Division of Water Resources

Division Mission
• Plan, conserve, develop, and protect Utah’s water resources

Project Purpose
• Propose regional boundaries, goals, and practices for M&I water conservation
How did we get here?

2001

25% By 2025
• In 2001, Governor Leavitt published a statewide conservation goal to reduce per capita use by 25 percent. Governor Herbert later added to the goal to achieve the reduction of 25 percent by 2025.

Water Use Monitoring

2005

Legislative Water Audit
• In 2015, the Utah Division of Water Resources had a legislative audit that looked at the divisions Municipal & Industrial (M&I) Water Use Report. The audit recommended regional water conservation goals.

2010

Regional Goals
• Utah is unique in that we have a variety of climates and microclimates, and other factors throughout the state that impact regional efficiency potential.

• Purpose of regional goal setting process is to combine scientific/engineering analysis with regional input to develop goals appropriate for different areas of the state.

2015

2018
Regional Water Conservation Goal Report

✓ Municipal water use

Ø Future supply

Ø Agriculture water
9 Water Conservation Regions
Goal Development Process

- Current Use
- Statistical Model
- Regions
- Potential
- Practices
- Goals
- Climate Change
- Costs

Public Involvement
Goal Development Process

Public Involvement

Current Use → Statistical Model

Regions → Potential → Practices → Goals

Climate Change → Costs
Public Involvement

Broad and Brief

Online Survey

Open Houses

Stakeholder Interviews and Draft Reviews

Deep and Focused
Q12 On a scale of 1 to 7, where 1 is very unwilling and 7 is very willing, how willing are you to do the following to become more efficient?

Answered: 1,407  Skipped: 248

- Take shorter showers
- Only water my landscape at...
- Avoid running water while...
- Avoid watering my landscape...
- Install a smart sprink...
- Adjust sprinklers t...
- Raise lawn mower to kee...
Q9 Why is it important to use water efficiently?

Answered: 1,402  Skipped: 253

- Because waste is not OK
- To help supply water for...
- To pay less on my water bill
- To delay costly...
- For sustainabili...
- It isn't important
- Other (please specify)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Q6 What source of water do you use to irrigate your landscape?

Answered: 1,646   Skipped: 9

- Drinking water: 54%
- Pressurized irrigation/sprinkler: 30%
- Ditch water: 2%
- Combination of drinking water and tank water: 8%
- Other (please specify): 6%
Open Houses
Past Practices

Scenario 1
- Traditional Landscaping – 80% turf 20% planting beds and hardscaped areas.
- Historic irrigation efficiency = 50% (Double the amount needed)
- Increased irrigation efficiency to 70%

Scenario 2
- 50% turf 50% planting beds and hardscaped areas.
- Increased irrigation efficiency to 80%.

Scenario 3
- 20% turf 80% planting beds and hardscaped areas.
- Increased irrigation efficiency to >80%.
## INDOOR WATER USE PROJECTIONS FOR DIFFERENT DEVELOPMENT PATTERNS

### Past Practices
- Water use averages prior to 2000.
- Limited use of high efficiency fixtures and appliances.

### Scenario 1
- 40% conversion to high efficiency fixtures and appliances.

### Scenario 2
- 80% conversion to high efficiency fixtures and appliances.

### Scenario 3
- 100% conversion to high efficiency fixtures and appliances.
- Elimination of leaks.
- Improved awareness and focus on water conservation.

Source: Water Research Foundation
Open House and Stakeholder Concerns:

- Landscaping practices
- Water use culture
- The goals are too aggressive or not aggressive enough
- Water use data management
- Cost and funding for conservation and water supply
- Water supply limitations
- Water rates
- Credit for past water conservation efforts
Potential Conservation Model

- Education
- Water Use Practices
- Acceptability
- Climate
- Metering
- Cost
- Landscapes
Population vs. Water Supply Over Time

- Population
- Water Supply
Goal Development Process

- Current Use
- Statistical Model

Regions → Potential → Practices → Goals

Climate Change → Potential

Costs → Potential

Public Involvement
Potential

- Population growth
- Development density increase
- Landscape change
- Increase in indoor efficiency
- Increase in outdoor efficiency
Practices

**INDOOR**

- Fixture and appliance conversion
- Fix indoor leaks
- Change in indoor water use habits
Practices

OUTDOOR

Improved irrigation efficiency
• Secondary metering
• Smart irrigation controls
• Drip irrigation systems

Water-wise landscaping
• Water-wise new construction
• Convert existing landscapes

Lot size and density guidelines
• Smaller lot sizes
• Less irrigated area
Practices

