



Utah Economic and Business Review

Bureau of Economic and Business Research
David Eccles School of Business
University of Utah

July/August 2004
Volume 64 Numbers 7 & 8

Highlights

- Water use along the Wasatch Front has been gradually changing over the past decades as increasing population and associated real estate development have increased the demand for treated drinking water. The amount of water supplied through public water systems serving the Wasatch Front increased by approximately 2 percent annually over the past 15 years, in line with the rise in population. During the same period, other water uses (primarily agriculture) have slightly declined.
- Surface water in the Provo and Weber River drainages is completely appropriated, with no new water rights being granted. Groundwater is nearly appropriated, with only residences not served by public water supplies being granted groundwater rights in Davis and Weber counties. In Utah County, surface water rights can be transferred to groundwater rights, but no new groundwater rights are being granted. In Salt Lake County, no new groundwater rights are being granted in the deep aquifer and there are restrictions on the transfer of groundwater rights.
- Total water withdrawals along the Wasatch Front for all uses increased from 1,219,265 acre-feet in 1985 to 1,372,680 acre-feet in 2000, with agriculture accounting for the majority. While agriculture accounts for much of the water used along the Wasatch Front, it is declining in both absolute terms and as a percentage of the total used. Agriculture accounted for 844,723 acre-feet of water (69.3 percent) used along the Wasatch Front in 1985, and dropped to 799,032 acre-feet (58.2 percent) in 2000. In contrast, the amount of water used by public water supply systems is increasing, rising from 344,175 acre-feet in 1985 (28.2 percent) to 512,847 acre-feet in 2000 (37.4 percent). Along the Wasatch Front, agricultural use of water is concentrated in Utah County, which accounts for 57.7 percent of agricultural water in the four Wasatch Front counties. While agriculture consumes 58.2 percent of the water used along the Wasatch Front, it produces only 0.1 percent of personal income and is responsible for only 0.9 percent of employment.
- Compared to the state as a whole, the Wasatch Front uses a larger percentage of its water for public supply systems and a lower percentage for agriculture. Statewide, agriculture accounts for over 80 percent of water usage, with public supply systems accounting for less than 15 percent of the total. Use of water in public supply systems is concentrated along the Wasatch Front as is population. The Wasatch Front is responsible for 72 percent of the water delivered through public supply systems and contains 76 percent of the state's population.

WATER USE TRENDS AND SUPPLY ALONG UTAH'S WASATCH FRONT

Alan E. Isaacson, Research Analyst

Growing water use along the Wasatch Front¹ and full appropriation of easily obtained water have resulted in other sources of water being utilized. Traditionally, springs, wells and local rivers and streams were the sources of drinking water used in Utah. These sources are close to being fully appropriated in Salt Lake and Utah counties as rising water consumption - a result of population growth and real estate development - necessitates transferring of water from other uses to public supply systems and development of other types of water sources. To develop additional water sources, both the Jordan Valley Water Conservancy District and the Weber Basin Water Conservancy District have experimented with storing excess spring runoff in natural aquifers for recovery during high use periods. The Jordan Valley Water Conservancy District is also participating in a groundwater clean up project in the southwest corner of Salt Lake Valley, with an eye toward eventually adding the water to the public water supply. As farmland is developed in Utah County, the State Engineer is encouraging conversion of agricultural water, which is usually surface water, to groundwater rights suitable for use in public water supply systems.

Total water withdrawals along the Wasatch Front amounted to 1,372,680 acre-feet² in 2000, up from 1,219,265 acre-feet in 1985. (Table 1) The fastest growing use of water is the various public supply systems, which accounted for 37.4 percent of total water withdrawals along the Wasatch Front in 2000, up from 28.2 percent in 1985. The volume of water delivered to public supply systems increased at an annual rate of 2.3 percent annually from 1985 to 2000, in line with the 2.1 percent annual population increase in the four Wasatch Front counties over the same period. (Figure 1)

¹In this report, the term Wasatch Front refers to Davis, Salt Lake, Utah and Weber counties collectively.

²An acre-foot (ac-ft) of water is equal to one acre of land (43,560 square feet) covered with one foot of water and contains 325,851 gallons. In Utah, most households use approximately one acre-foot of water in a year.

Table 1
Water Withdrawals by Source and Use

	1985		1990		1995		2000	
	Withdrawals (acre-feet)	Percent	Withdrawals (acre-feet)	Percent	Withdrawals (acre-feet)	Percent	Withdrawals (acre-feet)	Percent
State of Utah								
Total Withdrawals	4,687,746	100.0	4,903,396	100.0	4,818,232	100.0	5,335,245	100.0
Surface	3,802,754	81.1	3,823,970	78.0	3,949,560	82.0	4,191,220	78.6
Ground	884,992	18.9	1,079,427	22.0	868,672	18.0	1,144,025	21.4
Purpose								
Public Supply	500,536	10.7	569,548	11.6	556,712	11.6	714,450	13.4
Domestic Self-supply	6,889	0.1	6,777	0.1	10,552	0.2	18,034	0.3
Industrial - Mining Self-supply	93,935	2.0	164,583	3.4	114,378	2.4	77,234	1.4
Thermoelectric Power Self-supply	26,379	0.6	97,688	2.0	54,025	1.1	69,695	1.3
Agricultural Self-supply	4,059,592	86.6	4,059,457	82.8	4,078,276	84.6	4,455,831	83.5
Wasatch Front								
Total Withdrawals	1,219,265	100.0	1,376,164	100.0	1,227,767	100.0	1,372,680	100.0
Surface	927,378	76.1	973,170	70.7	963,111	78.4	999,236	72.8
Ground	291,887	23.9	402,994	29.3	264,656	21.6	373,445	27.2
Purpose								
Public Supply	344,175	28.2	419,673	30.5	402,737	32.8	512,847	37.4
Domestic Self-supply	3,282	0.3	3,484	0.3	3,797	0.3	na	na
Industrial - Mining Self-supply	22,056	1.8	114,187	8.3	42,185	3.4	57,620	4.2
Thermoelectric Power Self-supply	4,615	0.4	202	0.0	1,456	0.1	3,181	0.2
Agricultural Self-supply	844,723	69.3	833,723	60.6	775,229	63.1	799,032	58.2

Source: U.S. Geological Survey, U.S. Department of the Interior.

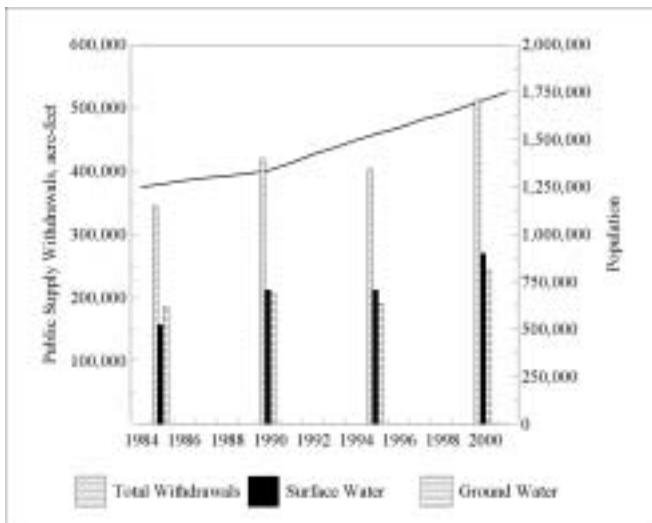
Water use by public supply systems is related to population. The Wasatch Front contained 76.2 percent of the state's population in 2000, and accounted for 71.8 percent of the water consumed through public supply systems. Other uses of water are more dependent on the type of use or function and less dependent on population. Although the Wasatch Front contains three-quarters of the state's population, it consumes less than 20 percent of the water used for agriculture in the state. Similarly, less

than 5 percent of the water consumed in Utah for thermo-electric power generation is used in the four Wasatch Front counties, as large electric generating plants in Emery and Millard counties consume most water used for generating electricity in Utah.

While public supply systems are the fastest growing use of water along the Wasatch Front, agriculture still accounts for the majority of water used. During 2000, agriculture was responsible for 58.2 percent of water withdrawals in the four Wasatch Front counties, down from 69.3 percent in 1985. Agricultural use of water along the Wasatch Front is also declining in absolute terms, not just as a percentage of the total used. In 1985, the four Wasatch Front counties used 844,723 acre-feet of water for agriculture, by 2000, the amount of water used by agriculture had declined to 799,032 acre-feet. Utah County consumes a majority (57.7 percent) of the agricultural water used along the Wasatch Front, followed by Weber (21.0 percent), Davis (12.9 percent) and Salt Lake (8.4 percent) Although agriculture consumes over half of the water used along the Wasatch Front, is it much less important in terms of the overall economy. While consuming 58.2 percent of the water, agriculture generates 0.1 percent of the personal income and 0.9 percent of employment in the four Wasatch Front counties.

