

Aquifer Storage and Recovery (ASR)

Storage – Peaking – Resiliency

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It Rains **A Lot** In Oregon

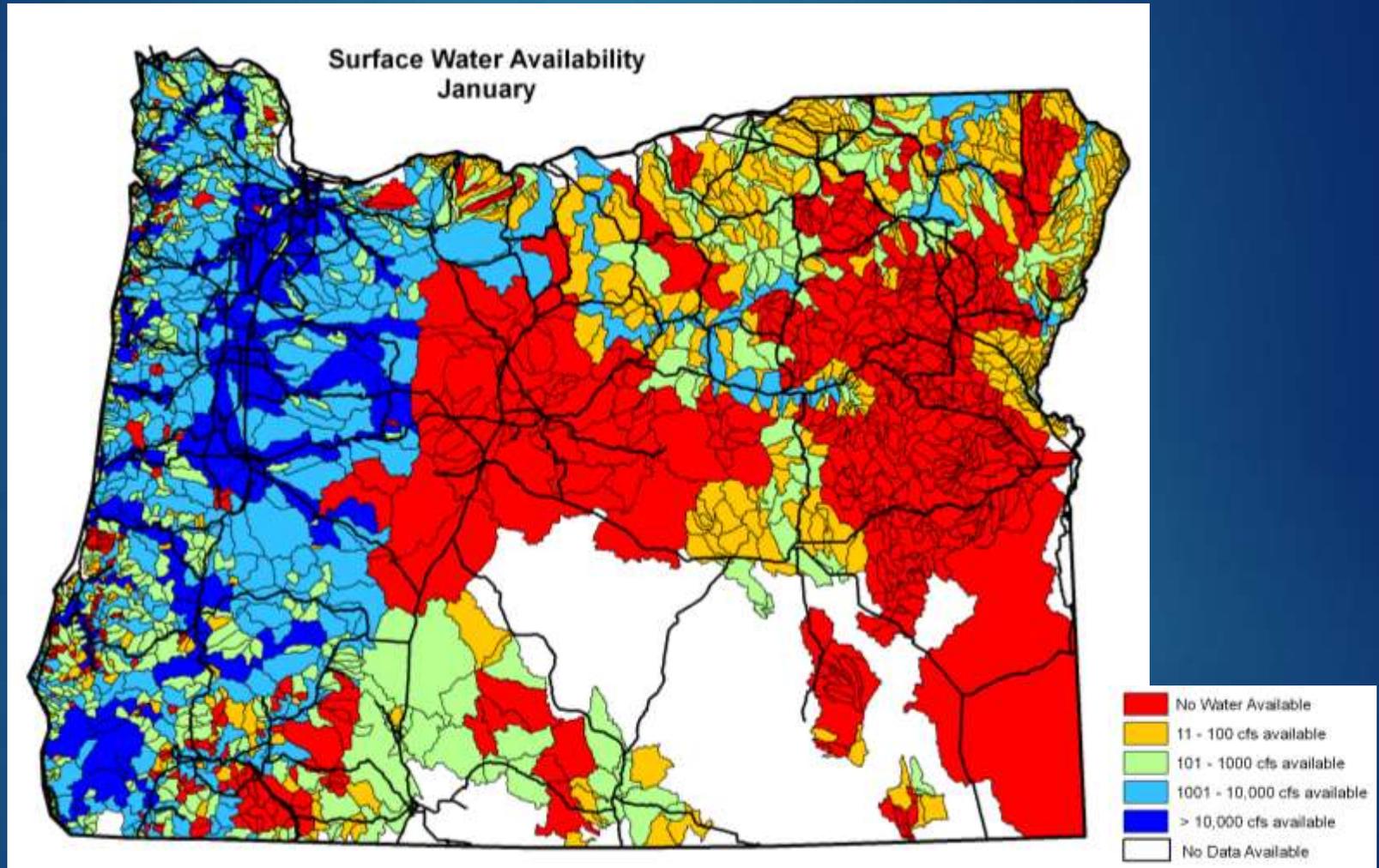


Photo Credit: Todd MecklemIt

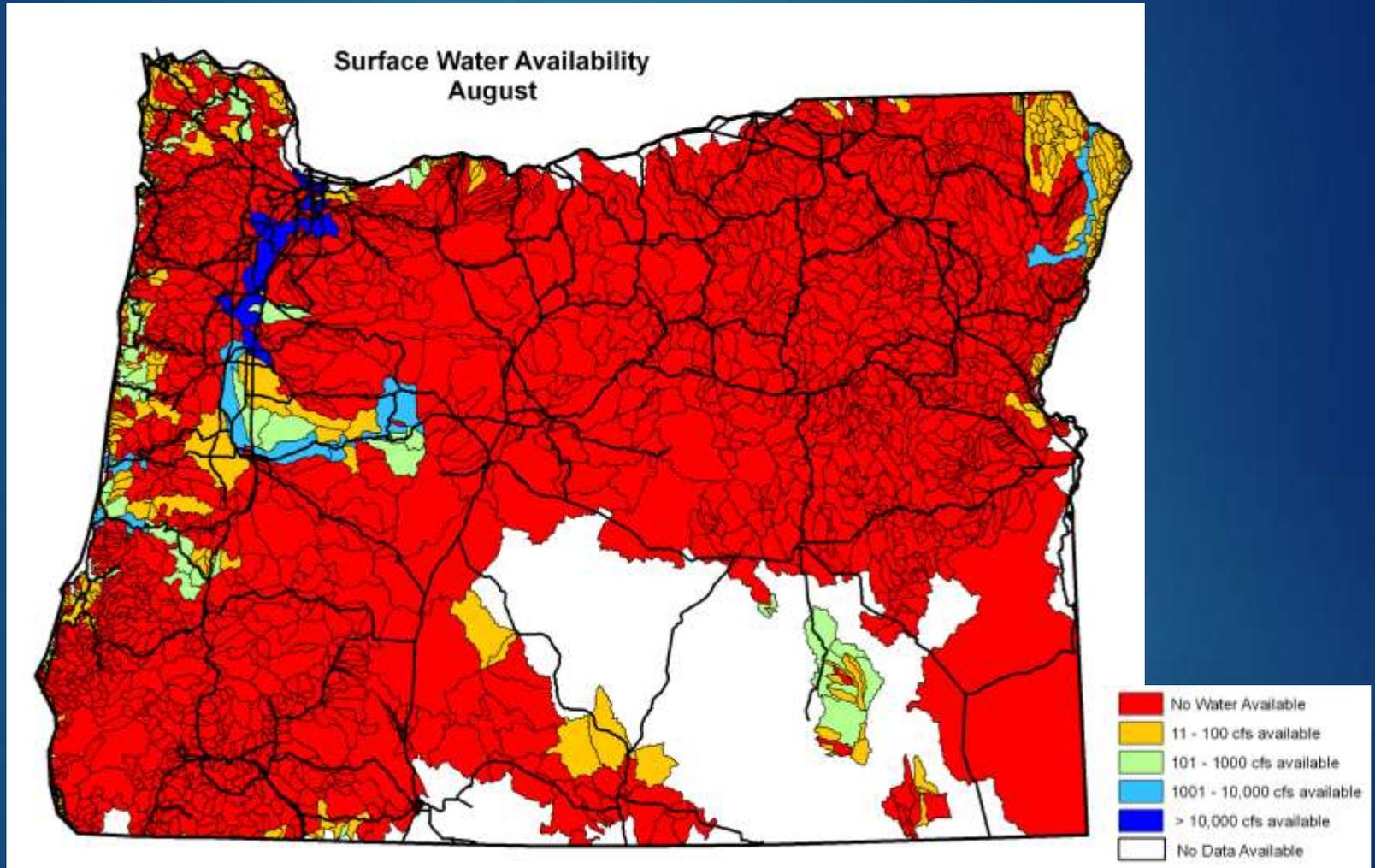
But In Our Summer...Not So Much



