UNIVERSITY OF ALASKA FAIRBANKS

BONANZA CREEK LTER
Boreal Forest Ecology

Bonanza Creek LTER Education and Outreach

Elena B. Sparrow

Christa Mulder & Katie Spellman

Mary Beth Leigh

K-20 Education & Citizen Science

- *Arctic and Earth SIGNs*
- *Alaska GLOBE*
- *Fostering Science*
- Arctic Harvest:Winterberry
- Undergraduates – REUs and 1st generation college students
- Graduate students

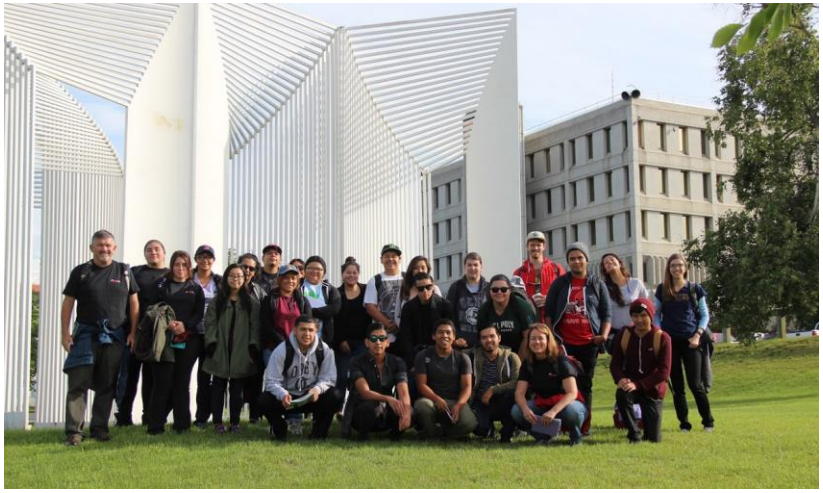
Other outreach

- Arts & Humanities
  - In a Time of Change
- Science Fairs/Symposia
- Collaboration with agencies
- Collaboration with tribal entities & subsistence users

BNZ LTER/USFS PI, Co-Pis, SP

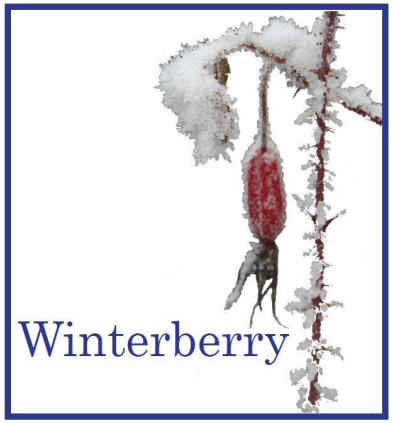
BNZ LTER PI, Co-PIs, SP

BNZ LTER Engaging K-20 Students and the Public in Scientific Investigations



Santa Ana College Students Research Immersion

Enlisting the power of nature and the passion of scientists
Fostering
Science
to empower youth in care



Arctic Harvest: Public Participation in Scientific Research

ARCTIC & EARTH
STEM INTEGRATING GLOBE & NASA

- Ecologists
- K12 educators – formal and informal
- Youth: K-20 students
- Community Members
- Alaska Native tribal and traditional
- councils

The GLOBE Program
http://www.globe.gov

Key Arctic and Earth SIGNs Project Characteristics

- Have an evolving model that addresses:
  - Access
  - Equity
  - Empowerment
- Significant Ingredients
  - Multiple knowledge systems
  - Hands on learning
  - Systems Thinking – Earth as a system – Holistic view
  - Establishing a strong sense of community (social cohesion)
  - Relevant to and based in community
  - Action oriented

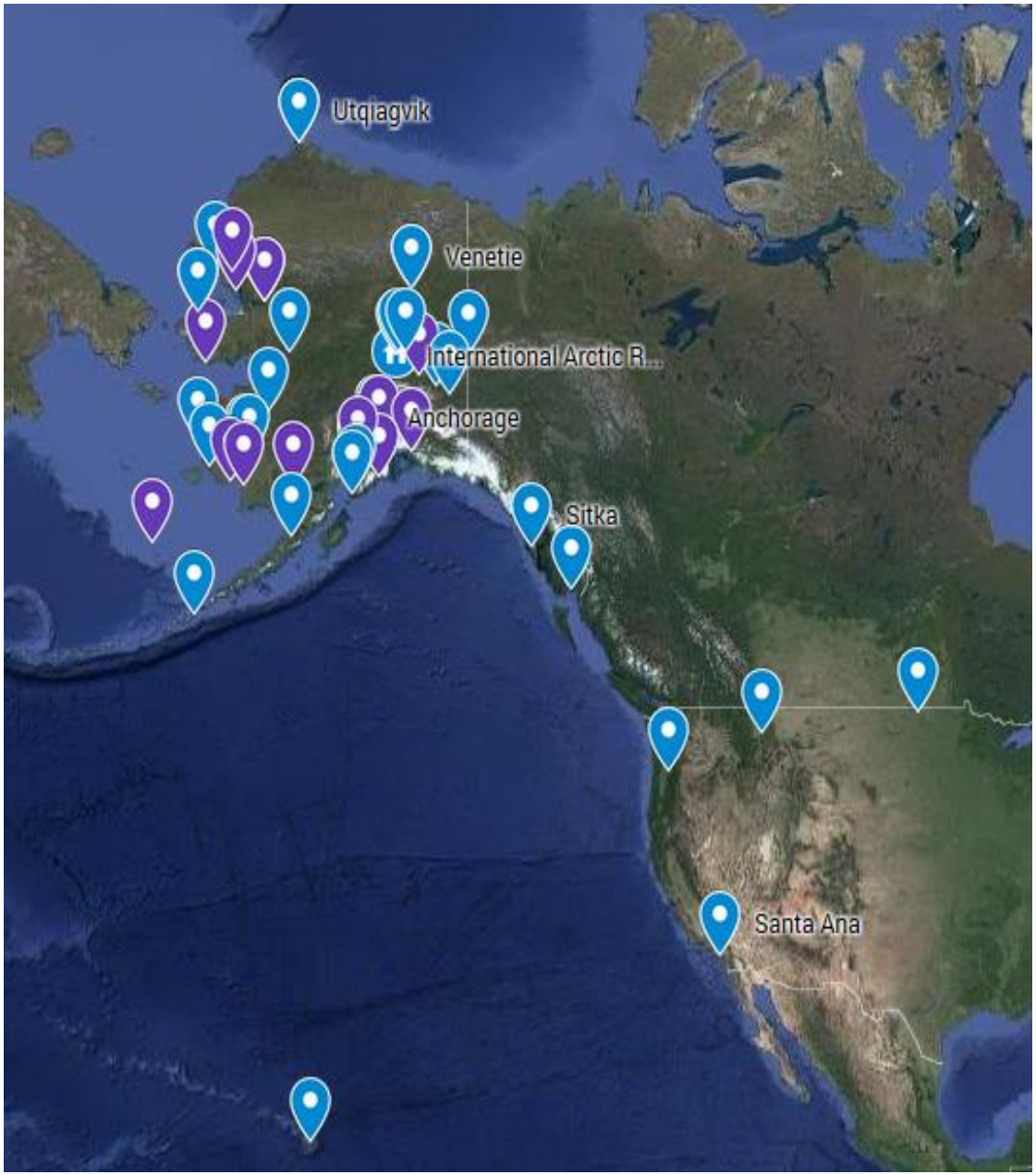
IMPACT

Educator and community member workshops by the numbers 2017-2018

28
Arctic and Earth SIGNs workshops delivered

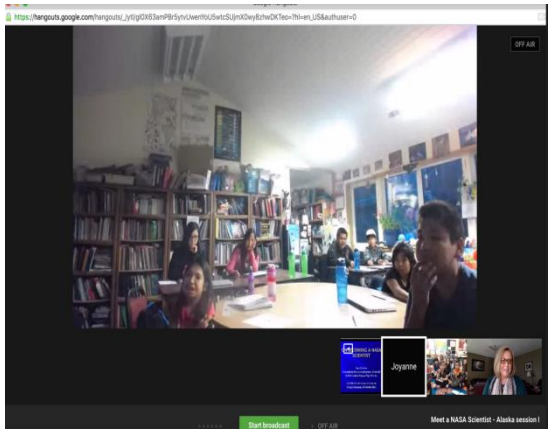
415
formal and informal science educators and community members trained

1394
students engaged in climate change learning using Arctic and Earth SIGNs activities

