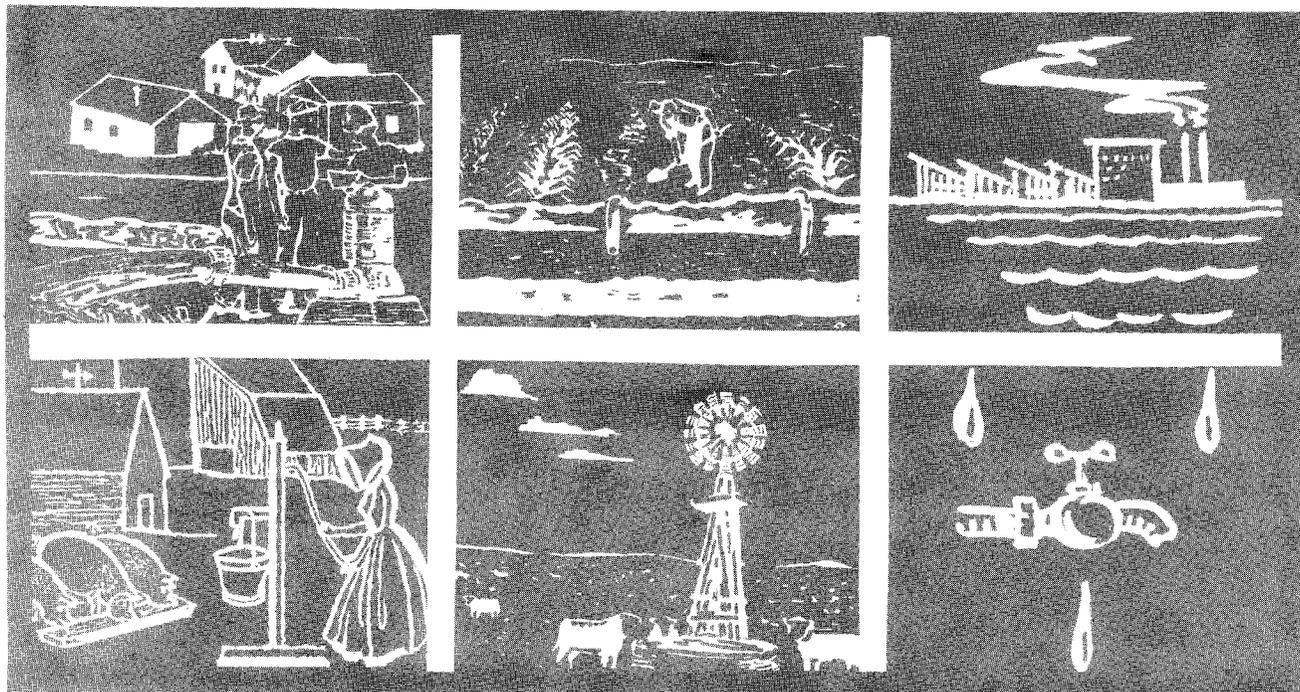


STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES

Carson City



WATER RESOURCES—INFORMATION SERIES

REPORT 7

ESTIMATED WATER USE IN NEVADA, 1950-65

By

J. R. Harrill and G. F. Worts, Jr.

Prepared cooperatively by the
Geological Survey, U.S. Department of the Interior

1968

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CONTENTS

	Page
Summary	1
Introduction	2
Hydrographic regions	3
Definitions of terms	9
Types of use	9
Types of water	9
Categories of use	10
Units of measurement	10
Estimated use in 1965	11
Irrigation	11
Public supply	11
Industrial self-supplied water	14
Rural use (livestock, domestic)	16
Summary of estimates	27
Trends in use 1950-65	31
Statewide estimates	32
Increases in ground-water withdrawals	33
Recommendations for future studies	35
Selected references	36

ILLUSTRATIONS

	Page
Figure 1. Map of Nevada showing hydrographic regions and basins	6
2. Trend of acres of land irrigated in the Truckee Meadows	22

TABLES

		Page
Table 1.	Area, population, population density, and principal towns and cities of hydrographic regions in Nevada	4
2.	Area, population, population density, and principal towns and cities of counties in Nevada	7
3.	Estimated 1965 irrigation withdrawals in Nevada by hydrographic regions	12
4.	Estimated 1965 irrigation withdrawals in Nevada, by counties	14
5.	Estimated 1965 public-supply withdrawals in Nevada, by hydrographic regions	17
6.	Estimated 1965 public-supply withdrawals in Nevada, by counties	20
7.	Estimated 1965 industrial self-supplied withdrawals in Nevada, by hydrographic regions	23
8.	Estimated 1965 industrial self-supplied withdrawals in Nevada, by counties	24
9.	Estimated 1965 withdrawals for rural use in Nevada, by hydrographic regions	25
10.	Estimated 1965 withdrawals for rural use in Nevada, by counties	26
11.	Summary of 1965 withdrawals in Nevada, by regions	28
12.	Summary of 1965 withdrawals in Nevada, by counties	29
13.	Summary of estimated water use in Nevada, 1950-65	30
14.	Estimates of gross pumpage in seven selected areas of ground-water development in Nevada, in 1950, 1955, 1960, and 1965	34

ESTIMATED WATER USE IN NEVADA, 1950-65

By J. R. Harrill and G. F. Worts, Jr.

SUMMARY

Estimated withdrawal use from streams and ground water in Nevada has increased from about 1.8 million acre-feet in 1950 to about 2.3 million acre-feet in 1965. Use of surface water has increased from 1.6 to 1.8 million acre-feet during this period, whereas use of ground water (pumpage and spring-flow) has increased from 190,000 to 540,000 acre-feet. The largest single use increase has been in pumpage for irrigation-- from about 30,000 acre-feet in 1950 to 290,000 acre-feet in 1965. Irrigation use from streams and ground water in 1965 accounted for 2.1 million acre-feet, or 93 percent of the total withdrawals.

Most of the surface-water resources already have been developed fully. Thus, little increase usage can be expected to occur in the future, and most of the future increased demand, except for diversions from the Colorado River, probably will be provided by ground water. During the period 1960-65 ground water use increased as follows: irrigation 37 percent, public supply 40 percent, industrial self-supplied 100 percent, and rural use 60 percent.

INTRODUCTION

Estimates of water use have been compiled in response to the growing need to know more about how and where the State's water resources are being utilized. Accordingly, this report has been prepared by the U.S. Geological Survey in cooperation with the Nevada Department of Conservation and Natural Resources, Division of Water Resources.

Most of the surface water in the State has been appropriated, and about 1,500,000 acre-feet used annually for irrigation for many years. However, between 1950 and 1965, Nevada's population increased from about 150,000 to about 470,000. Much of the increase was in urban and suburban areas, so the increased water use in local areas was mainly for public supply.

Considerable information is available on water use in the more highly developed areas of the State, but few attempts have been made to provide a reasonably detailed evaluation of water use throughout the State. Previous estimates of water use in Nevada during 1950, 1955, and 1960 have been published in U.S. Geological Survey Circulars 115 (Mackichan, 1951), 398 (Mackichan, 1957), and 456 (Mackichan and Kammerer, 1961), respectively. Those circulars were prepared primarily for the purpose of estimating the total use of water in the United States; consequently, specific information on the distribution of water use in Nevada has been grouped with information from adjacent States and is of limited use to persons concerned with planning and water management in Nevada.