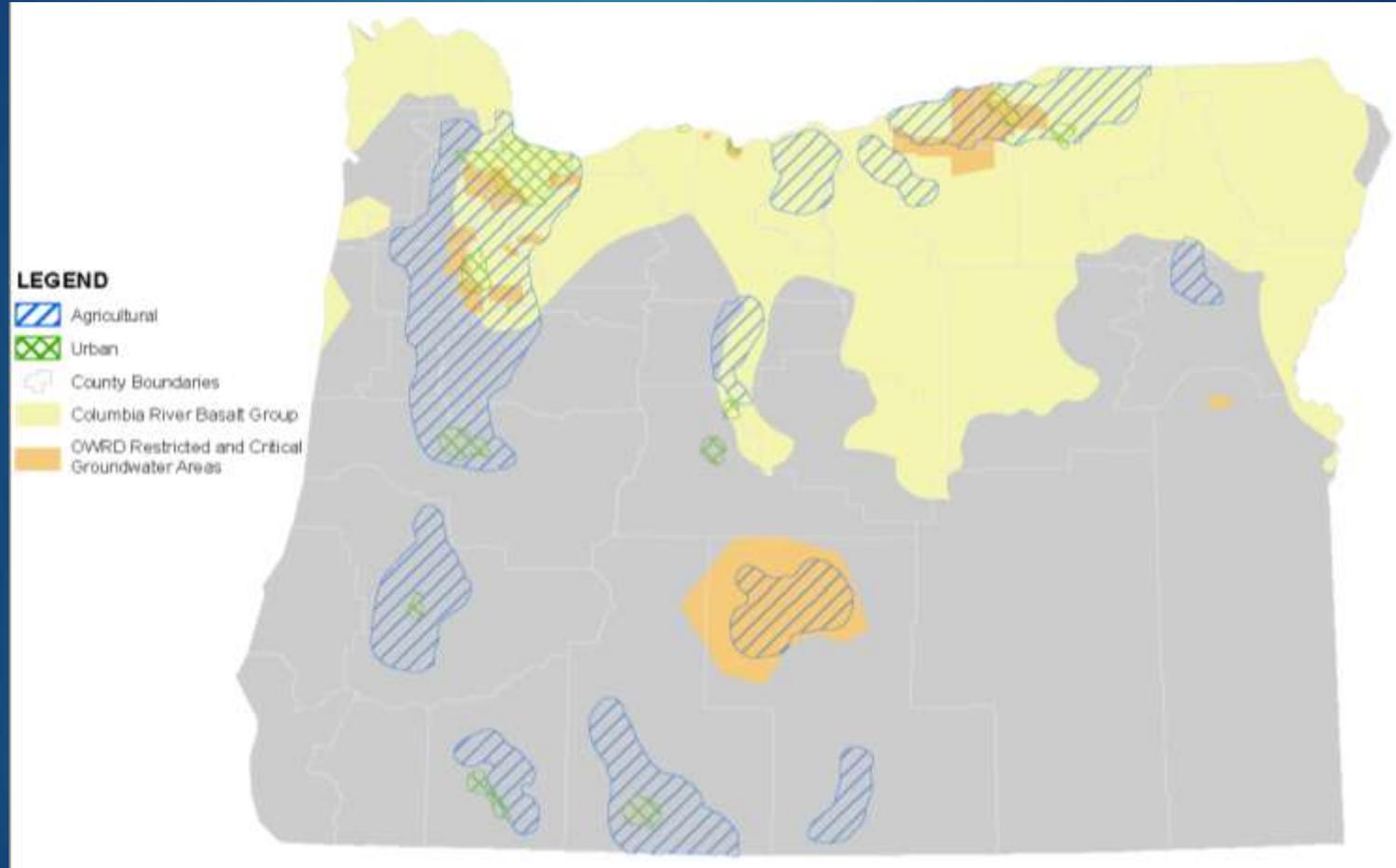
We Can Find Plenty of Water In January



But By August, It Is Hard to Come By!

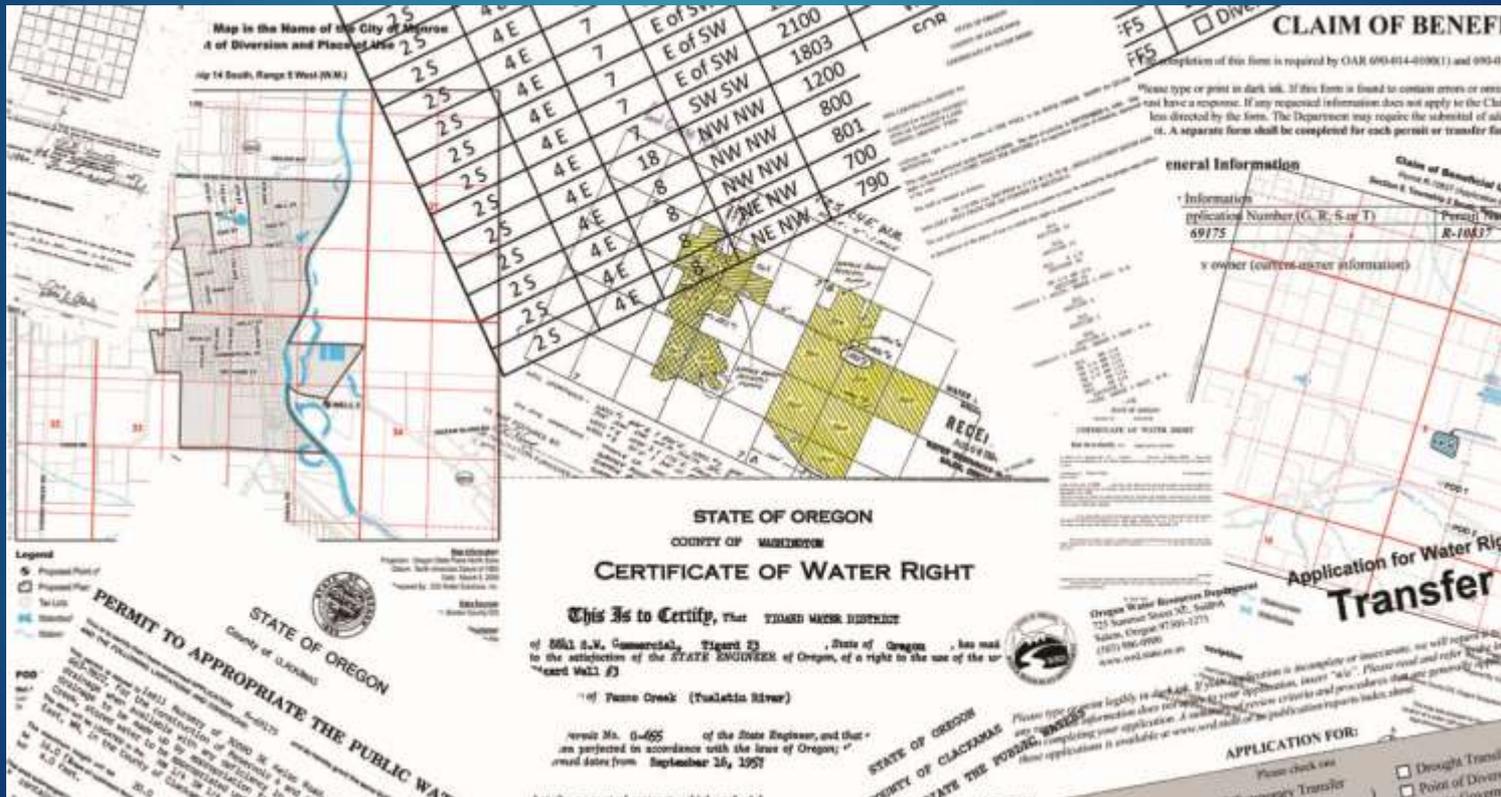


Our Groundwater Supply Is Seriously Depleted



- ▶ Most rivers were fully appropriated 100 years ago
- ▶ Groundwater Permits are uber challenging

