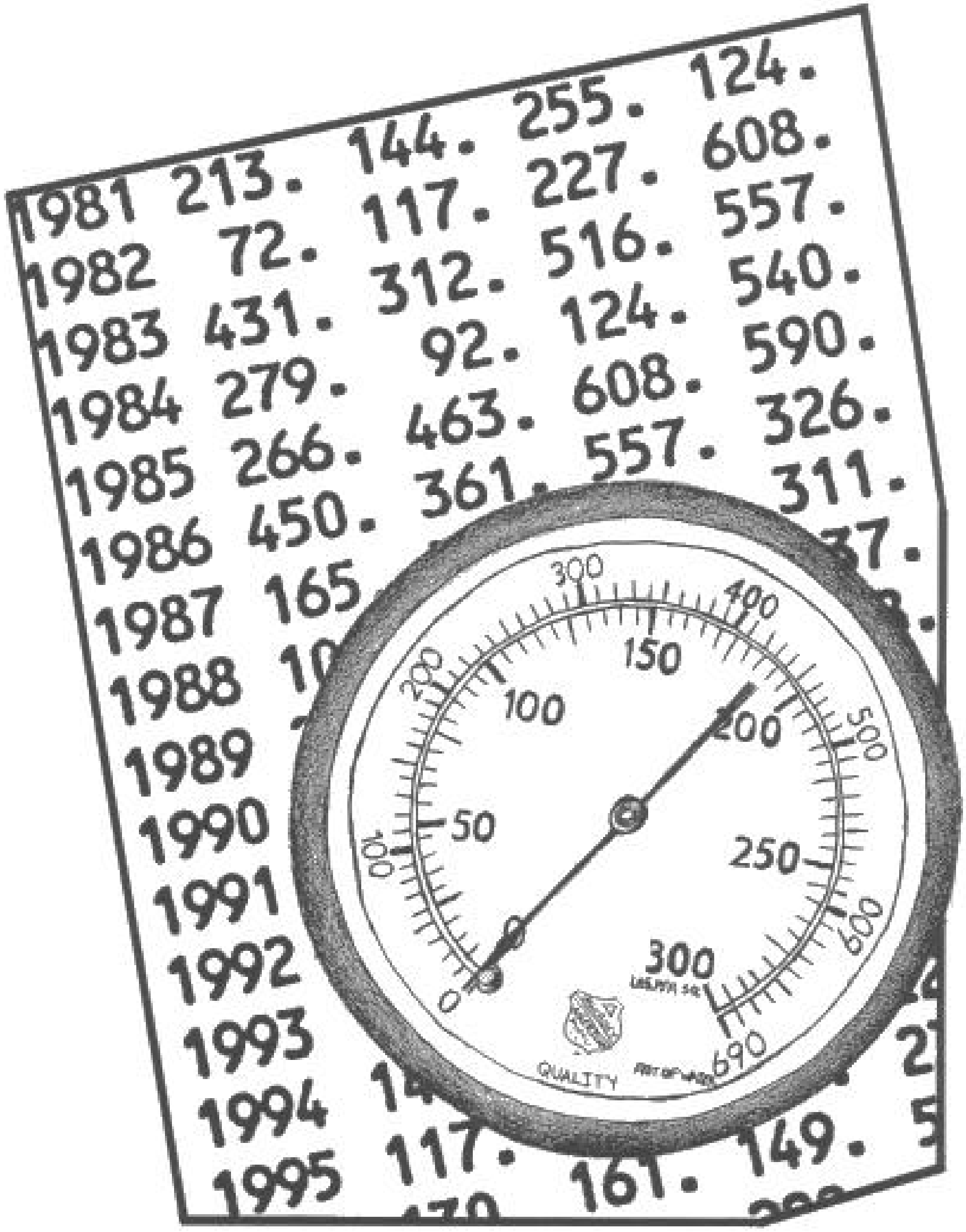
The

UTAH WATER DATA BOOK

Utah Division of Water Resources



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THE UTAH WATER DATA BOOK

Utah Division of Water Resources/Utah Department of Natural Resources
August 1997

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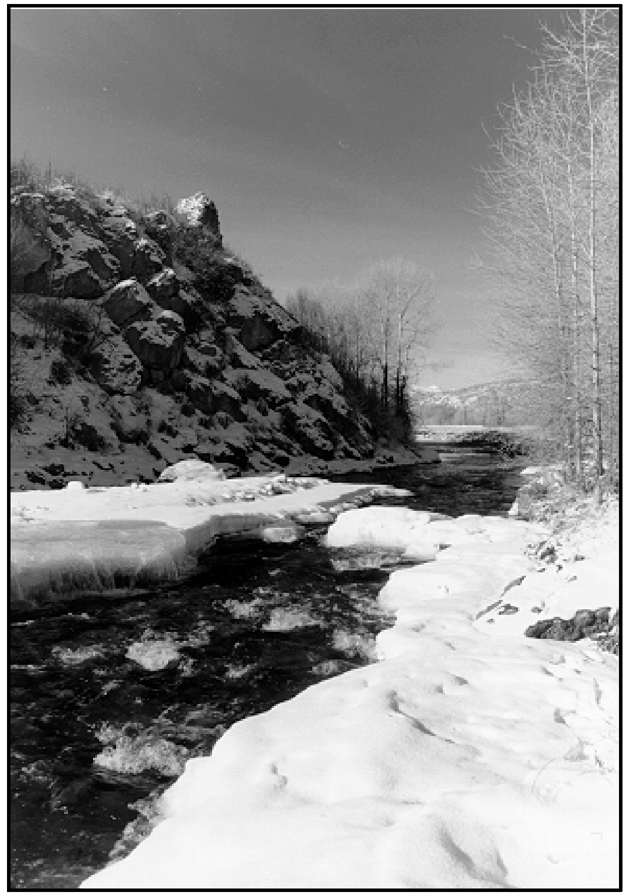


STATEWIDE WATER SUPPLY

An average 23 million acre-feet of water is yielded annually to streams and rivers which flow in or through Utah, including the Bear, Green and Colorado rivers. About 35 percent of the 23 million acre-feet is yielded each year from Utah watersheds.

Because of interstate stream compact requirements, not all of the state's water yield is available for use in Utah. Table 1 tabulates the remaining developable water supply for Utah, and shows the state has an annual water supply of about 7.6 million acre-feet. It also shows a 0.284 million acre-feet gain above yield in the Bear River Basin and a 0.819 million acre-feet loss of yield in the Upper Colorado River Basin. Of the 7.6 million acre-feet, approximately 4.3 million acre-feet is depleted, leaving a remaining supply of 3.3 million acre-feet. About 2.6 million acre-feet of the remaining supply is inflow to the Great Salt Lake.

In addition, the table shows an estimate of the remaining water supply that could be developed. The estimate of developable water is difficult to make, because much of the remaining supply is considered undevelopable due to widely fluctuating flows, lack of water storage facilities, instream flows, and flows for endangered species and other environmental issues. Line *Y* in the table shows a development potential for approximately 1.0 million acre-feet of the remaining supply. About 0.5 million of the 1.0 million acre-feet is in the Upper Colorado River Basin where it is assumed Utah will develop and deplete all of its compact allocation. Most of the remaining developable water is in the Great Basin. Another assumption is that 0.450 million acre-feet of the present inflow to the Great Salt Lake could be developed, but only 35-40 percent of that amount will be depleted.

