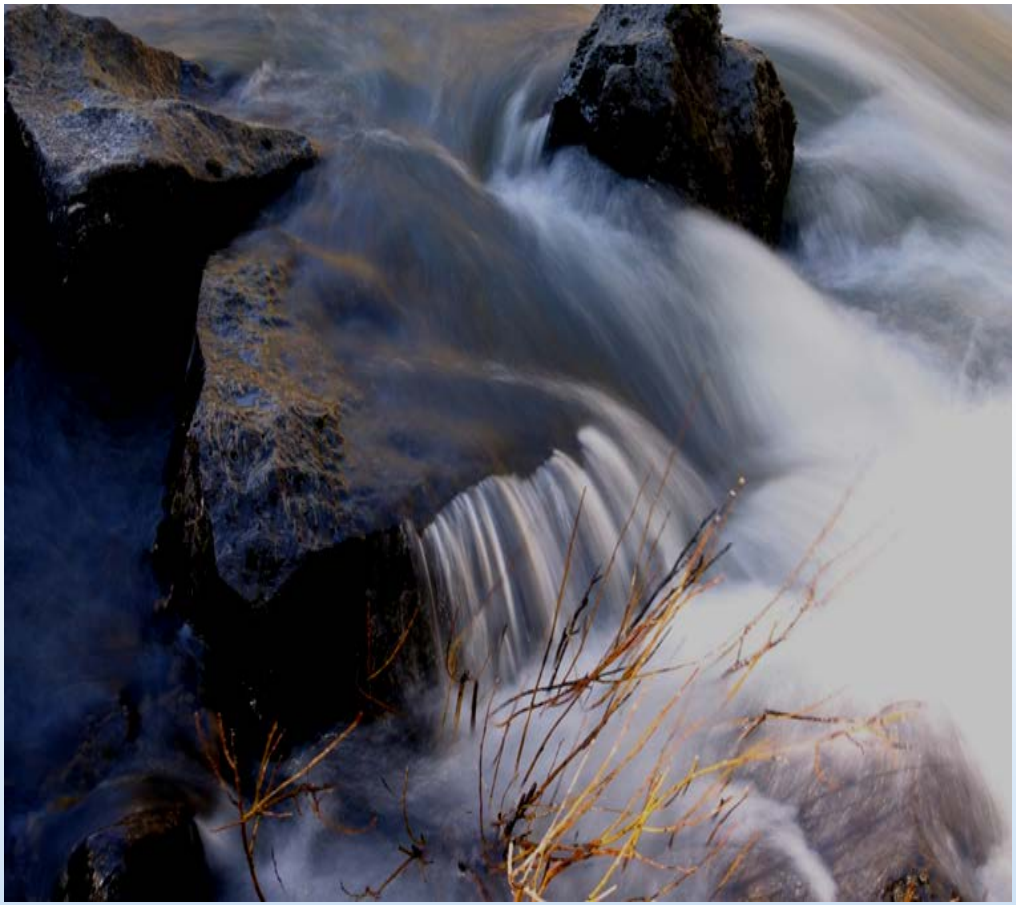
Klamath Basin Update

OREGON
WATER RESOURCES
DEPARTMENT

February 21, 2019

Ivan Gall
Justin Iverson
Michael Thoma



OREGON WATER RESOURCES DEPARTMENT

Overview

- Water management background
- Recent regulation
- Proposed Division 025 rule amendment process
- Proposal for 2019-2020 irrigation seasons
- Basin hydrology and stream depletion overview

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Background

- 2001 BOR Project shut-off and Bucket Brigade
- Listed species -Shortnose and Lost River suckers in lake, Coho salmon in Klamath River
- Four Tribes – Klamath, Hoopa, Karuk, and Yurok
- Federal litigation around takings (2001 shut-off) and ESA issues
- USGS & OWRD basin study and model reports completed in 2007 and 2012

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Background

- Considerable efforts to address water needs
  - adjudication process continues in circuit court
  - settlement negotiations occurred and ongoing
  - significant regulation to protect senior rights
- Declared droughts in six of the last nine years
- New Biological Opinion for BOR Project expected April 2019

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Regulation Background

- **2013 Findings of Fact and Order of Determination**
- **2014 Upper Klamath Basin Comprehensive Agreement – many provisions on regulation of wells**
- **2015 Division 025 rules adopted – include provisions from agreement**

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Regulation Background

- 2015-17 wells regulated under Division 025
- 2017 December 28th—Sec. of the Interior publishes Negative Notice terminating Agreement
- 2018 wells regulated under Division 009

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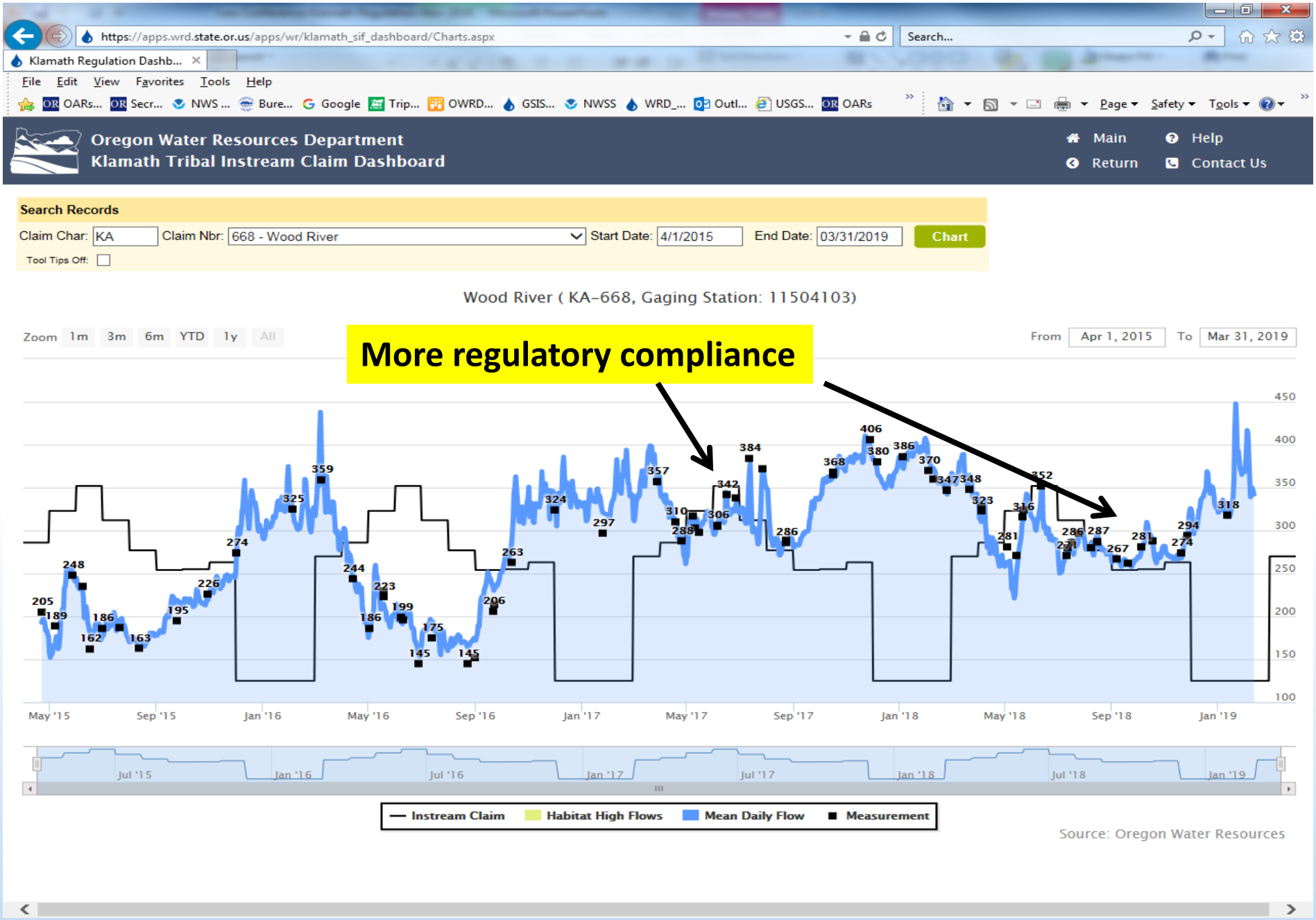
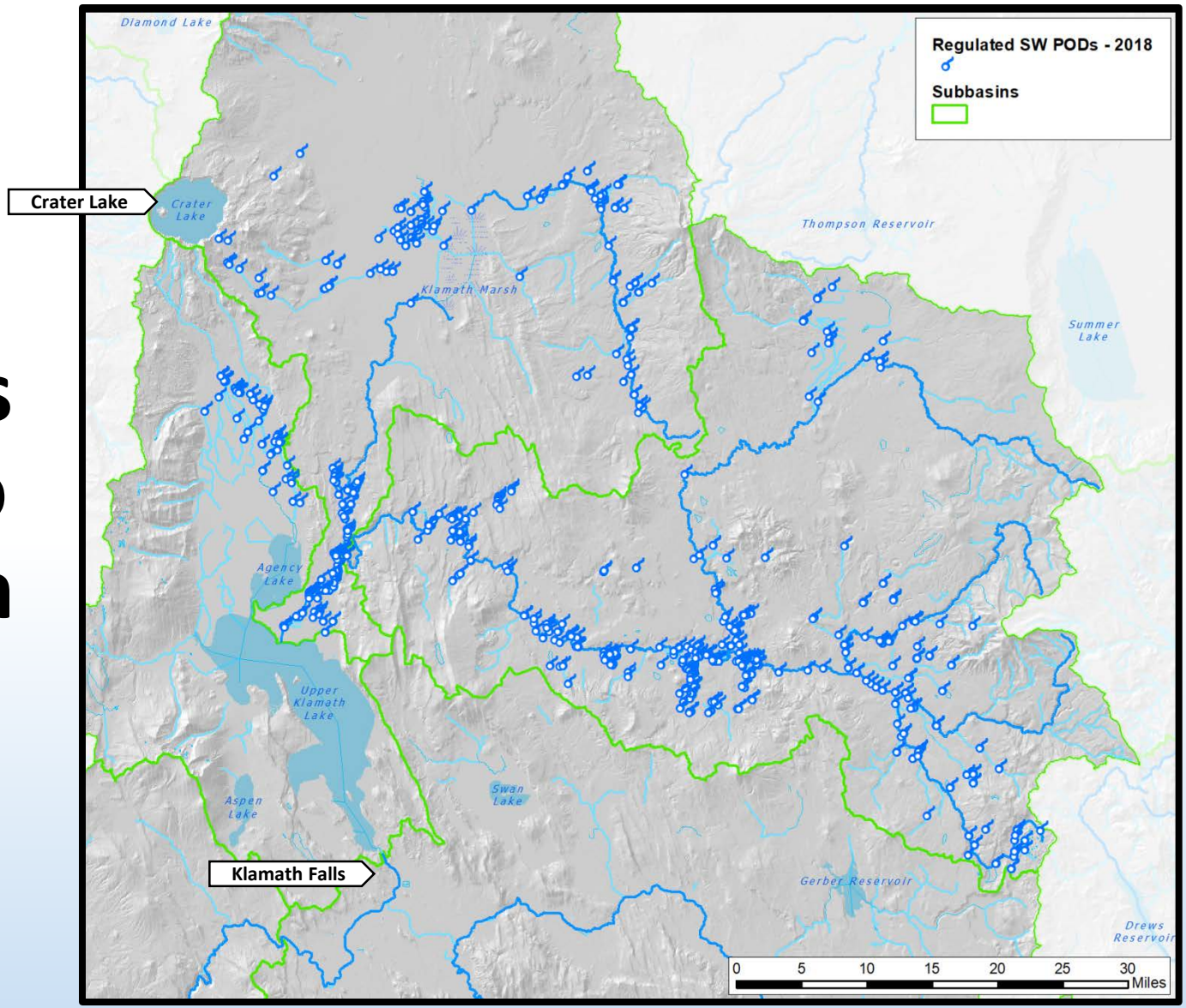
Regulation Background

- Increased stream gaging since 2013 to help with timely regulation

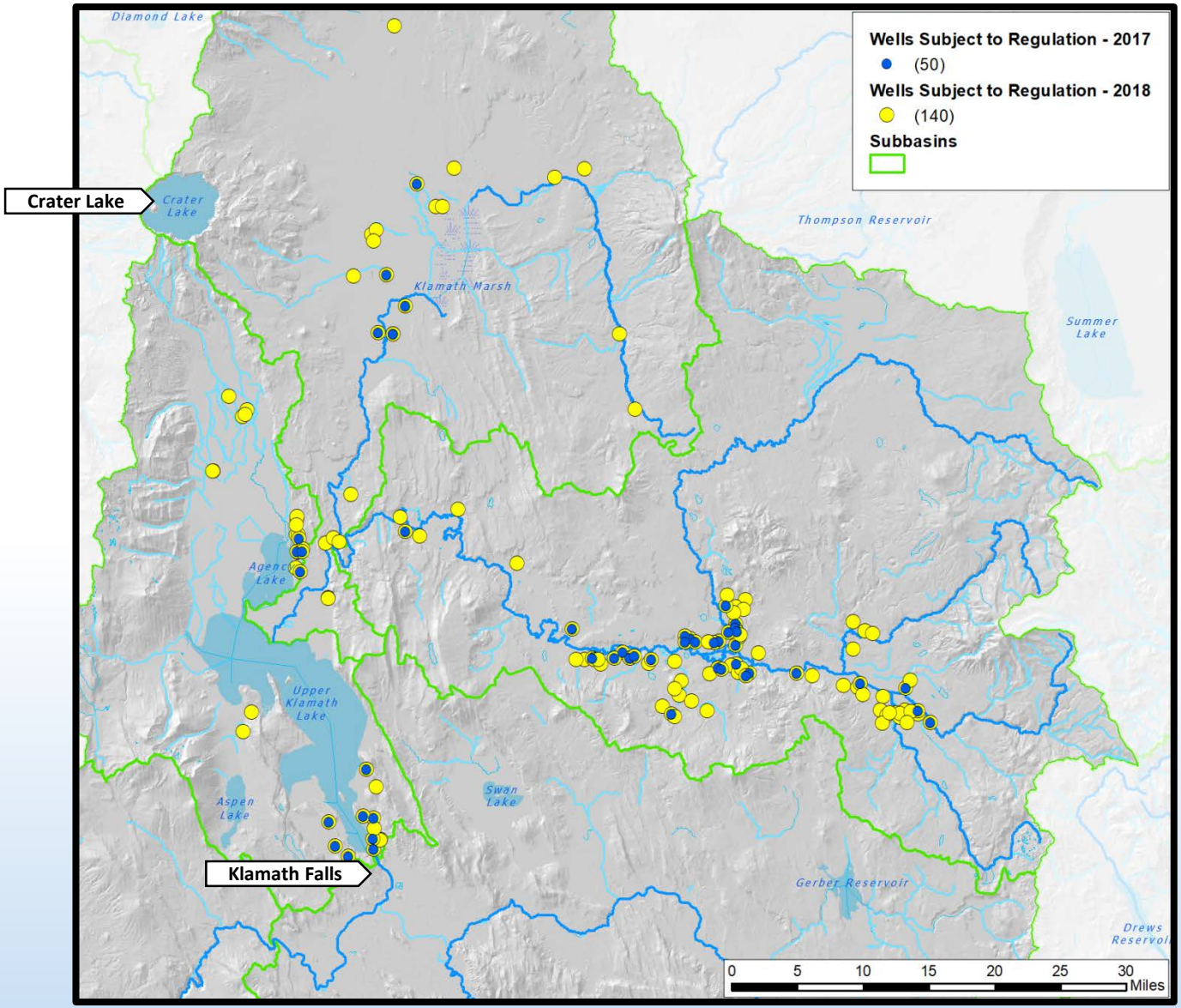
- Staff focused on the Wood River in 2017-18
  - Increased compliance, more protection of senior rights
  - Public more informed about water rights and regulation process


https://apps.wrd.state.or.us/apps/wr/klamath_sif_dashboard/Charts.aspx
Klamath Regulation Dashb...
Oregon Water Resources Department
Klamath Tribal Instream Claim Dashboard
Main
Help
Return
Contact Us
Search Records
Claim Char: KA
Claim Nbr: 668 - Wood River
Start Date: 4/1/2015
End Date: 03/31/2019
Chart
Tool Tips Off:
Wood River (KA-668, Gaging Station: 11504103)
Zoom 1m 3m 6m YTD 1y All
From Apr 1, 2015 To Mar 31, 2019
More regulatory compliance
450
400
350
300
250
200
150
100
May '15
Sep '15
Jan '16
May '16
Sep '16
Jan '17
May '17
Sep '17
Jan '18
May '18
Sep '18
Jan '19
Instream Claim
Habitat High Flows
Mean Daily Flow
Measurement
Source: Oregon Water Resources

In 2018, 433 surface water diversions subject to regulation



Wells subject to regulation in 2017 and 2018



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Proposed revision OAR 690-025

- **Regulation is based on peer-reviewed, best available science and statutory authority**

- **Water users continue to have concerns about groundwater management**

<u>Moving forward:</u>

- **Increase understanding of regulation and basin hydrology**

- **Work with junior and senior users to develop solutions, and where possible, methods for water distribution**

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Rule Advisory Committee

- **Two RAC meetings: January 15 and January 28, 2019**

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Rule Summary in Klamath Basin

Time Period	Rules under which well regulation occurred	Number of wells subject to regulation
2015-17	OAR 690-025 (Division 25)	50
2018	OAR 690-009 (Division 9)	140
2019-2020	Amended OAR 690-025	7
2021 - beyond	To be determined	To be determined

The scientific understanding is the same; the rule changes result from policy choices.

