

# NEVADA STATE WATER PLAN

## PART 1 – BACKGROUND AND RESOURCE ASSESSMENT

March 1999



Nevada Division of Water Planning  
Department of Conservation and Natural Resources

**Nevada Division of Water Planning**

**Nevada State Water Plan**

**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

**Section 1**

**Purpose, Guidelines and  
the Water Planning Process**

*Introduction and Purpose*

Nevada is the driest state in the nation and one of the fastest growing. Water is Nevada's most precious resource, and more than any other resource, water will determine Nevada's future. The success of our economic endeavors, the sustainability of our rural communities and the protection of our environment are all dependent on the wise management of the states' water resources. Thus, comprehensive, coordinated and continuing water management planning is vital to our state's economic future and quality of life.

Development of the state water plan is required by the Nevada Revised Statutes (NRS 540.101.) In statute, the Legislature also declares that "it is the policy of the State of Nevada to continue to recognize the critical nature of the state's limited water resources" and acknowledges the increasing demands placed on these resources by growth. Further, the Nevada Legislature "recognizes the important role of water resource planning and that such planning must be based on identifying current and future needs for water" ( NRS 540.011). Legislative review and consideration of the state water plan will provide additional legislative policy guidance to ongoing planning efforts.

The *Nevada State Water Plan* is designed to help guide the development, management and use of the state's water resources. The plan assesses the quantity and quality of Nevada's water resources, and identifies constraints and opportunities which affect water resource decision making. The plan looks at historical and current water use, and projects demands out to the year 2020. The most current and accepted hydrologic and socioeconomic data sets available are used to develop the plan's forecasts.

Along with providing data about water supplies and water use, the state water plan identifies pressing water management issues and recommends policy directions and actions designed to assist water managers throughout the state and all levels of government. Thus, the plan establishes a common base of knowledge and understanding which is critical if Nevadans are to reach consensus on future water management issues.

The state water plan is designed to be a policy and planning guide, not a water supply plan. Many of the decisions regarding how to meet a particular water supply objective are best determined and implemented at the local level. And in fact, many local governments have taken a close look at their own water supply needs and are now charting a course to meet those needs. Thus, while the plan

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summarizes local and regional water planning efforts, it focuses on a broad array of water planning issues which affect water planning, management and allocation of water resources statewide.

The key to development of the state water plan has been the establishment of a dynamic, flexible water planning process. Ongoing review and update of the plan is essential to ensure that we, as a state, successfully evaluate emerging issues and prepare ourselves to meet future challenges.

The state water plan's recommendations are addressed to a wide variety of agencies, organizations and decision makers. Thus, implementation of the plan's recommendations, subject to changing needs, will require a cooperative and coordinated effort. Prior to implementation, each of the plan's recommendations must be prioritized and evaluated for technical feasibility, and the costs and benefits of each must be identified and weighed. Implementation of the plan should assist local organizations and agencies with their own water planning, as well as help guide water management decisions at the state level. The plan's ultimate effectiveness will be judged by the extent to which it's recommendations are incorporated into other state, local and federal planning efforts and agency actions.

Public input is vital to any planning process. The state's water planning process provides Nevada's residents with a unique opportunity to help decide how the state's water resources should be managed. The state water plan has been significantly enhanced by the willingness of Nevada's residents to participate in its development, and to share their thoughts, ideas and perspectives. At its heart, the state water plan is a valuable expression of public interest.

### *Statutory Authority*

In 1995, the Nevada State Legislature amended Nevada Revised Statute (NRS) 540.101 and directed the Division of Water Planning to develop a state water plan. Following the 1997 legislative session, the Legislature sent the Division of Water Planning a "Letter of Intent" requesting the state water plan be submitted to the Legislature by February 15, 1999. That date was extended to April 1, 1999 to allow sufficient time to complete public review of the final draft.

The authority for the preparation of the State Water Plan is found in NRS 540.101 which states in part:

1. The Division [of Water Planning] shall develop a plan for the use of water resources in the state.
2. The Division shall coordinate with local governments in developing the plan pursuant to section 1. Upon request of the Division, each local government shall cooperate with and assist the Division in the development of the plan.
3. The water plan developed pursuant to subsection 1 must include provisions designed to protect the identified needs for water for current and future development in the rural areas of the state, giving consideration to relevant factors, including but not limited to, the economy of the affected areas and the quality of life in the affected areas.
4. The Division shall submit to the Legislature for its review and consideration:
  - (a) The plan developed pursuant to subsection 1; and

(b) The recommendations regarding the plan provided to the Division by the advisory board on water resources planning and development pursuant to NRS 540.111.

The Division must obtain the approval of the Legislature before the plan is implemented.

The legislative declaration of policy establishes the importance of protecting existing water rights, supporting water conservation, the relationship between water supply and growth, and the role water planning plays in this, the driest state. It further establishes that water planning must focus on current and future water needs and that all levels of government must be involved in water planning.

### ***Guidelines for the State Water Plan***

The *Nevada State Water Plan* was developed in accordance with the legislative declaration of policy found in Nevada Revised Statutes (NRS) 540.011, and based on a series of “guiding principles” generated by the Advisory Board on Water Resources Planning and Development (Advisory Board). (See subsection below, *Participants in the Planning Process*, for a discussion of those involved in developing the state water plan.) The Advisory Board then assisted with developing the goals for the state water planning process and strategies for developing the state water plan.

### **Legislative Policy**

NRS 540.011 establishes the basic legislative policy which has guided development of the state water plan:

NRS 540.011 Legislative declaration:

1. The legislature determines that it is the policy of the State of Nevada to continue to recognize the critical nature of the state’s limited water resources. It is acknowledged that many of the state’s surface water resources are committed to existing uses, under existing water rights, and that in many areas of the state the available groundwater supplies have been appropriated for current uses. It is the policy of the State of Nevada to recognize and provide for the protection of these existing water rights. It is also the policy of the state to encourage efficient and nonwasteful use of these limited supplies.
2. The legislature further recognizes the relationship between the critical nature of the state’s limited water resources and the increasing demands placed on these resources as the population of the state continues to grow.
3. The legislature further recognizes the relationship between the quantity of water and the quality of water, and the necessity to consider both factors simultaneously when planning the uses of water.
4. The legislature further recognizes the important role of water resource planning and that such planning must be based upon identifying current and future needs for water. The legislature determines that the purpose of the state’s water resource planning is to assist the state, its local governments and its citizens in developing effective plans for the use of water.

The legislative declaration of policy establishes the importance of protecting existing water rights, supporting water conservation, acknowledging the relationship between water supply and growth,

and the role water planning plays in this, the driest state. It further establishes that water planning must focus on current and future water needs and that all levels of government must be involved in water planning.

### **Guiding Principles for the State Water Plan**

At their January 6, 1994 meeting, the Advisory Board developed a set of 23 “guiding principles” to philosophically guide development of the State Water Plan. Some of the guiding principles reflect state law or state policy. Others reflect important water planning considerations identified during development of the state water. Later, in 1997, the Advisory Board condensed the guiding principles to these 11:

1. All water within the state, whether above or below ground, belongs to the public and its use is subject to a system of water rights administered by the State Engineer, and by state and federal court decrees and regulations.
2. Public education and public input is vital to statewide water resources planning.
3. The State Water Plan should integrate water supply, water quality, water use, and environmental issues, and should be used to guide decisions which affect water resources in the state.
4. The State Water Plan by design should be “growth neutral.” It should neither encourage nor restrict growth, and present no positions regarding the type, location or rate of growth.
5. Water right owners are entitled to buy, sell or trade their water rights to others under free market conditions. However, changes in the point of diversion, or place or manner of use must be approved prior to the change in accordance with the state water law, and state and federal court decrees and regulations.
6. The water resource needs of future generations of Nevadans should be protected by balancing economic goals with social, aesthetic, cultural and ecological values.
7. All water resource projects should be technically, environmentally and economically sound, and consistent with state law.
8. The State Water Plan should help integrate and coordinate the water planning and management activities of local, state and federal agencies.
9. The relationship between groundwater and surface water must be recognized in the State Water Plan.
10. Water conservation is an important component in the planning and management of the State’s Water Resources.
11. Watershed planning efforts should be encouraged and should include representatives of all agencies, municipalities, political subdivisions, water users and any others with an interest in the planning and management of a watershed.

### **Planning Goals**

Following development of the guiding principles, the Advisory Board and the Department of

Conservation and Natural Resources (DCNR) Steering Committee developed a number of goals and strategies for the planning process and the state water plan. As the plan evolved, so too did the goals and strategies. In general terms, the goal of the state water planning process is to make water planning and water decision making in Nevada *better*: more efficient, more effective and more inclusive. Following are results we hope to achieve through the water planning process and development of the state water plan:

1. **Water Supply:** Enough water of sufficient quality for future generations
2. **Water Rights:** Protection of existing water rights
3. **Economic Efficiency:** The preferential use of water for greatest economic gain to the state
4. **Conservation:** More conservation and less waste of water
5. **Water Quality:** Protection and enhancement of water quality
6. **Rural Water Supplies:** Protection of water supplies for current and future development in rural areas
7. **Environmental Quality :** Protection and enhancement of the environment
8. **Efficiency:** Agency actions which are coordinated and integrated to save money and time, reduce duplication in projects or services, address gaps in resource protection, and result in better decisions
9. **Decision making:** Less litigation and more cooperative decision making to resolve water resource issues
10. **Effectiveness:** More informed water resource decision making, with a greater awareness of aesthetic, cultural and ecological values
11. **Sound Science:** Water resource projects which are technically, environmentally and economically sound
12. **Public Involvement:** A better educated citizenry and more public participation in water resource decision making
13. **Quality of Life:** A higher quality of life for all Nevadans

Each update of the state water plan should bring us closer to reaching these goals. It is important to note that some of the goals may conflict, or appear to conflict, with one another. For example, economic efficiency may appear to be in direct conflict with environmental protection. However, there is growing recognition that environmental protection is actually an essential component of economic development. Economic and environmental *sustainability* is the emerging goal of many communities. Clearly, for a state that is now ranked in the top three in the country as a vacation destination, environmental quality goes hand-in-hand with economic efficiency. It is one of the roles of the water planning process to seek a balance among competing goals so that the plan's overall goal of better water management is achieved. Public involvement in the water planning process has been the key to achieving a balance which reflects the evolving interests and will of the citizenry. **Plan Components**

The primary elements to be included in the State Water Plan were derived from NRS 540.051, Duties

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of the Division of Water Planning and NRS 540.101, Development, contents and implementation of the [state water] plan. Statutory plan components include: (1) providing arid regions with information, alternatives and recommendations including courses of planning and actions for acquiring additional water or for conserving water, (2) investigation of new sources of water such as desalinization, importation, and conservation, (3) consideration of issues of water quantity and quality simultaneously, (4) development of forecasts of future supply and demand, (5) inclusion of provisions designed to protect the need for water for current and future development in the rural areas of the state, considering the economy and quality of life in the affected areas, and (6) the development of recommendations to the Legislature to improve state water policy. Additional plan components were added as a result of input from the Division's Advisory Board, Department of Conservation and Natural Resources staff and the public.

### ***Major State Statutory Policies Affecting the Water Planning Process***

Following is a summary of the major legislative policies, declarations and other statements in the Nevada Revised Statutes (NRS) that affect water planning and management in Nevada. Each NRS citation has been assigned to only one of the main categories, although the statute may address issues within two or more categories.

#### **Water Supply and Allocation**

- 533.024 “The legislature declares that it is the policy of this state:
14. To encourage and promote the use of effluent, where that use is not contrary to the public health, safety and welfare, and where that use does not interfere with federal obligations to deliver water of the Colorado River.”
  15. In a county whose population is less than 400,000 to recognize the importance of domestic wells as appurtenances to private homes, to create a protectible interest in such wells and to protect their supply of water from unreasonable adverse effects caused by municipal, quasi-municipal or industrial uses.”
- 533.025 “The water of all sources of water supply within the boundaries of the state whether above or beneath the surface of the ground, belong to the public.”
- 534.020 (1) “All underground waters within the boundaries of the state belong to the public, and, subject to all existing rights to the use thereof, are subject to appropriation for beneficial use only under the laws of this state relating to the appropriation and use of water and not otherwise.”
- 540.011 (1) “...It is acknowledged that many of the state's surface water resources are committed to existing uses, under existing water rights, and that in many areas of the state the available ground water supplies have been appropriated for current uses. It is the policy of the State of Nevada to recognize and provide for the protection of these existing rights...”
- 541.030 (2)(a) “It is therefore declared to be the policy of the State of Nevada:
- (a) To control, make use of and apply to beneficial use unappropriated waters in this state to a direct and supplemental use of such waters for domestic, manufacturing, irrigation, power and other beneficial uses.”

#### **Water Quality**

- 445.132 “1. The legislature finds that pollution of water in this state:
- (a) Adversely affects public health and welfare:

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- (b) Is harmful to wildlife, fish and other aquatic life; and
- (c) Impairs domestic, agricultural, industrial, recreational and other beneficial uses of water.
- 2. The legislature declares that it is the policy of this state and the purpose of NRS 445.131 to 445.354, inclusive:
  - (a) To maintain the quality of the waters of the state consistent with the public health and enjoyments, the propagation and protection of terrestrial and aquatic life, the operation of existing industries, the pursuit of agriculture, and the economic development of the state; and
  - (b) To encourage and promote the use of methods of waste collection and pollution control for all significant sources of water pollution (including point and diffuse sources).”

### **Environmental and Recreational Uses**

- 501.100 “1. Wildlife in this state not domesticated and in its natural habitat is part of the natural resources belonging to the people of the State of Nevada.
2. The preservation, protection, management and restoration of wildlife within the state contribute immeasurable to the aesthetic, recreational and economic aspects of these natural resources.”

- 527.260 (1)(b) “The legislature finds that:
- (b) The people of the State of Nevada have an obligation to conserve and protect the various species of flora which are threatened with extinction.”

### **Water Use Efficiency**

- 534.020 (2) “It is the intention of the legislature, by this chapter to prevent the waste of underground waters and pollution and contamination thereof ...”

- 540.011 (1) “...It is also the policy of the state to encourage efficient and nonwasteful use of these limited supplies.”

### **Water Planning and Management**

- 540.011 “1. The legislature determines that it is the policy of the State of Nevada to continue to recognize the critical nature of the state’s limited water resources...
2. The legislature further recognizes the relationship between the critical nature of the state’s limited water resources and the increasing demands placed on these resources as the population of the state continues to grow.
3. The legislature further recognizes the relationship between the quantity of water and the quality of water, and the necessity to consider both factors simultaneously when planning the uses of water.
4. The legislature further recognizes the important role of water resource planning and that such planning must be based upon identifying current and future needs for water. The legislature determines that the purpose of the state’s water resource planning is to assist the state, its local governments and its citizens in developing effective plans for the use of water.”

- 541.030 (2)(b) “It is therefore declared to be the policy of the State of Nevada:
- (b) To cooperate with the United States and agencies thereof under the federal reclamation laws or other federal laws now or hereafter enacted and to construct and finance works within or without the State of Nevada as herein defined and to operate and maintain the same.”

- 543.020 “It is hereby declared to be the policy of the State of Nevada to cooperate with the United States and its departments and agencies, and with the counties, cities and public districts of the state, in preventing loss of life and property, disruption of commerce; interruption of transportation and communication and waste of water resulting from floods, and in furthering the conservation, development, utilization and disposal



of water.”

548.095 “It is hereby declared, as a matter of legislative determination:

1. That the renewable natural resources of the State of Nevada are basic assets.
2. That they are being affected by the ever-increasing demands of farm and ranch operations and by changes in land use from agricultural to nonagricultural uses, such as, but not limited to, residential and commercial developments, highways and airports.
3. That conservation, protection, and controlled development of these renewable natural resources are necessary at such rate and such levels of quality as will meet the needs of the people of this state.”

548.100 “It is hereby declared, as a matter of legislative determination, that the consequences of failing to plan for and accomplish the conservation and controlled development of the renewable resources of the State of Nevada are to handicap economic development and cause degeneration of environmental conditions important to future generations.”

548.110 “It is hereby declared to be the policy of the legislature to recognize the ever-increasing demands on the renewable natural resources of the state and the need to conserve, protect and develop such resources at such levels of quality as will meet the needs of the people of the state.”

### ***The Planning Process***

The 1999 *Nevada State Water Plan* was developed over a period of 4-1/2 years (between late 1994 and January 1999) with the involvement of thousands of Nevada citizens. The Division of Water Planning has taken the lead, assisted by the Advisory Board on Water Resources Planning and Development, staff from the various agencies of the Department of Conservation and Natural Resources, and input from state, local and federal agencies and the public.

The steps in the water planning process were as follows:

- solicit public input to determine the scope of the plan and the issues to be addressed
- develop and update basic hydrologic and socioeconomic data sets
- analyze the water resources institutional framework
- forecast the state’s population and anticipated economic trends over the next 20 years
- forecast future water needs over the next 20 years
- inventory water supplies presently available
- inventory resources already committed (permits, vested rights, etc.)
- research additional possible sources of supply
- identify alternate scenarios to meet the water needs of the state
- identify issues that affect water use, allocation and management
- develop and evaluate policy and programmatic recommendations to address the issues
- solicit public input throughout plan development to gauge the relevancy of the issues and the appropriateness of recommendations
- present comprehensive plan with recommendations to the state legislature for review and approval

Once the state Legislature approves the Plan, the Division of Water Planning will communicate plan recommendations to agencies or individuals who are in the best position to further evaluate and

implement them. In some cases, the Division will establish new working groups or task forces to help determine the best approach to plan implementation. It is anticipated that the Water Planning Advisory Board will continue to advise the Division and assist in plan implementation. The Division will be responsible for tracking the progress of plan implementation and evaluating the effectiveness of plan recommendations. Subsequent updates of the Plan will include an evaluation of the state's progress in implementing the Plan's recommendations.

### **Participants in the Planning Process**

Many individuals, organizations and agencies participated in development of the State Water Plan. Plan participants and their roles in plan development are briefly described below.

**The Public.** Extensive public involvement has been key to development of the State Water Plan. The public's opinions, thoughts, and recommendations have been solicited during every phase of the planning process. In 1992, prior to initiation of the 1999 State Water Plan, more than 800 Nevadans participated in a series of Water Policy Forums sponsored by the Nevada Cooperative Extension, the Nevada Humanities Committee and others. The results of these forums were tabulated in a report titled *Nevada's Water Future: Making Tough Choices*. This report, representing a diversity of views, was useful in the early stages of plan development and in generating options to address water issues.

In 1994 and 1995, more than 600 citizens participated in 20 public workshops sponsored by the Division of Water Planning. The purpose of these workshops was to educate the public on Nevada water law and the water planning process, and to get an early sense of the public's perception of key issues such as interbasin transfers. These scoping sessions were useful to the Division in establishing the breadth and scope of the plan.

**Governor's Office.** The Governor and his staff have provided executive sponsorship during plan development. Starting with the 1990 biennial report, the Governor addressed the need for development of a new state water plan as one of the most critical issues facing the state. In discussing the need for natural resource planning, the report states:

Tantamount among these plans is the development of a statewide water management plan, especially as related to intercounty and interbasin transfers, projection of water needs, the outline of conservation methods, development of drought contingency plans and information on regulations to conserve water usage. (p. 5, *Perspectives: A Biennial Report of Nevada State Agencies - 1990*)

Subsequent biennial reports have continued to underscore the need for a state water plan and to reiterate the Governor's commitment to statewide water planning.

**Division of Water Planning.** Between 1993 and 1997, the Division of Water Planning compiled socioeconomic and hydrologic databases and wrote more than 25 publications (see Table 1-1) to serve as a basis for the water plan. Key documents produced during that period included the *Nevada Water Words Dictionary*, the *DRAFT State Water Policy*, reports on water usage by sector, three detailed water basin *Chronologies*, and the *County Graph and Data Books* and *Socioeconomic Overviews*.

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In 1994, the Division completed the early public scoping meetings which served to help prioritize the state water plan elements. The Division went on to develop drafts of the *State Water Plan*, and then finalized the draft to be presented to the Legislature. Almost all Division staff were involved in this work effort, from plan conceptualization to final editing. The Division also provided staff support to the Advisory Board on Water Resources Planning and Development, conducted public outreach efforts and organized technical work group and steering committee meetings.

**Technical Working Group.** In 1994, a 20- member interagency working group composed of state and federal agencies met over an 11- month period to frame the issues, generate ideas and develop options. The perspectives of this working group were drafted into issue papers which formed the basis of the policy recommendations contained in the *DRAFT State Water Policy*, produced in March 1995.

**DCNR Steering Committee.** In 1995, staff from Divisions within the Department of Conservation and Natural Resources formed a high-level departmental oversight committee to support development of the State Water Plan. This group, which included the Director and Assistant Director of the Department and staff from the Divisions of State Lands, Environmental Protection, Wildlife, Water Resources and Water Planning, and the Natural Heritage Program, provided insight into the laws, regulations and issues within their jurisdictions, recommended approaches to the planning and obtaining public input, evaluated existing state water policies and recommended changes. This steering committee was essential in setting the tone, pace and direction of the plan. Altogether, the DCNR steering committee members committed over 1700 hours to plan development.

**Advisory Board on Water Resources Planning and Development.** To advise the Division in matters relating to planning and development of water resources, NRS 540.111 establishes the Advisory Board on Water Resources Planning and Development (Advisory Board.) In 1995, the Legislature passed SB 101, which among other things, enlarged the Advisory Board from 13 to 15 members, and changed its composition. The Board for Financing Water Projects, formally ex-officio members of the Advisory Board, was separated to form a stand alone board, and new Advisory Board positions were opened up for representatives of mining, ranching, agriculture, conservation and the general public. The number of Washoe County representatives was also increased.

As a follow-up to the enactment of SB 101, in 1996 the Governor appointed a new set of Advisory Board members (see p viii for the list of members), only 4 of whom had served on the previous Advisory Board. The current composition of the Advisory Board on Water Resources Planning and Development is as follows:

- ❑ **Six** members representing the governing bodies of the county with the largest population in the state [Clark County] and the cities in that county;
- ❑ **One** member representing the largest water utility in the county with the largest population in the state [the Las Vegas Valley Water District];
- ❑ **Two** members representing the county with the second largest population in the state [Washoe County] and the cities in that county;
- ❑ **One** member representing the largest water utility in the county with the second largest population in the state [Sierra Pacific Power Company];

- ❑ **One** member representing the general public; and
- Four** members, each representing a different one of the following interests:
  - (1) Farming;
  - (2) Mining;
  - (3) Ranching; and
  - (4) Wildlife.

The Governor is to make the Advisory Board appointments so that at least seven members are residents of Clark County, three members are residents of Washoe County and at least three members are residents of counties which have a population less than 100,000. Altogether, the Advisory Boards held more than 25, one-to-two day meetings to participate in development of the state water plan. The Advisory Board meetings were always publicly advertised and open to public comment, and occasionally the Advisory Board held special workshops to solicit public comment in a more formal setting.

Pursuant to NRS 540.111, one of the Advisory Board's roles is to make recommendations to the Division concerning their level of concurrence with the content, findings and recommendations of the *State Water Plan*. The Division is to then submit the Advisory Board's recommendations to the Legislature with the *Plan*. The time and effort contributed by the Water Planning Advisory Board has been invaluable in bringing the Plan to fruition.

**Department of Conservation and Natural Resources Advisory Board.** The Department of Conservation and Natural Resources maintains its own Advisory Board. The seven DCNR Advisory Board members each represent one of the following interests: (1) general public, (2) state park users, (3) agricultural industry, (4) mining industry, (5) outdoor recreationists, (6) forestry/fire control, and (7) conservation. This Advisory Board has frequently reviewed *State Water Plan* drafts and provided advice and counsel as to the plan's content and the planning process.

**Interest Groups.** Many interest groups have been active in the development of the *State Water Plan*. Groups such as the Nevada Farm Bureau, Nevada Cattlemen's Association, Northern Nevada Conservation Forum, Southern Nevada Homebuilders Association, and the League of Women Voters have sponsored workshops on the plan and/or commented formally on plan work products.

**Local Governments.** Local government input has been critical to the planning process. The Division Administrator or staff met personally with 16 of the 17 County Commissions, and the Southern Nevada Water Authority in Clark County, to update them on plan progress, request review of key work products, and request their participation in meetings of the Water Planning Advisory Board. Nearly all county commissions sent representatives to participate in Advisory Board meetings and to provide input on local water issues.

**State Legislature.** The Nevada State Legislature plays a significant role in the water planning process. The Legislature initiated the water planning program and has set time frames for plan completion. The Legislature has also provided guidance for plan development via its declaration of legislative intent at the start of NRS 540, the water planning statute. Legislative committees have requested periodic briefings on plan progress, and individual Legislators have shown a special interest by participating in scoping sessions and public workshops, submitting comments on the plan

or by requesting additional information. When it is finalized, the *Nevada State Water Plan* will be presented to the 1999 Legislature for their review and consideration as required by NRS 540.101.4.

**Federal Agencies.** Federal agencies have been involved in plan development. Federal agency staffs made presentations to the Advisory Board on regional water issues, served on technical working groups, assisted in development of some issue papers, and commented on plan drafts. Federal agencies such as the U.S. Geological Survey, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service and Natural Resources Conservation Service made significant contributions.

### **Plan Formulation and Review**

Division of Water Planning staff researched and produced data compilations and publications as a preliminary step in developing the state water plan. As publications were finalized and sections of the *State Water Plan* were developed, they were reviewed by the DCNR Steering Committee, the Water Planning Advisory Board and the DCNR Advisory Board. Public comment was always solicited at meetings of both Advisory Boards. Once portions of the plan were in agreed upon draft form, the drafts were sent out for public review and comment. Typically, workshops were held to explain plan sections and to elicit comment from the public.

From this intensive review, public involvement and consensus building process, the *State Water Plan* has taken shape. The plan that has emerged is directed toward the development, adoption and implementation of a variety of programs, projects and policies designed to better utilize, conserve and protect the state's most valuable natural resource. However, the planning process not only resulted in the 1999 *State Water Plan*, but also in a strong consensus regarding the need to keep the water planning process alive, funded and connected to the state's water resource decision making processes and programs.

### ***Public Comments on the Water Plan Drafts***

An interim draft of the state water plan was released during the summer of 1998. This draft included many of the background and introductory plan sections, along with the basic data which formed the foundation of the plan. The goal of this early review period was to reach consensus on the data used to develop the plan, before moving on to addressing the more complex issues and recommendations in later plan sections. Six public workshops were held during this time. The Division also made presentations to 15 of the 17 county commissions, the Southern Nevada Water Authority in Clark County and the Carson City Board of Supervisors to update them on the plan, solicit their continuing assistance in plan development and receive their preliminary thoughts and comments.

The final public review draft of the state water plan was released at the end of January 1999 and the review period extended to March 8, 1999. Over 1000 copies of the draft state water plan were distributed for public review and comment. Drafts of the plan were also made available through the Division of Water Planning's website. During this time, seven public workshops were held to review the plan's recommendations and solicit public input. Additional presentations were made before various legislative committees, interested organizations and state advisory boards, working groups and commissions. Altogether, over 50 public workshops were held and presentations made on the

plan throughout the 4 ½ year planning cycle.

The Division received 39 written comments on the final public review draft of the water plan and many additional comments at public workshops. At the end of the final comment period, all of the comments received were entered into a database. The use of a database enabled the Division to more closely evaluate and analyze the comments, and to ensure that all comments on a topic were evaluated together and addressed appropriately and consistently.

Comments were provided by agricultural and rural interests, wildlife and environmental interests and agencies. Relatively few comments were received from urban interests. Of the 39 letters received 10 were from special interest groups, 8 from individuals and one from a business (mining). The other 21 letters were from local (9), federal (8) and state (1) agencies, irrigation districts (2) and tribes(1). Comments were directed most frequently to the issues and recommendations contained in the issue papers, to the data used in the plan and in some cases, to the findings (particularly the projected decrease in agricultural water use.) While some comments focused on edits or data corrections, a large number provided policy, philosophical or analytical perspectives, especially regarding growth, interbasin transfers and the importance of water planning to the state. Many comments recognized the significant work effort that went into developing the 1999 water plan and found it to be a valuable resource.

Issues given the greatest attention by commenters, both pro and con, included:

- \* conservation and credit for conservation
- \* water resources data collection, management and distribution
- \* integrated water management
- \* water measurement and estimation
- \* interbasin and intercounty transfers
- \* instream flows and water for wildlife and the environment
- \* local vs. state water planning

A number of the comments addressed the planning principles utilized in the plan or the plan's goals. The commenters generally noted the difficulty in developing a plan based on very general, and sometimes conflicting, goals. The water plan's goals and guiding principles were the subject of much discussion and debate early in the planning process by the Advisory Board, and were reconsidered at various points during development of the plan. Therefore, while the comments on these areas were acknowledged, the plan's goals and guiding principles were not revised.

Frequently, comments conflicted with one another. For example, some comments questioned the need for a water plan and supported the status quo. These commenters believe that the current system is working and a state water plan is not necessary. Others applauded the water plan as a critical step in proactively planning and managing the state's water resources. Another example related to the use of data in the plan. Some groups wanted the plan to include the most current data available, even if that meant that data sets weren't comparable between counties. Others wanted data sets standardized to a particular year, even if that meant that older "vintage" data was used in lieu of the latest available data. Some felt that since some of the data sets have weaknesses, no conclusions should be drawn in the plan, while others were comfortable with use of the best available data to

forecast future water use.

Environmental organizations wanted to see more emphasis on managing growth and implementation of water conservation technologies, while others felt the plan should stay away from growth issues altogether and that conservation was a good idea but should not be mandated. (The plan is designed to be growth neutral, but does make strong recommendations to enhance water conservation in the state.)

Some comments expressed philosophical opposition to interbasin transfers, going so far as to suggest that they be banned altogether, while others felt that water transfers represented THE solution to the state's water supply problems. Some comments suggested that the water plan should express a vision of the future on a variety of topics including concepts such as sustainability, watershed planning and biodiversity. (The plan does discuss watershed planning in depth and recommend its greater usage, but only addresses issues of biodiversity or sustainability in the context of other issues.)

Concern was expressed about the role of the plan, and whether it is to be considered a mandate. However, the plan is clearly designed to be an education, planning and policy tool which makes recommendations to enhance future water management. In and of itself, the plan is not a new law, nor does it change existing water rights or reallocate water rights in any way. Projections of future water use are simply projections based on existing trends, and do not assume sweeping changes in our economy. It is anticipated that the market for water rights will drive any transfers of water rights.

A number of agricultural groups felt the plan should highlight the importance of agriculture to the state and its value in enhancing wildlife habitat, open space and rural quality of life. However, the plan does not advocate the value of any one water use or economic endeavor over another.

Comments expressed concern about the lack of water rights for maintenance of instream flows, the habitat of endangered and threatened species and the environment in general. They felt the state should assume a more active role in purchasing water rights for environmental water uses and in protecting habitats. On the other hand, a number of rural counties considered the plan's recommendations for purchase of water rights as "alarming", and a threat to their tax base. They suggested assisting irrigators in maintaining minimum pools on their own land by, for example, purchasing hay for them in dry years to prevent a reduction in stream flows at critical times.

Domestic wells were mentioned by quite a few commenters. Concerns were expressed about definition and protection of the legal rights of domestic well owners (who are not required by law to have a water right until their use exceeds 1800 gallons per day). Other comments included the view that domestic wells should be a local issue only, not a state issue, and a request for state funding support if domestic wells are required to hook up to regional water systems by the state.

A number of commenters concurred with the plan's recommendations to enhance water education, support watershed planning, develop better data, measure water use more accurately, do better flood planning and management, provide greater water planning assistance to local governments and ensure that the public remains closely involved in both state and regional water planning.

All comments were carefully reviewed and incorporated into the plan wherever possible. It is

noteworthy that many of the issues raised by commenters had been discussed at length by both the Steering Committee and the Advisory Board during plan development. Thus, while these comments did not highlight new issues, they did validate the planning and public input process that was utilized. Some commenters did raise issues which were not specifically addressed in the plan. Recommendations for subjects to be addressed, or more thoroughly addressed, in future plans are listed below. It is the intent of the Division of Water Planning to include these issues in future plan updates:

- \* mine dewatering
- \* integrated management of surface and ground water
- \* conflict resolution
- \* better identification of environmental water needs
- \* more thorough discussion of various types of water storage
- \* dam safety
- \* better assessment of perennial yield and restoration of over utilized aquifers

Comments received on the final public review draft of the *Nevada State Water Plan*, as well as the comment database, are available for review at the Division of Water Planning's office in Carson City.

### ***Previous Water Planning Efforts***

The state water planning program began in the 1960's. In 1967 the Nevada Legislature directed the Division of Water Resources within the Department of Conservation and Natural Resources to determine Nevada's future water needs and available water resources. The Legislative Commission was directed to study future statewide water needs and it appointed a special Legislative Subcommittee to undertake the study. The State Engineer and the Subcommittee jointly recommended the establishment of a separate section within the Division of Water Resources to carry out the necessary planning studies, and specific legislation to establish the statutory authority to implement the program.

The 1969 Legislature authorized development of a comprehensive water resource plan for Nevada through an amendment to NRS 532, and made an appropriation to the Division of Water Resources to develop a planning section. The 1973 Legislature required the State Engineer to complete the water resource plan and submit it to the 1975 legislative session. The first state water plan, *Water for Nevada*, was completed and published by November 1974. The state water planning program was active until the early 1980's, although with a dwindling staff. In 1982 the program was all but eliminated due to severe funding shortages.

The water planning program was re-instituted in 1989 through the efforts of Assembly Speaker Joe Dini and like-minded legislators who were increasingly concerned about Nevada's rapidly growing population and the lack of a current plan to identify additional water resources to satisfy demands. There was also concern regarding the lack of flood, conservation and drought planning. Thus, the present day Water Planning Division was created under NRS 540 and a small staff was hired by 1991.



Since 1991, the Division of Water Planning has produced over 30 publications in support of the *State Water Plan* (as well as numerous publication updates and revisions); initiated a water education program and Internet home page; obtained grant funding to coordinate water planning activities in the Walker River Basin; assisted local governments in their water planning efforts; awarded over \$20 million in grants to small water systems; and sponsored numerous water resource conferences and workshops. In 1997 the Division received state and federal appropriations to initiate a flood planning and grant program.

The 1999 *Nevada State Water Plan* completes the latest cycle of statewide water planning. Following approval of the plan, the Division will turn its attention to developing a handbook for regional water planning and begin developing specific water management plans for the various hydrographic regions in Nevada.

### ***Organization of the Nevada State Water Plan***

The 1999 *Nevada State Water Plan* is being produced in six volumes:

- ❑ A *Summary* presents highlights of the State Water Plan's findings, with an emphasis on recommended legislative water policy and program initiatives.
- ❑ The main body of the *State Water Plan* includes an inventory, assessment and issue analysis of water resources in Nevada. It establishes the regulatory, historical and institutional framework affecting water planning and management within the state, provides the socioeconomic context within which water decisions are made, projects population and economic trends affecting water use, forecasts future water needs, identifies current water issues and presents recommendations to address those issues. The main body of the *State Water Plan* is divided into 3 parts as follows:
  - Part 1 – Water Resources Background and Assessment
  - Part 2 – Water Use and Forecasts
  - Part 3 – Water Planning and Management Issues
- ❑ Two *Technical Data Appendices* which contain the detailed planning data and forecasts of the State's counties, cities and hydrographic basins (also available upon request in an electronic format).

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**Nevada State Water Plan**  
**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

**Section 2**  
**Summary of 1974 State Water Plan**

*Introduction*

The first state water plan, *Water for Nevada*, was completed and published by November 1974. It consisted of a series of 16 planning documents which estimated water use, inventoried the water resources of the state, provided maps, developed forecasts for future water needs for mining, agriculture, fish and wildlife, recreation, power production and municipal use, evaluated the use of input-output economic models to analyze future water scenarios and described the water administration process in Nevada.

The *Water for Nevada* series was followed by a second series of 6 water planning reports - *Alternative Plans for Water Resource Use*. The objectives of these planning documents were environmental quality, economic efficiency and area development. The purpose of the plans was to unite these objectives for better resource management. The planning was focused on those regions which were having difficulty in meeting their water needs or which were expected to run out of water in the near future. Alternative plans were developed for the Walker, Humboldt, Carson-Truckee, Colorado and Snake River Basins and the Central Region of Nevada. Each report examined a series of alternate economic development scenarios for a region and projected those future scenarios which might occur without a plan in place.

All of the alternative plans identified water resource issues which remain issues today, 25 years later. For example, the 1974 Water Plan noted that Walker Lake was declining by 60,000 acre-feet per year, flooding was occurring throughout the basin and there were unmet water needs for agriculture and recreation. The Truckee-Carson River Basin Report noted the decline of Pyramid Lake, municipal, agricultural and industrial water shortages, lack of adequate water for wildlife areas, and flooding. These issues remain and are perhaps even more pressing today. At this time, both lakes have declined further, municipal and industrial water shortages are more common, efforts to obtain water for wildlife and recreation are currently underway and the New Year's Day Flood of 1997 has moved flooding to the top of many people's agendas.

A final *Special Summary Report* concluded the water planning series. It noted that virtually all of Nevada's surface water resources had been committed; that in a rare year some overflow might be available, but that in most cases storage facilities were inadequate to capture the runoff for later use. It noted that significant groundwater supplies had already been developed, and that some areas held good potential for further development. However, we had already reached the point in some basins, such as the Las Vegas Groundwater Basin and Diamond Valley, where no additional appropriations

could be allowed. It was also apparent that obtaining water supplies from outside the state's boundaries was likely to be problematic, as it still is today.

The *Special Summary Report* noted that Nevada's residents viewed the lack of readily available water as a mixed blessing. While the lack of water restricted economic development in many areas of the state, it also meant that Nevada would be preserved in a fairly natural state with a relatively small population, thus enhancing the resident's "quality of life." In general, it was concluded from reaction and comment at the water planning forums, that most people of the state wanted the water resources developed and used, but not "over used." With this in mind, the state water plan conclusions and recommendations sought a middle ground.

Many issues were identified in the 1974 State Water Plan, and a number of actions were recommended. In most cases, the plan suggested a cautious "wait and see" approach. Key Plan recommendations included: 1) enacting legislation to bring geothermal resources under the purview of state water law, 2) placing time limits on subdivision approvals, 3) establishing state funding for water system infrastructure and flood management, 4) actively protecting state sovereignty in water allocation decisions on federal lands, 5) establishing state level floodplain zoning, 6) analyzing the state's responsibilities for maintaining stream channels in navigable waterways, 7) continuing the data collection and water planning activities, 8) protecting critical habitat and rare and endangered species when making water resource decisions and 9) where necessary, acquiring water rights for wildlife protection. Many of these recommendations were ultimately implemented in one form or another. The following sections summarize the conclusions and recommendations presented in the 1974 State Water Plan and the status of each today. Of note, the conclusions and recommendations presented herein are directly excerpted from the 1974 *Special Summary Report*.

## ***General Conclusions and Recommendations of the 1974 State Water Plan***

### **Water Law and Administrative Procedures**

**1974 Recommendations.** "The theory inherent in the state water law involving the appropriation doctrine commonly referred to as 'first in time - first in right' and the concept that beneficial use is the measure of a right to the use of water have proven to be effective and in the State's interest. The law itself provides for changes in use as desire or demand dictate and thereby makes the law adaptable to varying conditions. Past legislative actions have provided necessary amendments all of which have been carefully evaluated for not only immediate but long term effects and ramifications. No basic changes in the theory or philosophy of the state water law are recommended. However, it should be continually scrutinized for necessary modification of specific provisions."

**Status.** The theory and philosophy of state water law has remained the same, however the State continues to carefully evaluate the water law and make some amendments in response to changing conditions. In fact, there have been some modifications to the state water law since 1974. One of the major statutory changes allows the State Engineer to approve temporary changes in place of diversion, manner of use or place of use of an existing water right (NRS 533.345). Another statutory change allows the State Engineer to issue environmental permits which are temporary permits to

appropriate water for the avoidance of pollution or contamination of a water source (NRS 533.437). NRS 534.250, added to the statutes in 1987, defined permitting requirements for recharge/recovery projects. In 1993, NRS 534.350 was added which allows a public water system in certain basins to receive water right credits for the addition of new customers previously served by domestic wells.

### **Funding of Water Resource Projects**

**1974 Recommendations.** “It has been suggested that a fund be established to provide State participation in funding water resource development or flood control projects. Legislative consideration of funding in the past has been on a project by project basis...Establishment of a separate construction or development fund is not recommended. Individual projects should continue to be considered by the legislature for partial or total funding or financial support.”

**Current Status.** In 1987, the Legislature established a \$200 million loan program for financing water projects (NRS 349.935 through 349.961). Through this program, loans can be issued for financing any project for the management, control, delivery, use or distribution of water. Only two loans have been issued under this program. In recent years, this program has had no activity.

In 1991, the Legislature established the AB 198 Grant Program administered by the Division of Water Planning which provides financial assistance to water purveyors. Grant funds can be used to partially finance capital improvements made necessary by State health regulations and the federal Safe Drinking Water Act. The Board for Financing Water Projects can award up to \$40 million in grants. Thus far, over \$20 million in grant funds have been awarded for 20 projects throughout Nevada. This program remains active today.

The federal Safe Drinking Water Act (SDWA) Amendments of 1996 authorized a Drinking Water State Revolving Fund for the purpose of loaning funds to public water systems for infrastructure improvements required to achieve or maintain compliance with SDWA requirements and to protect public health objectives of the Act. In Nevada, this program is currently being developed with the Bureau of Health Protection Services acting as the lead agency.

### **Local Options and Discretion**

**1974 Recommendations.** “...The concept of state administration of the water resource through application of the provisions of the water law is generally not only accepted, but endorsed with an enthusiasm for continuance...It is recommended that State authority over water resource administration be retained. Where and when possible, local options and discretion should be recognized in such matters as internal management, construction of projects affecting local interest, and financing of such projects.”

**Current Status.** The State has retained authority over water resource administration, however the need for local entities to be proactive in regional water resource planning is being recognized. In recent years, a number of local and watershed planning efforts have been undertaken. To ensure that counties are aware of water right application potentially affecting their region, statutory changes were made requiring the State Engineer to notify county commissioners of water right applications in their

county for use in another county (NRS 533.363).

## **Mining or Depletion of Ground Water**

**1974 Recommendations.** “Withdrawal of groundwater is limited to that naturally recharged to the groundwater basin. The only exception is covered under the provisions of NRS 534.120, which allows issuance of temporary permits to appropriate groundwater which can be limited as to time and which may be revoked if and when water can be furnished by entity. This provision has been applied only in Las Vegas Valley where the alternate source of the Colorado River is available. Concepts have been advanced whereby groundwater in storage would be depleted over a given period of time...It is recommended that caution be exercised in any legislative changes to expand authorization for depletion of ground water in storage. Any authorization, in addition to that presently existing, should be on an area-by-area or case-by-case basis and should not be applicable statewide.”

**Current Status.** It is the policy of the State of Nevada to appropriate groundwater up to the perennial yield. In some instances, some minor applications may be approved in a fully appropriated basin if the proposed use is a preferred use and is in the public interest. Mining is considered a temporary use, and in some basins, mining withdrawals have been allowed to exceed perennial yield with the excess water being put to beneficial use where feasible.

## **Transbasin Diversions**

**1974 Recommendations.** “There is presently no specific statutory reference to transbasin diversions. This has not created any problems and existing or proposed transbasin diversions can be considered, evaluated, and regulated under existing statutory provisions regarding availability of supplies and effects on existing water rights. It is recommended that no legislative amendments be initiated on this subject.”

**Current Status.** A number of actions have been taken since 1974. The discussion on “Interbasin and Intercounty Transfers” in Part 3 of the *State Water Plan* provides an overview of these actions and additional recommendations.

## **Preferred Uses**

**1974 Recommendations.** “The only existing provision for consideration of preferred use in the appropriation of water is NRS 534.120, which relates to new appropriations of groundwater in basins being depleted. The effectiveness of the time-priority system rather than type of use-priority, coupled with provisions for changing the manner of use of water supplies as need and desire arise, lead to the conclusion that no changes are required as regards preferred uses.”

**Current Status.** Since 1974, no legislative changes have been made regarding preferred uses. In designated basins, the State Engineer has continued to define preferred uses for specific regions as needed. In response to the influx of Desert Land Entry requests, the 1981 State Legislature adopted NRS 533.357 which establishes priorities for various categories of irrigation water use.

## **Reservation of Water Quantities**

**1974 Recommendations.** “The idea of reserving quantities of water and essentially setting them aside from appropriation for use for some specific purpose at some time in the future has been advanced. This has been specifically considered regarding future supplies for Municipal and Industrial purposes. It has been proven to be in the State and private interest to allow appropriation of available water for any beneficial use to which it can be applied at the time it can be applied. Again, as demands or requirements change, so can the manner of use of water be changed. It is recommended that this concept of reserving water be rejected.”

**Current Status.** Beginning prior to 1974, the State Engineer has issued orders which designate areas for preferred uses and denial of other uses. Through these orders, the State Engineer has essentially reserved an area for particular types of use. Regarding municipal water appropriations, changes to NRS 533.380 have given municipalities more flexibility in obtaining time extensions regarding the placing of water appropriations to beneficial use.

## **Termed Approvals of Water Appropriations**

**1974 Recommendations.** “Water rights, when perfected, are a right in perpetuity, subject to forfeiture and abandonment. There is perhaps some authority for issuing water rights for a specific term, or time period, if it is demonstrated that the capability for beneficial use is limited to that time. There is some interest in the western states in expanding the authority for issuing termed water rights. It is not clear how this might be applied in Nevada water administration at this time. It is recommended that the concept of issuing termed water rights be further explored before any definitive action is taken.”

**Current Status.** In 1991, NRS 533.371 was added which allows the State Engineer to issue permits that are effective for a limited time period for a temporary use.

## **Water Supplies and Rights for Temporary Construction Uses**

**1974 Recommendations.** “Generally, water supplies for temporary construction, such as highway projects, are available from existing sources and agreements can be reached for water use under some existing water right. However, time is required to obtain a water right, and this can affect obtaining water, particularly in designated groundwater basins. Limited problems created do not warrant the issuance of any type of ‘special permit.’ It is recommended that the State Highway Department consider this matter in bid notices and other material furnished potential bidders or contractors.”

**Current Status.** Language has been added to NRS 534.050 which allows the State Engineer to waive permit application requirements for the temporary use of water in highway construction, and other uses.

## **Wells for Domestic Use**

**1974 Recommendations.** “Current statutory provisions do not apply in the matter of obtaining



permits for underground water from a well for domestic purpose where the draught does not exceed 1800 gallons per day. A ‘permit system’ for individual domestic wells has been considered; but it is estimated that use from such wells is about one percent of the total water use in the state. The merits and benefits to be derived do not, at this time, warrant the time, staff, and financing that would be required to administer a domestic well permit system. This is a matter that warrants continuing consideration in the future.”

**Current Status.** The merits and benefits of a domestic well permitting system still do not warrant the time, staff and financing required. Several bills have been introduced in the Legislature attempting to create such a system, but have not been successful. For additional information, refer to the discussion on “Domestic Wells” in Part 3 of the *State Water Plan*.

### **Taxes on Well Production**

**1974 Recommendations.** “In a previous session of the legislature, a bill was introduced to provide a tax on water produced from wells. There was a serious objection from all areas of the State and the bill did not pass from committee. It has since been proposed that such a tax be considered, not on a statewide basis, but in particular areas. Specifically there is interest by some local residents in taxing production from wells in Las Vegas Valley. The thought is that this would equalize the cost of well water with that served by the public utilities. It is recommended that any consideration of taxes on well production be limited to that under temporary permits which are subject to revocation within the Las Vegas Artesian Basin. It is also recommended that even this be approached only after thorough evaluation of legal ramifications and equity.”

**Current Status.** With passage of Assembly Bill 436 in 1997, a program for the management of the groundwater in the Las Vegas Valley basin was created. As part of this program groundwater users are assessed an annual pumpage fee to fund the Las Vegas groundwater management program.

### **Geothermal Resources**

**1974 Recommendations.** “Nevada’s geothermal resources are administered by the state engineer pursuant to the attorney general’s opinion of August 12, 1965...The implementation of the federal geothermal leasing act makes no provision for compliance with existing State water law, or for protection of existing water rights on private or public lands. Designated critical ground water basins within the State require particular regulation by the state engineer. Unregulated exploratory drilling for geothermal resources in these designated basins and other basins could adversely affect existing rights, in that the federal geothermal leasing act makes no provisions for exploration activity on private or corporate lands. It is recommended that legislation be enacted to specifically provide that geothermal resources are subject to administration under the water law and to provide for establishment of rules and regulations for such control and administration.”

**Current Status.** NRS 534A describing geothermal resource administration was added to the statutes in 1975 with subsequent changes. Under NRS 534A, a permit is needed from the State Engineer if any of the geothermal water is consumptively used, not including reasonable system losses. Nonconsumptive geothermal permitting is administered by the Division of Minerals.

## **Water Supplies for Proposed Subdivisions**

**1974 Recommendations.** “Legislation was enacted in 1971 (NRS 116 and 117) giving the State Engineer the responsibility to confirm water supplies for proposed subdivisions. This was amended in 1973 to provide that the State Engineer was to prepare and provide a review of water quantity. Authority for final approval rests with the health division of the Department of Human Resources. It is appropriate and necessary that the State Engineer be responsible for water quantity determinations in accordance with the provisions of the water law. Such provisions require that due diligence be exercised in any development of water to satisfy any proposed use. Subdivision approval does not include similar requirements. It is recommended that consideration be given to time limits on subdivision approvals [by counties]. That is, subdivisions would be approved [by counties] for development within a given period, at the conclusion of which the undeveloped portion would be subject to reconsideration. An alternative to this approach would be a requirement that water supply and sewer or disposal service be available at each lot prior to sale.”

**Current Status.** NRS 278.360 has since been modified which places time limits on tentative subdivision map approvals. NRS 278.377, added in 1977 with subsequent revisions, requires approval of subdivision maps by the State Engineer with regard to water quantity. A 1978 Attorney General’s opinion found that this statute grants the State Engineer has the authority to disapprove tentative subdivision maps on the basis of water quantity. Also, NRS 278.462 was added which authorizes the State Engineer to make recommendations on water quantity for parcels when requested by the county or other governing body.

## **State vs. Federal Jurisdiction**

**1974 Recommendations.** “There [have] long existed questions about state and federal jurisdiction over water supplies on federally controlled lands. There have been numerous court decisions on this subject, however there remain many uncertainties which can only be resolved through federal legislation. Such legislation has been introduced in Congress in the past and will likely be introduced in the future. It is recommended that officials and citizens of the State closely scrutinize any such legislation and offer support or resistance in an effort to protect what should properly be the individual State role in administration of the resource.”

**Current Status.** The State continues to protect its primacy in water resources administration.

## **Flood Control**

**1974 Recommendations.** “...There are extensive flood insurance programs presently available through federal agencies, and State assistance is available to local authorities for securing information about such programs. It is recommended that flood plain zoning ordinances or regulations be formulated and enforced by local government agencies. If this is not effective, flood plain zoning should be considered at the State level.”

**Current Status.** There have been a number of improvements to state floodplain management since issuance of the 1974 State Water Plan. For details on these changes, refer to the discussion on

“Flood Management in Nevada” in Part 3 of the *State Water Plan*.

## **Navigability Effects**

**1974 Recommendations.** “There have recently been judicial determinations and legal opinions concerning navigability of some of the streams in Nevada. This has raised questions regarding State responsibilities and possible liabilities in maintaining stream channels and related issues. For example, if the course of a navigable stream is altered, either through natural processes or by design, what is the ownership status of the vacated area and resources, such as gravel aggregate within these areas. It is recommended that proper authority analyze possible ramifications, not only for the protection of the State, but so that the public may be better informed.”

**Current Status.** NRS 532.220 established a program to aid local governments in the clearance, maintenance, restoration, surveying and monumenting of navigable rivers. In 1980, the Attorney General issued an opinion stating that cities, counties and public districts (including irrigation districts and flood control districts) and the United States have the authority to maintain or improve the channel of a navigable river to assure its flow capacity or to avoid flood damage to adjoining property. However, no state or federal statutes require these entities to undertake such projects.

## **Environmental Considerations**

**1974 Recommendations.** “There has been an increasing public awareness and understanding regarding environmentally related concerns with respect to water and other natural resources within the State. Efforts to continue and extend this public awareness through dissemination of information and through the academic system should be encouraged. Specific project or resource planning should include a consideration of environmental impacts, not only on the immediate area, but on a regional basis. Watershed management programs should include such factors as sediment retention, vegetation manipulation and management, livestock and wildlife carrying capacities, and other factors to enhance environmental quality within water availability. Critical habitat and rare and endangered species should be considered and, if necessary for their protection, appropriate water rights should be acquired. In most instances, water quality and quantity questions and issues must be jointly considered. Compatibility of administrative procedures and regulations must be retained.”

**Current Status.** A number of actions have been taken since 1974. NRS 533.437 was added thereby allowing the issuance of temporary permits to appropriate water needed to avoid pollution of contamination of a water source. NRS 533.367 was added which states that “[b]efore a person may obtain a right to the use of water from a spring or water which has seeped to the surface of the ground, he must ensure that wildlife which customarily uses the water will continue to have access to it.” Since 1974, Nevada Supreme Court findings have led to a broader legal interpretation of beneficial use regarding wildlife needs. In 1988, *Nevada v. Morros* concluded that providing water to wildlife is a beneficial use of water.

There are numerous examples of water rights being acquired for resource conservation purposes. The Park and Wildlife Bond Act of 1990 (Question 5) authorized the expenditure of \$47.2 million

which has been used to purchase land with special resource values. In addition, \$5 million was designated for water rights acquisitions.

The Director of the Department of Conservation and Natural Resources and the Divisions of Water Resources, Environmental Protection, and Wildlife are jointly considering water quantity, water quality and wildlife impacts when reviewing mining withdrawal applications. The Division of Water Planning has been directed to consider both water quantity and quality in its planning.

For additional information, refer to the discussions on “Nonpoint Source Pollution”, “Comprehensive Groundwater Protection and Management”, “Watershed Planning and Management”, and “Wildlife and Environmental Water Uses and Needs” in Part 3 of the *State Water Plan*.

### **Continuing Planning Efforts**

**1974 Recommendations.** “The planning effort does not end here. In the 1969 report to the Legislative Commission and in testimony before the Legislative Committees, it was emphasized that water planning would be a continuing requirement. The State role and responsibility of review and evaluation of proposals by other agencies continues. Also, there is a need to provide assistance in other planning efforts, such as land planning, and water quality planning. Participation in federal, regional, and interstate investigation and negotiations is necessary to assure adequate consideration of the State of Nevada’s interest and position in water transfer or related matters. Data and information used in water resource decisions requires continuing attention to assure that it is current. It is recommended that staff and funding for the Water Planning Section in the Division of Water Resources be continued at the current rate for the next biennium and that requirements be reevaluated periodically thereafter.”

**Current Status.** The state water planning program was active until the early 1980's, although with a dwindling staff. In 1982, the program was eliminated due to severe funding shortages. The water planning program was re-instituted by the 1989 State Legislature, with staff hired during 1990. Since that time, the Division of Water Planning has undertaken a number of efforts. For example, the Division has produced over 50 publications including the *State Water Plan*, continues to provide

assistance to local planning efforts, compiles and distributes needed information, and administers a drinking water system grant program and a floodplain management program.

## ***Regional Conclusions and Recommendations of the 1974 State Water Plan***

### **Walker River Basin**

**1974 Recommendations.** “There is not sufficient water in the Walker River system to satisfy present and projected requirements upstream and yet maintain Walker Lake as a viable fishery as it presently exists. Water levels will continue to decline and salinity will continue to increase.

Water rights confirmed both by Decree from the Federal District Court and in appropriations through State procedures must be recognized in administering water supplies of the system.

It has been suggested that extensive studies such as State-Federal Task Forces be created to further evaluate water uses and practices within the Walker River Basin. Many of the findings of the Pyramid Lake Task Force can be applied, at least in concept, to the Walker River system. It is doubtful that another Task Force effort would yield significant new data or information.

Means of maintaining the Walker Lake fishery by introducing new species that can adjust to increased salinity should be explored. Also, replacement of fishery pressures to upstream reservoirs should be considered.

The only apparent means of maintaining the existing level of Walker Lake would be to acquire existing water rights upstream for transfer to Walker Lake. No recommendation is made for a legislative determination in this matter.

It is recommended that the allocation of water set forth in the California-Nevada Interstate Water Compact be recognized and preserved.”

**Current Status.** Since the completion of the 1974 State Water Plan, Walker Lake water levels have continued to decline and salinity has increased.

Walker River Decree rights and state appropriative rights continue to be recognized in administering the water supplies.

The University of Nevada Reno and the Desert Research Institute have been studying the feasibility of a water bank as a mechanism for the voluntary leasing or transferring of water rights from one user to another. The Walker River Basin Advisory Committee is studying strategies for improving water conservation in the basin. Both of these studies are funded primarily with federal monies. The U.S. Army Corps of Engineers is now planning to develop various ecosystem restoration studies and projects in the basin, and is seeking local sponsorship. The Division of Water Planning created the Walker River Basin Technical Network to increase coordination among the various groups studying the basin, and improve information sharing and distribution. Using federal funds, the Division hired

a part-time watershed planner to oversee the Network and begin development of a watershed plan.

A number of efforts addressing the Walker Lake situation have been undertaken in recent years. For instance, the Division of Wildlife is now acclimating hatchery fish to high salinity water prior to their release into Walker Lake. This has greatly decreased fish mortality following planting. Over 20 studies by 10 separate agencies are currently underway or pending.

In 1983, the Division of Wildlife perfected a water right (certificate was issued) for the Walker River flood waters flowing into Walker Lake. This right is one of the most junior on the system with a priority date of September 17, 1970. A number of studies are underway which examine feasible water augmentation solutions for Walker Lake.

The California-Nevada Interstate Compact remains unratified by U.S. Congress. The Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990 (Public Law 101-618) addressed interstate allocations of the Truckee and Carson rivers, and Lake Tahoe, but not interstate allocations of the Walker River.

### **Carson-Truckee River Basins**

**1974 Recommendations.** "...The State should continue to pursue and support Congressional approval of the California-Nevada Interstate Compact concerning waters of Lake Tahoe and the Truckee, Carson and Walker River Basins as ratified by the State of Nevada and California. Pending Congressional approval, the allocations of water and other provisions should be recognized and followed as State policy.

The Pyramid Lake Task Force Recommendations (both the so-called 'Government' recommendations and 'Sierra Club' recommendations) should be pressed for implementation in the areas found practical and feasible.

(Note: A summary of the main recommendations presented by these groups include:

- strict enforcement of existing decrees
- continue following suggested rules and regulations for operation of the Truckee and Carson rivers, including Lahontan Reservoir
- a variety of improvements to Truckee-Carson Irrigation District facilities to improve efficiencies while wildlife, waterfowl and recreation areas are kept viable
- initiate a cooperative pilot program to demonstrate the effects of a sprinkler system
- expedite design and construction of Marble Bluff Dam and Fishway)

The State should provide necessary funding for advancing and defending the State's position in litigation.

A firm decision should be made regarding development of water supplies within the 'Marlette-Hobart' system and intended uses of these supplies.

A reevaluation of Watasheamu Dam and Reservoir for possible recreation use and Municipal and

Industrial use in Carson Valley and Carson City should be requested of the Bureau of Reclamation.

Several alternatives for additional water supplies to serve Carson City have been identified and presented. Local interests should be encouraged to proceed with necessary legal, engineering and funding proposals for augmentation. The alternative will be a limitation on future growth and development.”

**Current Status.** The California-Nevada Interstate Compact remains unratified by U.S. Congress. The Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990 (Public Law 101-618) addressed interstate allocations of the Truckee and Carson rivers, and Lake Tahoe, but not interstate allocations of the Walker River.

Many of the recommendations of the Pyramid Lake Task Force were addressed in Public Law 101-618 including efficiency studies, and the purchase of water rights for wildlife. Other recommendations were addressed in OCAP (Operating Criteria and Procedures) such as storage levels, operational improvements, etc. Also, the Pyramid Lake Paiute Tribe has secured a right to the unappropriated water in the Truckee River in accordance with Nevada water law.

For about 25 years, the Department of Conservation and Natural Resources has had a fund for financing litigation in the Truckee, Carson and Walker rivers.

Since 1974, the State acquired the Marlette-Hobart system and operates it today to serve Silver City, Gold Hill, Virginia City and Carson City.

With California designating the East Fork of the Carson River as a wild and scenic river, the Watasheamu Dam and Reservoir project (which would inundate a portion of the river in California) was prohibited. Subsequent to this action, the Carson Water Subconservancy District funded a study examining the feasibility of a smaller dam and reservoir (Bodie Dam) which would not inundate lands in California. Bodie Dam was not found to be cost effective. The Subconservancy continues to examine alternative supply and management options.

Since 1974, Carson City has proceeded with the necessary steps for supply augmentation and has secured adequate water supplies for their planning horizon.

## **Humboldt River Basin**

**1974 Recommendations.** “Occasionally, there are surplus waters in the Humboldt river system...Portions of this water could be salvaged for beneficial conservation and recreation uses upstream. Additionally, there is need for stabilizing flows, reducing flood damages and providing sediment detention by providing upstream storage.

The proposed Humboldt River Storage Project includes...[a number of storage reservoirs]. The 1973 Legislature passed a Resolution supporting the Humboldt Project, contingent upon a favorable environmental and fish and wildlife impact assessment and other beneficial aspects. A sum was also appropriated for an analysis of the impacts. The results will be furnished in separate reports, and

specific recommendations will depend upon these results.

However, it can be recommended that in any event, existing water rights be protected and in no way jeopardized.

Also, water rights for the Humboldt-Toulon Wildlife area are being considered and will be considered further.”

**Current Status.** In 1974, an environmental investigation of proposed Humboldt River Storage Project plus the proposed Rock Creek dam was completed. Of the proposed projects, only the South Fork Dam and Reservoir has been constructed at a smaller scale than originally envisioned. South Fork Reservoir is operated solely for recreation purposes.

Existing water rights continue to be protected.

Water rights have been acquired for the Humboldt-Toulon Wildlife area.

## **Central Region**

**1974 Recommendations.** “This area encompasses the large portion of Central Nevada where there are no large stream systems or surface water sources...[Local people] were concerned about being ‘lumped’ in such a large area. Some Pahrump Valley residents felt that population projections were low.

Consideration should be given to a Compact concerning water of the Pahrump Valley Ground Water Basin between Nevada and California.

It is recommended that growth trends be carefully monitored to assess the potential water requirements.

This region also holds potential for the area development concept, but this should not be imposed on the local people without their opportunity to be heard.”

**Current Status.** No action has been taken on a compact between Nevada and California regarding Pahrump Valley groundwater. In 1991, NRS 532.175 was added to the statutes thereby authorizing the State Engineer to enter into agreements with neighboring states concerning the cooperative management of shared groundwater basins. Currently, no such agreement exists for Pahrump Valley.

