Oregon Geology - Parent of the Soil, Foundation for the Vine

By **Ray Wells**[1]

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U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

[1] Menlo Park, Calif.

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Oregon Geology - Parent of the Soil, Foundation for the Vine

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Project Chief, Pacific Northwest Urban Corridor Geologic Mapping

Project Website: http://geology.wr.usgs.gov/wgmt/pacnw

Cooperators - Alan Campbell, Chemeketa Community College, Salem, Oregon

Dave Johnson, Natural Resources Conservation Service, Salem, Oregon

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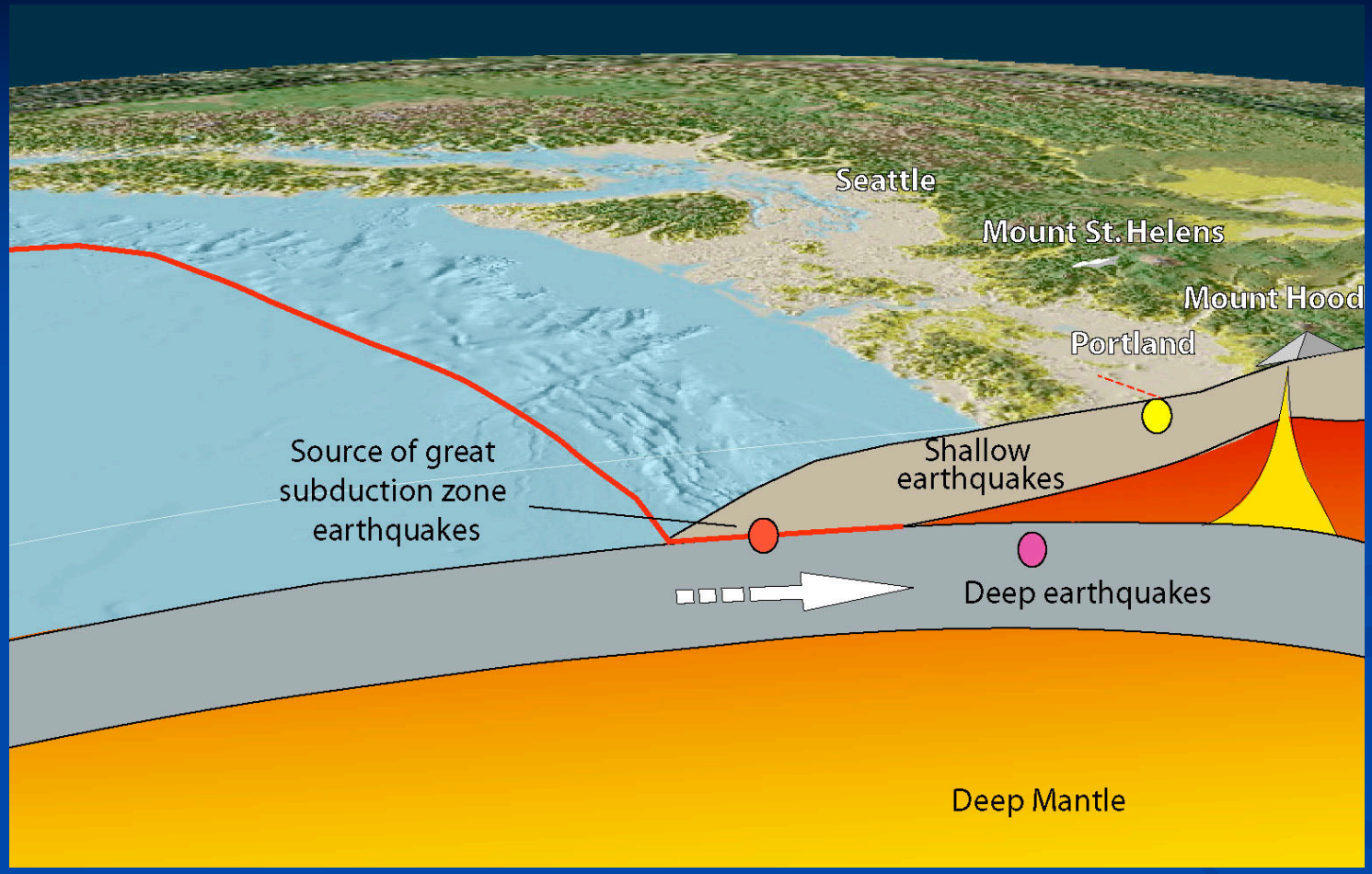
Here we are on the leading edge….



- This is where the Juan de Fuca oceanic plate dives beneath North America and sinks into the earth's deep mantle.
- This zone of convergence is called the Cascadia subduction zone, and it is the source of our rocks, geologic hazards, and landscape.

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Outline of Talk

- Rationale for USGS Geologic Mapping in Oregon
- Geologic map products
- Thumbnail sketch of geologic history
- New mapping in progress - NW Oregon
- Tour of NW Oregon geologic units
- Online sources of information

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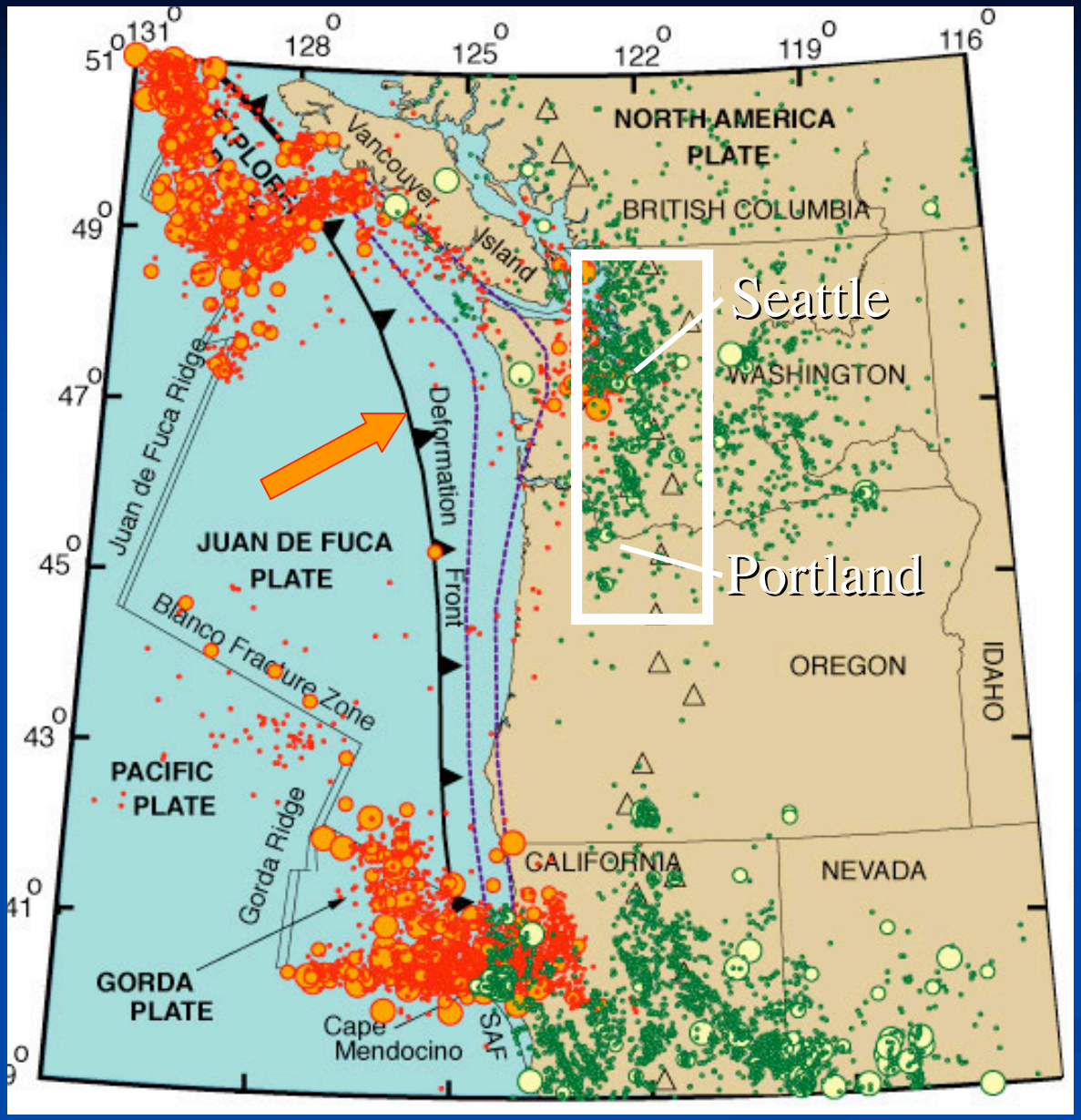

Subduction creates earthquakes and volcanoes

Urban Corridor is seismically active and is an area of intense study by USGS.

Earthquakes:
Green = N. Am plate
Red = J. de Fuca plate
Triangles=major volcanoes

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Earthquakes are created by motions of crustal blocks

- Small plates and blocks are dragged northward by Pacific Plate
- Blocks collide with one another - a terrane wreck - as they encounter the fixed buttress of Canada.

(from Wang et al., 2003, modified from Wells et al., 1998, Wells and Simpson, 2001; see also Magill et al., 1982; Walcott, 1993; Pezzopane and Weldon, 1993; Argus and Gordon, 1991)

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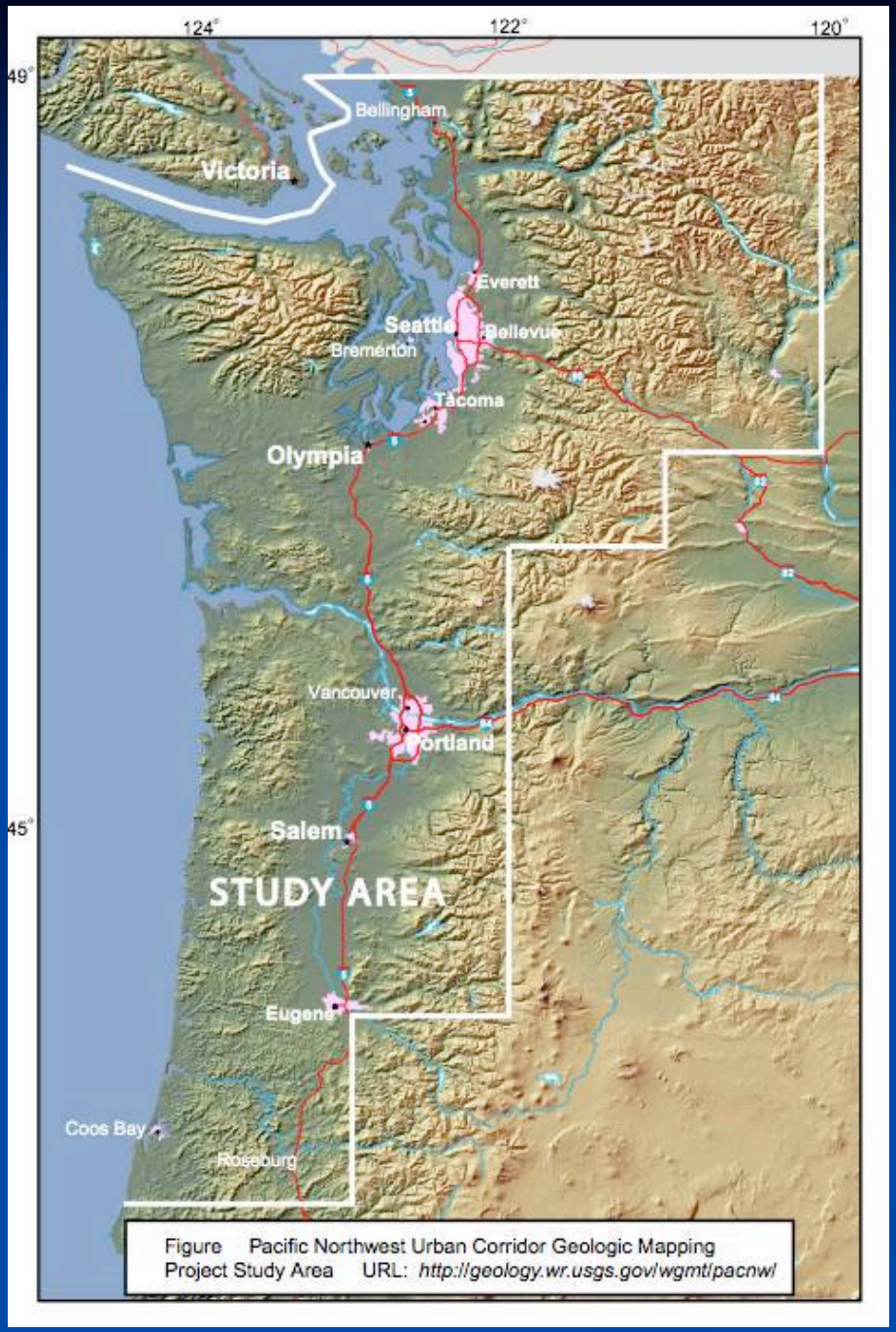

Geologic mapping is focused on convergent margin and I-5 Urban Corridor.

