Citizen Science for Authentic Learning

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During these times…

I hope you and your families are safe and well.

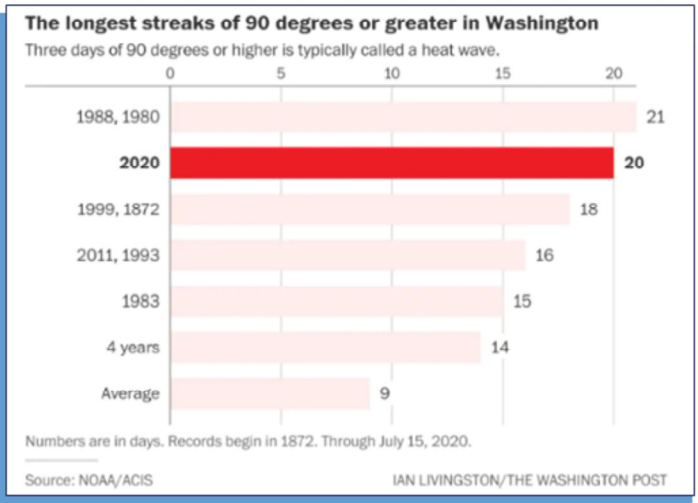
THANK YOU for all you do as educators!

Who am I?

- Once upon a time, a physical oceanographer
- Then a fellow with the GLOBE Program in 2002
- Since 2006 with NOAA Education
  - Program Officer for grants
  - Citizen Science Coordinator
- Also, a citizen scientist!

Washington, DC

Streak of 20 days with a high of at least 90 degrees Fahrenheit this June and July



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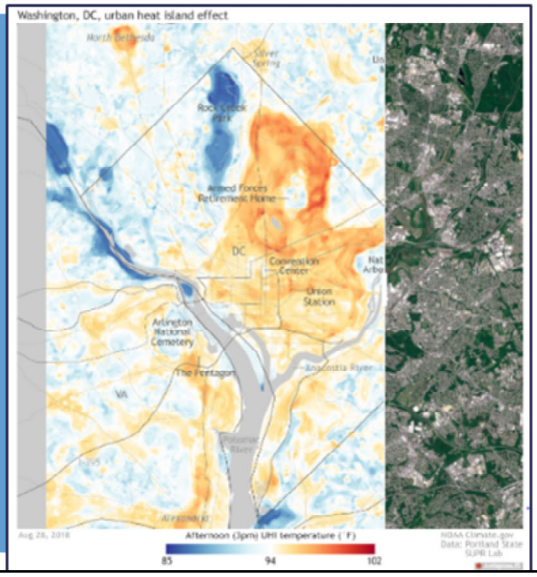
Source: https://www.washingtonpost.com/weather/2020/07/16/after-20-straight-days-with-90-degree-temperatures-or-higher-dc-may-tie-its-all-time-record-today/

Question

How much (in degrees Fahrenheit) do you think the air temperature measured at six feet above the ground varies throughout Washington, DC on a hot summer afternoon?

Citizen Scientists found...

a **17** degree Fahrenheit difference when they did a study on August 28, 2018.



Today I will discuss:

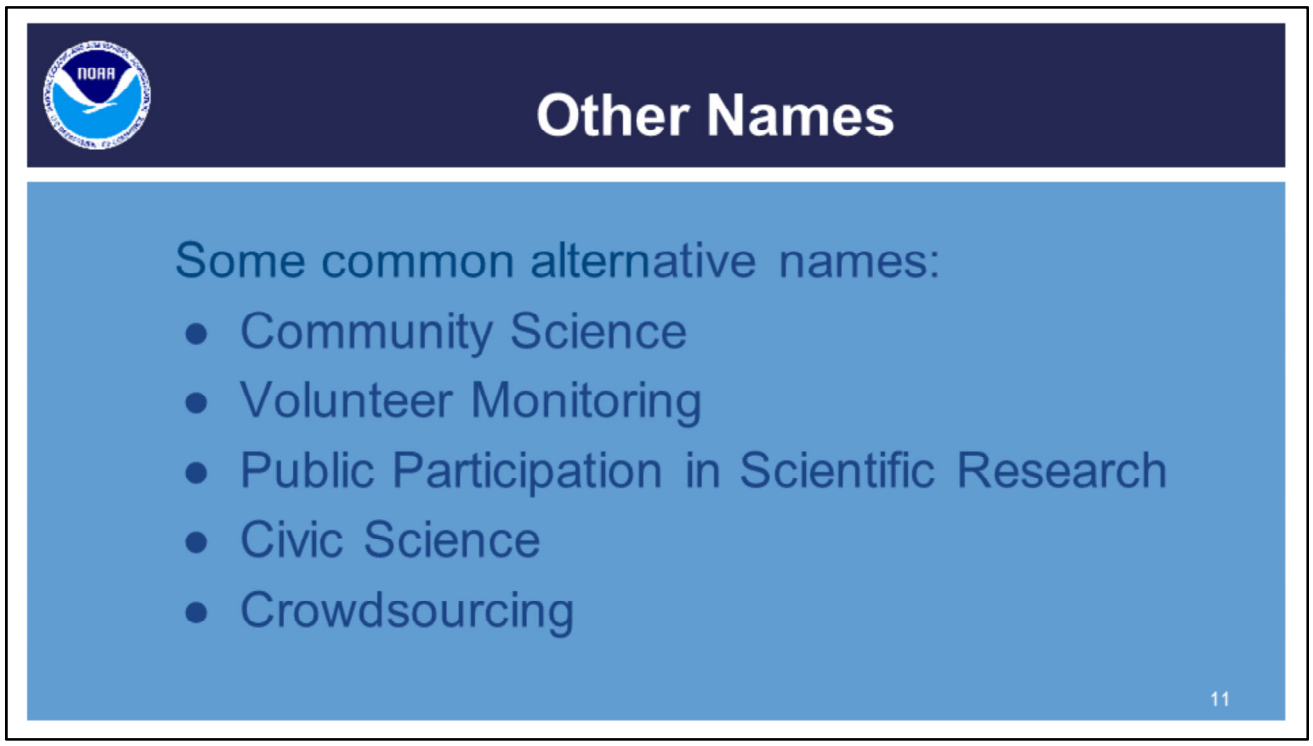
- What is citizen science?
- How it can be a tool to support authentic learning
- Some resources and example projects
- Thoughts on getting started

Teachers often report students that don't excel in the classroom end up doing so when doing investigations outdoors.

Citizen Science

A way for our agency to partner with Individuals to help learn together and accomplish common goals

This is a tool that can help NOAA fulfill components of its mission to understand and predict changes in climate, weather, oceans, and coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources.



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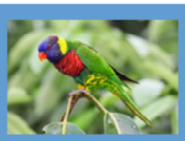
Who was the first?

Ornithology?

Wells Cooke developed a network to study bird migration in the 1880's.



Weather?

John Campanius Holm recorded storms in the American colonies in the mid-1600s.

Phenology?

Japanese cherry blossom records back to the 9th century.

Astronomy?

People have been sharing observations about the sky for millennia.

Info on Cherry blossoms

Foundational to Ornithology

A study looked at publications by ornithologists looking at avian migration and "found that papers based on citizen science constituted between 24 and 77% of the references"

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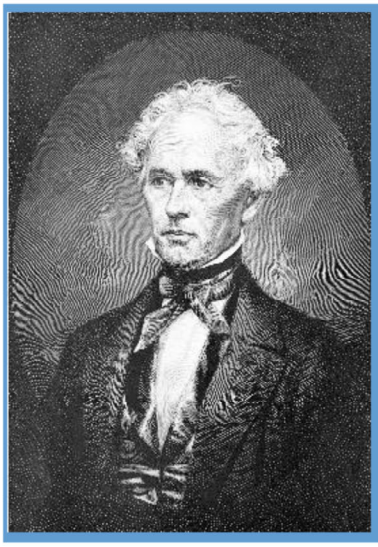
Reference: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0106508