Utah is primarily dependent upon surface water, with groundwater of greater importance in public supply systems. Statewide, nearly 80 percent of all water used is surface water. The Wasatch Front is more dependent on groundwater than the state as a whole, with just under 30

Figure 1
Trends in Public Water Supply Withdrawals and Population for the Wasatch Front



Source: U.S. Geological Survey, Governor's Office of Planning and Budget.

Table 2
Water Withdrawals by Purpose and Source

	1985		1990		1995		2000	
	Withdrawals (acre-feet)	Percent	Withdrawals (acre-feet)	Percent	Withdrawals (acre-feet)	Percent	Withdrawals (acre-feet)	Percent
State of Utah								
Public Supply	500,536	100.0	569,548	100.0	556,712	100.0	714,450	100.0
Surface Water	165,546	33.1	227,714	40.0	228,969	41.1	306,415	42.9
Ground Water	334,990	66.9	341,834	60.0	327,743	58.9	408,035	57.1
Domestic Self-supply	6,889	100.0	6,777	100.0	10,552	100.0	18,034	100.0
Surface Water	1,803	26.2	1,602	23.6	1,904	18.0	0	0.0
Ground Water	5,085	73.8	5,175	76.4	8,648	82.0	18,034	100.0
Industrial - Mining Self-supply	93,935	100.0	164,583	100.0	114,378	100.0	77,234	100.0
Surface Water	14,651	15.6	36,248	22.0	35,520	31.1	29,180	37.8
Ground Water	79,284	84.4	128,335	78.0	78,858	68.9	48,054	62.2
Thermoelectric Power Self-supply	26,379	100.0	97,688	100.0	54,025	100.0	69,695	100.0
Surface Water	26,379	100.0	97,688	100.0	54,025	100.0	55,055	79.0
Ground Water	0	0.0	0	0.0	0	0.0	14,640	21.0
Agricultural Self-supply	4,059,592	100.0	4,059,457	100.0	4,078,276	100.0	4,455,831	100.0
Surface Water	3,594,374	88.5	3,460,337	85.2	3,629,143	89.0	3,800,570	85.3
Ground Water	465,218	11.5	599,120	14.8	449,133	11.0	655,262	14.7
Wasatch Front								
Public Supply	344,175	100.0	419,673	100.0	402,737	100.0	512,847	100.0
Surface Water	157,291	45.7	212,334	50.6	212,536	52.8	269,943	52.6
Ground Water	186,885	54.3	207,339	49.4	190,200	47.2	242,903	47.4
Domestic Self-supply	3,282	100.0	3,484	100.0	3,797	100.0	na	na
Surface Water	1,479	45.1	1,322	37.9	1,344	35.4	na	na
Ground Water	1,803	54.9	2,162	62.1	2,453	64.6	na	na
Industrial - Mining Self-supply	22,056	100.0	114,187	100.0	42,185	100.0	57,620	100.0
Surface Water	6,306	28.6	35,117	30.8	14,629	34.7	26,267	45.6
Ground Water	15,749	71.4	79,071	69.2	27,556	65.3	31,353	54.4
Thermoelectric Power Self-supply	4,615	100.0	202	100.0	1,456	100.0	3,181	100.0
Surface Water	4,615	100.0	202	100.0	1,456	100.0	3,181	100.0
Ground Water	0	0.0	0	0.0	0	0.0	0	0.0
Agricultural Self-supply	844,723	100.0	833,723	100.0	775,229	100.0	799,032	100.0
Surface Water	757,688	89.7	724,128	86.9	733,145	94.6	699,843	87.6
Ground Water	87,035	10.3	109,595	13.1	42,084	5.4	99,189	12.4

Source: U.S. Geological Survey, U.S. Department of the Interior.

percent of water used being groundwater. The predominant use of surface water in Utah is due to large use of surface water by agriculture. (Table 2) Agriculture uses over 80 percent of the water in Utah, of which 85 percent is surface water.

When looking at public water supply systems, groundwater becomes much more important in Utah. Statewide, groundwater accounts for about 60 percent of

the public water supply. Along the Wasatch Front, groundwater provides just under half of the public water supply. In 2000, groundwater supplied 47.4 percent of the Wasatch Front's drinking water, down from 54.3 percent in 1985, with the remainder being surface water.

Since 2000, water deliveries through public supply systems have remained relatively constant, and even declined as a result of the recent drought and the

Table 3
Recent Water Deliveries by Major Systems Supplying the Wasatch Front (acre-feet)

	Salt Lake City	Metropolitan Water District of Salt Lake and Sandy ¹	Jordan Valley Water Conservancy District ²	Granger-Hunter Improvement District	Layton	Bountiful	Provo	Orem	Ogden	Roy
2003	92,308	59,801	73,429	22,462	9,837	5,127	24,734	21,172	20,682	3,318
2002	85,306	66,016	70,866	23,863	10,769	5,239	24,890	22,579	na	3,407
2001	91,712	73,133	81,804	21,050	11,442	5,369	25,130	24,160	na	3,422
2000	89,138	80,096	85,259	26,293	11,391	5,420	29,958	22,805	28,897	3,265
1999	86,168	74,190	79,770	24,777	10,551	5,408	24,461	25,557	23,405	3,805
1998	85,159	68,413	71,048	20,210	9,407	5,093	23,296	24,236	16,187	3,749
1997	88,921	63,962	66,275	21,649	9,181	4,948	23,141	20,127	22,955	2,974

¹All deliveries are wholesale sales to other entities.

²Includes wholesale and retail water deliveries, does not include irrigation and raw water or water treated and transported for other entities.

Source: Utah Division of Water Rights, Utah Department of Natural Resources; Jordan Valley Water Conservancy District; Salt Lake City, Granger-Hunter Improvement District.

emphasized need to conserve water. (Table 3) Salt Lake City delivered 85,306 acre-feet of water in 2002, down nearly 7 percent from the 91,712 acre-feet delivered in 2001. Similar declines occurred in the amount of water delivered by other major suppliers to the Wasatch Front.

Wasatch Front Public Water Systems

Salt Lake and Utah Counties

The water supply for the Wasatch Front is essentially two systems. The Jordan Valley Water Conservancy District and Metropolitan Water District of Salt Lake and Sandy integrate most of the water retailers in Salt Lake County by distributing Provo River water throughout the county. (Figure 2) Similarly, the Weber Basin Water Conservancy District integrates Davis and Weber counties by supplying Weber River water to many of the retail water systems in the two counties. (Figure 3) Water suppliers in Utah County are mainly self-sufficient, with only the cities of Orem and Provo supplying Provo River water through the culinary system. Other water suppliers in Utah County rely on local wells and springs.

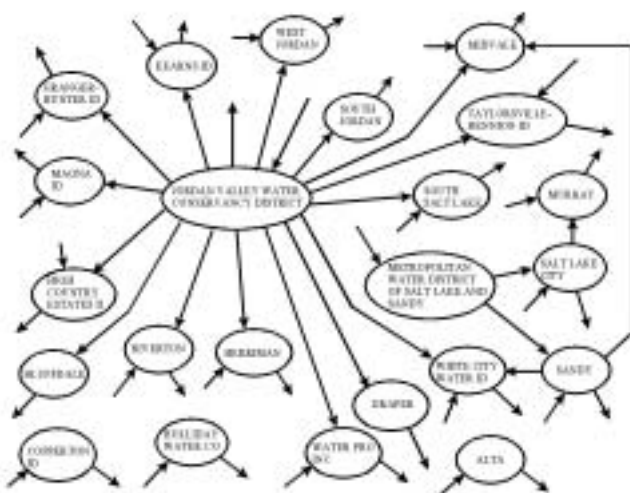
There are approximately 114 public water systems serving residents of the Wasatch Front. These systems are not necessary run by government entities, but are operated by a variety of organizations including municipal

Figure 3
Flows Among Public Water Suppliers in Davis and Weber Counties



Note: Arrows not originating at an oval denote water withdrawals. Arrows not terminating at an oval denote use of water.
Source: Utah Division of Water Rights.

Figure 2
Flows Among Public Water Suppliers in Salt Lake County



Note: Arrows not originating at an oval denote water withdrawals. Arrows not terminating at an oval denote use of water.
Source: Utah Division of Water Rights.

governments, improvement districts, water conservation districts, nonprofit associations, and for-profit utilities.

