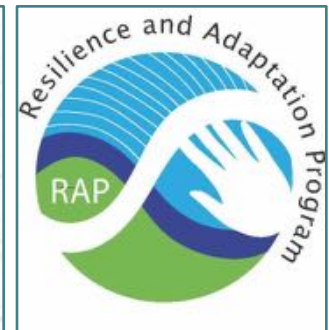
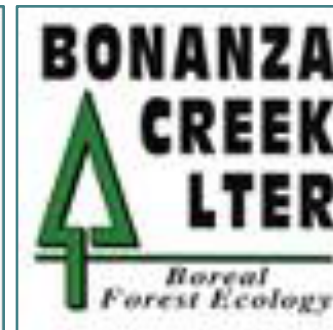


Citizen Science for Arctic Research and Classrooms

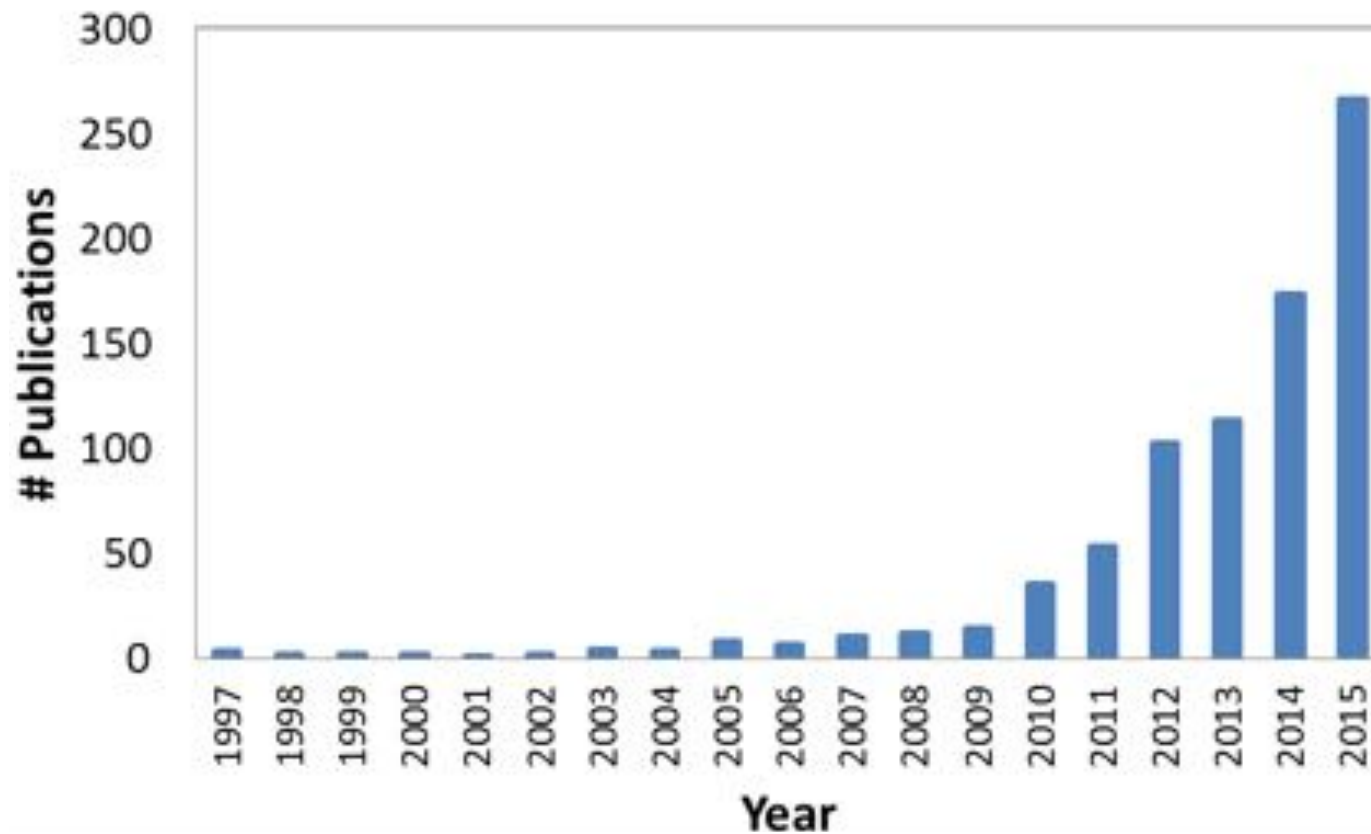


Katie Spellman

Postdoctoral Research Fellow
University of Alaska Fairbanks

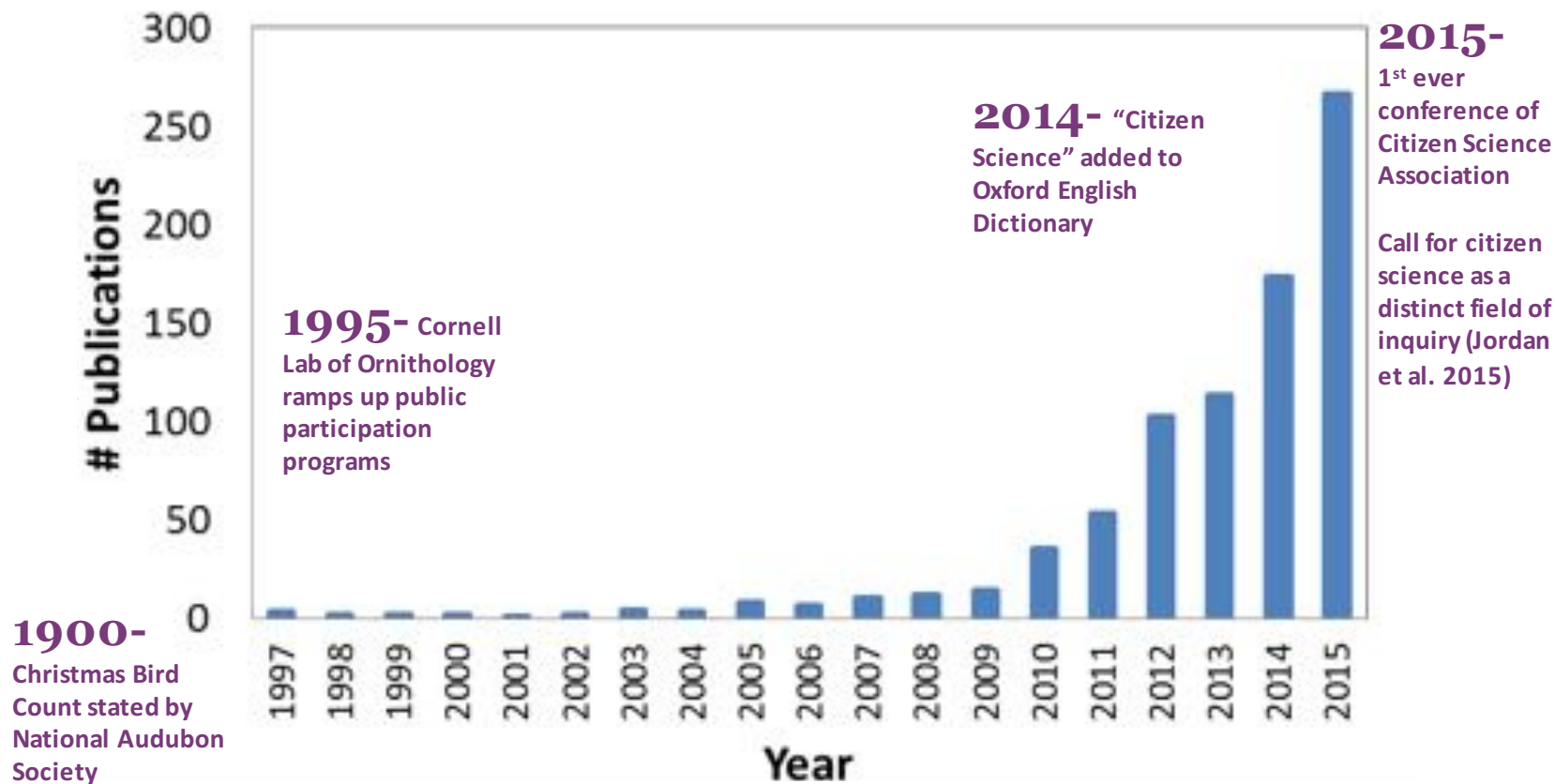


Citizen Science on the Rise



Number of peer-reviewed papers on Web of Science with “Citizen Science” as a key word published each year, 1997-2015

Citizen Science on the Rise



Number of peer-reviewed papers on Web of Science with "Citizen Science" as a key word published each year, 1997-2015

What is Citizen Science?

- Partnerships between scientists and non-scientists to conduct scientific research

Other names:

- Citizen monitoring
- Community-based monitoring
- Voluntary biological monitoring
- Public Participation in Scientific Research





K-12 Learning

Arctic Research

Citizen Science

Citizen Science Spectrum

**Theoretical or
generalizable
needs**



**Local
community
needs**

Question	Researcher	Citizens
Methods Design	Researcher	Citizens with researcher assist.
Data collection	Citizens	Citizens
Data Analysis	Researcher	Researcher with citizen assist.
Use of findings	Researcher & Citizens	Citizens & Researcher

Who was involved?



= Volunteers



= Professional researchers

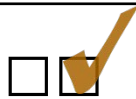
Project



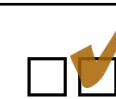
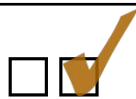
**Arctic
and Earth
SIGNS**