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OAR 690-025 Process

Date	Event
01/02/2019	Draft rules distributed to RAC for review
01/15 & 01/28	Two RAC meetings in Klamath Falls to solicit feedback on rules and fiscal impact statement
02/01 - 03/04	Public comment period for proposed rules
02/21	Public hearing on proposed rules in Salem
02/26	Public hearing on proposed rules in Klamath Falls
04/12	WRC considers adopting proposed 690-025

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Moving Forward

<u>If proposed rules adopted:</u>

Summer 2019 – Winter 2020:

- **Open house meetings to listen to water management ideas and share basin information**

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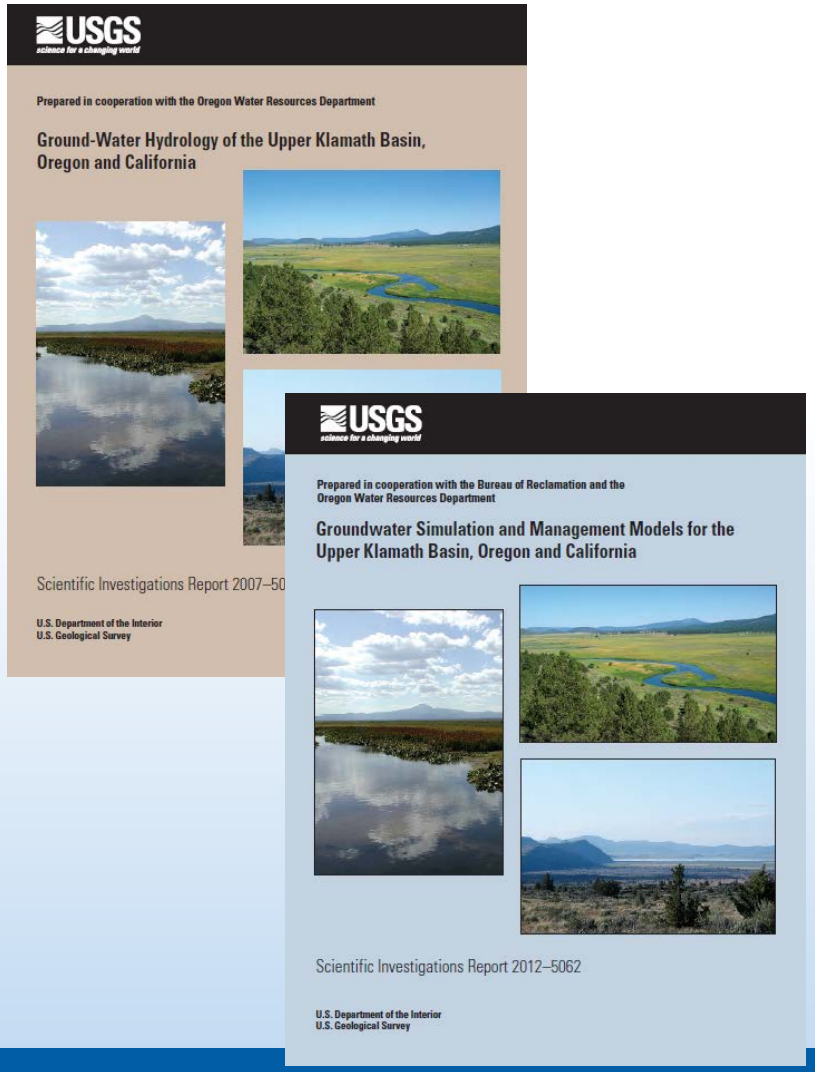
Klamath Basin Groundwater
Introduction

Outline:

- **Basic overview of Klamath Basin**
- **Geology and Hydrogeology**
- **Groundwater-Surface water connection**



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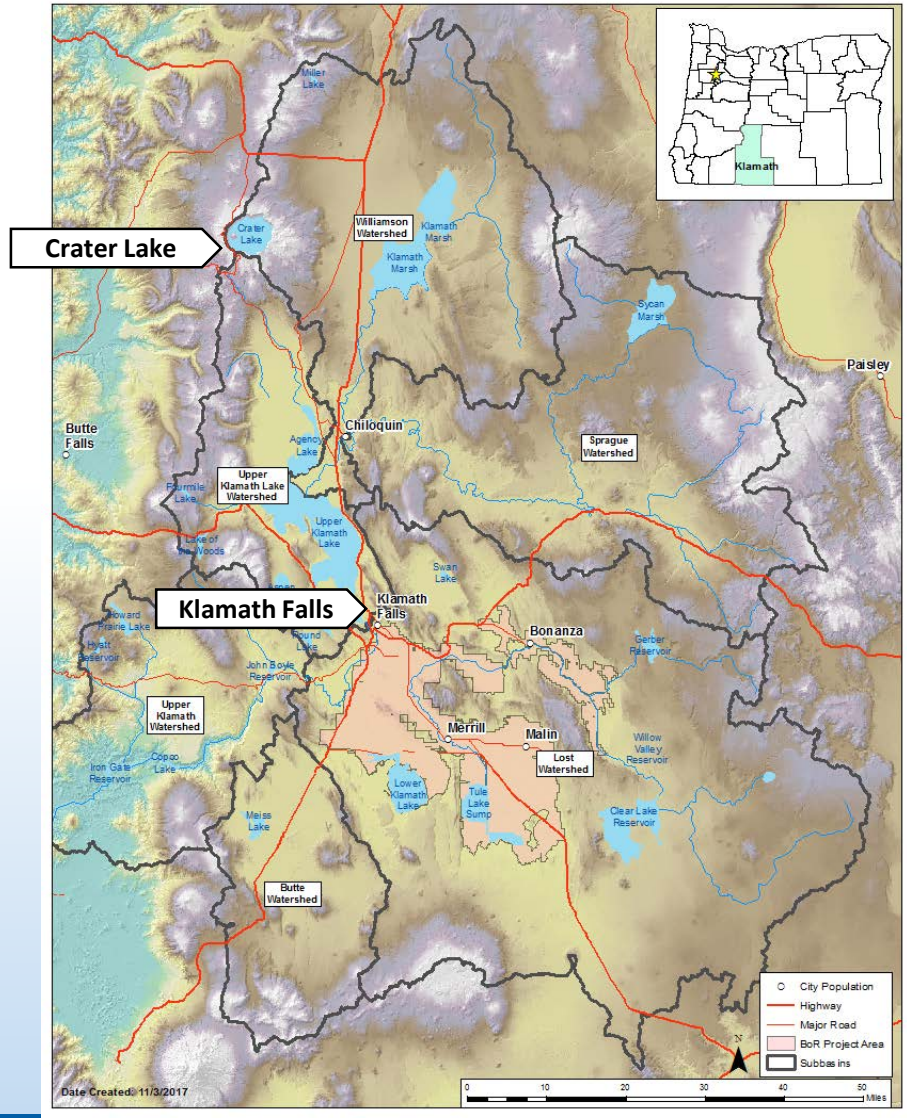
Klamath Basin Groundwater
Overview



South-central portion of Oregon, Northern California

- ~10,300 mi^2

Upper Klamath Basin:

- ~8,000 mi^2
- Tributary basins upstream of Copco Dam
- Over 500,000 acres irrigated
  - 200,000 Project Area
  - 70,000 from groundwater

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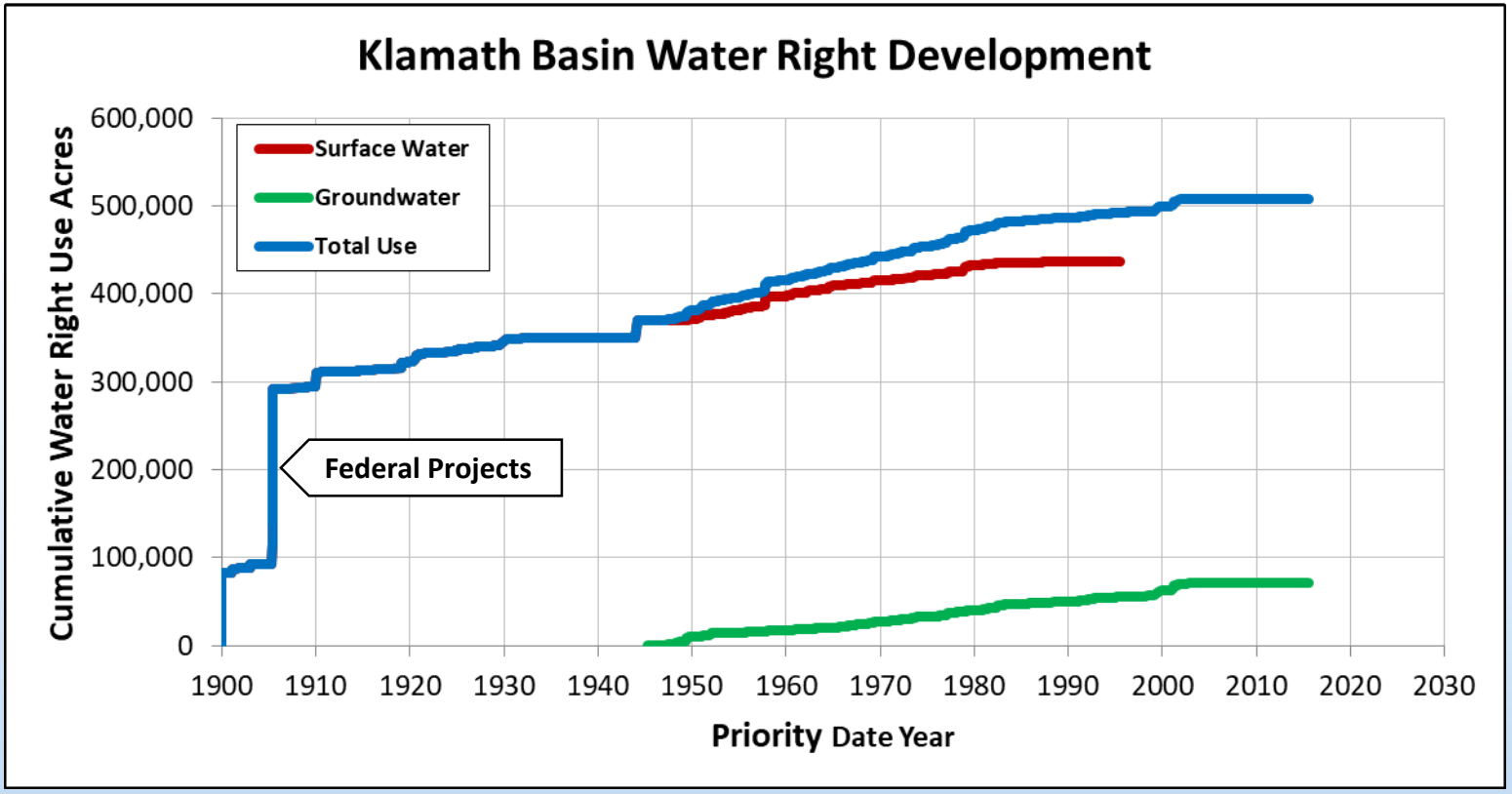
Klamath Basin Groundwater
Overview

- 500,000 acres irrigated lands
- Mostly surface water (437,000 acres)
- Very few issued since 2001



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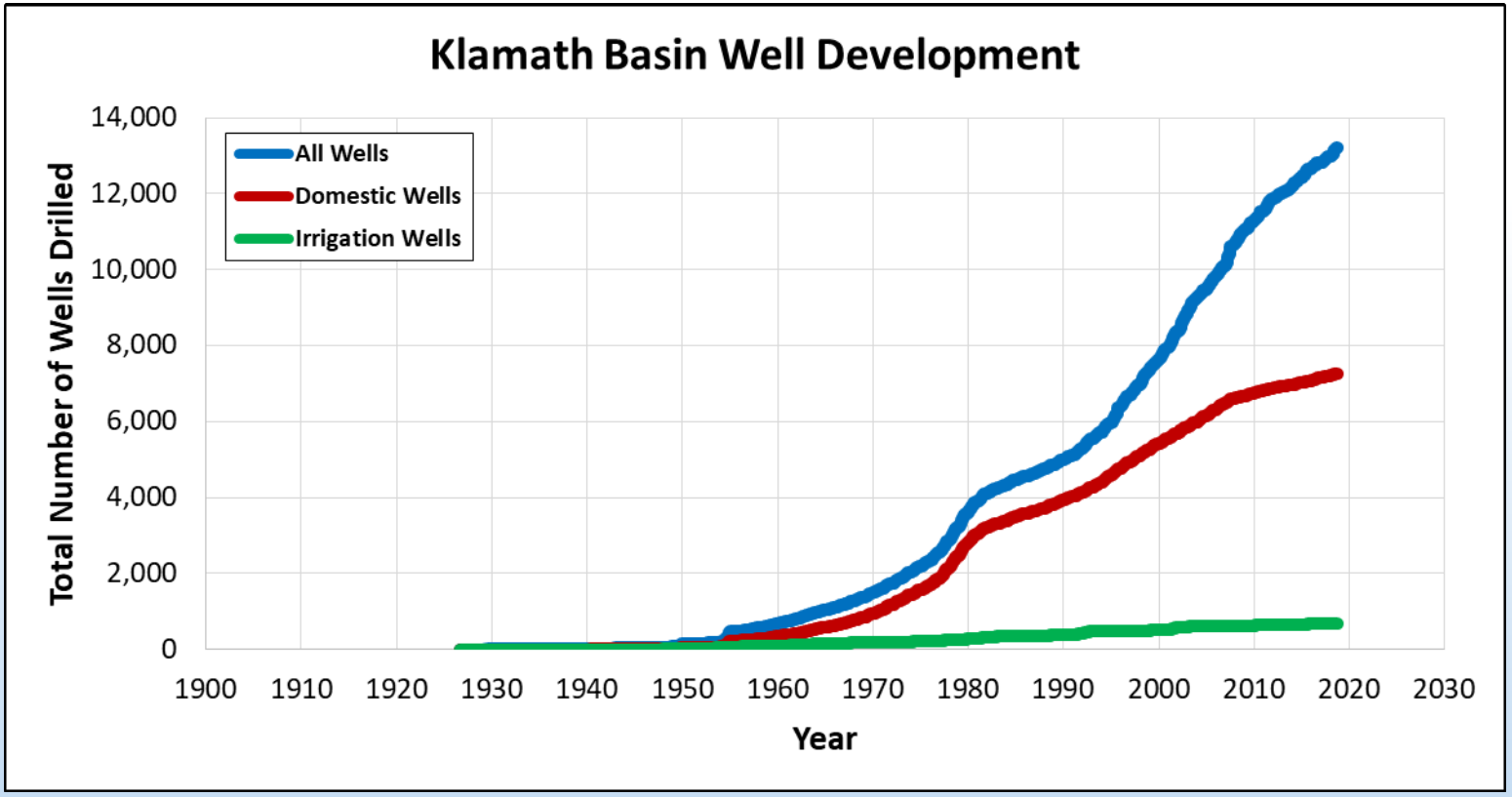
Klamath Basin Groundwater
Overview

