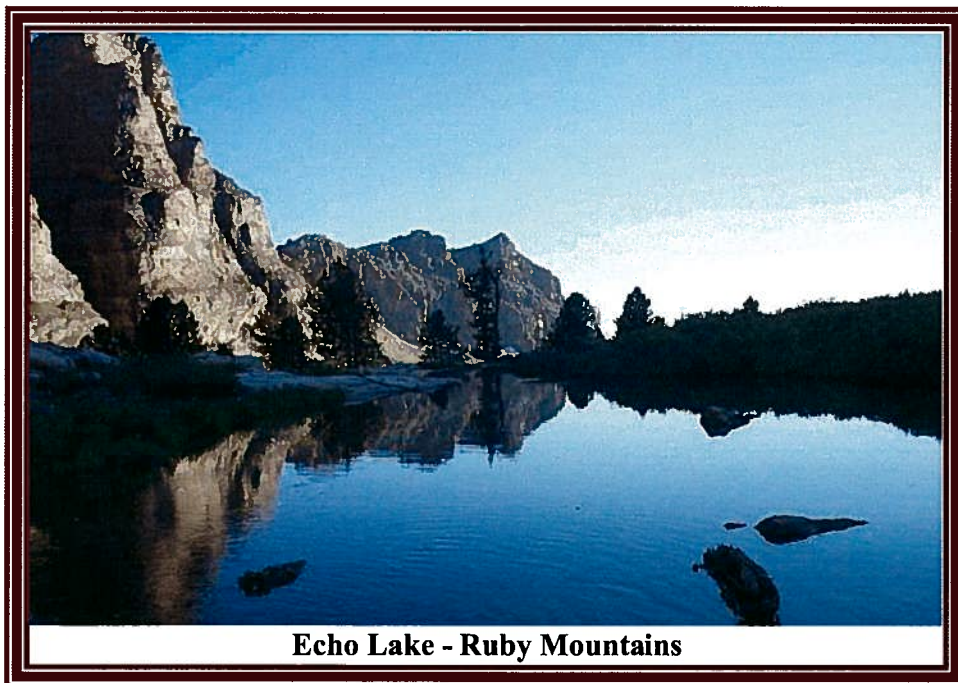


# **Elko County Nevada Water Resource Management Plan 2007**



**Echo Lake - Ruby Mountains**

**Prepared and Submitted by:**

**Elko County Board of Commissioners  
Elko County Water Planning Commission  
Elko County Planning & Zoning Division**

**September 2007**

**EXHIBIT F-1 - LANDS  
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## Executive Summary

The Elko County Water Resource Management Plan has been prepared to guide the development, management and use of water resources in conjunction with land use management over the next twenty five (25) years. Use by decision makers of information contained within this plan will help to ensure that the environment of the County is sustained while at the same time enabling the expansion and diversification of the local economy. Implementation of the Elko County Water Resource Management Plan will assist in maintaining the quality of life enjoyed by residents and visitors of Elko County now and in the future. Achievement of goals outlined in the plan will result in water resources found within Elko County being utilized in a manner beneficial to the residents of Elko County and the State of Nevada.

The *State of Nevada Water Plan* represents that Elko County will endure a loss of population and agricultural lands over the next twenty five years. Land use and development patterns prepared by Elko County do not agree with this estimated substantial loss of population and agricultural lands. The trends show that agricultural uses in Elko County are stable with minimal notable losses each year. Development patterns represent that private lands that are not currently utilized for agricultural are being developed in cooperation and conjunction with agricultural uses.

Elko County is currently the largest water user in the State of Nevada. Current water use in Elko County including domestic, recreation, commercial, industrial, mining, livestock and irrigated agriculture is estimated to be approximately **933,041** acre feet annually or 24% of the total state wide use. The largest of the water users being agriculture at approximately 97%. The *State of Nevada Demographer* and *State of Nevada Division of Water Planning* has provided estimates and forecast representing a decrease in population and a loss of agricultural lands in Elko County through 2026. Forecasts and estimates based on development patterns provided by **Elko County** represents continued growth of population, anticipated commercial and industrial growth, projected numbers of tourists visiting Elko County annually and sustained or minimal loss of agricultural lands. Should these estimates and forecasts come to realization annual water duties in Elko County could increase for domestic, commercial and municipal/ industrial consumptive uses by as much as 100 acre feet annually. However, this also represents a loss of Agricultural lands averaging 0.1% annually. Assuming that all of the elements of the economic and forecasted populations are achieved, the total water use in the year 2025 may exceed **918,000** acre feet annually. This represents a decrease of 1.6% primarily due to the loss of agricultural lands.

Studies conducted by the U.S.G.S. indicate that the quantity of groundwater being lost to evapotranspiration is generally more than double than that estimated in previous evaluations. Hydrographic Analysis Reports of this plan suggest that recharge over the specific areas of Elko County is significantly greater than previous estimates. However, research and analysis is characterized by considerable uncertainty and additional confirmation is required. The implications for this water plan are that more water is available and may be made available for development and use within Elko County. This mandates that additional Hydrographic Analysis Reports are necessary for the upper Humboldt River basin as well as all basins and hydrographic areas in Elko County to determine perennial yields based on current technology.

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## Abbreviations and Acronyms

<b>AF</b>	.....	Acre-Feet (or Acre-Foot)
<b>AFY</b>	.....	Acre-Feet per Year
<b>AWWA</b>	.....	American Water Works Association
<b>BFE</b>	.....	Base Flood Elevation (FEMA)
<b>BIA</b>	.....	Bureau of Indian Affairs (USDI)
<b>BLM</b>	.....	Bureau of Land Management (USDI)
<b>CFS</b>	.....	Cubic Feet per Second
<b>CORPS</b>	.....	U.S. Army Corps of Engineers (also USACE)
<b>CWA</b>	.....	Clean Water Act (EPA)
<b>DOW</b>	.....	Division of Wildlife (DCNR)
<b>DWR</b>	.....	Division of Water Resources (DCNR)
<b>DWP</b>	.....	Division of Water Planning (DCNR)
<b>FEMA</b>	.....	Federal Emergency Management Agency
<b>FIRM</b>	.....	Flood Insurance Rate Map (FEMA)
<b>FIS</b>	.....	Flood Insurance Study (FEMA)
<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>M&amp;I</b>	.....	Municipal and Industrial
<b>MGD</b>	.....	Million Gallons per Day
<b>MSL</b>	.....	Mean Sea Level
<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>NFIP</b>	.....	National Flood Insurance Program (FEMA)
<b>NPS</b>	.....	Non-Point Source [Pollution]
<b>PWS</b>	.....	Public Water System/Public Water Supply
<b>S.A.</b>	.....	Seasonally Adjusted
<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>SNOTEL</b>	.....	Snowpack Telemetry (NRCS)
<b>SPF</b>	.....	Standard Project Flood (FEMA)
<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>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>WRD</b>	.....	Water Resources Division (USGS)

## WATER EQUIVALENT TABLE

1 cubic foot = 7.48 gallons = 62.4 pounds of water  
1 acre-foot = 43,560 cubic feet = 325,851 gallons  
1 cubic foot per second (cfs) = 449 gallons per minute (gpm)  
1 cfs for 24 hours = 1.9835 acre-feet  
1 cfs for 30 days = 59.5 acre-feet  
1 cfs for 1 year = 724 acre-feet  
1 million gallons = 3.07 acre-feet  
1 million gallons per day (mgd) = 1,120 acre-feet per year = 1.55 cubic feet per second  
1,000 gallons per minute = 4.42 acre-feet per day

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Elko County Approval:

The *Elko County Water Resource Management Plan* has been developed from a culmination of several public workshops and hearings as per N.R.S. 278.210, under the direction of the Elko County Board of Commissioners and the Elko County Water Planning Commission.

