Nevada State Water Plan
PART 2 — WATER USE AND FORECASTS

Section 4
Meeting Our Future Water Supply Needs

Introduction

The future presents Nevada with many water resource challenges as a result of an ever increasing population, and competition over our limited water resources. Every effort should be made to ensure that all Nevadans have adequate and safe water supplies while protecting the quantity and quality of our water resources for current and future uses. This section of the *State Water Plan* is intended as an overview of future water demands, alternatives for meeting those needs, and water supply options identified in regional water plans.

Future Demands

As presented in Part 2, Section 3 of the *State Water Plan*, total statewide annual water withdrawals during the period 1995 to 2020 are forecasted to increase about 350,000 acre-feet (af) from 4,041,000 to 4,391,000 acre-feet per year (afy), assuming current levels of conservation. Correspondingly, annual consumptive use will increase about 96,000 af from 1,957,000 to 2,053,000 afy. This projected increase in water use is directly attributable to increasing population and related increases in economic endeavors, resulting in rising public supply (M&I), domestic, commercial, industrial and thermoelectric water usage.

The anticipated increase in total statewide water withdrawals is primarily the result of increasing public supply (M&I) water usage. Annual M&I water use is projected to increase by 509,000 af from 525,000 to 1,034,000 afy, almost doubling from 1995 to 2020. A majority of this increase in demand will be met with surface water supplies. Approximately 91 percent of this increase can be attributed to anticipated growth in Clark and Washoe counties. It is expected that M&I usage will account for almost one-quarter of the total statewide usage by 2020. One of Nevada's water resource challenges will be meeting the water needs of the nearly 3 million people expected to reside in the state by 2020.

The M&I water use projections presented in Part 2 of the *State Water Plan* are based upon existing water use patterns and conservation measures and do not include the effects of future conservation efforts. The implementation of additional M&I conservation measures will result in lower M&I water withdrawals (in 2020) than the 1,034,000 afy predicted in the water plan. Planning groups for Southern Nevada and Washoe County have estimated that their proposed additional conservation measures will result in annual M&I withdrawals about 150,000 af less than would occur without these additional measures. The achievement of additional conservation is an integral part of Southern Nevada's water supply plan for the future.

Based upon the economic forecasts in Part 2 of the *State Water Plan*, agricultural water use could experience a 7 percent decline through 2020. Nonetheless, agriculture will continue to account for a majority of the statewide use during the next 20 years. It must be noted that statewide agricultural water use is highly variable depending upon weather conditions and water supplies, and can vary more than 25 percent from a wet year to a dry year as a result of changing water availability. While the projections in the *State Water Plan* suggest that agricultural water use will decrease in the future, planning and management efforts need to consider providing more reliable water supplies for irrigation during drought periods.

Almost 6 to 7 percent of statewide water withdrawals occur in the mining industry. It is anticipated that mining water withdrawals will remain relatively constant at around 275,000 afy with a slight increase over the next 10 years followed by a slight decline after 2010. A majority of the withdrawals are associated with mine dewatering, and about 185,000 acre-feet per year of these withdrawals are either discharged to surface water systems, reinjected into aquifers or used by other sectors such as irrigation. The impacts of these future mine dewatering activities will continue to be monitored and evaluated.

Water Availability

Approximately 60 percent of the water withdrawn in Nevada comes from surface water sources. Most of Nevada's surface water is the result of runoff from melting snow, with peak flows generally occurring in May and June. Available surface water supplies are highly dependent upon weather conditions with variable monthly and annual flows. For example, the Humboldt River at Palisade (midway down the river) has experienced flows of 1,336,000 acre-feet during one year and only 25,000 acre-feet during another year. With such wide fluctuations, it is difficult to provide adequate and consistent water supplies to users on the system. Utilization of above ground and below ground storage capabilities are one strategy for smoothing out some of the flow fluctuations, thereby guaranteeing more reliable supplies.

Generally, Nevada's surface water sources have been fully appropriated and utilized for many years. Expanded usage of our surface water resources can only occur to a restricted extent. With limited "excess" surface water available, those looking to surface supplies to meet future demands will need to examine a variety of options such as water right acquisitions and transfers, storage and improved management.

Groundwater supplies provide about 40 percent of our water needs. In some areas, groundwater is used as a sole source. In other areas, groundwater is used as a supplemental source during times of limited surface water flows. Currently, about 60 percent of Nevada's groundwater basins have varying amounts of water available for additional appropriations for agriculture, urban and other uses. However, most of these groundwater resources exist in areas distant from the anticipated water demand growth areas. Development of these sources can become an expensive endeavor if interbasin transfers are involved.

Options for Meeting Future Water Needs

Meeting our future water needs will require implementation of a combination of strategies. Possible strategies have been divided into two categories: demand management and supply development. Through demand management, water purveyors make wiser use of the available water thereby lessening the need for new source development. Supply development strategies include a variety of methods for increasing supplies and improving supply reliability.

Increasing demands and competition for our limited resources oblige water managers and suppliers to implement both demand management and supply development strategies. However, each option needs to be evaluated on a case-by-case basis for suitability, cost effectiveness and public acceptance.