- Well development over time
- Significant increase in geologic and hydrogeologic information



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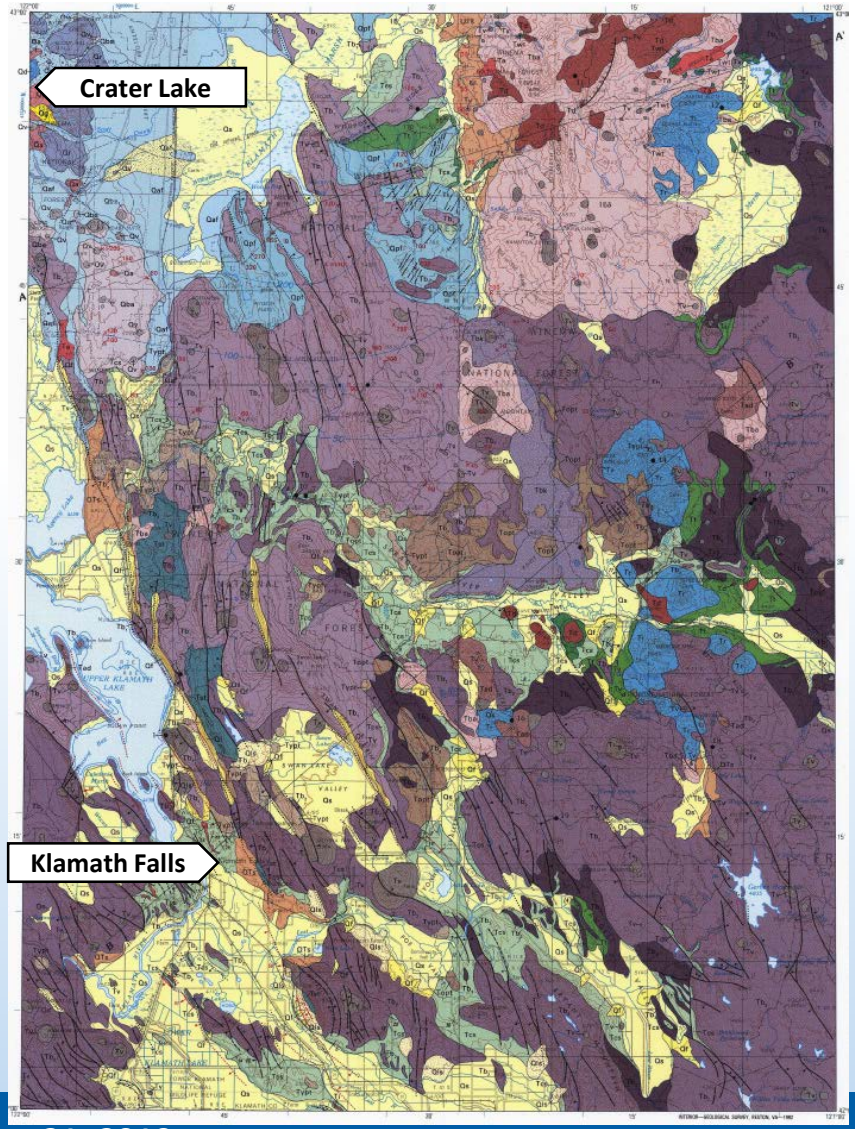
Klamath Basin Groundwater

Geologic History



- **Western Cascades** (< 6,800 yrs)
  - Crater Lake Eruption Qpf
- **Basin and Range** (7-2 Ma)
  - Volcanic Tb
  - Sedimentary Tcs
- **Klamath Mountains** (> 65 Ma)

Sherrod and Pickthorn, 1992

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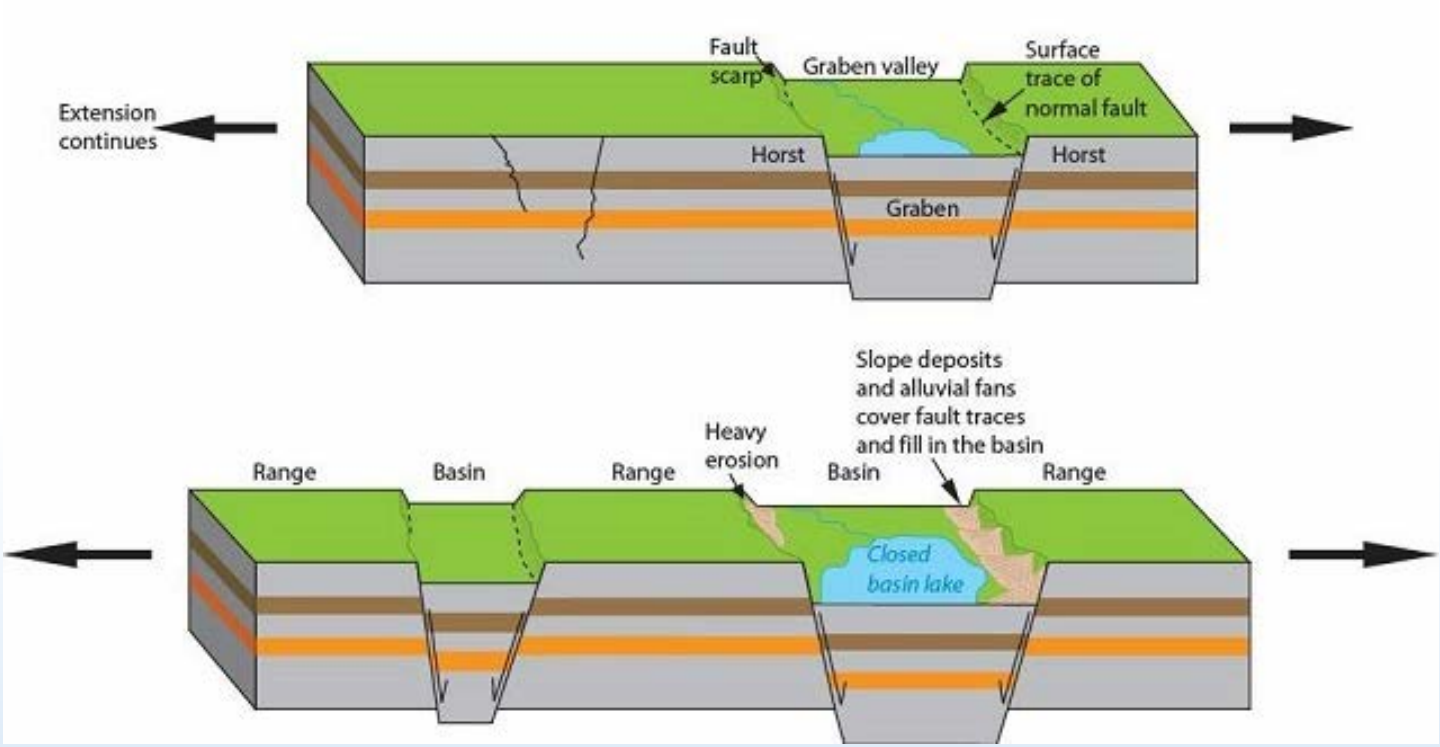
Klamath Basin Groundwater
Geologic History



https://www.nps.gov/articles/horst-and-graben.htm

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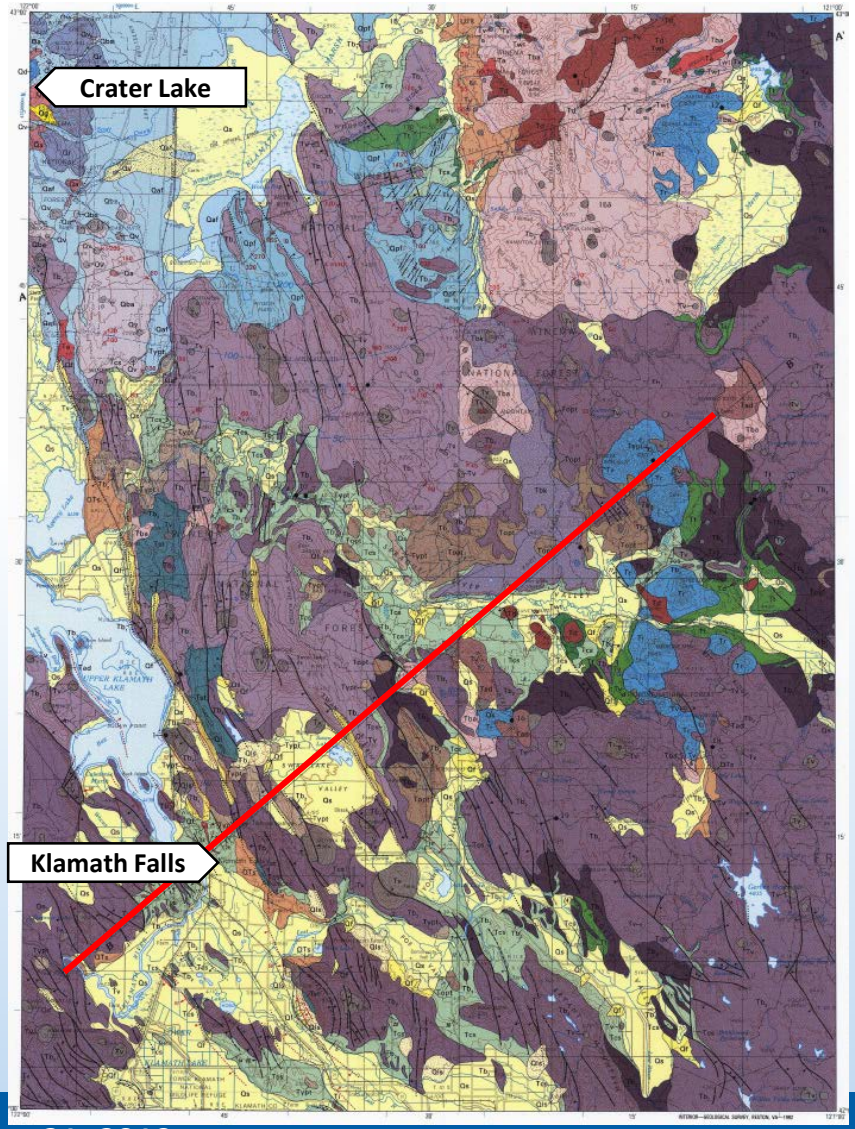
Klamath Basin Groundwater
Geologic History



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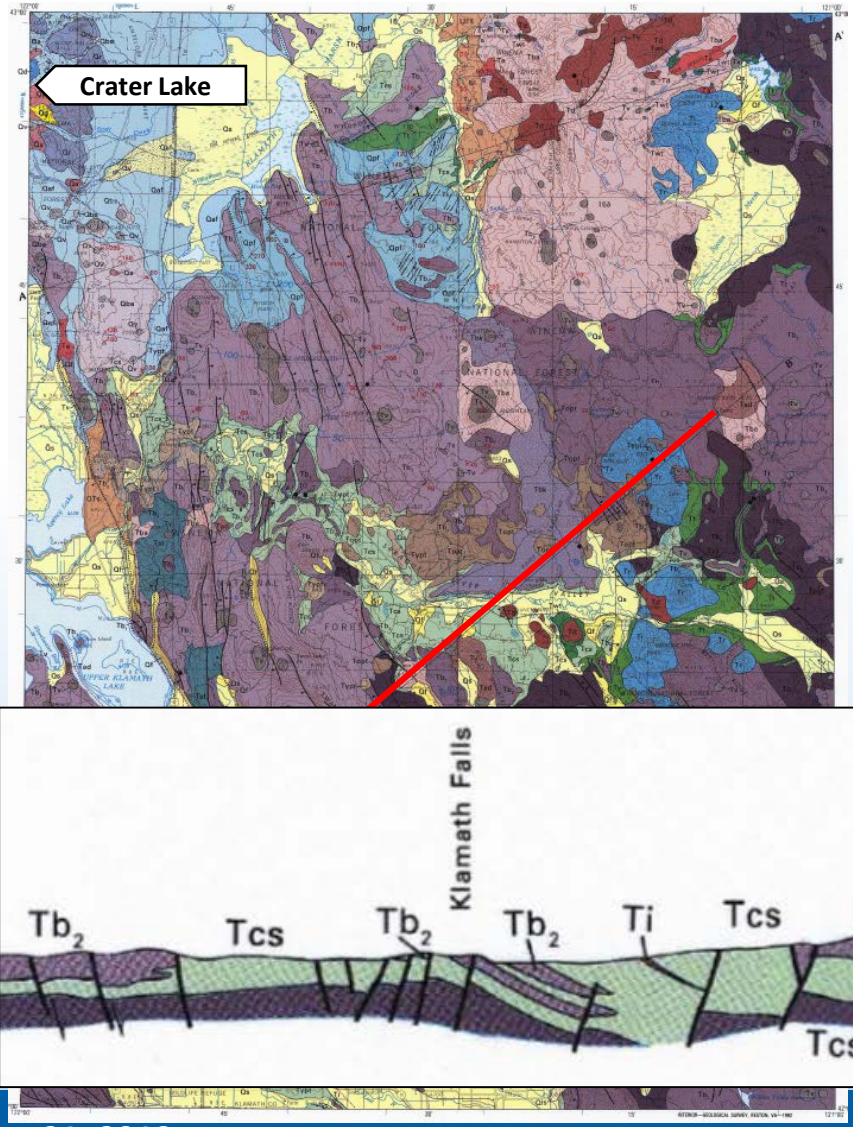

- **Western Cascades** (< 6,800 yrs)
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  - Volcanic Tb_2
  - Sedimentary Tcs
- **Klamath Mountains** (> 65 Ma)

Sherrod and Pickthorn, 1992

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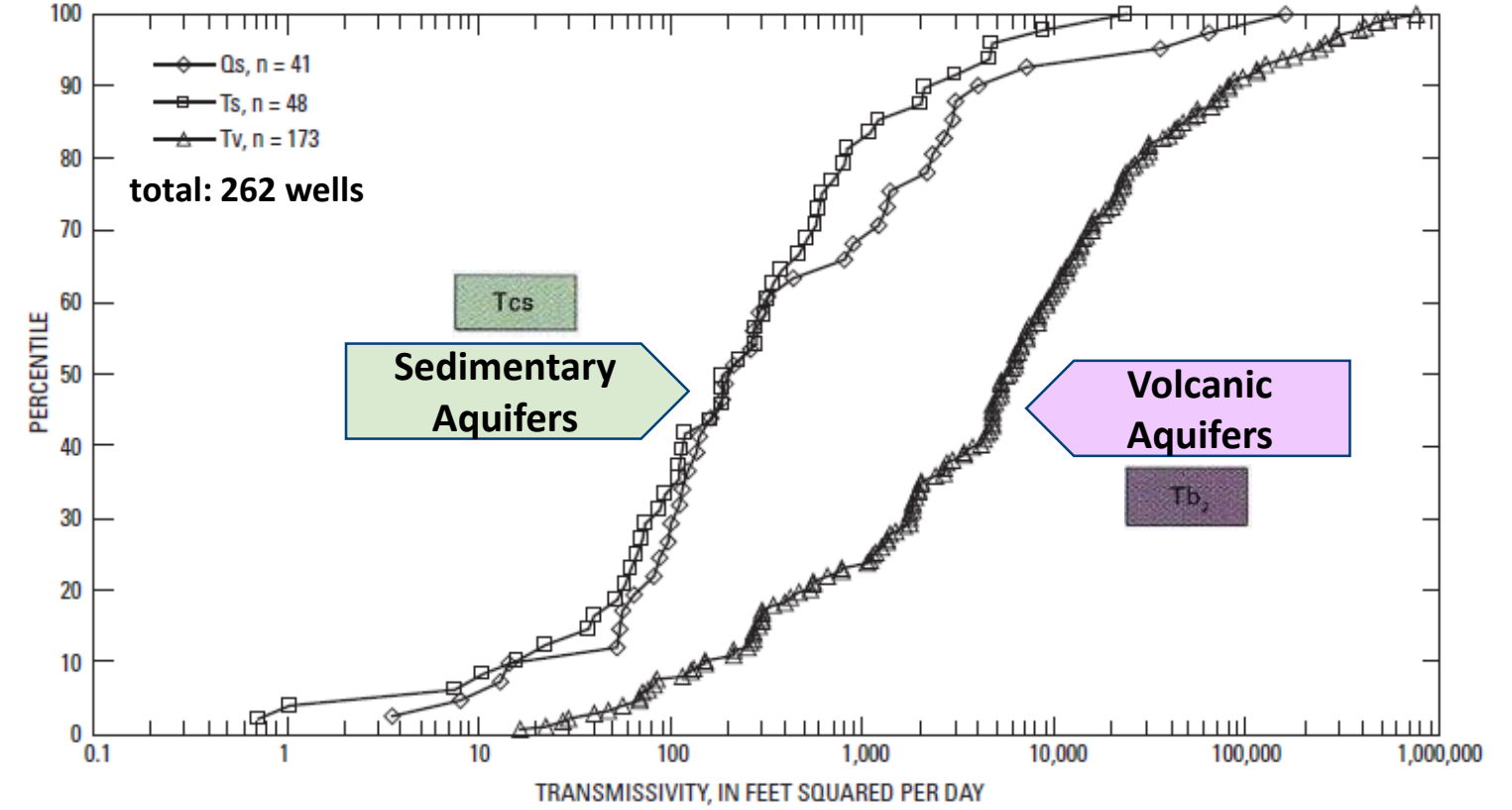
Klamath Basin Groundwater
Hydrogeology