Loeltz and Malmberg (1961) provided reasonably detailed information about the ground-water situation in Nevada in 1960, but the report is concerned primarily with irrigation use. Therefore, the specific intent of this report is to (1) provide reasonably detailed estimates of water use for irrigation, public supply, industrial, and rural purposes in Nevada during 1965, which may then serve as a basis of projection for future use; (2) show trends and changes in water use during the period 1950-65; and (3) identify areas where information on water use is lacking or inadequate so that improved estimates may be made in the future.

Because this report represents the first attempt to provide both areal coverage of the State and some degree of detail in the distribution of water use from both surface- and ground-water sources, many of the estimates are preliminary and may require revision at a later date when more refined information is available.

HYDROGRAPHIC REGIONS

Nevada has been divided into 14 hydrographic regions and basins (Rush and others, 1968), which now are used in the compilation of information pertaining to water resources and water use in studies made by the Nevada Department of Conservation and Natural Resources and the U.S. Geological Survey. Table 1 lists pertinent information for the regions shown in figure 1. More detailed descriptions of these regions and their constituent valleys and areas are presented in the report by Rush (1968).

Estimates of water use are also given by counties. Table 2 lists the 17 counties in Nevada, their areas, estimated populations, and principal towns and cities. The position of counties with respect to the 14 hydrographic regions or basins is shown in figure 1.

Table 1.--Area, population, population density, and principal towns and cities of hydrographic regions in Nevada

Region	Area ^{1/} (sq mi)	Estimated 1965 population ^{2/}	Estimated population density (persons per sq mi)	Principal cities or towns ^{3/}	
				Name	Estimated 1965 population ^{4/}
Northwest Region	3,052	500	0.16	Denio	100±
				Vya	50±
Subtotal					150±
Black Rock Desert Region	8,650	2,810	0.32	Empire	200±
				Gerlach	100±
				McDermitt	200±
				Orovada	100±
Subtotal					600±
Snake River Basin	5,235	1,680	0.32	Jackpot	200±
				Jarbidge	30±
				Mountain City	350±
				Owyhee	200±
Subtotal					780±
Humboldt River Basin	16,845	23,171	1.4	Austin	385
				Battle Mountain	1,500
				Carlin	1,030
				Elko	7,300
				Lovelock	1,984
				Wells	1,080
				Winnemucca	4,100
Subtotal					17,379
West Central Region	1,656	1,295	0.78	Fernley	675
Truckee River Basin	2,300	125,074	54	Crystal Bay	1,000±
				Incline Village	1,000±
				Reno	75,406
				Sparks	25,740
				South Lake Tahoe	3,166
				Verdi	500±
Subtotal					105,812
Western Region	577	1,900	3.1	--	--
Carson River Basin	3,519	31,389	8.9	Carson City	11,000
				New Empire	3,500
				Fallon	3,100
				Gardnerville	3,100
				Minden	150
				Silver Springs	150
				Virginia City	515
Subtotal					18,265

Table 1.--Continued

Region	Area ^{1/} (sq mi)	Estimated 1965 population ^{2/}	Estimated population density (persons per sq mi)	Principal cities or towns ^{3/}	
				Name	Estimated 1965 population ^{4/}
Walker River Basin	3,046	12,556	4.1	Babbitt Hawthorne Weed Heights Yerington	500± 5,700 1,100 <u>2,200</u> 9,500
Subtotal					
Central Region	46,785	15,727	0.34	Ely East Ely Eureka Gabbs Goldfield Luning McGill Mina Tonopah	5,122 495 775 150 78 2,000 460 <u>1,680</u> 10,760
Subtotal					
Great Salt Lake Basin	3,800	950	0.25	Montello Wendover	250± <u>400±</u> 650±
Subtotal					
Escalante Desert	106	nil	--	--	--
Colorado River Basin	12,376	253,048	20	Boulder City ^{5/} Caliente Henderson Las Vegas North Las Vegas Logandale Mesquite- Bunkerville Overton Panaca Pioche Searchlight	5,000 780 14,600 126,520 29,300 850 727 1,175 458 696 <u>250</u> 180,356
Subtotal					
Death Valley Basin	2,593	2,050	0.79	Beatty Mercury	1,200 <u>250±</u> 1,450±
Subtotal					
STATE	110,540	472,150	4.3		346,377

1. Areas from Rush (1968).

2. Population estimated by authors on the basis of estimates in the 1967 Nevada Community Profiles, on population shown on the 1965-66 Official Highway Map of Nevada, and on observations made by the staff of the U.S. Geol. Survey.

3. Includes all towns and cities shown on 1965-66 Official Highway Map of Nevada as having populations greater than 250 persons and some towns in sparsely populated areas with less than 250 persons.