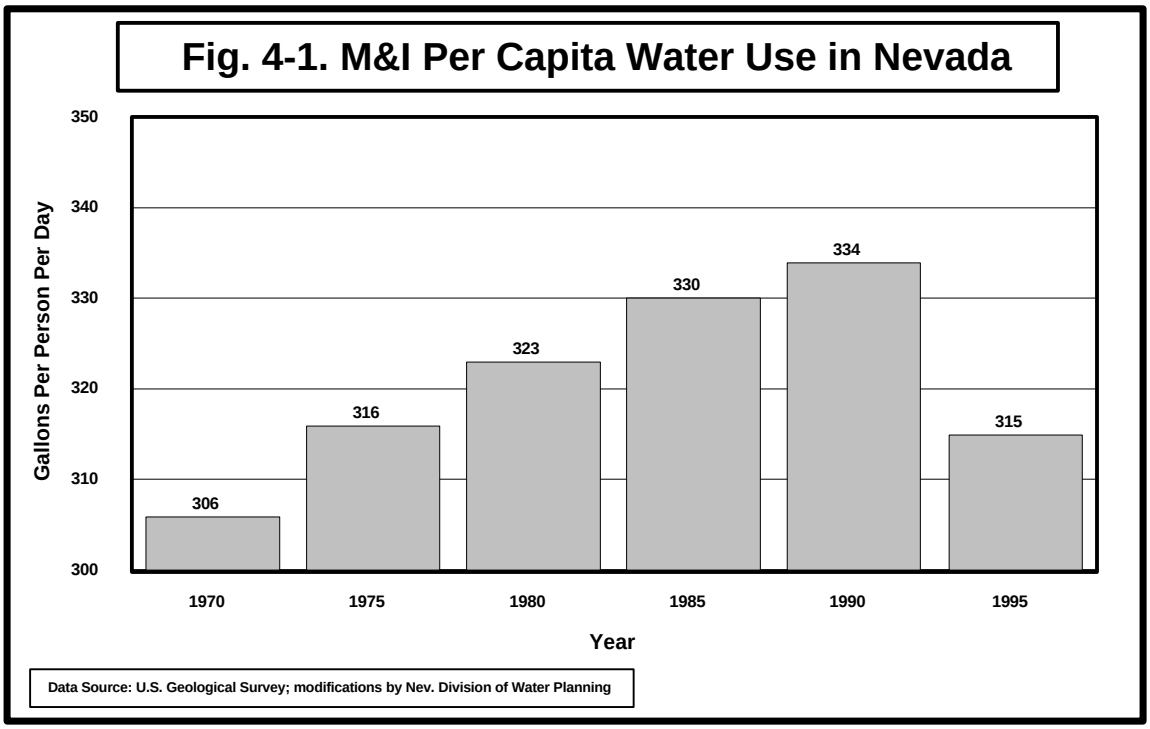
Demand Management Strategies

The time is past when water supply needs can be met simply by developing more water withdrawal, storage and delivery systems. Demand management must also be part of any long-range water supply plan. By reducing demands, new supply developments can be delayed with potential savings to the users. Demands can be managed through conservation measures and alternate strategies such as effluent reuse, greywater use and dual water systems.

Conservation. Conservation is recognized by most water suppliers and users as a cost-effective approach for extending water supplies, improving supply reliability during times of shortages, and deferring the need for new supply development. Numerous case studies have shown that a good conservation program can reduce demands significantly.

A comprehensive municipal water conservation program typically includes features such as: water system audits and leak detection, a public information and awareness program, utilization of increasing block billing, new ordinances, installation of low flow fixtures, landscape demonstration projects, use of drought tolerant plants and implementation of a xeriscape program, and installation of meters.

From 1970 to 1990, Municipal & Industrial (M&I) water use rates in Nevada were on the rise (Figure 4-1). Successful conservation programs during the 1990s have lowered statewide M&I water use from 334 gallons per person per day (gpcd) in 1990 to 315 gpcd in 1995. In the Las Vegas area, the critical impact of conservation to the region's water planning efforts has been recognized by the Southern Nevada Water Authority and participating water purveyors. The local governments and water suppliers have implemented a variety of conservation measures, such as: banning the creation of artificial lakes, adopting water waste ordinances, restricting lawn watering, establishing increasing block rates for billing purposes, establishing an active public education and outreach



program, and pursuing the use of lower quality water in lieu of potable supplies where feasible. As a result of these conservation efforts, Municipal & Industrial (M&I) water use in the Las Vegas Valley Water District has decreased from 358 gpcd (gallons per capita per day) in 1989 to 320 gpcd in 1997. Residential use has decreased from 213 gpcd to 197 gpcd during the same period.

Agricultural conservation programs typically include: laser leveling of fields, lining of ditches, use of soil and plant moisture monitoring devices, conversion to overhead or drip irrigation methods, and selection of low water use crops. Nevada's agricultural community has been implementing many of these conservation measures throughout the State, particularly in the Walker River and Carson River basins and the Lovelock area (Humboldt River basin).

For additional information on conservation, refer to Part 3 of the *State Water Plan.*

Alternate Strategies for Reducing Potable Water Demands. Conservation reduces potable water demands by decreasing the overall water needs of the users. Other options to achieve potable water demand reductions involve the utilization of lower quality water in lieu of treated potable water. The main options in this category include: effluent reuse, greywater reuse and dual distribution systems. These alternate strategies may not reduce overall water usage, but rather shift some of the demand from one water source (potable) to another (nonpotable). These approaches may not be appropriate in all situations and must be examined on a case-by-case basis.

- **Effluent reuse.** One way to reduce demands for potable water and thus extend the higher quality supplies is through the use of treated wastewater effluent as a replacement source in Nevada.