- Volcanic formations: high-yield aquifers Tb,
- Sedimentary formations: relatively low-yield Tcs



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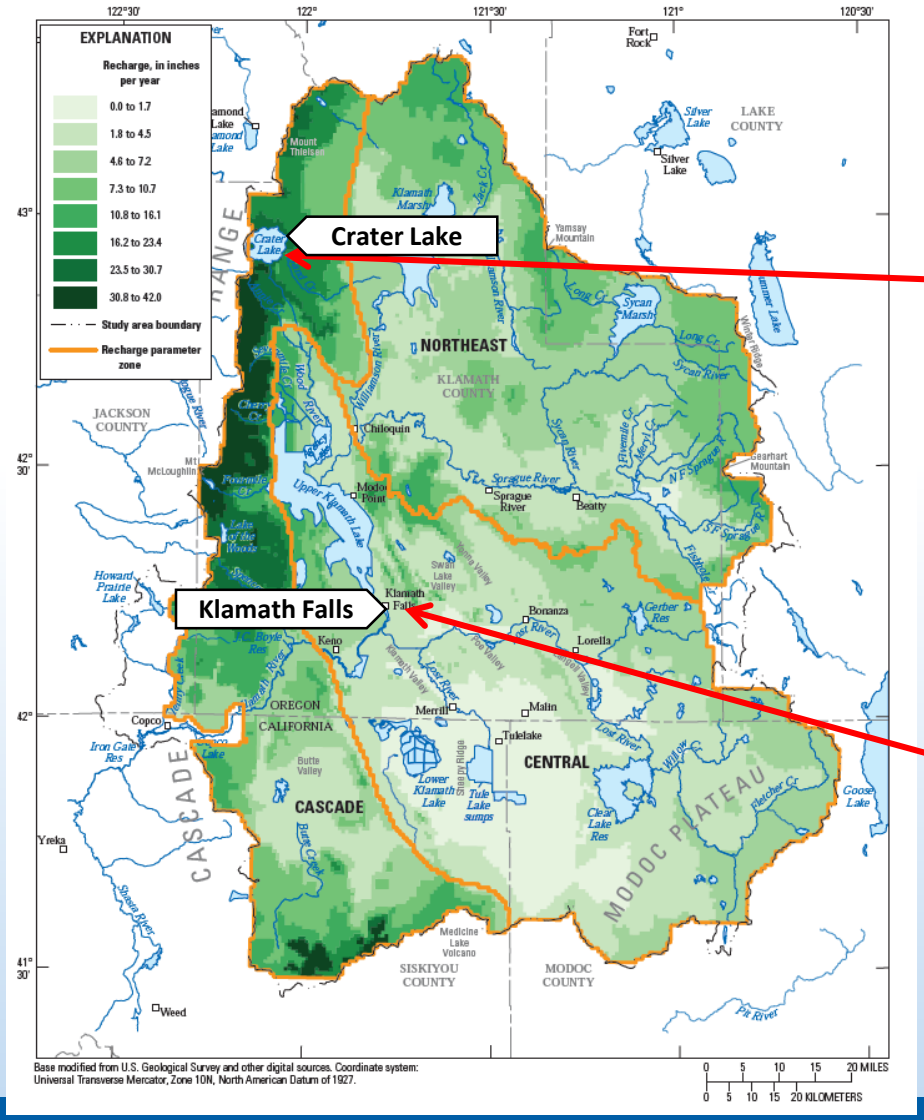
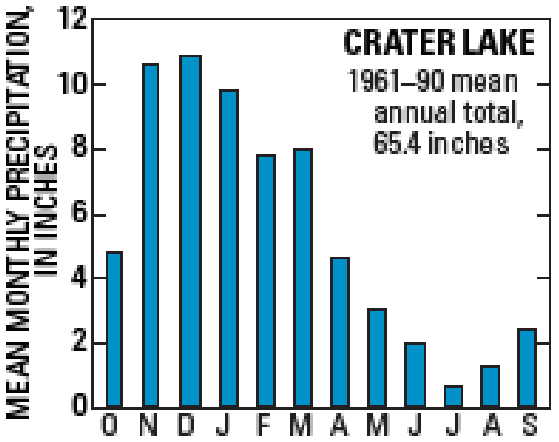
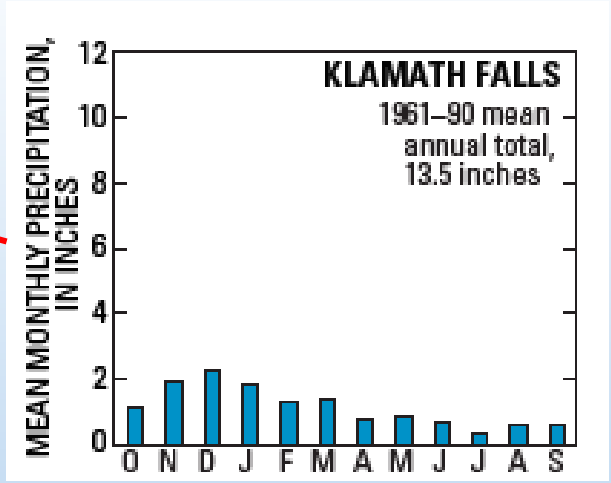
Klamath Basin Groundwater
Hydrogeology







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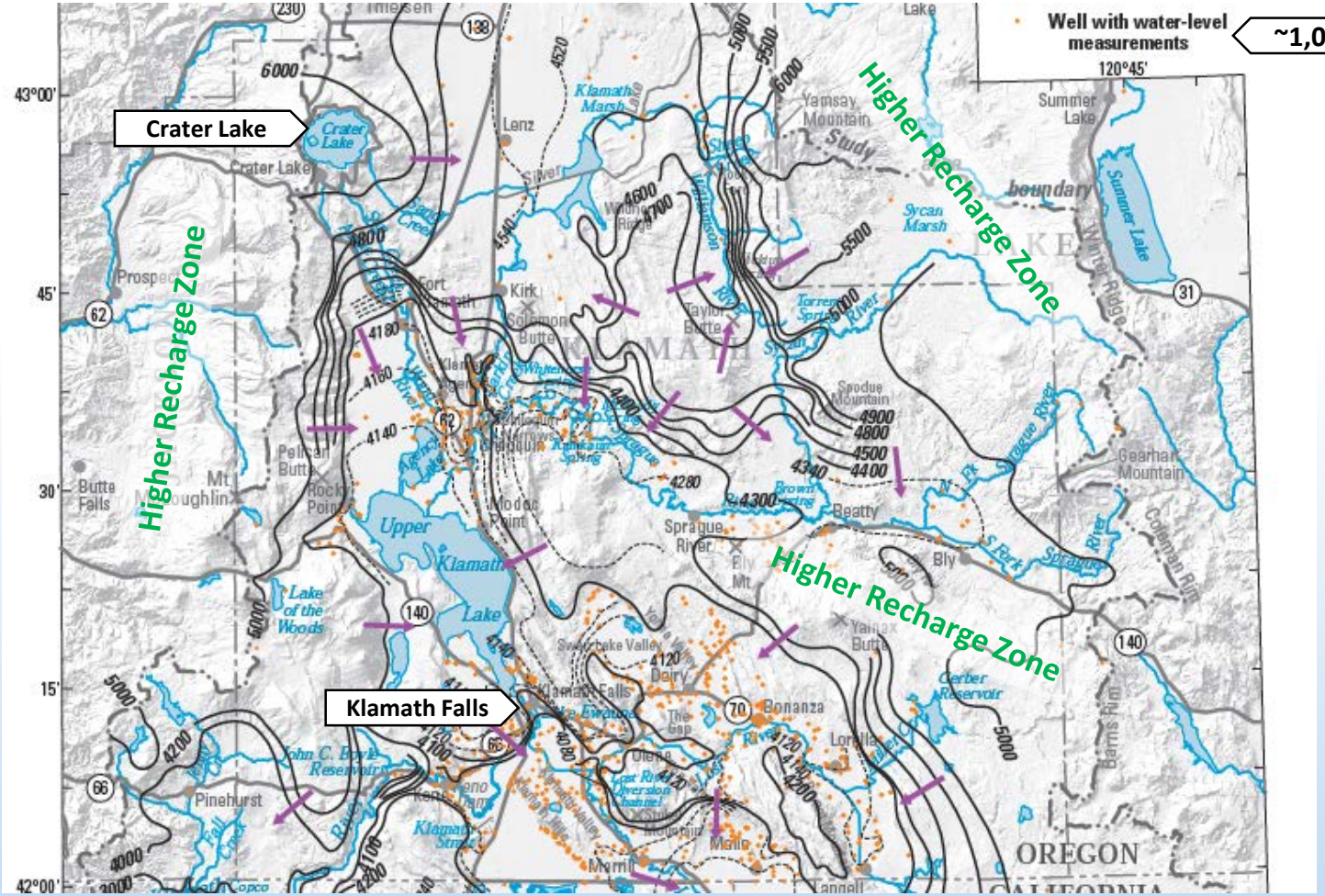
Klamath Basin Groundwater
Hydrogeology

- **Topographic relief creates regional flow toward valleys**



source: USGS SIR 2007-5050

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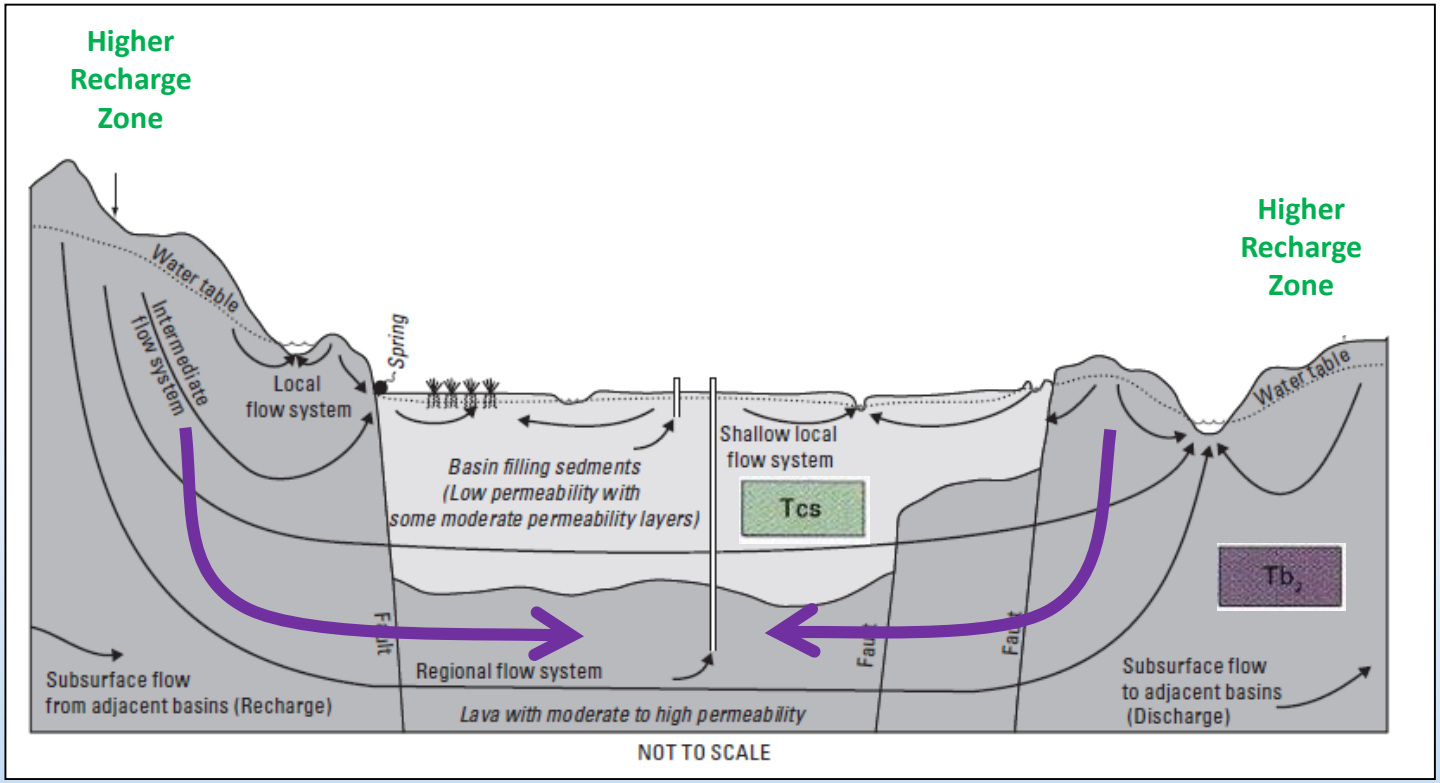
Klamath Basin Groundwater
Hydrogeology

- **Topographic relief creates regional flow toward valleys**
- **Faults juxtapose aquifer units**



source: USGS SIR 2007-5050

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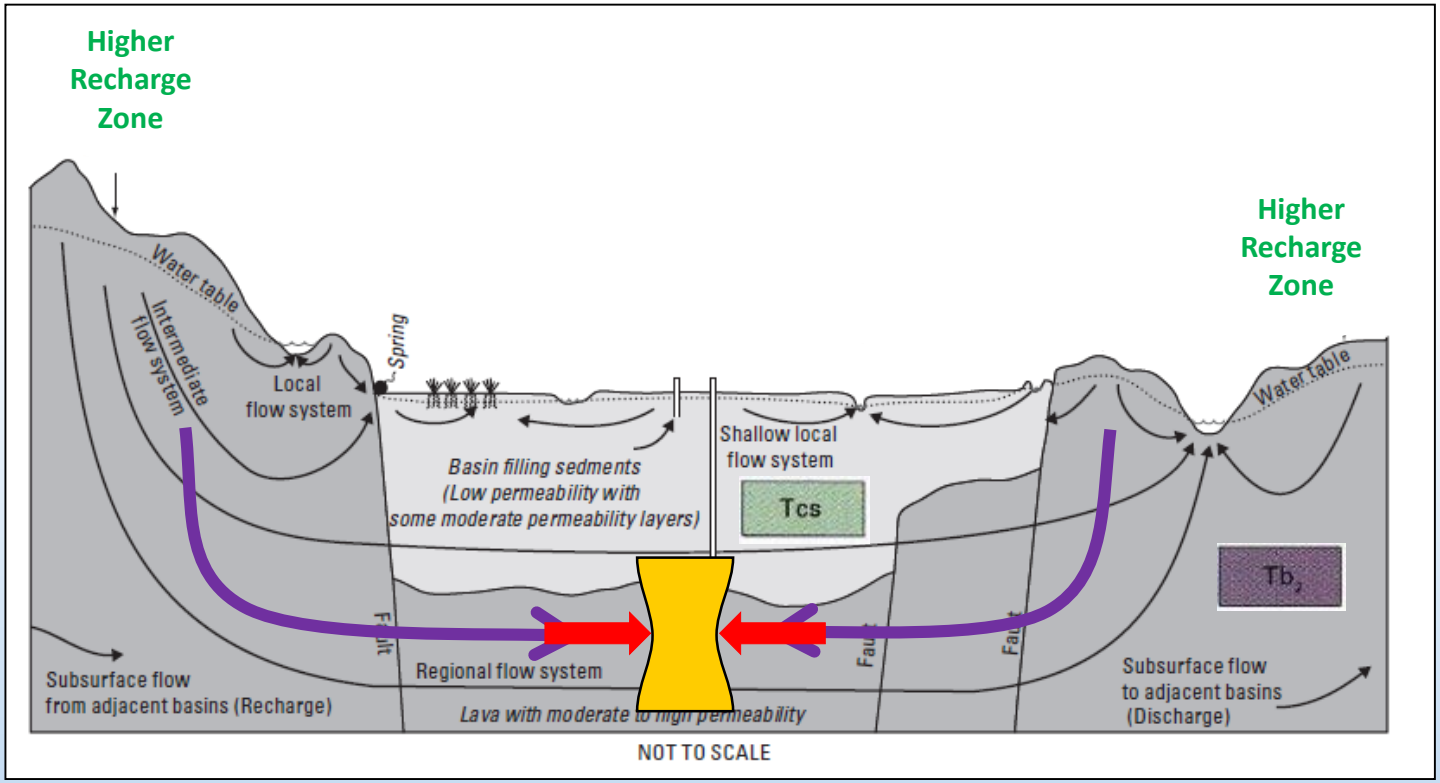
Klamath Basin Groundwater
Hydrogeology