4. Estimates from 1967 Nevada Community Profiles where available, other estimates by author.

5. Boulder City is on the divide between Colorado River Basin and Central Region.



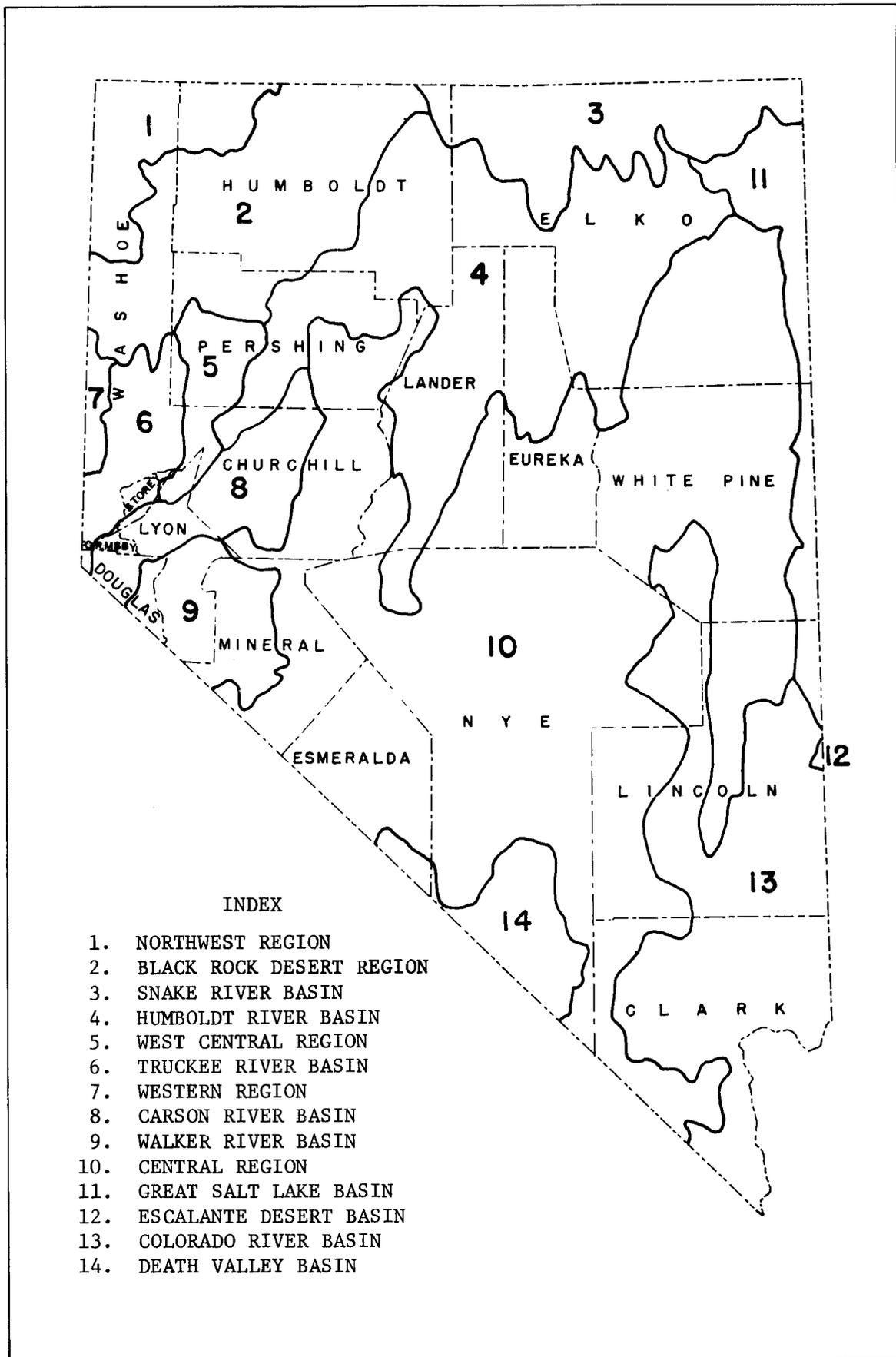


Figure 1.--Map of Nevada showing hydrographic regions and basins



Table 2.--Area, population, population density, and principal towns and cities of counties in Nevada

County	Area ^{1/} (sq mi)	Estimated 1965 population ^{2/}	Estimated population density (persons per sq mi)	Principal cities or towns ^{3/}	
				Name (*County seat)	Estimated 1965 population ^{4/}
Churchill	4,913	10,668	2.2	*Fallon	3,500
Clark	8,084	250,000	31	Boulder City	5,000
				Henderson	14,600
				*Las Vegas	126,520
				North Las Vegas	29,300
				Logandale	350
				Mesquite-Bunkerville	727
				Overton	1,175
				Searchlight	250
Subtotal					178,422
Douglas	751	6,366	8.5	Gardnerville	3,100
				*Minden	
				South Lake Tahoe	3,166
Subtotal					6,266
Elko	17,181	15,497	0.90	Carlin	1,030
				*Elko	7,300
				Jackpot	200±
				Jarbridge	30±
				Montello	250±
				Mountain City	350±
				Ovyhee	200±
				Wells	1,000
				Wendover	400±
				Subtotal	
Esmeralda	3,570	308	0.09	*Goldfield	150
Eureka	4,132	1,220	0.29	*Eureka	495
Humboldt	9,704	7,563	0.78	Denio	100±
				McDermitt	200±
				Orovada	100±
				*Winnemucca	4,100
				Subtotal	
Lander	5,621	2,036	0.36	*Austin	385
				Battle Mountain	1,500
Subtotal					1,885
Lincoln	10,650	2,826	0.27	Caliente	780
				Panaca	458
				*Pioche	696
Subtotal					1,934

Table 2.--Continued

County	Area ^{1/} (sq mi)	Estimated 1965 population ^{2/}	Estimated population density (persons per sq mi)	Principal cities or towns ^{3/}	
				Name (*County seat)	Estimated 1965 population ^{4/}
Lyon	2,024	3,331	4.1	Fernley Silver Springs Weed Heights *Yerington	675 150 1,100 <u>2,200</u> 4,125
Subtotal					
Mineral	3,837	6,800	1.8	Babbitt *Hawthorne Luning Mina	500 [±] 5,700 78 <u>460</u> 6,738
Subtotal					
Nye	13,064	5,675	0.31	Beatty Gabbs Mercury *Tonopah	1,200 775 250 <u>1,680</u> 3,905
Subtotal					
Ormsby	153	16,236	106	*Carson City New Empire }	11,000
Pershing	6,031	3,185	0.53	*Lovelock	1,984
Storey	262	660		*Virginia City	515
Washoe	6,608	124,453	25	Empire Crystal Bay Incline Village } Gerlach *Reno Sparks Verdi Vya	200 [±] 1,000 [±] 100 [±] 75,406 25,740 500 [±] <u>50[±]</u> 102,996
Subtotal					
White Pine	3,905	10,226	1.1	*Ely East Ely } McGill	5,122 <u>2,000</u> 7,122
Subtotal					
STATE	<u>110,540</u>	<u>472,150</u>	<u>4.3</u>		<u>346,377</u>

1. Areas obtained from Nevada Department of Conservation and Natural Resources, Division of State Lands.

2. Population estimated by authors on the basis of estimates in the 1967 Nevada Community Profiles, on population shown on the 1965-66 Official Highway Map of Nevada, and on observations made by the staff of the U.S. Geol. Survey.

3. Includes all towns and cities shown on 1965-66 Official Highway Map of Nevada as having populations greater than 250 persons and some towns in sparsely populated areas with less than 250 persons.

4. Estimates from 1967 Nevada Community Profiles where available, other estimates by authors.

DEFINITIONS OF TERMS

Types of Use

Uses of water may be classified in several different ways, among them are withdrawal and nonwithdrawal, consumptive and nonconsumptive uses:

Withdrawal use--Use which requires that the water be removed from the ground or diverted from a stream or lake. Irrigation, domestic, stock, public, and industrial uses are of this type. The quantity of water withdrawn at a designated place is the entire quantity of water taken for use. This quantity is variously referred to as pumpage, water intake, duty of water, or water requirement (Am. Water Works Assoc. Task Group, 1953).

Nonwithdrawal use--Use which does not require diversion. Navigation, recreation, waste disposal, and conservation of fish and wildlife are examples of nonwithdrawal uses.

Consumptive use--The quantity of water discharged to the atmosphere (evaporated) or incorporated in the products of the processes in connection with vegetative growth, food processing, or incidental to an industrial process (Am. Water Works Assoc. Task Group, 1953).

Nonconsumptive use--Includes that water withdrawn for use that is not consumed. Includes most water used in conjunction with nonwithdrawal purposes and water withdrawn for purposes such as hydropower generation.

Estimates derived in this report are withdrawal uses. Information on consumption will be included only where reasonably reliable data are available.

Types of Water

Surface water--Water obtained from rivers, streams, ponds, reservoirs, and ditches. It includes effluent and other types of waste water.

Ground water--Water obtained from wells or discharged by springs. It may either be pumped or flow naturally.

Categories of Use

Irrigation water--Water diverted or pumped for irrigation of crops or pasture. It does not include uncontrolled water which floods unimproved pasture or meadows by overflow during high-runoff years.

Public-supply water--Water withdrawn by and delivered to a public water system regardless of the use made of the water. It does not include water withdrawn by cooperatively-owned systems, private companies which serve small tracts of homes in suburban areas, casinos, and golf courses.

Industrial self-supplied water--Water withdrawn from privately developed sources and delivered through water systems established entirely or primarily for commercial and industrial use. Includes water used by the following, if self-supplied: mining, manufacturing, military establishments, educational and penal institutions, golf courses, hotels, motels, restaurants, casinos, and other small businesses.

Fuel-electric power (public utility)--Water withdrawn by public utilities primarily for condenser cooling.

