# Alaska's Berry Future:

## What is Happening in a Changing Environment and What We Can Do About It

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# Land Acknowledgement

- UAF is located on the traditional territory of the Lower Tanana Dene People; *Benhti Kenaga'* (Koyukon Athabascan)
- *Troth Yeddha'* – Indian Potato Ridge; Recognized as the official name in 2013

# Collaborators

Christa Mulder
PI

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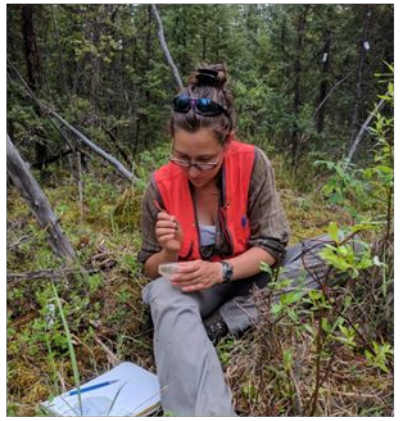
Co-PI



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Graphic Designer

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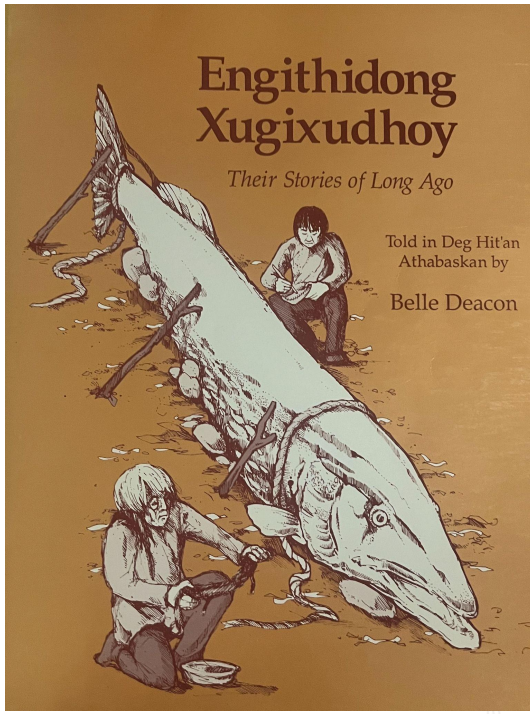
Laura Weingartner
researcher

Kristin Schroder
researcher

Anne Ruggles
Photographer

# Stories and knowledge

Across Indigenous People of AK, berries are woven into our stories, celebrations, outings, traditional foods and more




- Most families pick at least 19 L (5 gallons) of berries
- Some families pick > 75 L (20 gallons)

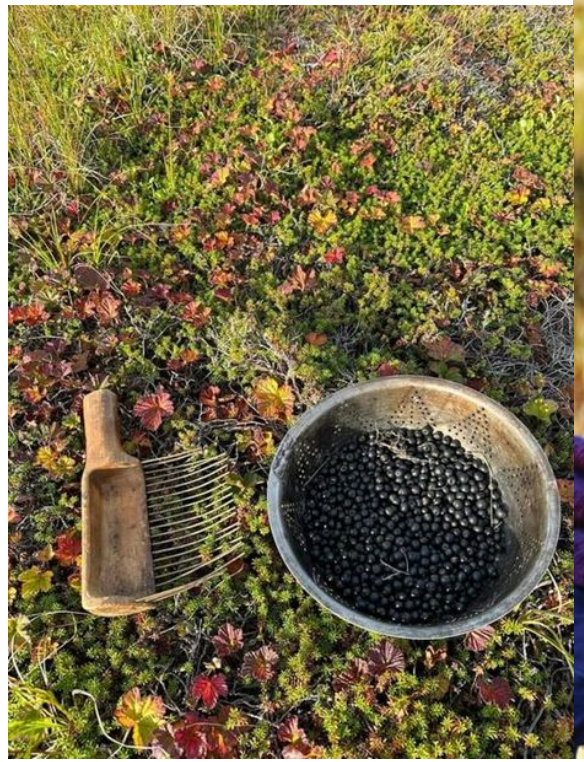
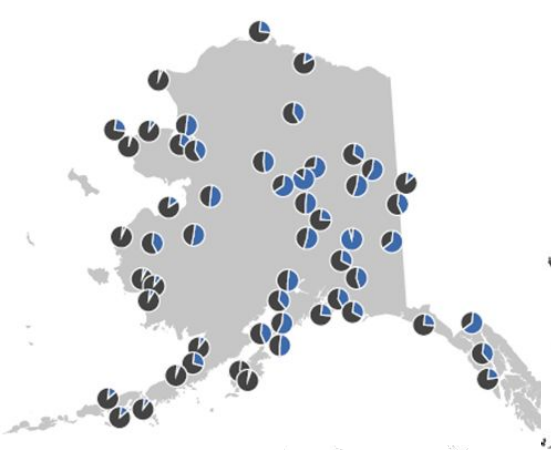
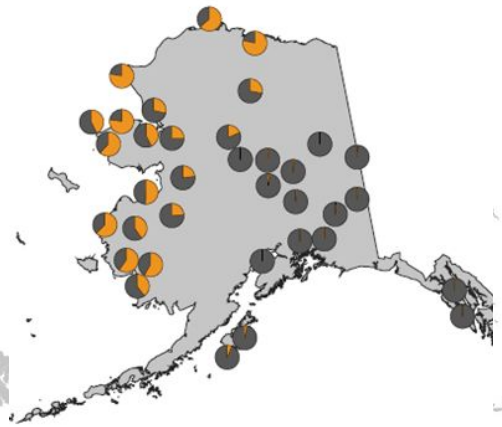


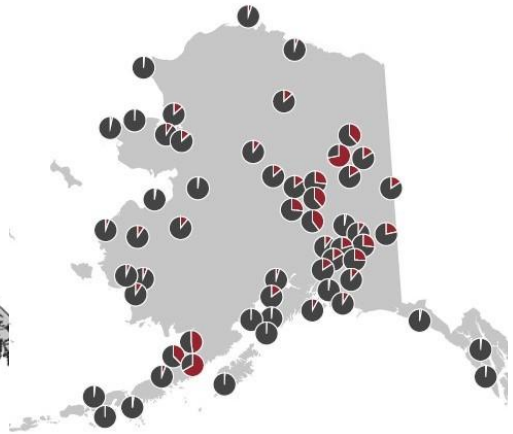
Photo: Kourak Nakak, Nome

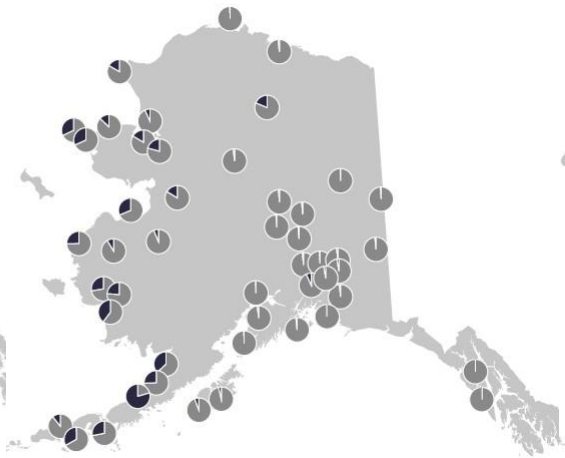
blueberry



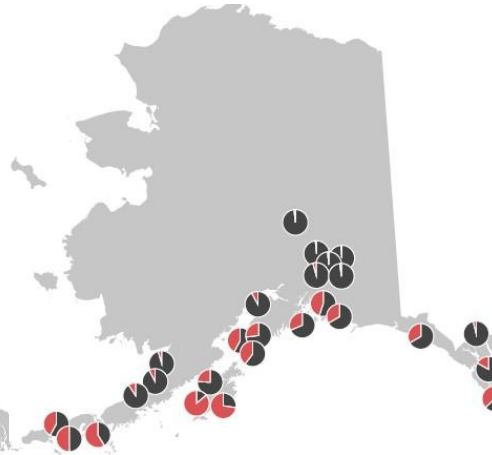
cloudberry



cranberry



crowberry



salmonberry

# Community Concerns

Biggest issues:

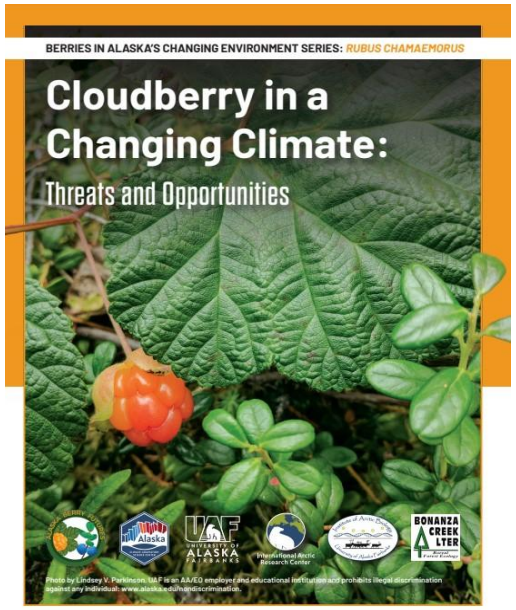
- Increased variability makes it hard to plan
- Distance needed to travel has increased
- Increased shrub cover

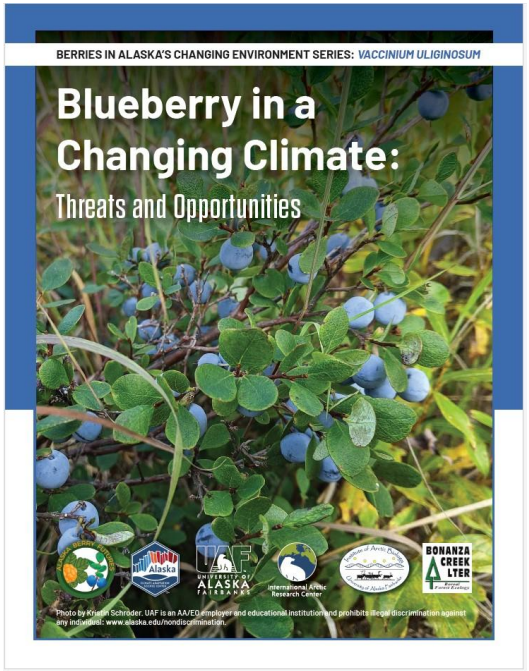
> Elders also say to wait to pick until after first frost, but now the berries are ripe before that point.
>
> – *Stephen Payton, Seldovia, Alaska's Berries in a Changing Climate Listening Session, Feb. 2022*

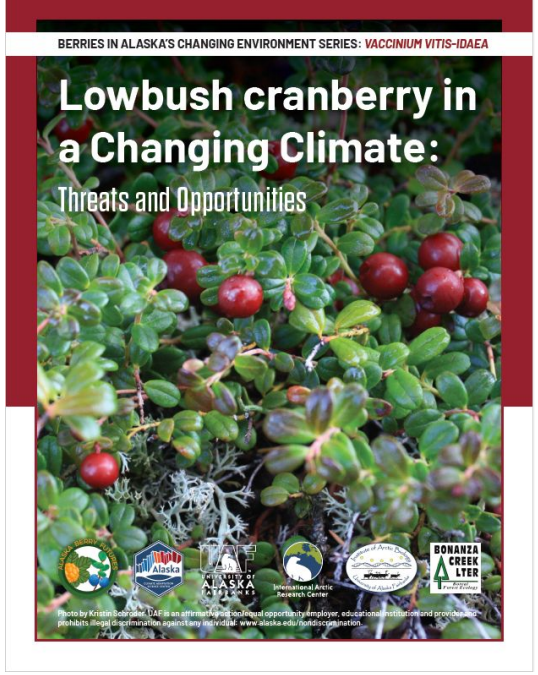

"Shrub cover has increased, making it harder to find and access berries..."

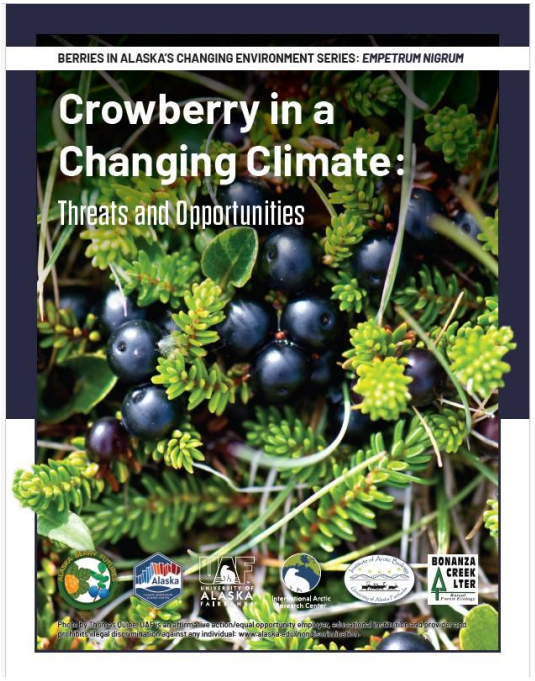
-Georgetown Vulnerability Assessment

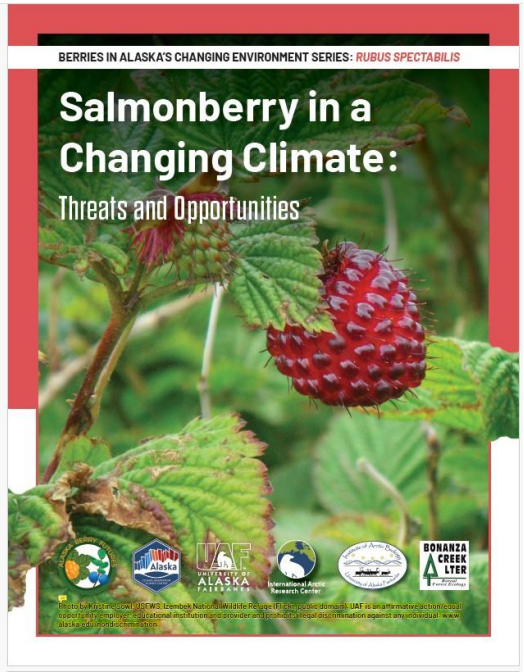
- At least 29 climate adaptation plans mention berries
- Across all plans there are only 2 references to the scientific literature