Leadership

• Policy
  ✓ Ordinances
  ✓ Development Agreements
  ✓ Advocacy
Practices

Education
✓ Stakeholders

Pricing
✓ Revenue
✓ Increasing Tiers
✓ Social Norming

Ben B (age 10)
Goal Development Process

- Current Use
- Statistical Model
- Regions
- Potential
- Practices
- Goals

Public Involvement

Climate Change

Costs
Climate Change Impacts in Utah by 2050

- Temperature increases by 2.3 °F
- Spring runoff occurs 1 month earlier
- Irrigation season lengthens by 8 days
- Precipitation becomes more rain and less snow
<table>
<thead>
<tr>
<th>Region</th>
<th>Required Investment in M&amp;I Water Conservation by 2030</th>
<th>Expected Annual Water Savings (ac-ft)</th>
<th>Annualized Unit Cost ($/ac-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bear River</td>
<td>$199,700,000</td>
<td>10,895</td>
<td>$1,192</td>
</tr>
<tr>
<td>Green River</td>
<td>$37,500,000</td>
<td>2,129</td>
<td>$1,146</td>
</tr>
<tr>
<td>Lower Colorado River North</td>
<td>$61,900,000</td>
<td>3,641</td>
<td>$1,106</td>
</tr>
<tr>
<td>Lower Colorado River South</td>
<td>$358,300,000</td>
<td>8,395</td>
<td>$2,776</td>
</tr>
<tr>
<td>Provo River</td>
<td>$791,800,000</td>
<td>39,281</td>
<td>$1,311</td>
</tr>
<tr>
<td>Salt Lake</td>
<td>$901,300,000</td>
<td>41,675</td>
<td>$1,407</td>
</tr>
<tr>
<td>Sevier River</td>
<td>$77,500,000</td>
<td>5,455</td>
<td>$924</td>
</tr>
<tr>
<td>Upper Colorado</td>
<td>$46,800,000</td>
<td>3,454</td>
<td>$881</td>
</tr>
<tr>
<td>Weber River</td>
<td>$786,400,000</td>
<td>49,905</td>
<td>$1,025</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3.26 billion</strong></td>
<td><strong>164,830</strong></td>
<td><strong>$1,287</strong></td>
</tr>
</tbody>
</table>

1 Annualized over 30 years at 5%.
<table>
<thead>
<tr>
<th>Source</th>
<th>Capital Cost</th>
<th>Yield (ac-ft)</th>
<th>Unit Capital Cost ($/ac-ft)</th>
<th>Annualized Capital Cost ($/ac-ft)</th>
<th>O&amp;M Cost ($/ac-ft)</th>
<th>Total Cost ($/ac-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Powell Pipeline</td>
<td>$1,383,430,000</td>
<td>86,249</td>
<td>$16,040</td>
<td>$1,043</td>
<td>$208</td>
<td>$1,252</td>
</tr>
<tr>
<td>Bear River Pipeline—to JWWCD</td>
<td>$723,260,182</td>
<td>50,000</td>
<td>$14,465</td>
<td>$941</td>
<td>$188</td>
<td>$1,129</td>
</tr>
<tr>
<td>Central Water Project(^4)</td>
<td>$16,736</td>
<td>1</td>
<td>$16,736</td>
<td>$1,089</td>
<td>$156</td>
<td>$1,245</td>
</tr>
<tr>
<td>Reuse—High(^5,7)</td>
<td>$56,957,000</td>
<td>4,200</td>
<td>$13,581</td>
<td>$882</td>
<td>$528</td>
<td>$1,411</td>
</tr>
<tr>
<td>Reuse—Low(^5,7)</td>
<td>$11,546,000</td>
<td>1,341</td>
<td>$8,610</td>
<td>$560</td>
<td>$258</td>
<td>$818</td>
</tr>
<tr>
<td>Average Sized Municipal Well(^7)</td>
<td>$8,073,000</td>
<td>807</td>
<td>$10,009</td>
<td>$651</td>
<td>$186</td>
<td>$837</td>
</tr>
<tr>
<td>Mixed Portfolio of Local Water Sources(^6,7)</td>
<td>$9,900</td>
<td>1</td>
<td>$9,900</td>
<td>$844</td>
<td>$117</td>
<td>$761</td>
</tr>
</tbody>
</table>
Goal Development Process

- Current Use
- Statistical Model

Public Involvement

Regions → Potential → Practices → Goals

- Climate Change
- Costs
WHERE ARE WE AT TODAY?

STATEWIDE WATER USE 2015

- Industrial Water Use: Manufacturing, plants, oil and gas producers, mining companies, dairies and stock watering.
- Institutional Water Use: Various public agencies and institutions (i.e. schools, municipal buildings, churches)
- Commercial Water Use: Office spaces, retail businesses, restaurants and hotels.
- Residential Indoor Water Use: Residential drinking water, cooking, washing clothes, miscellaneous cleaning, personal grooming and sanitation.
- Residential Outdoor Water Use: Irrigation of lawns, gardens and landscapes, and other residential activities.

