More Managed Aquifer Recharge (MMAR)
A Solution to Combat Droughts and Climate Change in the West

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Climate Challenges

U.S. Drought Monitor

June 29, 2021
(Released Thursday, Jul. 1, 2021)
Valid 8 a.m. EDT

Drought Impact Types:
- Delimits dominant impacts
  - S = Short Term, typically less than 6 months (e.g. agriculture, grasslands)
  - L = Long Term, typically greater than 6 months (e.g. hydrology, ecology)

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

What to call climate change where you live
Intensity shows risk level from low (lighter) to very high (darker)

Author: Geo teach Scheck
National Drought Mitigation Center

droughtmonitor.unl.edu

Water stress
Wildfires
Extreme heat
Hurricanes
Extreme rainfall

Sea level rise
Climate Challenges

U.S. Drought Monitor

June 14, 2022
(Released Thursday, Jun. 16, 2022)
Valid 8 a.m. EDT

Drought Impact Types:
- △ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g., agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g., hydrology, ecology)

Intensity:
- None
- 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. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/about.aspx

droughtmonitor.unl.edu

Author:
Adam Hartman
NOAA/NWS/NCEP/CPC
Climate Challenges - Snowpack
Climate Challenges – SWE & Precipitation
Climate Challenges – Reservoirs
Western Megadrought: Worst in 1,200 Years
Major Aquifers

- Unconsolidated basin-fill aquifers
- Unconsolidated valley-fill aquifers
- Sandstone aquifers
- Carbonate Rock

Groundwater Conditions in Utah | U.S. Geological Survey (usgs.gov)
Groundwater Management

Image from Barr Engineering
Groundwater Management

❯ Water Rights vs. Water Management vs. Water Conservation

❯ Groundwater Management Plans
  • Water Rights -> Don’t pump
  • When will we get serious about a groundwater management plan?

❯ Central Iron County
  • Cedar Valley
  • Excess flows—winter flow

❯ Cedar City airport recharge
Groundwater Management

Conjunctive Management of Surface and Ground Water in Utah

Although conjunctive management projects do not always involve storage of excess surface water underground, intentionally recharging aquifers when water is available and recovering it when needed is a common and critical element of most conjunctive management projects. Although this practice, known as aquifer storage and recovery (ASR), is common in many parts of the United States and the world, it has been used only a few times in Utah.
Utah Wet and Dry Cycles

Figure 6, Palmer Hydrological Drought Index for the Northern Mountains of Utah
Source: Utah Division of Water Resources, 2005
Groundwater Management

- Wet Years -> NO complete plan to store excess
- Water rights and runoff—better understanding of taking excess and storing it in the ground
- Aquifer/groundwater IN THE PLAN
Groundwater Management

❯ Provo River Management Plan—2017, 2019 fill up Jordanelle/Deer Creek with excess in Utah Lake (evaporate excess)

❯ Let’s have a plan to get water in the ground
ASR Programs

› 22 Recharge Applications
› 10 Recovery Applications

- Brigham City
- Weber Basin
- Provo City
- Sandy City
- Millville City
- Leamington
- Central Iron County
- Washington County
Aquifer Storage and Recovery (ASR)

- Weber Basin WCD
- Diverting water from Weber River
- Sedimentation basin
- Recovery wells
- Recovery amounts
Washington County (ASR)
Provo (ASR)
Precipitation Trends
Groundwater Trends

5600 North

Depth to Water (ft)

5000 North
Linear (5600 North)
Complex Stratigraphy – 3D Model

Image from Barr Engineering
Groundwater Modeling

Image from Barr Engineering
ASR Pilot Testing
Geophysical Surveys
Geophysical Surveys
ASR Pilot Testing

Image from Barr Engineering
ASR Pilot Infiltration Modeling
ASR Pilot Injection Testing
ASR Pilot Injection Modeling

Image from Barr Engineering
Thousands have lived without love, not one without water - W.H. Auden

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