Nevada State Water Plan
PART 2 — WATER USE AND FORECASTS

Section 1
Historic and Current Water Use

Introduction

Comprehensive water use information is critical to the success of all water planning and management functions. This section of the *State Water Plan* provides an overview of historic and current water use estimates and discusses observed trends in Nevada's water use.

Estimating Water Use

Approximately 65 to 75 percent of the total water withdrawn annually from groundwater and surface water sources in Nevada is either measured with detailed diversion records maintained by various entities or estimated by the State annually in detailed pumpage and crop inventories. According to the State Engineer's Office, water use data submitted to the Office and calculated by staff in the pumpage and crop inventories accounts for about 90 percent of the total groundwater usage. The balance of the groundwater and surface water usage must be estimated. The most significant water use estimation program in Nevada is implemented by the U.S. Geological Survey (USGS) as part of the USGS National Water Use Information Program.

USGS National Water Use Information Program

The USGS has the only program in Nevada responsible for estimating statewide water use on a routine and comprehensive basis. Staff in the USGS's National Water Use Information Program compile and disseminate water use information on local, state and national levels. In developing their estimates, the USGS staff work in cooperation with local, state, and federal agencies.

Since 1950, the USGS has estimated statewide water use at 5-year intervals and published these estimates in a national summary report. USGS water use estimates for Nevada and other states are included in the national summary report, but a separate detailed Nevada water use report with individual county breakdowns is not published. The national summary report includes water use information for each of the 50 states, plus the District of Columbia, Puerto Rico and the Virgin Islands, and for each of the 21 major water resources regions in the United States. The USGS water use estimates for Nevada have been maintained in an electronic database since 1985.

It is important to note that the Nevada water use figures developed by USGS staff are estimates and that the water use values developed are based upon a mixture of *measured* and *estimated* water use. To the extent possible, the USGS compiles water use data collected by other agencies. Much of the

information is obtained from the State Engineer's Office (Nevada Division of Water Resources). As discussed in Part 1, Section 4 of the *State Water Plan*, the State Engineer's Office develops crop and pumpage inventories for about 40% of the basins. Pumpage data from about 30% of the 256 hydrographic areas are submitted by water right holders to the State Engineer's Office as a requirement of permit conditions. However, the pumpage data that are submitted may not represent all water usage within a particular basin. The USGS obtains additional information through personal communcations with various irrigation districts, federal water masters, water purveyors and from any recent USGS studies for a particular region. Federal law does not allow the USGS to mail out surveys to collect additional data.

Much of the water use data presented in this section has been developed by the USGS as part of the National Water Use Information Program. Upon review of the USGS estimates, the Division of Water Planning identified some inconsistencies in the data. However, it is difficult to make adjustments to these data because the USGS does not produce a separate Nevada water use report documenting data sources and assumptions. Nevertheless, as feasible, modifications were made to the USGS estimates by the Nevada Division of Water Planning (NDWP) to address a portion of these inconsistencies. Clearly, a more comprehensive water measurement and/or estimation program is needed to improve water use quantification. Both the original source data obtained from the USGS and the NDWP modifications are presented in the appendix. The "Water Use Measurement and Estimation" issue discussion in Part 3 of the *State Water Plan* provides additional information on available data and needs.

Current Water Use and Past Trends

This section presents statewide water use estimates for the period 1970-1995 at 5-year intervals. These estimates are divided into 8 categories of water use:

- public supply
- domestic
- commercial
- industrial
- thermoelectric
- mining
- irrigation
- livestock

For the public supply category (municipal water systems), this section provides estimated withdrawals by source and deliveries to domestic, commercial, industrial, and thermoelectric power users. The other categories represent both public supplied and self-supplied uses. Self-supplied withdrawals by source, deliveries from public suppliers (where applicable), and consumptive use estimates are given for these categories. Detailed county estimates are presented in the appendices.

Public Supply Water Use

Public supply refers to water withdrawn by public and private water suppliers and delivered for a variety of uses such as domestic, commercial, industrial, thermoelectric, and public uses such as park landscape irrigation. Public supply use is also referred to as Municipal and Industrial (M&I) water use. "Public supply systems" are defined as those which provide water to at least 25 people or 15 connections.

Background on Data Sources. Water use information submitted to the State Engineer for water right permit compliance was the primary source of data utilized by the USGS in their public supply water use estimations. Currently, about 20% of the approximately 300 public supply systems in Nevada are required to submit water withdrawal information to the State Engineer's Office for permit compliance. These systems include over 95% of the total population served by public supply systems. However, the data submitted to the State Engineer do not include details needed to develop a comprehensive picture of public supply water use. Such details include:

- number of persons served by the system;
- deliveries by categories, i.e. domestic, commercial, industrial, thermoelectric;
- consumptive use amounts; and
- estimation of public uses and losses.

In developing their water use figures, the USGS relied on other data sources or estimations for these types of information. Upon review of the USGS estimates, the Division of Water Planning identified some inconsistencies in the data and modified the estimates as appropriate. Both the original USGS estimates and the Division of Water Planning modifications are presented in the appendix.

1995 Public Supply Water Use. More than 90 percent of Nevada's population is currently served by about 300 public supply systems. The percentage of the population that is served by public supply systems varies from county to county (Table 1-1). According to the U.S. Census Bureau, about 92.5% of Nevada's population were served by public supply systems in 1990 with the remaining 7.5% served by domestic wells or other individual water systems. For 1995, the USGS estimated that about 94.2% of the population was supplied by public supply systems.

Table 1-1. Percentage of Population on Public Supply Systems

County	1970	1980	1990
Carson City	86.1	92.2	92.9
Churchill	42.0	48.4	49.1
Clark	94.8	97.1	97.5
Douglas	78.5	81.6	77.1
Elko	80.0	85.2	84.8
Esmeralda	54.2	65.8	68.1
Eureka	60.4	67.3	58.1
Humboldt	71.6	72.0	63.9
Lander	81.5	82.4	77.6
Lincoln	83.7	85.2	77.1
Lyon	58.0	61.4	64.4
Mineral	87.5	90.6	92.5
Nye	72.4	59.0	51.3
Pershing	89.8	72.2	76.7
Storey	99.4	70.9	57.7
Washoe	91.9	93.1	92.5
White Pine	89.8	84.8	75.8
Average	90.7	92.4	92.5

Table 1-2 provides a summary of public supply water use estimates for 1995 (see appendix for more detailed water information). Public supply systems withdrew approximately 525,000 acre-feet (af) in 1995, which is about 13% of the total statewide water withdrawals. Approximately 37% (196,000 af) of the withdrawals were consumptively used by the various users.

While only about 10% of the public supply systems utilize surface water, over 70% of the people on public supply systems receive surface water as some portion of their drinking water supply. As of 1995, about 75% of public supply system withdrawals were surface water. Most of the surface water use is in the Las Vegas area (Colorado River) and the Reno-Sparks and Lake Tahoe areas (Lake Tahoe/Truckee River system).

Table 1-2. Estimated Public Supply Water Use for 1995

Category	Value
Population	
Population served	1,487,640
Percentage of total population	94.2%
Withdrawals (acre-feet)	
Groundwater	131,958
Surface Water	392,903
Total	524,861
Deliveries & public uses/losses (acre-feet)	
Domestic	342,605
Commercial	129,707
Industrial	2,454
Thermoelectric	1,624
Total deliveries	476,388
Public uses and losses	48,473
Total deliveries and public uses and losses	524,861
Consumptive use (acre-feet)	196,444
Water use per person (gallons per person per day)	
Withdrawals per person	315
Domestic deliveries per person	206

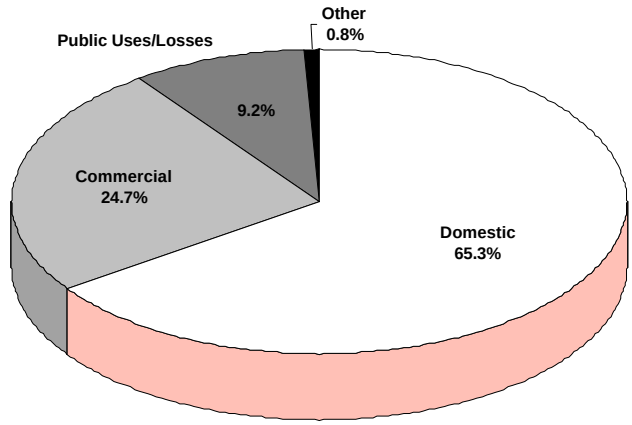
Note: Data are estimates only and subject to revision.