- Provide information useful for geologic hazard and resource assessments.
  - Distribution, age, and composition of geologic units (rocks and sediments)
  - Geometry and age of geologic structure (folds and faults)

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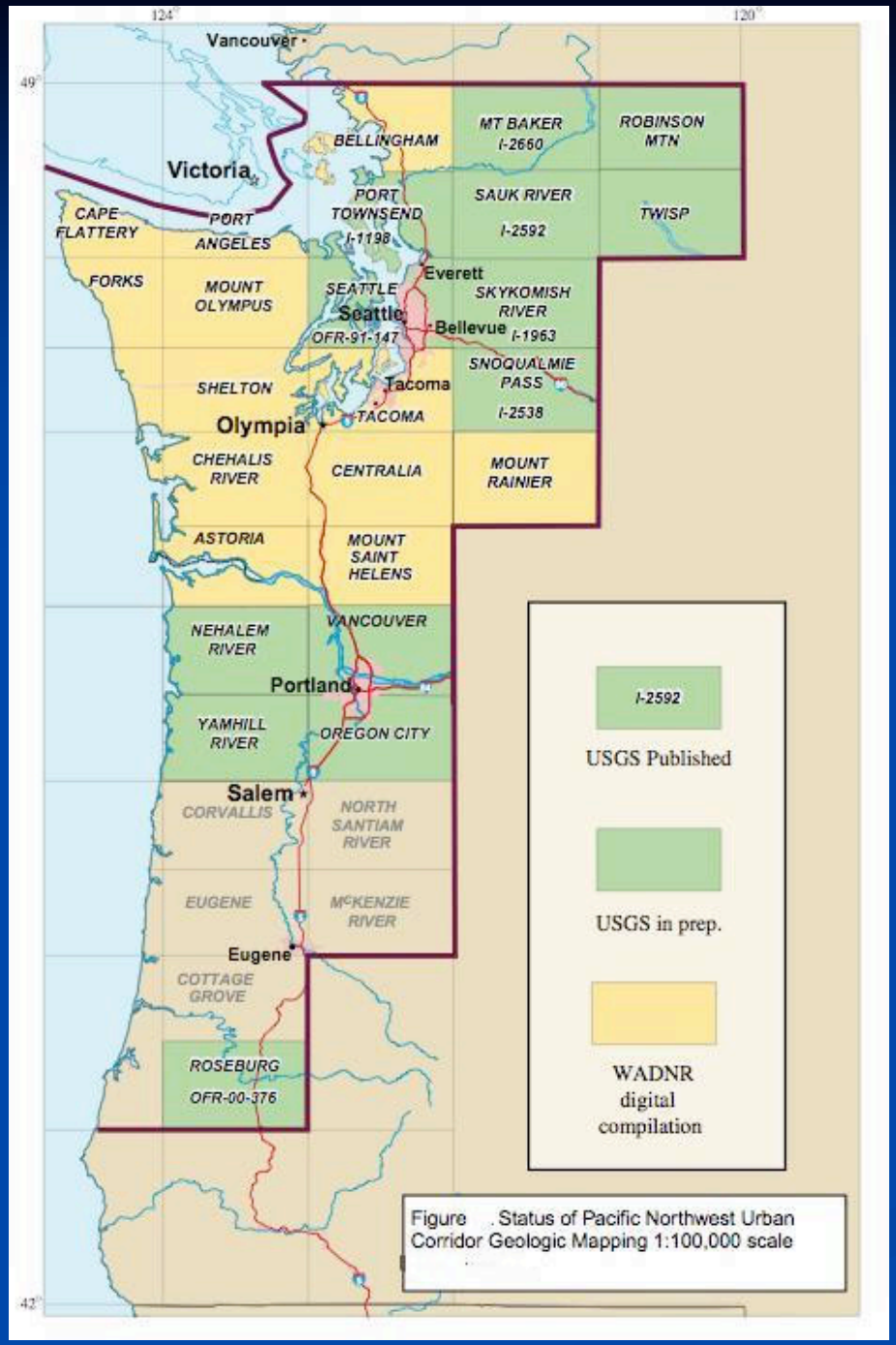

Figure . Status of Pacific Northwest Urban Corridor Geologic Mapping 1:100,000 scale

100 K Geologic Mapping

- Scale - 1:100,000 (1 inch on map = 1.6 miles on ground)
- On the web as PDFs and ArcGIS files
- State of Washington has complete digital geologic coverage at this scale (WADNR)
- State of Oregon in progress

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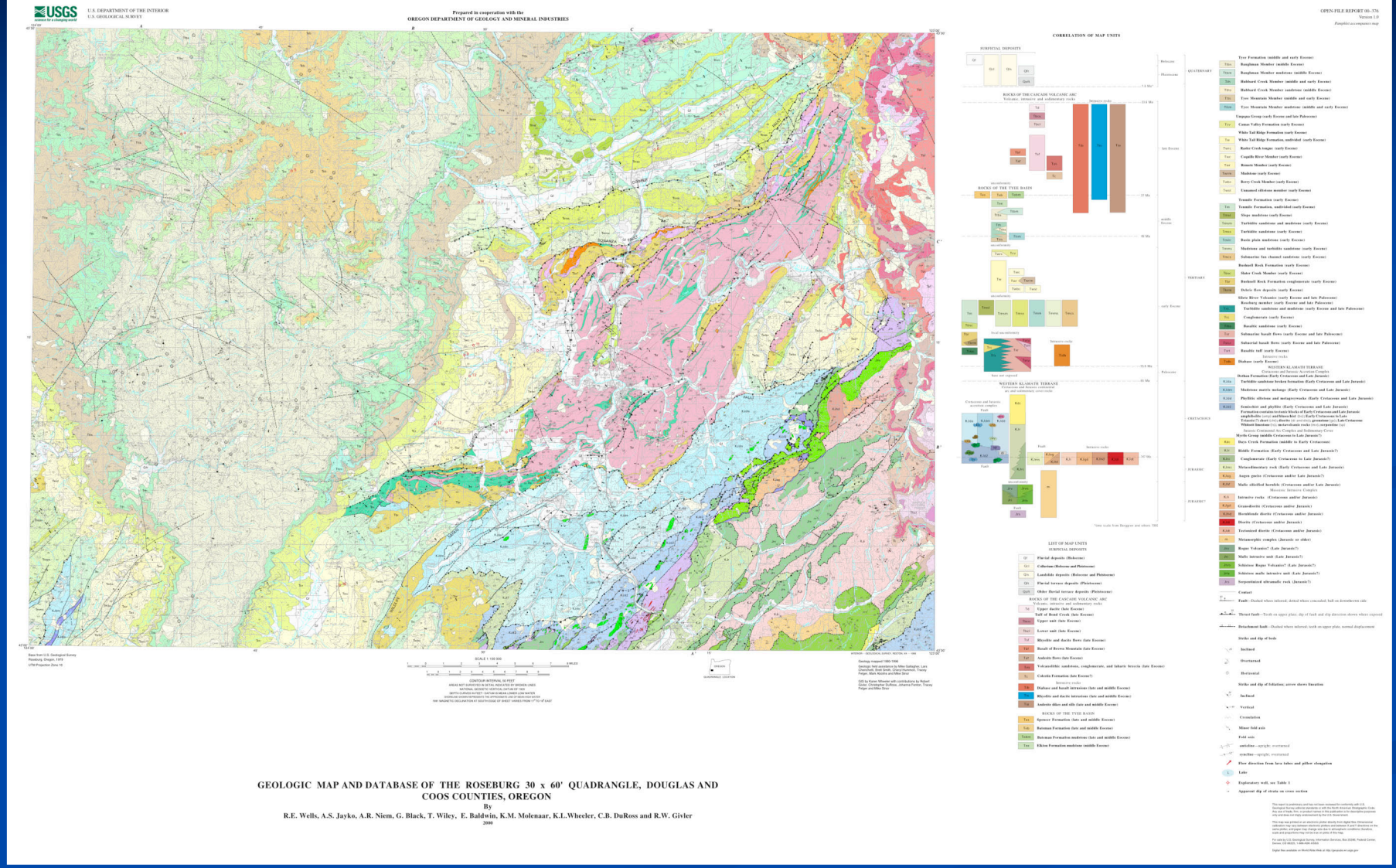
Geologic Map of Roseburg 100,000-scale quad



- Online at http://geopubs.wr.usgs.gov/open-file/of00-376/

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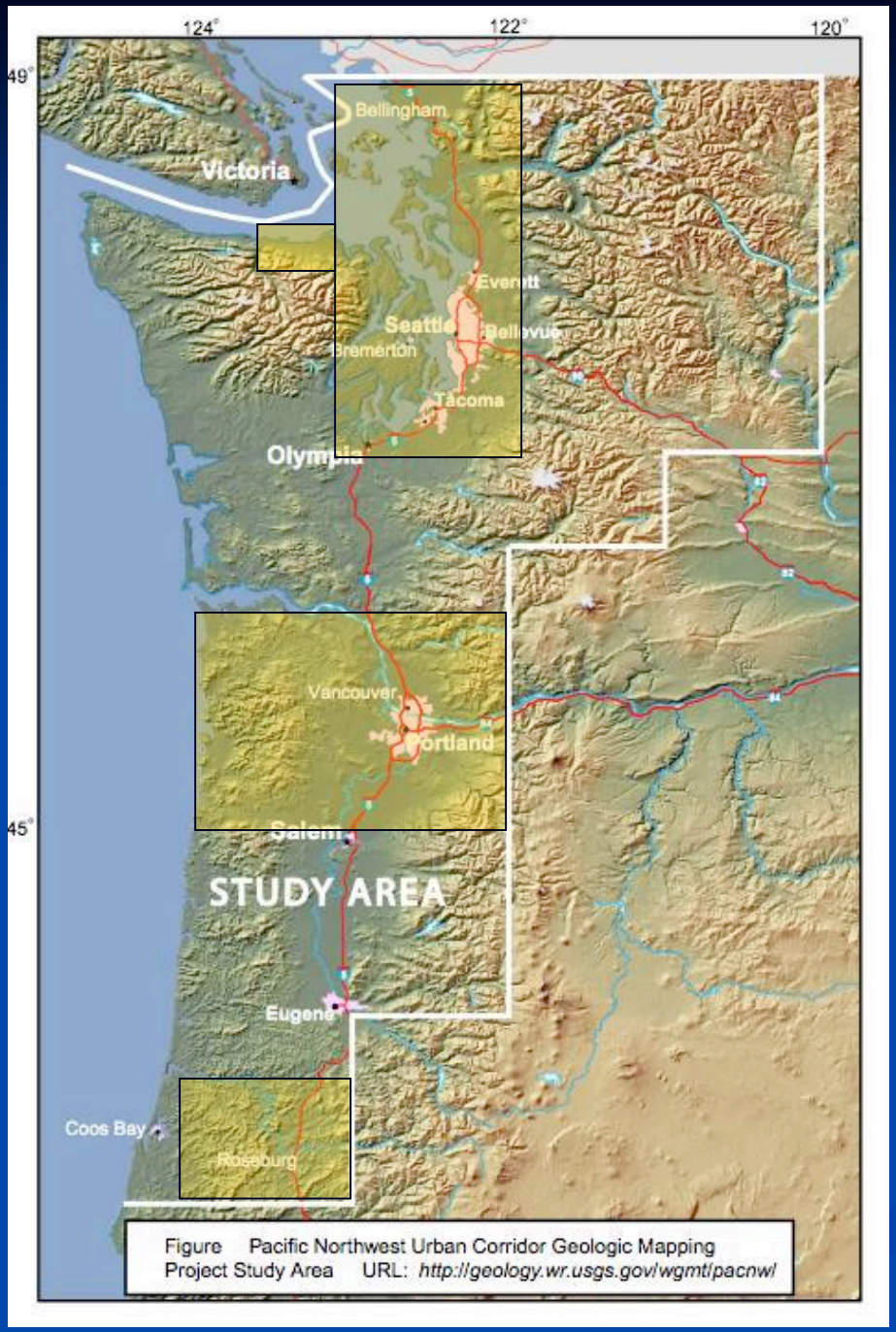

7.5' quad geology

- More detail - Scale is 1:24,000 (1 inch on map = 0.38 miles on ground)
- I-5 Urban Corridor
- On line as PDFs and ArcGIS geodatabases
- OR and WA state surveys (DOGAMI and WADNR) also publish similar maps