Figure 1 presents basic basin or subbasin data contained in Table 1. Symbols in Figure 1 illustrate total water supply available for use in each basin, the portion of the supply presently depleted, and what part of the remaining supply is developable or undevelopable. Developable water is defined as new water development, not water that changes from one use to another such as from agriculture to municipal and industrial uses.

Table 1
State of Utah
Annual Basin Water Data * (1,000 Acre-Feet)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A			*Great Basin*							*Upper Colorado River Basin*					
B		*Columbia Basin*	*Great Salt Lake Desert*	*Bear River*	*Weber River*	*Jordan River*	*Sevier River*	*Cedar/ Beaver*	*Sub Total*	*Uintah*	*West Colorado*	*Southeast Colorado*	*Sub Total*	*Lower Colorado River Basin*	*State Total*
C	**Water Supply**														
D	Yield/ Runoff	57.0	343.0	1,822.0	1,091.0	1,132.0	1,050.0	179.0	5,617.0	1,472.0	585.0	131.0	2,188.0	235.0	8,097.0
E	Compact and Mining Increases	---	---	284.0	---	---	---	35.0	319.0	---	---	---	0.0	---	319.0
F	Compact Decrease	---	---	---	---	---	---	---	0.0	(689.0)	(130.0)	0.0	(819.0)	---	(819.0)
G	Imports/Inflow	18.0	---	---	---	146.0	10.3	2.6	158.9	---	---	5.1	5.1	15.0	197.0
H	Exports/Outflow	(18.0)	---	---	(45.0)	---	(26.1)	(1.0)	(72.1)	(95.0)	(9.3)	---	(104.3)	(2.6)	(197.0)
I	*Supply Subtotal*	57.0	343.0	2,106.0	1,046.0	1,278.0	1,034.2	215.6	6,022.2	688.0	445.7	136.1	1,269.8	247.4	7,597.0
J	**Sub-Basin Inflow/Outflow Near GSL**														
K	Inflow	---	---	7.0	56.0	10.0	---	---	73.0	---	---	---	0.0	---	73.0
L	Outflow	---	(10.0)	---	(7.0)	(56.0)	---	---	(73.0)	---	---	---	0.0	---	(73.0)
M	*Supply Total*	57.0	333.0	2,113.0	1,095.0	1,232.0	1,034.2	215.6	6,022.2	688.0	445.7	136.1	1,269.8	247.4	7,597.0
N	**Depletions**														
O	Agriculture	4.7	88.0	295.0	208.0	304.0	630.0	179.0	1,704.0	305.0	168.0	23.0	496.0	52.0	2,256.7
P	Municipal & Industrial	0.1	2.0	21.0	83.0	207.0	6.0	7.0	326.0	15.0	58.0	4.0	77.0	24.0	427.1
Q	Wet/Open Water Areas/Reservoirs	0.2	205.0	346.0	230.0	351.0	380.0	28.0	1,540.0	45.0	75.0	70.0	190.0	19.0	1,749.2
R	*Depletion Subtotal*	5.0	295.0	662.0	521.0	862.0	1,016.0	214.0	3,570.0	365.0	301.0	97.0	763.0	95.0	4,433.0
S	**Remaining Basin Water Supply**														
T	Outflow	52.0	0.0	1,451.0	574.0	370.0	0.0	1.6	N/A	323.0	144.7	39.1	506.8	152.4	N/A
U	Inflow Great Salt Lake/Sevier Lake	0.0	38.0	1,451.0	574.0	370.0	18.2	0.0	2,451.2	0.0	0.0	0.0	0.0	0.0	2,451.2
V	*Remaining Supply Total*	52.0	38.0	1,451.0	574.0	370.0	18.2	1.6	2,452.8	323.0	144.7	39.1	506.8	152.4	3,164.0
W	**Breakdown of Remaining Water Supply**														
X	Undevelopable Supply	37.0	23.0	1,101.0	524.0	320.0	18.2	1.6	1,987.8	0.0	0.0	0.0	0.0	122.4	2,147.2
Y	Developable Supply	15.0	15.0	350.0	50.0	50.0	0.0	0.0	465.0	323.0	144.7	39.1	506.8	30.0	1,016.8

X1 - Because of widely fluctuating flows, infeasable storage, instream flows, endangered species and other environmental issues
Y1 - Diversion, not a depletion (See water use terms)
G2 - Inflow from Nevada
H2 - Nevada inflow is passed through to Idaho
T2 - River flow to Idaho
L3 - Export to Kennecott
Q3 - Does not include Great Salt Lake evaporation
E4 - Supply gained from Wyoming and Idaho under Bear River Compact
K4 - 7,000 to Ogden/Brigham Canal
U4 - Flow enters GSL which is in the GSL Desert Sub-Basin by definition.
H5 - Weber/Provo Canal and Shingle Creek Diversions
K5 - Inflow from Jordan River Basin near GSL
L5 - See K4
U5 - See U4
G6 - Includes 45,000 from Weber/Provo Canal and Shingle Creek, 95,000 from the Uintah Basin, and 6,000 from Sevier River Basin (includes 18,300 evaporation from Strawberry Reservoir)
Q6 - Includes the 18,300 evaporation from Strawberry Reservoir
U6 - See U4
G7 - Includes 6,800 from the San Rafael drainage, 2,500 from Fairview Tunnel and 1,000 G.W. from Cedar/Beaver
H7 - Includes 5,100 from Tropic Canal, 6,000 G.W. flow to the Jordan River Basin, and 15,000 to the Virgin River at Navajo Lake
E8 - 35,000 mined water, gain to surface supply
G8 - 2,600 from the Santa Clara River
H8 - 1,000 G.W. flow into Sevier River from Cedar/Beaver Basin
F10 - Yield lost to other states under Colorado River Compacts
H10 - Includes 18,300 evaporation from Strawberry Reservoir and 76,700 export to the Great Basin
F11 - See F10
H11 - See G7
G12 - See H7