- Topographic relief creates regional flow toward valleys
- Faults juxtapose aquifer units
- Fine-grained sediments add resistance to groundwater flow



source: USGS SIR 2007-5050

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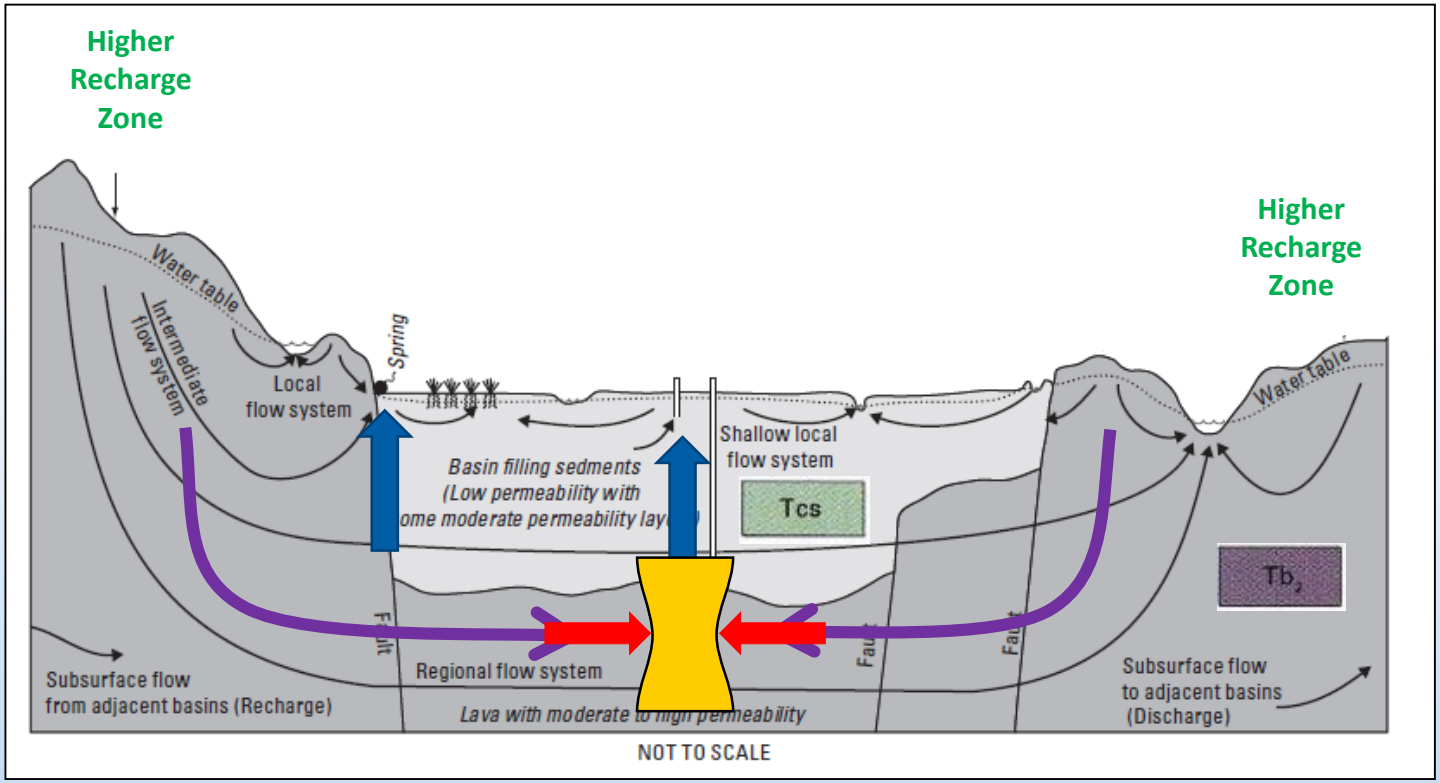
Klamath Basin Groundwater
Hydrogeology

- **Fine-grained sediments add resistance to groundwater flow**
- **Higher pressure in deep aquifer drives water upwards; streams move water away (discharge zone)**



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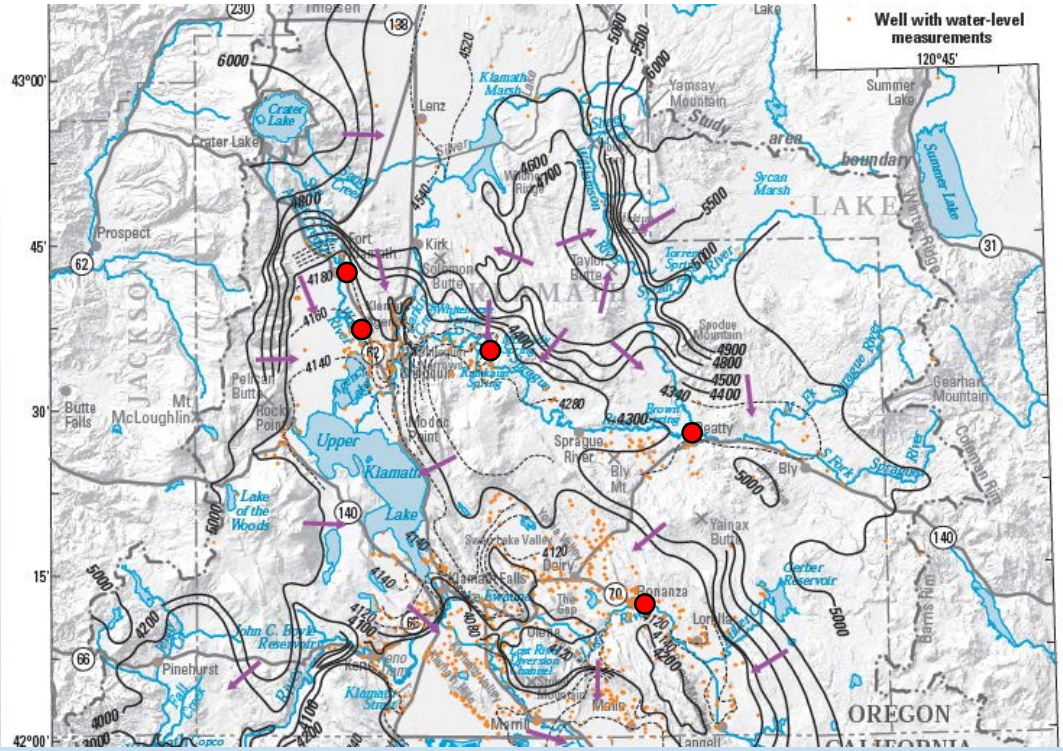
Klamath Basin Groundwater
Hydrogeology

- **Higher pressure in deep aquifer drives water upwards**
- **Large spring complexes associated with fault zones**
- **~1.8 million acre-feet annual groundwater discharge to streams**



Spring or Reach	Gains (cfs)
Beatty Gap (Sprague)	34
Kamkaun Spring (Sprague)	50
Torrent Spring (Sycan)	12
Wickiup Spring (Williamson)	24
Crooked Creek (Lwr. Williamson)	43
Tecumseh Spring (Lwr. Williamson)	27
Fort Creek (Lwr. Williamson)	21
Spring Creek (Williamson)	300
Bonanza Big Springs (Lost)	61

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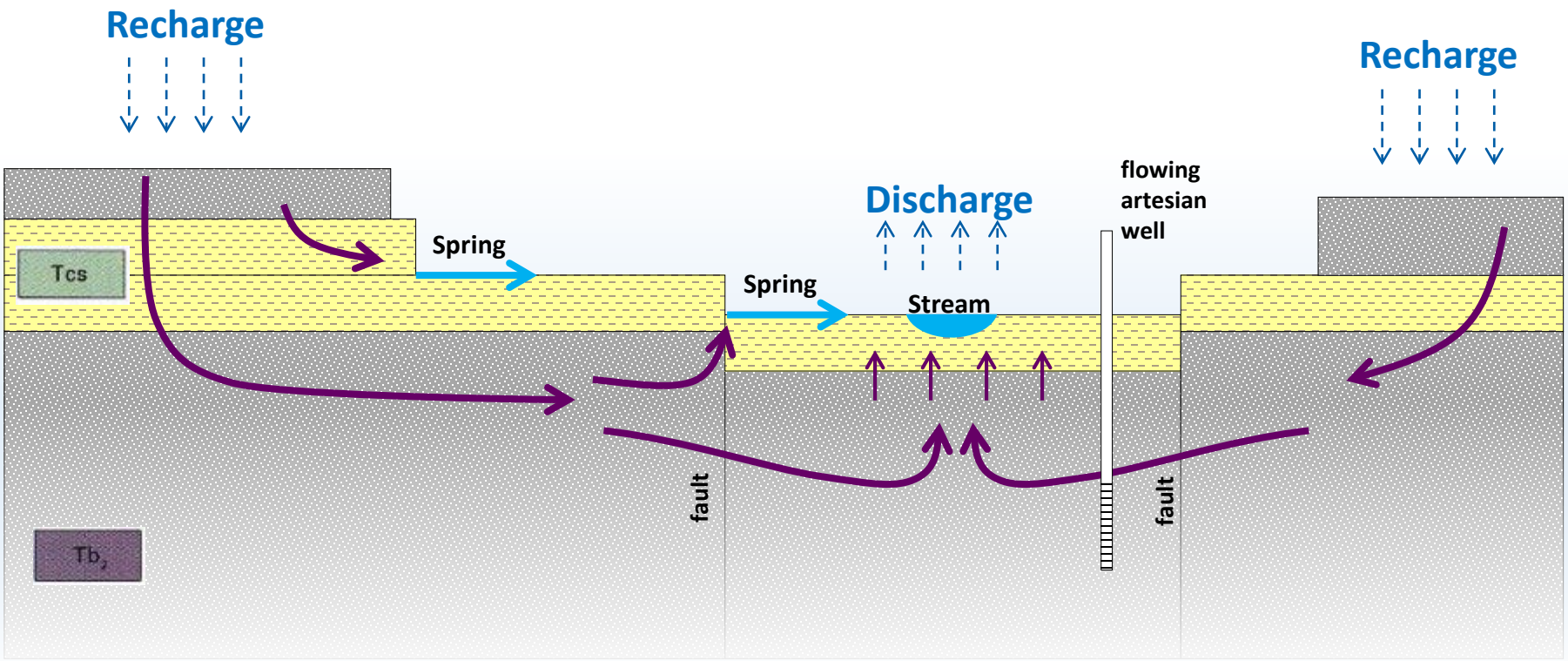
Klamath Basin Groundwater

Groundwater – Surface Water Interaction



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Klamath Basin Groundwater

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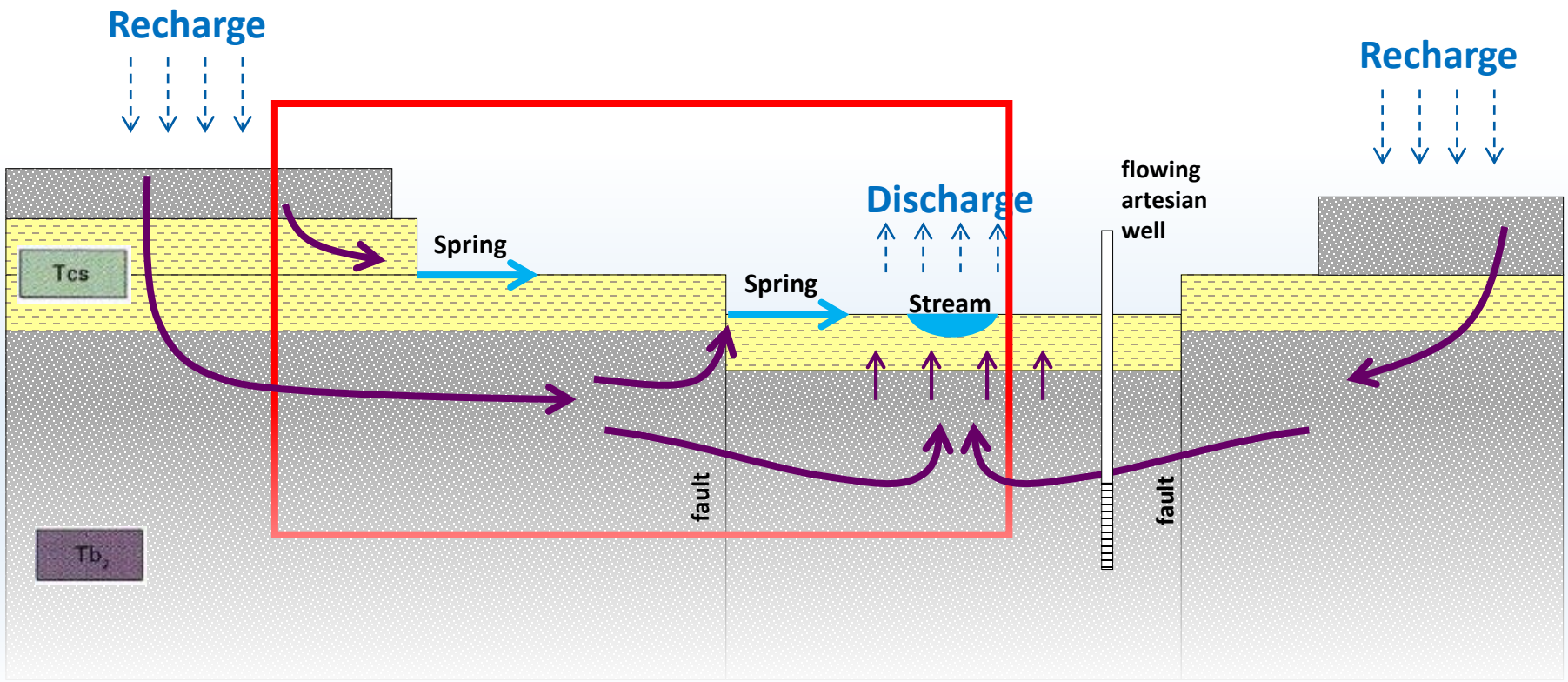

