Mid-Coast Water Planning

An Introduction to Water Resources

Presented by

Oregon Water Resources Department

March 29, 2017

Rick Hamell

The Water Setting

1. Physical description
2. Water use and control
3. Geology
4. Groundwater resources

Topography

Planning Area:
1,194 sq. miles
Land: 980 sq mi
Water: 214 sq mi

Elevations:
-10 feet to 3,405’

Land Use and Land Cover

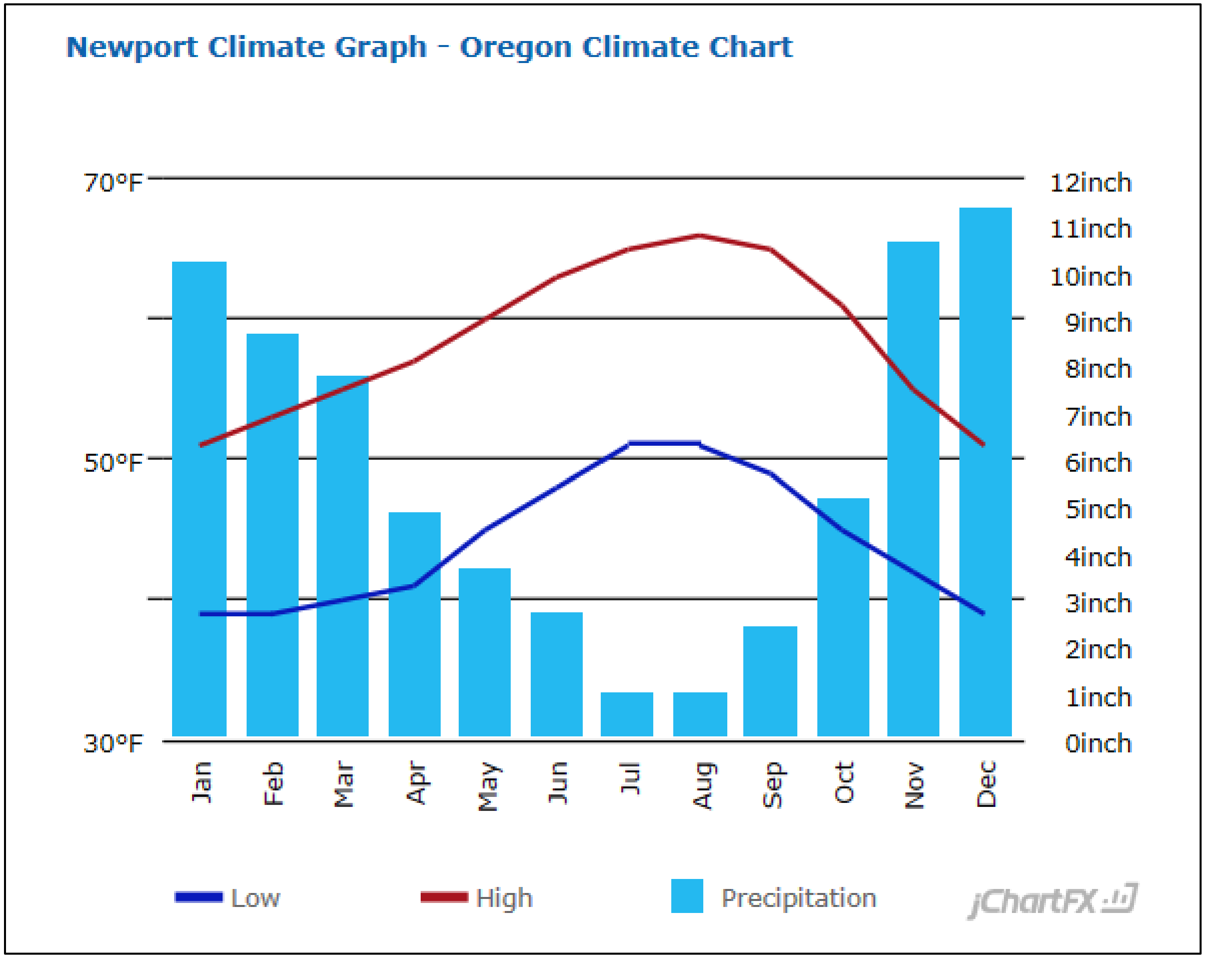




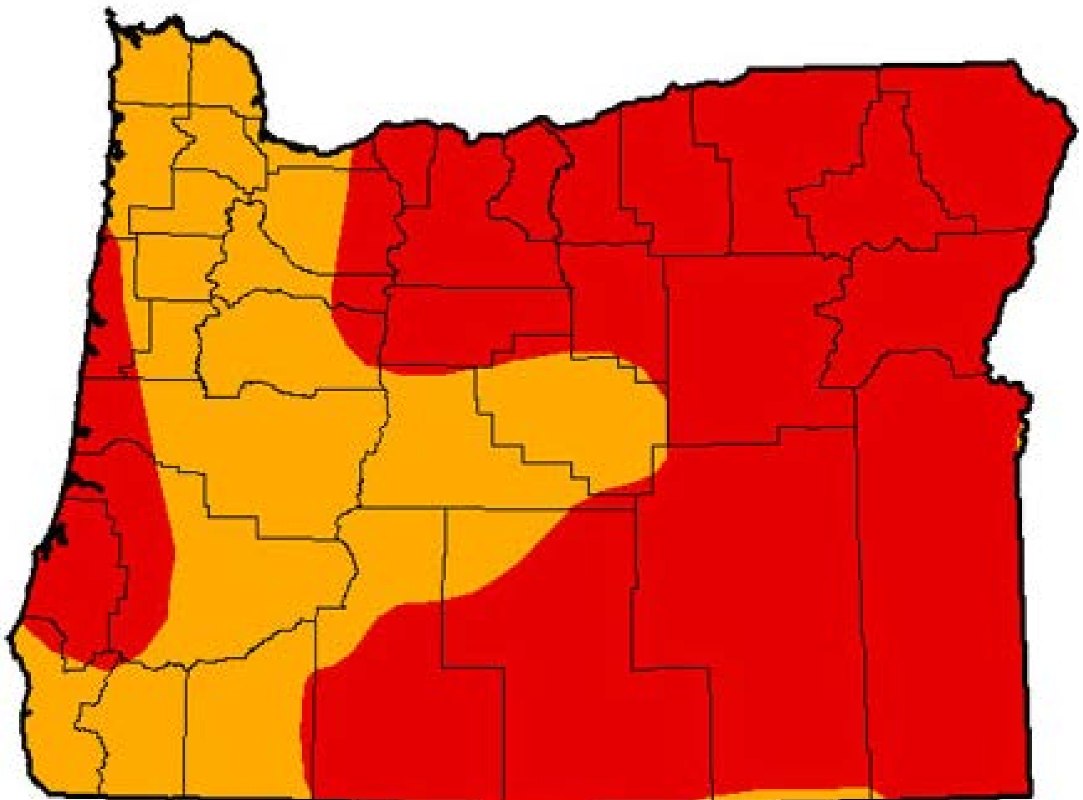

Climate

Mean annual precipitation 69.57 inches

June – Sept driest months



Drought Conditions



October 6, 2015
(Released Thursday, Oct. 8, 2015)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	67.29	0.00
Last Week 9/29/2015	0.00	100.00	100.00	100.00	67.29	0.00
3 Months Ago 7/7/2015	0.00	100.00	100.00	83.71	34.09	0.00
Start of Calendar Year 12/30/2014	13.61	86.39	80.70	49.29	34.11	0.00
Start of Water Year 9/29/2015	0.00	100.00	100.00	100.00	67.29	0.00
One Year Ago 10/7/2014	1.56	98.44	76.61	56.26	35.30	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

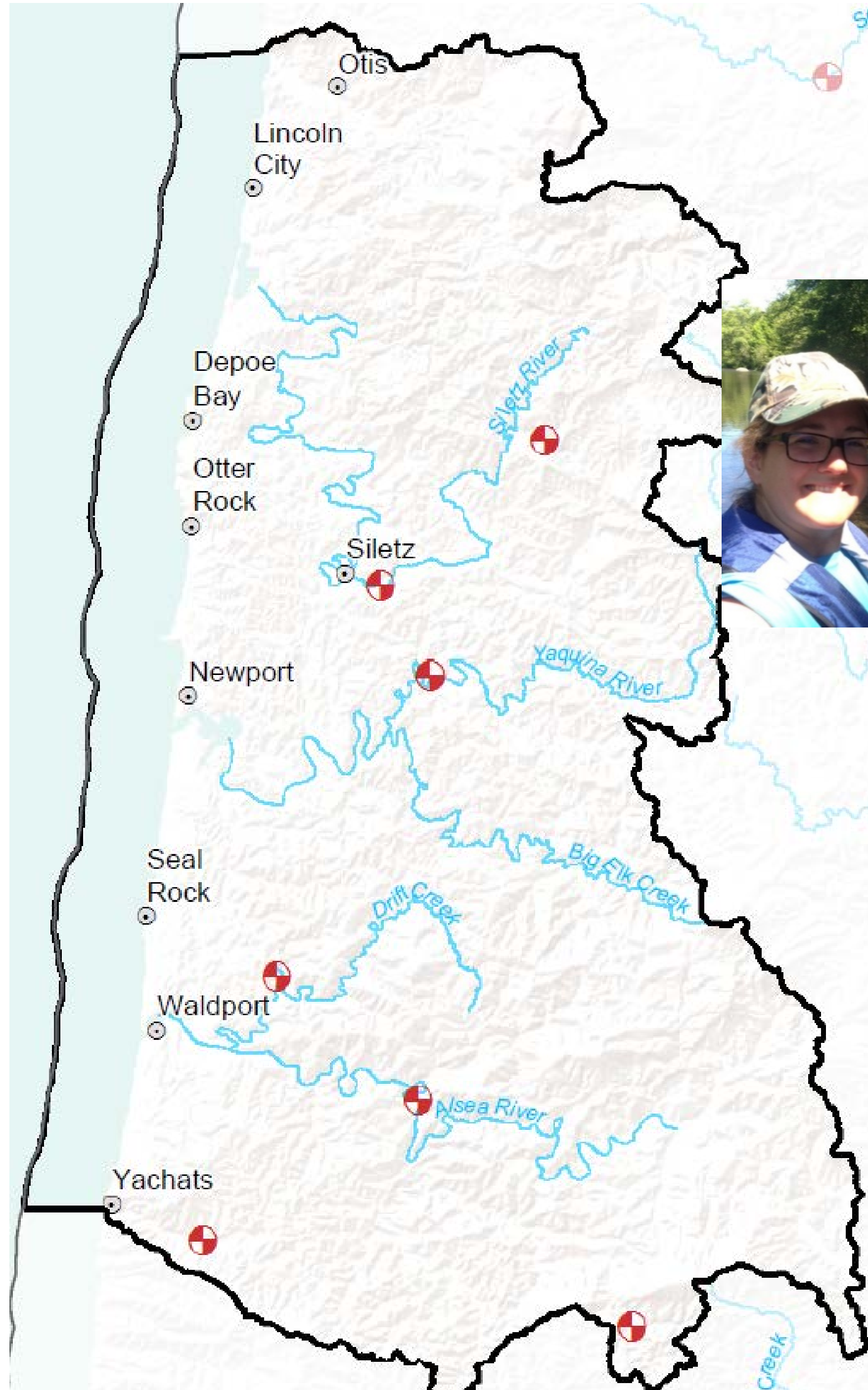
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

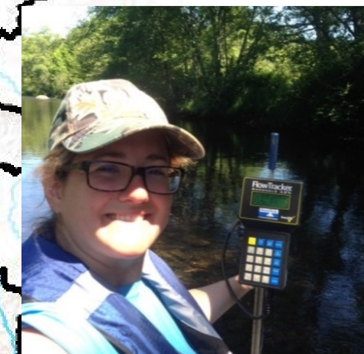
Author:
David Miskus
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