* 1961-90 average annual supply and present depletions

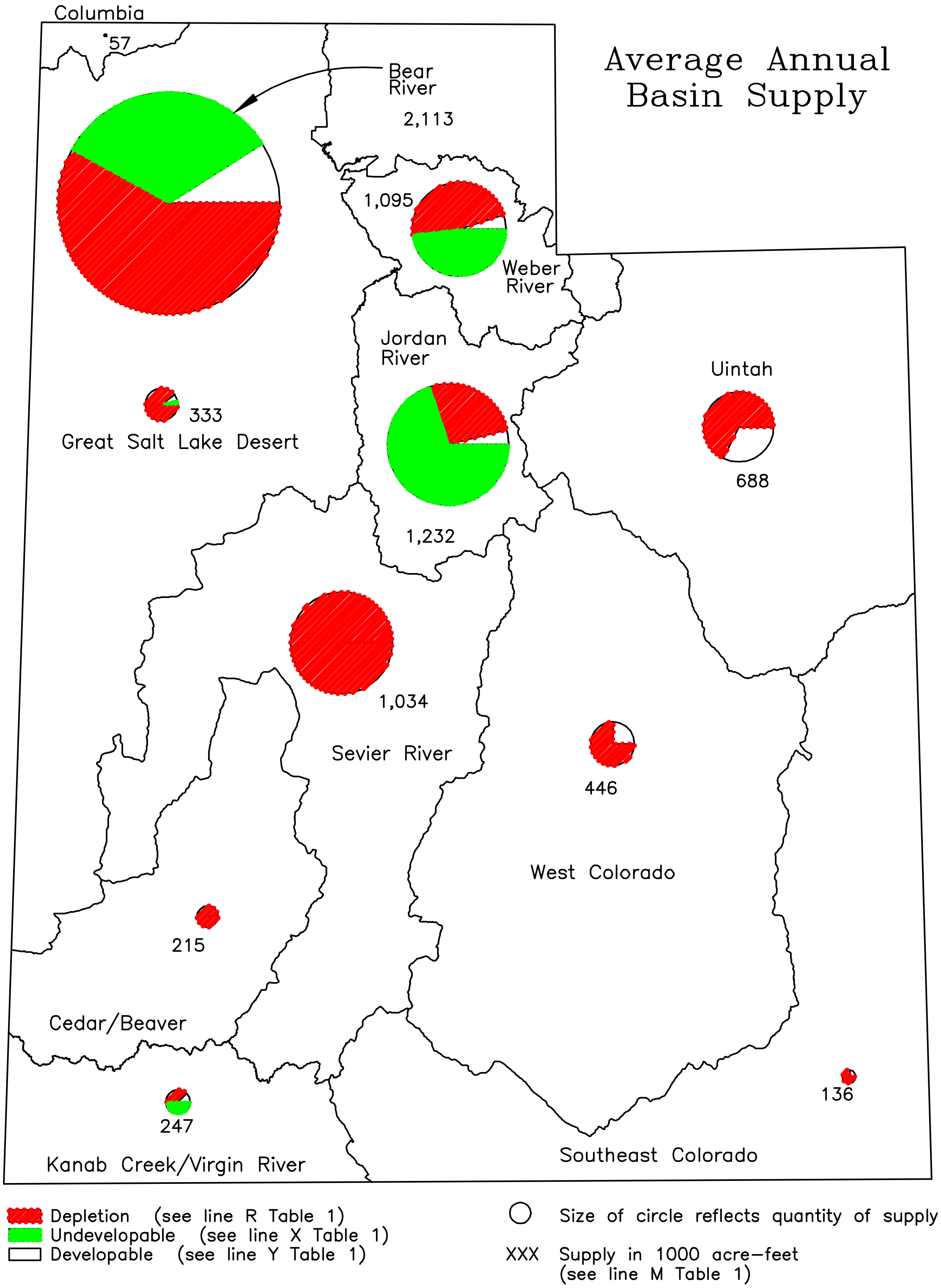


Figure 1. Basin Water Supply and Total Depletions.

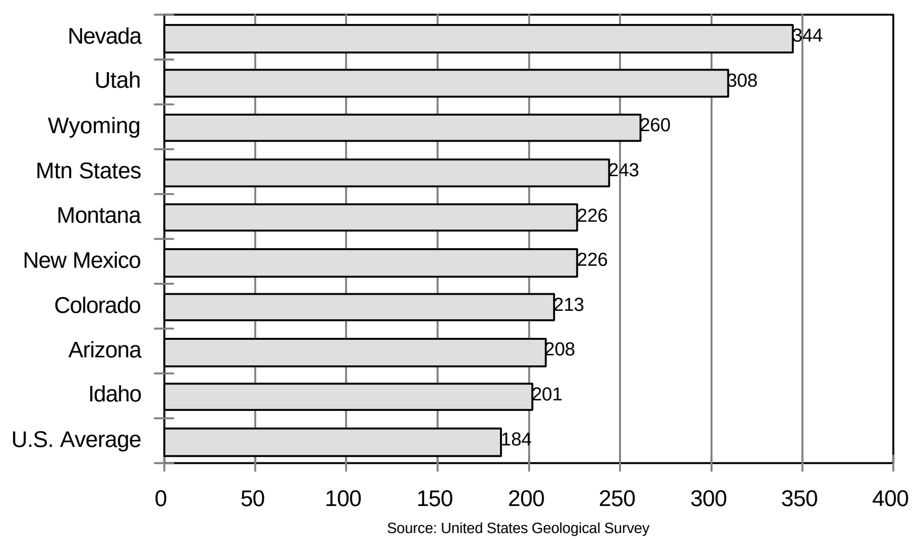
PER CAPITA WATER USE

The U.S. Geological Survey (USGS) generates water use data as part of its National Water Use Information Program, and its 1990 per capita water use data are shown in Figure 2. According to these data, Utah has the second highest per capita culinary water use in the U.S. at 308 gallons. This is approximately 0.35 acre-feet per year. The U.S. average is lower than in the Mountain States mainly because precipitation received in most other states is enough to make outside watering unnecessary.

Figure 2

1990 Per Capita Water Use

Culinary Gallons Per Day



Utah's Per Capita Water Use

Recent per capita water use data have been collected for the Wasatch Front Area for use in *State Water Plan* basin reports. Approximately 80 percent of Utah's population lives in the Wasatch Front drainage basins. These basins include Weber River, Jordan River (Salt Lake County) and Utah Lake drainage areas. Municipal water use per capita in the Wasatch Front drainage basins for residential, commercial and institutional uses is shown in the following two tables.

Table 2 shows the culinary (potable) per capita water uses, which include private domestic use as well as public water supply use. The total culinary water use is 275 gallons per capita per day (GPCD).

The secondary (non-potable) municipal per capita use, also listed in Table 2, shows the Weber River Basin uses the largest amount of secondary water. Total municipal use of secondary water is 44 GPCD compared to 275 GPCD for culinary water. Total municipal per capita use of culinary and secondary water is 319 GPCD, shown in Table 3. The residential portion of the total municipal use is 226 GPCD (71 percent). Commercial and institutional use is 93 GPCD (29 percent).

Table 2
Current Per Capita Culinary and Secondary Use Values for Wasatch Front Drainage Basins

	CULINARY PER CAPITA USE						SECONDARY PER CAPITA USE					
COUNTY	Residential Use		Commercial & Institutional Use		Total Culinary Use		Residential Use		Commercial & Institutional Use		Total Secondary Use	
	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)
Weber Basin					**0.221**	**197**					**0.153**	**137**
Summit	0.299	267	0.073	65	0.372	332	0.043	38	0.128	114	0.171	153
Morgan	0.294	262	0.052	46	0.346	309	0.061	54	0.026	23	0.087	78
Weber	0.133	119	0.094	84	0.227	203	0.119	106	0.051	46	0.170	152
Davis	0.121	108	0.080	71	0.201	179	0.098	87	0.042	37	0.140	125
Jordan Basin					**0.331**	**295**					**0.012**	**11**
Salt Lake	0.235	210	0.096	86	0.331	295	0.012	11	0	0	0.012	11
Utah Lake Basin					**0.356**	**318**					**0.016**	**14**
Utah	0.281	251	0.088	79	0.369	329	0.011	10	0	0	0.011	10
Juab	0.197	176	0.104	93	0.301	269	0.093	83	0.023	21	0.116	104
Wasatch	0.192	171	0.043	38	0.235	210	0.125	112	0	0	0.125	112
TOTAL USE	**0.217**	**194**	**0.091**	**81**	**0.308**	**275**	**0.036**	**32**	**0.013**	**12**	**0.049**	**44**

Table 3
Summary of Current Culinary and Secondary per Capita Water Use for the Wasatch Front Drainage Basins