Metropolitan Water District of Salt Lake City. The Metropolitan Water District of Salt Lake City was organized in 1934 to allow Salt Lake City to participate in the Provo River Project. Salt Lake City had previously acquired most of the water from Mill Creek, Big Cottonwood, and Little Cottonwood Creeks via exchange agreements with farmers in the Salt Lake Valley who had originally appropriated water from the streams draining the Wasatch Mountains. These exchange agreements allowed the city access to high quality water draining from the mountains in return for delivering irrigation water from the Jordan River through canals to the farms in the valley. Despite access to this water, the need for additional drinking water supplies became evident during the drought of the 1930s. The Metropolitan Water District of Salt Lake City was formed because at the time cities were not authorized due to legal constraints to enter into a contract that has a joint and several liability, which is required by the U.S. Bureau of Reclamation for such projects. Additionally, most of the cities participating in the project were limited by bond indebtedness.

The Provo River Project was constructed to divert water from the Weber River and Duchesne River drainages to the Provo River where it could then be made available to residents of Salt Lake and Utah counties for municipal and agricultural use. The sponsor of the Provo River Project was the Provo River Water Users Association, a Utah nonprofit corporation organized to provide water to its shareholders comprised of six metropolitan water districts, one conservation district, seven mutual irrigation companies and two small farming companies in Utah and Salt Lake counties. In addition to Deer Creek Dam and reservoir, the Provo River Project consisted of expanding the Weber-Provo diversion canal, expanding the Provo River Canal and constructing the Duchesne Tunnel. The Weber-Provo diversion canal diverts water from the Weber River east of Oakley to the Provo River just downstream from the town of Francis. The Duchesne Tunnel diverts

high spring flows from the north fork of the Duchesne River to the Provo River upstream from Woodland. The Weber-Provo diversion canal and the Duchesne Tunnel result in Deer Creek Reservoir storing water primarily from the Weber and Duchesne River drainages and not water from the Provo River drainage.

Sandy City annexed into the Metropolitan Water District of Salt Lake City in 1998. Sandy had acquired about 36 percent of the water rights in Little Cottonwood Creek through exchange agreements and wished to have the water treated at the Metropolitan Water District's Little Cottonwood Treatment Plant at the mouth of Little Cottonwood Canyon. Currently, the Metropolitan Water District of Salt Lake and Sandy delivers water to both the Salt Lake City and Sandy municipal water systems and to other water systems as supply allows.

Table 4
Public Water Systems Serving Salt Lake County

Water System Name	Population Served	Annual Deliveries (acre-feet)	Sources of Culinary Water
Metropolitan Water District of Salt Lake and Sandy	700,000	73,000	Deer Creek Reservoir via MWTP (60%), Little Cottonwood Creek via MWTP (30%), Deer Creek Reservoir via JWTP (10%)
Salt Lake City Water System	312,000	89,000	MWDSL Deer Creek via MWTP (24%), Big Cottonwood WTP (23%), MWDSL Little Cottonwood via MWTP (20%), Wells, springs, and tunnels (14%), MWDSL Deer Creek via JWTP (9%), Parley's WTP (5%), City Creek WTP (5%)
Jordan Valley Water Conservancy District	229,000	77,000	Jordanelle Reservoir CUP (48%), Wells (22%), Deer Creek Reservoir (9%), Provo River (9%), Echo Reservoir (4%), Wasatch Streams (3%), Upper Provo Reservoirs (3%), Weber River (3%)
Granger-Hunter Improvement District	106,000	24,000	JVWCD (75%), Wells (25%)
Sandy City Water System	88,000	30,000	MWDSL Little Cottonwood Creek (50%), Wells (30%), JVWCD (20%)
West Jordan Water System	82,000	16,000	JVWCD (75%), Wells (25%)
Taylorville-Bennion Water Improvement District	49,500	15,000	Wells (67%), JVWCD (33%)
Kearns Improvement District	44,000	8,500	JVWCD (90%), Wells (10%)
Murray City Water System	36,000	9,000	Wells (97%), Salt Lake City (3%)
South Jordan City	36,000	8,000	JVWCD (100%)
Magna Water Company Improvement District	31,000	4,800	Wells (85%), JVWCD (15%)
WaterPro, Inc.	23,000	4,300	JVWCD (50%), Big Willow Stream (40%), Wells (10%)
Riverton City Water System	22,000	6,400	Wells and spring (85%), JVWCD (15%)
South Salt Lake City	18,000	3,700	Wells (75%), JVWCD (25%)
White City Water Improvement District	15,800	3,400	Wells (97%), JVWCD (3%)
Holliday Water Company	15,000	4,500	Wells and springs (75%), Big Cottonwood Creek via Big Cottonwood WTP (25%)
Draper City Water System	13,200	2,100	JVWCD (100%)
Midvale City Water System	11,900	3,000	Wells (93%), JVWCD (5%), Sandy (2%)
Herriman City	9,600	na	JVWCD (50%), Wells (50%)
Salt Lake County Service Area Number 3 - Snowbird	3,200	na	na
Bluffdale Water System	3,100	1,100	JVWCD (100%)
Copperton Improvement District	990	300	Wells (100%)
Alta Town Water System	400	130	Tunnel (100%)
Emigration Improvement District	340	na	na
Hi-Country Estates #2	325	110	JVWCD (60%), Wells (40%)
Silver Lake Company	320	160	Tunnel (100%)
Hi-Country Estates #1	300	70	na
Silver Fork Pipeline Company	300	70	Tunnel (100%)
Boundary Springs Water Company	110	400	Springs (100%)
Webb Well Water Users	90	55	Well (100%)
Dansie Water Company	50	55	Wells (100%)
Spring Glen Water Company	50	na	na

Notes: MWTP: Metropolitan Water Treatment Plant, JWTP: Jordan Valley Water Treatment Plant, MWDSL: Metropolitan Water District of Salt Lake City and Sandy WTP: Water Treatment Plant, JVWCD: Jordan Valley Water Conservancy District, ID: Improvement District.
Sources: Environmental Protection Agency, Utah Division of Water Rights, Utah Department of Natural Resources.

Table 5
Public Water Systems Serving Utah County

Water System Name	Population Served	Annual Deliveries (acre-feet)	Sources of Culinary Water
Central Utah Water Conservancy District	150,000	16,000	Provo River Olmstead Diversion (95%), Deer Creek Salt Lake Aqueduct (5%)
Provo City	110,000	26,000	Wells and springs (95%), CUWCD (5%)
Orem City	90,000	23,000	CUWCD (55%), Wells and springs (45%)
Springville City	22,500	8,700	Wells and springs (100%)
Lehi	21,148	1,600	Wells and springs (100%)
American Fork City	21,000	9,500	Wells and springs (100%)
Spanish Fork	20,000	6,800	Wells and springs (100%)
Payson	15,000	2,000	Wells and springs (100%)
Pleasant Grove City	14,000	5,600	Wells and springs (100%)
Lindon	9,300	1,300	Wells and springs (100%)
Alpine	8,000	2,200	Wells and springs (100%)
Highland Water Company	6,701	1,000	Wells (100%)
Eagle Mountain Town	6,500	1,800	Wells (100%)
Mapleton	6,200	1,600	Wells and springs (100%)
Cedar Hills	5,800	na	na
Saratoga Springs Municipal	5,000	1,000	Wells (100%)
Salem	3,350	2,400	Wells and springs (100%)
Manila Culinary Water	2,450	2,200	Wells and springs (100%)
Santaquin City	2,188	2,000	Wells and springs (100%)
Elk Ridge	1,800	450	Wells (100%)
North Fork Special Service District	1,500	na	na
Woodland Hills	1,200	225	Wells (100%)
Genola	805	425	Well (65%), Santaquin (35%)
Utah State Hospital	800	na	na
Goshen	700	350	Springs (100%)
Spring Lake	460	145	Wells and springs (100%)
White Hills Subdivision	419	110	Well (100%)
Cedar Fort	360	100	Springs (100%)
Covered Bridge Canyon	225	65	Wells and springs (100%)
Alpine Cove Special Service District	210	75	Wells (100%)
Elberta	141	65	Wells (100%)
Springdell Plat A & B	100	na	na
Gooseneat Water Company	80	45	Wells and springs (100%)
Bradford Acres Water Association	41	na	na
Farfield Irrigation Company	35	10	Springs (100%)
Hidden Creek Water Company	31	na	na

Note: CUWCD: Central Utah Water Conservancy District.

