

Policy, Permitting & the Particulars of Aquifer Storage and Recovery in Washington State

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2018 Conference

October 23rd, 2018

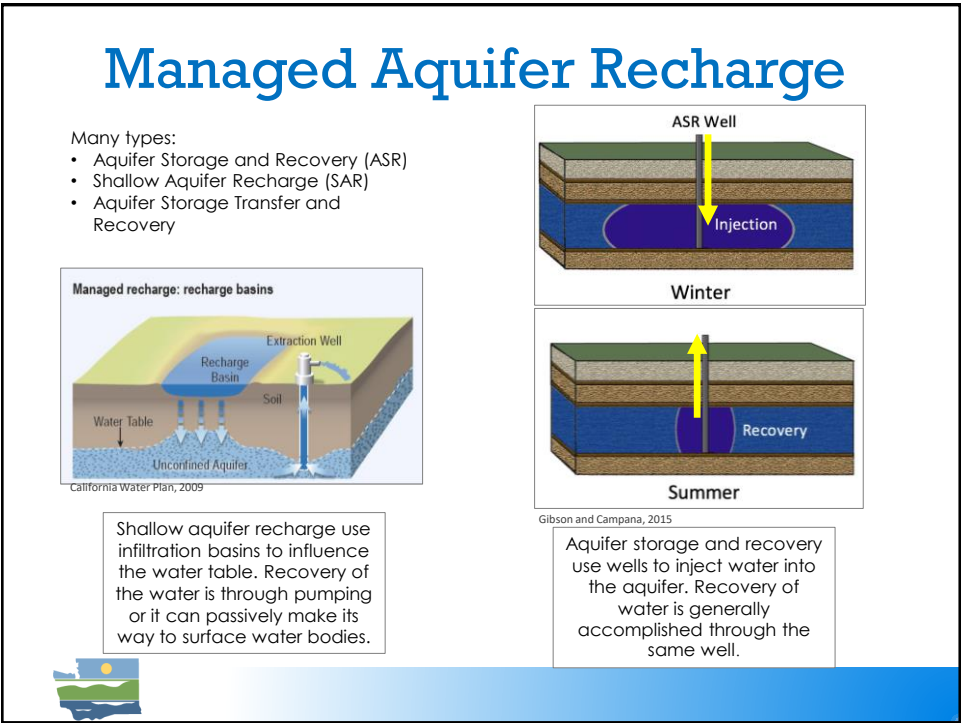
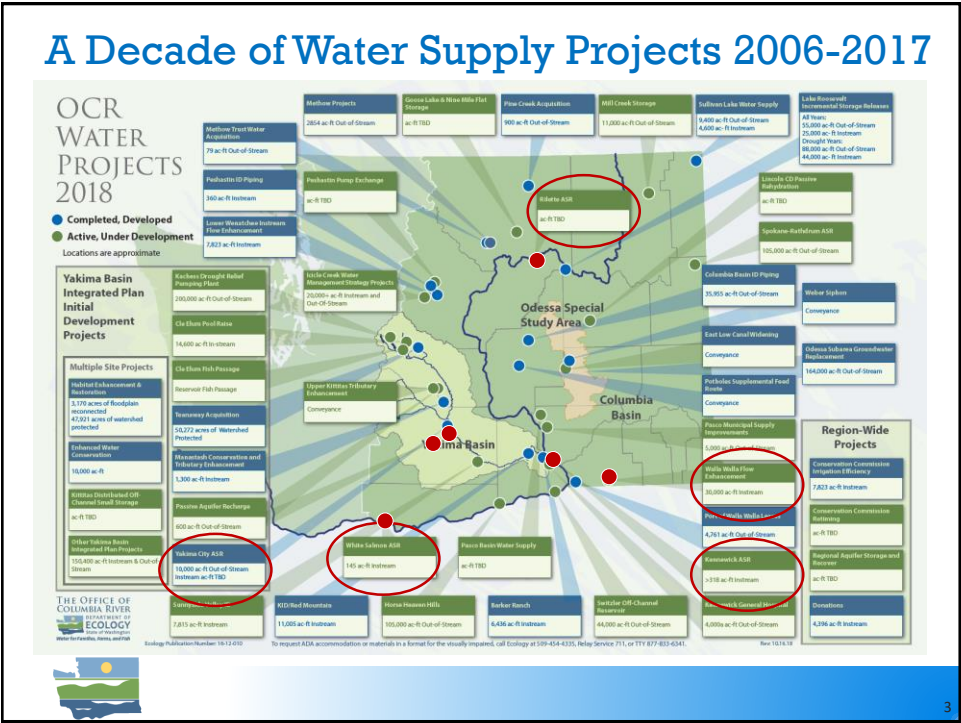