Question



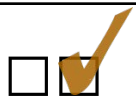
**Methods
Design**



**Data
collection**



**Data
Analysis**



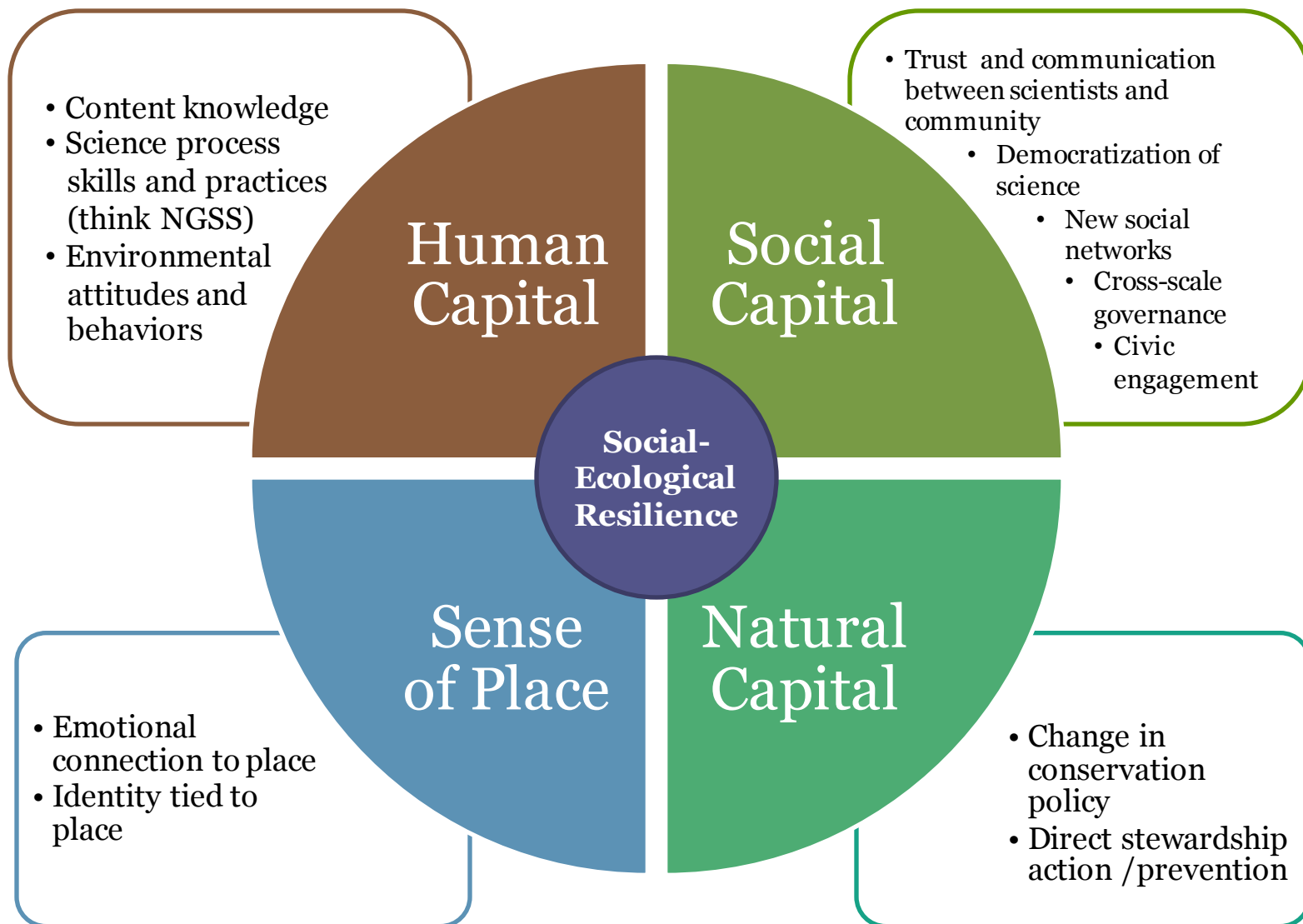
**Use of
findings**



**K-12
Education**



Documented outcomes from Citizen Science





Melibee Project Question:

Where in Alaska does the flowering times of invasive sweetclover and native berry species overlap the most?



Project BrownDown Question:

Can native or invasive plants take most advantage of extended fall growing seasons in Alaska

Our Approach:

- *Historical phenology data from herbarium records*
- *Current data from citizen science*



Cranberry specimen from the University of Alaska Museum of the North herbarium

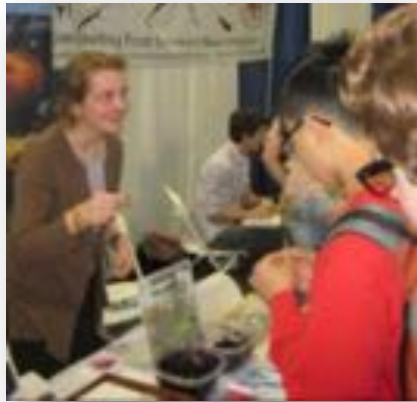


Monitoring lowbush cranberry in Fairbanks.



Label on a herbarium sample dating back to 1881.

Melibee/ BrownDown Team



Dr. Christa Mulder

Research design & publication
News Media
Recruiting
Website
Volunteer training



Dr. Katie Spellman

Research design & publication
Program mgmt
Recruiting
Website & materials develop.
Volunteer training
Program evaluation



Christine Villano

Teacher training
Recruiting
Lesson development
Classroom piloting



Steven Decina (RET)

Lesson development
Data collection



Dr. Matt Carlson

Research design & publication



Marcy Kuntz (RET)

Data collection
Classroom piloting



Patricia Hurtt

Data collection



Katie Moeller (REU)

Data collection
Website & materials develop.
Volunteer training

Participants

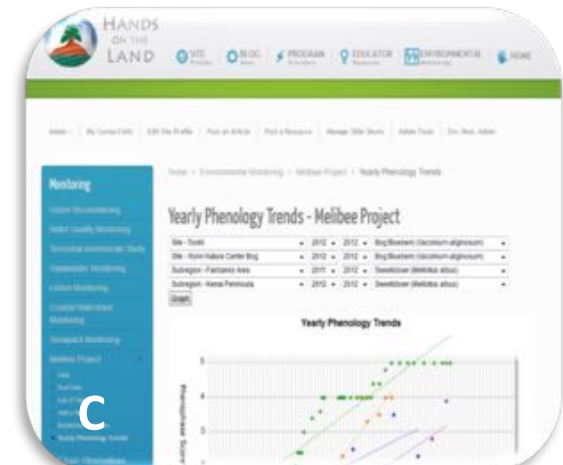
- Ecologists
- K12 educators & youth
- Land managers
- Interested individuals & families
- Alaska Native tribal and traditional councils

Training for Successful Collaboration

- Scientific protocols
- Collaborative problem solving
- Invasive plant ecology & management
- Communication & education approaches

Collaboration Strategies

- High quality email communication between ecologists and volunteers
- Monitoring site visits by ecologists
- Web-based portal to input, share & visualize data
- Team gathering & newsletter



Teacher trainings



Field learning on invasive plant ecology.



Practice with lab techniques.

Classroom trainings



Denali Elementary School training Fairbanks, AK

It's all about relationships!



US Fish and Wildlife Service Youth Corps monitoring plants “El Diablo Blanco” and “Malfoy Draco” at Tanana Lakes, Fairbanks, AK



Innoko River School training Shageluk, AK

Continued support

- Skype & email communications
- Lessons and teacher resources to help incorporate research into science classrooms (co-created with teachers and piloted)
- Newsletter and thank you events to demonstrate how student data is connected to the bigger picture



Senescence art.



Analyzing pollen loads on stigmas.



Kiersten

The Great Fall Leaf Race

HYPOTHESIS
Which shrubs will lose their leaves first, Alaskan wild rose or European bird cherry?



Alaskan Wild Rose



European Bird Cherry


Why do you think so?

I think the alaskan wild rose will loss on the lefe first warre it sass alaskan wild rose thean is more mltie coar and orsge bot less geene


Daniel

The Great Fall Leaf Race

HYPOTHESIS
Which shrubs will lose their leaves first, Alaskan wild rose or European bird cherry?



Alaskan Wild Rose



European Bird Cherry

Why do you think so?

I think it will lose more because it belong here.