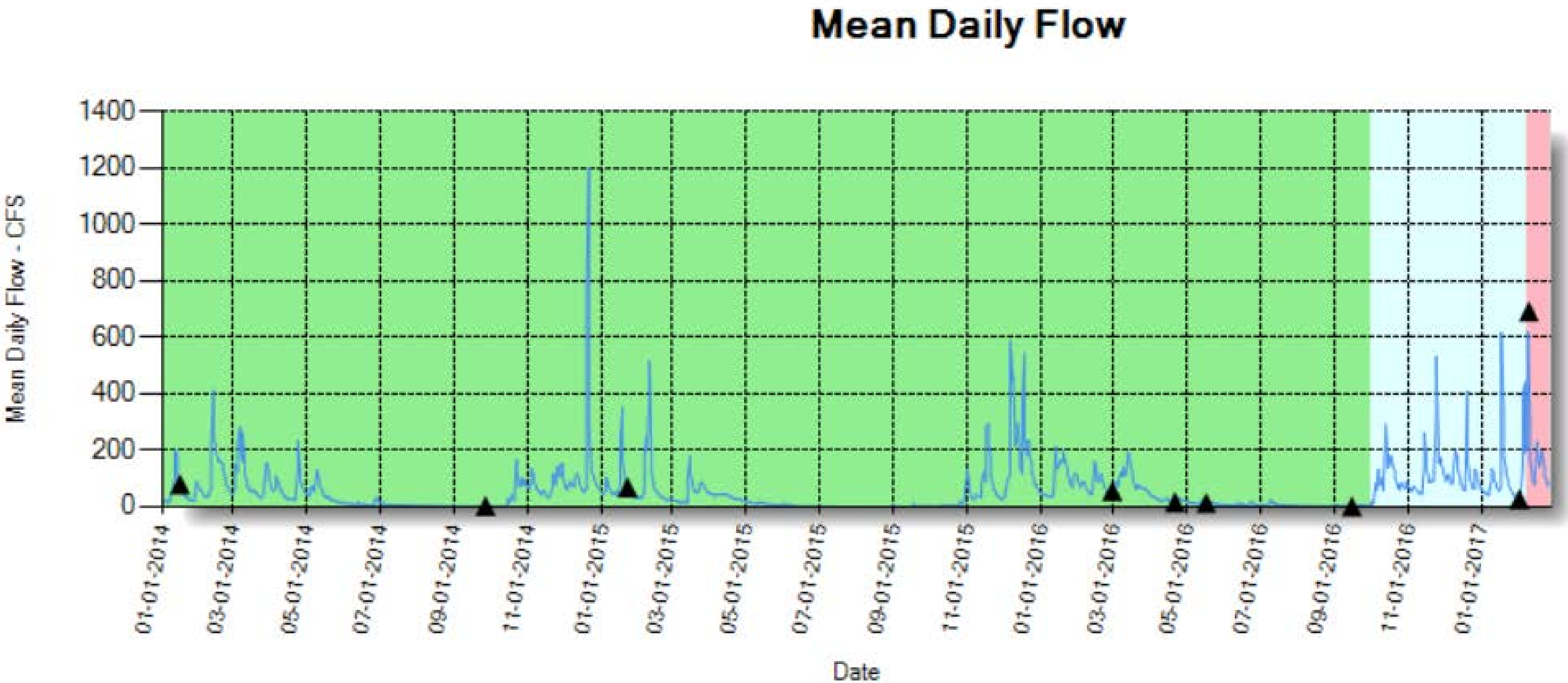
USGS/OWRD Stream Gauges

Sunshine Creek nr Valsetz



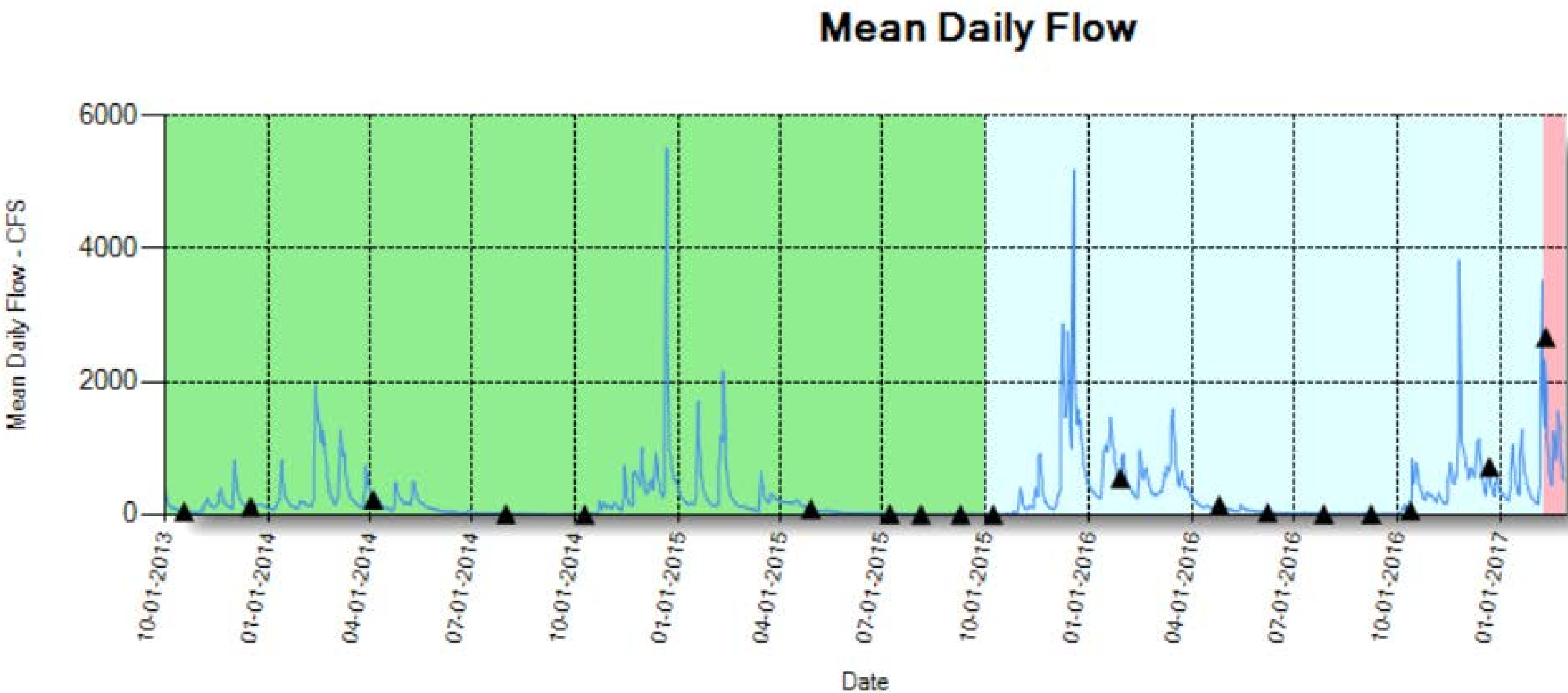


Hydrology: Sunshine Creek



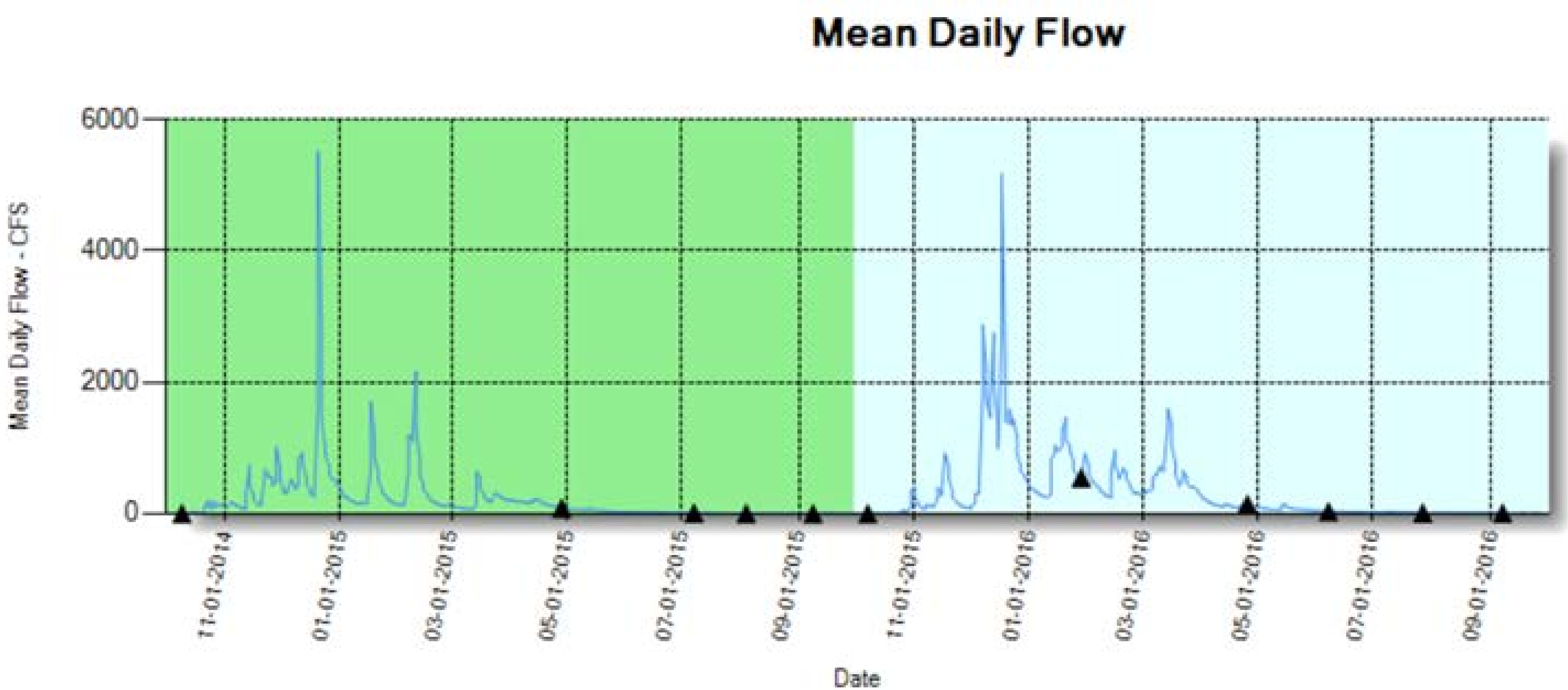
Drainage Area 7 sq miles

Hydrology: Yaquina River

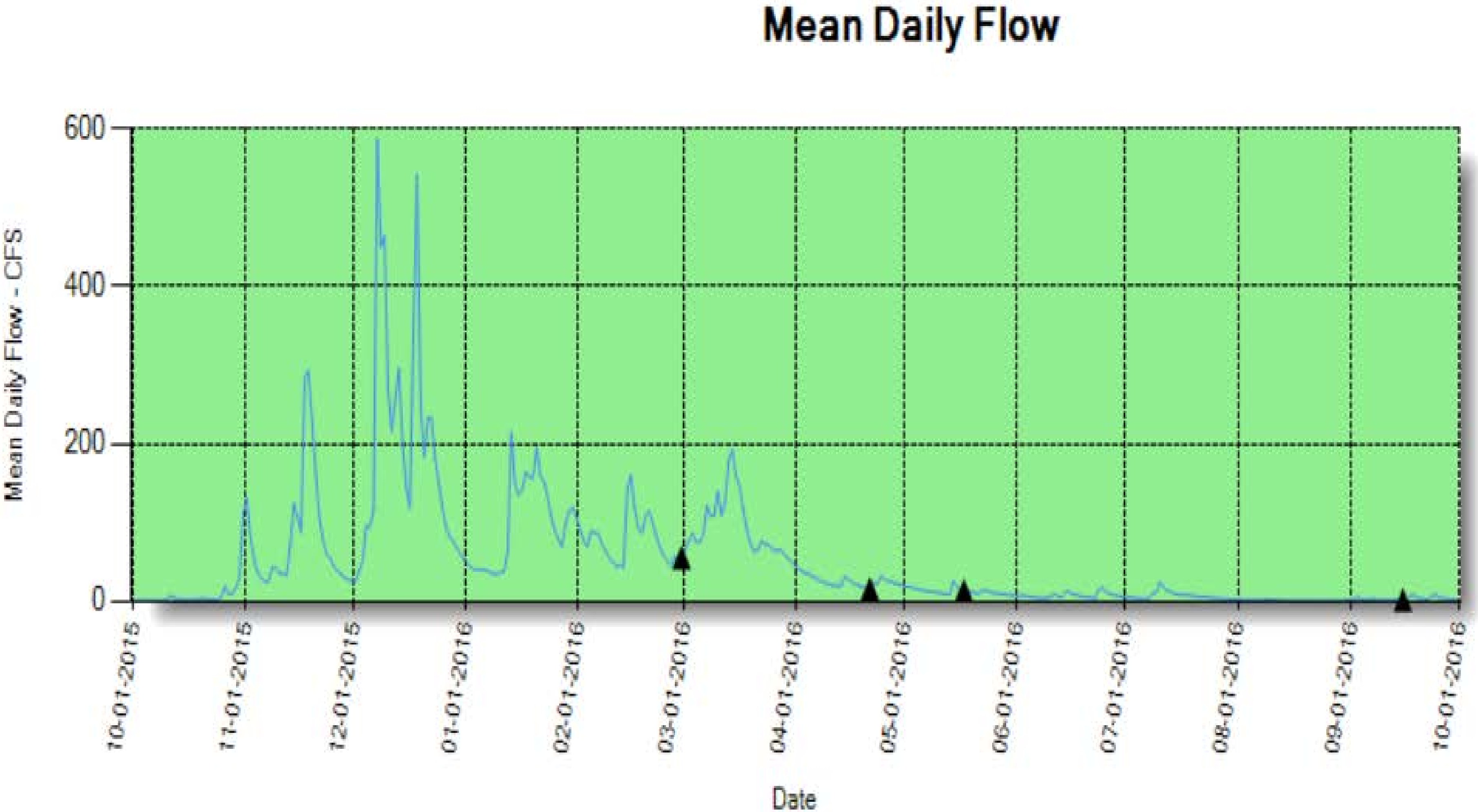


Drainage Area 71 sq miles

Hydrology: Siletz River

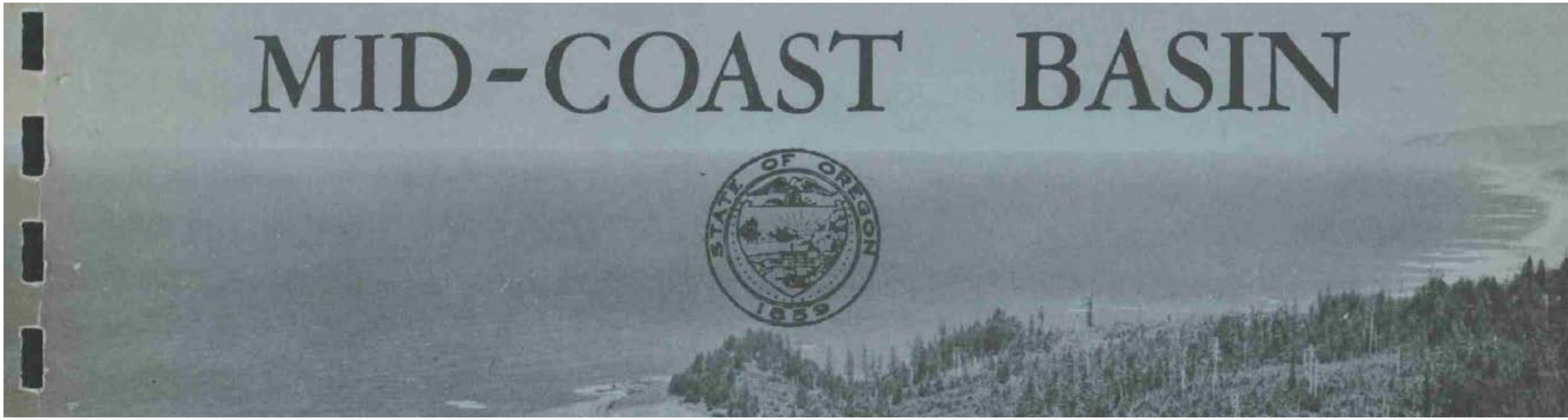


2016 Water Year



Sunshine Creek nr Valsetz full 2016 water year.

Mid-Coast Basin Program Rules



WATER RESOURCES DEPARTMENT

DIVISION 518

MID-COAST BASIN PROGRAM

NOTE: The Mid-Coast Basin is delineated on State Water Resources Board Map 18.6, dated 1964, available from the agency.