In other words, Oregon is out of **“Easy Water.”** (Bastasch, 1998)



For Many In Oregon,
The Cost-Effective Solution Is:



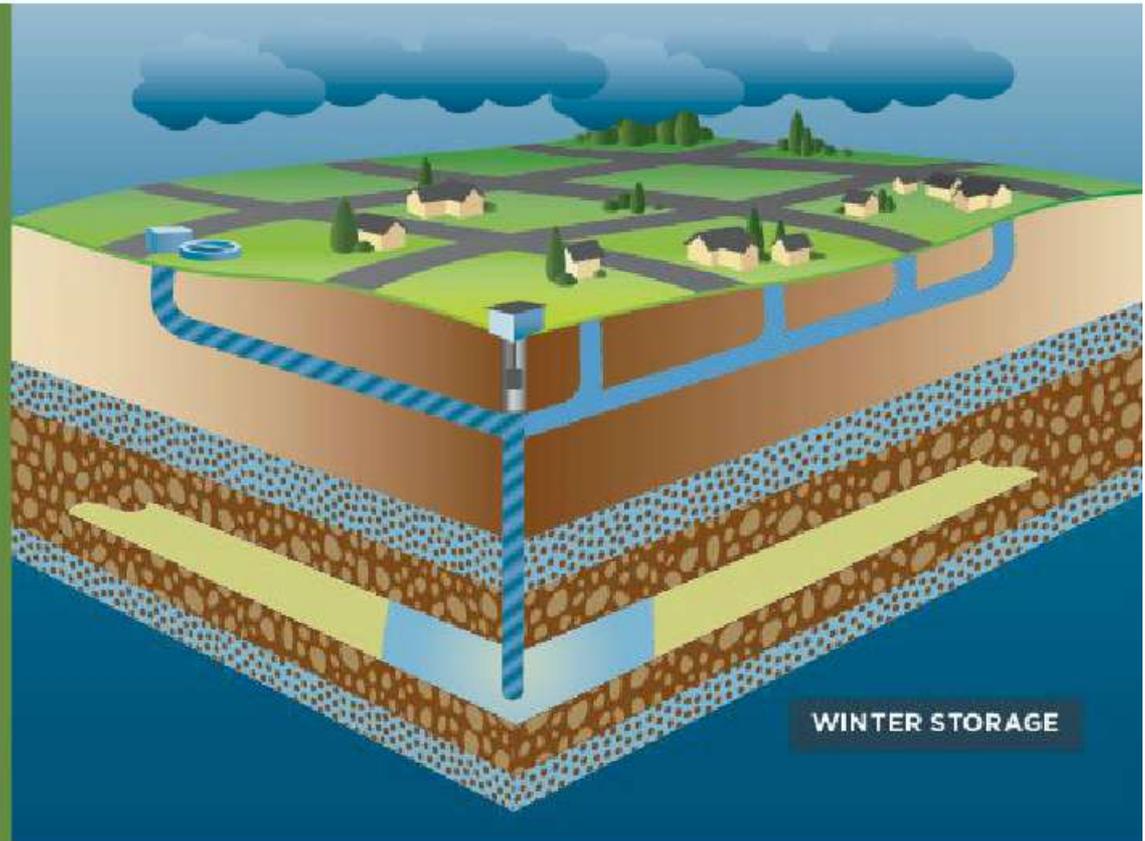
Aquifer **S**torage and **R**ecovery

ASR – How It works

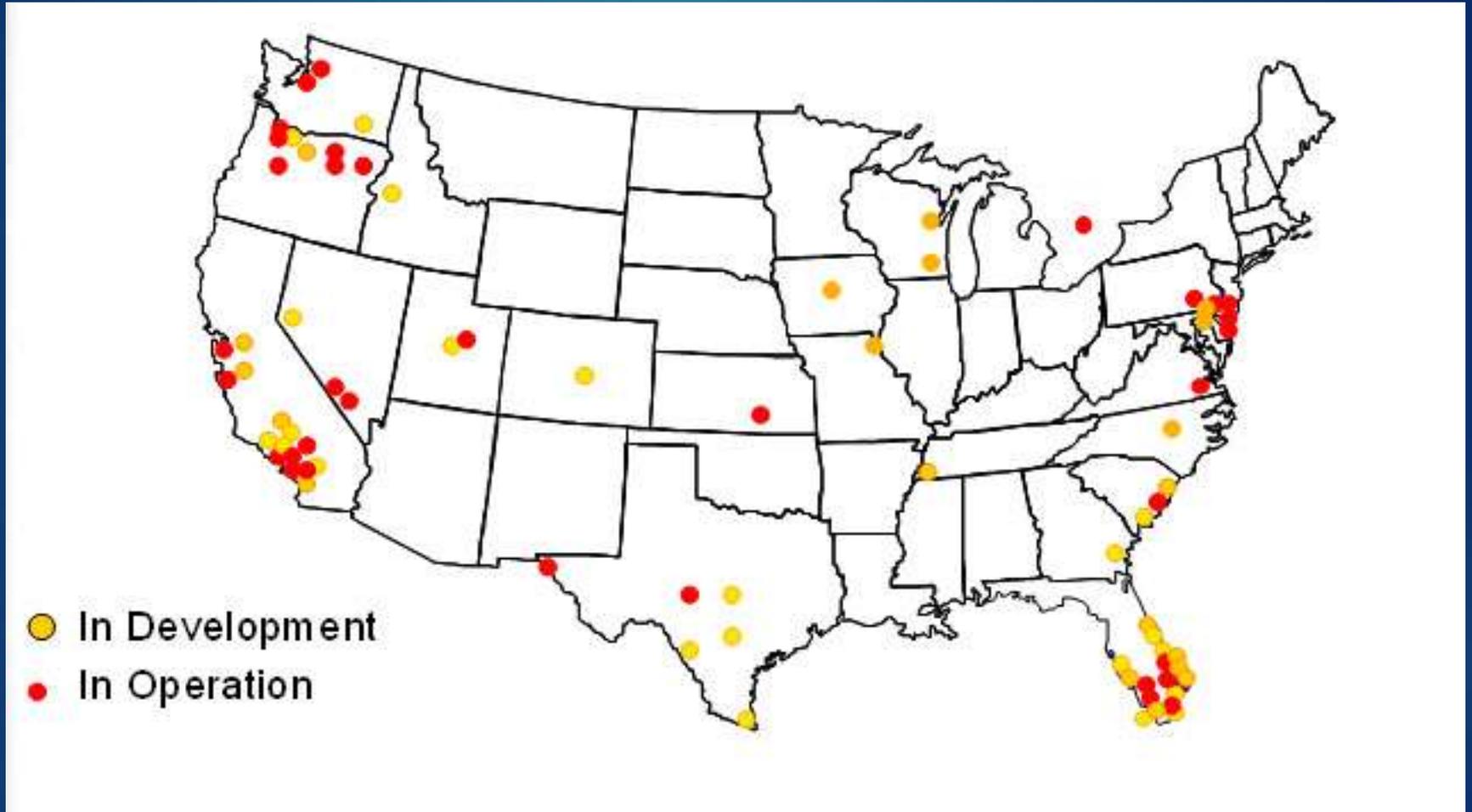
- 1 Sustainable
- 2 Preserves in-stream flow
- 3 Supports native groundwater system
- 4 Cost beneficial-Delays new infrastructure
- 5 Environmentally friendly
- 6 Emergency back-up

WINTER STORAGE: Water is pulled from the Tualatin River, treated to drinking water standards and then transported by pipe to the ASR site. There it is pumped into the aquifer and stored.