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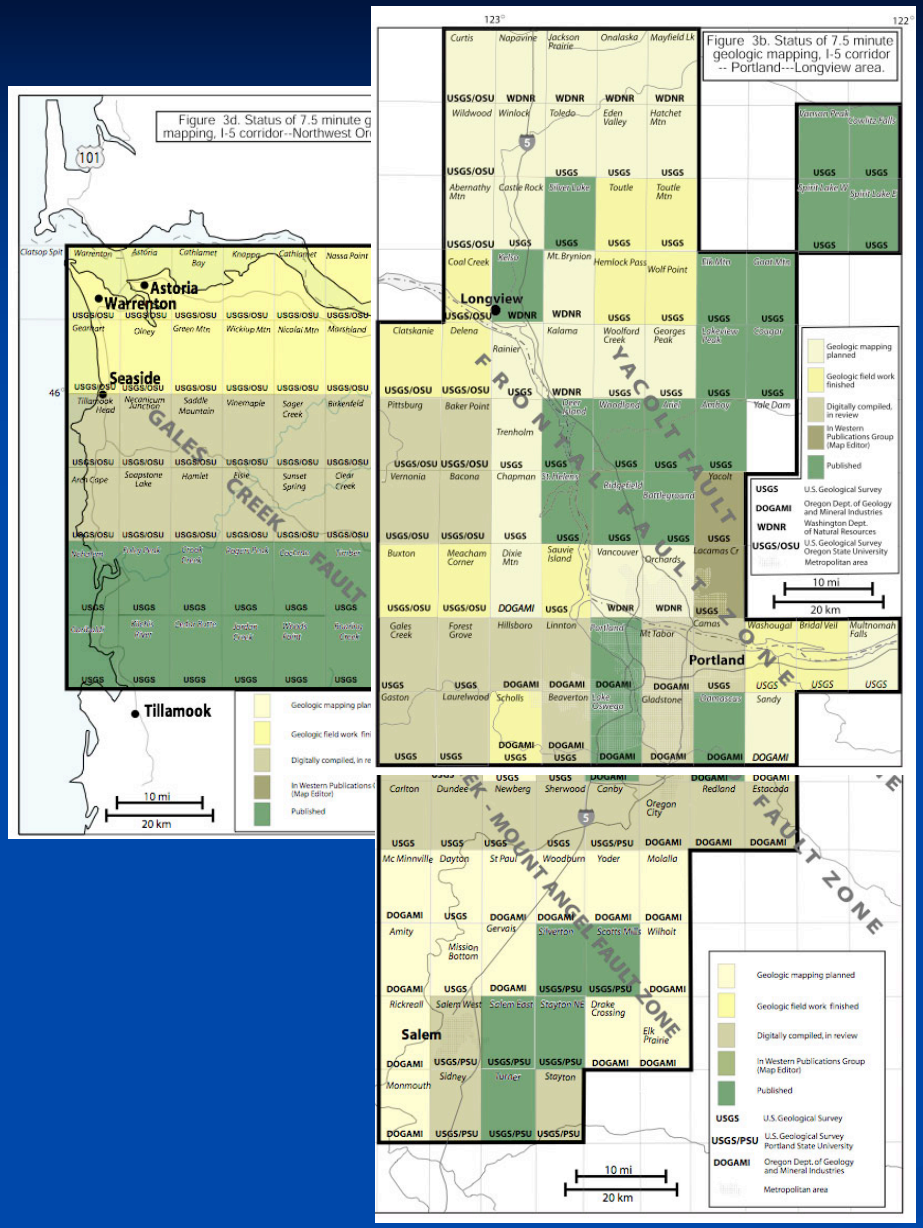
Status of 7.5' mapping Portland-Salem area



- 139 7.5' quads published or in progress by USGS, DOGAMI, WADGER, OSU, and PSU along I-5 corridor and major fault zones
- All will be digital and available online

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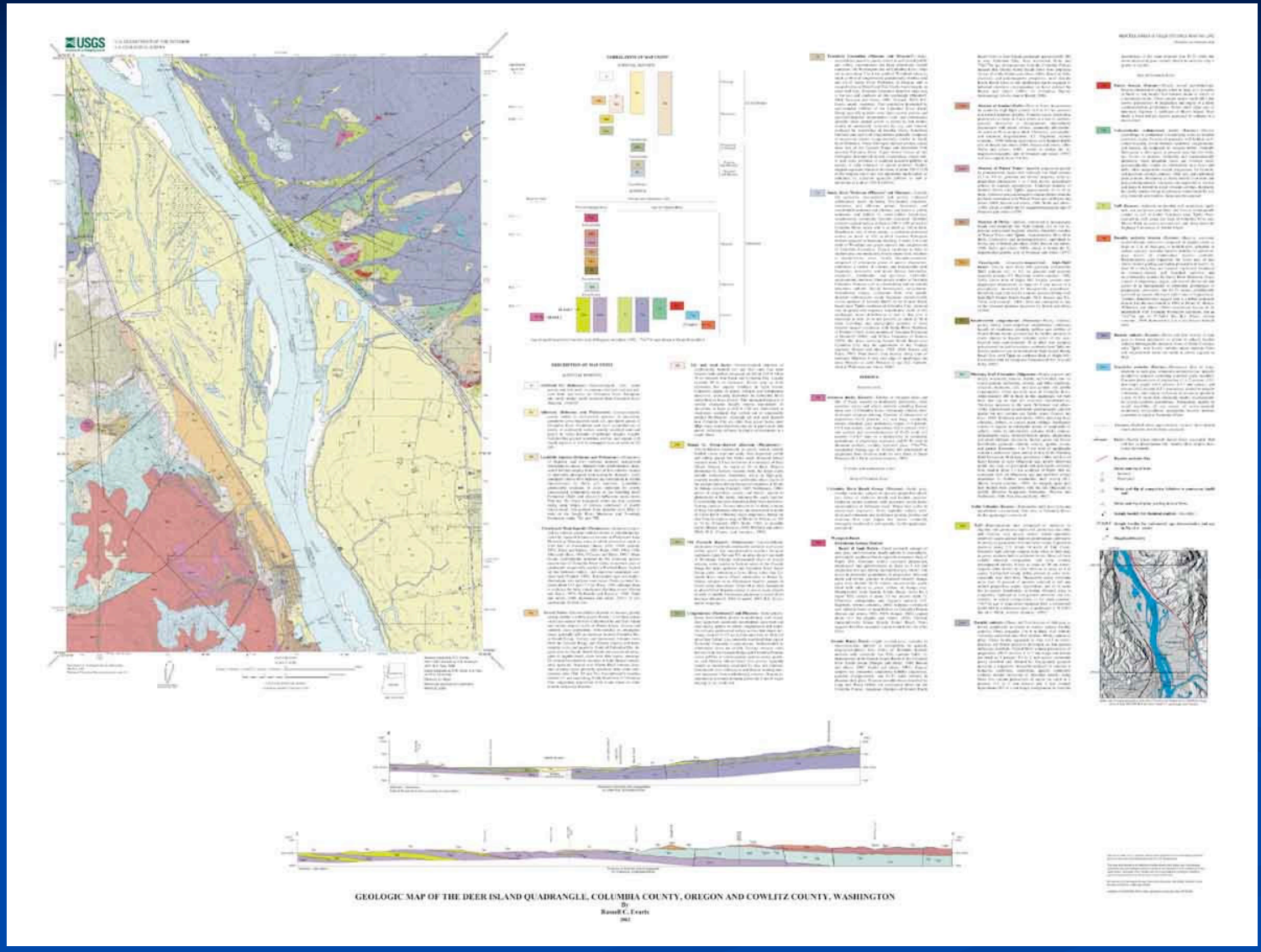
Online 7.5’ map Deer island, OR-WA



Evarts and others, 2002; http://pubs.usgs.gov/mf/2002/2392/

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Distribution of geologic maps online:

http://geology.wr.usgs.gov/wgmt/pacnw/100yam.html

USGS Earthquakes | PNW Earthquakes | PNW geologic mapping | Google News | News | Apple | Google Scholar

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Pacific Northwest geologic mapping and urban hazards

Home | What's new | Find maps | Current research | Publications | Links & resources | Site m

You are here: Home>Find maps>Pacific Northwest Project geologic maps>Yamhill River, OR 30' x 60'

http://geology.wr.usgs.gov/wgmt/pacnw

Find geologic maps Yamhill River, OR 7.5' maps

Amity
Ballston
Beaver
Blaine
Carlton
Dayton
Dolph
Dovre Peak
Dundee
Fairdale
Gaston
Gobblers Knob
Grand Ronde
Hebo
Laurelwood
Mcminnville
Midway
Mission Bottom
Muddy Valley
Neskowin
Nestucca Bay

Pacific Northwest Urban Corridor Geologic Maps

Geologic maps and databases of the Yamhill River, OR 30' x 60' Quadrangle

Location of Yamhill River, OR 100K quad.

Index to 7.5' geologic quadrangle maps. Green links to online USGS maps; purple links to USGS paper maps; pink links to USGS maps in preparation; yellow links to Oregon Dept. of Geology and Mineral Industries maps.

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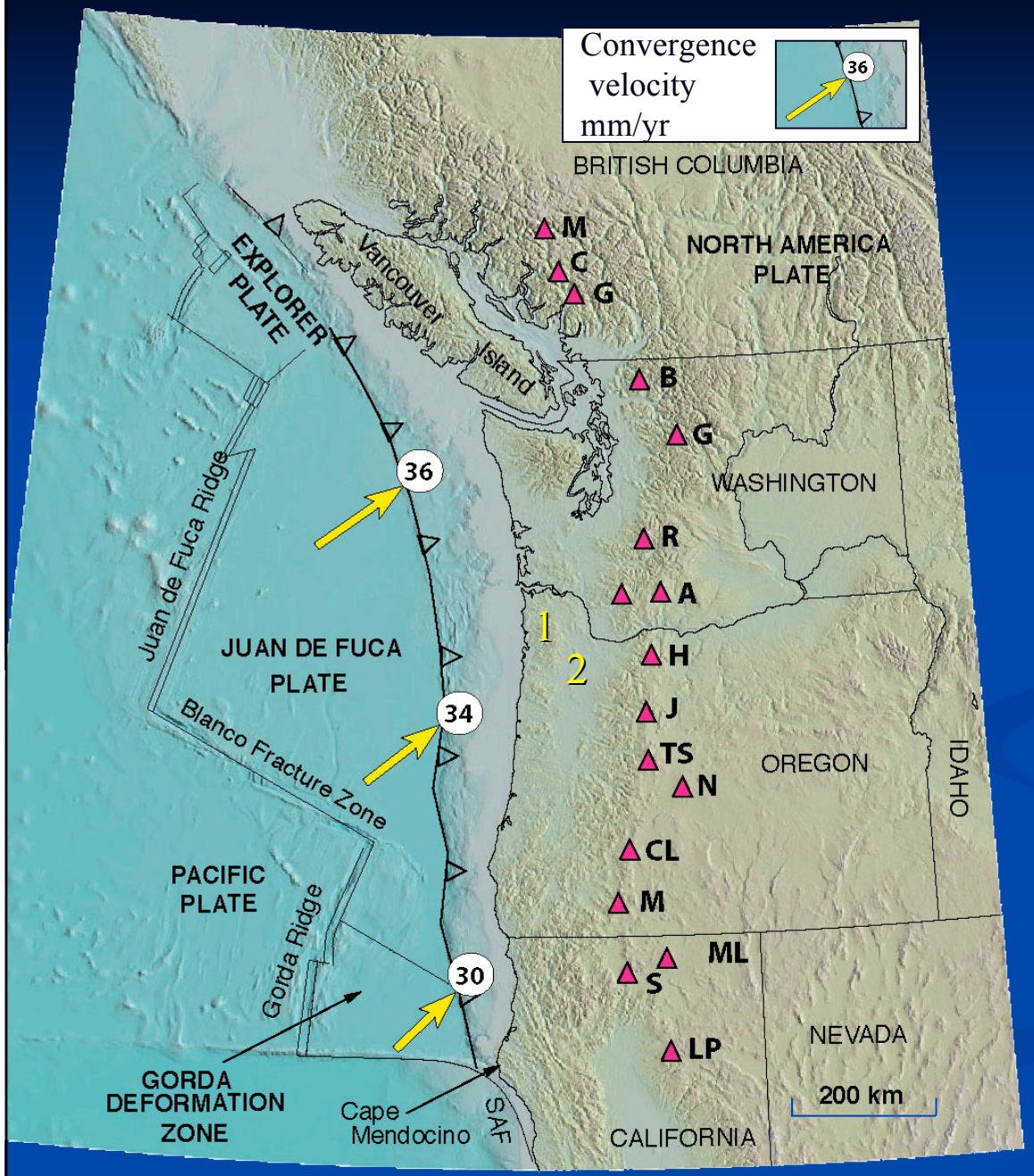
Cascadia Physiography



Subduction of Juan de Fuca plate:

- Holds up Coast Range (1)
- Depresses Puget-Willamette trough (2)
- Builds active Cascade volcanic arc (triangles)