Source: U.S. Geological Survey with modifications by Nevada Division of Water Planning

In 1995, public supply systems delivered approximately 65% (343,000 af) to domestic users, 25% (130,000 af) to commercial users, and 1% (4,000 af) to industrial and thermoelectric users. The remaining 9% (48,000 af) was estimated for public uses (firefighting, street washing, etc.) and losses from the distribution system (Figure 1-1).

Often public supply water use is presented in terms of gallons per person (capita) per day (gpcd). In 1995, Nevada's public supply systems withdrew an average of about 315 gallons each day for each person on these systems. This factor includes all water used for all purposes such as domestic, commercial, industrial, and thermoelectric, and also includes public uses and system losses. Domestic deliveries accounted for about 65% of all water used within the public supply systems, resulting in a residential use factor of 206 gpcd (Table 1-2). Per capita water use tends to vary from county to county and region to region. Nevada's average per capita water use is greatly impacted by Clark County usage rates. Public supply water use in Clark County accounts for over 70% of all public supply usage in Nevada.

Fig. 1-1. 1995 Public Supply Water Uses by Category

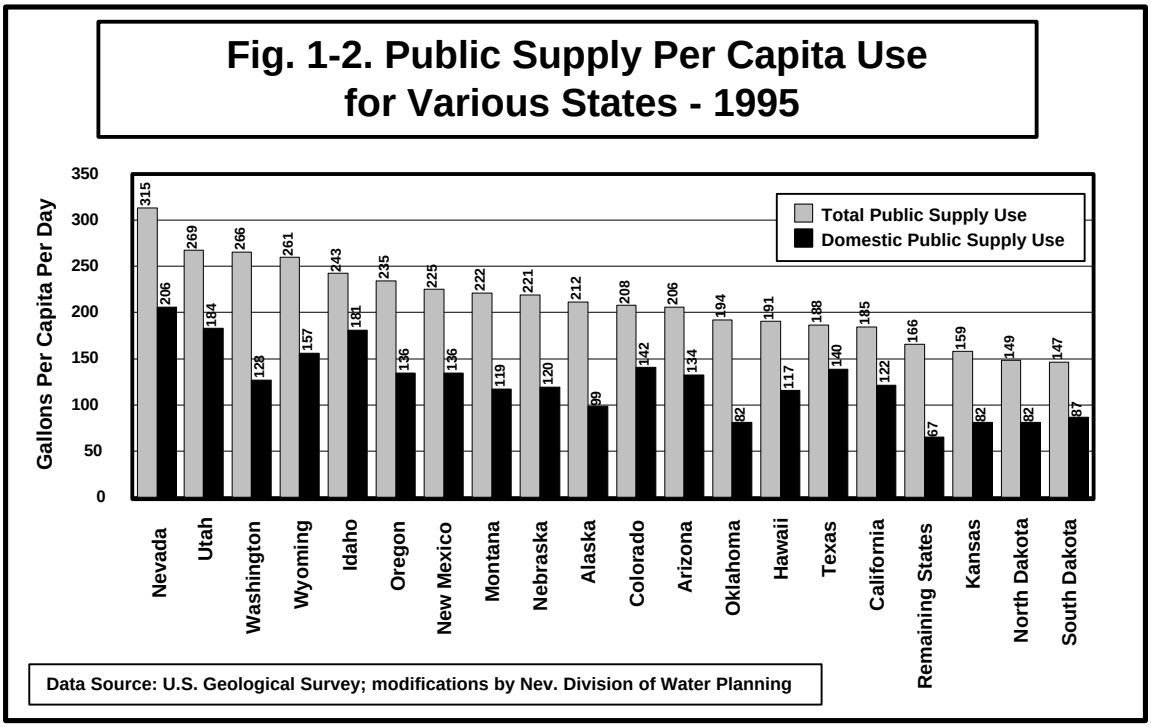


Data Source: U.S. Geological Survey; modifications by Nev. Division of Water Planning

Per capita public supply water use varies from state to state with higher per person water use in the western United States compared to the eastern states. According to USGS estimates for the period 1970-90, Nevada has typically had one of the highest per capita water use rates in the country. Figure 1-2 presents 1995 per capita water use for each of the western states and the remaining states as a whole. In 1995, Nevada had the highest per capita water use (315 gpcd) for all public supply uses and the highest per capita use (206 gpcd) for domestic public supply uses.

There are a few possible explanations for Nevada's high per capita water use. For instance, about 1/3 of the water withdrawn by Nevada public supply systems is used for landscape watering. As Nevada is the driest state in the U.S., more landscape watering is generally required than in other states thereby increasing our increasing our per capita water usage. Another possible explanation is that the public withdrawal amounts estimated by USGS include water used by hotels and casinos, and other tourism-dependent operations. However only the resident population is included in the per capita estimates. The large number of visitors to Nevada result in higher public supply water use and per capita rates.

Public Supply Water Use Trends. As expected, public supply water use has increased as Nevada's population has grown. Public supply withdrawals have increased from approximately



151,000 acre-feet to 525,000 acre-feet from 1970 to 1995 (Table 1-3, Figure 1-3). For the same period, the population served by public supply systems increased from about 441,000 to about 1,488,000. From 1970 to 1990, public supply water use rates in Nevada increased from 306 to 334 gallons per capita per day (gpcd). Successful conservation programs during the 1990s have lowered statewide M&I water use down to 315 gpcd by 1995. A majority of this decrease was due to aggressive conservation in the Las Vegas area. For example, M&I use within the Las Vegas Valley Water District decreased from 358 gpcd in 1989 to 320 gpcd in 1997. Detailed county water use data for 1985-95 are included in the appendices.

Table 1-3. Estimated Public Supply Withdrawals and Consumptive Use, 1970-95

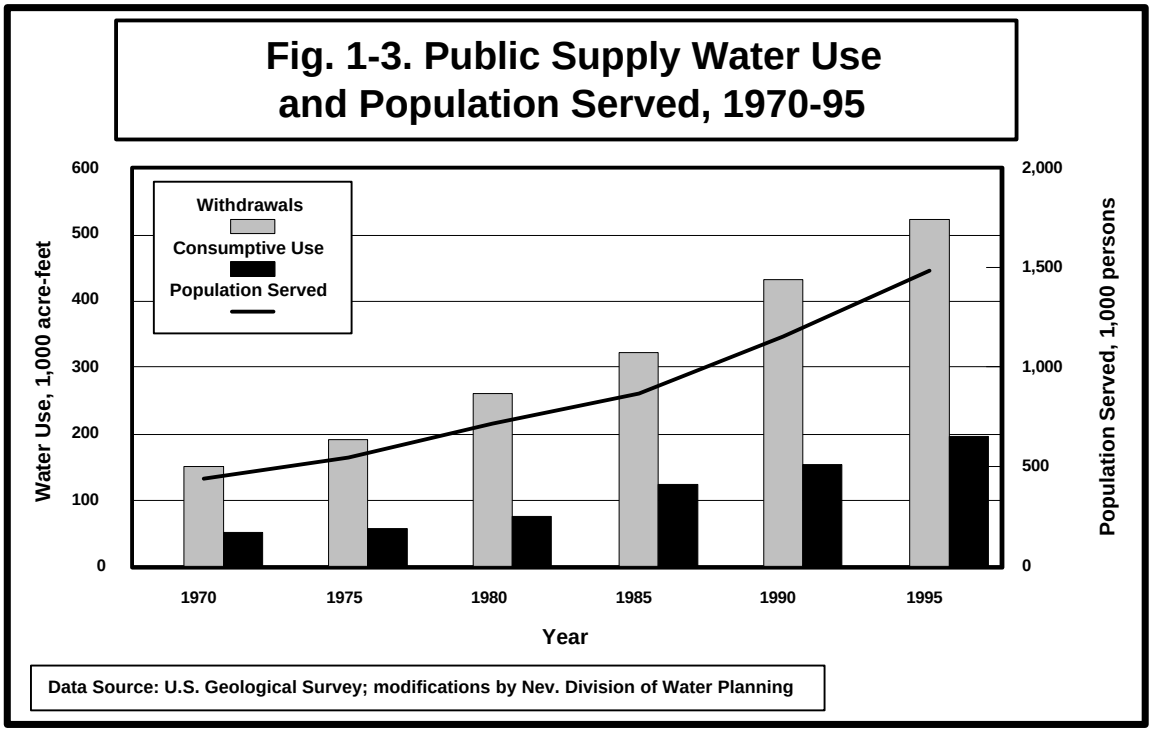
Category	1970	1975	1980	1985	1990	1995
Withdrawals (acre-feet)	151,219	192,664	260,993	322,143	431,322	524,861
Consumptive Use (acre-feet)	51,526	58,247	77,290	123,358	153,321	196,444

Population Served	441,000	545,000	721,000	871,140	1,152,770	1,487,640
% of State Population	90.2%	90.1%	90.1%	91.1%	93.3%	94.2%
Withdrawals Per Person (gpcd)	306	316	323	330	334	315

gpcd = gallons per capita (person) per day
Source: U.S. Geological Survey; modifications by Nev. Division of Water Planning
Note: Data are estimates only and subject to revision

Domestic Water Use

Domestic use refers to water used for household purposes and includes both indoor and outdoor uses, such as drinking, food preparation, bathing, clothes and dish washing, and lawn and garden watering. Domestic water needs are met by either public supply systems or self-supplied systems



(domestic wells, individual pumps, cisterns, etc.).

