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Data-driven: Alaska Citizen Scientists Quantify Stories of Berry Variability in Changing Climates

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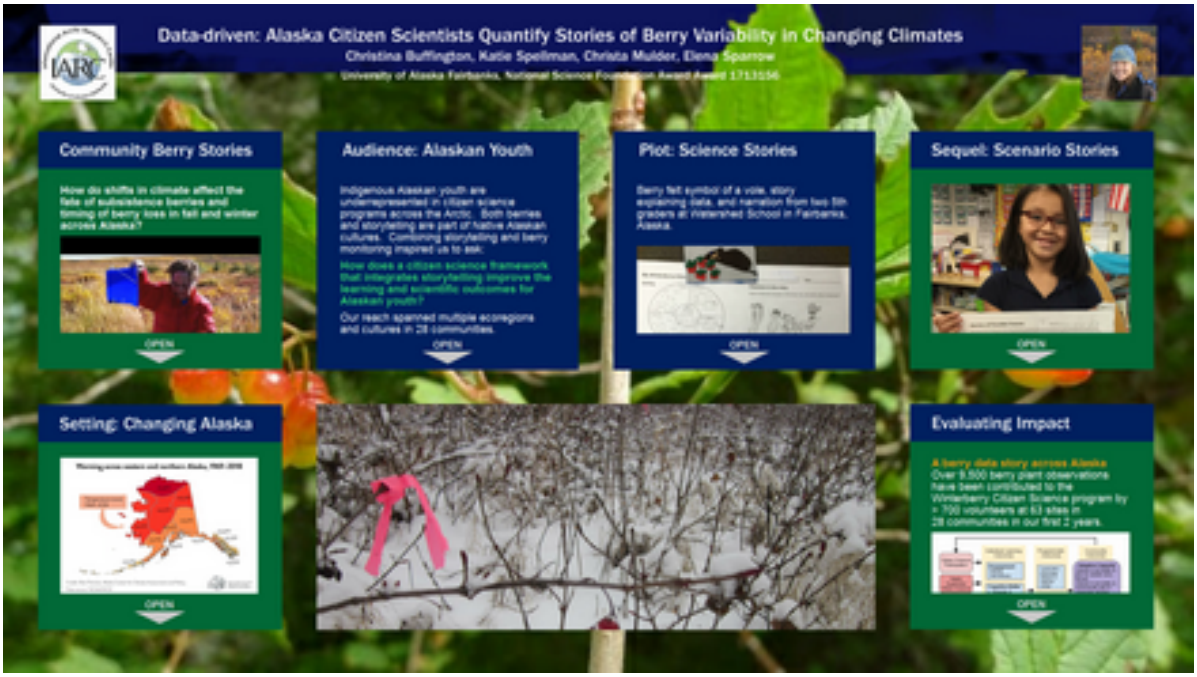
November 23, 2022

Abstract

Accessibility of scientific research to underrepresented voices is a forefront issue. Intentionally-designed citizen science programs, such as the University of Alaska Fairbanks' (UAF) citizen science and learning research project "Arctic Harvest-Public Participation in Scientific Research," are poised to improve the participation and effectiveness of citizen science across diverse audiences while gathering rigorous data. We selected our research question after first listening to stories of how Alaska's rural grocery store - the land and its bounty of berries - has become more variable. We investigate how shifts in climate affect the fate of subsistence berries and timing of berry loss from plants in fall and winter across Alaska. In our presentation, we outline the design elements and accommodations we made to enable a diverse group of 1,099 participants in 28 communities to collect phenology, berry abundance and condition, temperature, cloud cover, and snowpack data across ages, cultures, and learning environments. Over half of our volunteers were pre-K to 6th grade, while just under 10% were adults. Approximately 44% of our participants (479 of 1099 participants) were from groups historically underrepresented in STEM fields. We present learning outcomes evaluation, data collection approaches, and data quality per age group. To improve the success of a citizen science program, find the overlap between a topic of personal and cultural relevance to diverse participants and your university's ongoing research programs.

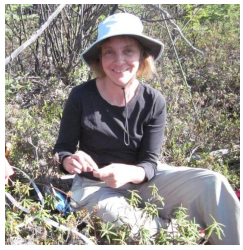
Data-driven: Alaska Citizen Scientists Quantify Stories of Berry Variability in Changing Climates



Christina Buffington, Katie Spellman, Christa Mulder, Elena Sparrow

University of Alaska Fairbanks, National Science Foundation Award Award 1713156



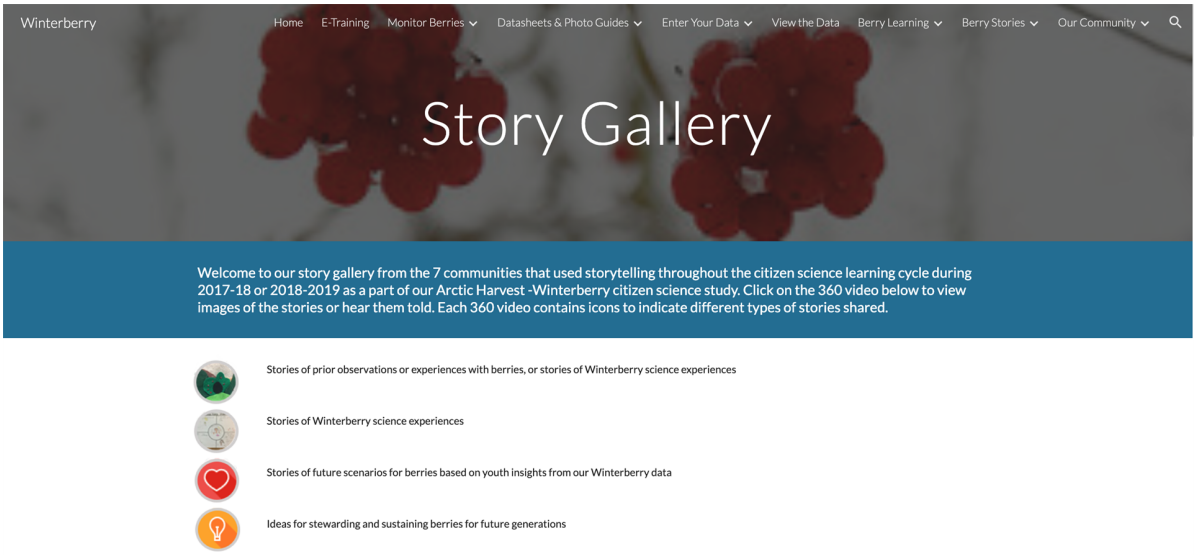



PRESENTED AT:

COMMUNITY BERRY STORIES

How do shifts in climate affect the fate of subsistence berries and timing of berry loss in fall and winter across Alaska?