690-518-0010

Classifications

(1) In accordance with ORS 536.220, 536.300, 536.310, and 536.340, the waters of the Mid-Coast Basin are classified for domestic, livestock, municipal, irrigation, power development, industrial, mining, recreation, wildlife and fish life uses with preference given to human consumption and livestock consumption over any other beneficial uses, with the following exceptions:

(a) The waters of the following natural lakes of the Mid-Coast Basin are classified for utilization of water for domestic, livestock, and in-lake uses for recreation, wildlife, and fish life purposes: Devils, Triangle, Lily, Sutton, Mercer, Collard, Munsel, Cleawox, Carter, Lost, Elbow, Clear, Woahink, Siltcoos, Tahkenitch, and Threemile;

(b) The waters of Clear Lake are classified for municipal use in addition to the uses specified in subsection (a) of this section;

(c) The waters of the following streams and their tributaries are classified for utilization of water for domestic, livestock, irrigation of lawn or noncommercial garden not to exceed one-half acre in area, power development and instream uses for recreation, wildlife, and fish life purposes:

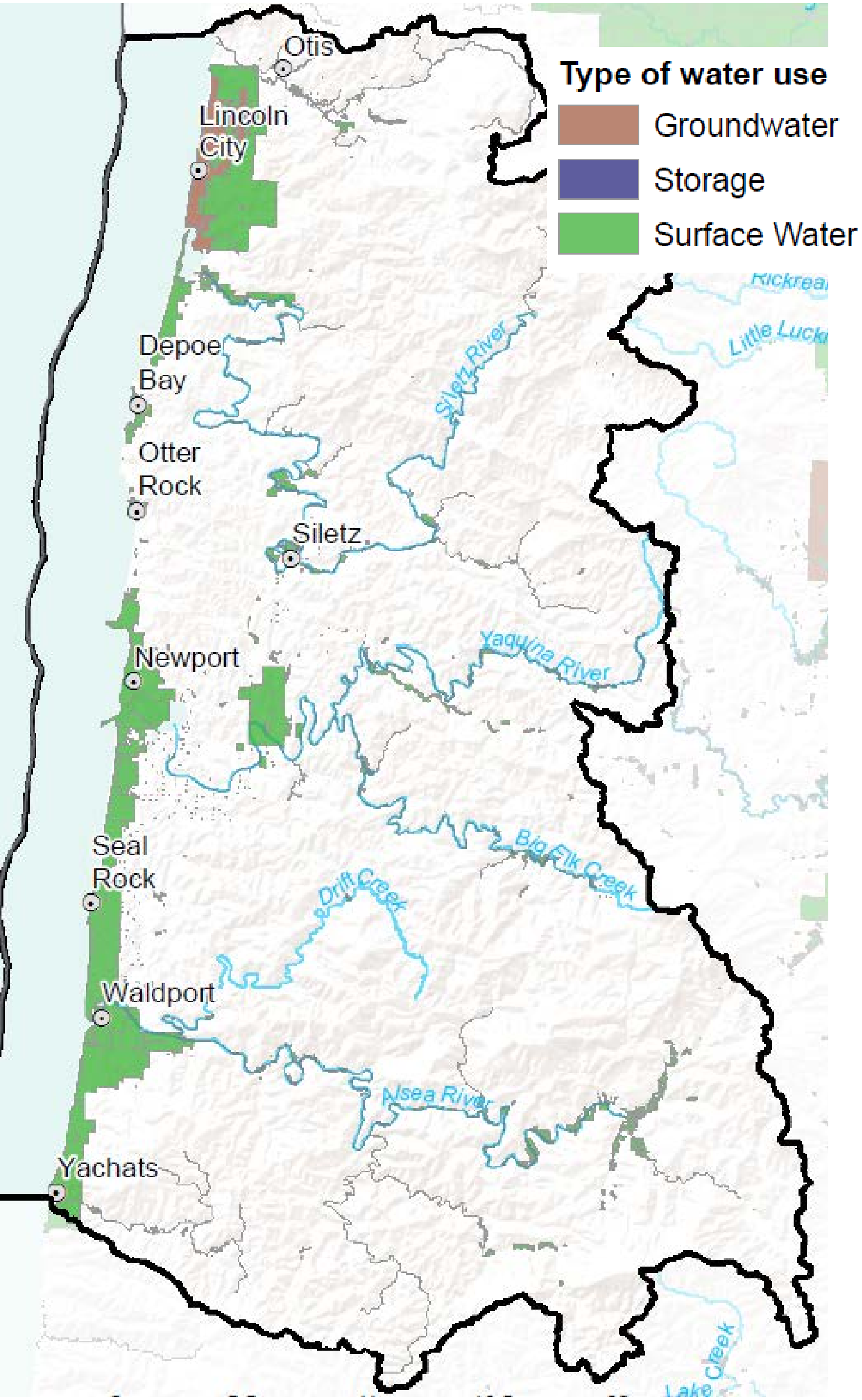
Water Rights by Use

Description:

Water rights fall into several categories of uses. Recreation, fish, wildlife, and livestock may overlap with other uses. Water rights may only be used for the use specified on the water right.

Places of Use Water Rights by Use

Recreation	Agriculture	Power
Fish	Livestock	Commercial
Wildlife	Irrigation	Domestic
Instream	Mining	Municipal
Misc.		



Water Rights by Type

Surface Water Diversions
2,148

Groundwater Appropriations
24

Storage Rights
180

Instream Water Rights
161

Domestic Wells Registered
5,500

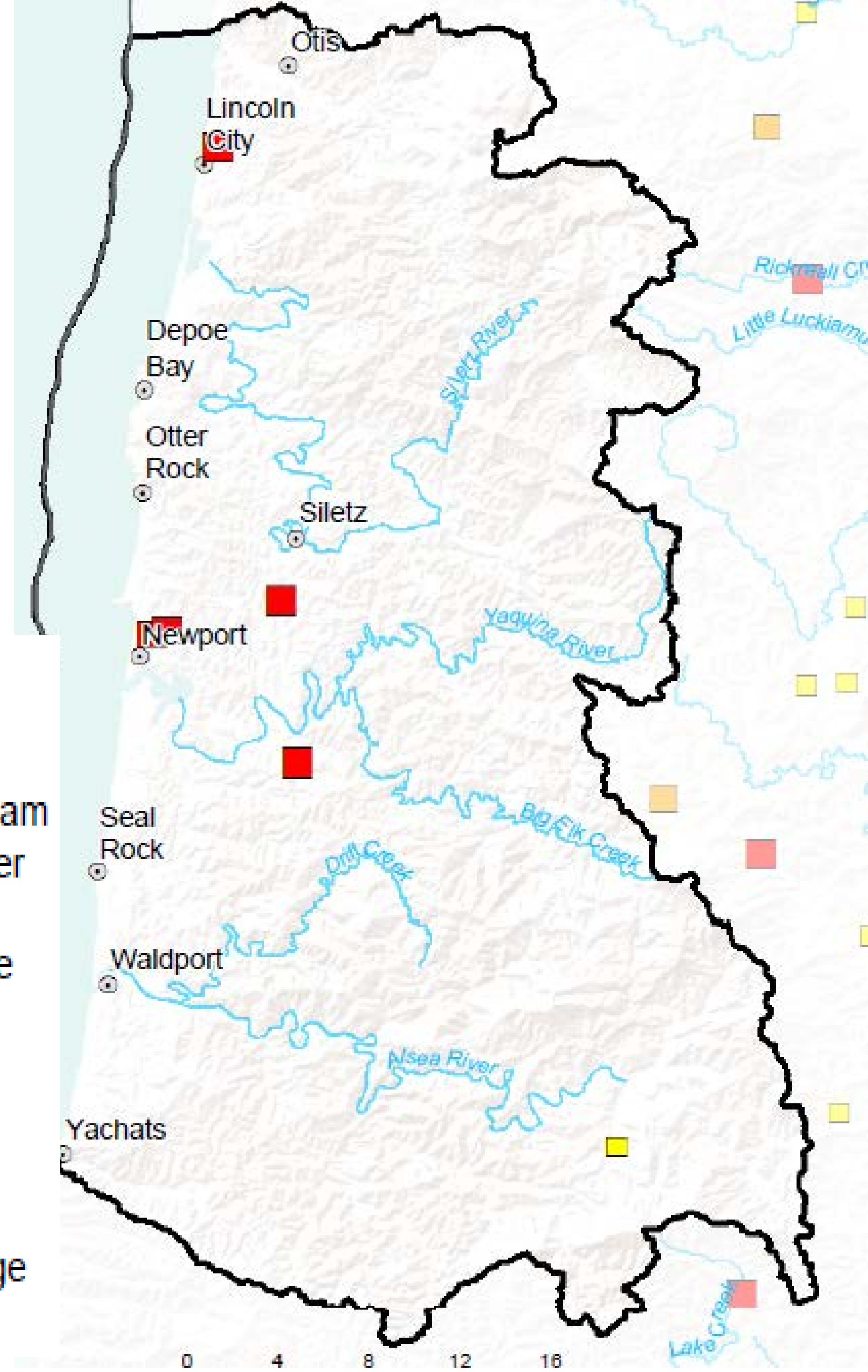
Water Use and Control

Dams and Reservoirs

State and Non-State Dams by Hazard

Hazard Level

- High
- Significant
- Low



Description:

The Oregon Water Resources Department maintains an inventory of Oregon dams. Information available includes dam height, storage capacity, dam name, location, permit number and hazard classification.

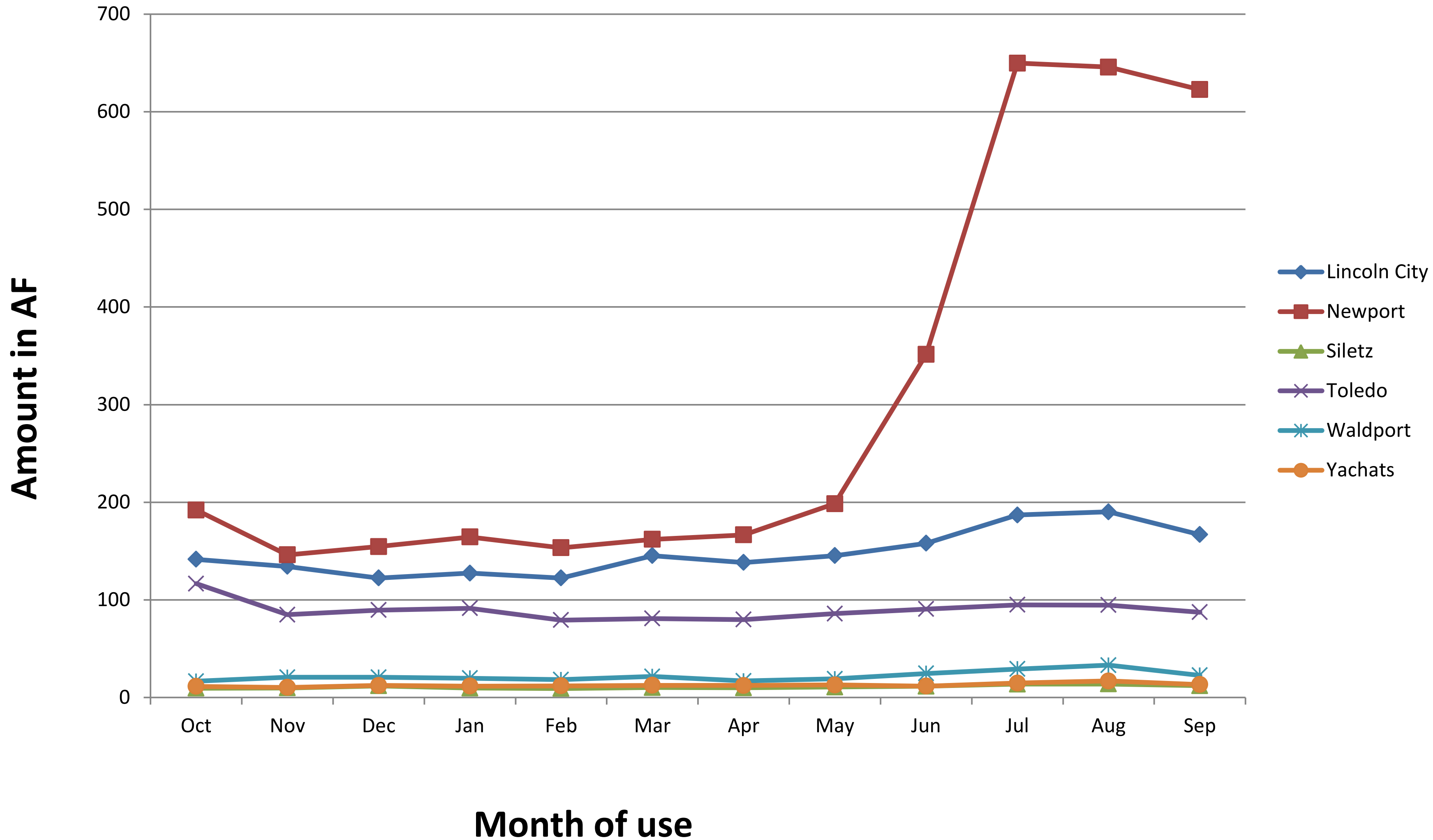
Hazard ratings were established by the Department and are based on the potential damage to life and property down-stream of a dam in the event of a dam failure.

High Hazard rating: loss of human life would be expected.

Significant Hazard rating: loss of life would be unlikely, but damage to property would be extensive.