Background on Data Sources. As described earlier, the major public supply systems submit water withdrawal information to the State Engineer's Office. However, these data are not divided into categories such as domestic, commercial, industrial, and thermoelectric, nor do they include information on the number of persons served. Fortunately, the larger water systems produce planning documents that provide these types of details. The USGS relies primarily on these planning documents and other available reports to analyze the domestic use portion of the total public supply use. For those smaller public supply systems lacking detailed water use reports, the USGS estimates the domestic use portion based upon factors developed for larger systems in the same region. Populations served by public supply systems are estimated based upon the available water planning documents.

Measurements of self-supplied domestic use are limited and, thus estimation is required for most values. As part of the National Water Use Information Program, the USGS estimates self-supplied domestic use by assuming a water use rate of approximately 120 gallons per person per day. A higher value is deemed to be more appropriate. For the *State Water Plan*, self-supplied domestic use for each county is assumed at 90 percent of county public-supplied domestic use. By multiplying these per person water use rates and the number of persons on private domestic systems, total self-supplied domestic water usages are estimated. The number of person on private domestic systems are estimated by subtracting the population served by public systems from total county populations.

1995 Domestic Water Use. Table 1-4 presents a summary of domestic water use estimates for 1995 as developed by the USGS and modified by the Division of Water Planning (see the appendices for more detailed estimates). In 1995, domestic use withdrawals were approximately 361,000 acre-feet with 50% (180,000 acre-feet) of this amount consumed. Domestic water withdrawals accounts for about 9% of the 1995 state total water withdrawals.

In 1995, the domestic water needs of 94.2% of Nevada's population (1,488,000) were met with public supply systems. Self-supplied systems provided domestic water for the other 5.8% (92,000). Over 96% (343,000 acre-feet) of the water needed for domestic purposes was delivered by public supply systems. Domestic self-supplied systems withdrew about 18,000 acre-feet in 1995, with groundwater being the primary source.

Table 1-4. Estimated Domestic Water Use for 1995

	Self-Supplied Domestic	Public-Supplied Domestic	All Domestic Combined
Population served	91,510	1,487,640	1,579,150
% of total population	5.8%	94.2%	100.0%
Withdrawals or deliveries, acre-feet			
Groundwater	17,783	86,303 *	104,086*
Surface water	321	256,302 *	256,623*
Total	18,105	342,605	360,710
Consumptive Use, acre-feet	9,022	171,015	180,037
Water use per person (gallons per person per day)	177	206	204

* Estimated by Nevada Division of Water Planning
Source: U.S. Geological Survey with modifications by Nevada Division of Water Planning
Note: Data are estimates only and subject to revision.

Domestic Water Use Trends. Domestic water use has increased over the years in response to the growing population. From 1970 to 1995, domestic water use increased from about 117,000 acre-feet to about 361,000 acre-feet (Table 1-5, Figure 1-4). Nevada's population increased from about 489,000 to about 1,579,000 during the same period, with the percentage of people served by public supply systems increasing from about 90% to 94% of the total population. Refer to the appendices

for detailed county water use data for 1985-95.

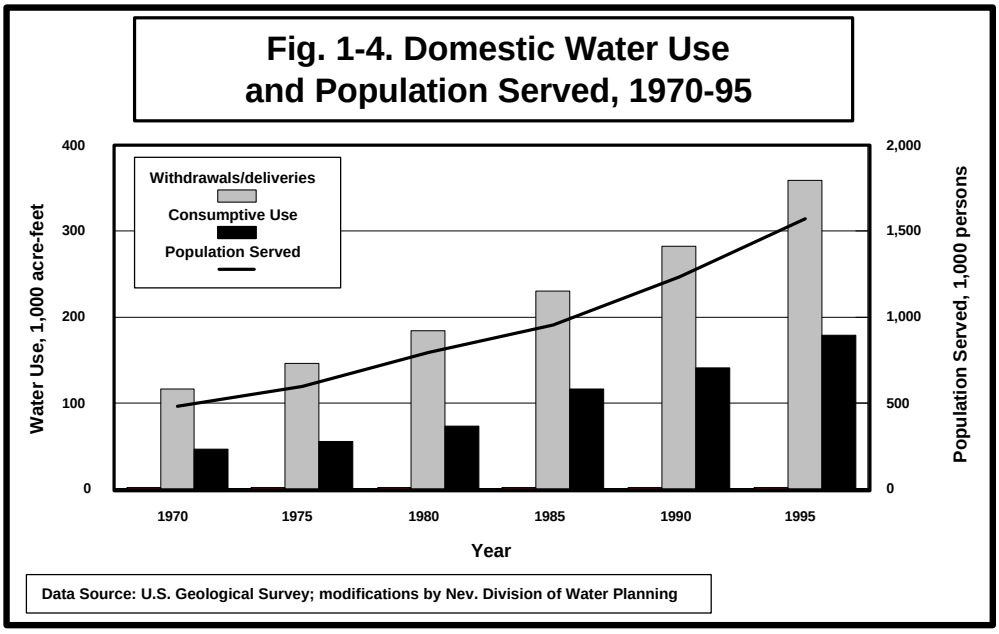
Table 1-5. Estimated Domestic Withdrawals and Consumptive Use, 1970-95

Category	1970	1975	1980	1985	1990	1995
Self-Supplied Domestic						
Withdrawals, acre-feet	10,200	13,400	16,500	19,673	16,668	18,105
Consumptive Use, acre-feet	5,100	6,700	8,250	10,092	8,385	9,022
Population Served	47,700 *	60,000 *	79,500 *	84,670	83,360	91,510
% of Total Population	9.8%	9.9%	9.9%	8.9%	6.7%	5.8%
Withdrawals Per Person, gpcd	190 *	200 *	185 *	207	179	177
Public-Supplied Domestic						
Deliveries, acre-feet	106,400 **	134,400 **	168,000 **	211,896	266,906	342,605
Consumptive Use, acre-feet	43,000 *	49,000 *	65,000 *	107,129	133,442	171,015
Population Served	441,000	545,000	721,000	871,140	1,152,770	1,487,640
% of Total Population	90.2%	90.1%	90.1%	91.1%	93.3%	94.2%
Withdrawals Per Person, gpcd	215	220	208	217	207	206
All Domestic Combined						
Withdrawals/deliveries, acre-feet	116,600 **	147,800 **	184,500 **	231,569	283,574	360,710
Consumptive Use, acre-feet	48,100 *	55,700 *	73,250 *	117,221	141,827	180,037
Population Served	488,700 *	605,000 *	800,500 *	955,810	1,236,130	1,579,150
Withdrawals Per Person, gpcd	213 *	218 *	206 *	216	205	204

* Data not available from USGS. Estimated by NDWP.
** Includes public uses & losses.
gpcd = gallons per capita (person) per day
Source: U.S. Geological Survey; modifications by Nev. Division of Water Planning
Note: Data are estimates only and subject to revision.

Commercial Water Use

Commercial use includes water for casinos, motels, restaurants, office buildings, campgrounds, other commercial facilities, and civilian and military institutions. Commercial water needs are met by



either public supply systems (community water systems) or self-supplied systems (non-community systems).

Background on Data Sources. In quantifying a portion of the public-supplied commercial water use, the USGS has relied upon reports produced by the larger public supply systems. For those smaller systems lacking detailed water use reports, the USGS estimated public-supplied commercial water use with factors developed for the larger public supply systems and other factors (such as water use per employee estimates).