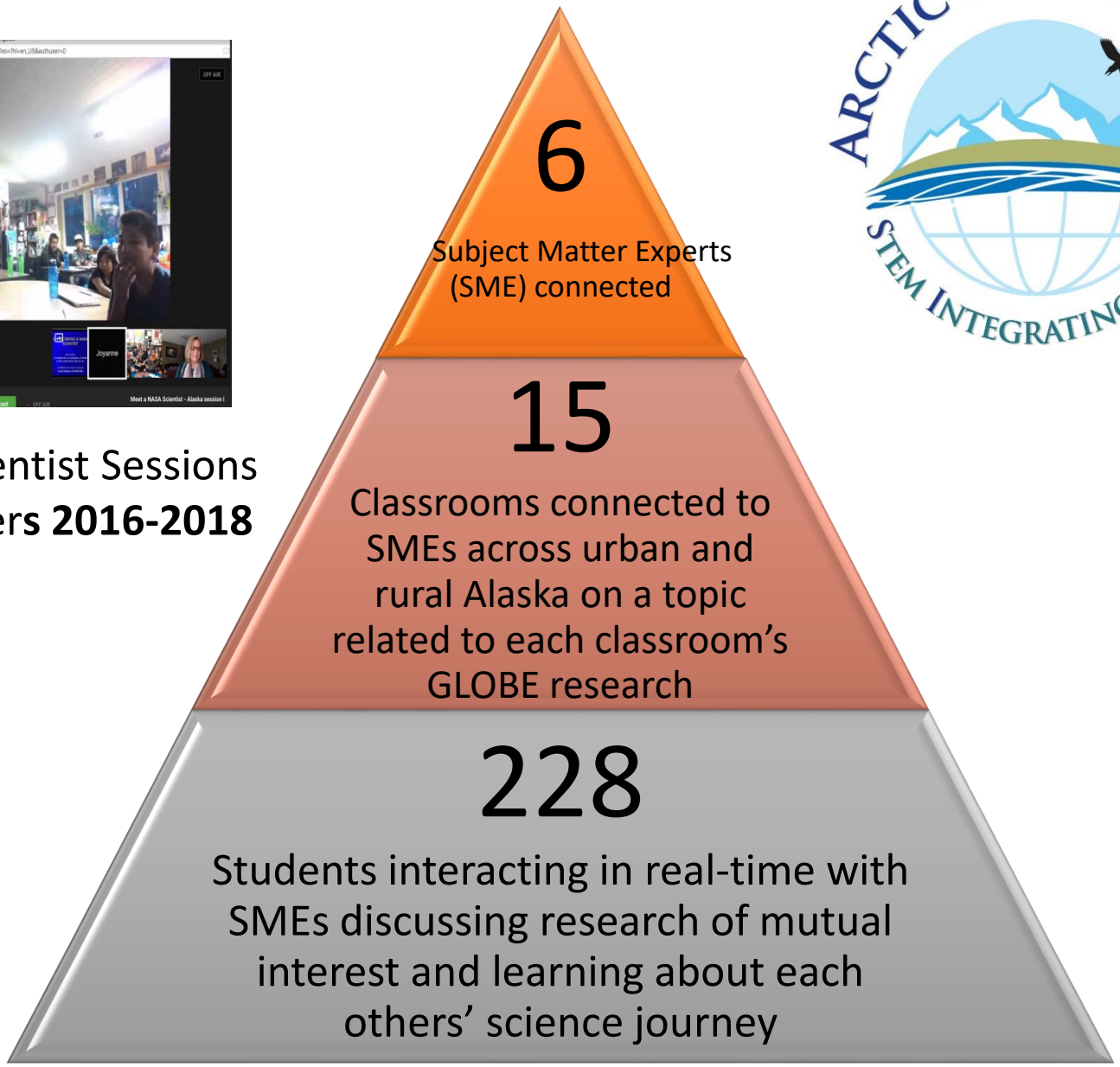


Reach map for Arctic and Earth SIGNs long-term community projects (Blue) and pre-service teachers (purple) reached through the Climate Change and My Community Course and Pre-service Teacher Workshops, 2016-18.

IMPACT



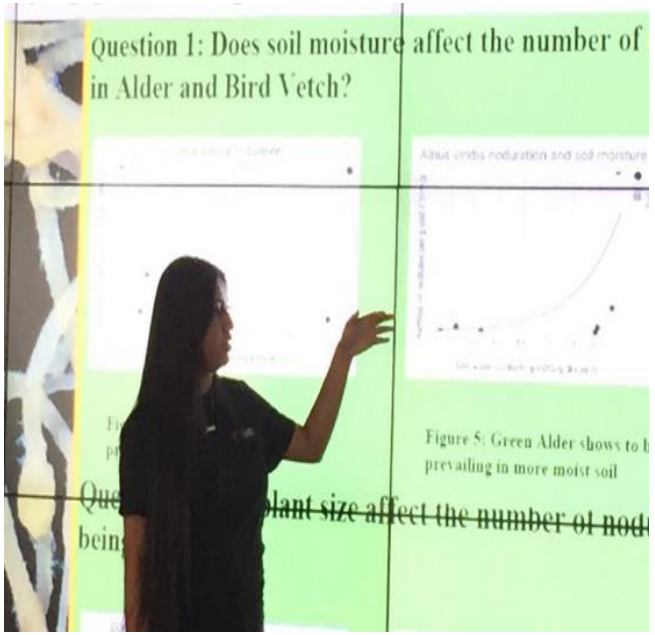
Meet the Scientist Sessions by the number**s 2016-2018**



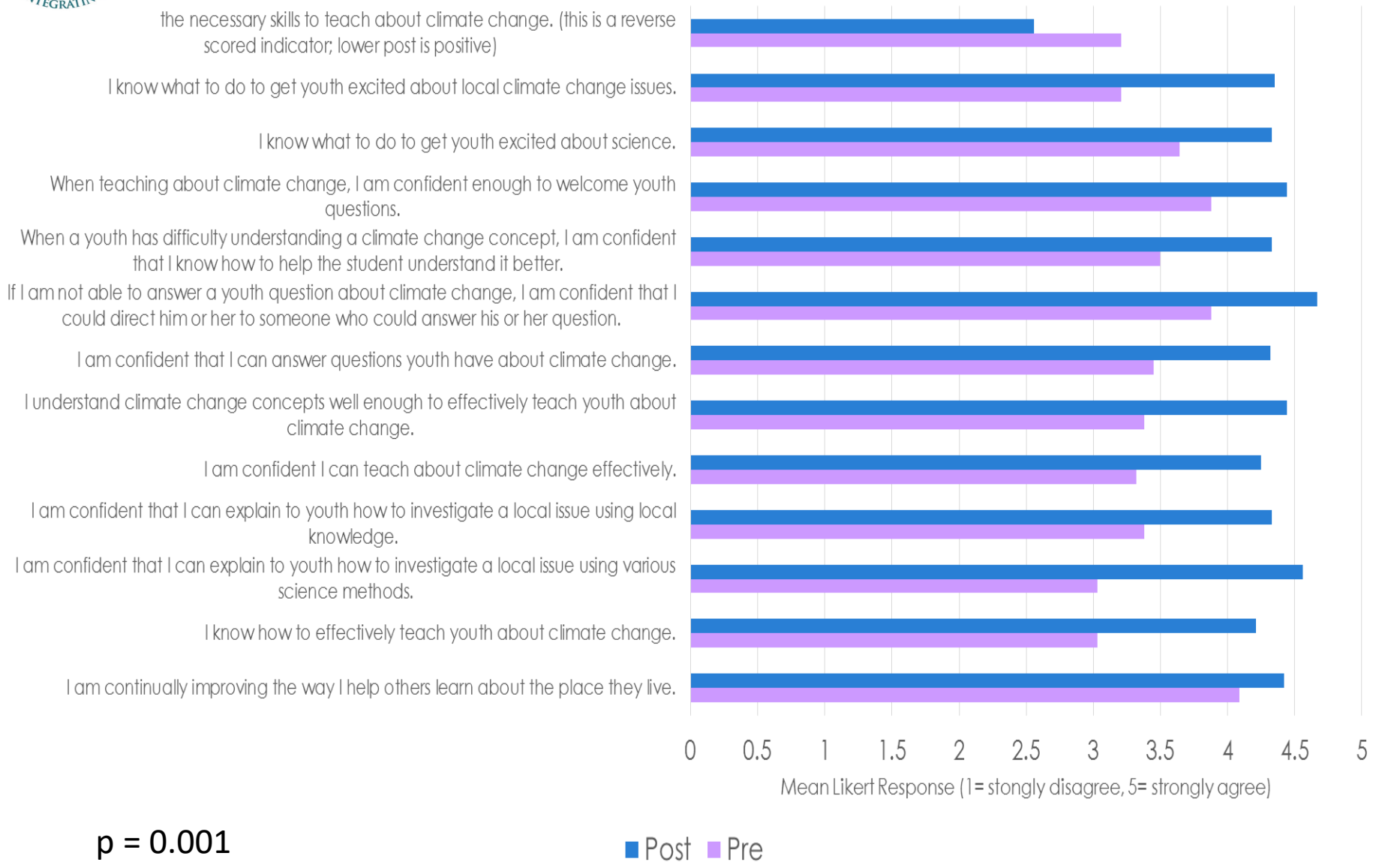
Participants Presentations at Conferences : Nine

