

Mount Rainier

Geology, Climate, Ecology, & more

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What We Are Going To Cover

- Geology & Climate of Mt Rainier
- Sub-Alpine & Alpine Zones
 - What they look like
 - Common Birds, Mammals & Butterflies
 - Plant communities
- Common plants in Sub-Alpine and Alpine Zones in 4 common Families
 - 1) Figwort Family
 - 2) Saxifrage Family
 - 3) Rose Family
 - 4) Heath Family

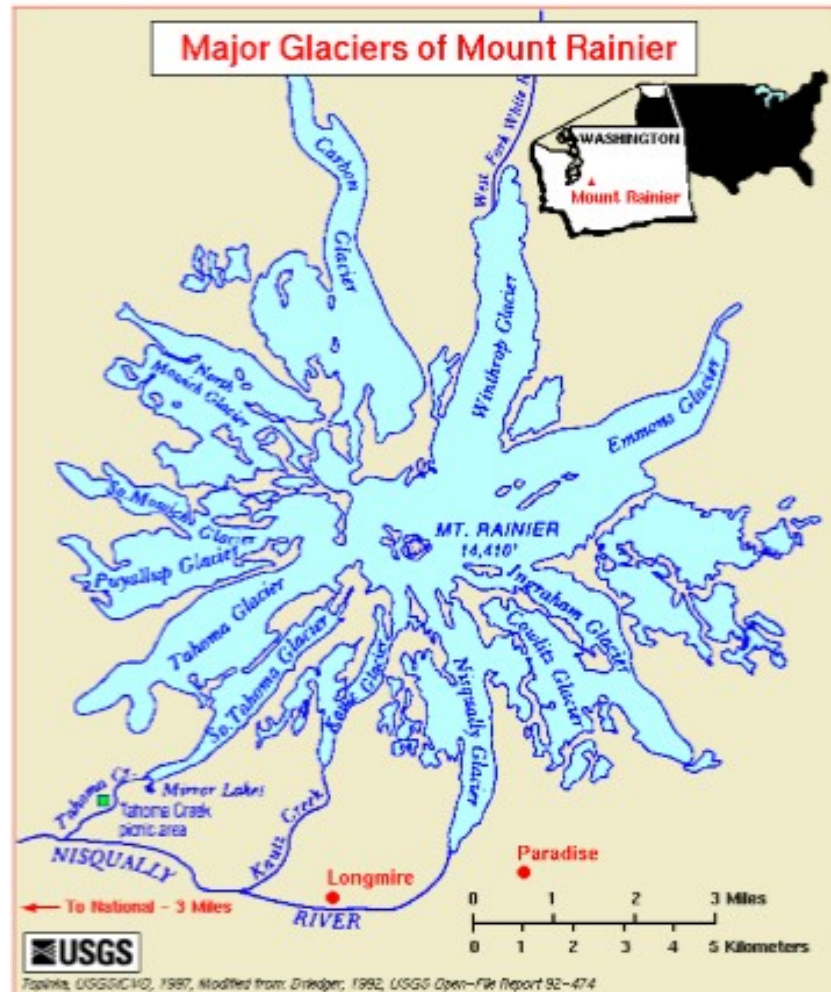


Some figures



- Elevation: 14,410 feet (4392 meters)
- Last erupted in the 1840s; a total of 33.6 cubic miles (140 cubic km) of material has erupted
- 36 glaciers containing 1 cubic mile (4.2 cubic km) of ice + snow

But that's not all of the history... gravity has its turn



- Erosional forces of wind, water and ice gradually wear down the mountain
- Mass-wasting (rockfalls, landslides, lahars) produces abrupt instances of erosion













