

Wild Berry Research

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UAF
UNIVERSITY OF ALASKA FAIRBANKS

Alaska Native Plant Research



Tissue culture propagation



Wildflower meadows, wildflower propagation



Aleutian shield fern, *Polystichum aleuticum*

Endangered species recovery plans

K-6 educational programs
Science and Alaska native plants

Alaskan Ethnobotany







Cultivation and wild stand management of Alaska wild berries

Fruit research- mid 1970s



Scammon Bay, SW AK



UAF Archives, 1950s



Fairbanks, AK



Berry Pickers, Barbara Lavallee

- Bog blueberry, *Vaccinium uliginosum*
- Coastal Blueberries, V. ovalifolium, caespitosum, alaskense
- Lingonberry, Vaccinium vitis-idaea

Lingonberries

- *Vaccinium vitis-idaea* L. ssp. *minus* (Lodd.) Hult.





Lowbush cranberries



- Greatest biomass in peat
- All other substrates = leaf chlorosis (mostly N deficiency)

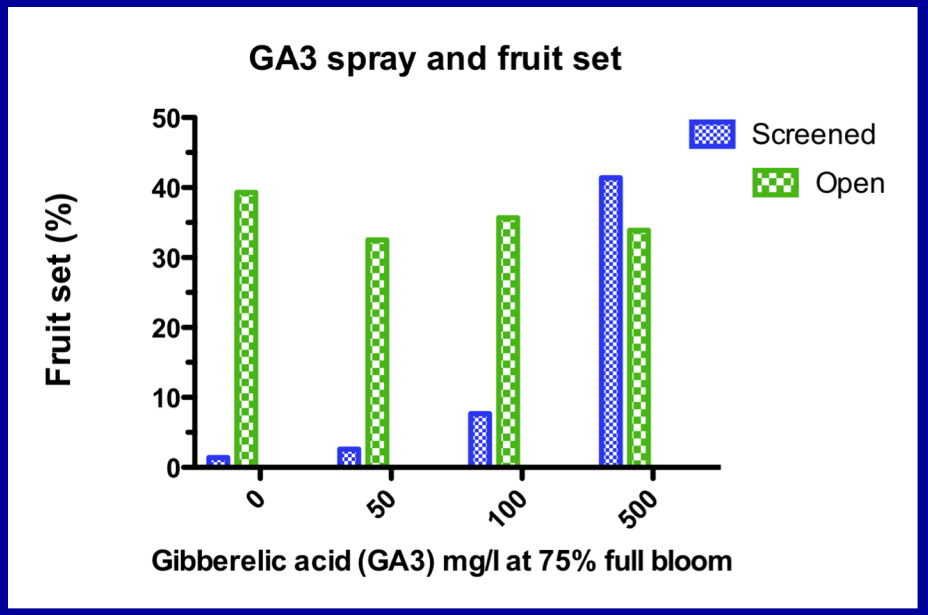
Optimum Substrate?

Lemeta peat (pH 4.8)
Silt loam soil (pH 6.5)
Chena very fine sandy loam (pH 6.4)
Soil/peat (50/50) [pH 5.4]



Location	Fruit set (%)	Fruit weight (g)	Seeds per berry
Floodplain			
Screened	4.7**	0.16**	5.2**
Open	38.9	0.27	12.7
Upland			
Screened	0		
Open	9.4**	0.13	8.9

** Means differ significantly, P<.01



- Fourteen Potential Pollinators of Lingonberry



Bombus terrestris



Bombus flavifrons flavifrons



Apis mellifera



Syrphus sp. (Syrphid fly)



Bombus sylvicola

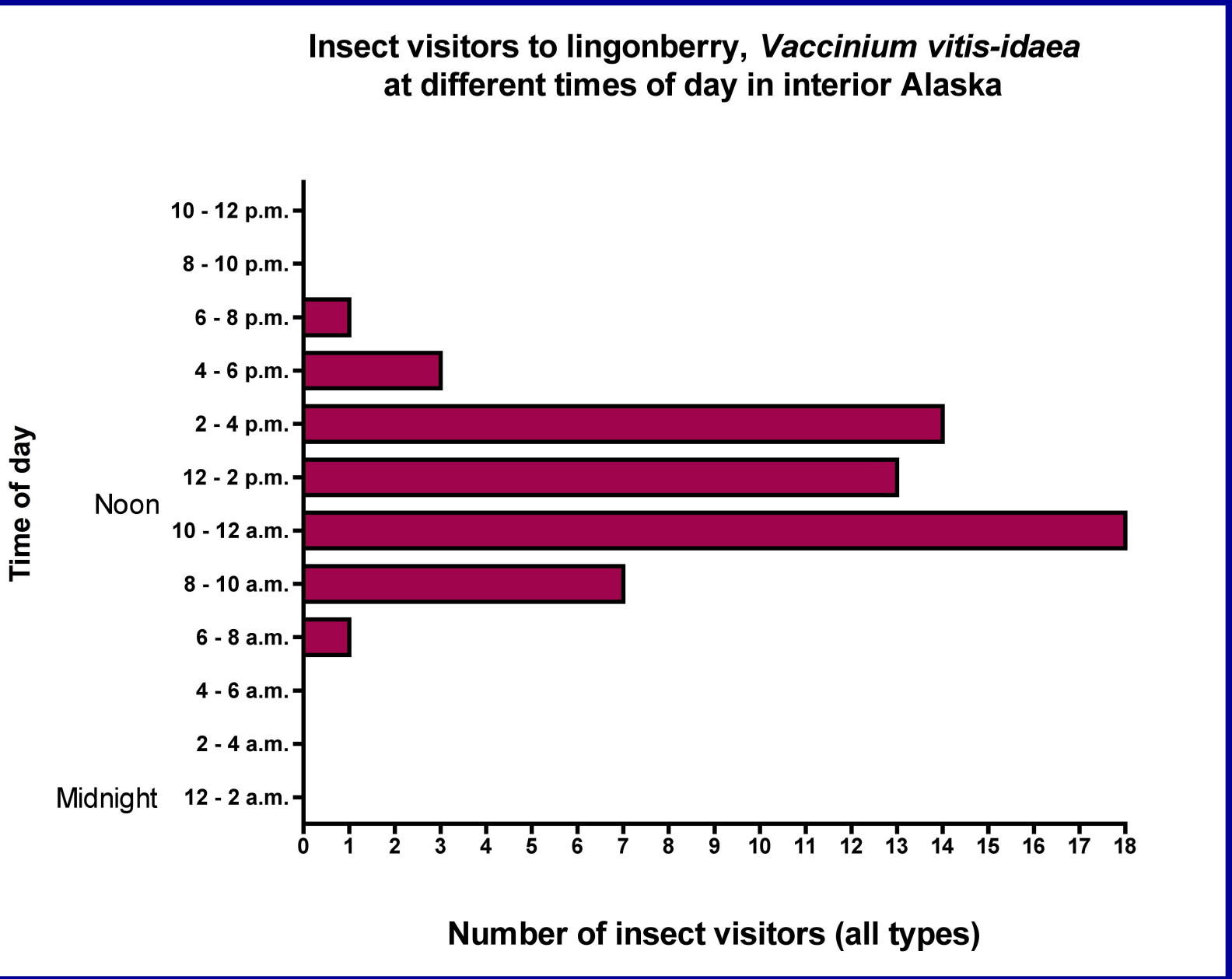


Andrena sp.
(Andrenid bee).