Some of the counties within the Central Region are developing water plans that examine growth trends and assess their future water needs.

## **Colorado River Basin**

**1974 Recommendations.** “Presently available sources of water for the Las Vegas Valley including groundwater, Colorado River supplies, and return flows from use of these sources are projected to



be adequate until sometime between 1990 and 2000. There may be a period of time before 1980 (prior to implementation of the second stage of the Southern Nevada Water Supply Project) when shortages could be expected. These times and dates will depend on growth of the area and resulting increases in water requirements.

Recommendations for this area are: The second stage of the Southern Nevada Water Supply Project should be expedited and completed at the earliest possible time.

Local water service entities should continue and, in fact, increase their efforts to maximize use of the Colorado River supplies and thus reduce withdrawals from the ground water basin.

Population growth and resulting increases in water requirements should be monitored closely.

The alternatives presented in the special Water Planning Report, 'Water Supply for the Future in Southern Nevada' [1971] should be considered in establishing goals and procedures for possible means of meeting future water requirements. This responsibility should be assumed by Clark County with necessary assistance provided by the State.

(Note: The basic alternatives presented in the above-referenced report included:

- water from sources within Nevada - Pahrump Valley, Amargosa Desert, Railroad Valley, Pahranaagat Valley, Virgin River Valley
- water from sources outside Nevada - Snake River basin, Columbia River basin, desalination of Pacific Ocean water in exchange for additional Colorado River water
- conservation to reduce demands
- population redistribution - providing economic incentives to future growth to occur outside of the Las Vegas metropolitan in other areas of excess water
- limiting population growth)

Return flow should be carefully administered and managed for optimum use.

The State and local roles in matters such as Colorado River salinity and water quality controls should continue to be vigorously pursued.

The State representation should continue active participation in efforts such as the Committee of '14' and the Colorado River Salinity Forum to assure that Nevada's interests in the Colorado River are protected.

Discussions should be initiated with representatives of Utah and Arizona directed to formulating a Compact to allocate the waters of the Virgin River."

**Current Status.** Construction of the second stage of the Southern Nevada Water Supply Project started in 1977 and was completed by 1983. Rapid growth has continued in the Las Vegas Valley and in 1993 the first phase of a multiyear capital improvement plan to supply the needed water was initiated. Phase I was completed in 1997 and Phase II will be completed in 1999.

In 1991, the Southern Nevada Water Authority (SNWA) was created through a cooperative agreement among the seven regional water and wastewater agencies 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, SNWA began an integrated resource planning process to aid in the selection of appropriate combinations of resources, facilities and conservation program to meet future demands in Southern Nevada. The SNWA Water Resource Plan was completed January 1996 and amended February 1997. SNWA continues to monitor population and water use growth, and examine alternatives which optimize all supplies, including the Colorado River, other surface water, groundwater, and reclaimed water.

Some of the alternatives presented in “Water Supply for the Future in Southern Nevada” are being implemented, fully or partially, or are still being considered as potential future solutions:

- Conservation measures are successfully reducing water demands in the Las Vegas Valley. The implementation of additional conservation measures is an integral part of SNWA’s Water Resource Plan for the future.
- The SNWA Water Resource Plan includes the Cooperative Water Project (CWP) as a potential future water supply alternative to meet demands beyond the year 2025. The CWP involves the collection and transmission of groundwater from sixteen hydrologic basins in Clark, Lincoln, Nye and White Pine counties.

Return flows to the Colorado River from Las Vegas Valley are calculated by a methodology developed by the U.S. Bureau of Reclamation in consultation with the Colorado River Commission, and was approved by the lower Colorado River basin states in 1984.

The Nevada Division of Environmental Protection established the Lake Mead Water Quality Coordination Forum with the objective to protect public health and preserve the water quality of the Las Vegas Valley Wash and Bay and Lake Mead. The Forum coordinates the many efforts of the interested parties and stakeholders regarding the water quality concerns.

The State continues to be active in the Colorado River Basin Salinity Control Forum and support those projects beneficial to Nevada.

The State Engineer has initiated discussions with Utah and Arizona representatives regarding the allocation of Virgin River water. Also, the State Engineer has issued a water right permit to Southern Nevada Water Authority for an average of 190,000 acre-feet per year from the Virgin River.

## **Snake River Basin**

**1974 Recommendations.** “The Nevada Legislature previously ratified a Columbia River Compact which includes the water supplies within this region. The Compact was not ratified by some other participating states and is therefore not effective. There has been a renewed interest throughout the Northwestern states in pursuing Compact negotiations.

It is recommended that Nevada representatives actively participate in such negotiations to protect our share of this resource.

The State is currently a party in a suit involving development and use of groundwater in Nevada and the possible effects on surface streams in Nevada which flow into Idaho. It is recommended that the State's position in this suit be aggressively pursued and defended.”

**Current Status.** The Columbia River Compact remains unratified by some states, however the Compact Commission is still in existence. The suit referred to the 1974 Recommendations (Bellbrand) has been settled. The surface waters in the Salmon Falls Creek and Goose Creek areas were adjudicated. The remainder of the tributaries are presently being adjudicated.

## ***1974 State Water Plan Conclusions and Recommendations on Projected Water Requirements***

### **Municipal and Industrial**

**1974 Recommendations.** “In most communities and cities throughout the State, there will be sufficient water available in the immediate area to meet projected municipal and industrial requirements, through the planning period or until 2020. In some cases, water quality problems may develop and treatment will be necessary. Also, in many instances, it may be necessary to acquire existing water rights and change the manner of use.

It is recommended that water service entities in the various cities and communities assess their water supply and treatment needs and immediately initiate programs to assure a sufficient water supply for their anticipated needs. Necessary data and assistance is available from State Water Planning information.”

**Current Status.** The larger municipal water suppliers have been actively planning for future water supply and treatment needs, and developing capital improvement programs. The Division of Water Planning continues to provide data and assistance to water service entities and others. Through the AB 198 grant program, the Division of Water Planning has provided funding assistance to the smaller communities for infrastructure improvements.

### **Electric Energy Generation**

**1974 Recommendations.** “More electric energy facilities will be required in the future to supply Nevada's demand, and possibly to supply a portion of demand in the remaining ten Western States.

Private, state, and federal studies should continue for conventional fossil fueled plants, as well as nuclear plants, geothermal plants, and pumped storage facilities. New dams and reservoirs should be analyzed to see if electric power generation would be feasible. Utilities should consider purchasing

existing water rights to provide the additional necessary water supplies required for steam-electric generation of electric energy.

Caution should be exercised not to overcommit water supplies for generation of power to be exported. If export is necessary for a period of time, a ‘recapture’ condition should be imposed to assure that demands and requirements within Nevada can be met.”

**Current Status.** In 1981, NRS 533.372 was added to the statutes authorizing the State Engineer to approve or disapprove any water right application for the purpose of generating energy to be exported out of Nevada.

## **Mining**

**1974 Recommendations.** “Mining has been an industry in Nevada for over 100 years and is expected to continue to be economically vital. Many of the mining processes require large amounts of water, some of which result in a degradation of water quality.

Discharge water should be adequately treated before returning to the stream or river system or to a ground water basin.

In water-short areas, or where the projected mining water demands exceed the available supply, plans to augment present supplies should be initiated. These might include interbasin transfers, purchasing existing water rights, and possibly reusing discharge waters.”

**Current Status.** Mining water use has changed significantly since the release of the 1974 State Water Plan. Since that time, withdrawals have increased over 10 times due primarily to increased pit dewatering activities. Of the estimated 274,000 acre-feet withdrawn in 1995 at mines, only about 32 percent was consumptively used by mine operations. The remaining volume was reinjected, infiltrated, evaporated, discharged to surface water bodies, or reused for irrigation purposes. Disposal of these excess waters has been regulated by the Division of Environmental Protection to ensure that the waters are adequately treated prior to discharge. While some mines are utilizing excess pit water, other mines have had to rely on interbasin transfers or the purchase of water rights for their needed supplies.

## **Recreation**

**1974 Recommendations.** “There is a general need for more water-based recreation in Nevada... In construction of new reservoirs, consideration should be given to minimum flows and maintenance of minimum pools. Diversions should be screened and fish ladders built at new and existing dams. As the demand increases for water-based recreation, new areas should be developed and new facilities should be established at existing lakes and reservoirs.

Requirements for minimum pools and minimum flows should not be imposed on existing facilities or

projects unless water rights are acquired for these purposes, either through new appropriation or acquisition of existing rights.”

**Current Status.** NRS 535.020 requires that new dams or the alteration of existing dams have fishways installed over or around dams, and for the protection and preservation of fish in streams obstructed by dams. In 1986, the South Fork Reservoir near Elko was constructed solely for recreational purposes. The operation of this reservoir provides for minimum downstream flows. There are numerous examples of water rights being acquired for recreation, environmental and wildlife purposes as presented in the “Environmental Considerations” discussion in this section of the *State Water Plan*. For additional information, refer to the discussion on “Maintaining Recreational Values” in Part 3 of the *State Water Plan*.

## **Agriculture**

**1974 Recommendations.** “Potential agricultural development is severely limited in many areas of the State because of inadequate water supplies. It has been necessary to deny issuance of permits to appropriate water for agricultural use in some areas. Existing agriculture is inhibited also in some cases by variations of flows, sedimentation, salinity, floods, and outmoded structures and facilities.

Consideration should be given by ranchers, farmers, irrigation districts and water companies to improved efficiencies, regulatory storage facilities, management and operation practices and to other conservation measures.

The state should continue to enforce water right conditions for maximum utilization of the limited supplies.”

**Current Status.** Nevada’s agricultural community has been implementing a variety of conservation measures throughout the State, particularly in the Walker and Carson River basins and the Lovelock area (Humboldt River basin). For more information, refer to the discussion on “Water Conservation” in Part 3 of the *State Water Plan*.

## **Fish and Wildlife**

**1974 Recommendations.** “As the development and use of water in the State has increased, in some cases, natural sources of water have been restricted or become completely inaccessible to wildlife. Other factors affecting wildlife watering include the continued physical presence of domestic livestock or human activity at or near water sources.

One possible solution would be for the Fish and Game Department to acquire water rights for wildlife purposes at the various natural water sources. This procedure would be time consuming and expensive.

An alternative would be legislation to provide that in new appropriations of water, that the applicant allow a sufficient quantity of water to remain at the source for wildlife needs. This requirement should not be imposed on existing facilities and should not impair or adversely affect existing water rights.

**Current Status.** A number of actions have been taken to provide water supplies for fish and wildlife. For more information, refer to the discussions on “Environmental Considerations” and “Recreation” presented earlier in this section of the *State Water Plan*.

**Nevada State Water Plan**  
**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

**Section 3**  
**The Institutional Framework for**  
**Water Planning and Management**

*Introduction*

This section presents an overview of the institutional framework affecting water planning and management within the State. All entities involved with water planning, allocation, management and development issues must navigate their way through portions of this institutional framework in their decision-making process.

*Statutory, Regulatory and Legal Considerations*

This subsection provides a general summary of the major state and federal statutory, regulatory and legal constraints impacting water planning and management. Water quantity allocation and management; interstate water resource management; water quality protection and management; resource protection; flood protection and drought planning; and conservation are all important constraints to consider for a successful water plan.

**Water Quantity Allocation and Management**

**Nevada Water Law.** All waters within the boundaries of Nevada, whether above or beneath the ground surface, belong to the public and are managed on their behalf by the State. The State Engineer is responsible for the administration of Nevada Water Law, which ensures that these waters are managed so that sufficient quantities are available to preserve our quality of life and to protect existing water rights. Entities within the State can apply for the right to use that water. Like many of the western states, Nevada water law is founded on the doctrine of prior appropriation - “first in time, first in right.” Under this doctrine, the first user of water from a watercourse acquires a priority right to the water and to the extent of its use under that right.

Nevada water law is set forth in Nevada Revised Statutes (NRS), Chapters 533 and 534. In addition, there are numerous court decisions which have further defined Nevada law. It is the State Engineer who determines the limit and extent of the rights of claimants to water, the use to which water may be put, the quantity of water that is reasonably required for beneficial use, and where water may be used.

As part of the duties of the office, the State Engineer reviews applications for new water rights appropriations. In approving or rejecting an application to appropriate water, the State Engineer follows statutory criteria:

- Is there unappropriated water in the proposed source?
- Will the proposed use impair existing rights?
- Will the proposed use prove detrimental to the public interest?
- Is the project feasible and not filed for speculative purposes?

All water rights are considered real property and can be bought, sold, traded and leased. The place of use and type of use can be changed with the State Engineer's approval. The attributes of appropriative water rights in Nevada are: 1) beneficial use is the measure and limit of the right to the use of the water; 2) rights are stated in terms of definite quantity, manner of use, and period of use; and 3) a water right can possibly be lost by abandonment or forfeiture.

The State Engineer has primary responsibility for the distribution of all surface water in Nevada except on civil decreed streams systems unless so granted by the civil court; and except on federally decreed stream systems. Stream systems which have been adjudicated are distributed in accordance with the associated decree by water commissioners. The water commissioners are recommended by the State Engineer and confirmed by the state district court. In areas where an irrigation district has been formed, the water is distributed by irrigation district personnel.

**Decrees.** Most surface waters in Nevada are managed in accordance with civil, state or federal decrees. There are over 100 decrees governing water allocation and management in Nevada. Following is a brief summary of the major decrees affecting water allocation and management in specified basins:

- **Alpine Decree (federal).** The waters of the Carson River are distributed in accordance with the Alpine Decree issued in *United States v. Alpine Land and Reservoir Co., et al.* by the federal district court on October 28, 1980. Although the Alpine Decree encompasses water rights in both Nevada and California, it is not an interstate allocation as neither state was a party to the decree.
- **Bartlett Decree, Edwards Decree (state).** The waters of the Humboldt River are distributed in accordance with the Bartlett Decree issued by state district court in 1931 and the Edwards Decree issued by state district court in 1935. The Edwards Decree corrected errors and omissions in the Bartlett Decree.
- **Orr Ditch Decree (federal).** The waters of the Truckee River and its tributaries are distributed in accordance with the Orr Ditch Decree issued in *United States v. Orr Ditch Water Company, et al.* by federal district court on September 8, 1944. No rights to the use of Truckee River water in California were included in this decree. The Orr Ditch Decree also incorporated the provisions of the earlier Truckee River Agreement. In 1935, the United States, Truckee-Carson Irrigation District, Sierra Pacific Power Company, and the Washoe County Water Conservation District entered into the Truckee River Agreement which set out the operational rules of the river system.



- **Walker River Decree (federal).** The waters of the Walker River and its tributaries are distributed in accordance with the federal decree issued in *United States v. Walker River Irrigation District, et al.* by federal district court on April 14, 1936 and amended on April 24, 1940. Although the Walker River Decree encompasses water rights in both Nevada and California, it is not an interstate allocation as neither state was a party to the decree.

**Tribal Water Rights.** When the United States reserved land from the public domain for uses such as Native American reservations, it also implicitly reserved sufficient water to satisfy the purposes for which the reservation was created. This federal reserved water rights doctrine was established by the U.S. Supreme Court in 1908 in *Winters v. United States*. Federally reserved Indian water rights differ from state-issued rights in a number of ways. For instance, the Winters Doctrine asserts that federal reserved rights cannot be lost by failure to put the associated water to beneficial use.

In Nevada, the more than 20 Native American reservations and colonies occupy approximately 1.6% of the land area (about 1 million acres). About 90% of these reserved lands are within five reservations: 1) Pyramid Lake Indian Reservation (southern Washoe County); 2) Walker River Indian Reservation (predominately northern Mineral County); 3) Duck Valley Indian Reservation (northern Elko County); 4) Goshute Indian Reservation (northeastern White Pine County); and 5) Moapa River Indian Reservation (northern Clark County).

### **Interstate Water Resource Management**

**Colorado River.** In addition to Nevada, the states of California, Arizona, Wyoming, Colorado, New Mexico, and Utah, and the Republic of Mexico, all use water from the Colorado River. In 1922, these seven states entered into an interstate compact which includes a provision for the equitable division and apportionment of the waters of the Colorado River system. The Boulder Canyon Act of 1928 provided, among other things, for the construction of works to protect and develop the Colorado River Basin by the U.S. Bureau of Reclamation. The U.S. Supreme Court Decree in *Arizona v. California*, 1964, established several additional dimensions to the apportionment of Colorado River water, including apportionments to the lower basin states of Nevada, California and Arizona. It was ruled that of the first 7.5 million acre-feet of mainstem water consumed in the lower basin, California was entitled to a consumptive use of 4.4 million acre-feet/year; Arizona to 2.8 million acre-feet/year; and Nevada to 0.3 million acre-feet/year. In 1968, the Colorado River Basin Project Act authorized the Central Arizona Project and it provided for allocations to the lower basin states in years of insufficient mainstream water to satisfy the specified consumptive use of 7.5 million acre-feet per year.

The Nevada State Legislature recognized the value of this resource in 1935 when it created the Nevada Colorado River Commission to serve as the State’s watchdog over the Colorado River. Among its other statutory responsibilities, the commission is required to “receive, protect and safeguard and hold in trust for the State of Nevada” all the water and associated water rights in the Colorado River to which the State is entitled under federal law, interstate compacts and treaties. The Commission is also responsible in various ways for the distribution of this water, and thus is authorized to contract for the use of the water.

**California-Nevada Interstate Compact.** The need for apportioning the water of the Truckee, Carson and Walker rivers between Nevada and California has been considered over the years. After years of negotiations, the state legislatures of California (in 1970) and Nevada (in 1971) passed legislation adopting the California-Nevada Interstate Compact. However, the U.S. Congress never ratified the Compact. Interstate allocations of the Truckee and Carson rivers were addressed in the Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990.

**Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990.** The latest effort to resolve long-standing disputes over water and water rights on the Truckee River has been the enactment of congressional settlement legislation for the Truckee and Carson Rivers. This legislation, known as the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (or “Negotiated Settlement”), was approved by the 101<sup>st</sup> Congress on November 16, 1990. The main authorizations and directives included in the legislation are:

- an interstate allocation between Nevada and California is made of the waters of the Truckee and Carson Rivers, and Lake Tahoe;
- a new operating agreement is to be negotiated for the Truckee River;
- the Newlands Projects is reauthorized to serve additional purposes, including recreation, fish and wildlife, and as a municipal water supply for the Fallon area;
- a recovery program is to be developed for the endangered Pyramid Lake cui-ui fish and threatened Lahontan cutthroat trout, with a water right acquisitions program authorized; and
- a water rights purchase program is authorized for the Lahontan Valley wetlands.

Many of the Negotiated Settlement’s provisions, including the interstate apportionment, will not become effective until a number of conditions are met, including dismissal of certain lawsuits and the negotiation of an operating agreement for the Truckee River among the United States, Nevada, California, the Pyramid Lake Paiute Indian Tribe, the Sierra Pacific Power Company, and other parties. The involved parties hope to complete the operating agreement negotiations by 1999.

### **Water Quality Protection and Management**

**Clean Water Act (CWA).** The Water Quality Act is a 1987 amendment to the Clean Water Act of 1977, which amended the Federal Water Pollution Control Act of 1972, and is the primary legislative vehicle for federal water pollution control programs. The Water Quality Act is often referred to as the Clean Water Act (CWA). This Act was established to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters” and set goals to eliminate discharges of pollutants into navigable water, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment.

The State Environmental Commission (SEC), established by State law, has adopted regulations which define State programs to carry out the provisions of Nevada’s Water Pollution Control Laws. These laws, contained in Chapter 445A of the Nevada Revised Statutes (NRS), establish the authority to implement portions of the CWA and the Safe Drinking Water Act in addition to several non-federal water pollution control programs. In addition to adopting regulations, the SEC establishes fee schedules for permits, advises, consults and cooperates with other governmental agencies regarding

water pollution matters, establishes qualifications for sewage treatment plant operators, and holds hearings regarding the actions of the Nevada Division of Environmental Protection (NDEP). The powers and duties of the SEC are listed primarily in NRS 445A.425, and also in NRS 445A.135, 445A.160, 445A.180, 445A.428, 445A.430, 445A.605, and 445A.610.

NDEP has been delegated the authority to implement aspects of the CWA in Nevada. Following is a summary of major sections of the CWA and their application to water quality management in Nevada.

- **Section 106(e) - Water Quality Monitoring.** With assistance from federal grants, NDEP operates a surface water quality monitoring network with water quality parameters monitored at about 100 sites throughout the State. In addition, NDEP has access to water quality data collected by other agencies. Data collected under these monitoring programs are used to establish water quality standards, assess compliance with water quality standards, conduct trend analyses, validate water quality models, set discharge limitations, conduct nonpoint source assessments, compile the Section 303(d) List, develop Section 208 Plan amendments, and develop the Section 305(b) Report.
- **Section 208 - Water Quality Management Plans.** Section 208 of the CWA was promulgated for the purpose of encouraging and facilitating the development and implementation of areawide wastewater treatment management plans. If an area(s) within the State is identified as having substantial water quality control problems as a result of urban-industrial concentrations or other factors, the Governor of the State may designate the boundaries of each such area and appoint a single representative organization, including elected officials from local governments or their designees, capable and responsible for developing effective areawide water treatment management plans. Absent action by the Governor, NDEP is the responsible agency for developing 208 Plans. Following are the five areas for which 208 plans have been developed and the agencies responsible for plan development:

Carson River Basin - NDEP

Clark County - Clark County Board of County Commissioners

Lake Tahoe Basin - Tahoe Regional Planning Agency

Washoe County - Truckee Meadows Regional Planning Agency

Remainder of the State (non-designated area) - NDEP

Section 208 Plans are used in the review of permit and funding applications. Proposed activities which are inconsistent with the 208 Plan cannot go forward until a plan amendment is approved.

- **Section 303 - Water Quality Standards.** Federal requirements for water quality standards and antidegradation are contained in Section 303 of the CWA. State requirements are contained in NRS 445A.520 and NRS 445A.425 states the powers and duties of the SEC, including the adoption of water quality standards. Water quality standards define water quality goals of a waterbody by designated uses and by setting criteria necessary to protect the uses. Antidegradation requirements are contained in NRS 445A.565 which requires that waters of higher quality be protected. Water quality standards serve as the regulatory basis for establishing

water quality based treatment controls. In Nevada, the SEC is required to establish water quality standards at a level to protect and ensure a continuation of the designated beneficial use or uses within a stream or other waterbody (NRS 445A.425).

- **Section 303(d) List.** Section 303(d) of the CWA requires states to identify waters that do not or are not expected to meet applicable water quality standards with existing controls alone. This Section 303(d) List, developed by the NDEP provides a comprehensive inventory of waterbodies impaired by all sources of pollution, including point sources, nonpoint sources, or a combination of both. This inventory is the basis for targeting waterbodies for watershed solutions.

Once these waters are identified, the State is required to develop total maximum daily loads (TMDLs) for these waters. A TMDL quantifies allowable pollutant loads that a given water body can assimilate to the level needed to meet the water quality standards. TMDLs are then used to set effluent limits for permitted discharges.

- **Section 305(b) - Water Quality Assessment.** Section 305(b) of the CWA requires states to produce biennial “Water Quality Assessments” that assess progress in achieving the objectives of the CWA. NDEP is responsible for producing Nevada’s 305(b) Reports.
- **Section 314 - Clean Lakes.** Pursuant to Section 314 of the CWA, the Clean Lakes Program was established in 1972 to define the causes and extent of water pollution problems in the lakes of each State and for developing and implementing effective techniques to restore them. Through the Clean Lakes Program, NDEP State has received Federal funding for numerous studies and implementation projects. Federal funding is no longer available under Section 314.
- **Section 319 - Nonpoint Source Pollution.** Section 319 of the CWA authorizes the Nonpoint Source Pollution Management Program and provides funding to states to implement nonpoint source program. Nevada began the Nonpoint Source (NPS) Management Program in 1987 using Federal funds. The primary goal of the program is to identify, control and abate the impacts of NPS pollution on the quality of the State’s surface and ground waters. The State’s current approach in controlling nonpoint sources is to seek voluntary compliance through regulatory and non-regulatory programs including technical and financial assistance, training, technology transfer, demonstration projects and education.
- **Section 401 Certification Program.** Under provisions of the CWA, any applicant for a Federal license or permit (e.g. 404 permit) to conduct any activity that may result in a discharge to navigable waters must provide the Federal agency with a Section 401 certification. The 401 certification, made by the state in which the discharge originates, declares that the discharge will comply with applicable provisions of the CWA, including water quality standards. Section 401 provides states with two distinct powers: 1) the power indirectly to deny Federal permits or licenses by withholding certification; and 2) the power to impose conditions upon Federal permits by placing limitations on certification.

In Nevada, NDEP has the responsibility to review and comment on proposed projects under the 401 Certification Program. NDEP may grant, waive or deny certification for a federally permitted

activity that may result in a discharge to the waters of the state or adversely impact downstream water quality. If the applicant can demonstrate that the proposed project will not impact existing water quality nor cause a violation of a water quality standard, or water quality improvements are expected, 401 certification is given. If the project is expected to negatively impact water quality, NDEP will require conditions in the permit to offset project impacts or deny certification.

- **Section 402 - National Pollutant Discharge Elimination System.** Section 402 of the CWA established a permit system known as the National Pollutant Discharge Elimination System (NPDES) to regulate point sources of discharges (wastewater treatment plants, etc.) into surface waters of the United States. In 1987, Section 402 was amended to require the regulation of stormwater runoff under the NPDES. The U.S. Environmental Protection Agency (EPA) has delegated this program to NDEP. NPDES permits cannot be issued if the proposed discharge is inconsistent with the 208 Water Quality Management Plan for the area (NRS 445A.490).
- **Section 404 - Dredge and Fill Permits.** Section 404 regulates the discharge of dredged and fill materials into navigable rivers, and protects wetlands from encroachment. None of these regulated activities may occur unless a permit is obtained from the U.S. Army Corps of Engineers. Generally, the project proponent must agree to mitigate or have plans to mitigate environmental impacts caused by the project before a permit is issued.

Under amendments in the CWA, the State is responsible for certifying a Section 404 project proposal's compliance with applicable water quality standards. NDEP has the responsibility to review and comment on proposed projects under the 401 Certification Program and has the right to deny certification of a 404 permit which would prevent the Corps of Engineers from using the permit.

- **Section 603 - State Revolving Fund Program.** Section 603 of the CWA provides for the establishment of State Revolving Fund (SRF) programs. Through the SRF, NDEP provides loans at or below market rates and other forms of financial assistance to municipalities and other entities to assist in financing the construction of waste water treatment works or projects to control nonpoint sources of water pollution. Only those facilities addressed in the Section 208 Plan are eligible for funding under this program.

**Other State Programs (NDEP).** In addition to the federal CWA and Safe Drinking Water Act programs delegated to NDEP, numerous state programs exist to protect, control and restore the quality of the waters of the State. Apart from the NPDES permits issued under the CWA, NDEP issues Water Pollution Control Permits with a zero-discharge performance standard for certain mining facilities, and State Ground Water Permits for infiltration basins, land application of treated effluent, large septic systems and industrial facilities. In addition to these permitting processes, NDEP reviews subdivision plans to ensure that wastewater is disposed of adequately. Also, NDEP regulates highly hazardous substances under the chemical accident prevention program. Remediation of polluted soil and/or groundwater falls under the State Corrective Actions Program which includes authorities under two federal acts: the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

**Other Federal Programs (NDEP).** Management of solid waste, hazardous waste and underground storage tanks are covered by the Resource Conservation and Recovery Act (RCRA) programs delegated to NDEP. Nevada also has a program under the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) to perform spill reporting and tracking, assessments, investigations and remedial activities as necessary.

**Safe Drinking Water Act.** In 1974, the U.S. Congress enacted the Safe Drinking Water Act (SDWA) to enhance the safety of public drinking water in the United States through the establishment and enforcement of national drinking water standards. Congress gave the EPA the responsibility for implementation and enforcement of the SDWA. In 1978, EPA granted primary enforcement authority (primacy) for the SDWA in Nevada to the State of Nevada (Division of Health). The State Health Division is responsible for implementing the program in 15 of Nevada's 17 counties. The Health Division has interlocal agreements with Clark County Health District and Washoe County District Health Department to implement various activities related to the SDWA and State Board of Health requirements in those counties.

The SDWA applies to all public drinking water systems which provide piped water for human consumption to at least 15 service connections, or regularly serve an average of at least 25 individuals daily for at least 60 days out of the year. There are currently about 700 public water systems in Nevada that are regulated under the SDWA.

In 1996, additional amendments were enacted and a state revolving loan fund was authorized. The amendments included a "right to know" provision which will require water authorities to disclose chemicals and bacteria found in drinking water and required EPA to establish more stringent standards against cryptosporidium and other drinking water contaminants that pose significant health risks. The new law goes beyond a regulatory approach to add the concept of prevention. The law seeks to prevent problems by increasing public water systems' capacity to provide safe drinking water, and by protecting the source waters. EPA is currently developing additional rules which will address radon, uranium and arsenic concentrations, disinfection byproducts, groundwater disinfection, and enhancement of the Surface Water Treatment Rule. Following are descriptions of the main highlights of the current SDWA.

- **Public Water Supply Supervision Program.** Primary enforcement authority of the SDWA is the responsibility of the Nevada Health Division. Through the State Public Water Supply Supervision Programs (PWSS), the Nevada Health Division enforces the drinking water quality standards of the water provided by the 700 public water systems in the State. The Health Division has interlocal agreements with Clark County Health District and Washoe County District Health Department to implement various activities related to the SDWA and State Board of Health requirements.
- **Underground Injection Control Program.** Authorized under the Safe Drinking Water Act, the Underground Injection Control (UIC) Program is delegated to the State. NRS 445 provides the authority which allows the NDEP, Bureau of Water Pollution Control, through the SEC, to regulate the UIC Program and issue permits. The purpose of the UIC permit is to regulate

underground injection and to prevent pollution of groundwater and protect the environment. A UIC permit must be obtained prior to drilling an injection well or injecting fluid into a well.

- **Wellhead Protection Program.** The 1986 Amendments to the SDWA established a new Wellhead Protection Program (WHPP) to protect groundwater supplies for public water supply systems, and mandated that each state develop a WHPP. The authority to implement Nevada's WHPP was delegated to NDEP by the Governor during the same year. At a minimum, each State's WHPP must: 1) specify roles and duties of state and local entities, and public water suppliers, with respect to the development and implementation of WHPPs; 2) delineate the wellhead protection area (WHPA) for each well; 3) identify sources of contamination within each WHPA; 4) develop management options to protect the water supply within the WHPA from such contaminants; 5) develop contingency plans in the event of contamination; 6) site new wells as needed to maximize yield and minimize potential contamination; and 7) ensure public participation.

In 1994, Nevada's WHPP was approved by EPA and has been successfully implementing wellhead protection at the local level. Presently there are seventeen Nevada communities developing or implementing WHPPs with the assistance of NDEP, and interest has been expressed by several more communities. The voluntary nature of Nevada's WHPP coupled with both financial and technical assistance from the State and EPA have been the keys to its success.

- **Comprehensive State Ground Water Protection Program.** EPA initiated the Comprehensive State Ground Water Protection Program (CSGWPP) guidance to provide states with a framework for developing comprehensive, integrated groundwater protection programs. EPA is encouraging states to develop and implement CSGWPPs that meet the needs of the state. CSGWPPs are voluntary and encourage groundwater resource management through a cooperative, multi-agency approach.

While the State of Nevada has the primary role in protecting and managing its groundwater resources, the CSGWPP process provides the opportunity to review, evaluate, and revise groundwater protection efforts so as to improve their effectiveness. The goal of a Fully-Integrated CSGWPP is to ensure that groundwater protection and management efforts are consistent and coordinated across all federal, State and local programs. The Nevada Division of Environmental Protection is the lead agency for the CSGWPP development and received EPA endorsement of its core CSGWPP in November 1997.

- **Drinking Water State Revolving Fund.** The SDWA Amendments of 1996 authorized a Drinking Water State Revolving Fund (DWSRF) to assist public water systems to finance the costs of infrastructure needed to achieve or maintain compliance with SDWA requirements and to protect public health objectives of the Act. The administrator of EPA is authorized to award capitalization grants to States, which in turn can provide low cost loans and other types of assistance to eligible systems (community and non-profit non-community water systems). To be eligible to receive capitalization grants, a state must establish a drinking water treatment revolving loan fund.

Under this program, Nevada will receive an annual allotment from the federal government, but must contribute an amount equal to 20 percent of the total federal contribution. The DWSRF funds can then be loaned to public water systems to facilitate compliance with national primary drinking water regulations and further the health protection objectives of the SDWA. Disadvantaged systems may receive loan subsidies, including forgiveness of the principal. Portions of the DWSRF funds may also be used for fund administration, small system technical assistance, Public Water Supply Supervision activities, state capacity development strategies, operator certification programs, and source water protection programs. The Bureau of Health Protection Services is the lead agency for the DWSRF.

- **Capacity Development.** Under the 1996 SDWA Amendments, states are given until October 1, 1999 to obtain the authority to ensure that new community water systems and non-transient non-community water systems have the technical, financial, and managerial capacity to meet National Primary Drinking Water Regulations. A state will receive only 80 percent of its Drinking Water State Revolving Fund allotment unless the state has such authority. As part of this program, states are required to prepare and submit to EPA a list of community water systems and non-transient, non-community water systems that have a history of significant noncompliance and the reasons for their noncompliance. States are also required to establish strategies for assisting systems in developing and maintaining technical, financial and management capacity. Periodic reports on the efficacy of their development strategies and water system capacity improvements are required.
- **Vulnerability Assessment Program.** The SDWA regulations set forth monitoring requirements (e.g. sampling frequency, etc.) for various potential contaminants. The costs associated with some of the related laboratory analyses can place a significant financial burden on water systems. Sensitive to these potential high costs, the SDWA allows states some flexibility in establishing water chemistry monitoring requirements. In response, the Nevada State Health Division, Bureau of Health Protection Services, has voluntarily developed a monitoring waiver program. Certain water quality monitoring requirements may be waived for a given water system if the vulnerability assessment shows the system to be at low risk to contamination.

The waiver program focuses on performing vulnerability assessments including an evaluation of the source water site, an evaluation of the components of the water system, previous monitoring results, prior historical/environmental/land usage in the source water area, contaminant persistence and transport potential, hydrogeology of the area, well construction, known well abandonment history and a review of the initial water quality monitoring results.

As a direct result of the vulnerability assessment program, water systems throughout Nevada have saved about \$3.5 million to date in monitoring costs. It is anticipated that a total of \$5.5 million to \$6 million could be saved if vulnerability assessments are performed for all water sources.

- **Source Water Assessment Program.** Reauthorization of the SDWA in 1996 added new requirements for States to develop and implement a Source Water Assessment Program (SWAP). The purpose of a SWAP is to identify existing sources of drinking water and determine what potential contamination problems may arise that need to be addressed. In part, the final SWAP



is to address: delineations of land area contributing to public water systems' sources (Source Water Protection Areas - SWPA); inventory of known and significant contaminants within the SWPAs; analysis of source susceptibility to contamination; and plans for protection of source waters. The Bureau of Health Protection Services is responsible for development and implementation of SWAP.

**Insecticide, Fungicide, and Rodenticide Act (Pesticide Management Plan).** The Nevada Division of Agriculture (DOA) has primacy to administer the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) in the State. With regard to pesticides, the primary responsibility is to regulate the registration, use, storage, sale, and disposal of unwanted, canceled and suspended pesticides in Nevada. The DOA has been involved in groundwater protection activities since 1988 as a direct result of a nationwide EPA study which discovered that at least 46 different pesticides had contaminated groundwater in 26 states. In most cases, sources of contamination were traced to legal, prescribed use of the particular pesticide. However, some contamination was attributed to direct sources such as pesticide mixing and loading, accidents, and improper well design.

Although the EPA study did not detect pesticide contamination in Nevada, the DOA decided to take a pro-active approach to this problem and designed a program that would prevent further degradation of groundwater quality. Based on the experience of other states and EPA, DOA has developed a program to address this issue. The program began with the development of a Generic State Management Plan that contains a description of essential elements designed to accomplish the goal of designing a protective program that would prevent further degradation of groundwater quality. This has led to the development of Pesticide Management Plans (PMPs). These PMPs as well as the Generic State Management Plan contain many elements. The major elements discussed in the plans will include: 1) protective and preventative actions; 2) monitoring; 3) resources available; 4) other state and federal agencies' roles and responsibilities; and the DOA's legal authority to administer the groundwater protection program. The Generic State Management Plan has been developed which addresses most of these elements. A regulatory framework will be part of the PMPs, which may require setback restrictions, restricted use classification, time of year restrictions, and outright cancellation of pesticides where the water resources may be vulnerable to groundwater contamination.

## **Resource Protection**

**Endangered Species Act.** The federal Endangered Species Act provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The U.S. Fish and Wildlife maintains a list of endangered and threatened species. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees, all of which are dependent upon water. The law prohibits any action, administrative or real, that results in a "taking" of a listed species, or adversely affects habitat.

In Nevada, there are 28 endangered taxa (species/subspecies) (2 are plants) and 14 threatened taxa (7 are plants). Approximately another 250 taxa are considered as potential candidates for listing. More information is needed before these taxa can be removed from the candidate list or moved to the threatened/endangered list. Nevada leads the nation and North America in having the most fishes

listed as endangered, threatened, or of special concern (43 taxa according to the American Fisheries Society). Rankings by the Nevada Natural Heritage Program place Nevada in the top ten states having the most globally imperilled species of plants and vertebrates.

**Nevada Natural Heritage Program.** The State of Nevada Natural Heritage Program researches, collects, and analyzes information on the existence, locations, numbers, condition, biology, and habitats of hundreds of sensitive plant and animal species throughout Nevada. These are species that could qualify for listing as a threatened or endangered in the future under current management and land-use situations. The Program continually prioritizes conservation needs throughout the State, and its easily-accessible computer database, maps, and paper files serve as a cost-effective “early warning system” designed to help prevent costly future species listings.

**Wildlife Commission Statutory Authority.** NRS 503.589 grants the Division of Wildlife administrator the authority to enter into agreements with other entities for the conservation, protection, restoration and propagation of species of native fish, wildlife and other fauna which are threatened with extinction.

**Division of Forestry Statutory Authority.** NRS 527.300 grants the state forester firewarden the authority to enter into agreements with other entities for the conservation, protection, restoration and propagation of species of native flora which are threatened with extinction.

**National Environmental Policy Act.** The National Environmental Policy Act (NEPA) directs federal agencies to prepare an environmental impact statement (EIS) for all major federal actions which may have a significant effect on the human environment. NEPA states that it is the goal of the federal government to use all practicable means, consistent with other considerations of national policy, to protect and enhance the quality of the environment. NEPA requires all federal agencies to consider the environmental impacts of their proposed actions during the planning and decision-making processes.

**Wild and Scenic Rivers Acts (Federal and California).** In 1968, Congress passed the National Wild and Scenic Rivers Act to preserve in their free-flowing condition rivers which possess “outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.” No rivers within Nevada have been designated under this federal act. In 1972, the California Legislature passed the State Wild and Scenic Rivers Act. Portions of the West Walker River and East Fork of the Carson River upstream of Nevada have been designated under the California Act. The California Act prohibits construction of any dam, reservoir, diversion or other water impoundments on a designated river.

The current U.S. Forest Service’s Humboldt and Toiyabe Land and Resource Management Plan has identified other river segments that are suitable for inclusion in the Wild and Scenic Rivers system. These river segments are:

- Jarbidge River - from Idaho-Nevada border to source;
- Little Humboldt River, North Fork - from reservoir at Little Humboldt River confluence to

source;

- Marys River - from west boundary of Section 13, T42N, R59E to source;
- Carson River, East Fork - from last diversion dam approximately one mile above Lahontan Fish Hatchery to source;
- East Walker River - from Bridgeport Reservoir to bridge crossing near Flying M Ranch headquarters; and
- West Walker River - from source at Tower Lake to confluence with Rock Creek.

### **Flood Protection and Drought Planning**

**Flood Control Act.** The Flood Control Act authorizes the U.S. Army Corps of Engineers to perform several flood-related tasks. Section 205 of the Act authorizes the construction of small flood control projects; Section 206 authorizes the Corps Flood Plain Management Services Program to deal with floods and floodplain issues; Section 208 provides for snagging and clearing for flood control in channels; and Section 14 authorizes emergency streambank and shoreline erosion protection for public facilities and services. Activities performed under the Flood Plain Management Services program include technical assistance, planning guidance, pamphlets and supporting studies.

**National Flood Insurance Act.** The National Flood Insurance Program (NFIP) was established in 1968 by the National Flood Insurance Act. The intent of this act is to encourage communities to mitigate future flood damage by adopting and enforcing strict floodplain management ordinances in accordance with federal regulations. The Act made federally subsidized flood insurance available in communities which participate in the NFIP. In Nevada, 15 counties and 13 incorporated cities voluntarily participate in the NFIP. The Federal Emergency Management Agency (FEMA) administers the program, providing flood insurance studies and mapping for participating communities. The flood insurance studies are used for development of the Flood Insurance Rate Maps (FIRMs) that are adopted and incorporated by reference into the Flood Hazard Reduction Ordinances administered by each community. In Nevada, the Division of Water Planning (NDWP) has responsibility for oversight and implementation of the NFIP.

**Emergency Watershed Protection.** The Emergency Watershed Protection program (EWP) is administered by the Natural Resource Conservation Service (NRCS). The program provides technical and financial assistance to restore small watersheds damaged by flooding. The type of assistance provided by the program includes clearing debris from clogged water sheds, restoring vegetation and stabilizing river banks. In addition, NRCS is authorized under the 1996 Farm Bill, to offer a floodplain easement option to agricultural landowners. This option allows land which has been damaged by flooding to be permanently restored to natural floodplain hydrology.

**State Floodplain Management.** Following the flooding experienced in northern Nevada in 1997, NDWP was designated as the lead agency for floodplain management at the State level. The Division's floodplain management duties include implementation of the Community Assistance Program (CAP) and Flood Mitigation Assistance program (FMA), sponsored by FEMA. Under CAP, NDWP provides technical assistance and training as needed to help communities achieve and maintain compliance with NFIP requirements. FMA grants are for mitigation projects aimed at reducing repetitive insurance losses and future damage.

- **Hazard Mitigation Program.** The Nevada Division of Emergency Management is responsible for implementing a comprehensive hazard mitigation program which includes flooding mitigation. The State Hazard Mitigation Officer manages the Hazard Mitigation Grant Program (HMGP), sponsored by FEMA.
- **Statewide All-Hazard Mitigation Committee.** This committee was established in 1998 to help coordinate mitigation activities and funding needs associated with all hazards including flooding. The 21 members come from a wide array of public and private organizations.
- **Channel Clearance Program.** The Channel Clearance program is managed by the Nevada Division of Water Resources (NDWR). The program provides funding for channel clearance maintenance, restoration, surveying and monumenting. Local communities, including counties, cities, irrigation districts, and flood control districts can apply for matching funds to maintain channels of navigable rivers within their jurisdictional boundaries.
- **Disaster Relief Bill.** During the 1997 State Legislative Session, Senate Bill 218 was passed, establishing a state fund of \$4 million to help communities recover from damages sustained in the event of a disaster. The fund is administered by the Legislative Counsel Bureau.

**Local Floodplain Management.** Regulations for the development of local flood control districts are described in NRS 543. The Clark County Regional Flood Control District was formed under this statute in 1985. The Clark County Regional Flood Control District is a proactive regional entity with the mission of protecting life and property from flood impacts through implementation of flood control infrastructure. Flood control projects are funded by a one quarter of one percent sales tax. The District has also implemented a comprehensive floodplain management program which includes flood hazard mitigation, community outreach, and mapping.

**State Drought Plan and the Drought Review and Reporting Committee.** During the first year of the 1987-94 drought, Governor Bryan formed the Drought Review and Reporting Committee (DRRC) to monitor drought severity and recommend actions. By 1991, NDWP, with assistance from the Governor's DRRC and the Advisory Board for Water Resource Planning and Development, developed the State Drought Plan. The State Drought Plan defines the State's response in the event of a drought. More specifically, the Drought Plan defines drought stages (warning, severe, emergency), and establishes the roles of the DRRC, drought task forces and other agencies during the various drought stages.

## **Conservation**

**Service Connection Metering.** A majority of the public water system withdrawals (in terms of volume) are metered, however not all deliveries to each service connection are metered. For example, only about 25 percent of residences in Reno/Sparks have water meters. Water meters were initially prohibited in the cities of Reno and Sparks by a 1919 statute (NRS 704.230). Since that time, gradual changes have occurred which: 1) require meters on all businesses (1977) and on all new homes built after 1988; and 2) allow meters on residences upon owner request and under certain

conditions tied to the Negotiated Settlement (1990).

**Low Flow Plumbing Standards.** The Nevada Legislature passed Assembly Bill 359 in 1991 thereby imposing certain minimum standards for plumbing fixtures (toilets, showers, faucets and urinals) in new construction and expansions in residential, industrial, commercial and public buildings. Each county and city was required to include these requirements in its building code or to adopt these requirements by ordinance, and to prohibit by ordinance the sale and installation of any plumbing fixture which does not meet the minimum standards.

**Conservation Plans.** In 1991, the Nevada Legislature passed Senate Bill 360 requiring all water purveyors (that supply water for municipal, industrial or domestic purposes) to adopt conservation plans before July 1, 1992. These plans were to include provisions relating to:

- Public education to increase public awareness for the need to conserve water;
- Specific conservation measures suitable for the service area;
- Water management, including leak detection, effluent reuse;
- Contingency plan for drought;
- Implementation schedule; and
- Measures to evaluate plan effectiveness.

Public water purveyors were to submit their plans to NDWP for review and approval before adoption (NRS 540.121 through 540.151). Private utilities were to submit their plans to the Public Service Commission (NRS 704.662 through 704.6624). However, Senate Bill 360 did not require periodic plan updates or progress reports.

**U.S. Bureau of Reclamation Conservation Plans.** On October 12, 1982, the Reclamation Reform Act (RRA) was signed into law. One of the provisions of the RRA requires each district, that has entered into a repayment contract or water service contract, to develop a water conservation plan. The plan is to contain definite goals, appropriate water conservation measures, and a time schedule for meeting the water conservation objectives. This provision of the RRA impacts districts such as the Truckee Carson Irrigation District and Pershing County Water Conservation District. Through their Field Services Program, Reclamation's intent is to encourage the consideration and incorporation of prudent and responsible water conservation measures in district operations. This is to be achieved by:

- Providing technical and financial assistance to districts and entities developing and implementing water conservation plans;
- Establishing collaborative efforts with districts and other entities to improve the management of water and to assist in meeting their water conservation goals;
- Encouraging joint efforts toward the coordinated planning, preparation and implementation of water conservation plans by districts with mutual or complementary needs;
- Ensuring that Reclamation assistance programs support and complement State water conservation efforts;
- Providing districts with education materials to assist with water plan development and implementation; and

- Providing water management and conservation planning workshops and training opportunities for districts and other entities.

***Local and State Water Planning and Management***

Many local and state entities have statutory authorities related to water use, management, protection and development. Some of the authorities are summarized in the following tables.

**Table 3-1. Local Organization Statutory Authority**

Category	Agency	Program	Authority (NRS)
<b>Water Supply</b>	Cities	Water Facilities	266.285
	Counties	Water Facilities	244.366
	General Improvement Districts	Water Facilities	318.144
	Irrigation Districts	Irrigation	539.010 - 539.783
	Water Conservancy Districts	Water Supply	541.010 - 541.420
<b>Water Quality</b>	Cities	Sewer Facilities	266.285
	Counties	Sewer Facilities	244.366
	General Improvement Districts	Sewer Facilities	318.140
<b>Environmental Uses</b>	Conservation Districts	Conservation of Natural Resources	548.010 - 548.550
<b>Flood Management</b>	Flood Control Districts	Flood Control	543.170 - 543.830
	Water Conservancy Districts	Flood Control and Drainage	541.010 - 541.420
<b>Water Planning and Management</b>	Cities	Master Plan	278.150 - 278.230
	Counties	Regional Plan	278.0272 - 278.029
		Master Plan	278.150 - 278.230

**Table 3-2. State Agency Statutory Authority**

Category	Agency	Program	Authority (NRS)
<b>Water Supply and Allocation</b>	State Engineer's Office (Division of Water Resources)	Water Right Adjudication and Appropriation	533
		Groundwater Regulation	534
	Division of Water Planning	Small Community Grant Program	349.980 - 349.987
		Conservation Plans	540.121 - 540.151
	Public Utilities Commission	Regulation of Public Utilities	704.001 - 704.960
		Utility Environmental Protection Act (UEPA)	704.001 - 704.960
Conservation Plans		704.662 - 704.6624	
<b>Water Quality</b>	Division of Environmental Protection	Water Pollution Control Clean Water Act State Groundwater Permit Safe Drinking Water Act Mining Reclamation	445A.300 - 445A.730 519A.010 - 519A.280
		Division of Agriculture	Control of Pesticides
	Bureau of Health Protection Services, Health Division	Safe Drinking Water Act	445A.800 - 445A.955
		Control of Septic Systems	444.650
<b>Environmental and Recreational Uses</b>	Division of Wildlife	Boating Safety	488, 501.243
		Wildlife Management and Propagation	504.140 - 504.490
		Protection of Threatened Species	503.584
	Natural Heritage Program	Threatened and Endangered Species Database	527.260 - 527.300
	Division of Parks	Park Facilities	407.011 - 407.250
	Division of Forestry	Protection and Preservation of Timbered Lands, Trees and Flora	527.010 - 527.330
Forest Practice and Reforestation		528.010 - 528.120	
<b>Flood Management</b>	Division of Water Planning	National Flood Insurance Program (Community Assistance, Flood Mitigation Assistance)	540
	Division of Water Resources	Dam Safety	535.005 - 535.110
		Channel Clearance	532.220 - 532.230
	Division of Emergency Management	Hazard Mitigation Grant	414
	Division of Forestry	Forest/Vegetative Cover for Flood Prevention	472.043
Department of Conservation and Natural Resources	Flood Control Loans	543.090 - 543.140	
<b>Water Planning and Management</b>	Division of Water Planning	State Water Plan	540.101
		Planning Assistance	540.011 - 540.151

## ***Regional Plans***

According to NRS 540.101(2), NDWP is to coordinate with local governments (political subdivisions) in developing the *State Water Plan*, and upon the request of the Division, each local government shall cooperate with and assist the Division in the development of the Plan. Following is a summary of selected regional planning efforts that are underway. These planning efforts will provide valuable information for the *State Water Plan*.

### **Southern Nevada Water Authority Water Resource Plan**

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

- 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; and
- City of North Las Vegas.

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. The SNWA Water Resource Plan was completed January 1996, and amended February 1997.

### **Washoe County Comprehensive Regional Water Management Plan**

In 1995, the Nevada State Legislature approved legislation which created the 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 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.

### **Clark County Regional Flood Control District Flood Control Master Plan**

In response to major floods in 1983 and 1984, the Clark County Regional Flood Control District (CCRFCDD) was established in 1985 to develop a regional flood control program for the Las Vegas Valley and surrounding environs. As part of the CCRFCDD mandate, a comprehensive, regional Master Plan was prepared and adopted in 1986. The principal objective of the Master Plan is to provide for the long-term improvement in public safety and property damage protection from flooding events by guiding the siting, design, and installation of flood control facilities. Periodic Master Plan updates are required by law to account for changes in land use, the construction of new facilities, and for improved hydrologic and hydraulic data.



### **Water Quality Management Plans (Section 208 of the Clean Water Act)**

Section 208 of the federal Clean Water Act was promulgated for the purpose of encouraging and facilitating the development and implementation of areawide waste treatment management plans. Following are the five areas for which 208 plans have been developed and the agencies responsible for plan development:

- Carson River Basin - NDEP
- Clark County - Board of County Commissioners
- Lake Tahoe Basin - Tahoe Regional Planning Agency
- Washoe County - Truckee Meadows Regional Planning Agency
- Remainder of the State (non-designated area) - NDEP

### **City/County Master Plans**

Nevada Revised Statutes 278.150 requires each city and county to prepare and adopt a comprehensive, long-term general plan for the physical development of the city, county or region. The master plan may address a variety of matters, such as:

- Conservation;

This element of the plan may address a variety of topics including development and utilization of natural resources, including water, underground water, water supply, forests, soils, rivers and other waters, harbors, fisheries, wildlife, minerals and other natural resources. The reclamation of land and waters, flood control, prevention and control of the pollution of streams and other waters may also be included

- Land use;
- Population;
- Public services and facilities;
- Recreation; and
- Solid waste disposal.

### ***Water Resources Data Collection and Research***

The following section provides a brief discussion of the main entities collecting water resources data and performing water resources research in Nevada.

#### **U.S. Geological Survey - Water Resources Division**

The mission of the Water Resources Division (WRD) of the U.S. Geological Survey (USGS) is to provide the hydrologic information and understanding needed to manage the Nation's water resources to benefit the people of the United States. To accomplish this mission, WRD in cooperation with federal, state and local agencies, uses a variety of investigative and interpretive techniques to collect

and transfer hydrologic information to interested parties. Programs sponsored by WRD in Nevada include:

- Data collection to aid in evaluating the quantity, quality, distribution, and use of water resources in Nevada. WRD routinely collects water discharge data for gaging stations on streams, canals and drains; peak flow data at miscellaneous sites and springs; water elevation and contents for lakes and reservoirs; water levels in wells; and water quality for stream, canal and drain sites, and wells.
- Analytical and interpretive water-resources appraisals to describe the occurrence, quality, and availability of surface and ground water in Nevada.
- Basic and problem-oriented research in hydraulics, hydrology, and related fields of science and engineering
- Scientific and technical assistance in hydrology to other federal, state and local agencies
- Development and maintenance of national computer databases and associated Geographic Information System (GIS) databases for hydrologic data - streamflow, water quality and biology, groundwater characteristics and water use.
- Public distribution of water resources data and results of water resources investigations through reports, maps, computerized information services, and other forms of release

The USGS cooperates with more than 40 local, State, and Federal agencies and Indian Tribes in Nevada. Partnerships with local and State agencies typically are financed on a matching-funds basis.

### **Desert Research Institute**

A nonprofit, statewide division of the University and Community College System of Nevada, Desert Research Institute (DRI) pursues a full-time program of basic and applied environmental research on a local, national, and international scale. The five centers within DRI research such diverse areas as: the natural and human factors influencing the availability and quality of water resources, issues and concerns common to arid and developing regions worldwide, improving society's fundamental knowledge and understanding of hydrologic systems, and encouraging more effective and efficient management of water resources (Water Resources Center); improving the fundamental understanding of the nature of the Earth's dynamic surface from approximately 2 million years ago to the present day, and applying this knowledge toward enhancing effective management of the environment and cultural resources (Quaternary Sciences Center); understanding atmospheric chemistry, climate dynamics, large-scale dynamic meteorology, mesoscale dynamic meteorology, and physical meteorology, and developing instrumentation and techniques for atmospheric measurements (Atmospheric Sciences Center); researching how natural and agricultural ecosystems function and respond to natural and human impacts on the environment, especially air quality, and the technology that can be applied to mitigate these impacts (Energy and Environmental Engineering Center). Additionally, the Western Regional Climate Center, within the Atmospheric Sciences Center, is one of six regional centers funded by the National Oceanic and Atmospheric Administration. The Climate Center provides data and products tailored to the needs of federal agencies, regional organizations, state and local entities, and the private sector.

### **University of Nevada Reno (UNR)**

Within UNR’s College of Agriculture, two departments perform a variety of research projects pertaining to Nevada’s water resources. The Department of Environmental and Natural Resource Sciences provides interdisciplinary research in physical, biological and ecological sciences. The Department of Applied Economic and Statistics with the College of Agriculture provides research which emphasizes the application of economic principles and statistical analysis to issues involving growth, infrastructure, agriculture, natural resources and the environment.

### **Natural Resources Conservation Service**

The Natural Resources Conservation Service (NRCS) within U.S. Department of Agriculture works in three primary areas: soil and water conservation; resource inventories; and rural community development. Under one NRCS program, staff perform snow surveys and develop water supply forecasts. The purpose of the program is to provide western states and Alaska with information on future water supplies. NRCS field staff collect and analyze data on depth and water equivalent of the snowpack at more than 1,200 mountain sites and estimate annual water availability, spring runoff, and summer streamflows. Individuals, organizations, and state and Federal agencies use these forecasts for decisions relating to agricultural production, fish and wildlife management, municipal and industrial water supply, urban development, flood control, recreation power generation, and water quality management. The National Weather Service includes the forecasts in their river forecasting function.

### **Nevada Division of Environmental Protection**

NDEP operates a surface water quality monitoring network. Under this program, water quality parameters are monitored by NDEP at about 100 sites throughout Nevada. A variety of other data are compiled under other NDEP programs. NDEP’s UIC (Underground Injection Control) program requires groundwater quality characterization data in the permit application. The Solid Waste program, hazardous waste facilities oversight, mining-related permitting and state groundwater permitting programs all require some amount of groundwater monitoring in the absence of any contaminant release. Facilities such as wastewater treatment plants and industrial operations with permitted discharges to surface water are required to monitor effluent quality and to submit discharge monitoring reports to NDEP.

### **Nevada Division of Water Resources**

NDWR maintains an electronic database of water rights within the State, including information on place of use, point of diversion, allowable diversion rates and volumes, and other ancillary data. NDWR also collects well log data and pumpage data, and develops crop and pumpage inventories.

### **Nevada Health Division and State Health Laboratory**

As required by state and federal drinking water regulations, public supply systems routinely submit

water samples to laboratories for analysis. The laboratory results are then sent as paper copies to the Nevada Health Division which has primary enforcement authority for drinking water regulations. Depending upon the public supply system, analyses are performed by either the State Health Laboratory or by private laboratories. The State Health Laboratory maintains analytical results in an electronic database.

### ***Funding Opportunities***

A variety of state and federal funding sources exist for the planning, management, protection and development of our water resources. The following discussion provides a brief introduction to the main funding programs available in Nevada.

#### **State Agencies**

**Grants for Capital Improvements to Community Water Systems (Nevada Division of Water Planning).** The Assembly Bill (AB) 198 Grant program provides assistance to water purveyors in partially funding capital improvements made necessary by the State health regulations and the federal Safe Drinking Water Act. Preference is given to water systems serving less than 6,000 people. Grants are limited to publicly owned water systems. Eligible projects include pipe and tank replacements, looping lines, improvement of springs, and drilling of new wells. Expansion of existing systems to meet growth needs is not eligible.

**Clean Water Act Section 319 Nonpoint Source Implementation Grant Program (Nevada Division of Environmental Protection, Nonpoint Source Program).** These grants are made available through federal funds passed through NDEP's Nonpoint Source Program, and are awarded annually on a competitive basis. Eligible activities include: best management practices which reduce, eliminate and/or prevent nonpoint source pollution; technology transfer, innovative methods or practices, ground water protection, pollution prevention, technical assistance and public education. This program is a matching grant program where at least 50 percent of the project cost is a local expense.

**Community Development Block Grant Program (Nevada Commission on Economic Development).** Under this program, grants are awarded for community infrastructure studies and construction. Eligible projects include construction of new wells and water distribution lines.

**Water Projects Financing Program (Nevada Department of Business and Industry).** Through this programs, loans are issued for financing any project for the management, control, delivery, use or distribution of water. To be eligible, any proposed project must satisfy one or more of the following: resolve or abate an emergency situation; provide for the best utilization of surface and ground waters; promote reclamation; provide storage; facilitate offstream storage; accomplish aquifer recharge; acquire site for a reservoir; generate benefits from the rehabilitation or modernization of existing facilities; and obtain significant economic, environmental and water conservation benefits.

**State Petroleum Fund (Nevada Division of Environmental Protection, UST/LUST/Claims**

**Branch).** The Nevada Petroleum Fund can reimburse underground and above-ground storage tank owners for a substantial percentage of costs incurred in clean-up activities. Home heating oil tanks are automatically enrolled in the Fund and are eligible for funding.

**State Revolving Fund (Clean Water Act) (Nevada Division of Environmental Protection, Bureau of Water Pollution Control).** The Nevada State Revolving Fund provides loans at or below market rate and other forms of financial assistance to municipalities and other entities to assist in financing the construction of waste water treatment works or projects to control nonpoint sources of water pollution.

**Drinking Water State Revolving Fund (Safe Drinking Water Act) (Nevada Division of Health, Bureau of Health Protection Services).** The SDWA Amendments of 1996 authorized a Drinking Water State Revolving Fund (DWSRF) to assist public water systems to finance the costs of infrastructure needed to achieve or maintain compliance with SDWA requirements and to protect public health objectives of the Act.

**Channel Clearance Program (Nevada Division of Water Resources).** This program provides funding for channel clearance maintenance, restoration, surveying and monumenting. Local communities, including counties, cities, irrigation districts, and flood control districts can apply for matching funds to maintain channels of navigable rivers within their jurisdictional boundaries.

**Disaster Relief Fund (Legislative Counsel Bureau).** In 1997, the Legislature established a state fund of \$4 million to help communities recover from damages sustained in the event of a disaster.

### **Federal Agencies**

**Rural Utilities Service Program (U.S. Dept. Of Agriculture, Rural Development).** This program provides a variety of funding opportunities for rural areas and towns with populations under 10,000. Rural Development offers loans for the development of water and waste disposal systems (including solid waste disposal and storm drainage). Also, Rural Development offers grants for:

- development of water and waste disposal systems;
- technical assistance and training on a wide range of issues related to water delivery and waste disposal;
- technical assistance and training for improved solid waste management; and
- emergency improvements to drinking water systems.

**Clean Water Act Section 104 (b)(3) Wetland Protection Development Grants (U.S. Environmental Protection Agency).** This grant program was designed to assist state, tribal and local governments in developing wetlands protection programs. Grants are provided to state agencies for priority wetlands planning activities such as wetland watershed protection approach demonstration projects; state wetlands conservation plan development, refinement or implementation; state/tribal section 404 assumption assistance; streamlining state/tribal regulatory programs; and assessing and monitoring the ecological integrity of wetlands.

**Wetlands Reserve Program (Natural Resources Conservation Service & U.S. Fish & Wildlife Service).** The Wetlands Reserve Program is a conservation easement and habitat restoration program that focuses primarily on wetlands in agricultural production. The purposes of the program are: to restore the hydrology and vegetation of converted wetlands (wetlands brought into agricultural production prior to December 23, 1985) or wetlands formed under natural conditions; to protect the functions and values of wetlands for wildlife habitat; and to improve water quality, floodwater retention, and ground water recharge capacity of wetlands. The program offers cash payment to landowners for placing permanent conservation easements on their wetland property, as well as cost-share assistance for restoration work.

**Environmental Quality Incentives Program (Natural Resources Conservation Service, USDA).** The 1996 Federal Agricultural Improvement and Reform Act of 1996 (1996 Farm Bill) created the Environmental Quality Incentives Program (EQIP) to combine the functions of most existing U.S. Department of Agriculture conservation cost-share programs. Its purpose is to provide flexible technical, financial and educational assistance to farmers and ranchers to address a broad range of conservation issues. EQIP provides cost-share assistance for up to 75 percent depending on the conservation practices used.