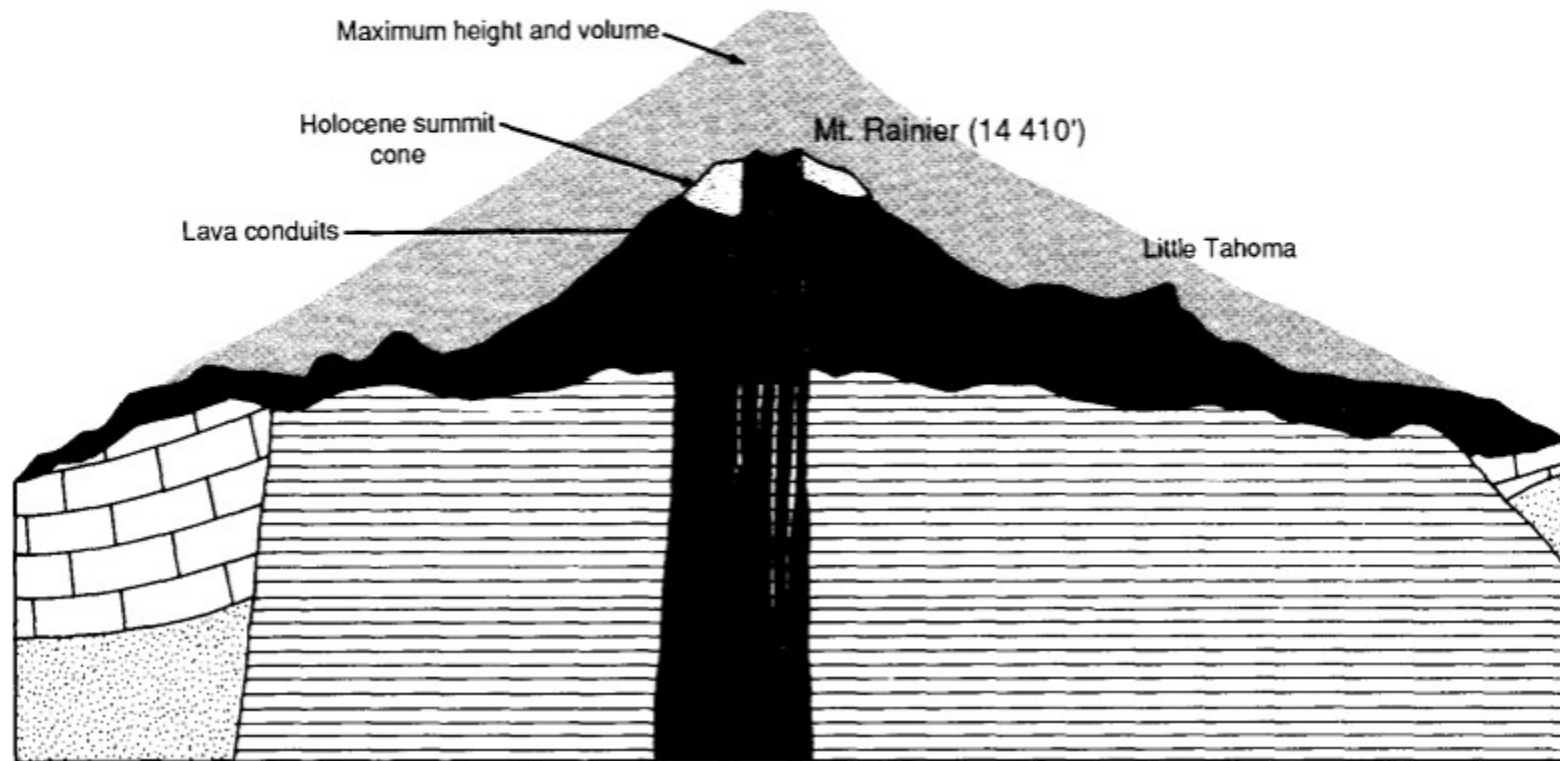


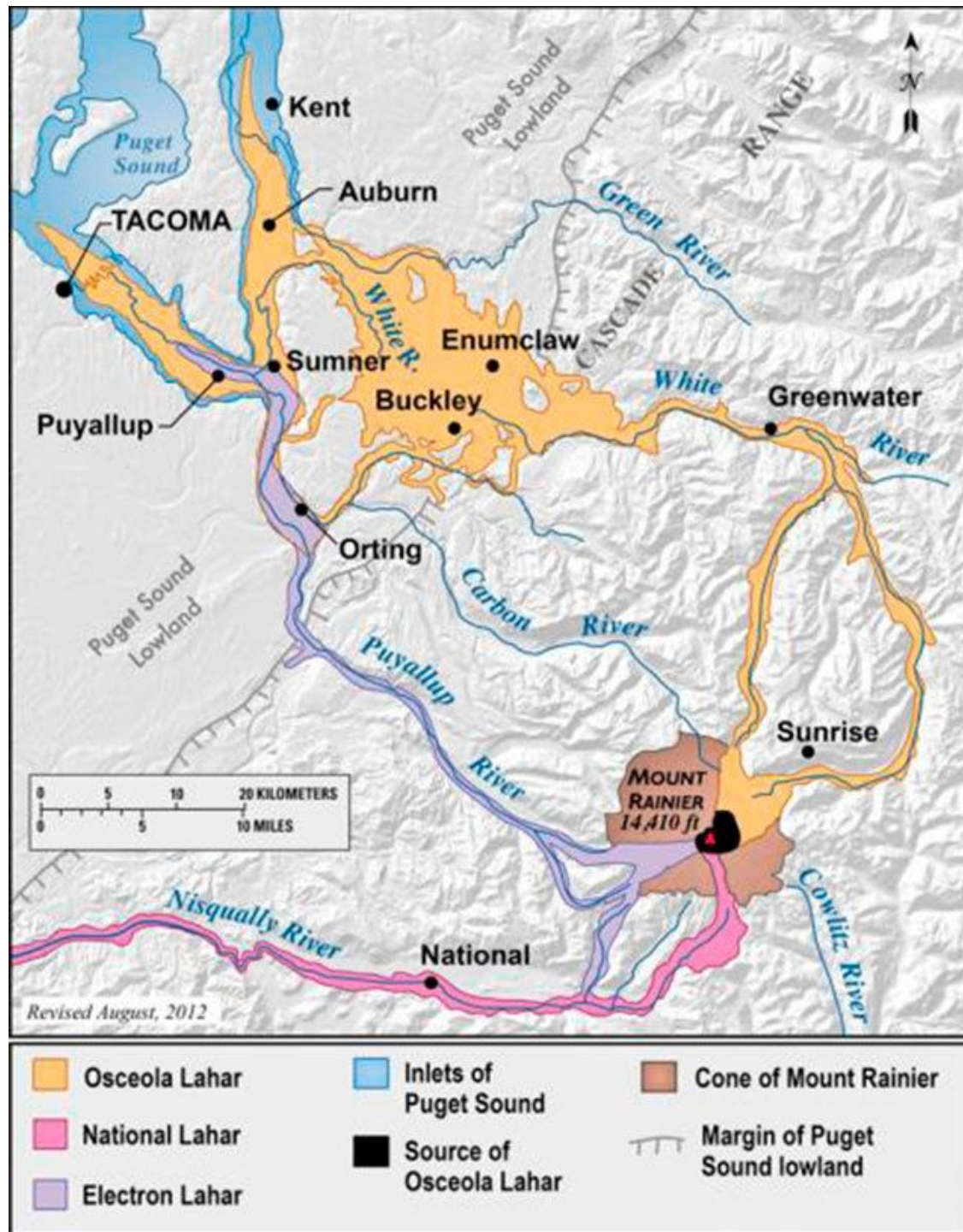


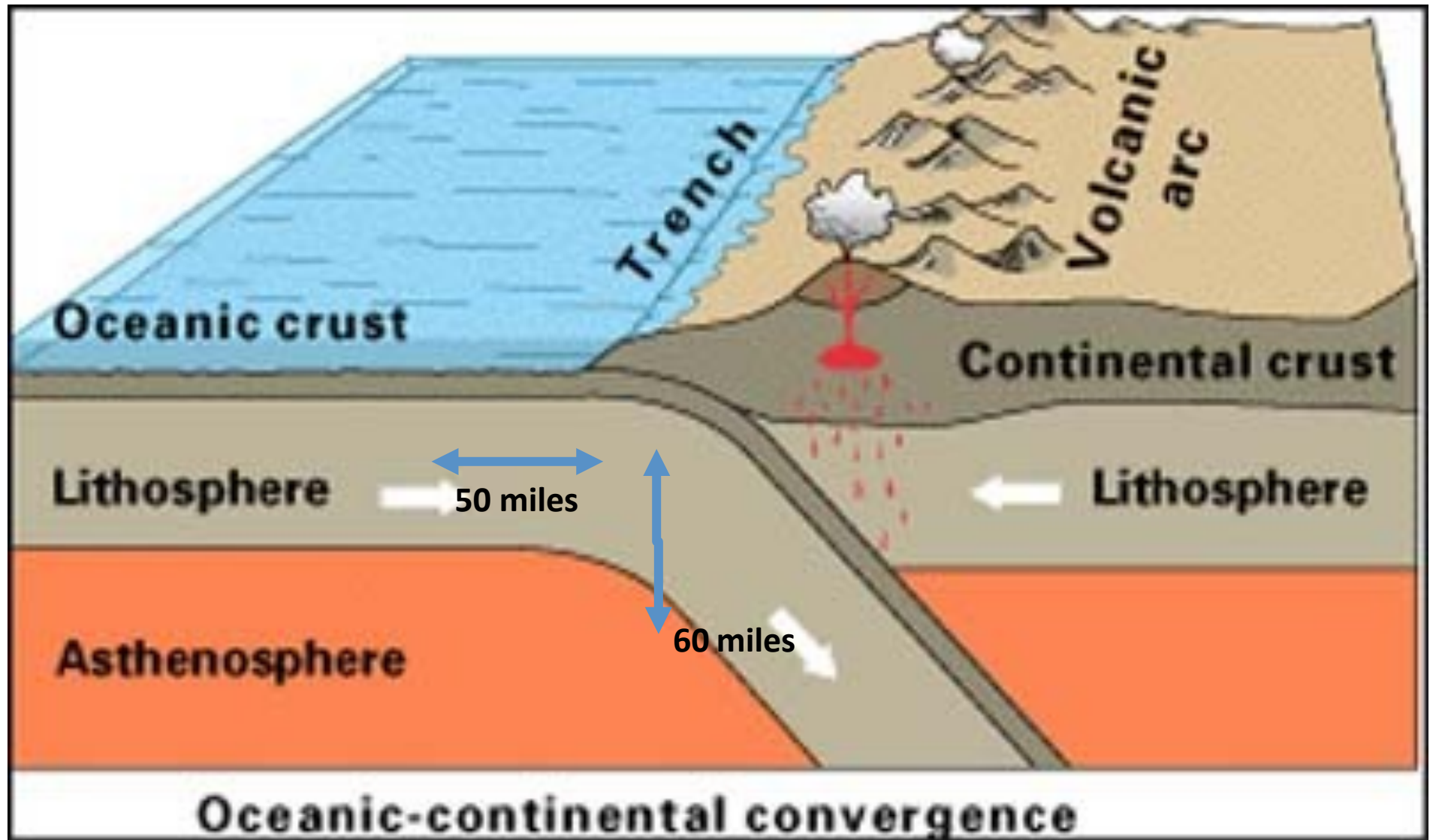


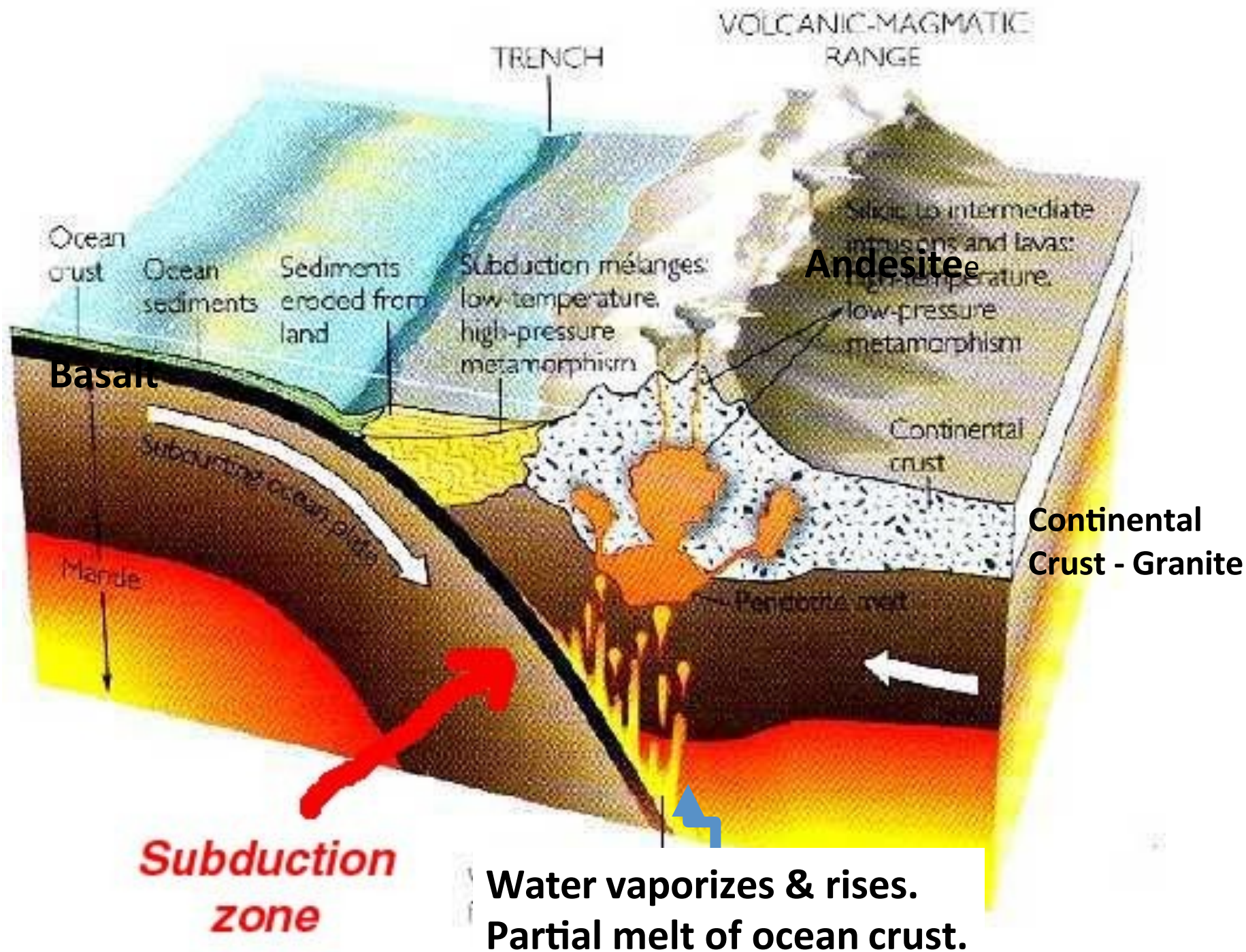


The mountain was taller and more symmetric 5600 years ago









Igneous Rocks

Plutonic

Cools very slowly



Granite
High in quartz

Granodiorite

Diorite

continuum



Gabbro
No quartz

Volcanic

Cools very fast



Rhyolite
High in quartz
Viscous
Lots of water

continuum



Andesite
Fairly viscous.
Imprecise.
Any medium gray volc.
rock in Cascades.

continuum



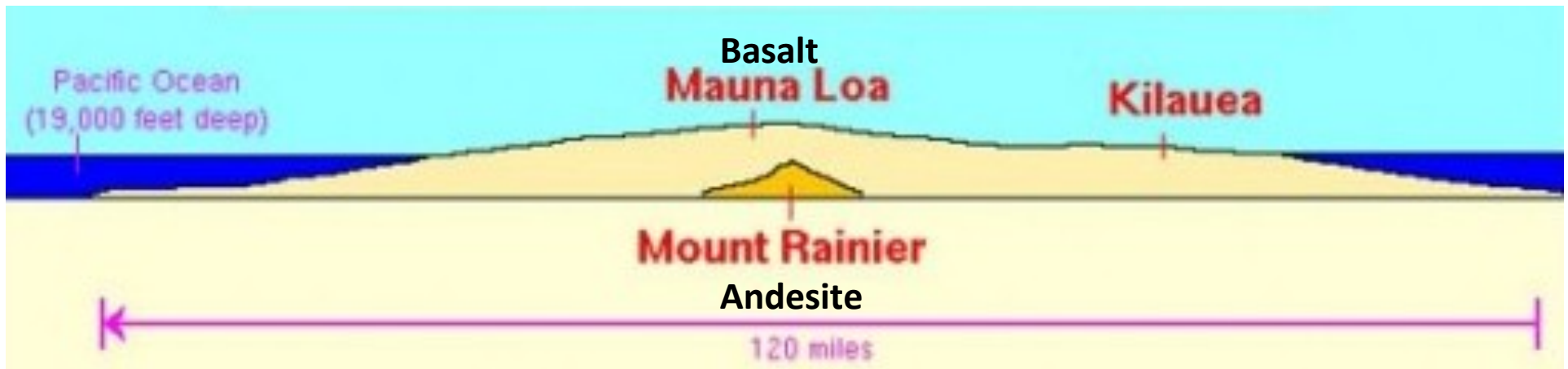
Basalt
No quartz
Fluid
Little water







Shield Volcano vs Stratovolcano



Why steep & strong slopes?

For Mt Rainier, some andesite eruptions produced mostly ash & fragments, others lava flows. So the mountain has angular rubble with lava flows knitting the structure together.

Life history

- About 50,000 years old. Typical volcano exists for 2 million years.
- High Cascade volcanic chain started activity 12 million years ago.
- Most Cascade volcano's career started by erupting basalt filling river valleys becoming a shield like volcano. But Mt. Rainier is not floored by basalt.
- It is erecting a large volcanic cone erupting varieties of andesite (without a lot of variation).
- Lavas are viscous & did not flow great distances & many of the flows are exceptionally thick.
- If it finishes with rhyolite lava, it may finally destroy itself in a great cataclysm.