Rural use--Water used by livestock and homes not supplied by public water systems; includes suburban developments, such as apartment houses or trailer courts with their own wells, and tract homes served by a central, cooperatively-owned well.

Units of Measurement

Quantities of water given in this report are in acre-feet per year. An acre-foot of water will cover an area of one acre to a depth of 1 foot; it is about 325,900 gallons. Three acre-feet equal about 1,000,000 gallons; 1,000 acre-feet per year equal about 0.9 million gallons per day.

ESTIMATED USE IN 1965

Irrigation

Water withdrawals for irrigation use were estimated by determining approximate acreages in production in 1965 and multiplying them by an estimated duty of water. The actual area watered varies each year in proportion to the naturally available supply. Bourns (1966) estimated that during years with an ample water supply, more than 1,000,000 acres may be wetted to some degree. Much of this acreage is "wild-flooded" pasture or meadow and may receive only one "irrigation" by stream overflow in the spring or from simple diversion systems. During years when the water supply is more restricted, Bourns estimated that crops or hay are harvested from only about 600,000 acres. These figures are in reasonable agreement with the preliminary findings of the 1964 United States Census of Agriculture (U.S. Bureau of the Census, 1966), which states that during 1964 there were 824,511 acres of irrigated land in farms and that 507,210 acres of irrigated cropland were harvested. These figures do not include marginal acreage or pasture that is watered so infrequently that it will not support sustained farming or ranching operations.

The estimate of 730,000 acres of land irrigated in 1965 used in this report does not include marginal lands which may have been wetted by stream overflow during short periods in the spring of 1965 and does not include areas primarily sub-irrigated by shallow ground water. This estimate represents the acreage of irrigated cropland harvested, and improved pasture or other pasture irrigated by withdrawn (diverted or pumped) water during 1965. As much as 200,000 acres of additional native pasture or marginal land may have been naturally wetted to some degree in 1965. Tables 3 and 4 list the estimated 1965 irrigation withdrawals in Nevada by hydrographic regions and by counties, respectively. Table 4 also lists the irrigated land in farms and irrigated cropland harvested in 1964, as determined by the 1964 Census of Agriculture.

Public Supply

Estimates of public-supply withdrawals during 1965 are based largely on population estimates (tables 1 and 2) and an estimated average per capita use of about 280 gpd (gallons per day). This comparatively high rate is used because of the arid climate and the fact that in many towns public-supply users are not metered but charged a flat rate. Per capita use probably will drop in the future as more meters are installed

Table 3.--Estimated 1965 irrigation withdrawals in Nevada by hydrographic regions
(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

Region	Estimated acreage irrigated by withdrawn water in 1965	Estimated percentage irrigated by:		Estimated average duty of water-1/	Springs-2/	Irrigation withdrawals			
		Ground water	Surface water			Pumpage	Ground water	Surface water	All
Northwest Region	19,000	8	92	2.75	600	3,500	4,100	48,000	52,000
Black Rock Desert Region	56,000	52	48	3.00	1,000	88,000	89,000	81,000	170,000
Snake River Basin	75,000	1	99	2.75	400	2,000	2,400	208,000	210,000
Humboldt River Basin	240,000	8	92	2.75	8,000	38,000	46,000	610,000	660,000
West Central Region	4,000	---	100	3.00	Minor	Minor	Minor	12,000	12,000
Truckee River Basin	27,000	4	96	3.00	Minor	3,500	3,500	77,500	81,000
Western Region	500	100	---	3.00	800	700	1,500	Trace	1,500
Carson River Basin	119,000	2	98	3.00	300	4,000	4,300	356,000	360,000
Walker River Basin	58,000	5	95	3.00	300	8,000	8,300	166,000	174,000
Central Region	83,000	48	52	3.1	42,000	82,000	124,000	133,000	257,000
Great Salt Lake Basin	19,000	19	81	2.75	8,500	2,000	10,500	42,000	52,000
Escalante Desert Basin	0	---	---	---	---	---	---	---	---
Colorado River Basin	27,000	95	5	4.75	63,000	45,000	108,000	6,000	114,000
Death Valley Basin	1,000	100	---	4.75	800	4,000	4,800	---	4,800
STATE	730,000	20	80	3	126,000	280,000	406,000	1,740,000	2,150,000

Footnotes to table 3.

1. Estimated as overall average for area. Actual duties higher for some harvested crops and lower for most irrigated pasture. Duty includes conveyance losses between "field headgates" and crops, but does not include losses along major irrigation ditches and canals that supply several farms. If these losses were included, duties of as much as 5 feet would be required for surface-water irrigation throughout parts of the Truckee, Carson, Walker, and Humboldt River Basins.
2. Estimated as that part of the annual discharge that could be diverted for irrigation during the growing season. Quantity ranges from about one-third of annual flow at the north end of the State to about two-thirds of annual flow at the south end of the State. Some flow that occurs during the nonirrigation season is used beneficially for stock water or other purposes.

Table 4.--Estimated 1965 irrigation withdrawals in Nevada, by counties

(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

County	Irrigated land in farms (1964) ¹ / ₍₁₉₆₄₎	Irrigated cropland harvested (1964) ¹ / ₍₁₉₆₄₎	Estimated acreage irrigated by water withdrawn (1965) ² / ₍₁₉₆₅₎	Estimated percentage		Estimated average duty water ³ / ₍₁₉₆₅₎	Irrigation withdrawals			All water	
				Ground water	Surface water		Estimated	Ground water			Surface water
								Springs ⁴ / ₍₁₉₆₅₎	Pumpage		
Churchill	56,800	36,402	57,000	2	98	3+	300	3,000	3,800	171,000	175,000
Clark	7,892	6,222	7,000	100	--	4.9	24,000	10,000	34,000	--	34,000
Douglas	57,603	17,441	57,000	4	96	3.0	1,000	5,000	6,000	165,000	171,000
Elko	239,260	187,780	233,000	3	97	2.75	13,000	8,000	21,000	620,000	641,000
Esmeralda	8,595	2,051	6,000	29	71	3.5	700	5,000	6,000	15,000	21,000
Eureka	34,945	21,672	29,000	37	63	3.0	8,000	24,000	32,000	55,000	87,000
Humboldt	111,111	83,722	108,000	33	67	2.8	2,000	98,000	100,000	202,000	302,000
Lander	30,213	20,710	25,000	17	83	3.0	2,500	10,500	13,000	62,000	75,000
Lincoln	10,935	6,530	11,000	96	4	4.7	20,000	30,000	50,000	2,000	52,000
Lyon	88,200	36,606	59,000	4	96	3+	900	7,000	8,000	171,000	179,000
Mineral	1,250	886	6,000	1	99	3.0	Minor	100	100	17,900	18,000
Nye	43,266	19,901	25,000	64	36	3.5	11,000	45,000	56,000	31,000	87,000
Ormsby	2,622	1,310	2,000	--	100	3.0	Minor	Minor	Minor	6,000	6,000
Pershing	51,019	30,650	40,000	9	91	2.8	1,000	9,200	10,000	102,000	112,000
Storey	544	424	500	--	100	3.0	--	--	--	1,500	1,500
Washoe	44,573	19,068	40,000	9	91	2.9	1,500	9,600	11,000	105,000	116,000
White Pine	35,593	18,901	23,000	80	20	3.0	40,000	15,000	55,000	14,000	69,000
STATE	824,511	503,239	730,000	20	80	3	126,000	280,000	406,000	1740,000	2150,000

1-4.