COUNTY	CULINARY AND SECONDARY PER CAPITA USE				TOTAL CULINARY & SECONDARY USE	
	Residential Use		Commercial & Institutional Use			
	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)	(Ac-Ft/Yr)	(GPCD)
Weber Basin					**0.374**	**334**
Summit	0.342	305	0.201	179	0.543	485
Morgan	0.355	317	0.078	70	0.433	387
Weber	0.252	225	0.145	129	0.397	354
Davis	0.219	196	0.122	109	0.341	304
Jordan Basin					**0.343**	**306**
Salt Lake	0.247	221	0.096	86	0.343	306
Utah Lake Basin					**0.372**	**332**
Utah	0.292	261	0.088	79	0.380	339
Juab	0.290	259	0.127	113	0.417	372
Wasatch	0.317	283	0.043	38	0.360	321
TOTAL USE	**0.253**	**226**	**0.104**	**93**	**0.357**	**319**

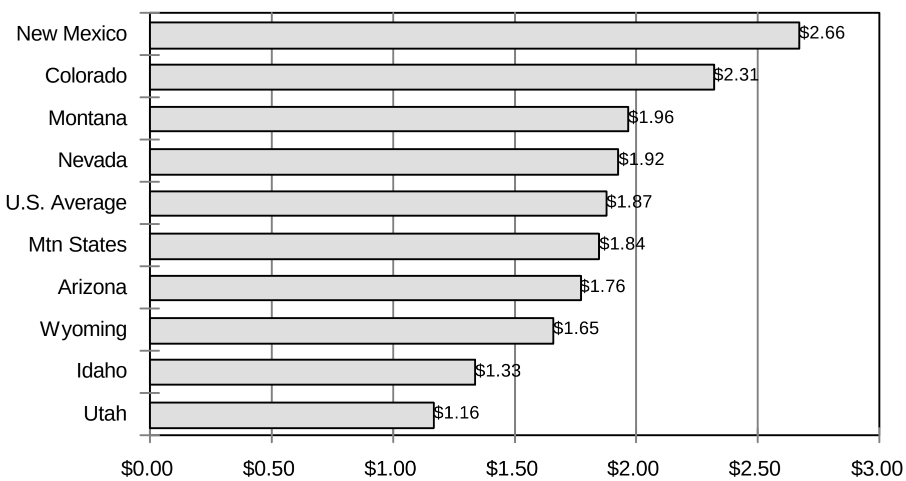
WATER USE RATES

American Water Works, a non-profit research organization, is the only known source of state-by-state water rate comparisons. Utah has the third lowest culinary water rates in the U.S. and the lowest rates in the Mountain States, shown in Figure 3, according to the American Water Works Water Industry Database. Figure 4 shows how consumer water rates have increased through the years 1960 to 1990.

Figure 3

1990 Water Rates

Dollars per Thousand Culinary Gallons

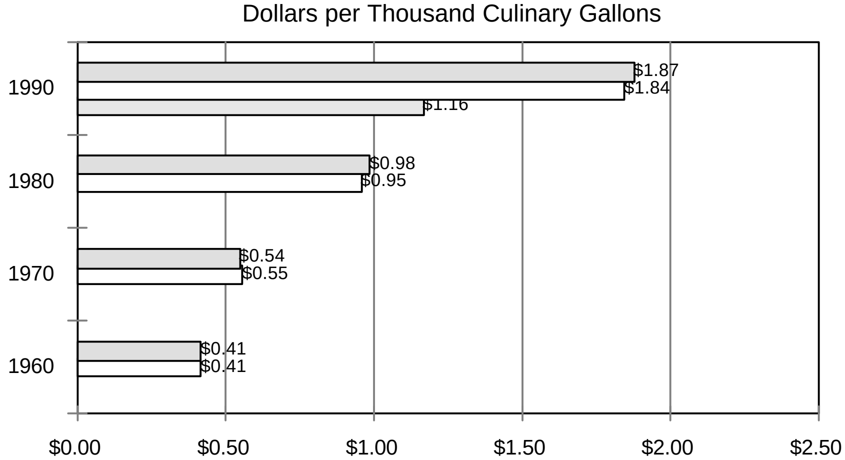


Source: American Water Works Association

Figure 4

Water Rates

Dollars per Thousand Culinary Gallons



WATER CONSERVATION OPPORTUNITIES

In pioneer times, when people had to draw water from a well or carry it from a river or creek, conservation and respect for the scarcity of water was a way of life. Since then, however, water has run from taps as if by magic. But population growth, environmental issues, social values and competing uses have brought conservation back as the key to stretching available water supplies.

The initial and major use of water in Utah was primarily for irrigation of agricultural crops. The current trend is toward the gradual transfer of water from agricultural uses to meeting increasing demands for municipal and industrial water. This necessitates changing the use of existing water storage, treatment and distribution facilities.

Although irrigated agriculture is declining along the Wasatch Front, it remains the largest single water use. Current estimates indicate 453,700 acre-feet of water annually is used to irrigated farmland in the Utah Lake Basin (Utah, western Wasatch, eastern Juab counties), 446,4000 acre-feet in the Weber River Basin, (Weber, Davis, Summit, Morgan counties), and 126,500 acre-feet in the Jordan River Basin (Salt Lake County). Historically, agricultural water conservation practices, such as improving water conveyance and application efficiencies, have yielded significant amounts of water savings. Along the Wasatch Front, particularly in Salt Lake and northern Utah counties, increasing the potable water supply by improving agricultural irrigation efficiencies is limited by the poor water quality of Utah Lake and the Jordan River. In other areas along the Wasatch Front, higher quality irrigation water continues to be converted to municipal supplies as irrigated lands are taken out of production and developed for housing and commercial enterprises.

Many agriculture-related water conservation projects are being developed as a result of the Central Utah Project Completion Act (CUPCA). Passed by Congress in 1992, the CUPCA authorizes the appropriation of $50 million of federal funds for conservation measures within the CUP district. Ten million dollars is allocated for the Wasatch County Water Efficiency Project, leaving $40 million for other projects to be completed by the year 2007. To date, about $4 million has been appropriated; the money is available on a 65-35 percentage basis (federal 65 percent, state and local 35 percent). The goal of the Water Conservation Credit (WCC) program is to conserve 39,225 acre-feet of water annually.

Potential residential water savings range from 5 to 50 percent. Almost 50 percent of all residential use is for indoor purposes. Utah's state plumbing code requires low-flow toilets and showerheads in new construction. Federal law mandates manufacture of only low-flow toilets (1.6 gallons).