[VIDEO] https://www.youtube.com/embed/-2Q-2JNDjg0?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0
Communities help answer this question by monitoring condition and abundance of four berry species. Stories from Indigenous Arctic Elders provide information for future observations and analysis (Galloway McLean 2010, Nakashima et al. 2012), as in this video from the University of Alaska Museum of the North.



(https://sites.google.com/alaska.edu/winterberry/berry-stories/community-berry-stories)

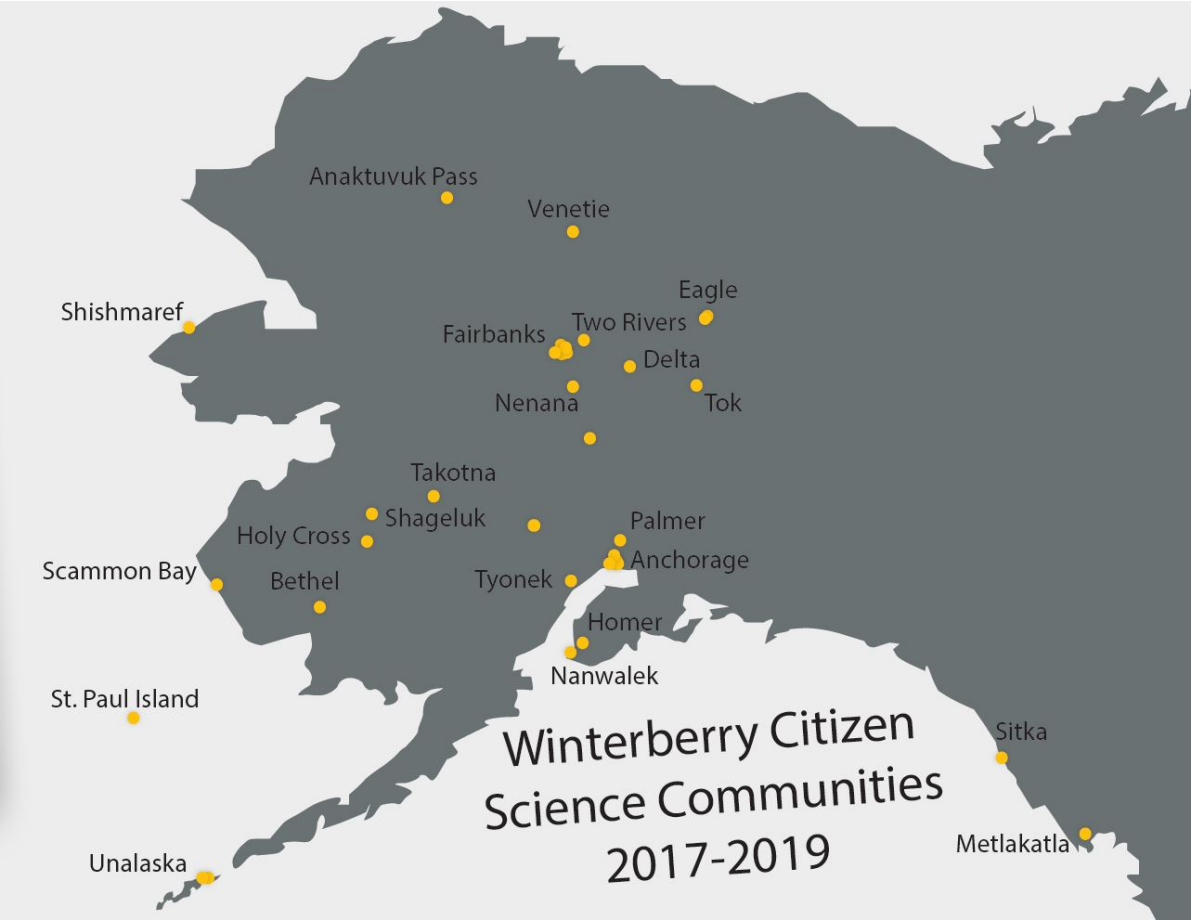
To kick off berry monitoring, we hosted Community Berry Story events. Click on the "Story Gallery" image to view and hear these berry stories. Participants created felt symbols of their berry stories and placed the symbol on a felt landscape while they shared the stories. Through a collaboration with an English Professor, Dr. Sarah Stanley, we recorded all these stories on audio and uploaded the symbols, audio stories, and 360 degree picture of the site to a ThingLink story sharing website. (http://thinglink.com/video/1101647895561502722)