Footnotes to table 4

1. Acreages from 1964 United States Census of Agriculture.
2. All irrigated cropland harvested plus most improved pasture and some unimproved pasture. Does not include land that is primarily subirrigated or that acreage wetted by uncontrolled overflow during periods of high water.
3. Estimated as overall average for area. Actual duties higher for some harvested crops and lower for most irrigated pasture. Duty includes conveyance losses between "field headgates" and crops, but does not include losses along major irrigation ditches and canals that supply several farms. If these losses were included, duties of as much as 5 feet would be required for surface-water irrigation throughout parts of the Truckee, Carson, Walker, and Humboldt River Basins.
4. Estimated as that part of the annual discharge that could be diverted for irrigation during the growing season. Quantity ranges from about one-third of annual flow at the north end of the State to about two-thirds of annual flow at the south end of the State. Some flow that occurs during the non-irrigation season is used beneficially for stock water or other purposes.
 - a. Includes irrigated land on Walker River Indian Reservation (Everett and Rush, 1967).

and other controls, such as alternate days of lawn watering, are more effectively utilized. Reported values were used where available. Tables 5 and 6 give estimates of public-supply withdrawals for the principal towns and cities in Nevada by hydrographic regions and by counties, respectively. Water withdrawn by cooperatively-owned systems and small private companies serving tracts of homes in suburban areas is not included in this estimate.

Nearly 110,000 acre-feet of water was withdrawn for public-supply use during 1965. The total population served was about 240,000. Ground-water withdrawals may have exceeded surface-water withdrawals by about 25,000 acre-feet. The percentage of water withdrawn that flowed through the waste facilities ranged from 20 to 80 percent. This large variation may be due to different rates of leakage from the sewer system rather than to greatly different rates of consumption. Only about 20 percent of the water withdrawn is assumed to be consumed when used (this figure is based on the towns with the highest estimated percentage of flow through the waste facility).

Industrial Self-Supplied Water

Tables 7 and 8 list estimated 1965 withdrawals of industrial self-supplied water in Nevada by hydrographic regions and by counties, respectively. The estimated 69,000 acre-feet withdrawn includes use by self-supplied hotels, motels, and casinos, principally in Las Vegas, and water diverted from Lake Mead for industrial use. It excludes 35,000 acre-feet, which is withdrawn primarily for cooling purposes in fuel-electric power generation and which is reused or returns to the source with little loss.

Rural Use (Livestock, Domestic)

Rural-use estimates include withdrawals for both domestic and livestock use. Domestic use is estimated on the basis of rural populations which in turn are estimated from data in the 1967 Nevada Community Profiles and on an estimated average daily per capita use of 100 gpd. This includes water pumped by small private water companies and cooperatively-owned systems that serve tract homes in suburban areas. Stock use includes about 13,000 milk cows at 20 gpd, 600,000 range cattle at 6 gpd, 235,000 sheep at 2 gpd, 6,000 hogs and pigs at 2 gpd, and 13,000 horses and mules at 10 gpd (Mackichan and Kammerer, 1961, p. 4).

Tables 9 and 10 list estimated 1965 withdrawals for rural use by hydrographic regions and by counties.

Table 5.--Estimated 1965 public-supply withdrawals in Nevada,

by hydrographic regions

(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

Region	Town	Source of supply ^{1/}	Estimated public-supply withdrawal ^{2/}			Estimated annual flow through waste facility ^{3/}
			Ground water	Surfac water	All water	
Northwest Region	Denio	SS	--	--	--	N
	Vya	SS	--	--	--	N
Black Rock Desert Region	Empire	Wells	60	--	60	N
	Gerlach	Springs	30	--	30	N
	McDermitt	SS	--	--	--	N
	Orovada	SS	--	--	--	N
Subtotal			90	--	90	
Snake River Basin	Jackpot	SS	--	--	--	N
	Jarbridge	SS	--	--	--	N
	Mountain City	SS	--	--	--	N
	Owyhee	SS	--	--	--	N
Humboldt River Basin	Austin	Canyons, tunnels, spring, and well	120	--	120	25
	Battle Mountain	Well	470	--	470	N
	Carlin	Spring and well	290	--	290	70
	Elko	Wells	a 2,900	--	2,900	1,400
	Lovelock	Wells	610	--	610	N
	Wells	Wells	340	--	340	N
	Winnemucca	Wells and springs	b 930	--	930	N
Subtotal			5,700	--	5,700	
West Central Region	Fernley	Well	210	--	210	N
Truckee River Basin	Crystal Bay	SS	--	--	--	N
	Incline Village					
	Reno	Truckee River, Hunter Creek, and wells	R4,300	R27,500	R31,900	23,000
	Sparks					
	South Lake Tahoe					
Verdi	SS	--	--	--	--	
Subtotal			4,300	27,600	31,900	
Western Region	--	--	--	--	--	--

Table 5.--Continued

Region	Town	Source of supply ^{1/}	Estimated public-supply withdrawal ^{2/}			Estimated annual flow through waste facility ^{3/}
			Ground water	Surface water	All water	
Carson River Basin	Carson City	Marlette Lake, streams, and wells	R 350	R 1,250	R 1,600	1,300
	New Empire					
	Fallon	Wells	1,100	--	1,100	450
	Gardnerville	Wells	970	--	970	N
	Minden					
	Silver Springs	Well	45	--	45	N
Virginia City	Marlette Lake	--	130	130	30	
Subtotal			<u>2,500</u>	<u>1,400</u>	<u>3,900</u>	
Walker River Basin	Babbitt	Creeks and well	50	100	150	N
	Hawthorne	Creeks and wells	500	1,300	1,800	340
	Weed Heights	Wells	340	--	340	N
	Yerington		<u>R 550</u>	<u>--</u>	<u>R 550</u>	N
Subtotal			<u>1,400</u>	<u>1,400</u>	<u>2,800</u>	
Central Region	Ely	Springs and well	1,600	--	1,600	N
	East Ely					
	Eureka	Springs and wells	155	--	155	30
	Gabbs	Wells	240	--	240	70
	Goldfield	Spring and wells	50	--	50	N
	Luning	Well	24	--	24	N
	McGill	Well	600	--	600	N
	Mina	Springs and well	110	--	110	N
	Tonopah	Wells	<u>530</u>	<u>--</u>	<u>530</u>	N
Subtotal			<u>3,300</u>	<u>--</u>	<u>3,300</u>	
Great Salt Lake Basin	Montello	Springs	80	--	80	N
	Wendover	SS	--	--	--	N
Subtotal			<u>80</u>	<u>--</u>	<u>80</u>	
Escalante Desert	--	--	--	--	--	--

Table 5.--Continued

Region	Town	Source of supply ^{1/}	Estimated public-supply withdrawal ^{2/}			Estimated annual flow through waste facility ^{3/}	
			Ground water	Surface water	All water		
Colorado River Basin	Boulder City	Lake Mead	--	R 2,800	R 2,800	560	
	Caliente	Wells	240	--	240	130	
	Henderson	Lake Mead	--	R 5,000	R 5,000	110	
	Las Vegas	Wells and Lake Mead	R 48,000	R 3,600	R 51,600	25,000	
	North Las Vegas						
	Logandale	Springs	270	--	270	N	
	Mesquite-Bunkerville	Wells	110	110	220	N	
		Overton	Springs	340	--	340	N
		Panaca	Well	140	--	140	N
		Pioche	Spring, well, and mine	220	--	220	40
	Searchlight	Well	R 50	--	R 50	N	
Subtotal			49,000	12,000	61,000		
Death Valley Basin	Beatty	Well and spring	380	--	380	N	
	Mercury	SS	--	--	--	N	
Subtotal			380	--	380		
STATE			67,000	42,000	109,000	(c)	

1. Primarily from data in Nevada Community Profiles (Nev. Dept. Econ. Development, 1965) and Inventory Municipal Water Facilities; 1963 (U.S. Public Health Service, 1964); SS indicates town probably is served largely by individual domestic wells or small privately owned water company.