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Klamath Basin Groundwater

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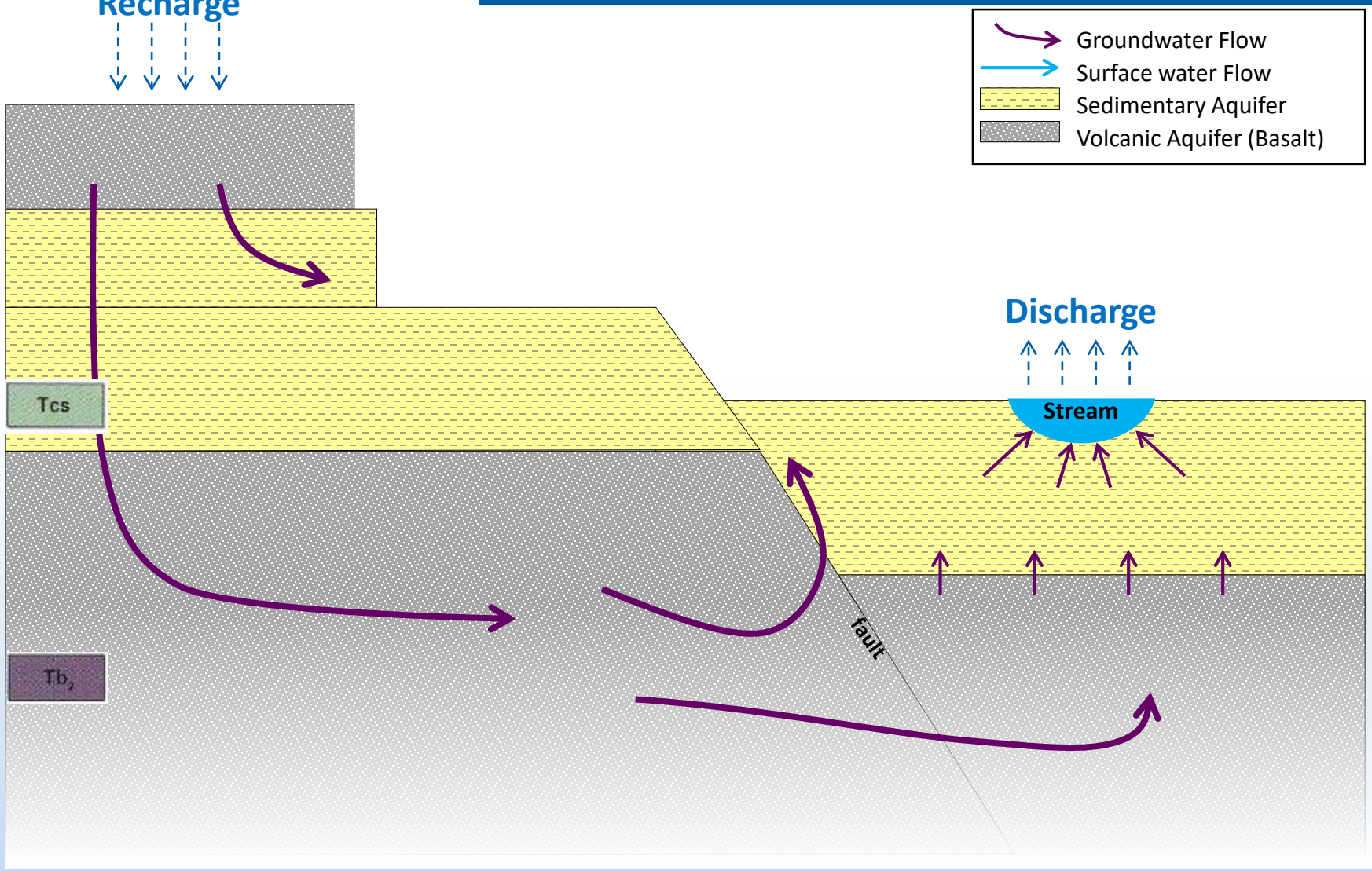

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Klamath Basin Groundwater

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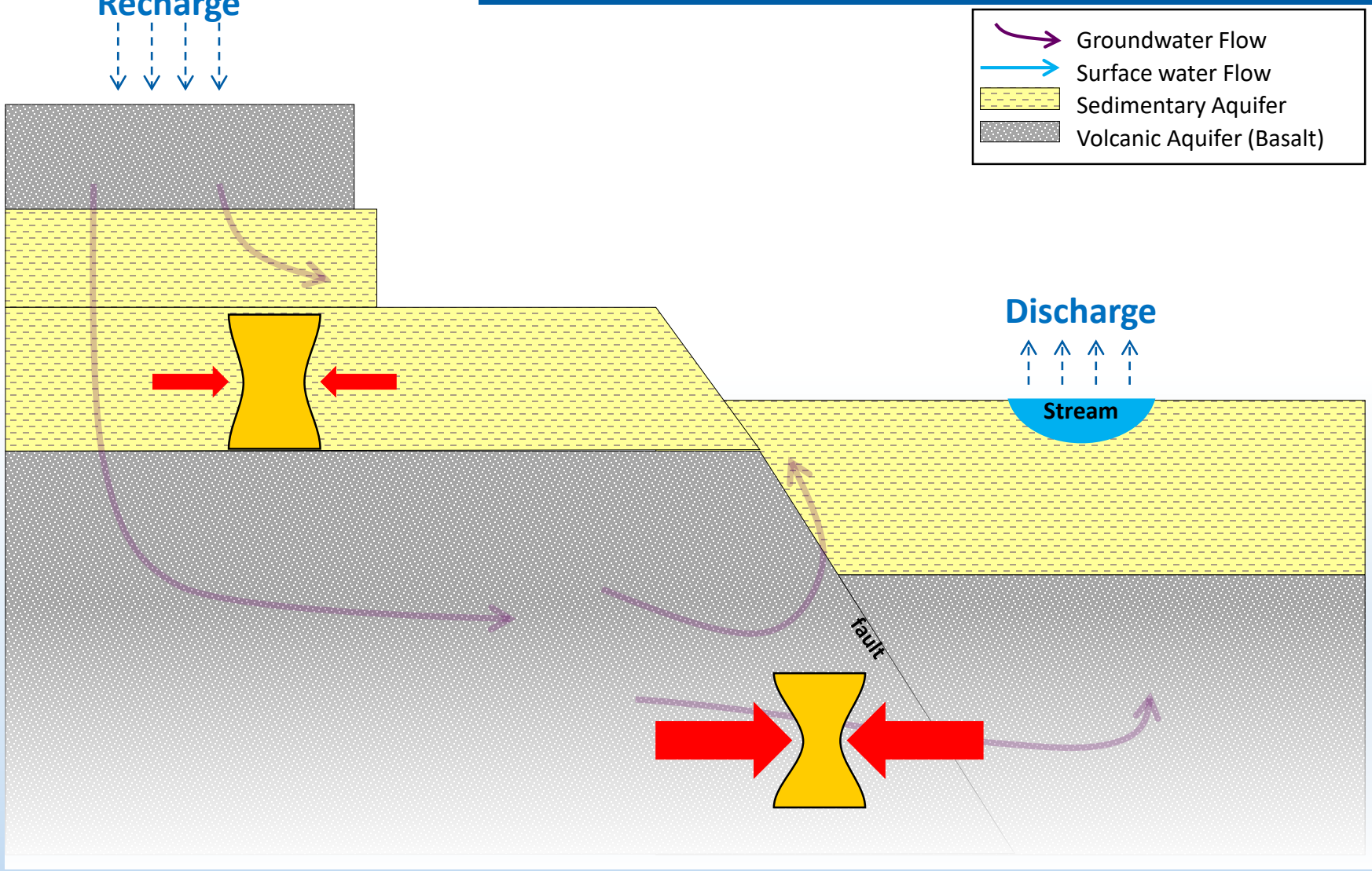

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Klamath Basin Groundwater

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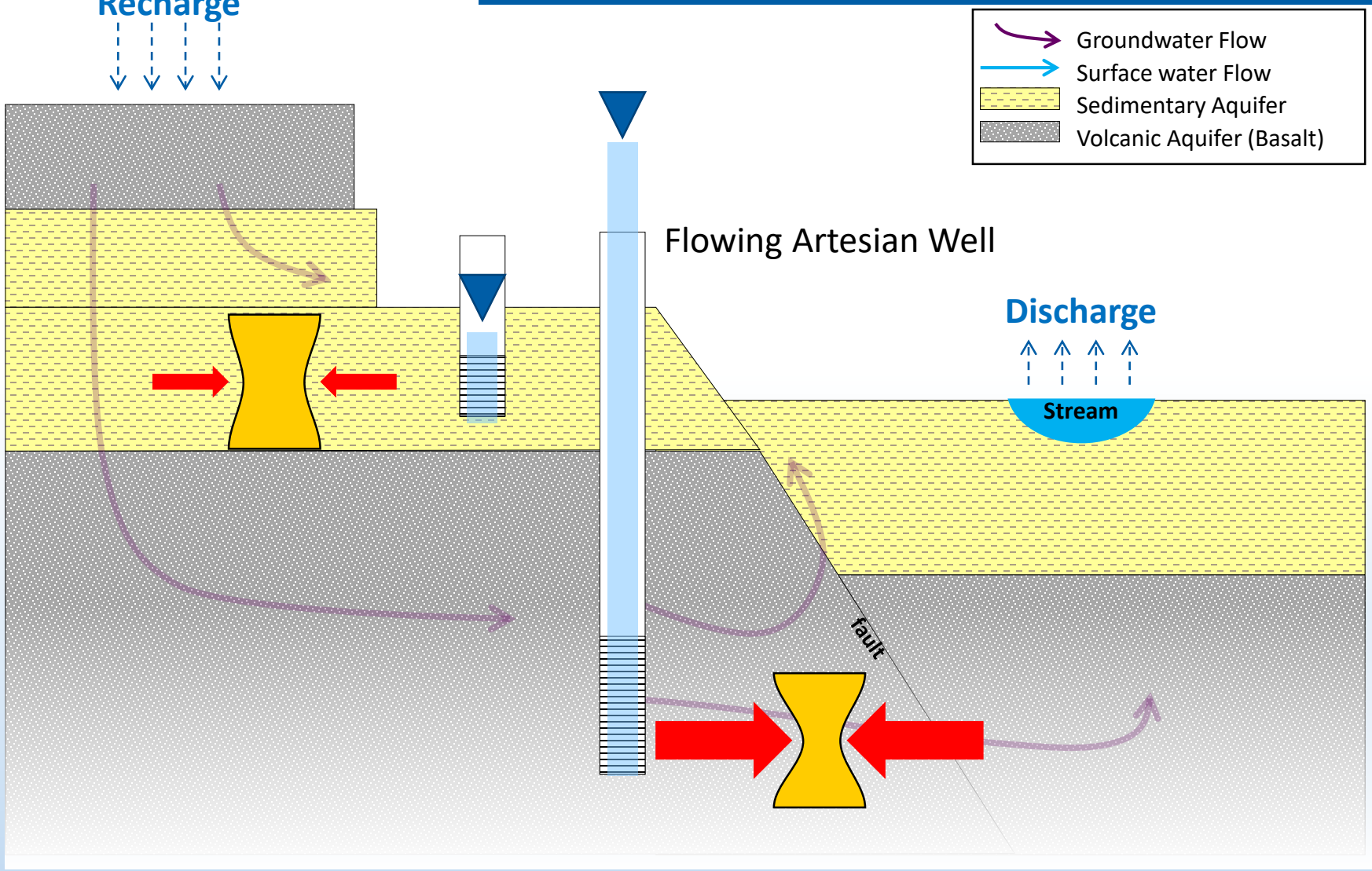

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Klamath Basin Groundwater

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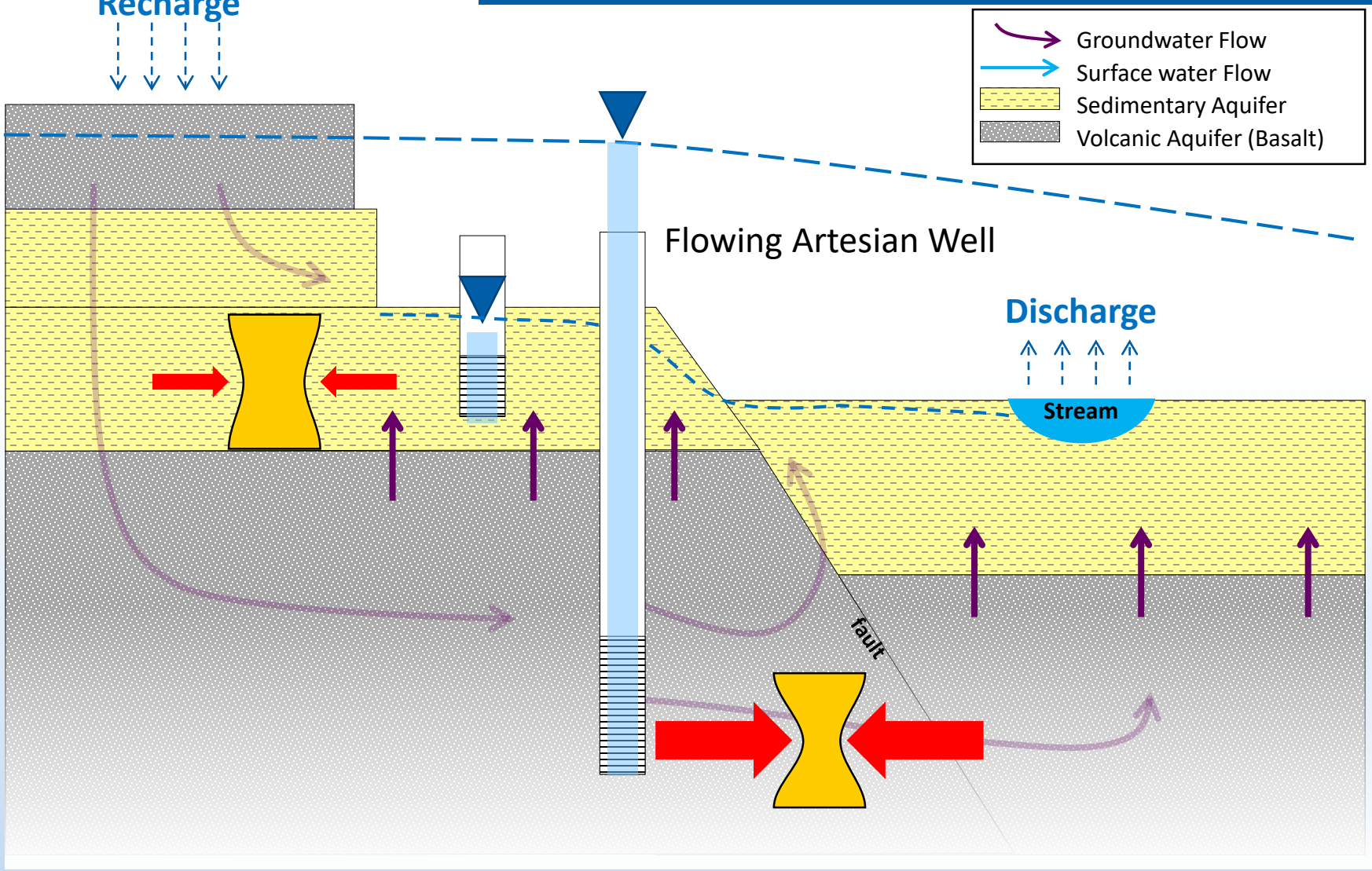