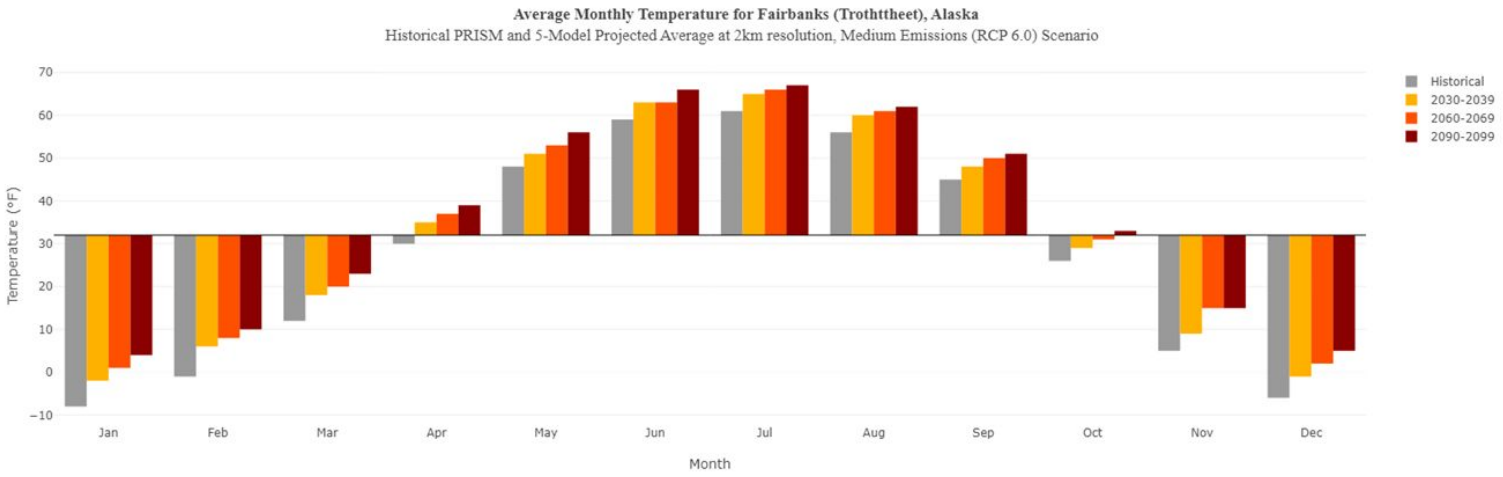




Download at:
casc.alaska.edu/changingberries

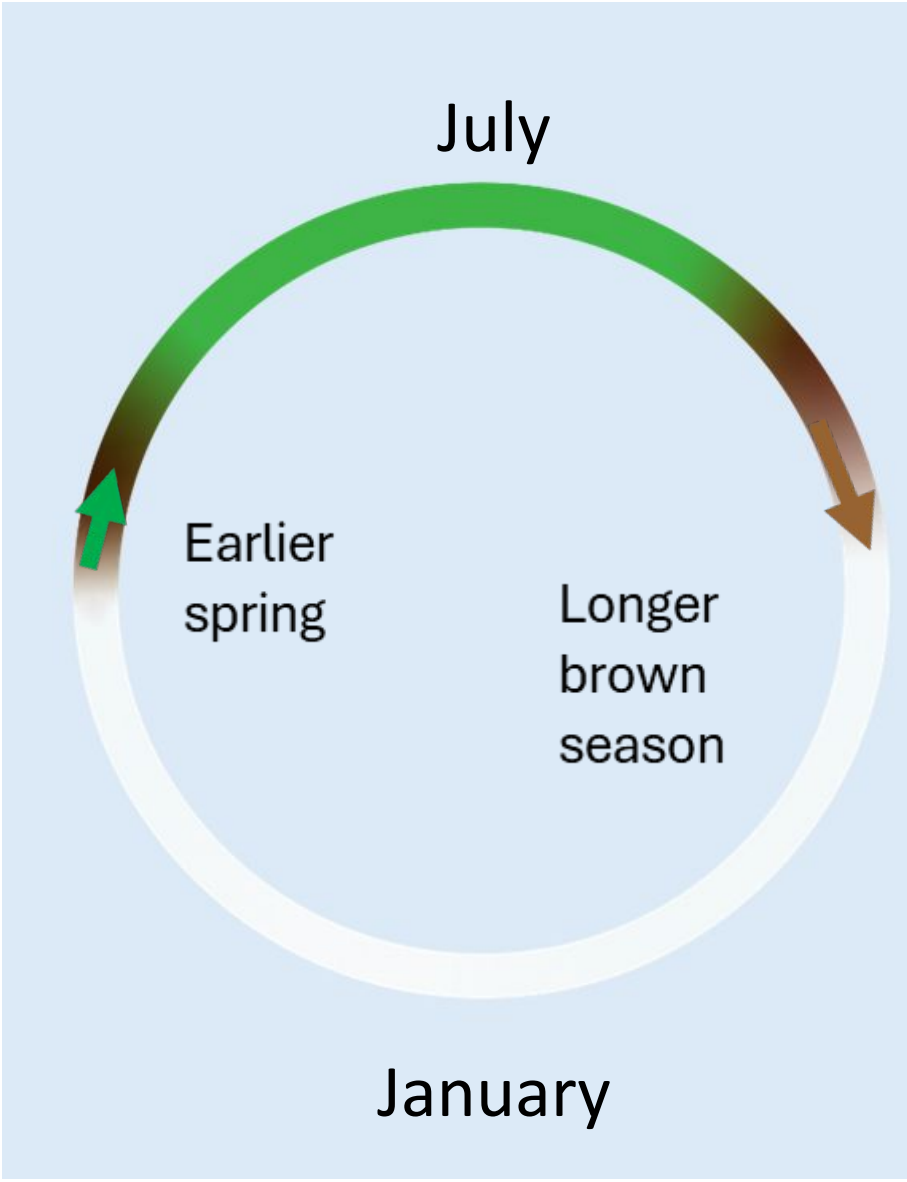
# Climate change in Alaska

Some changes are very well understood:

- Increases in temperature (especially in winter)
- Increases in growing season length