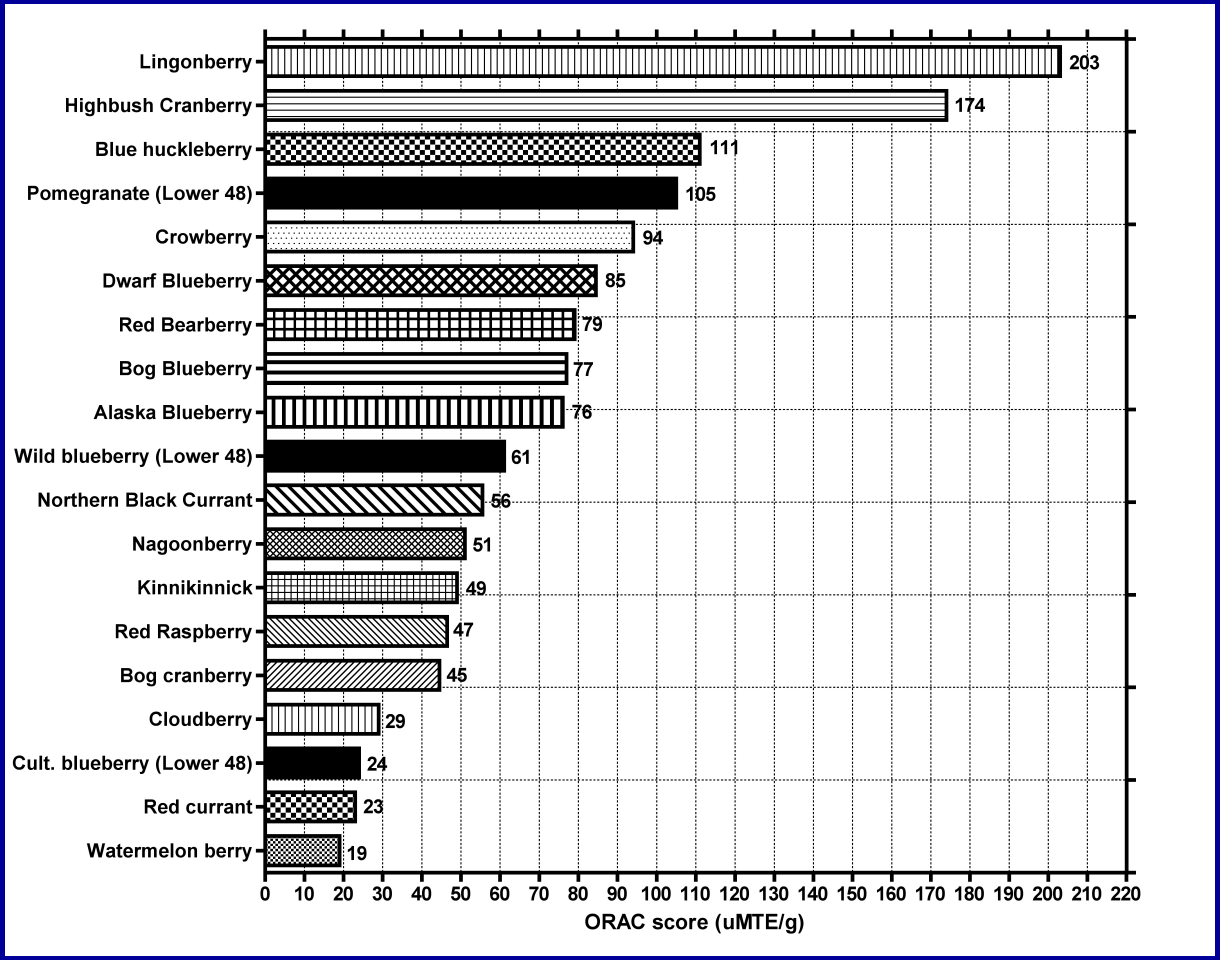
Ms. Nikki Demers. MS Natural Resources Management

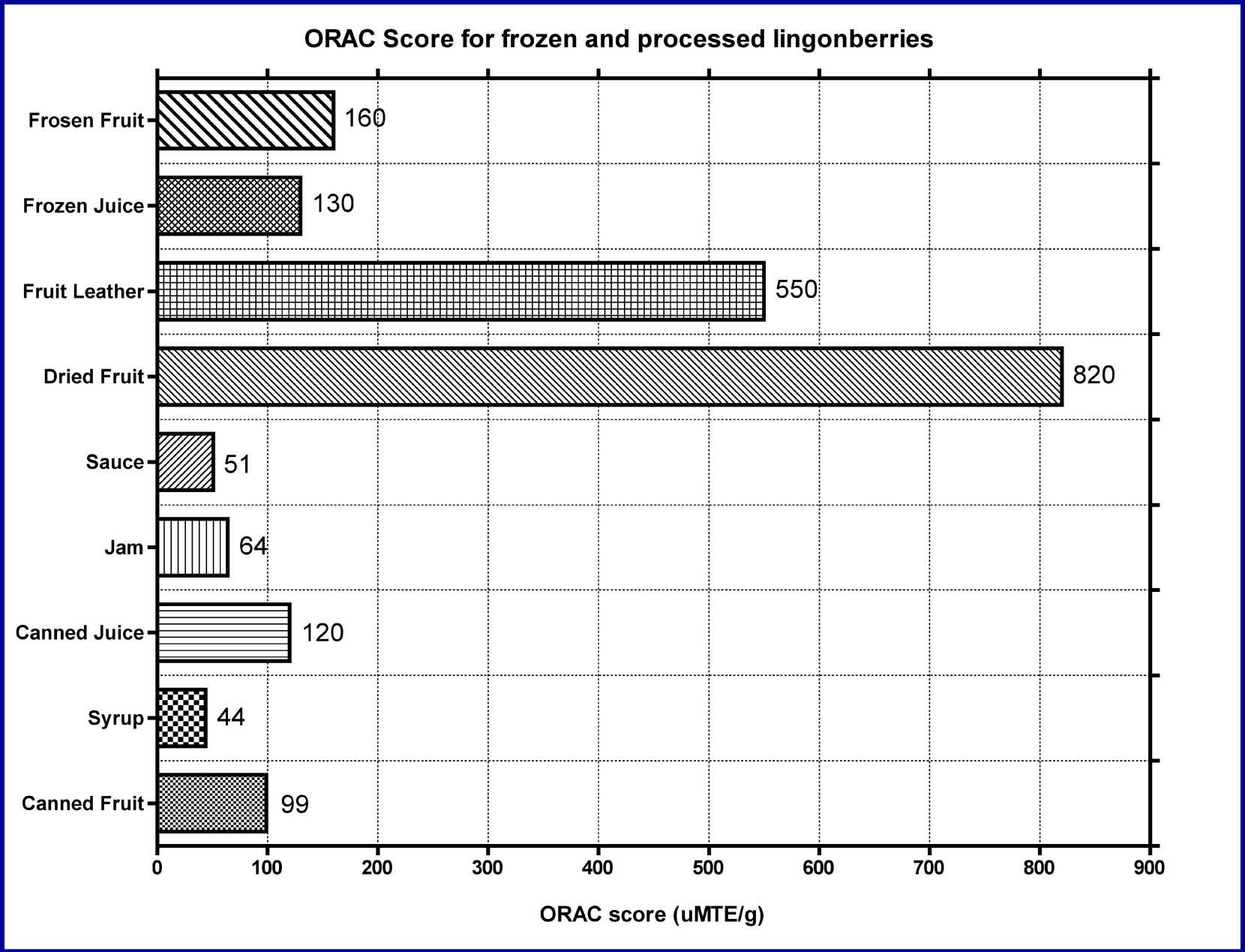
Time	Visitors
Midnight- 2 a.m.	0
2 – 4 a.m.	0
4 – 6 a.m.	0
6 – 8 a.m.	*Dolichovespula* (wasps)
8 – 10 a.m.	*Apis* *Dolichovespula* *Andrena* *Syrphus* *Melangyna* (hover fly) *Bombus*
10 – 12 p.m.	All of above + *Dialectus* *Rheumaptera* (moth)