AUDIENCE: ALASKAN YOUTH

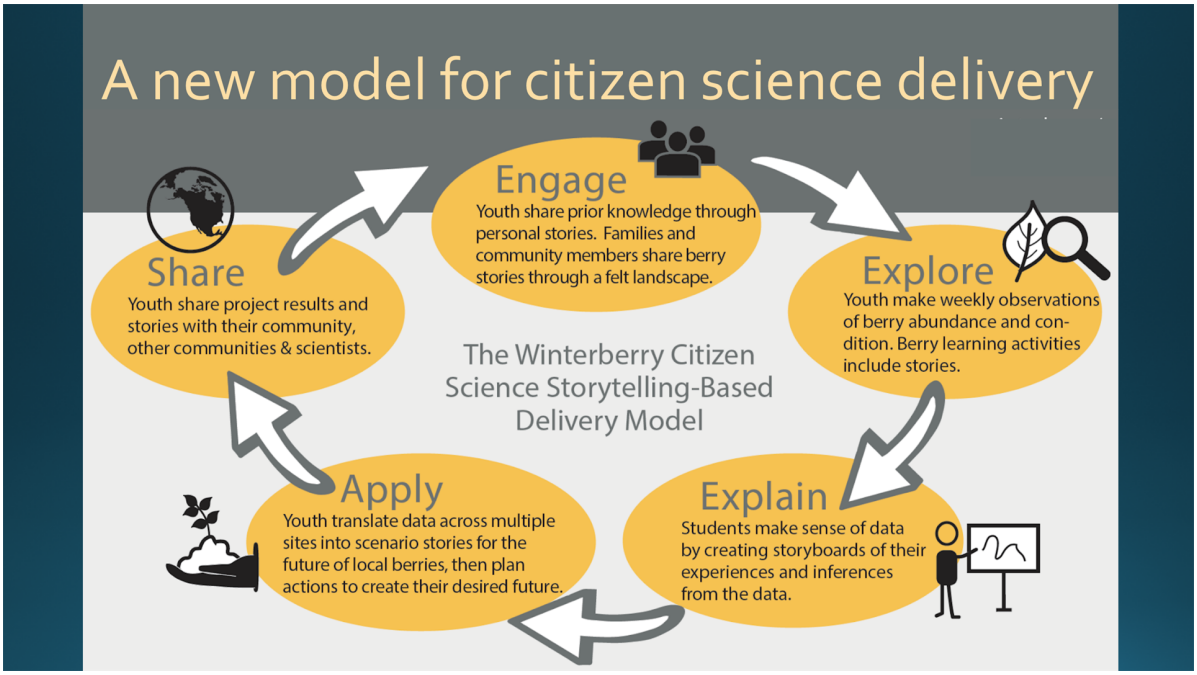
Indigenous Alaskan youth are underrepresented in citizen science programs across the Arctic. Both berries and storytelling are part of Native Alaskan cultures. Combining storytelling and berry monitoring inspired us to ask:

How does a citizen science framework that integrates storytelling improve the learning and scientific outcomes for Alaskan youth?

Our reach spanned multiple ecoregions and cultures in 28 communities.



We integrate storytelling into each phase of citizen science delivery.

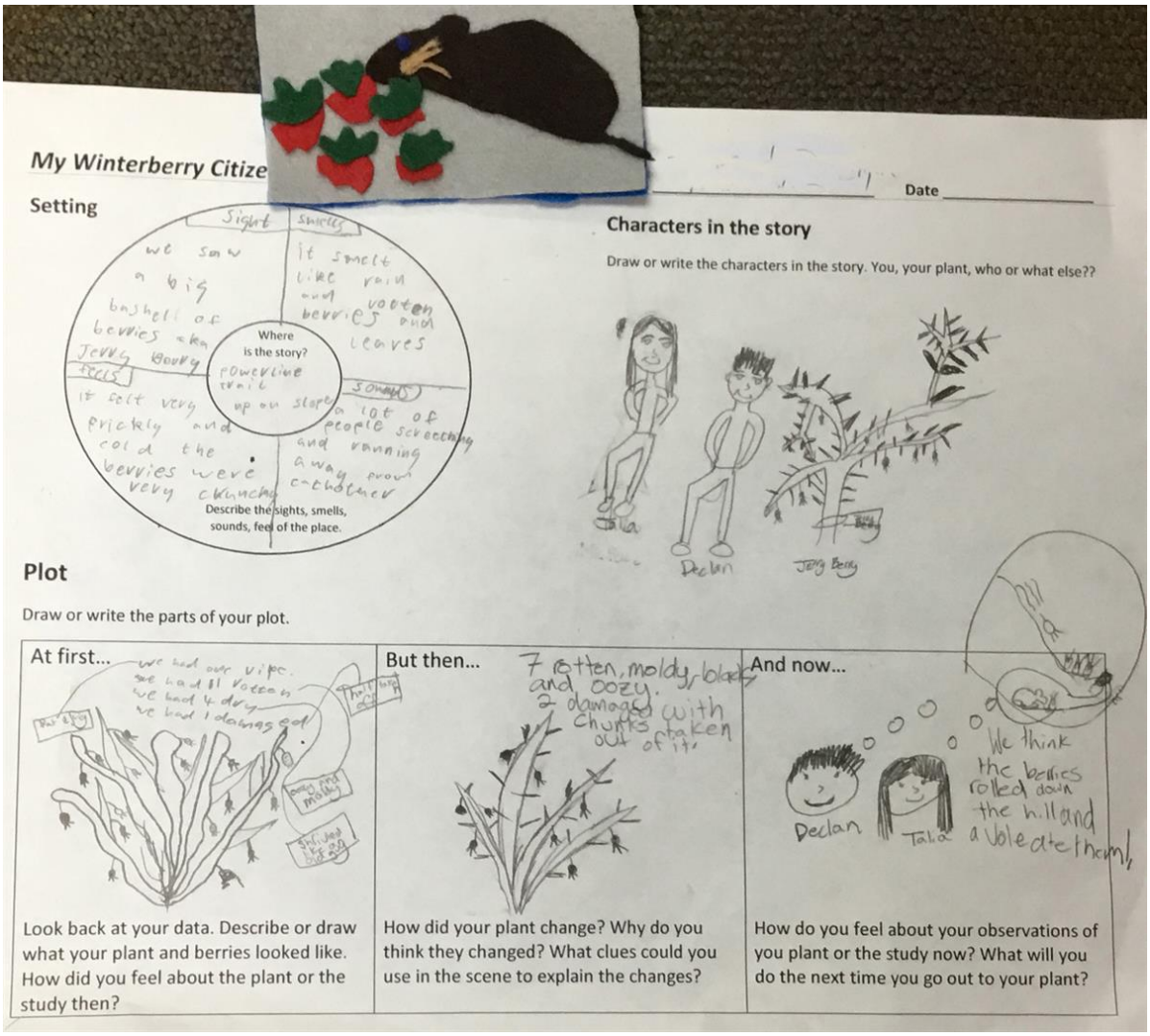


We make data accessible through berry pie charts on the Winterberry data visualization portal. (https://sites.google.com/alaska.edu/winterberry/view-the-data?authuser=0)