**Flood Mitigation Assistance Grants (Federal Emergency Management Agency and Nevada Division of Water Planning).** The Federal Emergency Management Agency provides grants to communities for mitigation projects aimed at reducing repetitive insurance losses and future damage. The Nevada Division of Water Planning is the point of contact for this grant program.

**Nevada State Water Plan**  
**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

**Section 4**  
**Water Resources Background**

*Introduction*

An understanding of the state's water resources is a necessary component to the planning and management process. It is the intent of this section to provide the reader with an overview of Nevada's surface water and groundwater resources.

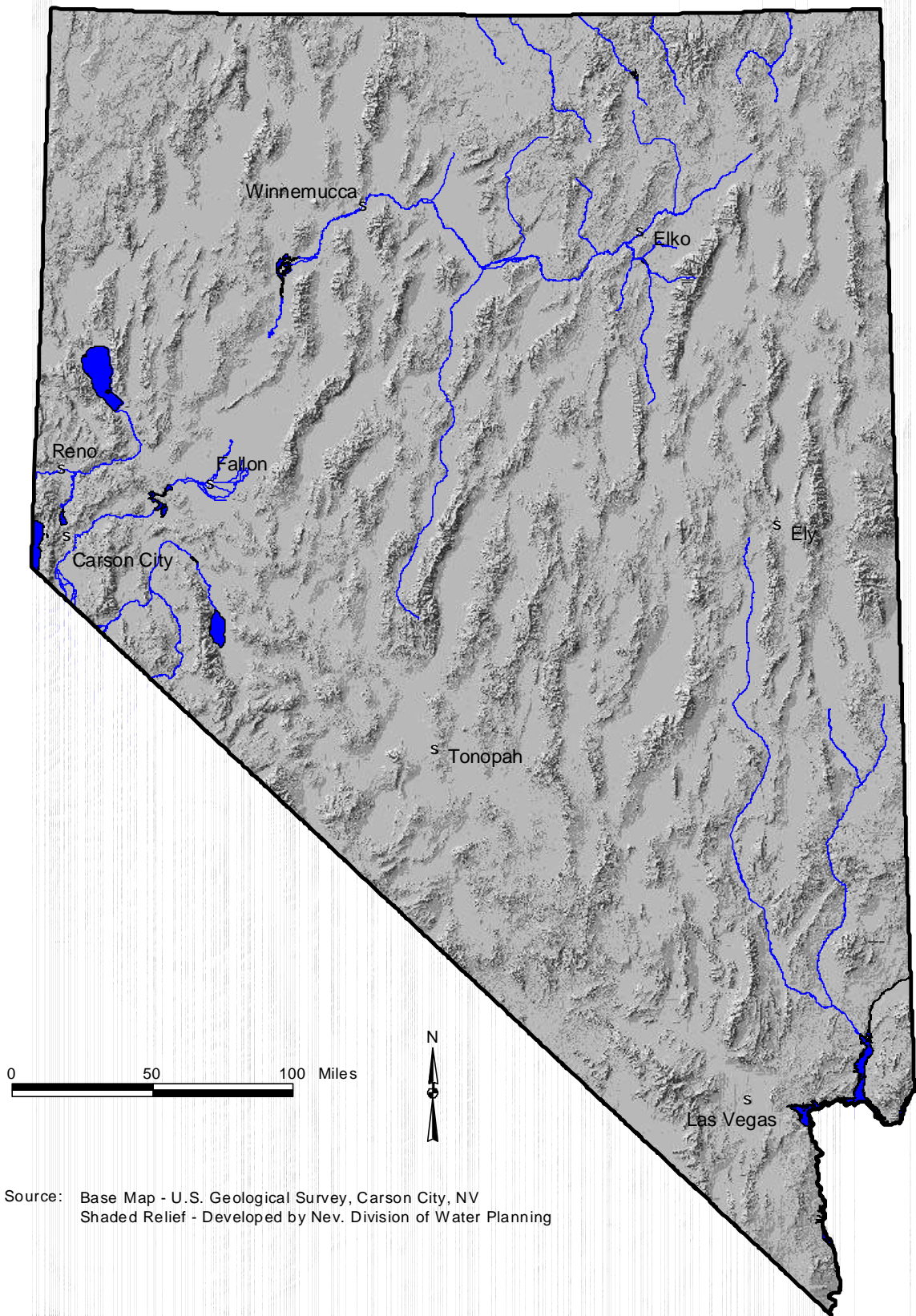
*Topography*

The topography of Nevada and the surrounding areas makes for a unique and diversified climate. Nearly all of Nevada is in the Basin and Range Province of the Intermountain Plateaus, a rugged elevated area between the Rocky Mountains and the Pacific mountain system. The topography of the Basin and Range province is characterized by isolated, long and narrow, roughly north-south trending, parallel mountain ranges and broad, intervening valleys as shown in Figure 4-1.

Internal drainage is a significant feature of the hydrology of much of Nevada. About 84 percent of the State is within the Great Basin in which drainage is to low areas in enclosed basins rather than to the sea.

**Hydrographic Areas**

The topography and related geology of the State has resulted in complex surface and ground water systems, complicating the management of these resources. In the 1960s, the Nevada State Engineer's Office and the U.S. Geological Survey (USGS) recognized the need for a systematic identification of the valleys or hydrographic areas throughout Nevada. Such a system was needed in the study, research, development, management and administration of the water resources, both ground-water and surface water. A hydrographic areas map was subsequently developed in 1968 by the USGS and the State Engineer's Office. This was the first known effort to identify completely and systematically the hydrographic regions and areas of the Nevada. While the 1968 map has undergone some minor revisions, it continues to provide the basis for water planning, management and administration. The current hydrographic area map delineates 256 hydrographic areas within 14 major hydrographic regions and basins (Figure 4-2, Table 4-1). Of the 14 hydrographic regions and basins, only the Snake River Basin and the Colorado River Basin drain to the sea.

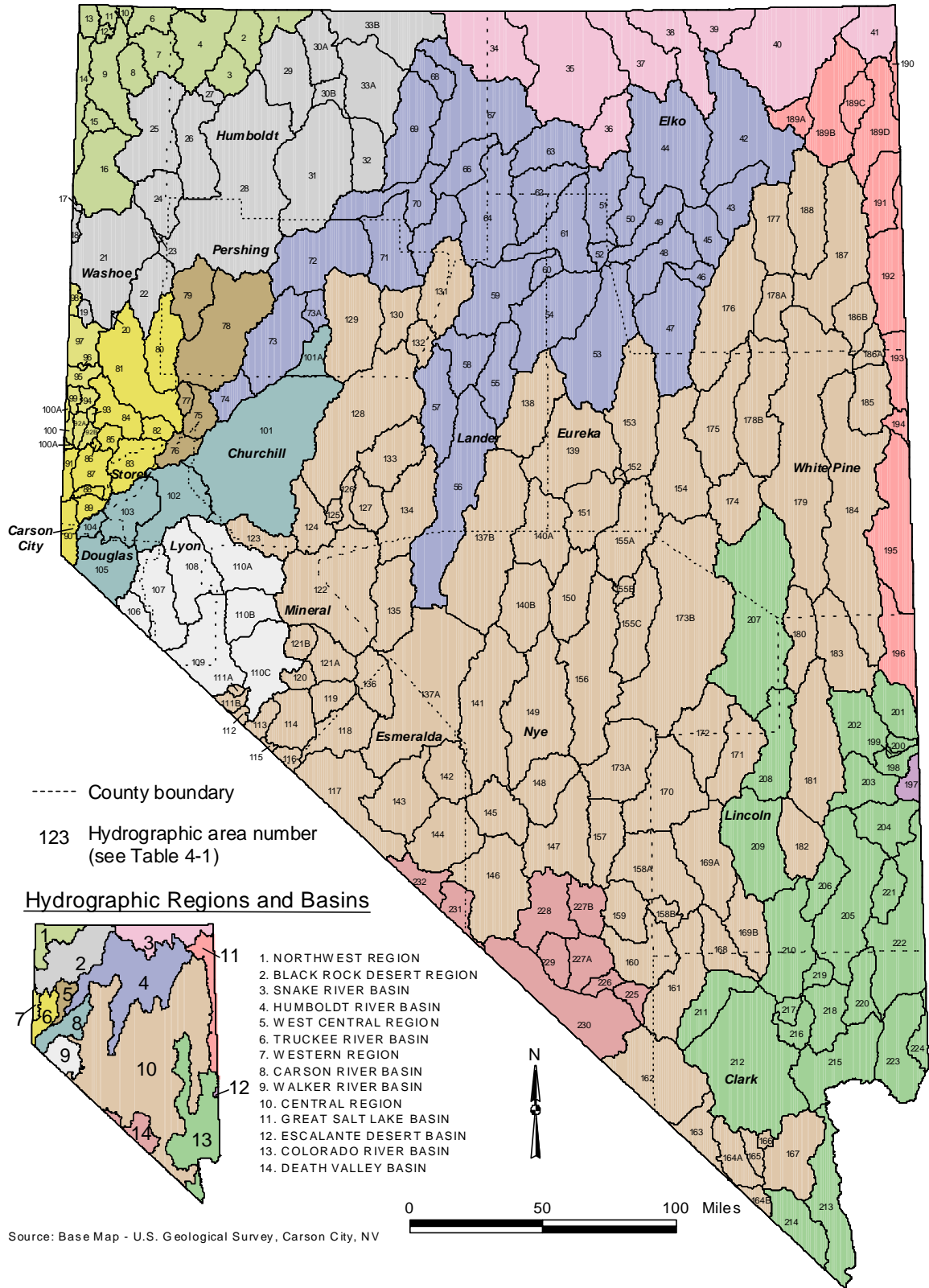


Source: Base Map - U.S. Geological Survey, Carson City, NV  
Shaded Relief - Developed by Nev. Division of Water Planning

**Figure 4-1. Shaded Relief Map of Nevada**



### Hydrographic Areas



**Figure 4-2. Hydrographic Regions and Basins**

Table 4-1. List of Hydrographic Areas

**1. NORTHWEST REGION**

1. Pueblo Valley
2. Continental Lake Valley
3. Gridley Lake Valley
4. Virgin Valley
5. Sage Hen Valley
6. Guano Valley
7. Swan Lake Valley
8. Massacre Lake Valley
9. Long Valley
10. Macy Flat
11. Coleman Valley
12. Mosquito Valley
13. Warner Valley
14. Surprise Valley
15. Boulder Valley
16. Duck Lake Valley

**2. BLACK ROCK DESERT REGION**

17. Pilgrim Flat
18. Painter Flat
19. Dry Valley
20. Sano Valley
21. Smoke Creek Desert
22. San Emidio Desert
23. Granite Basin
24. Hualapai Flat
25. High Rock Lake Valley
26. Mud Meadow
27. Summit Lake Valley
28. Black Rock Desert
29. Pine Forest Valley
30. Kings River Valley
  - (A) Rio King Subarea
  - (B) Sod House Subarea
31. Desert Valley
32. Silver State Valley
33. Quinn River Valley
  - (A) Orovada Subarea
  - (B) McDermitt Subarea

**3. SNAKE RIVER BASIN**

34. Little Owyhee River Area
35. South Fork Owyhee River Area
36. Independence Valley
37. Owyhee River Area
38. Bruneau River Area
39. Jarbidge River Area
40. Salmon Falls Creek Area
41. Goose Creek Area

**4. HUMBOLDT RIVER BASIN**

42. Marys River Area
43. Starr Valley Area
44. North Fork Area
45. Lamoille Valley
46. South Fork Area
47. Huntington Valley
48. Dixie Creek - Tenmile Creek Area
49. Elko Segment
50. Susie Creek Area
51. Maggie Creek Area
52. Marys Creek Area
53. Pine Valley
54. Crescent Valley
55. Carico Lake Valley
56. Upper Reese River Valley
57. Antelope Valley
  - (A) Eastern Part
  - (B) Western Part
58. Middle Reese River Valley
59. Lower Reese River Valley
60. Whirlwind Valley
61. Boulder Flat
62. Rock Creek Valley
63. Willow Creek Valley
64. Clovers Area
65. Pumpnickel Valley
66. Kelly Creek Area
67. Little Humboldt Valley
68. Hardscrabble Area
69. Paradise Valley
70. Winnemucca Segment
71. Grass Valley
72. Inlay Area
73. Lovelock Valley
  - (A) Oreana Subarea
74. White Plains

**5. WEST CENTRAL REGION**

75. Bradys Hot Springs Area
76. Fernley Area
77. Fireball Valley
78. Granite Springs Valley
79. Kumiva Valley

**6. TRUCKEE RIVER BASIN**

80. Winnemucca Lake Valley
81. Pyramid Lake Valley
82. Dodge Flat
83. Tracy Segment
84. Warm Springs Valley
85. Spanish Springs Valley
86. Sun Valley
87. Truckee Meadows
88. Pleasant Valley
89. Washoe Valley
90. Lake Tahoe Basin
91. Truckee Canyon Segment

**7. WESTERN REGION**

92. Lemmon Valley
  - (A) Western Part
  - (B) Eastern Part
93. Antelope Valley
94. Bedell Flat
95. Dry Valley
96. Newcomb Lake Valley
97. Honey Lake Valley
98. Skedaddle Creek Valley
99. Red Rock Valley
100. Cold Spring Valley
  - (A) Long Valley

**8. CARSON RIVER BASIN**

101. Carson Desert
  - (A) Packard Valley
102. Churchill Valley
103. Dayton Valley
104. Eagle Valley
105. Carson Valley

**9. WALKER RIVER BASIN**

106. Antelope Valley
107. Smith Valley
108. Mason Valley
109. East Walker Area
110. Walker Lake Valley
  - (A) Schurz Subarea
  - (B) Lake Subarea
  - (C) Whisky Flat - Hawthorne Subarea

**10. CENTRAL REGION**

111. Alkali Valley (Mineral)
  - (A) Northern Part
  - (B) Southern Part
112. Mono Valley
113. Huntoon Valley
114. Teels Marsh Valley
115. Adobe Valley
116. Queen Valley
117. Fish Lake Valley
118. Columbus Salt Marsh Valley
119. Rhodes Salt Marsh Valley
120. Garfield Flat
121. Soda Spring Valley
  - (A) Eastern Part
  - (B) Western Part
122. Gabbs Valley
123. Rawhide Flats
124. Fairview Valley
125. Stingaree Valley
126. Cowkick Valley
127. Eastgate Valley Area
128. Dixie Valley
129. Buena Vista Valley
130. Pleasant Valley
131. Buffalo Valley
132. Jersey Valley
133. Edwards Creek Valley
134. Smith Creek Valley
135. Ione Valley
136. Monte Cristo Valley
137. Big Smoky Valley
  - (A) Tonopah Flat

- (B) Northern Part
138. Grass Valley
139. Kobeh Valley
140. Monitor Valley
  - (A) Northern Part
  - (B) Southern Part
141. Ralston Valley
142. Alkali Spring Valley (Esmeralda)
143. Clayton Valley
144. Lida Valley
145. Stonewall Flat
146. Sarcobatus Flat
147. Gold Flat
148. Cactus Flat
149. Stone Cabin Flat
150. Little Fish Lake Valley
151. Antelope Valley (Eureka & Nye)
152. Stevens Basin
153. Diamond Valley
154. Newark Valley
155. Little Smoky Valley
  - (A) Northern Part
  - (B) Central Part
  - (C) Southern Part
156. Hot Creek Valley
157. Kawich Valley
158. Emigrant Valley
  - (A) Groom Lake Valley
  - (B) Papoose Lake Valley
159. Yucca Flat
160. Frenchman Flat
161. Indian Springs Valley
162. Pahrump Valley
163. Mesquite Valley (Sandy Valley)
164. Ivanpah Valley
  - (A) Northern Part
  - (B) Southern Part
165. Jean Lake Valley
166. Hidden Valley (South)
167. Eldorado Valley
168. Three Lakes Valley (Northern Part)
169. Tikapoo Valley (Tickaboo Valley)
  - (A) Northern Part
  - (B) Southern Part
170. Penoyer Valley (Sand Spring Valley)
171. Coal Valley
172. Garden Valley
173. Railroad Valley
  - (A) Southern Part
  - (B) Northern Part
174. Jakes Valley
175. Long Valley
176. Ruby Valley
177. Clover Valley
178. Butte Valley
  - (A) Northern Part (Round Valley)
  - (B) Southern Part
179. Steptoe Valley
180. Cave Valley
181. Dry Lake Valley
182. Delamar Valley
183. Lake Valley
184. Spring Valley
185. Tippet Valley
186. Antelope Valley (White Pine & Elko)
  - (A) Southern Part
  - (B) Northern Part
187. Goshute Valley
188. Independence Valley (Pequop Valley)

**11. GREAT SALT LAKE BASIN**

189. Thousand Springs Valley
  - (A) Herrill Siding - Brush Creek Area
  - (B) Toano - Rock Spring Area
  - (C) Montello - Crittenden Creek Area (Montello Valley)
190. Grouse Creek Valley
191. Pilot Creek Valley
192. Great Salt Lake Desert
193. Deep Creek Valley
194. Pleasant Valley
195. Snake Valley
196. Hamlin Valley

**12. ESCALANTE DESERT**

197. Escalante Desert

**13. COLORADO RIVER BASIN**

198. Dry Valley
199. Rose Valley
200. Eagle Valley
201. Spring Valley
202. Patterson Valley
203. Panaca Valley
204. Clover Valley
205. Lower Meadow Valley Wash
206. Kane Springs Valley
207. White River Valley
208. Pahroc Valley
209. Pahrnagat Valley
210. Coyote Spring Valley
211. Three Lakes Valley (Southern Part)
212. Las Vegas Valley
213. Colorado Valley
214. Piute Valley
215. Black Mountains Area
216. Garnet Valley (Dry Lake Valley)
217. Hidden Valley (North)
218. California Wash
219. Muddy River Springs Area (Upper Moapa Valley)
220. Lower Moapa Valley
221. Tule Desert
222. Virgin River Valley
223. Gold Butte Area
224. Greasewood Basin

**14. DEATH VALLEY BASIN**

225. Mercury Valley
226. Rock Valley
227. Fortymile Canyon
  - (A) Jackass Flats
  - (B) Buckboard Mesa
228. Oasis Valley
229. Crater Flat
230. Amargosa Desert
231. Grapevine Canyon
232. Oriental Wash

## *Climate*

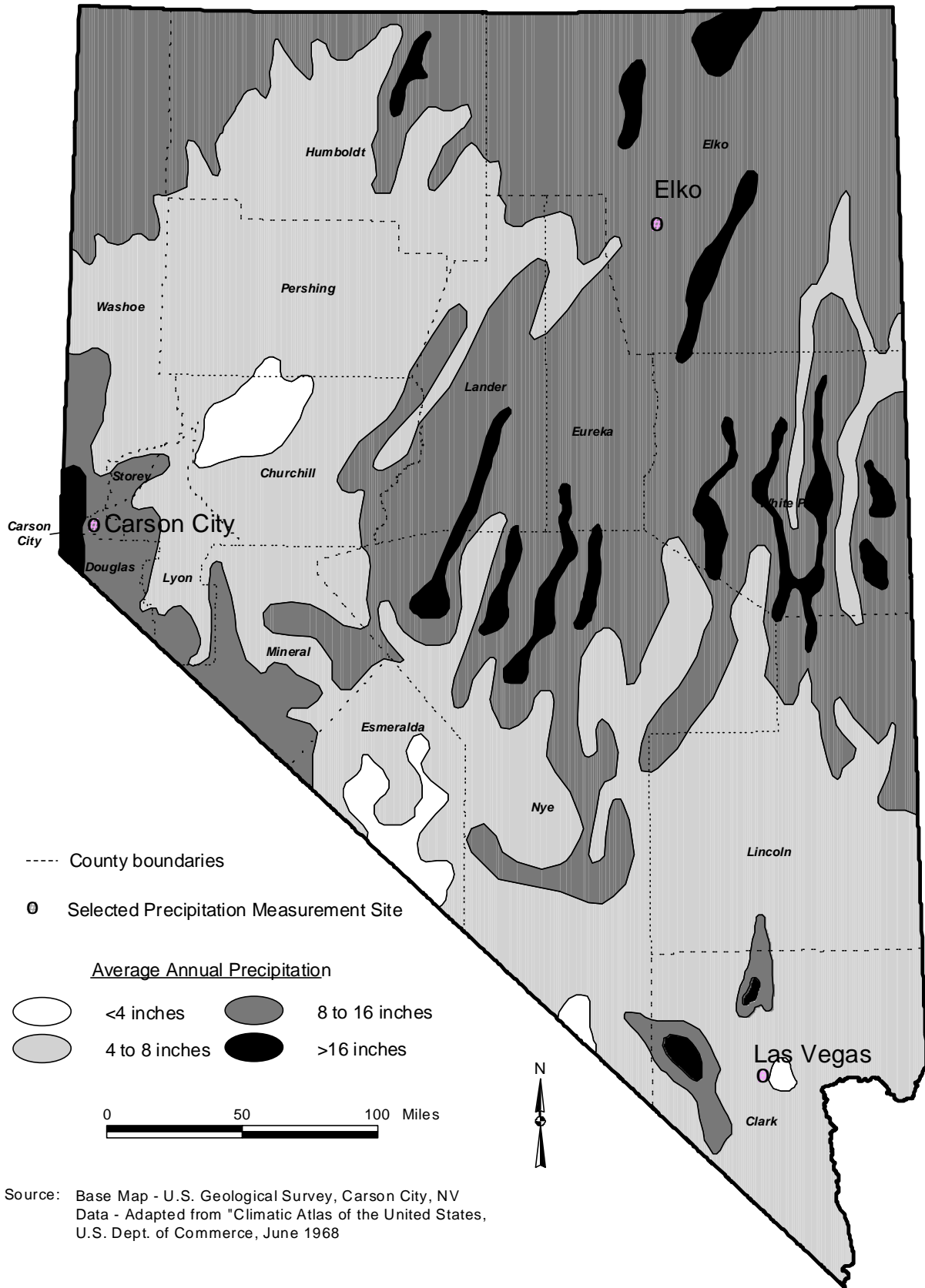
The climate of Nevada is characterized as semi-arid to arid with precipitation and climate varying widely throughout the State. With temperatures that fall below -40°F in the northeast, and rise over 120°F in the south, and precipitation that ranges from only three to four inches in Southern Nevada to over 40 inches (and over 300 inches of snowfall) in the Carson Range portion of the Sierra Nevada Mountains, Nevada is truly a land of contrasts. Three basic geographical characteristics are responsible for Nevada's unusual and diverse climate:

**Latitude:** Nevada spans approximately seven degrees of latitude, or about 500 miles, from the north boundary to the southern tip of the State. As a result, average temperatures are 15° to 20°F cooler in the north than the south.

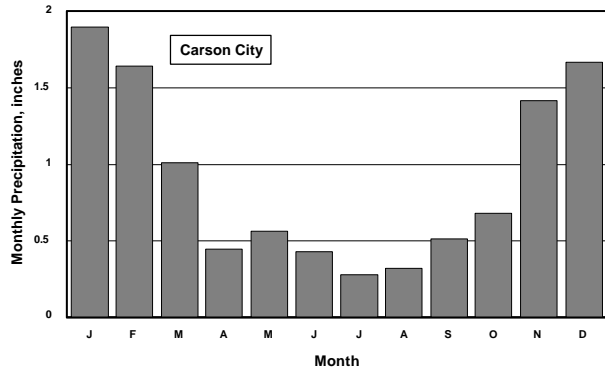
**Elevation:** The Basin and Range Province, with its wide elevation fluctuations from the valley floors to the mountain tops, is another factor responsible for our diverse climate. Elevations vary from under 1,000 feet to over 13,000 feet above sea level, with the higher elevations generally experiencing lower temperatures and more precipitation.

**Continentality:** Continentality is the most important factor affecting Nevada's climate. The continental effect results from the continuous barrier of the Pacific mountain system to the west. Moisture laden winds traveling east from the Pacific Ocean are forced to rise, cool and drop precipitation as the Pacific mountain system is encountered. The resulting winds entering Nevada are much drier and provide reduced precipitation. This rainshadow effect is the primary reason for Nevada's dry climate.

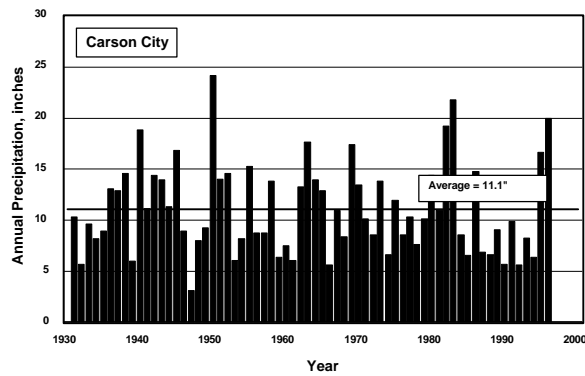
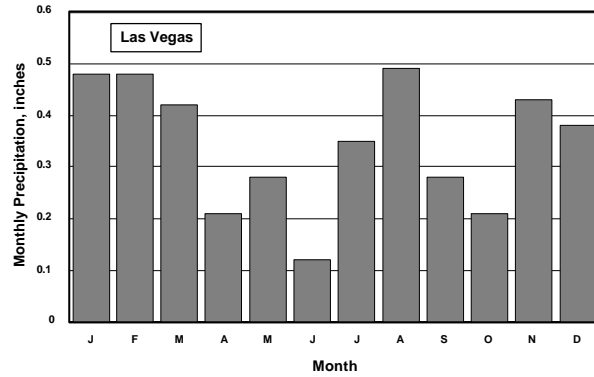
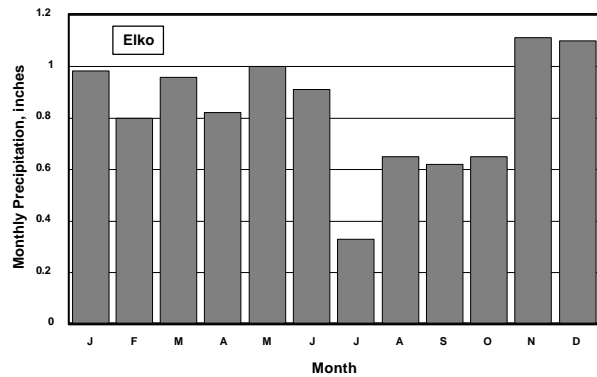
Figure 4-3 shows the spatial variability of precipitation in Nevada. With total precipitation averaging approximately nine inches per year, Nevada is the most arid state in the nation. Monthly and annual fluctuations in precipitation can be significant. Figure 4-4 displays monthly and annual precipitation variations for three selected precipitation measurement sites in Nevada. Of the total annual precipitation falling in Nevada, approximately 10 percent results in stream runoff and groundwater recharge (*Water for Nevada, Nevada's Water Resources - Report No. 3*, State Engineer's Office, October 1971). The remaining 90 percent is lost through evaporation and transpiration. Like precipitation, evaporation is also widely variable. Average lake surface evaporation rates range from less than 36 inches per year in the west to over 80 inches per year in the south (Figure 4-5).



**Figure 4-3. Average Annual Precipitation**



**Monthly Variations:** Precipitation in Nevada varies from month to month with most moisture falling in the winter. During the warmer and drier summer periods, the precipitation that does occur is the result of convective summer thunderstorms which can produce brief, but intense rainfall.



**Annual Variations:** The average of annual precipitation is commonly used as an indicator of the amount of precipitation that could be expected in a given year. However, annual variations in precipitation are significant and “average” years are rarely experienced.

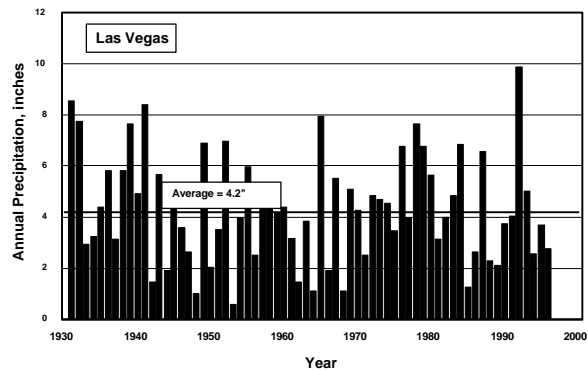
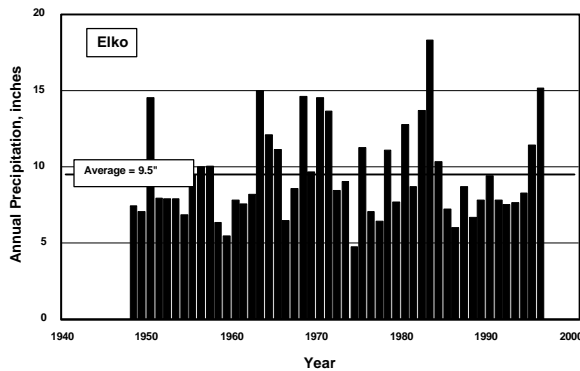
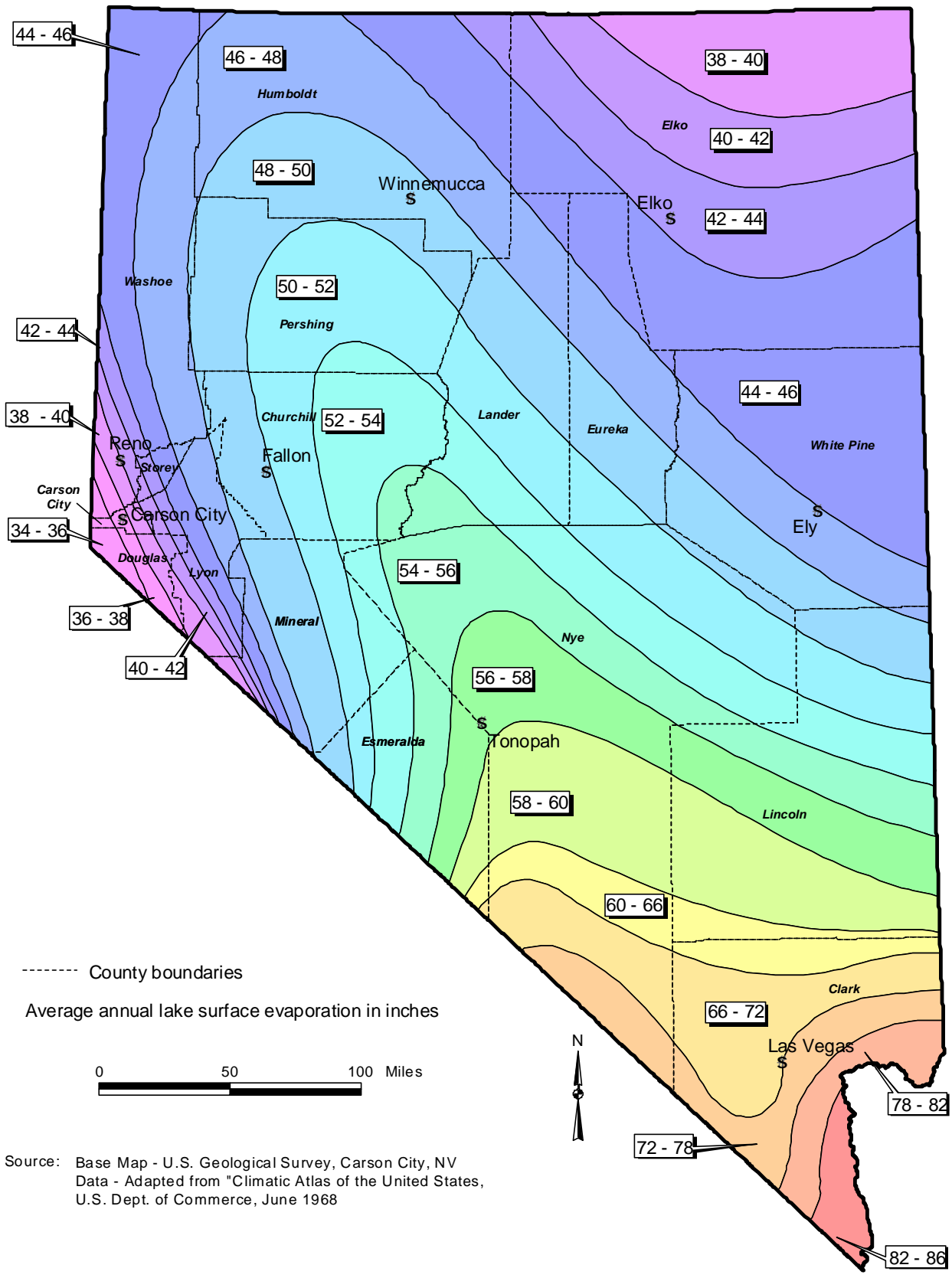


Fig. 4-4. Precipitation Variability for 3 Selected Sites



**Figure 4-5. Average Annual Lake Surface Evaporation**

## ***Surface Water***

Surface water is a limited and precious resource in Nevada providing about 70 percent of the total water supply used in the state. Spring and summer snowmelt supplies most of the streamflow in Nevada. However, isolated summer convective storms probably cause a majority of the streamflow in southern Nevada's low altitude basins.

Throughout the State, surface water flows can vary widely from year to year and from month to month, with maximum discharges generally in May and June as a result of snowmelt in the mountains. With the exception of the Humboldt Basin, most of the surface waters in Nevada's rivers are the result of snowmelt occurring in other states such as California, Wyoming, Colorado, and Utah.

Flows in the upper reaches of the larger rivers (Carson, Humboldt, Truckee, Walker) typically increase as one moves downstream. The larger rivers typically follow the flow pattern of a gaining stream in the well-watered mountain reaches and a losing stream in the lower-altitude reaches. Reductions in flow occur due to irrigation, public use, infiltration, and evapotranspiration.

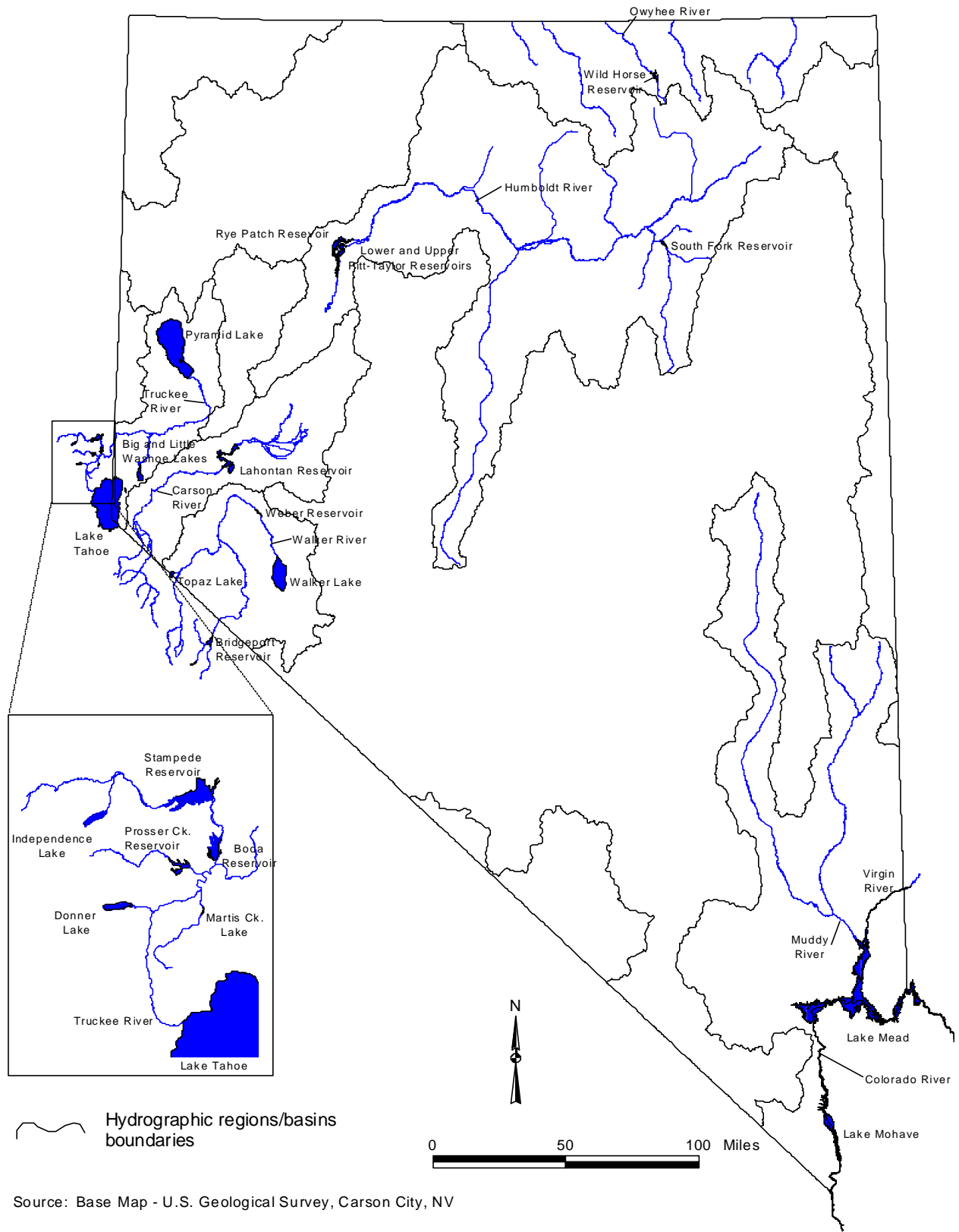
### **Major Rivers, Lakes and Reservoirs**

Nevada can claim very few large rivers and streams compared to other states. With the exception of the Colorado River, Nevada's perennial rivers are small by nationwide standards. Rivers in the Snake River Basin and Colorado River Basin regions flow into the ocean, with the remaining streams systems discharging into terminal sinks and lakes with no outflow to the sea. The major river systems in Nevada are the Colorado, Walker, Carson, Truckee, and Humboldt (Figure 4-6). Table 4-2 summarizes the main lakes and reservoirs within these river systems and in Nevada.

The **Carson River** flows from the eastern slopes of the Sierra Nevada in California and terminates in the Carson Sink. Waters of the Carson River are used predominately for agriculture from Carson Valley down to the Fallon area. Only a few regulating storage reservoirs exist in the basin, with Lahontan Reservoir being the largest. Lahontan Reservoir is used to store water from the Carson River, and water diverted from the Truckee River by Derby Dam and conveyed to Lahontan Reservoir via the Truckee Canal. Water released from Lahontan Reservoir is used predominately for agriculture, and wildlife purposes.

The **Colorado River** is the largest river in Nevada, flowing through Wyoming, Colorado, Utah, New Mexico, Arizona, California and Nevada. Along its 1,400 mile course to the Gulf of Mexico, the Colorado River Basin drains an area of about 240,000 square miles or about one-twelfth the area of the contiguous United States. The Colorado River and tributaries in Nevada provide a majority of the drinking water supply to the Las Vegas area, hydroelectric power and recreation opportunities at Lake Mead and Lake Mohave, and water for agricultural purposes.

Figure 4-6 Major rivers, lakes, reservoirs



Source: Base Map - U.S. Geological Survey, Carson City, NV

**Figure 4-6. Major Rivers, Lakes and Reservoirs**



Table 4-2. Major Lakes and Reservoirs of Nevada and Portions of California

Hydrographic Region	Lake/Reservoir	Surface Area, acres	Active Storage Capacity, acre-feet	Total Storage Capacity, acre-feet
<b>Carson River</b>	Lahontan Reservoir	14,600	317,000	317,000
<b>Colorado River</b>	Lake Mead	158,000	26,200,000	29,700,000
	Lake Mohave	28,000	1,810,000	1,820,000
<b>Humboldt River</b>	Pitt-Taylor Reservoir, Lower	2,570	22,200	22,200
	Pitt-Taylor Reservoir, Upper	2,070	24,200	24,200
	Rye Patch Reservoir	12,400	194,300	194,300
	South Fork Reservoir	1,650	41,000	41,000
<b>Snake River</b>	Wild Horse Reservoir	2,830	73,500	73,500
<b>Truckee River</b>	Big and Little Washoe Lakes	5,800	14,000	38,000
	Boca Reservoir	980	40,870	41,110
	Donner Lake	800	9,500	Not reported
	Independence Lake	700	17,500	Not reported
	Lake Tahoe	124,000	744,600	125,000,000
	Martis Creek Lake	770	20,400	21,200
	Prosser Creek Reservoir	750	28,640	29,840
	Pyramid Lake <sup>1</sup>	111,400 (as of 9/30/96)	not applicable	21,760,000 (as of 9/30/96)
	Stampede Reservoir	3,440	221,860	226,500
<b>Walker River</b>	Bridgeport Reservoir	2,914	40,500	40,500
	Topaz Lake	2,410	61,000	126,000
	Walker Lake <sup>1</sup>	33,500 (as of 9/30/96)	not applicable	2,153,000 (as of 9/30/96)
	Weber Reservoir	950	13,000	13,000

<sup>1</sup>Pyramid and Walker lakes are natural terminal lakes with no outlet.

The **Humboldt River** is the longest river contained wholly within the State. The Humboldt River originates in the Ruby, East Humboldt, Independence and Jarbidge Mountains and flows westward to terminate in the Humboldt Sink. A majority of the Humboldt River system water is used for agriculture. There are only a few flow regulating reservoirs in the basin, the largest (Rye Patch Reservoir) being near the end of the system. As a result, late season irrigation water shortages are commonplace throughout much of the area above Rye Patch Reservoir.

The **Truckee River** originates at the northern end of Lake Tahoe in California and terminates at Pyramid Lake. Along its course, water is utilized to meet a variety of needs, such as municipal and industrial, agriculture, hydroelectric power, and wildlife. A portion of the Truckee River flow is diverted at Derby Dam and is conveyed via the Truckee Canal to Lahontan Reservoir in the Carson River Basin. With numerous upstream reservoirs, mostly in California, the Truckee River is one of the most regulated river systems in Nevada.

The **Walker River**, with its headwaters in California, flows into Nevada and terminates at Walker Lake. Most of the flow of the Walker River system originates in California and is used predominately for agricultural purposes in Nevada and California. The two largest reservoirs on the system (Topaz Lake located in Nevada and California, Bridgeport Reservoir located wholly in California) are owned and operated by the Walker River Irrigation District and are predominately used to supply irrigation water to district members.

### **Streamflow Forecasts and Data Collection**

The collection and analysis of snowpack and streamflow data are essential for proper management and planning of our surface water resources. A better understanding of each basin's surface water system is made possible through snow depth and streamflow measurements.

**Snowpack Measurements and Streamflow Forecasts.** Natural Resources Conservation Service (NRCS) operates a series of snow depth measurement stations through the western United States, including Nevada. Utilizing the data collected at these stations, NRCS and National Weather Service hydrologists develop streamflow and water supply forecasts for the major surface water systems. These forecasts are used to guide water management and emergency management decisions.

**Gaging Stations.** The USGS is the principal Federal agency which collects surface water data in Nevada. The USGS began collecting streamflow data in 1889 with the establishment of a gaging station on the Truckee River near the Nevada-California state line. During the next six years, additional gaging stations were established in the Humboldt, Carson, Walker and Truckee basins. As of 1996, the USGS surface water quantity monitoring network consists of water discharge measurements for 170 gaging stations on streams, canals and drains, 99 peak flow stations and miscellaneous sites, and five springs; and water levels and contents for 22 lakes and reservoirs. The general objective of the stream-gaging program is to provide information on, or to develop estimates of, flow characteristics at any point on any stream.

Other entities collect streamflow data for regional purposes. For example, the Clark County Regional Flood Control District operates a network of meteorologic and water depth monitoring stations as

part of the District's Flood Threat Recognition Program..

**Streamflow Characteristics.** Most of the streamflow in Nevada is the result of runoff from melting snow. Runoff patterns in Nevada vary greatly both seasonally and geographically, and are mainly determined by precipitation patterns (location and timing) and other climate patterns, such as temperature. Other factors such as surface geology, vegetation, and land use affect the amount of runoff entering the rivers and streams. Streamflows are further affected by human-induced influences such as diversions and reservoir operations.

Table 4-3 summarizes some basic streamflow characteristics for selected USGS gaging stations throughout Nevada (see Figure 4-7 for station locations). As shown, average annual flows vary widely from river to river. Within a given river system, flows fluctuate year to year in response to changes in precipitation amounts. Some of these annual variations can be dramatic. For instance, at the "Walker River near Wabuska, NV" gaging station, the highest flows for a year exceeded the lowest annual flows by over 50 times. Figure 4-8 depict monthly and annual streamflow variations for the Colorado, Humboldt and Truckee rivers.

### **Water Yields and Committed Resources**

The estimated average annual yield from Nevada's surface water systems is approximately 3.2 million acre-feet per year (Table 4-4). Generally, Nevada's surface water sources, such as lakes, streams and springs, have been fully appropriated and used for many years. In some instances, water may be available from these sources during high water years, however storage facilities would be required to capture the surplus flows for later use.

Most priority rights for surface water in Nevada were established in the 1800s. Rights to use water for irrigation date back to the 1850s in streams draining the Sierra Nevada Mountains and to the 1870s and 1880s in the Humboldt River Basin.

### **Droughts and Floods**

Nevada is a land of extremes, with droughts and floods common in our highly variable climate. Years of average streamflows are rarely experienced. Periods of high flows followed by low flows are more the norm in Nevada.

**Droughts.** Years of below average flows in rivers are not uncommon and many water users are prepared to cope with one year of low streamflows by resorting to supplemental sources such as reservoirs and groundwater. For most of Nevada's water users, who depend mostly upon surface water, problems can begin to occur when below average flows are experienced for two or more consecutive years. Over time, reservoir and groundwater levels tend to decline due to increased uses and these supplemental sources may become depleted. Droughts can also create quality problems for both surface water and groundwater sources. The decreased flows experienced during a drought tend to result in diminished quality for the remaining water.

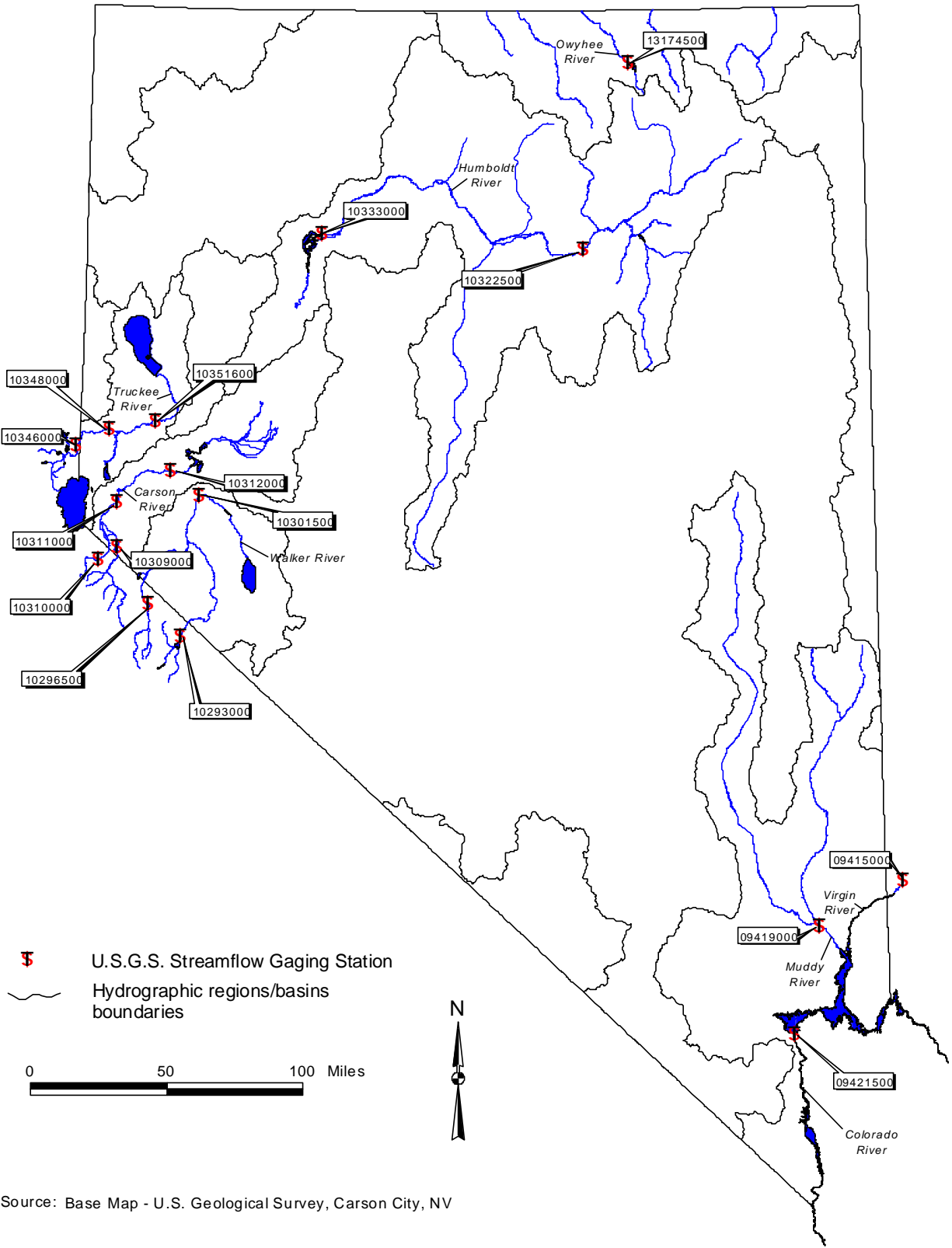
### **Table 4-3. Summary of Streamflow Data for Selected Gaging Stations**

Part 1. Section 4 – Water Resources Background

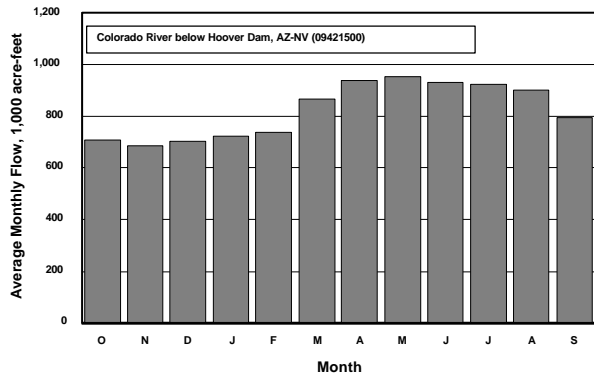
Hydrographic Region	Gaging Station Name (Number)	Period of Record	Annual Streamflow Statistics, acre-feet		
			Average Annual	Lowest Annual	Highest Annual
Carson River	East Fork Carson River near Gardnerville, NV (10309000)	1890-1997	278,800	66,300	655,200
	West Fork Carson River at Woodfords, CA (10310000)	1901-97	81,000	18,900	210,000
	Carson River near Carson City, NV (10311000)	1940-97	298,700	42,400	826,800
	Carson River near Ft. Churchill, NV (10312000)	1911-97	272,900	26,300	804,400
Colorado River	Virgin River at Littlefield, AZ (09415000)	1930-97	175,600	72,400	504,600
	Muddy River near Glendale, NV (09419000)	1913-97	30,600	23,500	35,900
	Colorado River below Hoover Dam, AZ-NV (09421500)	1935-97	10,050,000	5,556,000	22,150,000
Humboldt River	Humboldt River at Palisade, NV (10322500)	1903-97	288,800	25,200	1,336,000
	Humboldt River near Imlay, NV (10333000)	1935-97	201,000	18,800	1,460,000
Snake River	Owyhee River above China Diversion Dam near Owyhee, NV (13176000)	1939-84	107,600	33,500	230,800
Truckee River	Truckee River at Farad, CA (10346000)	1909-97	554,500	133,200	1,769,000
	Truckee River at Reno, NV (10348000)	1907-96	492,500	76,700	1,701,000
	Truckee River below Derby Dam near Wadsworth, NV (10351600)	1918-97	289,100	4,500	1,759,000
Walker River	East Walker River near Bridgeport, CA (10293000)	1922-97	105,800	27,100	320,700
	West Walker near Coleville, CA (10296500)	1903-97	202,100	53,900	484,300
	Walker River near Wabuska, NV (10301500)	1902-97	123,300	9,300	602,300

Note: Some years of data may be missing within each period of record.

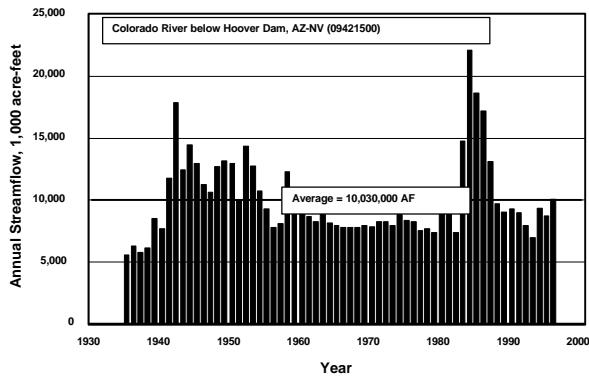
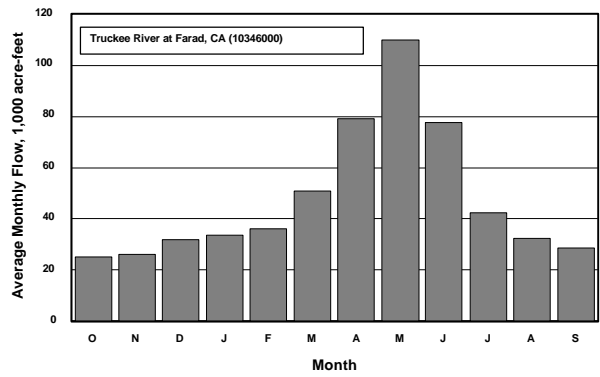
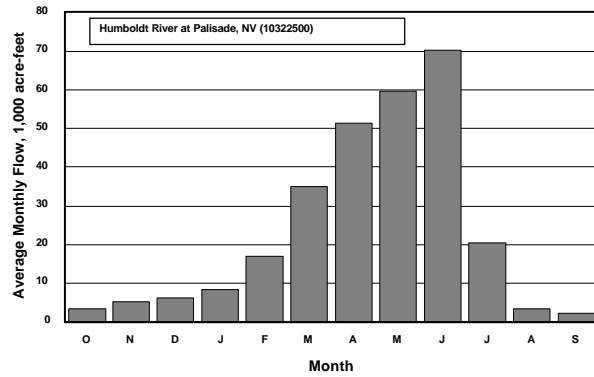
Source: U.S. Geological Survey



**Figure 4-7. Selected USGS Streamflow Gaging Stations**



**Monthly Variations:** Streamflows in Nevada vary from month to month with most flow occurring from March through June as a result of snowmelt. Colorado River flows fluctuate much less from one month to the next due to the regulating effect of reservoirs on the system.



**Annual Variations:** Streamflows vary from year to year in response to annual variations in precipitation amounts upstream of the gaging stations

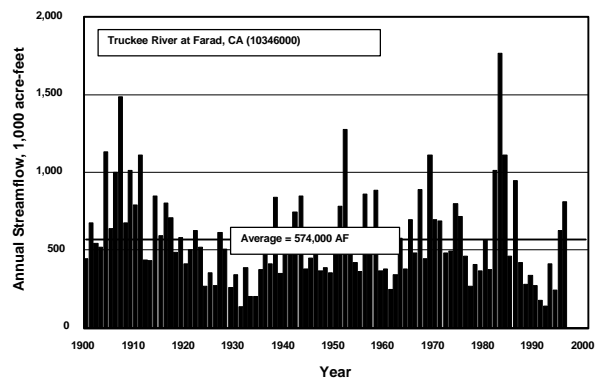
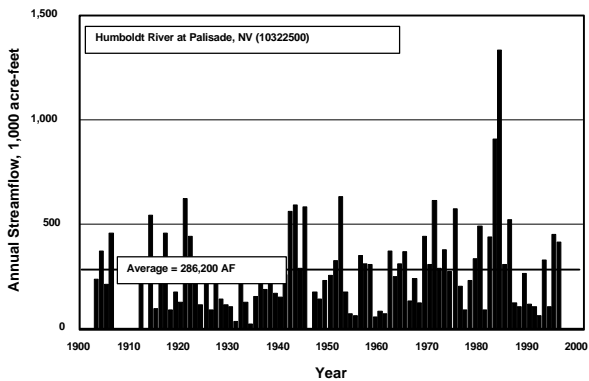


Fig. 4-8. Streamflow Variability for 3 Selected Sites

Table 4-4.

**Summary of Surface Water Runoff and Flows (excluding Colorado River)**

<b>Description</b>	<b>Acre-feet per year</b>
Average Annual Surface Runoff	
From Watersheds within Nevada	1,900,000
Inflow from Other States	1,300,000
Total	3,200,000
Average Annual Surface Outflow to Other States	700,000

Source: "Water for Nevada, Report No. 3", State Engineer's Office, 1971

Drought periods (consecutive years with streamflows much less than average) are frequent in Nevada. In many cases, Nevada's river systems experience more "below average water years" than "above average water years" (Figure 4-9). The most significant documented droughts of the 20<sup>th</sup> century were during 1928-37, 1953-55, 1959-62, 1976-77 and 1987-94, with the 1928-37 period possibly the most severe and longest of this century in northern Nevada.

**Floods.** Even though Nevada is the driest state with an average annual precipitation of nine inches, floods are common and have occurred in all parts of the state. The effects of floods in Nevada have increased steadily as population and development have increase since the mid-1900s. Development has encroached upon natural floodplains, including alluvial fans, and thereby increasing flood damage risks.

On the Truckee, Carson, and Walker rivers in west-central Nevada, the most severe floods have resulted from winter rains on snow in the Sierra Nevada Mountains. In the large drainages in southern Nevada, and small drainages and alluvial fans throughout Nevada, flash floods resulting from intense rainfall over relatively small areas are the most common. Flooding from these intense rainstorms is typically sudden and life threatening. Flooding along the Humboldt, Truckee, Carson, and Walker rivers in northern Nevada is generally not as sudden and more time is available to prepare for the flooding. However, these floods are usually longer with longer periods of flood inundation. Table 4-5 summarizes the major flood events that have occurred this century in Nevada.

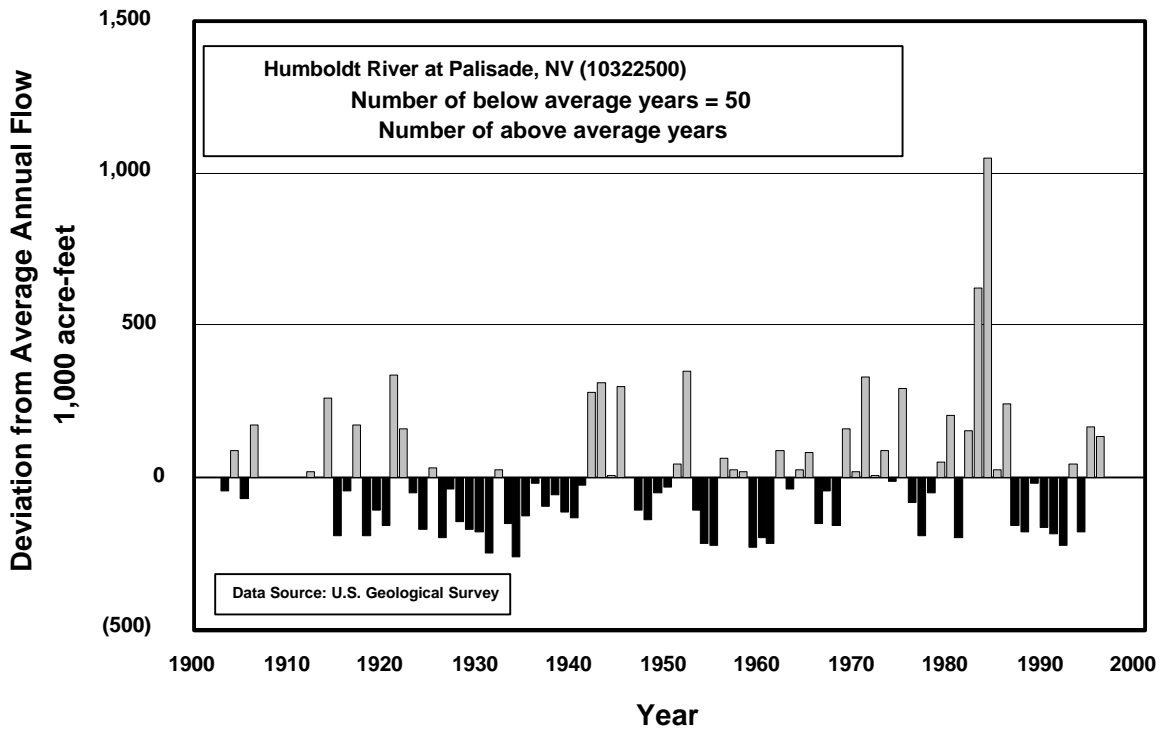
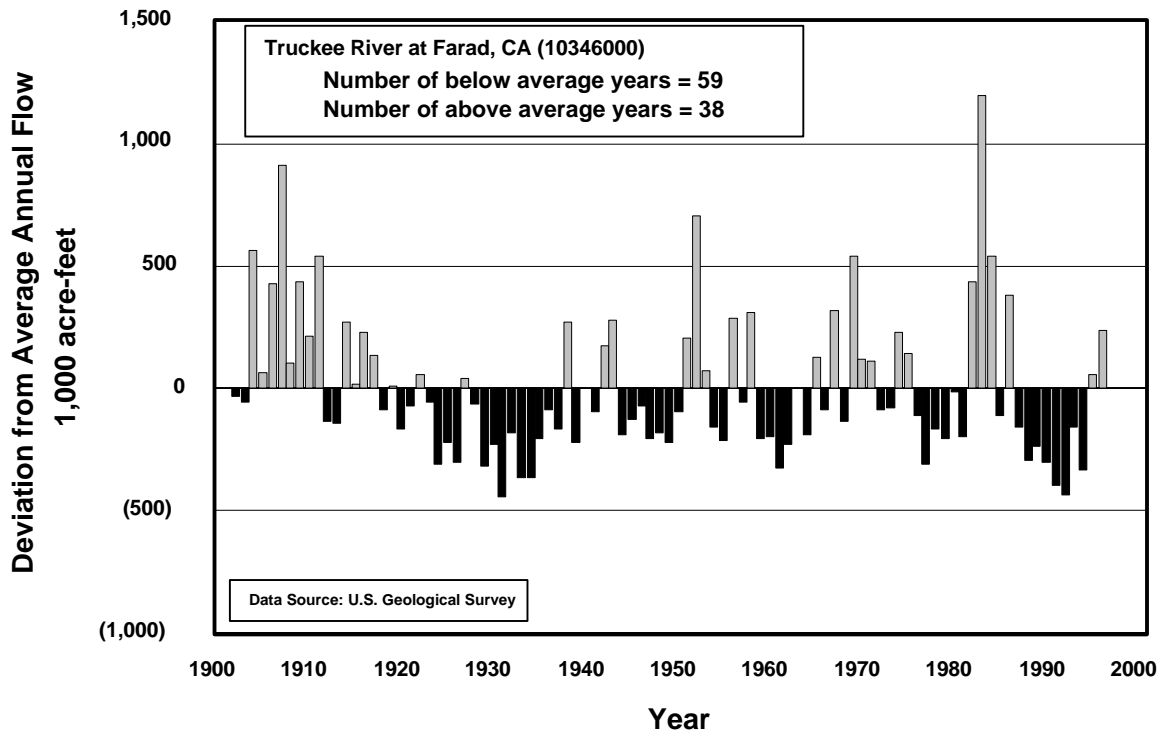


Fig. 4-9. Examples of Annual Deviations from Average Annual Flows



**Table 4-5. Summary of Major Floods in Nevada, 1907-97**

<b>Date</b>	<b>Area Affected</b>	<b>Recurrence Interval (years)</b>	<b>Remarks</b>
<b>Mar. 1907</b>	Sierra Nevada drainages	Unknown	May rank with 1950 and 1955 floods in Carson Valley and along Truckee River
<b>Feb. 1910</b>	Upper Humboldt River basin	>100	Similar to hydrologic conditions during Feb. 1962 flood.
<b>Nov.-Dec. 1950</b>	Sierra Nevada drainages	50	Not as severe as Dec. 1955 flood in Carson River drainage.
<b>Dec. 1955</b>	Sierra Nevada drainages	40 to 100	Most severe flood from upper Carson River drainage downstream to Carson City
<b>Feb. 1962</b>	Humboldt River drainage	>50 in upper Humboldt	Rapid thawing and light rain on snowpack
<b>Feb. 1963</b>	Sierra Nevada drainages	50	Severe in Carson and Truckee River drainages
<b>Dec. 1964</b>	Sierra Nevada drainages	20	
<b>Sept. 14, 1974</b>	Eldorado Canyon (dry tributary to the Colorado River, 50 miles southeast of Las Vegas)	>100	9 lives lost
<b>July 1975</b>	Las Vegas Valley	Unknown	2 lives lost
<b>Aug. 1981</b>	Moapa Valley and vicinity	Unknown	Severe damage to agriculture and highways.
<b>Mar.-June 1983</b>	Statewide except south	<10 to 50	Greatest snowmelt floods known (except in Humboldt River basin - see Apr.-June 1984).
<b>July 1983</b>	Las Vegas Valley, Muddy River	Unknown	
<b>Apr.-June 1984</b>	Centered in Humboldt River drainage	>100 along middle and lower Humboldt River	Greatest snowmelt floods known in Humboldt River basin.
<b>July-Sept. 1984</b>	Las Vegas Valley	Unknown	5 lives lost
<b>Feb. 1986</b>	Sierra Nevada drainages	10 to 50	Greatest discharge in main rivers since 1963
<b>Jan. 1997</b>	Sierra Nevada drainages	50 to >100	Heavy rainfall on snowpack

*Source:* National Water Summary 1988-89 - Floods and Droughts: Nevada, U.S. Geological Survey, Carson City, Nevada.; January 1997 Flooding in Northern Nevada - Was This a "100-Year Flood"?, U.S.G.S. Fact Sheet FS-077-97, U.S. Geological Survey, Carson City, Nevada, May 1997.