Also, visualizations of bird migration are beautiful and worth the time to check out. Here is a sample: http://help.ebird.org/customer/portal/articles/1006803-how-are-scientists-using-the-data

William C. Redfield (1789-1857)



- A saddle maker, steamboat captain, and self-taught amateur meteorologist from Middletown, CT
- Noticed something interesting after the New York Hurricane of 1821
- In 1831, he published his observations of trees falling northwestward in the eastern part of CT, and southeastward in the western part of the state

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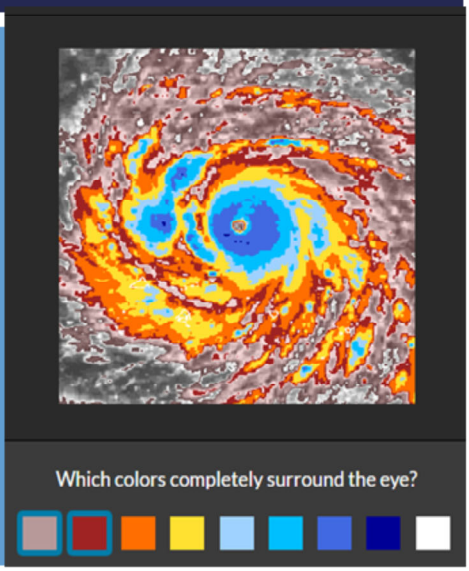
Leveraged Power of the Crowd

- During a 1839 storm Redfield had a network of observers record wind direction at noon
- Helped prove existence of cyclonic storms

Observations on the Storm of December 15, 1839
William C. Redfield
Transactions of the American Philosophical Society, Vol. 8 (1843), pp. 77-82

Then we had Cyclone Center

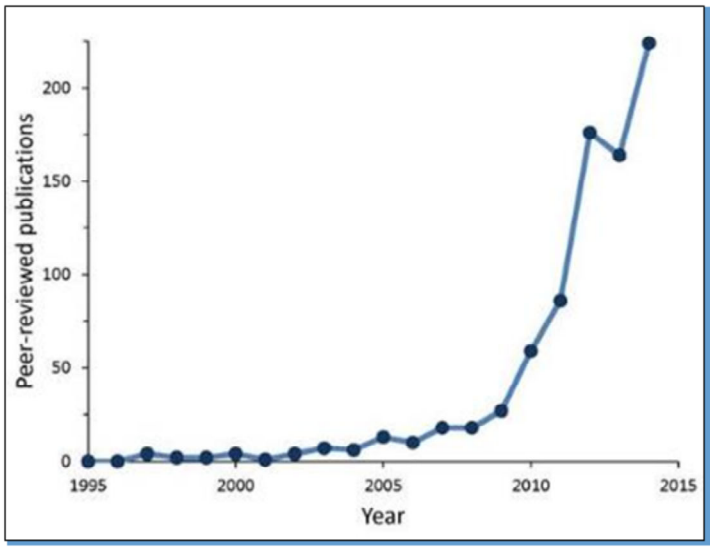
- *Is the intensity of tropical cyclones changing?*
- Volunteers classified storm intensity from satellite images by answering questions
- 188k+ volunteers submitted over 1M classifications



The web site is cyclonecenter.org.

The questions asked of volunteers result in the application of the Dvorak Technique for classification.

The Practice is Growing



David Hanych, an NSF Program Officer, described the growth in this field as a "coming tsunami" in 2012

Results for a search of the Web of Science for the keyword "citizen science"
McKinley et al (2015) Issues in Ecology 19.