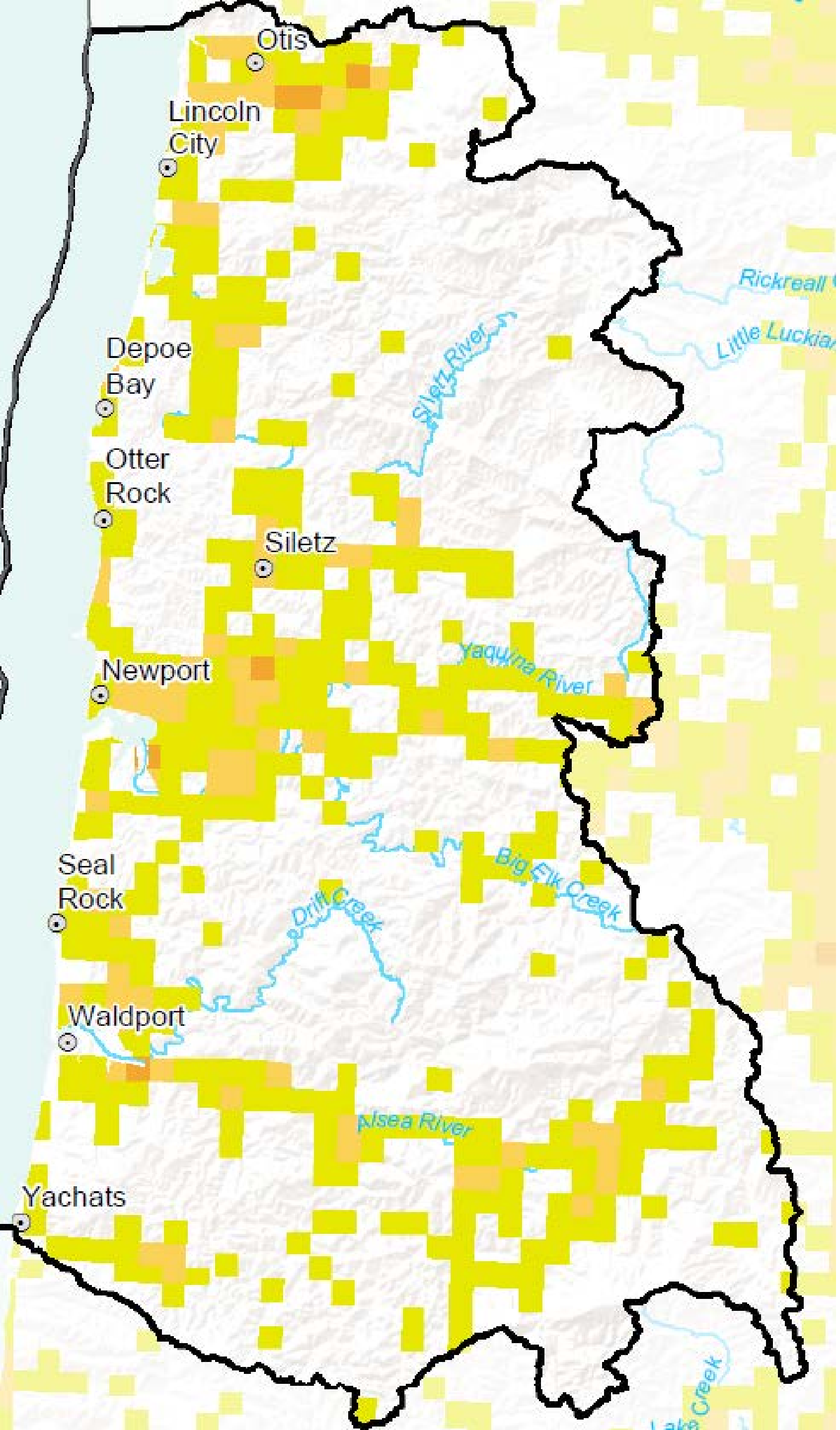
Low Hazard rating: loss of life would be unlikely and damage to property would not be extensive.

Municipal Water in 2016



Water Use Reported in AF (acre feet)

Average water used per month for ALL water uses reported = 52 af



Well Density

Number of Wells

- 1 - 10
- 11 - 40
- 41 - 100
- 101 - 200
- > 200

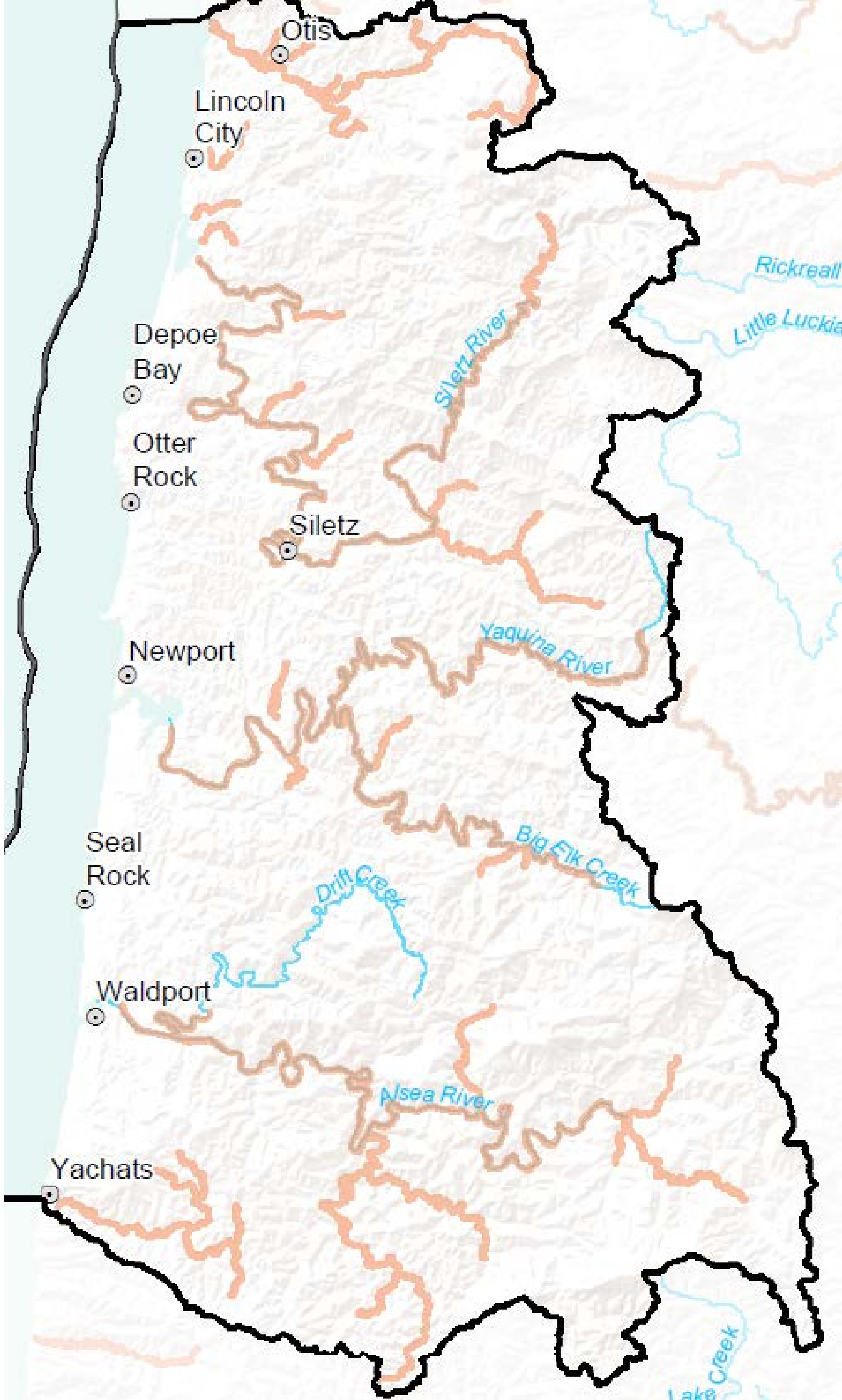
Most wells in the Mid-Coast are wells that serve exempt water uses, primarily domestic and stockwater.

Instream Water Rights

Majority of ISWR Priority Dates of **1966** or **1974**

Description:

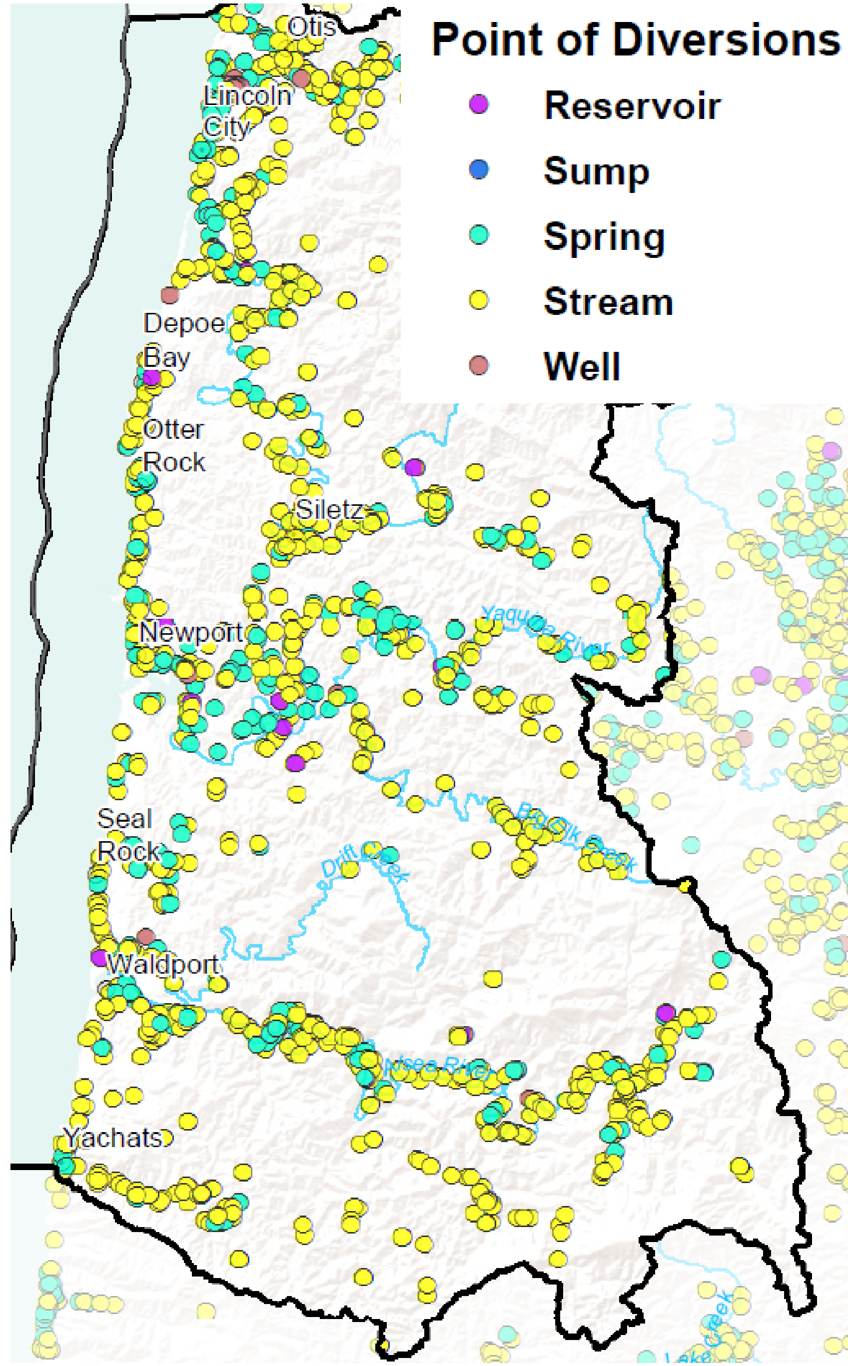
Instream water rights were established by the 1987 Legislature for protecting fish and wildlife, minimizing the effects of pollution, or maintaining recreational uses. Instream water rights establish flow levels to remain in a stream on a semi-monthly basis and are usually set for a certain stream reach and measured at a specific point on the stream. Instream water rights have a priority date and are regulated and enforced like all other water rights.



Water Rights Regulation

Watermasters respond to calls from water users and determine who in times of water shortage has the right to use water.

Each summer as streamflows drop, they regulate junior users to provide water to more senior users. Typically ISWR not being met triggers regulation.



Questions?

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District 1 Watermaster

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503-815-1967

Hydrogeology of the Coast Range

- Geology of The Coast Range
  - Older Rocks
  - Younger Sediments
- Groundwater Basics
  - Types of aquifers and properties
  - Flow in fractured rock
- Groundwater Resources

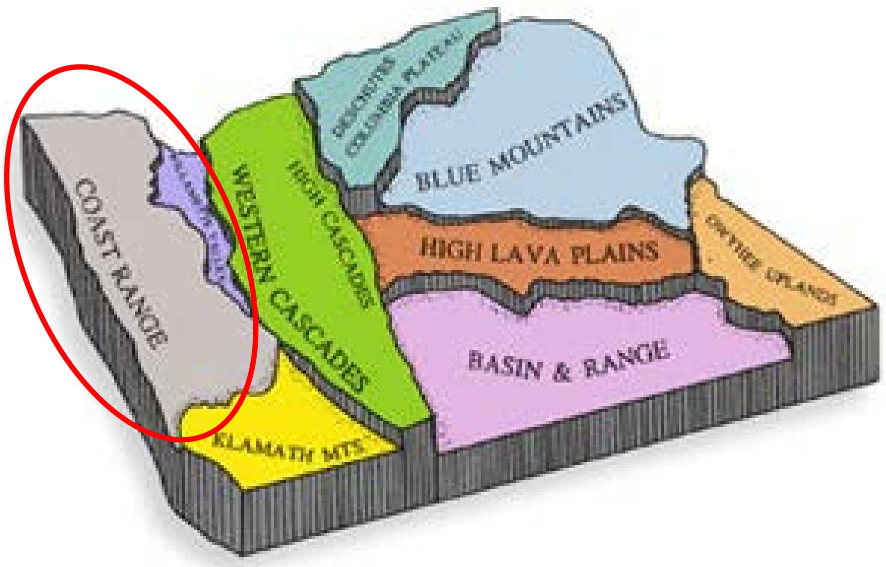
Coast Range Sediments:
50 million years of mud
50 million years ago to now

