Aquifer Storage & Recovery and Artificial Recharge in the State of Oregon

Oregon Dept. of Human Services
Oregon Dept. of Environmental Quality
Oregon Dept. of Water Resources
Outline

1. Intro to underground storage
2. Administrative processes
3. Feasibility: Key factors
4. Oregon Case Studies
What are the Benefits of Underground Storage?

- Allows capture and storage of water in winter when surface water is abundant.
- More water will be available for summer use and population growth.
- Improves use of declining aquifers.
- May increase base flow to streams.
What are the Benefits of Underground Storage?

- May cause less environmental impact or use less surface area than reservoirs.
- Lower cost than surface storage.
- Helps plan for expected population growth and climate change projections that put a premium on the need for water storage.
- Provides supplemental supply.
What are the Benefits of Underground Storage?

![Graph showing rainfall (supply) and water use (demand) over the year.]

Rainfall (supply)

Water Use (demand)

Month: J F M A M J J A S O N D

Season: Winter Spring Summer Fall
What are the Benefits of Underground Storage?

Rainfall (supply)

Water Use (demand)

J F M A M J J A S O N D

Winter Spring Summer Fall
Methods of Underground Storage

- Infiltration
- Injection

Diagram:
- Spreading Basin
- Injection Well
- Shallow Aquifer
- Deep Aquifer
Questions?
Underground Storage Administrative Process: an exercise in collaboration
Two Administrative Processes

- Aquifer Storage and Recovery (ASR)
- Artificial Recharge (AR)

Choose the one that best meets your needs.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Use</td>
<td>Primarily irrigation, industrial</td>
<td>Primarily drinking water</td>
</tr>
<tr>
<td>Recharge Method</td>
<td>Seepage systems, Injection wells</td>
<td>Injection wells only</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Recharge water cannot impair or degrade groundwater quality</td>
<td>Recharge water must meet drinking-water standards</td>
</tr>
</tbody>
</table>
## Key Differences between AR & ASR

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water-Rights</strong></td>
<td>Permits required to appropriate source water and to pump recharged ground water</td>
<td>Can use existing rights to store and recover the water</td>
</tr>
</tbody>
</table>
| **Governing Statutes /Rules** | ORS 537.135  
OAR 690-350-0120                                                               | ORS 537.531 to 537.534  
OAR 690-350-0010 to 690-350-0030                                                          |
Role of State Agencies

Authorizations are issued by Oregon Water Resources Department in collaboration with:

- Oregon Department of Environmental Quality
- Oregon Department of Human Services
- Oregon Department of Fish and Wildlife
Role of State Agencies

Oregon Water Resources Department:

- Regulates water rights for projects
- Coordinates review, comments, conditions from sister agencies
- Issues Limited Licenses and Permits
- Reviews annual reports
Role of State Agencies

Oregon Department of Environmental Quality

- Ensures projects meet Underground Injection Control Standards (UIC)
- Ensures that projects meet groundwater quality protection rules, including anti-degradation policy
- Issues permits for AR projects if DEQ deems necessary
- Reviews annual reports
Role of State Agencies

Oregon Department of Human Services

- Sets drinking water quality requirements for injected and recovered water
- Evaluates well construction/infrastructure and application materials
- Reviews annual reports
Role of State Agencies

Oregon Department of Fish and Wildlife

• Consults with OWRD on stream flow requirements that protect aquatic and fish life
Generalized Application Process for ASR and AR

Pre-Application Conference: arranged by WRD with DHS, DEQ, ODFW and applicant

Submit application & supplemental reports to WRD

WRD issues authorization conditioned by all agencies

Apply for additional authorization as needed

Operation monitoring and reporting to agencies
Questions?
Feasibility: Will underground storage work for us?
What Kinds of Questions Should Interested Communities Ask?

- What are our future water needs?
- Is water available for underground storage?
- Do we have a suitable hydrogeologic setting for underground storage?
- Are the appropriate water rights in place?
- What are the analysis and implementation costs?
Feasibility: What are our future water needs?

- How will population change affect need?