2. Reported values used where available (indicated by R); estimates derived as follows: Percentage of ground water or surface water determined from source of supply. Use estimated on the basis of per capita daily use of about 200 gpd and populations listed in table 1, except for towns where specific per capita use estimates are available.

3. Annual estimates based on average daily flow in 1962 (U.S. Public Health Service, 1963) which was adjusted for estimated 1965 populations. N indicates either insufficient information available to make estimate or waste disposed primarily through individual septic tanks.

- a. Per capita use 364 gpd (Holmes, 1966, p. 57).
 b. Per capita use 185 gpd (Holmes, 1966, p. 58).
 c. Incomplete.

Table 6.--Estimated 1965 public-supply withdrawals in Nevada, by counties

(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

County	Town	Source of supply ^{1/}	Estimated public-supply withdrawal ^{2/}			Estimated annual flow through waste facility ^{3/}
			Ground water	Surface water	All water	
Churchill	Fallon	Wells	1,100	--	1,100	450
Clark	Boulder City	Lake Mead	--	R2,800	R2,800	560
	Henderson	Lake Mead	--	R5,000	R15,000	110
	Las Vegas	Wells and Lake Mead	R48,000	R3,600	R51,000	25,000
	North Las Vegas					
	Logandale	Springs	270	--	270	N
	Mesquite-Bunkerville	Wells	110	110	220	N
	Overton	Springs	340	--	340	N
Searchlight	Wells	R50	--	R50	N	
Subtotal			49,000	12,000	60,200	
Douglas	Gardnerville	Wells	970	--	970	N
	Minden					
	South Lake Tahoe	SS	--	--	--	N
Subtotal			970	--	970	
Elko	Carlin	Spring and well	290	--	290	70
	Elko	Wells	a 2,900	--	2,900	1,400
	Jackpot	SS	--	--	--	N
	Jarbidge	SS	--	--	--	N
	Montello	Springs	80	--	80	N
	Mountain City	SS	--	--	--	N
	Owyhee	SS	--	--	--	N
	Wells	Wells	340	--	340	N
Wendover	SS	--	--	--	N	
Subtotal			3,600	--	3,600	
Esmeralda	Goldfield	Springs and wells	50	--	50	N
Eureka	Eureka	Springs and wells	155	--	155	30
Humboldt	Denio	SS	--	--	--	N
	McDermitt	SS	--	--	--	N
	Orovada	SS	--	--	--	N
	Winnemucca	Wells and springs	b 930	--	b 930	N
Subtotal			930	--	930	
Lander	Austin	Canyons, tunnels, spring and well	120	--	120	.25
	Battle Mountain	Well	470	--	470	N
Subtotal			590	--	590	

Table 6.--Continued

County	Town	Source of supply ^{1/}	Estimated public-supply withdrawal ^{2/}			Estimated annual flow through waste facility ^{3/}
			Ground water	Surface water	All water	
Lincoln	Caliente	Wells	240	--	240	130
	Panaca	Well	140	--	140	N
	Pioche	Spring, well and mine	220	--	220	40
	Subtotal		600	--	600	
Lyon	Fernley	Well	210	--	210	N
	Silver Springs	Well	45	--	45	N
	Weed Heights	Wells	340	--	340	N
	Yerington	Wells	550	--	550	N
	Subtotal		1,100	--	1,100	
Mineral	Babbitt	Creeks and well	50	100	150	N
	Hawthorne	Creeks and well	500	1,300	1,800	340
	Luning	Well	24	--	24	N
	Mina	Springs and well	110	--	110	N
	Subtotal		680	1,400	2,100	
Nye	Beatty	Well and spring	380	--	380	N
	Gabbs	Wells	240	--	240	70
	Mercury	SS	--	--	--	N
	Tonopah	Wells	530	--	530	N
	Subtotal		1,200	--	1,200	
Ormsby	Carson City New Empire	Marlette Lake, streams and wells	R350	R1,250	R1,600	1,300
Pershing	Lovelock	Wells	610	--	610	N
Storey	Virginia City	Marlette Lake	--	130	130	30
Washoe	Crystal Bay	SS	--	--	--	N
	Incline Village					
	Empire	Wells	60	--	60	N
	Gerlach	Springs	30	--	30	N
	Reno	Truckee River, Hunter Creek, and wells	R4,300	R27,600	R31,900	23,000
	Sparks					
	Verdi	SS	--	--	--	N
Vya	SS	--	--	--	N	
Subtotal			4,400	27,600	32,000	
White Pine	Ely	Springs and well	1,600	--	1,600	N
	East Ely					
	McGill	Well	600	--	600	N
Subtotal			2,200	--	2,200	
STATE			67,000	42,000	109,000	(c)

Footnotes to table 6.

1. Primarily from data in Nevada Community Profiles (Nev. Dept. Econ. Development, 1965) and Inventory Municipal Water Facilities; 1963 (U.S. Public Health Service, 1964); SS indicates town probably is served largely by individual domestic wells or small privately owned water company.

2. Reported values used where available (indicated by R); estimates derived as follows: Percentage of ground water or surface water determined from source of supply. Use estimated on the basis of per capita daily use of about 280 gpd and populations listed in table 1, except for towns where specific per capita use estimates are available.

3. Annual estimates based on average daily flow in 1962 (U.S. Public Health Service, 1963) which was adjusted for estimated 1965 populations. N indicates either insufficient information available to make estimate or waste disposed primarily through individual septic tanks.

a. Per capita use 364 gpd (Holmes, 1966, p. 57).

b. Per capita use 185 gpd (Holmes, 1966, p. 58).

c. Incomplete.

Table 7.--Estimated 1965 industrial self-supplied withdrawals

in Nevada, by hydrographic regions

(Estimated withdrawals, in acre-feet, to two significant figures)

Region	Estimated withdrawal		
	Ground water	Surface water	All water
Northwest Region	Minor	0	Minor
Black Rock Desert Region	500	0	500
Snake River Basin	50	Minor	50
Humboldt River Basin	3,200	Minor	3,200
West Central Region	100	0	100
Truckee River Basin	3,200	2,700	5,900
Western Region	Minor	0	Minor
Carson River Basin	1,100	Minor	1,100
Walker River Basin	5,700	500	6,200
Central Region	7,600	15,000	23,000
Great Salt Lake Basin	50	0	50
Escalante Desert Basin	0	0	0
Colorado River Basin	18,000	a 11,000	29,000
Death Valley Basin	Minor	0	Minor
STATE (rounded)	40,000	29,000	69,000

a. Lake Mead diversions for industrial use.