2018 GLOBE Learning Expedition in Ireland

2018 UAF Symposium

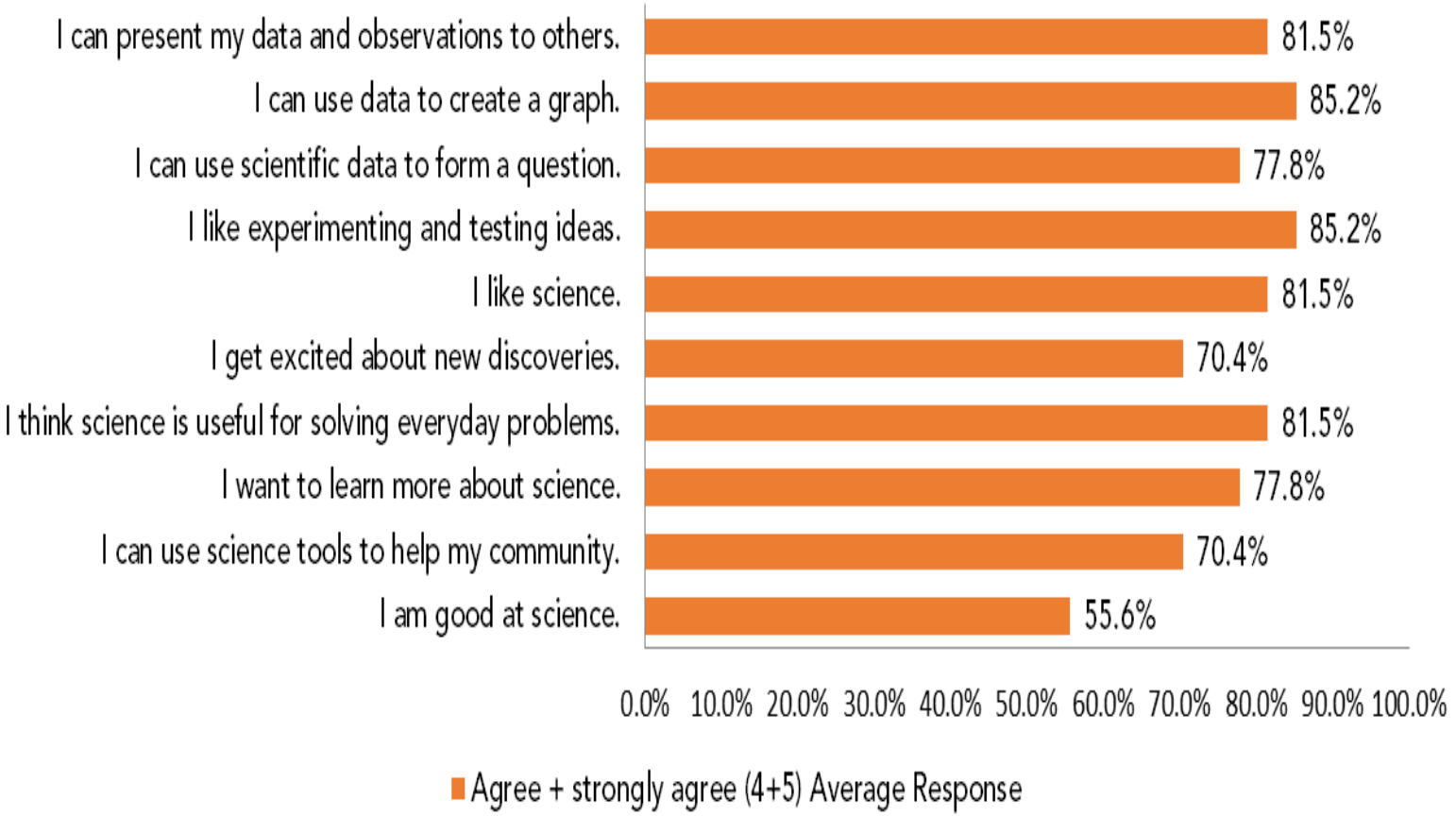


Self efficacy in leading a cross-cultural climate research and action project with youth involvement pre- and post-surveys



p = 0.001

Youth Self Efficacy in Science : Response to Survey Questions



Youth Participants

- 65% reported increased overall knowledge of scientific method
- 52% reported increased knowledge of earth systems
- 69% reported increased knowledge about climate change topics

Publication

- Spellman, K.V., E.B. Sparrow, M.J. Chase, A. Larson, K. Kealy. 2018. Connected climate change learning through citizen science: an assessment of priorities and needs of formal and informal educators and community members in Alaska. Connected Science Learning 1(6): 1-24.

Thank You

Alaska GLOBE

Collaborators: E. Sparrow, K. Spellman, C Buffington, C. Keill, GLOBE Implementation Office at UCAR, Alaska School Districts, Alaska Schools,

Funding: NASA, NSF, Arctic and Earth SIGNs, Winterberry, Bonanza Creek LTER, Alaska EPSCoR, The International Arctic Research Center

Arctic and Earth SIGNs

Collaborators: Elena Sparrow, Malinda Chase, K. Spellman, et al. University of Alaska Fairbanks; Association of Interior Native Educators; GLOBE Implementation Office; NASA Langley Research Center Office of Education; NASA Goddard Space Flight Center Cryosphere Branch; North Slope Borough School District and other school districts; Kenaitze Indian Tribe; 4-H Alaska; Santa Ana Community College MESA; Goldstream Group; NASA Science Mission Directorate STEM Activation Collective, 345 community/citizen scientists

Funding: NASA Science Mission Directorate,
Bonanza Creek LTER, The International Arctic Research Center

Winterberry

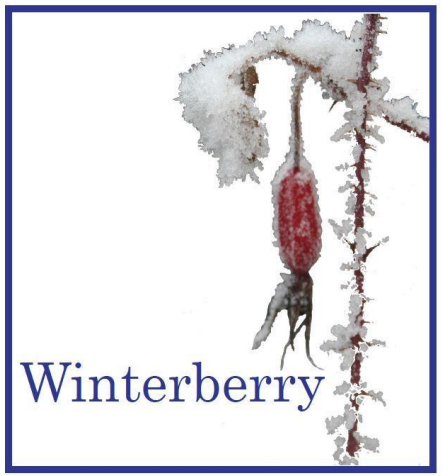
Collaborators: K. Spellman**,** C. Mulder, E. Sparrow, J. Shaw, D. Cost, S. Stanley, C. Villano, L. Parkinson, C. Buffington, 409 citizen/community scientists

Funding: NSF Advancing Informal Science Learning, Bonanza Creek LTER

Winterberry and Fostering Science Updates + introducing *Warming the West*

Christa Mulder, Katie Spellman, Elena Sparrow

LTER Symposium, March 11-12 2019

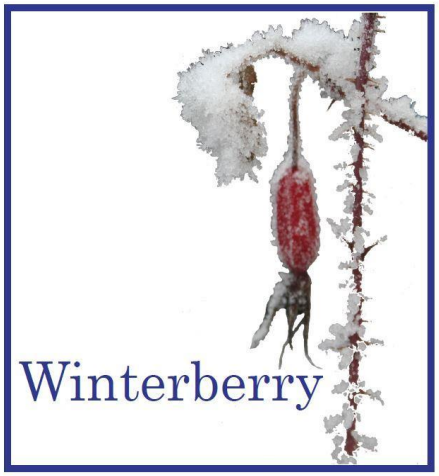


Enlisting the power of nature and the passion of scientists

Fostering Science

to empower youth in care

Winterberry Update, Year 2



Ecological Research Question:

- How do shifts in climate affect the fate of ripe berries and timing of berry loss from plants in fall and winter across Alaska?