Leafy Labels



leaf

vein

stem

pointy tips

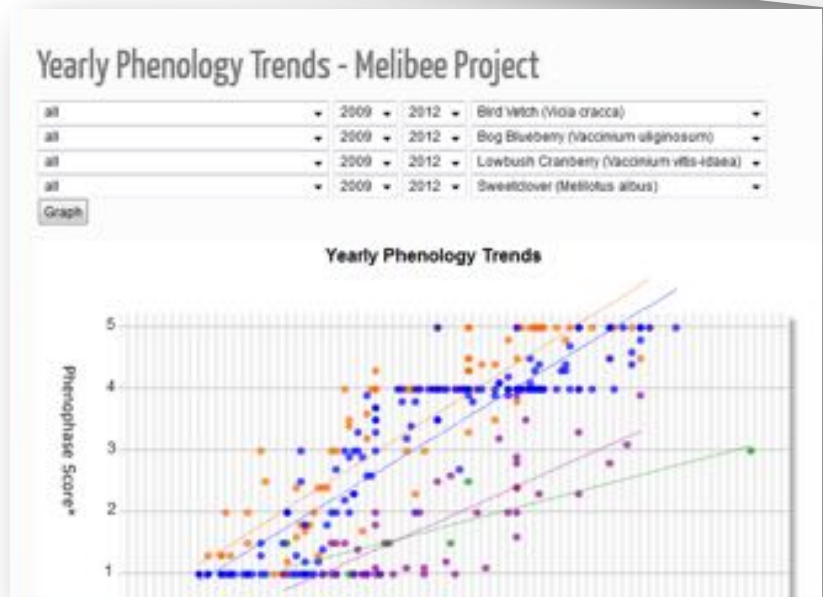
My Leaf Project by Gavin

	small 	big 
This is my leaf.	My leaf is <u>big</u> .	
	pointy 	curvy 
My leaf is <u>1</u> cubes tall.	My leaf is <u>pointy</u> .	

Accepting and Visualizing Data

- Online reporting
- Smartphone
- Mail or email
- Online access to protocols, research reports, training webinar and data visualizations

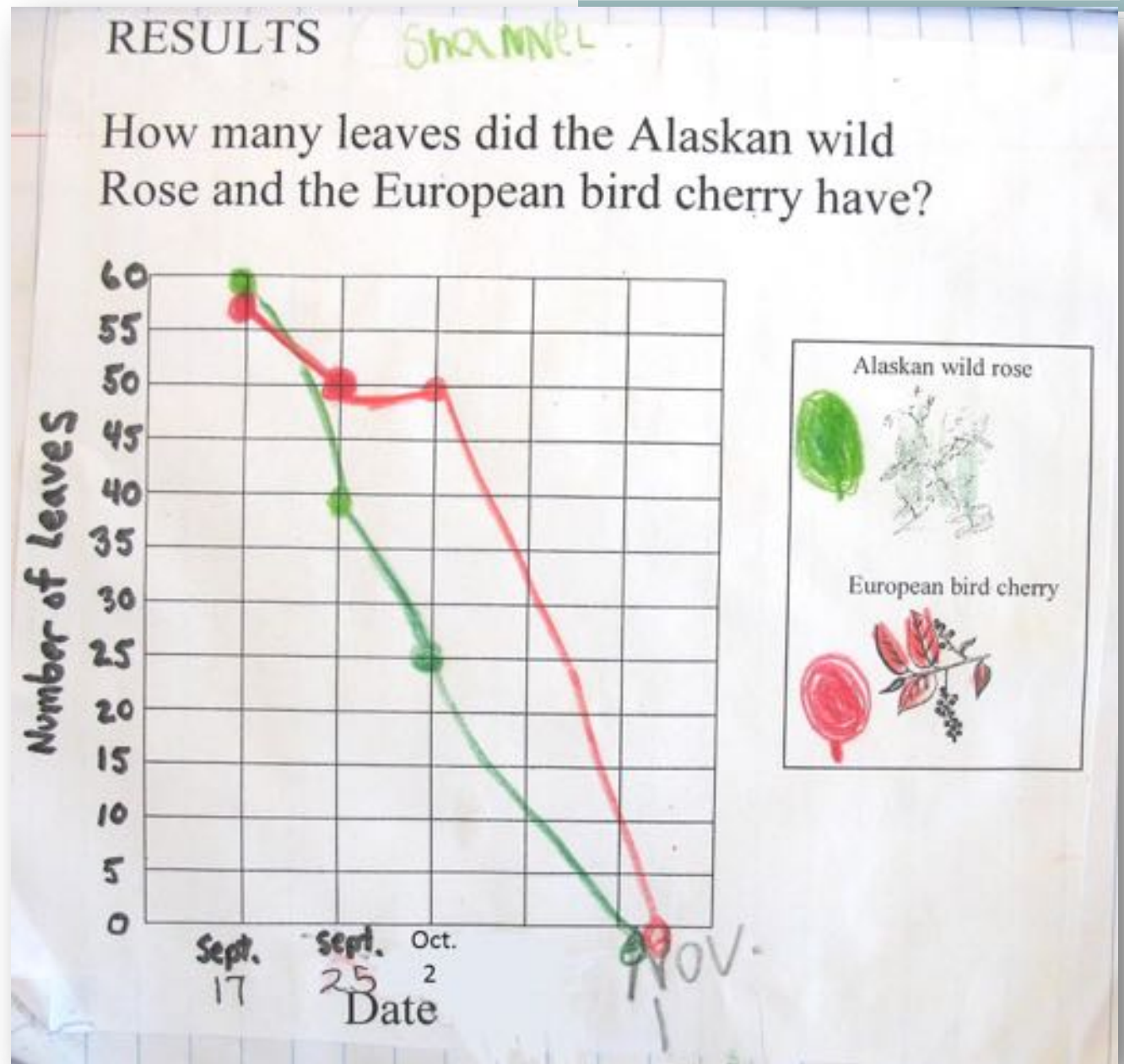
Google “Melibee citizen science”