You can read more about the growth of the field at:
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0143687

Empowered by New Technologies

- Report and access information from the field with mobile devices
- Analyze datasets and imagery through web-based tools
- Build communities on large scales with social media

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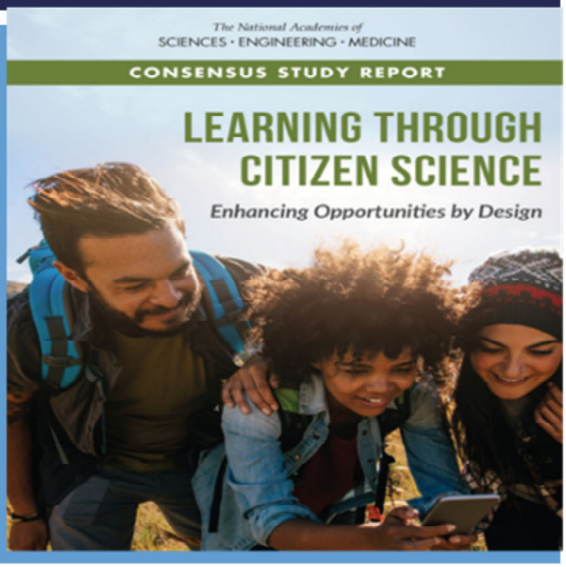
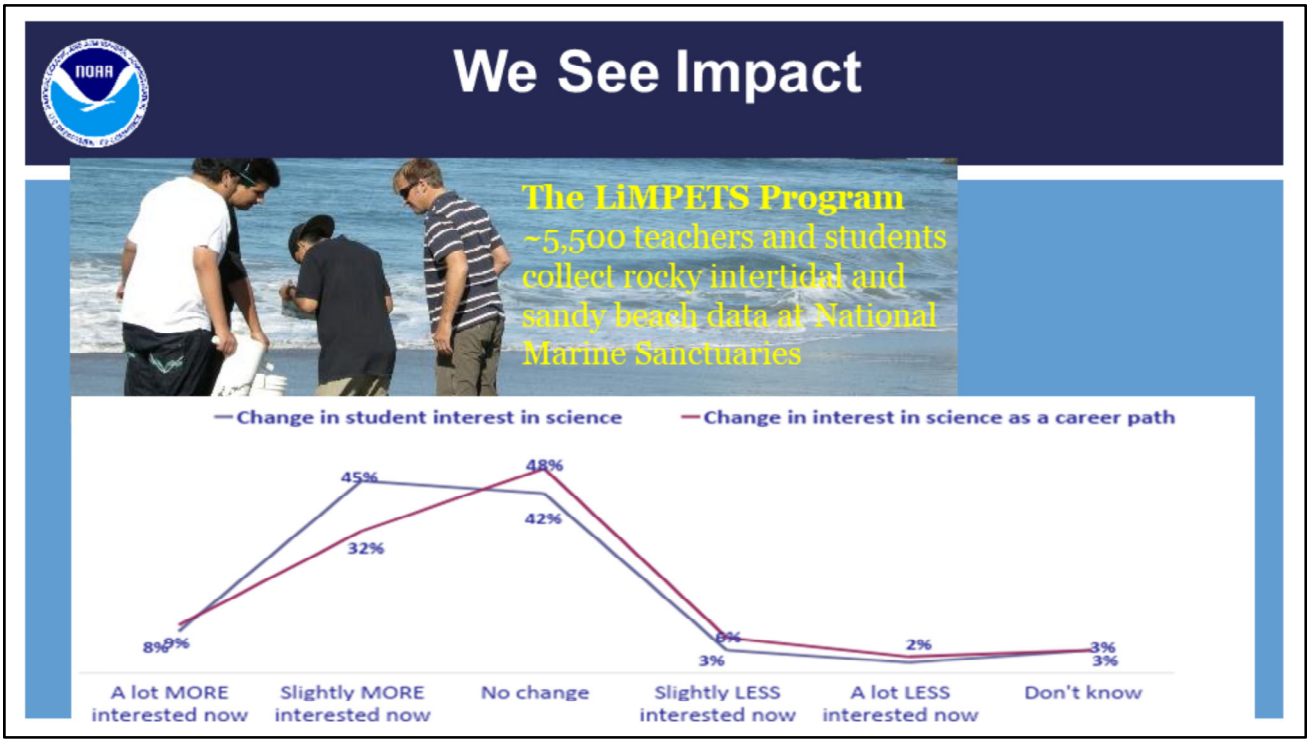
Multiple, Complementary Impacts