Local Question:

- Why are our berries changing?

Cit Sci Research Questions:

- Can the contributory model of citizen science be supplemented to increase diversity of participation and social-ecological resilience outcomes?

Winterberry Monitoring Across Alaska

Prickly rose
(*Rosa acicularis*)

Highbush cranberry
(*Vibernum edule*)

Lowbush cranberry
(*Vaccinium vitis-idaea*)

Crowberry
(*Empetrum nigrum*)

Plant name or number	# unripe (some green still on the berry)	# ripe berries (no green left on berry)	# rotten berries (berry is black or brown and squishy or moldy)	# dried berries (berry is shriveled and hard)	# rotten OR dried berries (cannot tell which)	# damaged (berry is ripped, has holes, or is shredded)	Notes for plants
Bob	2	6	0	2	1	0	Browsed by moose last year

Designing for personal relationships and alternative learning frameworks

Winterberry - Arctic Harvest Study Design

Basic

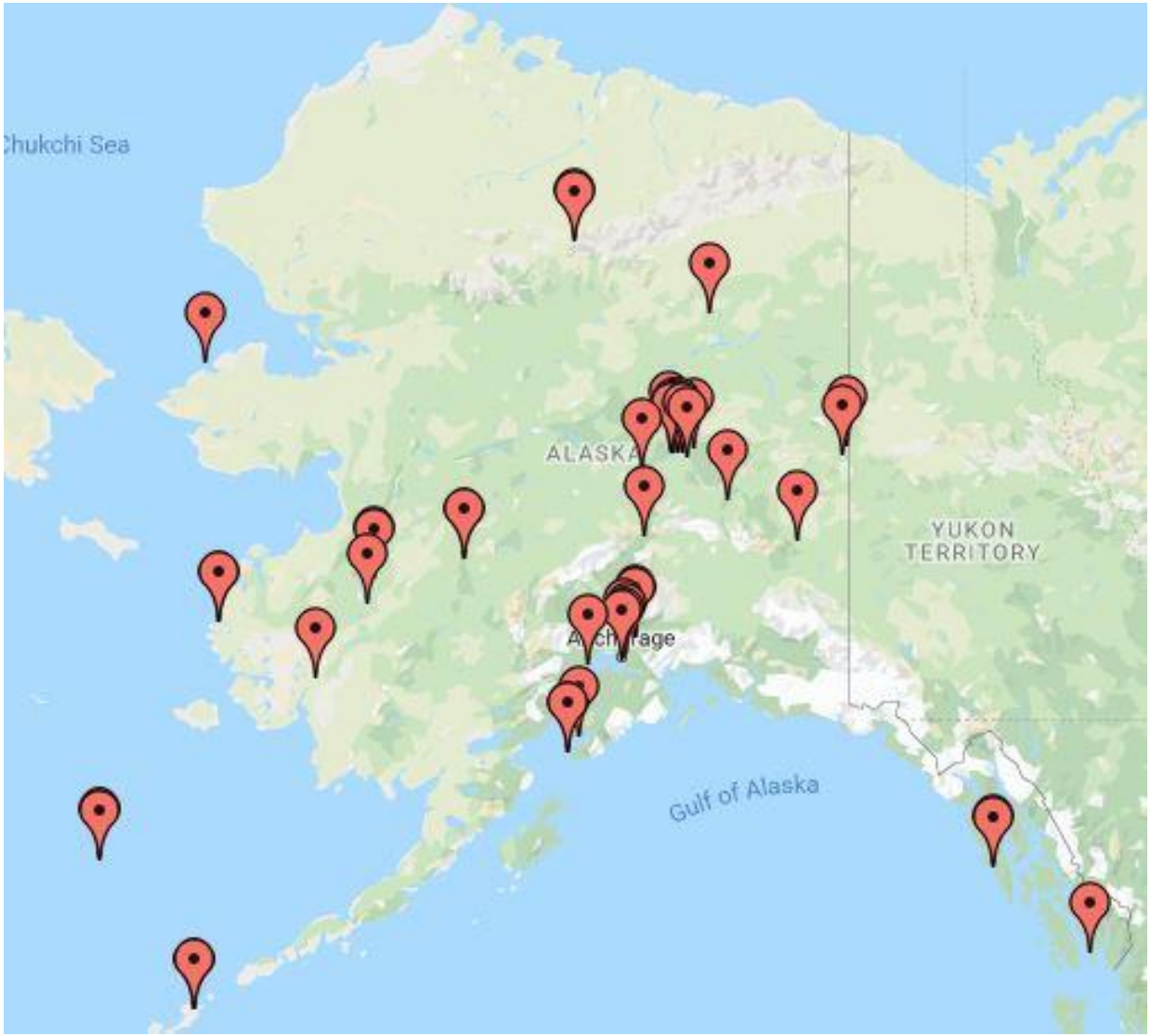
Highly Supported

Highly Supported & Storytelling

Year 2 Numbers for 2018-2019

1080 participants

- 28 communities
- 68 site + species combinations



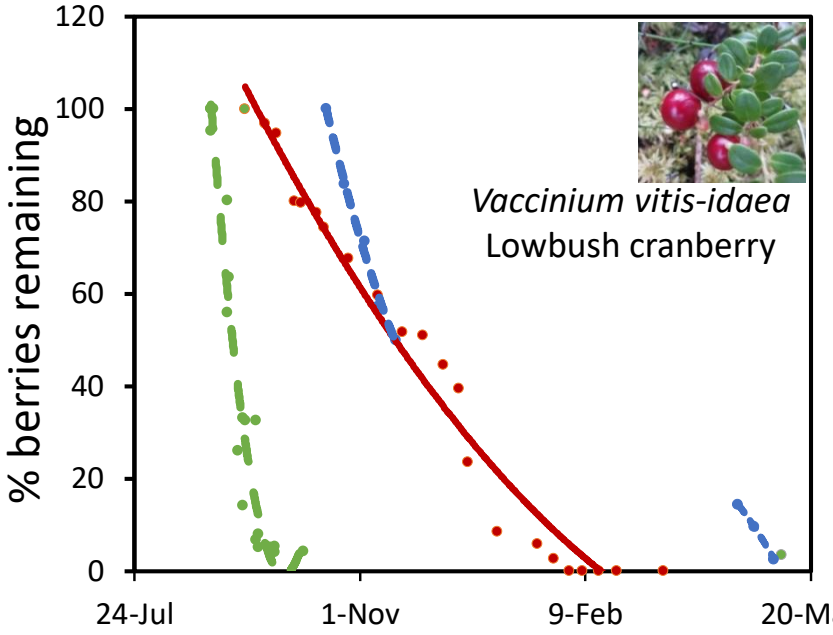
Some of our new communities

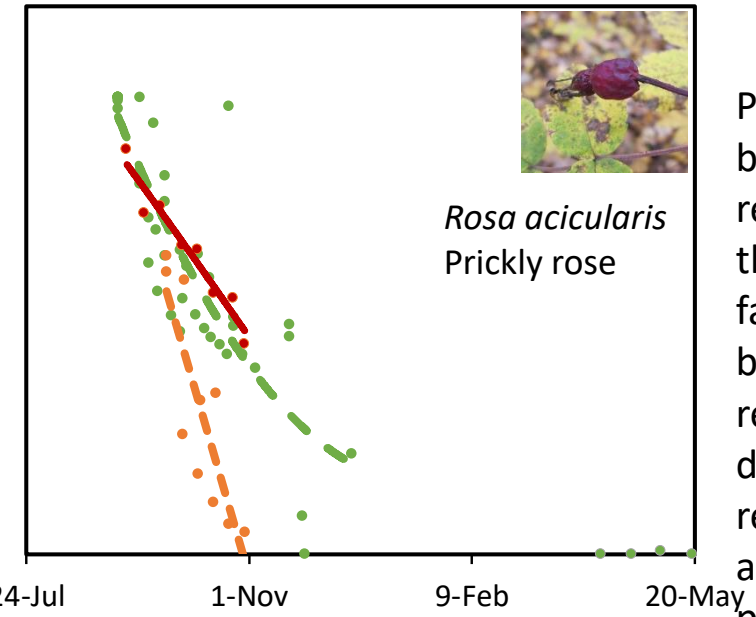
Nanwalek

Holy Cross

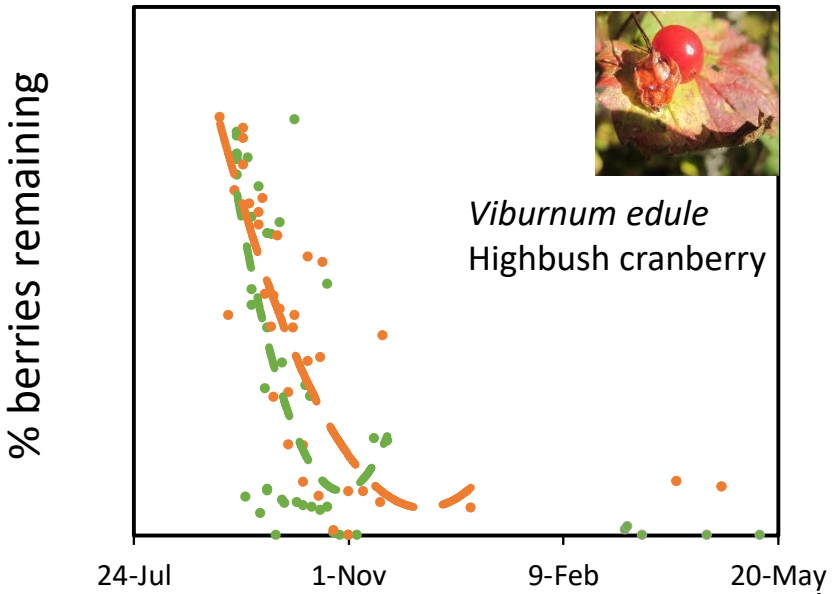
Scammon Bay

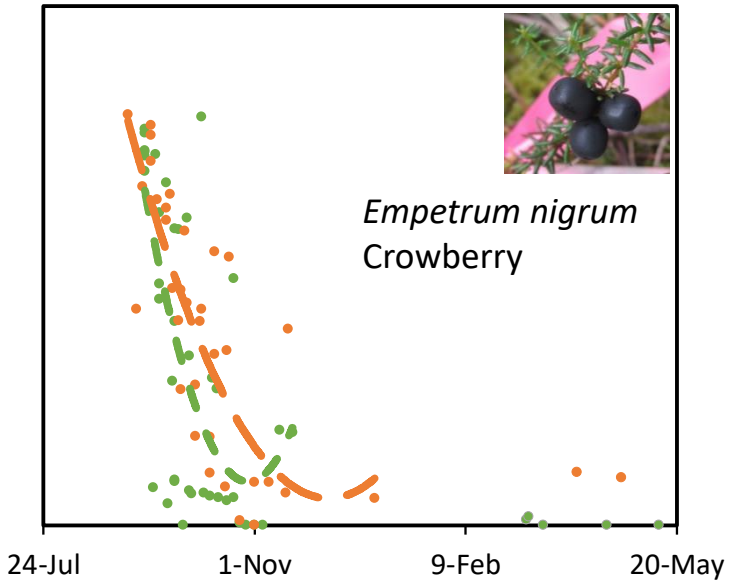
A Natural History of Berry Loss: preliminary results





Percent of berries remaining on the plant over fall and winter by species and region. Each dot represents an average of 20 plants.