There are about 400 self-supplied water systems in Nevada which provide water for casinos, motels, campgrounds and other commercial facilities. In general, the USGS applies various use factors to estimate water use by these systems thereby quantifying self-supplied commercial usage. The USGS also uses available water use information collected by the State Enginer's Office. None of the USGS estimates were modified by the Nevada Division of Water Planning.

1995 Commercial Water Use. Table 1-6 provides a summary of 1995 commercial water use estimates as developed by the USGS (see appendix for more detailed estimates). In 1995, about 153,000 acre-feet was used for commercial purposes, with about 17% (26,000 acre-feet) of these withdrawals being consumed. Commercial water use accounts for 4% of the state total. About 85% (130,000 acre-feet) of the water needed for commercial operations in 1995 was delivered by public supply systems. The remaining 15% (23,000 acre-feet) was provided by self-supplied systems. Surface water was the principal source for self-supplied water furnishing about 66% (16,000 acre-feet) of the self-supplied withdrawals.

Table 1-6. Estimated Commercial Water Use for 1995

	Self-Supplied Commercial	Public-Supplied Commercial	All Commercial Combined
Withdrawals or deliveries, acre-feet			
Groundwater	7,919	32,674 *	40,593 *
Surface water	15,559	97,033 *	112,592 *
Total	23,477	129,707	153,184
Consumptive Use, acre-feet	3,193	23,268	26,461

* Estimated by the Nevada Division of Water Planning
Source: U.S. Geological Survey
Note: Data are estimates only and subject to revision.

Commercial Water Use Trends. Commercial water use has increased from about 69,000 acre-feet to about 153,000 acre-feet during the period 1985 to 1995 (Table 1-7). Commercial water use trends cannot be established for previous years. Prior to 1985, the USGS had not provided water use estimates for commercial purposes as a separate category but rather commercial usage was aggregated under other uses. Refer to the appendices for detailed county water use data for 1985-95.

Table 1-7. Estimated Commercial Withdrawals and Consumptive Use, 1985-95

Category	1985	1990	1995
Self-Supplied Commercial			
Withdrawals (acre-feet)	8,287	25,426	23,477
Consumptive Use (acre-feet)	1,669	3,583	3,193
Public-Supplied Commercial			
Deliveries (acre-feet)	60,340	100,218	129,707
Consumptive Use (acre-feet)	12,096	18,401	23,268
All Commercial Combined			
Withdrawals/deliveries (acre-feet)	68,627	125,644	153,184
Consumptive Use (acre-feet)	13,765	21,984	26,461

Source: U.S. Geological Survey
Note: Data are estimates only and subject to revision.

Industrial Water Use

Industrial use includes water for manufacturing and construction. Industrial water needs are met by either public supply systems or self-supplied systems.

Background on Data Sources. To estimate industrial water usage, the USGS utilizes data obtained from water-supply companies, and Nevada Division of Water Resources pumpage records. However, these data generally cover only a portion of the industrial water use. Also, few public supply systems record industrial and commercial use as two separate categories. Due to the lack of data, the USGS estimates much of the industrial usage in Nevada. None of the USGS estimates were modified by the Nevada Division of Water Planning.

1995 Industrial Water Use. Industrial water use estimates for 1995 are shown in Table 1-8 (see the appendices for more detailed estimates). In 1995, approximately 19,000 acre-feet were used for industrial purposes with about 29% (5,000 acre-feet) being consumed. Industrial water withdrawals account for 0.5% of the state total. About 87% (17,000 acre-feet) of the water used for industrial purposes was furnished by self-supplied systems, with the other 13% provided by public supply systems. The self-supplied systems withdrew almost equal amounts of surface water and groundwater during 1995.

Table 1-8. Estimated Industrial Water Use for 1995

	Self-Supplied Industrial	Public-Supplied Industrial	All Industrial Combined
Withdrawals or deliveries, acre-feet			
Groundwater	8,322	618 *	8,940 *
Surface water	8,446	1,836 *	10,282 *
Total	16,768	2,454	19,222
Consumptive Use, acre-feet	4,952	537	5,489

* Estimated by the Nevada Division of Water Planning

Source: U.S. Geological Survey

Note: Data are estimates only and subject to revision.

Industrial Water Use Trends. Total industrial water use changed little during the period 1985 to 1995 (Table 1-9). Industrial water use trends cannot be established for previous years. Prior to 1985, the USGS did not separate out water use estimates for industrial purposes, rather industrial usage was aggregated with other uses. Refer to the appendices for detailed county water use data for 1985-95.

Table 1-9. Estimated Industrial Withdrawals and Consumptive Use, 1985-95

Category	1985	1990	1995
Self-Supplied Industrial			
Withdrawals (acre-feet)	11,369	11,437	16,768
Consumptive Use (acre-feet)	2,139	2,228	4,952
Public-Supplied Industrial			
Deliveries (acre-feet)	7,057	2,946	2,454
Consumptive Use (acre-feet)	1,411	582	537
All Industrial Combined			
Withdrawals/deliveries (acre-feet)	18,426	14,383	19,222
Consumptive Use (acre-feet)	3,550	2,810	5,489

Source: U.S. Geological Survey

Note: Data are estimates only and subject to revision.

Thermoelectric Water Use

Thermoelectric use includes water used in the production of electric power generation from fossil fuel and geothermal sources. Nevada has 22 thermoelectric powerplants, seven of which are fossil fueled and 15 are geothermal.

Background on Data Sources. Thermoelectric water use data, as compiled by the USGS, were obtained directly from the power plants, State Engineer's records and/or estimated. No modifications were performed by the Nevada Division of Water Planning.

1995 Thermoelectric Water Use. Thermoelectric water use estimates for 1995 are shown in

Table 1-10 (see the appendices for detailed county estimates). In 1995 approximately 65,000 acre-feet were used for thermoelectric power generation with about 63% (41,000 acre-feet) being consumed. Thermoelectric water withdrawals accounts for 2% of the state total. The USGS estimated that Nevada's thermoelectric plants generated about 19 billion kilowatt-hours in 1995.

Table 1-10. Estimated Thermoelectric Water Use for 1995

	Self-Supplied Thermoelectric	Public-Supplied Thermoelectric	All Thermoelectric Combined
Withdrawals or deliveries, acre-feet			
Groundwater	40,650	409 *	41,059 *
Surface water	23,176	1,215 *	24,391 *
Total	63,825	1,624	65,449
Consumptive Use, acre-feet	39,429	1,624	41,053

* Estimated by the Nevada Division of Water Planning
Source: U.S. Geological Survey
Note: Data are estimates only and subject to revision.

Over 97% (about 64,000 acre-feet) of the water needed for thermoelectric operations in 1995 was furnished by self-supplied systems. The remaining 2,000 acre-feet was provided by public supply water systems. Groundwater was the primary source for self-supplied water furnishing about 64% (41,000 acre-feet) of the self-supplied withdrawals.

Thermoelectric Water Use Trends. Total thermoelectric water withdrawals have more than doubled from 1985 to 1995 increasing from about 29,000 acre-feet to 65,000 acre-feet (Table 1-11). Over the 10 year period, public supply systems provided a minor portion of the total thermoelectric water used. Usage trends cannot be presented for previous years. Prior to 1985, the USGS did not compile water use estimates for all thermoelectric purposes as a separate category.

Table 1-11. Estimated Thermoelectric Withdrawals and Consumptive Use, 1985-95

Category	1985	1990	1995
Self-Supplied Thermoelectric			
Withdrawals (acre-feet)	26,278	74,019	63,825
Consumptive Use (acre-feet)	23,668	49,298	39,429
Public-Supplied Thermoelectric			
Deliveries (acre-feet)	2,722	896	1,624
Consumptive Use (acre-feet)	2,744	896	1,624
All Thermoelectric Combined			
Withdrawals/deliveries (acre-feet)	29,022	74,915	65,449
Consumptive Use (acre-feet)	26,390	50,194	41,053

Source: U.S. Geological Survey
Note: Data are estimates only and subject to revision.

Mining Water Use

Mining use refers to water used in the extraction, milling, and processing of naturally occurring minerals (including petroleum), and other activities that are part of mining, such as dust control. Minerals mined in Nevada can be divided into two categories: metals and industrial minerals. Metals mined in Nevada include gold, silver, lead, zinc, molybdenum and copper. Mined industrial minerals include aggregate, barite, clay, gypsum, lime, diatomite, lithium carbonate, magnesite and silica. Water use varies widely from operation to operation and is dependent upon the mineral being recovered and the recovery process employed.