Sources: Environmental Protection Agency, Utah Division of Water Rights, Utah Department of Natural Resources.

Salt Lake City is the largest provider of water to end users in the Salt Lake Valley. (Table 4) The Salt Lake City Water System is not confined to the city limits, but also provides water to a significant portion of the east side of Salt Lake County south of the city limits. In addition to obtaining water from the Metropolitan Water District, Salt Lake City has developed numerous other water sources. Water treatment plants in City Creek Canyon, Parley's Canyon, and Big Cottonwood Canyon treat water from these drainages and deliver it to the city distribution system. Salt Lake City also operates numerous wells throughout Salt Lake Valley and obtains water from various springs.

Jordan Valley Water Conservancy District. The Jordan Valley Water Conservancy District was organized in 1951 as the Salt Lake County Water Conservancy District. Post-World War II development in the Granger-Hunter and Kearns areas resulted in the district being formed to develop water

sources and provide water to the portion of Salt Lake Valley south of 2100 South and west of the area served by Salt Lake City. In 1999, the name was changed to the Jordan Valley Water Conservancy District to eliminate confusion with Salt Lake County Government. The Jordan Valley Water Conservancy District is a stockholder in the Provo River Water Users Association and therefore, has rights to water stored in Deer Creek Reservoir. The district also owns rights to Central Utah Project water stored in Jordanelle Reservoir, and Weber River and Echo Reservoir water which is transferred to the Provo River drainage via the Weber-Provo diversion canal. The district also operates wells in the Salt Lake Valley and obtains water from local streams. The Jordan Valley Water Treatment Plant in Bluffdale and the Southeast Regional Water Treatment Plant in Sandy are operated by the Jordan Valley Water Conservancy District. In addition to providing wholesale water to many of the water distributors in Salt Lake

County, the Jordan Valley Water Conservancy District also provides retail water service to portions of Holladay, Murray, Sandy, South Salt Lake, and the unincorporated county. The Jordan Valley Water Conservancy District also delivers irrigation water to the southern part of Salt Lake County and northern part of Utah County.

Other Salt Lake County Public Water Systems. Most of the other incorporated cities and towns in Salt Lake County have city-operated water supply systems. West Valley City and Taylorsville do not have municipal water systems, but are served by the Granger-Hunter Water Improvement District and the Taylorsville-Bennion Water Improvement District. These districts were organized when these areas became sufficiently developed to necessitate public water systems before the cities were incorporated. Several unincorporated areas of Salt Lake County are also served by water improvement districts, such as the Kearns Improvement District, the Copperton Improvement District, and the White City Improvement District. There are also several for-profit water utilities operating in the Salt Lake Valley.

Other than Salt Lake City, most of the public water systems in Salt Lake County rely on the Jordan Valley Water Conservancy District for a portion of the water they deliver to end users. Many of the older municipal systems, which were initially developed before the establishment of the Jordan Valley Water Conservancy District, rely mainly on their own water sources. Murray and Midvale in particular obtain over 90 percent of their

water from their own wells. Similarly, South Salt Lake obtains about 75 percent of its water from city-owned wells. By contrast, areas that have experienced large amounts of growth in the past several decades have relied heavily on the Jordan Valley Water Conservancy District to supply sufficient water to meet growing needs. The Granger-Hunter Improvement District, which serves the West Valley City area, and West Jordan City both obtain about 75 percent of their water from the Jordan Valley Water Conservancy District and the remaining 25 percent from wells owned by the respective entities. Similarly, South Jordan City obtains 100 percent of its water from the Jordan Valley Water Conservancy District.

Utah County Public Water Systems. In contrast to the water system in Salt Lake County, which relies heavily on wholesale water and is highly integrated between various retail providers, most of the municipal water systems in Utah County rely on locally owned wells and springs. (Table 5) The Orem City water system is the only public water system in Utah County that relies heavily on surface water. The Central Utah Water Conservancy District treats water from the Provo River and Deer Creek Reservoir at the Utah Valley Water Treatment Plant in Orem and delivers most of the water to Orem City. Provo City also obtains a small portion of the water it delivers from the Utah Valley Water Treatment Plant. The other public water systems in Utah County rely almost exclusively on locally owned wells and springs. One exception is Genola, which obtains about 35 percent of its water from Santaquin.

Table 6
Public Water Systems Serving Davis County

Water System Name	Population Served	Annual Deliveries (acre-feet)	Sources of Culinary Water
Weber Basin Water Conservancy District, South Layton Water System	78,100	27,000	Weber River (85%), Wells (15%)
Bountiful City	65,000	11,200	WBWCD (55%), Wells (45%)
Clearfield City	37,500	5,300	Wells (75%), Local streams (15%), WBWCD (10%), South Davis WID (10%)
Hill Air Force Base	26,640	5,300	WBWCD (75%), Wells (25%)
Kaysville City	22,082	3,100	Wells (70%), WBWCD (30%)
Centerville City	20,000	2,200	WBWCD (100%)
Clinton City	14,500	1,600	Wells (75%), WBWCD (25%)
Farmington City	13,923	1,300	WBWCD (100%)
South Davis Water Improvement District	12,800	1,500	Wells (75%), WBWCD (25%)
West Point Water System	9,277	1,000	Wells, springs (65%), WBWCD (35%)
North Salt Lake	7,000	500	WBWCD (75%), Wells (25%)
Woods Cross Water System	6,474	3,400	Wells (65%), WBWCD (35%)
Sunset Water System	6,400	1,100	Wells (90%), WBWCD (10%)
South Weber Water System	5,800	1,200	WBWCD (100%)
West Bountiful Water System	5,200	660	WBWCD (70%), Wells (30%)
Fruit Heights	5,175	680	WBWCD (70%), Wells (30%)
Syracuse Water System	5,000	480	WBWCD (90%), Wells (10%)
Mutton Hollow Improvement District	3,575	900	WBWCD (100%)
	560	200	WBWCD (100%)

Note: WBWCD: Weber Basin Water Conservancy District; WID, Water Improvement District.

Sources: Environmental Protection Agency, Utah Division of Water Rights, Utah Department of Natural Resources.

Table 7
Public Water Systems Serving Weber County

Water System Name	Population Served	Annual Deliveries (acre feet)	Sources of Culinary Water
Weber Basin Water Conservancy District, Central	298,000	20,000	Pineview Reservoir (75%), Wells (25%)
Ogden City	65,000	25,000	Wells (55%), WBWCD (30%), Pineview Reservoir (15%)
Roy	32,325	34,000	WBWCD (85%), Wells (15%)
North Ogden City	15,000	1,300	Wells and springs (100%)
South Ogden City	14,000	1,700	WBWCD (50%), Strong and Burch Creek (50%)
Bona Vista Water District	13,500	4,200	WBWCD (50%), Ogden City (30%), Wells (20%)
Hooper Water Improvement District	10,000	1,400	Wells (99%), WBWCD (1%)
Washingtgon Terrace	8,500	1,000	WBWCD (100%)
Riverdale	8,200	2,400	Wells (60%), WBWCD (40%)
Taylor-West Weber Improvement District	4,900	1,100	Wells (70%), WBWCD (30%)
Pleasant View Culinary Water	3,740	700	Wells and springs (100%)
Uintah Highlands Improvement District	2,100	280	WBWCD (67%), Springs (33%)
Eden Waterworks System	1,500	200	Wells and springs (100%)
Uintah	820	300	WBWCD (100%)
West Warren-Warren Improvement District	800	200	WBWCD (100%)
Liberty Pipeline Company	640	125	Springs (100%)
Huntsville	561	200	Springs (100%)
Nordic Valley Water Company	500	25	Wells (100%)
Wolf Creek Country Club	300	130	Wells and springs (100%)
Green Hills Country Estates	205	28	Wells (100%)
Lakeview Water Company	125	10	Wells (100%)
Durfee Creek Subdivision	121	na	na
Pineview West Water Company	100	na	na
Cole Canyon Water Company	74	na	na
Pole Patch Water System	66	na	na
Abbey of the Holy Trinity	40	na	na
Casey Acres Water Company	27	na	na

Sources: Environmental Protection Agency, Utah Division of Water Rights, Utah Department of Natural Resources.