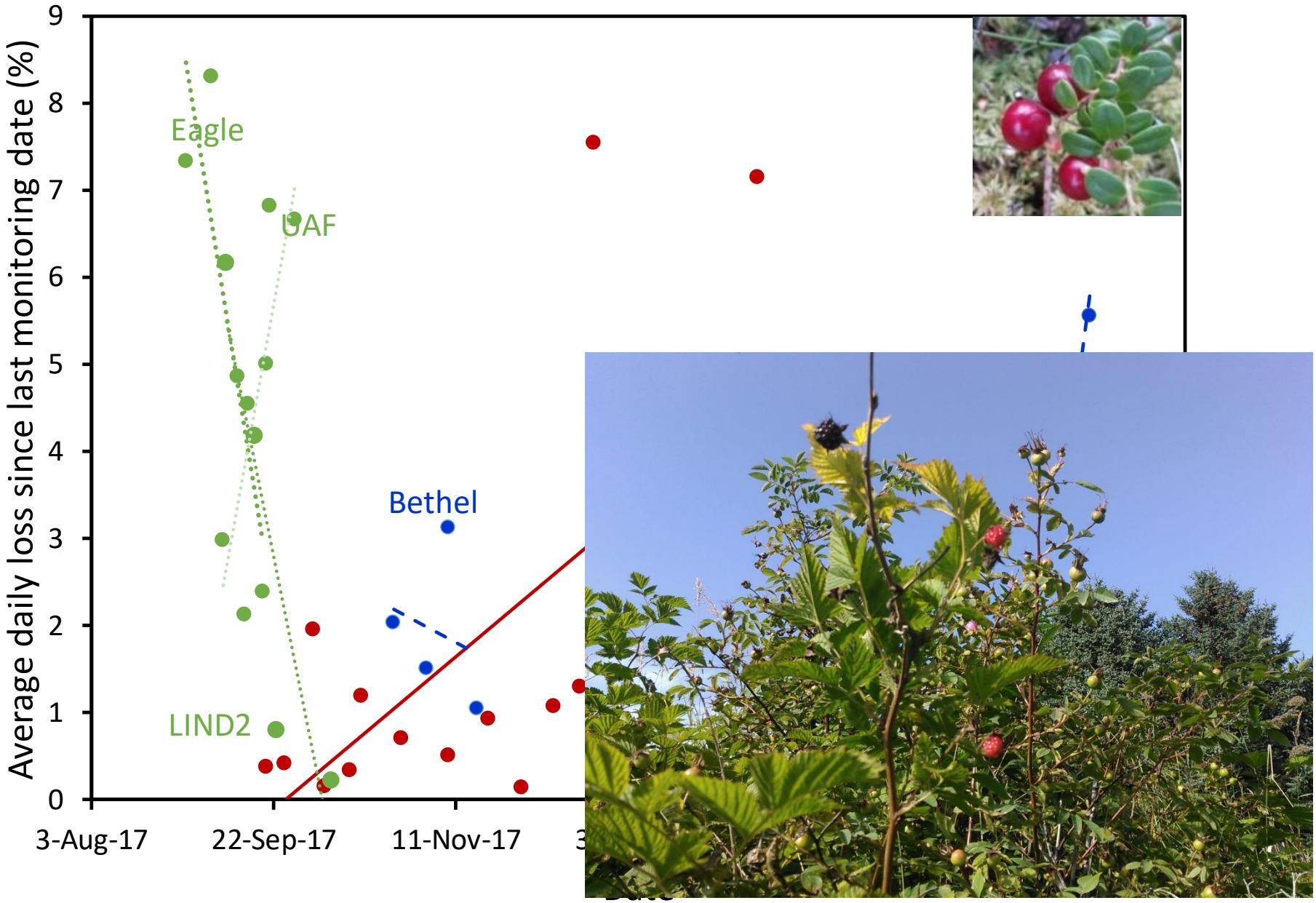




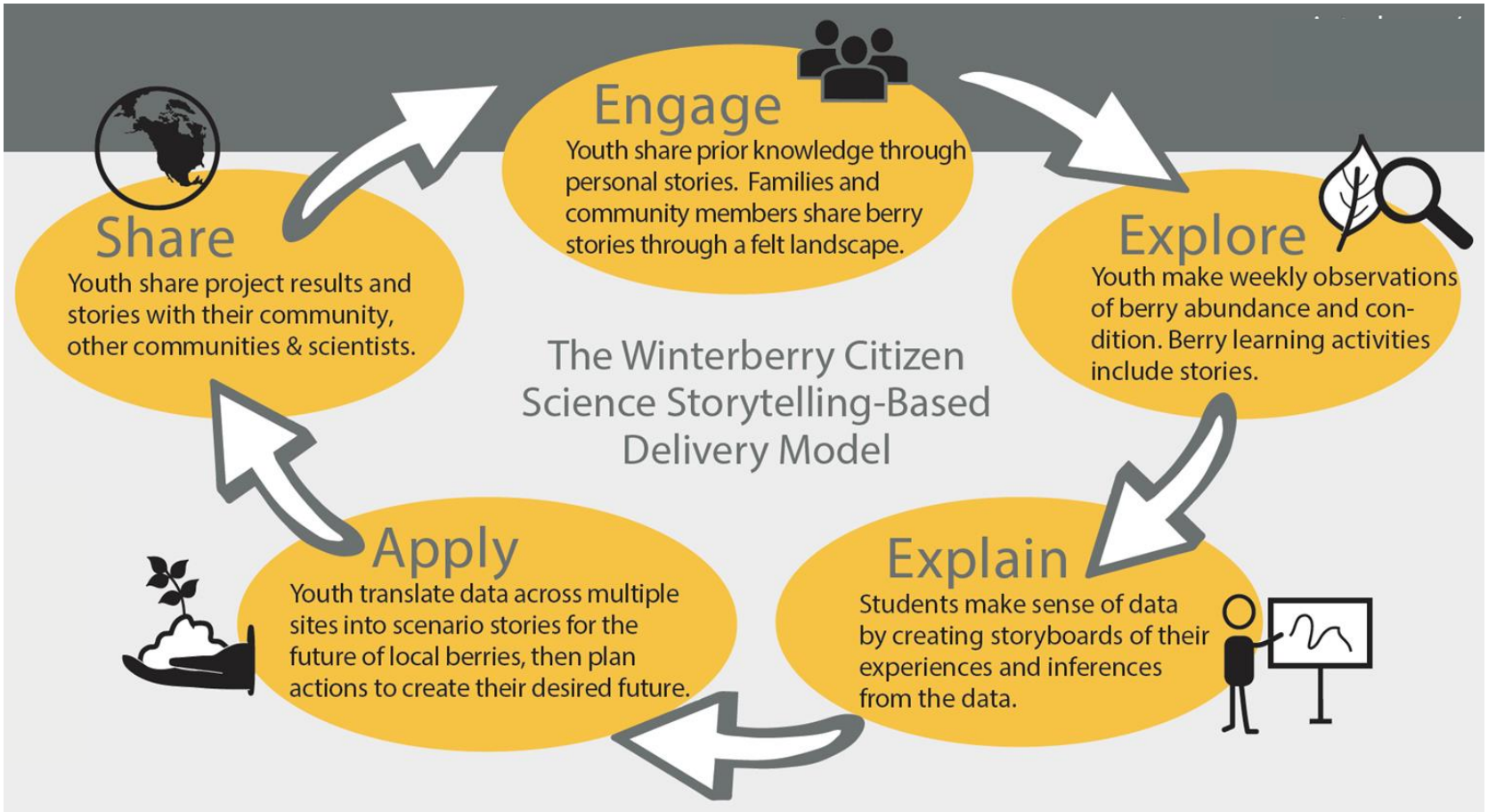
Regions:
Tundra
Interior
Boreal
Southern boreal
Temperate rainforest

Date (in 2017-2018)

A Natural History of Berry Loss: preliminary results



Designing for diverse learners: Storytelling-based citizen science learning



A new model for citizen science delivery

Engage

Youth share prior knowledge through personal stories. Families and community members share berry stories through a felt landscape.

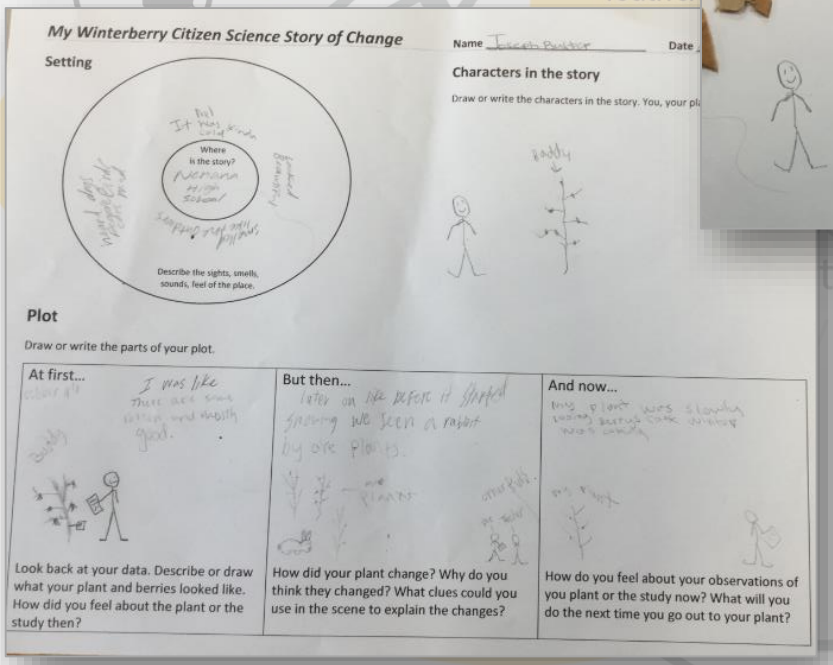
Explore

Youth make weekly observations of berry abundance and condition. Berry learning activities include stories.

Share

Youth share project results and stories with their community, other communities & scientists

A new model for citizen science delivery



Engage

Youth sh

telling-Based Model

observations nd con- activities

Explain

