# Citizen Science

A resource guide, grades K-12

## Stage 1 – Desired Results

ESTABLISHED GOALS

**Content Standard:**
- Make observations (first-hand or from media) to construct an evidence-based account for natural phenomena.

**Cultural Standards:**
-gather oral and written historical information from the local community and provide an appropriate interpretation of its cultural meaning and significance;
- identify appropriate forms of technology and anticipate the consequences of their use for improving the quality of life in the community

### *Transfer*

*Students will be able to independently use their learning to…*
- Identify and evaluate causes and effects within the local ecosystem.
- Determine the consequences of the role they play in the global ecosystem and ways they could modify their behavior for more favorable global conditions.

### *Meaning*

UNDERSTANDINGS

*Students will understand that…*
- Native peoples are, and have long been, the first scientists of their local environment.
- All parts of a living system rely on the other parts of that system to survive.
- One change in an environment can affect change for the environment as a whole.

ESSENTIAL QUESTIONS
- What does it mean to be interdependent?
- What observations can I make that add to the knowledge of my community?

### *Acquisition*

*Students will know…*
- How Local Indigenous Knowledge (also known as TEK, Traditional Ecological Knowledge) and Western science can work together to create a more complete understanding
- How humans rely on ocean systems.
- How the ocean affects global weather patterns.
- Environmental factors organisms need to survive.

*Students will be skilled at…*
- Understanding Indigenous knowledge of weather, marine, and terrestrial systems.
- Describing relationships as they occur in food webs.
- Investigating how organisms depend on biotic and abiotic factors in an ecosystem.
- Exploring how environmental changes affect organisms.

## Stage 2 – Evidence and Assessment

| **Evaluative Criteria** | **Assessment Evidence** |
|---|---|
| | PERFORMANCE TASK(S):<br>-Interact with community members and scientists.<br>-Identify connections between Local Indigenous Knowledge and Western science.<br>-Use tools appropriately for accurate scientific measurements. |
| | OTHER EVIDENCE:<br><br>-Journals with reflections on Local Indigenous Knowledge and Western science. |

## Stage 3 – Learning Plan

*Summary of Key Learning Events and Instruction*

**Preparation:** One-two months prior to the launch of the unit.

- Contact Elders about sharing local knowledge (see Cultural Notes).
- Contact a science advisor for a project outlined in this unit

**Overview:** This unit is organized around projects that involve students in community-based science. Some projects have been developed with Local Indigenous Elders and blend Native Ways of Knowing with Western science. Some of these projects, like NASA's GLOBE program, have a highly developed curriculum that spans all ages and can be tailored to local environmental conditions. Other projects, like those offered by the Kachemak Bay Research Reserve, are more narrowly focused on the grades of the students who can be involved, and yet still make a strong connection between observation and the needs of the community. In the Western scientific community, projects that involve everyday people in data collection for ongoing scientific studies are called citizen science. There is also a class of programs called community-based monitoring. These projects are often highly tailored to local conditions, like studying coastal erosion. The information gathered in these projects may be used in research, decision-making, and/or baseline assessment. In Native communities, the skill of observation is foundational to daily life and knowledge, which makes it the perfect skill to bridge two knowledge systems. Follow this link to a great diagram of how these two systems overlap or this article which explores the subject more deeply. Each of the following programs has its own lesson design that can be tailored to your community.

# Citizen Science Projects

**Kachemak Bay Research Reserve** - (KBRR)

European Green Crab Monitoring
Since 2006, European green crab (EGC) monitoring in Kachemak Bay has been underway for this invasive species that has been detected further south on the Pacific coast. Staff from the community monitoring program travel to schools to talk to students about invasive species, potential impacts from EGC in Alaska, local species identification, and data collection. Students then participate in a trapping event and collect bycatch data. In 2018 they did outreach work with the biology students at Port Graham.

Water Quality/Stream Monitoring
KBRR has been building out its program to work with local communities and prioritize monitoring depending on community interests/needs. Pre-covid they were working with Tyonek and Anchor Point on stream monitoring. They did headwaters stream and salmon with Ninilchik. In Port Graham, Nanwalek, and Seldovia they focused on Water Quality and plankton.

Contact Ingrid Harrald at the Kachemak Bay Research Reserve at 907-235-1598 or ieharrald@alaska.edu

**Center for Alaskan Coastal Studies** -

Alaska Coast Watch/ Marine Debris Clean-up
The Alaska CoastWatch Activity Guide was developed to help educators incorporate stewardship of our coastal resources into their classroom. It includes activities that range from the basic level of exploration and discovery of intertidal biodiversity to data collection and research on marine invertebrates. Background on beach etiquette as well as conducting a CoastWalk/Marine Debris Clean-up is also included. Updated and more comprehensive Alaska CoastWatch Curriculum.

Invasive Plants

The Weed Wackers: Invasive Plants of Alaska Activity Guide was developed to help educators engage their students in the emerging study of invasive plants in coastal, boreal, and arctic ecosystems of Alaska. It includes activities that explore the biology and impact of invasive plants, contributes to current research, and investigate humans' role in both the spread and prevention of invasive plants in Alaska.

Seabirds

Monitoring beachcast seabirds has provided valuable information on seabird mortality factors to University of Washington scientists studying these important indicators of ecosystem health. We are a local sponsor of a pilot project to expand a long-term, successful citizen-monitoring program from Washington and Oregon to Alaska. To learn more about the Coastal Observation and Seabird Survey Team, go to http://www.coasst.org. Call 907-235-6667 for more information.