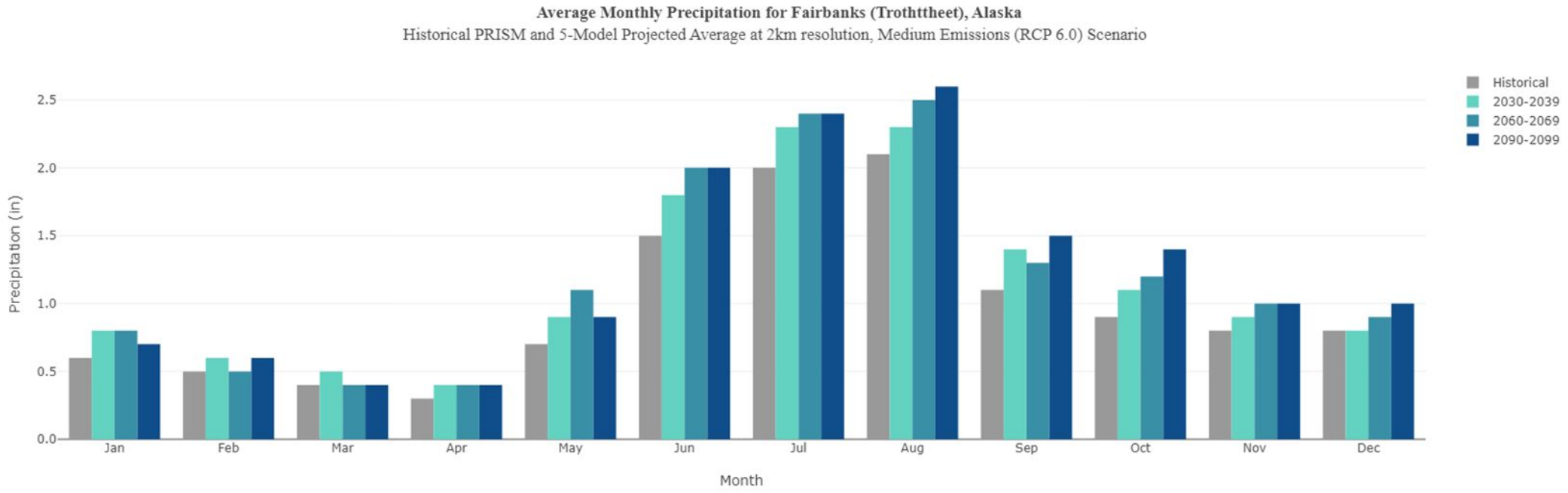

Source: Scenarios Network of Alaska + Arctic Planning 2024



# Climate change in Alaska

Some changes are less certain:

- Total precipitation
- Changes in timing and precipitation type (rain vs. snow)




Source: Scenarios Network of Alaska + Arctic Planning 2024

# The birth of a berry is a miracle.

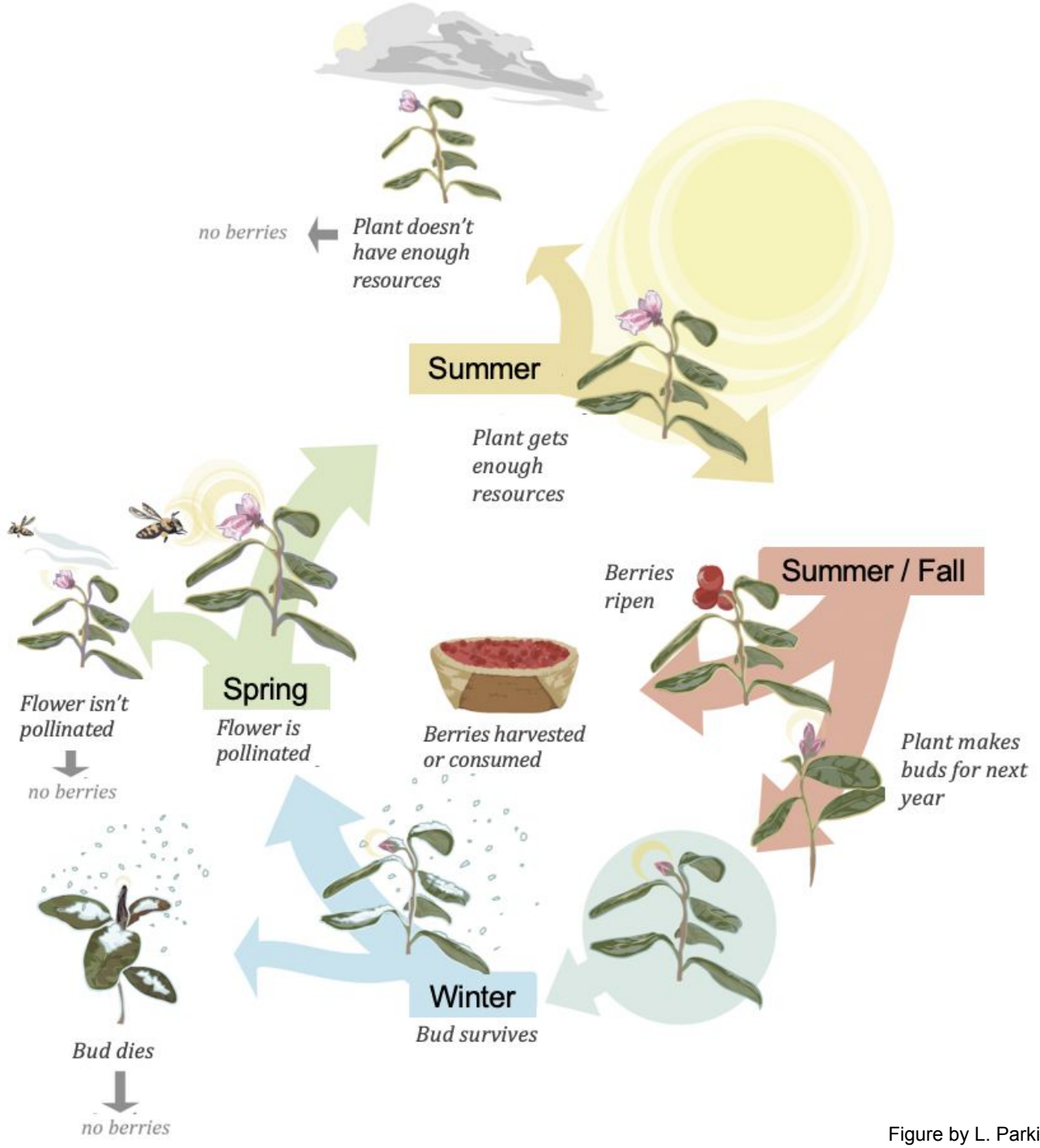
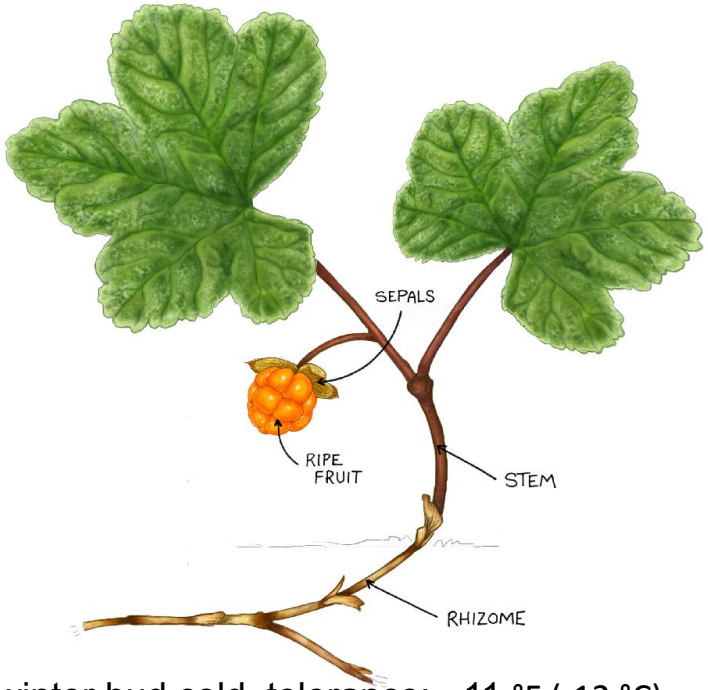