Students make sense of data by creating storyboards of their experiences and inferences from the data.

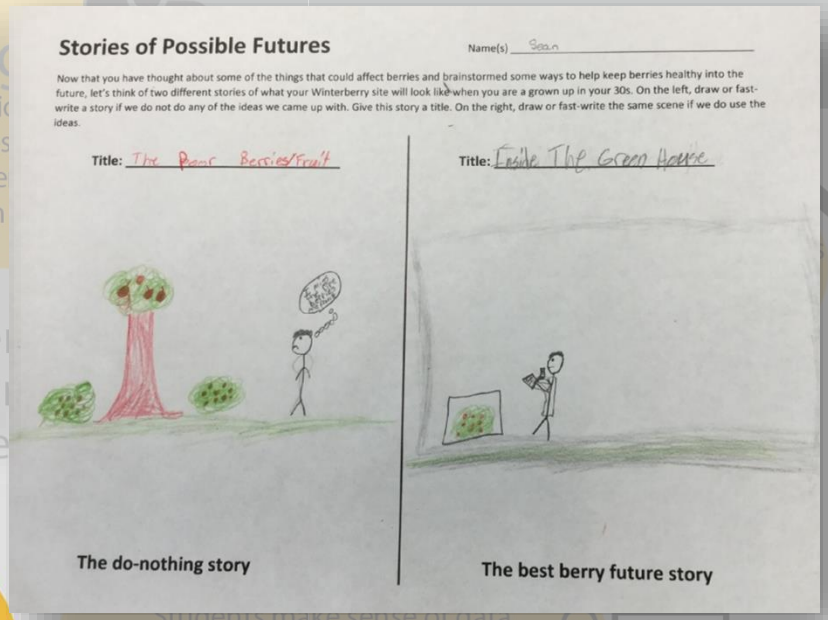
Designing for stewardship action

Share

Youth share project results and stories with their community, other communities & scientists

Apply

Youth translate data across multiple sites into scenario stories for the future of local berries, then plan actions to create their desired future.



Stories of Possible Futures

Name(s) Sean

Now that you have thought about some of the things that could affect berries and brainstormed some ways to help keep berries healthy into the future, let's think of two different stories of what your Winterberry site will look like when you are a grown up in your 30s. On the left, draw or fast-write a story if we do not do any of the ideas we came up with. Give this story a title. On the right, draw or fast-write the same scene if we do use the ideas.