Current uses for reclaimed water include: urban landscaping such as golf courses, parks, road medians, cemeteries, etc.; agricultural irrigation; industrial uses such as cooling water and process water; wetlands applications; and construction water.

Effluent reuse is not only a tool for managing and reducing potable water demands, but also a tool for managing treated wastewater. Increasingly stringent wastewater discharge requirements have induced some municipalities and industries to seek alternative methods to dispose of treated wastewater effluent. Effluent reuse decreases potable water demands only if it is used as a replacement source.

Effluent reuse is increasing in Nevada. In Clark County, approximately 11,000 acre-feet of treated wastewater was reused for landscape and golf course irrigation, and power plant purposes during 1997. The Southern Nevada Water Authority has projected wastewater reuse to reach approximately 25,000 acre-feet per year by the year 2000. Approximately 4,000 acre-feet of the wastewater generated in Washoe County (about 2,000 acre-feet from Lake Tahoe basin for reuse in Douglas County, about 2,000 acre-feet from Truckee Meadows area) was reused during 1997 for landscape, golf course and agricultural irrigation, and environmental uses, such as wetlands. According to the "1995-2015 Washoe County Comprehensive Regional Water Management Plan," effluent reuse is expected to increase as treated wastewater is substituted for fresh water used for irrigation. The City of Carson City reuses all of its treated wastewater (approximately 6,000 acre-feet in 1997) for landscape and agricultural irrigation, and will continue to do so as the community population and the associated wastewater volumes increase. Also, all wastewater generated (about 4,000 acre-feet in 1997) in Nevada's portion of the Lake Tahoe basin is exported for reuse in Douglas County.

Treated wastewater is also used in other counties, primarily Elko, and Lyon. Generally, effluent reuse has served both as a replacement for potable water and as an alternative disposal method.

- **Greywater Use.** Another potential method for reducing potable water demands is to irrigate trees and shrubs with greywater - water that has already been used for bathing or clothes washing. Greywater can account for more than one-half of all residential indoor water use. However, some household water, such as wastewater from toilets, kitchen sinks, dishwashers, or laundry water from soiled diapers, is not suitable for reuse because it may contain bacterial contaminants, grease or residues of detergents that are harmful to plants. Because greywater systems require dual piping, surge tanks and distribution piping, they can be expensive to install and may be more suitable for new construction rather than retrofit situations.

  In the early 1990s, California developed standards for household use of greywater for irrigation. The standards set specifications for plumbing design and equipment to ensure that greywater is safe for intended uses. The California Urban Water Conservation Council considers greywater use to be a potential Best Management Practice (BMP), but has taken no action to elevate it to a mandatory BMP. At this time, greywater is reused to a limited extent in Nevada.

- **Dual Water Systems.** The use of dual water systems is another method for reducing potable water demands. With this strategy, lower quality water (nonpotable) is used for outdoor landscape irrigation and is delivered to users via a second pipeline system separate from the potable water distribution network.

  Approximately one-third of our treated drinking water is used for landscape irrigation. Utilizing untreated water for landscape purposes has the potential to significantly decrease potable water needs. Dual water systems allow public water systems to extend their high quality water sources and reduce water treatment costs. However the requirement for an additional distribution system can cause dual water systems to be cost prohibitive. As with some of the other demand management strategies, the use of dual water systems may be more cost effective for new construction and limited retrofit situations.

  Dual water systems are common along the Wasatch Front in Utah. Most communities in that area utilize dual systems to pipe untreated water for landscape water purposes.

Supply Development Strategies

Supply development strategies include alternative methods for increasing supplies and improving supply reliability, such as use of uncommitted supplies, acquisition and transfer of existing water rights, improved management of both groundwater and surface water supplies, utilization of lower quality (saline) water, and increasing natural supplies. The strategies presented in the following discussion may not be appropriate in all situations and must be examined on a case-by-case basis.

Use of Existing Committed and Uncommitted Supplies. With this strategy, water suppliers further utilize supplies under their existing water rights and/or obtain new appropriations for previously unallocated water. In general, future new allocations will be limited to groundwater as most of the surface water resources have been fully appropriated. For some areas of Nevada, this strategy may be an expensive proposition as most of the unappropriated groundwater resources exist in areas distant from the growing metropolitan areas.

Water Transfers. One tool for increasing available supplies to meet future demands is water transfers. Under this option, water rights are purchased or leased from one user for use by another. As most groundwater and surface water sources are fully appropriated, opportunities for new appropriations are typically limited to basins distant from the growing metropolitan areas. In some cases, water transfers from existing uses may be more cost effective than developing distant sources.

Additional information on transfers is provided in the "Interbasin Transfer" discussion in Part 3 of the *State Water Plan*.

Groundwater Recharge and Recovery. Artificially recharging aquifers is a water resource management option available to some areas as a means of securing more reliable water supplies during periods of low surface water flows. This strategy involves recharging groundwater aquifers with available surface water for later use. In effect, it makes use of an underground reservoir to store water in much the same way that surface water reservoirs are used. The stored water is then removed

when needed to augment other supplies. It must be noted that groundwater recharge/recovery is only feasible in certain areas as dictated in part by aquifer conditions.

Underground water storage has a number of advantages over surface reservoirs. In general, surface reservoirs may have higher construction costs and more difficult environmental permitting requirements, and higher water losses (due to evaporation). Nevada state water law provides criteria for the establishment of groundwater recharge/recovery programs.