PLOT: SCIENCE STORIES

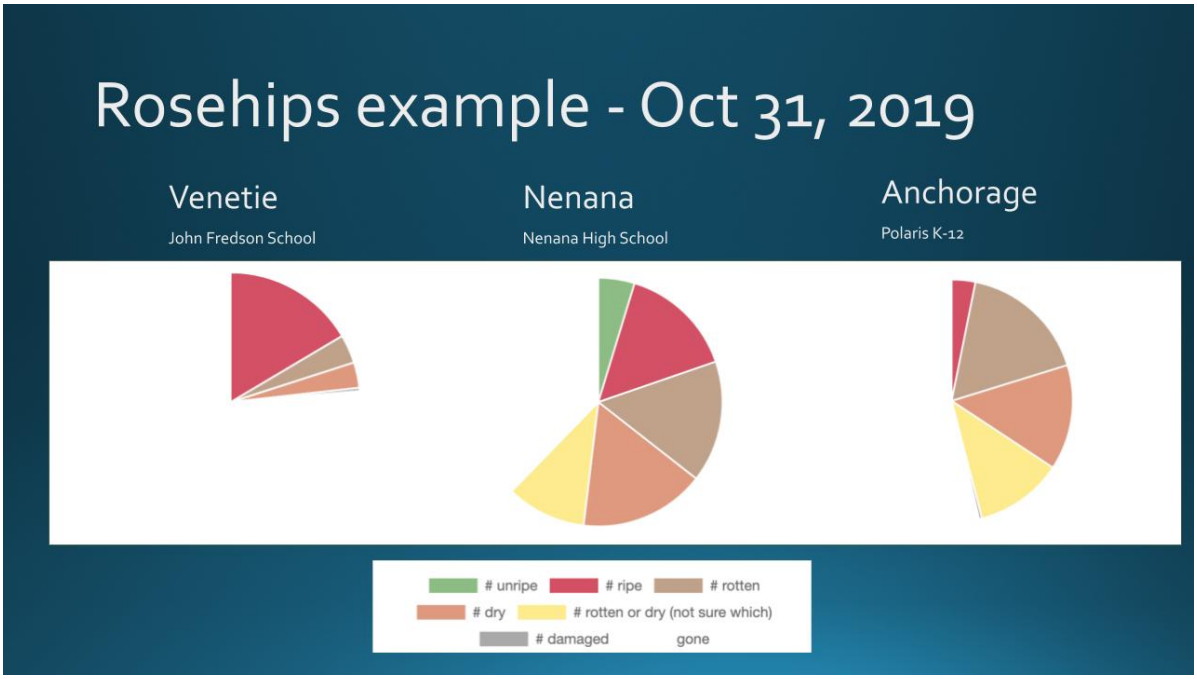
Berry felt symbol of a vole, story explaining data, and narration from two 5th graders at Watershed School in Fairbanks, Alaska.

0:00 / 1:07



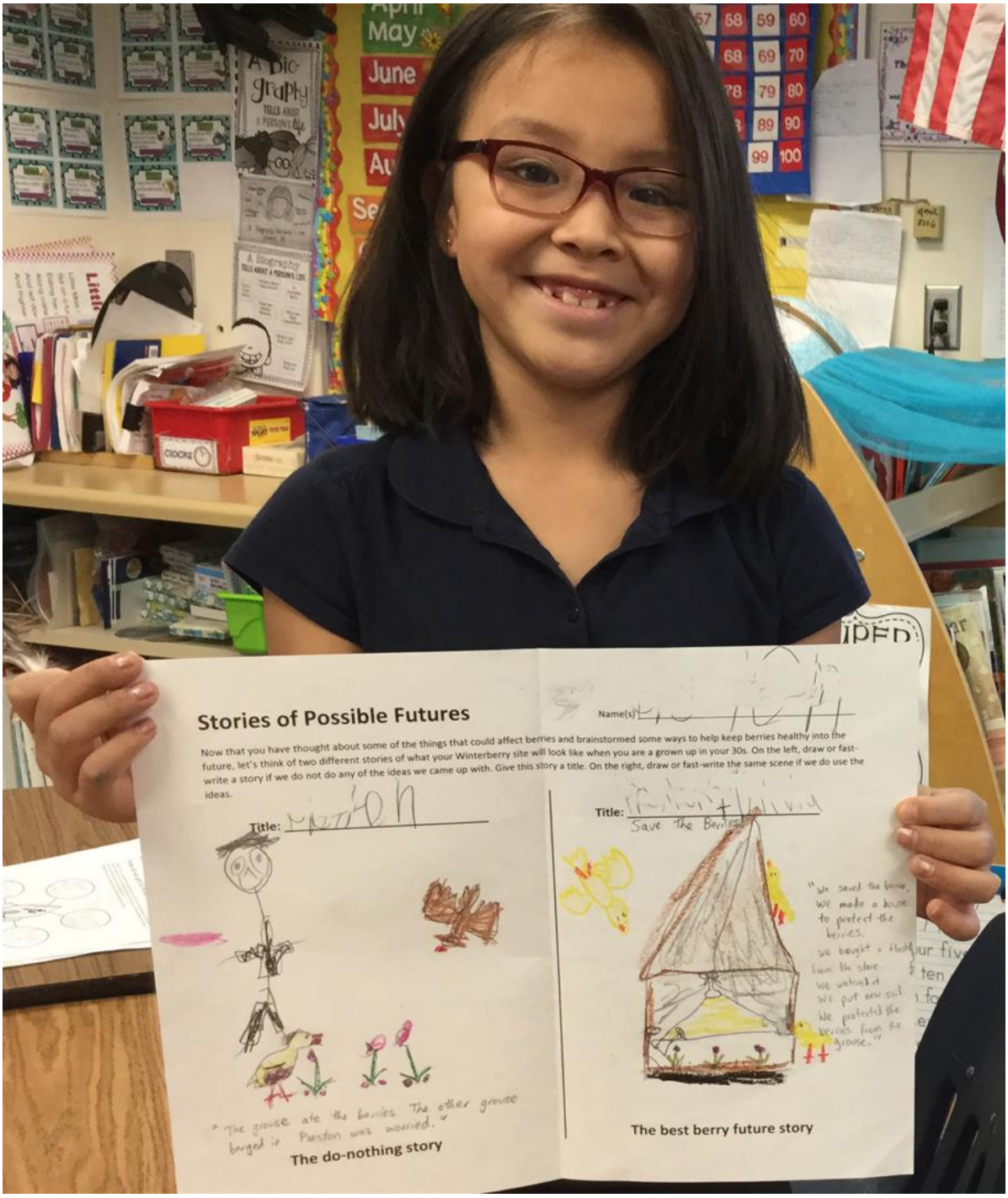
Click for a link to "My Story of Change" Lesson Plan.
(http://drive.google.com/file/d/1BrjYjdW4VI5ssdlQ1oOFDcjuTJ2WWm0B/view)