Title: The Bear Berries/Fruit

Title: Inside The Green House

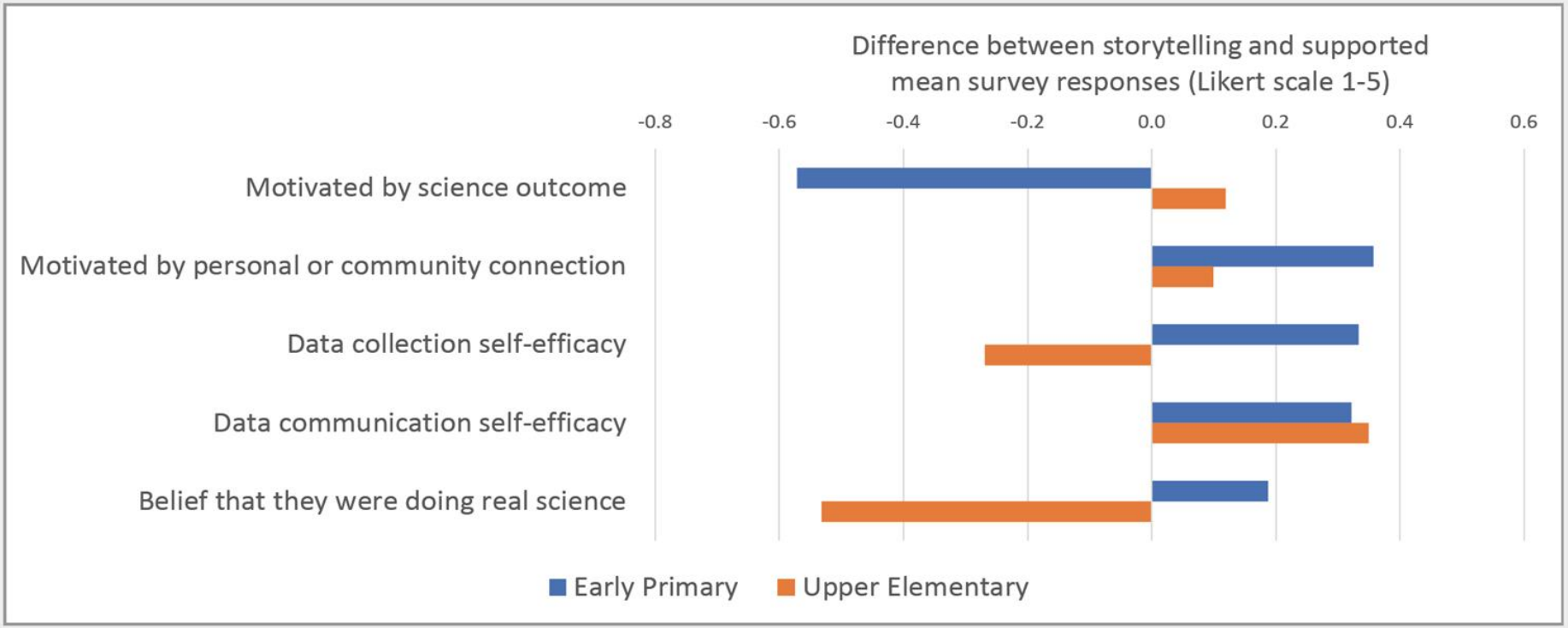
The do-nothing story

The best berry future story

Students make sense of data

by creating storyboards of their experiences and inferences from the data.

Preliminary data: Learning study



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.

Meet Madalynn

- First grader in Shishmaref, Alaska
- Member of the Climate Heroes After School Group
- Winner of the first prize at the Alaska State Science and Engineering Fair with her Winterberry project!!!

Photo: L. Villano

Enlisting the power of nature and the passion of scientists

Fostering Science

to empower youth in care

- Science education program designed for youth in care ages 11-16
  - Foster care
  - Care of relatives
  - Group home
- No experience needed

Why have a separate program for youth in care?

- Kids in foster care face obstacles in attending summer camps
- Positive focus on the future
- Safe environment with other kids who understand their circumstances
- Interacting with a range of people passionate about what they do
- Power of doing science and solving problems

Learning how to track snowshoe hares

Examples of Barriers to Access

- Lack of transportation
- Lack of gear
- Lack of documentation

List of Required Clothing and Gear
2019 Denali Summer Science Academy

Your safety and comfort are important to us; therefore, please read this list carefully and contact us with any questions or concerns. Denali's wilderness holds many challenges for visitors. We will be hiking off trail on rough terrain and will likely encounter wet conditions, including river crossings. Temperatures can be below 32 degrees F or as high as 70+ degrees F. Snow is possible. Mosquitoes can be numerous.

It is important that you have clothing that will keep you dry and warm, even in rainy weather. If you have any trouble acquiring some of these items, please let us know as we may be able to lend items to you.

Under Layers:
- 3 pairs wool or synthetic warm socks (no cotton)
- Underwear, as needed for the week.
- 2 pair of lighter weight synthetic long underwear
- 1 long-sleeve synthetic shirt (no cotton)
- 1 short sleeve synthetic t-shirt (no cotton)

Outer Layers and Warmer Layers
- Synthetic long pants, quick drying (No cotton), zip-off legs are excellent.
- Fleece pants or another thicker pair of long underwear
- 1 thick fleece pullover jacket or lightweight synthetic "puffy" jacket
- 1 lighter weight Fleece pullover or warmer synthetic shirt

Head, Hands and Foot Wear:
- Warm winter-style hat (wool or fleece)
- 1 pair synthetic gloves/mittens
- Baseball cap or sun hat
- Hiking boots (waterproofed & broken in!)

LISTS OF ACCEPTABLE DOCUMENTS
All documents must be UNEXPIRED

Employees may present one selection from List A
or a combination of one selection from List B and one selection from List C.

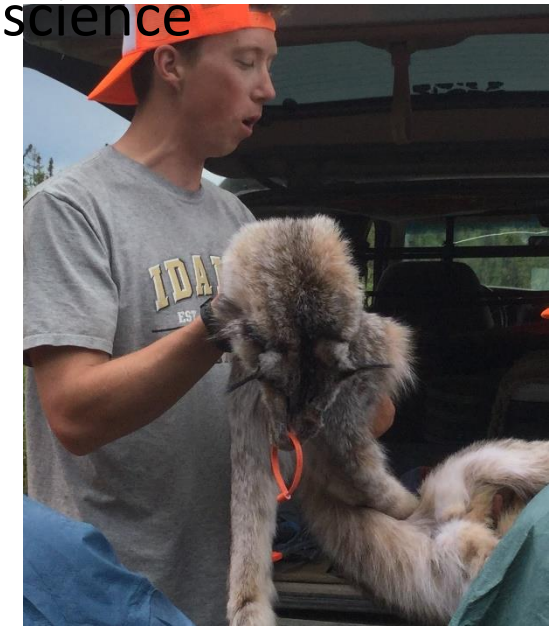
LIST A Documents that Establish Both Identity and Employment Authorization	OR	LIST B Documents that Establish Identity	AND	LIST C Documents that Establish Employment Authorization
1. U.S. Passport or U.S. Passport Card		1. Driver's license or ID card issued by a State or outlying possession of the United States provided it contains a photograph or information such as name, date of birth, gender, height, eye color, and address		1. A Social Security Account Number card, unless the card includes one of the following restrictions: (1) NOT VALID FOR EMPLOYMENT (2) VALID FOR WORK ONLY WITH INS AUTHORIZATION (3) VALID FOR WORK ONLY WITH DHS AUTHORIZATION
2. Permanent Resident Card or Alien Registration Receipt Card (Form I-551)		2. ID card issued by federal, state or local government agencies or entities, provided it contains a photograph or information such as name, date of birth, gender, height, eye color, and address		2. Certification of report of birth issued by the Department of State (Forms DS-1350, FS-545, FS-240)
3. Foreign passport that contains a temporary I-551 stamp or temporary I-551 printed notation on a machine-readable immigrant visa		3. School ID card with a photograph		3. Original or certified copy of birth certificate issued by a State, county, municipal authority, or
4. Employment Authorization Document that contains a photograph (Form I-766)		4. Voter's registration card		
5. For a nonimmigrant alien authorized to work for a specific employer because of his or her status:		5. U.S. Military card or draft record		

What do kids get out of it?

- Increase in self-confidence
- Increase in self-efficacy
- Making new friends
- Consider new careers and options
- Meet potential mentors
- Obtain useful skills
- Build resumé

How does this build resilience in our comm

We use an underused resource: people who like kids and are passionate about science



Dr. Justin Olnes – mammal tracking

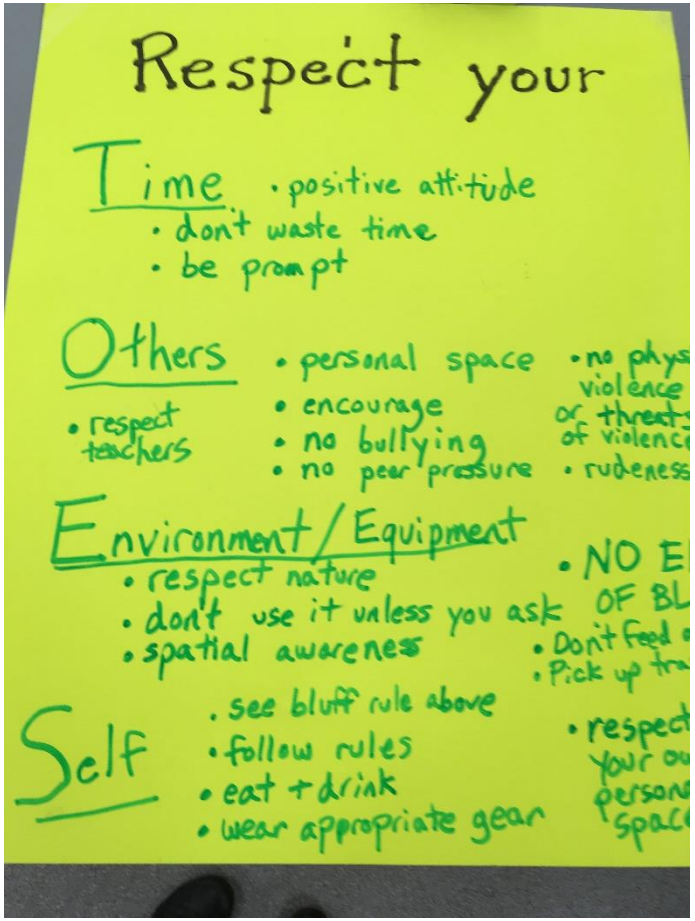
Jamie Hollingsworth – permafrost drilling, drones