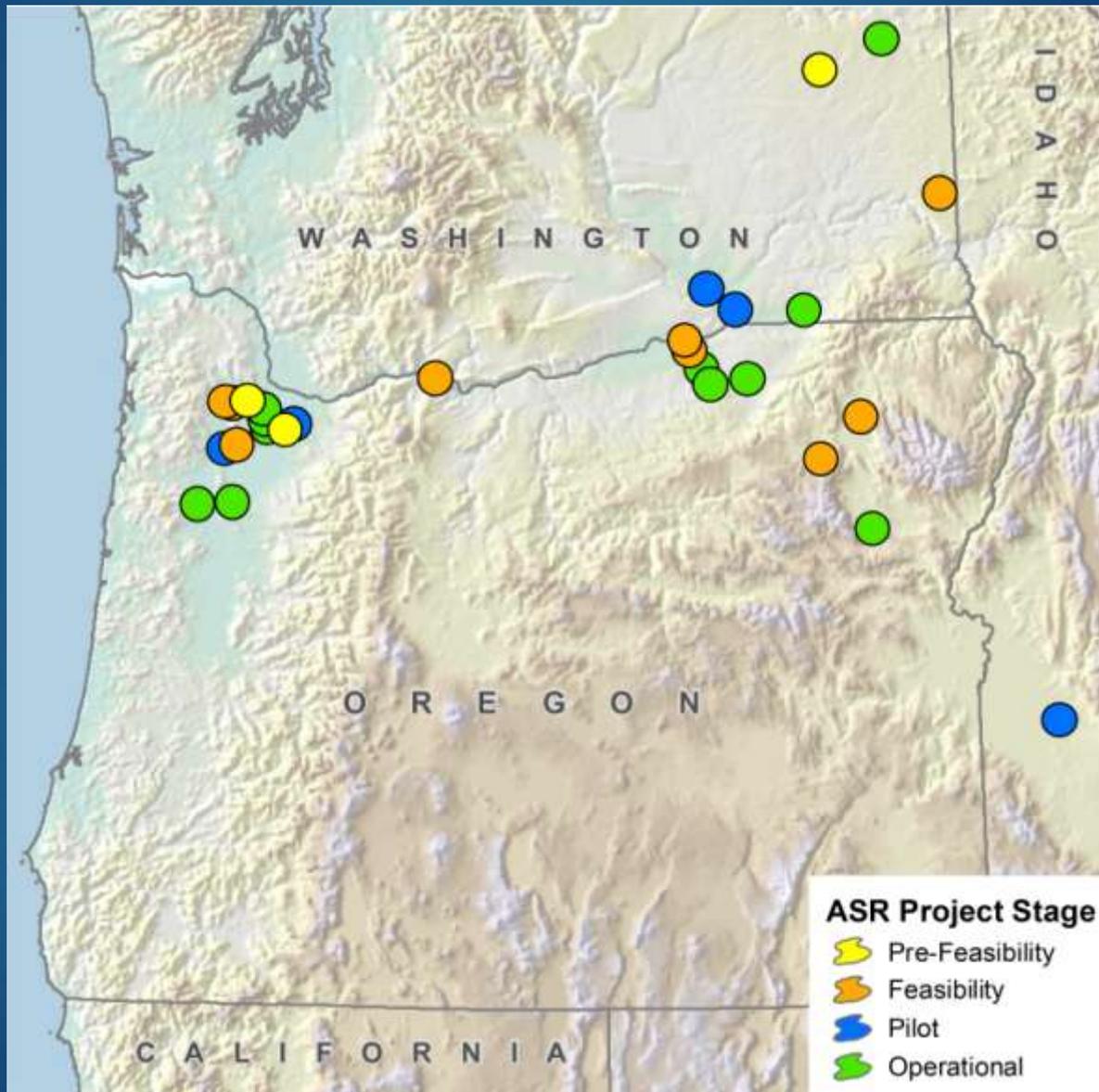
SUMMER RECOVERY: The treated water stored in the aquifer is now pumped out, re-chlorinated, and put into a pipe to be delivered to homes and businesses in Hillsboro, as well as areas served by Beaverton and Tualatin Valley Water District.