**Water Quality**

Nevada’s surface water quality is regulated by the Nevada Division of Environmental Protection (NDEP) and the State Environmental Commission (SEC). The quality of surface water in Nevada varies greatly from location to location and from month to month with changes in flows. Tables 4-6 and 4-7 shows average total dissolved solids concentrations at a number of surface water monitoring sites throughout Nevada. In planning, both water quantity and quality need to be considered concurrently as both are interrelated. In general, constituent concentrations vary with changes in streamflow. Similarly, lake water quality is impacted by water levels in the State’s terminal lakes. Figure 4-10 shows how total dissolved solids concentrations have increased in Walker and Pyramid lakes as the volume of water has decreased

**Table 4-6. Comparison of Streamflow and Dissolved-Solids Concentrations at Selected USGS Water-Quality Sites**

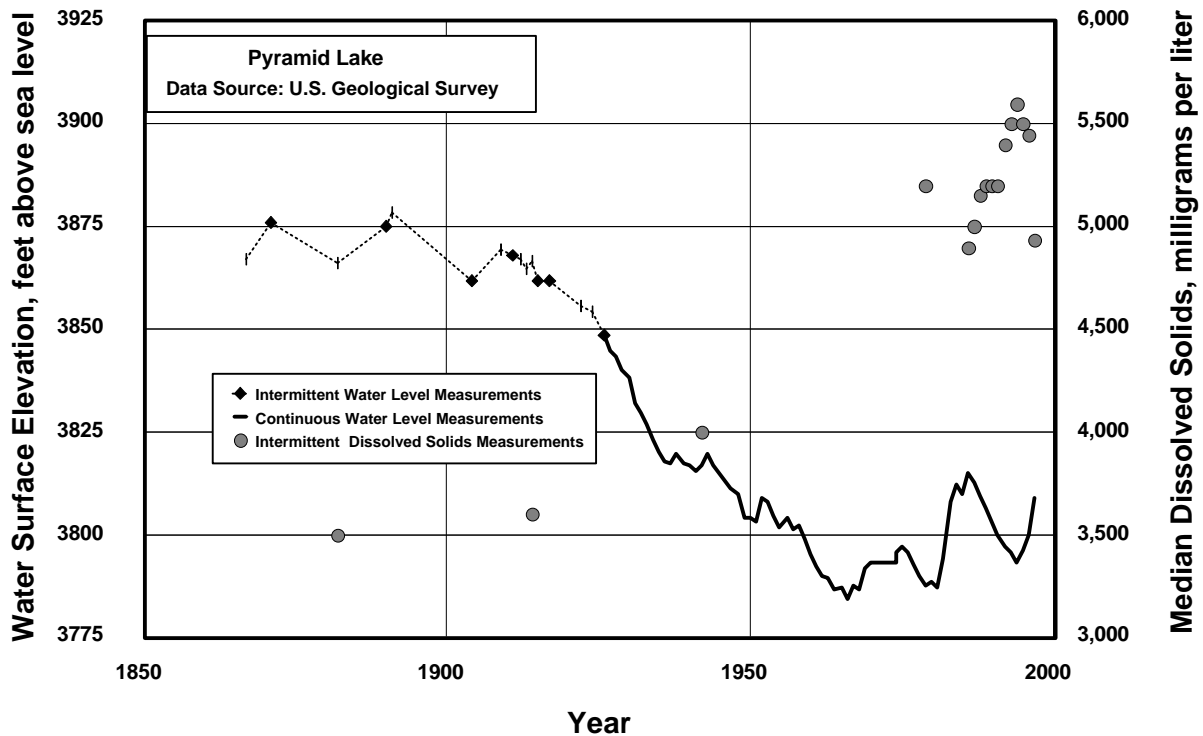
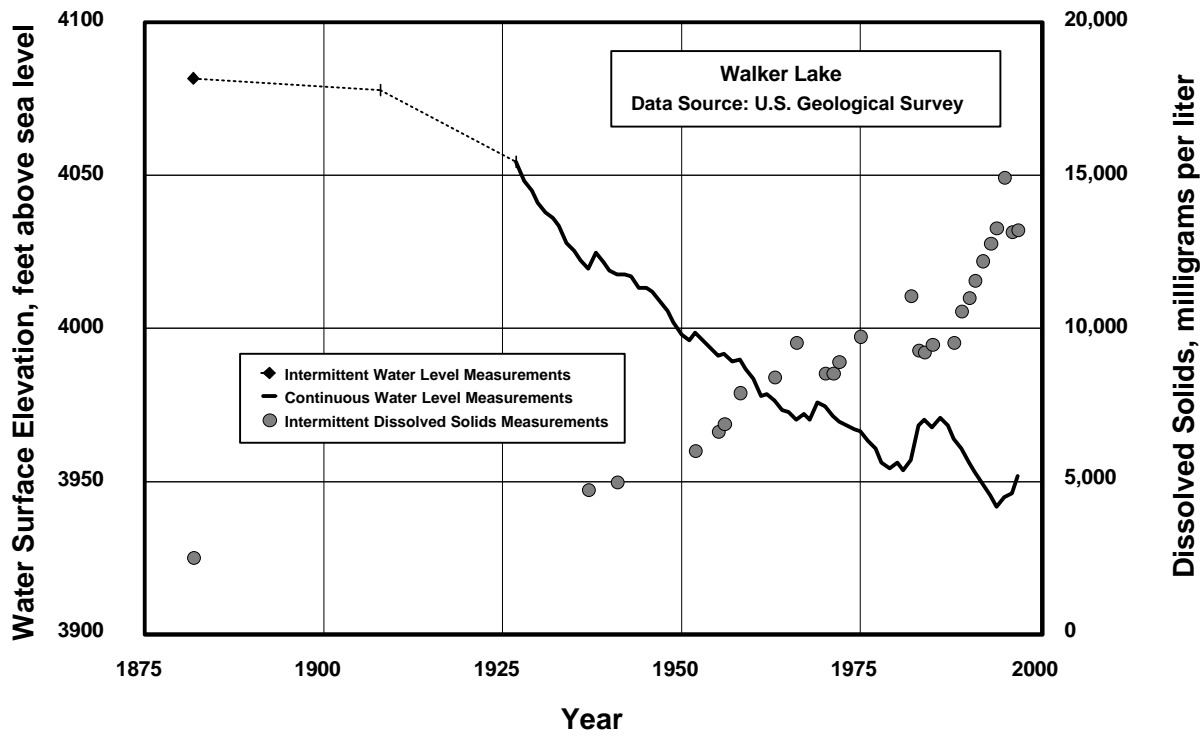
U.S.G.S. Water Quality Station	Mean Concentration of Dissolved Solids, milligrams per liter	Mean Discharge, cubic feet per second
Virgin River at Littlefield, AZ (09415000)	1,990	243
Colorado River below Hoover Dam, AZ-NV (09521500)	697	13,840
Steptoe Creek near Ely, NV (10244950)	180	7.0
South Twin River near Round Mountain, NV (10249300)	86	6.6
Carson River near Carson City, NV (10311000)	199	405
Humboldt River near Carlin, NV (10321000)	301	375

Source: Water Resources Data, Nevada, Water Year 1996, U.S. Geological Survey Water Data Report NV-96-1

**Table 4-7. Comparison of Streamflow and Dissolved-Solids Concentrations at Selected NDEP Water-Quality Sites**

NDEP Water Quality Station	Mean Concentration of Dissolved Solids, milligrams per liter	Mean Discharge, cubic feet per second
Truckee River at Tracy, NV	160	780
Walker River at Snyder Lane	200	180

Source: Nevada Division of Environmental Protection files, U.S. Geological Survey data, and Nevada Division of Water Planning files



**Fig. 4-10. Water Surface Elevations and Dissolved Solids Concentrations at Walker and Pyramid Lakes**

The impacts on water quality from the municipal and industrial discharges have been greatly reduced over the last few years, with most point source polluters eliminated from direct discharges or stringently controlled. Nonpoint source pollution due mainly to agriculture, urban runoff and hydrologic modifications impacts various waters of Nevada. Water quality parameters of concern include nutrients, suspended solids, turbidity and bacteria which are being targeted in the State's Nonpoint Source Program administered by NDEP. Water quality has been improving due to the removal of point sources and the implementation of more stringent standards. The Nonpoint Source Program helps to further improve water quality by promoting public awareness, improved grazing and irrigation practices, erosion control measures and the implementation of best management practices.

**Surface Water Quality Management and Data Collection.** Nevada's surface water quality is regulated by NDEP and the SEC. Certain aspects of the Federal Clean Water Act are implemented by NDEP for programs within Nevada. With assistance from federal grants, NDEP operates a surface water quality monitoring program of water bodies in Nevada, regularly monitoring over 100 sampling points in the 14 hydrographic regions. Section 303(d) of the Clean Water Act requires the State to develop a list of water bodies that need additional measures beyond existing controls to achieve or maintain water quality standards. The Section 303(d) list, developed by NDEP, provides a comprehensive inventory of water bodies impaired by all pollution sources, including point sources and nonpoint sources. This inventory is the basis for targeting water bodies for watershed-based solutions. Nevada's first priority in targeting water bodies is impairment of the beneficial use standards. In general, a water body is included on the 303(d) list if the beneficial use standards were exceeded more than 25% of the time. The current 303(d) list is available from NDEP upon request. For a more complete description of NDEP water quality programs, refer to Part 1, Section 3 of the *State Water Plan*.

As of 1996, the USGS collected water quality data for 96 stream, canal, spring and drain sites throughout Nevada as part of their systematic data-collection program. In addition to routine monitoring, USGS is also conducting the National Water Quality Assessment Program (NAWQA) in Nevada and throughout the United States in response to the lack of long-term, consistent information on water quality nationwide. NAWQA Program goals are to describe the status and trends in the quality of the Nation's water resources and to provide scientific understanding of the major factors which affect surface and ground water quality. The Nevada NAWQA Project began in 1991 and includes the Las Vegas Valley area and the Carson and the Truckee River Basins. Project scientists are using multi-disciplinary approaches to compare and contrast the effects of urban and agricultural activities on water quality.

## **Groundwater**

Groundwater in Nevada is an important water supply source. The surface water resources in our state have been virtually fully appropriated and future development must rely on either ground-water sources or the reallocation of surface water supplies. Groundwater provides about 40 percent of the total water supply used in Nevada and in some areas provides the entire supply. The extent to which groundwater is used may vary considerably from year to year. In many areas, groundwater is pumped to supplement surface water sources. As a result, groundwater usage in these areas increases during periods of low streamflow and decreases during high runoff periods.

Proper planning and management of our ground-water resources cannot occur without knowledge about aquifer location, perennial yield, recharge, storage volume, committed resources (water righted amounts), actual water usage, water levels, water quality, and projected trends. The following sections provide available background information on Nevada's groundwater resources.

### **Principal Ground-water Aquifers**

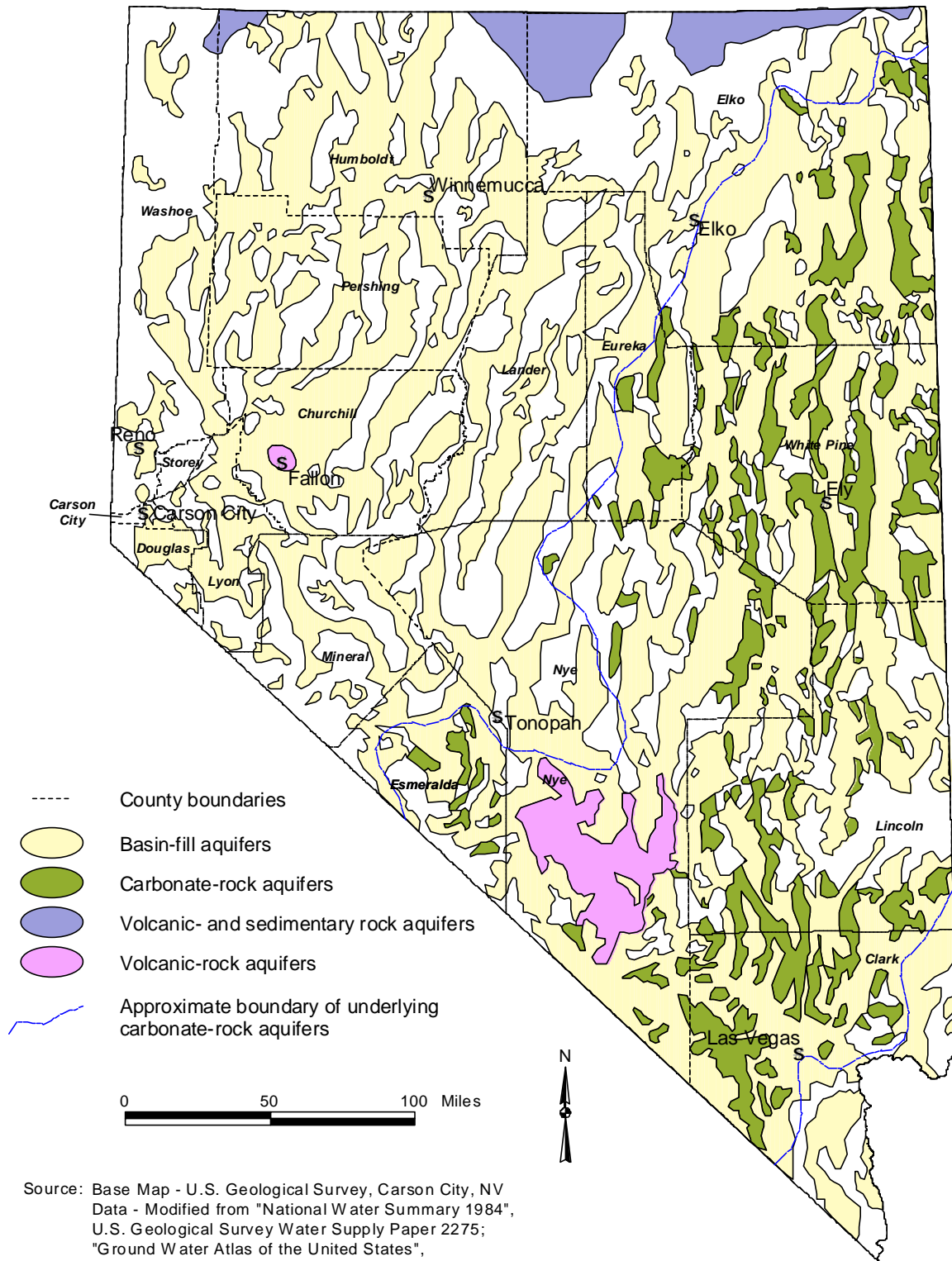
Principal ground-water aquifers in Nevada are basin-fill aquifers, carbonate-rock aquifers, volcanic-rock aquifers, and volcanic- and sedimentary-rock aquifers (Figure 4-11). The basin-fill aquifers, composed primarily of alluvial, colluvial and lacustrine deposits, are the major aquifers in the State. Virtually all major ground-water development has been in the basin-fill aquifers with the withdrawals from the upper 500 feet of these aquifers. In eastern and southern Nevada, thick sequences of carbonate rock underlie many of the alluvial basins forming a complex regional aquifer system or systems that are largely undeveloped and not yet fully understood. The carbonate-rock aquifer supplies water to numerous springs which are used for irrigation. Volcanic-rock aquifers extend over hundreds of square miles but only one volcanic-rock aquifer in the Carson Desert (Churchill County) of west-central Nevada has been developed as a municipal water supply.

Within the Basin and Range Province, aquifers are generally not continuous, or regional, because of the complex faulting in the region. Of the aquifer types discussed above, any or all may be in, or underlie, a particular basin and constitute separate sources of water. However in some instance, interconnection between the aquifers may exist.

### **Groundwater and Surface Water Interaction**

Groundwater and surface water cannot be viewed as independent and separate sources in water management decisions. In some areas, groundwater may discharge into streams and contribute significantly to surface water flows. Groundwater usage may lessen surface flows in these instances. Conversely, surface water infiltrates into the groundwater systems through natural causes and/or human activities (such as irrigation). As a result, changes in surface water flows and usage may impact groundwater levels.

Figure 4-11 Aquifers



**Figure 4-11. Approximate Boundaries of Major Aquifers in Nevada**

## **Perennial Yield and Committed Resources**

Perennial yield is the amount of usable water from a ground-water aquifer which can be economically withdrawn and consumed each year for an indefinite period of time without depleting the source. Estimates of perennial yield are necessary to provide the State Engineer with a guideline by which to limit groundwater allocations (committed resources).

Recognizing the need for more detailed groundwater information, such as perennial yield estimates, the State Engineer and the U.S. Geological Survey (USGS) began a cooperative groundwater study program in 1945 with funding from the State Legislature. A number of water resource bulletins have been produced from this program. However, the most statewide comprehensive groundwater study efforts did not begin until the State Legislature in 1960 authorized a series of ground-water reconnaissance studies be performed under the cooperative supervision of the Nevada Division of Water Resources (NDWR) and the USGS. This program, which extended until 1974, resulted in 60 reconnaissance reports covering the hydrology of 219 hydrographic areas. Based upon these reports, the water resources bulletins, and other more recent studies, estimates of perennial yield have been developed for the 256 hydrographic areas. The total combined perennial yield of the basin-fill aquifers statewide is approximately 2.1 million acre-feet per year. The perennial yield figures currently available are estimates only and provide guidelines for water planning and management. In developing these estimates, the USGS utilized the Maxey-Eakin method which was developed between 1947 and 1951. While some of the perennial yield estimates have been updated with more current methodologies, many of the yield estimates in use today were developed over 25 years ago.

In basins with significant groundwater discharge to streams, the USGS developed system yield estimates in addition to the groundwater perennial yield estimates. System yield is the amount of usable groundwater and surface water that can be economically withdrawn and consumed each year for an indefinite period of time without depleting the source. For these basins, the perennial yield estimates may include groundwater discharges to surface streams. Development of these groundwater aquifers could potentially reduce surface flows and impact downstream surface water users.

Under the authority granted in Nevada Revised Statutes 534, the State Engineer issues groundwater rights. The term “committed resource” represents the total volume of the permitted, certificated and vested groundwater rights which are recognized by the State Engineer and generally can be withdrawn from a basin or area in any given year. When reviewing groundwater right applications, the State Engineer considers the individual and regional perennial yield estimates, system yield estimates, and the committed resources amounts among other things in making determinations.

To assist in the tracking of the committed groundwater resources, NDWR maintains a computer database of state-issued water rights. Based upon this database, the total committed groundwater resource amount in Nevada equals about 3 million acre-feet per year (as of March/April 1998). The term “committed” refers to those water rights that are either permitted or certificated. Table 4-8 and Figure 4-12 summarizes the committed resources by hydrographic region and by type of use. Committed resource values presented in the *State Water Plan* are time sensitive and subject to change from future actions on pending applications and other procedures. It must be noted that the 3 million acre-feet figure is calculated from NDWR database output and represents the estimated amount of the groundwater resources committed (permitted or certificated) to a particular beneficial use. The database is still under development and all committed resource numbers presented in the *State Water Plan* are approximate. Actual groundwater withdrawal and consumption amounts are far less than the committed resource value of 3 million acre-feet. In 1995, approximately 1.6 million acre-feet of groundwater was withdrawn with about 0.7 million acre-feet consumed. There are a number of reasons for these differences:

- Some groundwater rights are *supplemental* to surface water rights. Supplemental groundwater is generally pumped only as needed to augment low surface water supplies. As a result, supplemental groundwater rights are not usually exercised to their fullest extent every year.
- Some groundwater rights are *supplemental* to other groundwater rights with one well pumped to augment the supply from another well. When this supplemental relationship exists between rights, the State Engineer assigns a combined annual pumpage duty for both wells which is less than the sum of each well’s individual duty. The NDWR database does not automatically account for these supplemental situations. NDWR staff must first make adjustments to the database numbers to avoid double counting of these supplemental commitments. These adjustments have been made to the database for about 35% of basins. In the other basins, committed resources values as taken from the NDWR may be overestimated due to double counting of the supplemental water rights.
- Some groundwater rights may not be exercised to their fullest extent every year. For example, municipalities are allowed to hold water rights in reserve as needed for future growth.
- Some groundwater rights are not currently being exercised as a water supply is being provided from another source. For example, groundwater being pumped as part of the mine dewatering operations at Barrick’s Post/Betze-Meikle Mine is utilized for irrigation in Boulder Flat Valley (Humboldt River Basin). Both the irrigation and mine dewatering are separately permitted with their permitted pumpage amounts included in Table 4-8. However under this situation, the irrigation operation is using the pit water rather than pumping the irrigation wells and exercising their groundwater rights. The NDWR database is not capable of adjusting for this type of substitution, and database printouts obtained for the *State Water Plan* include both the irrigation rights and the dewatering rights in the committed resource values.



**Table 4-8. Approximate Perennial Yield and Committed Groundwater Resources (as of March/April 1998) by Use and Hydrographic Region**

Hydrographic Region	Combined Perennial Yield, acre-feet per year	Committed Groundwater Resources by Category, acre-feet per year (as of March/April 1998)					
		Irrigation & Stock	Municipal & Quasi-municipal	Mining & Milling <sup>1</sup>	Commercial & Industrial	Other <sup>2</sup>	Total
1. Northwest Region	55,500	28,625	6	132	5	64	28,832
2. Black Rock Desert Region	178,825	215,658 <sup>3</sup>	608	58,952 <sup>4</sup>	920 <sup>5</sup>	1,687 <sup>5</sup>	277,825
3. Snake River Basin	62,100	8,091	1,145	7,813	4,877	511	22,437
4. Humboldt River Basin	463,900	492,307 <sup>3,6</sup>	53,737	141,576	63,637 <sup>5</sup>	91,055 <sup>7</sup>	842,312
5. West Central Region	8,200	1,678	8,743	58	28,249 <sup>5</sup>	1,289	40,017
6. Truckee River Region	76,425	34,989 <sup>3</sup>	83,902 <sup>8</sup>	5,172	68,030 <sup>5</sup>	19,014	211,107
7. Western Region	17,850	18,662	5,174	5,174	518	508	25,328
8. Carson River Basin	70,255	95,926 <sup>3</sup>	62,438	4,068	12,979 <sup>5</sup>	13,196 <sup>5</sup>	188,607
9. Walker River Basin	57,300	205,354 <sup>3</sup>	14,949	8,657	12,383 <sup>9</sup>	6,019	247,362
10. Central Region	798,460	573,277	50,978	96,765	37,141 <sup>5</sup>	9,775 <sup>5</sup>	767,936
11. Great Salt Lake Basin	63,150	28,155	3,506	1,305	732	13	33,711
12. Escalante Desert Basin	1,000	2	0	0	0	0	2
13. Colorado River Basin	219,800	78,057 <sup>3</sup>	101,362 <sup>10</sup>	11,171	35,895	19,165 <sup>11</sup>	245,650
14. Death Valley Basin	24,550	22,325	2,154	6,086	638	333	31,536
<b>TOTAL</b>	<b>2,097,315</b>	<b>1,803,106</b>	<b>388,702</b>	<b>342,221</b>	<b>266,004</b>	<b>162,629</b>	<b>2,962,662</b>

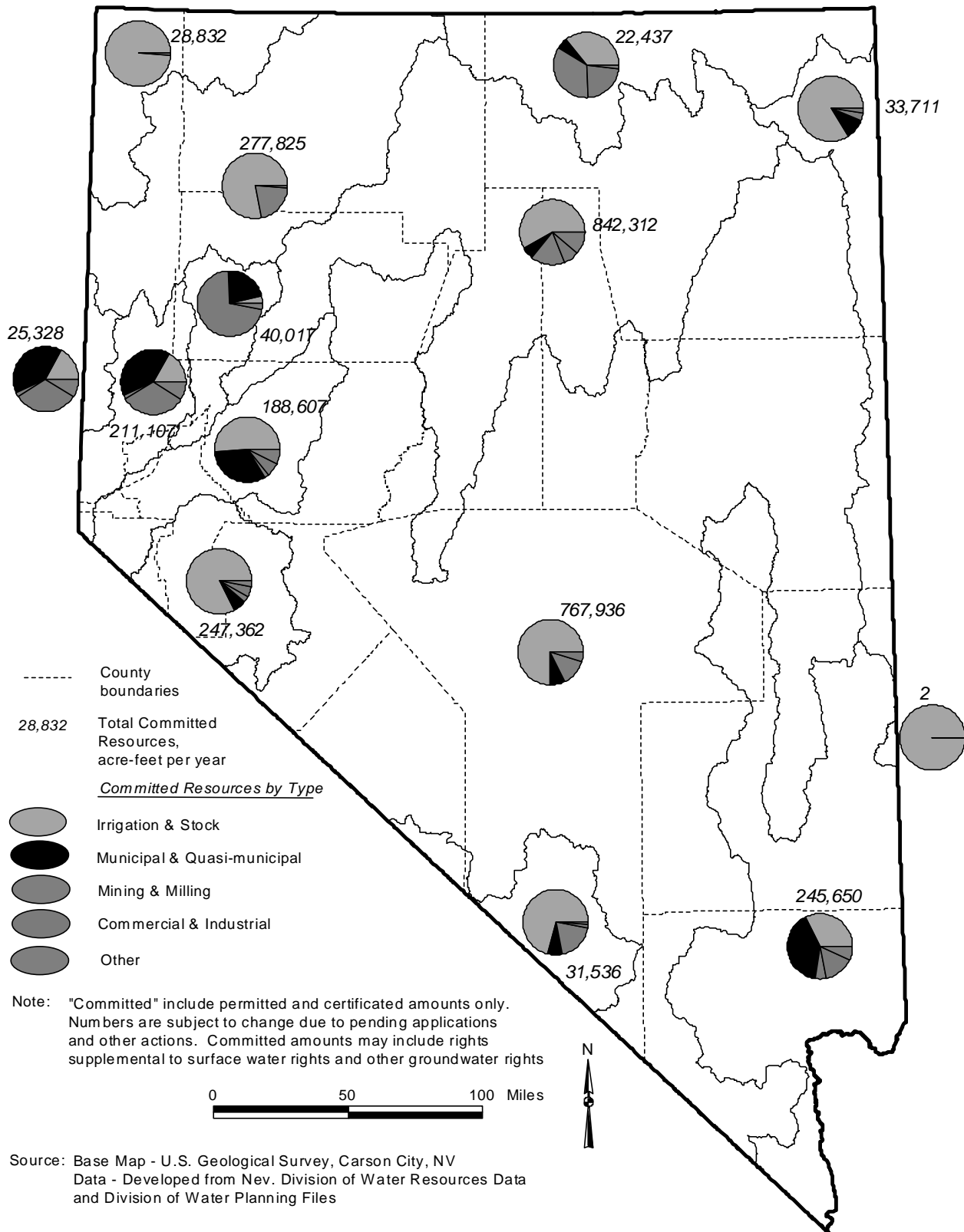
General notes:

- A. Data on committed resources were obtained from the Nevada Division of Water Resources water rights database and represent estimated resources committed as of March/April 1998.
- B. The committed resources values include permitted and certificated amounts only.
- C. These numbers are preliminary and intended to be used for planning purposes only. Totals may include water rights that have not been adjusted for supplemental relationships with other groundwater rights. Also, totals do not include any adjustment for supplemental relationships with surface water rights. Values are subject to change due to pending water right applications, and possible cancellations and forfeitures.

Other notes:

- <sup>1</sup> Mining is considered a temporary use by the State Engineer's Office and upon cessation of mining, many permits will expire. The "Mining & Milling" category includes only those rights associated with the consumptive use needs of the mines. Permits associated with dewatering operations are included in the "Other" category.
- <sup>2</sup> "Other" includes following uses: domestic, environmental, power generation, recreation, storage, wildlife, other/decreed. Includes environmental permits issued for environmental cleanup projects. These environmental permits are temporary and expire upon cessation of cleanup activities.
- <sup>3</sup> Portions of rights are supplemental to surface water and are used only when surface water is not available.
- <sup>4</sup> Majority of rights held for a mine operation that is no longer pumping.
- <sup>5</sup> Portion of rights include geothermal pumpage for power generation, with majority of geothermal water reinjected into geothermal reservoir.
- <sup>6</sup> Portion of rights not exercised as mine pit dewatering discharge is being used as a substituted water source. See Footnote 7.
- <sup>7</sup> Includes rights associated with mine pit dewatering. Portion of withdrawals are used as a water source for irrigation. See Footnote 6.
- <sup>8</sup> Actual annual pumpage limited to lower value by State Engineer restrictions.
- <sup>9</sup> Portion of rights include geothermal pumpage for power generation, with some of geothermal water not reinjected.
- <sup>10</sup> Includes permits that will be revoked when water right holders provided water from another source (Colorado River).
- <sup>11</sup> Includes environmental permits issued for environmental cleanup projects. These environmental permits are temporary and expire upon cessation of cleanup activities. Also includes permits granted for pumping of shallow poor quality groundwater in the Las Vegas area as needed to alleviate potential hazards resulting from rising groundwater levels caused by secondary recharge.

Figure 4-12. Estimated Committed Groundwater Resources by Type of Use and Hydrographic Region.



**Figure 4-12. Approximate Committed Groundwater Resources (as of March/April 1998) by Hydrographic Region and Use**

- The State Engineer has placed administrative limits on pumping in some areas. For example, the State Engineer has limited pumpage by Sierra Pacific Power Company from the Truckee Meadows Basin to an amount less than Sierra's water right duty. The NDWR database is not capable of reflecting this pumpage limit in any calculation of committed resource amounts. Any committed resource values taken from the NDWR database reflect only the permitted/certificated pumpage amounts, not any pumpage limits.

The committed resource figures derived from the NDWR database may not reflect long-term groundwater commitments for the following reasons:

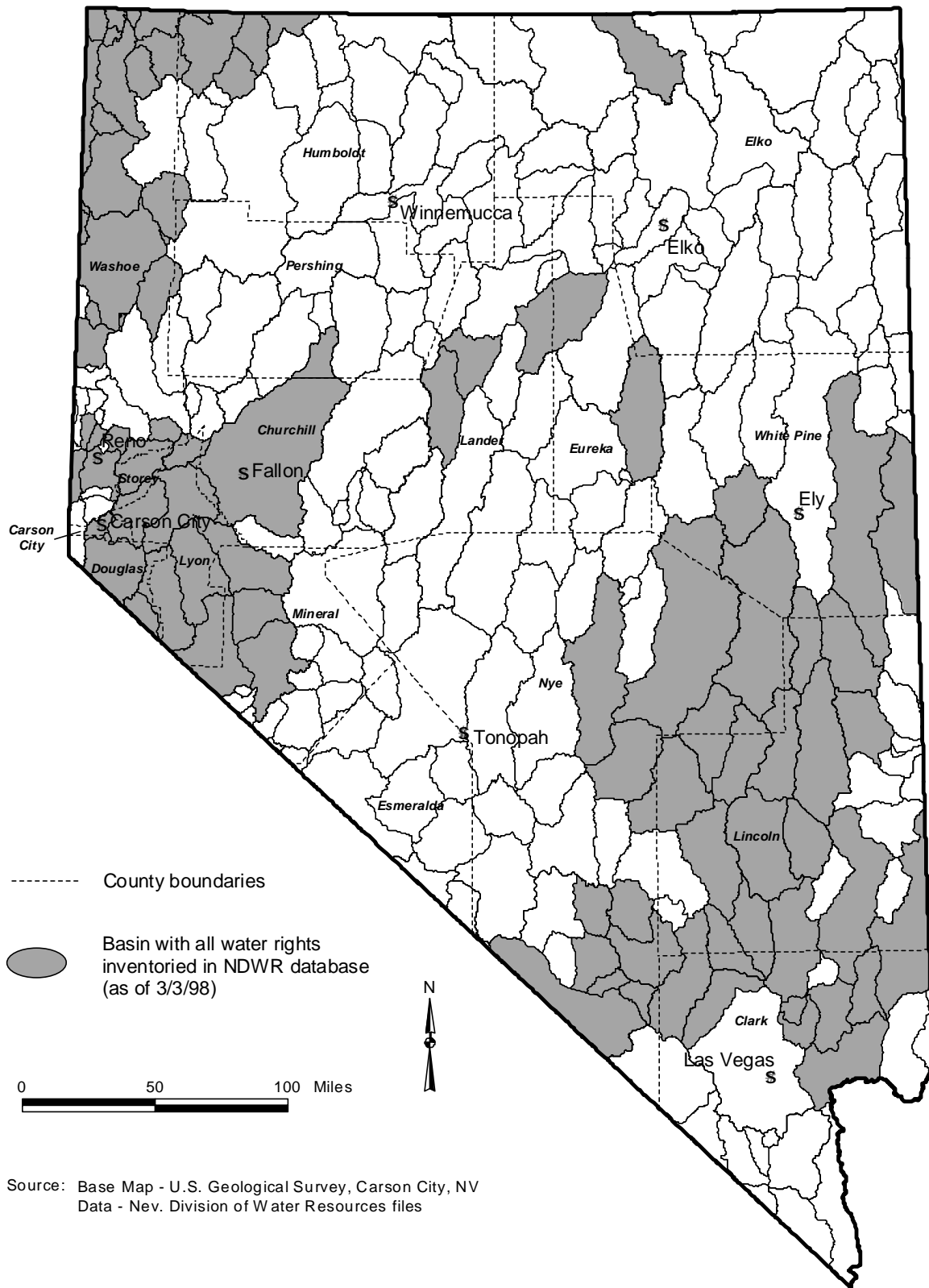
- Mining is considered a temporary use by the State Engineer's Office. With some mines, existing water right permits will expire once the mining operations have ceased.
- Environmental permits issued for environmental cleanup projects are included in the committed resource figures in Table 4-7. The cleanup projects are considered temporary, and once a cleanup operation is complete the associated water rights expire.
- The NDWR database includes committed resource amounts associated with revocable groundwater permits issued in the Las Vegas area. These rights will be revoked when the water right holders are provided water from another source, such as the Colorado River.

### **Management of Groundwater Rights Information**

The total committed groundwater resource values presented in Table 4-8 and Figure 4-12 were derived directly from the NDWR database as of March and April 1998. At that time (March/April 1998), approximately 85 percent of all state-issued water rights in Nevada had been entered into this database. However, the groundwater rights for 88 of the 256 basins have been completely entered into the database and adjusted for supplemental rights (Figure 4-13). As a result, the committed resource figures from the NDWR database for these 88 basins are more accurate than for the other 168 basins, and the committed resource totals derived from the NDWR database maybe slightly lower than the actual amount. Committed resource values for the 168 basins should be considered preliminary estimates. Also, the committed resource values in some basins change daily. Current estimates should be obtained from the Nevada Division of Water Resources.

### **Groundwater Availability**

As the demand for groundwater has increased over the years, the State Engineer has had to increase administrative efforts in some of the groundwater basins. The State Engineer may designate a groundwater basin which is being depleted or is in need of additional administration. Basins are designated through orders issued by the State Engineer. By "designating" a basin, the State Engineer is granted additional authority in the administration of the groundwater resources within the designated basin. For example, the State Engineer may issue orders which define preferred uses, deny certain water uses, or curtail pumpage. Preferred uses may include domestic, municipal, quasi-municipal, industrial, irrigation, mining and stock-watering uses or any other beneficial use. Each basin is managed as a separate unit with the State Engineer issuing orders and rulings as needed for



**Figure 4-13. Basins with Groundwater Rights Completely Entered into NDWR Water Rights Database (as of 3/3/98)**

the management of the groundwater resources. Figure 4-14 displays the designation status for the 256 groundwater basins in Nevada. This map is a useful tool to generally determine where the greatest impediments to groundwater development may exist. However, the associated State Engineer’s orders and rulings need to be examined for a complete understanding of the management issues and water availability within a basin. The designation status of basins as defined by the State Engineer’s orders have been divided into four general categories as shown in Table 4-9.

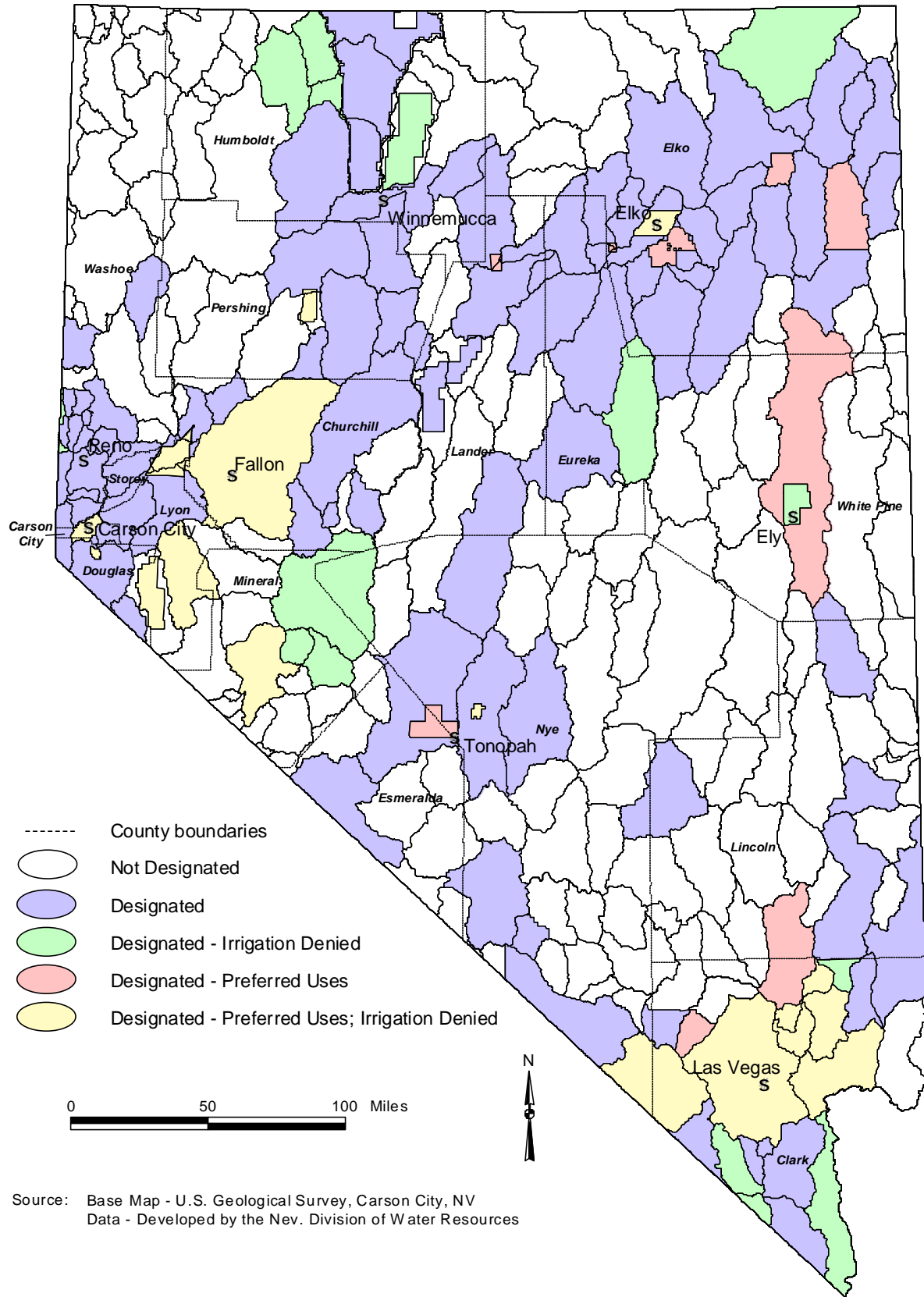
**Table 4-9. Designated Groundwater Basin Categories**

<b>Designation Status</b>	<b>General Description of Associated State Engineer’s Orders</b>
<b>Designated</b>	State Engineer’s order(s) do not define any administrative controls.
<b>Designated - Irrigation Denied</b>	State Engineer’s order(s) state that irrigation is <u>not</u> a preferred use in these basins and applications for new irrigation appropriations will be denied.
<b>Designated - Preferred Uses</b>	State Engineer’s order(s) list certain types of uses as preferred in these basins, and quantity restrictions may be placed on these preferred uses.
<b>Designated - Preferred Uses; Irrigation Denied</b>	State Engineer’s order(s) list certain types of uses as preferred in these basins. Quantity restrictions may be placed on these preferred uses. State Engineer’s order(s) also state that irrigation is <u>not</u> a preferred use in these basins and applications for new irrigation appropriations will be denied. Other uses may also be listed as denied.

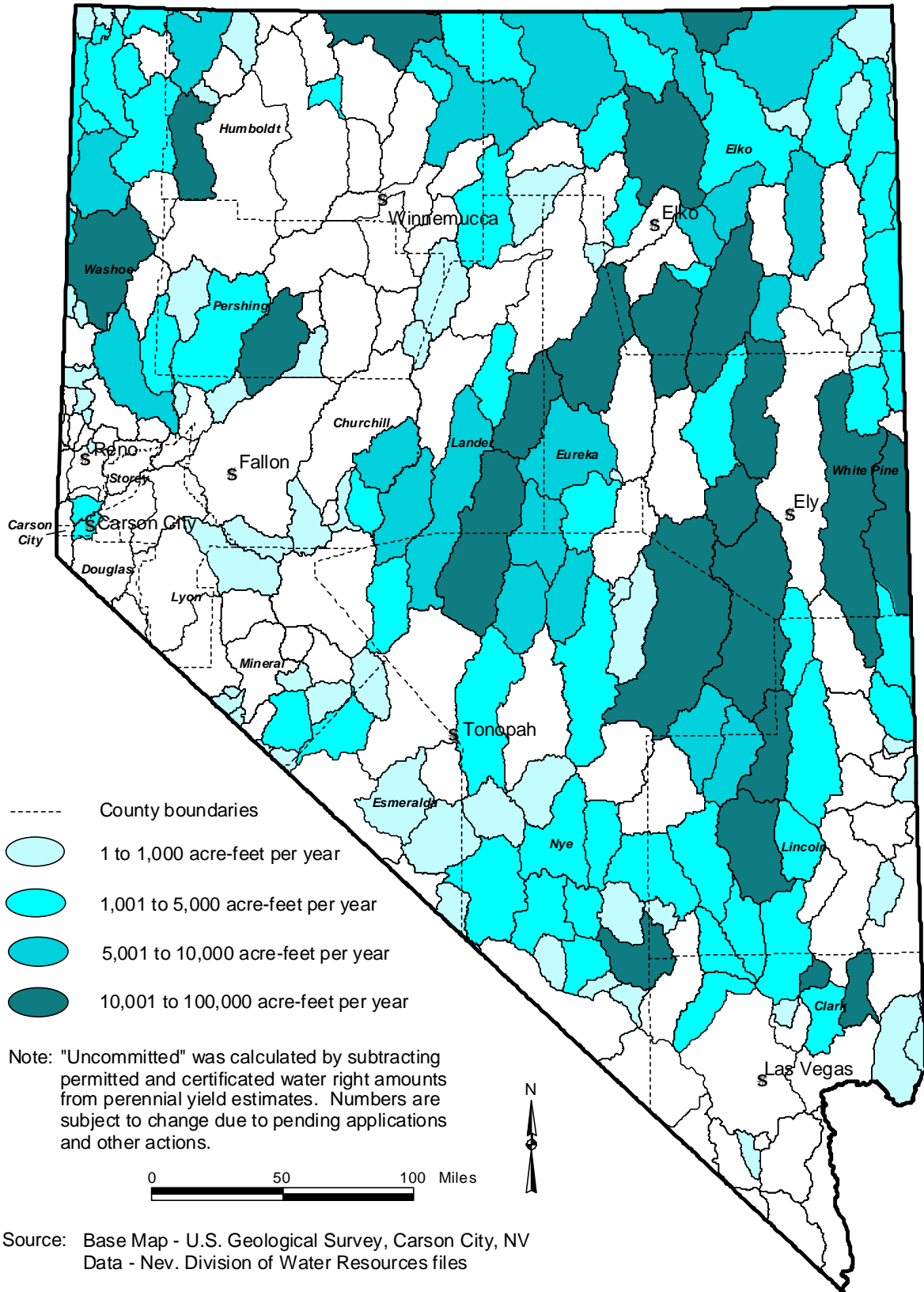
Whether or not a basin is designated dictates the procedures to be followed in obtaining a groundwater permit. In undesignated basins, a person can drill a well in these basins prior to filing an application for a groundwater permit. In designated basins, a groundwater permit must be obtained prior to drilling a well. Domestic wells are exempt from the permitting process, however, drillers are required to notify the State Engineer of their intent to drill a domestic well and submit a well log following completion.

In general for basins with preferred uses defined, applications for preferred uses are considered by the State Engineer prior to applications for non-preferred uses. However, the State Engineer has the authority to deny applications for non-preferred uses even though the designation orders do not explicitly prohibit these uses. Regardless of the basin designation status, the State Engineer has the authority to deny a water application if: 1) there is not unappropriated water; 2) the proposed use will impair existing rights; 3) the proposed use will be detrimental to the public interest; and 4) the project is not feasible and is filed for speculative purposes.

Figure 4-15 presents a general picture of the uncommitted groundwater resources in Nevada. “Uncommitted groundwater resources” are assumed equal to perennial yield estimates less permitted and certificated water right amounts as extracted from the NDWR water rights database as shown on Table 4-7. Approximately 60% of the 256 basins have committed resource volumes below the perennial yield estimates. The following qualifiers apply to the data upon which this map is based:



**Figure 4-14. Designated Groundwater Basins of Nevada**



**Figure 4-15. Approximate Uncommitted Groundwater Resources (as of March/April 1998)**

- The perennial yield figures are estimates only and are subject to change following future studies.
- In some basins, groundwater aquifers discharge to streams thereby providing a portion of the supply for downstream surface water users. In these basins, development of the entire perennial yield amount could potentially impact surface water uses.
- The committed resource numbers upon which this map is based are subject to change on a daily basis as a result of new actions, such as approval of pending applications or forfeitures. About 1/3 of the groundwater basins have pending applications. The most current information can be obtained from NDWR.

### **Groundwater Data Collection**

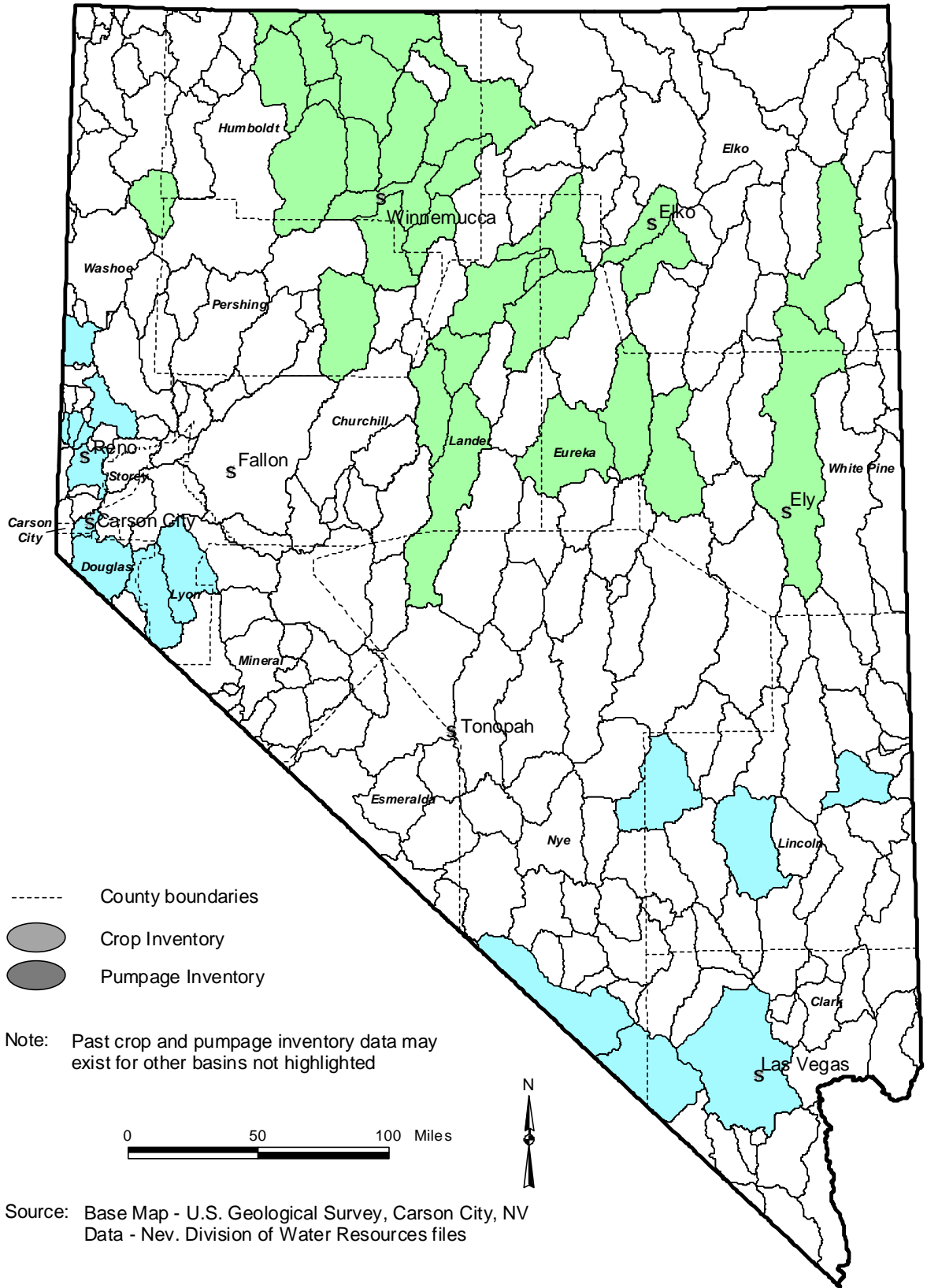
NDWR and USGS collect a majority of the groundwater usage and level data in Nevada as described in the following discussion.

**Pumpage and Crop Inventories.** As part of their groundwater management duties, NDWR performs annual estimates of pumpage or “pumpage inventories” for some of the groundwater basins. Generally, these pumpage inventories are based upon a mixture of both actual measurements and estimates. In other basins, NDWR performs crop inventories in which irrigated crop acreages and associated water use are estimated. Figure 4-16 shows the basin locations for these inventories and their status. Some pumpage data are submitted to NDWR by the permit holders as a requirement of water right permit conditions, however these data do not represent all of the groundwater use within these basins. Figure 4-17 shows the basin for which groundwater pumpage data are submitted to NDWR as required by water right conditions.

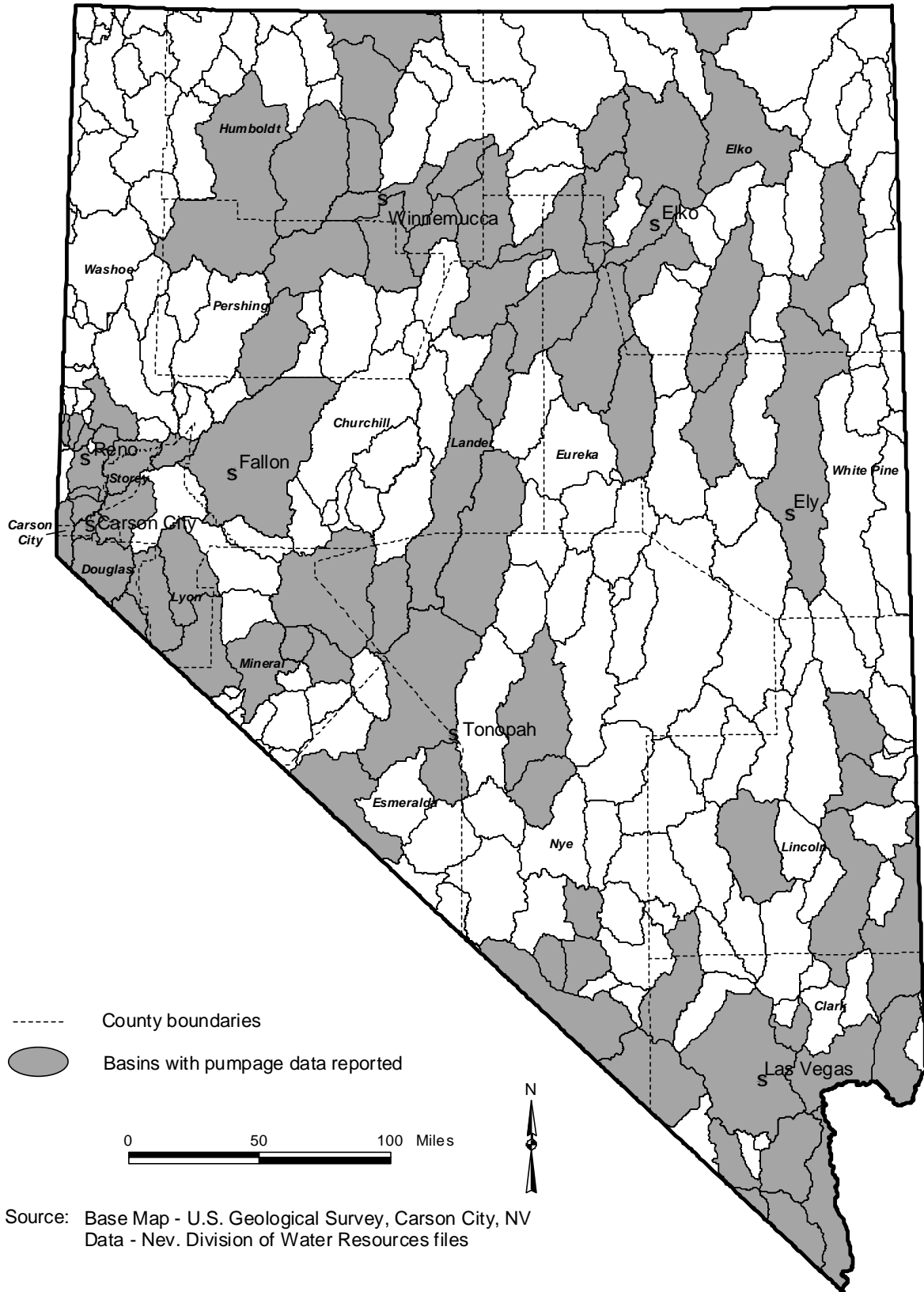
**Groundwater Level Data.** The USGS and NDWR are the primary agencies collecting groundwater level data on a statewide basis. In the report entitled “Water Resources Data, Nevada, Water Year 1996” which is part of an annual series, the USGS presents water level data for 145 primary observation wells (measured monthly or more frequently) and 1041 secondary observation wells (measured one to four times per year) within 98 hydrographic basins. These water level data are maintained in electronic databases. Some of the groundwater level data presented in USGS’s annual report have been collected by other agencies and then compiled by the USGS. NDWR currently collects groundwater level data in 73 basins. Figure 4-18 shows the basins where the USGS and NDWR collect groundwater level data. Most of the NDWR data is collected once a year, typically in the spring. Only a portion of the NDWR data are maintained in the USGS database with the remaining data stored in paper files.

Groundwater levels fluctuate seasonally and annually in response to changes in pumpage and the climate. Figure 4-19 shows long-term groundwater levels for six selected wells throughout Nevada. In some areas, groundwater levels during the late 1980s and early 1990s tended to decline due to heavier than average reliance upon groundwater during the drought of that period, but have been recovering with the return to normal and above-normal precipitation.

