** by drawing and planning out what area your map will show and information it will include.
- ***Build a Paper Clinometer*** and use it to calculate the height of trees.

During summer 2020, 14 families field-tested the activities and responded to questions related to availability of the materials at home, enjoyability, questions that were sparked, if the activity worked as expected, if there were any difficulties, modifications or substitutions that were needed, usefulness of the supplemental resources, and suggestions for improvement.

Feedback from library partners that offer STEM programs for families also reinforced the overall approach and informed recommendations for refining and strengthening this collection.

Following are **four top-level take-aways** from families and libraries:

Start with simple, fun activities. The aim is to begin building curiosity and exploration. The activities needed to be easy-to-do at home using materials that are generally accessible. Parents noted that the activities were appealing because of their simplicity and that they made science tangible. Below: Simplified activities.



Simplified versions of take-and-make activities

The simplified activities are also useful for educators to send home and easy for parents to replicate. **Library partners have posted these on their websites and printed the activities in "grab and go" science kits distributed through libraries, schools, and community organizations.** Printed materials are particularly important to households with limited access to internet and printers.

Provide support for parents and caregivers. Each activity is presented in a consistent format with supplemental resources, including video demonstrations with additional tips, safety considerations, adaptations for younger and older children, questions to prompt discussion, relevance to NASA, and links for going further. *Below: Watch a video demonstration of "Making a Map" activity.*

Offer multiple—and connected—opportunities and resources for engagement. Building engagement and interest in science is a process that goes beyond a single activity. Connections to multiple means are provided for families and learners to engage, increase interest, and—if they wish—contribute their data through GLOBE Observer. Connected collections include the GLOBE Clouds Family Guide (also available in Spanish) and the Mission Mosquito Science Notebook, with a companion guide for parents. A new GLOBE Trees Family Guide was released in late March 2021.

6. Resources and Acknowledgements

a. Resources

GLOBE Observer Toolkit for Informal Educators, observer.globe.gov/toolkit - Find information, activities, and resources to support programming

Los Angeles Public Library Neighborhood Science Program Website

STAR Net Libraries: Our Planet Earth Website

Earth Citizen Science with GLOBE Observer: Watch this recorded webinar to hear from librarians, Vivienne Byrd, LAPL, and Brittany Blomquist, LaSalle Public Library, talk about how they have involved their patrons in using GLOBE Observer.

SciStarter:

- GLOBE Observer page on SciStarter - Participants can track their participation across citizen science projects, including GLOBE Observer, if they register on SciStarter and sign up on this page.
- Girl Scouts Think Like a Citizen Scientist Journey: GLOBE Observer Clouds, Trees, and Mosquito Habitat Mapper are among the list of hand-picked and recommended citizen science projects that Girl Scout Troops can select for their Journey. Many libraries offer programs for Girl Scouts.

Our Favorite GLOBE Observer Activities for Families on the GLOBE Observer Website.

Schwerin, T.G., Fischer, H.A., and Mortimer, H. (2020). Engaging Families with GLOBE Observer. Connected Science Learning, Volume 2, Issue 4. Brief on results of field testing with families.

b. Acknowledgements

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