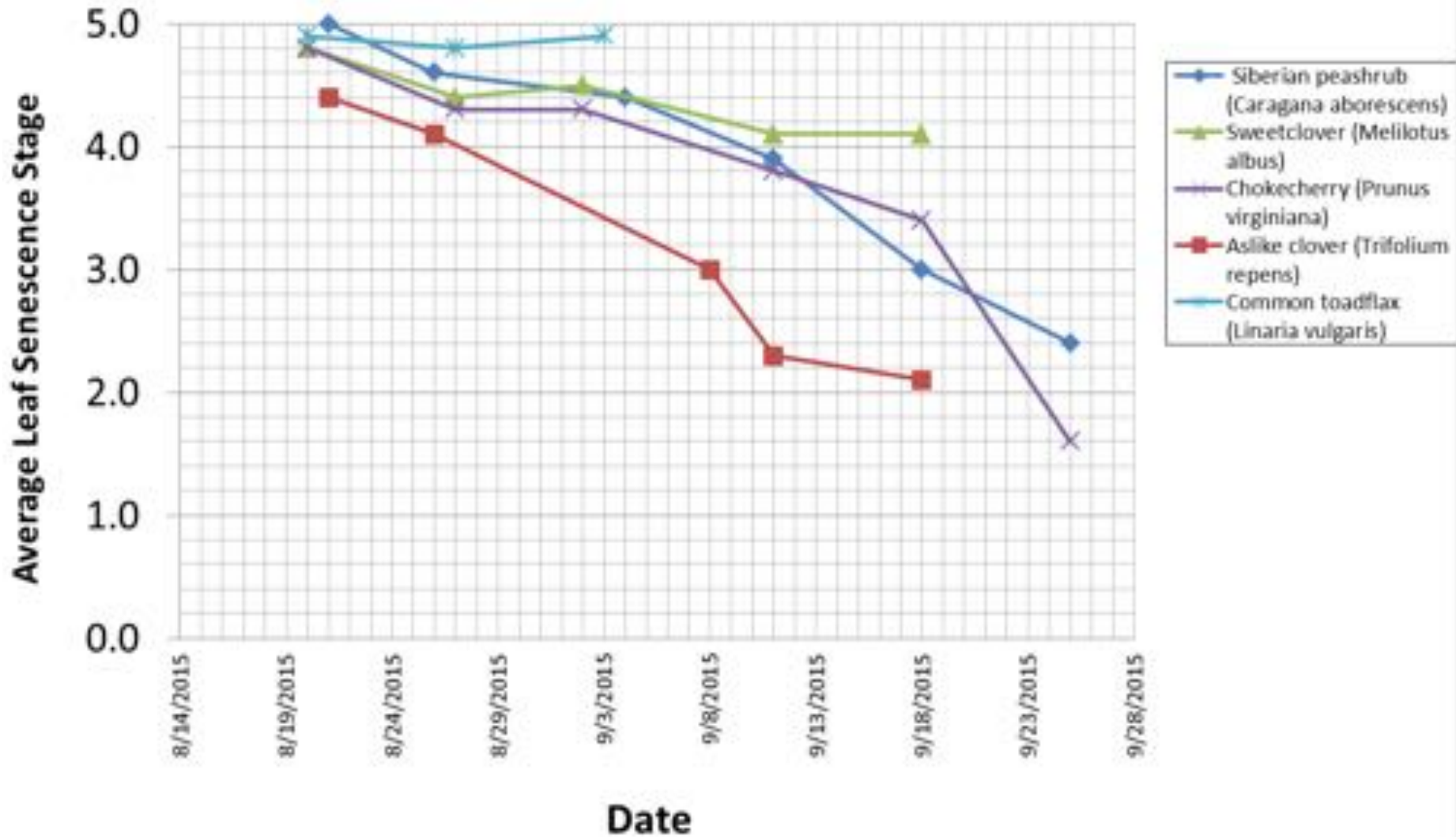
Data discovery



Denali
Elementary
1st Grade

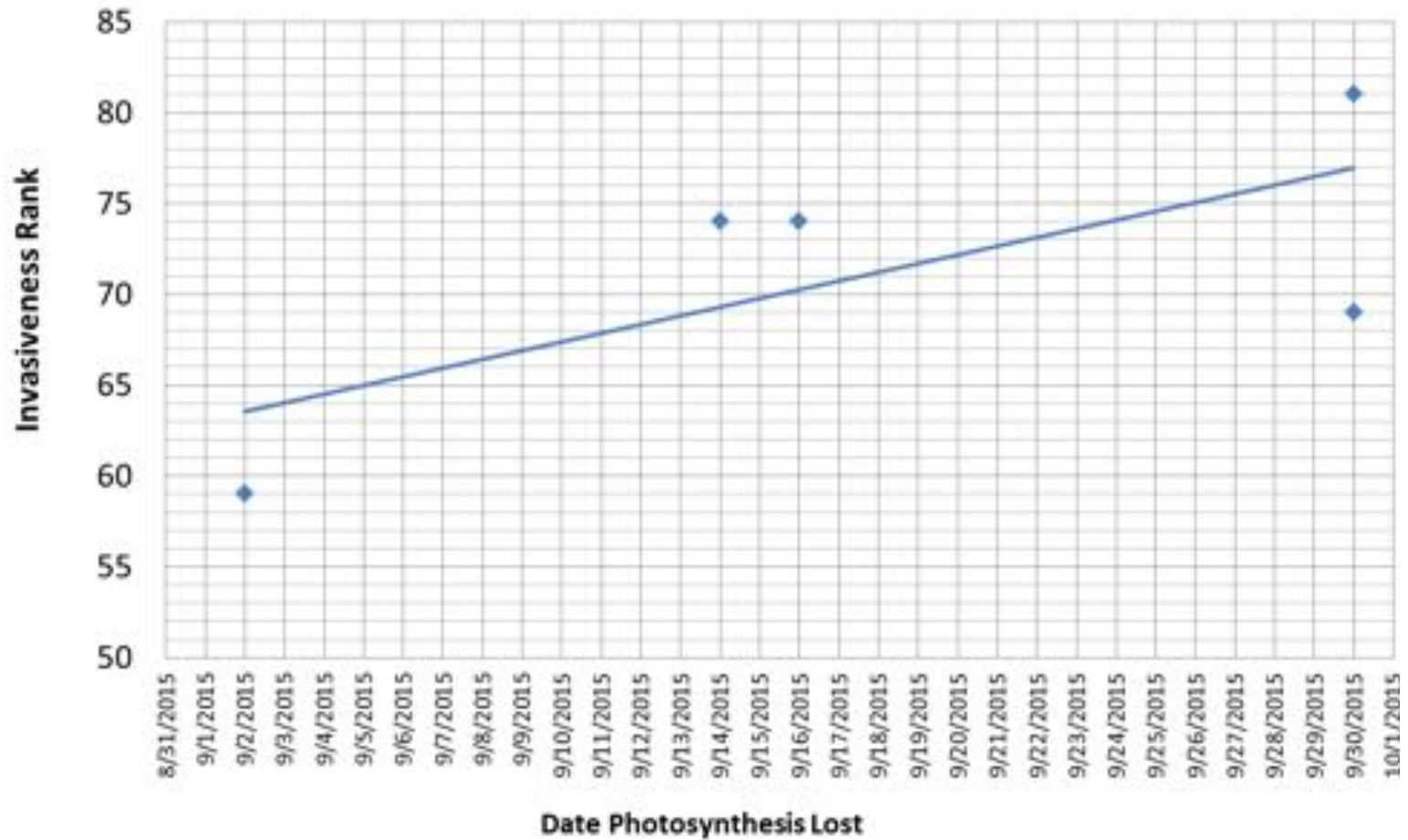


Monroe Catholic High School 7-12 Grade



Monroe Catholic High School 7-12 Grade

Invasiveness Rank vs. Average Date the Species Lost the Ability to Photosynthesize