The *Elko County Water Resource Management Plan* is formally approved and adopted by the Elko County Water Planning Commission, on this the 12th day of September, 2007.

  
Chris Johnson, Chairman

  
Gerald Miller, Vice Chairman

  
James Muth, Water Planning Commissioner

  
Tim Sirotek, Water Planning Commissioner

  
Jonathan Gorman, Water Planning Commissioner

  
David M. Evetts, Water Planning Commissioner

The *Elko County Water Resource Management Plan* is formally approved and adopted by the Elko County Board of Commissioners, on this the 5th day of September, 2007.

  
John Ellison, Chairman

  
Mike Nannini, Vice Chairman

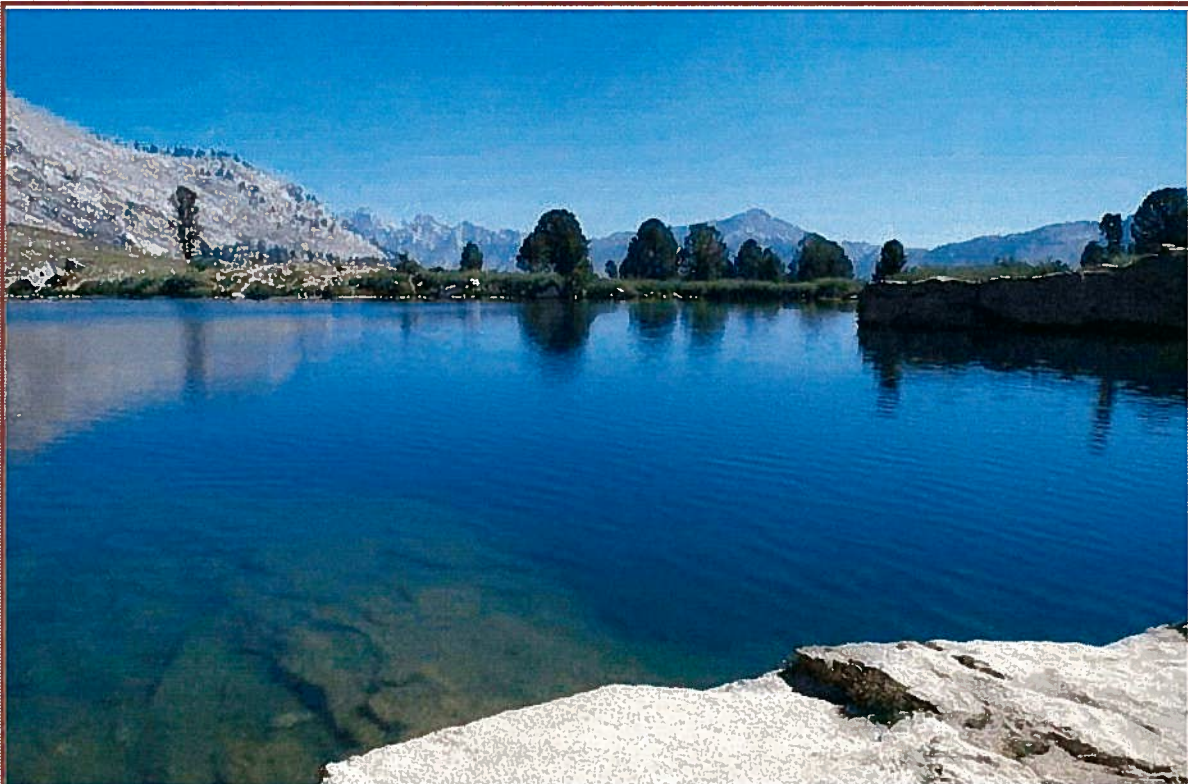
  
Sheri Eklund Brown, County Commissioner

  
Charlie Myers, County Commissioner

  
Warren Russell, County Commissioner

# **Elko County Water Resource Management Plan Plan Development Information**

## **Section 1**



**Mountain Lake - Ruby Mountains**

# SECTION 1

## Elko County Water Resource Management Plan

### Plan Development Information

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#### INTRODUCTION

The Elko County Water Resource Management Plan is developed by the Elko County Division of Planning and Zoning under direction of the Elko County Water Planning Commission and the Elko County Board of Commissioners . Data was obtained through the Elko County Assessor's Office, State of Nevada Department of Conservation and Natural Resources, State of Nevada Division of Water Resources, State of Nevada Engineer, State of Nevada Health Department, State of Nevada Demographer, State of Nevada Division of Forestry, The United States Bureau of Land Management, United States Forest Service, United States Geological Survey, private Hydrology and Engineering Consultants and the general public of Elko County. The Plan is a comprehensive effort to unite and direct land use planning and water use planning directions in Elko County, by realizing the **Economic and Quality of Life Benefits of Water Right Protection, Water Shed Protection and Water Conservation.**

Nevada is the driest state in the United States with mean annual precipitation ranging from 24" in the northwest to less than 6" in the south. The dry arid high desert and mountainous region of Elko County receives an average of only 12" per year. Therefore the necessity of planning future water needs to accommodate existing populations as well as projected population and development increases is imperative to our way of life.

Across the country, counties and municipalities are realizing the many benefits of water management and conservation plans, not just the economic values, but the health and quality of life issues as well. Reports and plans have been prepared and developed to promote and develop consistent and feasible future development of residential, commercial and industrial use of water, as well as to maintain existing uses. Agriculture, recreation and conservation have been a primary focus with the inclusion of the economic impacts of water availability to specifically planned residential communities and recreational areas. The reality of many of these referenced plans reflects the economic impact of quality of life issues in reference to potential water based recreation, commercial and industrial development. The economic value quality of life and health benefits contribute to commercial, industrial, residential, agricultural and recreational development in areas that have not been considered feasible.

The creation and implementation of the Elko County Water Resource Management Plan will provide the necessary information to develop proper water resource management and conservation procedure. The plan is designed to promote new technology in the identification of recharge and perennial yield analysis. The purposes of the plan are to:

- Develop and implement a plan to protect the public interest by maintaining existing water rights and water resources.
- Develop a water conservation program.
- Provide accurate measurement of hydrologic area perennial yields to encourage and promote economic diversity in Elko County.