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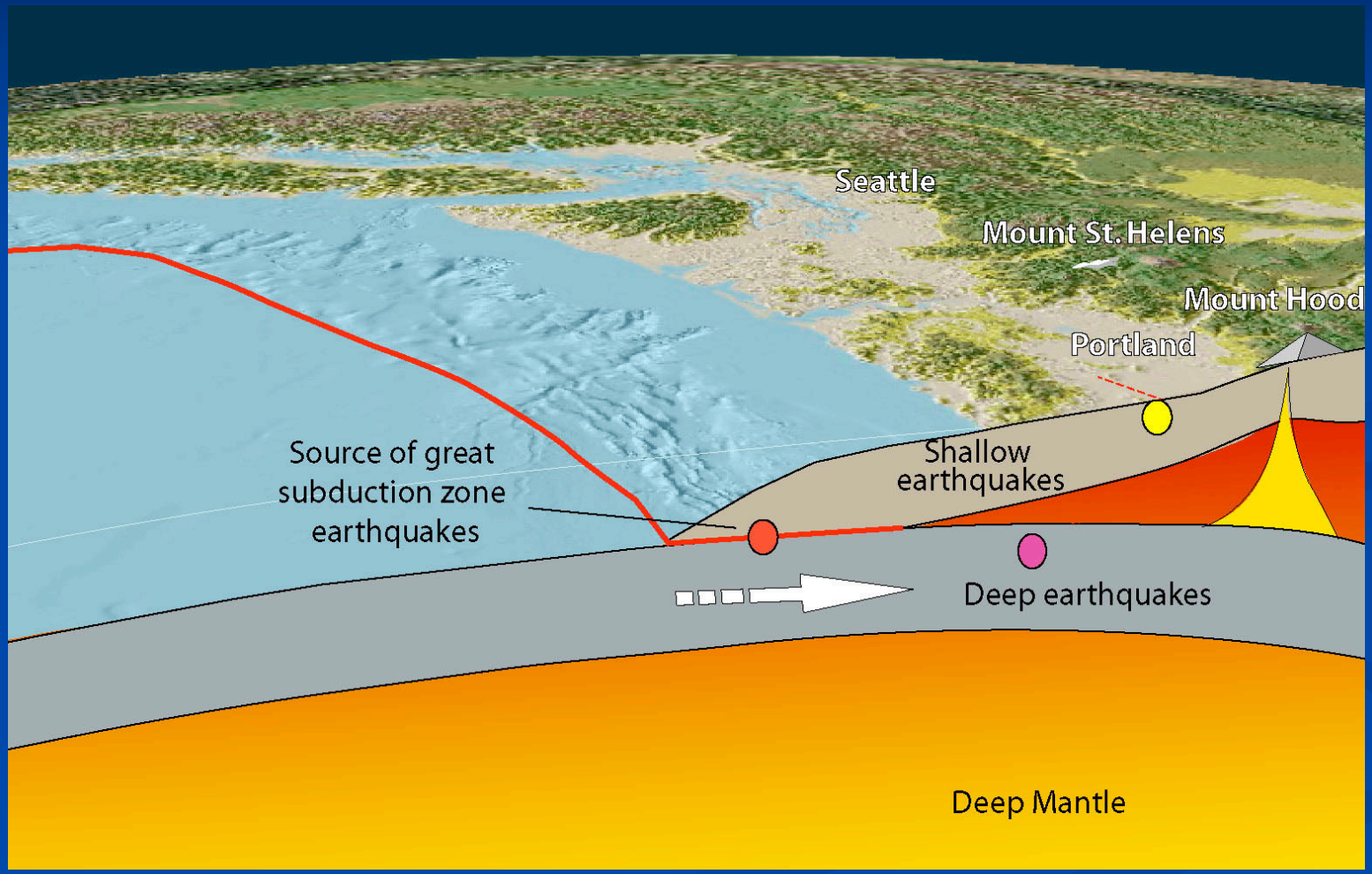
Cascadia's geologic history - A thumbnail sketch of 6 big events:



- For example - Imagine the Hawaiian Islands rafting into the subduction zone…

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1. Collision of ocean island chain with continent

- Island chain - similar to Hawaiian Islands - crashed into N. America and was accreted to the continent at about 50 Ma (million years ago).

52 million-year-old submarine pillow basalt, Trask River

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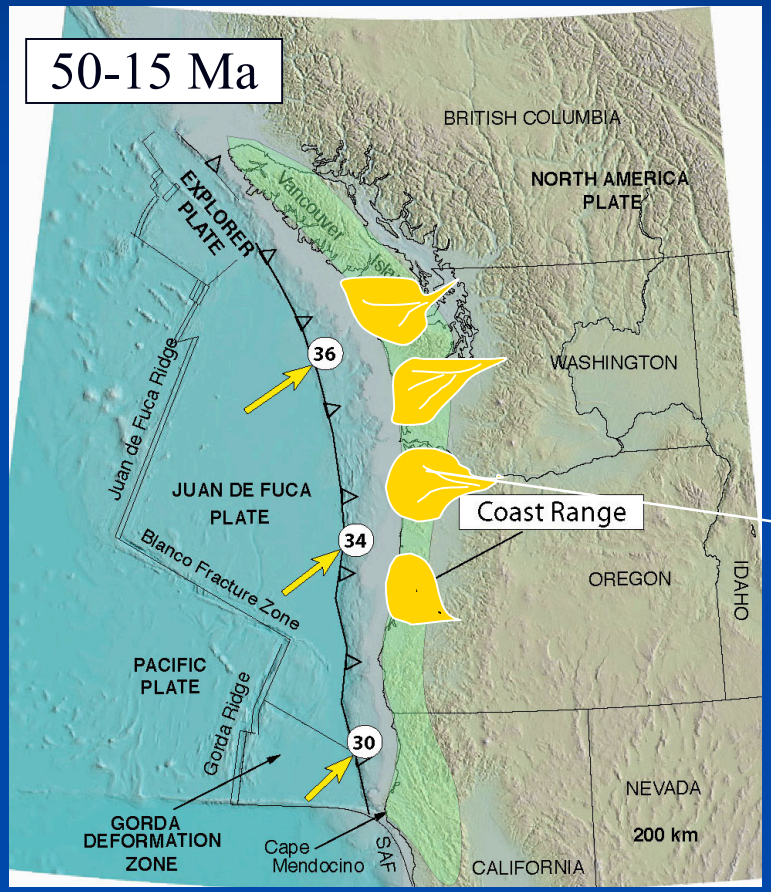
2. Marine sediments were deposited on the accreted terrane in W. Oregon and Washington

- Subduction zone jumped westward. Sand and mud from rivers built offshore deltas, shoreline deposits and submarine fans.



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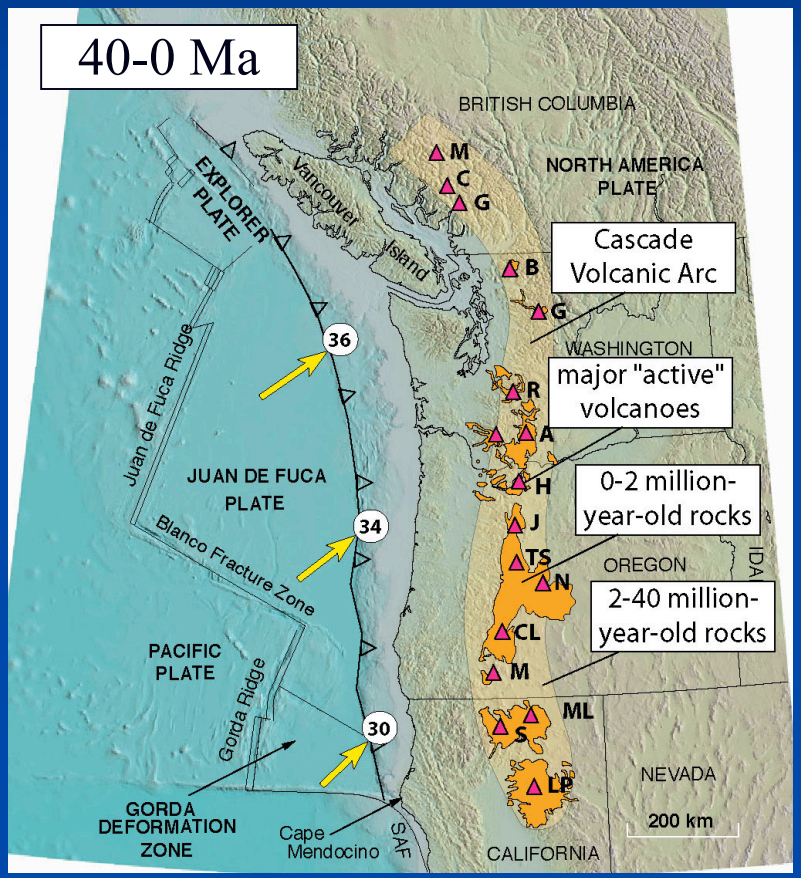
3. Cascade arc volcanoes buried the eastern edge of the marine sediments and the accreted terrane.



- Volcanic activity continues to the present.

Mount St. Helens Nov 05

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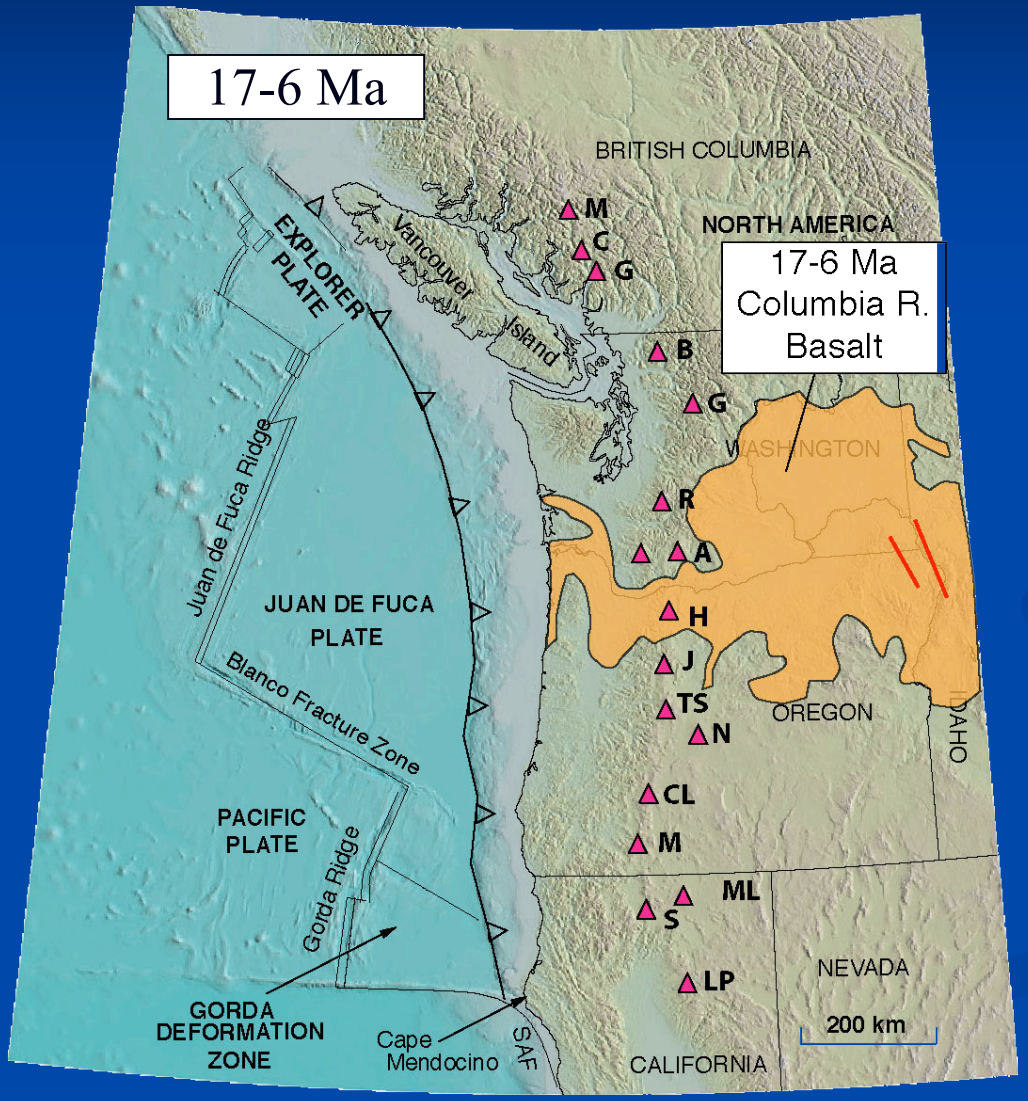
4. Crustal stretching released a flood of basalt from fissures east of the arc



- Columbia River Basalt (CRB)
- 80% by volume erupted between 16.2 and 15.5 Ma
- Flowed 450 mi. into Pacific Ocean

CRB, Ginkgo State Park, WA.