Measure Effects

Align with learning goals

- Opportunity for adults and youth to engage in scientific research
- Increase knowledge of invasive plants, phenology, and how climate change interacts with both

Align with research goals

- Contribute to scientific understanding by addressing research question
- Enhance management capacity



Learning ecology content and process skills

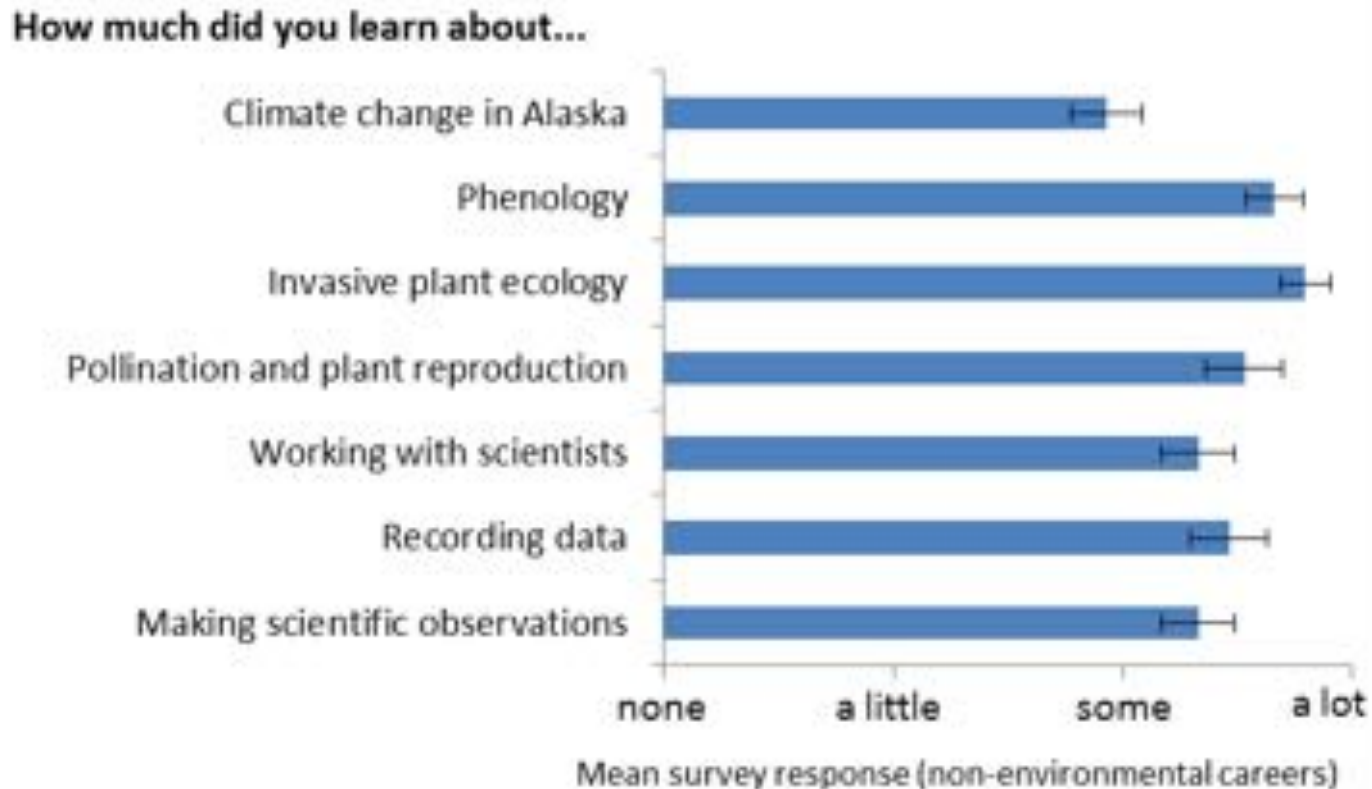


Figure 2. Learning reported by volunteers who were not engaged in environmental careers that occurred as a result of participation in the Melibee Project phenology monitoring program on key concepts and science process skills on key concepts and science process skills.