Table 8.--Estimated 1965 industrial self-supplied withdrawals
in Nevada, by counties

(Estimated withdrawals, in acre-feet, to two significant figures)

County	Estimated withdrawal		
	Ground water	Surface water	All water
Churchill	700	--	700
Clark	16,000	a 11,000	27,000
Douglas	400	700	1,100
Elko	200	--	200
Esmeralda	3,200	--	3,200
Eureka	2,000	--	2,000
Humboldt	900	--	900
Lander	100	100	200
Lincoln	1,300	--	1,300
Lyon	6,400	--	6,400
Mineral	500	500	1,000
Nye	3,200	--	3,200
Ormsby	100	--	100
Pershing	250	--	250
Storey	130	--	130
Washoe	2,400	2,000	4,400
White Pine	<u>1,200</u>	<u>15,000</u>	<u>16,000</u>
STATE (rounded)	40,000	29,000	69,000

a. Lake Mead diversions for industrial use.

Table 9.--Estimated 1965 withdrawals for rural use in Nevada, by hydrographic regions

(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

Region	Estimated domestic use		Estimated livestock use		Total rural use	
	Ground	Surface	Ground	Surface	Ground	Surface
Northwest Region	40	10	50	60	130	190
Black Rock Desert Region	240	40	200	130	290	420
Snake River Basin	160	30	190	100	300	400
Humboldt River Basin	600	50	550	600	1,000	1,600
West Central Region	70	--	70	30	30	50
Truckee River Basin	2,400	300	a 2,700	20	100	120
Western Region	210	--	210	Minor	--	Minor
Carson River Basin	1,400	50	1,500	120	440	560
Walker River Basin	320	20	340	30	230	260
Central Region	500	60	560	400	440	840
Great Salt Lake Basin	80	Minor	80	30	90	120
Escalante Desert Basin	--	--	--	--	--	--
Colorado River Basin	8,100	Minor	a 8,100	170	90	260
Death Valley Basin	90	Minor	90	20	--	20
STATE (rounded)	14,200	560	15,000	1,700	3,100	4,800
						16,000
						3,700
						20,000

a. Largely use by suburban families and tract homes.

Summary of Estimates

Estimated 1965 withdrawals for all purposes are summarized by regions in table 11 and by counties in table 12. The two regions with the largest ground-water withdrawals were the Colorado River Basin and the Central Region. The two counties with the largest ground-water withdrawals were Humboldt County and Clark County. More surface water was withdrawn (primarily for irrigation use) in the Humboldt River Basin than in any other region. Elko County had the largest surface-water withdrawal of any Nevada county.

Table 11.--Summary of 1965 withdrawals in Nevada, by regions

(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

Region	Irrigation		Public supply		Industrial		Rural		Total withdrawal		
	Surface	water	Surface	water	Surface	water	Surface	water	Surface	water	
Northwest Region	4,100	48,000	--	--	Minor	--	100	140	4,200	48,100	52,000
Black Rock Desert Region	39,000	31,000	90	--	500	--	370	330	90,000	81,300	171,000
Snake River Basin	2,400	208,000	--	--	50 Minor	--	260	330	2,700	208,300	211,000
Humboldt River Basin	46,000	610,000	5,700	--	3,200 Minor	--	1,200	1,000	56,100	611,000	667,000
West Central Region	Minor	12,000	210	--	100	--	100	30	400	12,000	12,400
Truckee River Basin	3,500	77,500	4,300	27,600	3,200	2,700	2,400	400	13,400	108,200	122,000
Western Region	1,500	Minor	--	--	Minor	--	210	Minor	1,700	--	1,700
Carson River Basin	4,300	356,000	2,500	1,400	1,100	--	1,500	490	9,400	357,800	367,000
Walker River Basin	3,300	166,000	1,400	1,400	5,700	500	350	250	15,800	168,200	184,000
Central Region	124,000	133,000	3,300	--	7,600	15,000	900	500	136,000	148,000	284,000
Great Salt Lake Basin	10,500	42,000	80	--	50	--	110	90	10,700	42,100	53,000
Escalante Desert	--	--	--	--	--	--	--	--	--	--	--
Colorado River Basin	108,000	6,000	49,000	12,000	18,000	11,000	8,300	90	183,300	29,000	212,000
Death Valley Basin	4,800	--	380	--	--	--	110	Minor	5,300	--	5,300
STATE (rounded)	410,000	1,740,000	67,000	42,000	40,000	29,000	16,000	3,700	530,000	1,800,000	2,300,000

Table 12.--Summary of 1965 withdrawals in Nevada, by counties

(Estimated withdrawals, in acre-feet, are significant to no more than two figures)

County	Irrigation		Public supply		Industrial		Rural		Total withdrawal	
	Surface	water	Surface	water	Surface	water	Surface	water	Surface	water
Churchill	3,800	171,000	1,100	700	---	950	240	6,600	171,000	178,000
Clark	34,000	Minor	49,000	16,000	11,000	8,100	300	107,000	33,000	140,000
Douglas	6,000	165,000	970	400	700	190	390	7,600	166,000	174,000
Elko	21,000	620,000	3,600	200	---	1,100	960	25,900	621,000	647,000
Esmeralda	6,000	15,000	50	3,200	---	60	20	9,300	15,000	24,000
Eureka	32,000	55,000	155	2,000	---	180	120	34,300	55,100	89,000
Humboldt	100,000	202,000	930	900	---	500	530	102,000	203,000	305,000
Lander	13,000	62,000	590	100	100	100	120	13,800	62,200	76,000
Lincoln	50,000	2,000	600	1,800	---	140	60	52,500	2,100	55,000
Lyon	8,000	171,000	1,100	6,400	---	510	300	16,000	171,000	187,000
Mineral	100	17,900	680	1,500	500	90	Minor	2,400	18,400	21,000
Nye	56,000	31,000	1,200	3,200	---	300	140	60,700	31,100	92,000
Ormsby	Minor	6,000	350	100	---	570	40	1,000	7,300	8,000
Pershing	10,000	102,000	610	250	---	190	190	11,000	102,000	113,000
Storey	---	1,500	---	180	---	10	Minor	190	1,500	1,700
Washoe	11,000	105,000	4,400	2,400	2,000	2,500	370	20,300	135,000	155,000
White Pine	55,000	14,000	2,200	1,200	1,500	400	240	58,800	15,700	74,000
STATE	410,000	1,740,000	67,000	40,000	29,000	16,000	3,700	530,000	1,800,000	2,300,000

(rounded)

TRENDS IN USE 1950-65

Statewide Estimates

Estimates of water use in Nevada for the years 1950, 1955, and 1960 are made in U.S. Geological Survey Circulars 115 (Mackichan, 1951), 398 (Mackichan, 1957), and 456 (Mackichan and Kammerer, 1961). In certain cases, those estimates have been revised on the basis of information that was not available at the time the estimates were made. Table 13 summarizes these estimates and indicates which ones have been revised.

In general, total water use has increased in all categories. This is due largely to a rapid increase in the use of ground water. Ground-water use has increased almost threefold since 1950. More than half this increase occurred during the last 5-year period (1960-65). Irrigation is the largest use category. The percentage of total water withdrawn that was used for irrigation decreased from about 95 percent in 1950 to about 93 percent in 1965 although the quantity withdrawn for irrigation increased by about 400,000 acre-feet during the same period. This indicates greater relative increases in other use categories. Use of irrigation water generally decreased in areas adjacent to the larger cities. This is illustrated in figure 2, which shows a declining trend in acres of irrigated land in the Truckee Meadows from 1947 to 1962. Thus far, development of desert lands by pumping ground water for irrigation has more than compensated for losses due to urban growth.