Geologic History of Cascades

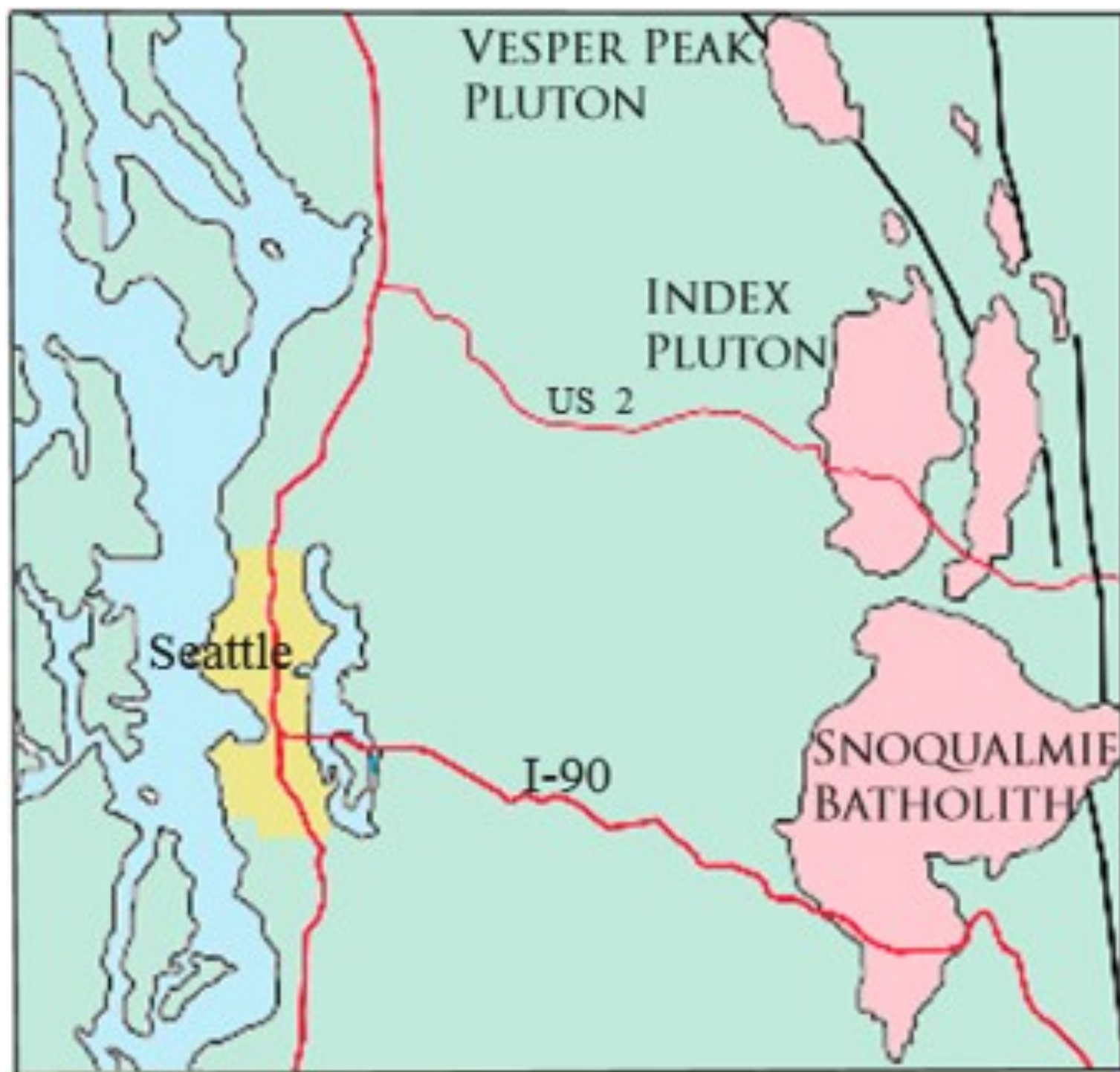
37 to 14 Ma -- Western Cascades erupt

Between 14 and 2.9 Ma -- Western Cascades erode, leaving behind only their exposed granite batholiths that form the foundation for the modern central Cascades.

At this time, the Cascades were an only slightly elevated province

2.9 Ma to present -- high cascades erupt 1

Ma – eruptions begin in Mt. Rainier area.



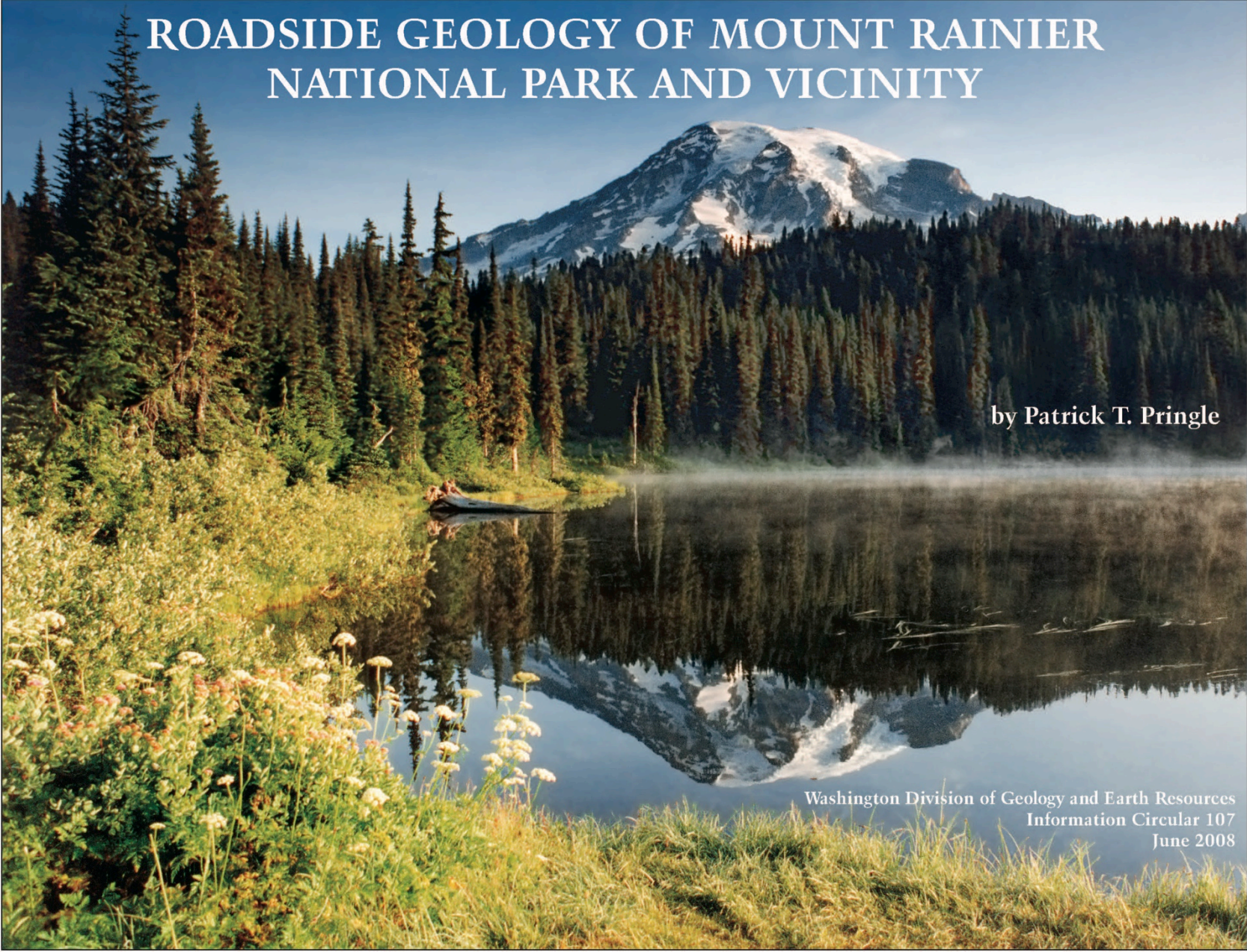


Snoqualmie Batholith, 25-17 Ma



The Tatoosh Batholith (20 Ma)