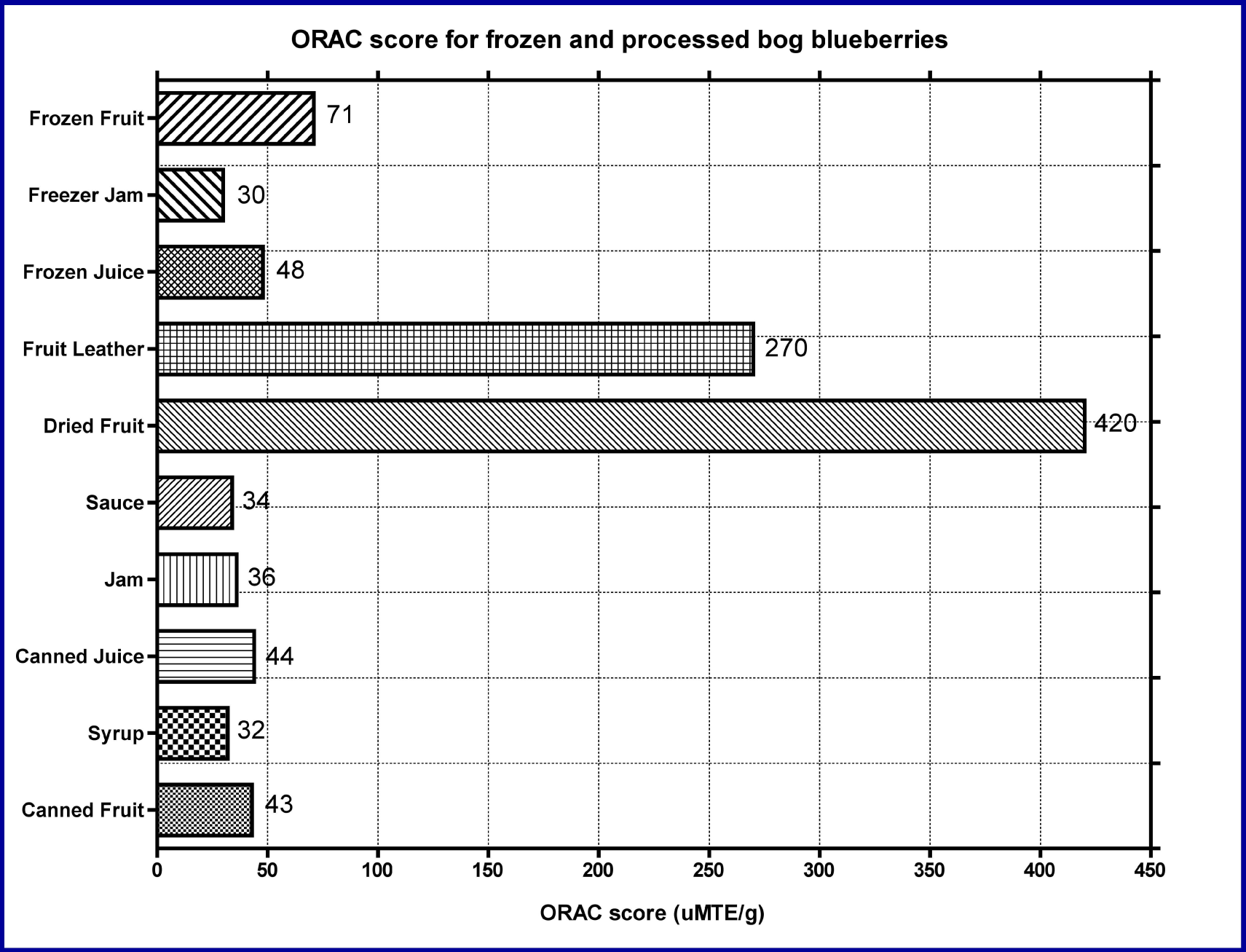
Time	Visitors
12 -2 p.m.	*Dialectus* *Ochlerotatus* (mosquito) *Syrphus* *Psithyrus* (cuckoo bee) *Bombus* *Andrena*
2 -4 p.m.	*Apis* *Andrena* *Dialectus* *Bombus* *Dolichovespula* *Syrphus*
4 – 6 p.m.	*Bombus* *Rheumaptera* *Melangyna*
6 – 8 p.m.	*Dialectus*
8 – 10 p.m.	0
10 – 12 a.m.	0


Insect visitors to lingonberry, *Vaccinium vitis-idaea* at different times of day in interior Alaska
Time of day
Noon
Midnight
10 - 12 p.m.
8 - 10 p.m.
6 - 8 p.m.
4 - 6 p.m.
2 - 4 p.m.
12 - 2 p.m.
10 - 12 a.m.
8 - 10 a.m.
6 - 8 a.m.
4 - 6 a.m.
2 - 4 a.m.
12 - 2 a.m.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Number of insect visitors (all types)

Antioxidant capacity of Alaska berries (ORAC score)




ORAC Score for frozen and processed lingonberries
Frosen Fruit
160
Frozen Juice
130
Fruit Leather
550
Dried Fruit
820
Sauce
51
Jam
64
Canned Juice
120
Syrup
44
Canned Fruit
99
0
100
200
300
400
500
600
700
800
900
ORAC score (uMTE/g)


ORAC score for frozen and processed bog blueberries
Frozen Fruit
71
Freezer Jam
30
Frozen Juice
48
Fruit Leather
270
Dried Fruit
420
Sauce
34
Jam
36
Canned Juice
44
Syrup
32
Canned Fruit
43
0
50
100
150
200
250
300
350
400
450
ORAC score (uMTE/g)

Natural products in bog blueberry- Colin McGill

1. β-sitosterol,
2. ursolic acid,
3. 3-O-(4-hydroxyphenylcarboxylic acid) 4-O-(β-D-glucopyranosyl) gallic acid*,
4. malic acid, and
5. 2,3-dihydroxybutane-1,2,3,4-tetracarboxylic acid* = **bluberric acid**

* Not previously known

Natural products in bog blueberry- Sally Gustafson

Dietary intake of bog blueberries:

Anti-inflammatory

Reduce oxidative stress

Protect against neuroinflammation

Protect against age related memory loss

NOT via antioxidant activity, chemicals directly prevent the accumulation of NOX enzymes that destroy brain neurons and lead to losses of brain function

Two ways to manage wild berries

- Improve wild stands
  - (Maine Blueberry Industry)
- Field Cultivation
  - Domesticate a wild crop



Lingonberry,
Lowbush cranberry
Vaccinium vitis-idaea



Bog blueberry
Vaccinium uliginosum

Maine wild blueberries

- Fertilizers
- Field leveling
- Stump removal
- Pesticides
- Irrigation
- Honeybees
- Burning





www.umaine.edu

Alaska blueberries are not Maine blueberries





Lowbush blueberry, *Vaccinium angustifolium*

Velvetleaf blueberry, *Vaccinium myrtilloides*





Three main species of Alaska blueberries



Oval leaf blueberry
Coastal blueberry
Early Blueberry
Oval leaf huckleberry
Vaccinium ovalifolium

Alaska Blues, LLC
Tongass NF, southeast, AK



Dwarf bilberry
Dwarf blueberry
Vaccinium caespitosum



Bog blueberry
Bog bilberry
Alpine blueberry
Vaccinium uliginosum

Central Siberian BG
UAF

Improving wild berry yields

Management requires knowledge

- How does it grow?
- Sun vs. shade
- Bog? Dry roadside?
- Mineral vs organic soils
- Bloom times
- Pollinators







Crowberry
Lingonberry
Blueberries
Highbush cranberry
Nagoonberry
Salmonberry
Currants
Raspberries
Watermelon berries

Wild stands- find the best berry spots

- Back yard? fish camp?
- Legal
- Accessible
- Less prone to spring frost
- Lots of berry plants
- No bears (yeah right!)