Each community participating in the story model of citizen science delivery engaged in an in-person or videoconference mid-project lesson where students craft stories with data from their individual plants. Each site had 20 plants with a minumum of 100 berries, so we helped students look at data on an individual plant scale, a site scale, and an ecoregional scale.

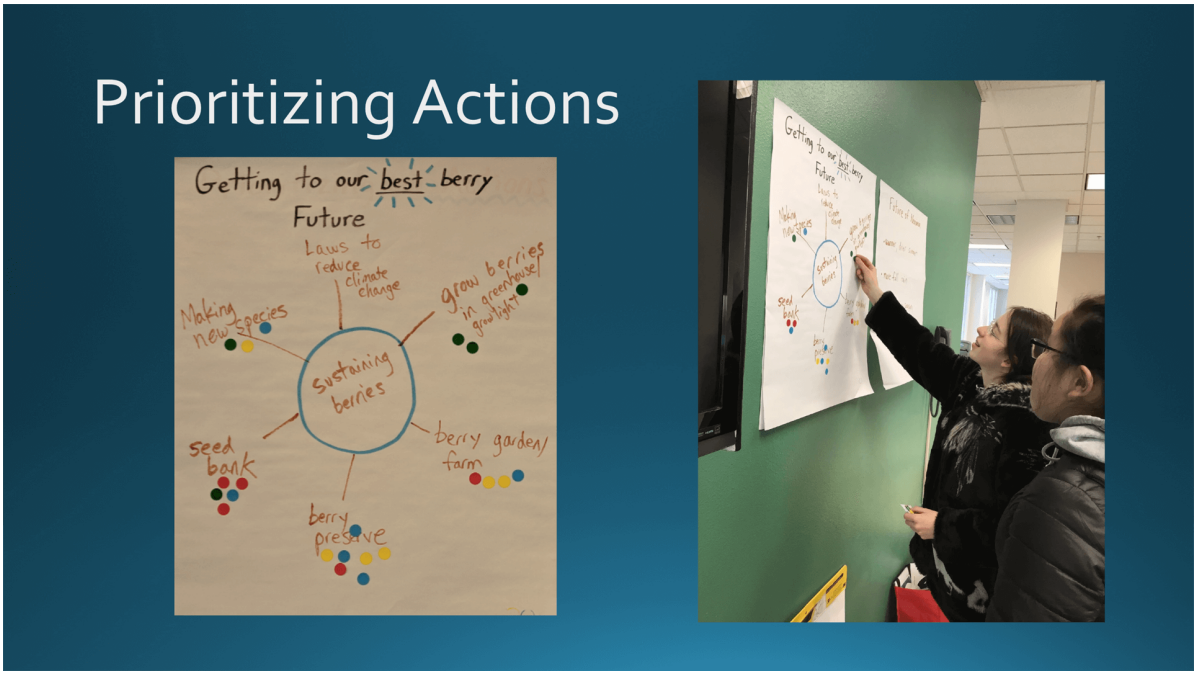


After crafting their berry stories, students compared berry pies and climate data from across the state using the Winterberry data visualization portal. (https://sites.google.com/alaska.edu/winterberry/view-the-data?authuser=0)

SEQUEL: SCENARIO STORIES



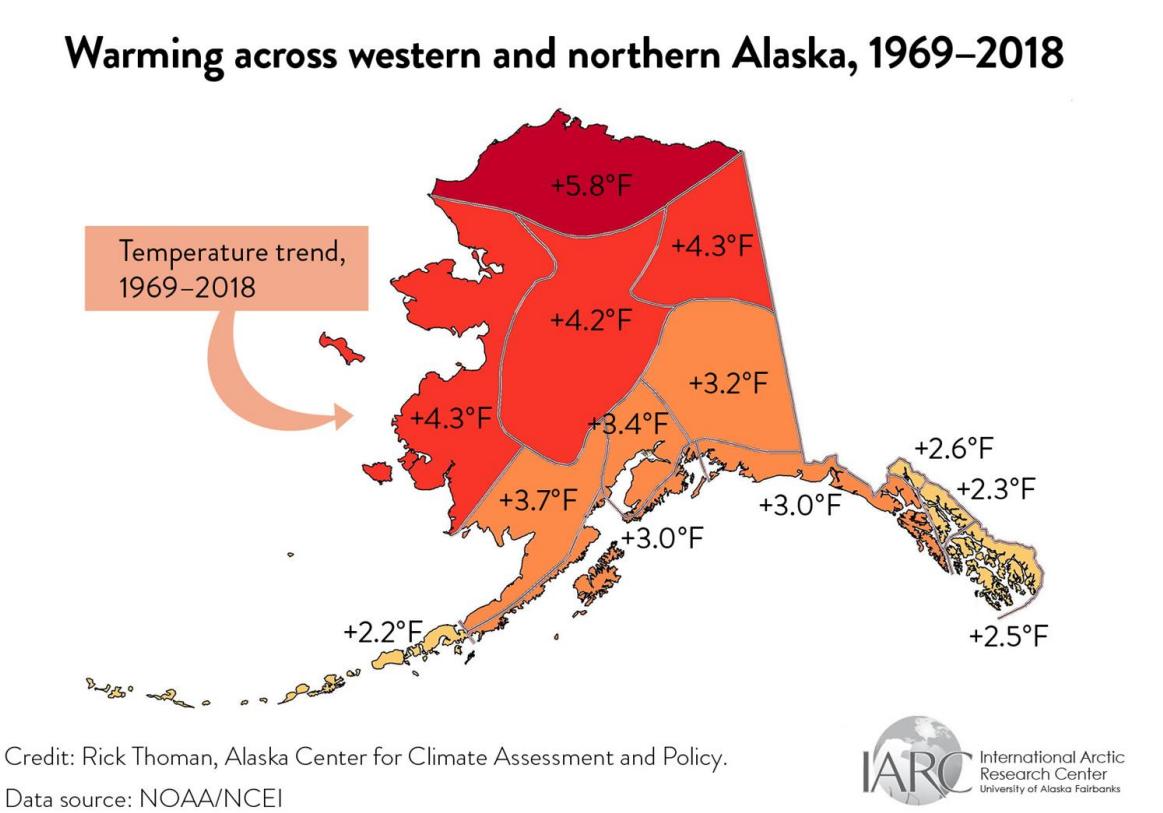
On the Stories of Possible Futures activity sheet (https://sites.google.com/alaska.edu/winterberry/berry-stories/scenarios-stories-for-berry-futures) (above), students imagine the future if they do nothing about the trends they observed and if they protect or conserve the berry resource. Next, they prioritize stewardship actions (below).