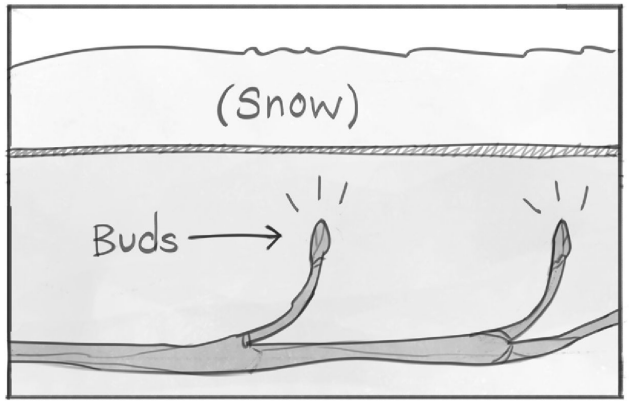


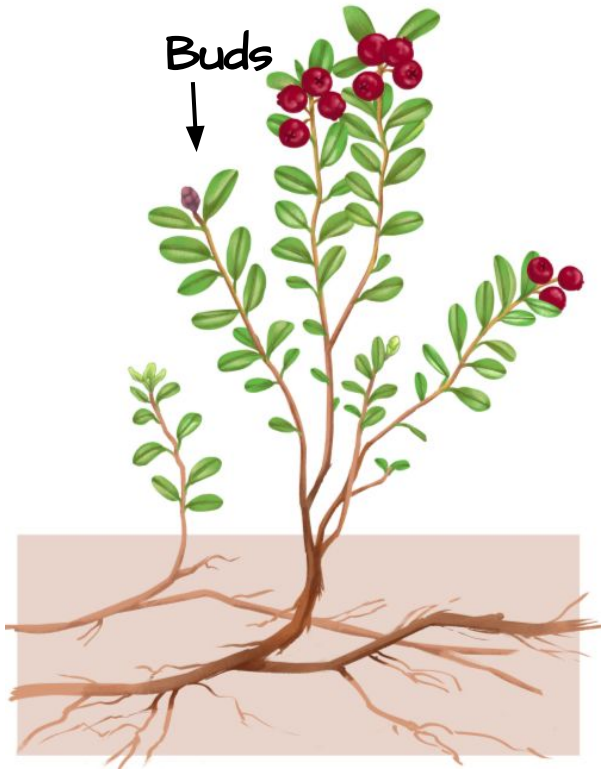

Figure by L. Parkinson and M. Perra

# **Winter**: it's all about the buds…

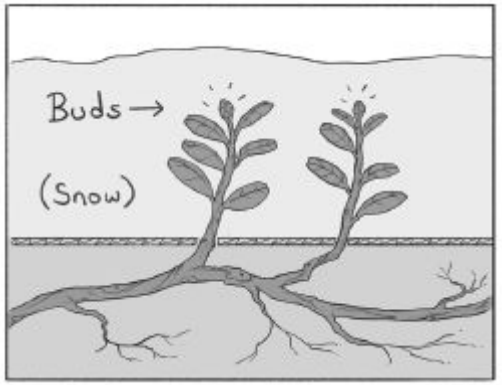


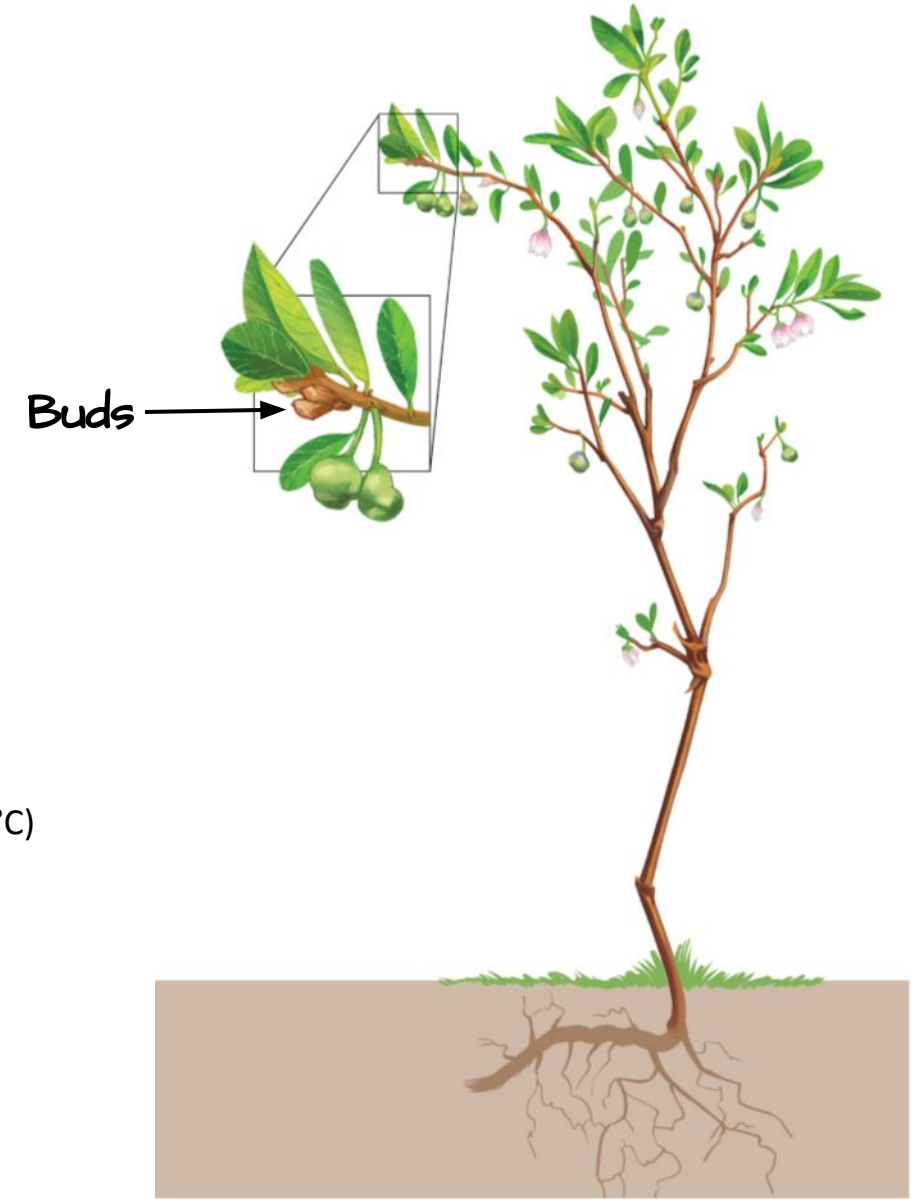

Mid-winter bud cold tolerance: ~11 °F (-12 °C)




Mid-winter bud cold tolerance: ~-112 °F (-80 °C)




Graphics: H. Foss, L. Bird

# Risks in late winter and early spring

- Flower buds become sensitive to cold, even before the snow melts
- Lower winter snowpack or temperature swings around freezing can damage buds
- Sudden snow cover loss can lead to exposure to damaging UV light

Winter-reddened leaves of cranberry and crowberry in spring

Photos: K. Schroder

Frost-damaged cranberry and crowberry stems following snow removal

Photo: K. Schroder

Healthy crowberry flower in bud

Photo: K. Schroder

Frost-damaged crowberry flower in bud

# Opportunities in late winter and early spring

Warmer winters = more snowfall. More snow is protective

This may also increase pollinator survival over the winter

Photo: CPH Mulder


The Xerces Society, Sarah Foltz Jordan



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# Actions to support winter and early spring stress!