Alaska-in-pictures.com

Remove Competition

- Grasses
- Trees
- Shrubs





- More nutrients, water, light available to crop

Where are the roots, rhizomes?

- Plants rooted in logs or moss dry out if trees (shade) are removed





Disturbance = grass invasion

- Dr. Arvo Kallio- bog blueberry research
  - Hand removal
  - Mowing
  - Herbicides



Add fertilizers

- Commercial fertilizers (especially N, P)
- Fish scraps, composts, liquid fish slop, manures
- Placement important





Garden Culture

- Transplantable
  - Lingonberry
  - Cloudberry
  - Wild red currant
  - Black currant
  - Nagoonberry
  - Watermelon berry

- Not as easily transplantable
  - Bog blueberries
  - Highbush cranberry
  - Crowberry

Not recommended
-Wild strawberry
-Wild raspberry
-Coastal blueberry

Pay attention to:

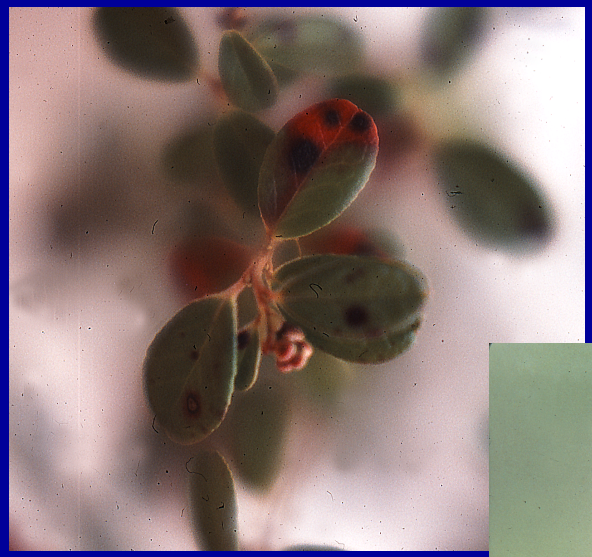
- Soil pH
- Organic matter
- Mulches (peat, sawdust)
- Moisture
- Row spacing

- Fertilizers





Pests and diseases



Leaf spot disease





Pesky, sneaky birds

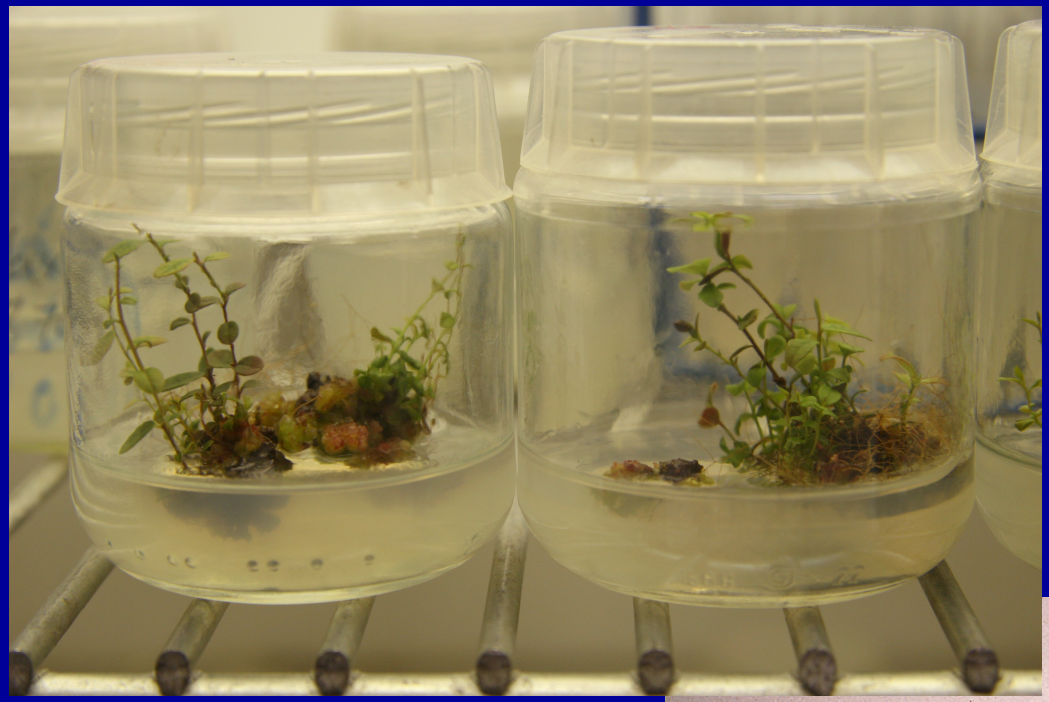
Rose bloom fungus

Cultivation = propagation

- Seeds?
- Clones (stem cuttings, root cuttings, layering)