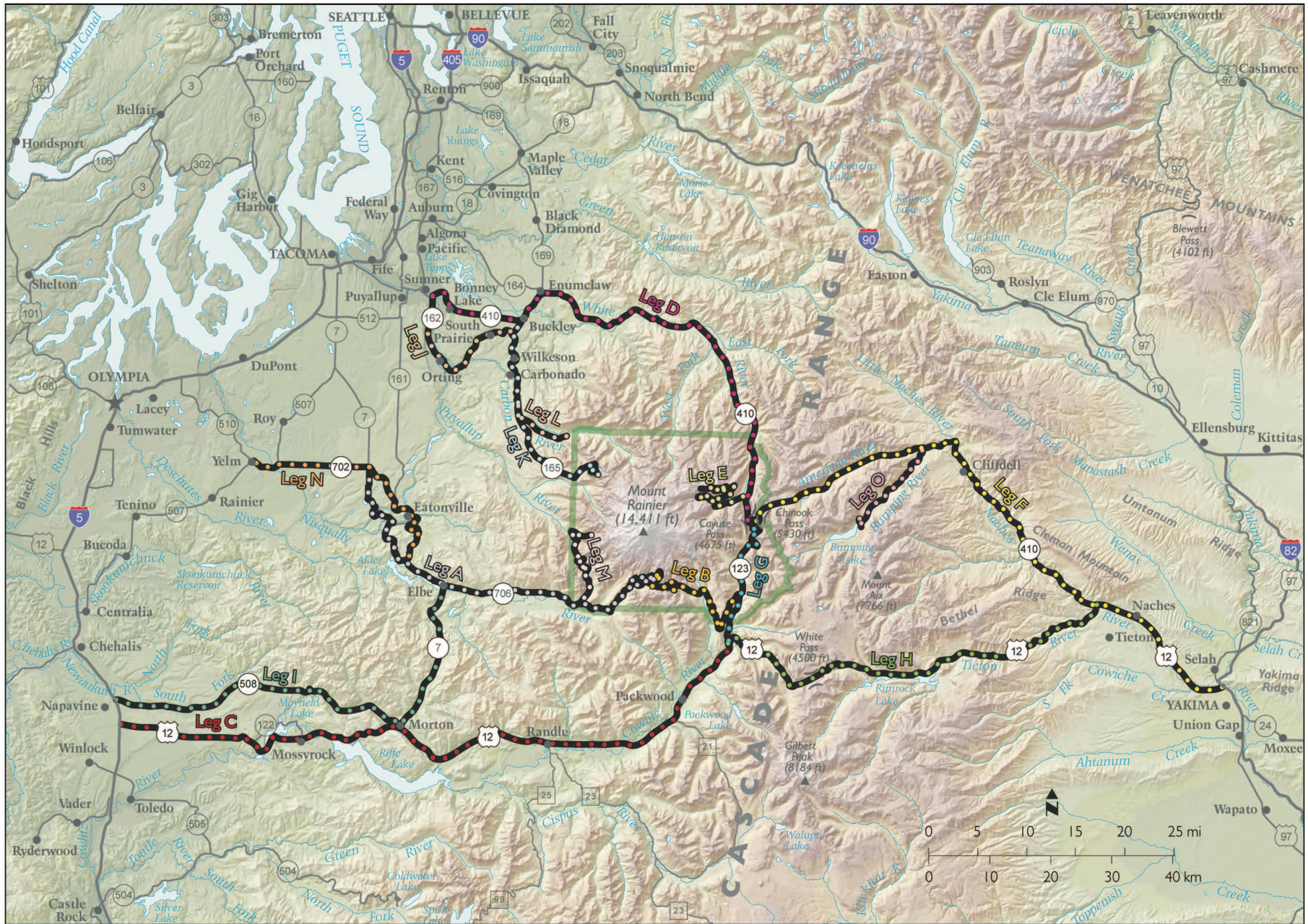




ROADSIDE GEOLOGY OF MOUNT RAINIER NATIONAL PARK AND VICINITY

by Patrick T. Pringle

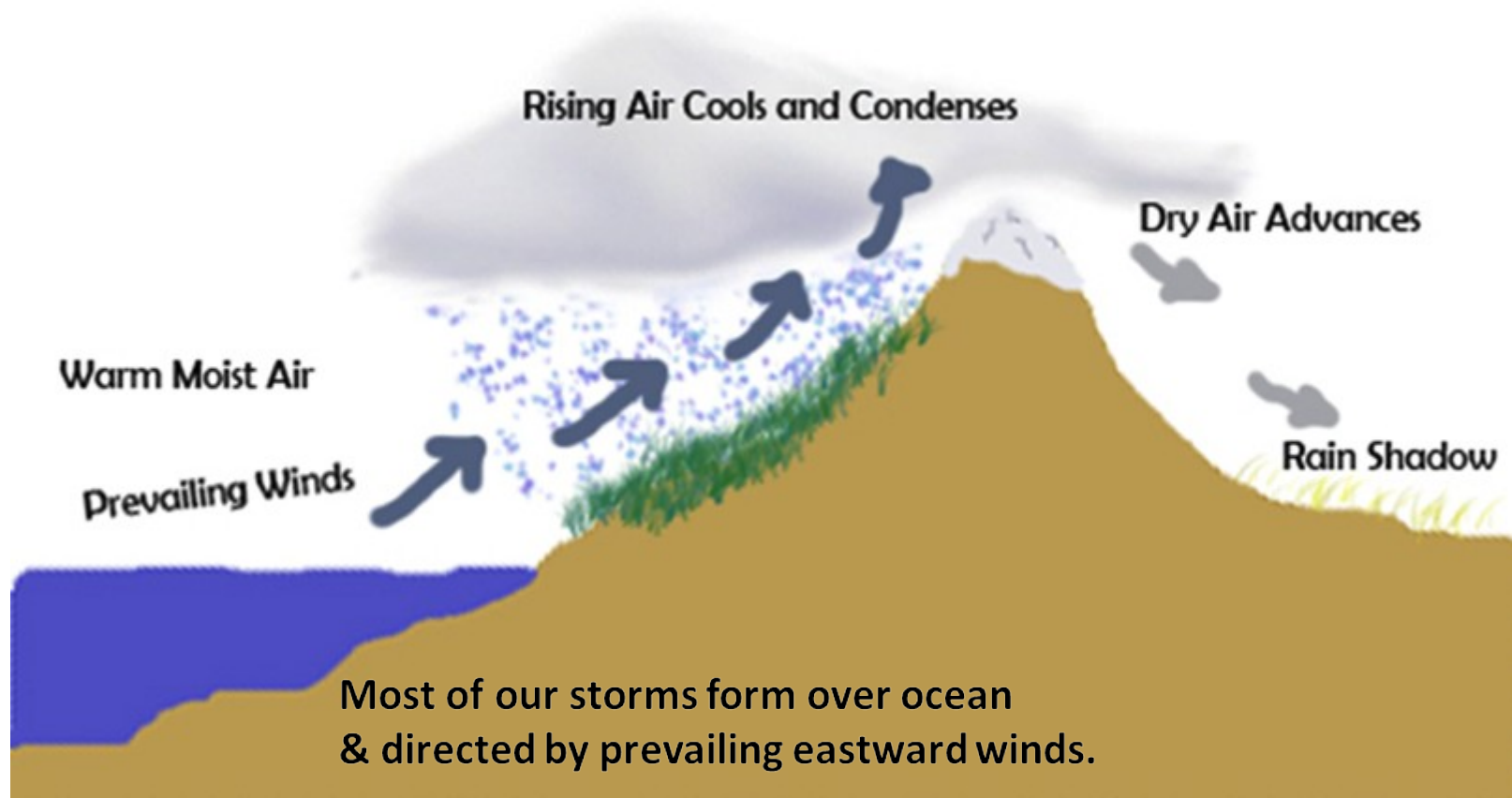
Washington Division of Geology and Earth Resources
Information Circular 107
June 2008



Shaded relief map of the Mount Rainier area and adjoining Puget Lowland, southwest Washington Cascade mountains, and westernmost Columbia Basin showing Mount Rainier National Park and the location of various scenic routes (legs) of the road guide. The map was generated from 10-meter digital elevation data.

Climate of Mt Rainier

- The location of the Park is on the west side of the Cascade Divide, but because it is so massive it produces its own rain shadow.
- Most moisture is dropped on the south and west sides, while the northeast side can be comparatively dry.



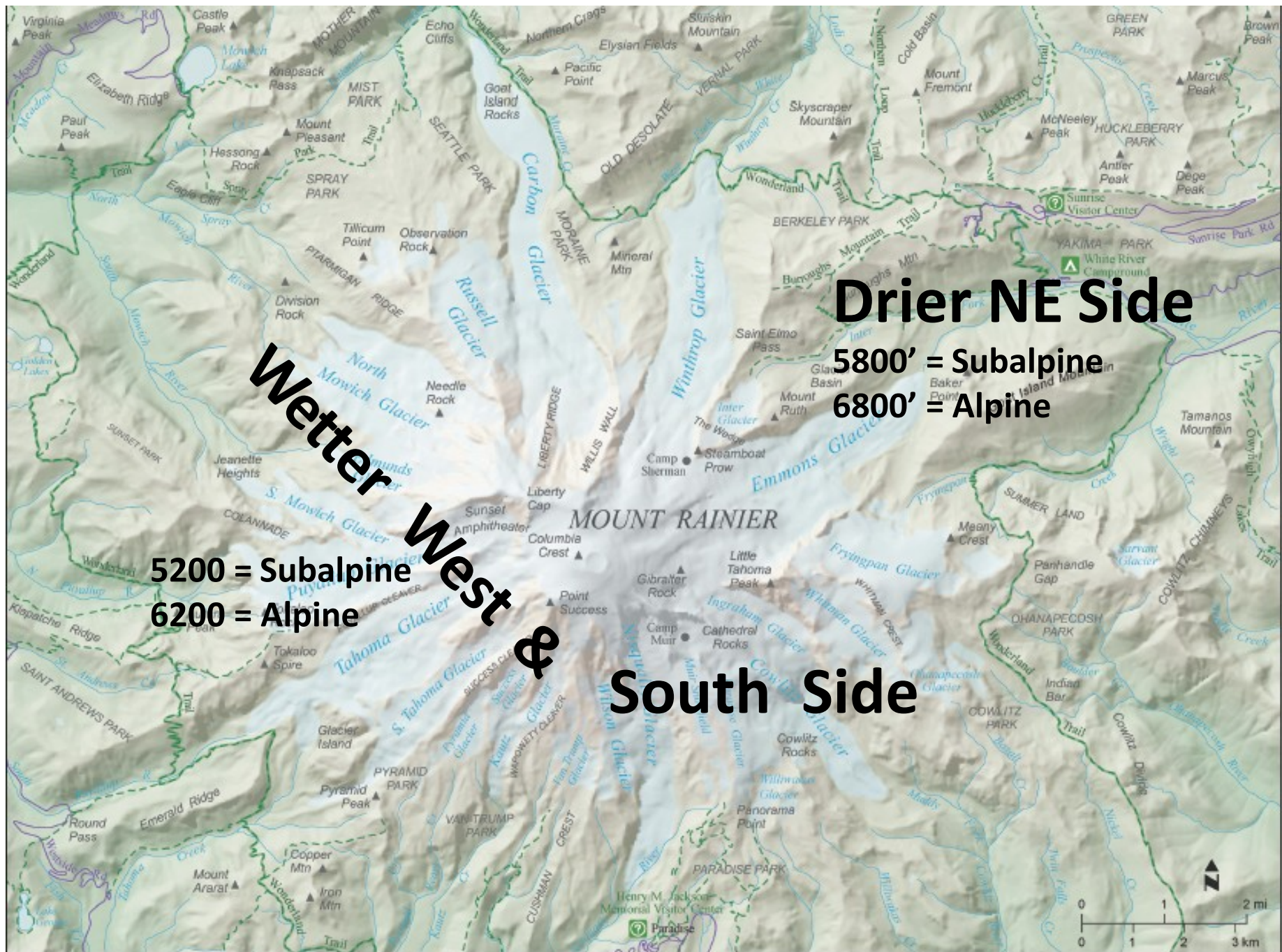
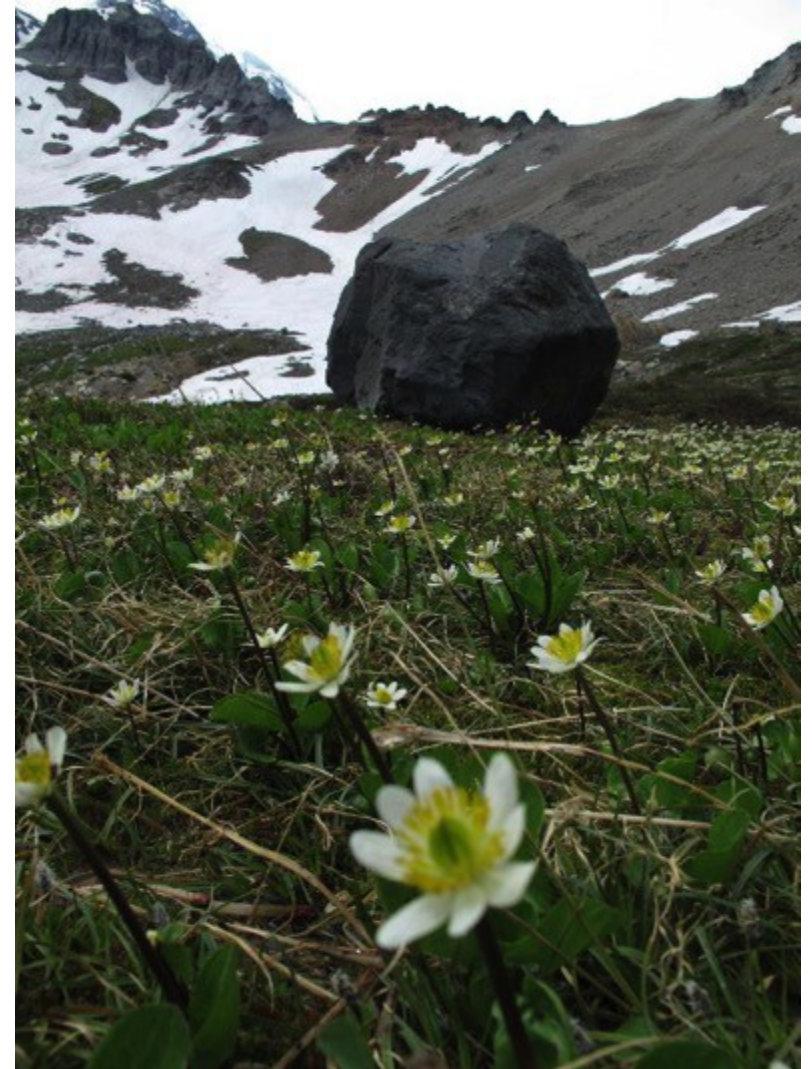


Figure 41. Mount Rainier's glaciers. Mount Rainier has the largest collection of glaciers of any single peak in the conterminous United States. The glaciers not only help carve the volcano's edifice, but also provide a source of water for lakes and groundwater for hydrothermal alteration.



Climate of Mt Rainier

- Special microclimates result from unique interactions of landforms and weather patterns.
- Knowing the amount of snow/rainfall and how the unique microclimates affect the vegetation will give you an idea of what will thrive in the area you visit.