Davis and Weber Counties

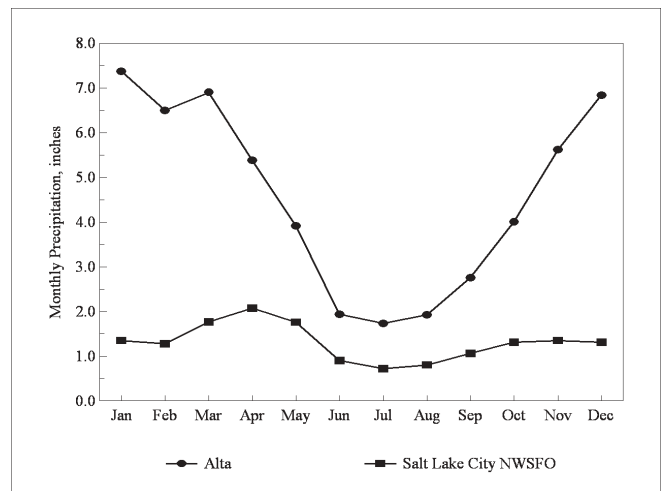
The public water supply system in Davis and Weber counties is highly integrated through the Weber Basin Water Conservancy District. Water from the Weber River drainage and district-operated wells throughout Davis and Weber counties is delivered to various retail water suppliers in the two counties.

The Weber Basin Water Conservancy District was created in 1950 to repay the U.S. Bureau of Reclamation for constructing the Weber Basin Project and develop other water sources within the district's boundaries. Several facilities in the Weber Basin were constructed earlier by other federal reclamation projects. The Ogden River Project was constructed during the 1930s and consists of Pineview Dam on the Ogden River and several canals and conduits to distribute water. Echo Reservoir was also constructed during the 1930s as part of the Weber River Project. As part of the Weber Basin Project, Rockport Reservoir, Causey Reservoir, Lost Creek Reservoir, and Smith and Morehouse Reservoir were all constructed. The Weber Basin Water Conservancy District also operates three water treatment plants in Davis and Weber counties and delivers irrigation water to Davis, Weber, and Box Elder counties.

There are 19 public water systems in Davis County. (Table 6) The largest of these, the Weber Basin Water Conservancy District, is a wholesaler of water to other

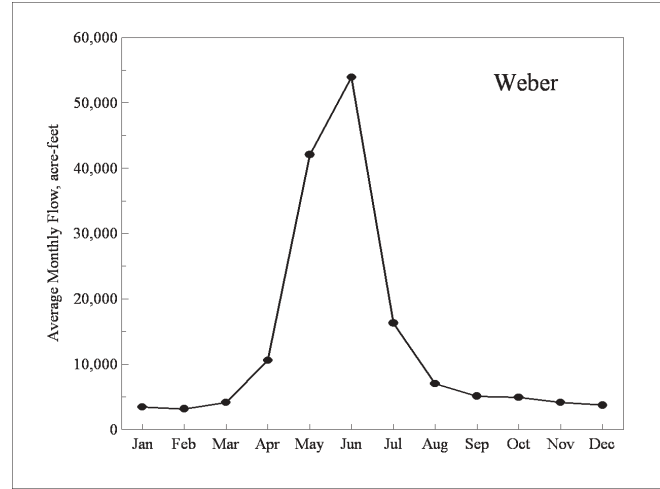
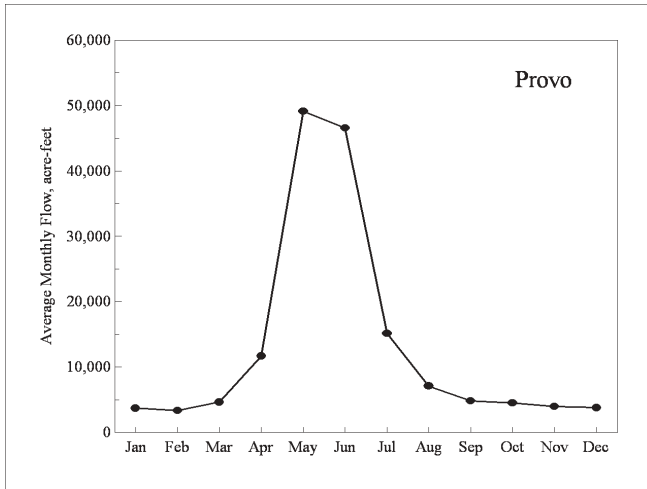
entities. The other water systems are a collection of municipal systems, improvement districts, and Hill Air Force Base. All of these systems rely on the Weber Basin Water Conservancy District for water to a varying extent. The largest water retailer in Davis County is Layton City, which relies on the Weber Basin Water Conservancy

Figure 4
Monthly Precipitation
Salt Lake City and Alta



Source: Western Regional Climate Center.

Figure 5
Monthly Stream Flow on the Provo and Weber Rivers



Source: U.S. Geological Survey.
Gage 10154200 Provo River Near Woodland, Utah. Gage 10128500 Weber River Near Oakley, Utah.

District for about 55 percent of its water. Bountiful City, the second largest water retailer in Davis County, is the only water system in Davis County to use local surface water, treating local streams draining the Wasatch Mountains at its city-owned treatment plant.

In Weber County, as in Davis County, the Weber Basin Water Conservancy District is the largest water supplier. (Table 7) Ogden City is the largest water retailer in Weber County, and obtains most of its water (55 percent) from city-owned wells, with the Weber Basin Water Conservancy District supplying 30 percent of the water

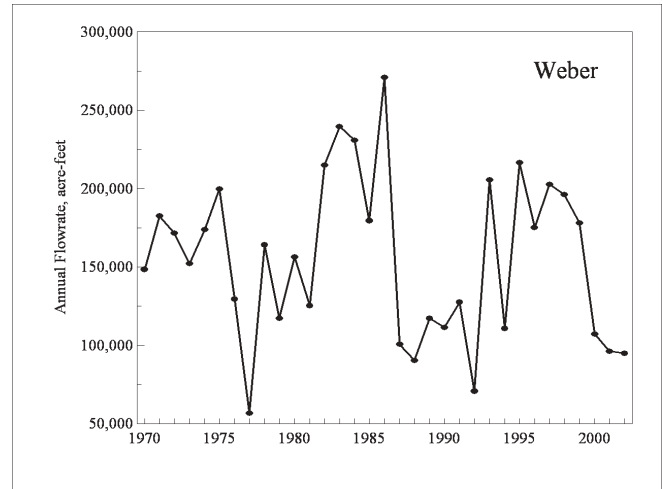
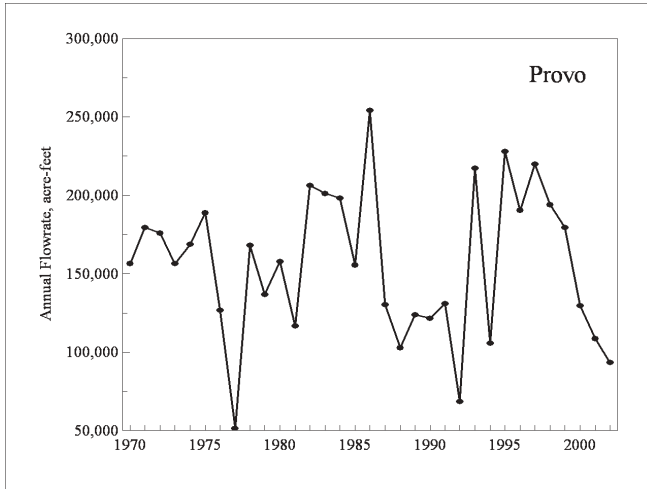
delivered by Ogden City, and the remainder being Ogden City water rights in the Ogden River and Pineview Reservoir. Ogden City operates a water treatment plant in Ogden Canyon to treat Ogden River and Pineview Reservoir water. Most of the other retail systems in Weber County also rely on the Weber Basin Water Conservancy District for a portion of their water. One exception is North Ogden City, which relies on city-owned wells and springs. Several smaller water suppliers in the Ogden Valley, upstream from Pineview Reservoir, also rely exclusively on local wells and springs.

