



#### Acknowledgements

- Coast Salish people: exploring and admiring Mt. Rainier for about 10,000 years
- NPS: 3 years of research permits, protecting park since 1899; special thanks to: Brooke Childrey, Beth Fallon, Declan Kay, Emma Mattix-Wand, Arnie Peterson, Jennifer Rand, Regina Rochefort, David Rynerson, Crow Veccio
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- Herbaria visited: JEPS/UC, MORA, PSM, V, WS, WTU (and 46 others on-line)
- iNaturalist (45,404 observations by 3203 observers within MRNP)







**Natural Heritage Program** 

**Acknowledgements** 







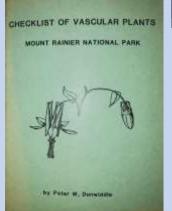


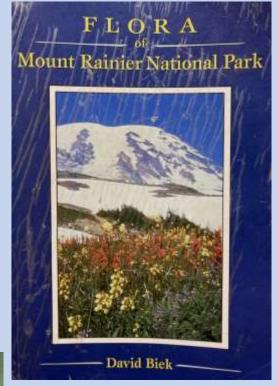


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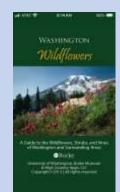
3,270,143 specimen records and 1,708,831 images from 53 participating herbaria Use of the data requires acceptance of our Data Usage Policy. Data last updated 11/21/2024

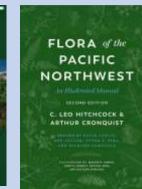














**50 Peaks Project** 









### Mt. Rainier National Park

236,381 acres (+ 140 acres: Tahoma Woods Administrative Area, Carbon River Ranger Station)

97% is designated wilderness

370 square miles

957 square km

78 square km under ice

Elevation range: 405 – 4392 m (1,329 – 14,411 feet)

**Undercast from Crystal Peak** 

#### Study objectives

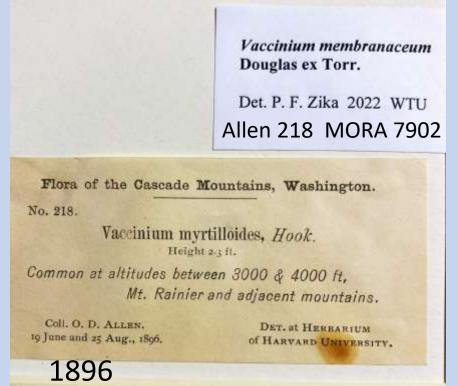
 Document additions to the known vascular flora of Mt.
 Rainier National Park



Carex saxatilis russet sedge Lake Eleanor Trail

- Research herbarium records
- Update nomenclature
- Correct misidentifications





#### Long-term goal

Produce a modern checklist of the vascular plants of Mt. Rainier National Park



Penstemon rupicola (cliff penstemon)

### XVI. THE FLORA OF MOUNT RAINIER By PROFESSOR CHARLES V. PIPER

CHARLES VANCOUVER PIPER was born on Vancouver Island, at Victoria, British Columbia, on June 16, 1867. He graduated from the University of Washington in 1885 and since then