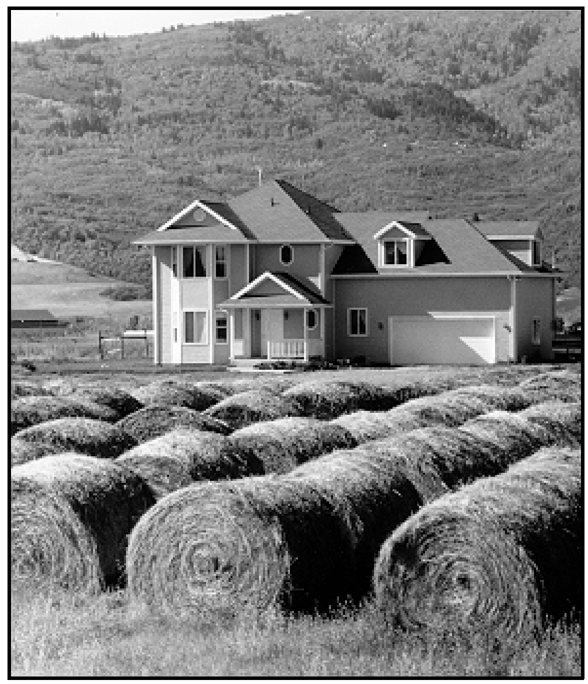
Outside water use accounts for over 50 percent of demand which peaks during the hot summer months as water is applied to lawns. Reduction in outside use can be achieved by not watering during the middle of the day to avoid evaporation loss, using water audits to determine when and how much water to apply, and switching to water-conserving landscapes.

Increasing water rates may encourage water conservation. Most water companies have switched to either a flat rate or increasing block rate schedule. Salt Lake City Corporation has adopted a *summer efficiency rate* which has reduced demand considerably. Facing increasing water costs, consumers are more likely to implement water conservation practices and benefit from public education programs.

The Wasatch Front Water Demand/Supply Model can project future demands with current conservation trends. A combination of low-flow plumbing, water-conserving landscapes and price increases will save 11 percent, or 47,700 acre-feet, of water a year by the year 2020 in Salt Lake County; 13 percent, or 24,400 acre-feet, in Utah County; and 14 percent, or 16,500 acre-feet, in Davis and Weber counties.

The Division of Water Resources believes water conservation measures can reduce water demand in Utah by as much as 25 percent between the years 1995 and 2050. To reduce per person per day water use from 319 gallons to 240 gallons by the year 2050 will require an aggressive water conservation program on outside water use for homes, parks, schools, play grounds, golf courses, churches, cemeteries, commercial buildings and landscape areas. Installation of computerized irrigation systems on large outside landscapes has the potential to save tremendous amounts of water. Recycling and process modifications can be utilized by a variety of industries and businesses.

Effluent from wastewater treatment facilities may be a significant source of secondary irrigation water along the Wasatch Front. Projects are being evaluated and legal issues are being studied to determine future strategies for reuse of sewage effluent.



UTAH'S
WATER
FUTURE

Water conservation will become more important as Utah's population increases. Water conservation and water development are essential to meet future water demands, and conservation practices deemed inconsequential now probably will be commonplace in 50 years.

Water Demand/Supply for Wasatch Front Basins

The Wasatch Front Water Demand/Supply Model was developed to estimate present and projected water demand of the populous Wasatch Front Area to the year 2050. The model, which covers Weber, Davis, Salt Lake and Utah counties, was developed at Utah State University in cooperation with the Division of Water Resources and the U. S. Bureau of Reclamation.

Results from the model and other water use studies in the Wasatch Front drainage basin have been used to estimate water use for the Weber, Jordan and Utah Lake basin reports of the *State Water Plan*. Approximately 80 percent of Utah's population lives in these basins.

Weber River Basin

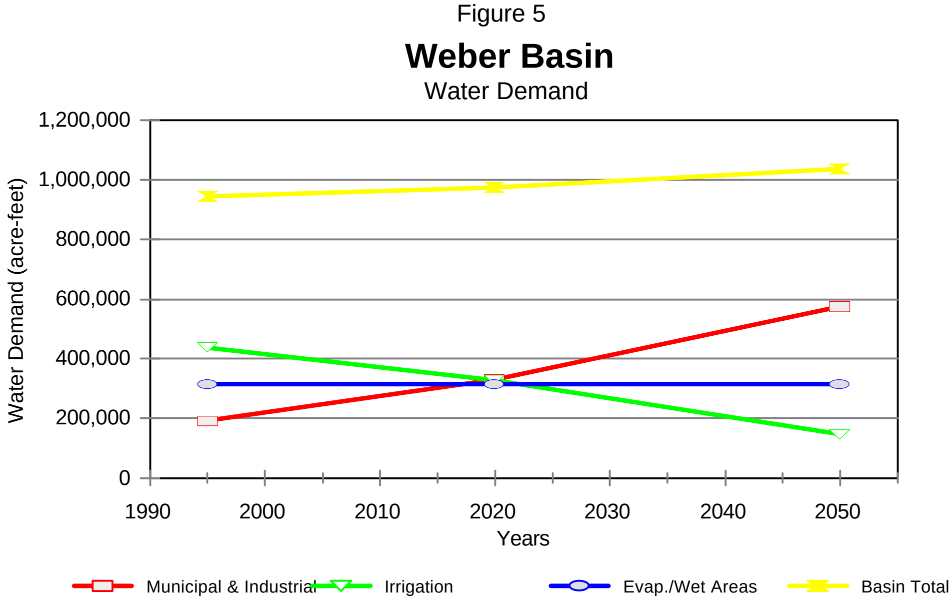
The projected total water demands and depletions for the years 1995 to 2050 in the Weber Basin are shown in Table 4. Data for the diversions (withdrawals) are shown graphically in Figure 5. Reservoir net evaporation and wet and open water areas are combined in Figure 5 and estimated to remain constant. Irrigation water use is expected to decline substantially by about 291,000 acre-feet by the year 2050 (about one-third of the present use) due to urbanization of irrigated land. Municipal and industrial water use is expected to increase by about 382,000 acre-feet (three times the present use) by the year 2050. Total water use in the basin is expected to increase about 91,000 acre-feet, or about 10 percent.

Table 4
Weber Basin Total Water Demand and Depletions (Acre-Feet)*

Use	Year					
	1995		2020		2050	
	Diversion	Depletion	Diversion	Depletion	Diversion	Depletion
Municipal & Industrial (Subtotal)	192,600	83,450	331,800	146,700	575,000	252,960
Culinary	92,600	27,780	142,900	40,700	249,000	69,760
Secondary	100,000	55,670	188,900	106,000	326,000	183,200
Irrigation	438,400	208,200	328,200	164,100	147,000	76,440
Wet/Open Water Areas	270,000	185,300	270,000	185,300	270,000	185,300
Net Evaporation (Major Reservoirs)	45,000	45,000	45,000	45,000	45,000	45,000
Basin Total	**946,000**	**521,950**	**975,000**	**541,100**	**1,037,000**	**559,700**

* Without Conservation

Figure 5



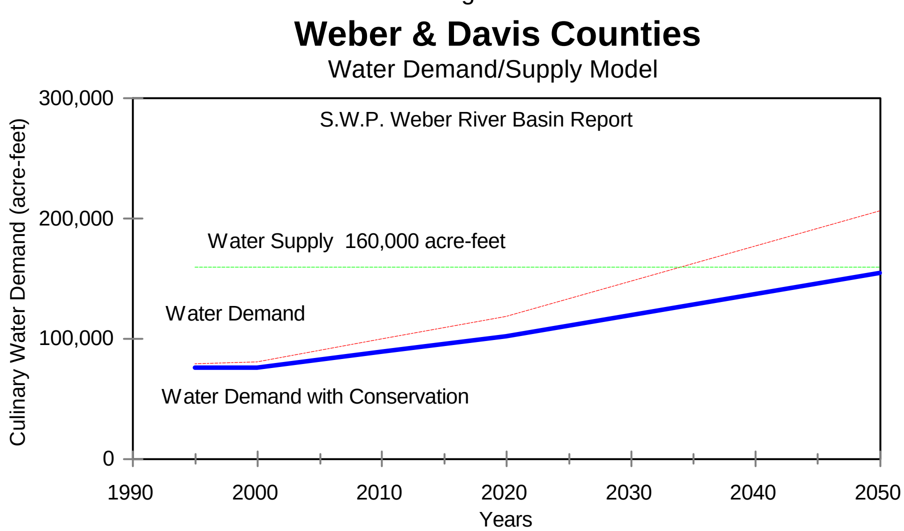
The culinary water demand and supply for Weber and Davis counties are shown on Figure 6. The culinary demand is based on the assumption the water from urbanizing irrigated land will be developed for secondary systems to service most of the new housing development in the counties. Figure 6 shows the current water supply will last to about the year 2040.