Bog blueberry 6 mo. seedlings

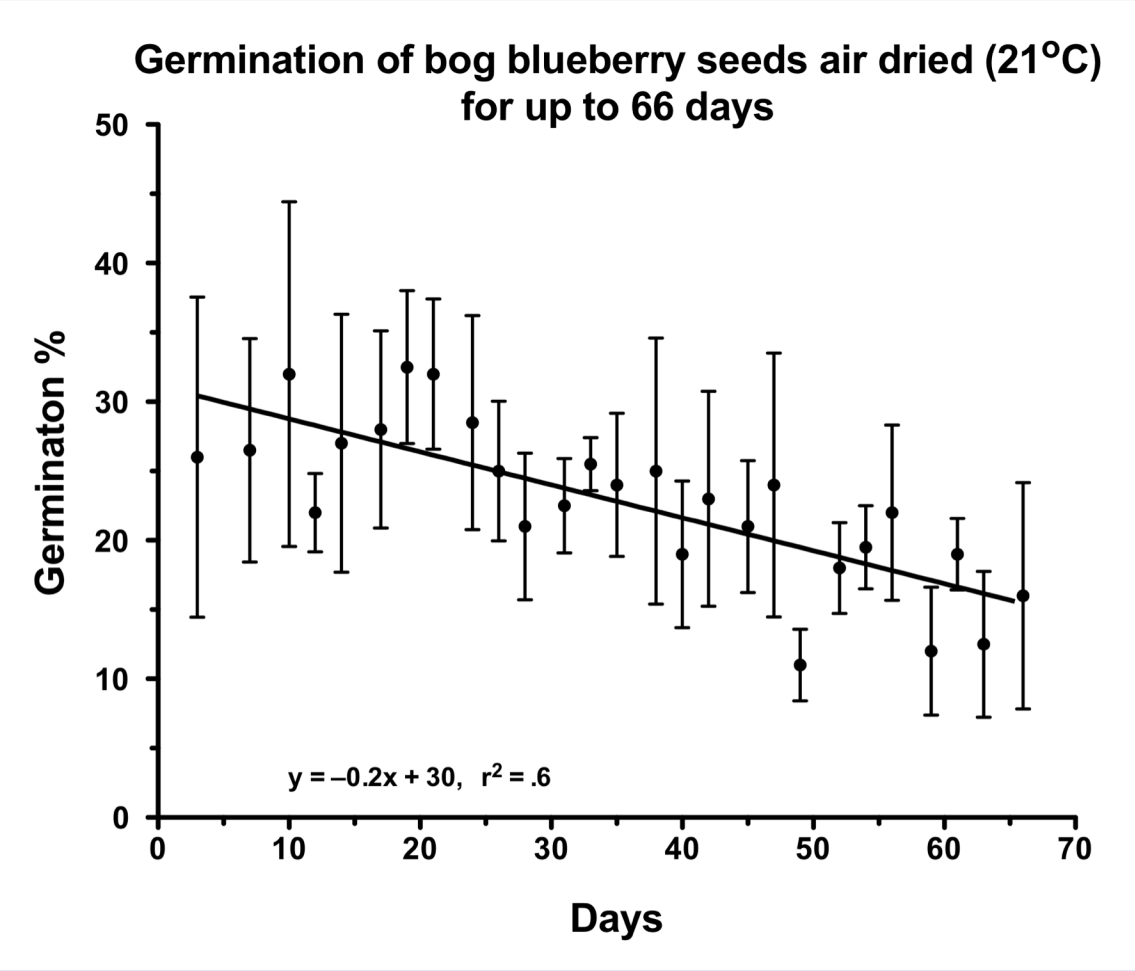


Lingonberries

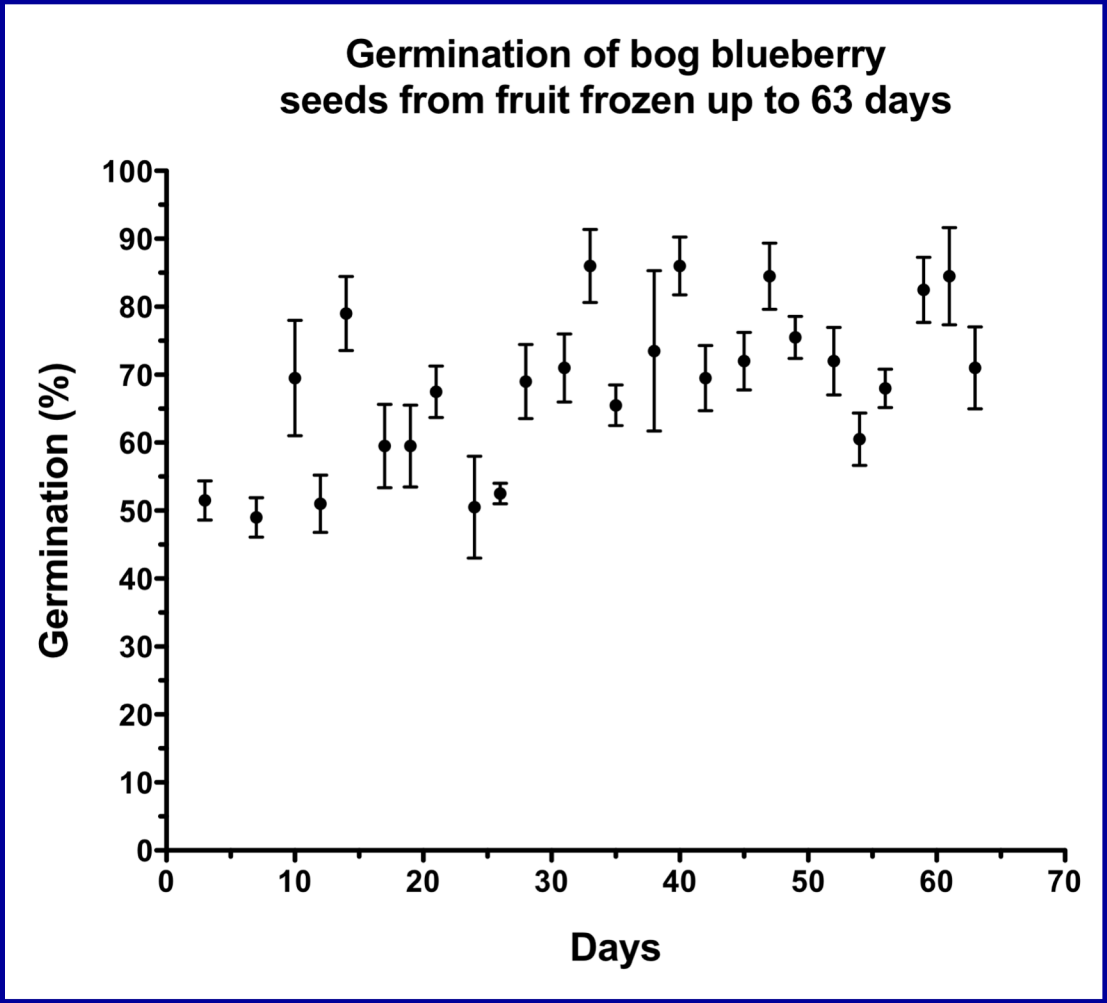


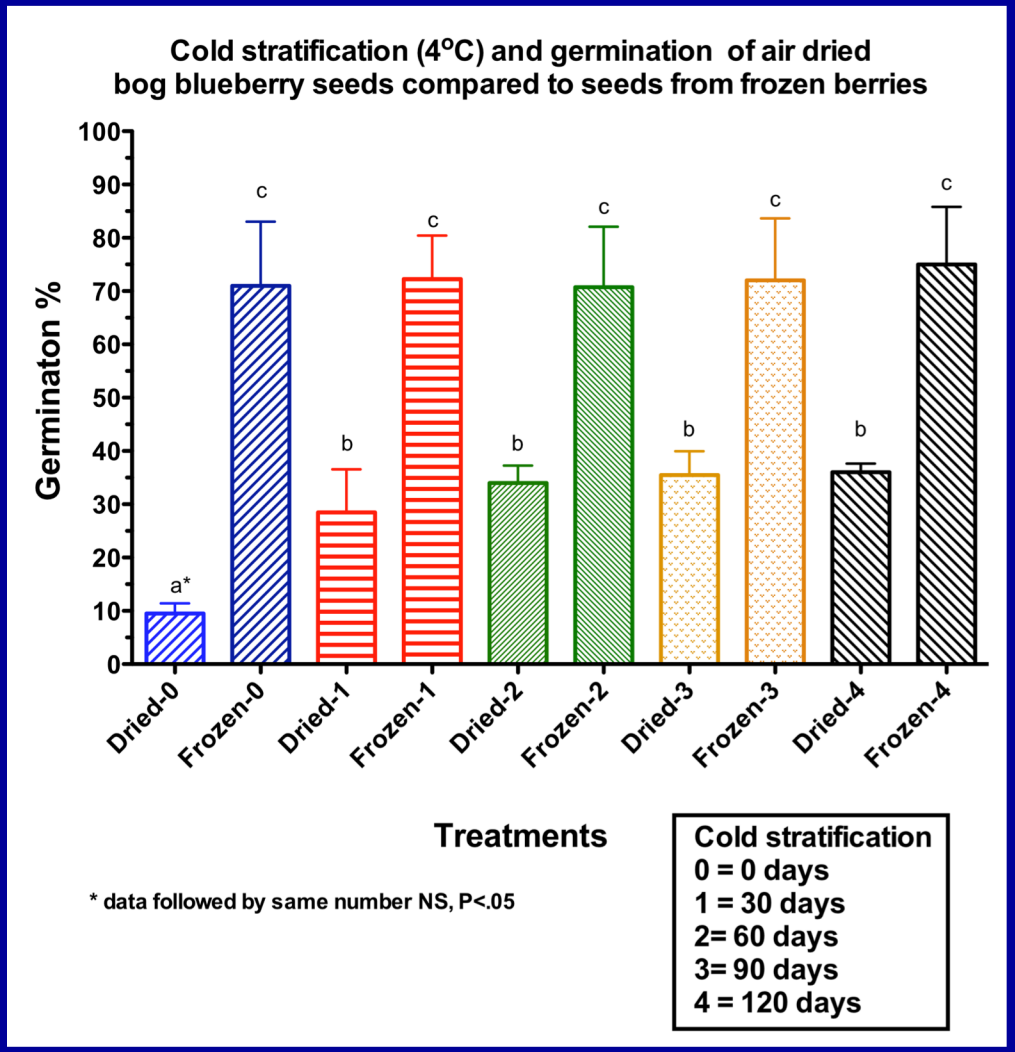
Seeds
Rhizome cuttings
Division

Seed germination bog blueberry



Frozen seeds





Cold stratify

Moistened filter paper sandwich

Petri dish

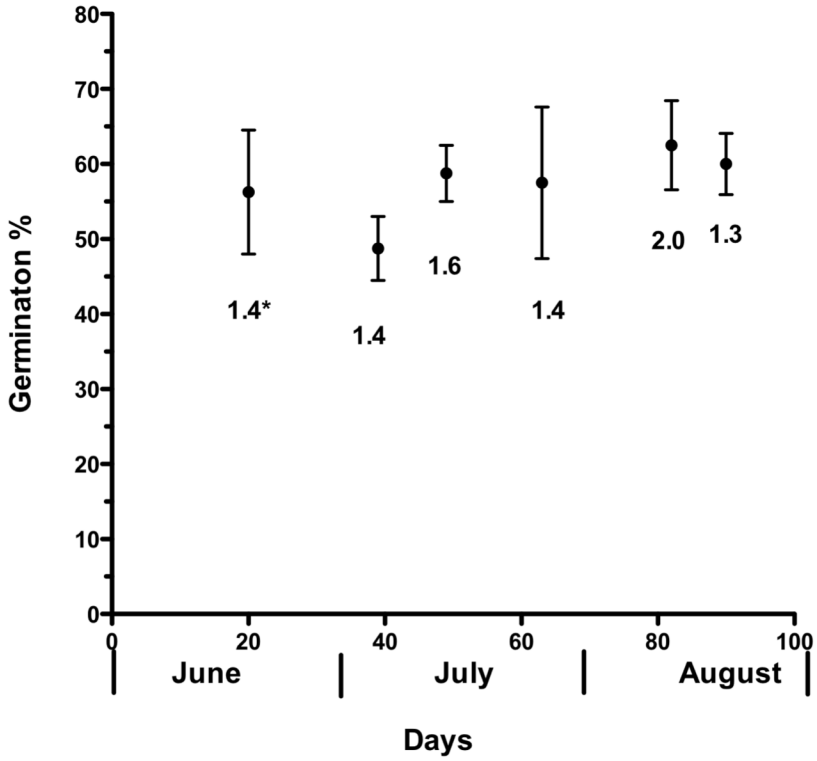
40F

Cutting propagation of bog blueberry

- Stem cuttings collected in late June - Aug