Water Supply Development Tools

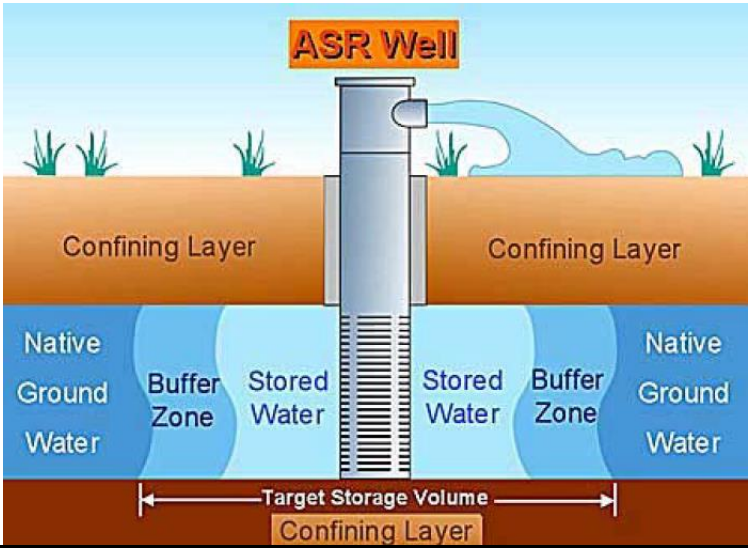


- Surface Storage
- Structural & Operational Changes
- **Aquifer Storage and Recovery**
- **Shallow Aquifer Recharge (aka Passive Rehydration)**
- Water Right Acquisition & Leases
- Pump Exchanges
- Conservation/Piping/Lining

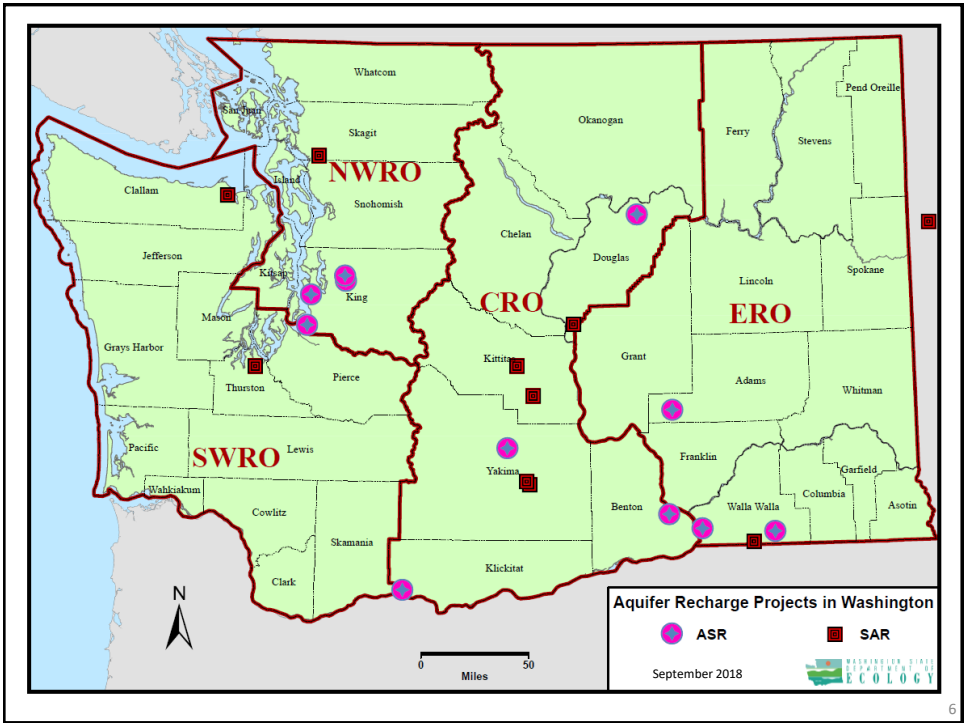




General ASR Schematic

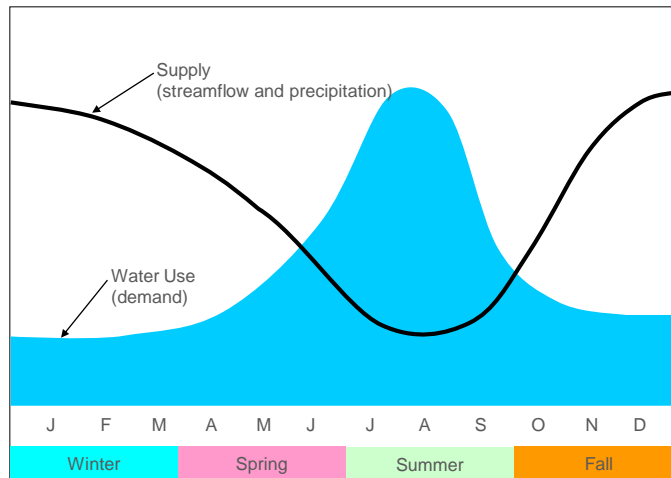


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The General Eastern Washington Water Supply Situation