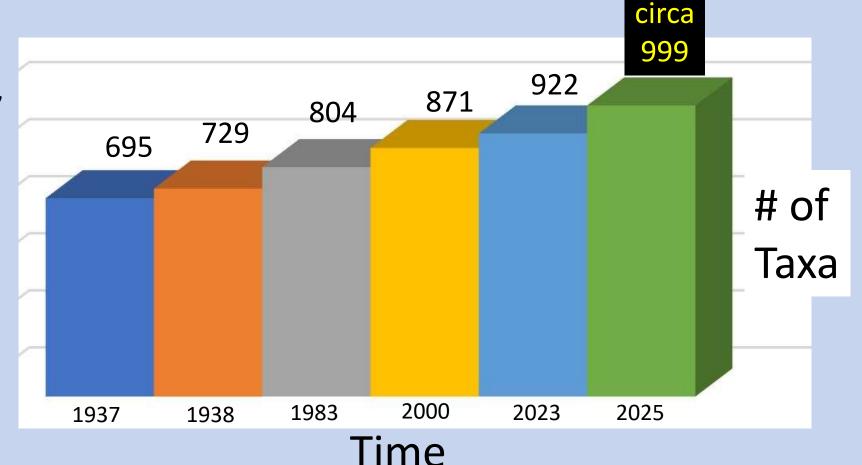
1901, 1905, 1916



### What do we already know about the flora?

#### A summary of some studies

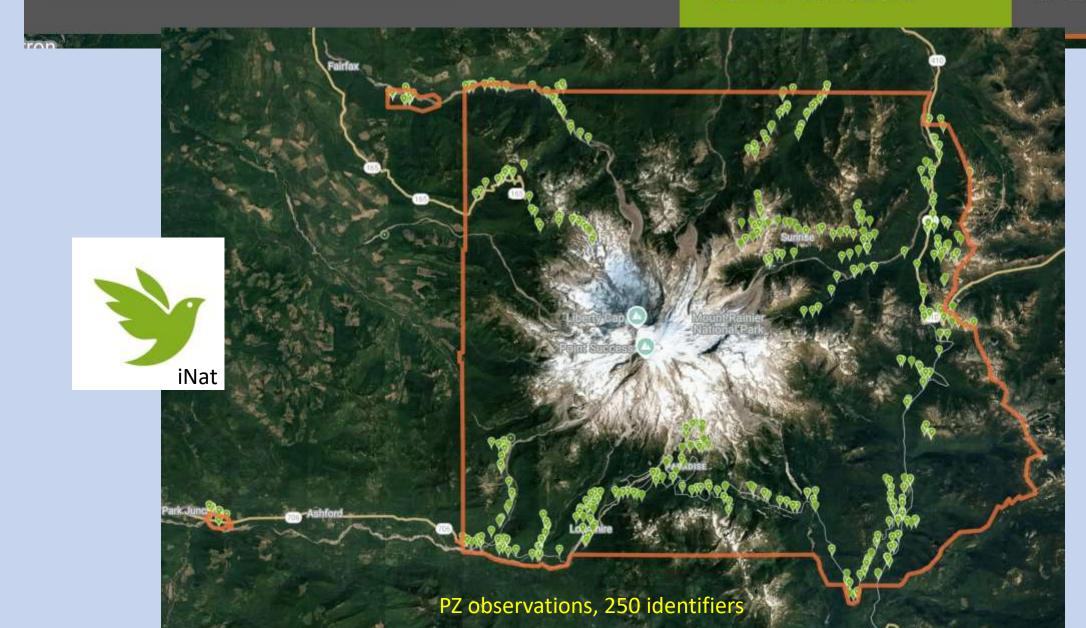
- Tolmie 1833
- Piper 1916
- St. John & Warren 1937
- Jones 1938
- Dunwiddie 1983
- Biek 2000
- NPS 2023
- This study 2022-2025