Background on Data Sources. In developing mining water use estimates for Nevada, the USGS relies upon pumpage data available from the Nevada Division of Water Resources and prepares estimates where data gaps exist. Prior to 1985, the USGS did not have a separate estimate for mining water use.

Many mines operate dewatering systems to maintain dry conditions as ore and other materials are removed. Under the USGS National Water Use Information Program, any water removed for mine dewatering that is not consumptively used in the mine operations is not included in the withdrawal figures. However in Nevada, mine dewatering represents a significant share of total water withdrawals and may impact the amount of water available for other uses. Therefore, mine dewatering needs to be considered in any planning effort. For this reason, the Division of Water Planning modified the USGS water use estimates to include all dewatering withdrawals. Utilizing the State Engineer's pumpage records for 1990 and 1995, the Division calculated the nonconsumptive use portion of the withdrawals. The mine dewatering figures include water that is reinjected into the groundwater, utilized for another use such as irrigation, or discharged. The nonconsumptive use dewatering values were added to the USGS consumptive use figures to arrive at total mining water withdrawals. Adjustments were not made to the USGS estimates for 1985 as no pumpage data are available from the State Engineer's Office for that year.

1995 Mining Water Use. Mining water use estimates for 1995 are shown on Table 1-12 (see the appendices for more detailed estimates). Of the estimated 274,000 acre-feet per year withdrawn in 1995, approximately 89,000 acre-feet per year (about 32%) was consumptively used by mining operations. The remaining 68% (185,000) was reinjected, infiltrated, evaporated, discharged to surface water bodies, or used for irrigation purposes. In some areas, mine dewatering discharges are being used for irrigation as a substitute for pumped water from irrigation wells. In these instances, the irrigation operation is temporarily using the mine dewatering discharge rather than pumping its own permitted groundwater wells.

Mine water withdrawals accounted for about 7% of the total state water withdrawals. A majority of statewide mine water withdrawals occur in the Humboldt River basin. In 1995, mine water withdrawals in the Humboldt River basin accounted for about 70% of the state total mine water withdrawals.

Table 1-12. Estimated Mining Water Use for 1995

Use Category	Use, acre-feet
Withdrawals	
Groundwater	270,524
Surface water	3,909
Total	274,433
Consumptive Use	89,163
Nonconsumptive Use	185,270

Source: U.S. Geological Survey with modifications by Nev. Division of Water Planning

Note: Data are estimates only and subject to revision.

Mining Water Use Trends. Mining water use has changed significantly since 1985. According to Table 1-13, total mining withdrawals have increased by a factor of 10 from 1985 to 1995 with consumptive uses increasing by a factor of 4. A majority of this increase is attributable to an increase in mining activities within the Humboldt River basin. Mining water use trends cannot be established for previous years. Prior to 1985, the USGS did not compile water use estimates for mining as a separate category. Refer to the appendix for detailed county water use data for 1985-95.

Table 1-13. Estimated Mining Withdrawals and Consumptive Use, 1985-95

Category	1985	1990	1995
Withdrawals (acre-feet)	27,309	120,124	274,433
Consumptive Use (acre-feet)	22,469	67,858	89,163
Nonconsumptive Use (acre-feet)	4,840	52,266	185,270

Source: U.S. Geological Survey: modifications by Nevada Division of Water Planning
Note: Data are estimates only and subject to revision.

Irrigation Water Use

Irrigation use, as classified by the USGS for the National Water Use Information Program, refers to water withdrawn and applied to lands to grow crops and pasture as well as self-supplied water used to irrigate golf courses and parks. Under this category, water for irrigation is self-supplied or supplied by irrigation companies or districts. The amount of self-supplied water used for golf course and park irrigation is minor compared to the agricultural irrigation use and could not be presented as a separate category due to data limitations. Landscape watering from a public supply water system is not included in the *irrigation use* category, but rather in the public supply category. The main field crops grown in Nevada include alfalfa and other hay, alfalfa seed, winter and spring wheat, potatoes, garlic and onions. These crops account for about 70% of the total irrigated acreage. In addition to harvested field crops, about 30% of the irrigated acreage in Nevada is pasture.

Background on Data Sources. Although irrigation is the largest use of water in Nevada, only limited irrigation measurements are available. The measured data that do exist must be obtained from a variety of sources which sometimes contain conflicting information.

For those areas of Nevada lacking measured water use data, the USGS typically estimates irrigation water use as follows:

- compile estimates of irrigated land by crop type and irrigation method (flood, sprinkler);

- develop consumptive use factors (acre-feet used per acre) and irrigation efficiency coefficients (ranging from 0.0 [least efficient] to 1.0 [most efficient]); and

- develop consumptive use and withdrawal estimates by applying the above factors to the irrigated acreage values.

The USGS staff has used a variety of data sources to develop irrigation water use estimates. Irrigated acreage estimates were generally derived from Nevada Division of Water Resources crop and pumpage inventories, data obtained from irrigation districts, other USGS project reports, some satellite imagery, the *Census of Agriculture* developed by the U.S. Census Bureau every 4 to 5 years, (however periods do not necessarily coincide with the USGS estimates), and the *Nevada Agricultural Statistics* published annually by the Nevada Agricultural Statistics Service (reports harvested crops only which accounts for about 70% of irrigated land). Consumptive use rates for different areas of the State and various crops were obtained from the U.S. Natural Resources Conservation Service; and irrigation efficiency factors were developed from available information and literature. The following general equations were utilized by the USGS to estimate consumptive use and withdrawals:

consumptive use (acre-feet) = irrigated acreage (acres) x consumptive use factor (acre-feet/acre)

withdrawals (acre-feet) = consumptive use (acre-feet) / irrigation efficiency coefficient

With the exception of the 1995 data, the USGS irrigation water use estimates for the previous years were utilized for the *State Water Plan*. The original 1995 data showed a significant drop in irrigated acreage and water use from 1985/90 to 1995 which was not consistent with data presented in the *Nevada Agricultural Statistics* reports. Therefore, the Division of Water Planning modified the 1995 estimates for inclusion in the *Plan*.

According to the USGS, the 1995 acreage estimates were based upon the 1992 U.S. Agriculture Census which indicated a sharp decline in irrigated land as a result of the drought. Also, the consumptive use factors utilized for the 1995 estimates were generally lower than those used for the previous 1985/90 estimates. For the *State Water Plan*, the Division of Water Planning developed new 1995 irrigated acreage estimates based upon *Nevada Agricultural Statistics* data. As the *Nevada Agricultural Statistics* reports only harvested hay acreages by county (which accounts for only about 70% of the total irrigated acreage), these data were adjusted as needed to include all irrigated lands. Consumptive use and withdrawal amounts were then developed by utilizing use consumptive use factors and efficiency coefficients more consistent with the 1985 and 1990 estimates. A detailed explanation of this methodology is presented in the appendix.

Irrigation water use in Nevada can be extremely variable from year to year in response to water availability. During periods of drought, irrigated acreage and water use typically decline or groundwater use may increase to augment reduced surface supplies. It must be emphasized that the USGS water use estimates are developed only every 5 years and as such these estimates do not accurately reflect the annual variations in irrigation water use.

1995 Irrigation Water Use. Table 1-14 provides a summary of 1995 irrigation water use estimates (see appendix for more detailed estimates). In 1995 about 3.1 million acre-feet were withdrawn for irrigation purposes, of which about 1.6 million acre-feet were consumed. Irrigation water withdrawals accounted for 77% of the 1995 total state withdrawals.

Table 1-14. Estimated Irrigation Water Use for 1995

Category	Value
Withdrawals, acre-feet	
Groundwater	1,138,184
Surface water	1,975,401
Total	3,113,585
Consumptive use, acre-feet	1,612,079
Irrigated Land, acres	
Sprinkler	175,284
Flood	540,156
Total	715,440

Source: U.S. Geological Survey with modifications by Nevada Division of Water Planning
Note: Data are estimates only and subject to revision.

It is estimated that about 63% of the total water withdrawn in 1995 was diverted from surface water sources with the remaining 37% produced from groundwater sources. Flood irrigation was used for about 75% of the approximate 715,000 acres irrigated, with sprinklers used for the other 25%. The average amount of water withdrawn for irrigation was about 4.4 acre-feet per irrigated acre (which includes conveyance losses). Consumptive use averages about 1/2 that amount, or 2.3 acre-feet per irrigated acre.