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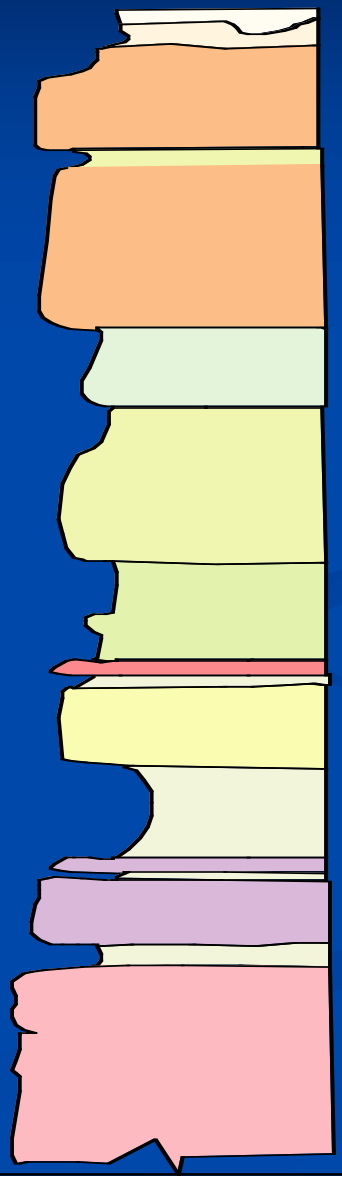
The resulting rock sequence in NW Oregon:

History	Age	Rock type
Modern rivers	15-0 Ka	Mud and sand Silt and sand
Glacial outburst floods (Missoula flood)	15 Ka	
Columbia R. Basalt	15 Ma	Basalt lava flows
Deposition of shallow-water marine sediments	40-20 Ma	Fine grained sandstone Sandstone
Deposition of deep marine sediments basalt intrusion	50-45 Ma	siltstone Basalt intrusions
Accretion of oceanic basalt terrane to N. America "Siletzia"	50 Ma	Basalt flows (submarine pillow basalt)



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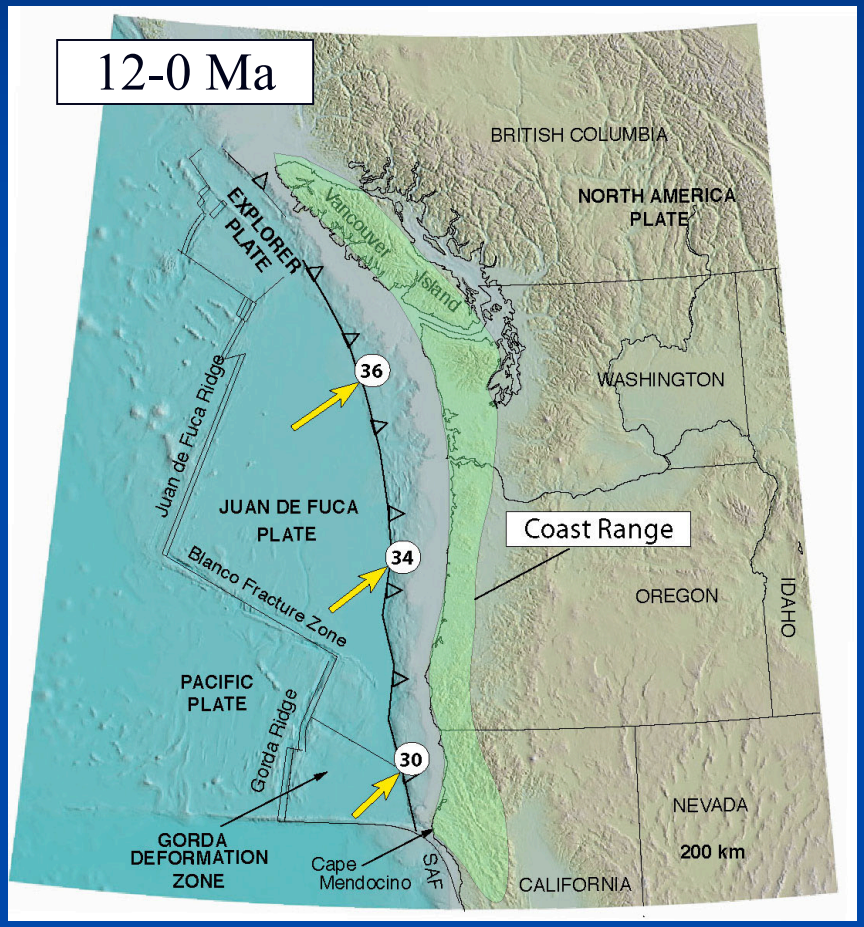
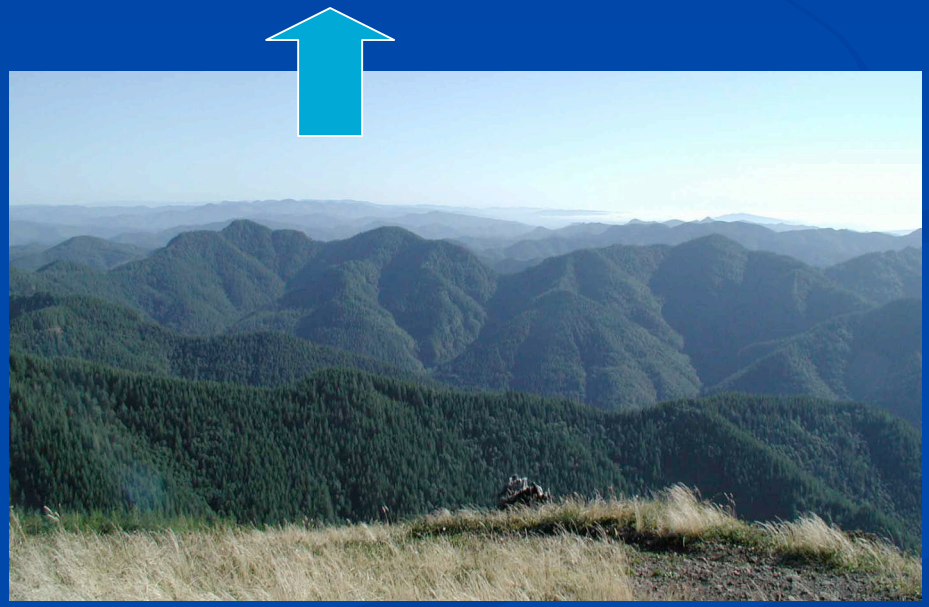
5a. An eastward "push" from Juan de Fuca plate causes uplift of the Coast Range.



- Uplift



View S. toward Cape Lookout, OR.

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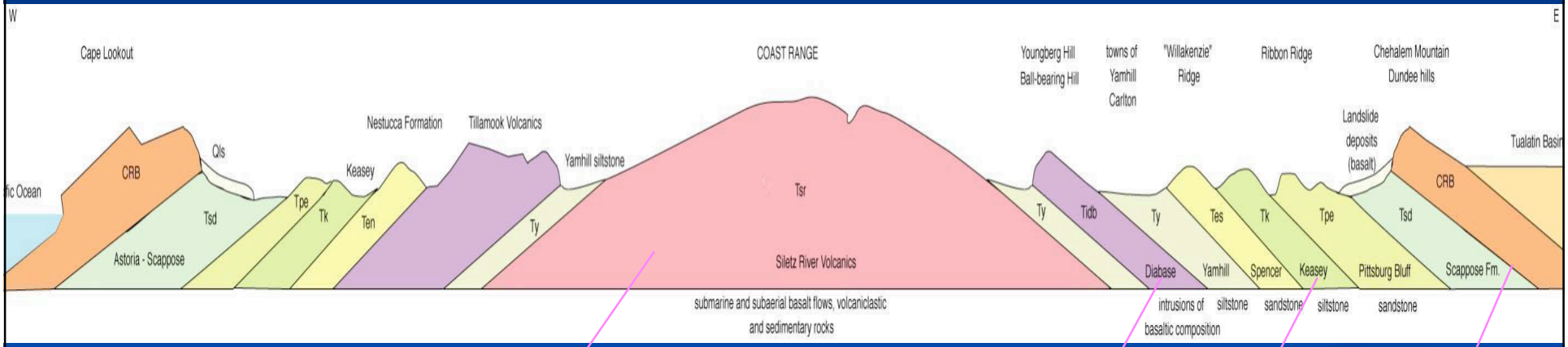
5b. The strata in the uplifted Coast Range were folded into a broad arch, with the oldest rocks in the center.



50-million year-old Siletz River Volcanics

40-million year-old diabase (basalt) intrusions

30-million year-old marine sandstone and mudstone

15-million year-old Columbia River Basalt

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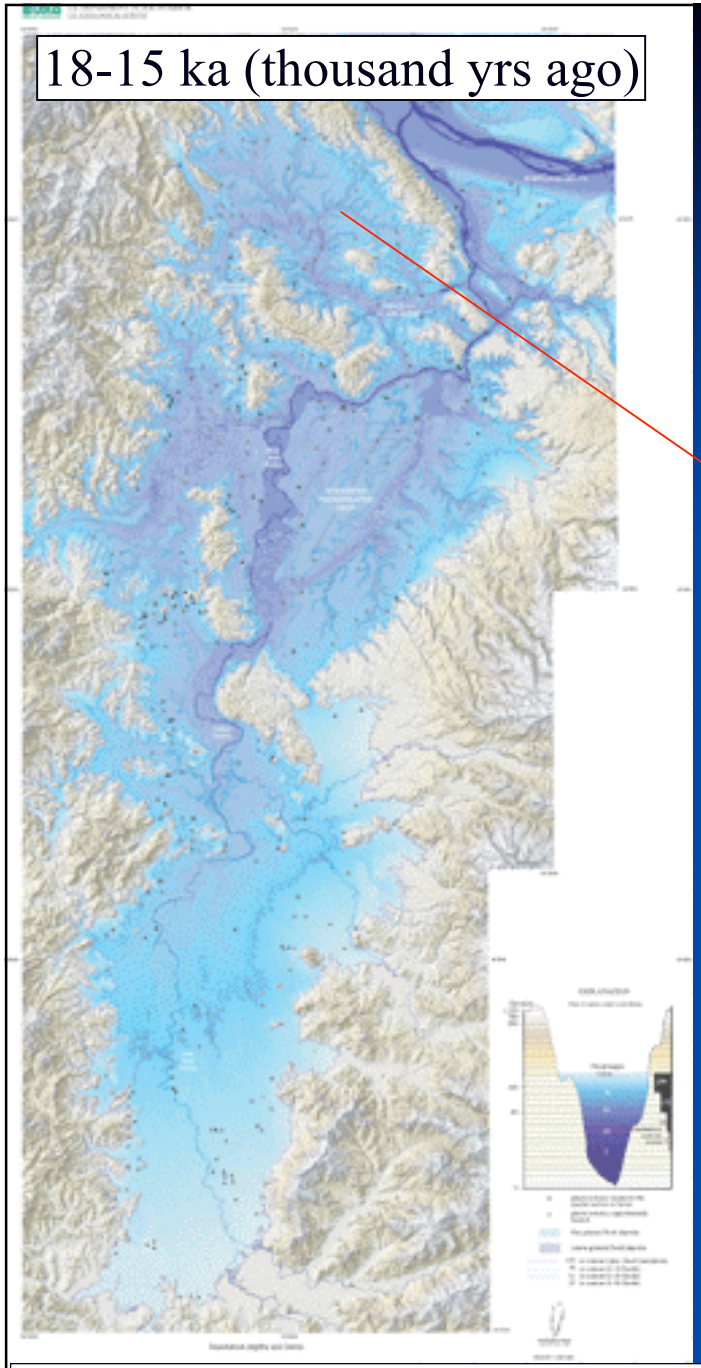
18-15 ka (thousand yrs ago)



http://geopubs.wr.usgs.gov/open-file/of03-408/

6. Catastrophic glacial outburst floods (at least 40) filled the Willamette Basin, leaving a blanket of silt on everything below ~ 400' elevation.

- 26 Rhythmically-bedded Missoula flood silts; Highway 26 at Cornell Rd.

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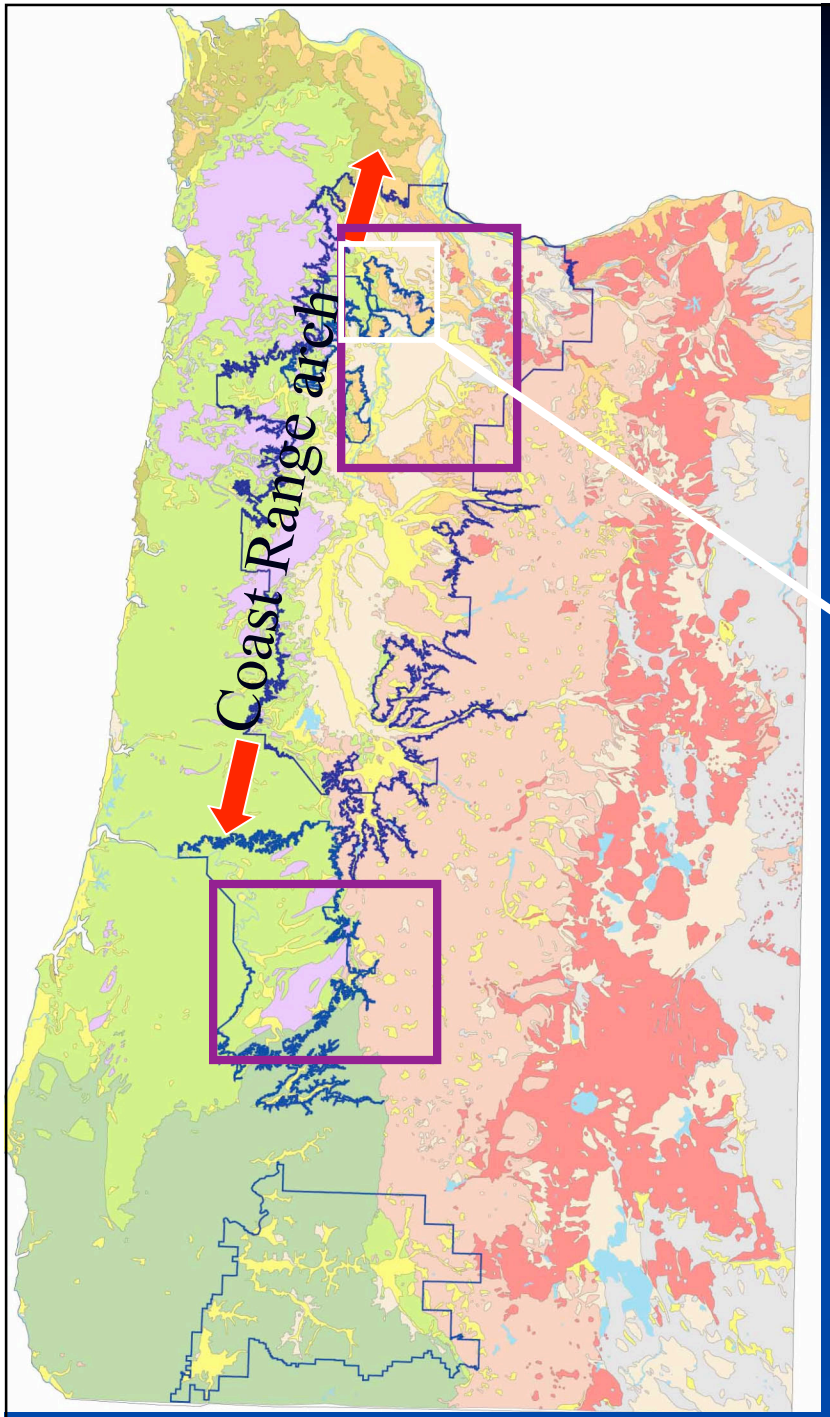
Oregon Geologic Map