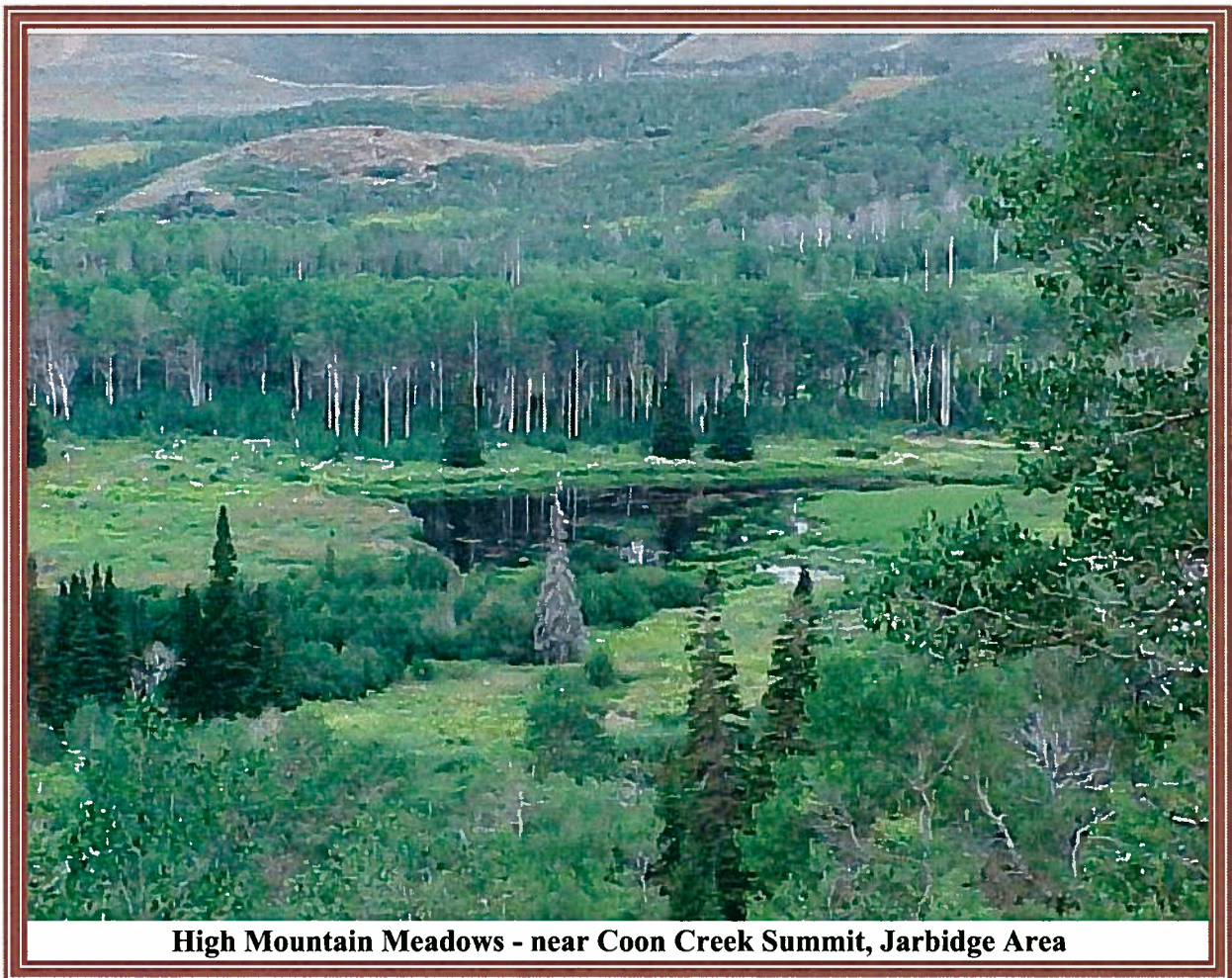
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The plan will provide comprehensive information to specific areas of high density development and aid in the development of private and public lands within the specific boundaries. This will provide data for short and long range planning to ensure that water supply and quality will not be affected by over development. The plan will provide pertinent general data about rural areas and comprehensive data on the specific hydrographic areas as outlined in Section 3 and provide the tools necessary for proper long range land use planning.

The Water Resource Management Plan is designed to guide the growth and development patterns for Elko County for a time of **Twenty five years (25)**, the plan will require review every five years. A comprehensive review is required at the twenty fifth (25<sup>th</sup>) year anniversary in **2032**. The Water Resource Management Plan is intended to provide the reader with pertinent water supply and demand information for future development.





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**INSTITUTIONAL FRAMEWORK & HISTORY**

***HISTORY***

April 17, 1997 a letter from the *State of Nevada Division of Water Resources* was delivered to the Elko County Division of Planning and Zoning. The letter was prepared by Mr. Michael Turnipseed, P.E., State of Nevada Engineer and Director of the Division of Water Resources. The letter was concerning the creation of additional parcels within the Elko Segment of the Humboldt River Basin. Mr. Turnipseed recommended to Elko County that for each new parcel created within the Elko Segment 2.02 acre feet of water rights in good standing must be relinquished and abandoned to the State of Nevada. This meant that for each Parcel map or Subdivision that created parcels smaller than forty (40) acres in size that required the development of individual domestic wells, the developer would be required to acquire water rights that equaled 1800gpd or 2.02 acre feet per each parcel before the Parcel map or Subdivision could be approved.

Mr. Turnipseed's letter provided some land status inventory of the Elko Segment, stating that approximately 4,500 parcels were at that time in existence and each parcel had been allocated for domestic wells. This number did not take into consideration access to other utilities, ingress / egress, topographic features or other limiting factors to the development of the parcel. The letter also recommended to Elko County that the creation and implementation of an Elko County Water Plan would be needed.

The letter was forwarded to the Elko County Board of Commissioners. The Commissioners directed staff to request the State Engineer to attend a regularly scheduled meeting at his convenience. Mr. Hugh Ricci, Deputy Director of the State of Nevada Division of Water Resources did attend and provide explanation as to the letter. His response was that the letter was only a recommendation to Elko County to proceed with new land development within the Elko Segment with caution as to the water allocation and to create and implement an Elko Segment or County Water Plan.

***THE ELKO COUNTY BOARD OF COMMISSIONERS***

In December of 1997 the Elko County Board of Commissioners approved by resolution the creation of the Elko County Water Planning Commission as an Advisory Board. The Water Planning Commission was charged with the duty to create and implement the Elko County Water Resources Plan. The Elko County Water Planning Commission was established and first met in February 1998. Upon the creation of the Plan, the Elko County Water Planning Commission was to submit the Plan, Recommendations and Policies to the Board of County Commissioners for approval.

***THE ELKO COUNTY WATER PLANNING COMMISSION***

The Elko County Board of Commissioners instructed staff to prepare project outlines and cost analysis for the Elko County Water Plan. In September of 1997 the Elko County Planning and Zoning Division prepared a project outline for the creation and implementation of the Elko County Water Plan and submitted it to the Elko County Board of Commissioners. The first priority was establishing the Elko County Water Planning Commission.