Snow addition or snow fences

# Spring: It's all about the flowers

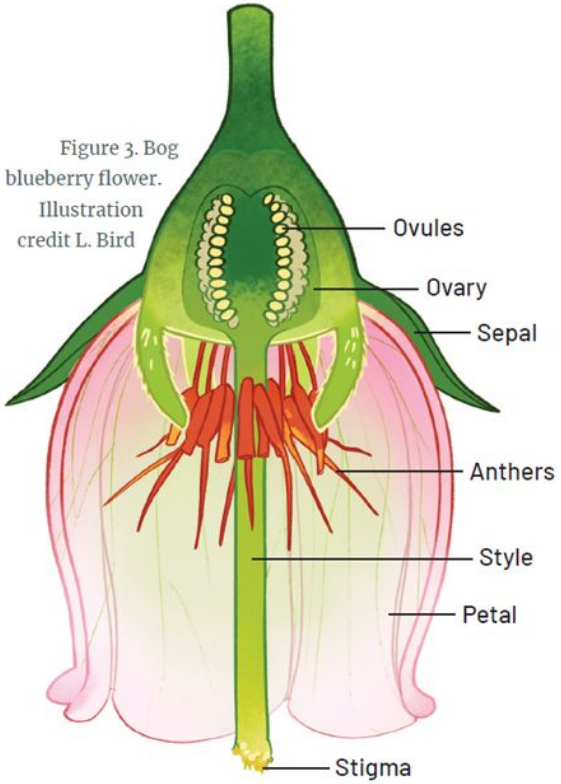
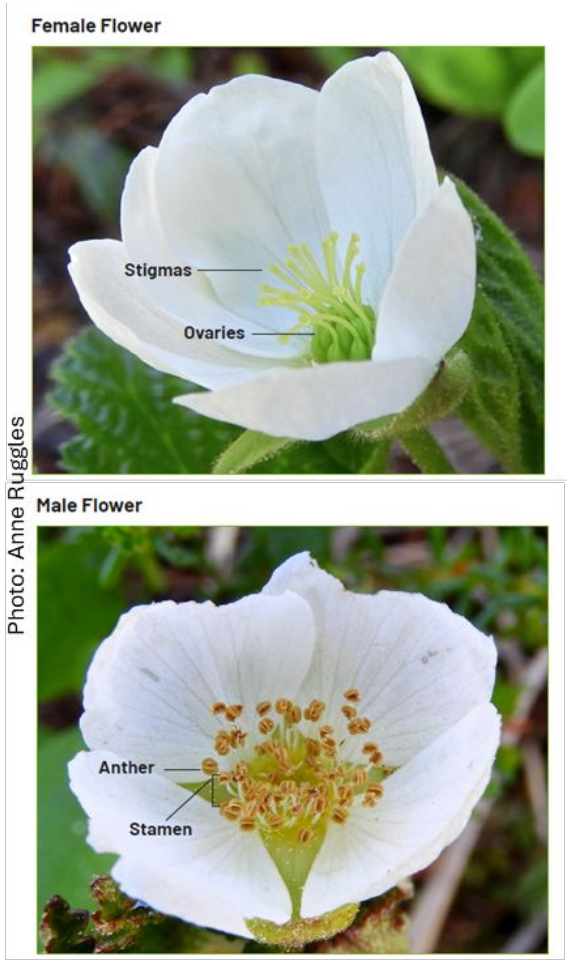



Figure 3. Bog blueberry flower. Illustration credit L. Bird

A bumblebee preparing to pollinate a blueberry. Image: L. Bird.

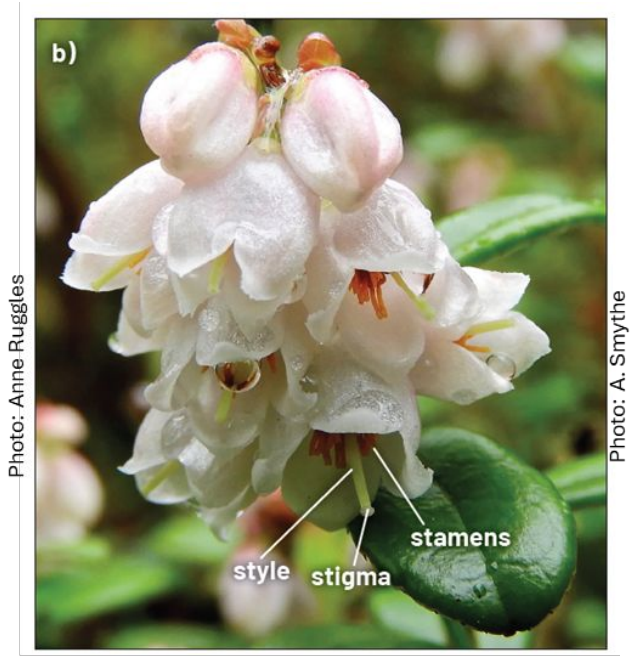
Cloudberry ovaries before and after fertilization