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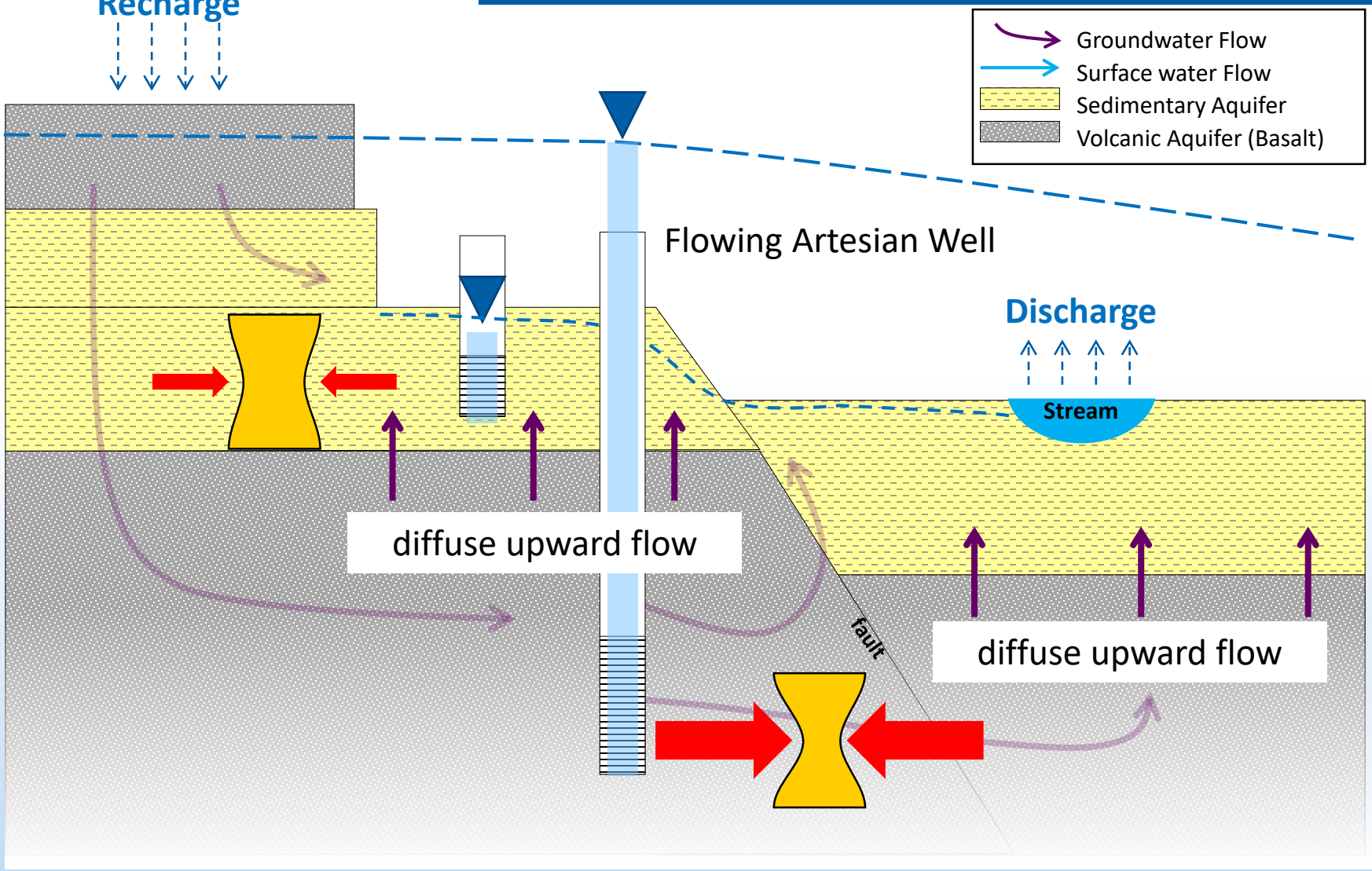

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Klamath Basin Groundwater

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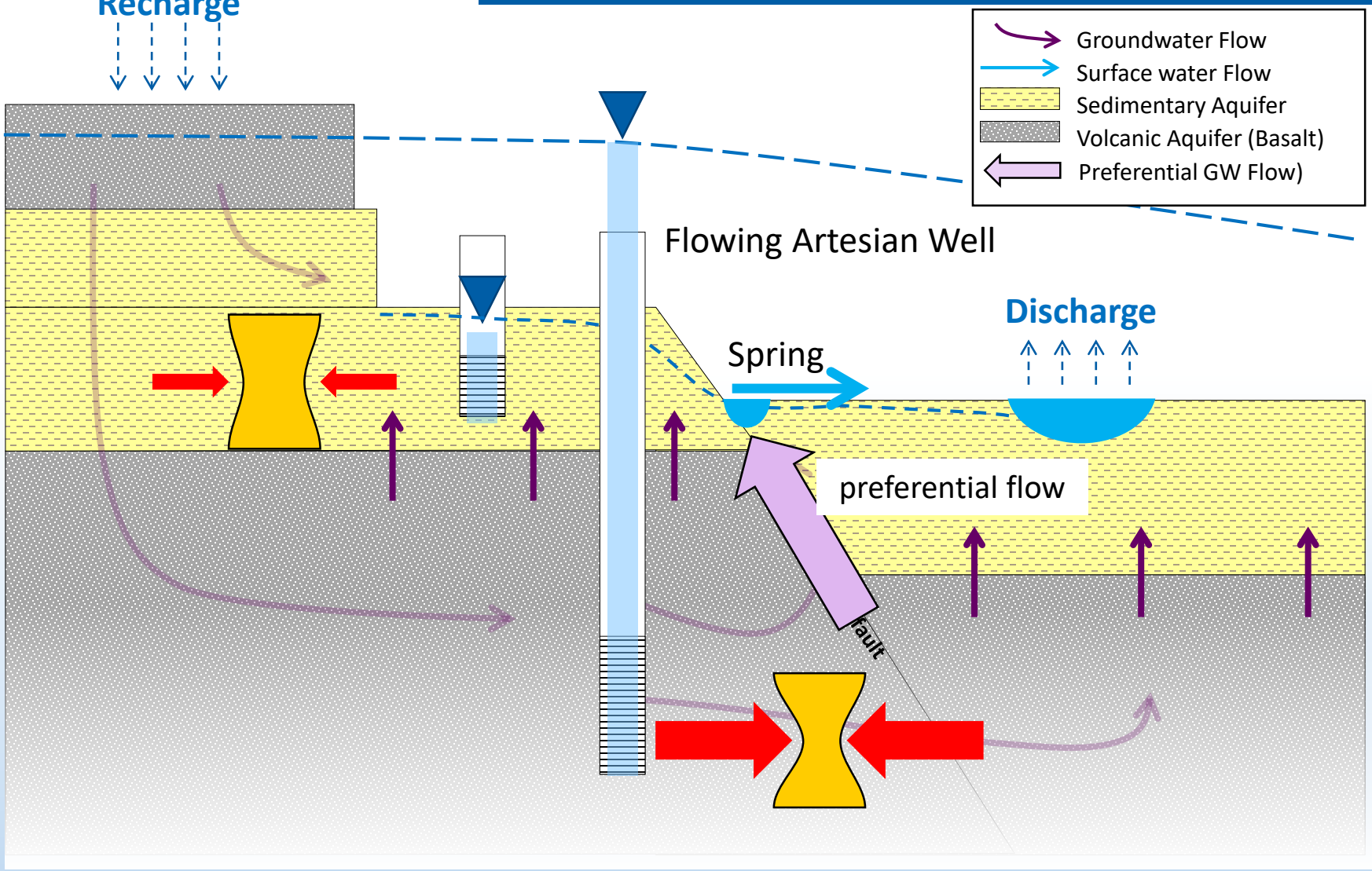

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Klamath Basin Groundwater

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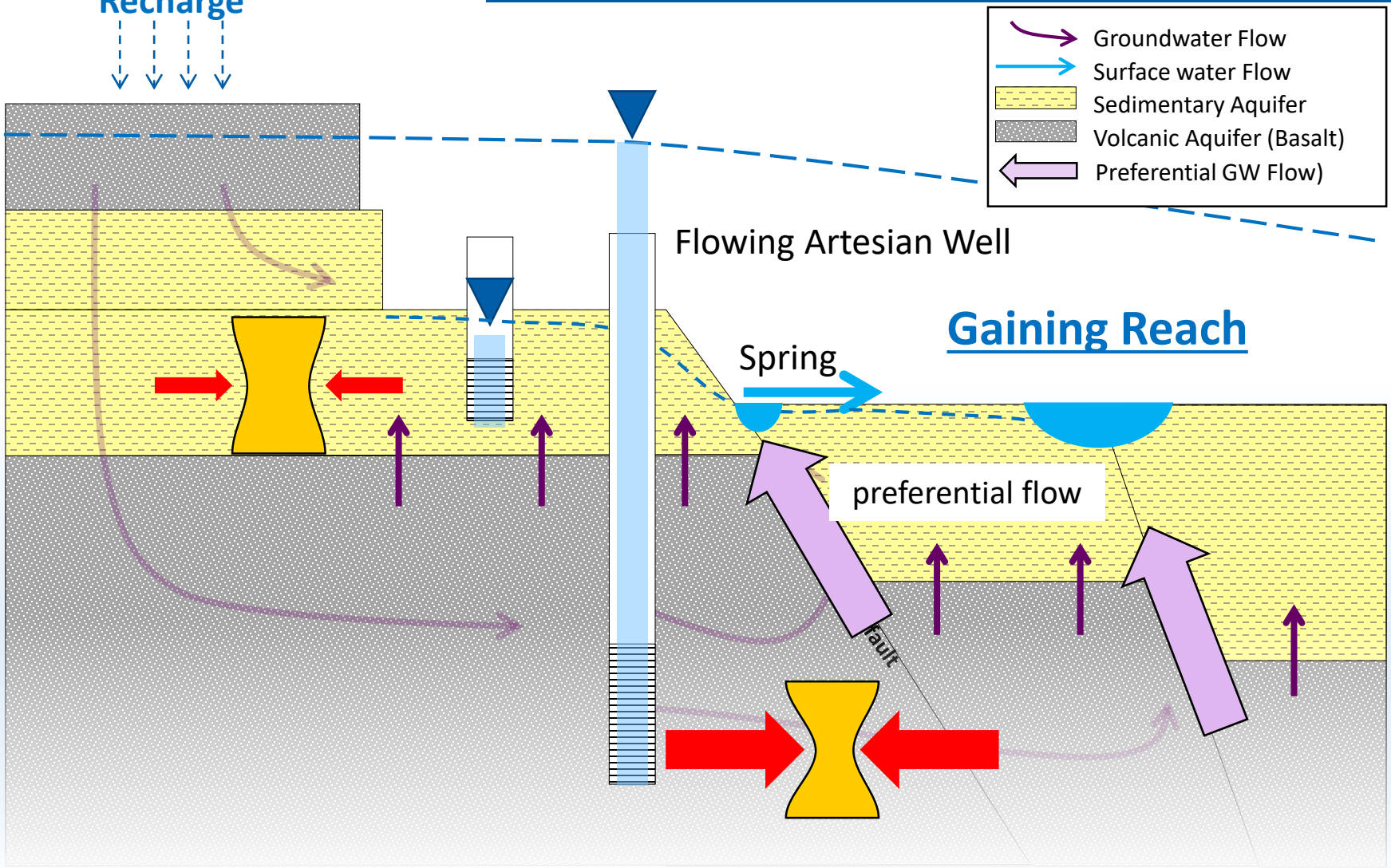

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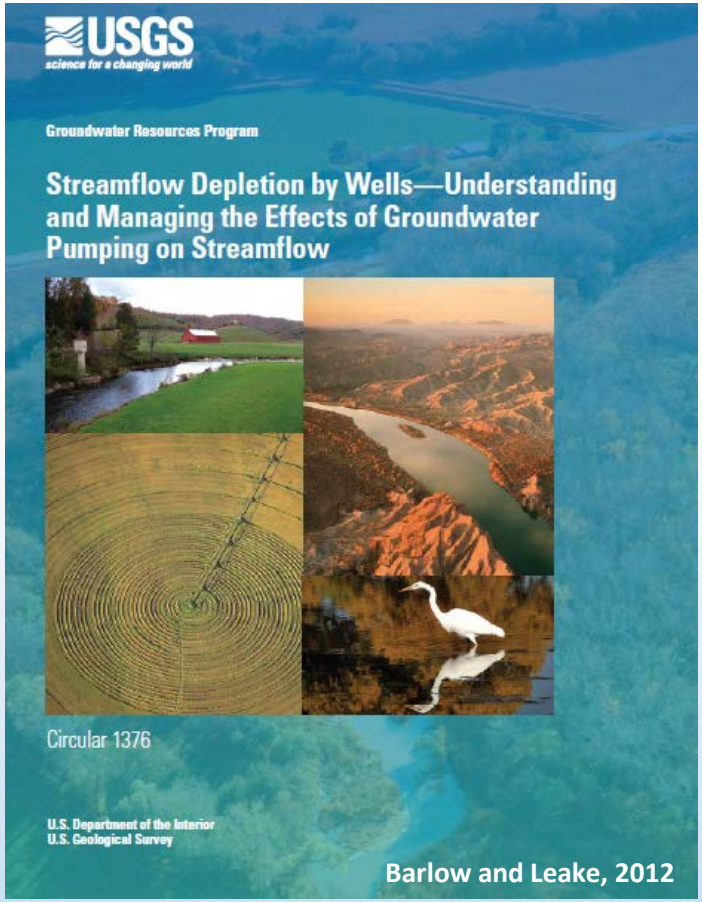
Klamath Basin Groundwater
Pumping and Stream-Depletion



Source of water to wells

- **Storage**
- **Induced Recharge**
- **Reduced Discharge / Stream-Depletion**

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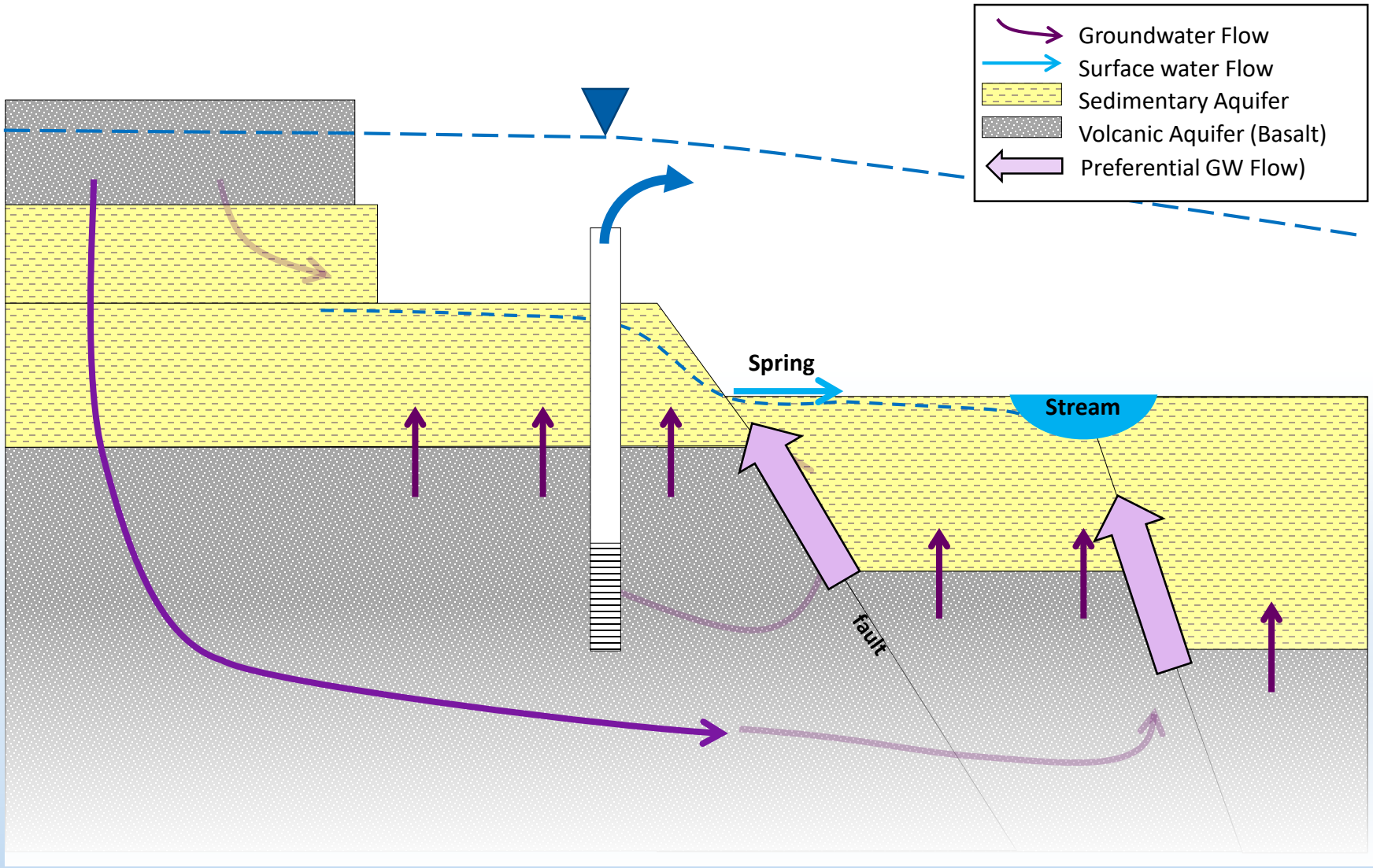
Klamath Basin Groundwater
Pumping and Stream-Depletion