Geology of Oregon

The Big Picture

The Coast Range

- Accreted Volcanics
- Marine Sediments
- Terrace and Recent Deposits



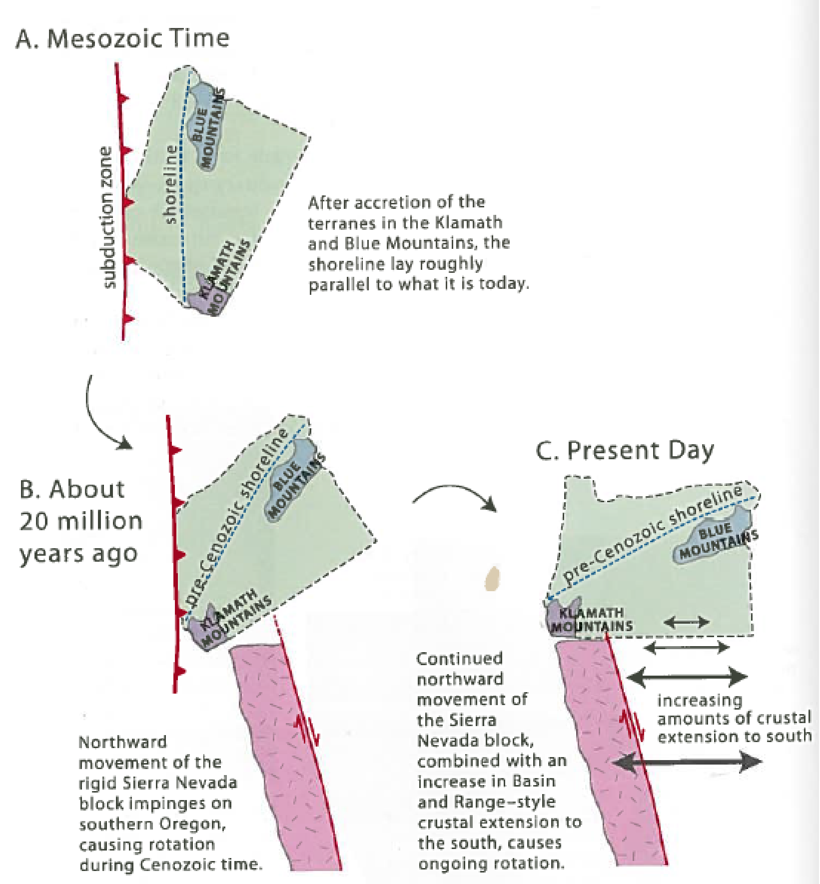
Source: http://www.oregongeology.org/sub/learnmore/GeologisSightseeing.HTM

Geology of Oregon

The Coast Range

Accreted Terranes

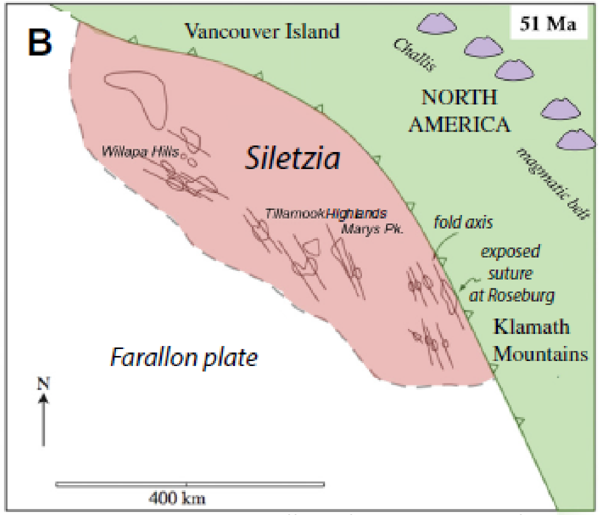
- Ancient Shoreline
- Rotating Continent
- Klamath / Blue Mtns. (200 Mya)
- Siletz River Volcanics



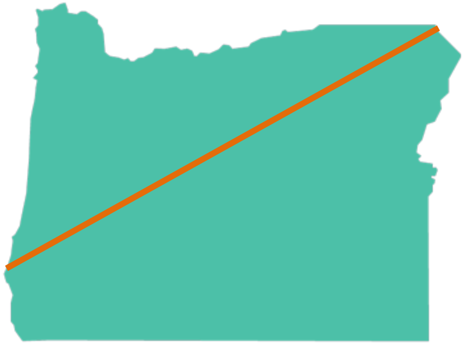
Geology of Oregon
The Coast Range

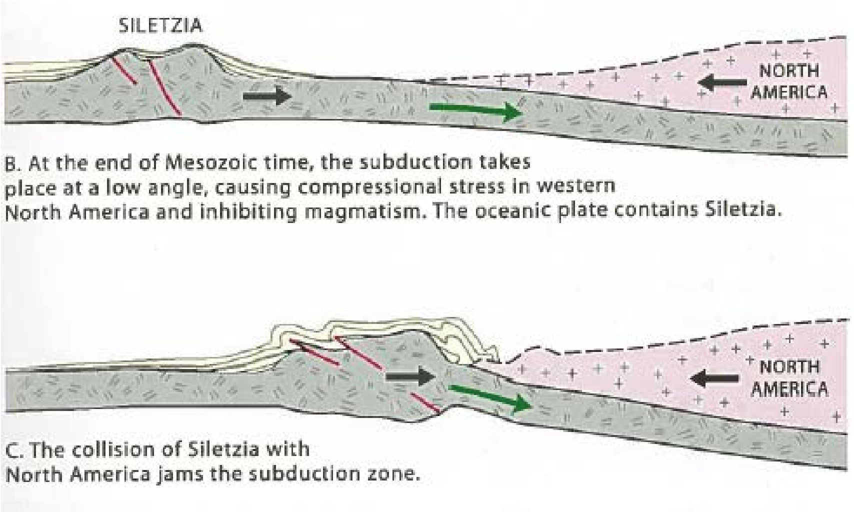
Accreted Terranes

- Siletz River Volcanic (60-40 Mya)
  - Hot spot Volcanics
  - Accreted onto continent
  - Form basement of Coast Range



Well et al., 2014. Geosphere





B. At the end of Mesozoic time, the subduction takes place at a low angle, causing compressional stress in western North America and inhibiting magmatism. The oceanic plate contains Siletzia.

C. The collision of Siletzia with North America jams the subduction zone.

Geology of Oregon

The Coast Range

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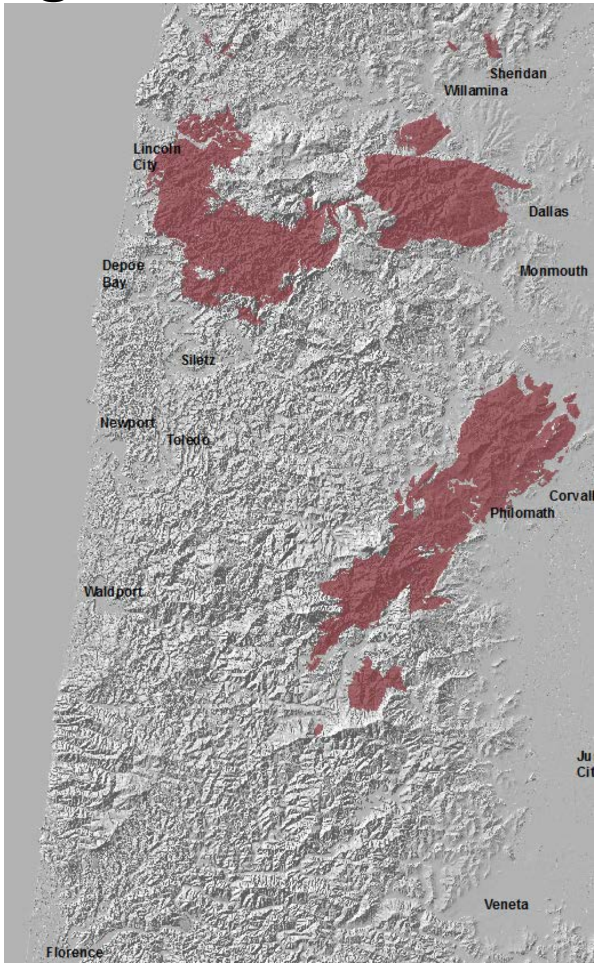
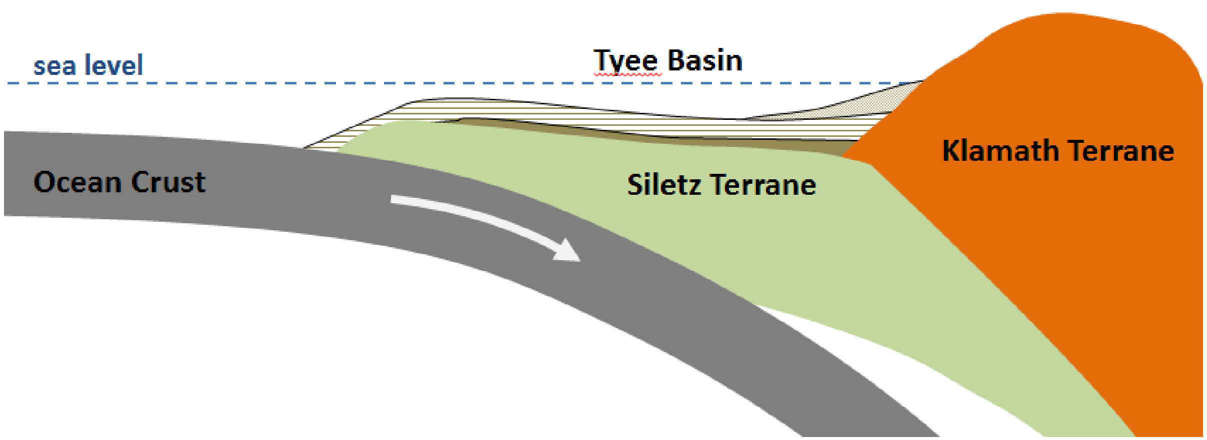


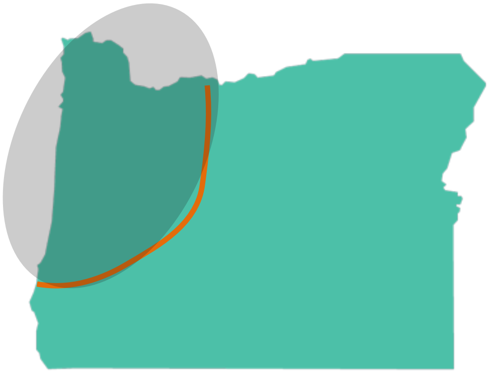
Geology of Oregon

The Coast Range

Depositional Basin

- Tyee Group (50-40 Mya)
  - Deposited ocean basin over subducting Siletz River Terrane
  - Fine-grained marine sediments
  - <u>Massive</u>





Geology of Oregon

The Coast Range

Tyee Group

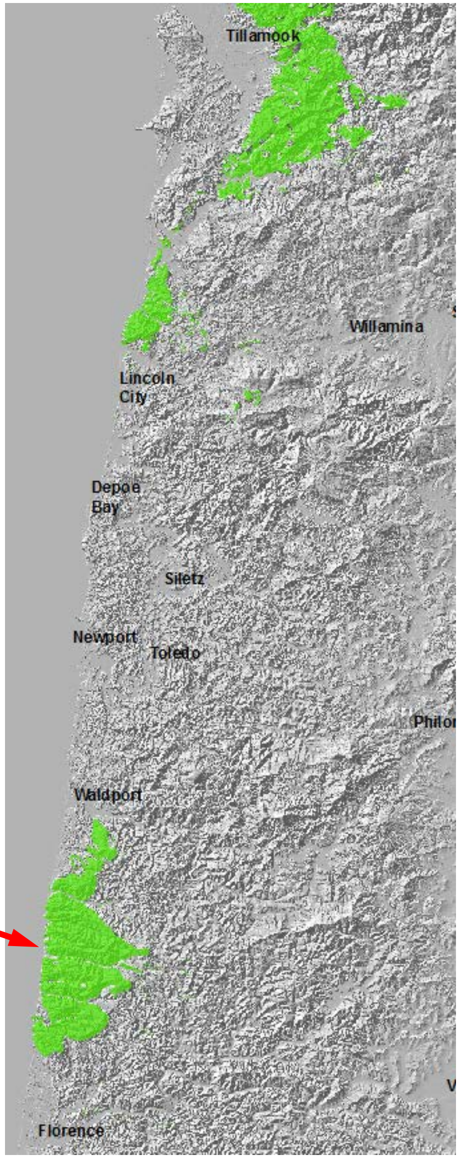
Source: https://pangea.stanford.edu/researchgroups/spodds/news/gallery/spodds-annual-meetings

Geology of Oregon

The Coast Range

The Second Attack

- Yachats; Cascade Head; Tillamook Volcanics (40-30 Mya)
  - Offshore Island Arc
  - Smaller than Siletzia

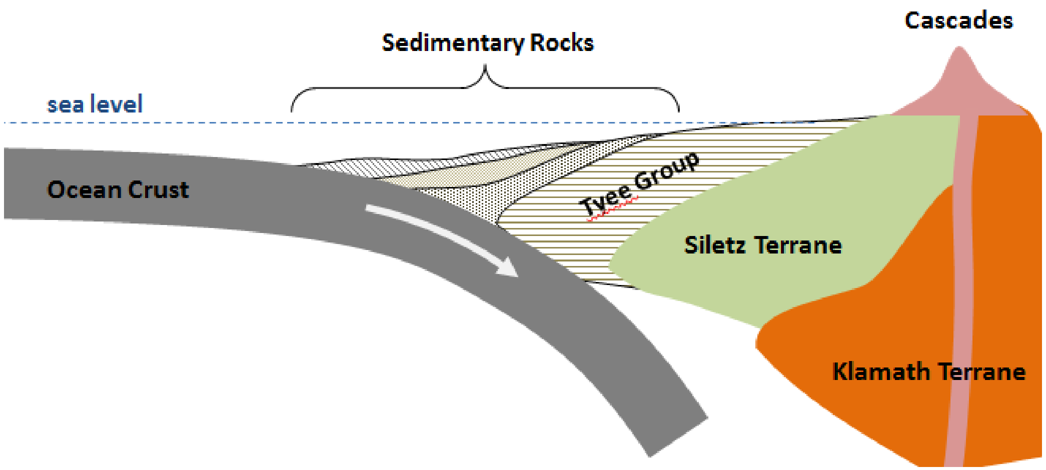


Geology of Oregon

The Coast Range

Shifting Continental Margin (30-20 Mya)

- Shift to N-S orientation
- Rise of Cascade Range
- Deposition limited to embayments
  - Atoria, Nye, Yaquina, Alsea