ASR - From Florida to Oregon

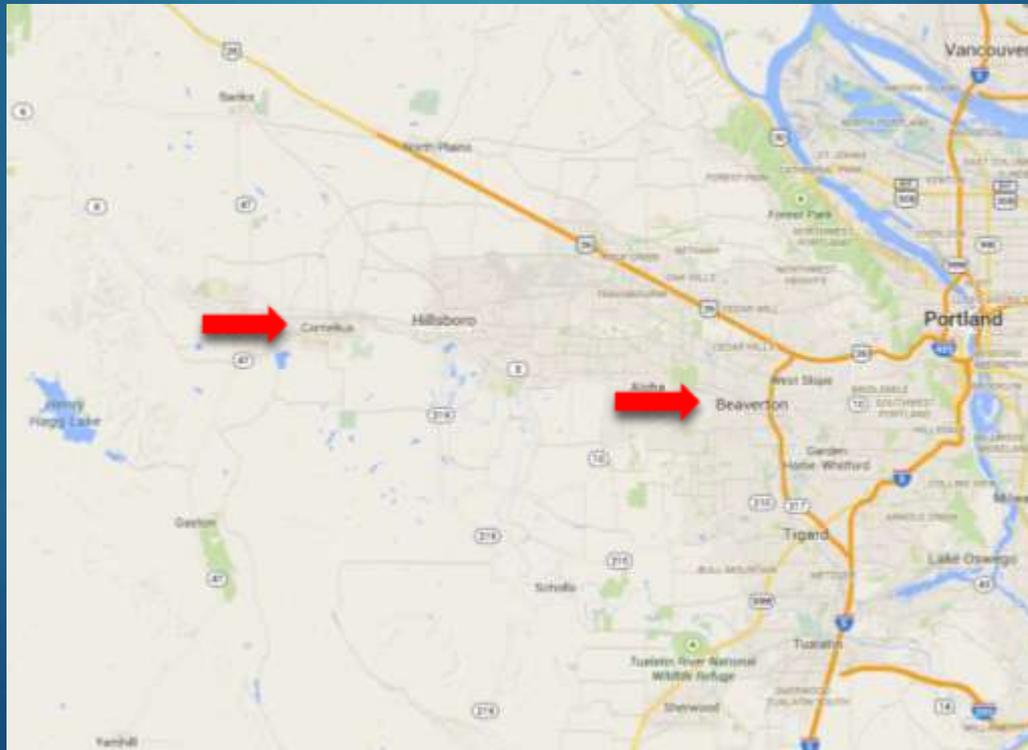


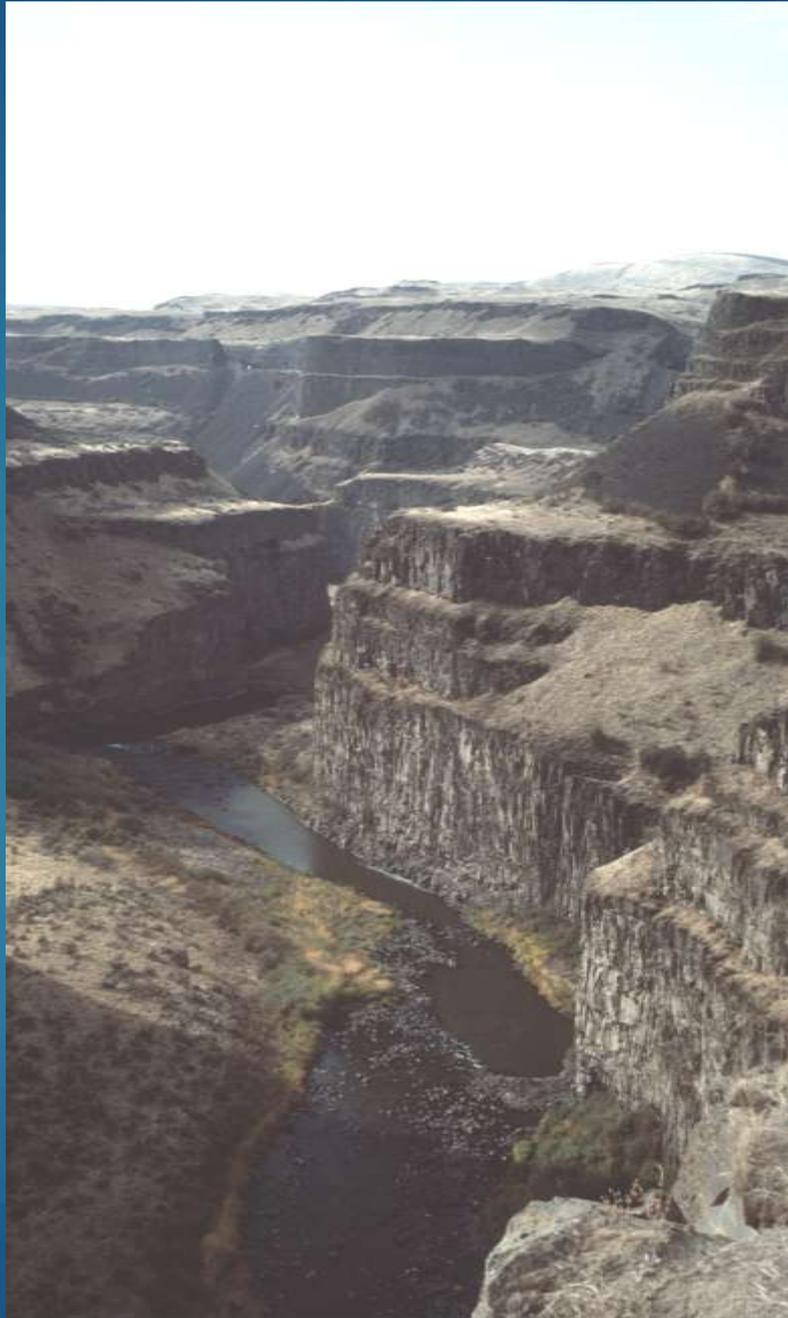
ASR – Rainy Northwest



ASR Examples – Large Storage to Modest Storage

1. Beaverton – 450 MG Storage (IFA pending)
2. Cornelius – 50 MG Storage (IFA supported)

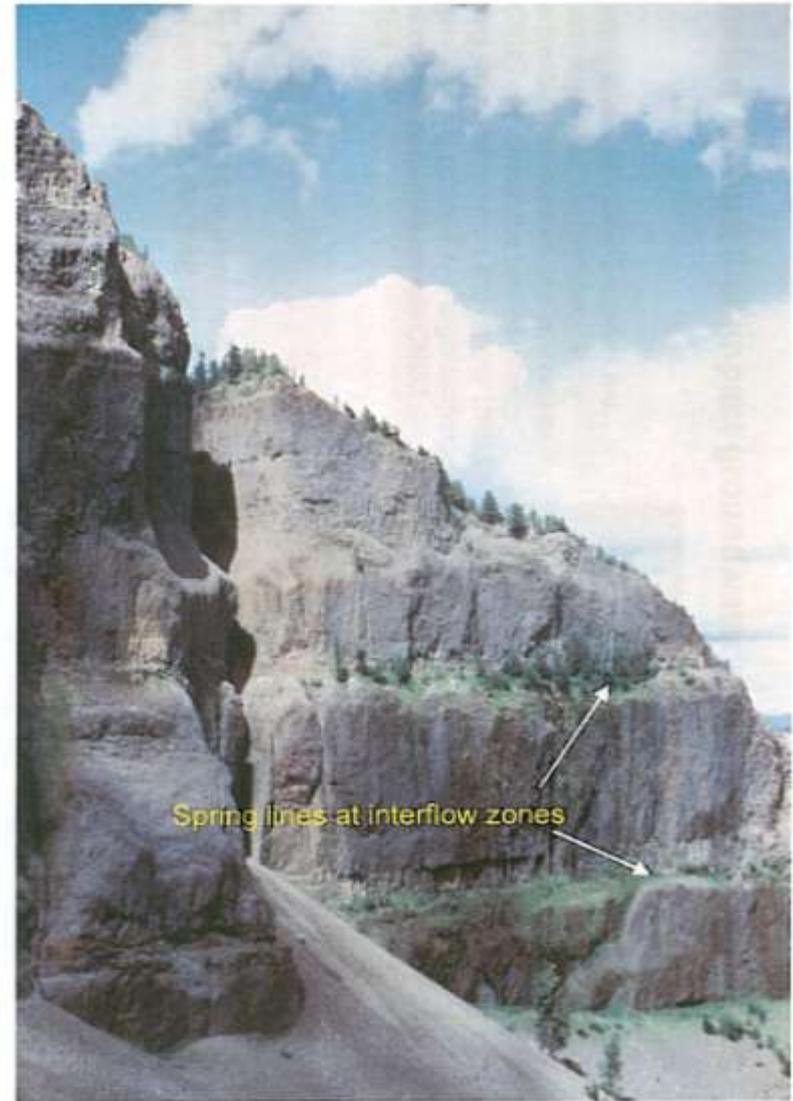
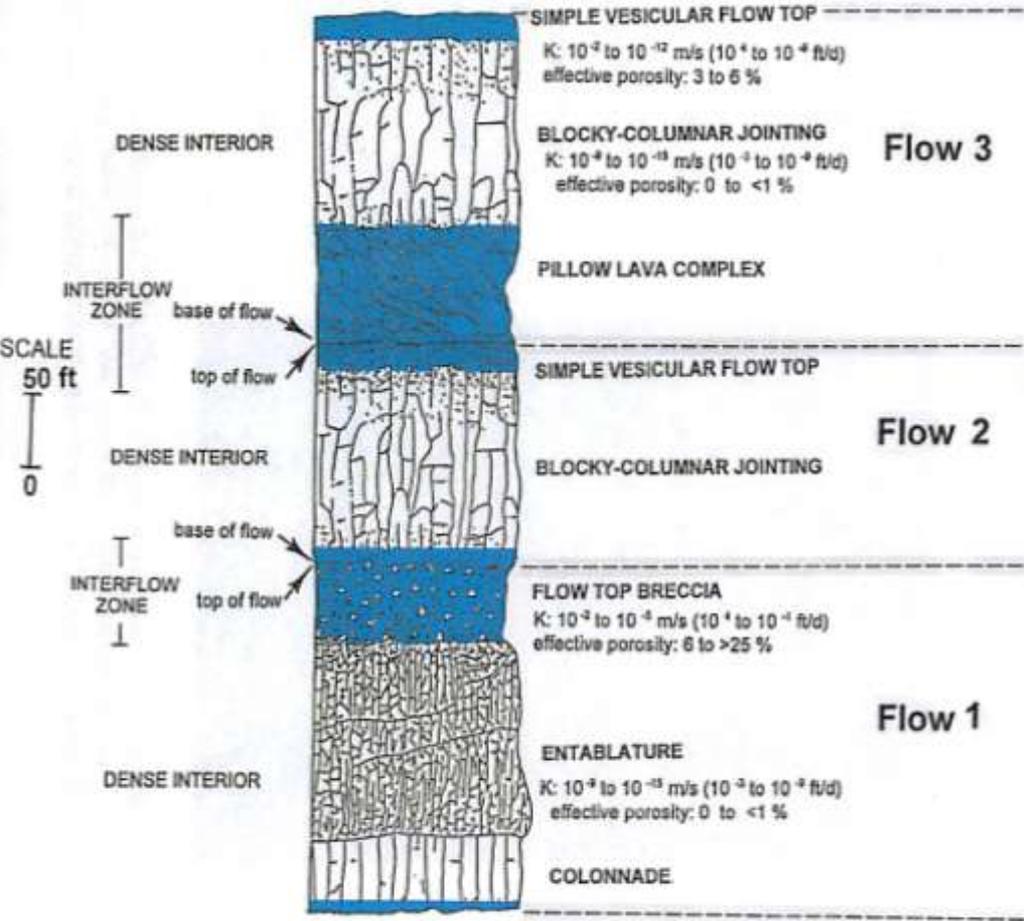




CRBG intraflow structures & their relevance to groundwater occurrence

CRBG intraflow zones typically host groundwater (aquifers) while the dense interiors of the flows are usually confining layers (aquitards). In their undisturbed state, the layered CRBG can consist of a series of confined aquifers.