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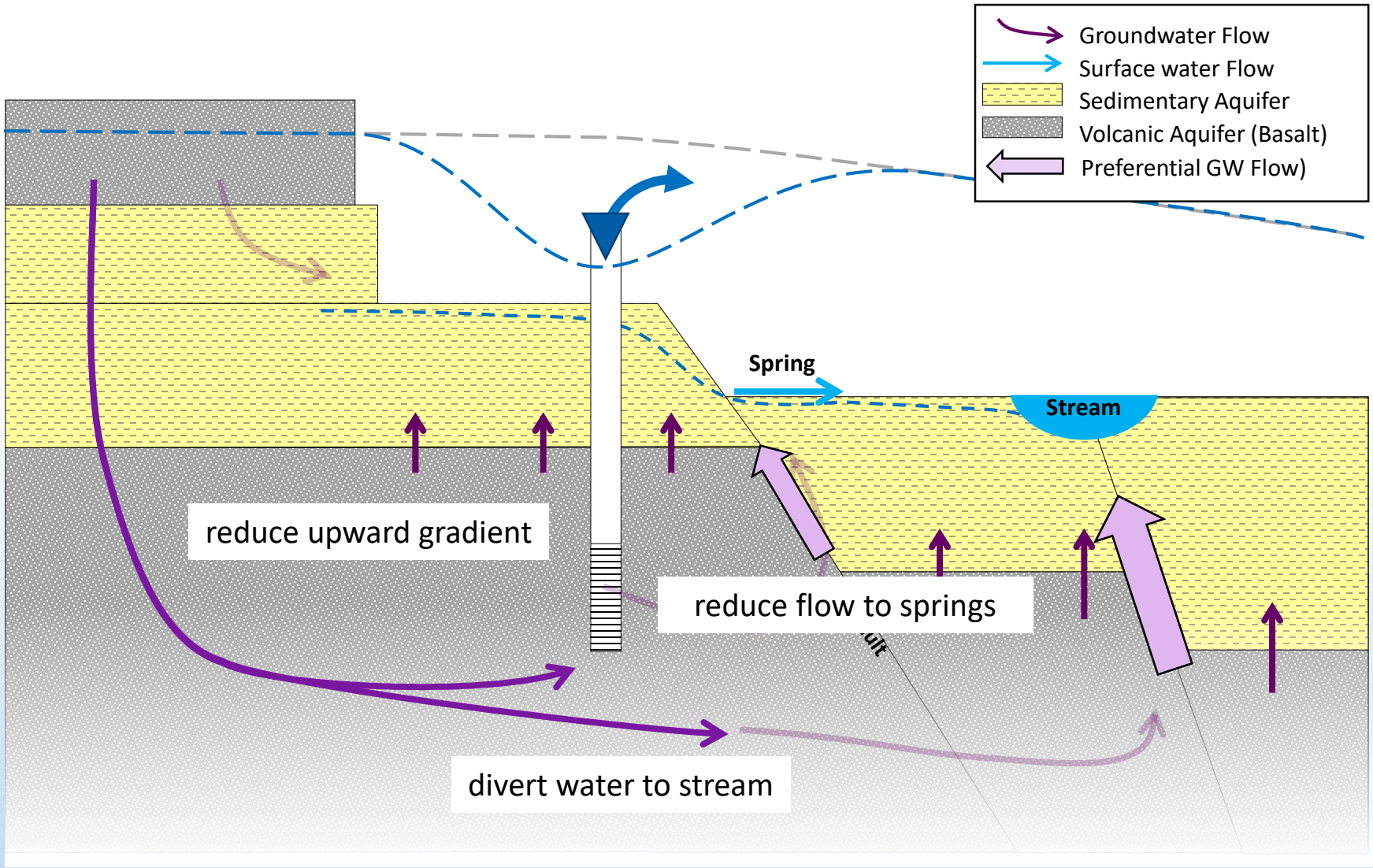

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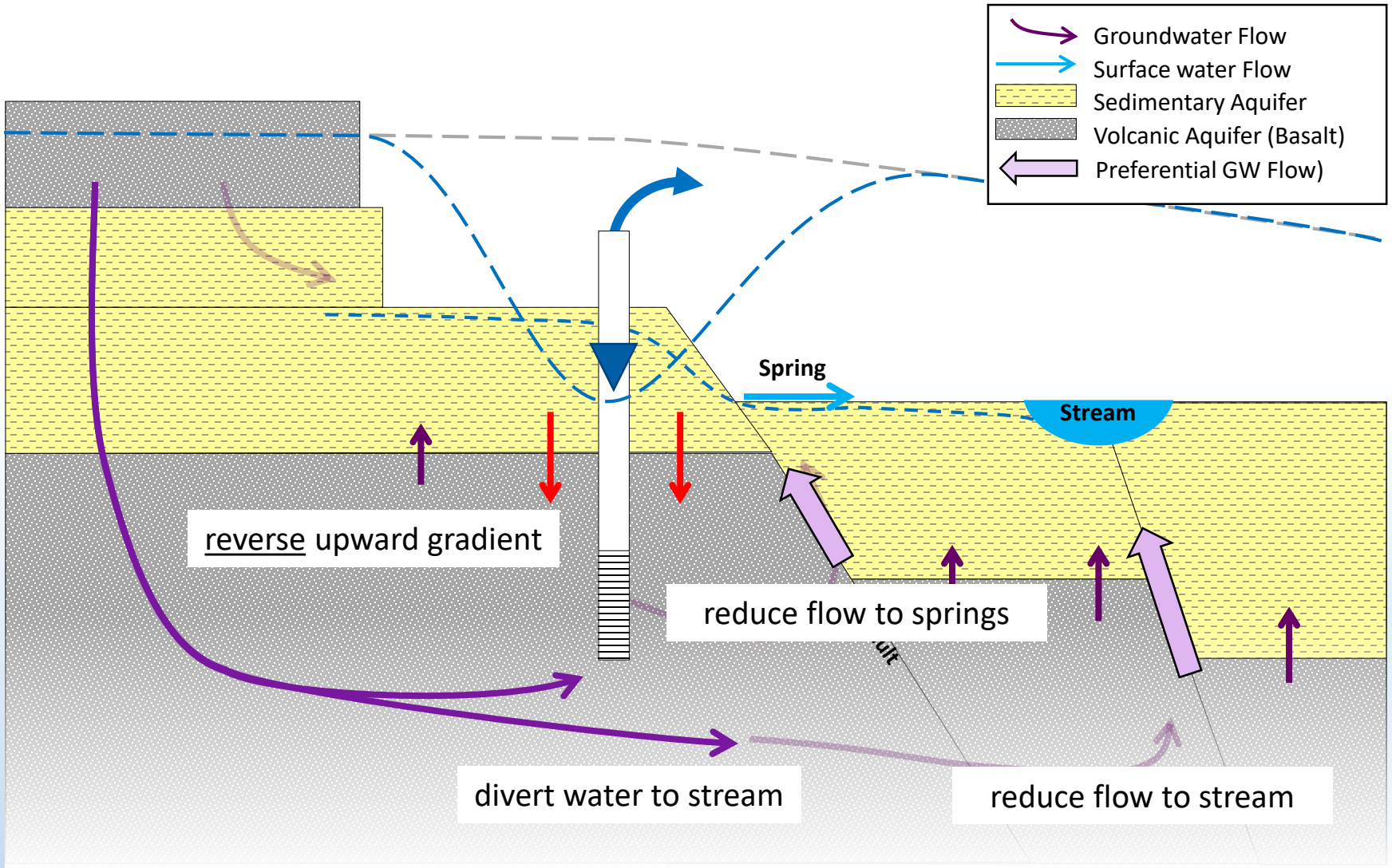

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Klamath Basin Groundwater
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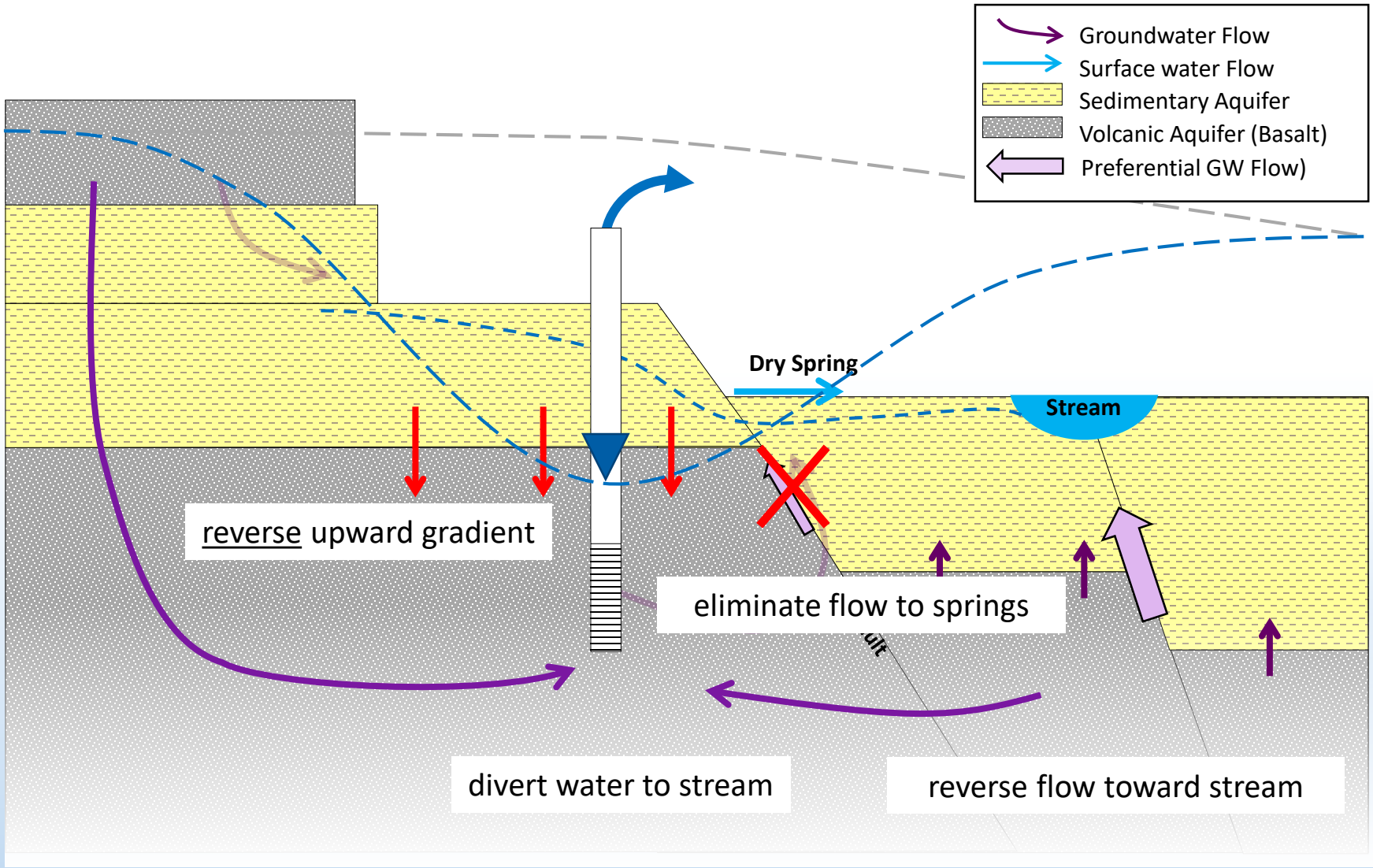

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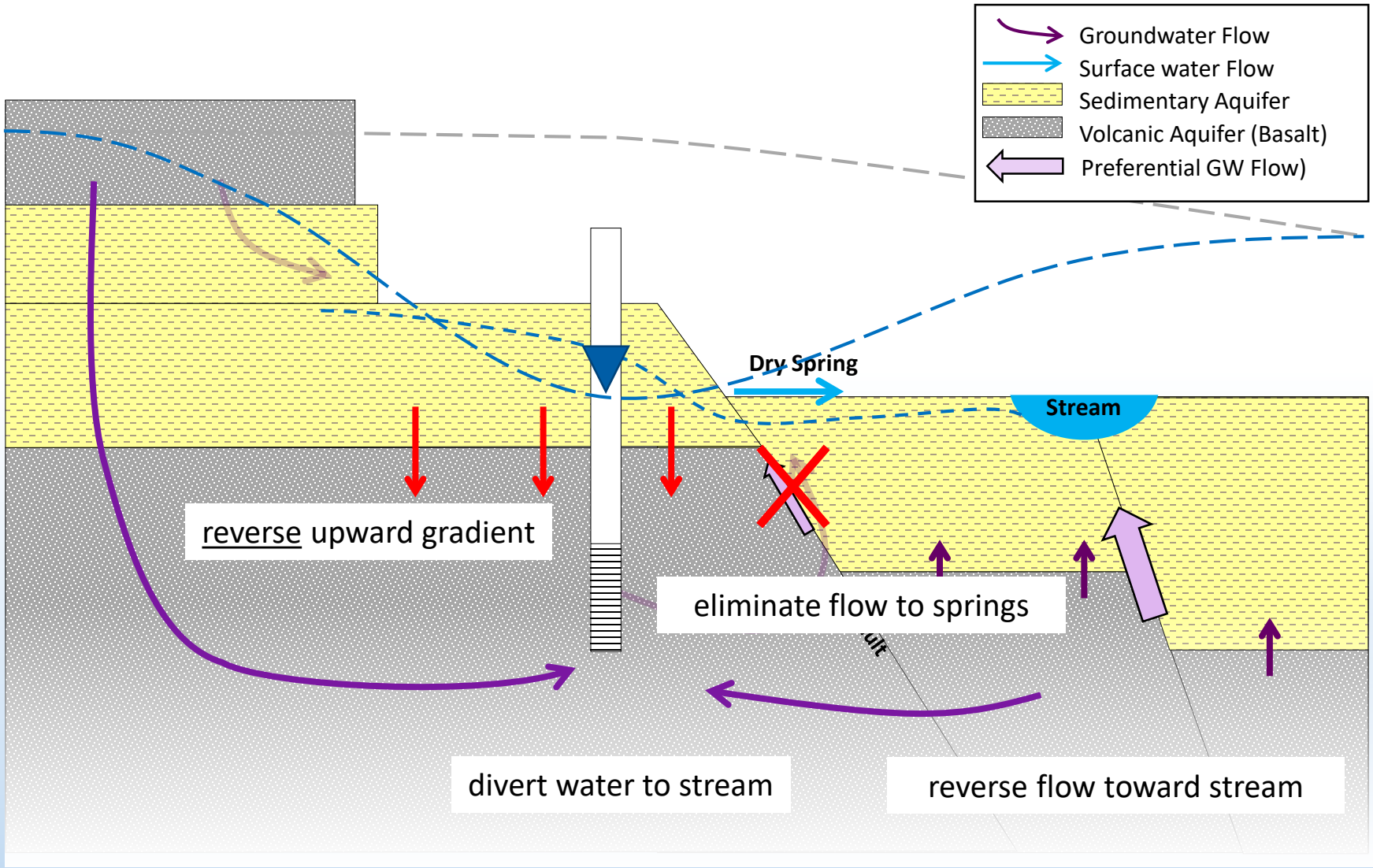

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Klamath Basin Groundwater
Conclusions

- Basin and Range geologic province – mixed volcanic and sedimentary units
- Groundwater flows from uplands (recharge) to valleys (discharge)
- Faults impact groundwater movement but do not exclude movement
- Fine-grained sediments create pressures in deep systems (flowing artesian wells) – drive groundwater upwards

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Klamath Basin Groundwater
Conclusions

- Upward groundwater movement via diffuse seepage and preferential flow
- Source of water to wells: storage, intercepted discharge (stream-depletion), induced recharge – multiple sources simultaneously
- Stream-depletion via: preferential paths and diffuse impacts
- Complex geology and hydrogeology require advanced techniques (grouping of units, statistical analysis, numerical models, etc.)

Klamath Basin Groundwater
Conclusions

Questions?