Major infrastructure, however, will be required to treat and deliver the water. Water rights/ownership may also delay or reduce delivery of the water supply. It is assumed that any future water shortage will be met by importation of Bear River water.

Jordan River Basin (Salt Lake County)

The total water demands and depletions for years 1995 to 2050 for the Jordan River Basin are shown in Table 5. The data for the diversions (withdrawals) are shown graphically in Figure 7. Water use from wet and open water areas is expected to remain constant. Irrigation is expected to be essentially gone by the year 2050. Most of the 126,500 acre-feet of water presently used for irrigation is poor quality, and it will require expensive desalting treatment processes before it could be used for culinary water. Municipal and industrial water use is expected to increase 441,000 acre-feet (2.3 times the present use) by the year 2050. Total water use in the basin is expected to increase by 320,000 acre-feet, an increase of 58 percent.

Figure 6



Source: Wasatch Front Water Demand/Supply Model. Feb 1997

Table 5
Jordan River Basin Total Water Demand and Depletions (Acre-Feet)*

Use	Year					
	1995		2020		2050	
	Diversion	Depletion	Diversion	Depletion	Diversion	Depletion
Municipal & Industrial (Subtotal)	331,500	145,850	496,500	233,980	773,000	390,000
Culinary	308,300	130,950	468,300	216,290	738,000	369,000
Secondary	23,200	14,900	28,200	17,690	35,000	21,000
Irrigation	126,500	50,600	50,000	20,000	5,000	2,000
Wet/Open Water Areas	94,500	94,500	94,500	94,500	94,500	94,500
Basin Total	552,500	290,950	641,000	348,480	872,500	486,500

* Without Conservation

The culinary water demand and supply for Salt Lake County are shown on Figure 8. Without conservation, the county will exceed its current water supply by about the year 2010. With conservation, the supply is expected to last until about the year 2016. Supplies to meet future demand will most likely come from conservation, the Bear River, desalting or exchange of Jordan River/Utah Lake water, and water re-use from wastewater treatment plants.

Figure 7

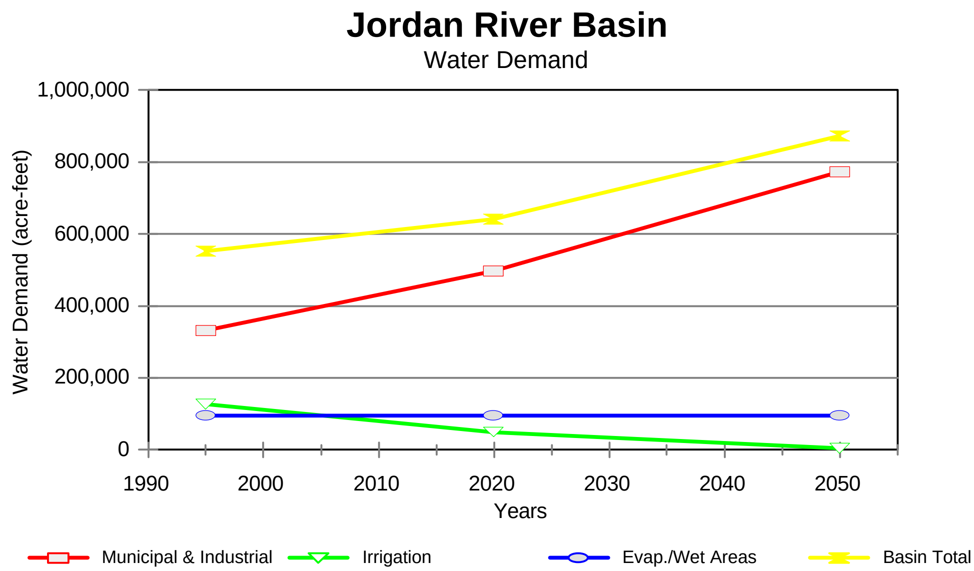
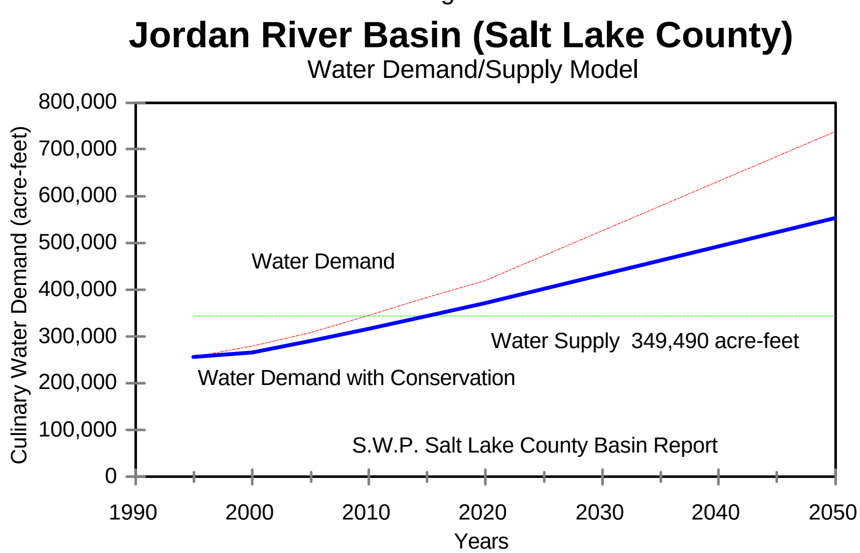


Figure 8



Source: Wasatch Front Water Demand/Supply Model. Feb 1997

Utah Lake Basin

Total water demands and depletions for the years 1995 to 2050 for the Utah Lake Basin are shown in Table 6. Data for the diversions (withdrawals) are shown graphically in Figure 9.

Reservoir net evaporation and wet and open water areas, combined in Figure 9, are expected to remain constant. Irrigation is expected to increase with completion of the Spanish Fork-Nephi System of the Central Utah Project. After the year 2020, irrigation water use is expected to decrease by about 92,000 acre-feet between the years 2020 and 2050 due to urbanization of irrigated land. Municipal and industrial water use is expected to increase by about 235,000 acre-feet (2.6 times the present use) by the year 2050. Total water use in the basin is expected to increase 177,000 acre-feet, an increase of 21 percent.

The culinary water demand and supply for Utah County are shown in Figure 10. The county will exceed its current culinary water supply by about the year 2025. The additional water required beyond the year 2025 will most likely come from the conversion of irrigation water use to municipal water supplies.