Table 8
Average Monthly Flows in Major Streams Supplying Water to the Wasatch Front (acre-feet per month)

Site	USGS Gage	January	February	March	April	May	June	July	August	September	October	November	December	Period of Record
Weber River near Oakley, Utah	10128500	3,456	3,171	4,144	10,592	42,058	53,911	16,294	7,010	5,088	4,913	4,147	3,720	1904-2002
Weber-Provo Diversion Canal near Woodland, Utah	10154500	1,500	1,356	1,611	5,462	15,003	13,210	2,626	94	14	14	1,232	1,414	1932-1998
Weber River at Echo, Utah	10132000	5,903	6,164	7,624	11,841	34,679	43,081	29,084	24,103	15,828	7,501	5,939	5,724	1927-2002
Lost Creek near Croyden, Utah	10132500	683	745	1,101	3,814	6,641	2,582	1,427	1,365	970	799	738	805	1921-2002
East Canyon Creek near Morgan, Utah	10134500	1,039	1,406	2,675	4,296	5,202	5,802	6,825	6,702	4,094	1,636	839	922	1931-2002
Weber River at Gateway, Utah	10136500	14,511	16,250	31,113	58,493	93,031	66,764	32,773	27,546	21,183	14,941	12,317	13,527	1919-2002
South Fork Ogden River near Huntsville, Utah	10137500	2,681	2,908	5,891	16,423	26,870	9,997	4,476	3,683	2,940	2,638	2,404	2,644	1921-2002
Weber River near Plain City, Utah	10141000	23,365	24,879	48,268	85,924	112,338	57,064	7,563	4,187	7,676	15,741	18,565	21,152	1907-2002
Provo River near Woodland, Utah	10154200	3,671	3,306	4,612	11,663	49,129	46,592	15,126	7,071	4,826	4,501	3,969	3,781	1963-2002
Provo River near Charleston, Utah	10155500	8,239	8,069	10,207	14,817	37,261	33,322	11,068	5,989	6,010	6,210	7,498	7,747	1938-2002
Provo River below Deer Creek Dam, Utah	10159500	12,666	12,327	15,003	18,625	36,462	47,306	30,928	26,009	20,707	12,974	10,413	13,035	1953-2002
Provo River at Provo, Utah	10163000	14,511	14,064	16,909	17,435	19,000	19,755	2,669	1,254	2,850	8,055	11,425	14,696	1903-2002
Diamond Fork below Red Hollow near Thistle, Utah	10149500	1,814	1,731	2,226	4,350	11,129	16,364	20,106	17,401	8,866	1,900	1,422	1,802	1953-2001
Spanish Fork River at Castilla, Utah	10150500	5,085	5,329	8,239	15,828	33,326	27,610	24,780	20,537	12,198	6,702	5,236	4,987	1919-2002
Spanish Fork River near Lakeshore, Utah	10152000	5,847	6,164	9,592	15,114	16,663	4,558	824	769	994	3,812	5,397	5,558	1904-1988
Jordan River at Narrows near Lehi, Utah	10167000	11,560	13,112	16,479	19,458	37,077	41,653	46,731	42,795	32,727	15,310	9,461	10,453	1935-1991
Big Cottonwood Creek near Salt Lake City, Utah	10168500	1,414	1,328	1,925	4,332	12,359	13,329	5,417	2,650	2,142	1,949	1,672	1,549	1930-1989
Jordan River at 1700 South at Salt Lake City, Utah	10171000	8,916	8,237	8,362	7,140	6,887	8,450	9,531	9,285	9,461	9,654	8,628	8,854	1942-2002
Surplus Canal at Salt Lake City, Utah	10170500	20,291	22,805	27,239	30,050	37,938	38,797	21,582	16,602	16,542	17,032	17,197	18,569	1942-2002
Little Cottonwood Creek (Channel) near Salt Lake City, Utah	10167499	336	282	318	726	6,333	12,555	5,042	984	690	719	459	319	1980-1988
City Creek (Channel) near Salt Lake City, Utah	10172499	440	383	606	1,107	2,779	2,529	1,051	598	497	445	408	441	1960-1988

Source: U.S. Geological Survey, U.S. Department of the Interior.

Figure 6
Annual Stream Flow on the Provo and Weber Rivers



Source: U.S. Geological Survey.
Gage 10154200 Provo River Near Woodland, Utah. Gage 10128500 Weber River Near Oakley, Utah.

Wasatch Front Water Supply

The Wasatch Front is heavily dependent upon winter precipitation at high altitudes for its water supply. Much of this water is captured as runoff during the spring and early summer and delivered to the various public water systems as surface water. Groundwater also plays an important role in supplying the public water systems

along the Wasatch Front as groundwater levels are maintained by precipitation seeping into the aquifers.

Surface Water

The Wasatch Front relies heavily on the Provo and Weber Rivers to provide surface water for both public supply systems and other uses. Both of these rivers have their

Table 9
Record Annual Flows in Major Streams Supplying Water to the Wasatch Front (acre-feet per year)

Site	USGS Gage	Record Low Flow		Record High Flow		Period of Record
		Flow	Year	Flow	Year	
Weber River near Oakley, Utah	10128500	55,601	1934	301,894	1907	1905-2001
Weber River at Echo, Utah	10132000	67,619	1934	405,421	1952	1928-1957, 1989-2001
Lost Creek near Croyden, Utah	10132500	5,864	1961	51,040	1952	1922, 1923, 1942-1966, 1989-1992, 2000, 2001
East Canyon Creek near Morgan, Utah	10134500	10,425	1935	107,147	1983	1932-1991, 1994-2001
Weber River at Gateway, Utah	10136500	100,631	1961	1,045,408	1986	1921-2001
South Fork Ogden River near Huntsville, Utah	10137500	23,601	1977	115,111	1986	1922-2001
Weber River near Plain City, Utah	10141000	36,416	1988	1,290,109	1908	1908-2001
Provo River near Woodland, Utah	10154200	51,474	1977	254,112	1986	1964-2001
Provo River near Charleston, Utah	10155500	65,229	1940	257,008	1997	1939-1949, 1992-2001
Provo River below Deer Creek Dam, Utah	10159500	107,147	1977	503,157	1986	1954-2001
Provo River at Provo, Utah	10163000	25,049	1992	439,448	1986	1937-2001
Diamond Fork below Red Hollow near Thistle, Utah	10149500	57,700	1963	142,621	1992	1954-1968, 1990-2000
Spanish Fork River at Castilla, Utah	10150500	57,990	1934	360,536	1984	1920-1924, 1933-2001
Spanish Fork River near Lakeshore, Utah	10152000	18,027	1963	327,957	1984	1910-1918, 1921-1925, 1938-1987
Jordan River at Narrows near Lehi, Utah	10167000	39,818	1990	1,244,499	1984	1936-1980
Big Cottonwood Creek near Salt Lake City, Utah	10168500	19,258	1934	91,944	1983	1931-1988
Jordan River at 1700 South at Salt Lake City, Utah	10171000	68,704	1962	162,893	1985	1943-2001
Surplus Canal at Salt Lake City, Utah	10170500	46,117	1961	1,405,944	1984	1943-1993, 1996-2001
Little Cottonwood Creek (Channel) near Salt Lake City, Utah	10167499	24,832	1981	47,058	1983	1981-1987
City Creek (Channel) near Salt Lake City, Utah	10172499	4,880	1961	19,258	1975	1978-1978, 1982

Source: U.S. Geological Survey, U.S. Department of the Interior.

Table 10
Major Reservoirs Providing Water to the Wasatch Front

Reservoir	River System	Operator	Height (feet)	Capacity at Spillway Crest (acre-feet)	Area at Spillway Crest (acres)
Causey	Ogden/Weber	Weber Basin WCD/USBR	218	7,870	100
Deer Creek	Provo	Provo River WUA/USBR	235	147,000	2,683
East Canyon	Weber	Davis & Weber Counties Canal Co./USBR	260	51,200	600
Echo	Weber	Davis & Weber Counties Canal Co./USBR	158	73,900	1,000
Jordanelle	Provo	Central Utah WCD/USBR	300	372,000	3,141
Little Dell	Parley's Creek	Salt Lake City	224	20,500	249
Lost Creek	Weber	Weber Basin WCD/USBR	248	22,500	375
Mountain Dell	Parley's Creek	Salt Lake City	105	3,166	81
Pineview	Ogden/Weber	Ogden River WUA/USBR	132	110,000	2,000
Rockport	Weber	Weber Basin WCD/USBR	175	62,100	1,000
Smith & Morehouse	Weber	Weber Basin WCD/USBR	92	8,350	197
Strawberry	Duchesne	Central Utah WCD/USBR	251	1,106,500	10,000
Willard Bay	Weber	Weber Basin WCD/USBR	36	215,000	9,000

Note: USBR: U.S. Bureau of Reclamation, WCD: Water Conservancy District, WUA: Water Users Association.
Source: Utah Division of Water Rights, Utah Department of Natural Resources; U.S. Bureau of Reclamation, U.S. Department of Interior.

headwaters in the western portion of the Uinta Mountains and winter snowfall is a major portion of the water supply. Surface water in both the Provo and Weber drainage basins is considered fully appropriated, and no new rights to surface water in the two drainages are being granted.