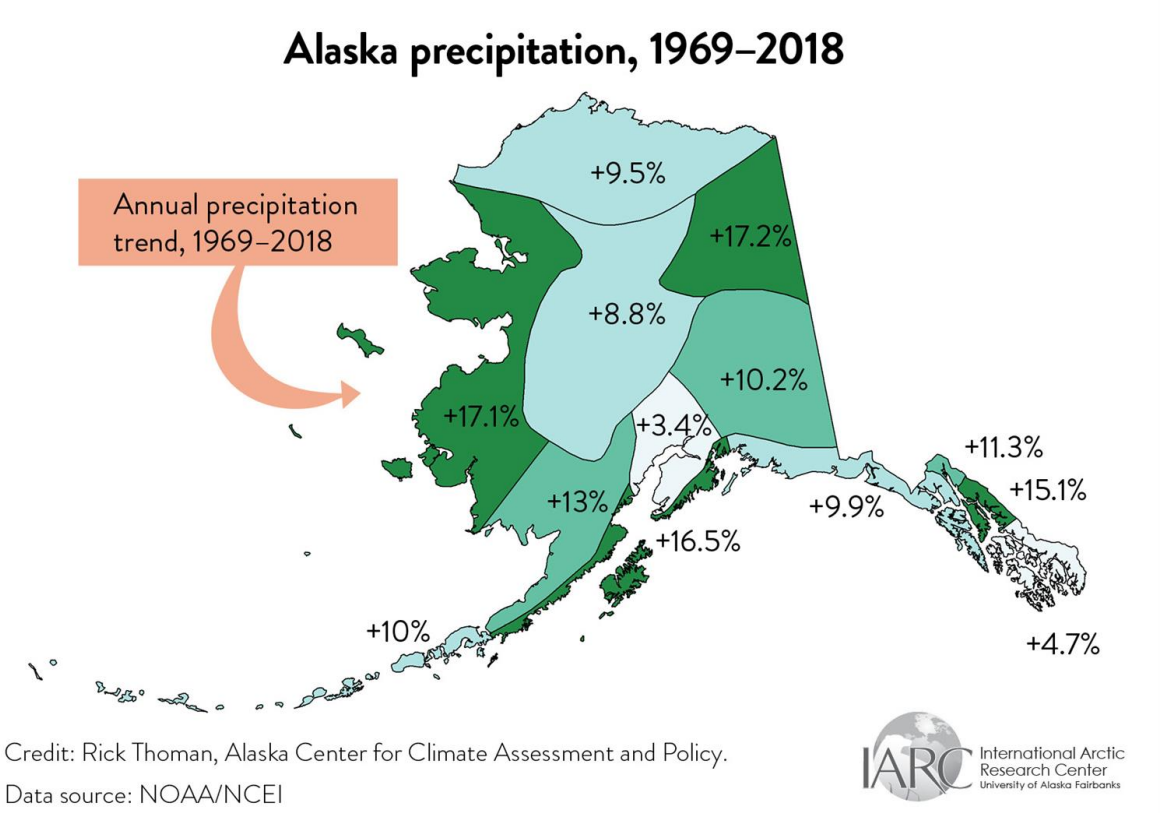


Click on the image for the Lesson Plan "Creating our best berry future: How to turn citizen science data into stewardship action using scenarios storytelling."
(https://drive.google.com/file/d/1gTVQVP9HqOBVklZaqx8dG2JybKYre5UZ/view)

This lesson, which we call a "Data Jam" culminates students' involvement in berry monitoring.

SETTING: CHANGING ALASKA



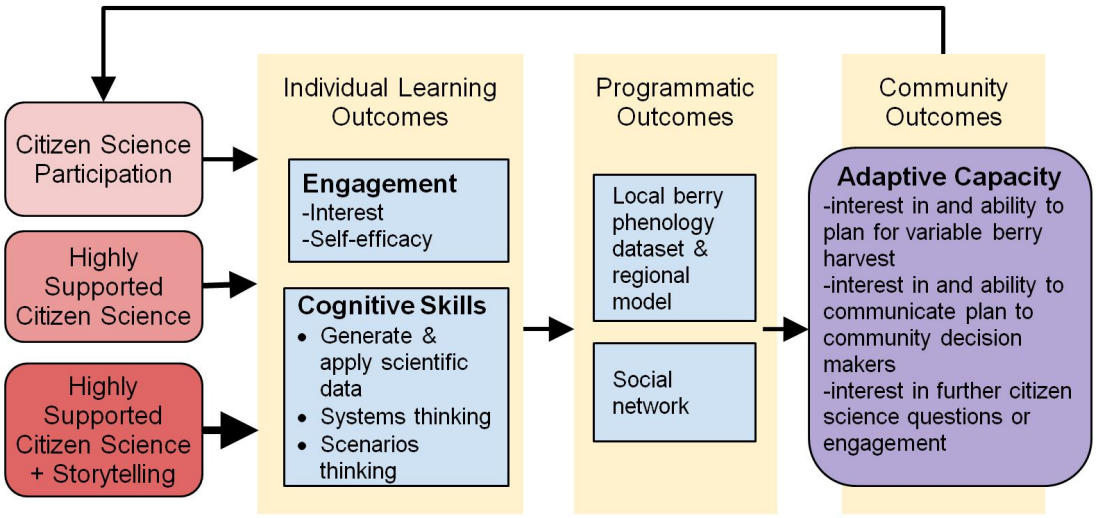


Besides warmer and wetter average annual conditions, Alaskans now experience a longer growing season, with warmer summers and wetter falls. What does warm and wet mean for berry phenology?