# Spring: it's all about the flowers…



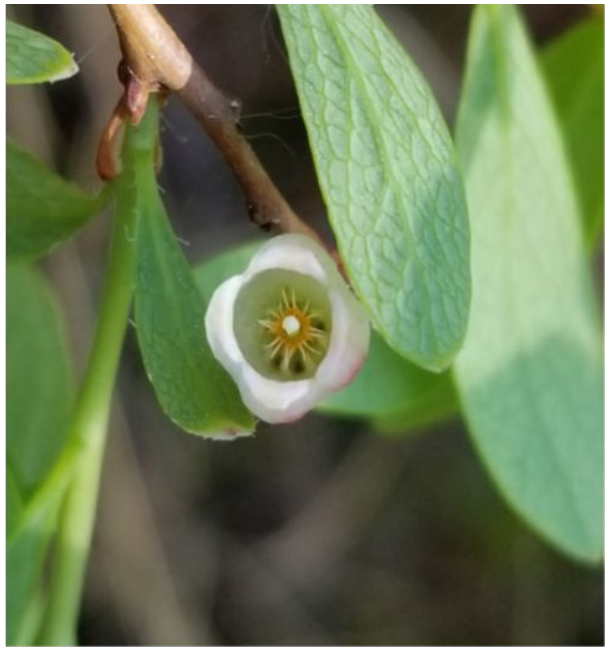

**Cloudberry**

Separate sexes;
requires insects




**Cranberry**

Requires buzz pollination
Self-incompatible




**Blueberry**

Requires buzz pollination
Self-pollination gives
fewer fruits


**Crowberry**

Wind or insect pollination
Some plants have only 1 sex

# …and pollinators!

Photo: V. Mononen, CC by NC-2.0 DEED

Bumblebee visiting a cranberry flower

Photo: Anne Ruggles

Syrphid fly visiting a male cloudberry

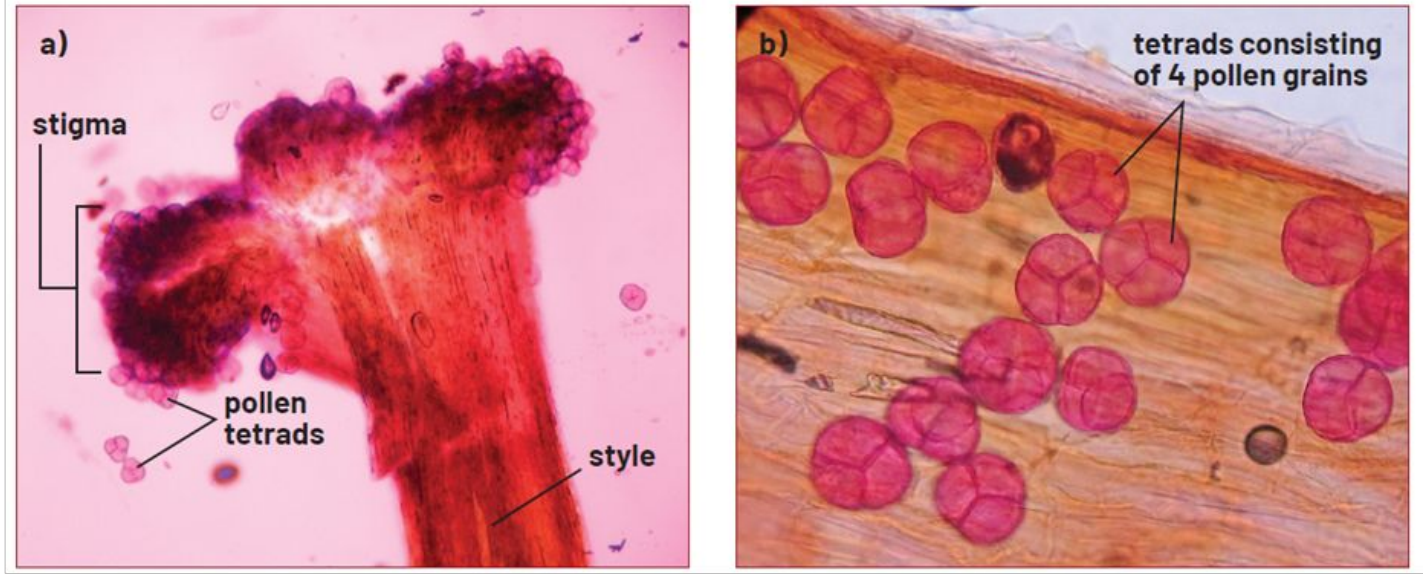



Photo: Katie Spellman

Cranberry pollen grains on the stigma

# Risks in spring

- Snow melt and ground thaw will come earlier and pollinators may not have emerged yet
- Increased rain or wind during May or June may reduce pollinator activity

Black-tailed bumblebee (*Bombus melanogypus*). Photo credit: Masumi Palhof; Kodiak, Alaska

Border collies don’t like rain either

# Opportunities in spring

- Warmer spring temperatures may reduce the chance of frost damage to flowers

- Solitary bees and syrphid flies cannot fly at cool temperatures. Warmer temperatures might lead to greater pollinator activity

Photo: Ann Ruggles

A syrphid fly on a cloudberry flower

Photo: Ann Ruggles

# Actions to support pollination!

iStock.com

Honeybee hives

Interplanting with flowers that attract pollinators

J. Evans

Pollinator monitoring - Alaska Bee Atlas Project (Alaska Center for Conservation Science and BLM Casey Burns)

# Summer: it’s all about growth

Photo: Christa Mulder

Blueberry

Photo: Christa Mulder

Cranberry

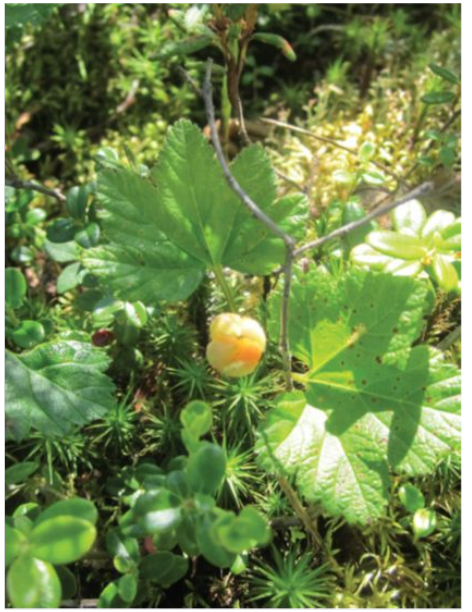


Photo: Christa Mulder

Cloudberry

Photo: Christa Mulder

Crowberry

Brew Brooks (Flickr, CC BY-SA 2.0)

Salmonberry

# Risks in summer

- Very hot temperatures may slow down growth, especially for cloudberry
- Shrub expansion by willows and alders might reduce growth of tundra plants
- Large, intense fire can hurt cloudberries and crowberries


Photo: M. Macander

Alder invading Selawik River, NW Alaska

Photo: National Park Service

A tundra fire in arctic Alaska

# Risks in summer

- Warmer and wetter conditions are likely to increase populations of insects and microbes (fungi, bacteria, viruses)

Photo: Lindsey Parkinson

Damage by insects and pseudoflowers made by *Exobasidium vaccinii* on cranberries

Photo: Lindsey Parkinson

Most blueberry leaves have damage by insects or microbes

# Opportunities in summer

- More frequent fire may help growth of blueberries and cranberries
- Cranberry and crowberry may grow better under warming (especially if their taller competitors are being eaten
- Greater thaw depth in late summer might give cloudberries more nutrients

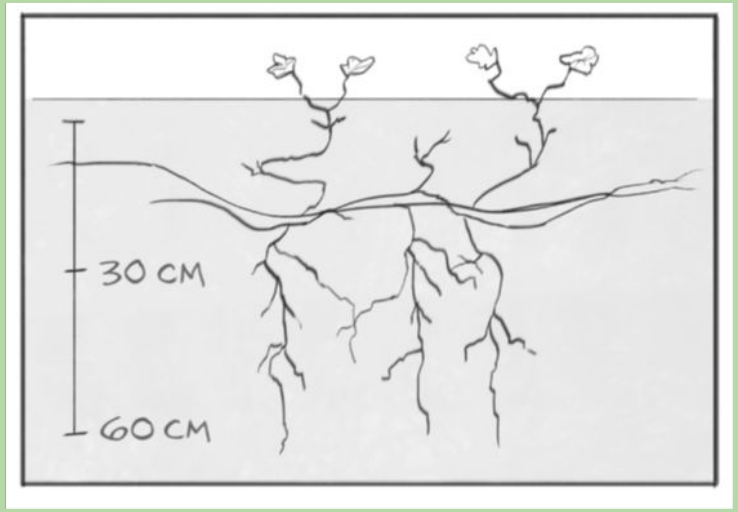



Illustration: H. Foss

Photo: K. Schroder


Photo: National Park Service

> ...two years after a fire has burned through the area, berries will often be found in abundance.
>
> – *Adapting to Climate Change in the Middle Kuskokwim.*