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ASR Project Elements

- Hydrogeologic Investigation
- Water Quality/Treatment Assessment
- Environmental Review
- Feasibility & Design
- Construction & Pilot Study
- Final Permitting & Monitoring



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Aquifer Storage and Recovery

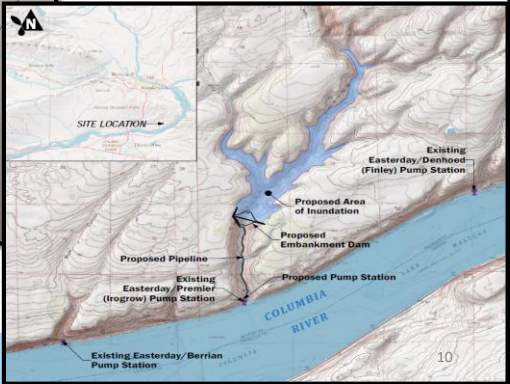
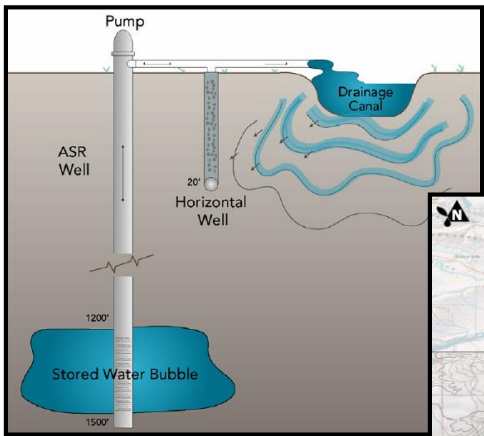
- Cities of
 - White Salmon
 - Kennewick
 - Yakima
 - West Richland
 - Othello
 - Quincy



- Source Water Supply
- Appropriate Geology to hold water
- Water Quality
- Economical Infrastructure
- Enabling Permitting Environment



Aquifer Storage v. Surface Storage



Drivers for ASR



- Environmental Benefits
 - Small footprint
 - Insignificant adverse impacts upon terrestrial and freshwater ecosystems
 - Reduced adverse impacts upon estuarine ecosystems
 - Climate Change Resiliency
- Economic Benefits
 - Low cost relative to other water supply and water storage options (10 to 50%)
 - Can be built incrementally
- Proven Performance
 - About 400 operating ASR wells nationwide
 - Very few failures



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City of Yakima ASR

- Permit issued
- Authorized for 14,400 acre-feet of injection per year
- Reservoir capacity 200,000 acre-feet of water
- Infrastructure
 - Two injection wells
 - Four extraction wells



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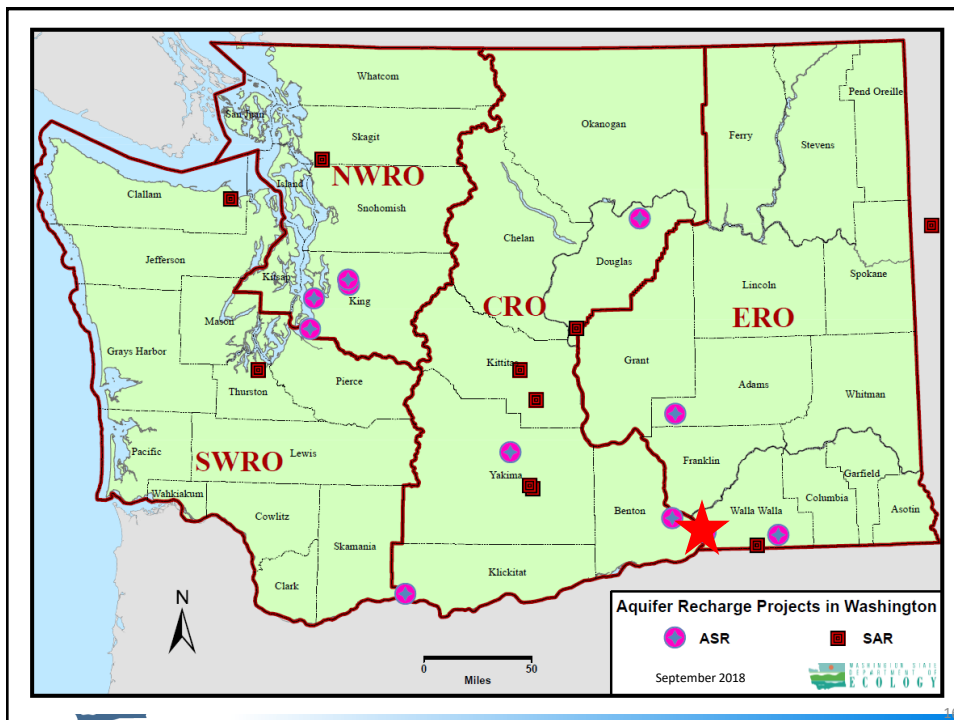
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City of Kennewick ASR