Forest and Plant Communities of Mt Rainier

- The zones show regular patterns that result in “associations” of certain shrubs and herbs relating to the dominant, climax tree species.
- The nature of the understory vegetation is largely determined by the amount of moisture available and the microclimates that exist.

Forest Zones of Mt Rainier

- Western Hemlock Zone – below 3,000 ft
- Silver Fir Zone – between 2,500 and 4,700 ft
- **Mountain Hemlock Zone** – above 4,000 ft
 - Mt. Hemlock
 - Subalpine Fir
 - Alaskan Yellow Cedar



Since most of the field trips will start above 4,000 ft we will only discuss plants found in the **Mountain Hemlock Zone and above.**

This zone includes the **Sub-Alpine and Alpine Plant communities.**



Forest and Plant Communities of Mt Rainier

Subalpine Meadows

- An elevational zone just below timberline but above the reach of continuous tree or shrub cover. From 5000' to about 7000'. About 23 % of park.
- Tree cover & location of plant comm. is limited by the depth & duration of the snow pack.
- Rapid growing & reproducing plants = best forage for ungulates as well as smaller mammals & birds.
More productive than dense, mature forest where nutrients are held in the biomass.
- Support relatively high bird & mammal populations.



Forest and Plant Communities of Mt Rainier

Alpine Zone

- Above the last outposts of trees to the mountain's summit. 50% is permanent snow & ice
- Plants grow in cushions or mats, leaves are often insulated and protected by hairs and roots dig deeply. Best growth on shallow slopes littered with small rocks.



Typical lowland lupine



Alpine lupine



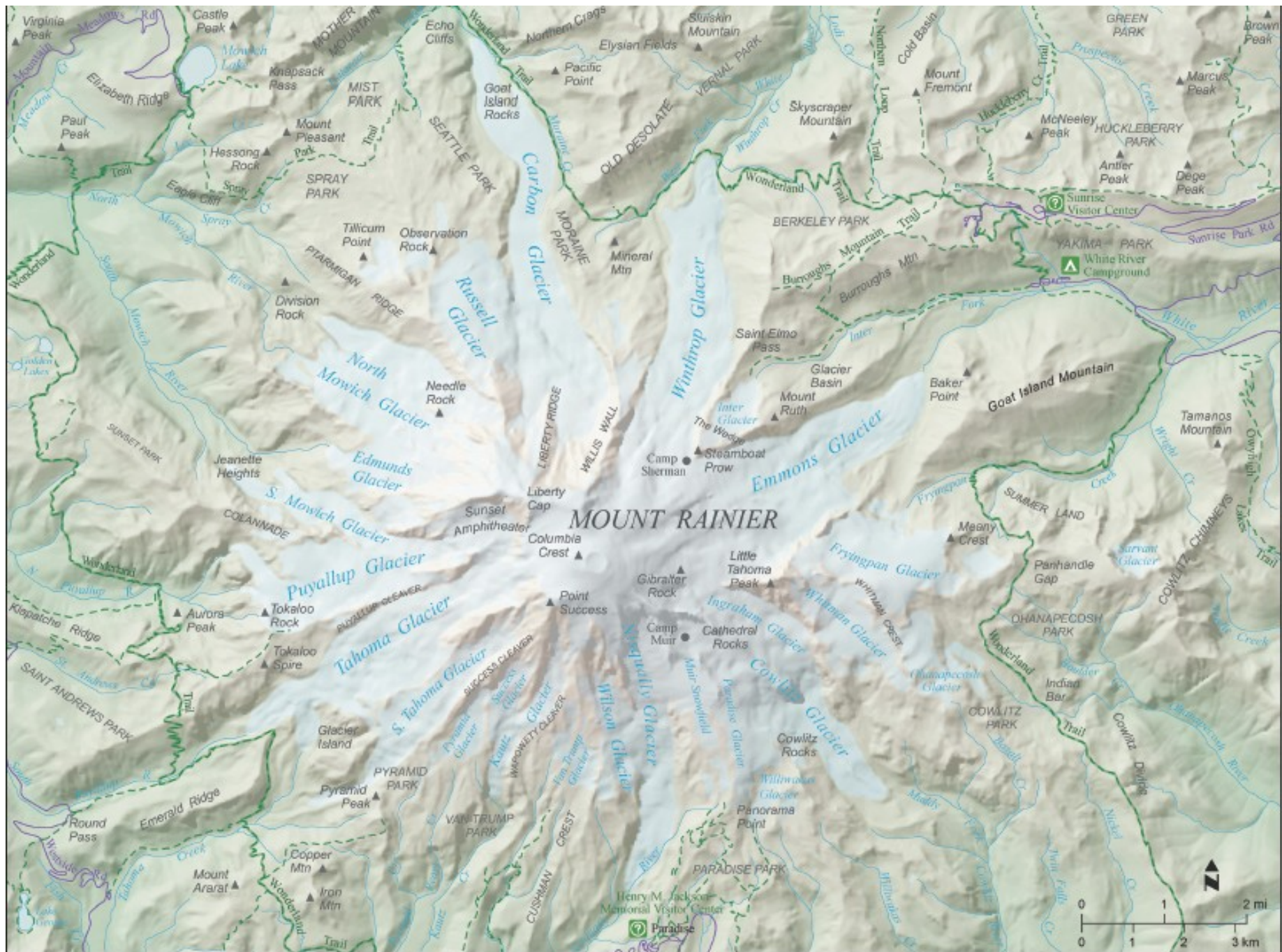
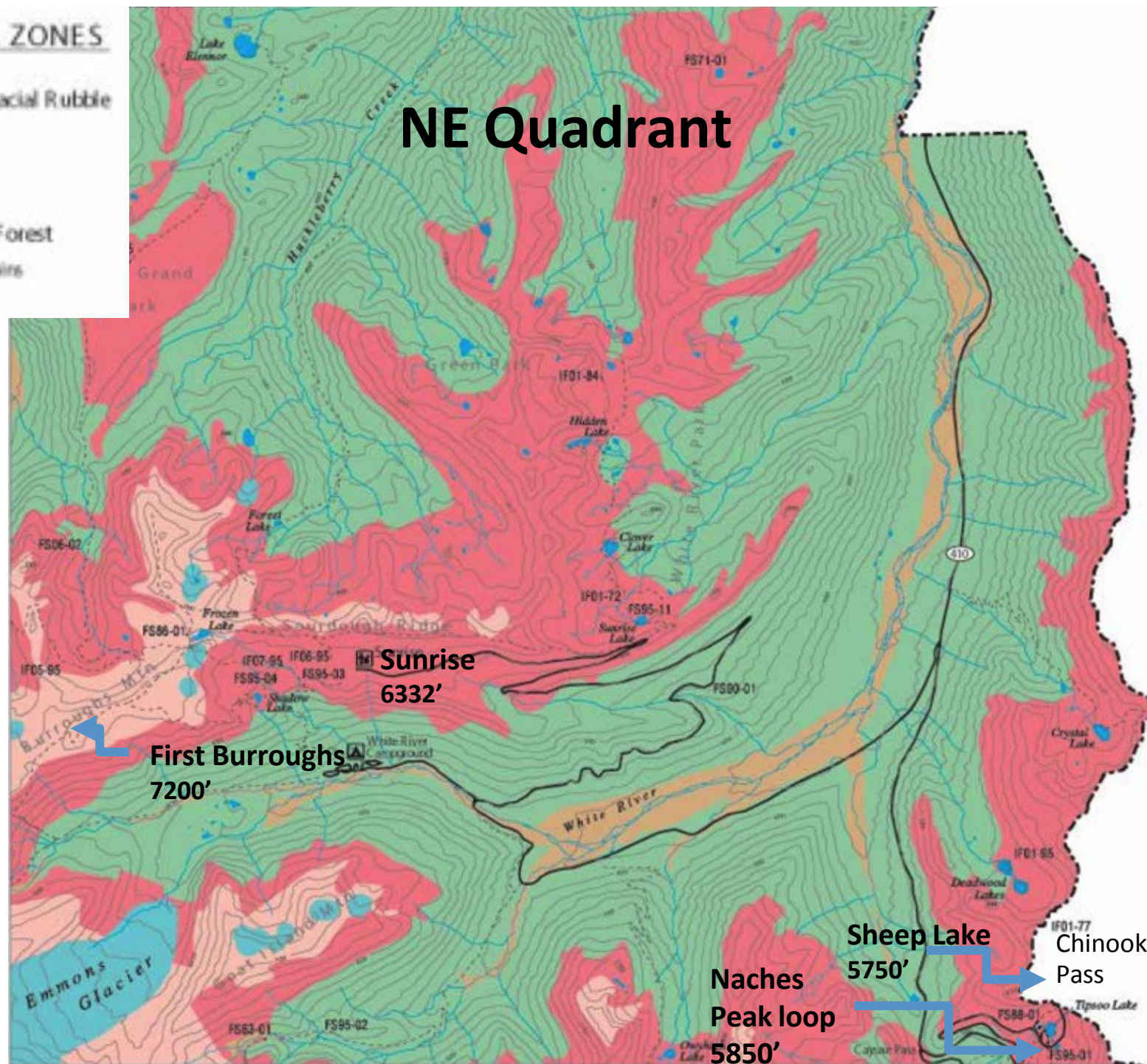


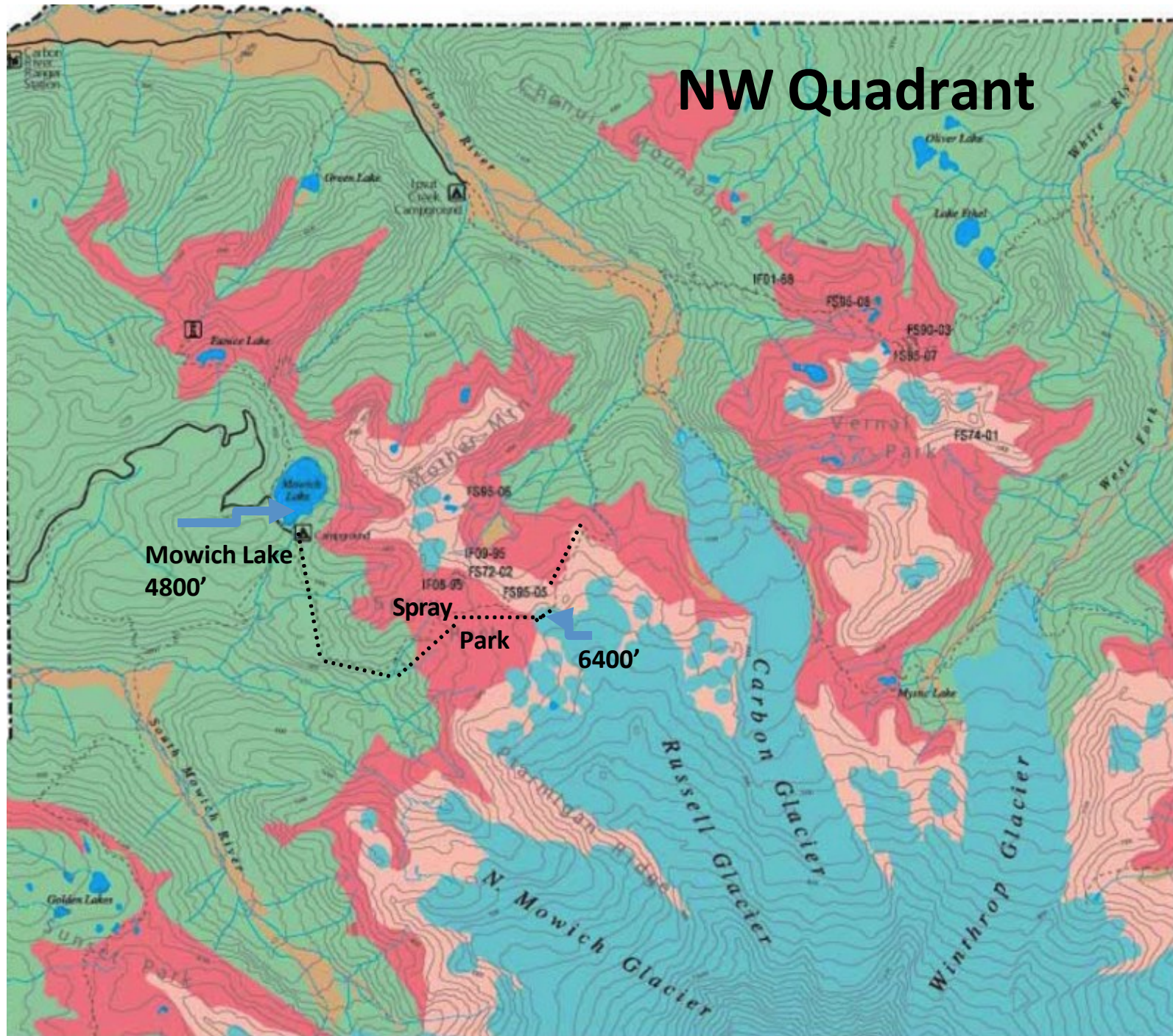
Figure 41. Mount Rainier's glaciers. Mount Rainier has the largest collection of glaciers of any single peak in the conterminous United States. The glaciers not only help carve the volcano's edifice, but also provide a source of water for lakes and groundwater for hydrothermal alteration.