Total - 239 gallons per capita per day (gpcd)

Source: Utah Division of Water Resources
Goal Development Process

Public Involvement

Current Use → Statistical Model

Regions → Potential

Potential → Practices

Practices → Costs

Goals → Climate Change

Current Use

Potential

Practices

Goals

Climate Change

Costs

Statistical Model
Hydraulic and system-specific
○ Ratio of public water systems with tiered water rates (individual responses)
○ Ratio of public water systems with documented water conservation programs or policies (individual responses)
○ Ratio of public water systems with clearly defined water conservation goal (individual responses)
○ Ratio of public water systems also covered by secondary water service (individual responses)
○ Ratio of total water use as industrial water use (DWRe 2018a, 2018b)

Demographic
○ 2015 population (DWRe 2018a, 2018b)
○ Population density (computed)
○ Average age (U.S. Census Bureau 2015a)
○ Ratio of second homes (vacation, recreational, or occasional) to total homes (U.S. Census Bureau 2015c)
○ Median household income (U.S. Census Bureau 2015b)
○ Persons per household (U.S. Census Bureau 2015b)

Climatic
○ Climate zone (Gillies and Ramsey 2009)
○ Average annual precipitation, 1981–2010, raster (PRISM 2018a)
○ Average annual evapotranspiration, 1980–2017, raster (DWRe 2018c; Lewis and Allen 2017)
○ Average minimum vapor pressure deficit, 1981–2010, raster (PRISM 2018a)
○ Average maximum annual air temperature, 1981–2010, raster (PRISM 2018a)
○ 2015 total precipitation, raster (PRISM 2018b)
○ 2015 total evapotranspiration, raster (DWRe 2018d; Lewis and Allen 2017)
○ 2015 growing season (May–Sept.) average temperature, raster (PRISM 2018b)
○ 2015 growing season (May–Sept.) total precipitation, raster (PRISM 2018b)
○ 2015 growing season (May–Sept.) total evapotranspiration, raster (PRISM 2018b)

Geographic
○ County (AGRC 2014)
○ Area (AGRC 2014)
○ Water right duty (DWRi 2018)
○ Ratio of developed area as green space (DWRe 2018a)
○ Average elevation (USGS 2018)
Regression Model Comparison

Elevation
Evapotranspiration
Vapor pressure deficit
Population
Population density
Second homes
Income
Industrial water use

Adj. $R^2 = 0.85$
RMSE = 82 gpcd
All p < 0.03
Goal Development Process

1. Current Use
2. Statistical Model
3. Regions
4. Potential
5. Practices
6. Climate Change
7. Costs
8. Goals

Public Involvement
2030 Goals

253 gpcd (17%)

187 gpcd (13%)

188 gpcd (17%)

329 gpcd (18%)

233 gpcd (18%)

277 gpcd (8%)

243 gpcd (10%)

274 gpcd (19%)
## 2030 Goals and Future Goal Projections

<table>
<thead>
<tr>
<th>Region</th>
<th>2015 Baseline (gpcd)</th>
<th>2030 Goal</th>
<th>Reduction from 2015</th>
<th>2040 Projection (gpcd)</th>
<th>Reduction from 2015</th>
<th>2065 Projection (gpcd)</th>
<th>Reduction from 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bear River</td>
<td>304</td>
<td>253</td>
<td>17%</td>
<td>232</td>
<td>24%</td>
<td>219</td>
<td>28%</td>
</tr>
<tr>
<td>Green River</td>
<td>270</td>
<td>243</td>
<td>10%</td>
<td>234</td>
<td>13%</td>
<td>232</td>
<td>14%</td>
</tr>
<tr>
<td>Lower Colorado River North</td>
<td>286</td>
<td>233</td>
<td>18%</td>
<td>214</td>
<td>25%</td>
<td>201</td>
<td>30%</td>
</tr>
<tr>
<td>Lower Colorado River South</td>
<td>303</td>
<td>277</td>
<td>8%</td>
<td>267</td>
<td>12%</td>
<td>259</td>
<td>15%</td>
</tr>
<tr>
<td>Provo River</td>
<td>226</td>
<td>188</td>
<td>17%</td>
<td>174</td>
<td>23%</td>
<td>170</td>
<td>25%</td>
</tr>
<tr>
<td>Salt Lake</td>
<td>214</td>
<td>187</td>
<td>13%</td>
<td>176</td>
<td>18%</td>
<td>167</td>
<td>22%</td>
</tr>
<tr>
<td>Sevier River</td>
<td>401</td>
<td>329</td>
<td>18%</td>
<td>306</td>
<td>24%</td>
<td>302</td>
<td>25%</td>
</tr>
<tr>
<td>Upper Colorado River</td>
<td>337</td>
<td>274</td>
<td>19%</td>
<td>257</td>
<td>24%</td>
<td>253</td>
<td>25%</td>
</tr>
<tr>
<td>Weber River</td>
<td>250</td>
<td>192</td>
<td>23%</td>
<td>176</td>
<td>30%</td>
<td>171</td>
<td>32%</td>
</tr>
</tbody>
</table>

Note: M&I = municipal and industrial; gpcd = gallons per capita per day based on permanent population. Reported per-capita use includes all residential, commercial, institutional, and industrial uses averaged over the permanent population in each region.
Past Practices

Current Use (214 gpcd)

Scenario 1

2030 Goal (187 gpcd) 13%

Scenario 2

2040 Projection (176 gpcd) 18%

Scenario 3

2065 Projection (167 gpcd) 22%
Key Clarifications

Ø Utah should not be compared to other states that report water use differently
Ø The regions should not be compared to each other
Ø Current water use should not be compared to 2000 water use
Report available
water.utah.gov

Thank You