Geology of Oregon

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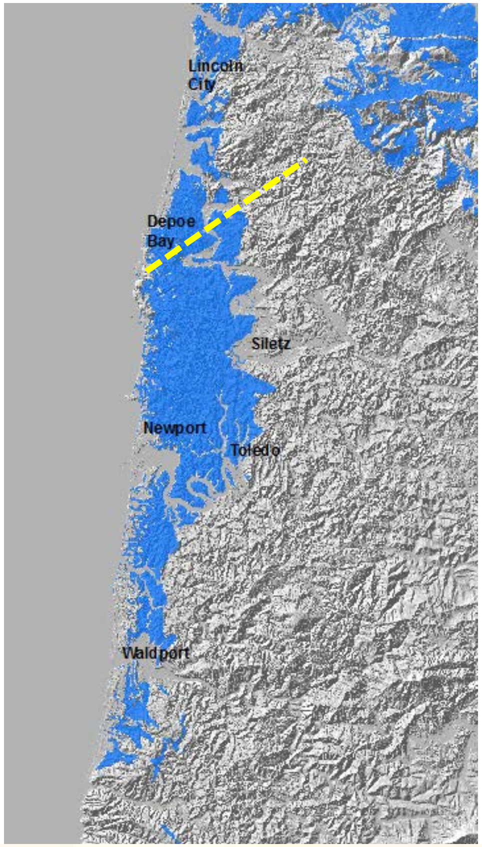
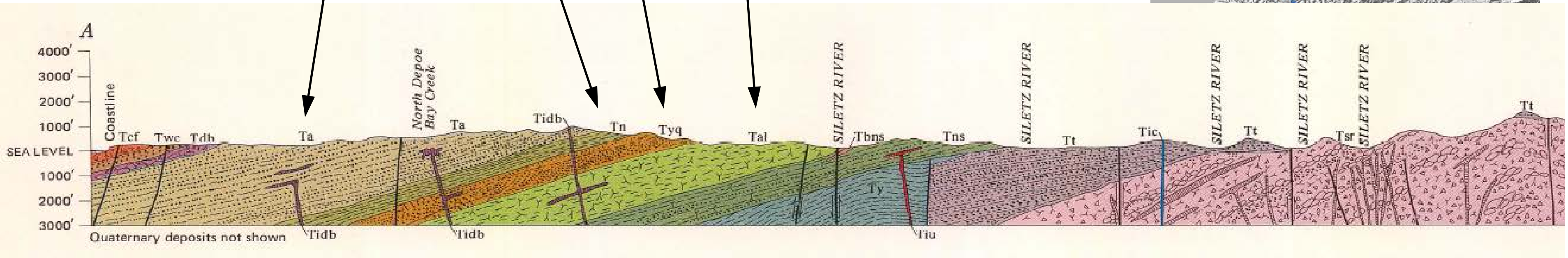


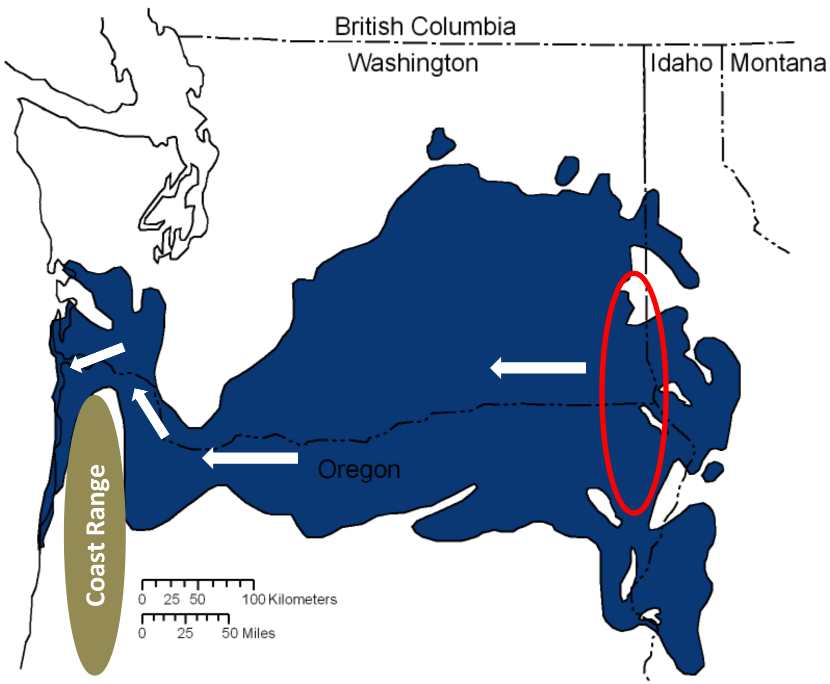


Geology of Oregon

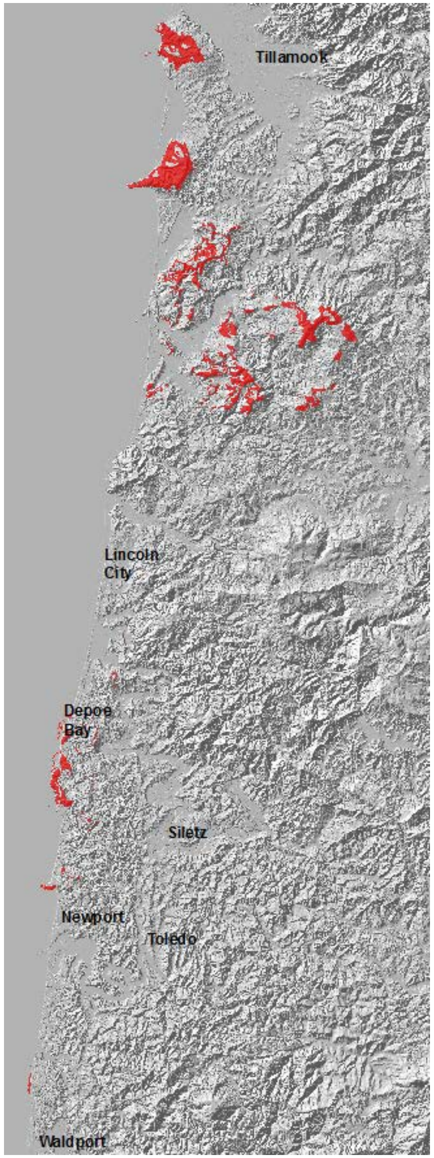
The Coast Range

Invasion from the East

- Columbia River Basalts (17-15 Mya)
  - Covered and intruded coastal sediments



http://geology.isu.edu/Digital_Geology_Idaho/Module10/mod10.htm



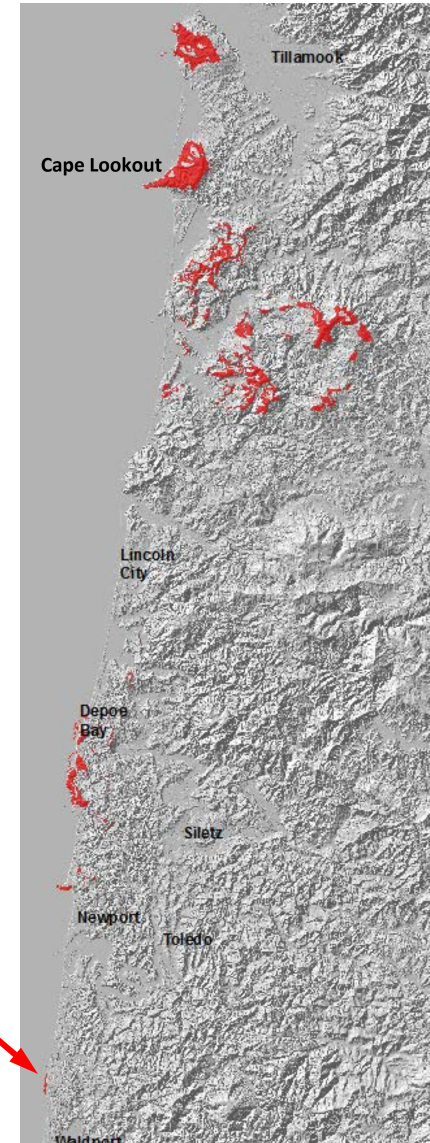
Geology of Oregon

The Coast Range

Invasion from the East

- Columbia River Basalts (15-16 Mya)
  - Covered and intruded coastal sediments
  - More resistant to erosion
    - Elephant Rock; Yaquina Head; Cape Lookout

http://geotripper.blogspot.com/2012/08/a-kid-in-candy-shopon-oregon-coast.html

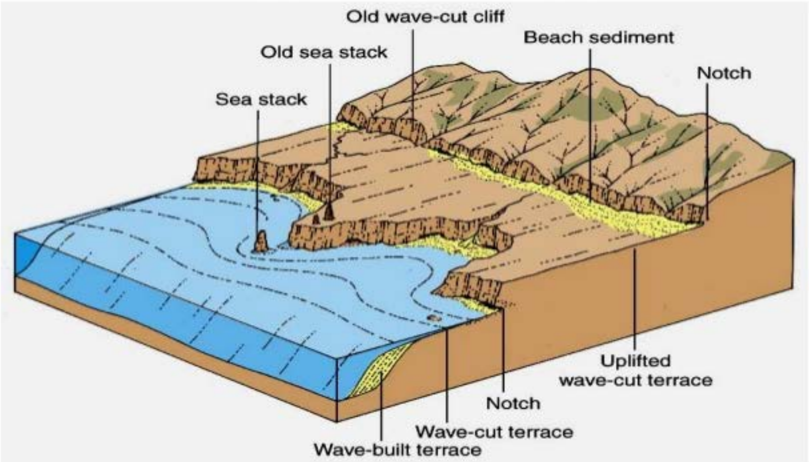


Geology of Oregon

The Coast Range

Up we go!

- Marine Terraces (0.2 – 0 Mya)
  - Old shorelines; stranded and uplifted
  - Semi-consolidated sediments
  - Thin



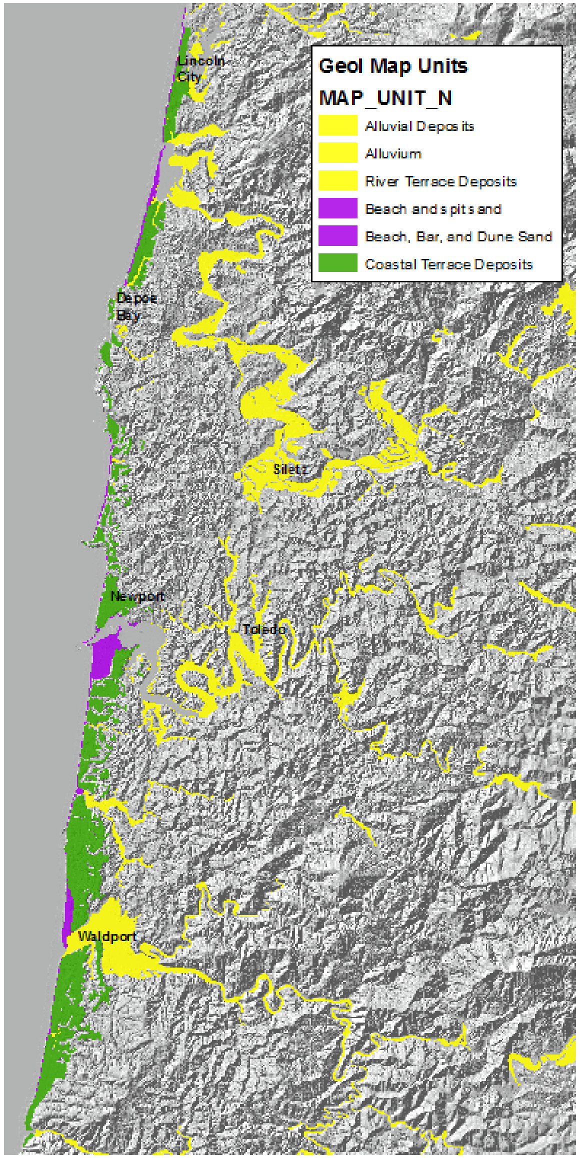
https://www.slideshare.net/wwlittle/natural-disasters-topic-11-coastal-hazards

Geology of Oregon

The Coast Range

Recent

- Marine Terraces
- River Alluvium
- Beach sands

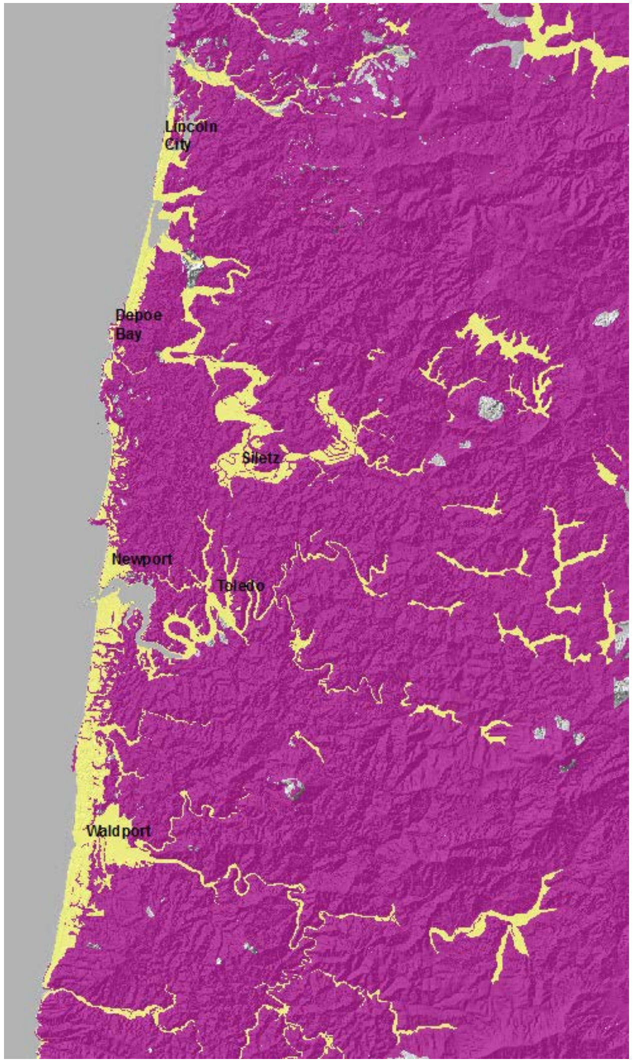


Geology of Oregon

Coast Range Aquifers

In general

- Consolidated Bedrock
  - Accreted Terranes
    - Siletz, Yachats, etc.
  - Sedimentary Rocks
    - Tyee, Alsea, Astoria, etc.
  - “Fractured Rock Aquifer”
- Unconsolidated Sediments
  - Marine Terraces
  - River Deposits
  - Beach Deposits
  - “Sand and Gravel Aquifer”