- Root in peat under intermittent mist



Fig 1. Percent rooting of softwood and semi-hardwood stem cuttings of *Vaccinium uliginosum*

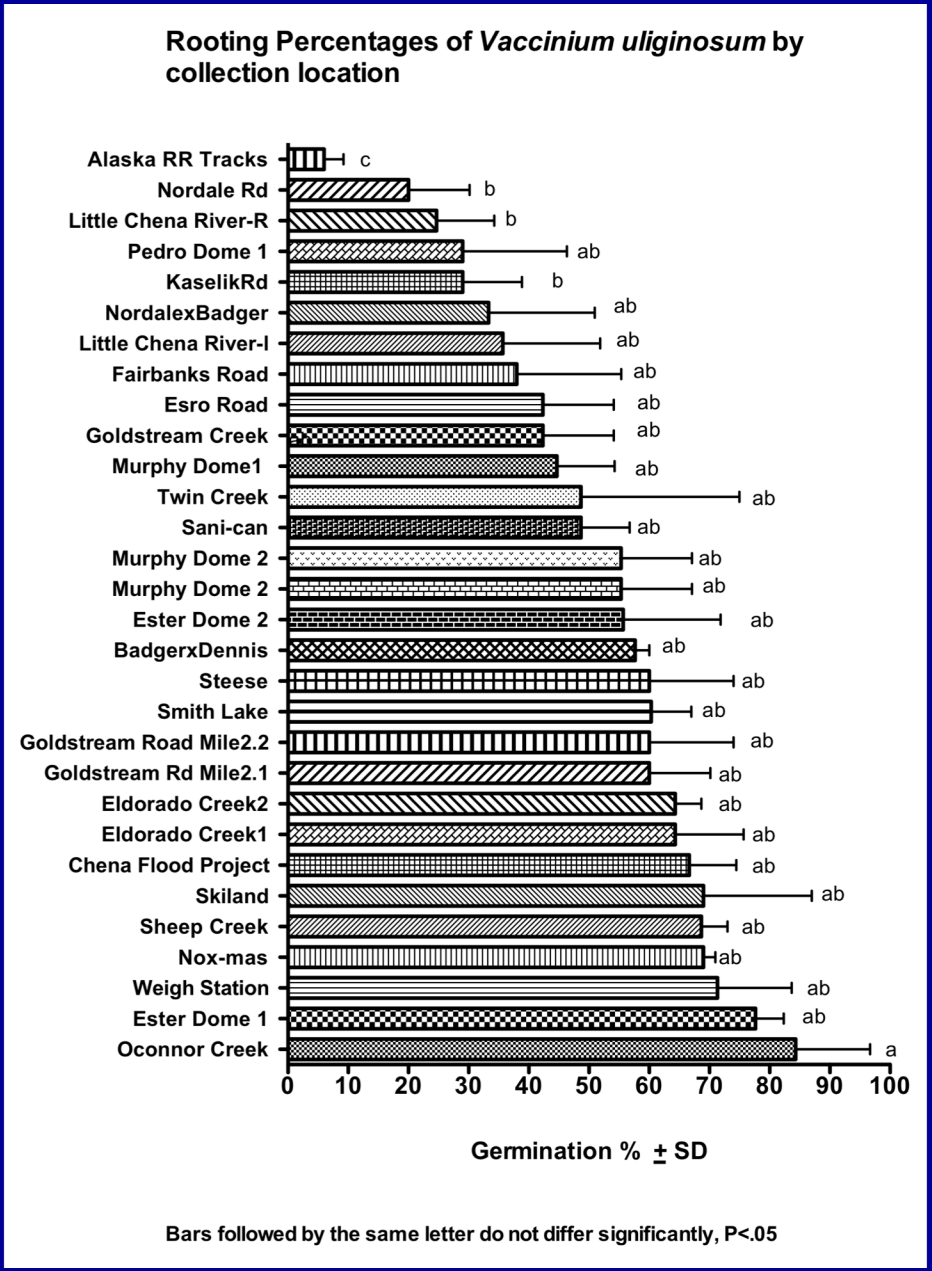


*Root quantity rating: 1= least roots, 3=most roots

Cutting Collection areas

Best sites not necessarily best rooting

Genetic diversity



Other Cultivation Protocols

- Crowberry- *Empetrum nigrum*
- Highbush Cranberry *Viburnum edule*
- Red, black Currants Ribes spp.