Changes in Activity Frequency

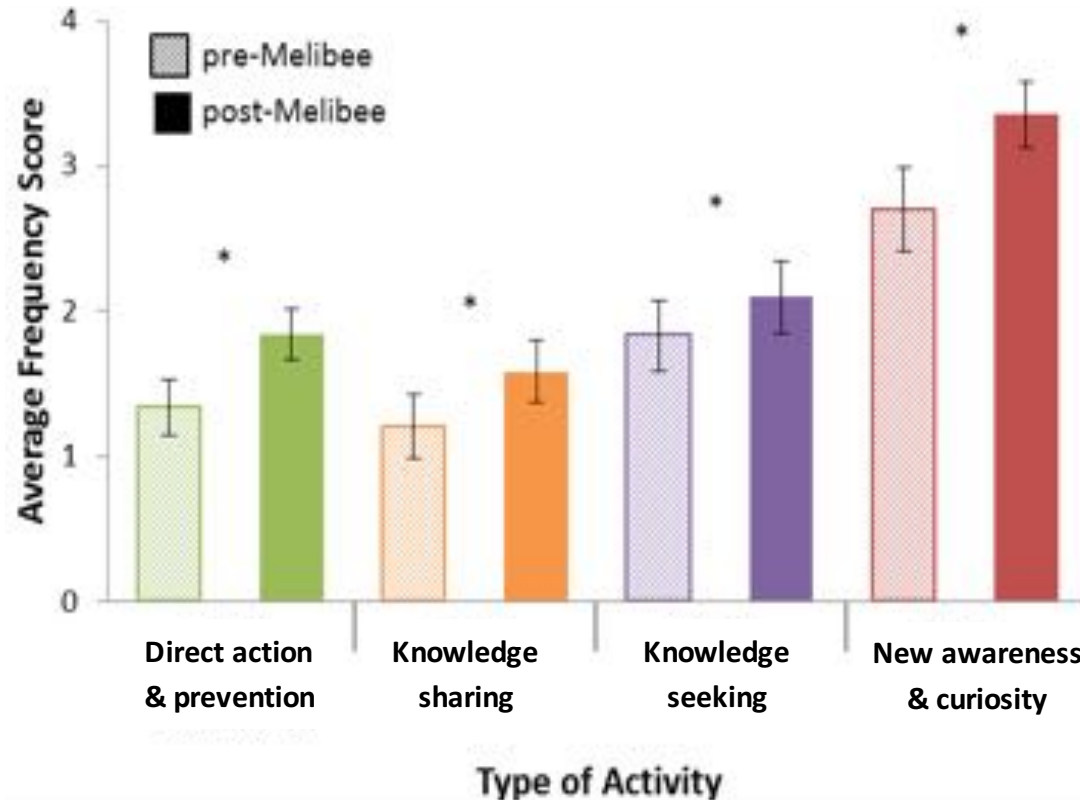
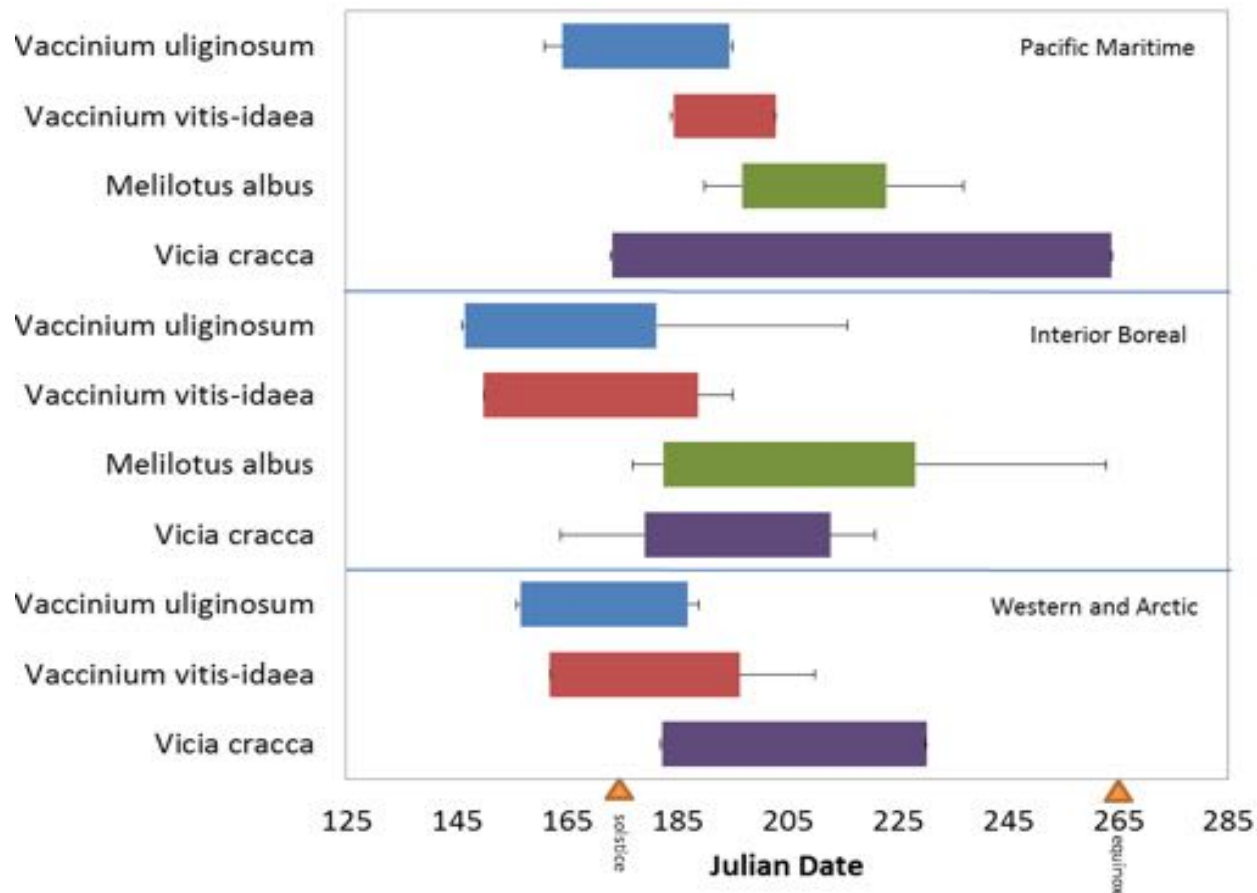


Figure 3. Average self-reported activity frequency scores in different outcome categories for volunteers before (pre-) and after (post-) their participation in the Melibee Project Citizen Science Program. Statistical differences between pre- and post- Melibee activity frequency (tested using two-tailed t-tests) is indicated by * ($p < 0.05$).