SHEET FLOWS

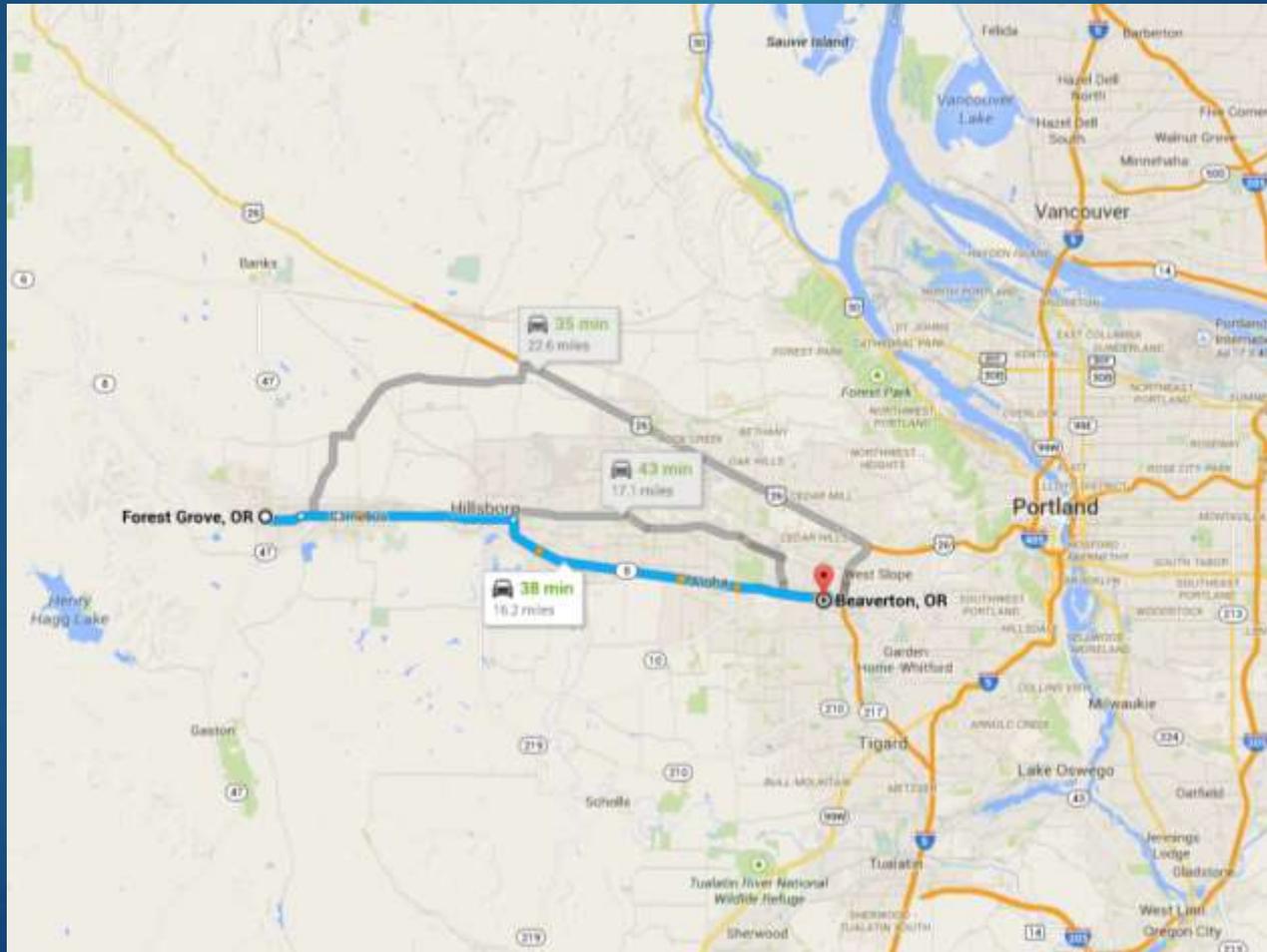


450 MG is a lot of Water



Beaverton's Source Pipeline

- ▶ (P) Transmission from JWC: 14 mgd – Peak 18 mgd



When Beaverton's Emergency Comes, ASR will be Ready!