**Arctic and Earth: STEM Integrating GLOBE and NASA (SIGNs)**

In the 1990s University of Alaska, Fairbanks professor Dr. Elena Sparrow brought the NASA GLOBE program to Alaska. Dr. Sparrow formed the International Arctic Research Center which "supports the Association of Interior Native Educators' mission to provide a voice for Native educators and advocacy for educational issues affecting Alaska Native people such as climate change education and to share Alaska Native cultural knowledge in a variety of education settings." Moreover, this is an active state-wide organization with opportunities for ongoing training, collaborating with other schools within the state, and localized lessons. Working with SIGNS connects you with a science advisor who can provide on-site and remote visits, free equipment, and technical support.

Projects are organized around the focus of atmosphere, biosphere, hydrosphere, and pedosphere (soils) and vary in duration from three or four hour-long sessions to daily monitoring of 10- 45 minutes throughout the year. Some of the projects from the NASA Wavelength, GLOBE, and PBS Learning that have been localized for Alaska include:

- Fire fuel - a study in land cover and carbon carrying capacity
- Changes in Clouds- making regular ground-based observations to support satellite imaging
- Alaska Climate Change - a study of how climate change will affect humans and wildlife in Alaska
- Human Health - a study of factors such as mosquitoes, atmospheric aerosols, and water quality
- Green Up, Green Down - a climate change study that documents the length of plant growing season (bi-weekly, seasonal)
- Food Security - a study of subsistence, habitat, and climate change
- Glacial Melt - a study of weather, temperature, precipitation, and glaciers
- Soil Investigation - a study of the effect of climate change on soil temperature

Arctic and Earth staff are eager to work with the community to design and/or adapt projects to areas of local interest. Contact the Arctic and Earth office at 907-474-2794 to discuss the project that will best fit your community and academic needs.

**Multi-Agency Rocky Intertidal Network (MARINe)**

Sea Star Wasting

Sea stars along much of the North American Pacific coast experienced a massive die-off in 2013/14 due to a mysterious wasting syndrome. The disease, called "sea star wasting syndrome" (SSWS) has persisted at low levels in most areas and continues to kill sea stars. Similar die-offs occurred in the 1970s, 80s, and 90s, but never before at this magnitude and over such a wide geographic area. Your student's observations help document the distribution and health of sea stars along the west coast of North America by means of reports submitted by the general public, and collaborative monitoring done by citizen science groups. All information is available at this link.

# Community-Based Monitoring Programs

**Monitoring Coastal Erosion - Department of Natural Resources**
A program for high school students and community members to monitor coastal erosion. There is a high time commitment to set up the study site and learn the monitoring protocols but once established the site needs to be measured every one to three months. Download the step-by-step guide here.

For more information contact Jacquelyn Overbeck Coastal Hazards Program Manager Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys (907) 451-5026 jacquelyn.overbeck@alaska.gov

**University of Alaska Fairbank - Winterberry**

Winterberry ran as a citizen science project in which University of Alaska Fairbanks scientists and community volunteers investigated how shifting seasons could affect when berries are available to animals and people. The research component is completed, but the protocols and support material are still available at this link. The strength of this program is the ability to work with all grade levels K-12, the proximity of berries to most village schools, and the role of berries in a subsistence diet.

**National Geographic - BioBlitz**
Consider starting with this program if you've never used your community as a science lab before. A BioBlitz is an event that focuses on finding and identifying as many species as possible in a specific area over a short period of time. At a BioBlitz, scientists, families, students, teachers, and other community members work together to get a snapshot of an area's biodiversity. Instructions on how to organize BioBlitz are available at this link.

## Cultural Notes

*General guidelines for school and community success*
*and space to make notes specific to your community*

**Asking for help from Elders**

- Ask a trusted colleague about the accepted community norms for requesting help from an Elder. These may include the following considerations: making a personal visit, using a liaison, establishing first contact via phone or email, or having a conversation about a visit while at the store, post office, or other community space.
- You are asking an elder to walk around the community with the class and share community knowledge of locations and resources and their uses. Account for the physical demands of walking and speaking loudly enough to be heard outside.
- Also, ask for permission to make an audio recording of what the Elder shares on the walk. Explain that the students will use the recording as a resource to help them learn.

## Other Resources

**Indigenous Climate Action Network**

The Indigenous Climate Action is a Canadian group whose focus is advocacy. They state, “Indigenous Climate Action is proud to develop programming and resources that speak to the wants and needs of Indigenous communities in so-called Canada, that empower knowledge and awareness of climate change issues and how they are intricately connected to Indigenous rights and sovereignty.” They do have some programs aimed at high school-aged students and this might be a place for cooperation for students already involved at a state level in leadership and inter-tribal activities.

**LEO Network**

The Local Environmental Observation Network describes itself as, “a group of local observers and topic experts who share knowledge about an unusual animal, environment, and weather events. With LEO, you can connect with others in your community, share observations, raise awareness, and find answers about significant environmental events. You can also engage with topic experts in many different organizations and become part of a broader observer community.

To participate you must join LEO and set up your personal profile. Once a member you may connect with other LEO Network members, read all Observations on the Network, and submit your own Observations.

Search by the terms “Kachemak Bay” or “Cook Inlet” to get a sense of the types of contributions made by citizens. You may also search by topic, time, location, source, keyword, or many other dimensions. The results of your search are mappable, downloadable, sharable, and can be saved to return to later.

Although the LEO Network does not have a curriculum, the observations that the students make either through a citizen science project or independently as a community observer can be submitted and made part of this international database.