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***COMPOSITION OF THE WATER PLANNING COMMISSION***

The Water Planning Commission is a seven member board, with an additional seven member voting alternates, to act in an advisory role to the Board of County Commissioners. The Water Planning Commission consists of:

**Voting Members:**

Elko County Board of Commissioners, one member, and Staff  
City of Elko, one member, and Staff  
City of Wells, one member, and Staff  
City of West Wendover, one member, and Staff  
City of Carlin, one member, and Staff  
At Large Members, two members

**Voting Alternates:**

Elko County Board of Commissioners, one member  
City of Elko, one member  
City of Wells, one member  
City of West Wendover, one member  
City of Carlin, one member  
At Large Members, two members

The method of selecting and appointing the members of the Elko County Water Planning Commission was conducted as follows:

- 1) Request to the City Council of each Incorporated City within the boundary of Elko County, to appoint one voting member from the planning commission or city council and one voting alternate, to be accompanied by any support staff that may be available and qualified.
- 2) Request applications from the general public for the appointment of two at large voting members and two alternate members.
- 3) Elko County Planning and Zoning Division is the primary staff and coordinate all planning activities.

The Water Planning Commission is charged with the task of creating and implementing a comprehensive Elko County Water Resource Management Plan, as directed and approved by the Elko County Board of Commissioners. The Water Planning Commission is a working board for the creation of the Elko County Water Resource Management Plan, including the gathering and compilation of needed data.

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#### ***ELKO COUNTY WATER RESOURCES MANAGEMENT PLAN MISSION STATEMENT***

The mission of the Elko County Water Resource Management Plan is to create a comprehensive plan of Elko County to protect existing and future water rights and water resources of the general public and individual land owners. The Water Resource Management Plan will ensure that future development in Elko County is managed and do not result in diverse impacts on our water resources. The Water Resource Management Plan is to be created by the public of Elko County and approved by the Governing Board of County Commissioners for the health, safety and welfare needs of the citizens of Elko County.

#### ***PLANNING DATA CRITERIA OF THE ELKO COUNTY WATER RESOURCE MANAGEMENT PLAN***

There are areas of intense development that will require more in-depth comprehensive information and data areas of low or no development activity will not require comprehensive study. These different areas are identified, and are established using development patterns and potential land use as the major influence. The areas include:

***Elko Segment Water Basin***, extending from Carlin to Osino along the Humboldt River Basin. This area has historically and currently shown a high rate of residential, commercial and industrial development patterns over the past fifteen (15) years, especially within three(3) to eight (8) miles from the incorporated boundary of the City of Elko, primarily east along the Humboldt River. Most all commercial development has occurred within the City of Elko limits. Industrial development is sporadic along the East Idaho Street, primarily within the City of Elko limits, with pockets of industrial uses directly adjacent to the city boundary.

***Spring Creek, Lamoille, and South Fork Areas***. Currently these areas are being developed at a high rate. A large percentage of this area is serviced by water systems; Spring Creek Utilities and Lamoille Water Users Association. Other rural land owners are developing parcels for residential use, utilizing individual domestic wells and septic systems. These areas are part of the Spring Creek / Lamoille Master Plan and South Fork Master Plan. The Spring Creek / Lamoille Master Plan designates extensive areas for potential commercial and industrial development. However, the Dixie Creek / Ten Mile basin water resources will prohibit specific high consumption of water for industrial or commercial uses. This is due primarily to the residential development of the valley.

***North Fork Humboldt and Humboldt River Area ( I-80 Corridor)*** from the ***Osino Area***, to east of the ***City of Wells***. This area represents areas of low to moderate growth. The potential of residential and commercial development is present, as evidenced by numerous existing subdivisions and industrial zoned areas along the Interstate 80 corridor. [The ***Adobe Range*** north along ***Mountain City Highway (SR 225)*** to the ***Wild Horse Reservoir***] This area represents an area of low to moderate development. This area is increasing in developmental activity and is primarily an area of agricultural - residential development in ten acre parcels. The potential for higher density is present, primarily in the Adobe Summit area north towards Lone Mountain Station.

***Elko County (Remainder)***. Slow, steady development has been occurring throughout the remainder of the County. Agricultural use is dominant for much of Rural Elko County, however development patterns show a loss of agricultural lands to to development of residential subdivisions. These subdivisions are creating parcels ranging from five acres to 40 acres.

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**GOALS & OBJECTIVES**

The goals and objectives of the Elko County Water Resource Management Plan are presented along with principles that guided the Elko County Water Planning Commission in the development of this plan. The plan provides a history of the processes that were used to develop the Water Resource Management Plan and the relationship between this plan and other land use planning documents.

**GOALS:** The Elko County Water Resource Management Plan is prepared and implemented to ensure that adequate supplies of water remain available in Elko County to; maintain and enhance the cultural integrity of the environment; maintain and improve the quality of life for residents and visitors to Elko County and to expand and diversify our economy.

**OBJECTIVES:**

- 1) Identify and define all existing water resources in Elko County utilizing current science and technology.
- 2) Identify existing water uses in Elko County.
- 3) Identify projected growth patterns and water supply demands for the twenty five (25) year plan life.
- 4) Continual identification of water supply issues that are pertinent to the protection, conservation and distribution of Elko County water resources.
- 5) Identify short and long term water demands in Elko County that benefit the environment and citizens.
- 6) Identify specific basin recharge rates and demands.
- 7) Conduct perennial yield and recharge rate studies in using current technologies that provide sound water resource information for future development.
- 8) Educate the general public about the effects of state and local laws, policies and issues.
- 9) Provide water resource management information and policy to existing and future land use Master Plans of Elko County.
- 10) Develop a review program of the plan every fifth (5<sup>th</sup>) year anniversary and a comprehensive review at the twenty fifth (25<sup>th</sup>) anniversary.
- 11) Provide comprehensive water planning data for specific regions of Elko County, to allow proper future Land Use planning.
- 12) Comply with and adopt all Applicable Federal and State Laws concerning Water Resource Management.



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**GUIDING PRINCIPLES**

- 1) All water **resources** of Elko County belong to the public and are managed by the State of Nevada Division of Water Resources, the State Engineer and Nevada Revised Statutes **533** and **534**.
- 2) Water resource needs of the current and future of Elko County residents must be managed with a balanced approach that provides for Elko County's economic goals without detriment to the social, aesthetic, cultural, recreational, individual and ecological values of Elko County.
- 3) The appropriation and beneficial use of Elko County's water resources is administered by the Nevada State Engineer in accordance with the requirements and provisions of Nevada Water Law and by state and federal decrees and regulations.
- 4) Public education and public input is imperative to the success of water resource management planning and all units of local government.
- 5) Water **rights** in Nevada are private property and may be bought, sold and traded under free market conditions.
- 6) Elko County, in filing for ground and surface rights within the Elko County Boundary is only interested in augmenting and enhancing the water resources for Elko County citizens and the economic diversity.
- 7) All water resource development in Elko County should be conducted in a manner that is technically, environmentally and economically sound and consistent with state and federal laws.
- 8) Water conservation and re-use methods are important components of the planning and management of Elko County water resources.
- 9) The Elko County Water Resource Management Plan must be based on sound science and water resource evaluation and management principles.
- 10) The Elko County Water Resource Management Plan is to be adopted as an element to the Elko County Master Plan as per Nevada Revised Statutes 278.150 through 278.265 inclusive.