Matt Cameron – birds and mammals

Dr. Elena Sparrow – soils and insects

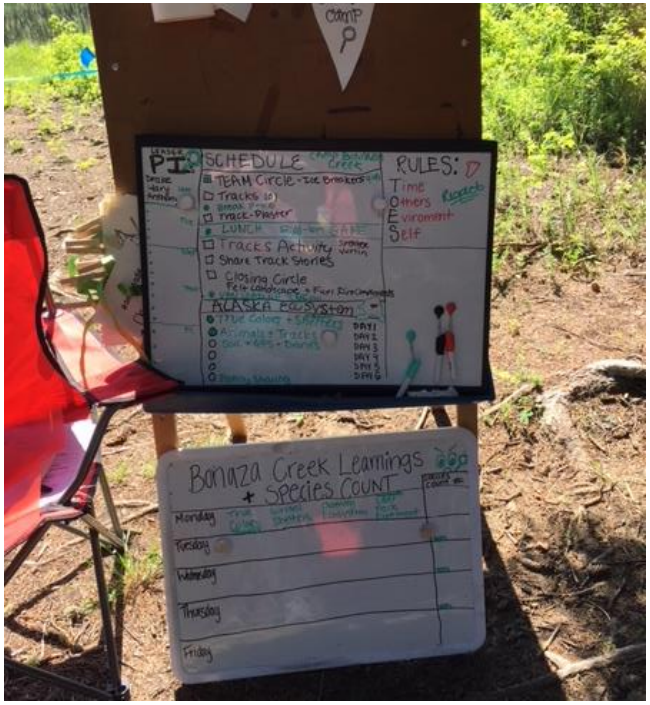
Dr. Teresa Hollingsworth – forests

Orientation



Daily structure

- Centering exercise
- Morning Circle / PI announcement
- Science Activity
- Games
- Lunch / PI announcement
- Science activity
- Closing circle – felt landscapes, kudos

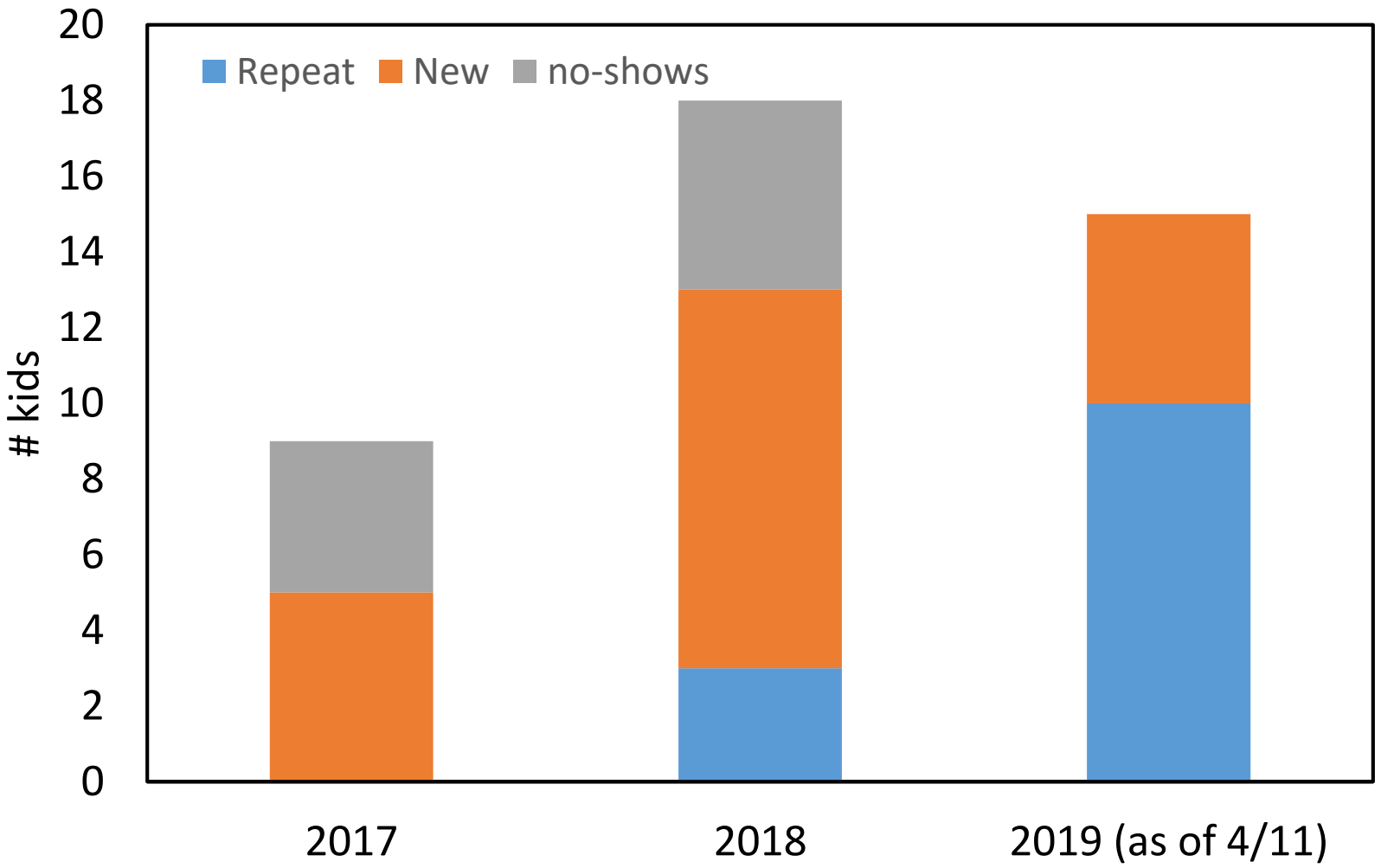


Saturday: Sharing Day

Weaving our Strengths Together

Natalie and James explain what the Bonanza Creek Science Adventure Camp did for them

Attendance


Repeat
New
no-shows
kids
20
18
16
14
12
10
8
6
4
2
0
2017
2018
2019 (as of 4/11)

Foster Science Expansion!

TWO camps in 2019:

- Bonanza Creek Science Adventure Camp: June 17-21
- Denali Science Adventure Camp: June 1-3

NEW Opportunities:

- Junior Counselors: experienced campers age 16 or older
- Kids from Nenana?

Denali Summer Science Academy

Hello Bonanza Creek Foster Group & Christa Mulder,
We are excited to have your group join us for the 2019 Denali Summer Science Academy!
Start preparing yourselves for:

- Learning about field science.
- Gathering real data to help scientists.
- Hiking in Denali's wilderness.
- Camping in Denali National Park and Preserve.

Here are the steps you will need to take to confirm:

Warming the West:

How Climate Change is Altering Communities from Alaska to Arizona

Editors:

Christa Mulder, Institute of Arctic Biology, U. Alaska Fairbanks

Seth White, Columbia River Inter-Tribal Fish Commission, Portland, Oregon

Contributing Authors: Regina M. Rochefort, Stephen T. Gibbons, Malinda Chase, Tara Martin, Marlow Pellatt, Val Schafer, David Thoma, Erin Shanahan, Lisa Ellsworth, Elizabeth Schuyler, Miranda Gray, Clare Asland, Leah Samberg, Sasha Storz, Collin Haffey, Cari Kimball, Gabe Sheoships, Pamela Wright, Jerrica Mann, Aerin Jacob

Collaboration with artist Megan Wood

Structure of each chapter

General Structure

- Opening image
- Critter Story
- Human story
- Science behind the stories
- Resolution

Mulder & Chase Chapter

- Little cranberry plant
- Dene woman picking berries
- Impact of climate change on phenology; trophic mismatches
- More investment in preservation; sharing via Facebook; commercial berries?