CHARACTERS: CROWBERRY, PRICKLY ROSE, LOWBUSH, HIGHBUSH CRANBERRY

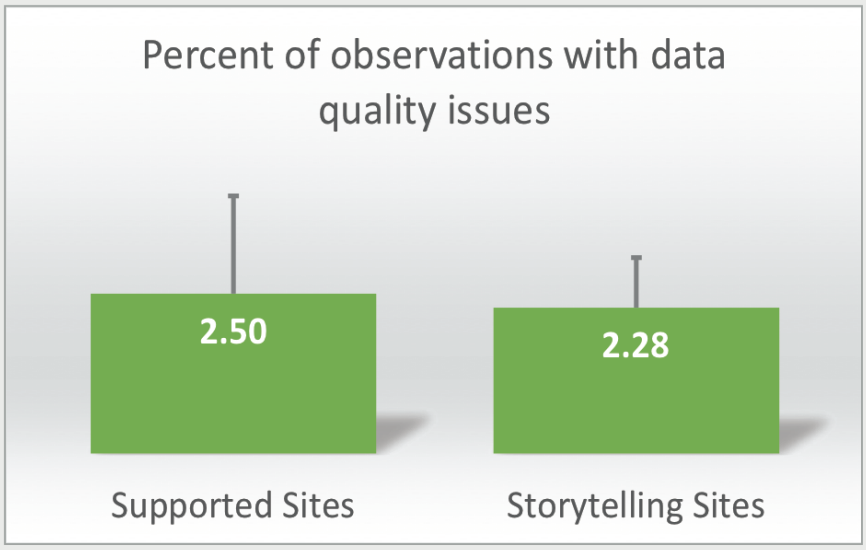
EVALUATING IMPACT

A berry data story across Alaska
Over 9,500 berry plant observations have been contributed to the Winterberry Citizen Science program by > 700 volunteers at 63 sites in 28 communities in our first 2 years.

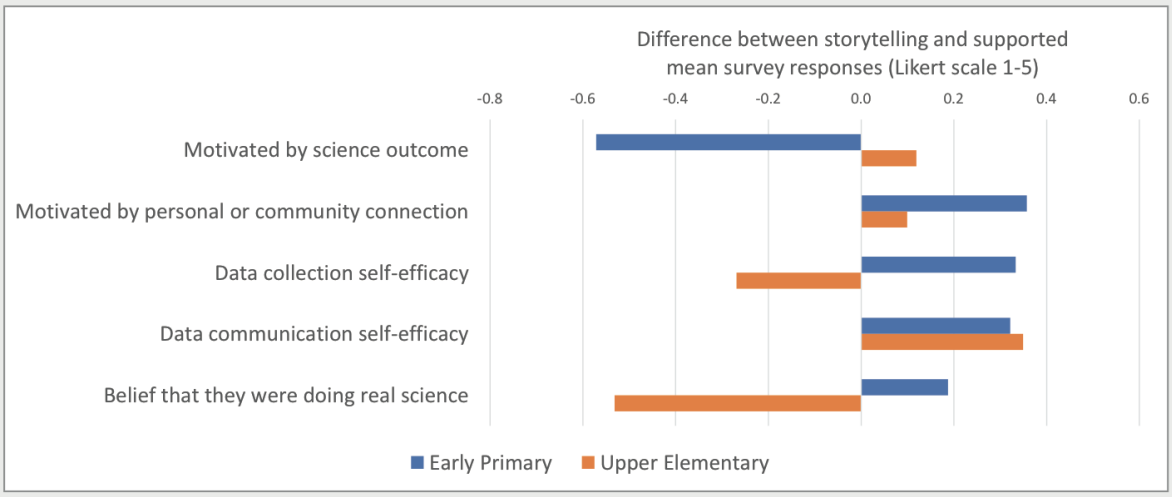


Framework for evaluating the impact of three Winterberry citizen science delivery methods (left) on learning outcomes at multiple scales (adapted from Jordan et. al. 2012). We are measuring the outcomes shown in bold. The larger arrow size for the highly supported citizen science and storytelling method indicate a larger hypothesized effect on engagement and cognitive skills.

Preliminary Results



These data are from 8 youth groups engaged in supported and storytelling delivery models. Mean number of observations per group was 150. Mean grade level was 6.5 for supported sites and 5.0 for storytelling sites.



Difference in mean Likert responses across science attitude scales in post-surveys between storytelling and supported models from youth in early primary (K-3) and upper elementary (4-6) grades. Positive numbers indicate higher scores for storytelling model.

The storytelling model did not affect quality of the berry data collected by the youth, but did influence youth science attitudes.

CV

Christina Buffington is the Science Education Specialist with the International Arctic Research Center (IARC) at the University of Alaska Fairbanks (UAF). She is the Project Coordinator for the Winterberry Project and conducts site visits, "Berry Data Jam" sessions, "Community Story Events," and data entry consultations. With experience as an environmental science consultant and researcher, as well as a licensed secondary teacher, she empowers students in applied sciences. After several years in academia, Christi served as a certified middle and high school science teacher and a GLOBE teacher and trainer. At UAF, Christi conducts research on citizen science pedagogy, teaches an undergraduate Watershed Management course, and braids Indigenous knowledge and Western science in arctic climate change monitoring, education, and resilience.