Additional information on groundwater recharge and recovery is provided in the "Integrated Groundwater and Surface Water Management" discussion in Part 3 of the *State Water Plan*.

Conjunctive use. Conjunctive use is the coordinated management of both surface water and ground water supplies. Under an active form of conjunctive use, surface water is used when available, excess surface water (if available) is stored in groundwater aquifers, and groundwater and stored surface water is then pumped to meet demands over and above those met with the surface water supplies. (Note: With the groundwater recharge/recovery strategy, only the stored surface water is removed to augment existing surface water supplies.) A passive form of conjunctive use is to simply rely on surface water in wet years and use groundwater in dry years with no institutional groundwater recharge program. Benefits of conjunctive use include improved management of resources, more reliable supplies, emergency and drought relief capacity, and summer peaking options.

Additional information on conjunctive use is provided in the "Integrated Groundwater and Surface Water Management" discussion in Part 3 of the *State Water Plan*.

Desalination. Desalination is a process that removes dissolved minerals (including but not limited to salt) from seawater, saline water, or treated wastewater. A number of technologies have been developed for desalination, examples being reverse osmosis (RO) and distillation. Of the more than 7,500 desalination plants in operation worldwide, 60 percent are located in the Middle East. In contrast, 12 percent of the world's desalination capacity is in the Americas, with most of the plants located in the Caribbean and Florida. According to the California Water Plan, California has more than 150 desalting plants (combined capacity of 66,000 acre-feet per year) providing freshwater for municipal, industrial, power, and other uses. In California, the main applications, in order of treatment capacities, are groundwater recovery, wastewater desalination and seawater desalting.

The desalination of saline waters is proven technology but has little application in Nevada. While Nevada does have areas of high salinity groundwater, the cost of developing other freshwater supply options has been more cost effective. Desalination may become more cost effective in the future as available freshwater sources become fully utilized and/or more expensive to develop. As long as cheaper freshwater sources are available, future use of desalination plants in Nevada will be limited.

Desalination for Southern Nevada has been suggested in the form of an exchange with California, i.e. Las Vegas would pay for desalination facilities in California in exchange for the use by Southern Nevada of a portion of California's Colorado River apportionment. However, high desalting costs continue to keep this option as a lower priority.

Cloud Seeding. Cloud seeding is a weather modification technique involving the injection of a substance into a cloud for the purpose of increasing precipitation amounts, thereby increasing snowpack amounts and associated streamflows. In northern Nevada where the primary water source is snowmelt from the Sierra Nevada and other mountain ranges, the appropriate cloud seeding option is one which augments the winter snowpack over these mountain ranges.

Operational cloud seeding over mountain ranges in the western United States has been conducted for over 40 years. Currently, most of the watersheds on the western slopes of the Sierra Nevada have wintertime cloud seeding projects associated with them, with sponsorship primarily by farming organizations and power companies. The value of water to these groups has made cloud seeding a viable alternative for additional water for many years. Cloud seeding first began in Nevada in the Lake Tahoe basin in the 1960s. Currently, cloud seeding activities exist in the drainage basins of Lake Tahoe, Truckee River, Carson River, Walker River, upper Humboldt River, South Fork of the Owyhee River, and Reese River. The Desert Research Institute has designed and operated the Nevada state cloud seeding program since its inception. Estimates of augmented water from seeding have varied from 35,000 to 60,000 acre-feet over each of the last ten years.

Meeting Future Municipal and Industrial (M&I) Water Needs

As already discussed, statewide M&I water use could increase from 525,000 to 1,034,000 acre-feet per year by the year 2020 if current water use patterns continue. Approximately 91 percent of this increase can be attributable to anticipated growth in Clark and Washoe counties. According to planning documents for Clark and Washoe counties, the increase in their M&I demands will be met primarily with expanded utilization of surface water supplies. Projections show that a number of other counties are also expected to experience significant M&I water use growth from 1995 to 2020: Nye (113 percent), Lyon (105 percent), Churchill (89 percent), Pershing (76 percent), Douglas (74 percent), Elko (64 percent), Storey (57 percent), Carson City (56 percent), and Humboldt (55 percent).

Many of these counties have developed or are actively developing plans to deal with these increasing water needs. The most common solutions being considered in these plans are: conservation; expanded use of current supplies; acquisition and transfer of existing rights; reclaimed water use; groundwater recharge/recovery; and conjunctive use. Following is a discussion of some regional water planning efforts that have been undertaken around the State. This is not intended to be an exhaustive presentation of all water supply planning activities in Nevada, but rather an overview of some of the major M&I supply challenges facing different regions and associated potential solutions. Each region has its own unique set of challenges and solutions must be evaluated on a case-by-case basis.

Southern Nevada Water Authority

The Southern Nevada Water Authority (SNWA) was created in 1991 through a cooperative agreement among the seven regional water and wastewater agencies in Clark County. SNWA membership includes:

- Big Bend Water District (Laughlin)
- City of Boulder City
- Clark County Sanitation District
- City of Henderson
- City of Las Vegas
- Las Vegas Valley Water District
- City of North Las Vegas

It should be noted that water use by entities within the Authority accounts for a majority of the Municipal & Industrial (M&I) use in Clark County. The purposes of SNWA are to seek new water resources for Southern Nevada, to manage existing and future water resources, to construct and manage regional water facilities, and to promote responsible conservation. In 1994, the Authority began an integrated resource planning process to aid in the selection of appropriate combinations of resources, facilities and conservation programs to meet future water demands in Southern Nevada. The SNWA Water Resource Plan was completed January 1996 and amended February 1997.