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### DEMOGRAPHICS

#### ***GEOGRAPHICS:***

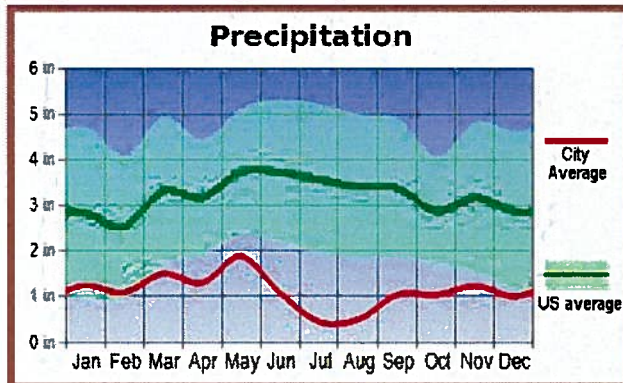
Geographically, Elko County was created March 5<sup>th</sup> 1869 from a portion of Lander County. Its 17,181 square miles are spread over the northeast corner of the State of Nevada. It is Nevada's second largest County and is the fourth largest in the United States, excluding Alaska. The County seat is the City of Elko. Elko County is bounded on the west by Humboldt County, and on the south by Lander, Eureka and White Pine Counties. Elko County is bounded on the east by the state of Utah and on the north by the state of Idaho. Elko County is approximately 200 miles wide east to west and 180 miles north to south. Most of the County lies above the 5,000 foot mean sea level elevation (MSLE). The land consists of rugged mountain ranges, broad fertile valleys, various sagebrush species, tree covered canyons and lofty peaks. The mountain ranges and valleys run primarily in a north south direction. Several peaks are over 10,000 feet MSLE, including the Matterhorn, Spruce Mountain, Pilot Peak, Hole in the Mountain and Ruby Dome. Elko County contains a substantial portion of the Humboldt River Basin as well as portions of the Ruby Mountains, Mary's River, North Fork, South Fork, Maggie Creek, Elko Reach, Pine Valley and Battle Mountain sub-basins. The Humboldt River flows generally westward terminating in the Humboldt sink, located in north central Nevada.

Physiographically Elko County can be divided into mountains, intermediate slopes or uplands, and grass valleys or lowlands. Geologic uplift, warping and faulting has contributed to the present relief. Several mountain ranges have steep fronts with sharply incised canyons and less steeply dipping back slopes. Glacial scouring and deposits occur in few of the high mountain ranges, most notably in the Ruby and Jarbidge Mountains.

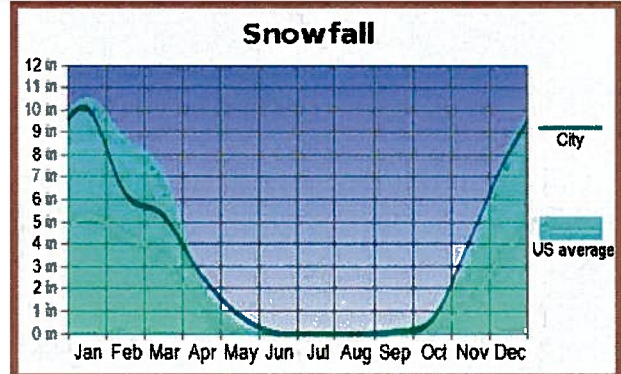
#### ***ELKO COUNTY CLIMATE & PRECIPITATION:***

The climate of Elko County is generally considered to be semi-arid or arid. Summers are hot especially at lower elevations and winters are cold. Annual precipitation is normally light in the Lake Bonneville region (east quarter of the county), averaging less than 8 inches. Valleys in the rest of the county receive on average 9 inches of precipitation. The county is subject to short duration high intensity summer convection storms. At higher elevations precipitation is much greater usually in excess of 20 inches. Much of this precipitation falls as snow during the winter and early spring and accumulates to considerable depths. The snow-melt irrigates crops in adjacent valleys or runs off and is stored in man-made reservoirs. The average temperatures are in the upper 20's in the winter and low to upper 80's in the summer. The sun shines about 80 percent of the day in the summer and about 70 percent in winter. The prevailing wind is from the southwest, with the highest average wind speed of 7 miles per hour occurring in the spring.

**Figure 1 - Average Valley Floor Precipitation**



**Figure 2 - Average Valley Floor Snowfall**

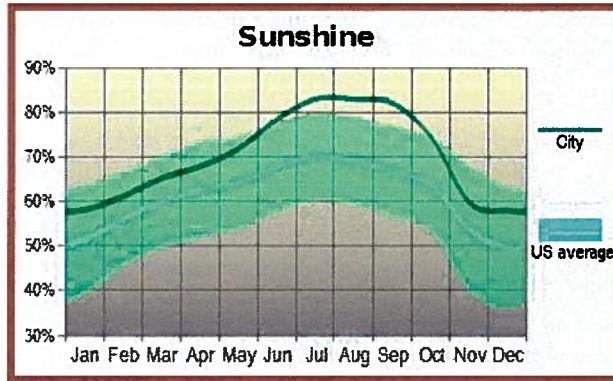


# SECTION 1

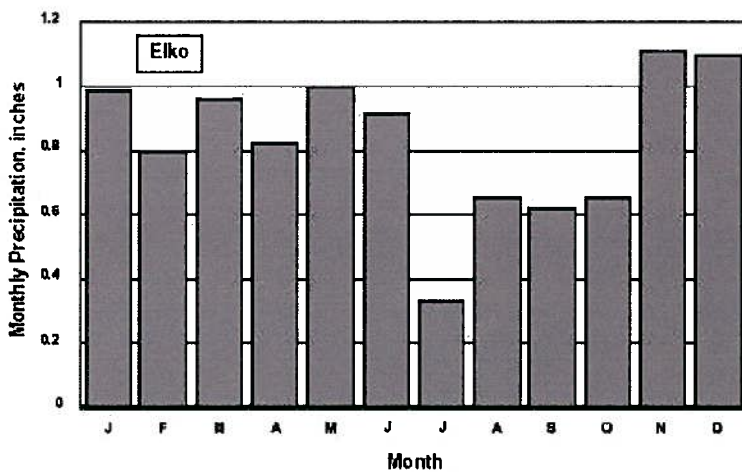
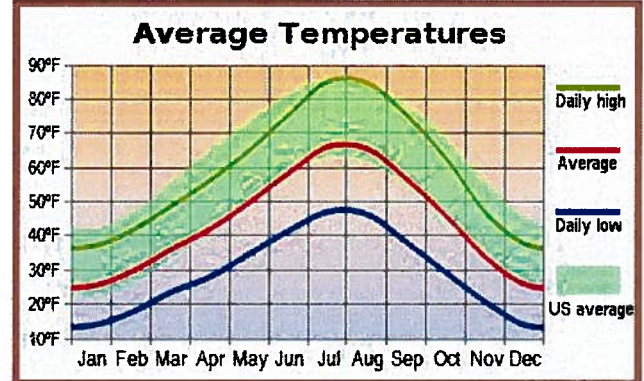
## Elko County Water Resource Management Plan