Katie Spellman, Ph.D. is the Principal Investigator for the Berry Citizen Science Project and provides team integration. She connects with each youth group and school and is responsible for the data collection, analysis, and write-up of the learning research. Spellman is Research Assistant Professor in Education and Outreach at the International Arctic Research Center (IARC) at UAF where she conducts research on models of citizen science that meet the scientific and local community needs in a changing climate. Over the past 14 years, she has coordinated, created, and evaluated multiple large citizen science programs in Alaska, and uses these experiences to conduct both education and ecology research.

Christa Mulder, Ph.D. is a Professor of Plant Ecology and leads the science component of this citizen science project. She works primarily in boreal and arctic systems; her current research is focused on changes in plant phenology under climate change, from the earliest stages of the plant reproductive cycle (development of flower buds in the year prior to flowering) to the last stages (fruit loss to consumers and decomposers). For this project she will be analyzing the data collected from across the state by Winterberry participants to evaluate differences between regions and (eventually) to make predictions about changes in fruit retention under climate change into the future. Christa loves working with people of all ages and backgrounds in addressing these and other ecological questions, and she especially enjoys helping young people find the scientist within them.

Elena Bautista Sparrow, Ph.D., is a Research Professor in the Department of Natural Resources and Environment, and Director of Education Outreach at the International Arctic Research Center at the University of Alaska Fairbanks. She's a co-PI of this Arctic Harvest: Public Participation in Scientific Research Winterberry project. She leads the Arctic and Earth STEM Integration of Global Learning and Observations to Benefit the Environment (GLOBE) and NASA assets (SIGNs) that braids Indigneous and western science and ways of knowing in engaging educators, youth and community members in climate change learning and stewardship projects in an Earth systems approach.

Winterberry Volunteers We are so grateful to have an amazing network of volunteers working to help monitor berries! (https://sites.google.com/alaska.edu/winterberry/monitor-berries) Click on the link above to see the six steps of the berry monitoring process. The Making Observations Video below is step 4, Collect Data. The volunteer youth groups, families, and individuals braved the cold, rain, sleet, snow, and heat to monitor berries every week.

[VIDEO] https://www.youtube.com/embed/Os-bAVSjMWc?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0

Youth Groups

Arctic Light Elementary STEM club, Ft. Wainright

Bethel Regional High, Bethel, AK

Boys and Girls Club of Metlakatla, Metlakatla, AK

Center For Alaskan Coastal Studies Eco-Kids club, Homer, AK

Delta FFA Club, Delta, AK

Eagle Community School and 4-H, Eagle, AK

East High Environmental Club, Anchorage, AK

John Fredson School K-2, Venetie, AK

Mat-Su Career and Technical High, Wasilla, AK

Polaris K12, Anchorage, AK

Randy Smith Middle School Extended Learning, Fairbanks, AK

Shishmaref Climate Heroes Club, Shishmaref, AK

Sitka 4-H, Sitka, AK

St. Paul High School, St. Paul, AK

Tanana Middle School 8th, Fairbanks, AK

Tanana Middle School Extended learning, Fairbanks, AK

Two Rivers Elementary, Two Rivers, AK

UAF Biol239 Class, Fairbanks, AK

UAF NRM240 Class, Fairbanks, AK

Watershed 5th Grade, Fairbanks, AK

Watershed 8th Grade, Fairbanks, AK

Watershed Kindergarden, Fairbanks, AK

Blackwell School, Anvik, AK

Denali Elementary, Fairbanks, AK

Eagle's View Elementary 3-4 grade, Unalaska, AK

Girl Scout Troop (C. James), Palmer, Alaska

Holy Cross School, Holy Cross, AK

Hunter Elementary Afterschool Club, Fairbanks, AK

Innoko River School K-3, Shageluk, AL

Innoko River School 4-12, Shageluk, AK

John Fredson School 3-5, Venetie, AK

Nanwalek School and Tribal Council, Nanwalek, AK

Nenana High School, Nenana, AK

North Pole Middle, North Pole, AK

Nunamiut School, Anaktuvuk Pass, AK

Scammon Bay High School, Scammon Bay, AK

Takotna School, Takotna, AK

Tebughna High School, Tyonek, AK

Tok School, Tok, AK

Unalaska City Jr./Sr. High 5-6 grade, Unalaska, AK

Adult Groups and Families:

R. Rovira, Joint Base Elmendorf-Richardson, AK

Emmerson Family, Emmerson Homestead, AK

Reidell-Rader Team, Anchorage Botanical Garden, AK

Campbell Creek Science Center, Anchorage, AK

St. Paul Island Berry Course, St. Paul, AK

James Family, North Pole, AK

Pilot Point Tribal Council-Environ. Program, Pilot Point, AK

ABSTRACT

Accessibility of scientific research to underrepresented voices is a forefront issue. Intentionally-designed citizen science programs, such as the University of Alaska Fairbanks' (UAF) citizen science and learning research project "Arctic Harvest-Public Participation in Scientific Research," are poised to improve the participation and effectiveness of citizen science across diverse audiences while gathering rigorous data. We selected our research question after first listening to stories of how Alaska's rural grocery store - the land and its bounty of berries - has become more variable. We investigate how shifts in climate affect the fate of subsistence berries and timing of berry loss from plants in fall and winter across Alaska. In our presentation, we outline the design elements and accommodations we made to enable a diverse group of 1,099 participants in 28 communities to collect phenology, berry abundance and condition, temperature, cloud cover, and snowpack data across ages, cultures, and learning environments. Over half of our volunteers were pre-K to 6th grade, while just under 10% were adults. Approximately 44% of our participants (479 of 1099 participants) were from groups historically underrepresented in STEM fields. We present learning outcomes evaluation, data collection approaches, and data quality per age group. To improve the success of a citizen science program, find the overlap between a topic of personal and cultural relevance to diverse participants and your university's ongoing research programs.

Tuesday, 10 December 2019; 13:40 - 15:40 eLightning Talk; Moscone South, eLightning Theater IIIIN23B: Making Data Usable and Accessible: Gaining Insight from Citizen Science Applications II eLightning

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