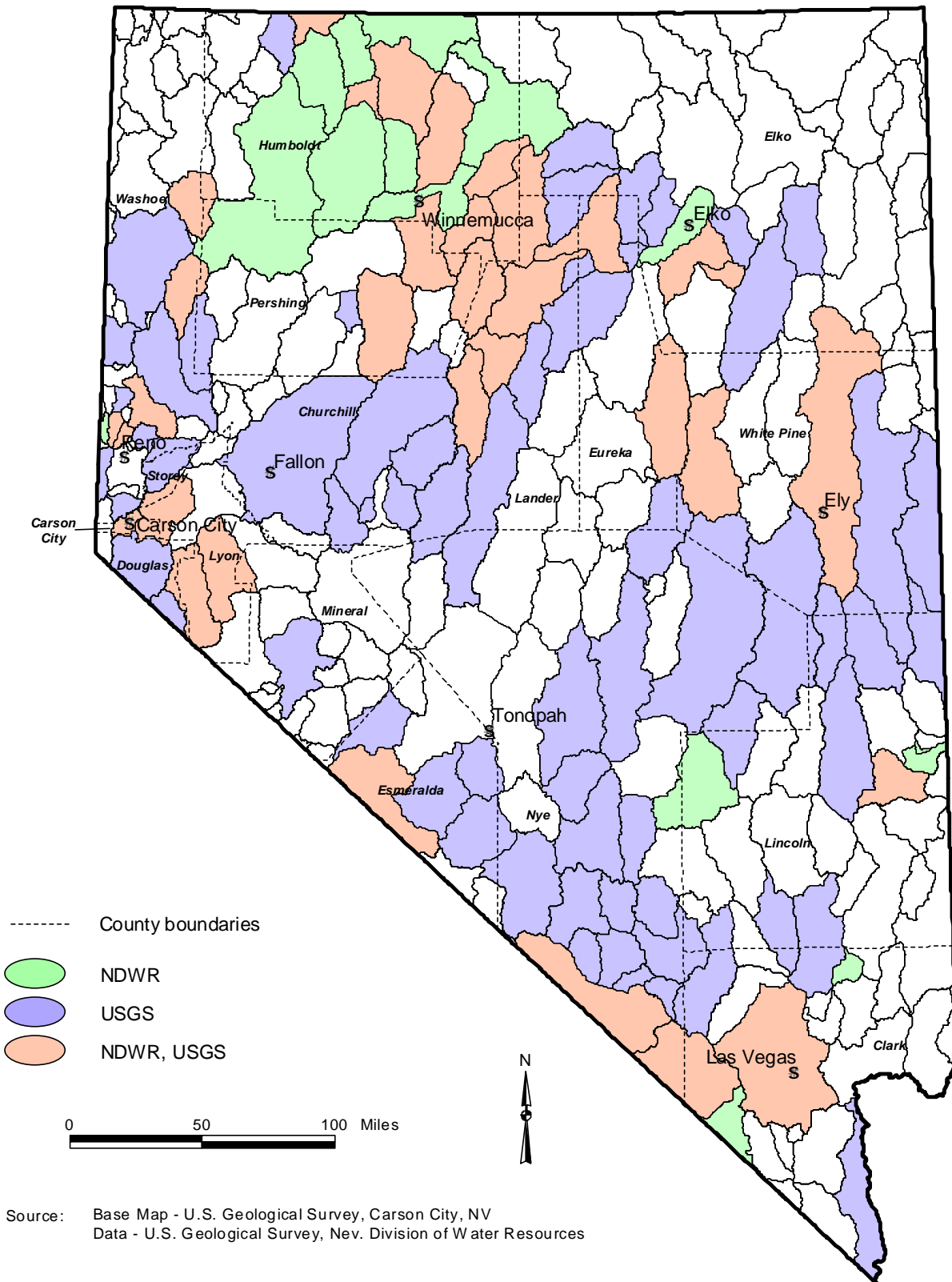




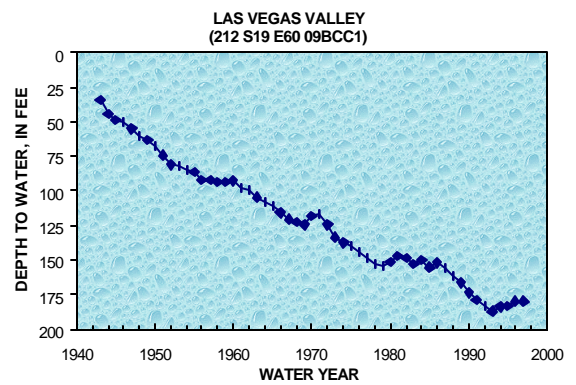
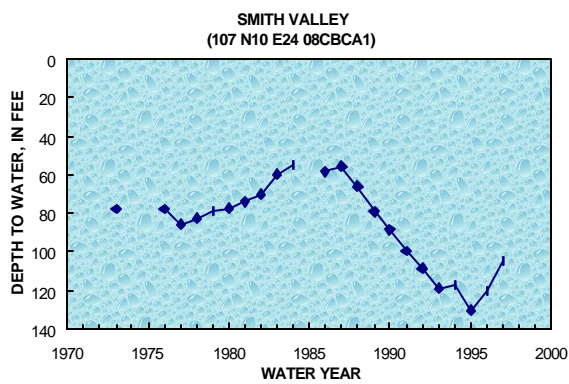
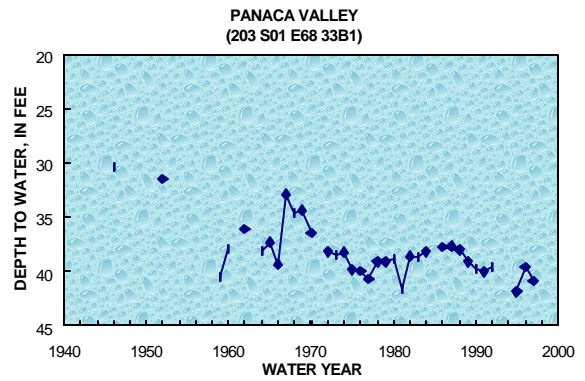
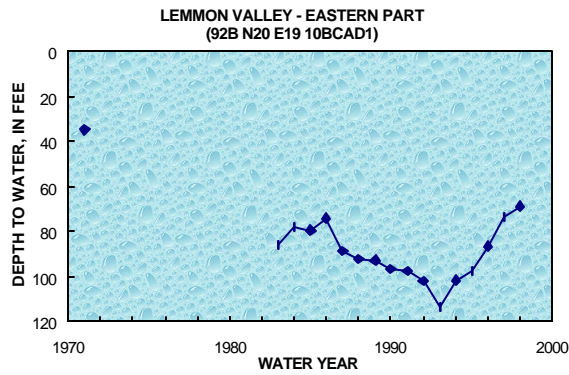
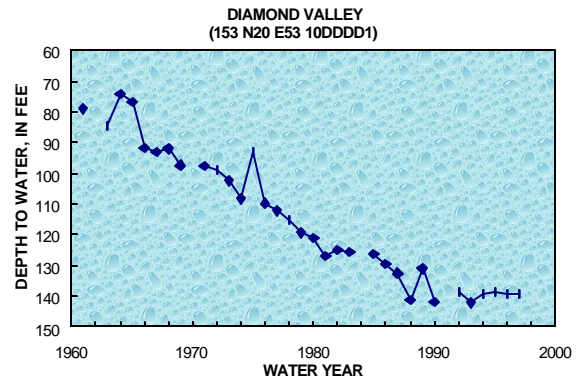
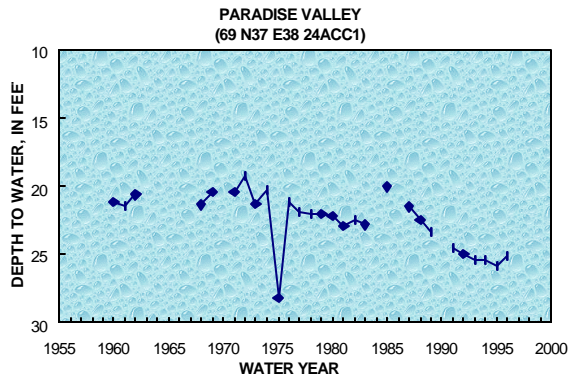
**Figure 4-16. Current Crop and Pumpage Inventory Activities by Nevada Division of Water Resources**



**Figure 4-17. Basins with Groundwater Pumpage Data Collected by Nevada Division of Water Resources as Required by Water Rights Conditions**



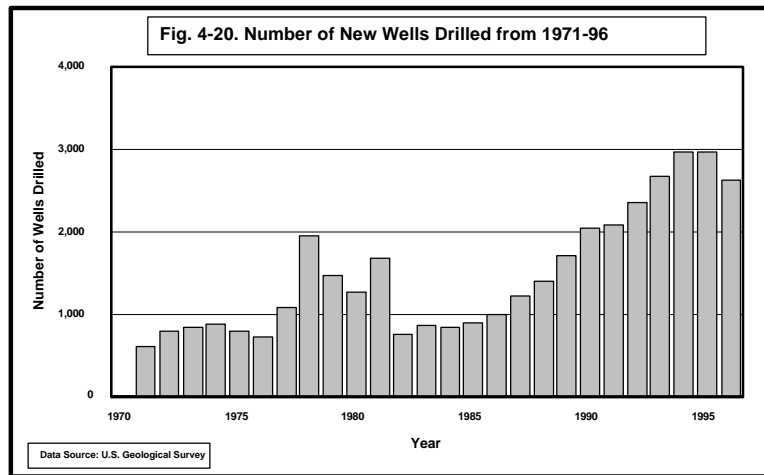
**Figure 4-18. Current Groundwater Level Collection Activities by U.S. Geological Survey and Nevada Division of Water Resources**



**Fig. 4-19. Long-term Water Levels in 6 Selected Wells**

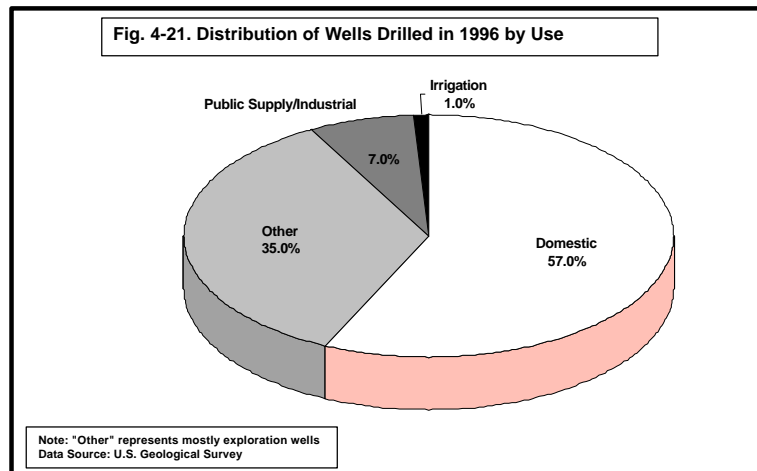
As shown on Figure 4-19, significant groundwater level declines have occurred in Diamond Valley. In response, the State Engineer has designated the basin and has taken actions to reduce total pumpage in the basin. Las Vegas Valley has also experienced significant groundwater level declines (Figure 4-19) due to overpumpage. Another result of overpumping groundwater is the reduction of artesian pressures in the aquifer, which leads to the compaction of aquifer materials and to land surface subsidence. Subsidence in the Las Vegas Valley has been monitored since 1935. Since that time, the land surface has subsided over five feet in many areas of the valley. A number of actions have been taken to address the basin overdraft and subsidence problems. Starting in 1987, the Las Vegas Valley Water District began an artificial recharge program to temporarily store Colorado River water in the principal aquifer during times of lower water use. The State Engineer has designated the basin and has taken actions to reduce pumpage in the basin. In 1997 the Nevada State Legislature created a Las Vegas Valley Groundwater Management Program for the oversight, protection and stabilization of the basin’s groundwater supply.

**Well Logs.** Since the 1940s, well logs have been submitted to the State Engineer’s Office. These well logs include a variety of information such as: well location, drilling method, proposed use, well depth, and depth to water. Examination of these logs indicates that groundwater development in Nevada has continued to expand over the years. Figure 4-20 displays the increase experienced in the number of wells drilled annually from 1971 to 1996. In 1996, there were approximately 2,632 new wells drilled in Nevada. Of this total, about



1,500 wells were for domestic uses and about 900 were exploration wells (Figure 4-21). In 1996 the well drilling was concentrated in the north-central, northwestern, and southern parts of the State.

In 1994, NDWR and USGS cooperatively developed a computer database for managing the well log information. Currently, the database contains information on approximately 50,000 wells in Nevada. The database does not contain any detailed information on the subsurface geology.



## **Groundwater Quality**

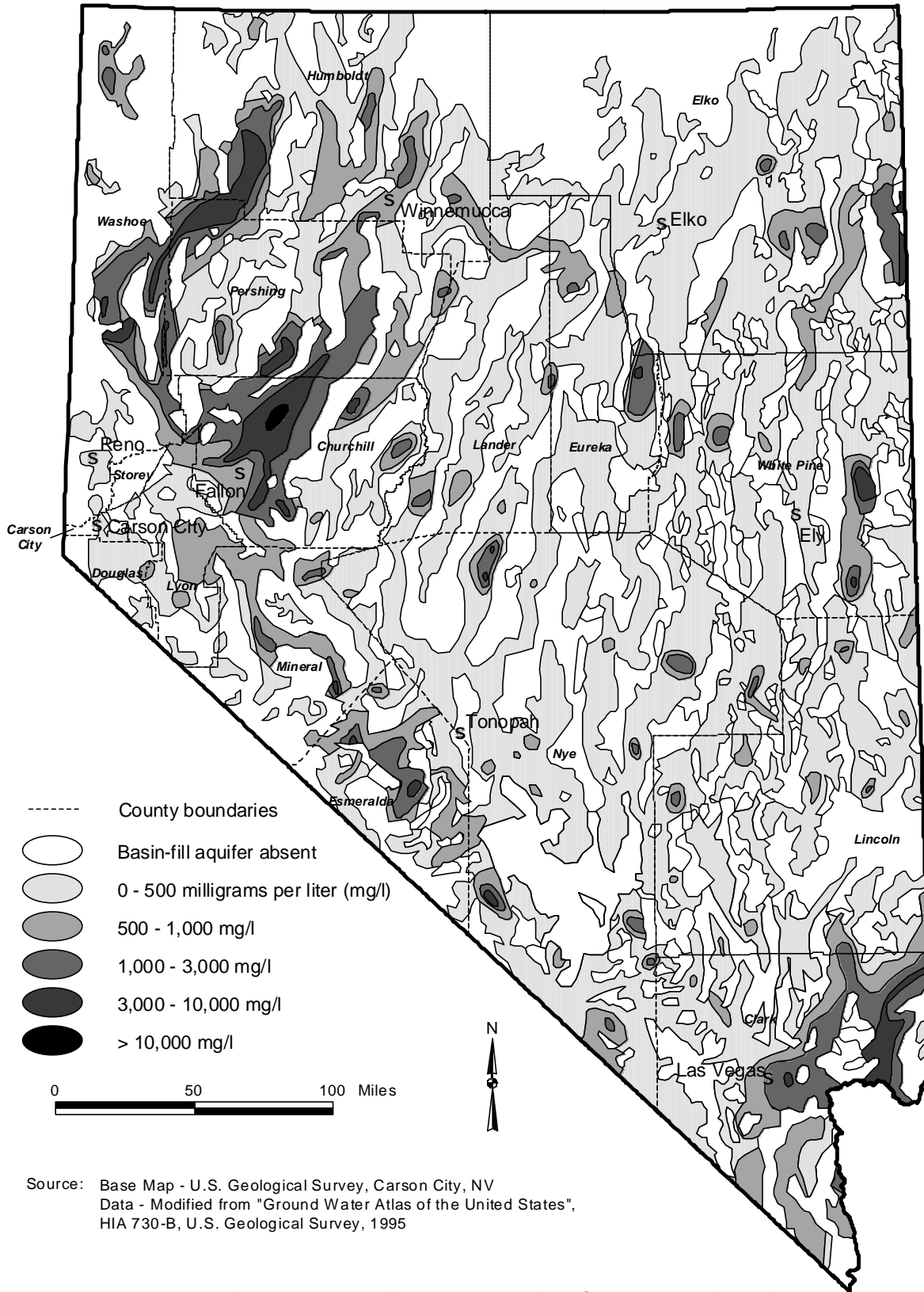
The quality of water from most aquifers in Nevada is suitable or marginally suitable for most uses. Most aquifers contain water with a majority of the constituent concentrations not exceeding State and national drinking water standards. However, there are parts of some aquifers with constituent concentrations exceeding these standards. It is important to realize that these excessive concentrations of certain constituents in groundwater may result from both natural processes and/or human activities.

The quality of groundwater in the unconsolidated deposits in the Basin and Range alluvial aquifers varies from basin to basin. Dissolved-solids concentrations range from less than 500 parts per millions (ppm) to more than 10,000 ppm in some areas (Figure 4-22). By comparison, ocean water has dissolved-solids concentrations of about 35,000 ppm. Locally, saline water is present near thermal springs and in areas where the basin-fill aquifers include large amounts of soluble salts. In discharge or sink areas such as the Carson and Humboldt sinks, the dissolved-solid concentrations can make the water economically unuseable. Although highly mineralized water is common in aquifers beneath playas, a deeper freshwater flow system may be present in some areas.

**Groundwater Quality Management and Data Collection.** Groundwater quality is regulated by NDEP and the SEC. Certain aspects of the Federal Clean Water Act and the Safe Drinking Water Act are implemented by NDEP within Nevada. Groundwater quality is monitored by NDEP, and other State and Federal agencies. However, there is no ambient groundwater quality monitoring network in Nevada as there is with the surface water resources. Most of the available groundwater quality data are the result of special studies in specific areas, monitoring required by State permitting programs and by drinking water regulations. For instance, NDEP may require groundwater monitoring for groundwater discharge permits issued for industrial plants, land applications of treated sewage effluent, and geothermal injection wells. Groundwater monitoring also may be required in response to suspected contamination, such as mining sites or leaking fuel tanks.

Other NDEP activities include the development of the Comprehensive State Ground Water Protection Program (CSGWPP) and the Wellhead Protection Program (WHPP). NDEP initiated the CSGWPP to protect groundwater resources throughout Nevada and has received EPA endorsement on the program. The WHPP is intended to protect existing and future municipal groundwater resources. For a more complete description of NDEP water quality programs, refer to Part 1, Section 3 of the *State Water Plan*.

All community water systems are required to monitor water quality under the Federal Safe Drinking Water Act and State law for both groundwater and surface water systems. The State Health Division, Bureau of Health Protection Services, uses these data to check for compliance with the drinking water standards.



**Figure 4-22. Dissolved-solids Concentrations in Groundwater in Basin-fill Aquifers**

Another significant source of groundwater quality data is the USGS. The USGS undertakes a wide range of special studies in specific basins which results in the collection and compilation of groundwater quality data. As of 1996, the USGS is collecting water quality data for 111 wells within 11 of the 256 hydrographic basins. As stated above, most groundwater monitoring is short-term and site specific in response to a particular problem. This lack of continuous, long-term groundwater quality data makes any trend assessments a difficult proposition. In response to the lack of long-term, consistent information on water quality nationwide, the USGS developed the National Water-quality Assessment (NAWQA) Program. NAWQA Program goals are to describe the status and trends in the quality of the Nation's water resources and to provide scientific understanding of the major factors that affect surface and ground water quality. The Nevada NAWQA Project began in 1991 and includes the Las Vegas Valley area and the Carson and the Truckee River Basins. Project scientists are using multi-disciplinary approaches to compare and contrast the effects of urban and agricultural activities on water quality.



**Nevada State Water Plan**  
**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

**Section 5**  
**Socioeconomic Background**

*Introduction*

This section of the *Nevada State Water Plan* provides an overview of demographic and economic characteristics and trends within the State of Nevada. Nevada's seventeen counties have shown considerable variation in their population's growth rates and other economic conditions. To facilitate a better understanding of these county-specific conditions and trends, individual county socioeconomic overviews have been compiled as stand-alone publications in support of the state water plan.

Nevada's present and future water needs can only be determined in concert with a thorough understanding of the trends in the state's population growth and economic prospects. This overview of Nevada's socioeconomic characteristics is intended to provide the baseline information upon which future water demands can be determined. By analyzing and combining economic conditions and water usage patterns with forecasts of future socioeconomic trends, a more accurate picture of Nevada's future water use needs can be derived.

*Early Settlement Patterns, Economic Pursuits and Population Trends*

Nevada's earliest European settlements served the needs of the first emigrant wagon trains traveling to Oregon and California. In the 1850's, in the northern part of the state, water diversions for irrigation originated along the Humboldt, Carson, Truckee and Walker rivers to facilitate increased agriculture production, making this the state's first and longest lasting industry. In the southern part of the state, the city of Las Vegas and the valley in which it lies were named for the lush meadows supported by natural artesian springs. The first organized water diversion and irrigation efforts in the state was recorded in the Las Vegas Valley, where early Mormon colonists began diverting the flow of Las Vegas Creek for agricultural purposes.

Later, in the 1860's, the early discoveries of Nevada's vast mineral wealth, particularly with the Comstock Lode (Storey County), Aurora (Mineral County) and Bodie (California), led to an expansion of agriculture and ranching endeavors in Smith and Mason valleys (Lyon County). Carson Valley (Douglas County) and Stillwater (Churchill County) also became important agricultural centers for the early influx of miners. A virtual explosion in population took place in Nevada's various mining districts. Water, and particularly its availability and use, soon influenced Nevada's growth patterns. Early in Nevada's development, water-rights conflicts arose among the mines and ore-

processing mills, the loggers and lumbermen, and the state’s agricultural interests.

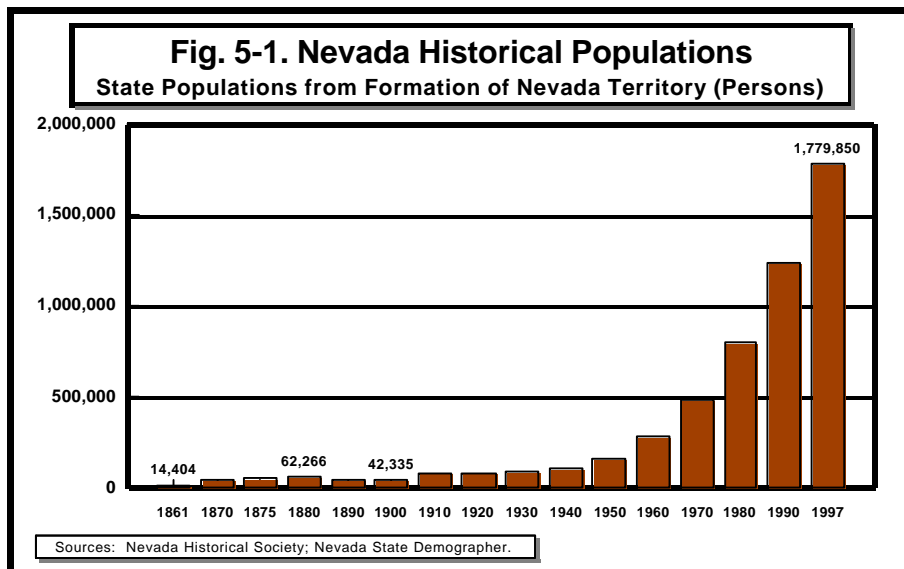
On November 25, 1861, the Nevada Territory was separated from the Utah Territory and the first Nevada Territorial Legislature met in Carson City and carved nine counties out of the newly created territory — Churchill, Douglas, Esmeralda, Humboldt, Lyon, Ormsby (later Carson City), Storey, Washoe and Lake counties. Just over a year later Lake County, which comprised the northern portion of present-day Washoe County, was renamed Rook County, and finally, in 1883, it became incorporated into Washoe County. At its inception, Esmeralda County comprised virtually four-fifths of the area of the new Territory of Nevada, with the remaining eight counties clustered in the northwestern portion of the state. Eventually, Esmeralda County was whittled down, ultimately resulting in the creation of an additional eight counties for Nevada.

While Nevada was still a territory, both Lander County (1862) and Nye County (1864) were created out of Esmeralda County. After statehood was obtained on October 31, 1864, Lincoln County, named after the President who supported Nevada’s entry into the Union, was formed in 1866 out of Nye County. Then, in 1869, Elko and White Pine counties were created out of Lander County, as was Eureka County in 1873. Later, in 1908, Clark County was formed out of the southern portion of Lincoln County, Mineral County was formed in 1911 out of Esmeralda County, and finally, rounding out Nevada’s present 17 counties, Pershing County was formed in 1919 out of the southern portion of Humboldt County. (See the Nevada and county map on the inside of the front cover.)

Based on a special territorial census conducted in 1861, Nevada’s population was recorded at 14,404 persons, with the greatest portion, or 4,581 persons, residing in and around Virginia City (Storey County). By the 1870 census, Nevada’s population had risen dramatically to 42,491 persons, of which 11,359 inhabitants, or 27 percent of the state’s total, were located in Virginia City and its environs, and 7,189 persons, or another 17 percent of the state’s total population, were located in and around Ely in White Pine County. These constituted the two principal mining centers in the state at that time. Meanwhile, Reno’s (Washoe County’s) population of only 3,224 persons comprised less than eight percent of the state’s total population, while Las Vegas (Clark County) was still part of

Lincoln County (1870 population of 2,985) and would not come into its own until 1908.

By 1875 the state’s population had grown to 52,630 persons and that of Virginia City, mirroring the fortunes of the Comstock Lode silver mining boom, had peaked at 19,528 residents, comprising over 37 percent of the state’s total population.

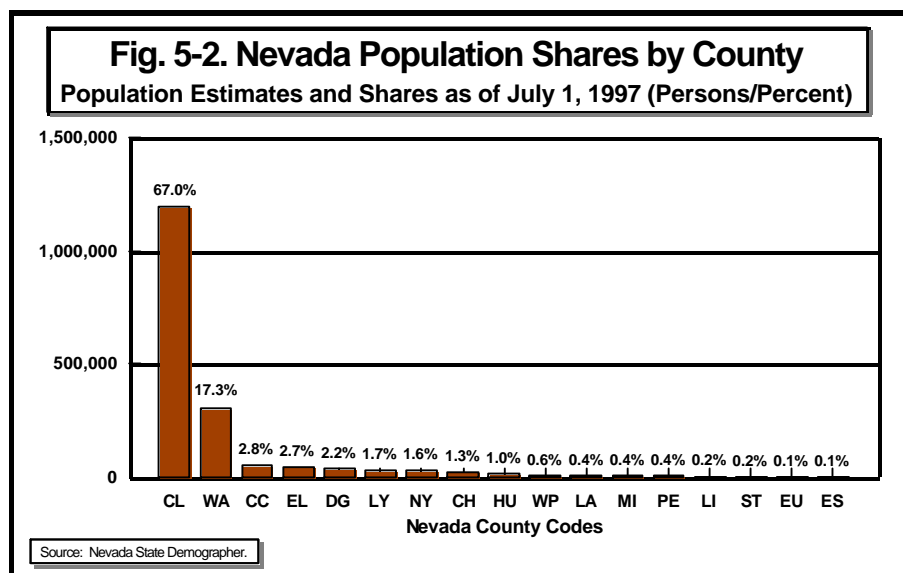


By 1877, however, the era of the Comstock mines was beginning to wane. While mining efforts in this area continued at a far reduced scale for another 20 years, the last of the great bonanzas, uncovered in 1875, steadily and gradually played out after 1880. By the time of the 1880 census, the state’s population had risen to 62,266 persons, although with the decline of the Comstock, Virginia City’s population, at 16,155 persons, had begun its inevitable decline.

By the turn of the century, the collapse of the mining industry produced the state’s Great Depression of 1880–1900, reducing Nevada’s population to 42,335 persons in 1890, down nearly 20,000 persons and 32 percent from that recorded in 1880 (see Figure 5–1). The temporary demise of Nevada’s mining industry led to profound population contractions throughout the state with almost 16,000 persons abandoning the Comstock mining area alone. As a result, by 1900 only 3,673 persons remained in Virginia City to work the mine tailings and eke out an existence as best they could. This exodus from the Comstock continued virtually unabated and by 1930 less than 700 persons remained in the town that had, quite literally, secured a place for Nevada in the Union.

Nevada’s 1900 census of population showed that Reno, located along the Truckee River, had become the dominant socioeconomic center of the state, a distinction it would not relinquish until late in 1950 to Las Vegas. Reno’s 9,141 residents recorded in the 1900 census accounted for almost 22 percent of Nevada’s total population. The other two large communities were Winnemucca, located along the Humboldt River and the path of the Central Pacific Railroad, which accounted for 4,463 of the state’s population, and Elko, with 5,688 residents. Together, these three large agriculture-based economies — Reno, Winnemucca, and Elko — strategically located along both river systems and rail routes, accounted for over 45 percent of Nevada’s 42,335 total residents in 1900. Interestingly, some 30 years before this time, the two major mining areas of the state — Virginia City and Ely — had comprised an identical 45 percent of the state’s total population. By 1890, however, their share of Nevada’s total resident population had fallen to only 13 percent, and would eventually fall to less than one percent by 1997. It was not the last time that mining in Nevada so abruptly altered the socioeconomic patterns and fortunes of a region.

New mineral discoveries and massive infusions of capital and labor brought Nevada back to its feet and effectively ended the state’s 1880–1900 Great Depression. On May 19, 1900, an erstwhile miner named Jim Butler discovered a promising outcrop of ore in the desert of southwestern Nevada. Initial assays revealed over 640 ounces of silver and \$200 of gold per ton. The rush



was on to the Goldfield Mining District and the cycle of prosperity, so reminiscent of the Comstock era, provided an unexpected boon to the state. During the 1900 census, Goldfield's (Esmeralda County) population was recorded at only 1,972 persons. Within five years, this isolated mining community had swelled to between 25,000 and 30,000 persons and was by far the largest community in Nevada. Nearly just as quickly, however, the Goldfield mining boom began its inevitable downward spiral. Goldfield's population fell to 9,369 persons by 1910 and then to only 2,410 persons by the time of the 1920 census, fewer than had been recorded during the 1880 population census of Esmeralda County. Such extreme variations in population would come to characterize early mining in Nevada. Thirty miles to the north of Goldfield, the town of Tonopah (Nye County) also boomed from local gold discoveries, with its population exploding from just 1,140 persons in 1900 to 7,513 persons by 1910.

As further evidence of Nevada's extensive mineral wealth, promising gold deposits were discovered north of Carlin in Eureka and Elko counties in 1907. However, many decades would pass before precious metal prices and advancements in mining extraction and milling technology allowed for the extensive development and cost-effective mining of this vast, but relatively low-grade region of ore, later to be called the "Carlin Trend".

### ***The Development of Modern Nevada***

After the last of the great gold rushes in central Nevada, events began to take place that were destined to dramatically shape Nevada's future and lay the foundations for solid economic growth and prosperity. After an absence of 21 years, gambling again became legal in the State of Nevada on March 19, 1931. At that time, probably few could foresee the far-reaching impacts that the legalization of gaming would have on the state's future socioeconomic development, the fiscal structure of the state, water-use patterns and consumption rates, and the economic prosperity of its citizens. While showing modest growth through the Great Depression era and World War II, after the war the industry began to expand rapidly based largely on improved transportation infrastructure and a more mobile and affluent population.

The development of Nevada's gaming industry since WWII has been complemented by a diversification into other business endeavors as well, most notably warehousing, transportation, manufacturing and distribution. Early railway development was enhanced by Nevada's strategic location and access to the large urban markets of California, Oregon, and Washington, and public warehousing gained a natural foothold in Nevada. Legislative support for these industry pursuits came in the form of a 1949 law granting tax-exempt status to stored personal property awaiting interstate or international transshipment. In 1969, the "Freeport Law" was enhanced further by including "manufacturing" in the list of freeport-allowable processes and interpreting "processing" to include the feeding, watering, and slaughter of livestock. This law has proven to be instrumental in the continued growth and diversification of Nevada's economy.

Based upon Nevada's growing emphasis on gaming, tourism, warehousing and manufacturing, by 1960 nearly 75 percent of Nevada's population of 285,278 inhabitants lived in either Las Vegas with 127,016 persons (45 percent of the total population), or Reno with 84,743 persons (30 percent of

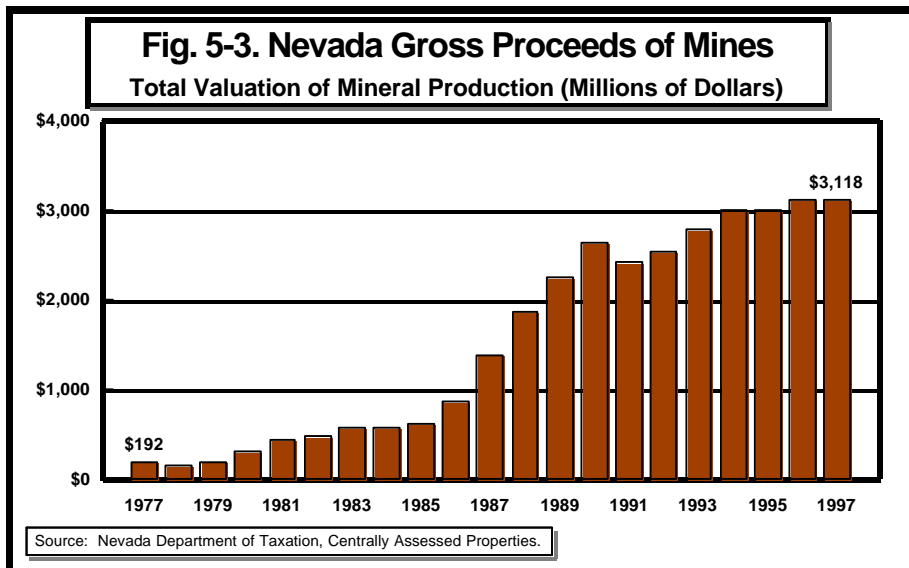
the total population). By the 1970 census, Nevada's population stood at 488,738 persons, of which 56 percent resided in Las Vegas and 25 percent were located in Reno. These two metropolitan areas now accounted for almost 81 percent of Nevada's total population.

By the late 1970's and early 1980's, the

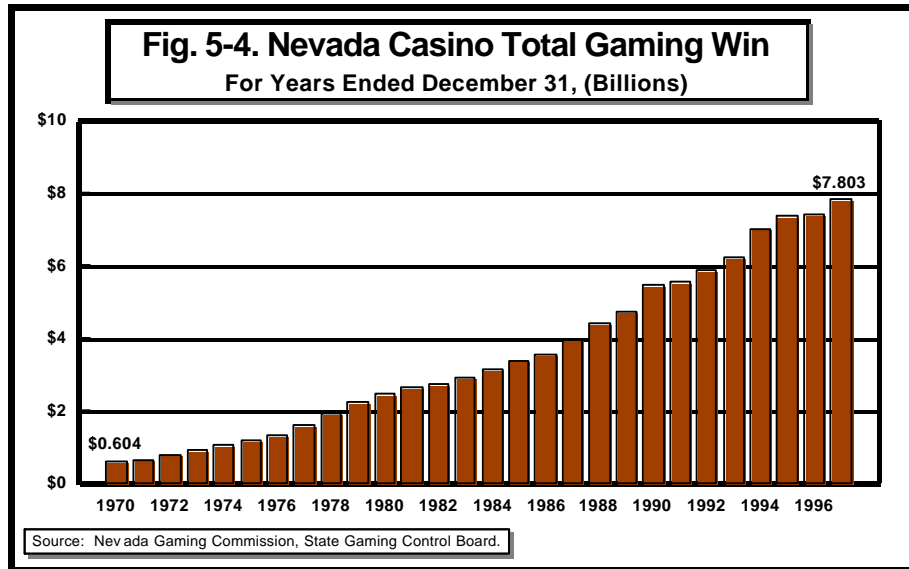
combination of national inflation, recession, and economic uncertainty had significantly elevated the price of gold and fostered a new resurgence in Nevada mining activities. Although gold had first been discovered along the "Carlin Trend" in 1907, it took the combination of high prices and advanced technology in the extraction and milling processes to promote the extensive development of these new mining operations. Today, the Carlin Trend constitutes Nevada's richest gold deposit and covers a vast area of north-central Nevada, running in approximately a northwesterly direction from Carlin, in Elko County, through the northeast corner of Eureka County, and back into Elko County (see Figure 5-3).

Major expansions in the state's gaming and tourism industry continued through the 1970's, 1980's and especially in the 1990's, when a new paradigm of Nevada casino, the mega-resort hotel and entertainment complex, became evident along the Las Vegas Strip. These full-featured casino, resort, and entertainment complexes firmly established the Las Vegas market as the premier destination resort location in the world, enticing over 30 million visitors in 1997 to the many-varied features (see Figure 5-4). After the severe national recession of 1980-82, which had noticeable effects on the state's gaming industry, the state's political leaders reinforced Nevada's commitment to economic diversification through the creation of a Commission of Economic Development and financial support of regional economic development authorities. With the state's economy and fiscal sources of revenues critically dependent on the health of the casino gaming industry, the state's diversification efforts ably served to present "the other side of Nevada."

During the late 1990's, effective marketing of the state's tourism and gaming attractions, combined with the continued promotion of diversified business interests, made Nevada the fastest growing state in the nation. By 1997, Nevada's resident population was estimated to have reached nearly 1.8 million persons, a considerable expansion from the 14,404 persons recorded in the first special territorial census taken in 1861. This overall growth equated to an average increase of nearly 13,000 persons per year over each of these 136 years. Furthermore, since 1950, Nevada's population has increased by an average of approximately 34,500 persons per year during the last 47 years. Of the total 1997 estimated population of 1,779,850 persons, 1,192,200 persons, or 67.0 percent, were



estimated to be living in Las Vegas, and 308,7000 persons, or 17.3 percent, were living in Reno. Together, these two areas now account for over 80 percent of Nevada's total population. Adding the other principal urban areas of Carson City (50,410 residents) and City of Elko (19,670 residents), produces an urban population concentration in Nevada of over 88 percent (see Figure 5-2).



But growth in Nevada and in particular the high rate of growth, has put severe strains on the state's resource requirements, particularly water. The state's infrastructure needs, social service requirements, police and fire protection, environmental conditions, and overall quality of life have also been affected. While some of the problems related to this rapid growth may be overcome or mitigated with judicious and timely legislation and more effective planning, others may become long-term situations that Nevada's residents in these rapidly growing areas will just have to accept. Despite the issues that growth raises, many believe that growth, appropriately planned and managed, must continue if the state, and its fundamental economic sectors, are to remain competitive and viable.

### ***Geography, Land Ownership, and County Relationships to Hydrographic Regions***

Nevada is situated in the western United States and is bordered by the State of California to the west and south; the states of Oregon and Idaho to the north, and the states of Utah and Arizona to the east. The Colorado River serves as Nevada's southeastern border with part of Arizona.

Nevada is divided into sixteen counties and one incorporated city, Carson City, the state's capital and the former Ormsby County. Nevada has a total surface area of 110,540 square miles and is the seventh largest state in the nation. Figure 5-5 shows county shares of Nevada's total area. From this graph we may see that just two counties — Nye and Elko — account for nearly one-third of Nevada's total area. The relationship between county populations and areas can be seen in Figure 5-9, which shows the population densities in persons per square mile using 1997 population figures. Nevada's overall topography is characterized by basins and ranges consisting of isolated mountain ranges with intervening long and relatively narrow valleys. Most of Nevada, totaling approximately 93,000 square miles, lies within what is called the Great Basin, in which all surface waters drain inward to terminal lakes, sinks, or playas. The highest point in the state is Boundary Peak (13,140

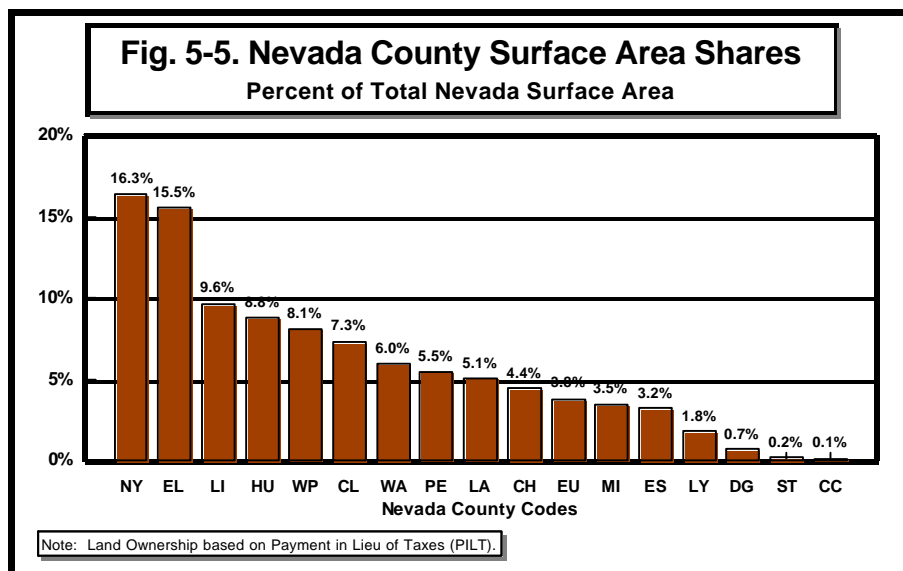
feet above mean sea level, or MSL), located in the Sierra Nevada Mountains in Esmeralda County and along the border with California. The lowest elevation in the state is 490 feet (MSL) and is located in the southernmost tip of the state along the Colorado River.

Nevada is the driest state in the nation in terms of its average annual rainfall. While the state

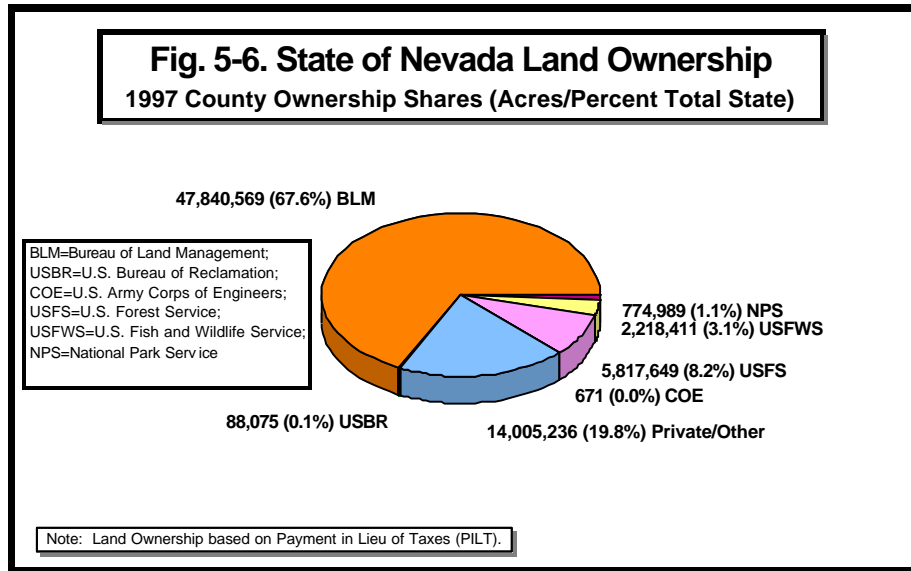
is characterized by a number of high mountain ranges, much of the precipitation driven by the jet stream and coming off the Pacific Coast is blocked by the rain shadow effect of the Sierra Nevada Mountains which lies along Nevada’s western border. Other precipitation entering the state typically comes in from the north and east, affecting the Ruby, Jarbidge, Independence, and East Humboldt mountains in Elko County in northeastern Nevada, and from wet tropical storm systems driven up from the south into Clark County and the Las Vegas area. The seasonal nature of the state’s precipitation, combined with its highly uneven nature, has required the extensive use of dams, reservoirs, lakes and diversion structures to trap the from the mountains in the spring and supply water for irrigation during the growing season and livestock and municipal purposes throughout the year. Groundwater pumping has also proven an increasingly important source of water, particularly for domestic purposes.

Of Nevada’s 70,745,600 acres of surface area, 56,740,364 acres, or over 87 percent of the state’s total area are managed and controlled by the federal government. Of these federally-managed public lands, approximately 47,840,569 acres are managed by the U.S. Bureau of Land Management (BLM); 5,817,649 acres are managed by the U.S. Forest Service (USFS); 2,218,411 acres are managed by the U.S. Fish and Wildlife Service (USFWS); 774,989 acres are managed by the National Park Service (NPS); 88,075 acres are managed by the U.S. Bureau of Reclamation (USBR); and 671 acres in Lincoln County are controlled by the U.S. Army Corps of Engineers (COE). Another 1,114,521 acres of the state lie within Indian Reservations and are held in trust by the Bureau of Indian Affairs (BIA). The state owns 264,166 acres. Relative to other states in the nation, Nevada has the highest percentage of federally-managed public lands. Figure 5–6 presents the areas and shares of the state’s total area that is owned or managed by various entities. This graph is based on the “Payment in Lieu of Tax System (PILT)” and includes only those lands specifically withdrawn for public use for which the federal government pays taxes to the state.

The U.S. Geological Survey (USGS) and the Nevada Division of Water Resources (DWR), Department of Conservation and Natural Resources, have divided the State of Nevada into discrete hydrologic units for water planning and surface and groundwater management purposes. These



have been identified as 232 hydrographic areas (256 hydrographic areas and sub-areas, combined) within 14 major hydrographic regions or basins. These fourteen hydrographic regions (basins) and their 256 hydrographic areas and sub-areas, and their relationship to Nevada’s seventeen counties are presented below and in the map which follows.



- [1] **Northwest Region** — Covers 3,052 square miles (7,905 square kilometers or 1,953,280 acres) of northern Washoe and Humboldt counties and encompasses 16 hydrographic areas; extends into the State of California to the west and the State of Oregon to the north;
- [2] **Black Rock Desert Region** — Covers 8,632 square miles (22,357 square kilometers or 5,524,480 acres) of parts of Washoe, Humboldt, and Pershing counties and includes 17 hydrographic areas, two of which are divided into separate hydrographic sub-areas; extends into the State of California to the west and the State of Oregon to the north;
- [3] **Snake River Basin** — Covers 5,230 square miles (13,546 square kilometers or 3,347,200 acres) in parts of Elko and Humboldt counties and includes eight hydrographic areas; extends into the states of Oregon and Idaho to the north and the State of Utah to the east;
- [4] **Humboldt River Basin** — Covers 16,843 square miles (43,623 square kilometers or 10,779,520 acres) in parts of eight counties — Elko, White Pine, Eureka, Humboldt, Lander, Nye, Pershing, and Churchill — and the largest river (Humboldt River) wholly contained within Nevada. This basin contains 34 hydrographic areas and one hydrographic sub-area and is one of only two that are wholly contained within the State of Nevada. It originates in the Ruby, Jarbidge, Independence, and East Humboldt Mountain ranges (Elko County) and terminates in the Humboldt Lake and Sink (Pershing and Churchill counties). During particularly wet years, the Humboldt Sink may drain into the Carson Sink by means of the Humboldt Slough;
- [5] **West Central Region** — Covers 1,656 square miles (4,289 square kilometers or 1,059,840 acres) and includes parts of Pershing, Lyon, and Churchill counties and comprises five hydrographic areas. This basin is one of only two waterbasins that are wholly contained within the State of Nevada;
- [6] **Truckee River Basin** — Encompasses 2,300 square miles (5,957 square kilometers or 1,472,000 acres) containing parts of Washoe, Pershing, Churchill, Lyon, Douglas,



Carson City, and Storey counties comprising 12 hydrographic areas; originates in the Sierra Nevada Mountains, the State of California and the Lake Tahoe Basin and terminates in Pyramid Lake (Washoe County);

- [7] **Western Region** — Covers 602 square miles (1,559 square kilometers or 385,280 acres) and is contained only in Washoe County in Nevada; contains nine hydrographic areas, one of which is divided into two sub-areas and another into one hydrographic sub-area; extends to the west into the State of California;
- [8] **Carson River Basin** — Covers 3,519 square miles (9,114 square kilometers or 2,252,160 acres) and includes parts of six counties—Douglas, Carson City, Lyon, Storey, Churchill, and Pershing; contains five hydrographic areas and one sub-area; has its origin to the west in the Sierra Nevada Mountains and the State of California and its terminus in the Carson Sink and Desert (Churchill and Pershing counties);
- [9] **Walker River Basin** — Covers 3,046 square miles (7,889 square kilometers or 1,949,440 acres) of Mineral, Lyon, and Douglas counties (and a very small portion of Churchill County) and includes five hydrographic areas, one of which has been divided into three hydrographic sub-areas; has its origin to the west in the Sierra Nevada Mountains and the State of California and its terminus in Walker Lake (Mineral County);
- [10] **Central Region** — By far the largest hydrographic region in Nevada covering 46,783 square miles (121,167 square kilometers or 29,941,120 acres) in thirteen Nevada counties—Nye, Elko, White Pine, Lincoln, Clark, Humboldt, Pershing, Churchill, Lander, Eureka, Lyon, Mineral, and Esmeralda. This region includes 78 hydrographic areas, ten of which are divided into two sub-areas and one into three sub-areas; extends to the south and west into the State of California;
- [11] **Great Salt Lake Basin** — Covers 3,807 square miles (9,860 square kilometers or 2,436,480 acres) of the easternmost portions of Elko, White Pine, and Lincoln counties; includes eight hydrographic areas, one of which is divided into four hydrographic sub-areas; extends to the east into the State of Utah;
- [12] **Escalante Desert Basin** — Covers a large area in Utah but only a very small part of it is in Lincoln County, Nevada—106 square miles (275 square kilometers or 67,480 acres). It is made up of only one hydrographic area; extends to the east into the State of Utah;
- [13] **Colorado River Basin** — Covers 12,376 square miles (32,054 square kilometers or 7,920,640 acres) including parts of Clark, Lincoln, Nye, and White Pine counties and is divided into 27 hydrographic areas; extends to the south into California, borders the Colorado River to the south and east, and extends into the states of Arizona and Utah to the east;
- [14] **Death Valley Basin** — Covers 2,593 square miles (6,716 square kilometers or 1,659,520 acres) of Nye and Esmeralda counties including eight hydrographic areas, one of which has been divided into two hydrographic sub-areas; also extends into the State of California to the south and west.

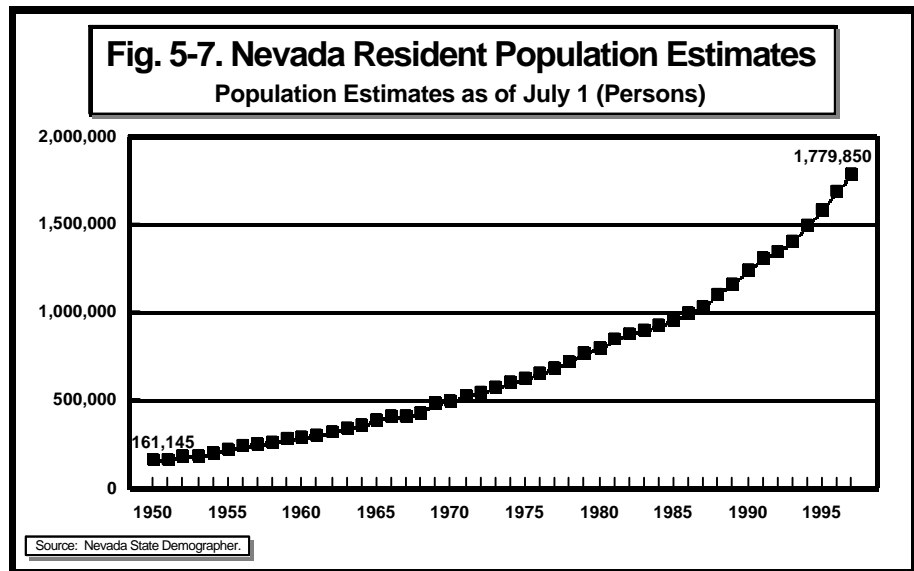
The figure, Nevada Hydrographic Regions/Basins and County Boundaries, shows the relationship between Nevada's political borders, i.e., counties, and its water basins. This information, and the relationship between the political (county) designations and the watershed boundaries becomes important as water planning shifts from a county basis, as largely presented in this water plan, to a more watershed-oriented basis.

[Placement of Figure 1.5 – 1. Nevada Hydrographic Regions/Basins and County Boundaries]

**Socioeconomic Characteristics**

**Population.** Nevada’s resident population was estimated at 1,779,850 persons on July 1, 1997, representing a population increase of 5.7 percent over the prior year and corresponding to an increase of 95,280 persons. During the years of 1990 through 1997, Nevada’s population growth averaged 5.2 percent per year. By decade, Nevada’s population has grown at an annual average rate as follows: 1950’s — 6.0 percent per year; 1960’s — 5.6 percent per year; 1970’s — 4.9 percent per year; and during the 1980’s — 4.4 percent per year (see Table 5–1). During the entire 1950–1997 time period, Nevada’s population growth has averaged a rate of growth of 5.4 percent per year. Figure 5–7 presents the trend in the state’s population estimates for 1950 through 1997. This graphs shows the more recent rapid rise in population since 1990, which corresponded to trends in Las Vegas (Clark County) and the completion of the first mega-resort casino properties — The Mirage and Excalibur.

Nevada’s total population has grown by 72.0 percent over the most recent ten-period of 1987–1997. Over this same 10-year period, the fastest growing counties in terms of population have been Elko (96.3 percent), Clark (93.3 percent), and Nye County (81.6 percent). The slowest growing counties with respect to resident population since 1987 include Eureka (11.4 percent), Mineral



(9.4 percent), Lincoln (8.4 percent) and Esmeralda County (down 5.2 percent). Other counties’ 10-year population growth rates, ranked by rate of growth, include Lyon (65.6 percent), Storey (65.3 percent), Pershing (60.6 percent), Douglas (57.9 percent), Lander (52.8 percent), Humboldt (52.5 percent), Churchill (42.8 percent), Carson City (36.3 percent), White Pine (33.0 percent), and Washoe County (29.5 percent). Figure 5–8 shows annual population growth rates for 1950 through 1997.

Table 5–1. Nevada Population Estimates — 1950–1997, shows total state and individual county decennial population estimates for the years 1950 through 1990, the latest population estimate for 1997, and annual average rates of growth for each decennial estimation period and for the period of 1990 through 1997. Population growth rates declined for the three decades after the 1950’s when growth averaged nearly 6.0 percent per year. However, by the 1990’s, with rapid growth in the state’s basic industry of gaming and tourism and the construction of mega-resort casino complexes in Las Vegas (Clark County), population growth accelerated to nearly 5.4 percent per year, a trend

that is likely to carry into the early 21<sup>st</sup> century as new mega-resort complexes continue to be constructed into the year 2000 (see Figure 5–8).

**Table 5–1. Nevada Population Estimates — 1950–1997**

**Population Estimates by County and Period Annual Average Growth (Persons)**

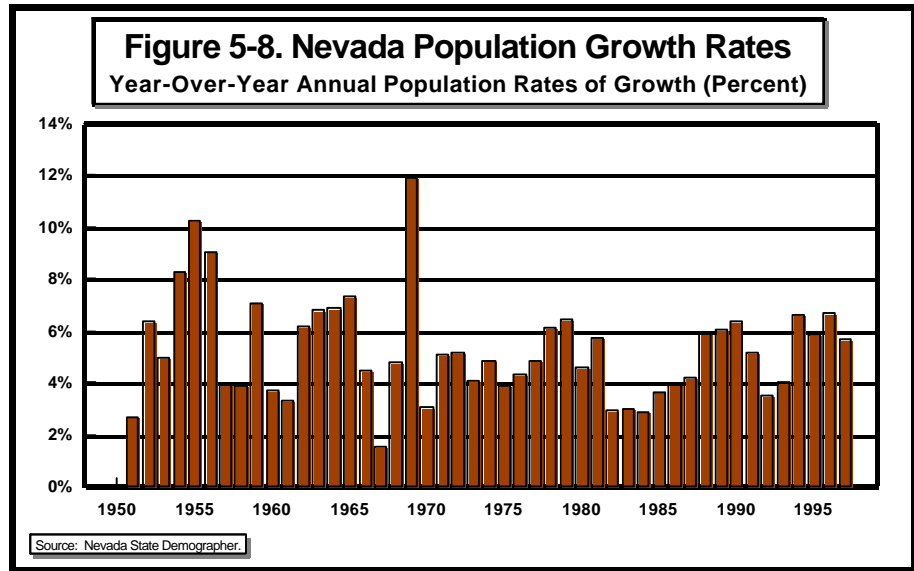
State/County	1950	1960	1970	1980	1990	1997
<b>NEVADA</b>	<b>161,145</b>	<b>287,660</b>	<b>494,990</b>	<b>800,508</b>	<b>1,236,130</b>	<b>1,779,850</b>
Annual Average Growth	—	5.97%	5.58%	4.92%	4.44%	5.35%
<b>Carson City</b>	4,198	8,020	16,054	32,022	40,950	50,410
Annual Average Growth	—	6.69%	7.19%	7.15%	2.49%	3.01%
<b>Churchill County</b>	6,188	8,505	10,650	13,917	18,100	23,860
Annual Average Growth	—	3.23%	2.27%	2.71%	2.66%	4.03%
<b>Clark County</b>	48,811	128,734	277,230	463,087	770,280	1,192,200
Annual Average Growth	—	10.18%	7.97%	5.26%	5.22%	6.44%
<b>Douglas County</b>	2,023	3,575	7,067	19,421	28,070	39,590
Annual Average Growth	—	5.86%	7.05%	10.64%	3.75%	5.04%
<b>Elko County</b>	11,703	12,051	13,946	17,269	33,770	47,710
Annual Average Growth	—	0.29%	1.47%	2.16%	6.94%	5.06%
<b>Esmeralda County</b>	611	634	623	777	1,350	1,460
Annual Average Growth	—	0.37%	-0.17%	2.23%	5.68%	1.13%
<b>Eureka County</b>	897	775	938	1,198	1,550	1,660
Annual Average Growth	—	-1.45%	1.93%	2.48%	2.61%	0.98%
<b>Humboldt County</b>	4,870	5,723	6,380	9,449	13,020	17,520
Annual Average Growth	—	1.63%	1.09%	4.01%	3.26%	4.33%
<b>Lander County</b>	1,860	1,580	2,653	4,076	6,340	7,030
Annual Average Growth	—	-1.62%	5.32%	4.39%	4.52%	1.49%
<b>Lincoln County</b>	3,850	2,378	2,526	3,732	3,810	4,110
Annual Average Growth	—	-4.70%	0.61%	3.98%	0.21%	1.09%
<b>Lyon County</b>	3,703	6,245	8,437	13,594	20,590	30,370
Annual Average Growth	—	5.37%	3.05%	4.89%	4.24%	5.71%
<b>Mineral County</b>	5,588	6,329	6,961	6,217	6,470	6,860
Annual Average Growth	—	1.25%	0.96%	-1.12%	0.40%	0.84%
<b>Nye County</b>	3,101	4,642	5,459	9,048	18,190	27,610
Annual Average Growth	—	4.12%	1.63%	5.18%	7.23%	6.14%
<b>Pershing County</b>	3,122	3,178	2,656	3,408	4,550	6,600
Annual Average Growth	—	0.18%	-1.78%	2.52%	2.93%	5.46%
<b>Storey County</b>	657	571	696	1,503	2,560	3,520
Annual Average Growth	—	-1.39%	2.00%	8.00%	5.47%	4.65%
<b>Washoe County</b>	50,484	84,988	122,574	193,623	257,120	308,700
Annual Average Growth	—	5.35%	3.73%	4.68%	2.88%	2.65%
<b>White Pine County</b>	9,479	9,732	10,140	8,167	9,410	10,640
Annual Average Growth	—	0.26%	0.41%	-2.14%	1.43%	1.77%

Note: Annual Average Growth Rates are measured from the preceding decennial population estimate.

Source Data: Nevada State Demographer.

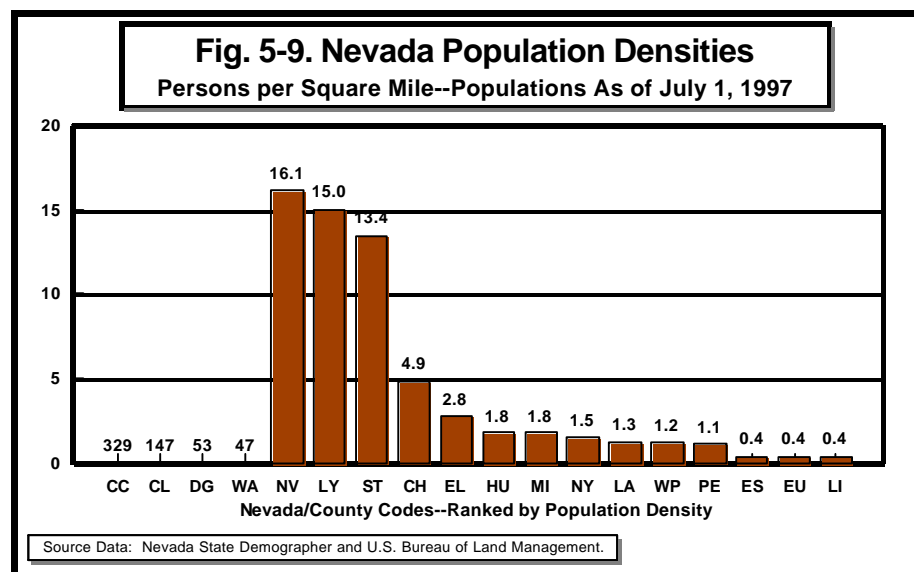
Nevada shows extreme variation in its population density among its seventeen counties. Based on

1997 populations, Nevada's average population density across all counties was approximately 16.1 persons per square mile. By county, Nevada's most populous counties in 1997 were Carson City (329 persons per square mile), Clark County (147 persons per square mile), Douglas County (53 persons per square mile), and Washoe County (47 persons per square mile). At the opposite extreme, Nevada's least populous counties were Esmeralda, Eureka, and Lincoln, all with a population density of approximately 0.4 person per square mile.



**Labor Force and Employment.** Table 5-2. Nevada Labor Force and Employment Information, presents populations, labor force information, total employment and unemployment for the years 1970 through 1997. The labor force and employment information in Table 5-2 is based on Nevada's resident population and shows only those workers residing within the state. The labor force to population ratios provide information on Nevada's labor force participation rate, an important measure in assessing that portion of the total population either employed or actively seeking employment.

Figure 5-10 presents trends in Nevada's labor force and employment over the period of 1970 through 1997 while Figure 5-11 shows the level and percent (of the labor force) of the state's unemployment for these same years.



**Table 5-2.**  
**Nevada Labor**  
**Force and**  
**Employment**  
**Information**

1970-1997 Populations, Labor Force, Employment and Unemployment

Year	Population (Persons)	Total Labor Force (Persons)	Labor Force to Population Ratio	Total Employment (Persons)	Persons Unemployed	Unemploy. Rate (S.A.)
1970	494,990	217,850	44.0%	204,600	13,250	5.9%
1971	520,000	227,950	43.8%	211,900	16,050	7.0%
1972	546,800	241,300	44.1%	224,075	17,225	7.0%
1973	569,200	260,175	45.7%	244,125	16,050	6.1%
1974	596,700	276,125	46.3%	253,900	22,225	7.8%
1975	620,000	288,300	46.5%	260,325	27,975	9.7%
1976	646,800	304,875	47.1%	277,750	27,125	8.9%
1977	678,100	333,875	49.2%	318,725	15,150	4.5%
1978	719,300	336,875	46.8%	321,775	15,100	4.4%
1979	765,300	400,000	52.3%	379,800	20,200	5.0%
1980	800,508	429,975	53.7%	402,575	27,400	6.3%
1981	846,220	463,025	54.7%	429,875	33,150	7.1%
1982	870,970	483,000	55.5%	433,975	49,025	10.2%
1983	897,160	486,000	54.2%	437,225	48,775	9.9%
1984	922,580	500,000	54.2%	457,775	42,225	7.8%
1985	955,810	521,000	54.5%	478,450	42,550	8.1%
1986	993,220	532,025	53.6%	500,000	32,025	6.0%
1987	1,035,040	557,025	53.8%	521,475	35,550	6.3%
1988	1,096,130	583,975	53.3%	554,000	29,975	5.1%
1989	1,162,340	602,000	51.8%	571,875	30,125	5.0%
1990	1,236,130	667,000	54.0%	633,125	33,875	5.0%
1991	1,299,360	693,000	53.3%	654,850	38,150	5.5%
1992	1,345,035	715,000	53.2%	667,400	47,600	6.6%
1993	1,398,840	745,975	53.3%	691,300	54,675	7.2%
1994	1,491,490	777,525	52.1%	729,700	47,825	6.1%
1995	1,579,150	804,350	50.9%	760,950	43,400	5.4%
1996	1,684,570	844,050	50.1%	798,400	45,650	5.4%
1997	1,779,850	883,225	49.6%	846,975	36,250	4.4%

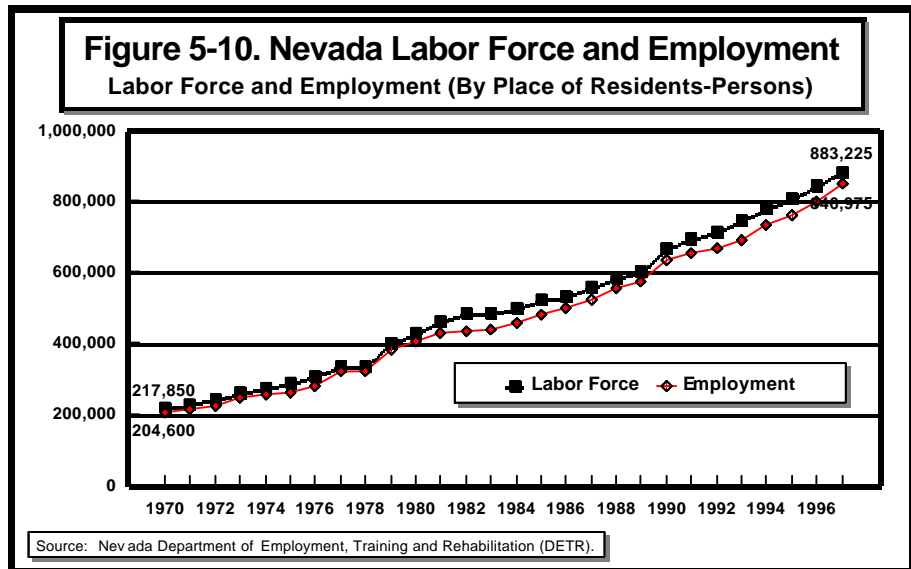
*Notes:* Population estimates are as of July 1st; labor force and employment are measures of the number of persons by place of residence and are based on census relationships.

*Source Data:* Nevada State Demographer; Nevada Department of Employment, Training and Rehabilitation (DETR), Research and Analysis Bureau.