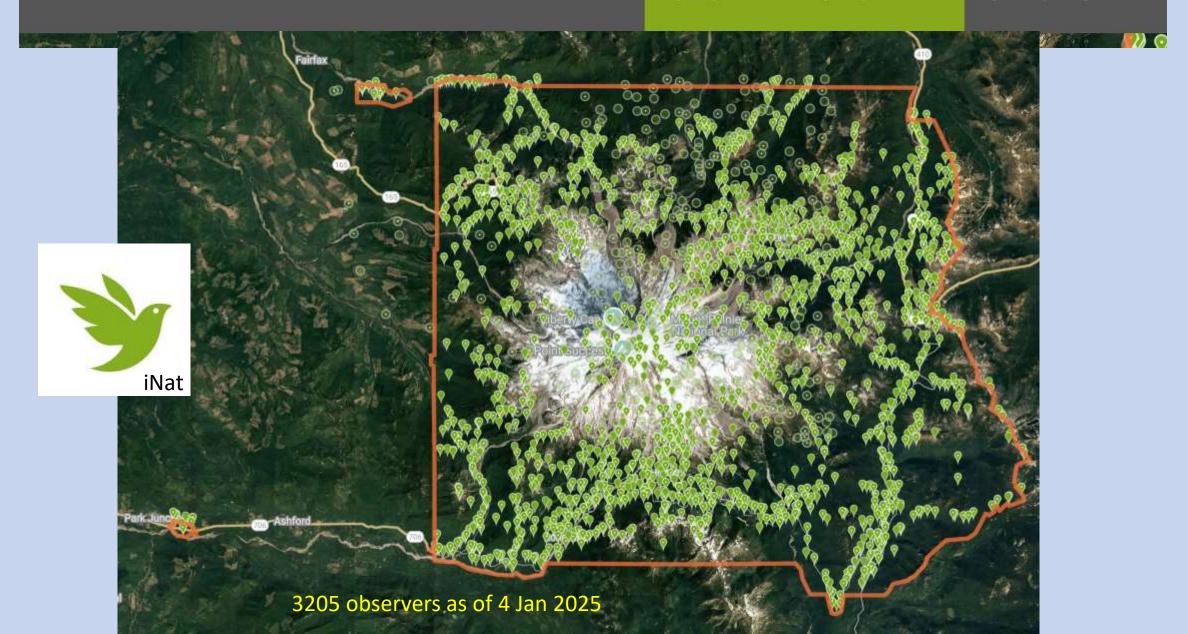




Sorbus sitchensis (Sitka mountain-ash) Sunrise

**781** SPECIES





#### Douglasia 45:3 (Fall 2021)

#### by Arnie Peterson

#### A Brief History of Plant Collections from Mount Rainier National Park

by Arnie Peterson, Ph.D.

Beginning 20 years ago I have occasionally worked on a hobby of improving the plant species list for Mount Rainier National Park. Following the idea that a species list should be based on herbarium specimens that can be verified. I naïvely thought a preliminary draft could be created relatively easily from a list of herbaria specimens—but then I ended up with a list of 4,578 plant names (including synonyms and misidentifications).





Fan-leaf cinquefoil (Potentilla flabellifolia) type specimen at Royal Botanic Gardens, Kew. Collected by W.F. Tolmie September 2, 1833 specimens.kew.org/herbarium/K000762575. PHOTO: © COPYRIGHT OF BOARD OF TRUSTEES OF THE ROYAL BOTANIC GARDENS, KEW

Type specimen at Kew from Mt. Rainier Potentilla flabellifolia (Fan-leaf cinquefoil) Collected 2 Sept 1833 by William Fraser Tolmie

#### Four Days in Paradise: C. V. Piper and the Muir Expedition of 1888

by Donovan Tracy

Midday August 12, 1888 John Muir came upon a meadow and experienced his first close encounter with The Mountain. He later recounted the moment: "Out of the forest at last there stood the mountain, wholly unveiled, awful in bulk and majesty, filling all the view like a separate, newborn world, yet withal so fine and so beautiful it might well fire the dullest observer to desperate enthusiasm. Long we gazed in silent admiration, buried in tall daisies and anemones by the side of a snowbank,"
He had arrived at Camp of the Clouds, east of a small hill now known as Alta Vista, on the southern flank of Mount Rainier.

Fifty-year-old Muir was in the Northwest to gather materials for his latest book Picturesque California, the Rocky Mountains and the Pacific Slope. He had settled into retirement on his California ranch and his days of inspired writing had ceased. However, he plunged enthusiastically into this new project, returning to the wilderness world he loved. While he hadn't planned on climbing Rainier, he was a man who had known mountain fever before, and given the opportunity he wouldn't resist a summit attempt.<sup>2</sup>

Fortuitously, a local mountaineer had organized a party to attempt an ascent from the mountain's south side. Having failed twice to summit in 1886 and 1887 via the northeast slope, Edward Sturgis Ingraham was determined to make it to the top, and much to his delight John Muir agreed to join his party. He liked to be addressed as Major Ingraham in defer-