Water Use Forecasts. M&I water withdrawals in Clark County have been forecasted by the Division of Water Planning to increase from about 380,000 acre-feet in 1995 to 784,000 acre-feet in 2020 (Table 4-1). This value corresponds favorably with SNWA's Year 2020 forecasts ("With Existing Conservation" Scenario) for Authority water purveyors. Conservation measures are being successfully implemented by SNWA purveyors. For example, Las Vegas Valley Water District has reduced their total M&I usage from 358 gallons per capita per day (gpcd) in 1989 to 320 gpcd in 1997, a decline of about 11 percent. Domestic usage decreased from 213 gpcd to 197 gpcd during that same period.

The achievement of additional conservation is an integral part of SNWA's Water Resource Plan and needed to meet demands to the Year 2025. Based upon planned additional conservation in the future, SNWA estimated M&I water withdrawals to be approximately 642,000 acre-feet in the Year 2020 and 714,700 acre-feet in 2030 (Table 4-1). The SNWA Water Resource Plan presents options for meeting these demands.

Table 4-1. Comparison of M&I Water Withdrawal Projections for Southern Nevada

Agency	Scenario	Applicable Region	1995 (acre-feet)	2020 (acre-feet)	2030 (acre-feet)
USGS	Estimated historic use	Clark County	380,000	not applicable	not applicable
NDWP	Based upon 1995 water use and conservation patterns	Clark County	See USGS data	784,000	not applicable
SNWA (per SNWA Water Resource Plan)	Based upon existing conservation measures	SNWA water purveyors (Note: Includes about 96% of Clark County's M&I usage; includes both potable and nonpotable water usage)	364,400	777,500	865,400
	With planned additional conservation greater than 1995 patterns			642,000	714,700

Data Sources: U.S. Geological Survey, SNWA Water Resource Plan (1997), Nev. Division of Water Planning

Supply Options. According to the SNWA Water Resource Plan, water demands can be met from now until approximately 2007 by fully utilizing the Authority's existing long-term water supplies, unused Nevada (non-SNWA) Colorado River water, the Las Vegas Valley aquifer, and continuing conservation efforts. The existing long-term water supplies include:

- reclaimed water;
- current groundwater rights;
- pre-1992 Colorado River water rights;
- Colorado River water acquired from Southern California Edison and Basic Management Inc.; and
- SNWA's 1992 contract with the Secretary of the Interior for additional Colorado River water.

To meet increased water demands from 2007 until 2025, the Authority intends to utilize Colorado River surpluses (if available), the Southern Nevada Groundwater Bank, the Arizona Banking Demonstration Project, and the future Arizona groundwater bank (if necessary). The Authority also intends to exercise the 1992 contractual rights it has with the Secretary of the Interior (right similar to those relied upon by California). These rights provide for an annual distribution by the Secretary of the Interior of unused apportionments and surplus flows within the lower Colorado River. Banked water, unused apportionments and surplus flows are all critical resources for the Authority. Since unused apportionments and surplus flows are uncertain, however, the Authority will continue to aggressively pursue other future resources.

Under the Southern Nevada Groundwater Bank, the Las Vegas Valley Water District is recharging available Colorado River water into the regional groundwater system for later use. Under the Arizona Banking Demonstration Project, the Authority paid the Central Arizona Water Conservation District to store a portion of Arizona's Colorado River apportionment in Arizona aquifers for use by Nevada. Under certain conditions, Nevada will be able to divert additional Colorado River water in exchange for the water stored in the Arizona aquifers.

To meet water demands beyond 2025, future resource possibilities for SNWA include: utilization of surface water from the Virgin and/or Muddy rivers, Colorado River water banked in the Southern Nevada Groundwater Bank or the Arizona Groundwater Bank, managed surpluses of Colorado River water, Colorado River transfers and marketing, or construction of the Cooperative Water Project to import groundwater from sixteen hydrologic basins in southern and eastern Nevada via a pipeline network.

Washoe County

In 1995, the Nevada State Legislature approved legislation which created the Washoe County Regional Water Planning Commission and provided the basis and direction for the Commission and the 1995-2015 Washoe County Comprehensive Regional Water Management Plan. This legislation required that the Commission develop "...a comprehensive plan for the region covering the supply of municipal and industrial [public supply] water, quality of water, sanitary sewerage, treatment of sewerage, drainage of storm waters and control of floods." The plan was completed and approved by the 1997 State Legislature. All areas of Washoe County are included in the plan except for the Tahoe Basin, the Pyramid Lake Paiute Reservation, and generally the area north of Pyramid Lake. Water use by the public water systems within the Washoe County Plan area accounts for a majority of the potable water use in Washoe County.

Water Use Forecasts. The Washoe County Plan includes potable water withdrawal projections up to the year 2015 and discusses options for meeting these future needs. Because of uncertainty in future water use patterns, the Washoe County Plan provides a range of potential water use figures.