### Plan Development Information

**Figure 3 - Average Valley Floor Sunshine**

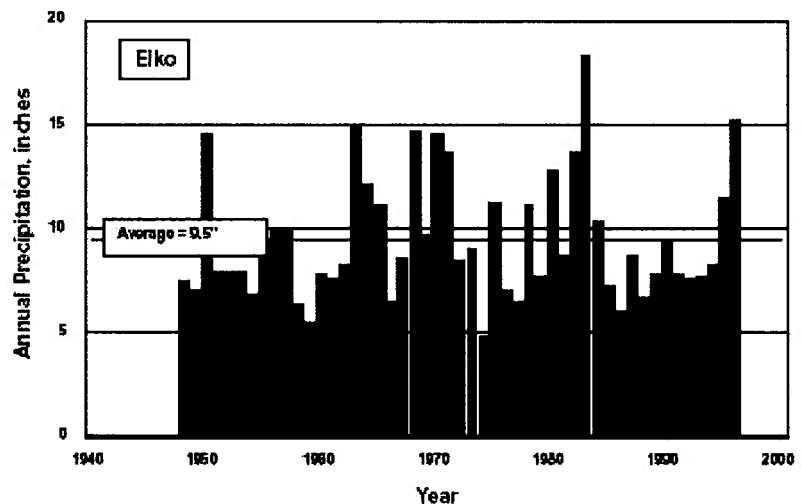


**Figure 4 - Average Valley Floor Temperatures**



**Figure 5 - Monthly  
Precipitation Inches  
Inclusive**

**Figure 6 - Annual  
Precipitation Inches  
Inclusive**





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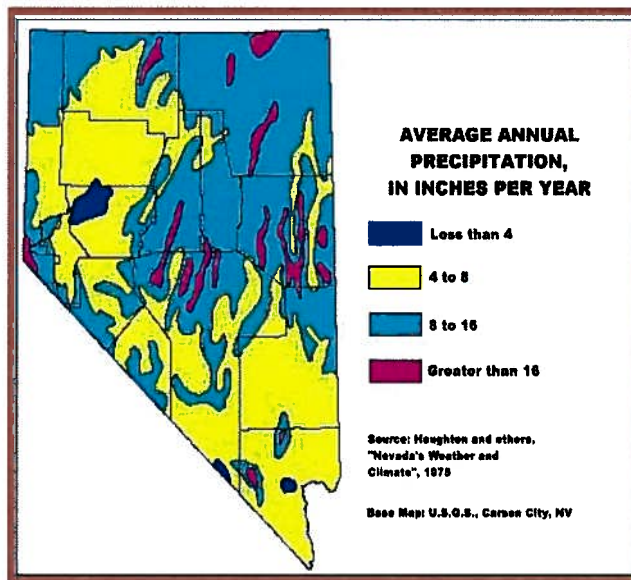
## Elko County Water Resource Management Plan

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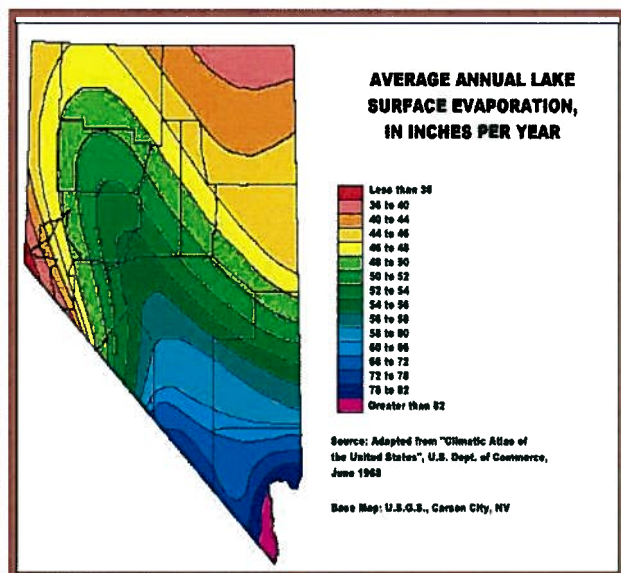
#### NEVADA CLIMATE AND PRECIPITATION:

The climate of Nevada is characterized as semi-arid to arid with precipitation and temperature varying widely between the northern and southern regions of the State, and between valley floors and mountain tops. With temperatures that fall below -40 F during some months in the northeast, and rise over 120 F during a few summer days 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, Nevada is truly a land of great climatic contrast (James, J.W., State Climatologist, *Climate of Nevada*, Paper No. 84-12, Bureau of Business and Economic Research, University of Nevada, Reno, 1984). Total precipitation averages approximately 9 inches per year (53,000,000 acre-feet) making Nevada the most arid State in the Nation (Geraghty, J.J. et al., *Water Atlas of the United States*, Water Information Center, Port Washington, N.Y., 1973). Of the total annual average precipitation amount, approximately 10 percent accounts for stream runoff and ground-water recharge. The remaining 90 percent is lost through evaporation and transpiration. Average lake surface evaporation rates vary widely across the State from less than 36 inches per year in the west to over 80 inches per year in the south (State Engineer's Office, *The Future Role of Desalting in Nevada*, Carson City, Nevada, April 1973).

**Figure 7 - Nevada Average Annual Rainfall**



**Figure 8 - Average Annual Lake Surface Evaporation**



AVERAGE ANNUAL PRECIPITATION AT SELECTED LOCATIONS		
County	City	Average Annual Precipitation, in inches
Carson City	Carson City	10.8
Churchill	Fallon	4.9
Clark	Las Vegas	4.2
Douglas	Minden	8.2
Elko	Elko	9.3
Esmeralda	Goldfield	5.6
Humboldt	Winnemucca	7.9
Lander	Battle Mountain	7.5
Lincoln	Caliente	9.1
Lyon	Yerington	5.5
Mineral	Hawthorne	4.6
Nye	Tonopah	4.9
Perkins	Lovelock	5.5
Storey	Virginia City	12.1
Washoe	Reno	7.5
White Pine	Ely	9.0