This formal portrait of Piper was taken by the renowned Seattle photographer Edward Curtis in his studio on Second Ave. It's believed the date is Sept. 15, 1897, the day he married Laura Maud Hungate; Charles was age 30, Maude was 26. PHOTO: EDWARD HUNGAT

Douglasia 46:2 (Summer 2022) by Donovan Tracy

#### Field work 2022-2024

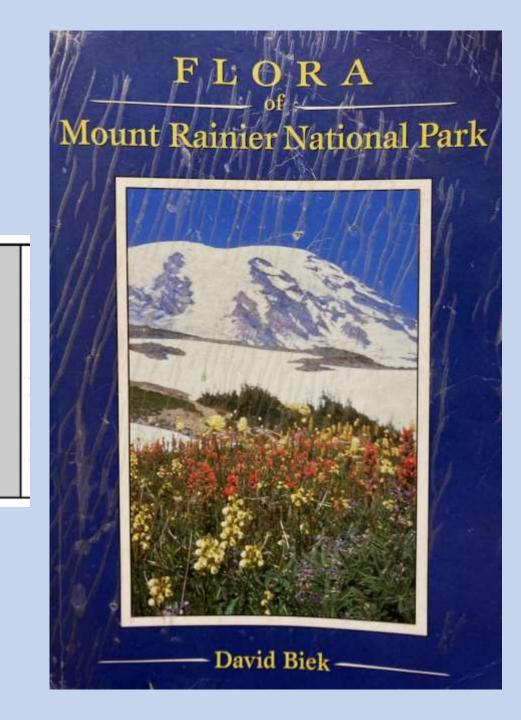
### SCIENTIFIC RESEARCH AND COLLECTING PERMIT

Grants permission in accordance with the attached general and special conditions

United States Department of the Interior National Park Service

**Mount Rainier** 

To date: 74 field days





## Field work 2022-2024

- Additions to the flora (163) \*
- Recently described (Viola pluviae)
- New weeds (49)
- Technical/large/difficult groups:
  - Grasses, sedges, rushes, willows
  - Aquatics, composites
  - Boechera (rockcresses)
  - *Prunus* (cherries)
  - Polygonum (knotweeds)