The Division of Water Planning projected Washoe County public supply withdrawals at 115,800 acre-feet per year for the year 2015 and 123,000 acre-feet for 2020 (Table 4-2). These forecasts were developed using factors representative of 1995 water use patterns and conservation efforts. NDWP's 2015 forecast of 115,800 acre-feet per year is just slightly higher than Washoe County's forecast of 111,500 (with 1996 typical conservation). One reason for the difference is that the NDWP projections include Lake Tahoe, Pyramid Lake Paiute Reservation, and northern Washoe County public supply water usage.

At the direction of the Washoe County Regional Water Planning Commission, the Washoe County Plan identifies the scenario "with Negotiated Settlement" (94,000 acre-feet in the year 2015) as the most probable potable water demand projection. The Washoe County Plan also provides non-potable water demand forecasts. According to the Plan, "[T]he outlook [for non-potable water usage] is for a broad decline in freshwater use to irrigate large public areas (e.g. parks, golf courses) and remaining agricultural lands."

Table 4-2. Comparison of M&I Water Withdrawal Projections for Washoe County

Agency	Scenario	Applicable Region	1995 (acre-feet)	2015 (acre-feet)	2020 (acre-feet)
USGS	Estimated historic use	Washoe County	79,400	not applicable	not applicable
NDWP	Based upon 1995 water use and conservation patterns	Washoe County	See USGS data	115,800	123,000
Washoe County (per Washoe County Water Plan)	With 1996 typical conservation	Washoe County excluding Lake Tahoe basin, Pyramid Lake Paiute Reservation, and northern regions (Note: includes about 95% of Washoe County's M&I usage)	83,300[1]	111,500[1]	not available
	With Negotiated Settlement conservation and metering			94,000[1]	
	With aggressive conservation			86,600[1]	

[1]Values include water withdrawals for domestic wells, however the Washoe County Plan does not provide a detailed breakdown to represent estimated domestic well usage. According to NDWP estimates, 1995 domestic water use was approximately 5,000 acre-feet.

Data Sources: U.S. Geological Survey, 1995-2015 Washoe County Comprehensive Regional Water Management Plan (1997), Nev. Division of Water Planning

Supply Options. Current primary water sources for public supply systems within the Washoe County Plan study area include Truckee River water (about 75 percent) and/or groundwater (about 25 percent). Both of these sources are utilized to meet potable water needs in the Central Truckee Meadows and some outlying areas. For most of the basins outside the Central Truckee Meadows, groundwater is the primary water resource. Conjunctive use of Truckee River water and groundwater is implemented to optimize the yield of the region's water resources, thus reducing the risk that some outlying basins in Washoe County will experience groundwater overdrafts in the near future. Of the current potable water withdrawal of approximately 83,000 acre-feet/year, about 60,000 to 70,000 acre-feet is diverted from the Truckee River with the remainder withdrawn from groundwater sources. The primary water purveyor in Washoe County is Sierra Pacific Power Company (SPPCo) which has produced it own plan entitled "1995-2015 Water Resource Plan." Since issuance of its plan, SPPCo has entered into a service territory agreement with Washoe County making its Truckee River water supplies available regionwide through wholesale agreements. The Washoe County Regional Water Plan recommends that the SPPCo plan serve as the basis for water resource planning in the Central Truckee Meadows and adjoining systems which are interconnected to SPPCo.

The Washoe County Water Plan is based upon the assumption that the Negotiated Settlement (Public Law 101-618) will be fully implemented. The Negotiated Settlement not only provides sufficient water resources for the next 50 years or more, it also secures the community's existing Truckee River supply. The Settlement quiets bi-state claims to Truckee River water, resolves many years of litigation, provides environmental and Tribal benefits, and more than triples available drought storage. Upon full implementation, the Negotiated Settlement will provide a water supply from the Truckee River of 119,000 acre-feet/year (current usage is 60,000 to 70,000 acre-feet/year), sufficient to meet regional water needs well past the Year 2020. Incremental yield of the Negotiated Settlement has been estimated at 39,000 acre-feet per year which reflects the conversion of 42,900 acre-feet of

Truckee River irrigation rights to municipal uses.

Since the Negotiated Settlement is not yet in effect, SPPCo has studied and evaluated alternate resource options. In the event the Settlement is not completed, subsequent Washoe County Plan revisions will need to include alternate water supplies, including regional conjunctive use of resources, artificial recharge and contract(s) for storage in Federal reservoirs.

The Washoe County Water Plan also identifies water supply alternatives for meeting future M&I needs in the valleys north of the Central Truckee Meadows area. These options include: delivery of Truckee River water, and importation of surface water and groundwater from neighboring hydrographic basins.

Douglas County

In 1994, the "Carson Valley Comprehensive Water Plan" was prepared to provide a comprehensive review of municipal water resource supply and provisions of water service to the various communities within the Carson Valley. The plan elements and recommendations were updated and included in the Douglas County Master Plan adopted in 1996. This element of the Water Plan addresses the water needs of those public supply systems in the Carson Valley and Topaz Lake regions of the county. There are a number of public supply systems in the Lake Tahoe basin portion of Douglas County which are not included in the master plan element. Subsequent to the adoption of the 1996 Master Plan, Douglas County has developed updated water use projections for Carson Valley (Douglas County only).

Water Use Forecasts. NDWP has forecasted Douglas County M&I water withdrawals at approximately 18,000 acre-feet for the year 2015 and 19,200 acre-feet for 2020 (Table 4-3). Utilizing higher population estimates, the County has projected annual M&I use (excluding Lake Tahoe basin and the Topaz Lake area) at about 19,500 acre-feet by 2017.