- Citizen Science can:
  - Enhance scientific research and monitoring
  - Provide hands-on learning and increase STEM literacy
  - Help address societal needs
- 2018 report from National Academies of Science suggest the impacts can complement each other



NAS Report: https://www.nap.edu/catalog/25183/learning-through-citizen-science-enhancing-opportunities-by-design



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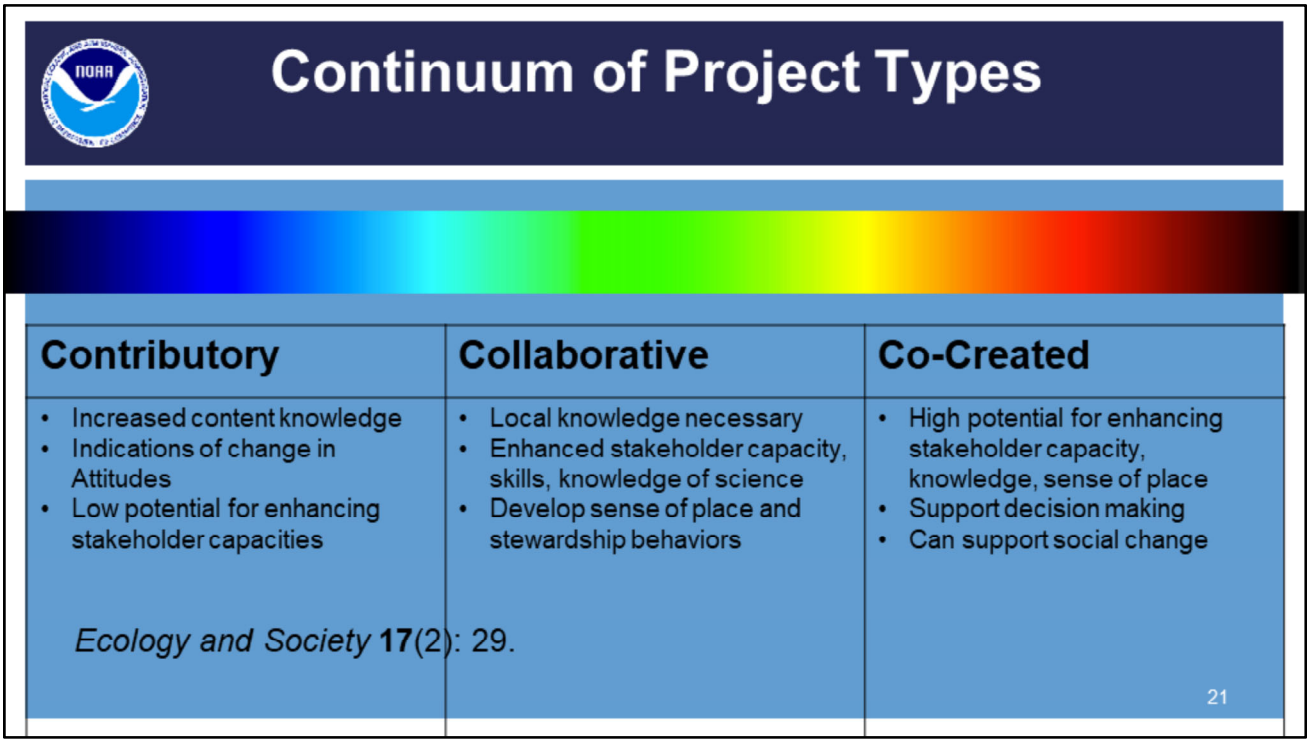

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Many projects out there!