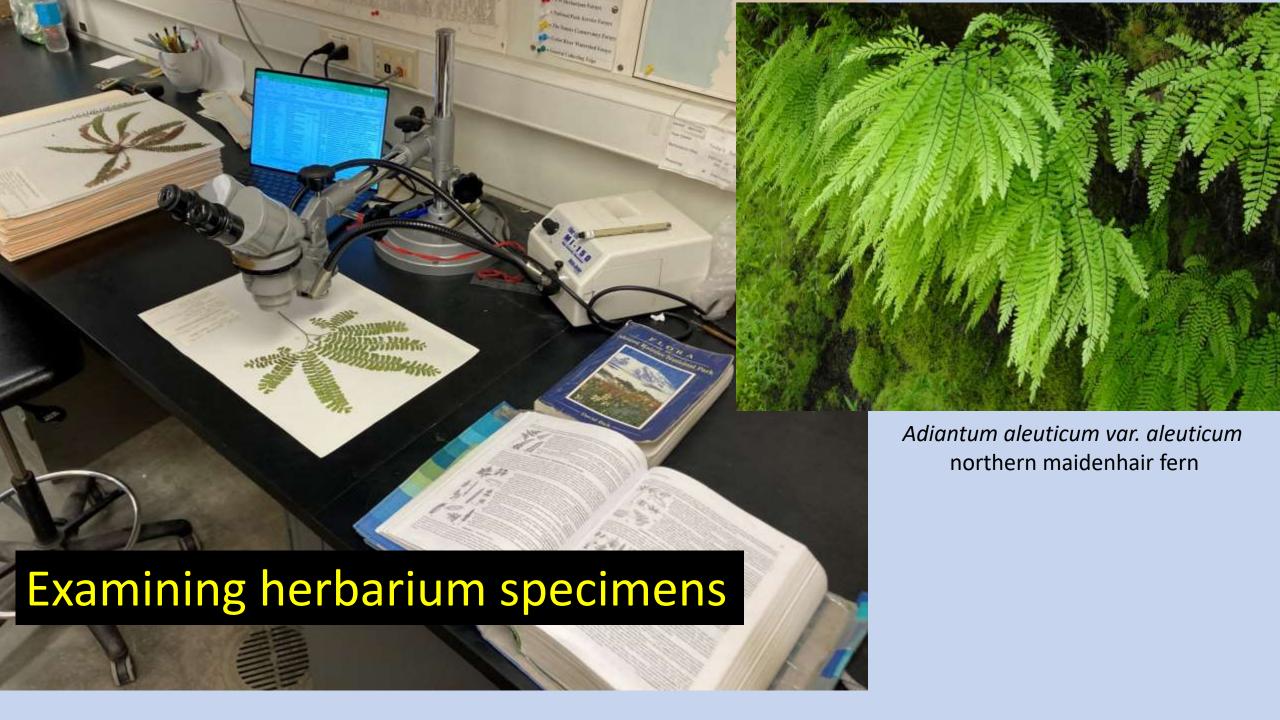


- Deletions to the flora (67) \*
- False reports, misapplied names
- Misidentified photographs
- Misidentified herbarium specimens
- Outdated nomenclature
- Old synonyms
- Replacements: changing taxonomic concepts (Viola palustris becomes V. pluviae in our region)

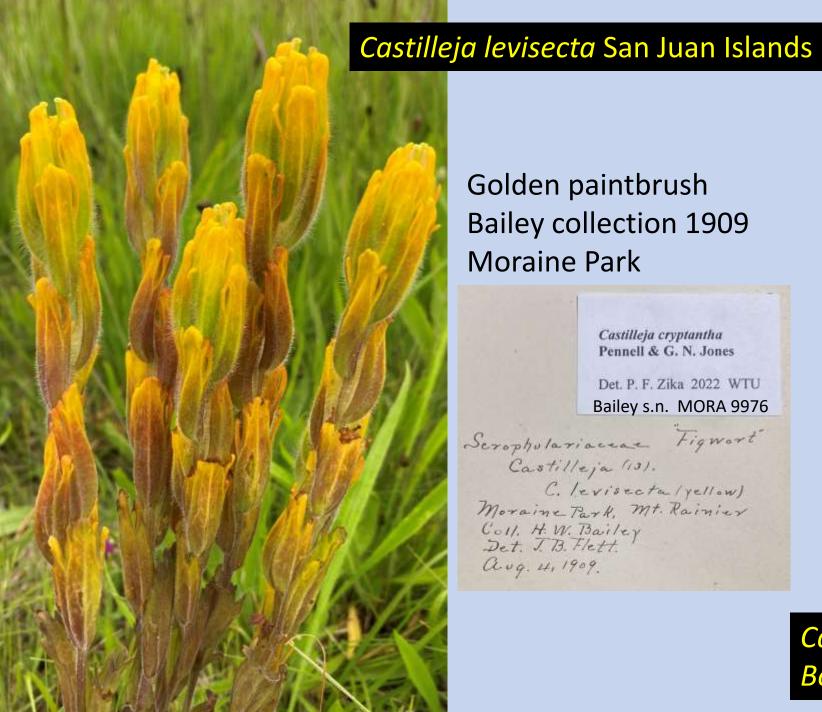




*Microseris nutans* (nodding microseris) Cliffs near Dewey Cr







Golden paintbrush Bailey collection 1909 **Moraine Park** 

Castilleja cryptantha Pennell & G. N. Jones Det. P. F. Zika 2022 WTU Bailey s.n. MORA 9976 Scrophulariaceae Figwort Castilleja (13). C. levisectalyellow) Moraine Park, Mt. Rainier Det. J. B. Flett. aug. 4, 1909.