Increases in Ground-Water Withdrawals

Ground-water withdrawals have increased steadily since 1950 with the most pronounced increases occurring from 1960 to 1965. In 1965 ground-water use exceeded surface-water use in all categories except irrigation; however, more ground water was withdrawn for irrigation than for any other purpose.

The relative proportion of ground-water withdrawals in relation to surface-water withdrawals probably will continue to increase rapidly in the future. This increase will be due primarily to pumping. Utilization of spring discharge for irrigation, public supply, and rural use has remained almost constant at about 130,000 acre-feet per year since 1950. Pumpage (estimated as total ground-water use minus 130,000 acre-feet of spring discharge, table 13) doubled during the 1950-55 and 1955-60 periods and increased by 60 percent during the 1960-65 period. Future pumpage may increase at a rate slightly greater than the 30,000 acre-feet per year noted during the 1960-65 period.

Table 13.--Summary of estimated water use in Nevada, 1950-65

(Estimates for 1950-60 from U.S. Geological Survey Circulars 115, 398, and 456, unless otherwise indicated; all estimates, in acre-feet, significant to no more than two figures)

Year	Categories of use					
	Irrigation			Public supply		
	Surface water	Ground water	Total	Surface water	Ground water	Total
1950	1,500,000	160,000	1,700,000	23,000	22,000	50,000
1955	1,500,000	200,000	1,700,000	40,000	32,000	72,000
1960	1,600,000*	300,000	1,900,000*	40,000	43,000	83,000
1965	1,700,000	410,000	2,100,000	42,000	67,000	110,000

Year	Categories of use					
	Self-supplied industrial			Rural		
	Surface water	Ground water	Total	Surface water	Ground water	Total
1950	21,000*	7,000	28,000*	4,400*	5,900*	10,000*
1955	27,000*	11,000*	38,000*	4,400*	6,500*	11,000*
1960	27,000*	20,000*	47,000	4,000*	10,000*	14,000*
1965	29,000	40,000	69,000	3,700	16,000	20,000

Year	Total use		
	Surface water	Ground water	Total
1950	1,600,000	190,000	1,800,000
1955	1,600,000	250,000	1,800,000
1960	1,700,000	380,000	2,100,000
1965	1,800,000	530,000	2,300,000

* Revised on the basis of information not available at the time that the original estimate was made.

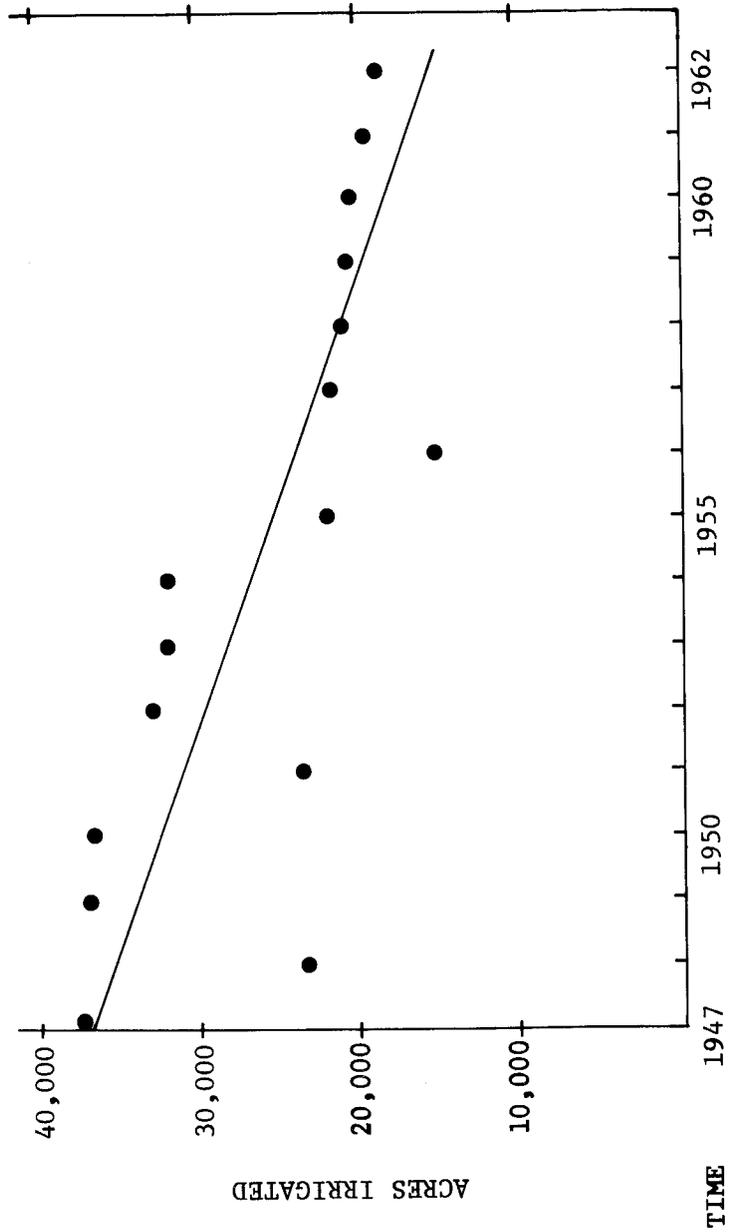


Figure 2.--Trend of acres of land irrigated in the Truckee Meadows
 (Illustration from Little, 1965, p. 6.)

Much pumping is concentrated in a comparatively small number of valleys. This is illustrated by table 14, which lists estimates of gross pumpage in 1950, 1955, 1960, and 1965 for seven selected areas of development. In 1965, more than half the gross pumpage within the State was from those seven areas. Significant ground-water development has occurred in about 30 additional valleys in the State.

RECOMMENDATIONS FOR FUTURE STUDIES

Evaluation of use of the State's water resources is a continuing process which must be constantly improved as the need for current and better information arises. Although this report contains reasonably detailed estimates of water withdrawals throughout the State, it is lacking in the following information which should become increasingly important to those involved in planning and water management:

1. Most of the estimates presented in this report were computed indirectly. Direct measurements would provide much more reliable determinations of water use. The State Division of Water Resources began such a program in 1967 in the principal irrigated areas of the State. These determinations are expected to improve the knowledge of water use in Nevada.

2. Detailed estimates of consumptive use--specific estimates of consumptive use are not given in this report because adequate information is lacking throughout much of the State. A considerable part of the State's water might potentially be used several times before it is ultimately consumed; consequently, knowledge of water consumption should become much more significant in the future as demands approach or equal the local supply.

3. Estimates of conveyance losses along major irrigation ditches and canals--considerable information is available concerning these losses in parts of the Carson, Truckee, Walker, and Humboldt River basins. Estimates of these losses are not made in this report because each irrigation system has its own characteristics, and it was beyond the scope of this brief study to collect and adequately analyze all available information. This should be done in future studies.

4. All future estimates would doubtlessly be improved by additional specific information regarding all categories of use. However, because acquisition of such data is costly, detailed information might be most efficiently collected on a need-to-know basis.

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