**Table 1 - Nevada Average Annual Rainfall by Location**

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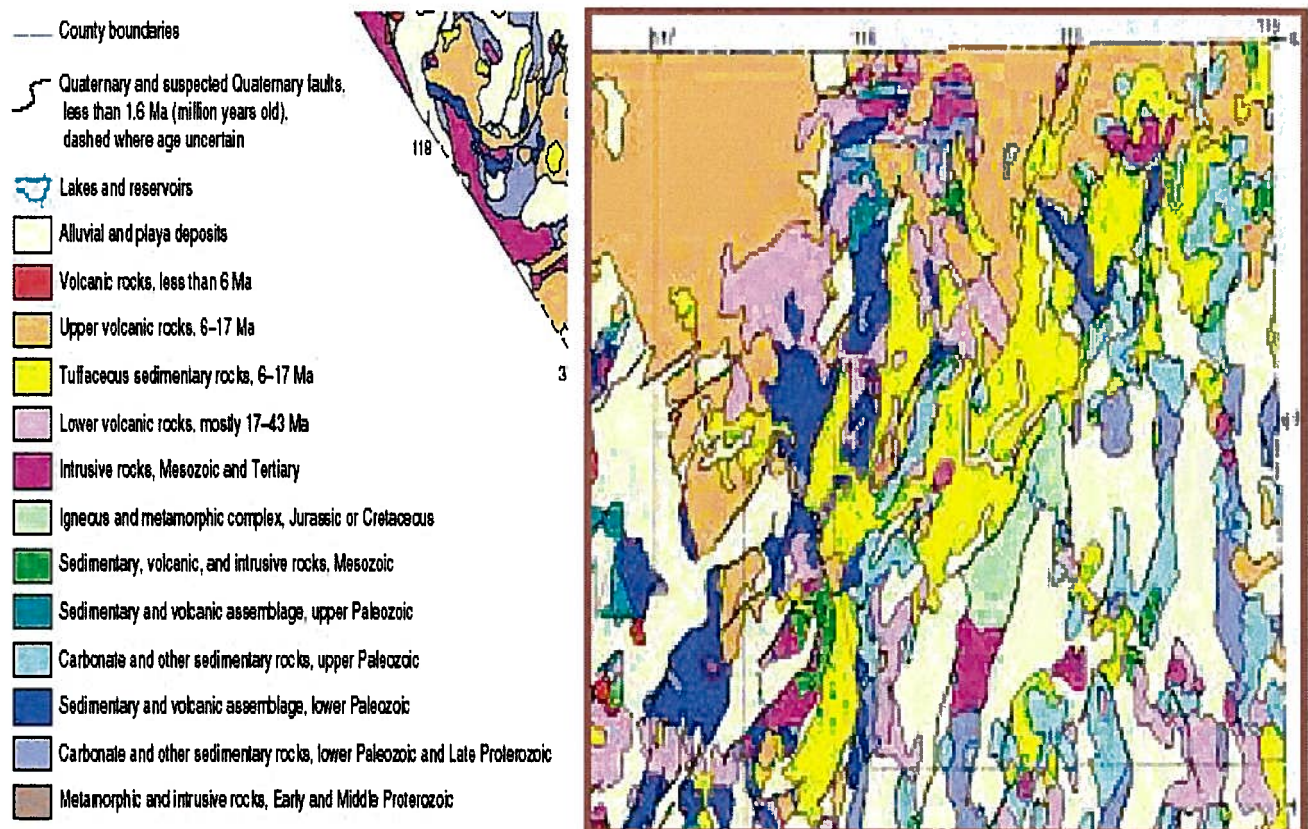
## Elko County Water Resource Management Plan

### Plan Development Information

#### ***GEOLOGY AND SOILS:***

Hills and mountains consist mainly of Tertiary volcanic extrusives, Devonian limestone and Cretaceous granite. Valleys consist of consolidated and unconsolidated Tertiary and Pleistocene alluvial deposits of ash, tuff and clastic material. Floodplains are of recent unconsolidated Holocene alluvium. Basin floors in the east quarter of the county consist of Pleistocene and Holocene lacustrine and beach deposits. Typical soils found in the mountains and hills are steep, very gravelly, medium textured and moderately deep to bedrock. Valley soils are gently sloping, medium textured and are moderately deep to a hardpan. Soils on floodplains are nearly level, salt and alkali affected, fine textured and very deep. Soils found on basin floors in the Lake Bonneville region of the county are salt and alkali affected, nearly level, fine textured (upper horizon), coarse textured (lower horizons) and are very deep.

**Figure 9 - General Geology, Elko County, by Nevada Bureau of Mines**





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## Elko County Water Resource Management Plan

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#### VEGETATION:

Major plant associations in the area typify the general zonation of vegetation common in the Great Basin Region. Basin floors in the southeast quarter of the county are dominated by salt-desert shrub plant communities consisting of shadscale, budsage and winterfat. Valley floors above the salt-desert shrub zone are dominated by sagebrush-grass plant communities consisting of Wyoming big sagebrush, black sagebrush, basin big sagebrush and bluebunch wheatgrass. Mountain big sagebrush, low sagebrush, Antelope bitterbrush and Idaho fescue dominate the hills and mountains. Curlleaf mountain mahogany and stands of aspen are common at the highest elevations. Singleleaf pinyon and Utah Juniper are extensive in the hills and mountains in the southeast quarter of the county. Riparian areas along floodplains, stringer meadows and springs and seeps are characterized by diverse plant species consisting of herbaceous meadow vegetation and willows.

## Land Use / Land Cover

- |                                       |                               |
|---------------------------------------|-------------------------------|
| 1. Ash                                | 34. Sub Alpine Fir_2          |
| 2. Aspen_2                            | 35. Sub Alpine Fir_3          |
| 3. Aspen_3                            | 36. White Fir_1               |
| 4. Engelmann Spruce_2                 | 37. White Fir_2               |
| 5. Engelmann Spruce_3                 | 38. White Fir_3               |
| 6. Great Basin Subalpine Pine_1       | 39. Bitterbrush               |
| 7. Great Basin Subalpine Pine_2       | 40. Blackbrush                |
| 8. Juniper_1                          | 41. Creosote/Bursage          |
| 9. Juniper_2                          | 42. Greasewood                |
| 10. Mojave Bristlecone_1              | 43. Hopsage                   |
| 11. Mojave Bristlecone_2              | 44. Mesquite                  |
| 12. Mojave Bristlecone_3              | 45. Mojave Mixed Scrub        |
| 13. Mountain Mahogany_1               | 46. Mountain Sagebrush        |
| 14. Mountain Mahogany_2               | 47. Mountain Shrub            |
| 15. Mountain Mahogany_3               | 48. Sagebrush                 |
| 16. Pinyon_1                          | 49. Sagebrush/Perennial Grass |
| 17. Pinyon_2                          | 50. Salt Desert Scrub         |
| 18. Pinyon/Juniper_1                  | 51. Sierra Mountain Shrub     |
| 19. Pinyon/Juniper_2                  | 52. Alpine                    |
| 20. Ponderosa Pine_1/Mountain Shrub   | 53. Dry Meadow                |
| 21. Ponderosa Pine_2                  | 54. Grassland                 |
| 22. Sierra Lodgepole_1                | 55. Wet Meadow                |
| 23. Sierra Lodgepole_2                | 56. Agriculture               |
| 24. Sierra Lodgepole_3                | 57. Barren                    |
| 25. Sierra Red Fir_2                  | 58. Lowland Riparian          |
| 26. Sierra Red Fir_3                  | 59. Mountain Riparian         |
| 27. Sierra Whitebark_1                | 60. Playas                    |
| 28. Sierra Whitebark_2                | 61. Sand Dunes                |
| 29. Sierra White Fir_3                | 62. Snow                      |
| 30. Sierra Yellow Pine_1              | 63. Urban                     |
| 31. Sierra Yellow Pine_2              | 64. Water                     |
| 32. Sierra Yellow Pine_3              | 65. Wetland                   |
| 33. Sierra Yellow Pine/Mountain Shrub | 66.                           |