(R) Transmission Breaks – Big One

- ▶ ASR in-town resource: meets emergency needs

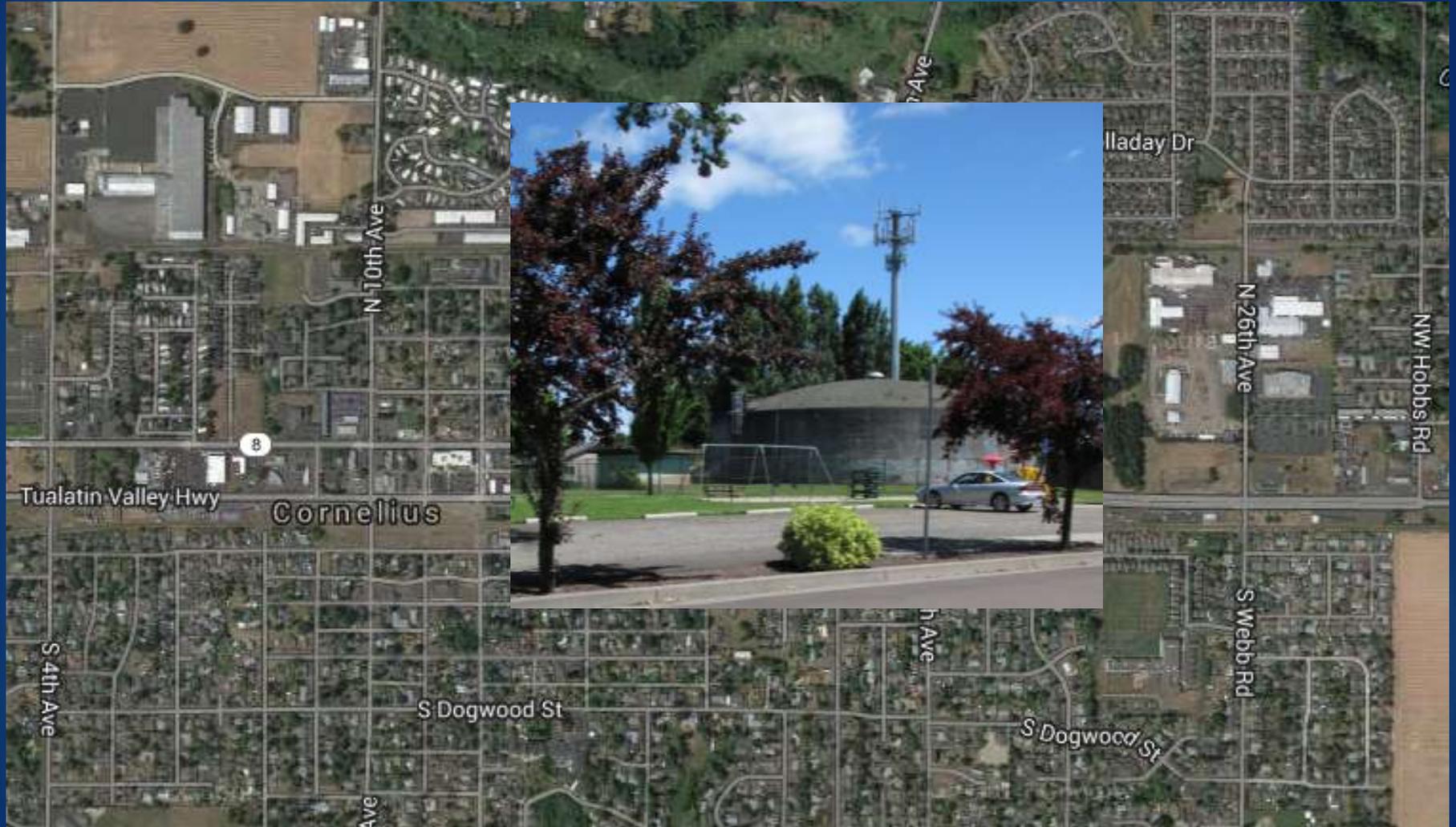


Cornelius - 2014

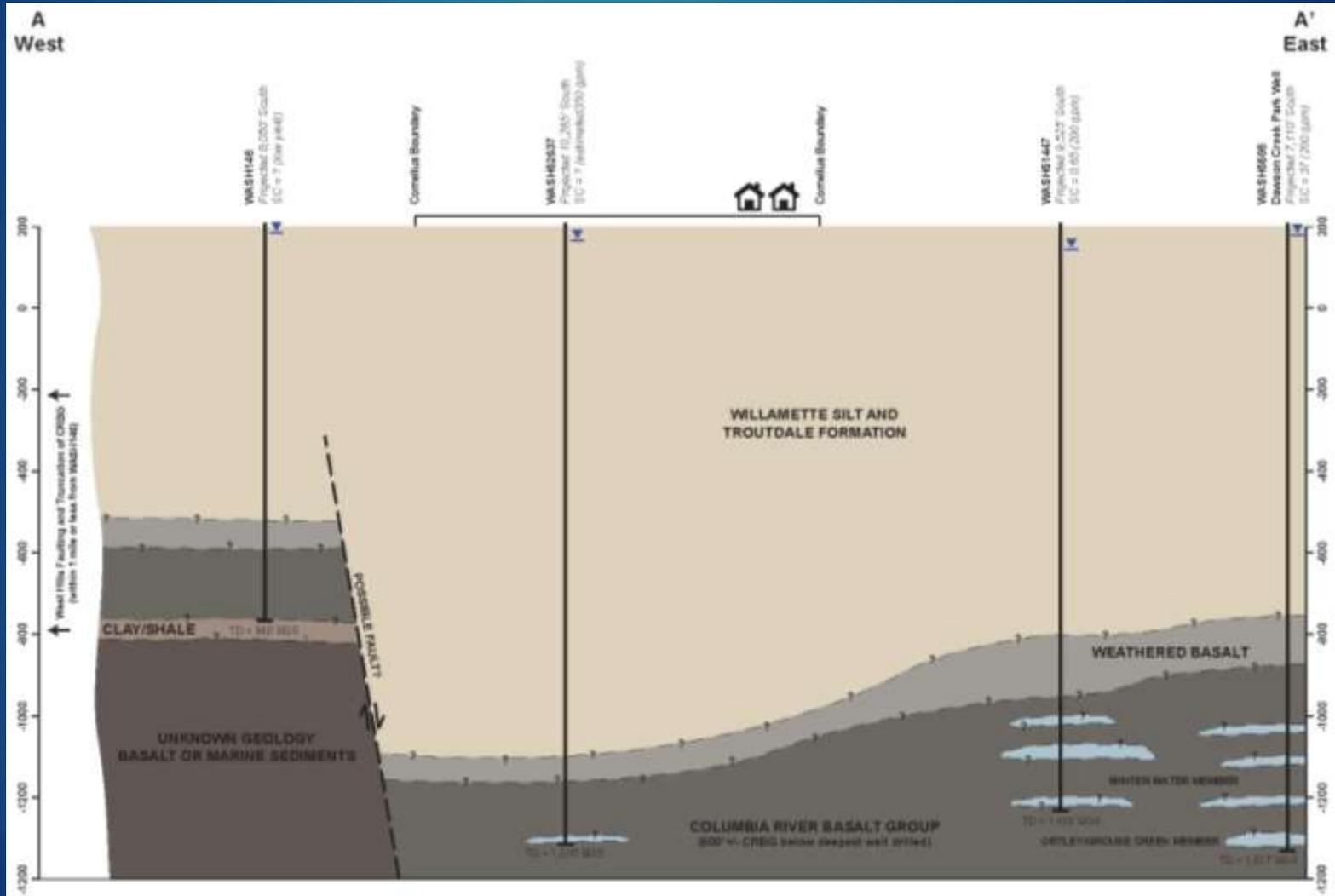
- ▶ Limited in-town storage
- ▶ No water source – yikees
- ▶ ASR – Better storage option and cost effective



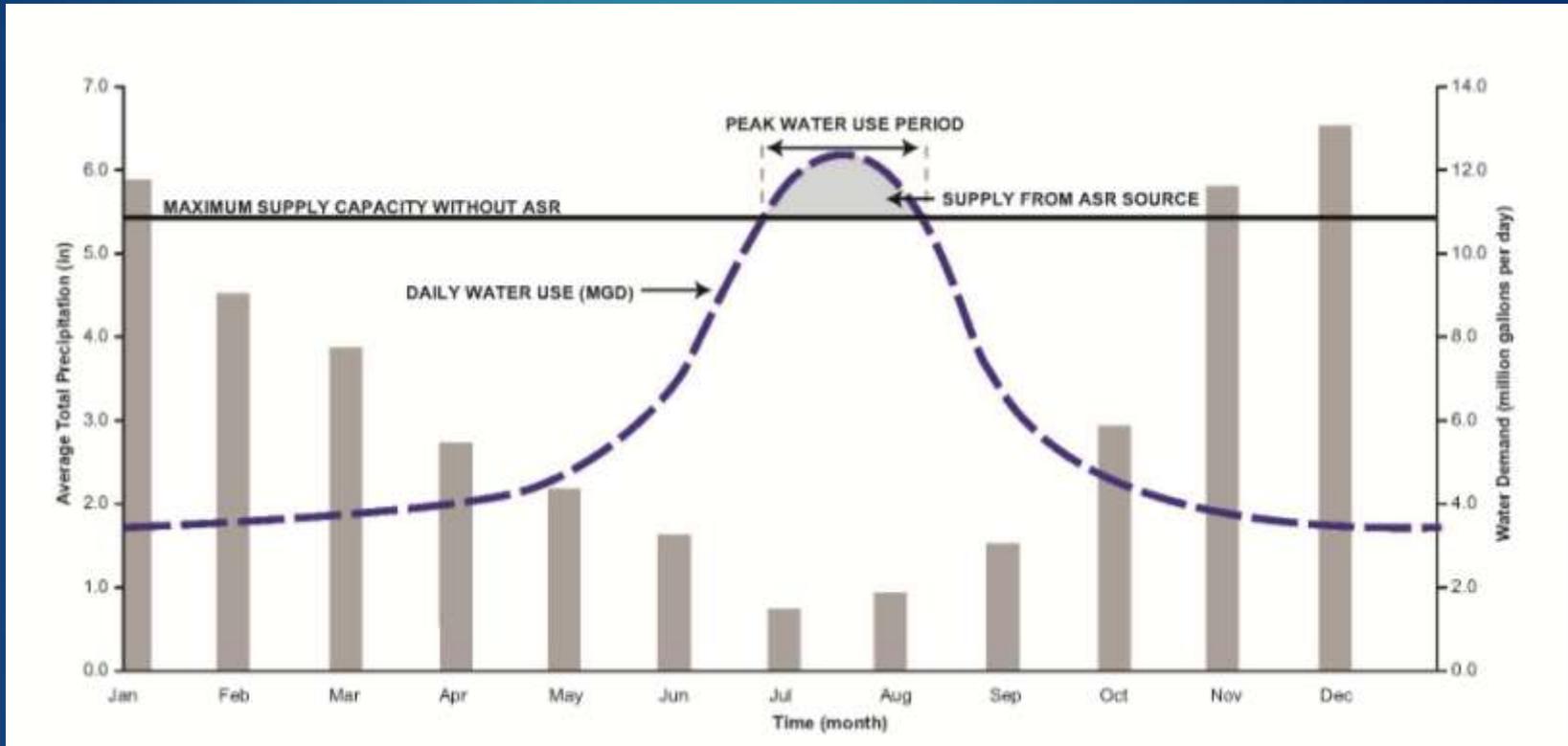
Cornelius Reservoir



Subsurface Conditions: Cornelius – going for it!