Groundwater

Aquifer Basics

General aquifer properties

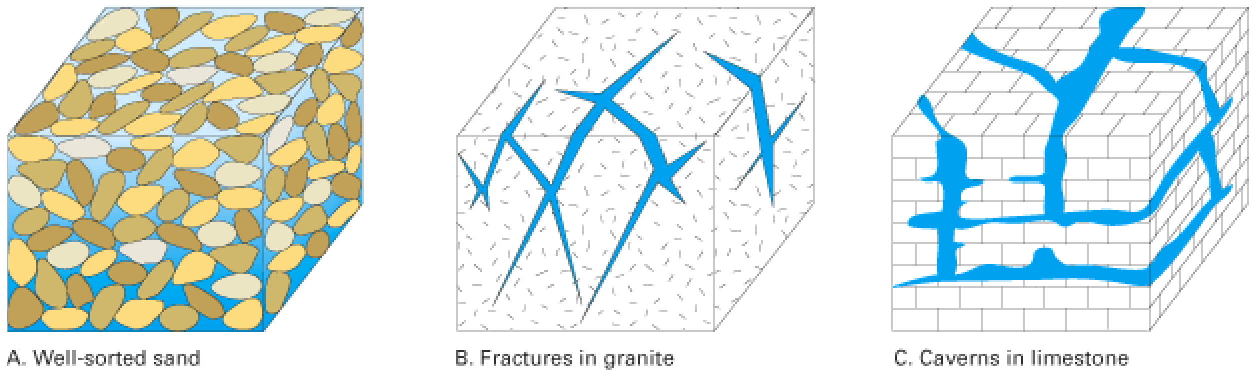
- Storage/Porosity (how much)
- Transmissivity (how fast)
- Well Yield (how much how fast)

Groundwater

Aquifer Basics

Groundwater occupies voids in the rocks

- pores, fractures, caverns, inter-granular voids



Source: http://pubs.usgs.gov/circ/2003/circ1262/

"Sand and Gravel Aquifer"

- Marine Terraces
- Alluvial Sediments
- Beach Deposits

"Fractured Rock Aquifer"

- Accreted Terranes
- Sedimentary Rocks
- Basalts

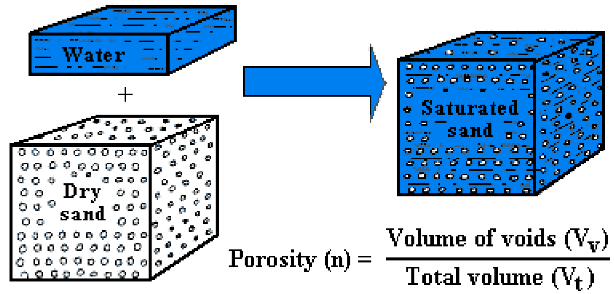
Rare in Oregon

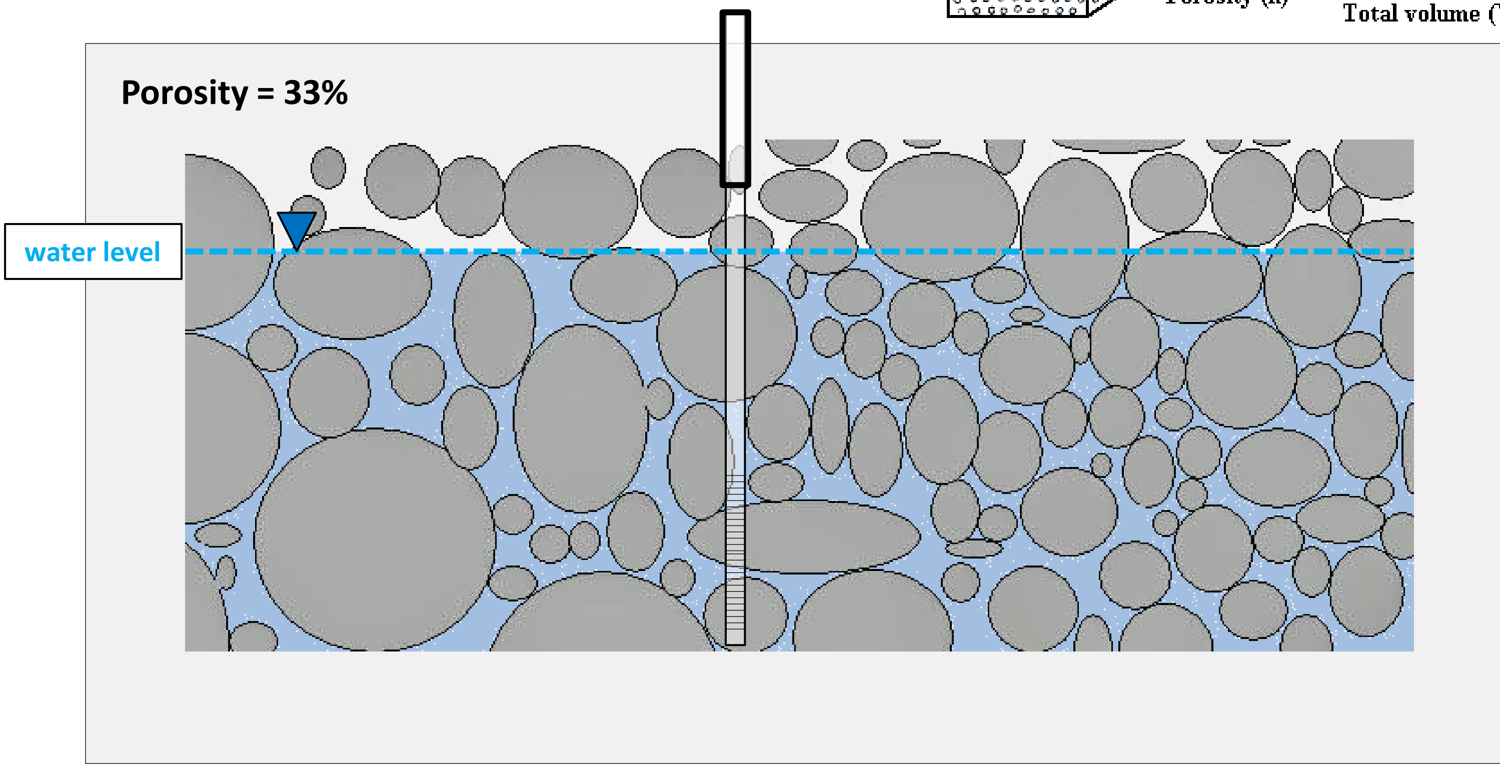
Groundwater

Aquifer Basics

Storage (how much)

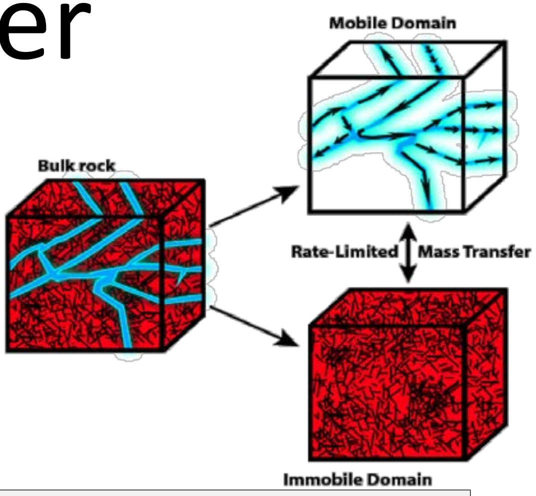
- Porosity = V_{pores}/V_{total}



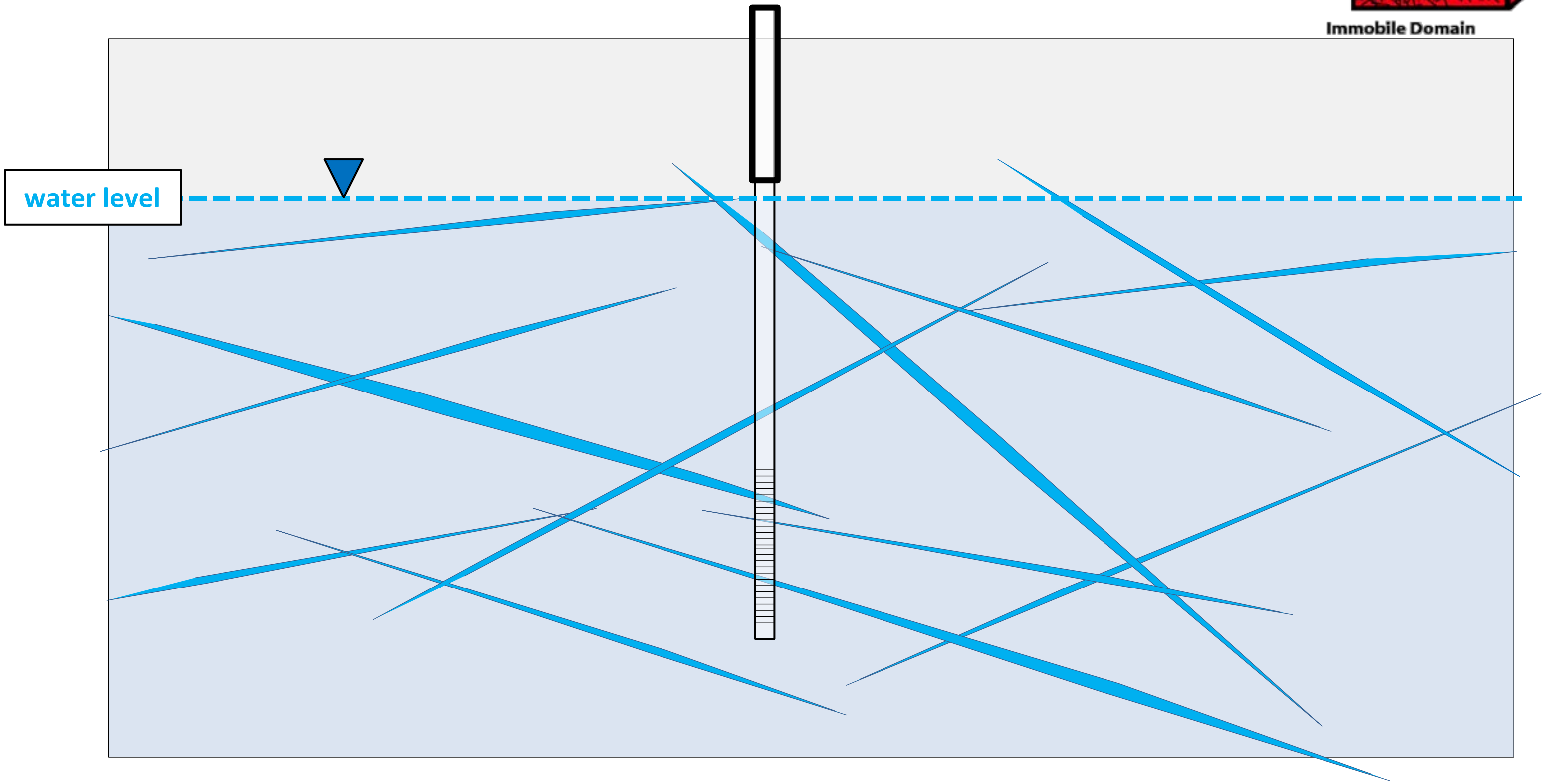


Groundwater

Aquifer Basics



- Storage (how much)
  - Porosity = $V_{fractures}/V_{total}$



Groundwater

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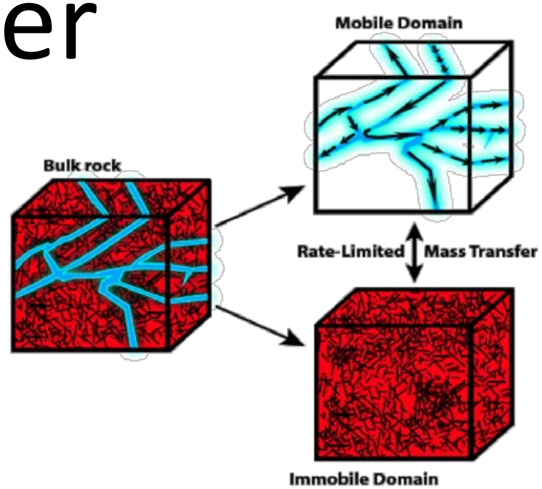

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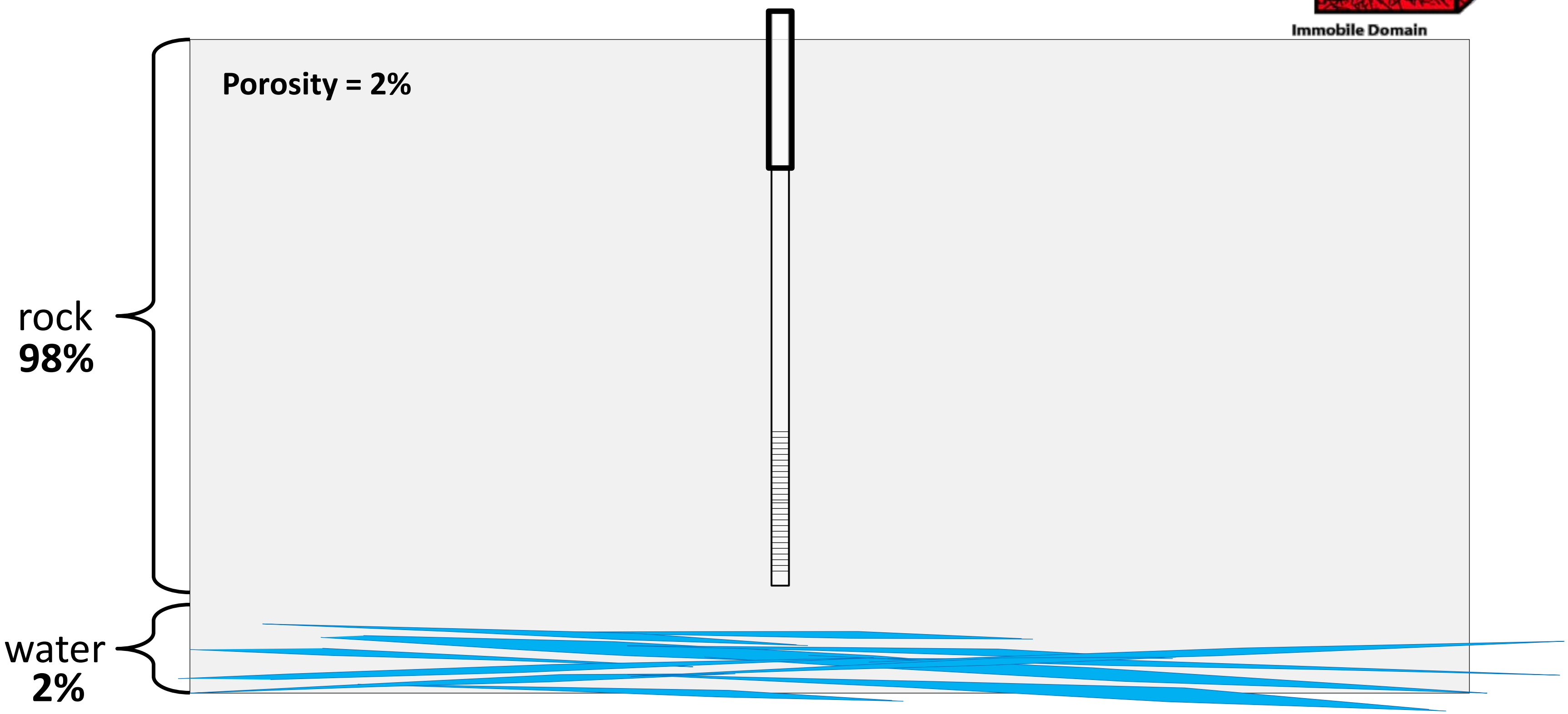
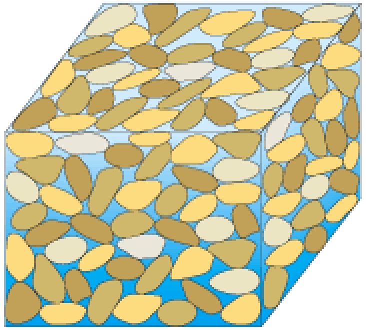