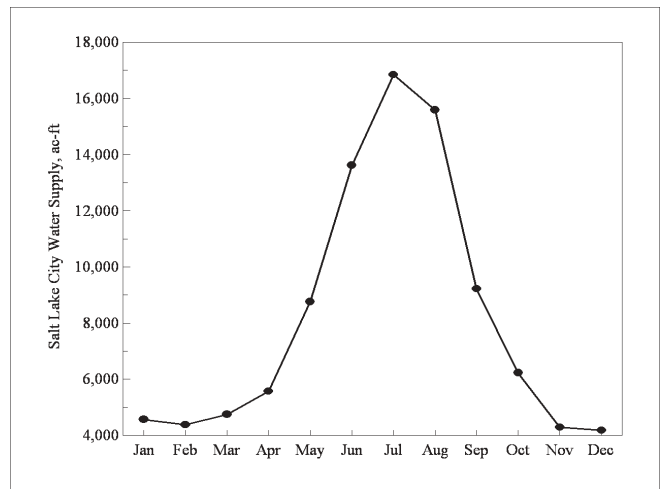
With two significant water supplies to the Wasatch Front (the Provo and Weber Rivers), originating on the western slope of the Uinta Mountains, the Wasatch Front water supply is largely dependent upon precipitation in the Uinta Mountains, especially winter snowfall. Similarly, local streams supplying the Wasatch Front - City Creek, Parley's Creek, Big Cottonwood Creek and Little Cottonwood Creek and Mill Creek in Bountiful - depend on winter snowfall in the Wasatch Mountains. Precipitation greatly increases at the high altitudes of the Uinta and Wasatch ranges over the surrounding valley floors. For example, Alta, at 8,730 feet elevation and surrounded by 11,000 foot peaks, averages 54.72 inches of precipitation annually, nearly three and one-half times the 15.72 inches averaged at the National Weather Service Forecast Office near the airport in Salt Lake City, which is at 4,220 feet elevation. (Figure 4) Winter snowfall accounts for a large portion of the precipitation at high altitudes, with precipitation from November through March responsible for 60 percent of the precipitation at Alta.

With the majority of precipitation occurring during the winter months, stream flows vary greatly throughout the year. Snow melt in the spring and early summer results in the highest flows in May and June. (Figure 5) The average monthly flow on the Weber River near Oakley peaks at 53,911 acre-feet per month in June, which is 17 times the

average low monthly flow of 3,171 acre-feet per month during February. (Table 8) Similarly, the average monthly flow at the Provo River near Woodland peaks at 49,129 acre-feet per month in May, which is nearly 15 times the average low monthly flow of 3,306 acre-feet per month in February. Other rivers and streams draining the Wasatch Front experience similar seasonal variations in flow.

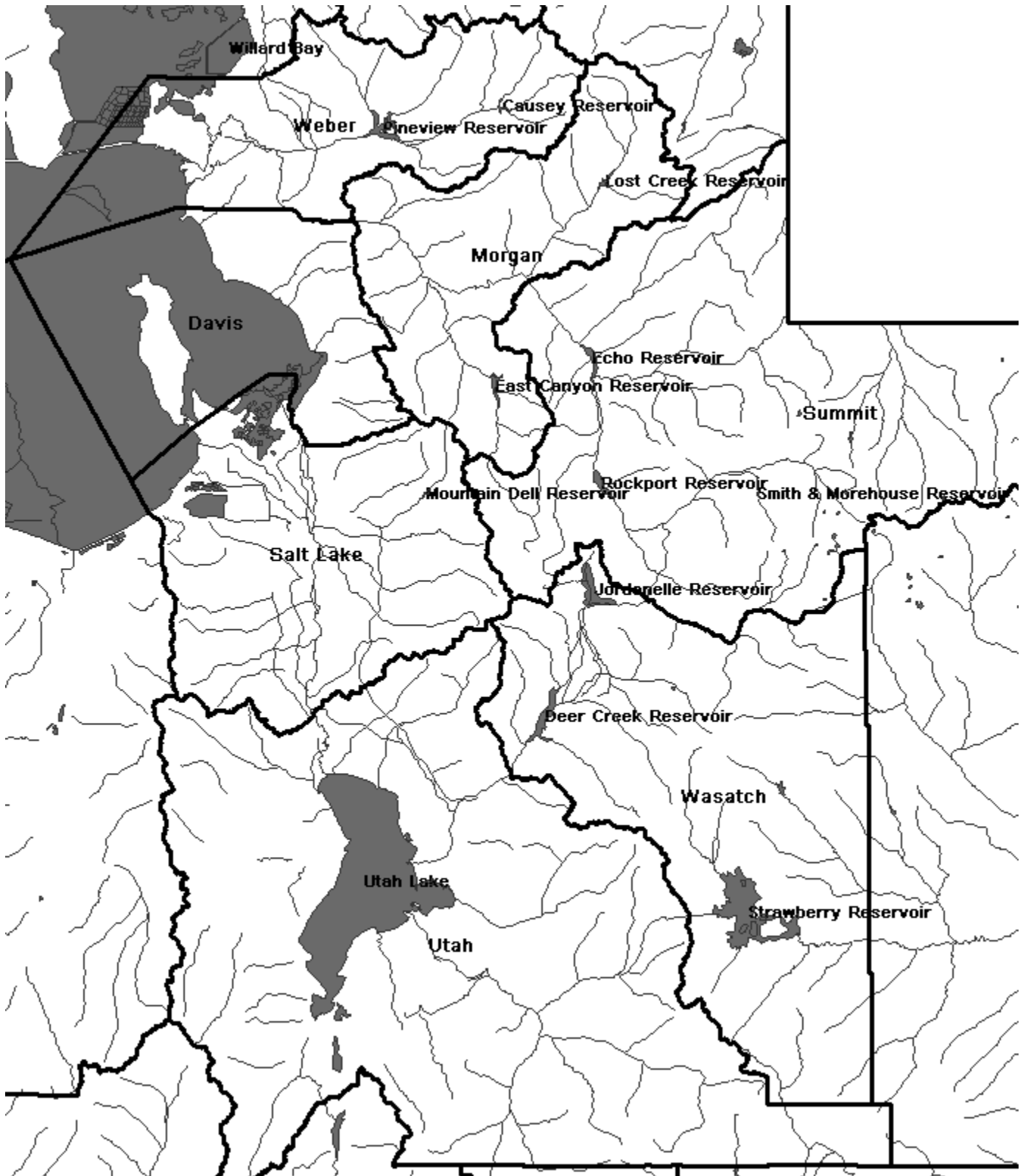
Varying annual precipitation also results in greatly different average stream flows from year to year. (Figure 6) The highest recorded annual flow on the Weber River near

Figure 7
Water Supplied to the Salt Lake City System, 2002



Source: Utah Division of Water Rights.

Figure 8
Major Reservoirs Supplying Water to the Wasatch Front



Oakley was 301,894 acre-feet in 1907, which is over five times the record low annual flow 55,601 acre-feet which occurred in 1934. (Table 9) Similar annual variations in flow occur on the Provo River, with the highest recorded annual flow on the Provo River near Woodland being 254,112 acre-feet in 1986, almost five times the lowest recorded annual flow of 51,474 acre-feet in 1977.

While the highest stream flow occurs in May and June, water demand peaks in July and August. During 2002, the amount of water supplied to the Salt Lake City system during July was about 175 percent of that delivered during May, the month that traditionally has the highest flow rate in the Provo River, a major source of water for Salt Lake City. (Figures 5 and 7) Numerous reservoirs have been constructed in the Provo and Weber River drainages to store water for use during the summer months when demand for water is greatest. (Table 10) These reservoirs also store water from high precipitation years for use during years of low precipitation. The federal government originally built a number of the dams serving the Wasatch Front as part of various reclamation projects and the U.S. Bureau of Reclamation retains legal title to the property, but the dams are operated by local entities organized to operate the water projects after construction. Two of the reservoirs listed in Table 10, Willard Bay and Soldier Creek (Strawberry Reservoir) do not provide water to public water supply systems, but are major suppliers of agricultural water to the Wasatch Front. Strawberry Reservoir is actually in the Duchesne River drainage and ultimately drains into the Colorado River, but the Strawberry Tunnel transfers water from the reservoir to the Spanish Fork River drainage and southern Utah County. Other reservoirs and tunnels further east in the Uinta Basin transfer water from other drainages to Strawberry Reservoir as part of the Central Utah Project. As the Wasatch Front grows and the demand for water by public supply systems increases, some of the water stored in Willard Bay and Strawberry reservoirs will eventually be converted to use in public supply systems.