Cornelius Realized the Benefits of ASR Peaking



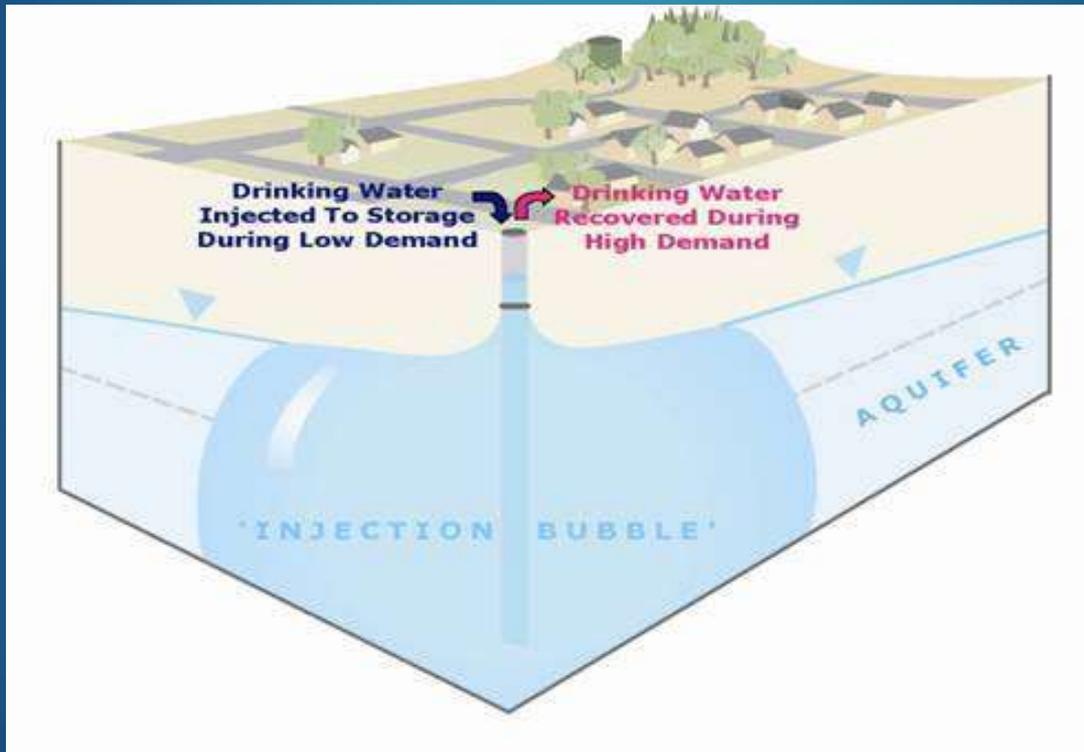
Cornelius – Water Storage Costs Dramatically Less than Traditional Storage

- ▶ Storage comparison
 - ▶ \$2M (min) for 2 MG Reservoir – \$1/gal
 - ▶ \$1.7M for 50 MG ASR system – 3.4 cents/gal



Cornelius – ASR Increases in-town Capacity and Minimizes Peaking Cost

- ▶ Cost of summer time peak water – high
- ▶ Use stored water from ASR



Cornelius Increased Its Resiliency with a Robust System

- ▶ ASR well survives transmission failure



ASR's Other Benefits

Keeps water in-stream in the summer.



ASR's Other Benefits

Delays building big pipelines



ASR's Other Benefits

Maximizes the use of existing treatment plant



ASR's Other Benefits

Is totally green – saves the aquifers



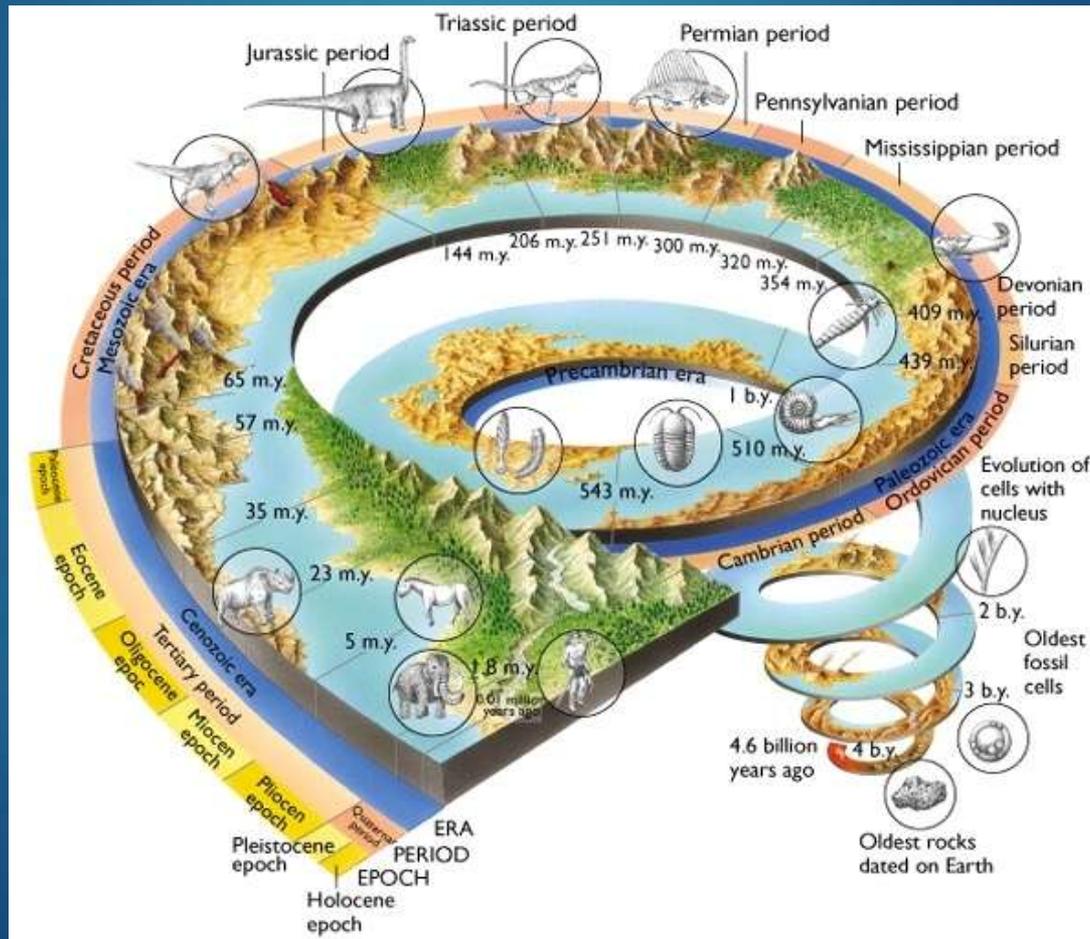
ASR's Other Benefits

Summer ASR water is cold (folks enjoying a frosty drink)



ASR's Other Benefits

More but I am out of geologic time



Questions?