Castilleja cryptantha & **Botrychium simplex** Sunrise Lake

#### Type Specimens

- 24 types collected on Mt. Rainier
- Castilleja cryptantha
- Castilleja rupicola
- Gentiana calycosa
- Pedicularis contorta
- Pedicularis ornithorhynchos
- Pedicularis rainierensis
- Potentilla flabellifolia
- Vaccinium deliciosum
- Viola pluviae



- 38 additional types are now mere synonyms
- Artemisia tacomensis
- Corydalis allenii
- *Hieracium flettii*
- Luina piperi
- Lupinus volcanicus
- Oxytropis mazama
- Rosa rainierensis
- Stellaria washingtoniana



Castilleja rupicola (cliff paintbrush) described by Piper in 1898 using his collection at 7000 feet on Mt. Rainier

#### Type Specimens

 Duplicates of 23 type specimens, collected by Oscar Allen in the 1890s housed in the MORA Herbarium in Ashford



Type specimen collected by Oscar D. Allen (his number 278) from Mt. Rainier, elev. 6500 feet, on 30 August 1897 (snow falling)

#### **ISOLECTOTYPE**

Hesperogenia stricklandii J. M. Coult. & Rose, Contributions from the United States National

Herbarium 5: 203, pl. 27 (1899). Hololectotype at US.

Contributions from the United States National Herbarium 7: 76 (1900). Mount Rainier 6500 feet, *O. D. Allen 278* MORA 7963

= Tauschia stricklandii (J. M. Coult. & Rose) Mathias & Constance

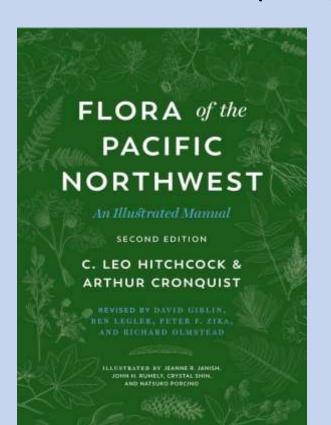
Verified P. F. Zika 2024 WTU



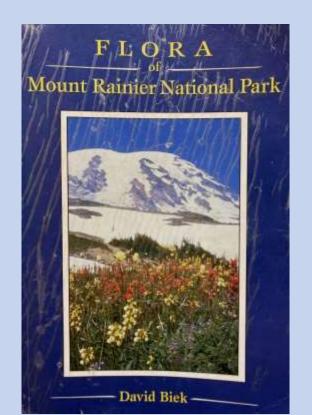
#### Floral diversity: Native vs. nonnative

- 1076 taxa
- = 582 native (54%)
- = 494 exotic (46%)
  - Wild **Plants** Greater SEATTLE

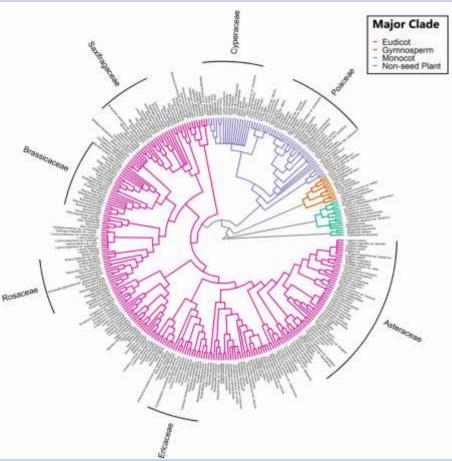
- 5,545 taxa
- 3891 native taxa (73%)
- 1444 exotic taxa (27%)



- Estimated 999 taxa
- 789 native (79%)
- 210 exotic (21%)



#### Floral diversity: Native vs. nonnative



Ertsgaard EW, Gjording NL, Bakker JD, Kleinkopf JA, Giblin DE (2025) Geology and climate drive alpine plant compositional variation among peaks in the Cascade Range of Washington. PLoS ONE 20(1): e0317140.