# Actions to support summer growth!

Photo: Amazon.com

## Shading

## Berry Agrovoltaics

Blueberry agrivoltaic project in Maine.
Photo: University of Maine

# Actions to support summer growth!

Photo: H. Rader, UAF CES

- Pruning berry plants
- Cutting back competitors

> See, a lot of people think we never touched the wild . . . berries. But we did. We cultivated it. We pruned it . . . *qw'alhem* [salmonberries], it's done, after you pick it, *tl'exwiiy* ["breaking the tops off"] they called that. My grandma tell me that if you let it grow this high [two meters or so], then it doesn't produce much berries.
>
> – *Kwaxsistalla Wathl'thla (Chief Adam Dick of the Kwakwaka'wakw); British Columbia, Canada. Personal communication to Nancy Turner71*

# Fall: it’s all about the fruits

Photo: K. Schroder

Photo: Ann Ruggles

Photo: Ann Ruggles

Photo: Ann Ruggles

Bradley Davis (Flickr, CC BY-ND 2.0)

# … and seed dispersers

Photo: K. Schroder

Ptarmigan in a blueberry patch

Photo: R. Rovira

A vole cache of cranberries

Lynette Elliott (Flickr, CC BY-NC 2.0)

Robin with a salmonberry

Photo: CPH Mulder

Fox scat with blueberry fruits

Photo: K. Schroder

Bear scat in fall full of crowberry fruits

# Risks in fall

> "...the wet summers make it hard to harvest [blueberries] before they fall off or rot"
>
> – *Participant, Alaska's Berries in a Changing Climate Listening Session, 12/9/2021*[132]

- Fungi thrive in warm and wet conditions. Warmer and wetter fall weather can cause more fruits to rot

Photo: CPH Mulder

Photo: Ann Ruggles

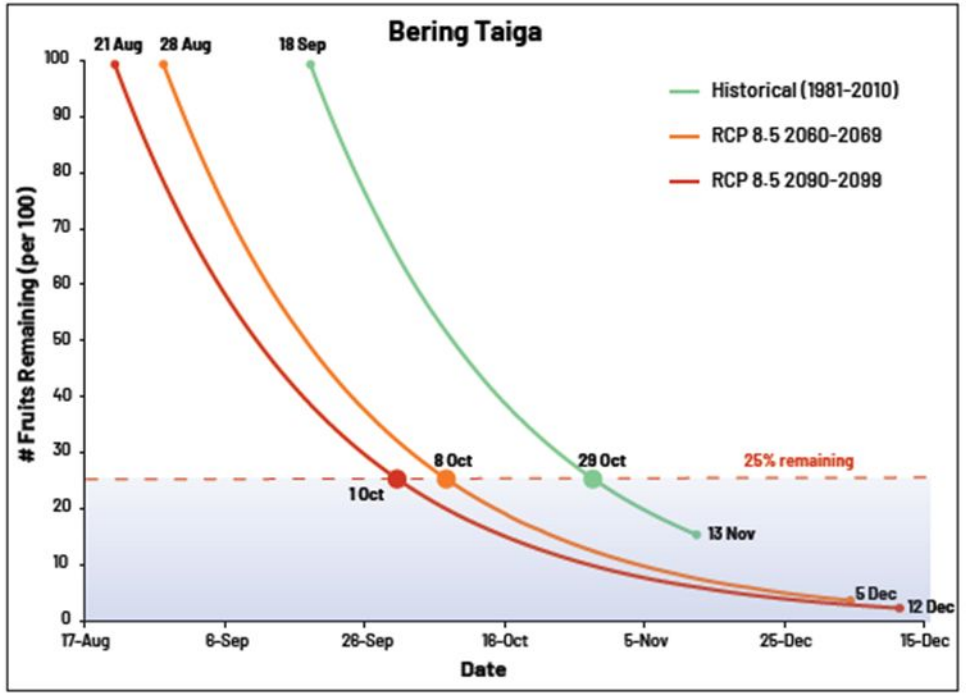
Rotting crowberries and cranberries

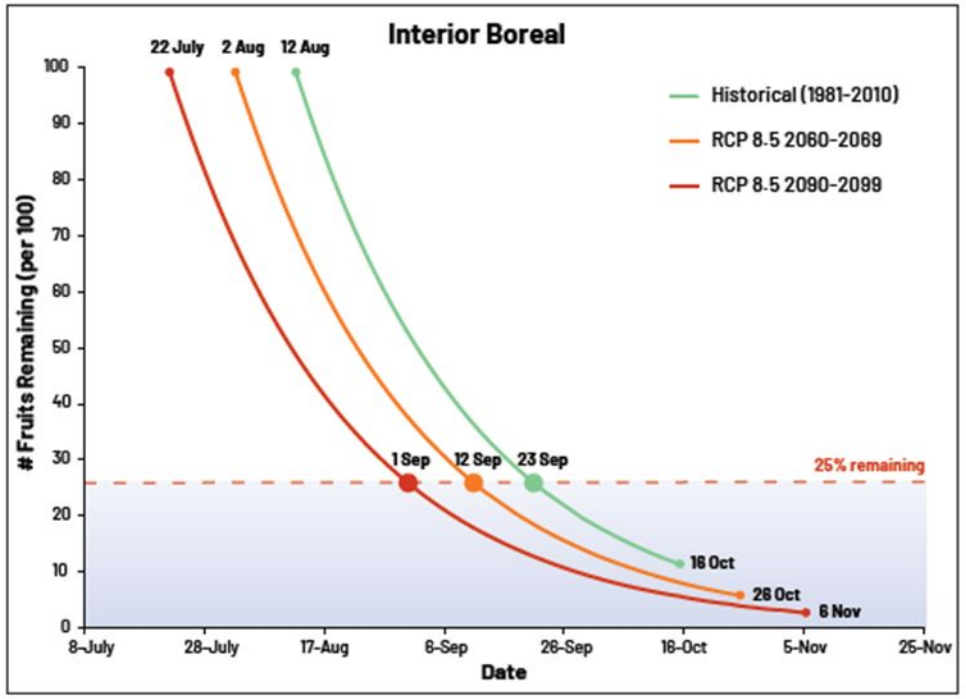
# Risks in fall

- Earlier flowering + longer “brown season” may cause more crowberry and cranberry fruits to be eaten before the snow hits
- A problem for animals like voles, foxes and bears that depend on fruits being available in winter or spring

Predicted shift in # fruits remaining on the plant for cranberry in two ecoregions

Data: CPH Mulder and the Winterberry Project. Image: CPH Mulder & M Putnam



# Actions to support continued access to berries


## Trying out new berry types

Photo: K. Spellman, UAF

Honeyberry plot at Georgeson Botanical Garden in Fairbanks

Berry cultivation

# Actions to support berry availability in a changing climate

Photo: G. Winter, MIC

Fruit-bearing trees and shrubs planted around Metlakatla Indian Community

## Community food forests

> We are working on building food forests, [...] focusing on native berry species. This is for food security as well as to preserve berry species from other climate or development impacts. This also creates a space for elders to harvest in a safer area
>
> – *Genelle Winter, Metlakatla*

Photo credit: A. Smyth

# Actions to support berry availability in a changing landscape!

Photo: Hoonah Native Forest Partnership

Forest stand management

# Share what you learn!


Did you observe pollinators, pathogens, or pests on berry plants? Post your observations on LEO!

Credit: L. Parkinson

Insect larva feeding on cranberry flower.

Did you or someone in your community try a strategy? How did it go? Coming soon: a way to shared what you learned on our website

# Contact details

**WEBSITE (download all completed booklets):**

casc.alaska.edu/changingberries

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