- Areas of new USGS mapping in purple
- American Viticultural Areas (AVAs) in blue
- Area of detail in next slide

Qal alluvium
QLavas of Cascade Arc
CRB
Cascade1
Cascade2
CoastRange marine sedimentary rocks 2
CoastRange marine sedimentary rocks
CoastRange oceanic island basalt
pre-Tertiary

water

Geology simplified from Walker and Macleod, 1991

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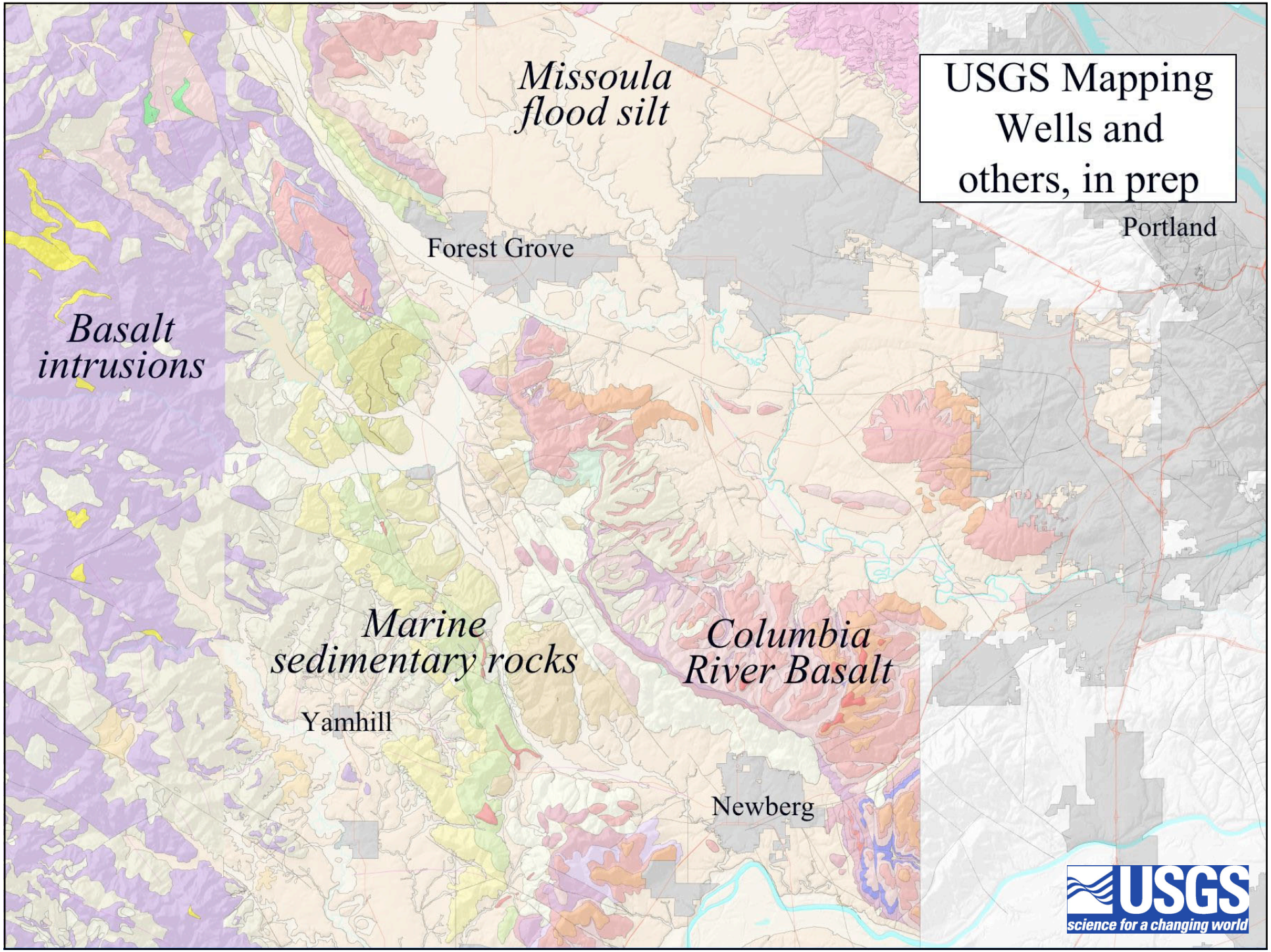
Missoula
flood silt
USGS Mapping
Wells and
others, in prep
Portland
Forest Grove
Basalt
intrusions
Marine
sedimentary rocks
Columbia
River Basalt
Yamhill
Newberg
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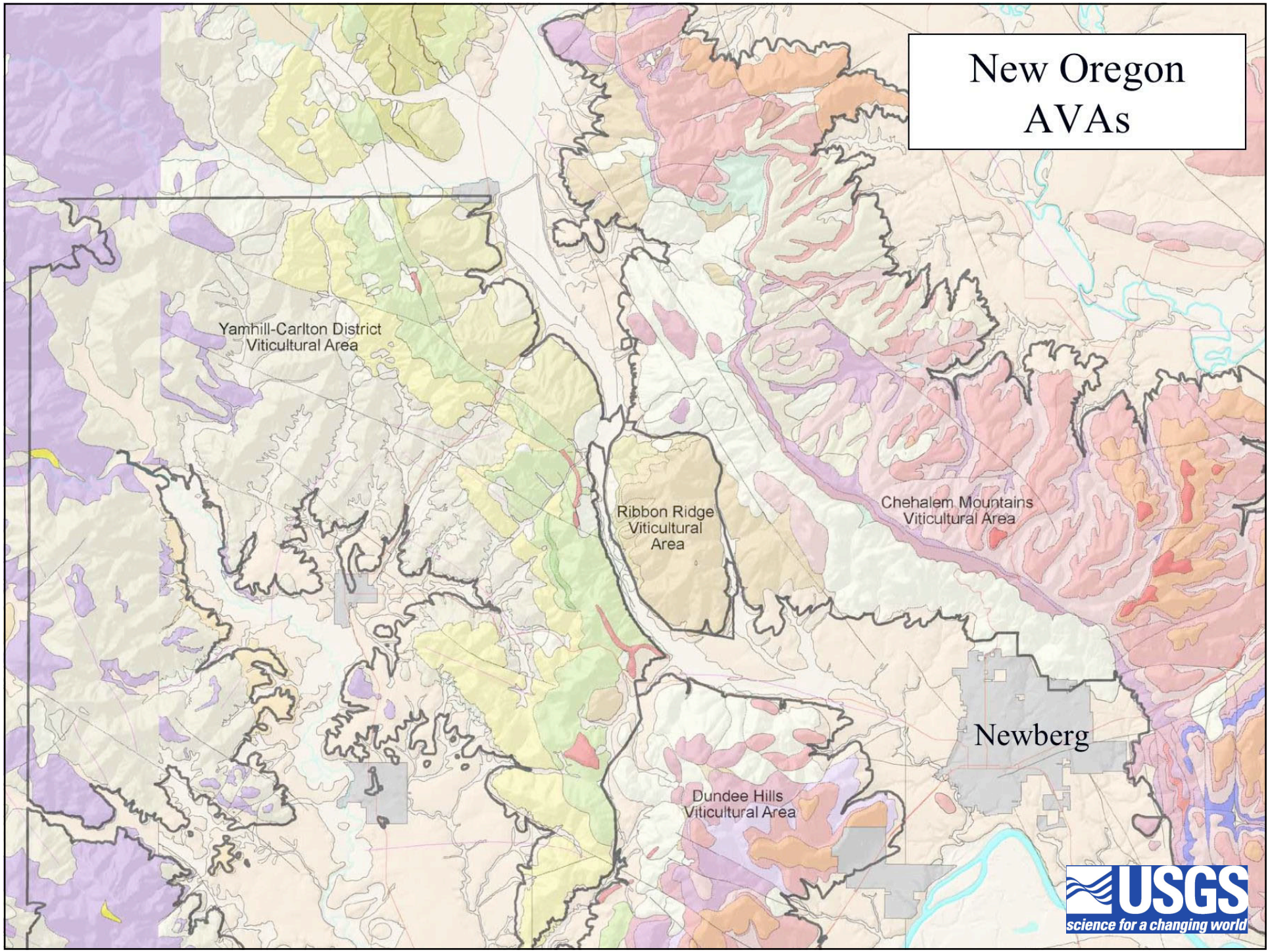
New Oregon AVAs
Yamhill-Carlton District Viticultural Area
Ribbon Ridge Viticultural Area
Chehalem Mountains Viticultural Area
Newberg
Dundee Hills Viticultural Area
USGS
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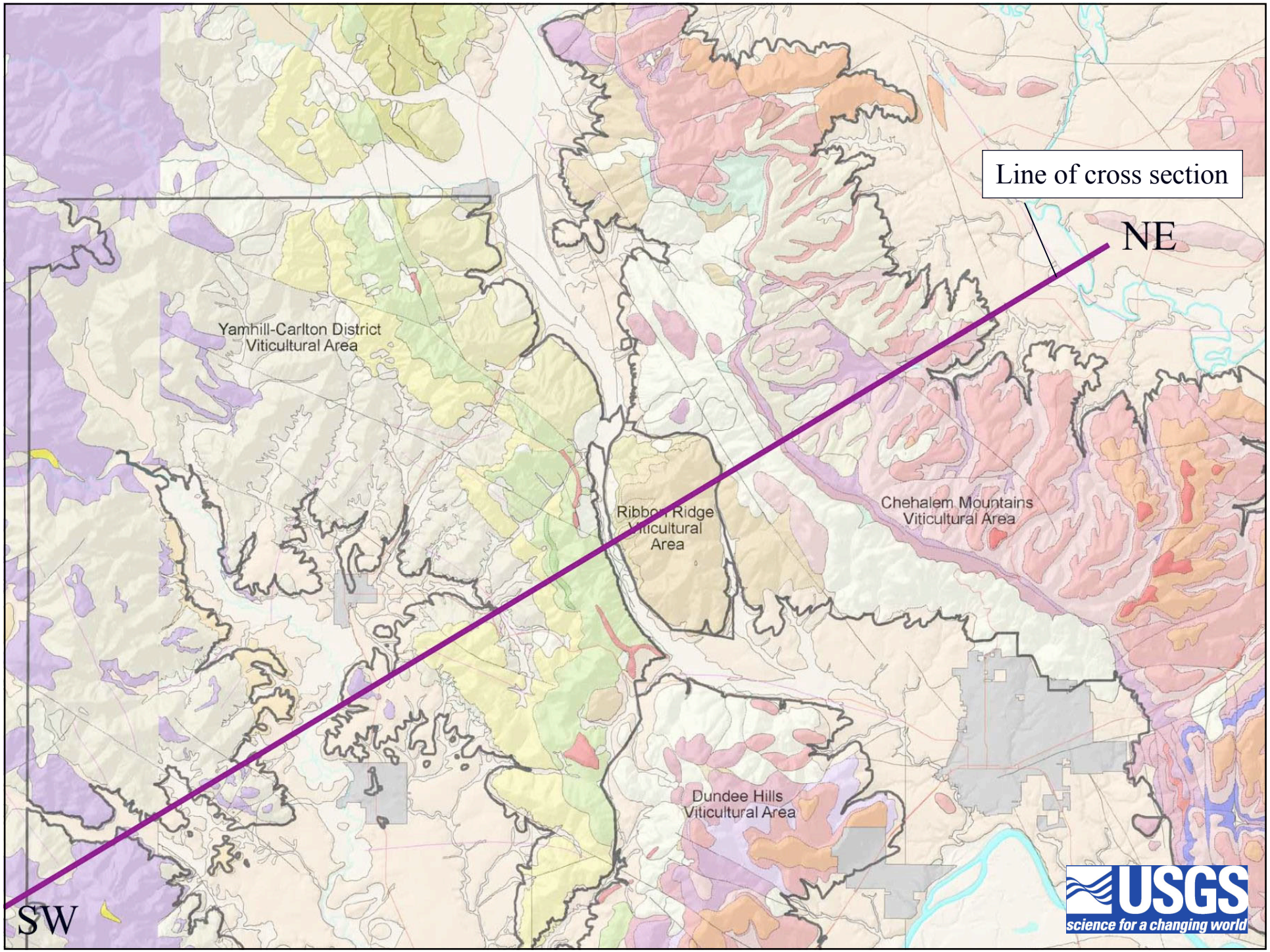
Line of cross section
NE
SW
Yamhill-Carlton District
Viticultural Area
Ribbon Ridge
Viticultural
Area
Chehalem Mountains
Viticultural Area
Dundee Hills
Viticultural Area
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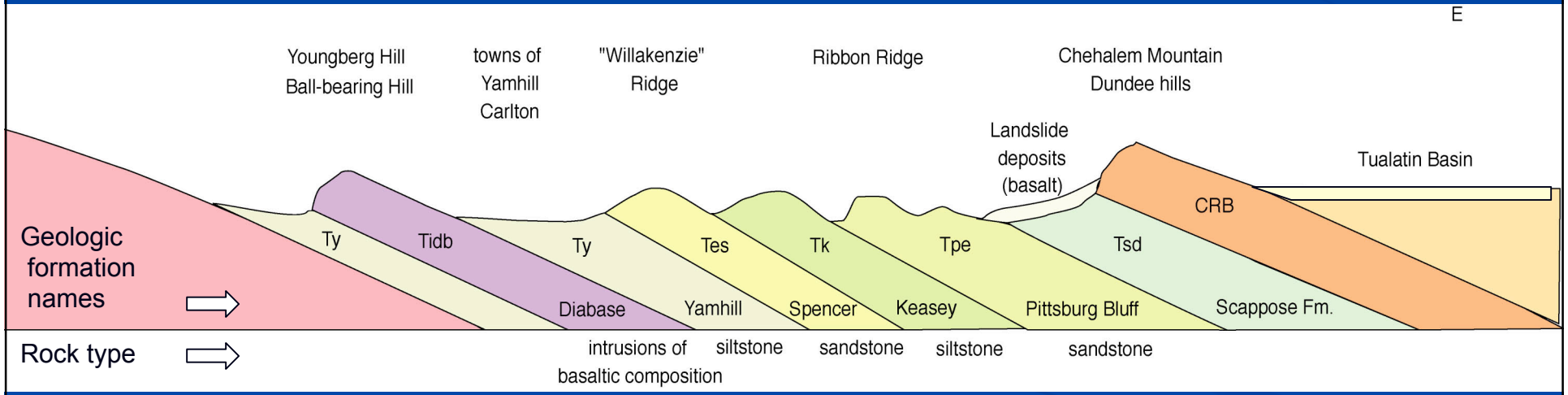
Mountains are held up by basalt. Sandstone and siltstone underlie lower ridges and valleys.