ENVIRONMENTAL ZONES

- Perpetual Snowfields and Glacial Rubble
- Alpine Tundra
- Subalpine Parkland
- Northwest Maritime Forest
- High Energy Floodplains

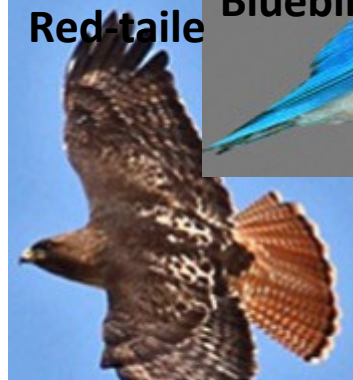


NW Quadrant



Some Subalpine birds in Sunrise Area

A. For 3 miles to the road end, the road traverses large meadows with dense clusters of subalpine tree species.



B. Around the visitor's Center -- very good



Chestnut-backed Chickadee



Horned Lark



**Some true Alpine birds in
Sunrise Area (Frozen Lake, 6,750')**

**Gray-crowned
Rosy-Finch**



American Pipit



White-tailed Ptarmigan

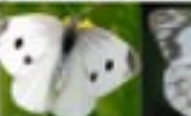
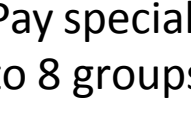
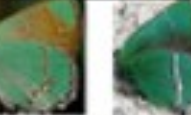
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Swallowtails (3-5) & Relatives	Subf: Papilioninae		
		Clover Parnassian	Mountain Parnassian
Swallowtails (3-5) & Relatives	Subf: Swallowtailinae		
		Western Tiger Sw.	Anise Sw.
Swallowtails (3-5) & Relatives	Subf: Swallowtailinae		
		Pale Tiger Sw.	Two-tailed Tiger Sw.
Swallowtails (3-5) & Relatives	Subf: Swallowtailinae		
		Oregon Sw.	India Sw.
Whites (2-5) & Sulphurs (2-5)	Subf: Whites		
		Cabbage W.	Pine W.
Whites (2-5) & Sulphurs (2-5)	Subf: Whites		
		Western W.	Saras Orange-tip Margined W.
Whites (2-5) & Sulphurs (2-5)	Subf: Whites		
		Wilson's W.	Large Marble
Whites (2-5) & Sulphurs (2-5)	Subf: Whites		
		Spring W.	
Whites (2-5) & Sulphurs (2-5)	Subf: Sulphurs		
		Orange Sulphur	Clouded Sulphur
Whites (2-5) & Sulphurs (2-5)	Subf: Sulphurs		
		Western Sulphur	Queen Alexandra's Sulphur
Gossamer Wings	Tribe: Coppers		
		Purplish Copper	Blue Copper
Gossamer Wings	Tribe: Coppers		
		F. Mariposa Copper	Lilac-bordered C. Nymph
Gossamer Wings	Tribe: Hairstreaks		
		Gray Hairstreak	Brown Elfin
Gossamer Wings	Tribe: Hairstreaks		
		W. Pine Elfin	Thicket Hestk
Gossamer Wings	Tribe: Hairstreaks		
		Cedar Hestk	W. Green Hestk
Gossamer Wings	Tribe: Hairstreaks		
		Sheridan's Gr. Hestk	
Gossamer Wings	Tribe: Coppers		
		F. Sylvan Hairstreak	Coral Hestk
Gossamer Wings	Tribe: Coppers		
		Behr's Hestk	Sooty Hestk
Gossamer Wings	Tribe: Coppers		
		Cathartes Hestk	
Gossamer Wings	Tribe: Blues		
		Western Tailed Blue	
Fritillaries (2-5)	Tribe: Fritillaries		
		Great Spangled Fritillary	Fritillary
Fritillaries (2-5)	Tribe: Fritillaries		
		Coronis F.	Zerene F.
Fritillaries (2-5)	Tribe: Fritillaries		
		Calippe F.	Hydaspe F.
Fritillaries (2-5)	Tribe: Fritillaries		
		Western Meadow (Lesser Fritillary) (L.75)	Fritillary

5 Families worldwide

Pay special attention to 8 groups

Size & color pattern.

Chart  Book

** on the survey I am about to show you

· Generally see a lot

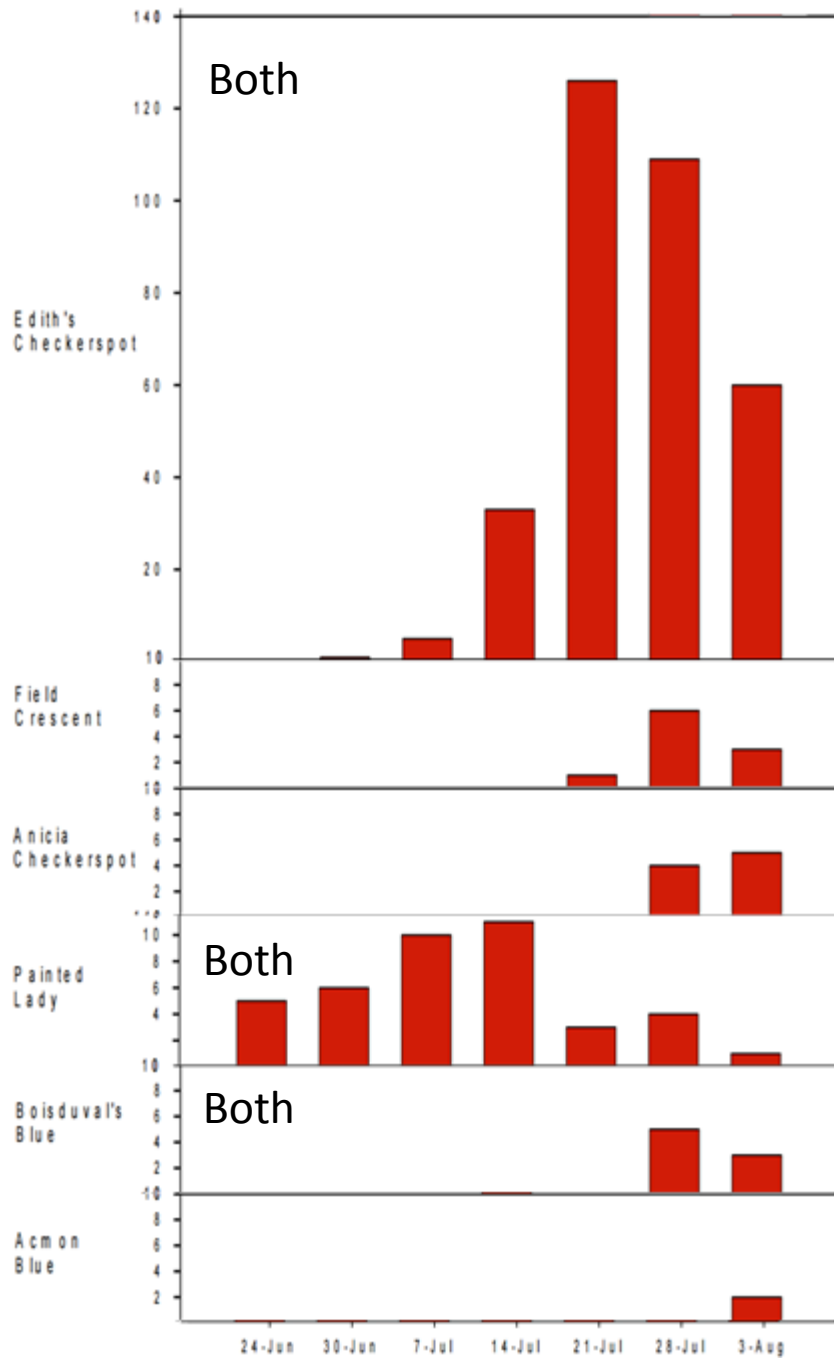
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Brushfoots	
Subf: Spiny Brushfoots	
Tribe: True Nymphs	Tribe: Checkers (2.25) & Crescents (1) Checkerspots    Anicia Checkerspot Edith's Checkerspot Chalcedona Check. Crescents     Mylitta Crescent Northern Cr. Field Cr. Hoary Comma Genus: Anglewings & Commas (2)   Satyr Anglewing Green Comma Genus: Tortoise Shell (2.5-3)   California Tortoise-shell Mourning Cloak Genus: Ladies (2-3)   West Coast Lady Painted Lady Genus: Admirals (3)  Lorquin's Admiral
	Subf: Satyrs, Browns, Ringlets   Ochre Ringlet Common Wood Nymph
	Subf: Milkweeds  Monarch (3)

2005 Sunrise Transect Data



2 ¼"



1"