- 307 taxa
- 306 native taxa (99.7%)
- 1 exotic taxon (0.3%)



North Cascades, WA 32 alpine peaks



Taraxacum officinale dandelion



https://doi.org/10.1371/journal.pone.0317140

#### Floral diversity: Native vs. nonnative

- 81 Native Families (at least one native species in each family)
- 325 Native Genera (at least one native species in each genus)
- 55 natives not seen in 40+ years (7%)

Native
Lupinus sericeus (silky lupine)
David Biek's station
Crystal Mountain

- 7 Non-native Families (no native representatives in these families)
- 76 Non-native Genera (no native representatives in these genera)
- 48 Non-natives not seen in 40+ years (23%)

 Road- & river-side weed control efforts by park; extirpations

Failed colonizations



#### Endemics & near-endemics

- Castilleja cryptantha (all records in park except one in Yakima Co 3 km E of park boundary)
- Pedicularis rainierensis (all records in park except one in Pierce Co < 1 km from park boundary)</li>
- [Tauschia (Hesperogenia) stricklandii] (15 km E in Yakima Co; Lincoln and Multnomah Cos in Oregon; 250 km to SW) [Regional endemic, not near-endemic]



Tauschia (Hesperogenia) stricklandii Strickland's tauschia Grand Park



Castilleja cryptantha obscure paintbrush Frozen Lake outlet



Pedicularis rainierensis Mt. Rainier lousewort Spray Park

#### Most Successful: Pine Family, Pinaceae

- Dominance
- Biomass
- Shade

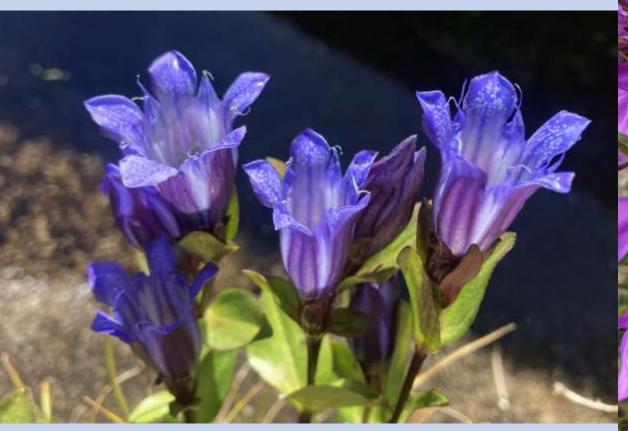




L to R: *Tsuga heterophylla* (western hemlock), Corallorhiza mertensiana (western coral-root) Lysichiton americanus (skunk cabbage), Calypso bulbosa (fairy slipper)

Refugees from shade: roadsides, cliffs, shores

meadows, alpine slopes



Gentiana calycosa explorer's gentian Spray Park



Penstemon fruticosus shrubby penstemon Stevens Canyon

#### Botanical diversity on Mt. Rainier by Family

- 129 taxa Asteraceae
- 106 taxa Poaceae
- 62 taxa Cyperaceae
- 57 taxa Rosaceae
- 54 taxa Brassicaceae
- 39 taxa Ericaceae
- 35 taxa Fabaceae
- 32 taxa Plantaginaceae
- 30 taxa Saxifragaceae
- 27 taxa Juncaceae
- 27 taxa Ranunculaceae

129



Aster Family *Microseris borealis*northern microseris

106



Grass Family

Elymus elymoides

common squirreltail

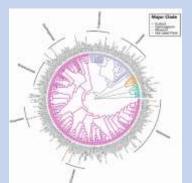
62



Sedge Family

Carex nigricans

black alpine sedge



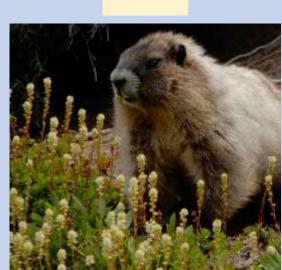
#### **Alpine Diversity by Family**

Asteraceae
Poaceae
Brassicaceae
Cyperaceae
Rosaceae

#### Botanical diversity on Mt. Rainier by Family

- 129 taxa Asteraceae
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- 62 taxa Cyperaceae
- 57 taxa Rosaceae
- 54 taxa Brassicaceae
- 39 taxa Ericaceae
- 35 taxa Fabaceae
- 32 taxa Plantaginaceae
- 30 taxa Saxifragaceae
- 27 taxa Juncaceae
- 27 taxa Ranunculaceae