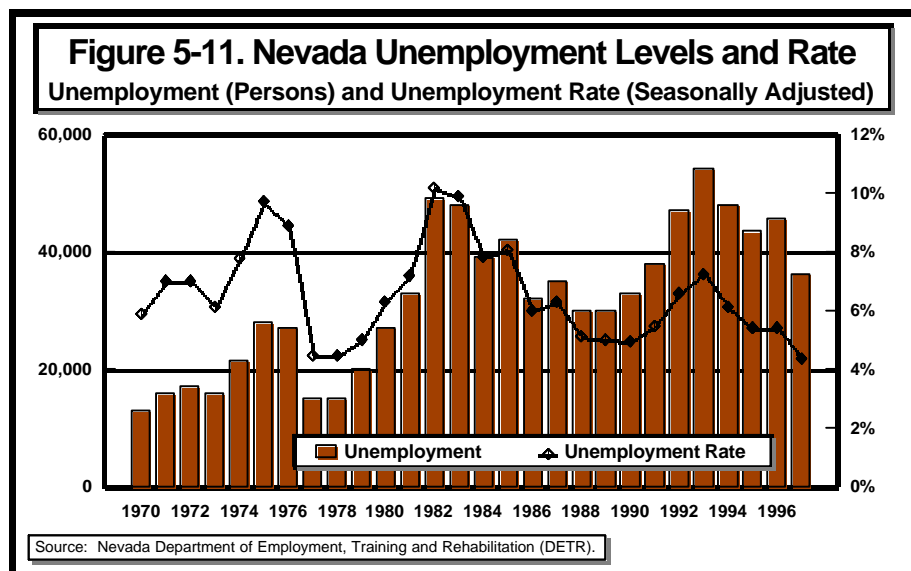
**Covered Employment and Payrolls.** Table 5-3. Nevada Covered Employment and Payrolls — 1997, presents Nevada's employment characteristics based on Nevada's 1997 total covered

employment (i.e., workers covered under state and federal unemployment insurance programs). This table shows that of Nevada’s 888,574 workers (excluding agriculture) in 1997, the 371,753 workers in the state’s service industry accounted for the greatest portion of total employment at 41.8 percent. Nevada’s 216,491 gaming industry jobs alone accounted for 24.4 percent of the state’s total jobs in 1997. The state’s service industries also accounted for the greatest percentage of total state payrolls at 38.9 percent, with gaming alone accounting for 20.4 percent of Nevada’s 1997 payrolls. (See Figure 5–12 for trends in Nevada’s total covered employment for 1980 through 1997.)

The highest average annual salary in Nevada in 1997 was in the mining industry which, at \$49,905 per worker per year, was 74.1 percent greater than the state’s average all-industry annual salary of \$28,671 per worker. The lowest average annual salary was in the state’s wholesale and retail trade industries, which, at \$21,704 per worker per year, was only 75.7 percent of Nevada’s overall average annual wage. Based on U.S. Department of Commerce, Bureau of Economic Analysis (BEA) full and part-time job classifications, the combined classification of agriculture, forestry, and fishing-related employment was estimated to comprise only approximately 1.4 percent of all jobs within Nevada in 1996 as compared to 2.1 percent of all jobs in 1970.



**Table 5-3.**  
**Nevada Covered Employment and Payrolls — 1997**  
 Covered Employment, Payrolls, and Average Annual Salaries



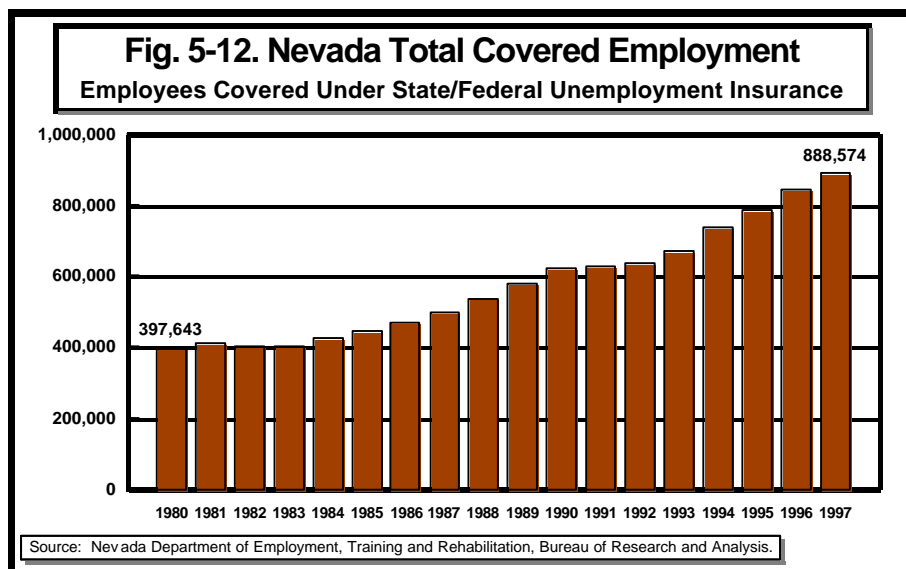


Industry Category	Employment (Persons)	Percent of Total Employment	Payrolls (Millions of Dollars)	Percent of Total Payrolls	Annual Average Salaries (Dollars)	Salary as a Percent of the County Average
<b>TOTAL STATE</b>	<b>888,574</b>	<b>n.a.</b>	<b>\$25,476.73</b>	<b>n.a.</b>	<b>\$28,671</b>	<b>100.0%</b>
Mining	14,663	1.7%	731.75	2.9%	49,905	174.1%
Construction	81,953	9.2%	2,907.04	11.4%	35,472	123.7%
Total Manufacturing	40,604	4.6%	1,342.50	5.3%	33,063	115.3%
Trans., Public Utilities	44,877	5.1%	1,459.20	5.7%	32,516	113.4%
Total Trade	180,425	20.3%	3,915.94	15.4%	21,704	75.7%
Finance, Insurance and Real Estate	40,338	4.5%	1,371.24	5.4%	33,994	118.6%
Service Industries	371,753	41.8%	9,906.98	38.9%	26,649	92.9%
Gaming-Related	216,491	24.4%	5,202.57	20.4%	24,031	83.8%
Total Government	104,255	11.7%	3,638.94	14.3%	34,904	121.7%
Federal Government	13,519	1.5%	572.76	2.2%	42,367	147.8%
State Government	24,974	2.8%	838.29	3.3%	33,566	117.1%
Local Government	65,762	7.4%	2,227.89	8.7%	33,878	118.2%

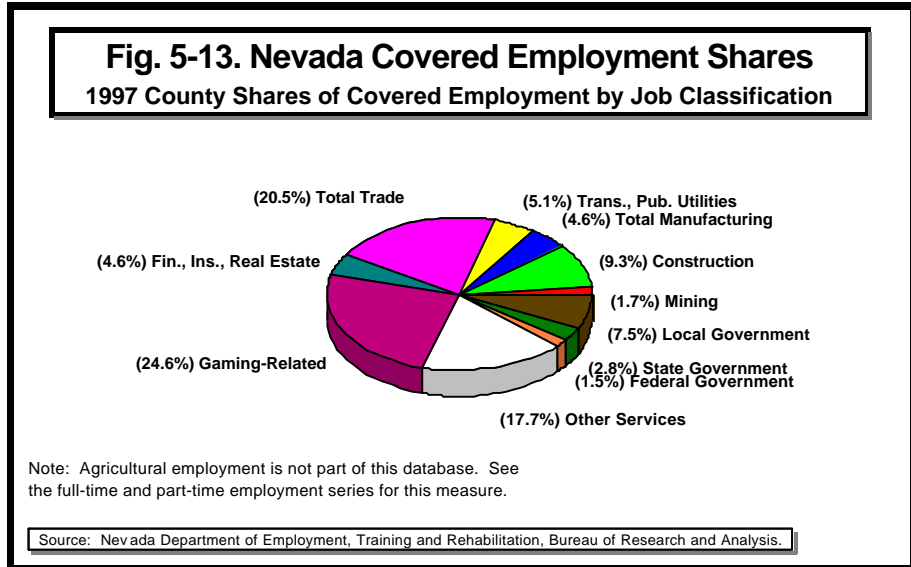
Note: Includes employees covered under state and federal unemployment insurance programs. Agricultural employment is not part of this employment series.

Source Data: Nevada Department of Employment, Training and Rehabilitation (DETR), Research and Analysis Bureau.

Of Nevada’s principal industry sectors, the state’s service industry dominates labor market and employment trends. With nearly 42 percent of all jobs in various service industries, primarily gaming related, medical and health care, and business and personal services, this industry tends to both drive and

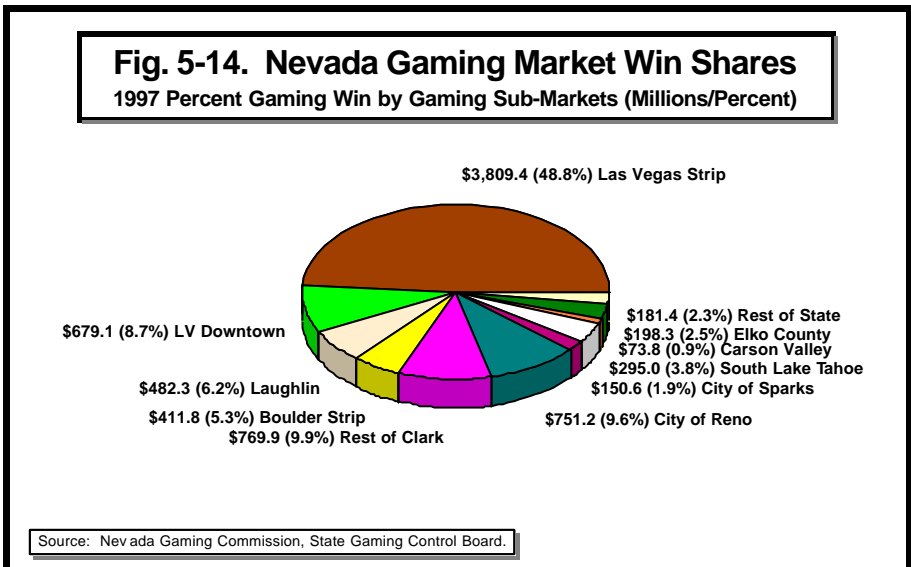


respond to employment trends in many other sectors, particularly trade, transportation and communication, finance and real estate, and state and local government sectors. Furthermore, with the services sector, one quarter of all jobs in Nevada are employed directly in gaming and related industry sectors of amusement and recreation.



**Casino Gaming.** The Nevada casino gaming industry represents a fundamental underpinning of the state’s economy both in terms of economic output and in terms of its fiscal effects on state and local government revenues. In addition, gaming also represents the state’s major “export” industry, bringing new capital (i.e., money) into the state in terms of tourism expenditures for Nevada’s gaming and tourism-related products and services. Nevada’s total casino gaming win, that is, the casinos’ “take” after payment of all winnings to players, was \$7.803 billion in 1997 and has grown at an average annual rate of approximately 9.5 percent since 1970.

Table 5–4. Nevada Casino Gaming Win — 1970–1997, shows gaming win trends for Nevada and its principal gaming markets and sub-markets. The Nevada casino gaming industry is characterized by a number of principal gaming markets, typically delineated by county or city boundaries. Figure 5–14 presents Nevada’s principal gaming markets and sub-markets and their 1997 levels of total gaming win and shares of statewide total gaming win. On a principal gaming market basis, Clark County accounted for 78.9 percent of Nevada’s total gaming win in 1997, Washoe County accounted for 12.7 percent of statewide total gaming win, and the South Lake Tahoe portion of Douglas County accounted for 3.8 percent of 1997’s total gaming win. Other



principal gaming markets in Nevada included Elko County, which accounted for 2.5 percent of the state's total gaming win in 1997, and Carson Valley, which includes Carson City and that portion of Douglas County outside the South Lake Tahoe area and accounted for slightly less than 1.0 percent of the state's total gaming win in 1997.

**Table 5–4. Nevada Casino Gaming Win — 1970–1997**  
**Total Casino Gaming Win† by Principal Gaming Market (Millions of Dollars)**

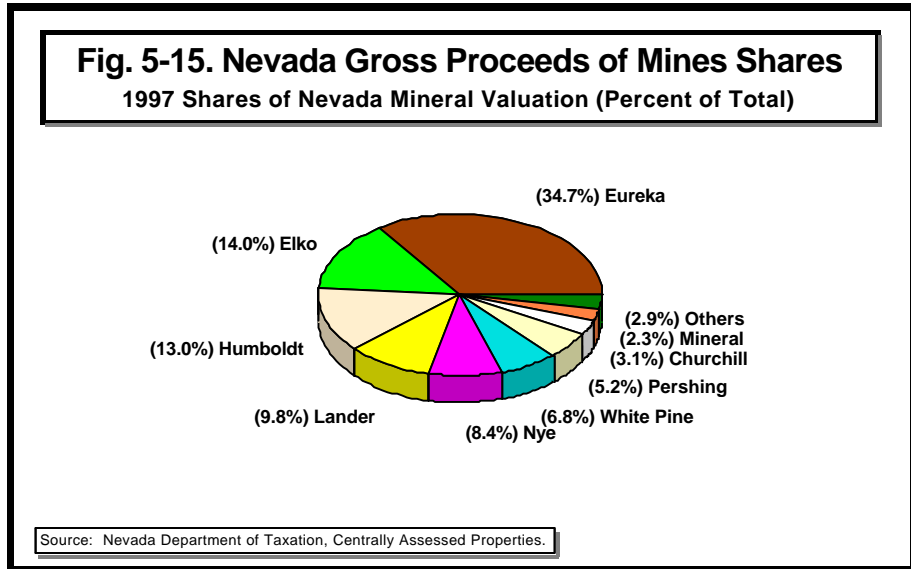
<b>Principal Gaming Market or Sub-Market</b>	<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>1997</b>	<b>1990-97 Change in Gaming Win and Share</b>	<b>1990-97 Percent Change in Gaming Win</b>
<b>TOTAL STATE</b>	<b>604.35</b>	<b>2,478.45</b>	<b>5,480.25</b>	<b>7,802.70</b>	<b>2,322.45</b>	<b>42.38%</b>
<b>Clark County[1]</b>	394.24	1,697.41	4,103.39	6,152.42	2,049.03	49.94%
Percent of Total	65.23%	68.49%	74.88%	78.85%	3.97%	
Las Vegas Strip	290.90	1,231.98	2,604.98	3,809.40	1,204.41	46.23%
Percent of Total	48.13%	49.71%	47.53%	48.82%	1.29%	
Las Vegas Downtown	91.50	348.63	676.91	679.05	2.15	0.32%
Percent of Total	15.14%	14.07%	12.35%	8.70%	-3.65%	
Laughlin	n.a.	n.a.	398.64	482.26	83.62	20.98%
Percent of Total			7.27%	6.18%	-1.09%	
Boulder Strip	n.a.	n.a.	142.14	411.79	269.64	189.70%
Percent of Total			2.59%	5.28%	2.68%	
Rest of Clark County[2]	11.84	116.80	280.72	769.93	489.21	174.27%
Percent of Total	1.96%	4.71%	5.12%	9.87%	4.75%	
<b>Washoe County[3]</b>	119.52	462.28	814.14	995.23	181.09	22.24%
Percent of Total	19.78%	18.65%	14.86%	12.75%	-2.10%	
City of Reno	91.72	362.12	628.02	751.21	123.19	19.62%
Percent of Total	15.18%	14.61%	11.46%	9.63%	-1.83%	
City of Sparks	n.a.	n.a.	104.04	150.64	46.61	44.80%
Percent of Total			1.90%	1.93%	0.03%	
<b>South Lake Tahoe[4]</b>	72.21	221.09	339.16	294.97	(44.19)	-13.03%
Percent of Total	11.95%	8.92%	6.19%	3.78%	-2.41%	
<b>Carson Valley[5]</b>	3.88	34.63	57.26	73.75	16.49	28.80%
Percent of Total	0.64%	1.40%	1.04%	0.95%	-0.10%	
<b>Elko County</b>	7.48	37.87	111.67	198.31	86.64	77.58%
Percent of Total	1.24%	1.53%	2.04%	2.54%	0.50%	
City of Wendover	n.a.	n.a.	53.39	99.83	46.44	86.99%
Percent of Total			0.97%	1.28%	0.31%	

*Notes:* Casino gaming win is equal to the “house hold,” or the amount retained by the casino after all payouts as winnings to customers. “Percent of Total” measures each gaming market’s share of Nevada’s total gaming win. Principal gaming markets are presented in bold face type; gaming “sub-markets” appear in regular type. The Clark County (Las Vegas) casino gaming market consists of a number of sub-markets, the most important being the Las Vegas Strip. Others sub-markets include Las Vegas Downtown, Laughlin, Boulder Strip and the “Rest of Clark County,” consisting of off-Strip properties and casinos in North Las Vegas. Carson Valley casinos include those in Carson City and Douglas County, excluding the South Lake Tahoe properties. n.a. = Gaming win data not available for these time periods.

Source Data: Nevada Gaming Commission, State Gaming Control Board.

Nevada’s gaming markets are further subdivided into distinct gaming areas or sub-markets, typically based on a city or defined geographic area basis. These principal sub-markets include the Las Vegas Strip (comprising 48.8 percent of Nevada’s total gaming win in 1997), Las Vegas Downtown (comprising

8.7 percent of the state’s total gaming win), Laughlin (comprising 6.2 percent of statewide gaming win), Boulder Strip (comprising 5.3 percent of statewide gaming win), the city of Reno (comprising 9.6 percent of total gaming win), the city of Sparks (comprising 1.9 percent of total gaming win), and the city of Wendover in Elko County (comprising 1.3 percent of statewide total gaming win).



**Mining.** Table 5–5. Nevada Mining Industry Analysis — 1985–1997, presents information and trends with respect to the total valuation of minerals produced, the number of mining workers, and the productivity of mining workers for Nevada’s counties principally involved in mining activities. With the exception of White Pine County, which produces gold, silver and copper, the principal output of these counties’ mines is gold, with silver being a by-product. The rapid and relatively recent growth in gold mining in Nevada is clearly reflected by the trends between 1985 and 1990 (see Figure 5–3). Since that time, production has typically shown more modest gains and in some cases actually shown retrenchment in total production (e.g., Eureka and Humboldt counties).

Since the state became a territory in 1861, mining has and continues to play a crucial role in terms of the socioeconomic characteristics and trends of Nevada’s more rural counties. Today, Nevada represents the largest gold producer in the United States with \$2.671 billion in total gold production in 1997. The total value of all mining activity in the state in 1997 came to \$3.118 billion, up slightly over 1996’s total mineral production of \$3.110 billion. Five Nevada counties — Eureka County (accounting for 34.7 percent of total mineral production in 1997), Elko County (14.0 percent of total production), Humboldt County (13.0 percent of total production), Lander County (9.8 percent of total production), and Nye County (8.4 percent of total production) — accounted for 79.9 percent of the state’s 1997 total proceeds of mines (see Figure 5–15 for shares of mining proceeds for Nevada’s major producing counties).

**Table 5–5. Nevada Mining Industry Analysis — 1985–1997**

**Gross Mineral Proceeds, Workers, Productivity of Nevada’s Principal Mining Counties  
(Proceeds in Millions of Dollars; Productivity in Dollars per Worker per Year)**

<b>Mining County</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>1997</b>	<b>1990-97 Volume Change</b>	<b>1990-97 Percent Change</b>
<b>NEVADA</b>						
Gross Mining Proceeds[1]	\$623.63	\$2,635.47	\$2,991.62	\$3,118.09	\$482.61	18.31%
Number Mining Workers	6,081	14,321	13,187	14,663	342	2.39%
Mining Worker Productivity[3]	\$102,554	\$184,029	\$226,862	\$212,650	\$28,621	15.55%
<b>Elko County</b>						
Gross Mining Proceeds	\$102.35	\$238.43	\$183.47	\$436.31	\$197.88	82.99%
Number Mining Workers	774	1,289	1,295	1,427	138	10.71%
Mining Worker Productivity	\$132,235	\$184,970	\$141,674	\$305,751	\$120,780	65.30%
<b>Eureka County</b>						
Gross Mining Proceeds	\$114.88	\$789.73	\$1,412.68	\$1,081.39	\$291.66	36.93%
Number Mining Workers	636	3,599	3,927	4,270	671	18.64%
Mining Worker Productivity	\$180,633	\$219,432	\$359,735	\$253,254	\$33,822	15.41%
<b>Humboldt County</b>						
Gross Mining Proceeds	\$31.94	\$356.96	\$441.82	\$405.24	\$48.28	13.52%
Number Mining Workers	393	1,527	2,305	2,451	924	60.51%
Mining Worker Productivity	\$81,272	\$233,768	\$191,681	\$165,338	(\$68,431)	-29.27%
<b>Lander County</b>						
Gross Mining Proceeds	\$96.22	\$276.03	\$279.94	\$304.58	\$28.55	10.34%
Number Mining Workers	845	1,360	1,082	1,290	(70)	-5.15%
Mining Worker Productivity	\$113,869	\$202,961	\$258,726	\$236,110	\$33,149	16.33%
<b>Nye County</b>						
Gross Mining Proceeds	\$140.04	\$500.41	\$229.55	\$260.90	(\$239.52)	-47.86%
Number Mining Workers	884	1,949	1,296	1,363	(586)	-30.07%
Mining Worker Productivity	\$158,420	\$256,754	\$177,120	\$191,413	(\$65,341)	-25.45%
<b>Pershing County</b>						
Gross Mining Proceeds	\$16.12	\$96.90	\$111.60	\$163.04	\$66.15	68.27%
Number Mining Workers	195	683	682	861	178	26.06%
Mining Worker Productivity	82,688	141,869	163,639	189,367	47,498	33.48%
<b>White Pine County</b>						
Gross Mining Proceeds	\$22.16	\$98.04	\$60.87	\$210.65	\$112.61	114.86%
Number Mining Workers	412	886	615	767	(119)	-13.43%
Mining Worker Productivity	\$53,783	\$110,653	\$98,980	\$274,636	\$163,982	148.19%

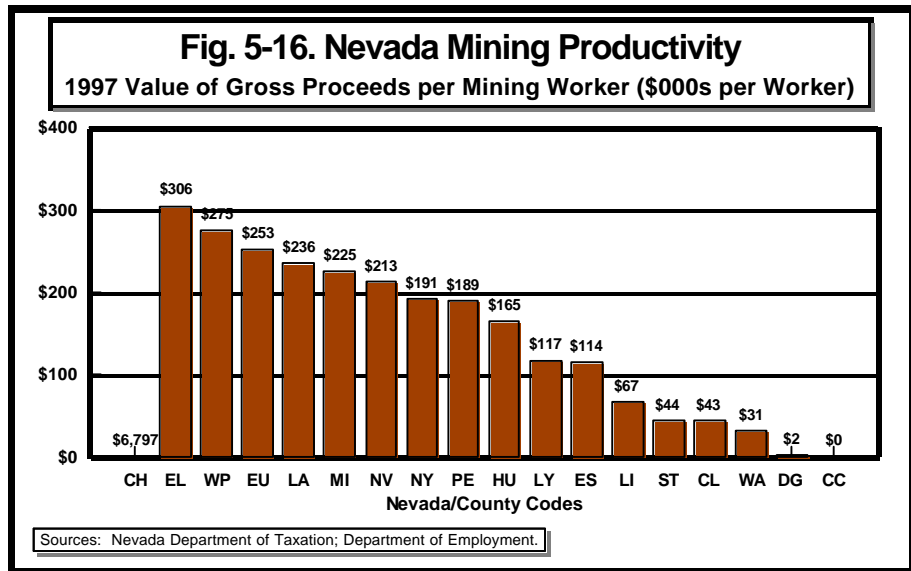
[1] Gross mining proceeds measures the market valuation of mineral sales made by the Nevada mining industry.

[2] Mining worker productivity measures the total state or county gross mining proceeds divided by the respective mining employment; measured in dollars per mining worker per year.

Source Data: Nevada Department of Taxation, Centrally Assessed Properties, Division of Assessment Standards.

In 1997 Nevada mines employed 14,663 workers, accounting for 1.7 percent of the state’s total employment. The Nevada mining industry paid \$731.75 million in total payrolls, accounting for 2.9 percent of the state’s total payrolls. Mining jobs averaged \$49,905 in annual wages per worker, 74.1 percent greater than the state’s all-industry average payroll of \$28,671 per worker. On average, the mining worker in Nevada produced \$212,650 in gross proceeds in 1997, effectively covering the average mining wage by 4.26 times. In Eureka County’s gold mines, the average worker produced

\$253,254 in gross proceeds in 1997, covering the average mining wage in that county by 4.80 times. Figures of mining productivity provide good measures of the viability of future mining operations with higher productivity measures also providing higher returns to producers (see Figure 5-16 for relative levels of mining worker productivity measures).

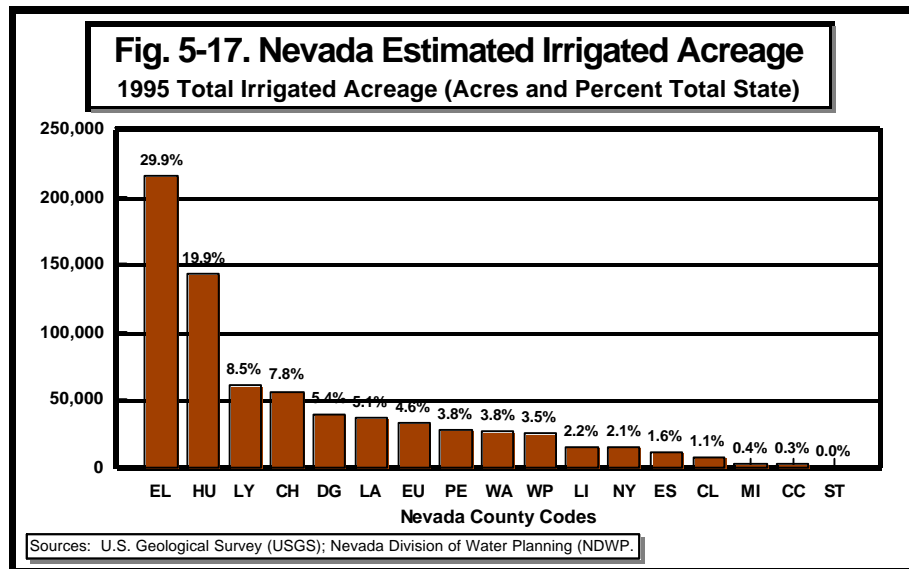


While mining’s impact to the major population centers is slight, a number of rural counties are critically dependent on the health of this industry sector and it will continue to be a primary driving force for those counties’ socioeconomic conditions and trends.

**Agriculture.** Agriculture represents one of Nevada’s oldest and longest-lasting economic activities. While mining may have been responsible for the early influx of emigrants through and into Nevada between 1850-1880, as well as bringing the State of Nevada into the Union in 1864, it was agriculture that remained after the original Comstock Lode’s demise in the 1870’s and 1880’s. It was also agriculture that persevered during Nevada’s depression of 1880-1900 when the state lost nearly one-third of its population. Agriculture in Nevada continued to survive and even prosper when later mining efforts in the state went through boom and bust cycles during the early 1990’s. Today, agriculture remains a fundamental socioeconomic underpinning for a number of rural Nevada counties and, no doubt, will remain an integral part of these counties’ economies irrespective of current or future mining trends.

Figure 5-17 shows the county shares of the state’s total irrigated acreage, which was estimated at 715,439 acres in 1995.

Table 5-6. Nevada Agricultural Statistics — 1974-1995, shows key agriculture statistics for all Nevada’s counties. It appears that agriculture, in terms of total irrigated



acreage, peaked in the state during the late 1970's or early 1980's. There has also been a more recent trend towards a strong statewide decline in on-farm workers and stronger growth to employment in related agricultural areas, primarily agricultural service workers, most typically representing the landscaping and lawn care service industries in the more urbanized areas of the state. On a statewide basis, workers involved in farm activities declined from 4,570 workers in 1974 to 3,962 workers by 1995 while workers in agricultural-related activities increased from 1,325 workers in 1974 to 9,180 workers by 1995.

**Table 5–6. Nevada Agricultural Statistics — 1974–1995**  
**Irrigated Acreage, Farm Marketings and Farm-Related Employment**

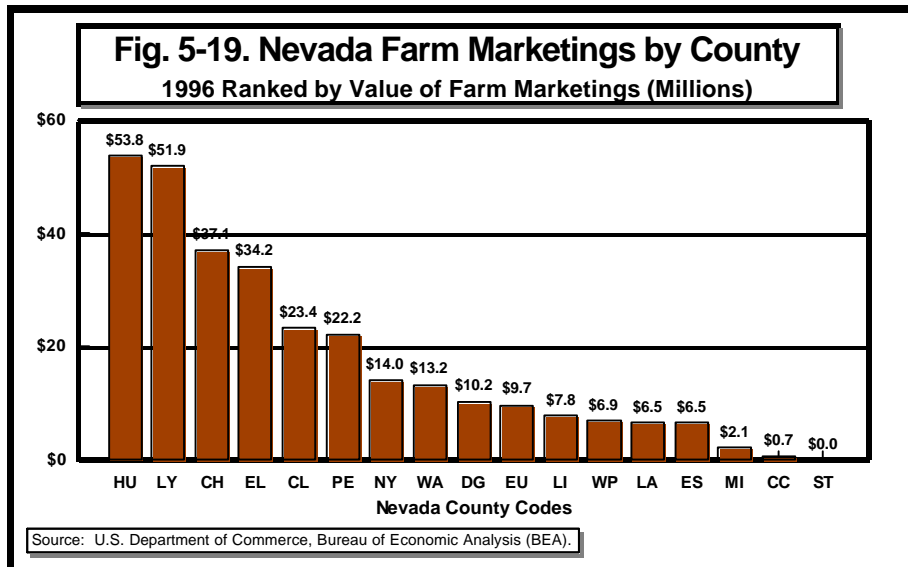
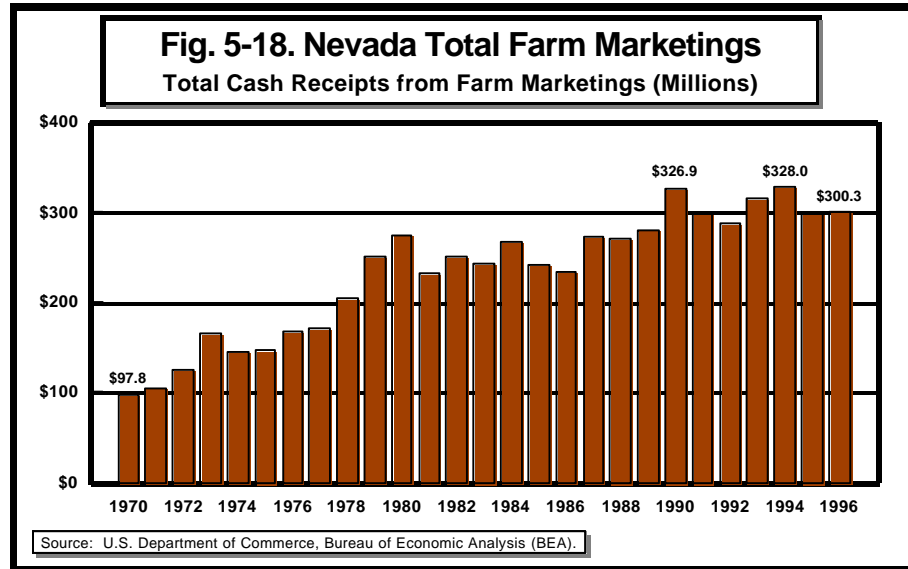
NEVADA	1974	1978	1982	1987	1990	1995
Irrigated Acres	777,510	881,151	829,761	773,588	728,350	715,439
Farm Marketings (\$000s)	\$145,458	\$204,047	\$250,610	\$271,904	\$326,889	\$298,085
Farm Workers	4,570	5,639	5,140	5,628	5,260	3,962
Agric. Services Workers	1,325	2,089	2,723	4,405	6,227	9,180

*Source Data:* Irrigated acreage figures for 1974, 1978, 1982 and 1987 are from the Bureau of the Census, Agriculture Division; irrigated acreage figures for 1990 are estimates from the U.S. Geological Survey (USGS); irrigated acreage for 1995 are derived from estimates made by the Nevada Division of Water Planning (NDWP). Farm marketings, number of farm and agricultural service workers are from U.S. Department of Commerce, Bureau of Economic Analysis (BEA), Regional Economic Information Service (REIS). Agricultural Services Workers include workers in agricultural services, which is primarily landscaping and lawn care, as well as jobs in the forestry and fisheries areas.

With rising prices for agricultural produce, it appears that the value of Nevada's farm marketings peaked in the early 1990's, considerably later than the peak in reported acreage under irrigation (see Table 5–6 and Figure 5–18). Figure 5–19 shows the value of farm marketings ranked by county. In comparing these figures with the ranking of county irrigated acreage in Figure 5–17, we may see that while Elko County accounted for nearly 30 percent of the state's total irrigated acreage in 1996, it accounts for \$34.2 million, or 11.4 percent, of the state's total farm marketings. On the other hand, Lyon County, which accounted for only 8.5 percent of statewide irrigated acreage in 1996, made up \$51.9 million, or 17.3 percent of total farm marketings. The differences between shares of irrigated acreage and shares of farm marketings are best explained by the nature of the crops, with lower producing counties emphasizing forage crops like alfalfa, and other counties producing higher-valued crops (potatoes, onions, garlic, etc.).

In viewing the individual county figures, which are presented in Appendix 4 of the Appendices, particularly with respect to the amount of irrigated acreage, there also appears wide fluctuations in these levels of irrigated acreage indicating either highly volatile irrigation and crop production cycles based on water available for irrigation or, also very likely, fundamental problems in reporting and gathering accurate data on this industry sector.

The volatility in historical measures of this industry, particularly with respect to irrigated acreage, related water usage rates and livestock figures, makes forecasting irrigation and livestock water use especially difficult. However, there does appear to be a trend towards no new agricultural lands being brought under cultivation and in some counties, e.g., Carson City, Churchill, Douglas, and Washoe in particular, it appears that encroaching urbanization and the transfer of water rights to other uses, i.e., municipal and industrial, is causing the level of irrigated lands to actually decline. Given new and growing demands for limited water resources in the state, particularly for municipal use, wildlife protection and fishery restoration, instream flows and recreation, the future of agriculture in Nevada becomes especially uncertain.





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## Nevada Division of Water Planning

# Nevada State Water Plan

## PART 1 — BACKGROUND AND RESOURCE ASSESSMENT

### Section 6

# Glossary of Terminology

[Source: Nevada Division of Water Planning's *Water Words Dictionary*. Words presented in italics and the referenced appendices may be found in that source. Words and definitions included in this glossary which explain or summarize elements of existing water law are not intended to change that law in any way.]

**(Prior) Appropriation Doctrine** — The system for allocating water to private individuals used in the western United States under which (1) the right to water was acquired by diverting water and applying it to a beneficial use and (2) a right to water acquired earlier in time is superior to a similar right acquired later in time. In most states water rights are not now acquired by diverting water and applying it to a beneficial use. Such a system is referred to as the constitutional method of appropriation. Water rights are acquired by application, permit, and license, which may not require diversion and application to a beneficial use. Superiority of right is based on earliest in time and has no reference to whether two rights are for a similar use. The doctrine of *Prior Appropriation* was in common use throughout the arid west as early settlers and miners began to develop the land. The prior appropriation doctrine is based on the concept of "*First in Time, First in Right*." The first person to take a quantity of water and put it to *Beneficial Use* has a higher priority of right than a subsequent user. Under drought conditions, higher priority users are satisfied before junior users receive water. Appropriative rights can be lost through nonuse; they can also be sold or transferred apart from the land. Contrast with *Riparian Water Rights*.

**Appropriative Water Right [Nevada]** — Nevada's water law is based on statutes enacted in 1903 and 1905 and are founded on the principal of *Prior Appropriation*. Unlike some other states, Nevada has a statewide system for the administration of both ground water and surface water. Appropriative water rights are based on the concept of applying water to *Beneficial Use* and "*First in Time, First in Right*." Appropriative water rights can be lost through nonuse and they may be sold or transferred apart from the land. Due in large part to the relative scarcity of water in Nevada and numerous competing uses, Nevada has had a thriving market for water transfers for a number of years. A person in Nevada who desires to place water to beneficial use must file an application with the State Engineer to initiate the process of acquiring an appropriative water right. Also see *Riparian Water Rights*, *Prescribed Water Rights*, and *Reserved Water Rights (Federal)*.

**Beneficial Use (of Water)** — (1) The amount of water necessary when reasonable intelligence and diligence are used for a stated purpose. (2) A use of water resulting in appreciable gain or benefit to the user, consistent with state law, which varies from one state to another. Most states recognize the following uses as beneficial:

- [1] domestic and municipal uses;
- [2] industrial uses;
- [3] irrigation;
- [4] mining;
- [5] hydroelectric power;
- [6] navigation;
- [7] recreation;
- [8] stock raising;
- [9] public parks;
- [10] wildlife and game preserves.

(2) The cardinal principle of the *(Prior) Appropriation Doctrine*. A use of water that is, in general, productive of public benefit, and which promotes the peace, health, safety and welfare of the people of the State. A certificated

water right is obtained by putting water to a beneficial use. The right may be lost if beneficial use is discontinued. A beneficial use of water is a use which is of benefit to the appropriator and to society as well. The term encompasses considerations of social and economic value and efficiency of use. In the past, most reasonably efficient uses of water for economic purposes have been considered beneficial. Usually, challenges have only been raised to wasteful use or use for some non-economic purpose, such as preserving instream values. Recent statutes in some states have expressly made the use of water for recreation, fish and wildlife purposes, or preservation of the environment a beneficial use. Also see *Appropriative Water Rights*.

**Biodiversity** — Refers to the variety and variability of life, including the complex relationships among microorganisms, insects, animals, and plants that decompose waste, cycle nutrients, and create the air that we breathe. Diversity can be defined as the number of different items and their relative frequencies. For biological diversity, these items are organized at many levels, ranging from complete *Ecosystems* to the biochemical structures that are the molecular basis of heredity.

**Clean Water Act (CWA) [Public Law 92–500]** — More formally referred to as the *Federal Water Pollution Control Act*, the Clean Water Act constitutes the basic federal water pollution control statute for the United States. Originally based on the *Water Quality Act* of 1965 which began setting water quality standards. The 1966 amendments to this act increased federal government funding for sewage treatment plants. Additional 1972 amendments established a goal of zero toxic discharges and “fishable” and “swimmable” surface waters. Enforceable provisions of the CWA include technology-based effluent standards for point sources of pollution, a state-run control program for nonpoint pollution sources, a construction grants program to build or upgrade municipal sewage treatment plants, a regulatory system for spills of oil and other hazardous wastes, and a *Wetlands* preservation program (Section 404).

**Clean Water Act (CWA), Section 319** — A federal grant program added by Congress to the CWA in 1987 and managed by the *U.S. Environmental Protection Agency (EPA)*, Section 319 is specifically designed to develop and implement state *Nonpoint Source (NPS) Pollution* management programs, and to maximize the focus of such programs on a watershed or waterbasin basis with each state. Today, all 50 states and U.S. territories receive Section 319 grant funds and are encouraged to use the funding to conduct nonpoint source assessments and revise and strengthen their nonpoint source management programs. Before a grant is provided under Section 319, states are required to: (1) complete a Nonpoint Source (NPS) Assessment Report identifying state waters that require nonpoint source control and their pollution sources; and (2) develop Nonpoint Source Management Programs that outline four-year strategies to address these identified sources.

**Clean Water Standards (EPA)** — Generally refers to any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the *Federal Water Pollution Control Act (Clean Water Act) [Public Law 92–500]* or contained in a permit issued to a discharger by the *U.S. Environmental Protection Agency (EPA)* or by a state under an approved program, as authorized by Section 402 of the Clean Water Act, or by local governments to ensure compliance with pretreatment regulations as required by Section 307 of the Clean Water Act.

**Designated Groundwater Basin [Nevada]** — In the interest of public welfare, the Nevada State Engineer, *Division of Water Resources, Department of Conservation and Natural Resources*, is authorized by statute (Nevada Revised Statute 534.120) and directed to designate a ground water basin and declare *Preferred Uses* within such designated basin. The State Engineer has additional authority in the administration of the water resources within a designated ground water basin. [A listing of Nevada’s Hydrographic Regions, and designated Areas and Sub-Areas is presented in the NDWP’s *Water Words Dictionary* in Appendix A–1 (hydrographic regions, areas and sub-areas), Appendix A–2 (listed sequentially by area number) Appendix A–3 (listed alphabetically by area name), and Appendix A–4 (listed alphabetically by principal Nevada county(ies) in which located).]

**Drought** — There is no universally accepted quantitative definition of drought. Generally, the term is applied to periods of less than average or normal precipitation over a certain period of time sufficiently prolonged to cause a serious hydrological imbalance resulting in biological losses (impact flora and fauna ecosystems) and/or economic losses (affecting man). In a less precise sense, it can also signify nature’s failure to fulfill the water wants and needs of man.

**Ecosystem** — A community of animals, plants, and bacteria, and its interrelated physical and chemical environment.

An ecosystem can be as small as a rotting log or a puddle of water, but current management efforts typically focus on larger landscape units, such as a mountain range, a river basin, or a watershed. Also see *Biodiversity*.

**Ecosystem Management** — (Environmental) An approach to managing the nation’s lands and natural resources which recognizes that plant and animal communities are interdependent and interact with their physical environment (i.e., soil, water, and air) to form distinct ecological units called *Ecosystems*. The fact that these ecosystems span jurisdictional and political boundaries necessitates a more comprehensive and unified approach to managing them. Implementing the initial stage of a government-wide approach to ecosystem management typically requires clarifying the policy goals and undertaking certain practical steps to apply the principles being considered to include:

- [1] Delineating the ecosystem;
- [2] Understanding the system(s) ecologies;
- [3] Making management choices;
- [4] Unifying disparate data and information needs and sources; and
- [5] Adapting management on the basis of new information.

**Endangered Species** — Any plant or animal species threatened with extinction by man-made or natural changes throughout all or a significant area of its range; identified by the Secretary of the Interior as “endangered”, in accordance with the 1973 *Endangered Species Act (ESA)*, below. [See Appendix D–1, Nevada’s Endangered and Threatened Species.]

**Endangered Species Act (ESA)** — An act passed by Congress in 1973 intended to protect species and subspecies of plants and animals that are of “aesthetic, ecological, educational, historical, recreational and scientific value.” It may also protect the listed species’ “critical habitat”, the geographic area occupied by, or essential to, the protected species. The *U.S. Fish and Wildlife Service (USFWS)* and the *National Marine Fisheries Service (NMFS)* share authority to list endangered species, determine critical habitat and develop recovery plans for listed species. Currently, approximately 830 animals and 270 plants are listed as endangered or threatened nationwide at Title 50, Part 17, sections 11 and 12 of the Code of Federal Regulations. Further, under a settlement with environmental groups, USFWS has agreed to propose listing another 400 species over the next few years. The 1973 Endangered Species Act superseded and strengthened the *Endangered Species Preservation Act* of 1966 and the *Endangered Species Conservation Act* of 1969. The 1973 provisions required that the act be re-authorized by Congress every five years.

**“First in Time, First in Right”** — A phrase indicating that older water rights have priority over more recent rights if there is not enough water to satisfy all rights. See (*Prior Appropriation Doctrine* and *Appropriative Water Rights*).

**Gage, or Gauge** — (1) An instrument used to measure magnitude or position; gages may be used to measure the elevation of a water surface, the velocity of flowing water, the pressure of water, the amount of intensity of precipitation, the depth of snowfall, etc. (2) The act or operation of registering or measuring magnitude or position. (3) The operation, including both field and office work, of measuring the discharge of a stream of water in a waterway.

**Great Basin [Nevada]** — An area covering most of Nevada and much of western Utah and portions of southern Oregon and southeastern California consisting primarily of arid, high elevation, desert valleys, sinks (playas), dry lake beds, and salt flats. The Great Basin is characterized by the fact that all surface waters drain *inward* to terminal lakes or sinks. Principal excluded regions within Nevada include the extreme north-central portion of the state whose waters drain northward into the Snake River Basin, thence to the Columbia River and finally to the Pacific Ocean, and the south-eastern portion of Nevada whose surface waters drain into the Colorado River Basin, thence to the Gulf of California (Mexico) and the Pacific Ocean. Within this area referred to as the Great Basin, major river drainage areas include:

- [1] **Truckee River**, whose source is Lake Tahoe (Basin) and whose terminus is Pyramid Lake in western Nevada;
- [2] **Carson River**, whose west and east forks originate along the eastern slopes of the Sierra Nevada Mountains and whose terminus is the Carson Sink (Playa) in west-central Nevada;
- [3] **Walker River**, whose west and east fork tributaries also originate along the eastern slopes of the Sierra Nevada Mountains and whose terminus is Walker Lake in western Nevada; and

[4] **Humboldt River**, the only major river wholly contained in Nevada, whose principal source is the Ruby Mountains in eastern Nevada and whose terminus is the Carson Sink (Playa) in west-central Nevada. Pyramid Lake and Walker Lake in western Nevada represent the remnants of the ancient *Lake Lahontan*, an *Ice Age* lake that covered a considerable portion of northwestern Nevada during the Pluvial Period of some 75,000–10,000 years ago. The Great Salt Lake in western Utah, the last major remnant of the ancient Ice Age Lake Bonneville, which covered a large portion of what is now the Utah portion of the Great Basin, is also contained within this area and acts as the terminus for surface water drainage from the western slopes of the Wasatch Range in north-central Utah.

**Ground Water, also Groundwater** — (1) Generally, all subsurface water as distinct from *Surface Water*; specifically, the part that is in the saturated zone of a defined aquifer. (2) Water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper level of the saturate zone is called the Water Table. (3) Water stored underground in rock crevices and in the pores of geologic materials that make up the earth's crust. Ground water lies under the surface in the ground's *Zone of Saturation*, and is also referred to as *Phreatic Water*.

**Integrated (Water) Resource Planning (IRP)** — A comprehensive, interdisciplinary approach to water resource planning that encompasses water resource assessment, demand considerations, analysis of alternatives, risk management, resource diversity, environmental considerations, least-cost analysis, multidimensional modeling, and participatory decision making and public input, among other factors. Integrated Resource Planning begins with specific policy objectives that are applied to extensive lists of options for water supply sources, distribution systems, or other operational requirements. The options are then narrowed after evaluating demand requirements, environmental impacts, conservation options, costs, risks, and other aspects of a project. IRP involves a dynamic process of assessing demand and supply conditions and creatively integrating alternatives and new technologies. While the concepts of IRP are relatively new to the process of water planning, it has been used extensively in the energy industry. As a planning process it helps decision makers select the best mix of water resources, facilities, and conservation measures to meet water demands. In addition to traditional planning techniques, IRP also

- [1] Includes extensive public involvement;
- [2] Considers both supply-side (resources and facilities) and demand-side (conservation) alternatives as ways of meeting demands;
- [3] Considers goals and objectives in addition to dollar costs (e.g., environmental concerns, public acceptability, etc.);
- [4] Considers uncertainty in demand forecasts, regulations, etc.; and
- [5] Considers the effect of water rates on water demands.

**Interbasin Transfer (of Water)** — A transfer of water rights and/or a diversion of water (either groundwater or surface water) from one *Drainage or Hydrographic Basin* to another, typically from the basin of origin to a different hydrologic basis. Also referred to as *Water Exports* and/or *Water Imports*.

**Interstate Allocation [Nevada and California]** — An agreement between the states of Nevada and California over the use of the waters of Lake Tahoe and the Truckee, Carson, and Walker rivers which was ratified by California (1970) and Nevada (1971), but was never ratified by Congress. Despite this, both states have enacted legislation to enforce to the allocation of the Truckee, Carson, and Walker rivers between these two states. Subsequently, in 1990 many of the compact's provisions dealing with the waters of Lake Tahoe and the Truckee and Carson rivers became formalized under *Public Law 101–618* (the *Negotiated Settlement*).

**Interstate Water Compact** — (1) Broadly, an agreement between two or more states regarding competing demands for a water resource which are beyond the legal authority of one state alone to solve. (2) States administer water rights within their own political boundaries; however, the process becomes more complicated when involving an interstate body of water (*Interstate Water*). Under these conditions there are three possible ways to achieve an interstate allocation of water: (1) A suit for equitable apportionment brought by the states in the U.S. Supreme Court; (2) a Congressional act; and (3) an interstate compact. An interstate compact is an agreement negotiated between states, adopted by their state legislatures, and then approved by Congress. Once an allocation of interstate water is determined by such a means, the individual states may then issue water rights to its share of the water through their normal administrative process. Interstate compacts have been traditionally used in making water allocations in the western states. Also see *Interstate Allocation [Nevada and California]*.

**Interstate Waters** — According to law, interstate waters are defined as: (1) rivers, lakes and other waters that flow across or form a part of state or international boundaries; (2) waters of the Great Lakes; and (3) coastal waters

whose scope has been defined to include ocean waters seaward to the territorial limits and waters along the coastline (including inland streams) influenced by the tide.

**Intrabasin Transfer (of Water)** — Transfers of water within the same water basin or hydrographic area.

**Junior (Water) Rights** — A junior water rights holder is one who holds rights that are temporarily more recent than senior rights holders. All water rights are defined in relation to other users, and a water rights holder only acquires the right to use a specific quantity of water under specified conditions. Therefore, when limited water is available, junior rights are not met until all senior rights have been satisfied. See *Prior Appropriation Doctrine*.

**National Economic Development** — One of the two main objectives of planning for water and related land resources by governmental agencies whose activities involve planning and development of water resources. Such activities are reflected in the increase in the nation's productive output, an output which is partly reflected in a national product and income accounting framework to measure the continuing flow of goods and services into direct consumption or investment.

**National Environmental Policy Act (NEPA)** — A 1970 Act of Congress that requires all federal agencies to incorporate environmental considerations into their decision-making processes. The act requires an *Environmental Impact Statement (EIS)* for any "major federal action significantly affecting the quality of the human environment."

**National Flood Insurance Program (NFIP)** — A federal program enabling property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government that if a community will implement and enforce measures to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHA), then the federal government will make flood insurance available to protect against flood losses that do occur. The NFIP was established by Congress through the passage of the National Flood Insurance Act of 1968. Features of the program were modified and extended with the 1973 passage of the Flood Disaster Protection Act, and other legislative measures. The NFIP is administered by the Federal Insurance Administration (FIA), which is a component part of the *Federal Emergency Management Agency (FEMA)*.

**Navigable Waters [Nevada]** — In Nevada bodies of water are navigable if they are used, or are susceptible of being used, in their ordinary condition as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water. In Nevada, this test of navigability (*State of Nevada v. Julius Bunkowski, et al.*, 1972) held that the Carson River was navigable, and therefore the State of Nevada owned its bed, as logs were floated down the river from about 1860 to 1895 (the commerce requirement).

**Perennial Yield (Ground Water)** — The amount of usable water of a ground water reservoir that can be withdrawn and consumed economically each year for an indefinite period of time. It cannot exceed the sum of the *Natural Recharge*, the *Artificial (or Induced) Recharge*, and the *Incidental Recharge* without causing depletion of the groundwater reservoir. Also referred to as *Safe Yield*.

**Perfected Water Right** — (1) A completed or fully executed water right. A water right is said to have been perfected when all terms and conditions associated with it have been fully accomplished, e.g., the diversion has been effected and the water applied to beneficial use. (2) A water right to which the owner has applied for and obtained a permit, has complied with the conditions of the permit, and has obtained a license or certification of appropriation. (3) A water right which indicates that the uses anticipated by an applicant, and made under permit, were made for *Beneficial Use*. Usually it is irrevocable unless voluntarily canceled or forfeited due to several consecutive years of nonuse. Also referred to as a *Certified Water Right*. Also see *Appropriation Doctrine*.

**Permit** — (1) (Water Right) A written document which grants authority to take unused water and put it to *Beneficial Use*. If all requirements of the permit are satisfied, then the permit for water appropriation can mature into a license or *Perfected Water Right*. (2) (Discharge) A legally binding document issued by a state or federal permit agency to the owner or manager of a point source discharge. The permit document contains a schedule of compliance requiring the permit holder to achieve a specified standard or limitation (by constructing treatment facilities or modifying plant processes) by a specified date. Permit documents typically specify monitoring and reporting requirements to be conducted by the applicant as well as the maximum time period over which the permit is valid. Also see *Application, Water Right*.

**Permit, Water [Nevada]** — The written permission from the state engineer to appropriate public waters for a beneficial use from a surface or underground source, at a specific point of diversion, under limited circumstances. If all requirements of the permit are satisfied, then the permit for water appropriation can mature into a license or *Perfected Water Right*. Also see *Permitted Water Right [Nevada]*, and *Application, Water Right*.

**Planning** — A comprehensive study of present trends and of probable future developments, together with recommendations of policies to be pursued. Planning embraces such subjects as population growth and distribution; social forces; availability of land, water, minerals, and other natural resources; technological progress; and probable future revenues, expenditures, and financial policies. Planning must be responsive to rapidly changing conditions.

**Planning Horizon** — The overall time period considered in the planning process that spans all activities covered in or associated with the analysis or plan and all future conditions and effects or proposed actions which would influence the planning decisions.

**Policy** — (Water Planning) A statement of governmental intent against which individual actions and decisions are evaluated. The wording of policies conveys the level of commitment to action, for example, policies which use the word “shall” are mandatory directives, while those using the word “should” are statements of direction to be followed unless there are compelling reasons to do otherwise.

**Preferred Use** — A use given some sort of preference not given other uses. Preference can take many forms, depending on state law. One type of use, such as domestic use, may be preferred over others when there are competing applications to appropriate the same water. Persons having water rights for preferred use may be entitled to take water before those having rights for other uses, regardless of their relative priorities. A person needing water for a preferred use may be authorized to condemn (i.e., to buy in a forced judicial sale) water being used for non-preferred purposes. Also see *Designated Ground Water Basin* and *Designated Ground Water Basin [Nevada]*.

**Preferred Use [Nevada]** — In the interest of public welfare, the state engineer is authorized and directed to designate preferred uses of water within the respective areas so designated by him and from which the ground water is being depleted. In acting on applications to appropriate ground water, he may designate such preferred uses in different categories with respect to the particular areas involved within the following limits: domestic, municipal, quasi-municipal, industrial, irrigation, mining and stock-watering uses and any uses for which a county, city, town, public water district or public water company furnishes the water.

**Prescribed Water Rights** — (1) Water rights to which legal title is acquired by long possession and use without protest of other parties. (2) Water use rights gained by trespass or unauthorized taking that ripen into a title; on a par with rights to land gained through adverse possession. To perfect the right, the use of water must be adverse, hostile, open and continuous for five continuous years against the recognized water rights holder. Contrast with *Appropriative Water Rights*, *Riparian Water Rights*, and *Littoral Water Rights*.

**Prior Appropriation Doctrine** — (1) A concept in water law under which a right to a given quantity of water is determined by such a procedure as having the earliest *Priority Date*. (2) The system for allocating water to private individuals used in most of the western United States. The doctrine of *Prior Appropriation* was in common use throughout the arid west as early settlers and miners began to develop the land. The prior appropriation doctrine is based on the concept of “*First in Time, First in Right*”. The first person to take a quantity of water and put it to *Beneficial Use* has a higher priority of right than a subsequent user. Under drought conditions, higher priority users are satisfied before junior users receive water. Appropriative rights can be lost through nonuse; they can also be sold or transferred apart from the land. Contrasts with *Riparian Doctrine* and *Riparian Water Rights*. Also see *Littoral Water Rights* and *Prescribed Water Rights*.

**Priority** — The concept that the person first using water has a better right to it than those commencing their use later. An appropriator is usually assigned a “priority date”. However, the date is not significant in and of itself, but only in relation to the dates assigned other water users from the same source of water. Priority is only important when the quantity of available water is insufficient to meet the needs of all those having a right to use water. See (*Prior Appropriation Doctrine* and *Appropriative Water Rights*).

**Priority Date** — The date of establishment of a water right; the officially recognized date associated with a water right. The rights established by application have the application date as the date of priority. Relative to other water rights, the priority date may make a water right senior (predating other rights) or junior (subordinate to other rights). See (*Prior Appropriation Doctrine* and *Appropriative Water Rights*).

**Public Interest, or Public Welfare** — An interest or benefit accruing to society generally, rather than to any individuals or groups of individuals in the society. In many states, a permit to appropriate water must be denied if the appropriation would be contrary to the public interest or public welfare. These terms are sometimes vague



and state engineers or others administering the water permit systems generally have viewed narrowly the authority granted under such provisions. In some cases they have restricted their consideration to matters of economic efficiency or the effects of the proposed appropriation on existing or future use for the water and have not considered such things as the environmental effects. However, recent developments, such as state environmental policy acts or legislation addressing specific public interest criteria, have placed new emphasis on this issue. Also see *Public Trust Doctrine*.

**Public Scoping** — The process of soliciting public comments on the issues to be examined in environmental documents such as an *Environmental Impact Statement (EIS)* or water planning documents. The process can be carried out by public meetings, soliciting written comments, or both. The identification of issues, alternatives, impacts, mitigation and/or monitoring all may be addressed during the scoping process.

**Public Trust Doctrine** — (1) A vaguely defined judicial doctrine under which the state holds its navigable waters and underlying beds in trust for the public and is required or authorized to protect the public interest in such waters. All water rights issued by the state are subject to the overriding interest of the public and the exercise of the public trust by state administrative agencies. (2) Based in Roman Law, the Public Trust Doctrine holds that certain resources belong to all the people and are therefore held in trust by the state for future generations. Since the 1970s, court rulings have expanded the concept of public trust to protect not only the traditional uses of navigation, commerce, and fishing, but also ecological preservation, open space maintenance, and scenic and wildlife habitat preservation. In a 1983 landmark ruling by the California Supreme Court (*National Audubon Society v. Superior Court of Alpine County*), the court held that water right licenses held by the City of Los Angeles and its Department of Water and Power to divert water from streams tributary to Mono Lake remain subject to ongoing State of California supervision under the public trust doctrine and could be curtailed or revoked, if necessary, to protect the public trust. The court held that public trust uses must be considered and balanced when the rights to divert water away from *Navigable* bodies of water are to be considered. Therefore, in issuing or reconsidering any rights to appropriate or divert water, the state must balance public trust needs with the needs for other beneficial uses of water. Also see *Equal Footing Doctrine (U.S. Constitution)* and *Public Interest, or Public Welfare*.

**Reasonable Use** — A rule with regard to percolating or riparian water restricting the landowner to a reasonable use of his own rights and property in view of and qualified by the similar rights of others, and the condition that such use not injure others in the enjoyment of their rights.

**Reasonable Use Theory** — A *Riparian Owner* may make reasonable use of his water for either natural or artificial wants. However, he may not so use his rights so as to affect the quantity of quality of water available to a lower riparian owner.

**Reservation Doctrine, Reserved Rights Doctrine, and Winters Doctrine (or Winters Rights)** — The legal rule which states that when the United States reserves public lands for a particular purpose it also reserves sufficient water to accomplish that purpose. Those who initiate water rights after the date of the reservation are subject to the reserved right. The doctrine was first announced by the United States Supreme Court in the case of *Winters v. United States*, 207 U.S. 564 (1908), involving a dispute between an Indian reservation and a rancher. For many years it was thought that the doctrine only applied to Indian reservations, but in recent years it has been extended to other types of federal reservations, such as national parks and forests. Also see *Winters Rights (Decision)* and *Practically Irrigable Acreage (PIA)*.

**Reserved Water Rights (Federal)** — (1) A category of federal water rights, created by federal law and recognized by judicial decision. These rights are created when the federal government withdraws land from the public domain to establish a federal reservation such as a national park, forest, or Indian reservation. By this action, the government is held to have reserved water rights sufficient for the primary purpose for which the land was withdrawn. (2) This class of water rights is a judicial creation derived from *Winters v. United States* (207 U.S. 564, 1907) and subsequent federal case law, which collectively hold that when the federal government withdraws land from general use and reserves it for a specific purpose, the federal government by implication reserves the minimum amount of water unappropriated at the time the land was withdrawn or reserved to accomplish the primary purpose of the reservation. Federal reserved water rights may be claimed when Congress has by statute withdrawn lands from the public domain for a particular federal purpose or where the President has withdrawn lands from the public domain for a particular federal purpose pursuant to congressional authorization. The right to such water is not lost by nonuse, and its priority date is the date the land was set aside. Also see *Winters Rights (Decision)*, *Reservation Doctrine*, *Reserved Rights Doctrine*, and *Winters Doctrine (or Winters Rights)*, and *Water Law [Federal]*.

**Riparian Doctrine** — The system for allocating water used in England and the eastern United States, in which owners of lands along the banks of a stream or water body have the right to *Reasonable Use* of the waters and a *Correlative Right* protecting against unreasonable use by others that substantially diminishes the quantity or quality of water. The right is appurtenant to the land and does not depend on prior use. Under this doctrine, ownership of land along a stream or river (i.e., riparian lands) is an absolute prerequisite to a right to use water from that body of water and each such landowner has an equal right to withdraw “reasonable” amounts of water (whether or not he is presently using it or not) so long as downstream landowners are not unreasonably damaged. Contrast with *Prior Appropriation Doctrine*.

**Safe Drinking Water Act [SDWA] (Public Law 93–523)** — An amendment to the *Public Health Service Act* which established primary and secondary quality standards for drinking water. The SDWA was passed in 1976 to protect public health by establishing uniform drinking water standards for the nation. In 1986 SDWA Amendments were passed that mandated the *U.S. Environmental Protection Agency (EPA)* to establish standards for 83 drinking water contaminants by 1992 and identify an additional 25 contaminants for regulation every 3 years thereafter. See *Drinking Water Standards, Drinking Water Standards [Nevada], Primary Drinking Water Standards, and Secondary Drinking Water Standards*. [Also see Appendix B–3, Nevada Drinking Water Standards of the *Water Words Dictionary*.]

**Senior Rights** — A senior rights holder is one who holds rights that are older (more senior) than those of junior rights holders. All water rights are defined in relation to other users, and a water rights holder only acquires the right to use a specific quantity of water under specified conditions. Thus, when limited water is available, senior rights are satisfied first in the order of their *Priority Date*.

**Snowpack Telemetry (SNOTEL)** — A remote, automated measurement system operated and maintained by the *Natural Resources Conservation Service (NRCS)* in the western United States to assess snowpack accumulation and potential streamflows. The concept is based upon the relationship between the water content in the snowpack and spring runoff under certain assumptions. Forecasts of runoff are made through the coordination of hydrologists with the NRCS and the *National Weather Service (NWS)*. A typical SNOTEL site consists of: (1) a precipitation measurement tube which measures the actual level of precipitation in inches of equivalent water; (2) a snow “pillow” which measures the weight of the snowpack and therefore its water content, and (3) the measurement and transmitting equipment which send the data to NRCS collection offices.

**Socioeconomics** — The study of the economic, demographic, and social interactions of humans.

**Stream** — A general term for a body of flowing water; natural water course containing water at least part of the year. In *Hydrology*, the term is generally applied to the water flowing in a natural channel as distinct from a canal. More generally, as in the term *Stream Gaging*, it is applied to the water flowing in any channel, natural or artificial. Some classifications of streams include, *in relation to time*:

- [1] **Ephemeral Streams** — Streams which flow only in direct response to precipitation and whose channel is at all times above the water table.
- [2] **Intermittent or Seasonal Streams** — Streams which flow only at certain times of the year when it receives water from springs, rainfall, or from surface sources such as melting snow.
- [3] **Perennial Streams** — Streams which flow continuously.