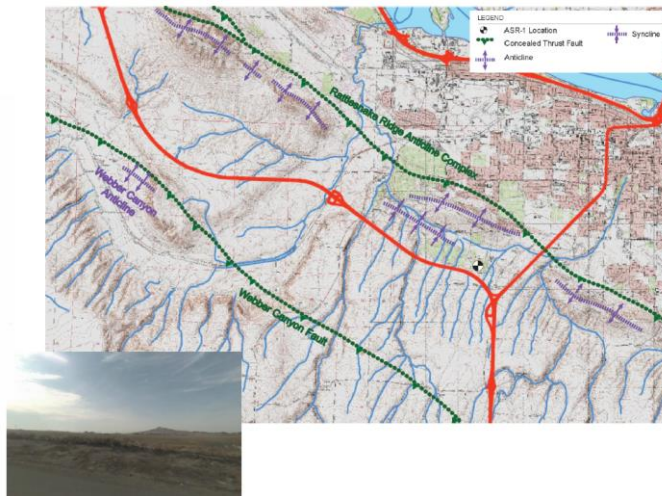
- Temporary permit issued
- Authorized for 1,458 acre-feet per year
- Injection period: October thru May
- Extraction period: June thru October



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City of Kennewick ASR



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ASR Permitting Objective

- Generate or gather sufficient information to ensure that ASR permit(s) conditions protect future water quality and availability for human and environmental purposes.
- Ensure project compliance with the applicable laws, rules, policies & guidance

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ASR Regulations

There is only guidance for ASR projects, no permitting criteria. ASR in Washington is governed by an mixture of existing rules and regulations.

- **Aquifer Storage and Recovery regulation**
 - Chapter 173-157 WAC
- **Water Code/ Reservoir permits**
 - RCW 90.03.370
- **Groundwater appropriation**
 - RCW 90.44
- **Groundwater Quality Standards**
 - Chapter 173-200 WAC
- **State Waste Discharge permit program**
 - Chapter 173-216 WAC
- **Underground Injection Control (UIC) Regulation**
 - Chapter 173-218 WAC

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ASR is a Complex World of Laws & Regulations

Source of Water	Underground Storage?		Beneficial Use ?		Recharge Location	
	Yes	No	Yes	No	Surface Infiltration	Underground Injection
Surface or Groundwater Diversion	Chapter 90.03 RCW Chapter 90.44 RCW Chapter 90.48 RCW Chapter 173-157 WAC Chapter 173-200 WAC	Chapter 90.03 RCW Chapter 90.44 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.03 RCW Chapter 90.44 RCW	Chapter 90.03 RCW Chapter 90.44 RCW	Chapter 90.03 RCW Chapter 90.44 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.03 RCW Chapter 90.44 RCW Chapter 90.48 RCW Chapter 173-157 WAC Chapter 173-200 WAC Chapter 173-218 WAC
Stormwater	Chapter 90.03 RCW Chapter 90.44 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.03 RCW Chapter 90.44 RCW Chapter 90.48 RCW Chapter 173-157 WAC Chapter 173-200 WAC	Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.48 RCW Chapter 173-200 WAC Chapter 173-218 WAC
Reclaimed Water	Chapter 90.46 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.46 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.46 RCW Chapter 90.48 RCW Chapter 90.03 RCW Chapter 90.44 RCW Chapter 173-200 WAC	Chapter 90.46 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.46 RCW Chapter 90.48 RCW Chapter 173-200 WAC	Chapter 90.46 RCW Chapter 90.48 RCW Chapter 173-200 WAC Chapter 173-218 WAC
Chapters 90.03 and 90.44 RCW's are administered by the Water Resources Program						
Chapters 90.46 and 90.48 RCW's are administered by the Water Quality Program						

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Components of an ASR permit

Chapter 173-157-110 WAC requires info on:

- Hydrogeologic Conceptual Model
- Project Operation Plan
- Legal framework
- Environmental Assessment
- Mitigation Plan
- Monitoring Plan



WAC 173-157-120

Hydrogeologic Conceptual Model

- ❖ Aquifer properties
- ❖ Groundwater flow direction
- ❖ Anticipated changes
- ❖ Area affected
- ❖ Geology, stratigraphy, structure
- ❖ Natural hazards
- ❖ Surface water
- ❖ Other wells in area
- ❖ Chemistry of source and groundwater