"I can find citizen science opportunities that relate to almost any interest of our youth, connecting them to the larger world of science."
—Bill Million, 4-H Educator

Taken from a Citizen Science Association blog post: www.citizenscience.org/out-of-school

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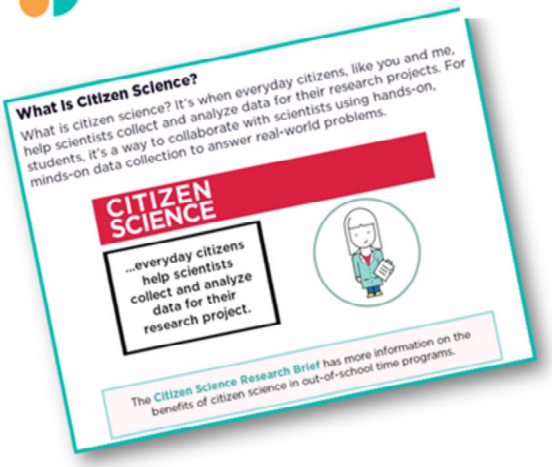
Y4Y Citizen Science Course

You for Youth

https://y4y.ed.gov/learn/citizen-science/



Learn how citizen science fits into out-of-school time learning, how to select citizen science activities for your students and your program, and how to prepare for and implement a citizen science project

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Where to Find Additional Projects

- SciStarter.org - broad set of projects with multiple options to search them
- Zooniverse.org - online projects from classifying galaxies to counting penguins to transcribing manuscripts.
- CitizenScience.gov - has a catalog all projects supported by U.S. federal agencies

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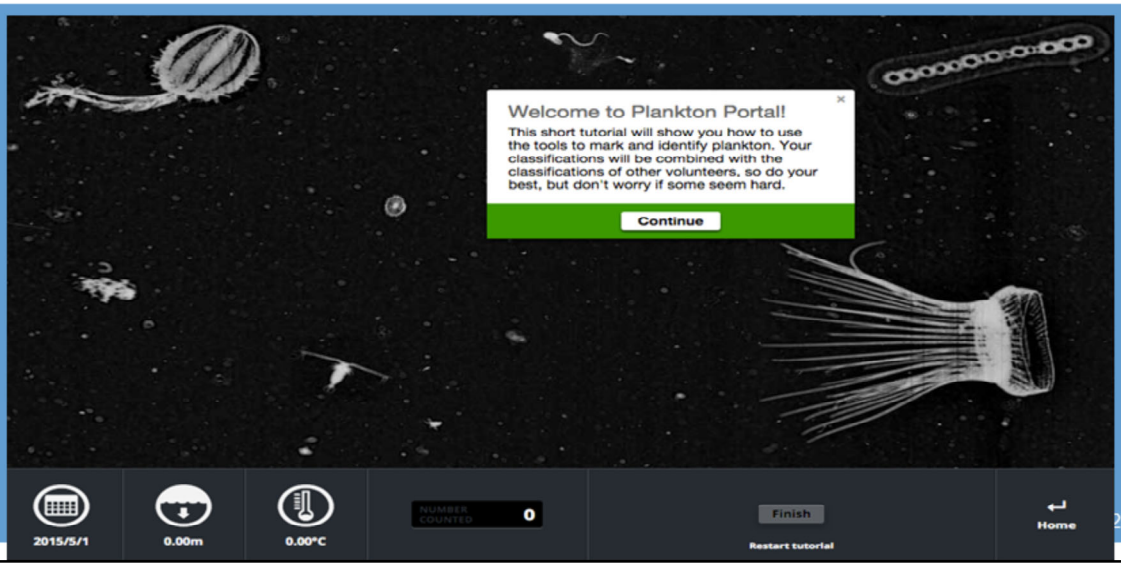
Project Noah