Table 6
Utah Lake Basin Total Water Demand and Depletions (Acre-Feet)*

Use	Year					
	1995		2020		2050	
	Diversion	Depletion	Diversion	Depletion	Diversion	Depletion
Municipal & Industrial (Subtotal)	150,700	60,830	226,620	96,020	386,000	169,940
Culinary (subsubtotal)	141,360	55,100	212,440	87,080	368,000	158,240
Secondary (subsubtotal)	9,340	5,730	14,180	8,940	18,000	11,700
Irrigation	453,700	253,660	487,000	282,460	395,000	237,000
Wet/Open Water Areas	16,700	16,700	16,700	16,700	16,700	16,700
Net Evaporation (Major Reservoirs)**	240,000	240,000	240,000	240,000	240,000	240,000
Basin Total	861,100	571,190	970,320	635,180	1,037,700	663,640

* Without Conservation
** Includes Utah Lake

Figure 9

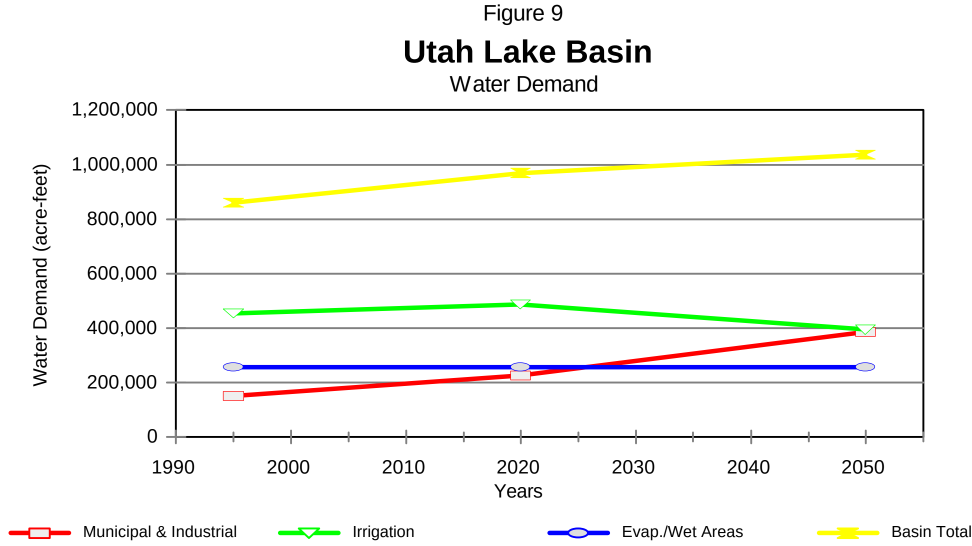
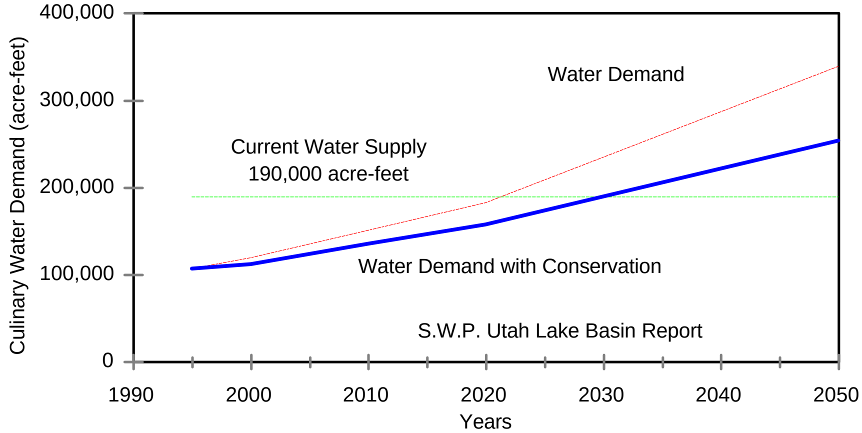


Figure 10

Utah County

Water Demand/Supply Model



Source: Wasatch Front Water Demand/Supply Model. Apr 1997

MEETING WATER DEMANDS OF THE 21ST CENTURY - UTAH DIVISION OF WATER RESOURCES.

The following are recommendations of the Utah Division of Water Resources to meet water demands of the 21st century:

- ♦ *Water Conservation*

Water conservation should play an important role in meeting Utah's future water demands. Stretching existing water supplies is less expensive and the right thing to do. Water suppliers should implement a strong water conservation program to make their already developed water supply go further.

Utah's cultural ethic encourages people to have attractive yards and gardens which include lots of turf. Traditionally, this ethic has resulted in high water use, since the normal response to any problems in the landscape has been to increase the amount of water applied. However, most landscape problems are not directly related to the amount of water applied but to irrigation inefficiencies, horticultural practices, and poor maintenance of irrigation systems. Utahns need to learn to efficiently manage lawn and garden irrigation and renovate landscapes with more water efficient designs. Current estimates indicate current lifestyle and landscapes can be maintained while reducing outside water use by 30 to 50 percent. Since over half of all public system water is for outside use, this translates to a reduction of up to 25 percent of water use in the residential sector if landscape irrigation is carefully and effectively managed..

- ♦ *Water Education*

The education of water users goes hand-in-hand with developing and implementing a successful water conservation program. Teaching water conservation values to school children and providing adults with water conservation information should help people change traditional water use practices such as using too much water on their lawns.

- *Conversion of Agriculture Water to Municipal and Industrial Use*

In areas of rapid growth, such as Davis, Weber and Utah counties, agriculture water is being converted to municipal and industrial use as subdivisions are built on existing irrigated lands. Since very few places remain to expand irrigation on the Wasatch Front, moving water from irrigation use to municipal and industrial uses is a good practice. Due to poor water quality and limited acres of irrigated land in Salt Lake County, conversion of agricultural water to municipal and industrial uses is limited and will be expensive.

- *Encourage Development in Rural Utah*

The state could develop a philosophy to encourage future development in areas of rural Utah where an adequate water supply already exists. For example, putting Bear River water to use in Cache and Box Elder counties could reduce the impact of population growth expected in the Wasatch Front. If water users are willing to convert agricultural water to municipal and industrial uses, many areas such as the Sevier River and Uinta basins where there is large agriculture acreage could be areas of potential growth in Utah. A good example of this in the Sevier River Basin is the sale of several thousand acre-feet of agricultural water to the Intermountain Power Project in Delta.

- *New Water Development*

If the majority of the growth continues to occur in Utah, Salt Lake, Davis and Weber counties, ways must be found to either treat the Jordan River/Utah Lake water to drinking water standards or develop the Bear River and import it into the area. The *State Water Plan* basin reports show a substantial surplus of water in Davis, Weber, and Utah counties in the next 20-30 years. This surplus water is being created by the continued growth of subdivisions in existing agricultural areas in these counties.

- *Funding for Infrastructure Replacement*

To keep pace with statewide growth, communities will require hundreds of millions of dollars for water infrastructure in the next 20 years. The state should continue its current practice of providing monetary support for improving and replacing water infrastructure.