Supply Options. The water element of the Douglas County Master Plan recommends that the future M&I demands (Year 2015) be met by consolidating some of the water systems and further utilizing existing M&I water rights. There are approximately 14 public water supply systems in the Carson Valley and Topaz Lake regions of Douglas County. When considered as a whole, these public supply systems possess sufficient cumulative M&I groundwater rights to meet future M&I water system demands beyond the year 2015. However some of the public supply systems have excess rights, while others have insufficient rights to meet these future demands. The Douglas Master Plan water and wastewater element recommends the physical interconnection of a number of these systems to benefit the systems with inadequate water rights and to improve overall water supply reliability.

Table 4-3. Comparison of M&I Water Withdrawal Projections for Douglas County

Agency	Scenario	Applicable Region	1995 (acre-feet)	2015 (acre-feet)	2020 (acre-feet)
USGS	Estimated historic use	Douglas County	11,100	not applicable	not applicable
NDWP	Based upon 1995 water use and conservation patterns	Douglas County	See USGS data	18,000	19,200
Douglas County Master Plan	With 1996 typical conservation	Douglas County - excluding Lake Tahoe basin and Topaz Lake area (Note: includes about 75% of Douglas County's M&I usage)	9,531 (1996)	19,500 (2017)	not applicable
	With 10% conservation			17,531 (2017)	

Data Sources: U.S. Geological Survey, Douglas County Master Plan (1996), correspondence from Douglas County, Nev. Division of Water Planning

Summary

The previous discussion presented a brief summary of current M&I water supply planning efforts undertaken by SNWA, Washoe County, and Douglas County. Each planning effort has identified strategies that may be useful for other planning efforts.

Upon reviewing these regional plans, a number of observations can be made and some lessons can be learned:

- Water purveyors are utilizing demand management as a means for delaying or reducing the need for additional supplies. Conservation has become commonplace and additional conservation measures are planned for the future. For example, the achievement of additional conservation is an integral part of Southern Nevada Water Authority's water supply plan for the future.

- Effluent reuse has increased in recent years and these plans indicate that this trend will continue during the planning horizon.

- In general, these plans call for a variety of strategies and sources for meeting future demands. By not putting all their eggs in one basket, water purveyors will be able to provide reliable and safe drinking water supplies.

- Conjunctive use and recharge/recovery program are recognized as useful tools for managing both groundwater and surface water sources. The implementation of conjunctive use and recharge/recovery programs will expand in the future.

- Municipal and Industrial water supply planning is being done on a regional basis. All persons within a region can benefit when planning includes all users and interest groups, and considers both water quantity and quality within a region.

- Creative water supply solutions are being developed. With our limited water resources and growing demands, it has become necessary to look for creative solutions, such as SNWA's Arizona Banking Demonstration Project.

- The positive value of regional, consolidated M&I water systems is being acknowledged. Improved water management and "economies of scale" can be realized through water system consolidation.

- Currently, there is little reliance upon greywater and dual water systems, and desalination treatment due to the higher costs of these options. These plans suggest that this trend will probably continue.

One or all of the options presented in the SNWA, Washoe County and Douglas County plans may have possible application for M&I water systems throughout Nevada. Other water purveyors and planners stand to gain valuable insight into their own water supply problems and solutions by studying other water plans.

Meeting Future Agricultural Water Needs

According to U.S. Geological Survey estimates, annual irrigation withdrawals have varied from 3.1 to 3.4 million acre-feet over the last 25 years. Irrigation withdrawals in 1995 were estimated at about 3.1 million acre-feet, with about 63 percent diverted from surface water sources. Historically, irrigated acreage and associated water usage has varied greatly from year to year in response to our fluctuating precipitation and surface water supplies. With highly variable streamflows in Nevada, those agricultural operations utilizing surface water are faced with unreliable supplies during low flow periods. As a result, many of these irrigators have developed groundwater supplies to supplement surface water sources. However, pumping groundwater is generally expensive and may not be cost effective in some cases.

Based upon past use trends, NDWP projects that statewide agricultural water withdrawals could experience a 7 percent decline through 2020. In part, encroaching urbanization and the transfer of agricultural water rights to other uses such as municipal and natural resource needs will drive future agricultural water use reductions.

While the projections in the water plan suggest that the agricultural water supply will be generally adequate to meet future usage, that should not preclude water managers, planners and users from evaluating other water supply and management issues and options such as:

- methods to improve water supply reliability for agricultural users dependent upon fluctuating surface water sources, including storage:
- implementation of water conservation methods;
- increased utilization of treated wastewater effluent; and
- development of available groundwater resources.

Meeting Future Mining Water Needs

Mining water withdrawals are anticipated to remain relatively constant at about 275,000 afy with a slight increase up to the year 2010 followed by a slight decline. Beginning in the early 1990s, a majority of the mining withdrawals have been associated with mine dewatering. These withdrawals have been significantly higher than the mines' consumptive use needs, thereby requiring the mining operations to develop alternative disposal methods for the excess water. A majority of this "excess" water has been either discharged to surface water systems, reinjected into aquifers or used by other sectors such as irrigation. It is anticipated that this trend will continue with pit dewatering activities generating water volumes in excess of mine processing and consumptive needs.

The forecasted future mining withdrawals are estimates only and are highly dependent upon the price of gold. Actual water use may also be affected by shifts from open pit mining to underground mining. However, some degree of mine dewatering is expected to continue regardless of the type of production activity.