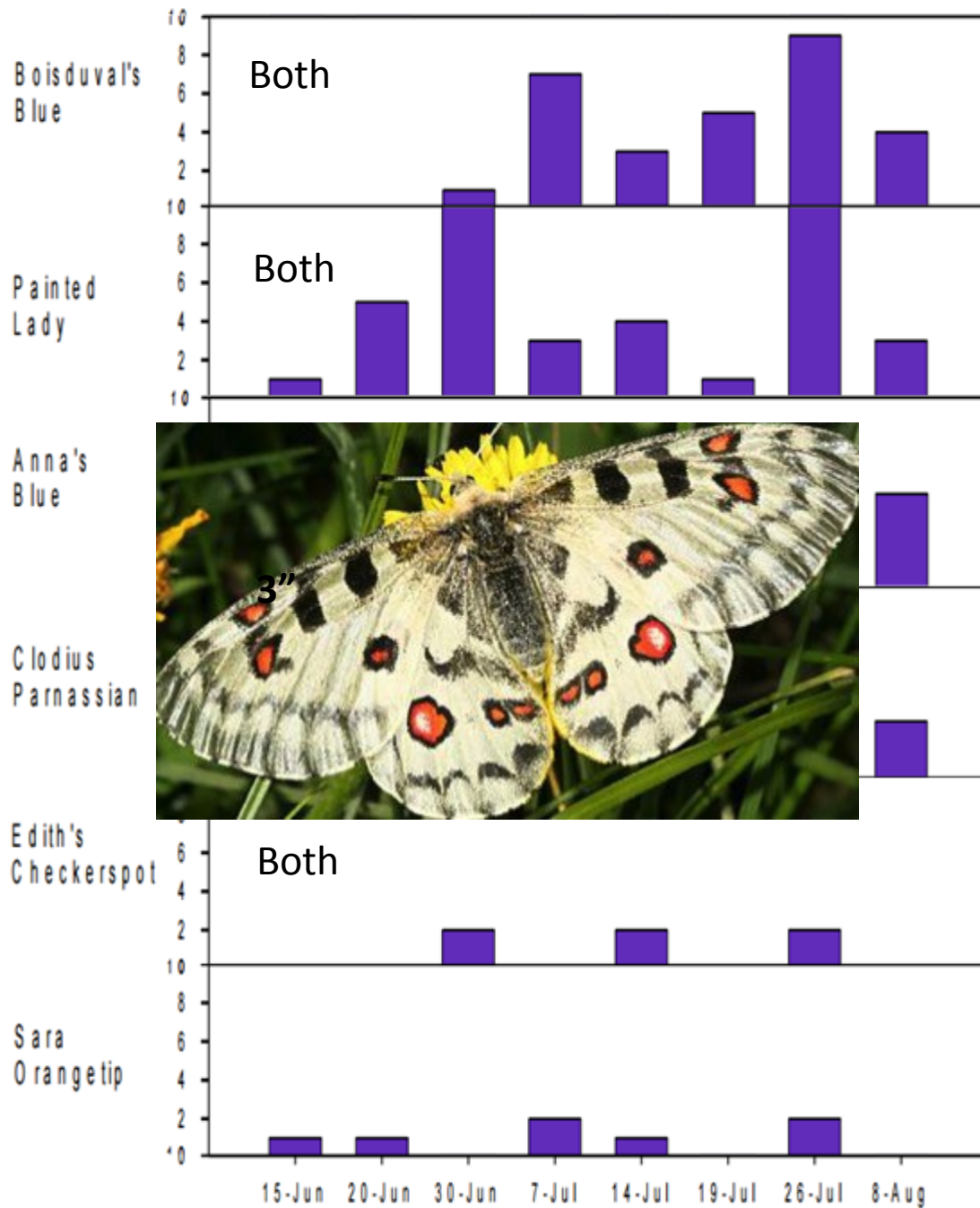
2 to 3"



1"



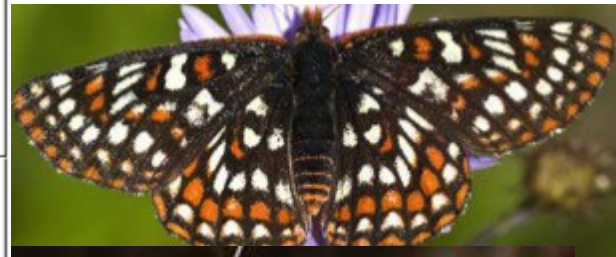
2005 Chinook Pass Transect Data



1"

2 to 3"

Painted Lady



2 ¼"



2"

Subalpine Fauna in Mt. Rainier N.P.

1. Red fox
2. Washington weasel
3. Canada lynx
4. Mountain lemming mouse
5. Rainier meadow mouse
6. Large-footed mouse
7. Oregon & heather voles
8. Rainier pocket gopher
9. Hoary marmot
10. Yellow pine chipmunk
11. Townsend chipmunk
12. Mantled ground squirrel
13. Snowshoe hare
14. Pika
15. Pine marten
16. Coyote
17. Black bear
18. Mountain lion
19. Elk
20. Black-tailed deer



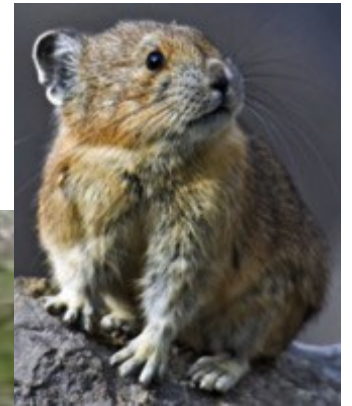
**Bigger.
Less dark**



Some Alpine Fauna in Mt. Rainier N.P.

These feed during the brief July through September summer.

1. Mountain goats
2. Pika
3. Marmots
4. Some small rodents



Forest and Plant Communities of Mt Rainier

Subalpine Meadows of Mount Rainier

- Divided into 5 communities (J Henderson 1988):
 - 1) Heather Huckleberry Comm.....**"Huckleberry heather meadows"**
 - 2) Sitka Valarian-Showy Sedge Comm.....**"English cottage garden"**
 - 3) Mountain Bunchgrass Communities.....**"Grasslands"**
 - 4) Black Alpine Sedge Communities..... **"Taller grassland"**
 - 5) Low Herbaceous Communities.....**"Plant clumps on bare ground"**

Subalpine Meadows of Mount Rainier

1. Heather Huckleberry Communities

- Dense, low shrubs dominated by heather & huckleberry.
- South and west sides of Mt Rainier.
- **Heath Family** - White, Pink and Yellow Heathers ; Cascade Blueberry



Also

- 1) **Pea Family** - *Sub-alpine Lupine*
- 2) **Aster Family** - Woolly Pussytoes
- 3) **Rose Family** - Partridgefoot
- 5) **Broomrape Family** -- Magenta Paintbrush; Bird's Beak Lousewort
- 6) **Buckwheat Family**- American Bistort
- 7) **Grass Family**- Mountain Hairgrass



Subalpine Meadows of Mount Rainier

2. Sitka Valerian-Showy Sedge Communities....."English Cottage Gardens"

- Tall, dense, lush stands of perennial wildflowers that are found all around the park. Especially on the south and west sides of the Park,
- On moderate to steep slopes
- The growth of shrubs (including the heathers and huckleberries) and trees is suppressed by avalanches.
- In addition to Sitka Valerian & Showy Sedge**, important species include:

Also:

- | | |
|--|--|
| 1) Pea Family - Sub-alpine lupine ** | 6) Broomrape Family - Magenta paintbrush |
| 2) Buckwheat Family - American bistort ** | 7) Aster Family - Subalpine daisy** |
| 3) False Hellebore Family - Green false hellebore | 8) Parsley Family -Cow parsnip; Gray's lovage |
| 4) Lily Family - Glacier lily; Avalanche lily | 9) Rose Family - Fan-leaf cinquefoil |
| 5) Buttercup Family - Western pasqueflower** | |



Subalpine Meadows of Mount Rainier

3. Mountain Bunchgrass Communities....."Grasslands"

- Grassy meadows of Mountain Bunchgrass
- On the drier east side of the park, which receives less snow & rain (rain shadow)
- Soils are dry and loose. The prevailing wind has, over the centuries, favored the area with pumice and ash from eruptions (Sunrise timberline).

1) **Grass Family** - Green mountain bunchgrass **

2) **Sedge Family** - Showy sedge**

3) **Aster Family** - Cascade aster**

4) **Rose Family** - Fan-leaf cinquefoil

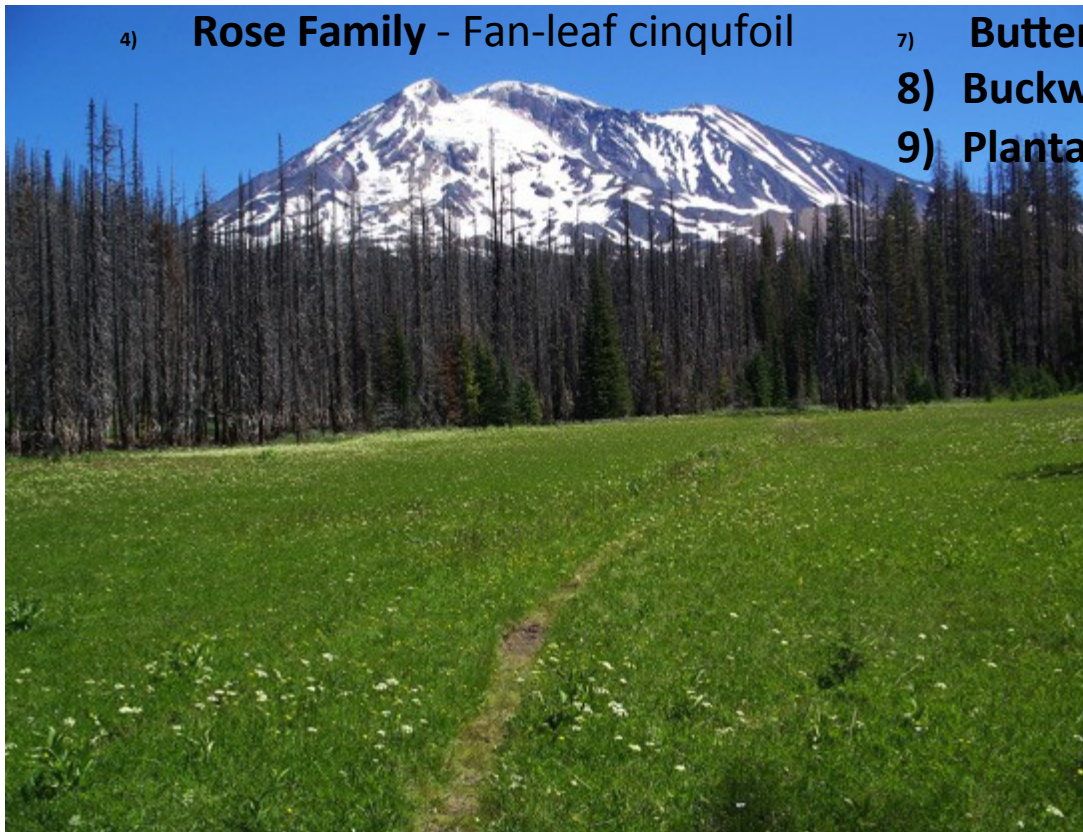
5) **Purslane Family** - Western springbeauty

6) **Parsley Family** - Gray's lovage

7) **Buttercup Family** - Western pasqueflower;

8) **Buckwheat Family** - American bistort

9) **Plantain Family** - Cusick's veronica



Subalpine Meadows of Mount Rainier

4. Black Alpine Sedge Communities....."Taller Grasslands"

- Dense mats of black sedge.
- Areas with persistent late-season snow.
- Very short growing season.

Also:

- 1) **Pea Family** - Sub-alpine lupine
- 2) **Aster Family** - Tundra aster
- 3) **Rose Family** - Fan-leaf cinquefoil , Partridgefoot
- 4) **Evening Primrose Family** - Alpine willow-herb
- 5) **Grass Family** - Mountain hairgrass



Showy Sedge

Sedge Family –

Black alpine sedge**

and Showy sedge**



Subalpine Meadows of Mount Rainier

5. Low Herbaceous Communities.....“Plant clumps on bare ground”

- Dominated by mosses, in areas of disturbance or unstable soil.
- Vegetation grows in clumps, possibly with patches of bare ground visible.