Irrigation Water Use Trends. USGS estimates (with 1995 Division of Water Planning modifications) show that irrigated acreage and water use decreased during the period 1970 to 1995 (Table 1-15, Figure 1-5). Due to the uncertainty with the data, it is unknown if this decrease is indicative of any statewide trend or is merely an artifact of the estimation process.

Table 1-15. Estimated Irrigation Withdrawals and Consumptive Use, 1970-95

Category	1970	1975	1980	1985	1990	1995
Withdrawals (acre-feet)	3,400,000	3,500,000	3,500,000	3,750,000	3,161,000	3,114,000
Consumptive Use (acre-feet)	1,600,000	1,700,000	1,700,000	1,934,000	1,634,000	1,613,000
Irrigated Land (acres)	830,000	860,000	850,000	844,000	729,000	715,000

Source: U.S. Geological Survey; 1995 USGS estimates modified by Nevada Division of Water Planning
Note: Data are estimates only and subject to revision.

Other data sources for the amount of historically irrigated lands include the U.S. Census and the *Nevada Agricultural Statistics*. U.S. Census data show that irrigated acreage fluctuated during the period 1959 to 1992 (Figure 1-6) varying from lows of about 550,000 acres in 1959 and 1992 (both dry years) to a high of 881,000 acres in 1978. Data published in *Nevada Agricultural Statistics* reports indicates that the amount of harvested cropland has fluctuated widely during the 1960 to
1995 period (Figure 1-7). The amount of harvested cropland peaked at just over 600,000 acres during the early 1980s. According to the U.S. Census data, harvested cropland accounts for about 70% of the total irrigated land in Nevada.

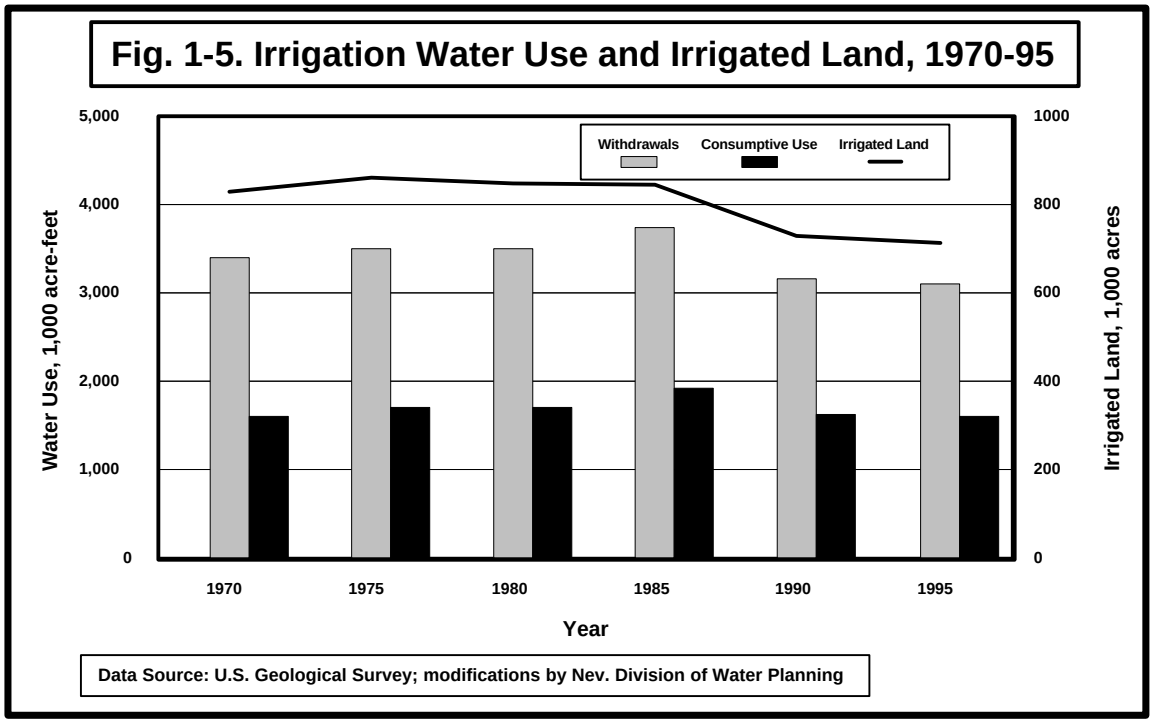


Fig. 1-5. Irrigation Water Use and Irrigated Land, 1970-95
Withdrawals
Consumptive Use
Irrigated Land
Water Use, 1,000 acre-feet
Irrigated Land, 1,000 acres
5,000
4,000
3,000
2,000
1,000
0
1000
800
600
400
200
0
1970
1975
1980
1985
1990
1995
Year
Data Source: U.S. Geological Survey; modifications by Nev. Division of Water Planning

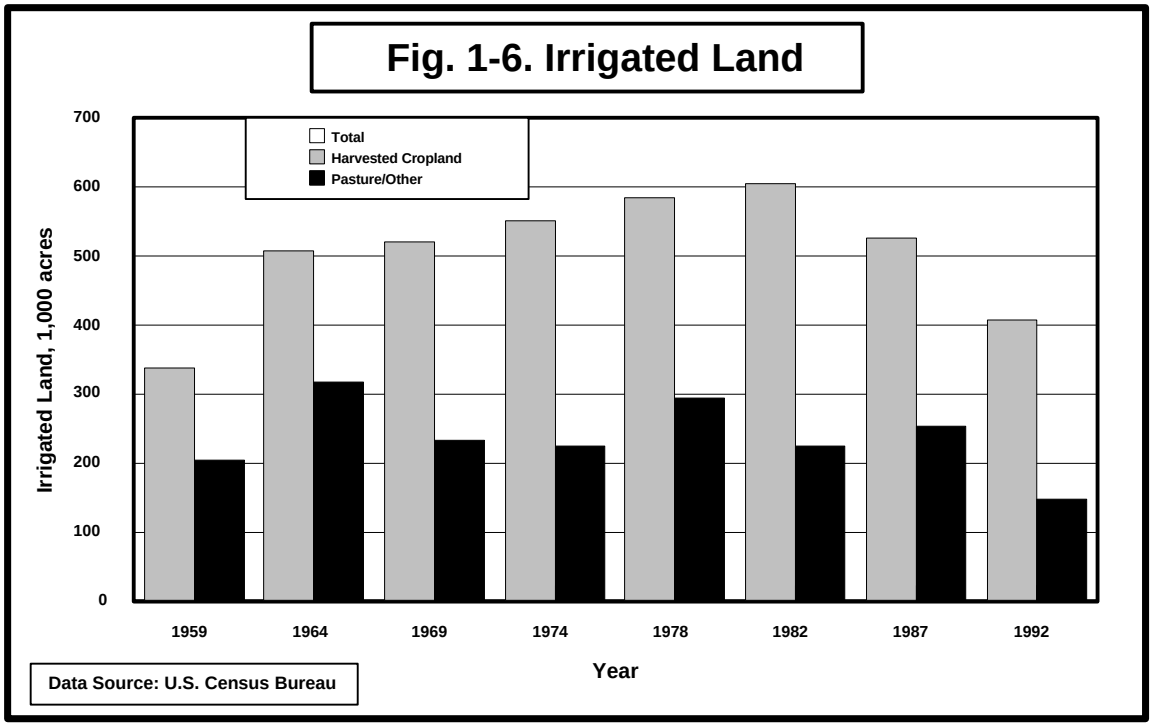
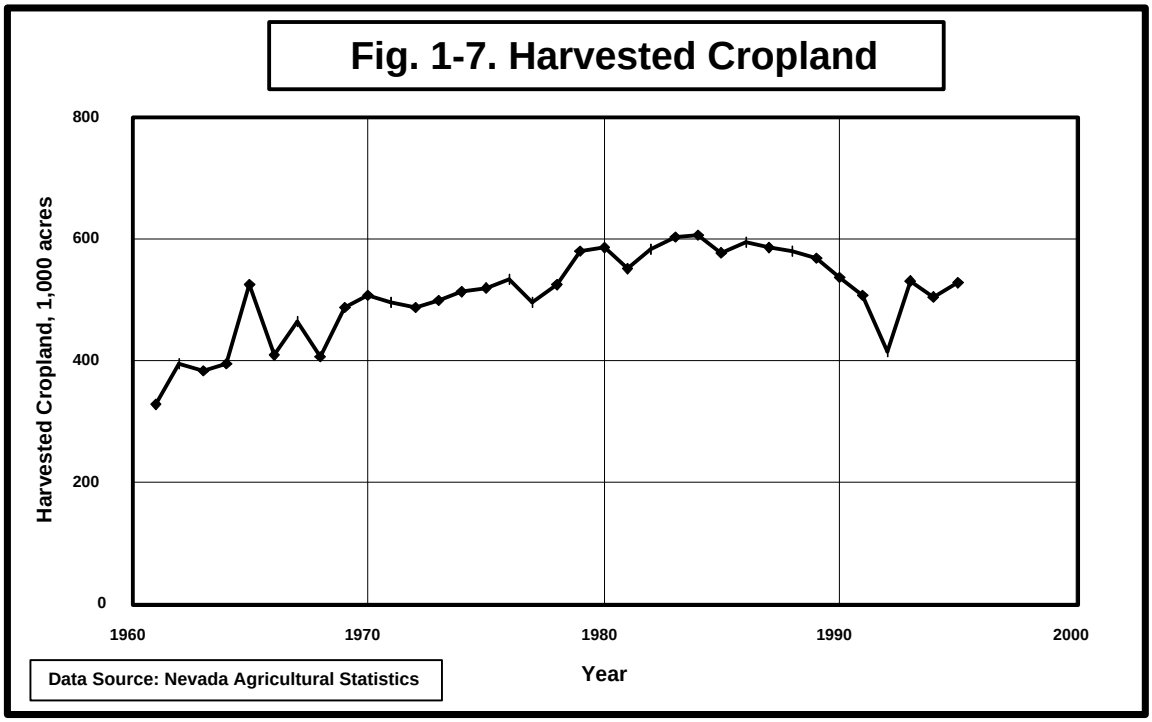