Highbush cranberry, *Viburnum edule*

Flower Biology Essentials

- Flower timing
- Sex of flowers
- Pollinators
- Barriers to pollination
- Pollination intensity
- Disease and insect pests



Cloudberry, Salmonberry

- Spread by rhizomes
- Acidic, high moisture
- Male and female plants
- Insects + male + female + good weather



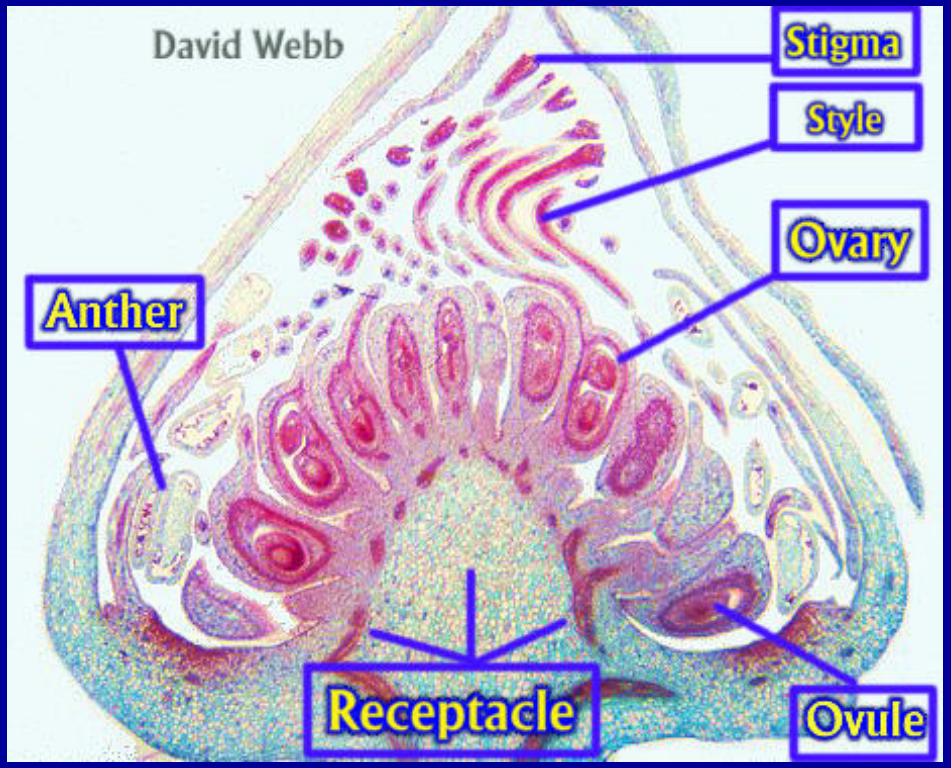
male



female

Raspberries

- Male, female, or both in one flower
- Pollination
  - Selfing
  - Insects
  - Staggered bloom time