The Central Utah Water Conservancy District has plans to construct the Utah Lake Drainage Basin Water Delivery System to complete the Bonneville Unit of the Central Utah Project. As currently planned, this system would pipe Uinta Basin water from Strawberry Reservoir to the mouth of Spanish Fork Canyon, and deliver the water to Salt Lake and Utah counties. Currently plans are to deliver 30,000 acre-feet of water annually to Salt Lake County. This water would be delivered to the Jordan Valley Water Conservancy District and the Metropolitan Water District of Salt Lake and Sandy. The primary

subscriber to the water for municipal use in Utah County is the Southern Utah Valley Municipal Water Association, an association of 10 municipalities in the southern part of Utah County. This water will be used for both drinking water and in secondary water systems. Other water delivered to Utah County would be used for maintaining in-stream flows in tributaries to Utah Lake to replace flows diverted for other uses. The in-stream flows would be supplied to provide spawning grounds for the June Sucker, an endangered fish native only to Utah Lake.

In 1991, the State Legislature passed the Bear River Development Act, which directed the state Division of Water Resources to develop water in the Bear River. The act also allocated 50,000 acre-feet of Bear River water to the Jordan Valley Water Conservancy District and the Weber Basin Water Conservancy District and 60,000 acre-feet of water to the Bear River Water Conservancy District and Cache County. Several different configurations and pipelines have been proposed for transporting Bear River water to the Wasatch Front, including storing Bear River water in Willard Bay. Although the Jordan Valley Water Conservancy District has acquired rights-of-way for pipelines to transport Bear River water to the Wasatch Front, the development of the Utah Lake Drainage Basin Water Delivery System will probably postpone the need for the Bear River water for several decades.

Groundwater

In addition to surface water, the Wasatch Front depends on groundwater for nearly 50 percent of its public water supply. As with surface water, groundwater is nearly fully appropriated along the Wasatch Front. Use of groundwater does not reduce the dependency upon annual precipitation for the water supply because precipitation is necessary to recharge groundwater levels. Withdrawing more water than is recharged over a long-term basis is referred to as "mining groundwater." Generally, along the Wasatch Front, there has been little mining of groundwater, although some has occurred in Weber County. Some wells in Weber County have seen water levels drop as much as 80 feet below the original level. The water level in wells can also vary noticeably with annual precipitation levels.

Although groundwater is an important component of the public water supply, little large-scale development of groundwater resources will occur along the Wasatch Front in the future. Development of additional groundwater sources for drinking water in these counties will primarily

result from transfer of existing water rights in Utah County and developing wells in a shallow aquifer in Salt Lake County. The State Engineer has closed most of Utah County to new ground water appropriation, but allows surface water rights to be changed to groundwater sources to encourage transfer of irrigation water to drinking water as agricultural land is developed. In Utah County, most ground water is tributary to Utah Lake and the strong relationship between surface water and ground water allows surface water rights to be changed to groundwater sources.

In the Salt Lake Valley there is a deep principal aquifer covered by a layer of impervious soil which is then overlain with a shallow aquifer. Generally, the deep aquifer has much better water quality than the shallow aquifer and drinking water wells have usually tapped the deep aquifer. The deep aquifer has been closed to new groundwater appropriations and existing water rights in the shallow aquifer cannot be transferred to the deep aquifer. The Jordan Valley Water Conservancy District is exploring the use of water from the shallow aquifer for drinking water and has drilled several wells into the aquifer to examine it for water quality.

In contrast to Salt Lake and Utah counties, Davis and Weber counties are open to limited appropriations of groundwater. The lower valleys of Davis and Weber counties are open to new groundwater appropriation for residential use in areas that are not served by a public water supply system. These appropriations are limited to one acre-foot per year and must be abandoned if a public water system starts serving the area. Upstream groundwater basins in the Weber River drainage, including the Morgan Valley, Rhodes (or Kamas) Valley and Park City area are closed to new groundwater appropriations.

Summary

Although the amount of water delivered through public supply systems has remained level over the past several years, given long-term trends in increasing water use with population, water demand will undoubtedly increase. This increase in demand and limited amount of water available along the Wasatch Front will eventually require new sources of water, including importing water from other drainage basins, recycling of water, and enhanced water conservation measures.

References

- Hooton, L. W. Jr., *The Metropolitan Water District of Salt Lake City - Provo River Project - Deer Creek Reservoir*. 34 pp.
- Hutson, S. S., N. L. Barber, J. F. Kenny, K. S. Linsey, D. S. Lumina and M. A. Maupin. "Estimated Use of Water in the United States in 2000." U.S. Geological Survey Circular 1268. 2004. <http://water.usgs.gov/pubs/circ/2004/circ1268/>
- Israelsen, Brent. "Jordan Valley OKs Piping off Brine." *Salt Lake Tribune*. April 29, 2004.
- Jordan Valley Water Conservancy District. 2002 *Annual Report*.
- Lowe, Mike. "New Aquifer Storage and Recovery Project to Augment Ground-Water Supplies in the Ogden Area." *Survey Notes* Utah Geological Survey. Vol. 35, No. 3. Aug. 2003.
- Solley, W. B., R. R. Piece, and H. A. Perlman. "Estimated Use of Water in the United States in 1995." U.S. Geological Survey Circular 1200. 1998. 71 pp.
- Trentelman, Charles. F. "Getting More Moisture: New Project Soaks River Water into South Weber Aquifer." *Ogden Standard Examiner*. March 29, 2004.
- U.S. Environmental Protection Agency. "Safe Drinking Water Information System." <http://www.epa.gov/safewater/dwinfo.htm>
- U.S. Geological Survey. "Surface Water Data for the Nation." <http://waterdata.usgs.gov/nwis/sw>
- U.S. Geological Survey. 2000 County-level Water Use Data for Utah. Obtained from U.S. Geological Survey Utah Office.
- Utah Division of Water Rights. "Public Water Suppliers Flow Data." <http://waterrights.utah.gov/cgi-bin/wuseview.exe>
- Utah Division of Water Resources. *Bear River Development*. August, 2000.
- Utah Division of Water Rights. *Groundwater Management Plan for the Bountiful Sub-area of the East Shore Area*. January 4, 1995.
- Utah Division of Water Rights. *Groundwater Management Plan for the Weber Delta Sub-area for the East Shore Area*. October 31, 1995.
- Utah Division of Water Rights. *Salt Lake Valley Groundwater Management Plan*. June 25, 2002.
- Utah Division of Water Rights. *Utah/Goshen Valley Groundwater Management Plan*. November 15, 1995.
- Utah Geological and Mineralogical Survey. *Mineral and Water Resources of Utah*. UGMS Bulletin 73. 1964. pp. 239-275.
- Utah Lake Drainage Basin Delivery System. Central Utah Water Conservancy District Brochure. April 26, 2004.
- Utah Lake Drainage Basin Water Delivery System. *Draft Environmental Impact Statement Summary*. Central Utah Water Conservancy District.
- Utah State Water Plan. *Jordan River Basin*. Utah Division of Water Resources, 1997.
- Utah State Water Plan. *Utah Lake Basin*. Utah Division of Water Resources, 1997.
- Utah State Water Plan. *Weber River Basin*. Utah Division of Water Resources, 1997.

Bureau of Economic and Business Research
University of Utah
1645 East Campus Center Drive, Room 401
Salt Lake City, Utah 84112-9302

Address Service Requested

NON-PROFIT ORG.
U.S. POSTAGE PAID
Salt Lake City, UT
Permit No. 1529

UTAH ECONOMIC AND BUSINESS REVIEW

VOLUME 64 NOs. 7 & 8



Michael K. Young
President

David Eccles School of Business

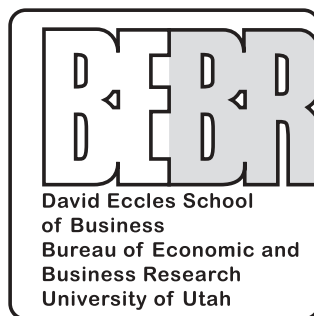
Jack W. Brittain

Dean

Bureau of Economic and Business Review

James A. Wood

Director



Research Staff

Jan E. Crispin
Diane S. Gillam
Alan E. Isaacson
Pamela S. Perlich
Nathan Schaff

Senior Economist
Accountant/Editor
Research Analyst
Senior Research Economist
Research Assistant

<http://www.business.utah.edu/bebr/>

The University seeks to provide equal access to its programs, services, and activities to people with disabilities.