Fig. 1-6. Irrigated Land
Total
Harvested Cropland
Pasture/Other
Irrigated Land, 1,000 acres
700
600
500
400
300
200
100
0
1959
1964
1969
1974
1978
1982
1987
1992
Year
Data Source: U.S. Census Bureau



Livestock Water Use

Livestock use refers to water used for stock watering, feed lots, dairy operations, and other on-farm needs. Cattle are the major livestock raised in Nevada with most grazed on open range. Other livestock include sheep, horses and hogs.

Background on Data Sources. Several sources are used by the USGS in deriving livestock water use estimates. Livestock population estimates are compiled from a number of agencies such as the Nevada Department of Agriculture, U.S. Bureau of Census, and U.S. Bureau of Land Management. Assumed water use rates per animal are applied to the population counts to estimate water use. None of the USGS estimates were modified by the Division of Water Planning.

Table 1-16. Estimated Livestock Water Use for 1995

Category	Value
Withdrawals, acre-feet	
Groundwater	1,119
Surface water	5,210
Total	6,329
Consumptive Use, acre-feet	2,319

Source: U.S. Geological Survey
Note: Data are estimates only and subject to revision

1995 Livestock Water Use. Table 1-16 provides a summary of 1995 livestock water use estimates (see appendix for more detailed estimates). In 1995 about 6,000 acre-feet was withdrawn for livestock purposes, of which about 2,000 acre-feet was consumed. About 80% of the total water withdrawn in 1995 was diverted from surface water sources. Livestock water withdrawals accounted for about 0.2% of the 1995 total state use.

Livestock Water Use Trends. USGS estimates for 1970-95 shows wide fluctuations in

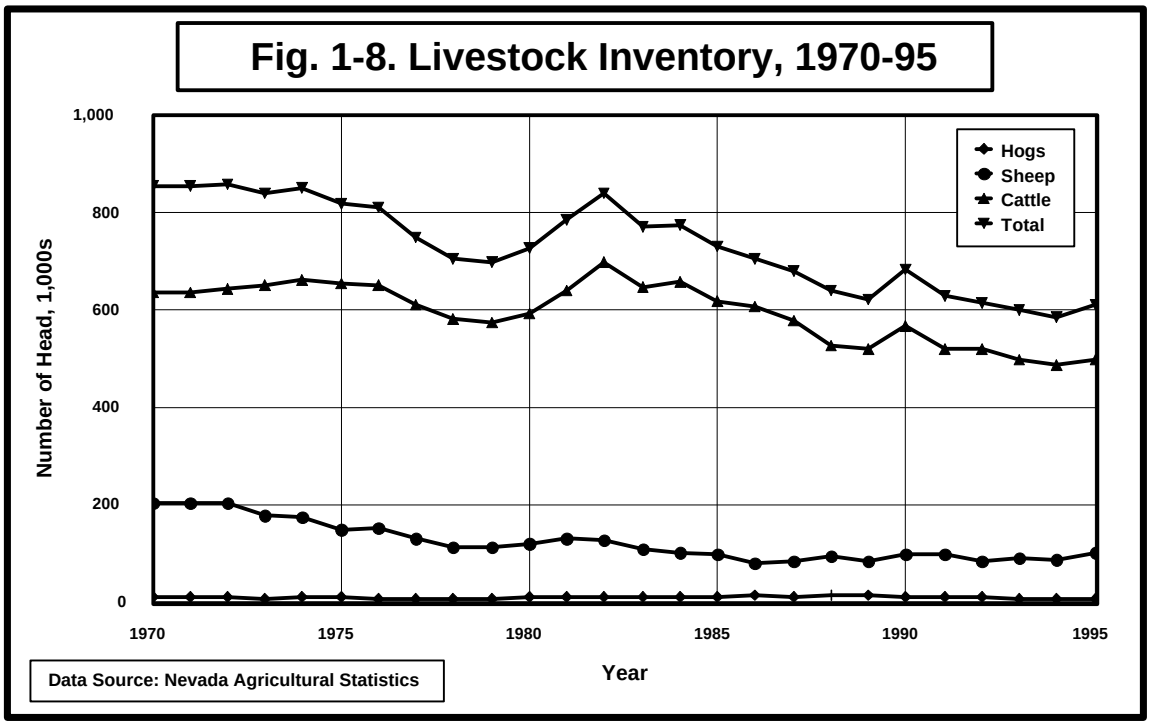
statewide livestock water use (Table 1-17). The variations in the data may be the result of inconsistent estimation techniques from year to year. As a result, these data may not be suitable as a basis for evaluating past water use trends. The *Nevada Agricultural Statistics* reports are an alternative data source for examining livestock trends. According to the *Nevada Agricultural Statistics*, during the 1970 to 1995 period there was a general decline in the number of head of cattle, sheep and hogs from about 850,000 to about 600,000 (Figure 1-8).

Table 1-17. Estimated Livestock Withdrawals and Consumptive Use, 1970-95

Category	1970	1975	1980	1985	1990	1995
Withdrawals (acre-feet)	4,900	13,400	13,400	29,100	6,300	6,300
Consumptive Use (acre-feet)	2,400	9,900	10,000	7,400	2,300	2,300

Source: U.S. Geological Survey

Note: Data are estimates only and subject to revision

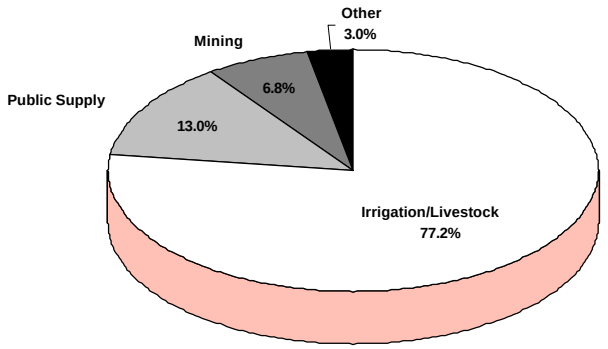


Water Use Summary

Statewide water use for the period 1970 to 1995 is summarized in two different forms in the following tables and figures. Tables 1-18 and 1-19, and Figure 1-9 presents water use divided into two major categories - public supply uses and self-supplied uses. Table 1-20 and 1-21, and Figure 1-10 provides a water use breakdown by type of use regardless of water supplier.

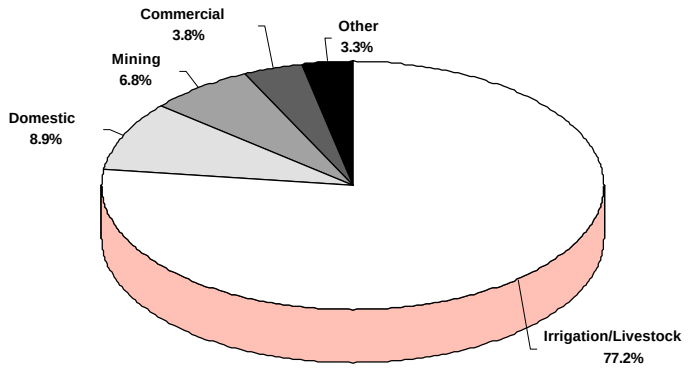
Over the last 20 years, statewide water withdrawals in Nevada have been about 4 million acre-feet per year, with a little under 2 million acre-feet consumptively used. In 1995, about 60 percent of the withdrawals were from surface water sources. Irrigation has historically been the largest water use in Nevada varying from about 80 percent to 90 percent of the total statewide water withdrawals and consumptive use. In 1995, irrigation use accounted for about 77 percent of the total state withdrawals. Variations in irrigation water use are primarily the result of Nevada's variable weather and streamflow conditions.