The U.S. Census Bureau projects a population increase of one million people in Oregon by 2030.
Feasibility: What are our future water needs?

- How will climate change effect water supply?
- Planning: community water system master plan
Feasibility: Water Availability in Oregon

- In general, there is more water available during the winter months than in summer months, when demand is highest.
Feasibility: Water Availability in Oregon

• Access surface water availability on OWRD web site, search by basin and stream name to find month by month report:

Water Availability Analysis

CLATSKANIE R> CLATSKANIE SL- AT MOUTH
NORTH COAST BASIN

Watershed ID #: 70945
Date: 8/20/2008

Water Availability as of 8/20/2008

Select any Watershed for Details

Return to Search Page | Return to Main Menu | Download Data (Text, Excel)
Feasibility: What Hydrogeologic Features Influence Suitability?

• Ability of the aquifer to accept water
• Ability to retain water
• Sufficient storage to reach economy of scale
• Favorable aquifer boundary conditions
Feasibility: What Hydrogeologic Features Influence Suitability?

unconsolidated vs. fractured vs. layered volcanics
Feasibility: Hydrogeologic Suitability

• WRD staff are evaluating geology across the state for the physical ability to store water: results on the web in July 2009
Feasibility: Cost vs. Benefit

- Costs are lower than for surface reservoirs
- Few environmental impacts
- Minimal land requirements
- Lower construction costs
But nothing is free... Must factor in costs of

- Feasibility Study: site characterization and monitoring
- Water treatment: filtration and disinfection
- Infrastructure improvements: pumping systems, pipes, wells
- Ongoing maintenance and monitoring
Feasibility: Infrastructure

- Water treatment (esp. for ASR) and/or water quality monitoring equipment
- Canals and pipelines to move water from source to recharge site
- Monitoring wells upgradient and downgradient of recharge site
Feasibility: Water Quality Concerns

- Must meet water quality standards before recharge, during storage and at time of recovery
- Source water and ambient groundwater must be compatible
Questions?
Oregon Experience with underground storage: Case Studies
Status of ASR/AR in Oregon

- Active ASR sites = 11
- Active AR sites = 5
Status of ASR/AR in Oregon

Underground Storage (ac-ft) in Oregon
Oregon Experience: Case Studies

- Buell-Red Prairie AR
- County Line AR
- Salem ASR
- Pendleton ASR
- Pendleton
- Baker City
- Eugene
- Bend
- Burns
- Grants Pass
- Klamath Falls
• Canal recharge began in 1978
• Recharges an average of 6,000 ac-ft/year
• Augments Ordnance Critical Area gravel aquifer for irrigation
• Source water: Umatilla River
Buell-Red Prairie AR: Polk County

- Obtained permit in 1991 for recharge through 2 wells (before current ASR rules were created)
- Annual maximum recharge to the Siletz River Volcanic aquifer is 61 ac-ft
- Source Water: Gooseneck Creek
Pendleton ASR: Umatilla County

- Obtained an ASR limited license in 2003
- Injects up to 500 million gallons/year through 2-3 wells
- Stores water in Columbia River Basalt
- Source Water: Umatilla River
Salem ASR: Marion County

- The City began ASR in 1997
- Stores up to 500 Million Gallons/year
- Source Water: North Santiam River
- Columbia River Basalt aquifer
Status of ASR/AR in 2009-11 Agency Budgets

- Oregon Water Resources Dept.
  - ASR is in WRD’s #1 priority package
  - 1 FTE to serve as ombudsman

- Oregon Dept. of Environmental Quality
  - 1 FTE in Eastern Region to evaluate water quality aspects of projects
Conclusions

• Underground storage is a useful tool to add to traditional storage methods

• Underground storage in Oregon is authorized through close collaboration between state agencies
Contacts for Further Information

• WRD – Jen Woody –
  www.wrd.state.or.us
• DEQ – Barbara Sellars –
  www.deq.state.or.us
• DHS – Tom Pattee –
  www.oregon.gov/DHS/
• ODFW – Rick Kepler
  www.dfw.state.or.us