SW NE



Idealized cross section

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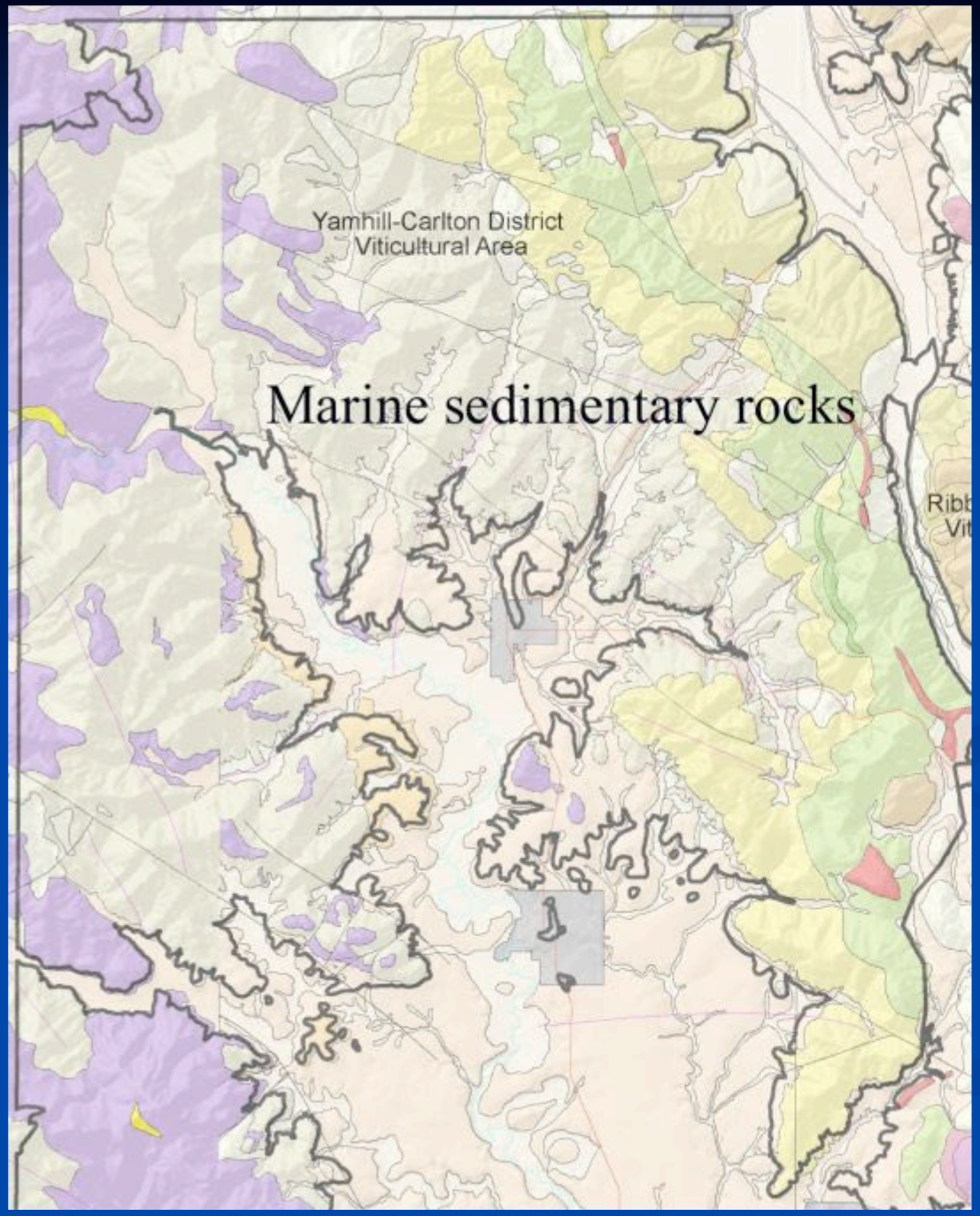

Yamhill-Carlton AVA

- Marine sedimentary rocks (yellow and green)
  - Spencer sandstone
  - Yamhill siltstone
  - Keasey Formation
  - Pittsburg Bluff Fm.
- Basalt intrusions (purple and red)

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Diabase (coarse-grained basalt intrusion) holds up many hills in Yamhill-Carlton-McMinnville area

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Yamhill-Carlton

- Spencer Formation sandstone
- Underlies "Willakenzie Ridge"

Well-exposed Spencer Formation sandstone at Hagg Lake

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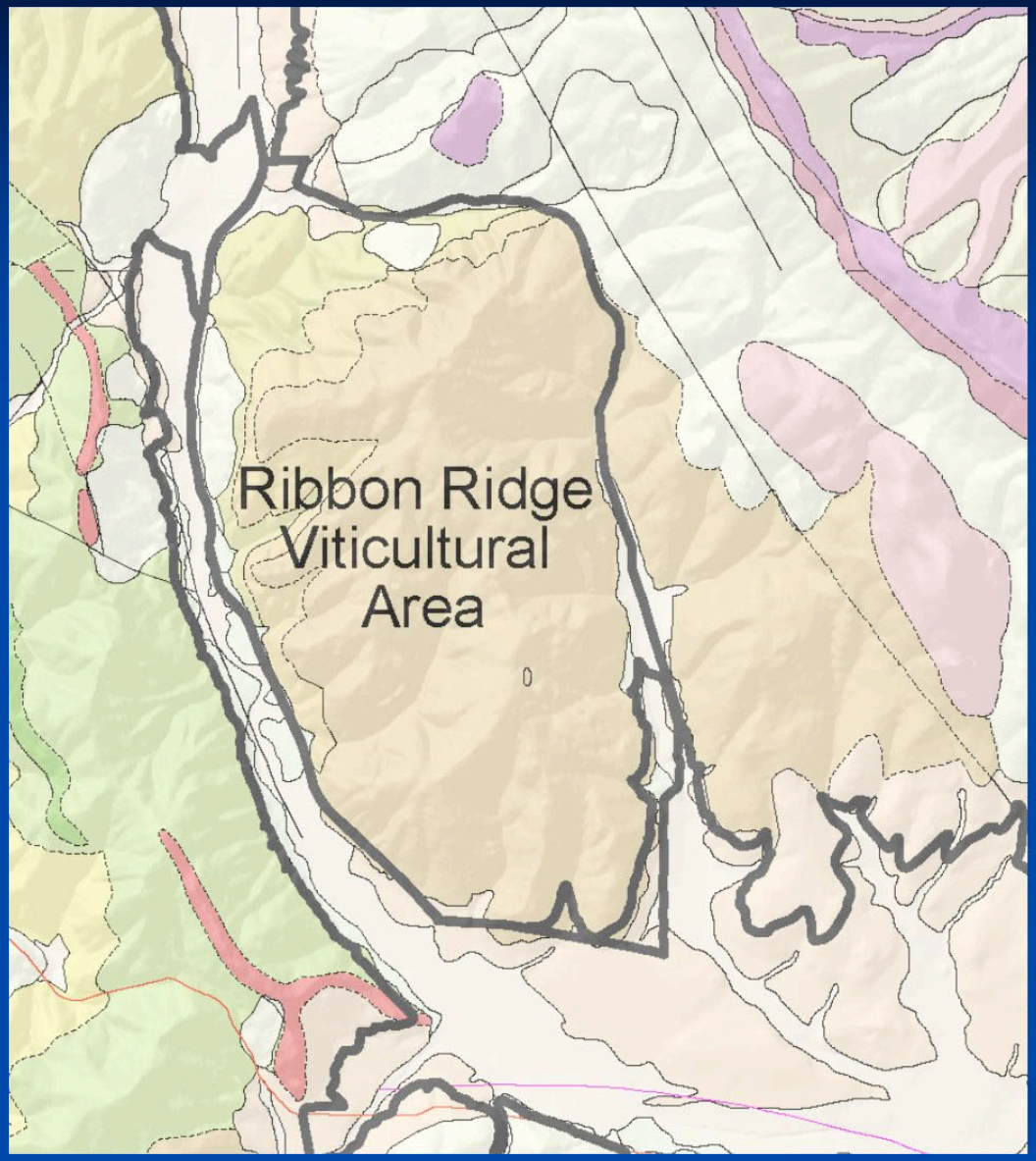

Ribbon Ridge AVA

- Pittsburg Bluff Formation
  - Marine fine sandstone, siltstone, and mudstone
  - Volcanic tuff beds from Cascade arc