See: www.projectnoah.org

See: www.projectnoah.org

Plankton Portal



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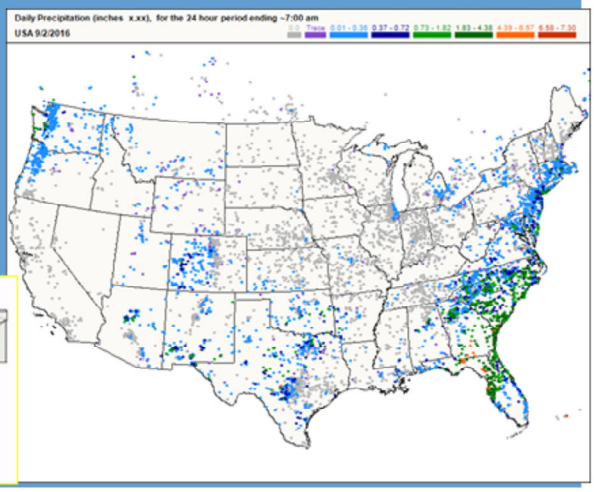
CoCoRaHS

Community Collaborative Rain, Hail, and Snow Network

- Over 20,000 active volunteers
- Used by National Weather Service, climate scientists, agriculture, etc.
- Educator Network and resources
- They make it fun!



Learn more, and join at: http://cocorahs.org/

Information on the school network:
http://cocorahs.org/Content.aspx?page=CoCoRaHS_Schools

The GLOBE Program

- Objective: To promote and support a worldwide **community** of students, teachers, scientists and citizens working together to better understand and sustain Earth's environment at local, regional, and global scales
- Started in 1995
- NASA and National Science Foundation are primary sponsors

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Learn more, and join at: globe.gov

Information on the school network:
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The GLOBE Program Continued

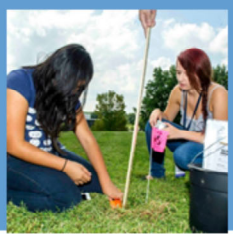
- Educators trained to collect Earth System measurements using over 50 vetted protocols and inquiry-based methods
- Students contribute and use data to perform research investigations
- Concepts are introduced through a suite of Learning Activities and has materials for elementary age students

Can compare local and global observations

Information about Elementary GLOBE is available at:
http://www.globe.gov/web/elementary-globe

Recent GLOBE Additions

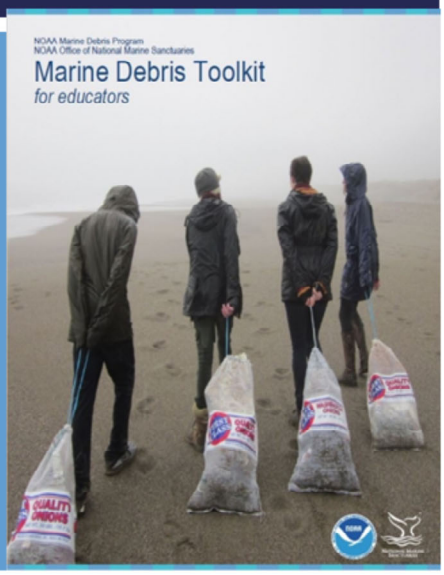
- eTraining
  - You no longer need to be trained in person
- GLOBE Observer App: measure clouds, land cover, trees, and mosquito habitats



eTraining modules are available at: http://www.globe.gov/get-trained/protocol-etraining

Marine Debris Toolkit for Educators

- Provides useful marine debris resources
- Adapts the Marine Debris Monitoring and Assessment Project, a robust citizen science monitoring initiative, for classroom use



Project is available at: https://marinedebris.noaa.gov/curricula/marine-debris-monitoring-toolkit-educators