Contribution to scientific understanding

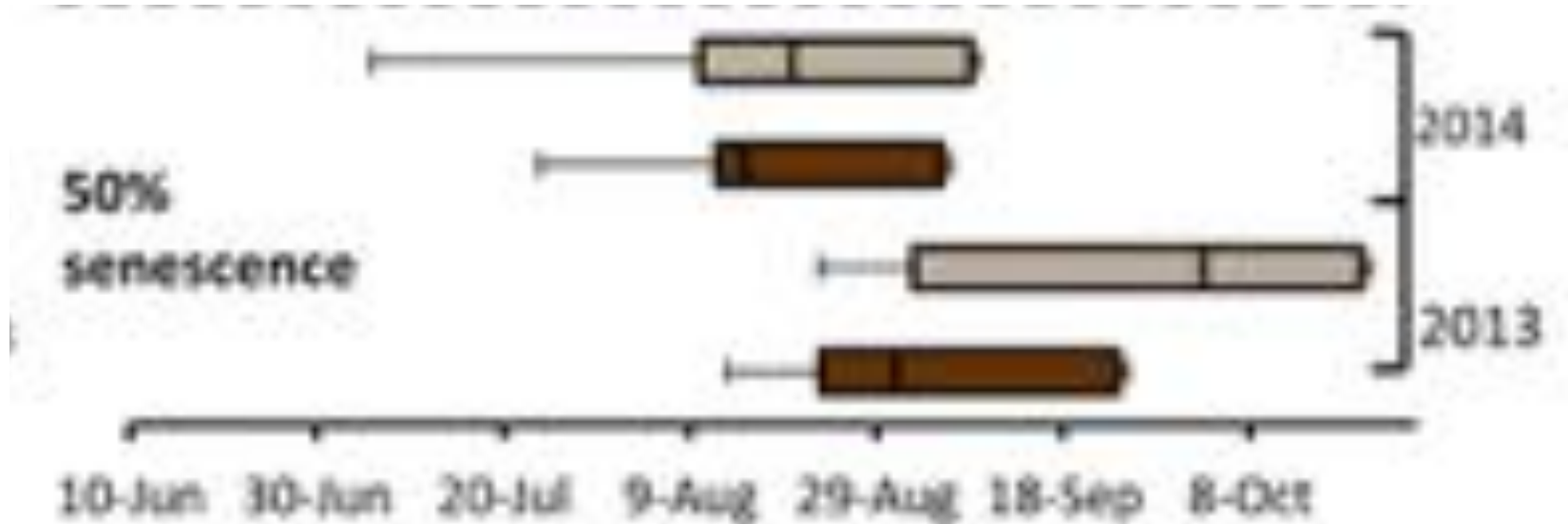


Peak flowering dates (score of 1.1 to 2.9) for focal species in the three ecoregions of Alaska based on two years of citizen science monitoring data (2012-2013). Boxes are average start and end dates from regressions and the whiskers are the earliest and latest observed dates.

Figure 1. Ecoregions of Alaska (Storck et al. 2001).



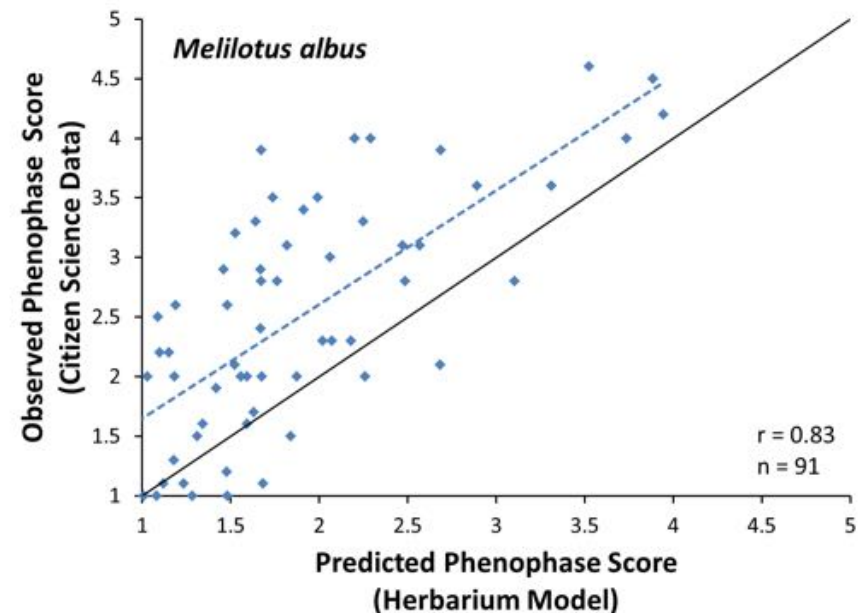
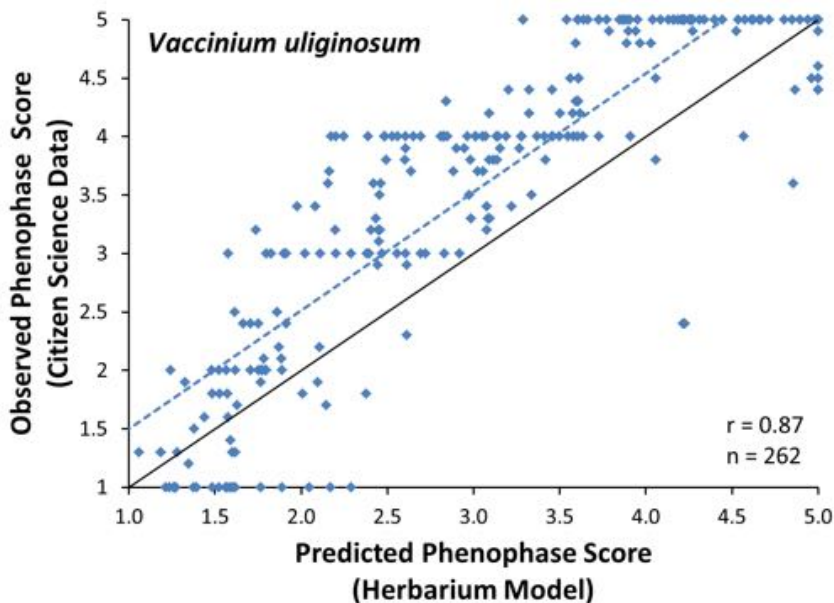
Contribution to scientific understanding



Date of 50% leaf senescence in native (dark brown) and non-native (shaded) boreal plant species in 2013 and 2014.

Enhancing management planning capacity

- Herbarium-based models for predicting flowering overlap
- Model validation using citizen science data
- Planning tool for concerned communities



What did Melibee volunteers like best about the citizen science experience?



Figure 1. Word cloud showing frequency of responses to survey question “What did you like best about participating in the Melibee Citizen Science project? “ The size of the word corresponds with the frequency of the response.

Citizen Science Resources

General:

Citizen Science Alliance- <http://www.citizen-science.org/>

Citizen Science Central- <http://www.birds.cornell.edu/cit-scitoolkit/>

CitSci.org- <http://www.citsci.org/>

Scientific American Citizen Science Portal-

<http://www.scientificamerican.com/citizen-science/>

Some neat projects:

GLOBE- <http://www.globe.gov/>

iNaturalist- <http://www.inaturalist.org/>

Project Budburst- <http://www.neoninc.org/budburst/>

Cell Slider / ClicktoCure- <http://www.clicktocure.net/#/>

National Phenology Network- www.usanpn.org/

Belly Button Biodiversity- <http://www.wildlifeofyourbody.org/>