- 1) **Sedge Family** - Black alpine sedge**
- 2) **Saxifrage Family** - Tolmie's saxifrage**
- 3) **Aster Family** - Slender hawkweed

4) **Rose Family** - Partridgefoot**, Woolly pussytoes

5) **Purslane Family** - Pussypaws

6) **Valerian Family** - Sitka valerian

7) **Grass Family** - Mountain hairgrass



Alpine Meadows of Mount Rainier

- From tree line to the mountain summit. Type and location of vegetation is controlled by length of the growing season, slope, and exposure to the sun
- Permanent snow and ice covers about 50 percent of the zone. Alpine vegetation covers the remainder---divided into four broad vegetation types (Edwards 1980):
 - 1) **Fellfields** - Areas with gentle slopes covered by small rocks, and small persistent patches of snow. Has small dispersed groups of plants.
 - 2) **Talus Slopes and Ridgetops** - Steep, unstable areas. First to be snow free so have a longer growing season. Small, groups of plants often overlooked
 - 3) **Snow beds**-have the shortest growing season. Areas can have meadows with cold wet soil, streams and tarns.
 - 4) **Heather Communities**. Oldest known community of vegetation in the park. Persisted for up to 10,000 years.



Alpine Plants

Pussypaws, Golden draba, Golden daisy, Elegant Jacob's Ladder,
Dwarf lupine, Tolmei's Saxifrage, Alpine buckwheat,
Alpine willow-herb, Smelowskia, stonecrops---
and of course the heathers.



Pussypaws



Dwarf Lupine



Smelowskia



Elegant Jacob's
Ladder



Alpine Buckwheat



Pink Mt. Heather

**Some common flowers & shrubs
in the subalpine & alpine zones of
Mt. Rainier N.P.**

The Figwort* Family includes some of the NW's most interesting flowers.

Mount Rainer is a great place to see all of the Figwort* species.



Flowering parts in 3s (or multiples)

Leaves with parallel veins

Lily, Orchid, & Iris

Flowering parts in 4s

Leaves with veins in branching pattern

Evening Primrose
Mustard

Flowering parts in 5s (leaves with branching veins)

Flowers with **bilateral symmetry**

Petals fused

Petals free

Mint
Figwort

Pea
Violet
Buttercup - some

Flowers with radial symmetry

Many **small flowers in tight bunches**

Buckwheat
Parsley
Waterleaf
Valerian
Rose - some

Flowers not in tight bunches

Flowers with **central clusters** or seemingly so
(more than 10 stamens crowding the center)

Buttercup
Rose
Sunflower – technically
belongs with “Many small
flowers in tight bunches”

Normal flowers (10 or fewer stamens)
(or just use the “handles” to Id. these 7 Families)

Pink
Purslane
Saxifrage

Petals fused

Petals free (or nearly so)

Heath
Phlox
Primrose
Borage

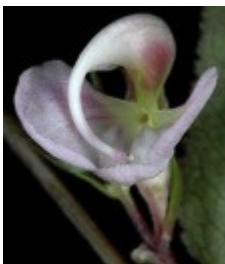
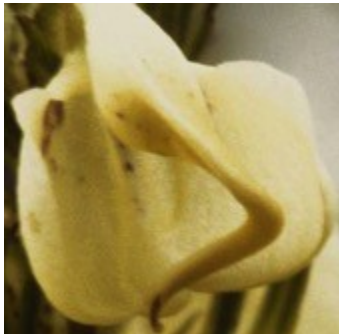
Key to common plant families

Figwort (Broomrape) Family

Louseworts (Pedicularis) (a genus)



General
1 – 2' high



Leaves
Mostly basal
Mostly fern like



Louseworts or *Pedicularis* have perhaps 500 hemiparasitic species that produce *haustorial* connections upon contact with roots of surrounding host plants. There is no known host specificity. With a few exceptions, species in our area are restricted to high elevations.

- Name comes from ancient superstition that cattle gets “lousy” (having lice) by eating louseworts.
- Each flower shape fits the anatomy of a particular species of insect pollinator and in a few instances, hummingbirds.

Hemiparasitic – a green plant that obtains nutrients via parasitism, but also manufactures its own food through photosynthesis.

Hhaustorial---the portion of a parasitic plant or fungus that penetrates the host’s tissue and derives nutrients from it.

Several species of Louseworts



Sick Lousewort



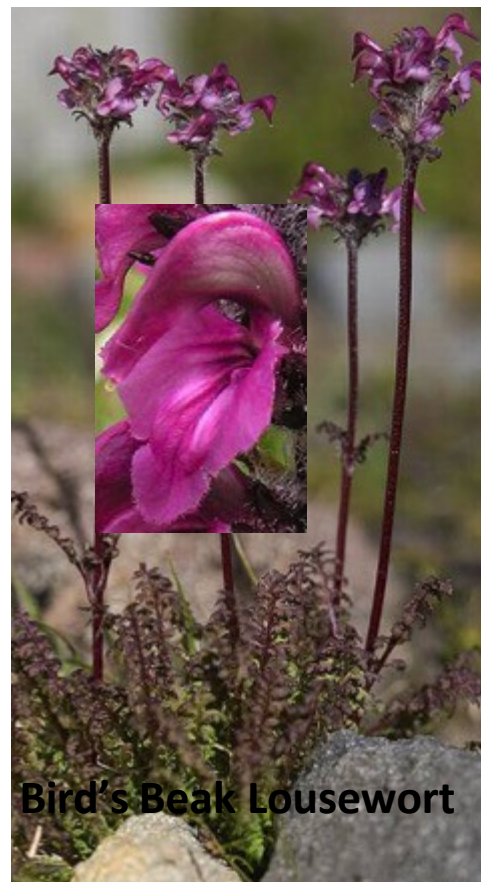
Bracted Lousewort



Elephant's Head



Mt. Rainier Lousewort



Bird's Beak Lousewort



Coiled Beak Lousewort

Figwort (Broomrape) Family

Paintbrushes (Castilleja)



Leaves

All along stem
Tip lobed or not



Flower

Crowded in axils of showy bracts.
Long, tubular with beaklike tip
Often greenish.

General

1 – 1 1/2' tall

Bracts

"Brush" is not flower. The
leafy bracts surround flowers &
resemble brush dipped in paint.
Yellowish or reddish



Indian Paintbrush or Castilleja are also partially parasitic on other plant roots---hemiparasitic.

The flowers of Indian paintbrush are edible and sweet, and were consumed in moderation by various Native American tribes as a condiment with other fresh greens.

However, these plants absorb and concentrate selenium in their tissues from the soils in which they grow, and can be potentially very toxic if the roots or green parts of the plant are consumed. So, you need to be confident of the actual edible part before eating.

Hemiparasitic – a green plant that obtains nutrients via parasitism, but also manufactures its own food through photosynthesis.

Several types of Paintbrush (species & subspecies)



Figwort (Lopseed) Family

Monkeyflower (Erythranthe)



General
Erect – 1-3'
Wet areas .



Leaves
Prominently veined.
Toothed.



Flower
Yellow or pinkish.
"Ahhhh" with
tongue out.

Monkeyflowers are a small group, concentrated in two centers of diversity, one in Australia, the other in western North America.

- Members of this group occur in diverse habitats including deserts, river banks and mountains.
-
- Mostly wet, wet, wet.
Bearing tubular, bilaterally symmetric flowers---2 upper 3 lower

Figwort (Plantain) Family

Penstemon (Penstemon)

General
Cushion to erect



Flower
Tubular
Blue to purple



Leaves
Opposite.
Toothed or not.
Small or large.



Penstemon

- 250 species in North America-They are difficult to identify.
- Native Americans used penstemon roots to relieve toothache.

Several types (species) of Penstemon



Figwort (Plantain) Family

Speedwell (Veronica)

General

Erect . 4-8"
Wet areas .

Flower

More weakly bilateral.
4 lobed. 2 stamens.
Generally, long stamens & pistil.

Leaves

Opposite.
Ovate generally.



Cusick's Speedwell
Veronica cusickii

Saxifrage Family (5)

Leaves



Bare flower stems

Medium sized &
broad shaped

Leaves

Clearly basal



or tiny & linear

Saxifrage Family Flowers



Most often in clusters, loose or tight

Small.

White (usually).

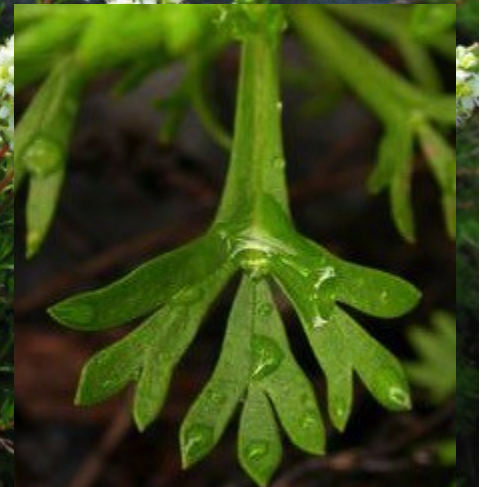
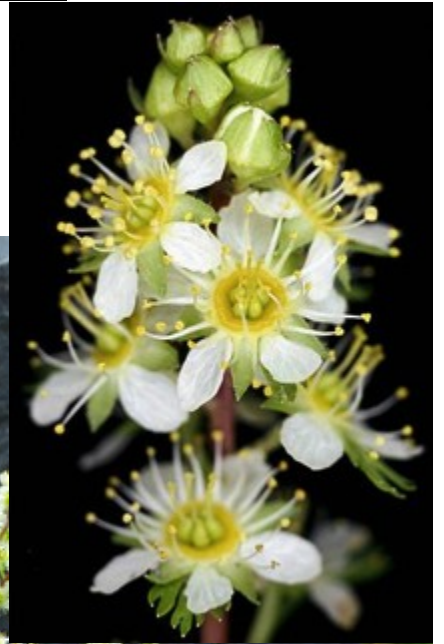


Family: Rose Family (5)

We have already discussed the Rose Family in past classes. Our intent here is to introduce you to some of the genera that are unique to the alpine and sub-alpine areas.

Partidgefoot Rose Family

- Mats Upright
- stems White
- flowers in dense spikes
- Found where snow persists



Fan-leaved Cinquefoil Rose Family

- **Low perennial**
- **Flowers yellow** (not shiny).
Leaves a little like a strawberry leaf
- **Subalpine meadows, stream banks and seeps**



Subalpine Spirea

Rose Family

- 1-4 ft shrub
- Flowers, rose-pink in showy flat-topped clusters
- Alternate leaves ovals serrated $\frac{1}{2}$ length



Cascade Mountain Ash

Rose Family

- Large deciduous shrub – 16 ft
- 9-17 leaflets that are toothed along the full length and sharp pointed.
- White flower cluster.
- Red-orange berries in the fall



Sitka mountain-ash to 10'
Sorbus sitchensis



Shorter leaflets & rounded tips
Serrations no more than $\frac{1}{2}$ length

Family: Heath Family (4)

Mountain Heathers

Pink Mtn Heather

Yellow Mtn Heather

White Mtn Heather



White-flowered Rhododendron



Without the flowers these two can look very similar.

- The Rhododendron leaf is shiny green on top.

False Azalea or Fools Huckleberry



Sitka Valerian

Valerian Family

- Tall plant. To 3'
- Compound leaves, basal, opposite---leaves coarsely toothed



The End
Enjoy the flora
& fauna!!!!