57



Rose Family

Luetkea pectinata

partridgefoot

(and hoary marmot)



54

Mustard Family Boechera Iyallii Lyall's rockcress

39



Heath Family

Vaccinium deliciosum

Cascades huckleberry

#### Botanical diversity on Mt. Rainier by Genus

- 52 taxa *Carex*
- 18 taxa *Juncus*
- 15 taxa *Epilobium*
- 15 taxa *Poa*
- 12 taxa *Salix*
- 11 taxa *Arnica*
- 11 taxa Boechera
- 11 taxa *Veronica*
- 10 taxa *Cardamine*
- 10 taxa Erigeron
- 10 taxa Ranunculus

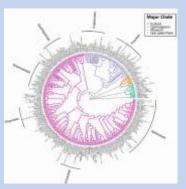


Carex arcta
northern clustered sedge





Poa stenantha narrow-flowered bluegrass



Alpine Diversity by Genus Carex Boechera, Draba, Erigeron Lupinus, Poa

#### Botanical diversity on Mt. Rainier by Genus

- 52 taxa *Carex*
- 18 taxa *Juncus*
- 15 taxa *Epilobium*
- 15 taxa *Poa*
- 12 taxa *Salix*
- 11 taxa *Arnica*
- 11 taxa Boechera
- 11 taxa Veronica
- 10 taxa *Cardamine*
- 10 taxa *Erigeron*
- 10 taxa Ranunculus







#### Most collected plant on Mt. Rainier (110+ colls)

- Carex spectabilis Subalpine or alpine
- Synonyms *Carex nigella* & *Carex tolmiei*: types (K) collected by Tolmie
- Both described in 1839 by Francis Boott
- "Columbia River" or 2 Sept 1833 on Mt. Rainier?

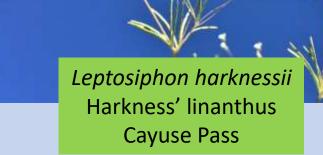
138. C. nigella (Boott); spicis r cronatis ferrugineis, fœmineis 2-3 bracteatis evaginatis, perigyniis triq tato fuliginosis basi pallidis squams stigmatibus 3.

HAB. Columbia River. Tolmie.





*Iris missouriensis* western blue flag Longmire







Eleocharis rostellata, walking spike-rush Ohanapecosh Hot Springs trailside



Arching & rooting at stem tip

Eleocharis rostellata, walking spike-rush
Ohanapecosh Hot Springs trailside

Eleocharis nitida quill spike-rush Route 123

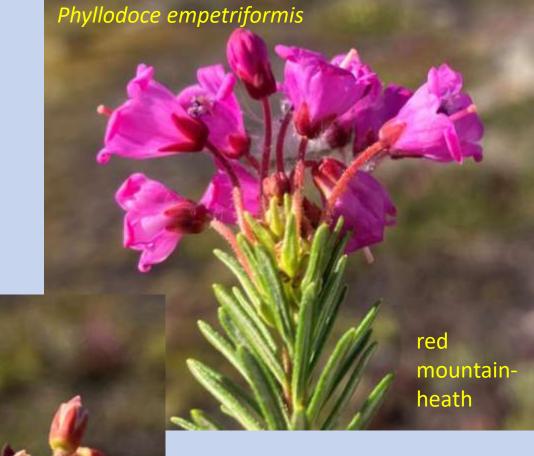




### Hybrids

Phyllodoce × intermedia

Panorama Point



## Tellima grandiflora fringecup 10 small anther broad petal base pinnate petals wide calyx eglandular ovary

#### Hybrids



pinnate petals

glandular ovary