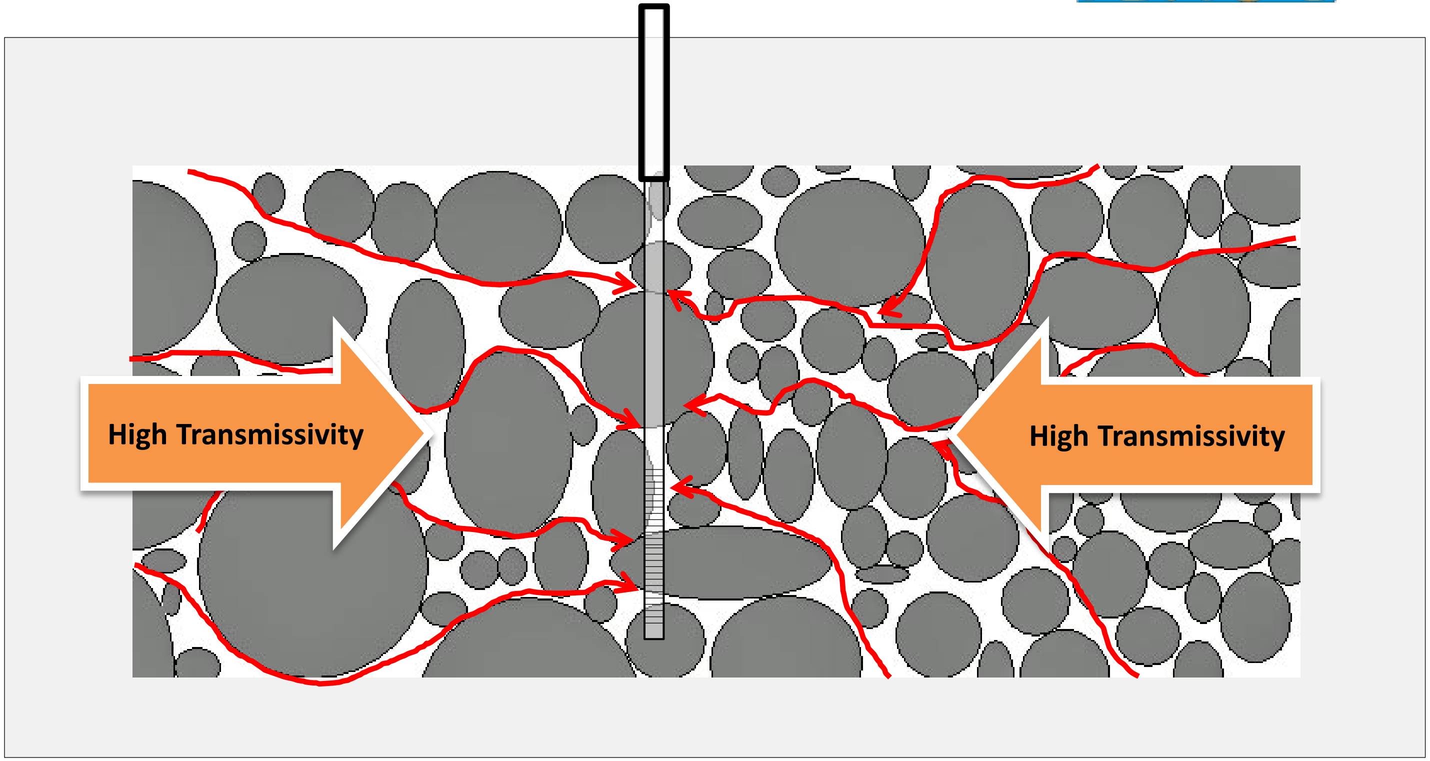
Groundwater

Aquifer Basics



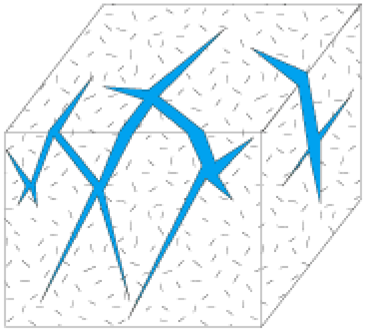
Transmissivity (how fast)

- *T* = conductivity x thickness



Groundwater

Aquifer Basics



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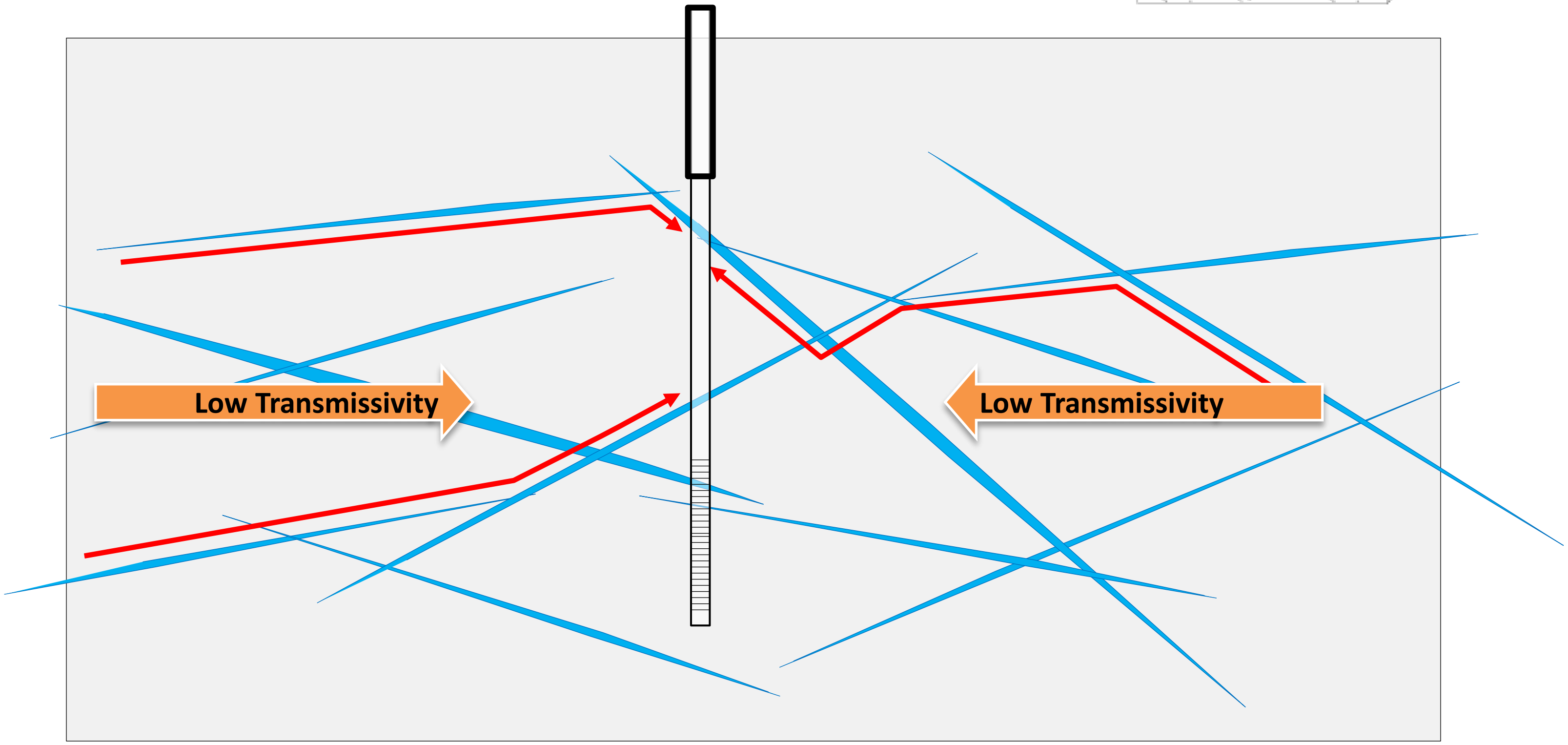
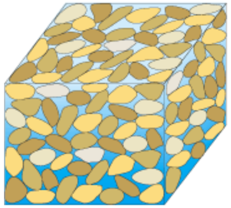


Groundwater
Aquifer Basics



Yield

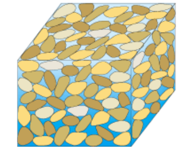
- How much water can I get
- Function of Transmissivity and Storage
  - High Yield: 100s gal/min
  - Low Yield: 1s gal/min
  - Dry Hole: Not worth measuring

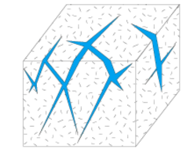
Groundwater

Coast Range Aquifers

In general:

- Consolidated Rock
  - "Fractured Rock"
  - Low Yield
  - Poor-productive aquifer
- Unconsolidated Sediments
  - "Sand and Gravel"
  - High Yield
  - Limited in aerial extent and depth





Transmissivity

Characteristic	Willamette Silt Unit	Basin-Fill Sediment Unit	Columbia River Basalt Unit	Low-Yield Bedrock Unit
Porosity	High	Moderate to High	Low to Moderate	Low
Dominant Porosity Type	Intergranular	Intergranular	Intergranular	Fracture
Storage Capacity	High	Moderate to High	Low	Low to Very Low
Horizontal Permeability	Low	High	High	Very Low
Vertical Permeability	Low	Moderate	Very Low	Very Low
Well Yields	NA	Moderate to High	Low to High	Very Low to Low
Pumping Impacts	NA	Local to Intermediate	Widespread	Local
Overdraft Potential	NA	Low	High	High but Localized
Miscellaneous Problems		Sands and gravels thin or absent in some areas High arsenic in some areas	Porous zones may not be laterally extensive Porous zones not always present between lava flows Local aquifer boundaries common Salty water at depth in some areas	Fractures may close over time High salinity is common High arsenic in some areas
Pitfalls	NA	High potential for stream interference	High yields but low storage capacity	Initial yields not representative of long-term yields
Uncertainty of Resource Capacity Predictions	NA	Low	Moderate	High

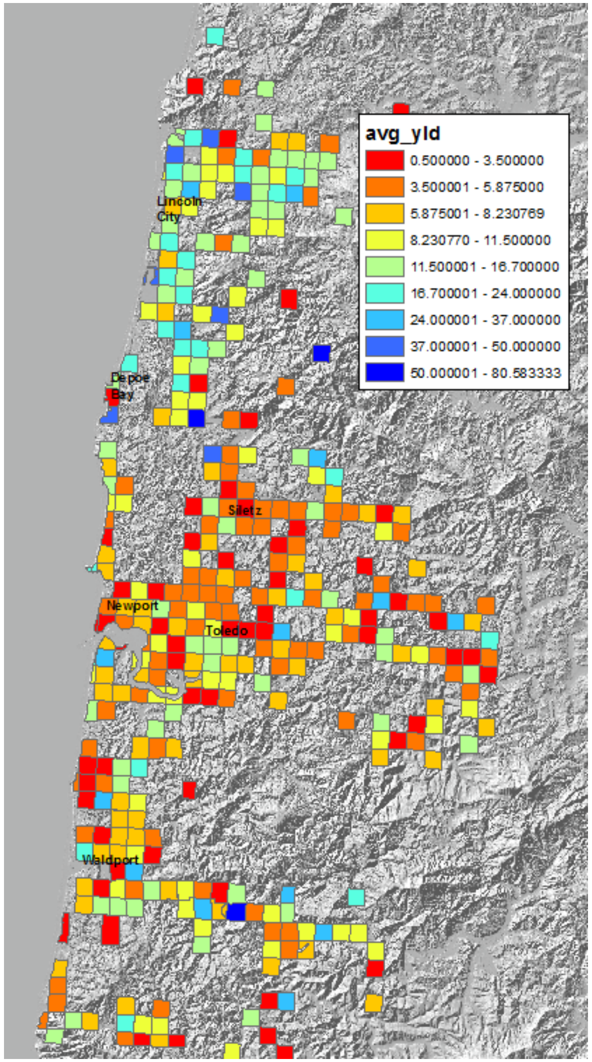
Source: Groundwater Supplies in the Willamette Basin. OWRD Report. 2002

Groundwater

Coast Range Aquifers

In general:

- Consolidated Rock
  - “Fractured Rock”
  - Low Yield
  - Poor-productive aquifer
- Unconsolidated Sediments
  - “Sand and Gravel”
  - High Yield
  - Limited in aerial extent and depth
- Median Well Yield: Lincoln Co.
  - 6.0 gal/min



Questions?

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