And, *in relation to ground water*:

- [4] **Gaining Streams** — Streams or a reach of a stream that receive water from the zone of saturation. Also referred to as an *Effluent Stream*.
- [5] **Insulated Streams** — Streams or a reach of a stream that neither contribute water to the zone of saturation nor receive water from it. Such streams are separated from the zones of saturation by an impermeable bed.
- [6] **Losing Streams** — Streams or a reach of a stream that contribute water to the zone of saturation. Also referred to as an *Influent Stream*.
- [7] **Perched Streams** — Perched streams are either losing streams or insulated streams that are separated from the underlying ground water by a zone of aeration.

**Surface Water** — (1) An open body of water such as a stream, lake, or reservoir. (2) Water that remains on the earth’s surface; all waters whose surface is naturally exposed to the atmosphere, for example, rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc., and all springs, wells, or other collectors directly influenced by surface water. (3) A source of drinking water that originates in rivers, lakes and run-off from melting

snow. It is either drawn directly from a river or captured behind dams and stored in reservoirs. Also see *Ground Water Under the Direct Influence (UDI) of Surface Water*.

**Transfer (Water Right)** — (1) The process of transferring a water right from one person to another. (2) A passing or conveyance of title to a water right; a permanent assignment as opposed to a temporary lease or disposal of water. Most states require that some formal notice or filing be made with an appropriate state agency so that the transaction is officially recorded and the new owner is recorded as the owner of the water right.

**Truckee–Carson–Pyramid Lake Water Rights Settlement Act of 1990** — See *Negotiated Settlement*.

**Underground Injection Control (UIC)** — A program required in each state by a provision of the *Safe Drinking Water Act (SDWA)* for the regulation of *Injection Wells*, including a permit system. An applicant must demonstrate that the well has no reasonable chance of adversely affecting the quality of an underground source of drinking water before a permit is issued.

**Usufruct, also Usufructuary** — (Legal–Civil Law) The right of enjoying a thing, the property of which is vested in another, and to draw from the same all the profit, utility, and advantage which it may produce, provided it be without altering the substance of the thing. For example, in Nevada, the state’s water belongs to the people, but is permitted, through the water rights permitting process, to be used beneficially by other individuals or entities.

**Usufructuary (Water) Right** — (1) A right to use rather than own the property of another, such as the state’s water. (2) A water right holder’s authority to divert and use a certain amount of water. See *Usufruct*.

**Vested Water Right** — (1) The water right to use either surface or ground water acquired through more or less continual beneficial use prior to the enactment of water law pertaining to the source of the water. These claims become final through *Adjudication*. (2) A fully executed or finalized appropriative right to use the waters of a state for a beneficial purpose. Also see *Certificated Water Right* and *Perfected Water Right*.

**Water Administration (and Management)** — A broad term referring to the collective role of defined state agencies to implement state and federal water laws, commonly through the development and implementation of appropriate statutes and regulations. This role can include oversight, approval, and enforcement responsibilities.

**Water Duty [Nevada]** — The *Alpine Decree* and *Orr Ditch Decree* provide the basis for virtually all irrigation water duties relating to water diversions from the Truckee, Carson, and Walker rivers in Northern Nevada. These decrees provide for an annual maximum irrigation duty of 4.5 acre-feet per acre for water-righted *Bench Lands* and 3.5 acre-feet per acre for water-righted *Bottom Lands* delivered to farm headgates. These duties are based on the *Crop Water Requirement* on the irrigation of alfalfa, as it is the most prominent crop and the highest water-using crop grown in the *Newlands (Irrigation) Project* in west-central Nevada. However, neither decree identifies lands as to bottom or bench. This has created considerable controversy, particularly within the Newlands Project, which constitutes a principal water user of both Carson River waters and Truckee River (diverted) waters. Also see *Alpine Decree [California and Nevada]*, *Orr Ditch Decree [Nevada and California]*, *Bench Lands [Nevada]*, and *Bottom Lands [Nevada]*.

**Water Law** — A law that has been instigated to control the right to the use of water. See *(Prior) Appropriation Doctrine* and *Riparian Doctrine*.

**Water Law [Federal]** — Except when provided by federal law, e.g., *Federal Reserved (Water) Rights*, federal water rights must satisfy the administration and permitting process of the state in which the federal project is located. An important 1978 U.S. Supreme Court case (*California v. United States*) held that unless state law conflicted with clear Congressional directives, the federal government must obtain water rights under state law for reclamation purposes. Under the federal reserved rights concept, the federal government reserves sufficient water rights when it withdraws land from the public domain to establish a federal reservation such as a national park or Indian reservation. Also see *Reservation Doctrine*, *Reserved Rights Doctrine*, and *Winters Doctrine* and *Winters Rights (Decision)*.

**Water Law [Nevada]** — Nevada’s water law is based on the *Prior Appropriation Doctrine*. Furthermore, unlike some other states, Nevada has a statewide system for the administration of both ground water and surface water. *Appropriative Water Rights* are based on the concept of applying water to *Beneficial Use* and “*First in Time, First in Right*”. Appropriative water rights can be lost through nonuse and they may be sold or transferred apart from the land. Due in large part to the relative scarcity of water in Nevada and numerous competing uses, Nevada has

had a thriving market for water transfers for a number of years. Water rights in Nevada are administered by the State Engineer. Also see *Application, Water Right, Riparian Doctrine, Riparian Water Rights, Littoral Water Rights, Prescribed Water Rights, and Reserved Water Rights*.

**Water Management** — (1) (General) Application of practices to obtain added benefits from precipitation, water, or water flow in any of a number of areas, such as irrigation, drainage, wildlife and recreation, water supply, watershed management, and water storage in soil for crop production. Includes *Irrigation Water Management* and *Watershed Management*. (2) (Irrigation Water Management) The use and management of irrigation water where the quantity of water used for each irrigation is determined by the water-holding capacity of the soil and the need for the crop, and where the water is applied at a rate and in such a manner that the crop can use it efficiently and significant erosion does not occur. (3) (Watershed Management) The analysis, protection, development, operation, or maintenance of the land, vegetation, and water resources of a drainage basin for the conservation of all its resources for the benefit of its residents. Watershed management for water production is concerned with the quality, quantity, and timing of the water which is produced. Also see *Basin Management*.

**Water Plan** — A document of issues, policies, strategies and action plans intended to effectively and economically execute a *Water Planning* process. Also see *Water Policy*.

**Water Planning** — Water planning is an analytical planning process developed and continually modified to address the physical, economic, and sociological dimensions of water use. As a planning process it must assess and quantify the available supply of water resources and the future demands anticipated to be levied upon those resources. Based upon this continuous supply and demand evaluation, water planning must also give direction for moving water supplies to points of use while encouraging users to be good and effective stewards of available water resources. The water planning process requires constant re-evaluation and updating to address changing social, political, economic, and environmental parameters. While the ultimate objective of such efforts is typically the development of a comprehensive, publicly-supported *Water Plan*, it is also critical to develop and maintain a comprehensive and viable water planning process that covers various aspects of water resource development, transport, water treatment, allocation among various competing uses, conservation, waste-water treatment, re-use, and disposal. Also see *Water Policy*.

**Water Resource Plan** — A planning document or process which assesses both sources and uses of water and develops strategies for their most effective and efficient use according to public needs and criteria. Also see *Water Plan, Water Planning, and Water Policy*.

**Water Right** — (1) The legal right to use a specific quantity of water, on a specific time schedule, at a specific place, and for a specific purpose. (2) A legally-protected right, granted by law, to take possession of water occurring in a water supply and to put it to *Beneficial Use*. (3) A legal right to divert state waters for a beneficial purpose.

**Water-Righted Acreage** — The land base for which there are water rights.

**Water Rights** — (1) The legal rights to the use of water. (2) A grant, permit, decree, appropriation, or claim to the use of water for beneficial purposes, and subject to other rights of earlier date or use, called *Priority* or *Prior Appropriation*. They consist of *Riparian Water Rights, Appropriative Water Rights, Prescribed Water Rights, and Reserved Water Rights*. Also see *Water Law, Water Law [California], Water Law (Federal), and Water Law [Nevada]*.

**Water Rights, Correlative Doctrine** — When a source of water does not provide enough for all users, the water is reapportioned proportionately on the basis of prior water rights held by each user.

**Water Use** — The amount of water needed or used for a variety of purposes including drinking, irrigation, processing of goods, power generation, and other uses. The amount of water used may not equal the amount of water withdrawn due to water transfers or the recirculation or recycling of the same water. For example, a power plant may use the same water a multiple of times but withdraw a significantly different amount. Also see *Water Use, Types*, below.

**Water Use Practices** — Direct, indirect, consumptive, and nonconsumptive uses of water. These include domestic practices (e.g., washing, bathing, cooking, drinking), navigation, wildlife habitat management, irrigation practices, recreation activities, industrial uses, and hydroelectric power generation.

**Water Use, Types** — The use of water may be classified by specific types according to distinctive uses, such as the following:

- [1] Commercial Water Use
- [2] Domestic Water Use
- [3] Hydroelectric Power Water Use

- [4] Irrigation Water Use
- [5] Livestock Water Use
- [6] Mining Water Use
- [7] Navigational Water Use
- [8] Other Water Use
- [9] Public Water Use (same as *Utility Water Use*)
- [10] Residential Water Use (same as *Domestic Water Use*)
- [11] Rural Water Use
- [12] Thermoelectric Power Water Use

**Watermaster** — Often an employee of a court hired to administer a court decree. Also may be an employee of a water department who distributes available water supplies at the request of water rights holders and collects hydrographic data. Also refers to a position within an irrigation project that is responsible for the internal distribution of project water.

**Watershed** — (1) An area that, because of topographic slope, contributes water to a specified surface water drainage system, such as a stream or river. (2) All lands enclosed by a continuous hydrologic drainage divide and lying upslope from a specified point on a stream; a region or area bounded peripherally by a water parting and draining ultimately to a particular water course or body of water. Also referred to as *Water Basin* or *Drainage Basin*. (3) A ridge of relatively high land dividing two areas that are drained by different river systems. Also referred to as *Water Parting*.

**Watershed Management** — The analysis, protection, development, operation or maintenance of the land, vegetation and water resources of a drainage basin for the conservation of all its resources for the benefit of its residents. Watershed management for water production is concerned with the quality and timing of the water which is produced. Also referred to as *Water Management* and *Basin Management*.

**Watershed Planning** — The formulation of a plan, based on the concept of a *Watershed*, a *Water Basin*, a *Hydrologic Region*, or a *Hydrologic Study Area (HSA)*, with the intent to assess climatological conditions, inventory existing ground and surface water resources, determine current water uses, project future socioeconomic and environmental demands for those resources, and explore feasible water-balancing options, so as to maximize the benefits to the inhabitants of a study area while simultaneously preserving and protecting the region's wildlife, habitat, and environmental conditions.

**Wellhead Protection (Program)** — Programs intended to protect and preserve the quality of ground water used as a source of drinking water. A typical wellhead protection program will have a number of critical elements to include: (1) delineating the roles and responsibilities of state agencies, local governments, and water purveyors; (2) delineation of wellhead protection areas; (3) contaminant source inventories; (4) management options; (5) siting of new wells; (6) contingency and emergency planning; and (7) public participation. Typically, steps taken to protect and preserve the quality of a well are far less costly than actions necessary to restore a contaminated well.

**Wetlands [Nevada]** — (State Wildlife Management Areas) Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands typically include swamps, marshes, bogs, playas, springs, seeps, and similar areas. Wetlands are land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water.

**Winters Doctrine** — The doctrine of (federal) reservation rights. See *Winters Rights (Decision)*.

**Winters Rights (Decision)** — The U.S. Supreme Court precedent decision (*Winters v. United States*, 207 U.S. 564 [1908]) in which the Court prohibited any uses by non-Indians that interfered with the Indian tribes' use of their reserved water. In *Winters*, the Court held that when reservations were established, Indian tribes and the United States implicitly reserved, along with the land, sufficient water to fulfill the purposes of the reservations. The ruling rests on the principle that Indian tribes retain all rights not explicitly relinquished. These federal reserved water rights are commonly known as *Winters Rights* as based on the *Winters Doctrine*. The court recognized these rights as having a priority date coinciding with the date the reservation was established, thus providing a means to integrate federally reserved rights with *Appropriative Water Rights* recognized under state law. Since reserved rights are not created by state law, *Winters Rights* retain their validity and seniority regardless of whether tribes have put the water to *Beneficial Use*. On-going conflicts concerning this ruling tend to involve non-Indian water users appropriating water under state law, water that previously may have been reserved for Indian tribes, though never quantified by courts or fully used on reservations. Also see *Reservation Doctrine*, *Reserved Rights Doctrine*,

## ***Nevada State Water Plan***

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*and Winters Doctrine, Practicably Irrigable Acreage (PIA), (Prior) Appropriation Doctrine, and Water Law [Federal].*

**Yield, Firm** — The maximum annual supply of a given water development that is expected to be available on demand, with the understanding that lower yields will occur in accordance with a predetermined schedule or probability. Sometimes referred to as *Dependable Yield*.

**Yield, Perennial** — The amount of usable water of a ground-water reservoir that can be economically withdrawn and consumed each year for an indefinite period of time. It cannot exceed the sum of the *Natural Recharge*, the *Artificial (or Induced) Recharge*, and the *Incidental Recharge* without causing depletion of the groundwater reservoir. Also referred to as *Safe Yield*.

**Yield, Safe** — With reference to either a surface- or ground-water supply, the rate of diversion or extraction for *Consumptive Use* which can be maintained indefinitely, within the limits of economic feasibility, under specified conditions of water-supply development. Also see *Perennial Yield*.

**Nevada State Water Plan**  
**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

**Section 7**  
**Glossary on Selected Federal, State,  
and Local Agencies and Organizations**

[Source: Nevada Division of Water Planning's *Water Words Dictionary*. Words presented in italics and the referenced appendices may be found in that source.]

**(United States) Army Corps of Engineers (Corps or COE)** — Originally formed in 1775 during the Revolutionary War by General George Washington as the engineering and construction arm of the Continental Army. Initially, the Corps of Engineers built fortifications and coastal batteries to strengthen the country's defenses and went on to found the Military Academy at West Point, help open the West, and to develop the nation's water resources. In its military role, the COE plans, designs, and supervises the construction of facilities to insure the combat readiness of the U.S. Army and Air Forces. In its civilian role, the COE has planned and executed national programs for navigation and commerce, flood control, water supply, hydroelectric power generation, recreation, conservation, and preservation of the environment. In a very general sense, the U.S. Army Corps of Engineers has a primary responsibility for water projects which protect property from potential flood damage, whereas the (U.S. Department of the Interior) *Bureau of Reclamation (USBR)* is responsible for primarily western water projects with respect to developing water sources for agriculture and commerce. In reality, however, quite often these federal agencies' project goals overlap with USBR's dams and reservoirs providing important flood protection and the COE's water projects — dams, locks, and canals — providing important water transportation linkages and benefits to commerce. The following are the COE's primary missions and objectives. [See Appendix E-2 of the *Water Words Dictionary* for a more complete description of the U.S. Army Corps of Engineers' organizational structure and primary missions and objectives.]

- [1] ***Navigation Improvements***—to assist in the development, safety, and conduct of waterborne commerce;
- [2] ***Flood Control***—to prevent or reduce flood damages and disruptions by accommodating flood flows in problem areas;
- [3] ***Hurricane and Storm Damage Reduction***—preventing or reducing tidal and storm-related damage by building protective structures, such as dams or barriers, in estuaries; by raising the heights of dunes and natural beaches; and by building groins, dikes, seawalls or breakwaters;
- [4] ***Coastal and Shoreline Erosion***—protect against ocean and lake shoreline erosion by providing seawalls, groins or other structures that reduce waves' destructive effects; by filling and nourishing beaches and dunes to replace and maintain lost areas; and by planting vegetation that will hold and stabilize erodible materials; by preventing streambank erosion through the use of gabions, riprap and vegetative plantings;
- [5] ***Water Supply***—at the request of local interests, include water supply storage in new projects, and modify existing projects for new or additional water supply storage, and in limited emergency circumstances, provide emergency supplies of clean water to a locality confronted by a source of contaminated water likely to cause a substantial threat to public health;
- [6] ***Hydroelectric Power***—facilities for hydroelectric power are recognized as primarily the responsibility of non-federal interests; however, the Corps may include hydroelectric power development in multipurpose projects when it complements the major objectives of flood control or navigation;
- [7] ***Outdoor Recreation***—facilitate the development of outdoor recreation facilities at Corps projects thereby providing a variety of opportunities for picnicking, camping, swimming, boating, hunting, fishing, hiking, and other pursuits;
- [8] ***Environment***—per various federal requirements (*Fish and Wildlife Coordination Act, Endangered Species Act, National Historic Preservation Act*), a recognition that Corps projects must include not only facilities

to mitigate unavoidable environmental damages, but also considerations of environmental restoration through opportunities created by the projects;

- [9] **Water Quality Control**—per *Federal Water Pollution Control Act (Clean Water Act)* requirements, the Corps is required to consider including water storage for regulation of stream flow and quality improvements in its reservoir and lake projects;
- [10] **Aquatic Plant Control**—per the *River and Harbor Act*, the Corps is authorized to conduct research and control or eradicate undesirable aquatic plants through research and application on the use of chemicals, mechanical harvesters, and natural enemies (insects, pathogens, and fish).

**(United States) Bureau of Indian Affairs (BIA)** — An agency of the U.S. Department of the Interior which has the primary responsibility for exercising the federal government’s trust relationship with Indian tribes. The BIA was first established in 1824 in the War Department, then transferred to the Department of the Interior in 1849. The BIA has prime responsibility to provide services to Indian tribes and plays a central role in the settlement process of Indian water rights disputes. The BIA exercises prime trust responsibility in providing federal government protection for Indian resources and federal assistance in resource development and management. Quite often this responsibility complicates the Department of the Interior’s other broad responsibilities to manage the use of lands and natural resources on public lands through its *Bureau of Land Management (BLM)* land use programs, its *Bureau of Reclamation (USBR)* water-related projects, and its *U.S. Fish and Wildlife Service (USFWS)* wildlife and habitat restoration programs, which may frequently come in conflict with the Bureau of Indian Affairs Indian water rights issues. [For example, in *Nevada v. United States* (463 U.S. 129{1983}), the United States Supreme Court held that the United States [Department of the Interior] could adequately represent more than one interest simultaneously, and so it is not subject to the same standards as a private trustee. In this case, the Court found that claims made by the United States on behalf of the Pyramid Lake Paiute Indian Tribe to protect fisheries should have been asserted in prior litigation. Nevertheless, the Court found the failure to do so was not a breach of its trust obligations to the tribe, even though the United States also had protected the competing interests of non-Indian irrigators.] Also see *Negotiated Settlement* and *Truckee River Operating Agreement (TROA)*.

**(United States) Bureau of Land Management (BLM)** — An agency of the U.S. Department of the Interior responsible for the stewardship of the nation’s public lands. The Bureau of Land Management is committed to the sustained management, protection, and improvement of these lands in a manner consistent with the needs of the American people. The BLM’s management philosophy is based on the principles of multiple use and sustained yield of our nation’s resources within a framework of environmental responsibility and scientific technology. The resources under the BLM’s oversight include recreation, rangelands, timber, minerals, watersheds, fish and wildlife, wilderness, air, and scenic, scientific and cultural values. The BLM oversees the largest natural resource base in the federal government. This base includes 270 million acres of public lands ranging from old growth forests in the Pacific Northwest to sun drenched desert ecosystems in the Southwest to Arctic tundra in Alaska. The BLM also supervises mineral leasing and operations on an additional 300 million acres of federal mineral estate that underlie other surface ownerships. BLM managed public lands provide habitat for thousands of wildlife and plant species, including some 220 federally-listed threatened and endangered species and 1,200 species considered candidates for listing. The BLM manages over 169,000 miles of fish bearing streams and more than 50 million acres of forested lands. In addition, the BLM is caretaker of an estimated 4 million cultural properties, including 400 listed in the *National Register of Historic Places*. The BLM also manages more than 1.6 million acres of designated wilderness and 22.8 million acres of wilderness study areas. More than 46,500 wild horses and burros roam BLM land in the West. The BLM permits and manages various uses of the public lands, including grazing, mining, recreation, and timber operations. These activities traditionally have been managed on an individual basis. However, more recently the BLM’s management efforts have shifted to a more comprehensive ecosystem basis of managing such lands to insure sustained benefits for future generations of Americans. The Bureau of Land Management has its headquarters office in Washington, D.C. There are an additional eleven state offices for managing resources in the western states of Alaska, Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, and Wyoming. BLM resources for the Eastern United States are managed out of Springfield, Virginia. The BLM also supports a National Interagency Fire Center (NIFC) in Boise, Idaho as well as a public information service center (SC) in Denver, Colorado and a centralized employee training center in Phoenix, Arizona. In Nevada alone, the BLM manages some 48 million acres of public lands



or approximately 67 percent of all lands in Nevada.

**(United States) Bureau of Reclamation (USBR)** — An agency of the U.S. Department of the Interior responsible for many of the dam, reservoir, and irrigation projects in the Western United States. The USBR reclamation program was authorized by the Reclamation Act of 1902 which was initially intended to reclaim the arid and semiarid lands of the Western United States by conserving and supplying irrigation water to make them productive. Since that beginning, the USBR's mission has expanded considerably to include multipurpose water development by providing water for irrigation, hydroelectric power, water for homes, businesses and factories, outdoor recreation, flood control, fish and wildlife enhancement, improved water quality, river regulation and control, and other related uses of water. Currently the USBR administers some 322 storage dams, 14,490 miles of canals, 174 pumping plants, and 50 hydroelectric plants. USBR water irrigates 146,000 farms in the West, provides part or all the water needs on nearly 10 million acres, yielding enough food for 33 million people, and also provides 620 billion gallons of water a year of municipal and industrial use in western towns and cities. In terms of its original intent and broad governing guidelines, the U.S. Bureau of Reclamation is primarily responsible for water projects with respect to developing water sources for agriculture and commerce, while the *U.S. Army Corps of Engineers (COE)* has had primary responsibility for water projects which protect property from potential flood damage. In reality, however, quite often these federal agencies' project goals overlap with USBR's dams and reservoirs providing important flood protection and the COE's water projects—dams, locks, and canals—providing important water transportation linkages and benefits to commerce.

**Colorado River Commission [Nevada]** — An agency of the State of Nevada consisting of seven members, to include four members appointed by the Governor and three members from the *Southern Nevada Water Authority Board of Directors*. The Colorado River Commission has broad statutory authority to establish policies for the management of Nevada's allocation of power and water resources from the Colorado River and for the development of designated land in Southern Nevada.

**Department of Conservation And Natural Resources [Nevada]** — The mission of the Department is to conserve, protect, manage, and enhance the Nevada's natural resources in order to provide the highest quality of life for Nevada's citizens and visitors. The Department consists of nine divisions and/or agencies which include:

- [1] ***Division of Conservation Districts*** — Regulates the activities of the state's locally elected conservation districts which work for the conservation and proper development of the state's renewable natural resources by providing services to individual landowners and coordination with other public and private agencies.
- [2] ***Division of Environmental Protection (DEP)*** — Responsible for the administration and enforcement of all environmental statutes and regulations; issues permits, monitors for air and water pollution and inspects solid and hazardous waste management. The Division consists of the *Bureau of Air Quality*, the *Bureau of Water Pollution Control*, *Bureau of Mining Regulation and Reclamation*, *Bureau of Water Quality Planning*, *Bureau of Corrective Actions*, *Bureau of Waste Management*, and the *Bureau of Federal Facilities*. The *State Environmental Commission* is also part of the Division and is responsible for adopting necessary environmental rules, regulations and plans authorized by statute. [See Appendix E-4 for a more complete description of DEP's functional responsibilities.]
- [3] ***Division of Forestry*** — Manages and coordinates all forestry, nursery, endangered plant species and watershed resource activities on certain public and private lands; responsible for protecting structural and natural resources through fire protection, prevention and suppression. The Division also conducts the Forestry Conservation Camps Program which coordinates and supervises the outside work performed by inmates residing in Department of Prison conservation camps.
- [4] ***Division of State Lands*** — Acquires, holds, and disposes of all state lands and interests in lands; provides technical land-use planning assistance, training, and information to local units of government or other agencies; develops policies and plans for the use of lands under federal management and represents the state in its dealings with the federal land management agencies.
- [5] ***Division of State Parks*** — Plans, develops, and maintains a system of parks and recreational areas for the use and enjoyment of residents and visitors. The Division also preserves areas of scenic, historic, and scientific significance in Nevada.

- [6] ***Division of Water Planning*** — Provides technical, financial and economic assistance to government agencies and individual citizens concerning regional and local water supplies; develops and implements a statewide water resource management plan and policy initiatives on a watershed basis; conducts hydrologic, climatologic, and socioeconomic data collection, research, modeling, forecasting and data analysis; develops and implements water resource public information and education programs; provides technical and financial assistance and outreach programs to assist local governments, watershed planning groups, and other agencies with respect to water resource matters; and develops and implements a statewide water conservation program.
- [7] ***Division of Water Resources*** — Responsible for protecting the health and safety of Nevada citizens through the appropriation of public waters. Other responsibilities include the adjudication of claims of vested water rights; distribution of water in accordance with court decrees; review of water availability for new major construction and housing projects; review of the construction and operation of dams; appropriation of geothermal resources; licensing of well drillers and water right surveyors; review of flood control projects; maintenance of water resource data and records; and providing technical assistance to government boards, offices, and agencies.
- [8] ***Division of Wildlife*** — Preserves, protects, manages and restores wildlife and its habitat within the state for aesthetic, scientific, recreational and economic benefits; tasked with promoting safety for persons and property in the operation of equipment and boating vessels
- [9] ***Natural Heritage Program*** — Serves as a centralized repository containing detailed information on sensitive (threatened and endangered) species of animals, plants, and communities; provides information on biology, habitats, locations, population and conservation status, and management needs.

**(United States) Department of the Interior (USDI)** — Originally established by Congress in 1849 as the executive department of the United States government, the USDI's function has changed from that of performing housekeeping duties for the federal government to its present role as custodian of the nation's natural resources. As the nation's principal conservation agency, the USDI has the responsibility of protecting and conserving the country's land, water, minerals, fish, and wildlife; of promoting the wise use of all these natural resources; of maintaining national parks and recreation areas; and of preserving historic places. It also provides for the welfare of American Indian reservation communities and of inhabitants of island territories under U.S. administration. As of 1988 the USDI managed more than 220 million hectares (550 million acres, or 850,000 square miles) of federal resource lands; about 340 units of the national park system; 70 fish hatcheries, and 442 *National Wildlife Refuges (NWR)*; and numerous reclamation dams that provide water, electricity, and recreation. The USDI also constructs irrigation works, enforces mine safety laws, makes geological surveys and prepares maps, conducts mineral research, and administers wild and scenic rivers as well as national and regional trails. The USDI is currently in charge of the *Bureau of Indian Affairs (BIA)*, the *U.S. Fish and Wildlife Service (USFWS)*, the *National Park Service (NPS)*, and the *U.S. Geological Survey (USGS)*. It also oversees the Bureau of Mines, which is responsible for ensuring that the nation has adequate mineral supplies and for overseeing and evaluating all aspects of minerals research; the *U.S. Bureau of Land Management (BLM)*, which manages public lands and their resources; the *U.S. Bureau of Reclamation (USBR)*, which assists local governments in reclaiming arid lands in western states and provides programs for hydro-electric power generation, flood control, and river regulation; the Minerals Management Service, which deals with leasable minerals on the Outer Continental Shelf and ensures efficient recovery of mineral resources; and the Office of Surface Mining Reclamation and Enforcement, which helps to protect the environment from adverse effects of mining operations. Other agencies under the USDI's jurisdiction include the Office of Small and Disadvantaged Business Utilization and the Office of Territorial and International Affairs.

**Department of Water Resources (DWR) [California]** — The California state agency within *The Resources Agency* that is responsible for long-term water planning, operation of the *State Water Project*, and state water conservation programs. The basic goal of the DWR is to ensure that California's needs for water supplies, water-related recreation, fish and wildlife, hydroelectric power, prevention of damage and loss of life from floods and dam failure, and water-related environmental enhancements are met; and to ensure that the manner in which these needs are fulfilled is consistent with public desires and attitudes concerning environmental and social

considerations. The *California Water Commission*, also within The Resources Agency, serves as a policy advisory body to the Director of the DWR on matters within the department’s jurisdiction and coordinates state and local views on federal appropriations for water projects in California. The commission also conducts public hearings and investigations statewide for the department and provides an open forum for interested citizens to voice on water development issues. The *California State Water Resources Control Board (SWRCB)*, located within the California Environmental Protection Agency, is assigned the responsibility to protect water quality and allocate water rights.

**Desert Research Institute (DRI) [Nevada]** — The Desert Research Institute was created in 1959 by an act of the Nevada Legislature as a unit of the University of Nevada. When the University of Nevada System was formed in 1968, DRI became an autonomous, nonprofit division of this system. Since that time DRI has grown to be one of the world’s largest multi-disciplinary environmental research organizations focusing on arid lands. The DRI operates from statewide facilities in Las Vegas, Reno, Stead, Laughlin, and Boulder City. The DRI’s activities are directed from five research centers representing the *Geosphere* (Quaternary Sciences Center), *Hydrosphere* (Water Resources Center), *Biosphere* (Biological Sciences Center), and *Atmosphere* (Atmospheric Sciences Center and Energy and Environmental Engineering Center). Multi-disciplinary teams drawn from these centers are assembled to address basic and applied research problems on a project-by-project basis. Listed below are the DRI’s five research centers and their primary mission statement. [See Appendix E–3 of the *Water Words Dictionary* for a more complete listing of the DRI’s major laboratories operated and the principal skills and activities supported.]

- [1] **Atmospheric Sciences Center (ASC)** — The ASC is a nationally recognized leader in the field of atmospheric sciences. The ASC’s mission is to improve the fundamental understanding of the earth’s atmosphere, particularly as it relates to the weather and to the climate of arid regions. The ASC is the home of the strongest atmospheric modification research program in the United States.
- [2] **Biological Sciences Center (BSC)** — The BSC focuses on plant and soil biology from an ecological perspective. The BSC’s mission is to improve the fundamental understanding of the earth’s biosphere, thereby providing the knowledge needed to effectively manage biological resources important to the future use and habitation of the earth.
- [3] **Energy and Environmental Engineering Center (EEEC)** — The EEEEC largely conducts air resources research. The EEEEC’s mission is to conduct high-quality research to understand current and future human impacts on the environment, especially air quality, and the technology that can be applied to mitigate these impacts.
- [4] **Quaternary Sciences Center (QSC)** — The QSC is one of approximately 15 Quaternary research programs worldwide. The QSC’s mission is to improve the fundamental understanding of past climates and associated environmental responses and human adaptations to climate change during the Quaternary Period (covering the last 1.8 million years).
- [5] **Water Resources Center (WRC)** — The WRC is the largest water research group focused on arid lands in the United States. The WRC’s mission to improve the fundamental understanding and knowledge of hydrologic systems, with special emphasis on arid lands, for more effective management of hydrologic resources.

**(State) Division of Health [Nevada]** — An agency within the Department of Human Resources, State of Nevada, whose primary water-related mandate (Nevada Revised Statutes 445.361) is “to provide water which is safe for drinking and other domestic purposes and thereby promote the public health and welfare.” The Division serves as the primacy agency for the *Public Water System Supervision Program (PWSSP)* as authorized under the federal *Safe Drinking Water Act (SDWA) [Public Law 93–523]* and its amendments. The Division implements State Board of Health regulations which address drinking water monitoring and quality, public water system construction, and public water system operator certification. To accomplish its tasks, the Division consists of a number of Boards and Bureaus, to include:

- [1] **State Board of Health** — Advises the Health Division Administrator on matters relating to public health and welfare.
- [2] **State Health Officer** — Primary state adviser on matters pertaining to medical health; oversees the activities of the Bureau of Laboratory Services, Bureau of Community Health Services, Bureau of

- Family Health Services, Bureau of Disease Control and Intervention Services, and the Bureau of Health Planning.
- [3] **Bureau of Health Protection Services** — Provides for safe drinking water, health engineering, sanitation (food, dairy, drugs and cosmetics), and radiological health matters.
  - [4] **Bureau of Laboratory Services** — Microbiology lab, chemistry lab, research and testing on community water systems.
  - [5] **Bureau of Community Health Services** — Family planning, community health nursing, and clinic services.
  - [6] **Bureau of Family Health Services** — Genetics, special children’s clinic, children’s dental services, newborn screening, and health promotion and education.
  - [7] **Bureau of Health Planning** — State health plan, primary care development center, state center for health statistics, tobacco control initiative.
  - [8] **Bureau of Disease Control and Intervention Services** — Programs dealing with surveillance, immunization, TB control.
  - [9] **Bureau of Licensure and Certification** — Programs dealing with health facilities, laboratory personnel certification, emergency medical services and trauma.
  - [10] **Bureau of Administrative Services** — Fiscal management, personnel, affirmative action, legal services, vital records, and cancer registry.

**(United States) Environmental Protection Agency (EPA)** — The U.S. Environmental Protection Agency (EPA) is responsible for implementing the federal laws designed to protect the environment. EPA endeavors to accomplish its mission systematically by proper integration of a variety of research, monitoring, standard-setting, and enforcement activities. As a complement to its other activities, EPA coordinates and supports research and anti-pollution activities of state and local governments, private and public groups, individuals, and educational institutions. EPA also monitors the operations of other Federal agencies with respect to their impact on the environment. EPA was created through Reorganization Plan #3 of 1970, which was devised to consolidate the federal government’s environmental regulatory activities into a single agency. The plan was sent by the President to Congress on July 9, 1970, and the agency began operation on December 2, 1970. EPA was formed by bringing together 15 components from 5 executive departments and independent agencies. Air pollution control, solid waste management, radiation control, and the drinking water program were transferred from the Department of Health, Education, and Welfare (now the Department of Health and Human Services). The federal water pollution control program was taken from the Department of the Interior, as was part of a pesticide research program. From the Department of Agriculture, EPA acquired authority to register pesticides and to regulate their use, and from the Food and Drug Administration, EPA inherited the responsibility to set tolerance levels of pesticides in food. EPA was assigned some responsibility from the Atomic Energy Commission, and absorbed the duties of the Federal Radiation Council. The enactment of major new environmental laws and important amendments to older laws in the 1970s and 1980s greatly expanded EPA’s responsibilities. The agency now administers ten comprehensive environmental protection laws:

- [1] Clean Air Act (CAA)
- [2] Clean Water Act (CWA)
- [3] Safe Drinking Water Act (SDWA)
- [4] Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or “Superfund”)
- [5] Resource Conservation and Recovery Act (RCRA)
- [6] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- [7] Toxic Substances Control Act (TSCA)
- [8] Marine Protection, Research, and Sanctuaries Act (MPRSA)
- [9] Uranium Mill Tailings Radiation Control Act (UMTRCA)
- [10] Pollution Prevention Act

The primary mandates for the water-related programs administered through the EPA Water Management Division are the *Federal Water Pollution Control Act (Public Law 92–500)*, as amended, commonly referred to as the *Clean Water Act (CWA)*, and the *Safe Drinking Water Act (SDWA — Public Law 93–523)*. The CWA addresses the discharge of pollutants from point and nonpoint sources into waters of the United States (as defined). The goal

of the SDWA is to protect public health over lifetime exposure to drinking water by ensuring that the source water as well as the system storage distribution and service lines are free and protected from contamination. EPA water-related programs establish national and regional objectives, promote delegation of programs to states (primacy), and support that delegation in a manner that ensures achievement of required objectives. Also see *Science Advisory Board (SAB)*. The following constitute the principal offices of the EPA. [See Appendix E–1 of the *Water Words Dictionary* for a more complete description of the organizational structure of the U.S. Environmental Protection Agency and a description of each office’s functions.]

- [1] Office of the Administrator (OA)
- [2] Office of Administration and Resources Management (OARM)
- [3] Office of Enforcement (OE)
- [4] Office of General Counsel (OGC)
- [5] Office of Policy, Planning, and Evaluation (OPPE)
- [6] Office of International Activities (OIA)
- [7] Office of Inspector General (OIG)
- [8] Office of Water (OW)
- [9] Office of Solid Waste and Emergency Response (OSWER)
- [10] Office of Air and Radiation (OAR)
- [11] Office of Prevention, Pesticides and Toxic Substances (OPPTS)
- [12] Office of Research and Development (ORD)

**Federal Emergency Management Agency (FEMA)** — An independent agency of the federal government founded in 1979 and reporting to the President of the United States and headquartered in Washington D.C. FEMA’s mission is to reduce loss of life and property and protect our nation’s critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery. Primary support functions of FEMA include; (1) advising on building codes and flood plain management; (2) teaching people how to get through a disaster; (3) helping equip local and state emergency preparedness; (4) coordinating the federal response to a disaster; (5) making disaster assistance available to states, communities, businesses and individuals; (6) training emergency managers; (7) supporting the nation’s fire service; and (8) administering the national flood and crime insurance programs (*National Flood Insurance Program*). FEMA’s operating directorates consist of: (1) Mitigation Directorate; (2) Information Technology Directorate; (3) Federal Insurance Administration (Program); (4) Operations Support Directorate; (5) Preparedness Directorate; (6) Response and Recovery Directorate; (7) United States Fire Administration; and (8) ten Regional Offices. FEMA’s ten regions, Federal Regional Centers, and states included in each region are:

- [1] Region I (Boston, Massachusetts) — Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont;
- [2] Region II (New York, N.Y., Caribbean Division – San Juan, Puerto Rico) — New York, New Jersey, the Commonwealth of Puerto Rico and the Territory of the U.S. Virgin Islands;
- [3] Region III (Philadelphia, Pennsylvania) — District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, West Virginia;
- [4] Region IV (Atlanta, Georgia) — Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee;
- [5] Region V (Chicago, Illinois) — Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin;
- [6] Region VI (Denton, Texas) — Arkansas, Louisiana, New Mexico, Oklahoma and Texas;
- [7] Region VII (Kansas City, Missouri) — Iowa, Kansas, Missouri, Nebraska;
- [8] Region VIII (Denver, Colorado) — Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming;
- [9] Region IX (San Francisco, California) — Arizona, California, Hawaii and Nevada; and the Territory of American Samoa, the Territory of Guam, the Commonwealth of the Northern Mariana Islands, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau;
- [10] Region X (Bothell, Washington) — Alaska, Idaho, Oregon and Washington.

**(United States) Fish and Wildlife Service (USFWS)** — Part of the U.S. Department of the Interior, the early beginnings of the Fish and Wildlife Service go back to 1871 when the federal government established the Commissioner of Fisheries. In 1896, the Division of Biological Survey was established within the Department

of Agriculture. In 1939, these functions were transferred to the Department of the Interior. Then in 1940, these functions were formally consolidated and redesignated as the Fish and Wildlife Service. Further reorganization came in 1956 when the Fish and Wildlife Act created the Bureau of Sport Fisheries and Wildlife. An amendment to this act in 1974 designated the Bureau as the U.S. Fish and Wildlife Service. Today the USFWS consists of a headquarters in Washington, D.C., eight regional offices, and over 700 field units and installations. Included are more than 470 National Wildlife Refuges, comprising more than 90 million acres, 57 fish and wildlife research laboratories and field units, 43 cooperative research units at universities across the country, nearly 135 national fish hatcheries and fishery assistance stations, and a nationwide network of law enforcement agents and biologists. The functions of the USFWS primarily includes the following:

- [1] Acquires, protects and manages unique ecosystems necessary to sustain fish and wildlife, such as migratory birds and endangered species;
- [2] As specified in the *Endangered Species Act (ESA)* (1973), as amended, and in conjunction with the *National Marine Fisheries Service (NMFS)*, determines critical habitat and develops recovery plans for protected endangered and threatened species of plants and animals;
- [3] Operates fish hatcheries to support research, develop new techniques and fulfill the public demand for recreational fishing;
- [4] Operates wildlife refuges to provide, restore, and manage a national network of lands and waters sufficient in size, diversity and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available;
- [5] Conducts fundamental research on fish, wildlife and their habitats to provide better management and produce healthier and more vigorous animals; also protects fish and wildlife from dislocation or destruction of their habitats;
- [6] Renders financial and professional assistance to states, through federal aid programs, for the enhancement and restoration of fish and wildlife resources;
- [7] Establishes and enforces regulations for the protection of migratory birds, marine mammals, fish and other non-endangered wildlife from illegal taking, transportation or sale within the United States or from foreign countries; and
- [8] Communicates information essential for public awareness and understanding of the importance of fish and wildlife resources, and changes reflecting environmental degradation that ultimately will affect the welfare of human beings.

Also see *National Wildlife Refuge System*, *Endangered Species Act (ESA)*, *Endangered Species*, *Threaten Species*, and *National Oceanic and Atmospheric Administration (NOAA)*.

**(United States) Forest Service (USFS)** — The largest and most diverse agency of the U.S. Department of Agriculture, the Forest Service provides leadership in the management, protection, and use of the nation's forests and rangelands, which comprise almost two-thirds of the nation's federally owned lands. The creation of the Forest Service go back to 1891 when the President was authorized to establish Forest Reserves from forest and range lands in the *Public Domain*. In 1905 the responsibilities for the management and protection of these Forest Reserves was transferred from the Department of the Interior to the Department of Agriculture and the Forest Service was formally established. The Forest Reserves were then renamed National Forests. Today the Forest Services manages 156 National Forests, 19 National Grasslands, and 16 Land Utilization Projects that make up the National Forest System located in 44 states, Puerto Rico, and the Virgin Islands. Much of the nation's fresh water supply flows from National Forest System lands and insuring adequate yields of high quality water and continuing soil productivity are primary aims of the Forest Service's watershed management programs. The Forest Service manages more than 14 percent of the nation's 1.2 billion acres of forest range. This National Forest System (NFS) rangeland is managed to conserve the land and its vegetation while providing food for both domestic livestock and wildlife. The Forest Service manages fish and wildlife habitat on the National Forests and National Grasslands in cooperation with the individual states' fish and game departments. Of the 191 million acres of National Forests, 86.5 million acres are classified as commercial forests, available for, and capable of, producing crops of industrial wood. National Forest timber reserves are managed on a sustained-yield basis to produce a continuous supply of wood products to meet the nation's economic demands while maintaining the productive capacity of these lands. In 1924 the Forest Service pioneered the establishment of wilderness areas on National Forest lands. National Forest lands are a major source of mineral and energy supplies with regulatory and

management responsibilities for mineral activities shared with the Department of the Interior, Bureau of Mines. The Forest Service, with one of the world's largest wildland firefighting forces, provides direct fire protection and control for National Forest System lands as well as cooperative fire control on several million additional acres. The Forest Service is responsible for the forest management aspects of the Watershed Protection and Flood Prevention Program administered by the *Natural Resources Conservation Service (NRCS)*. The Forest Service also participates in the forestry aspects of the River Basin Program, which guides and coordinates water and related land resource planning among several federal departments. The Forest Service operates an extensive forestry research program consisting of eight Forest and Range Experiment Stations, a Forest Products Laboratory, and 75 research labs located throughout the U.S., Puerto Rico, and the Pacific Trust Territories. The Forest Service is organized into nine (9) regions as listed below (regional headquarters are in parentheses):

- [1] **Eastern Region** (Milwaukee, Wisconsin) — Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Ohio, Indiana, Michigan, Illinois, Missouri, Iowa, Wisconsin, Minnesota;
- [2] **Southern Region** (Atlanta, Georgia) — Virginia, North Carolina, South Carolina, Kentucky, Tennessee, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas;
- [3] **Rocky Mountain Region** (Denver, Colorado) — South Dakota, Nebraska, Kansas, Wyoming, Colorado;
- [4] **Northern Region** (Missoula, Montana) — North Dakota, Montana, Idaho (northern part only), South Dakota (northwest corner only), Wyoming (northwest corner only);
- [5] **Intermountain Region** (Ogden, Utah) — Nevada, Utah, Idaho (except northern portion), Wyoming (western portion only);
- [6] **Southwest Region** (Albuquerque, New Mexico) — Arizona, New Mexico;
- [7] **Pacific Northwest Region** (Portland, Oregon) — Washington, Oregon;
- [8] **Pacific Southwest Region** (San Francisco, California) — California, Hawaii;
- [9] **Alaska Region** (Juneau, Alaska) — Alaska.

**(United States) Geological Survey (USGS)** — An agency of the U.S. Department of Interior responsible for providing extensive earth-science studies of the Nation's land, water, and mineral resources. The USGS was established by an act of Congress on March 3, 1879, to provide a permanent federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of national domain." An integral part of that original mission is to publish and distribute the earth-science information needed to understand, plan the use of, and manage the nation's energy, land, mineral, and water resources. Since 1879, the research and fact-finding role of the USGS has grown and been modified to meet the changing needs of the nation it serves. As part of that evolution, the USGS has become the map-making agency for the federal government, the primary source of data on surface- and ground-water resources of the nation, and the employer of the largest number of professional earth scientists. The USGS is organized into three operational Divisions: the National Mapping Division (NMD), charged with development and application of mapping and *Geographic Information System (GIS)* technology; the Geologic Division (GD), which conducts geologic mapping and research; and the Water Resources Division (WRD). The mission of the Water Resources Division of the USGS is to provide the hydrologic information and understanding needed to manage the nation's water resources to benefit its residents. Typical water resource programs sponsored by the WRD include:

- [1] Data collection to aid in evaluating the quantity, quality, distribution, and use of the nation's water resources;
- [2] Analytical and interpretive water-resources appraisals to describe the occurrence, quality, and availability of surface and ground water throughout the nation;
- [3] Basic and problem-oriented research in hydraulics, hydrology, and related fields of science and engineering;
- [4] Scientific and technical assistance in hydrology to other federal, state, and local agencies;
- [5] Development and maintenance of national computer data bases and associated Geographic Information Systems (GIS) of hydrologic data — streamflow, water quality and biology, groundwater characteristics, and water use; and
- [6] Public distribution of water-resources data and results of water-resources investigations through reports, maps, computerized information services, and other forms of release.

Programs of the Water Resources Division are funded under three types of arrangements:

- [1] *Federal Program* — funding is appropriated directly to USGS by the U.S. Congress for projects of national interest;
- [2] *Cooperative Program* — funding is shared by USGS and interested state and local agencies; and
- [3] *Other Federal Agencies (OFA) Program* — funding is supplied by federal agencies requesting technical assistance from the USGS.

The Water Resources Division's headquarters is at the USGS National Center in Reston, Virginia. Regional offices are maintained in Reston; Atlanta, Georgia; Denver, Colorado; and Menlo Park, California. With the exception of the National Research Program (NRP) centers at Reston, Denver, and Menlo Park, most of the WRD program is distributed to 51 USGS District Offices organized by state boundaries.

**National Oceanic and Atmospheric Administration (NOAA)** — An agency of the U.S. Department of Commerce, the National Oceanic and Atmospheric Administration was formed in 1970, but its origins may actually be traced as far back as 1807 when President Thomas Jefferson ordered a survey of the new nation's coastline. Today, NOAA has translated the United States' geographic, atmospheric, oceanic, and meteorological informational needs into an organization concentrating in the following principal areas:

- [1] ***Research and Analysis*** — NOAA researchers and scientists in the areas of oceanography, meteorology, biology, and physics explore the sea and air for new clues aimed at understanding or reversing environmental damage such as ozone depletion, the greenhouse effect, and possible global warming;
- [2] ***Satellite Imaging and Mapping*** — NOAA's satellites provide essential information for accurate weather forecasts, monitor winter snowpack conditions across the country, and gauge the health of coastal estuaries;
- [3] ***Data Compilation and Dissemination*** — The results of NOAA's data collection, satellite mapping, and research and analysis affords vast stores of information in NOAA's global data centers available for climate, oceanographic and geophysical reports vital to the public and industry;
- [4] ***Forecasting and Weather Warning*** — Through the National Weather Service (NWS), NOAA provides extensive information and warnings when severe weather threatens life and property.

The National Oceanic and Atmospheric Administration consists of a number of separate agencies to effect these research, analysis, monitoring, informational, and forecasting requirements.

- [1] ***National Weather Service (NWS)*** — The National Weather Service operates a vast network of automated weather stations around the nation equipped with sophisticated doppler radar systems on the ground as well as sophisticated satellites providing detailed imaging which provide meteorologists and citizens early warnings of severe weather conditions. In cooperation with the Federal Aviation Administration (FAA), the NWS is proceeding with establishing some 1,000 fully automated weather data collection sites, termed *Automated Surface Observing Systems (ASOS)*.
- [2] ***National Ocean Service (NOS)*** — The National Ocean Service charts and surveys America's coastal waterways, providing safe passage for commerce and recreation interests. The NOS also plays a major role in managing America's coastlines and NOAA's *Coastal Zone Management Program* strives to protect wetlands, water quality, beaches, wildlife, and other important resources and uses of our coasts. As part of the NOS, NOAA's *National Marine Sanctuaries*, the nation's underwater national parks, provide unique undersea preserves to protect important coastal resources. The NOS monitors the health of the coast and probes how our use of the nation's nearshore waters affects the environment.
- [3] ***National Environmental Satellite, Data and Information Service (NESDIS)*** — The NESDIS operates the world's largest environmental data storage and distribution facility providing extensive and highly detailed data on weather, the oceans and geophysics. The NESDIS is also responsible for NOAA's polar orbiting and geostationary satellites which provide important information on the oceans and atmosphere. Other NESDIS satellites collect images of cloud and storm patterns which are then relayed to NOAA's National Weather Service and are extensively used by the nation's meteorologists for local weather reporting and forecasting.
- [4] ***National Marine Fisheries Service (NMFS)*** — The NMFS serves as steward for America's living marine resources, conducting research necessary to manage these valuable resources and enforces



fishery regulations, maintains the wholesomeness of U.S. seafood products, and protects coastal fishery habitats and nurseries. The NMFS manages the 32 federal fishery resource plans, covering more than 230 species, and plays a key role in protecting coastal habitats, marine mammals and endangered and threatened species per the *Endangered Species Act (ESA)*.

- [5] **Office of Oceanic and Atmospheric Research** — NOAA’s scientists conduct leading edge research on weather, climate, air quality, the oceans and the Great Lakes through a network of environmental laboratories and monitoring stations as well as through university researchers supported by NOAA through the *National Sea Grant College Program* and the *National Undersea Research Program*.
- [6] **NOAA Corps** — NOAA also operates the nation’s smallest uniformed service consisting of some 400 officers commanding NOAA’s fleet of hurricane hunter aircraft and environmental research ships providing in a variety of scientific and research operations.

**National Weather Service (NWS)** — An agency of the (U.S. Department of Commerce) *National Oceanic and Atmospheric Administration (NOAA)*, the primary mission of the National Weather Service is to protect life and property and enhance the nation’s economy by providing warnings and forecasts of hazardous weather, including thunderstorms, flooding, hurricanes, tornadoes, winter weather, and tsunamis. The primary customer of the NWS is the private weather industry whose meteorologists receive data and information directly from the NWS and incorporate it into local news reports. The NWS also operates its own radio network; the *NOAA Weather Radio* is the sole government radio system providing direct warnings of hazardous weather conditions and natural disasters to private citizens through a network of 390 transmitters across the nation. The NWS provides short and long-range forecasts, severe weather warnings, and atmospheric data continually to private weather vendors for a fee using a telephone data transmittal system called *Family of Services*. NWS Doppler radar data is provided through the *NWS NEXRAD Information Dissemination Service (NIDS)* and is available from commercial weather vendors under an agreement with the NWS. The *NOAA Weather Wire Service* is the primary NWS telecommunications network for NWS forecasts, warnings, and other products to the mass media (TV, radio, newspaper) and emergency management agencies. It consists of a satellite communications system operated under contract by GTE/Contel. In a joint effort with the Federal Aviation Administration (FAA), some 250 NWS manual data collection field offices will be replaced with approximately 1,000 automated data collections sites, termed *Automated Surface Observing Systems (ASOS)*, thereby greatly enhancing both the timeliness and frequency of the NWS weather reporting capabilities.

**(United States) Natural Resources Conservation Service (NRCS)** — Formerly known as the *Soil Conservation Service (SCS)*, an agency of the U.S. Department of Agriculture, the Natural Resources Conservation Service (NRCS) had its beginnings with a 1929 emergency act of Congress in response to the famous Dust Bowl when land practices, primarily in the Midwest Farm Belt, caused extensive soil erosion and threatened the food production of the United States. Initially, ten experiment stations were established to work with Land Grant Universities to study soil erosion and ways to prevent it. As a result of these initial efforts, the Soil Erosion Service was established in 1933 to show American farmers new ways of preventing and recovering from soil erosion. In 1935 Congress changed the Soil Erosion Service into the Soil Conservation Service and made it a permanent agency of the U.S. Department of Agriculture. In 1994 the name was change to Natural Resources Conservation Service to denote a broader role of responsibility in natural resource conservation. Presently, the NRCS works in three primary areas: (1) soil and water conservation; (2) resource inventories; and (3) rural community development. These activities are covered under a number of direct NRCS programs, involving only NRCS resources, and NRCS assisted programs, involving the NRCS and at least one other government agency.

***Direct NRCS Programs:***

- [1] Technical Assistance
- [2] Great Plains Conservation Program
- [3] Watershed Protection, Long-Term Contracts (Public Law 566)
- [4] USDA Compliance Plans

***NRCS Assisted Programs:***

- [1] Agriculture Conservation Program
- [2] Water Bank Program
- [3] Colorado River Salinity Control Program

- [4] Conservation Reserve Program
- [5] Water Quality Incentive Program
- [6] Emergency Conservation Program
- [7] Wetlands Reserve Program

**Newlands (Irrigation) Project [Nevada]** — One of the first Department of the Interior, *U.S. Bureau of Reclamation (USBR)* (U.S. Reclamation Service at that time) irrigation projects completed in the United States. The project was authorized originally as the *Truckee–Carson Irrigation Project* on March 14, 1903 by the Secretary of the Interior and was renamed the Newlands Project in 1919 in honor of Nevada Senator Francis G. Newlands, who originally sponsored the 1902 Reclamation Act. Derby Dam, located on the lower Truckee River, was completed in June 1905 to divert waters from the Truckee River Basin to the Carson River. In August 1906 the Truckee Canal was completed between the Truckee and Carson rivers. Waters began flowing through this canal in 1906 while 1907 proved to be the first full year of irrigation. Lahontan Reservoir was completed in 1915 on the Carson River to receive Truckee River waters through the Truckee Canal and provided a more stable supply of water for irrigation needs to a defined service area in the Town of Fernley and the lower Carson River Basin near the City of Fallon, Churchill County, in western Nevada. The project originally (1902) called for the possible irrigation of up to 450,000 acres; however, this figure was continually reduced, finally to approximately 73,000 acres when it was found, after much legal controversy, that the full use of the waters of Lake Tahoe would not be available. Soon after the project was authorized, this figure of irrigable acreage was reduced to 210,000 acres in 1904, to 172,000 acres in 1910, and to 97,400 acres in 1925, of which 73,301 acres were determined to be irrigable in 1926. The project’s service area currently consists of approximately 73,800 acres of land that are entitled to receive irrigation water, of which only approximately 58,000–60,000 acres are actually irrigated. Water for these lands is supplied from the Truckee and Carson rivers. Water from the Truckee River is diverted to the Carson River Basin at Derby Dam via the 32.5–mile long Truckee Canal. Since its completion, the Newlands Project has been embroiled in controversy resulting from intense competition for the limited water from these two rivers. Controversy has centered on the actual number of acres with legal water rights, the classification of irrigation lands as *Bench Land* or *Bottom Land* (which determines the applicable water duty — 4.5 AF/year or 3.5 AF/year, respectively), the maximum allowable water duty, the efficiency of project operations, and the volume of water diverted from the Truckee River’s terminus, Pyramid Lake. In 1967, *Operating Criteria and Procedures (OCAP)* were first instituted in order to maximize the use of Carson River flows to satisfy project requirements and to minimize water diversions from the Truckee River at Derby Dam. Even so, controversy continued and in 1973, the Federal District Court in Washington, D.C. ordered the implementation of a new OCAP for this project. Amid continued controversy, in 1985 the Bureau of Reclamation published an *Environmental Assessment (EA)* which examined an alternative OCAP. Based on comments to this 1985 EA, the Bureau of Reclamation made the decision to initiate an *Environmental Impact Statement (EIS)*. A final OCAP was approved in 1988. *Public Law 101–618*, enacted on November 16, 1990, (also referred to as the *Negotiated Settlement*), requires the current OCAP to remain in effect at least through December 31, 1997, and is intended to allow all principal parties to develop a new *Truckee River Operating Agreement (TROA)*. A major issue has been to secure an adequate water supply (both as to quantity and quality) to preserve Pyramid Lake and protect its environmentally sensitive fish species, the endangered cui-ui (*Chasmistes cujus*) and the threatened Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*).

**(The) Resources Agency [California]** — The mission of the California Resources Agency is to oversee the state’s activities relating to the conservation, management, and enhancement of California’s natural and cultural resources; including land, wildlife, water, and minerals. The administrative head of The Resources Agency, the Secretary for Resources, is a member of the Governor’s Cabinet, serves as the Governor’s representative on the Agency’s boards and commissions, and oversees administration of the *California Environmental Quality Act (CEQA)*. The California Resources Agency is comprised of the following entities:

- California Coastal Commission
- Department of Boating and Waterways
- Department of Conservation
- California Conservation Corps
- Department of Fish and Game

- Department of Forestry and Fire Protection
- Department of Parks and Recreation
- Department of Water Resources
- California Energy Commission
- California State Lands Commission
- San Francisco Bay Conservation and Development Commission
- California Tahoe Conservancy
- Colorado River Board of California
- Coachella Valley Conservancy
- Santa Monica Mountains Conservancy
- State Coastal Conservancy
- State Reclamation Board

Other special programs administered by The Resources Agency include:

- CERES, the California Environmental Resources Evaluation System
- California Biodiversity Council
- California Rivers Assessment
- CAL–FED Bay–Delta Program
- Natural Community Conservation Program
- California Ocean Resources Management Program

**Southern Nevada Water Authority (SNWA) [Nevada]** — An agency created in 1991 through a cooperative agreement among the seven regional water and wastewater agencies in southern Nevada. The purpose of the SNWA was to address water resource management and water conservation on a regional basis through *Integrated Resource Planning (IRP)* techniques and, through such efforts, plan, manage, and develop additional supplies of water for southern Nevada. The seven regional agencies comprising the SNWA include:

- [1] Big Bend Water District (Laughlin)
- [2] City of Boulder City
- [3] City of Henderson
- [4] City of Las Vegas
- [5] City of North Las Vegas (serving portions of unincorporated Clark County and the City of Las Vegas)
- [6] Clark County Sanitation District
- [7] Las Vegas Valley Water District (LVVWD, serving the City of Las Vegas and portions of unincorporated Clark County)

Potable water in the Las Vegas region is provided by five different water purveyors: Big Bend Water District, Boulder City, City of Henderson, Las Vegas Valley Water District (LVVWD), and the City of North Las Vegas. Wastewater service is provided by four different agencies: Boulder City, City of Henderson, the City of Las Vegas and Clark County Sanitation District. Also see *Southern Nevada Water System (SNWS)*.

**Southern Nevada Water System (SNWS) [Nevada]** — On October 22, 1965, President Lyndon B. Johnson signed legislation authorizing construction of the Alfred Merritt Smith Water Treatment Facility and the Robert B. Griffith Water Project. These two projects form the Southern Nevada Water System, which supplies municipal and industrial water to the Las Vegas Valley Water District, Nellis Air Force Base and the cities of Boulder City, Henderson, and North Las Vegas. The Southern Nevada Water System refers to the system of treatment and transmission facilities that diverts raw Colorado River water from Lake Mead, and delivers potable water to three major retail water purveyors in the Las Vegas Valley, as well as Nellis Air Force Base and Boulder City. The treatment facility, located on the shores of Lake Mead, is known as the Alfred Merritt Smith Water Treatment Facility (AMSWTF). The transmission facilities, which divert water from Lake Mead to the treatment plant and then deliver treated water to Boulder City through the River Mountains tunnel and throughout the Las Vegas Valley, are referred to as the Robert B. Griffith Water Project. Treatment facilities were constructed in two stages by the State of Nevada acting through its Colorado River Commission. Transmission facilities were also constructed in two stages by the federal government through the U.S. Bureau of Reclamation. The state and federal facilities work together to form the Southern Nevada Water System which, as of January 1, 1996, is controlled by the *Southern Nevada Water Authority (SNWA)*. SNWA in turn employs the Las Vegas Valley Water

District (LVVWD) as its operating agent. The principal facilities of the SNWS are detailed below:

**Treatment Facilities** – Treatment facilities currently have the capacity to treat 600 million gallons per day (MGD). Until completion of the SNWS Phase II Improvements in 1999, delivery capability is 480 MGD. During 1997 the treatment plant produced an average of 314.8 MGD. The maximum day production was 469.5 MGD. The treatment process involves disinfection, aeration, flocculation, filtration and post-treatment. Disinfection is accomplished primarily by the application of chlorine; however, new facilities will employ ozonation for disinfection as well. Aeration is done primarily to improve aesthetic qualities of the water. Flocculation is a chemical process that causes minute particles in the water to coagulate into larger particles that can be filtered out. Filtration is provided by 26 filters, each with 2800 square feet of surface area; the filter media is composed of anthracite coal, silica sand, and aggregate. Filter performance is monitored and, when it declines below acceptable limits, the filter is backwashed. All backwash water is reclaimed and recycled to the head of the facility; no backwash water is returned to Lake Mead. Sludge captured in the backwash process is dried and disposed of in a landfill. Post-treatment is the addition of a small amount of chemicals to retard corrosion, and additional chlorine if necessary, to prevent bacteriological regrowth in the distribution systems. Water quality is assured by testing samples taken from over 260 different locations throughout the system. Samples are tested for chemical, microbiological, and other contaminants. Lake Mead has proven to be a very high quality water source which, along with effective design and operation of the treatment facilities, allows SNWS to provide water that exceeds all applicable standards to the over one million people in the Las Vegas Valley.

**Transmission Facilities** – Transmission facilities begin with the 13-foot diameter intake tunnel, which diverts Lake Mead water from 150 feet below its surface and conveys it through Saddle Island to Pumping Plant #1. The pumping plant lifts the water up to the raw water aqueduct, which conveys it to the AMSWTF. Treated water is lifted 708 feet to the River Mountains Tunnel, where it flows 4 miles by gravity to the Las Vegas Valley. After emerging from the tunnel, water is diverted to various points throughout the valley, where it is handed off to the facilities of retail purveyors at 17 rate-of-flow control stations. Pumping plants are used to move the water uphill, and rate-of-flow control stations are used to regulate and measure the flow into customers' storage facilities. Water from the AMSWTF is also conveyed to Boulder City by five pumping plants and eight miles of pipelines. Once it enters the system, treated water is never exposed to open air until the consumer uses it. SNWS consumes approximately 10 percent of the power generated by Nevada Power Company, making it the largest single customer.