www.uhi.edu



Poor pollination or genetics



Black, red currants

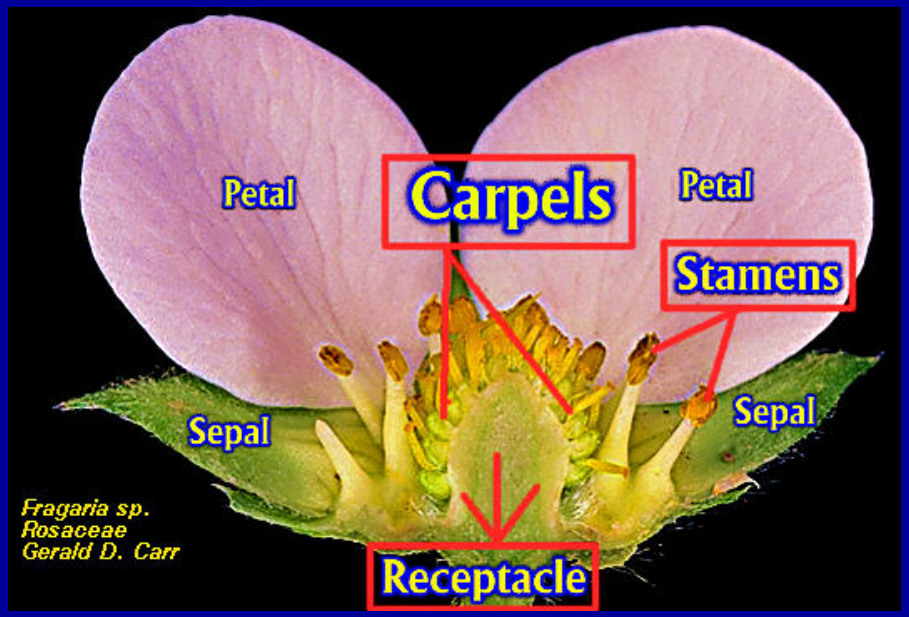


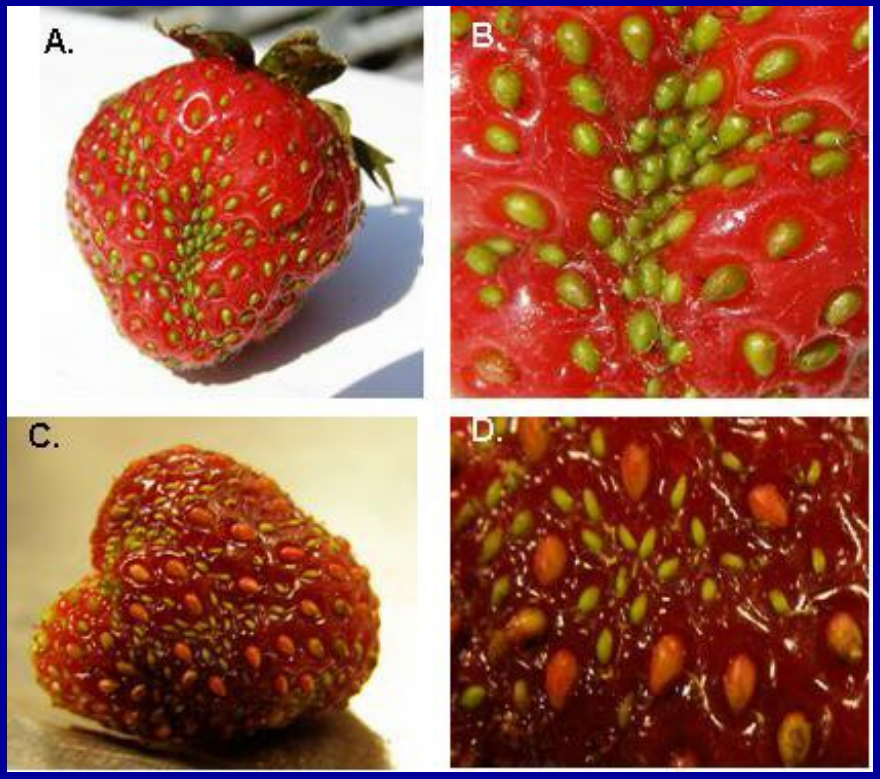
- Very early flowering – frost damage



- Insect pollination- beeflies, wasps
- Self incompatibilty

Strawberries





www.botany.hawaii.edu

Nagoonberries

- Clonal by rhizomes
- Male + female
- Self incompatible

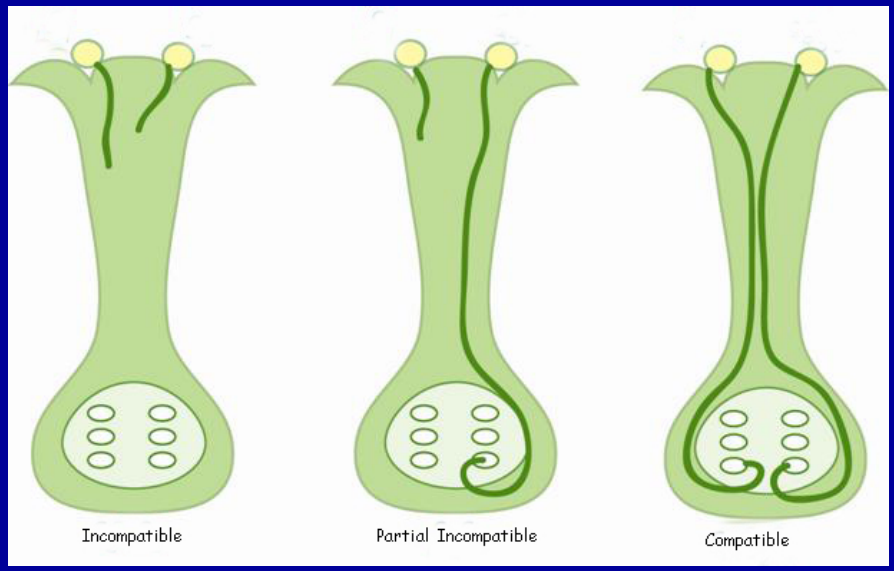


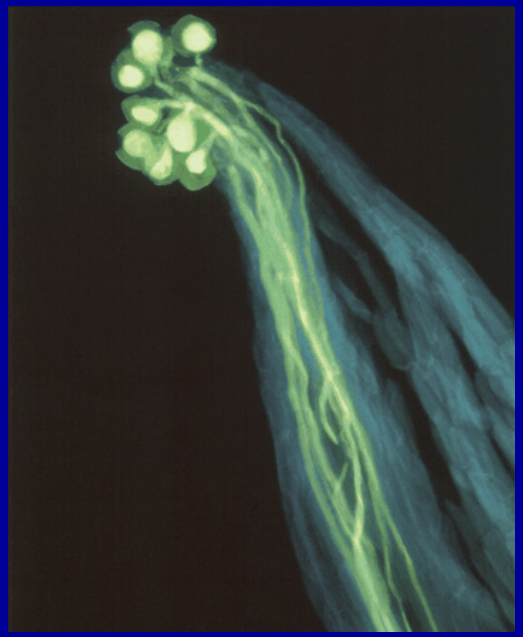


fotki.com

Incompatibility

- Inability of pollen to fertilize ovules on plants with the same genetic signature





Fruits with incompatibility

- Apples
- Crabapples
- Cherries
- Plums
- Apricots
- Nagoonberries
- Currants
- Gooseberries
- Saskatoon serviceberry
- Mountain ash
- Raspberries (some)

Fruits- cultivated and wild - need insect pollinators

- What are environmental conditions of insects?

- Nesting sites
- Food sources









Honey bees

- Expensive, annual costs
- Imported bees
- Limited life



Honey bees
visit lingonberry, blueberry
flowers but no increase in yield

Problems with honey bees

- *Varroa destructor, tracheal mites*
- *Nosema* disease (protozoa)
- Colony collapse disorder



Maarec.psu.edu





Bumble bees

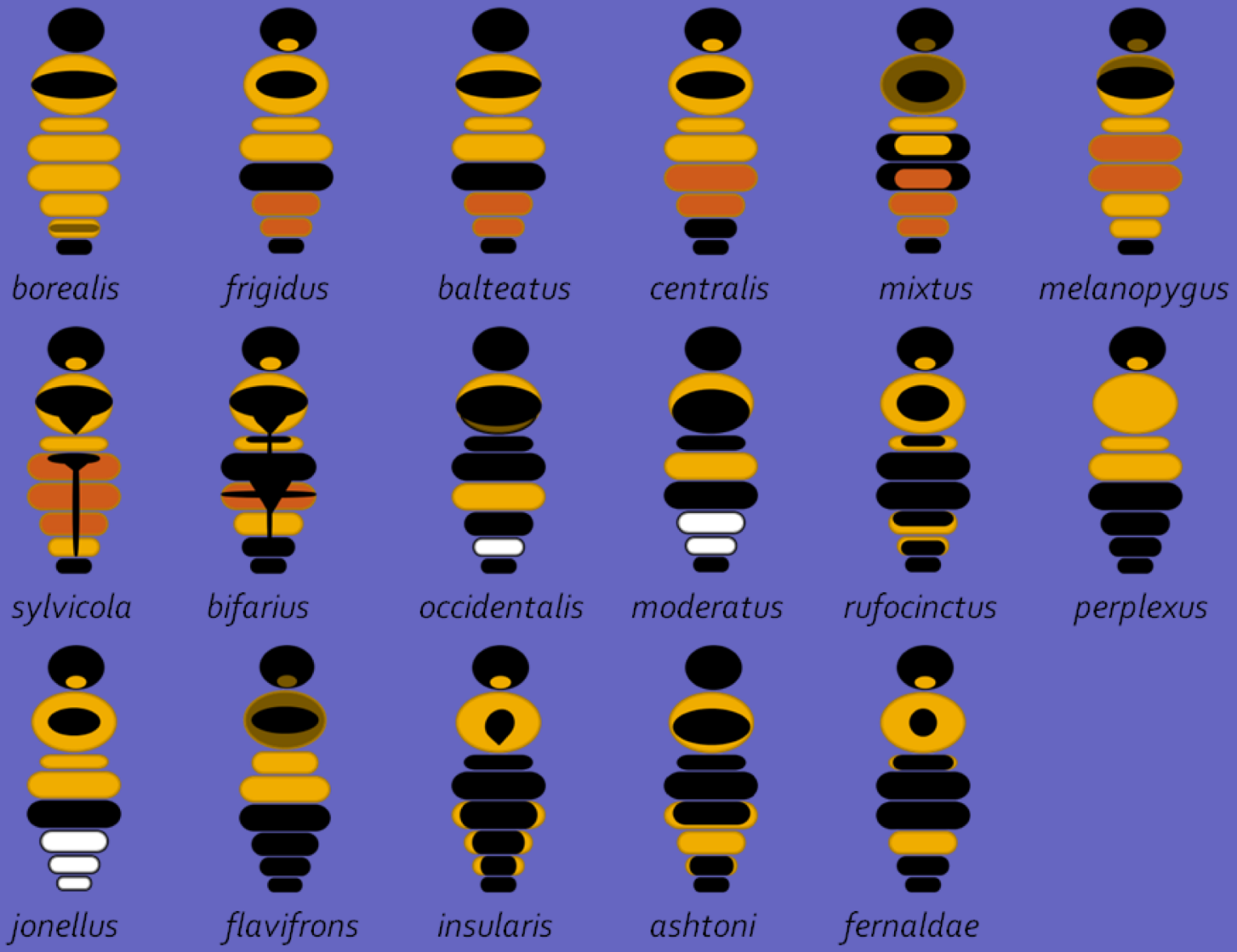
- Nest in
  - Warm, south-facing slopes
  - Vegetation cover
  - Nearby bee plants







28 bumble bee species in Alaska



Bumble bee nests

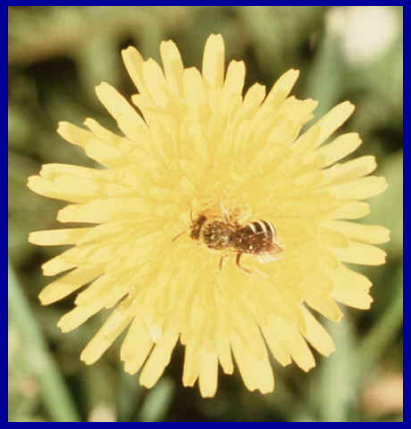
- Old vole holes
- nests in the ground



- Insulation, wood shavings, dark boxes, flower pots



Other pollinators



Sweat bees



Yellow jackets



Andrenid bees



Mosquito

Why mosquitoes don't work on blueberries, lingonberries



- Anthers have tubes
- Buzz pollination
- 10 mph winds do not dislodge pollen













Lakkakermakakku cake
Cream cake with cloudberries
www.axis-of-aevil.net/archives/food