Marine Debris Tracker

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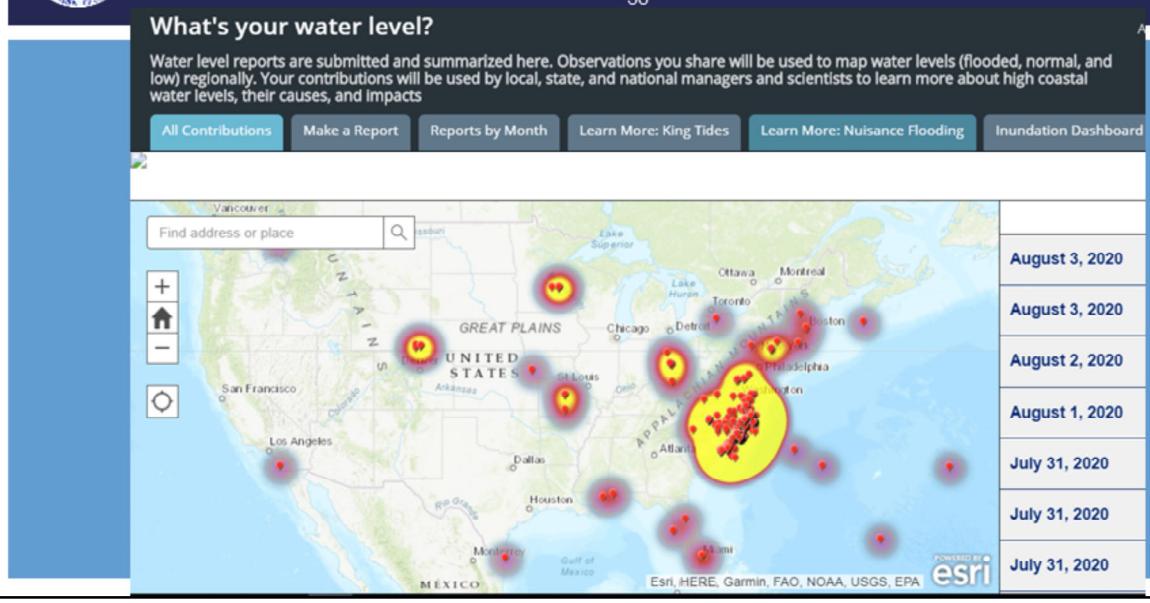
- Participants can report litter ANYWHERE in a watershed
- Users recently reporting Personal Protective Equipment (PPE)
- Requested a specific section dedicated to PPE

Web site: https://marinedebris.noaa.gov/partnerships/marine-debris-tracker

What's Your Water Level?

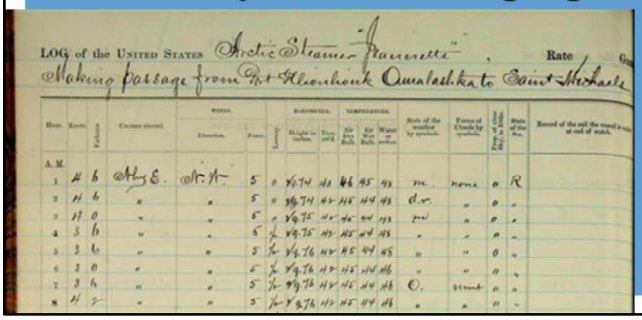


Website:
https://noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=8e4a278576964f47b4fc050e51f344ca

Web site: http://www.oceanvideolab.org/

Old Weather

- Help digitize and recover Arctic and worldwide weather observations made by United States ships since the mid-19th century by transcribing ships' logs
- Also, work with logbooks from Arctic whaling ships
- Great way to involve language arts



Project is available at: www.oldweather.org

Impacts of NOAA Projects

Key Findings

NOAA 2020 CS Portfolio SUMMARY - 25 submissions

- **Almost 50% of reporting projects started after 2015**
- **100% of reporting NOAA CS projects included at least one partnership**
- **FY'19 reported over 1 million volunteer hours**
- **FY'19 reported almost 16 million CS observations**
- **84% of reporting projects listed Education, Outreach, and Engagement as a main goal of their program**

New NOAA Strategy

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Coming out for public comment tomorrow!

Some Thoughts on Getting Started

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Some Tips

- Keep it simple!
- …but be open to building on research interests from students
- Choose a topic that you and your students want to learn more about
- Make sure any project you choose is contributing to real science

simple is beautiful.

Questions?

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