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Ribbon Ridge

- Loess (windblown silt)
- Paleosol (orange)
- Sandstone of Pittsburg Bluff

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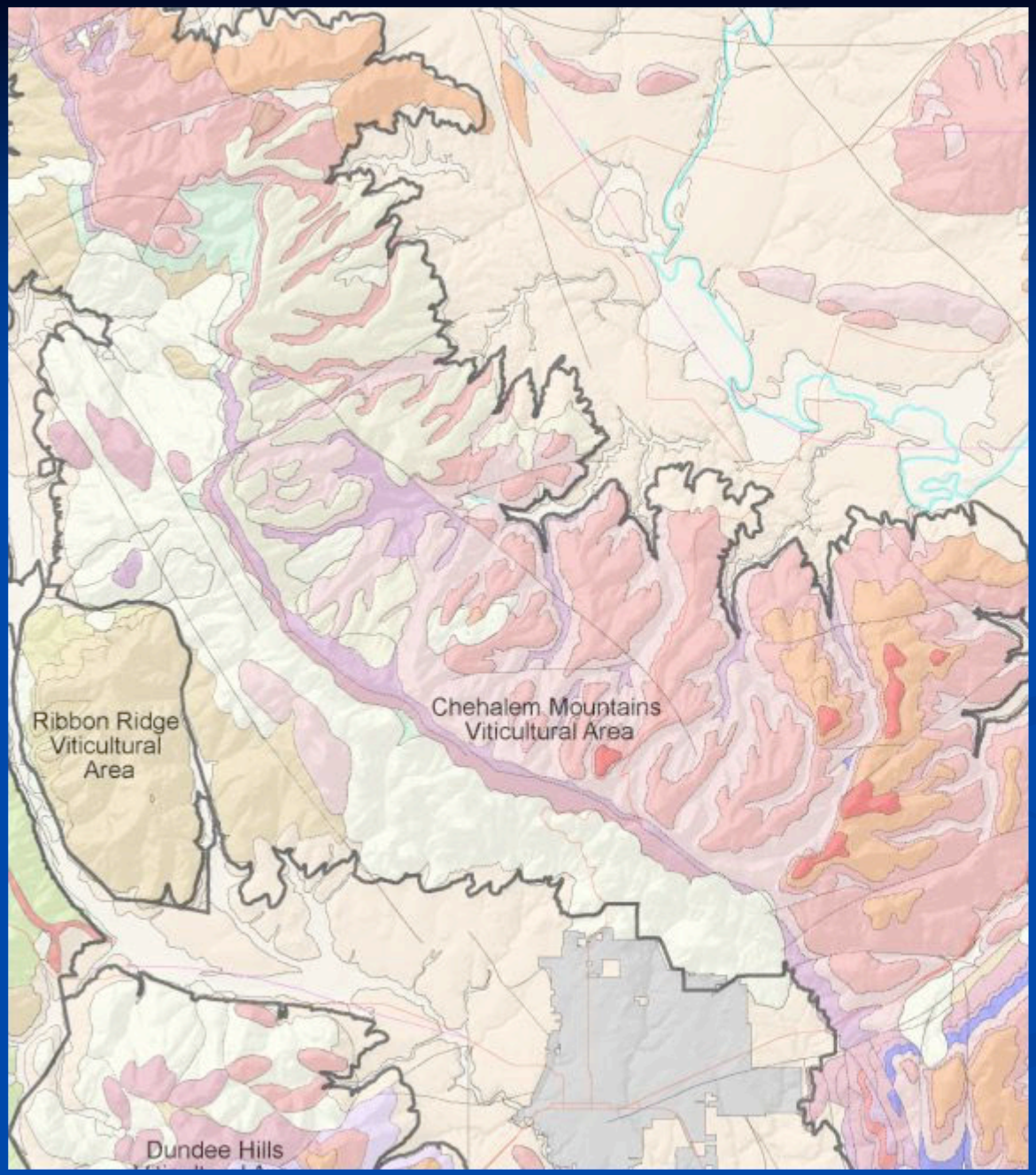

Chehalem Mountains AVA

- Columbia River Basalt
- Loess cap
- Slide bench of basalt on SW side
- Pittsburg Bluff marine sedimentary rock down low on west side.

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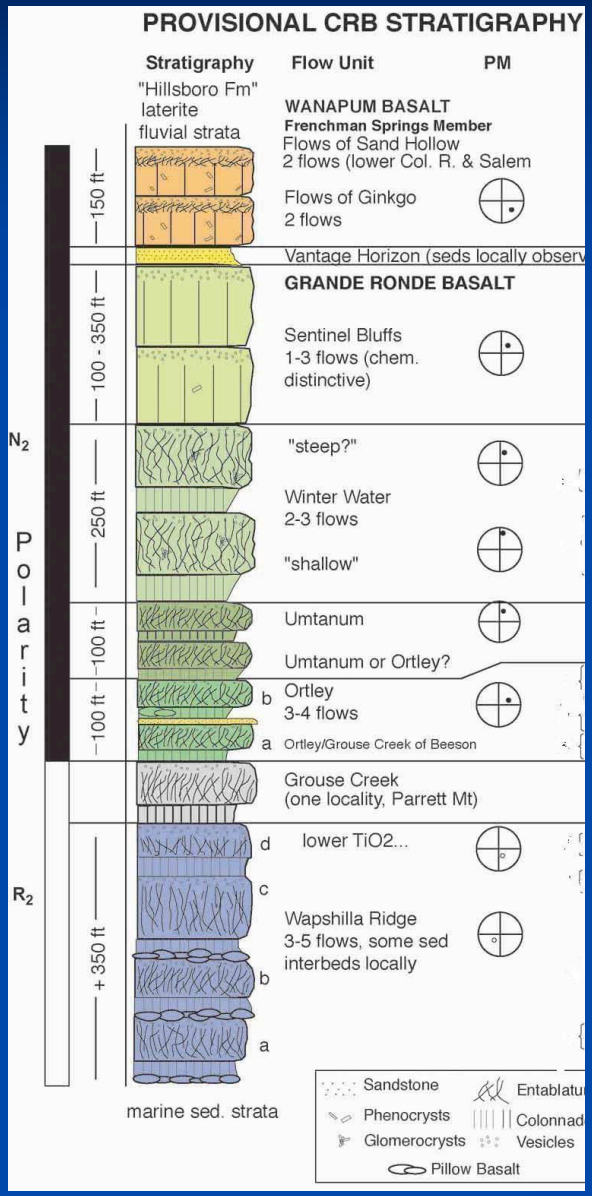
Flow by flow stratigraphy of the CRB



- Individual flows of CRB can be recognized with chemistry, physical appearance, and paleomagnetism.

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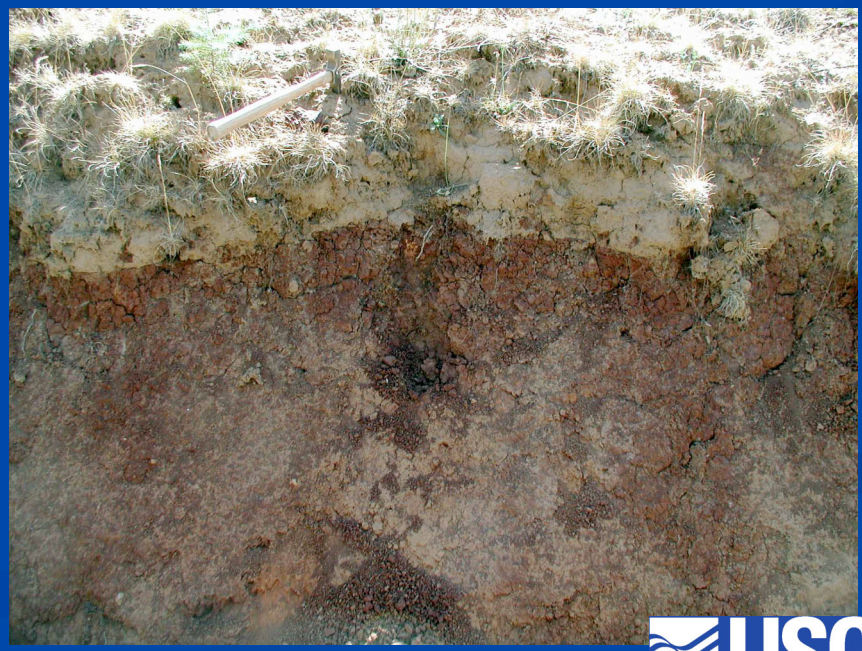
Chehalem Mountains

- Columbia River Basalt (CRB)
  - Sentinel Bluffs Mbr. of Grande Ronde Basalt
- Loess (wind-blown silt) over Jory-like paleosol on CRB



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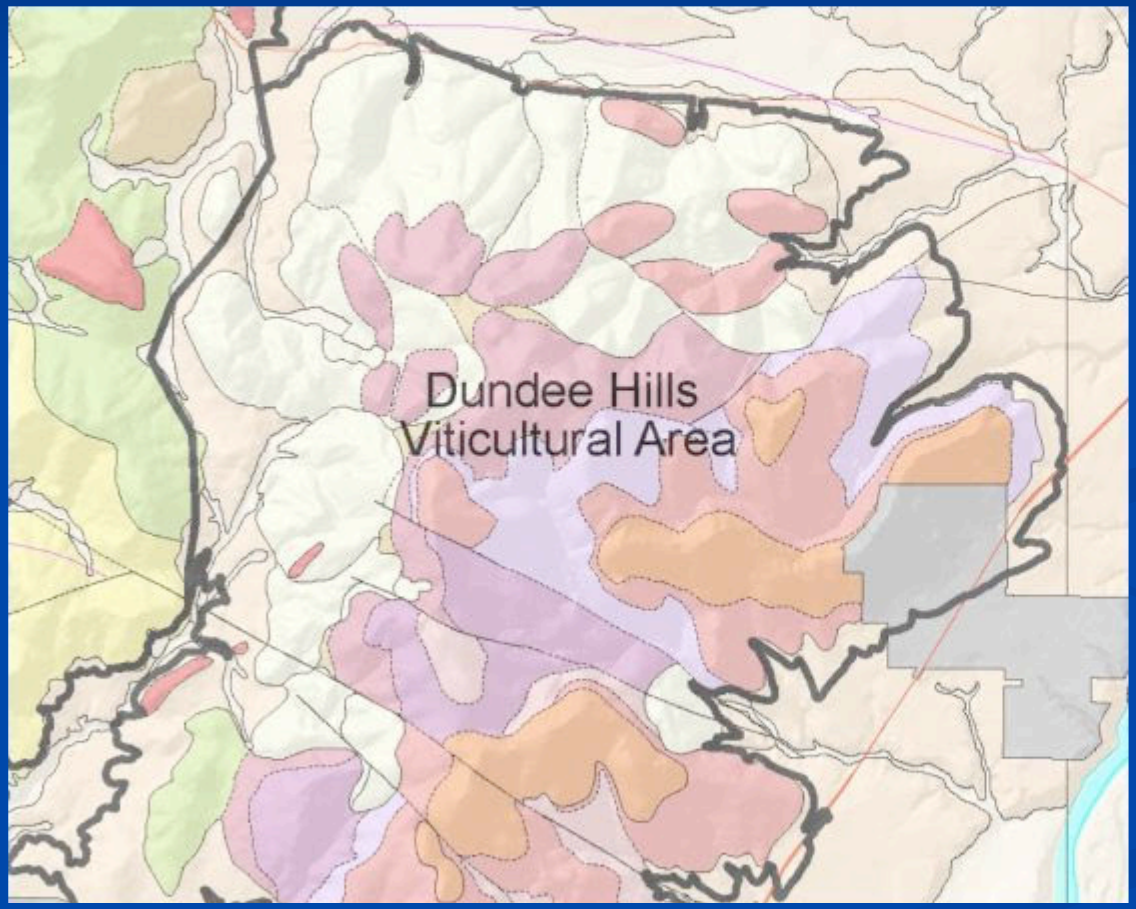
Dundee Hills AVA



- Mostly Columbia River Basalt
  - Frenchman Springs Member
  - Grande Ronde-Sentinel Bluffs Mbr
  - Grande Ronde-Winter Water/Ortley/Wapshilla flows
  - Landslide bench on N and W

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Dundee Hills

Maresh Vineyard

- Columbia River Basalt beneath Jory Soil
  - Grande Ronde Basalt in distance
  - Frenchman Spr. Mbr. Of Wanapum Basalt in upper part of vineyard

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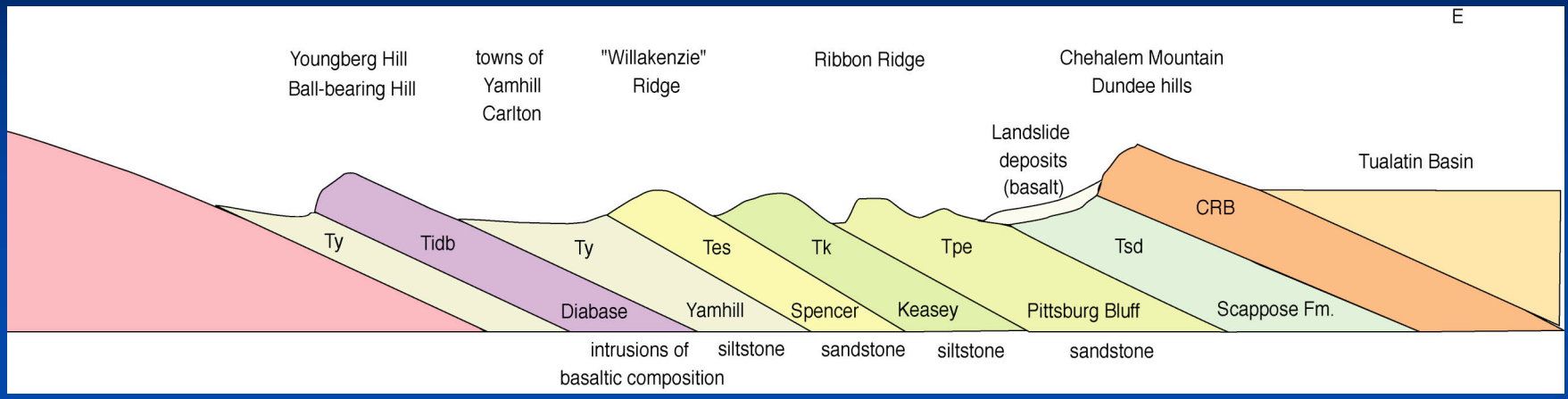
What is the take away?



- From the Rogue to the Tualatin, each hillside has a story.
- Geology provides the landscape, its interaction with the sun and water, and the parent materials for the soils…
- And it holds up the vineyards!

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