Fig. 1-9. 1995 Statewide Water Withdrawals by Public Supply and Self-Supplied Uses



Data Source: U.S. Geological Survey; modifications by Nev. Division of Water Planning

Fig. 1-10. 1995 Statewide Water Withdrawals by Type of Use



Data Source: U.S. Geological Survey; modifications by Nev. Division of Water Planning

Overall, the total statewide water use has changed little since 1970, however, there have been some significant changes within certain use sectors. The most significant changes have occurred with "Public Supply" and "Mining" water uses. Public supply water use has more than tripled since 1970 in response to Nevada's ever increasing population. Mining water use has experienced a significant increase since 1985 mostly as a result of increased mining activity in the Humboldt River basin.

Table 1-18. Summary of Estimated Statewide Water Use (1970-95) Grouped by Public Supply and Self-Supplied Uses (in acre-feet)

Water Use Category		1970	1975	1980	1985	1990	1995
Public Supply							
Domestic	Withdrawals	106,400	134,400	168,000	211,900	266,900	342,600
	Consumptive Use	43,000	49,000	65,000	107,100	133,400	171,000
Commercial [1]	Withdrawals				60,300	100,200	129,700
	Consumptive Use				12,100	18,400	23,300
Industrial [1]	Withdrawals	44,800	58,300	93,000	7,100	2,900	2,500
	Consumptive Use	8,500	9,200	12,300	1,400	600	500
Thermoelectric [1]	Withdrawals				2,700	900	1,600
	Consumptive Use				2,700	900	1,600
Public Uses and Losses [1]	Withdrawals	Included in "Public Supply - Domestic" Category			40,100	60,400	48,500
	Consumptive Use				0	0	0
Total Public Supply	Withdrawals	151,200	192,700	261,000	322,100	431,300	524,900
	Consumptive Use	51,500	58,200	77,300	123,400	153,300	196,400
Self-Supplied							
Domestic	Withdrawals	10,200	13,400	16,500	19,700	16,700	18,100
	Consumptive Use	5,100	6,700	8,300	10,100	8,400	9,000
Commercial [1]	Withdrawals				8,300	25,400	23,500
	Consumptive Use				1,700	3,600	3,200
Industrial [1]	Withdrawals				11,400	11,400	16,800
	Consumptive Use	150,000	260,000	270,000	2,100	2,200	5,000
Thermoelectric [1]	Withdrawals	55,000	80,000	95,000	26,300	74,000	63,800
	Consumptive Use				23,700	49,300	39,400
Mining [1]	Withdrawals				27,300	120,100	274,400
	Consumptive Use				22,500	67,900	89,200
Irrigation	Withdrawals	3,400,000	3,500,000	3,500,000	3,750,000	3,160,700	3,113,600
	Consumptive Use	1,600,000	1,700,000	1,700,000	1,934,000	1,633,800	1,612,100
Livestock	Withdrawals	4,900	13,400	13,400	29,100	6,300	6,300
	Consumptive Use	2,400	9,900	10,000	7,400	2,300	2,300
Total							
	Withdrawals	3,716,300	3,979,500	4,060,900	4,194,100	3,846,000	4,041,400
	Consumptive Use	1,714,000	1,854,800	1,890,600	2,124,800	1,920,800	1,956,600

Source: U.S. Geological Survey; modifications by Nevada Division of Water Planning

Note: Figures may not add to totals because of independent rounding. Data are estimates only and subject to revision.

[1] Individual estimates were not available for 1970-80

Table 1-19. Estimated 1995 Statewide Groundwater and Surface Water Withdrawals for Public Supply and Self-Supplied Uses (in acre-feet)

Category	Source	Amount
Public Supply		
Total Public Supply	Groundwater	132,000
	Surface water	392,900
	Total	524,900
Self-Supplied		
Domestic	Groundwater	17,800
	Surface water	300
	Total	18,100
Commercial	Groundwater	7,900
	Surface water	15,600
	Total	23,500
Industrial	Groundwater	8,300
	Surface water	8,400
	Total	16,700
Thermoelectric	Groundwater	40,700
	Surface water	23,200
	Total	63,900
Mining	Groundwater	270,500
	Surface water	3,900
	Total	274,400
Irrigation	Groundwater	1,138,200
	Surface water	1,975,400
	Total	3,113,600
Livestock	Groundwater	1,100
	Surface water	5,200
	Total	6,300
Total		
Statewide Total	Groundwater	1,616,500
	Surface water	2,424,900
	Total	4,041,400

Source: U.S. Geological Survey; modifications by Nevada Division of Water Planning

Note: Figures may not add to totals because of independent rounding. Data are estimates only and subject to revision.

Table 1-20. Summary of Estimated Statewide Water Use (1970-95) Grouped by Type of Use (in acre-feet)

Water Use Category		1970	1975	1980	1985	1990	1995
Domestic (self-supplied & public supplied)	Withdrawals	116,600	147,800	184,500	231,600	283,600	360,700
	Consumptive Use	48,100	55,700	73,300	117,200	141,800	180,000
Commercial [1] (self-supplied & public supplied)	Withdrawals				68,600	125,600	153,200
	Consumptive Use				13,800	22,000	26,500
Industrial [1] (self-supplied & public supplied)	Withdrawals				18,400	14,400	19,200
	Consumptive Use	194,800	318,300	363,000	3,600	2,800	5,500
Thermoelectric [1] (self-supplied & public supplied)	Withdrawals	63,500	89,200	107,300	29,000	74,900	65,400
	Consumptive Use				26,400	50,200	41,100
Mining [1]	Withdrawals				27,300	120,100	274,400
	Consumptive Use				22,500	67,900	89,200
Irrigation	Withdrawals	3,400,000	3,500,000	3,500,000	3,750,000	3,160,700	3,113,600
	Consumptive Use	1,600,000	1,700,000	1,700,000	1,934,000	1,633,800	1,612,100
Livestock	Withdrawals	4,900	13,400	13,400	29,100	6,300	6,300
	Consumptive Use	2,400	9,900	10,000	7,400	2,300	2,300
Public Supply - Public Uses and Losses	Withdrawals	Included in "Domestic" Category			40,100	60,400	48,500
	Consumptive Use				0	0	0
Total	Withdrawals	3,716,300	3,979,500	4,060,900	4,194,100	3,846,000	4,041,400
	Consumptive Use	1,714,000	1,854,800	1,890,600	2,124,800	1,920,800	1,956,600

Source: U.S. Geological Survey; modifications by Nevada Division of Water Planning
Note: Figures may not add to totals because of independent rounding. Data are estimates only and subject to revision.
[1] Individual estimates were not available for 1970-80.

Table 1-21. Estimated 1995 Statewide Groundwater and Surface Water Withdrawals for Use Types

Category	Source	Amount
Domestic (self-supplied & public supplied)	Groundwater	104,100
	Surface water	256,700
	Total	360,800
Commercial (self-supplied & public supplied)	Groundwater	40,600
	Surface water	112,600
	Total	153,200
Industrial (self-supplied & public supplied)	Groundwater	8,900
	Surface water	10,300
	Total	19,200
Thermoelectric (self-supplied & public supplied)	Groundwater	41,100
	Surface water	24,400
	Total	65,500
Mining	Groundwater	270,500
	Surface water	3,900
	Total	274,400
Irrigation	Groundwater	1,138,200
	Surface water	1,975,400
	Total	3,113,600
Livestock	Groundwater	1,100
	Surface water	5,200
	Total	6,300
Public Supply - Public Uses and Losses	Groundwater	12,200
	Surface water	36,300
	Total	48,500
Total	Groundwater	1,616,700
	Surface water	2,424,800
	Total	4,041,500

Source: U.S. Geological Survey; modifications by Nevada Division of Water Planning
Note: Figures may not add to totals because of independent rounding. Data are estimates only and subject to revision.

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