WATER EQUIVALENTS

The following water equivalents table is provided for general information.. **One acre-foot of water is an acre of land covered with one foot of water.**

Table 7
Water Equivalents

1 cubic foot = 7.48 gallons = 62.4 pounds
1 acre-foot (AF) = 43,560 cubic feet = 325,851 gallons
1 cubic foot per second (cfs) = 448.83 gallons per minute (gpm)
1 cfs for 24 hours =1.9835 acre-feet
1 cfs for 30 days =59.5 acre-feet
1 cfs for 1 year =723.97 acre-feet
1 million gallons = 3.0689 acre-feet
1 million gallons per day (mgd) = 1,120 acre-feet per year
1 mgd = 1.55 cfs
1,000 gpm = 4.42 acre-feet per day
1 gallon per capita per day = 0.001120 acre-feet per year

Discharge/Flow Equivalents

Unit	Equivalent
U.S. gallon per day	0.134 cubic feet per day 6.94×10^{-4} gallons per minute 3.07×10^{-6} acre-feet per day 1.55×10^{-6} cubic feet per second 4.38×10^{-8} cubic meters per second 1.12×10^{-3} acre-feet per year
Cubic foot per day	7.48 gallons per day 5.19×10^{-3} gallons per minute 2.30×10^{-5} acre-feet per day 1.16×10^{-5} cubic feet per second 3.28×10^{-7} cubic meters per second
U.S. gallon per minute	1,440.0 gallons per day 193.0 cubic feet per day 4.42×10^{-3} acre-feet per day 2.23×10^{-3} cubic feet per second 6.31×10^{-5} cubic meters per second
Acre-foot per day	3.26×10^{5} gallons per day 43,560.0 cubic feet per day 226.0 gallons per minute 0.504 cubic feet per second 0.0143 cubic meters per second
Cubic foot per second	6.46×10^{5} gallons per day 86,400.0 cubic feet per day 448.83 gallons per minute 1.98 acre-feet per day 0.0283 cubic meters per second

WATER RESOURCE DEFINITIONS

Many water resources terms are defined differently by various water agencies, and some terms are used interchangeably. The following are definitions and a few water terms commonly used by the Division of Water Resources.

Water Use Terms

Water is often said to be *used* when it is diverted, withdrawn, depleted or consumed. But it is also *used* in place for such things as fish and wildlife habitat, recreation and hydropower production.

Commercial Use - Uses normally associated with small business operations which may include drinking water, food preparation, personal sanitation, facility cleaning/maintenance and irrigation of landscapes.

Consumptive Use - Consumption of water for residential, commercial, institutional, industrial, agricultural, power generation and recreational purposes. Naturally occurring vegetation and wildlife also consumptively use water. Water consumed is not available for other uses within the system.

Depletion - Net loss of water through consumption, export and other uses to a given area, river system or basin. The terms *consumptive use* and *depletion*, often used interchangeably, are not always the same.

Diversion/Withdrawal - Water diverted from supply sources such as streams, lakes, reservoirs, springs or wells for a variety of uses, including cropland irrigation and residential, commercial, institutional and industrial purposes. The terms *diversion* and *withdrawal* are often used interchangeably.

Industrial Use - Use associated with the manufacturing or assembly of products which may include the same basic uses as commercial business. The volume of water used by industrial businesses, however, can be considerably greater than water use by commercial businesses.

Institutional Use - Uses normally associated with general operation of various public agencies and institutions, including drinking water; personal sanitation; facility cleaning and maintenance; and irrigation of parks, cemeteries, playgrounds, recreational areas and other facilities.

Irrigation Use - Water diverted and applied to cropland. Residential lawn and garden uses are not included.

Municipal Use - This term is commonly used to include residential, commercial and institutional uses. It is sometimes used interchangeably with the term *public water use*.

Municipal and Industrial (M&I) Use - This term is used to include residential, commercial, institutional and industrial uses.

Private-Domestic Use - Includes water from private wells or springs for use in individual homes, usually in rural areas not accessible to public water supply systems.

Residential Use - Water used for residential cooking; drinking; washing clothes; miscellaneous cleaning; personal grooming and sanitation; irrigation of lawns, gardens, and landscapes; and washing automobiles, driveways and other outside facilities.

Water Supply Terms

Water is supplied by a variety of systems for many uses. Most water supply systems are owned by an irrigation company or a municipality, but in some cases the owner/operator is a private company or a state or federal agency. Thus, a public water supply may be either publicly or privately owned. Systems may also supply treated or untreated water.

Municipal and Industrial (M&I) Water Supply - A supply that provides culinary/secondary water for residential, commercial, institutional and industrial uses.

Public Water Supply - Includes culinary water supplied by either privately or publicly owned community systems which serve at least 15 service connections or 25 individuals at least 60 days per year. Water from public supplies may be used for residential, commercial, institutional, and industrial purposes, including irrigation of publicly and privately owned open areas.

Secondary/Non-Potable Water Supply - Pressurized or open-ditch water supplies of untreated water for irrigation of privately or publicly owned lawns, gardens, parks, cemeteries, golf courses and other open areas. These are sometimes called dual water systems.

Groundwater Terms

Aquifer - A saturated body of rock or soil which will yield water to wells or springs.

Groundwater - Water which is contained in the saturated portions of soil or rock beneath the land surface. Excludes soil moisture which refers to water held by capillary action in the upper unsaturated zones of soil or rock.

Mining - Long-term groundwater overdraft in excess of recharge.

Phreatophyte - A plant species that extends its roots to the saturated zone under shallow water table conditions and transpires groundwater. These plants are high water users and include such species as tamarisk, greasewood, willows and cattails.

Recharge - Water added to the groundwater reservoir, or the process of adding water to the groundwater reservoir.

Recoverable Reserves - The amount of water which could be reasonably recovered from the groundwater reservoir with existing technology.

Safe Yield - The amount of water which can be withdrawn from an aquifer on a long-term basis without serious quality, environmental or social consequences, or seriously depleting the reservoir.

Total Water in Storage - A volume of water derived by estimating the total volume of saturated aquifer and multiplying by the porosity (intergranular space containing water).

Other Water Terms

The following water terms are peculiar to the water industry.

Call - The ability to order a quantity or flow of water at a given time and for a given period of time.

Carriage Water - Water needed for hydraulic operation of a delivery system.

Drinking Water - Water used for a potable/culinary supply.

Export Water - A man-made diversion of water from a river system or basin other than by the natural outflow of streams, rivers and groundwater. This is sometimes called a *transbasin diversion*.

Instream Flow - Water flow maintained in a stream for the preservation and propagation of wildlife or aquatic habitat and for aesthetic values.

Non-Point Source Pollution - Pollution discharged over a wide land area, not from one specific location. These are forms of diffuse pollution caused by sediment, nutrients, etc., carried to lakes and streams by surface runoff.

Point Source Pollution - Pollutants discharged from any identifiable point, including pipes, ditches, channels and containers.

Potable/Culinary - Water suitable for drinking or cooking purposes. The terms *culinary* and *potable* are often used interchangeably.

Reuse - The reclamation of water diverted from a municipal or industrial wastewater treatment system.

Riparian Areas - Land areas adjacent to rivers, streams, springs, bogs, lakes and ponds. They are ecosystems composed of plant and animal species highly dependent on water.

Watershed - The total area of land above a given point on a waterway that contributes runoff water to the flow at that point; a drainage basin or a major subdivision of a drainage basin.

Wet/*Open Water Areas* - Includes lakes, ponds, reservoirs, streams, mud flats and other wet areas.

Wetlands - Areas where vegetation is associated with open water, wet and/or high water table conditions.

Water Yield - The runoff from precipitation that reaches water courses and, therefore, may be available for man's use.

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NATURAL RESOURCES
Division of Water Resources

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