**Major Components of the Transmission Facilities** – (1) Intake Tunnel: 1400 feet long, 13 feet in diameter; (2) 6 miles of raw and treated water aqueducts, 10 feet in diameter, and associated surge tanks; (3) River Mountains Tunnel: 4 miles long, 12 feet in diameter; (4) 14 major pumping plants and associated electrical equipment; (5) 18 major lateral systems totaling over 80 miles of pipeline as large as 12 feet in diameter; (6) 17 rate-of-flow control stations and associated regulating tanks.

**State Water Resources Control Board (SWRCB) [California]** — The water rights and water permitting agency of the State of California. The SWRCB consists of five members (to include a Chairman and Vice Chairman) whose responsibility it is to “protect water quality and allocate water rights” within the State of California. To assist in these functions, the SWRCB is served by a staff to include an Executive Director, a Chief Deputy and nine (9) Regional Board Executive Officers serving the regions of:

- [1] North Coast Region;
- [2] San Francisco Bay Region;
- [3] Central Coast Region;
- [4] Los Angeles Region;
- [5] Central Valley Region;
- [6] Lahontan Region;
- [7] Colorado River Basin Region;
- [8] Santa Ana Region; and
- [9] San Diego Region.

**Tahoe Regional Planning Agency (TRPA) [California and Nevada]** — A bi-state regulatory agency created in July 1968 as part of a provisional California–Nevada Interstate Compact developed by the joint California–Nevada

Interstate Compact Commission which was formed in 1995. The TRPA was the first bi-state regional environmental planning agency in the United States. The TRPA was intended to oversee land-use planning and environmental issues within the Lake Tahoe Basin and is dedicated to preserving the beauty of the region. Today, the TRPA leads the cooperative effort within the basin to preserve, restore, and enhance the unique natural and human environment of the region and is a leading partner in a comprehensive program which monitors water quality, air quality, and other threshold standard indicators. The TRPA's Environmental Thresholds Carrying Capacities (ETCC) programs are designed to address the following thresholds:

- Water Quality
- Air Quality
- Soil Conservation
- Vegetation
- Fisheries
- Wildlife
- Scenic Resources/Community Design
- Recreation
- Noise

The structure of the TRPA consists of a 15-member Governing Board which sets TRPA policy, oversees administration of the agency, approves all amendments to the Lake Tahoe Basin Regional Plan and reviews major project applications. The Governing Board is advised by a 19-member Advisory Planning Commission made up of area planning and natural resource management professionals, and lay persons. The Executive Director directs approximately 50 staff members in the following principal functional areas: (1) Environmental Education; (2) Environmental Improvement Program (EIP) Facilitation; (3) Environmental Compliance Division; (4) Project Review Division; and (5) Long Range Planning Division. Representation on the TRPA's Governing Board is as follows:

- [1] Governor of California Appointee (California);
- [2] Governor of California Appointee (California);
- [3] California Assembly Speaker Appointee (California);
- [4] California Senate Rules Committee Appointee (California);
- [5] El Dorado County Appointee (California);
- [6] Placer County Appointee (California);
- [7] City of South Lake Tahoe Appointee (California);
- [8] Governor of Nevada Appointee (Nevada);
- [9] Nevada Government Appointee (Nevada);
- [10] Nevada Department of Conservation & Natural Resources Appointee (Nevada);
- [11] Washoe County Appointee (Nevada);
- [12] Douglas County Appointee (Nevada);
- [13] Carson City Appointee (Nevada);
- [14] Nevada at-Large Appointee (Nevada);
- [15] Presidential Appointee (United States)

In late 1995 the TRPA created the Shorezone Partnership Committee of 20 organizations and entities to lessen the problems among those interested in the future development of Lake Tahoe. Those represented included: California and Nevada state lands; California and Nevada state parks, California Department of Fish and Game, California Tahoe Conservancy, Lahontan Regional Water Quality Control Board; League to Save Lake Tahoe; Nevada Division of Wildlife; Tahoe Lakefront Owners Association; TRPA; Tahoe Research Group; Tahoe-Sierra Preservation Council; U.S. Army Corps of Engineers; U.S. Forest Service; commercial property owners; Lake Tahoe marinas; Lake Tahoe tour-boat operators; other private property owners; and Lake Tahoe Basin recreation concessionaires.

**Truckee-Carson Irrigation District (TCID) [Nevada]** — The agent of the U.S. Department of the Interior *Bureau of Reclamation (USBR)* which serves the interests of the water-righted agricultural water users in the *Newlands (Irrigation) Project*, located in Churchill County, Nevada. The Newlands Project, originally named the Truckee-Carson Irrigation Project, was America's first federal reclamation project completed under the Reclamation Act of 1902. The Truckee-Carson Irrigation District has operated the Newlands Project since 1926

and is responsible for dispersing some 320,000 acre-feet of water from the Carson and Truckee rivers during normal water years. TCID is responsible for the operation of the Lake Tahoe Dam at the outlet to Lake Tahoe at Tahoe City in Placer County, California, Derby Dam on the lower Truckee River in Washoe County, Nevada, Lahontan Dam on the lower Carson River in Churchill County, Nevada, and, some six miles below Lahontan Dam, the Carson Diversion Dam which distributes the releases from Lahontan Reservoir into the project's principal "T" (T-Line) and "V" (V-Line) primary distribution canals. Within the Newlands Projects, there are 102 miles of main canals, 312 miles of irrigation laterals, an extensive system of private ditches, 345 miles of drainage ditches, and numerous diversion dams and regulating reservoirs. TCID offices are located in Fallon, Nevada (Churchill County), and its operations are managed by a Project Manager, a board of seven members, and approximately 50 full-time employees. In 1978 the USBR canceled the contract under which TCID had operated the project since 1926. The cancellation was in response to a refusal of the farmer-dominated organization to follow federal water conservation guidelines, or *Operating Criteria and Procedures (OCAP)*. TCID has been operating under a temporary contract since 1984.

**Walker River Irrigation District (WRID) [Nevada]** — The litigation of *Pacific Live Stock Company v. Antelope Valley Land and Cattle Company* and the issuance of *Decree 731* caused a number of farmers in Smith and Mason valleys to band together in April 1919 and form the Walker River Irrigation District (WRID). WRID included all irrigated areas in Nevada on the East Walker River, the West Walker River, and the main Walker River, except those areas within the Walker River Indian Reservation. WRID moved to obtain the financing and rights to both Bridgeport and Topaz reservoir sites, sites which had earlier been selected and surveyed by the U.S. Reclamation Service (USRS, currently the U.S. Bureau of Reclamation, USBR). The water rights for Topaz Reservoir were obtained from the liquidation of the Antelope Valley Land and Cattle Company. Although WRID was established as a Nevada agency serving lands entirely within Nevada, its reservoirs would be located either entirely in California (Bridgeport Reservoir) or partially in California and Nevada (Topaz Reservoir). Funding for dam and reservoir construction and operation was obtained privately with water recipients obligated to pay off the debt. Initial funding was held down as WRID assumed no responsibility for the construction or maintenance of irrigation canals, ditches, or laterals.

**Water Alliances For Voluntary Efficiency (WAVE)** — A water conservation program conceived by the *U.S. Environmental Protection Agency (EPA)* in December 1992 and designed to help increase water efficiency in U.S. lodging facilities. The program encourages participating hotels to install water efficient technologies for bathroom fixtures, dish washing and laundry facilities, cooling towers, and landscaping. The program's goal is to reduce water use and associated energy consumption, help inform hotel guests and employees about the importance of water conservation, and help hotels realize a monetary savings for their efforts. Program components consist of technical assistance, research material availability, computer software programs to survey water use and evaluate options, and public recognition of participation.

## Nevada Division of Water Planning

# Nevada State Water Plan

## PART 1 — BACKGROUND AND RESOURCE ASSESSMENT

### Section 8

# Glossary on Selected Water-Related Decrees, Agreements and Operating Criteria

[Source: Nevada Division of Water Planning's *Water Words Dictionary*. Words presented in italics and the referenced appendices may be found in that source. Words and definitions included in this glossary which explain or summarize elements of existing water law are not intended to change that law in any way.]

**Alpine Decree [California and Nevada]** — The Federal Court adjudication of the relative water rights on the Carson River which is the primary regulatory control of Carson River operations today. The decree is administered in the field by a *Watermaster* appointed by the federal district court. The decree, initiated by the U.S. Department of the Interior on May 1, 1925 through *United States of America v. Alpine Land and Reservoir Company, et al.*, Civ. No. D-183 BRT, to adjudicate water rights along the Carson River. The decree was finally entered 55 years later on October 28, 1980, making it the longest lawsuit undertaken by the federal government against private parties over water rights. The decree established the respective water rights (to surface water only) of the parties to the original lawsuit, both in California and Nevada to Carson River water. The decree did not make an interstate allocation of the Carson River between California and Nevada; it only quantified individual water rights. Neither state was a party to the decree. In addition to Carson River surface water rights, it also established the rights to reservoir storage in the high alpine reservoirs and confirmed the historical practice of operating the river on rotation, so that irrigators with more junior priorities could be served as long as possible. These upper alpine reservoirs were permitted to fill out of priority order, in accordance with historical practice. The decree also specifically recognized *Riparian Water Rights* in California (as distinguished from the quantified *Appropriative Water Rights* used in Nevada). For purposes of water distribution, the Carson River and its east and west forks, were divided into eight (8) segments and when the river went into regulation (i.e., there was not enough water in the Upper Carson River to serve the most junior priority) each segment of the river was to be administered autonomously. Duties of water were set forth for various locations according to *Bench Land* and *Bottom Land* designations. For lands in the *Newlands Irrigation Project* (i.e., below Lahontan Dam) in Churchill County near Fallon, the Alpine decree provided for an annual net consumptive use of surface water for irrigation of 2.99 acre-feet per acre and a maximum water duty of 4.5 acre-feet per acre for water-righted bench lands and 3.5 acre-feet per acre for water-righted bottom lands *delivered to the land*. For lands above the Newlands Project (i.e., above Lahontan Reservoir), the net consumptive water use was set at 2.5 acre-feet per acre with water duties of 4.5 acre-feet per acre *diverted to the canal* for bottom lands, 6.0 acre-feet per acre diverted to the canal for the alluvial fan lands and 9.0 acre-feet per acre diverted to the canal for the bench lands. This annual net consumptive use, or *Crop Water Requirement*, was based on the water duty of alfalfa as it is a dominant and the highest water-using crop grown in Nevada. While the Alpine Decree established water duties for bench and bottom lands throughout the Carson River Basin, it made no identification of those lands. The decree also granted landowners on the Newlands Project an *Appurtenant Water Right* for the patented lands, effectively transferring water rights to these land holders individually.

**Bartlett Decree [Nevada]** — The Bartlett Decree was issued on January 2, 1931 by Judge George A. Bartlett and adjudicated water rights along the Humboldt River and its tributaries. In addition to adjudicating the river system's water rights, this decree also recognized that the surface waters within the Humboldt River system were already fully appropriated, leaving no surplus water for irrigation during an average, or normal water year. Another important finding of the Bartlett Decree recognized the differences in growing seasons between the Humboldt River's upper basin and its lower basin and therefore divided the river system into two districts, District

No. 1 below Palisade (USGS gaging station 10322500) and District No. 2 above Palisade. The Bartlett Decree also recognized the seasonal and ephemeral nature of many streams within the Humboldt River Basin through the concept of “flash streams” and the special need to accommodate water appropriators along such stream systems. These water courses were defined as streams “that have a sudden or flash flow or flush flow for a comparatively brief period of time, while such stream is draining the particular basin or source of supply fed by melting snows... These flash streams in varying degrees are typical of the necessity of cumulating the flow during the flush for the particular rights to be served. Where lands are entitled to irrigation from such flash streams, they must be served at the times when the water is available.” The Bartlett Decree established three classes of lands with different irrigation requirements (water duties) and irrigation periods (both with respect to the number of days of allowable irrigation and the specific periods of irrigation). These irrigable land classes included: (1) Harvest crop lands (Class A) – all lands devoted to cultivated crops, including irrigated native or other grass lands which normally receive sufficient water to produce a crop which will justify cutting for hay, although it may sometimes be pastured and not cut; (2) Meadow pasture lands (Class B) – all grass lands free from brush which receive sufficient water to produce what may be classed as good pasture, but not sufficient to warrant cutting for hay; and (3) Diversified pasture lands (Class C) – all lands from which the brush has not been cleared but which are artificially irrigated to some extent for the production of grasses for pasturage. Further, the irrigation periods within the Humboldt River system varied by both the class of the land and whether it was in District No. 1 (below Palisade) or District No. 2 (above Palisade). Due to extensive review and corrections of the written findings by Judge Bartlett, the final Bartlett Decree would not be entered until October 20, 1931. The Bartlett Decree was subsequently modified by the *Edwards Decree*. With respect to adjudication of the Humboldt River, also see *Carville Decree*.

**California–Nevada Interstate Compact [California and Nevada]** — After thirteen years of negotiations between the two states (began in 1955), the joint California–Nevada Interstate Compact Commission approved a provisional Interstate Compact in July 1968 for the division of the waters of Lake Tahoe, and the Truckee, Carson, and Walker rivers. This provisional compact, with some modification, was eventually ratified by both states (California in September 1970 and Nevada in March 1971). The compact created the Tahoe Regional Planning Agency (TRPA) to oversee land-use planning and environmental issues within the Lake Tahoe Basin. However, the compact was never ratified by Congress which would have made it law. A major issue of contention was a phrase in the compact which stated that the use of waters by the federal government, its agencies, instrumentalities, or wards was to be against the use by the state in which it is made. This limitation, combined with new court interpretations of the federal *reserved water rights (Winters Doctrine)*, waters required for Pyramid Lake fish species under the *Endangered Species Act (ESA)*, and *public trust doctrine* issues combined to derail Congressional approval. Even so, both states chose to implement its terms under individual state legislation. With respect to the Lake Tahoe Basin, the compact provided for a maximum annual gross diversion from all sources of 34,000 acre-feet, of which California was allocated 23,000 acre-feet per year and Nevada 11,000 acre-feet per year.

**Carville Decree [Nevada]** — The Carville Decree was issued on January 24, 1935 by Judge E.P. Carville and adjudicated water rights for the Little Humboldt River. As with the 1931 *Bartlett Decree* (and the 1935 *Edwards Decree* modifying the Bartlette Decree), the Carville Decree determined water rights for three classes of lands: (1) Class A – harvest crops; (2) Class B – meadow pasture; and (3) Class C – diversified pasture. In general, the decree provided for a flow of 1.0 cfs per 100 acres of decreed land, or at rates proportional to this. When water was available, Class A water rights are for the delivery of water at this rate of flow for a period of 180 days from March 15 to September 15, or a total water diversion during the season of 3.6 acre-feet per acre. Class B rights are for 90 days from March 15 to June 13, for a total of 1.8 acre-feet per acre. Class C rights are for 45 days from March 15 to April 28, for a total of 0.9 acre-feet per acre. With respect to adjudication of the Humboldt River, also see *Bartlett Decree* and *Edwards Decree*.

**Colorado River Compact** — An agreement entered into on November 24, 1922 and ratified by the legislatures of the seven states within the Colorado River Basin — Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming — agreeing to the general allocation of the waters of the Colorado River. The compact divided the Colorado River Basin into an *Upper Basin* and a *Lower Basin*, with the division point established at Lees Ferry, a point in the mainstream of the Colorado River approximately 30 river miles south of the Utah-Arizona boundary. The Upper Basin was defined to include those parts of the states of Arizona, Colorado, New Mexico, Utah, and



Wyoming within and from which waters naturally drain into the Colorado River system above Lees Ferry, and all parts of these states that are not part of the river's drainage system but may benefit from water diverted from the system above Lees Ferry. The Lower Basin was defined to include those parts of the states of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River system below Lees Ferry, and all parts of these states that are not part of the river's drainage system but may benefit from water diverted from the system below Lees Ferry. The compact did not apportion water to any state; however, it did apportion to each upper and lower basin the exclusive, beneficial consumptive use of 7,500,000 acre-feet of water per year from the Colorado River system in perpetuity. Further, the compact gave to the Lower Basin the right to increase its annual beneficial consumptive use of such water by 1,000,000 acre-feet. This compact cleared the way for federal legislation for the construction of Hoover Dam. Subsequently, the Upper Basin states entered into the *Upper Colorado River Basin Compact* on October 11, 1948 which provided Arizona to use 50,000 acre-feet of water per year from the upper Colorado River system and apportioned the remaining water to the Upper Basin states according to the following percentages: Colorado, 51.75 percent; New Mexico, 11.25 percent; Utah, 23 percent; and Wyoming, 14 percent. The Lower Basin states could not come to an agreement on apportionment on their own, and in October 1962, the U.S. Supreme Court ruled that of the first 7,500,000 acre-feet of mainstream water in the Lower Basin, California is entitled to 4,400,000 acre-feet (58.67 percent), Arizona to 2,800,000 acre-feet (37.33 percent), and Nevada to 300,000 acre-feet (4.00 percent).

**Decree 731 (Interim Walker River Decree) [Nevada]** — In response to the suit filed in 1902 (*Miller et Lux v. Rickey*), subsequently renamed to the *Pacific Livestock Company v. Antelope Valley Land and Cattle Company*, water rights adjudication in the Federal District Court for Nevada resulted in the issuance of Decree 731 on March 24, 1919. [During the Nevada gold mining boom of the early 1900's, Thomas B. Rickey was actively involved in both mining and banking as well as ranching. So much so, in fact, that he suffered failure in the panic of 1907 and his ranching properties were sold to the Antelope Valley Land and Cattle Company. Also, the agricultural holdings of Muller and Lux were taken over by the Pacific Livestock Company.] The Decree addressed the amount of water to which each party was entitled, the source of the water, the area to which it was to be applied, and the priority date for each use. The Decree also encompassed many, but not all, of the other water users on the river, particularly the water rights of the smaller agricultural water users as well as the irrigation rights of the Walker River Indian Reservation. Five separate water rights for the reservation were quantified with priority dates ranging from 1868 to 1886 (the reservation was established on November 29, 1859) and the government was permitted to purchase additional rights from the proposed Topaz Reservoir to supply the reservation. [These five water rights included: (1) 1868 priority date – 4.70 cfs, 385.95 acres irrigated; (2) 1872 priority date – 3.55 cfs, 295.80 acres irrigated; (3) 1875 priority date – 6.15 cfs, 512.80 acres irrigated; (4) 1883 priority date – 7.50 cfs, 625.20 acres irrigated; and (5) 1886 priority date – 1.03 cfs, 85.80 acres irrigated.] In effect, the Decree addressed essentially only direct diversions from the river and its tributaries. Except for some general provisions pertaining to the Antelope Valley Land and Cattle Company's storage rights, particularly those relating to the prospective development of Alkali Lake (Topaz) Reservoir, no other storage rights were quantified. As an interim measure, Decree 731 did assign priorities and amounts of water for irrigating specified lands of the parties and allowed incidental domestic and stock-watering uses to be served under the irrigation rights.

**Decree C-125 (Final Walker River Decree) [Nevada]** — In adjudication of the 1924 filing of *United States v. Walker River Irrigation District, et al.*, Decree C-125 for waters of the Walker River was issued on April 14, 1936 by the Federal District Court for Nevada. In addition to recognizing the water rights defined in Decree 731 (March 24, 1919) as to priority date, amount and place of use, and defined other storage and diversion rights, the Walker River Indian Reservation's attempt to acquire a right to divert 150 cfs for the irrigation of reservation lands was rejected. While Decree C-125 adjudicated most of the irrigation rights of the Walker River system, the court did not define domestic rights, irrigation uses on natural forest land, some private riparian lands, and any storage rights for Weber Reservoir, which had recently been constructed on the Walker River Indian Reservation. Also, no rights were included for Walker Lake itself. A federal *Watermaster* would be responsible for its enforcement. The District Court refused the Tribe's claim (for right to a rate of flow of 150 cfs), stating that even if an implied tribal water right was included with reservation lands, the white pioneers were in "an inexpugnable position" and the "court was not about to take fifty years of beneficial farming use away from these settlers for the sake of supplying the tribe with guaranteed water." In June 1939 Decree C-125 was modified on appeal to the U.S. Circuit Court of Appeals, Ninth Circuit (104 Fed 2d 334 [1939]). The Walker River Indian Reservation was

granted a right to divert 26.25 cfs (they had asked for 150 cfs) for 180 days (amounting to 9,450 acre-feet from natural flows) to be measured at the Parker Gage (currently the Wabuska gage) at the north (outlet) end of Mason Valley approximately where the reservation boundary begins. This diversion period is in contrast to upstream users who have an irrigation season of up to 245 days as reaffirmed in the “Rules and Regulations for the Walker River System” under Decree C–125. All defendants agreed to the stipulation which granted the Walker River Indian Reservation a November 29, 1859 priority date for its water rights for the irrigation of 2,100 acres of reservation land. The original priority dates established in Decree 731 in 1919 had assigned priority dates (5) ranging from 1868 to 1886. [These five water rights included: (1) 1868 priority date – 4.70 cfs, 385.95 acres irrigated; (2) 1872 priority date – 3.55 cfs, 295.80 acres irrigated; (3) 1875 priority date – 6.15 cfs, 512.80 acres irrigated; (4) 1883 priority date – 7.50 cfs, 625.20 acres irrigated; and (5) 1886 priority date – 1.03 cfs, 85.80 acres irrigated.

**Edwards Decree [Nevada]** — The Edwards Decree was issued on October 8, 1935 and represented a modification of adjudicated water rights for the Humboldt River based on the October 20, 1931 *Bartlett Decree*. Due to subsequent protests to the issuance of the Bartlett Decree, on December 16, 1931, the first of a number of rulings for the modification, correction and amendment of the Bartlett Decree was made by Judge H.W. Edwards. This was followed by additional changes and amendments entered on April 27, 1933, February 8, 1934, June 8, 1934, October 1, 1934, November 19, 1934, February 11, 1935, and finally on March 11, 1935. Collectively, this compilation of modifications and changes to the 1931 Bartlett Decree became known as the Edwards Decree. One particular change of some importance removed the Bartlett Decree’s language pertaining to the formal division of the Humboldt River system into a District No. 1 below Palisade and a District No. 2 above Palisade. In its place, the Edwards Decree merely established specific irrigation seasons and reaffirmed the three classes of land for specific water rights, the water duty for each land class, and the period over which water was to be received by these lands. As most of the corrected water-rights contained within the Edwards Decree applied to lands above Palisade (i.e., the upper Humboldt River Basin), the Edwards Decree was applied to and used for distribution of the Humboldt River system’s waters above Palisade, while the Bartlett Decree continued to apply to and be used in the distribution of water below Palisade. In general, the Edwards Decree provided for a flow of 1.23 cfs per 100 acres of decreed land or at proportional rates. Three land classes were established (the same as for the Bartlett Decree) with different dates of use and number of days of allowed irrigation. Each sub-basin within the overall Humboldt River Basin had its unique amount of decreed land and decreed water within the three land classes (A, B and C). Diverted water for irrigation purposes was to be measured where the main ditch enters or becomes adjacent to the land to be irrigated. With respect to adjudication of the Humboldt River, also see *Carville Decree*.

**Floriston Rates [California and Nevada]** — Currently represents the primary operational criteria of the Truckee River between its source (Lake Tahoe) and its terminus (Pyramid Lake). The rates originated in a 1915 decree (*Truckee River General Electric Decree*) in which the *U.S. Bureau of Reclamation (USBR)* gained an easement to operate the Lake Tahoe outlet dam in return for providing year-round flow rates for run-of-the-river users — hydropower and a pulp and paper mill. Along with the *Orr Ditch Decree* (1944) and the *Truckee River Agreement* (1935), which has been incorporated into the Orr Ditch Decree, these requirements govern the Truckee River flows. The Floriston rates essentially constitute a minimum instream flow in the river, as long as water is physically available in Lake Tahoe and Boca Reservoir to support the rates. Water may only be stored in Lake Tahoe and Boca Reservoir when rates are being met. The precise definition contained in the Truckee River Agreement is as follows:

- [1] **Floriston Rates** means the rate of flow in the Truckee River at the head of the diversion penstock at Floriston, California (to be measured at the Iceland gage, but currently measured at the Farad gage) consisting of an average flow of 500 cubic feet of water per second each day during the period commencing March 1 and ending September 30 of any year, and an average flow of 400 cubic feet per second each day during the period commencing October 1 and ending the last day of the next following February of any year.
- [2] **Reduced Floriston Rates** means rates of flow in the Truckee River, measured at the Iceland gage (currently the Farad gage), effective and in force during the period commencing November 1 and ending the next following March 31 of each year, determined as follows:
  - (a) 350 cubic feet per second whenever the elevation of the water surface of Lake Tahoe

- is below 6226.0 feet above sea level and not below 6225.25 feet above sea level; and
- (b) 300 cubic feet per second whenever the water surface elevation of Lake Tahoe is below 6225.25 feet above sea level.

Also see *Truckee River Agreement [Nevada and California]*.

**(Truckee River) General Electric Decree [California]** — Represented the resolution, through a 1915 federal court consent decree, of a lengthy series of conflicts, litigation, and negotiations between the U.S. Bureau of Reclamation (USBR, then the U.S. Reclamation Service, USRS) and the Truckee River General Electric Company (predecessor to the present-day Sierra Pacific Power Company), which, in 1902, through a complicated series of real estate transactions had obtained title to the Lake Tahoe Dam, surrounding lands, and the hydropower plants on the Truckee River. The Bureau of Reclamation was in desperate need of Lake Tahoe water for its Newlands Project, then nearing completion near Fallon in Churchill County. This decree granted the Bureau of Reclamation an easement to operate the Lake Tahoe Dam and to use surrounding property owned by the power company. On its part, the Bureau of Reclamation was required to provide certain year-round flow rates (the *Floriston Rates*), measured at a stream gage near the state line, to support hydropower generation. These rates, in fact, dated back to a 1908 river flow agreement among the Truckee River General Electric Company, the Floriston Land and Power Company, and the Floriston Pulp and Paper Company and required that “...there shall be maintained a flow of water in the said Truckee River at Floriston [California] of not less than 500 cubic feet per second from the First day of March to the 30th day of September inclusive, in each year, and of not less than 400 cubic feet per second from the 1st day of October to the last day of February, inclusive, in each year.” While this decree did dictate how the Lake Tahoe Dam would be operated, it did little to solve the concerns of residents of the lake and lessen California’s concerns over the apportionment of Lake Tahoe waters.

**OCAP (Operating Criteria and Procedures) [Nevada]** — Operating criteria originally instituted in 1967 for water diversions and irrigation of the *Newlands (Irrigation) Project [Nevada]* in the Carson River Basin and designed to maximize use of Carson River flows to satisfy project requirements and minimize diversions from the Truckee River. Current OCAP requirements for this project were set in 1988 and according to *Public Law 101–618* (the *Negotiated Settlement*) are to remain in effect at least through December 31, 1997 at which time a new *Truckee River Operating Agreement (TROA) [Nevada and California]* will be implemented.

**Orr Ditch Decree [Nevada and California]** — A tabulation or adjudication of Nevada (only) water rights for the Truckee River and its tributaries regulated through a series of reservoirs and irrigation canals, administered by the U.S. District Court Federal Water Master in Reno, Nevada. In combination with the *Truckee River Agreement [Nevada and California]* and the *Floriston Rates [California and Nevada]*, the Orr Ditch Decree currently represents the basis for operation of the Truckee River between its source (Lake Tahoe) and its terminus (Pyramid Lake). The Orr Ditch Decree (1944) incorporates the provisions of the Truckee River Agreement (1935), which provides for operation of storage facilities, especially Lake Tahoe, to satisfy Truckee River water rights. The Floriston rates constitute the chief operation objective on the Truckee River today and originated as a turn-of-the-century flow requirement for run-of-the-river users — hydropower and a pulp and paper mill. While the Orr Ditch Decree establishes water rights for entities within Nevada using the Truckee River’s waters, the Truckee River Agreement, as part of that Decree, determines the operational mechanisms to satisfy those rights. Also see *Truckee River General Electric Decree [California]*.

**Preliminary Settlement Agreement (PSA) [Nevada]** — An agreement reached between the Pyramid Lake Paiute Tribe of Indians and Sierra Pacific Power Company (SPPCo) on May 23, 1989. The PSA provides SPPCo the ability to store its water rights in federally operated reservoirs along the Truckee River in California at times when it is not needed for municipal and industrial (M&I) water supply in the Reno–Sparks Metropolitan Area. In exchange, excess water in storage is used for fishery purposes when drought conditions are not in effect. Also, SPPCo forgoes its right to single-use hydroelectric flows in the Truckee River under the *Orr Ditch Decree [Nevada and California]*, thereby enabling the United States and the Tribe to store water for fishery benefit at certain times of the year. The PSA is incorporated into *Public Law 101–618* (the *Negotiated Settlement*) by reference.

**Public Law 101–618 (PL 101–618) [Nevada and California]** — Omnibus legislation passed by the 101st Congress at the end of its 1990 session intended to settle a number of outstanding disputes concerning the Truckee and

Carson Rivers. The legislation authorized an ambitious environmental restoration program to benefit the *Lahontan Valley Wetland System [Nevada]* and Pyramid Lake and the lower Truckee River. It also established a framework for resolving separate by closely-related water-resource conflicts involving the Pyramid Lake Paiute and Fallon Paiute–Shoshone Tribes, the cities of Reno and Sparks (Nevada), the states of Nevada and California, and (pending the resolution of several as-yet unsatisfied controversies) the *Newlands (Irrigation) Project [Nevada]*. The legislation contains two primary titles: *TITLE I — The Fallon Paiute–Shoshone Indian Tribal Settlement Act*; and *TITLE II — The Truckee–Carson–Pyramid Lake Water Rights Settlement Act*. Collectively, the legislation can be referred to as the *Negotiated Settlement*. The seven (7) main elements covered by the legislation include:

- [1] ***Promote the Enhancement and Recovery of Endangered and Threatened Fish Species*** — A recovery program is to be developed for the Pyramid Lake endangered fish species cui-ui (*Chasmistes cujus*) and the threatened fish species Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) in compliance with the *Endangered Species Act (ESA)* and the *Truckee–Carson–Pyramid Lake Water Rights Settlement Act*. Water rights acquisitions are authorized for this purpose.
- [2] ***Protect Wetlands from Further Degradation*** — A water rights purchase program is authorized for *Lahontan Valley Wetlands*, with the intent of sustaining an average of 25,000 acres of wetlands (*Stillwater National Wildlife Refuge*: 14,000 acres; *Carson Lake and Pasture*: 10,200 acres; and *Fallon Reservation and Indian Lakes*: 800 acres) to both prevent further degradation and improve the habitat of the fish and wildlife which depend on those wetlands. The *U.S. Fish and Wildlife Service (USFWS)* has estimated that this will require up to 125,000 acre-feet (AF) of water per year.
- [3] ***Encourage the Development of Solutions for Demands on Truckee River Waters*** — An operating agreement is to be negotiated for the Truckee River — *The Truckee River Operating Agreement (TROA)* — covering procedures for using storage capacity in upstream reservoirs in California consistent with recovery objectives for listed Pyramid Lake fishes. This includes the implementation of the terms and conditions of the *Primary Settlement Agreement (PSA)* between SPPCo and the Pyramid Lake Paiute Tribe.
- [4] ***Improve Management and Efficiency of the Newlands Project*** — The Secretary of the Interior is authorized to operate and maintain the *Newlands Project* to serve additional purposes, including recreation, improved water quality flowing to the wetlands, improved fish and wildlife habitat, and municipal water supply for Lyon and Churchill counties. A project efficiency study is required. The 1973 Gesell Decision is recognized and the 1988 *Operating Criteria and Procedures (OCAP)* is to remain in effect at least through 1997.
- [5] ***Fallon Paiute–Shoshone Water Issues Settlement*** — Establishment of a settlement fund for the Fallon Paiute–Shoshone Tribe totaling \$43 million. The Tribe is authorized to purchase land and water rights to consolidate tribal holdings within the reservation. Specific litigation filed by the Tribe is to be dismissed.
- [6] ***Pyramid Lake Paiute Tribe Issues Settlement*** — A tribal economic development fund of \$40 million was established for the Pyramid Lake Paiute Indian Tribe to provide for the settlement of water, fish, and other issues. Another fund of \$25 million was established for the Pyramid Lake fishery.
- [7] ***Interstate Water Apportionment Settlement*** — Facilitate an interstate allocation of the waters of the Truckee River, Carson River, and Lake Tahoe between the states of California and Nevada.

Also see *Truckee River Agreement [Nevada and California]*.

**Sierra Valley Decree [California–Nevada]** — Adjudication (1958) allowing the Sierra Valley Water Company to divert a portion of the Little Truckee River in California into Webber Creek for irrigation purposes in the Sierra Valley in the Feather River Basin. The maximum allowable diversion is 60 cubic feet per second (cfs), averaging approximately 5,700 acre-feet (AF) per year (although as a supplemental water source, diversions typically vary between 1,500 AF and 10,000 AF per year). Waters may be diverted only between March 15th and September 30th of each year. The *Priority Date* of this water right was set at 1870.

**Tahoe–Prosser Exchange Agreement (California–Nevada)** — Also referred to as the “Agreement for Water Exchange Operations of Lake Tahoe and Prosser Creek Reservoir,” this agreement was finalized in June 1959 and designated certain waters in Prosser Reservoir in the Truckee River Basin as “Tahoe Exchange Water.” By this

agreement, when waters were to be released from Lake Tahoe for a minimum instream flow (50 cfs winter; 70 cfs summer) and when such releases from Lake Tahoe were not necessary for *Floriston Rates* due to normal flows elsewhere in the river, then an equal amount of water (exchange water) could be stored in Prosser Reservoir and used for releases at other times. Also see *Truckee River Agreement [Nevada and California]*.

**Tri-Partite Agreement [Lahontan Valley, Nevada]** — The 50-year agreement among Truckee-Carson Irrigation District (TCID), Nevada State Board of Fish and Game Commissioners (currently the Nevada Board of Wildlife Commissioners as part of the Nevada Division of Wildlife, NDOW), and U.S. Fish and Wildlife Service (USFWS) regarding the establishment, development, operation, and maintenance of *Stillwater National Wildlife Management Area*, dated November 26, 1948. In 1960 the management of this area was changed to a two-party agreement between USFWS and NDOW.

**Truckee River Agreement [Nevada and California]** — The Truckee River Agreement (1935) represents the current basis for the operation of the Truckee River, including its tributaries and diversions, between its source (Lake Tahoe) and its terminus (Pyramid Lake). Parties to this agreement include the *Truckee-Carson Irrigation District (TCID)*, serving the irrigation rights of agricultural water users of the *Newlands (Irrigation) Project [Nevada]* in Churchill County, Nevada, Sierra Pacific Power Company (SPPCo), serving primarily the municipal and industrial water needs of the cities of Reno and Sparks, Nevada, and the Washoe County Water Conservation District (WCWCD), serving the agricultural water users in the Truckee Meadows. Operation of upstream reservoirs is under the supervision of the Federal Water Master, who administers court-imposed requirements under the *Orr Ditch Decree [Nevada and California]* to supply water to achieve *Floriston Rates [California]* (mandated river flow rates) at the California–Nevada border. The 1944 Orr Ditch Decree, which incorporates the Truckee River Agreement, affirmed numerous individual water rights (both municipal and industrial and agricultural), including Truckee River diversion rights earlier than 1939. The Truckee River Agreement provides for operation of storage facilities, especially Lake Tahoe, to satisfy these rights and required the building of Boca Dam and Reservoir. The agreement further contains language intended to settle the disputes over pumping Lake Tahoe by:

- [1] Establishing the natural conditions in the bed and banks of Lake Tahoe and of the Truckee River near Tahoe City, Placer County, California, and prohibiting any alteration of such natural conditions without the approval of the Attorney General of the State of California, and, in fact, allowing parties to the agreement the right to restore these areas to their natural condition, as necessary;
- [2] Prohibiting the creation of any other outlet of Lake Tahoe in addition to the present and natural outlet at the head of the Truckee River;
- [3] Prohibiting the removal of water from Lake Tahoe for irrigation or power uses by any means other than gravity except upon the declaration of the U.S. Secretary of the Interior; and
- [4] Prohibiting the removal of water from Lake Tahoe for sanitary or domestic uses by any means other than gravity, except upon the condition that the Departments of Health of the States of Nevada and California, or other officers exercising similar authority, shall first have made and filed with the Attorney General of the State of Nevada and the Attorney General of the State of California certificates showing that a necessity for such pumping of Lake Tahoe exists.

The prescribed Floriston rates constitute the chief operational objective on the Truckee River today and originated as a turn-of-the-century flow requirement for run-of-the-river users — hydropower and a pulp and paper mill. Stored water in Lake Tahoe and Boca Reservoir is used to “make rates,” as specified in the Truckee River Agreement, when the river’s natural flow alone does not suffice. The following is a listing of the dams and reservoirs that are operated along the Truckee River and their ownership, uses, and operational criteria. Not all these reservoirs are operated as part of the Truckee River Agreement.

- [1] **Lake Tahoe** — The first dam at Lake Tahoe’s exit into the Truckee River, located at Tahoe City in Placer County, California, was constructed in the early 1870s and the existing Lake Tahoe Dam was constructed in 1913. The Lake Tahoe drainage area covers approximately 506 square miles. Water is stored only in the top 6.1 feet, from an elevation of 6,223.0 feet (the lake’s assumed natural rim above mean sea level — MSL) to an elevation of 6,229.1 feet (MSL). Total storage capacity equals approximately 744,600 acre-feet and is used to supplement Floriston rates in conjunction with natural runoff of other tributaries and Boca Dam releases. The Lake Tahoe Dam is owned by the USBR and operated under agreement by the TCID for the Newlands Project in Churchill County, Nevada. Lake Tahoe storage capacity is not considered part of the U.S. Army Corps of Engineers (COE) flood control system. Lake Tahoe waters may be exchanged for water from Prosser Creek Reservoir (the

Tahoe–Prosser Exchange Agreement) in order to maintain a live stream below the Lake Tahoe Dam without adversely affecting Nevada water users’ storage. Whenever possible, Lake Tahoe releases are to maintain a minimum instream flow of 50–70 cubic feet per second (cfs) downstream from the dam (varies with season).

- [2] **Donner Lake** — The first dam on Donner Lake was built in 1877, while the current dam was constructed in the 1930s. Donner Lake drains an area of only approximately 14 square miles. Water in Donner Lake is privately owned by Sierra Pacific Power Company (SPPCo) of Reno, Nevada and TCID and is not required to be used to meet Floriston rates. The dam is jointly owned and operated by SPPCo and TCID. Lake storage levels range between 5,924 feet MSL and 5,935.8 feet MSL (providing for 9,500 acre-feet of storage capacity). The SPPCo portion of the stored water is used to supplement Reno–Sparks municipal and industrial water use; the TCID portion is used to supplement Newlands Project irrigation water requirements. After the lake fills, lake inflows are passed through to supplement Floriston rates. Lake storage is not part of COE flood control system. The State of California requires a minimum flow of 2–3 cfs downstream from the dam for maintaining fish habitat.
- [3] **Independence Lake** — The original Independence Lake dam was constructed in 1879 and created a storage capacity of 3,000 acre-feet. After SPPCo acquired ownership of the lake and dam in 1937, the dam was enlarged in 1939 to its present size with a total storage capacity of 17,500 acre-feet. Independence Lake drains an area of only eight square miles. Like Donner Lake water, this water is privately owned and not required to be used to meet Floriston rates; the stored waters are owned by SPPCo and supplement the SPPCo water supply for the Reno–Sparks municipal and industrial water use during droughts. The lake’s first storage priority is for 3,000 acre-feet of (original) storage; an additional 14,500 acre-feet of storage is permitted after Boca Reservoir is full and the Floriston rates and Truckee River diversion rights (Orr Ditch Decree) are satisfied. The State of California requires a minimum flow of 2 cfs downstream from the dam for maintaining fish habitat.
- [4] **Martis Creek Reservoir** — The Martis Creek Dam was constructed by the COE in 1971 and was intended to store waters from a 40 square mile drainage area to include not only Martis Creek, by the East, West, and Central Martis Creeks as well. In accordance with COE requirements, this reservoir, with a total storage capacity of 20,400 acre-feet, serves only flood control purposes. While legislation allows for other uses, only temporary storage is currently permitted due to an unsafe, leaking dam. Except during flood storage, reservoir outflows equal inflows.
- [5] **Prosser Creek Reservoir** — The Prosser Creek Reservoir was constructed by the USBR in 1962 to store waters from a 50 square mile drainage area beginning 11 miles to the west at Warren Lake. The reservoir, with a total capacity of 29,800 acre-feet, is owned and operated by the USBR for three purposes: (a) as part of the COE Truckee River flood control program; (b) the storage of water under the terms of the Tahoe–Prosser Exchange Agreement (which provides that a portion of this water, when available, may be used to meet Floriston rates in lieu of making such releases from Lake Tahoe); and (c) to meet the spawning flow needs of Pyramid Lake’s endangered cui-ui fish species and its threatened Lahontan cutthroat trout, or for other federal purposes. The State of California generally requires a minimum flow of natural flow or 5 cfs, whichever is less, downstream from the dam for maintaining fish habitat.
- [6] **Stampede Reservoir** — The dam and reservoir, constructed by the USBR in 1970, drains an area of some 136 square miles and has a total capacity of 226,000 acre-feet. Water must be used primarily for spawning flows for the endangered cui-ui fish species and the threatened Lahontan cutthroat trout of Pyramid Lake. Storage space is also part of COE flood control plan. Stampede Reservoir water may be stored only after: (1) Floriston rates and Truckee River diversion rights have been satisfied; (2) Boca Reservoir is full; and (3) Independence Lake is full. Due to its relatively junior water rights, this reservoir seldom fills and therefore has been targeted as a prime storage location for Reno–Sparks municipal water as part of the Negotiated Settlement (Public Law 101–618) and the implementation of a new Truckee River Operating Agreement (TROA). The State of California requires a minimum flow of 30 cfs downstream from the dam for maintaining fish habitat (although this agreement has expired, the rates of flow have been maintained).
- [7] **Boca Reservoir** — The original Boca dam was built around 1868 for ice harvesting. The present, much larger dam, was constructed in 1937 and created a reservoir with a total capacity of 40,800 acre-

feet and a drainage area, to include the entire Little Truckee River Basin (including both Independence Lake and Stampede Reservoir) of some 172 square miles. Title to stored water is held by the USBR and operated by the Washoe County Water Conservation District (WCWCD). The reservoir's water is used in conjunction with Lake Tahoe water to maintain Floriston rates and to provide part of the required COE flood control capacity. Up to 25,000 acre-feet of water may be stored in Boca Reservoir only after Floriston rates are satisfied and Independence Lake's first storage priority of 3,000 acre-feet is satisfied. The balance may not be filled unless the Newlands Project diversion right at Derby Dam (on the lower Truckee River) has been satisfied. SPPCo stores a small portion (800 acre-feet) of its privately owned stored water (POSW) rights here. There are no minimum downstream flow requirement associated with Boca Reservoir.

- [8] **Derby Dam/Truckee Canal/Lahontan Reservoir** — Although Lahontan Reservoir is not a storage facility of the Truckee River Basin, it does store Truckee River waters diverted at Derby Dam on the lower Truckee River. Derby Dam, which is located approximately 11 miles upstream from Wadsworth, Nevada, is the regulating device by which Truckee River waters are diverted into the Truckee Canal for use within the Truckee Division of the Newlands Project and for storage in Lahontan Reservoir in the Carson River Basin for use within the Carson Division of the Newlands Project. The dam, originally named the Truckee River Diversion Dam, was completed by the USBR in June 1905, whereas the Truckee Canal was not completed through to the Carson River until August 1906. Lahontan Reservoir was not completed until 1915, at which time the Truckee Canal's outlet was re-routed slightly upstream so as to enter Lahontan Reservoir instead of flowing directly into the Carson River below the dam. Diversions and releases are conducted in accordance with the Truckee River Agreement, the Orr Ditch Decree, and Newlands Project OCAPs, which allow for a maximum diversion of up to 1,500 cfs (Orr Ditch Decree right, although current canal capacity is only 900 cfs) from: (a) remainder of Floriston rates and return flows from upstream diversions; (b) right to Truckee River tributary water; and (c) any water bypassed or released to obtain space to store flood waters in reservoirs if water right holder did not identify a use for the release. Under the more recent project OCAPs, the quantity of water which may be diverted from the Truckee River at Derby Dam varies with the determination of irrigation entitlement each year (water-righted acreage to be irrigated and the appropriate water duty for bench and bottom lands) and the predicted runoff from the Carson River and water in storage in Lahontan Reservoir.

Also see *Operational Criteria and Procedures (OCAP) [Nevada]*, *Public Law 101–618 [Nevada and California]*, and *Truckee River Operating Agreement (TROA) [Nevada and California]*.

**Truckee River General Electric Decree [California]** — Represented the resolution, through a 1915 federal court consent decree, of a lengthy series of conflicts, litigation, and negotiations between the *U.S. Bureau of Reclamation (USBR)* and the Truckee River General Electric Company (predecessor to the present-day Sierra Pacific Power Company), which, in 1902, through a complicated series of real estate transactions had obtained title to the Lake Tahoe Dam, surrounding lands, and the hydropower plants on the Truckee River. The USBR was in desperate need of Lake Tahoe water for its Newlands Project, then nearing completion near Fallon in Churchill County. This decree granted the USBR an easement to operate the Lake Tahoe Dam and to use surrounding property owned by the power company. On its part, the USBR was required to provide certain year-round flow rates (the *Floriston Rates*), measured at a stream gage near the state line, to support hydropower generation. These rates, in fact, dated back to a 1908 river flow agreement among the Truckee River General Electric Company, the Floriston Land and Power Company, and the Floriston Pulp and Paper Company and required that "...there shall be maintained a flow of water in the said Truckee River at Floriston [California] of not less than 500 cubic feet per second from the First day of March to the 30th day of September inclusive, in each year, and of not less than 400 cubic feet per second from the 1st day of October to the last day of February, inclusive, in each year." While this decree did dictate how the Lake Tahoe Dam would be operated, it did little to solve the concerns of residents of the lake and lessen California's concerns over the apportionment of Lake Tahoe waters.

**Truckee River Operating Agreement (TROA) [Nevada and California]** — The Truckee River Operating Agreement is incorporated in Section 205 of *Public Law 101–618* (the *Negotiated Settlement*) and requires that the U.S. Secretary of the Interior negotiate an operating agreement for the Truckee River with the States of Nevada and California, and other parties. The intent of the TROA is to supplant the current *Truckee River Agreement* and provide for the comprehensive management of the Truckee River waters in California and Nevada, as well

as to provide important long-term drought protection for the Reno–Sparks (Nevada) Metropolitan Area. The primary purpose of the TROA is to improve management of Truckee River reservoirs located in California by expanding existing operations for the benefit of municipal and industrial water use, increase drought storage, aid in the recovery of endangered and threatened fish species, and, in general, improve fish and wildlife habitat within the Truckee River Basin. This would be accomplished by “networking” reservoir releases and storage (i.e., unify reservoir operations for a common objective and into a single schedule) in a manner that would not infringe on existing water storage, release, and use rights or flood control requirements. The TROA would also allow for the exchange, transfer, and release of waters from the upstream reservoirs to improve the likelihood of maintaining instream flows for fish and wildlife. The TROA is intended to provide a number of substantive benefits to users of Truckee River waters. These benefits may be listed in four fundamental areas:

- [1] **Reservoir Management** — Improve river flow and river management by improving flexibility, coordinate reservoir storage and release, allow transfers and exchanges among various reservoirs to reduce spills, provide for recreational pools, etc., create a water credit system, promote more efficient use of existing water supplies, allow for the storage of “other waters”, centralize Truckee River water management, improve water accounting (budgeting) and forecasting, eliminate releases solely for power generation, permit storage of water savings from conservation in the Reno–Sparks Metropolitan Area, and provide for greater water marketing among private water rights holders;
- [2] **Fish and Wildlife** — Enhance spawning potential of the Pyramid Lake endangered cui-ui (*Chasmistes cujus*) and threatened Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) fish species through improved overall river operations, commitment of specified waters, increased water availability, and mitigation of significant adverse environmental impacts;
- [3] **Municipal and Industrial Use** — Provide additional M&I drought relief storage for the Reno–Sparks Metropolitan Area through an M&I Water Credit System;
- [4] **Conservation** — Promote water conservation in the Reno–Sparks Metropolitan Area through water metering and various conservation programs.



## Nevada Division of Water Planning

# Nevada State Water Plan

## PART 1 — BACKGROUND AND RESOURCE ASSESSMENT

### Section 9

## Abbreviations and Acronyms

[The following terms have been extracted from the Nevada Division of Water Planning's *Water Words Dictionary* and may appear within the *Nevada State Water Plan*. Definitions of these words and a more extensive listing of water-related acronyms may be found in the *Water Words Dictionary*. With respect to notation and presentation, where two acronyms have different meanings, generally the more frequently used one will be listed first.]

<b>AF</b>	Acre-Feet (or Acre-Foot)
<b>AFY</b>	Acre-Feet per Year
<b>ASC</b>	Atmospheric Sciences Center (DRI)
<b>ASCE</b>	American Society of Civil Engineers
<b>ASOS</b>	Automated Surface Observing Systems (NWS/NOAA)
<b>AWWA</b>	American Water Works Association
<b>BAC</b>	Biological Activated Carbon [Process]
<b>BADT</b>	Best Available Demonstrated Technology
<b>BAT</b>	Best Available Technology [Economically Achievable]
<b>BCF</b>	Bioconcentration Factor
<b>BCP</b>	Bioconcentration Potential
<b>BCT</b>	Best [Conventional] Control Technology
<b>BFE</b>	Base Flood Elevation (FEMA)
<b>BIA</b>	Bureau of Indian Affairs (USDI)
<b>BLM</b>	Bureau of Land Management (USDI)
<b>BMP</b>	Best Management Practice [Urban Water Use]
<b>BOD</b>	Biochemical Oxygen Demand/Biological Oxygen Demand
<b>BPI</b>	Bureau of Plant Industry [Evaporation Pan] (USDA)
<b>BPT</b>	Best Practicable Control Technology
<b>BSC</b>	Biological Sciences Center (DRI)
<b>CAA</b>	Clean Air Act (EPA)
<b>CAPA</b>	Critical Aquifer Protection Area (SDWA)
<b>CEQA</b>	California Environmental Quality Act
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
<b>CERES</b>	California Environmental Resources Evaluation System
<b>CFCs</b>	Chlorofluorocarbons
<b>CF</b>	Cubic Feet (or Foot)
<b>CFS</b>	Cubic Feet per Second
<b>CIR</b>	Consumptive Irrigation Requirement/Crop Irrigation Requirement
<b>CLOMR</b>	Conditional Letter of Map Revision (FEMA)
<b>COI</b>	Cone of Influence
<b>COD</b>	Chemical Oxygen Demand
<b>COD</b>	Cone of Depression
<b>CORPS</b>	U.S. Army Corps of Engineers (also USACE)
<b>CSS</b>	Combined Sewer System

## *Nevada State Water Plan*

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<b>CWA</b>	Clean Water Act (EPA)
<b>DBPs</b>	Disinfection By-Products
<b>DCNR</b>	Department of Conservation and Natural Resources (State of Nevada)
<b>D/DBP</b>	Disinfectant and Disinfection By-Product Rule (EPA)
<b>DEP</b>	Division of Environmental Protection (DCNR)
<b>DNAPLs</b>	Denser (than water) Non-Aqueous-Phase Liquids
<b>DO</b>	Dissolved Oxygen
<b>DOC</b>	Dissolved Organic Carbon
<b>DOF</b>	Division of Forestry (DCNR)
<b>DOW</b>	Division of Wildlife (DCNR)
<b>DDT</b>	Dichlorodiphenyltrichloroethane
<b>DRI</b>	Desert Research Institute (University of Nevada System, State of Nevada)
<b>DWR</b>	Division of Water Resources (DCNR)
<b>DWR</b>	Department of Water Resources (The Resources Agency, State of California)
<b>DWP</b>	Division of Water Planning (DCNR)
<b>EA</b>	Environmental Assessment (NEPA)
<b>EA</b>	Endangerment Assessment (EPA)
<b>EDF</b>	Environmental Defense Fund
<b>EEEC</b>	Energy and Environmental Engineering Center (DRI)
<b>EIS</b>	Environmental Impact Statement (NEPA)
<b>EPA</b>	[U.S.] Environmental Protection Agency
<b>ESA</b>	Endangered Species Act (USFWS)
<b>ESWTR</b>	Enhanced Surface Water Treatment Rule (EPA)
<b>ET</b>	Evapotranspiration
<b>ETAW</b>	Evapotranspiration of Applied Water
<b>EWMP</b>	Efficient Water Management Practice [Agricultural Water Use]
<b>FBFM</b>	Flood Boundary Floodway Map (FEMA)
<b>FEMA</b>	Federal Emergency Management Agency
<b>FERC</b>	Federal Energy Regulatory Commission
<b>FHBM</b>	Floodway Hazard Boundary Map (FEMA)
<b>FIRM</b>	Flood Insurance Rate Map (FEMA)
<b>FIS</b>	Flood Insurance Study (FEMA)
<b>FONSI</b>	Finding of No Significant Impact (NEPA)
<b>FS</b>	Feasibility Study (EPA)
<b>FTE</b>	Full Time Equivalent (Employment)
<b>GAC</b>	Granular Activated Carbon
<b>GACT</b>	Granular Activated Carbon Treatment
<b>GD</b>	Geologic Division (USGS)
<b>GFD</b>	Gallons per Square Foot [of membrane] per Day
<b>GID</b>	General Improvement District
<b>GIS</b>	Geographic Information System
<b>GPC</b>	Gallons per Capita (Person)
<b>GPCD</b>	Gallons per Capita per Day
<b>GPD</b>	Gallons per Day
<b>GPED</b>	Gallons per Employee per Day
<b>HCP</b>	Habitat Conservation Plan (EPA)
<b>HSA</b>	Hydrologic Study Area (DWR, State of California)

<b>ICR</b>	Information Collection Rule (EPA)
<b>I.E.</b>	Irrigation Efficiency
<b>IOWE</b>	International Office for Water Education (Utah State University)
<b>IRP</b>	Integrated Resource Planning
<b>JTU</b>	Jackson Turbidity Unit
<b>KGAL</b>	Kilogallons (thousand gallons)
<b>KGRA</b>	Known Geothermal Resource Area
<b>LOMA</b>	Letter of Map Amendment (FEMA)
<b>LOMR</b>	Letter of Map Revision (FEMA)
<b>LR</b>	Leaching Requirement
<b>LTAR</b>	Long Term Acceptance Rate [of Soils]
<b>LVEA</b>	Lahontan Valley Environmental Alliance
<b>MAF</b>	Million Acre-Feet
<b>M&amp;I</b>	Municipal and Industrial
<b>MBAS</b>	Methylene Blue Active Substance
<b>MCL</b>	Maximum Contaminant Level (EPA)
<b>MCLG</b>	Maximum Contaminant Level Goal (EPA)
<b>MEQ/L</b>	Milliequivalents per Liter
<b>MGD</b>	Million Gallons per Day
<b>MG/L</b>	Milligrams per Liter
<b>MIS</b>	Management Indicator Species
<b>MSL</b>	Mean Sea Level
<b>MTBE</b>	Methyl Tertiary Butyl Ether
<b>NAPLs</b>	Non-Aqueous-Phase Liquids
<b>NASQAN</b>	National Stream Quality Accounting Network (USGS)
<b>NDEPS</b>	National Pollutant Discharge Elimination System (EPA)
<b>NDOW</b>	Nevada Division of Wildlife (DCNR)
<b>NDSP</b>	Nevada Division of State Parks (DCNR)
<b>NDWP</b>	Nevada Division of Water Planning (DCNR)
<b>NEPA</b>	National Environmental Policy Act
<b>NESDIS</b>	National Environmental Satellite, Data and Information Service (NOAA)
<b>NEXRAD</b>	Doppler Radar Data System (NWS/NOAA)
<b>NFIP</b>	National Flood Insurance Program (FEMA)
<b>NFS</b>	National Forest Service (USDA)
<b>NGVD</b>	National Geodetic Vertical Datum
<b>NHP</b>	Natural Heritage Program (DCNR)
<b>NIDS</b>	NEXRAD Information Dissemination Service (NWS/NOAA)
<b>NIFC</b>	National Interagency Fire Center (BLM)
<b>NIPDWR</b>	National Interim Primary Drinking Water Regulations
<b>NMD</b>	National Mapping Division (USGS)
<b>NMFS</b>	National Marine Fisheries Service (NOAA)
<b>NOAA</b>	National Oceanic and Atmospheric Administration (U.S. Department of Commerce)
<b>NO<sub>x</sub></b>	Oxides of Nitrogen
<b>NPDES</b>	National Pollutant Discharge Elimination System (EPA)
<b>NPDWR</b>	National Primary Drinking Water Regulations (SDWA/EPA)
<b>NPL</b>	National Priorities List [“Superfund” List] (EPA)

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<b>NPS</b>	Non-Point Source [Pollution]
<b>NPS</b>	National Park Service (USDI)
<b>NRCS</b>	Natural Resources Conservation Service (USDA)
<b>NRDC</b>	Natural Resources Defense Council (private environmental organization)
<b>NRP</b>	National Research Program [Centers] (WRD/USGS)
<b>NSDWR</b>	National Secondary Drinking Water Regulations
<b>NTU</b>	Nephelometric Turbidity Unit
<b>NVS</b>	Non-Volatile Solids
<b>NVSS</b>	Non-Volatile Suspended Solids
<b>NWIC</b>	National Water Information Clearinghouse (USGS)
<b>NWPA</b>	Newlands [Irrigation Project] Water Protective Association
<b>NWR</b>	National Wildlife Refuge [System] (USFWS)
<b>NWS</b>	National Weather Service (NOAA)
<b>OCAP</b>	Operating Criteria and Procedures (TCID/USBR)
<b>OFA</b>	Other Federal Agencies [Program] (WRD/USGS)
<b>OSM</b>	Office of Surface Mining Reclamation and Enforcement (Bureau of Mines/USDI)
<b>PAHs</b>	Polycyclic Aromatic Hydrocarbons, or Polararomatic Hydrocarbons
<b>PAMs</b>	Polyacrylamides
<b>PCBs</b>	Polychlorinated Biphenyls
<b>PCE</b>	Perchloroethylene
<b>PDC</b>	Project Dependable Capacity
<b>pH</b>	Hydrogen Ion Concentration [Potential of Hydrogen]
<b>PIA</b>	Practicably Irrigable Acreage
<b>P.L.</b>	Public Law
<b>PLSS</b>	Public Land Survey System
<b>PMF</b>	Probable Maximum Flood (FEMA)
<b>PNA<sub>s</sub></b>	Polynuclear Aromatic Hydrocarbons
<b>PPB</b>	Parts per Billion
<b>PPM</b>	Parts per Million
<b>PPT</b>	Parts per Thousand
<b>PS</b>	Point Source [Pollution]
<b>PSA</b>	Primary Settlement Agreement
<b>PWS</b>	Public Water System/Public Water Supply
<b>PWSS</b>	Public Water Supply System
<b>QPF</b>	Quantitative Precipitation Forecast
<b>QSC</b>	Quaternary Sciences Center (DRI)
<b>RCRA</b>	Resource Conservation and Recovery Act (EPA)
<b>RI</b>	Remedial Investigation (EPA)
<b>RI/FS</b>	Remedial Investigation/Feasibility Study (EPA)
<b>RMCL</b>	Recommended Maximum Containment Level
<b>RMP</b>	Resource Management Plan (BLM)
<b>S.A.</b>	Seasonally Adjusted
<b>SAB</b>	Science Advisory Board (EPA)
<b>SAE</b>	Seasonal Application Efficiency
<b>SCS</b>	Soil Conservation Service (now NRCS)
<b>SDWA</b>	Safe Drinking Water Act (EPA)
<b>SFHA</b>	Special Flood Hazard Area (FEMA)

<b>SFIP</b>	Standard Flood Insurance Policy (FEMA)
<b>SIC</b>	Standard Industrial Classification [Code]
<b>SMCL</b>	Secondary Maximum Contaminant Level (EPA)
<b>SNOTEL</b>	Snowpack Telemetry (NRCS)
<b>SPCCP</b>	Spill Prevention Control and Countermeasures Plan (CWA)
<b>SPF</b>	Standard Project Flood (FEMA)
<b>SWAP</b>	Source Water Protection Program (EPA)
<b>SWCS</b>	Soil and Water Conservation Society
<b>SWE</b>	Snow Water Equivalent
<b>SWPP</b>	Source Water Protection Program (EPA)
<b>SWRCB</b>	State Water Resources Control Board (DWR/State of California)
<b>SWTR</b>	Surface Water Treatment Rule (SDWA)
<b>TC</b>	Total Carbon
<b>TCID</b>	Truckee–Carson Irrigation District [Nevada]
<b>TDS</b>	Total Dissolved Solids
<b>THMs</b>	Trihalomethanes
<b>TMDL</b>	Total Maximum Daily Load (EPA)
<b>TNC</b>	The Nature Conservancy
<b>TROA</b>	Truckee River Operating Agreement [California and Nevada]
<b>TS</b>	Total Solids
<b>TSCA</b>	Toxic Substances Control Act (EPA)
<b>TSS</b>	Total Suspended Solids
<b>TTHMs</b>	Total Trihalomethanes
<b>UDI</b>	[Ground Water] Under the Direct Influence [of Surface Water]
<b>UIC</b>	Underground Injection Control
<b>USACE</b>	U.S. Army Corps of Engineers (also Corps)
<b>USBR</b>	U.S. Bureau of Reclamation (USDI)
<b>USDA</b>	U.S. Department of Agriculture
<b>USDI</b>	U.S. Department of the Interior
<b>USDW</b>	Underground Source of Drinking Water
<b>USFS</b>	U.S. Forest Service (USDA)
<b>USFWS</b>	U.S. Fish and Wildlife Service (USDI)
<b>USGS</b>	U.S. Geological Survey (USDI)
<b>USRS</b>	U.S. Reclamation Service (USBR)
<b>UV</b>	Ultraviolet Radiation
<b>VOC</b>	Volatile Organic Carbon
<b>VOCs</b>	Volatile Organic Chemicals
<b>WAVE</b>	Water Alliances for Voluntary Efficiency (EPA)
<b>WCWCD</b>	Washoe County Water Conservation District (Nevada)
<b>WET</b>	Water Education for Teachers
<b>WHPA</b>	Wellhead Protection Area
<b>WMA</b>	Wildlife Management Area (NDOW/State of Nevada)
<b>WPA</b>	Watershed Protection Approach (EPA)
<b>WRC</b>	Water Resources Center (DRI)
<b>WRD</b>	Water Resources Division (USGS)
<b>ZOC</b>	Zone of Contribution
<b>ZOI</b>	Zone of Influence

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**PART 1 — BACKGROUND AND RESOURCE ASSESSMENT**

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