Meeting Future Domestic Water Needs

Statewide domestic water withdrawals are forecasted to increase from about 361,000 afy to about 701,000 afy by 2020 in response to a growing population. Public supply systems are the primary providers of water for domestic uses. As of 1995, the domestic water needs for about 94.2 percent of Nevada's population were met by public water systems. This percentage is projected to increase to 95.4 percent by 2020. Nevertheless, the number of persons on domestic wells is still expected to increase from 92,000 to 140,000 over the next 20 years.

Meeting Future Commercial, Industrial and Thermoelectric Water Needs

In 1995, commercial, industrial and thermoelectric sectors withdrew about 238,000 af of water accounting for about 6 percent of total statewide withdrawals. Public supply systems met a majority (about 85 percent) of the total commercial needs in Nevada. In the industrial and thermoelectric sectors, self-supplied systems provided most (95 percent) of the water needs (Table 4-3).

Table 4-3. 1995 Commercial, Industrial and Thermoelectric Water Use

Sector	Self-Supplied Withdrawals (acre-feet per year)	Public Supplied Deliveries (acre-feet per year)	Total Water Use (acre-feet per year)
Commercial	23,500 [15% of total commercial]	129,700 [85% of total commercial]	153,200
Industrial	16,800 [87% of total industrial]	2,500 [13% of total industrial]	19,300
Thermoelectric	63,800 [98% of total thermoelectric]	1,600 [2% of total thermoelectric]	65,400
Total	104,100 [44% ot total commercial, industrial, thermoelectric]	133,800 [56% of total commercial, industrial, thermoelectric]	237,900

Source: U.S. Geological Survey

By the year 2020, commercial, industrial and thermoelectric withdrawals are projected to increase to about 416,000 afy. It is anticipated that public supply systems will continue to satisfy a majority of future commercial water needs, while self-supplied systems will be utilized to meet most future industrial and thermoelectric demands.

Meeting Future Wildlife and Environmental Water Needs

Interest in obtaining the necessary water supplies to meet wildlife and environmental water needs is increasing. However, quantifying these water needs is a challenge. In the broadest sense, all water (with the possible exception of deep groundwater) may provide benefits to wildlife and the environment. For example, all surface water whether in rivers, ponds, lakes or reservoirs supports a variety of flora and fauna, while also supporting other needs such as public system and irrigation uses. Additionally, shallow groundwater supports riparian vegetation and phreatophytes which provide habitat. Also, habitat may be created as a result of other activities such as irrigation. Wildlife and environmental water needs become difficult to quantify when examined in this broad manner.

The securing of water supplies for wildlife and environmental purposes is still a relatively new resource management concept. In recent years, governmental agencies and conservation organizations in Nevada have used a variety of mechanisms to obtain water for fishes, wildlife, special status species, wetlands and water quality improvement. Water has been obtained by purchasing and transferring water rights to a designated water body or portion thereof, filing for new appropriative water rights and entering into formal and informal agreements for reuse of water from agricultural irrigation systems, wastewater treatment plants, mine dewatering operations and an electric generating station. The water obtained for wildlife and environmental needs is generally used to augment stream flow, reservoir and lake levels, spring pools, wetlands and riparian areas.

Water rights have been acquired for the Lower Truckee River, Meadow Valley Wash (Condor Canyon), Upper Blue Lake (Humboldt County), Bruneau River, Carson Lake and Pasture and for a

number of other aquatic and wetland resources on various federal wildlife refuges and state wildlife management areas. Many water acquisition projects have been cooperative interagency actions to meet requirements of state and federal legislation, such as the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Public Law 101-618) Endangered Species Act, Section 404 of the Clean Water Act (wetland protections), the Migratory Bird Treaty Act and the National Environmental Policy Act.

Currently, efforts to assess and provide water supply needs are commonly retrospective, having been concentrated where ecosystem components already are deteriorating. Providing for future wildlife and environmental water supplies requires implementation of an ongoing, structured assessment process to determine where additional water supplies for wildlife and environmental needs are not being met as evidenced by deterioration in essential resource conditions. Laws and regulations have been instituted which require assessment and management actions to minimize the risk that municipal and industrial water supplies will not meet demand. A similar policy approach is needed for wildlife and environmental resources.

Meeting Future Recreation Water Needs

The popularity of water based outdoor recreation continues to grow. The number of people fishing, wildlife watching, boating, and swimming in Nevada's waters has never be higher, significantly adding to the state and local economies. In fact, tourism officials now commonly advertise the other side of Nevada, its expansive landscape and comparatively unique and rare water resources in the desert. Government agencies responsible for maintaining recreation resource values have acquired water for recreation purposes, primarily at reservoirs in the state. However, as recent experience has shown parks managers and visitors, droughts can dramatically impact water supplies at reservoirs, resulting in significant loss of available recreation resource area. Sometimes the seniority of acquired water rights does not ensure water availability during drier seasons.

As with wildlife and environmental water needs, quantification of recreational water needs may be difficult. In some instances, water for recreation is provided as the result of other water use activities. For example, reservoirs created for irrigation or municipal water supplies also provide recreation opportunities as a secondary or additional benefit. Anticipating future water needs for recreation will require implementation of a comprehensive and integrated assessment process. In fact, recreation resource needs are often intertwined with those of wildlife and the environment. Therefore, it would be practical to combine recreation and natural resource water needs assessments.

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