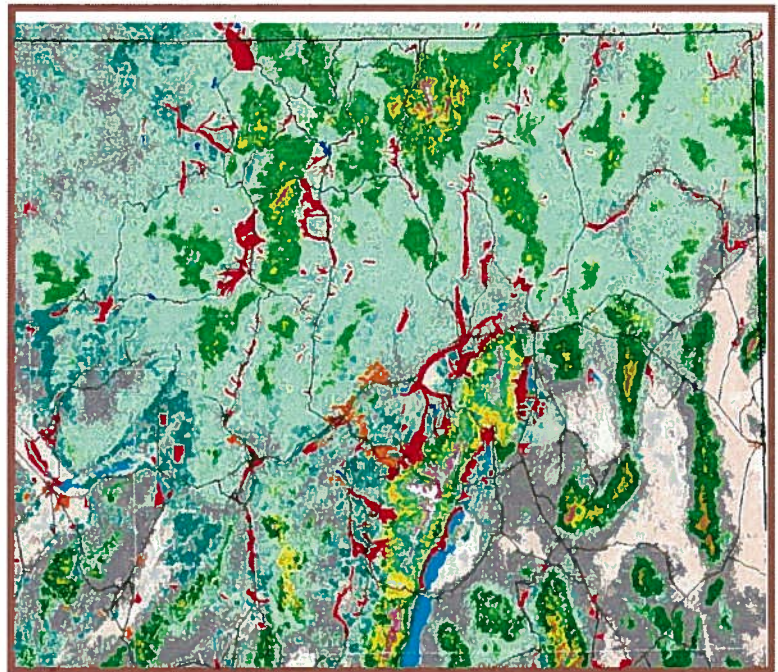


Figure 10 - General Vegetation Elko County



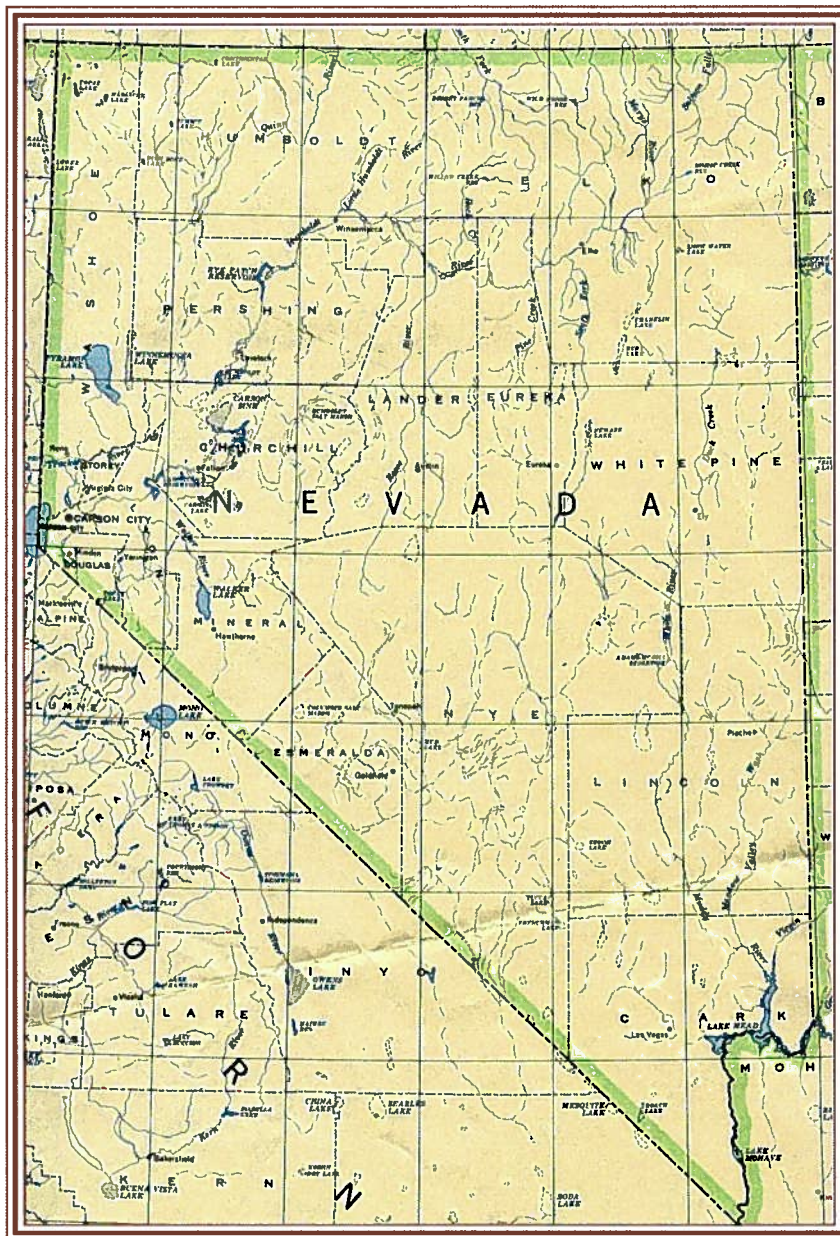
# SECTION 1

## Elko County Water Resource Management Plan

### Plan Development Information

#### LAND MASS:

The total area of Elko County is 17,181 square miles or 10,995,840 acres. Of this total area 71.91%, or 7,907,333 acres, is managed by the Bureau of Land Management (BLM), the U.S. Forest Service (USFS) and Division of Fish and Wildlife. Privately owned property in Elko County is \*\* 26.80% or 2,946,775 acres. \*\* Other exempt lands owned, such as nonprofit exempt properties, Bureau of Indian Affairs, state or local governments, equals 1.69%, or 185,568 acres. The BLM is responsible for the largest portion of public lands, 62.12%, or 6,830,881 acres. The USFS manages 9.7%, or 1,068,886 acres, and the Division of Fish and Wildlife manages 0.069%, or 7,566 acres.



**\*\*Note:** Acreage and populations were calculated from information provided by the Bureau of Land Management, United States Forest Service, State of Nevada Demographer and the Elko County Assessor. A common error exists in deeds prepared without the benefit of a survey and the error is normally within the deed acreage not being correct. An example of this error may be that a deed reflects a section of land or a square mile containing exactly 640 acres, while the actual or true acreage may be more or less than 640 acres or that a specific lot may have a legal description such as the NW 1/4 of the NW 1/4 containing 40 acres while the actual acreage may be more or less than 40 acres. Currently, the total parcel count in Elko County is 49,696 parcels and it is estimated that only 25% of these parcels calculated acreage is based on a survey for accuracy. Therefore, calculated total acres in Elko County indicated herein is more than the actual calculated total area of Elko County. The error is 0.38% or 42,000 acres.

Figure 11 - Nevada Counties



# SECTION 1

## Elko County Water Resource Management Plan

### Plan Development Information

#### 2006 POPULATION:

The Nevada State Demographer's Office prepares annual population estimates for Nevada's Counties, Cities and Unincorporated Towns. The 2006 Official State of Nevada Demographer Estimates for Elko County are:

#### Incorporated Cities:

City of Carlin -	2,281
City of Elko -	18,183
City of Wells -	1,449
City of West Wendover -	4,871

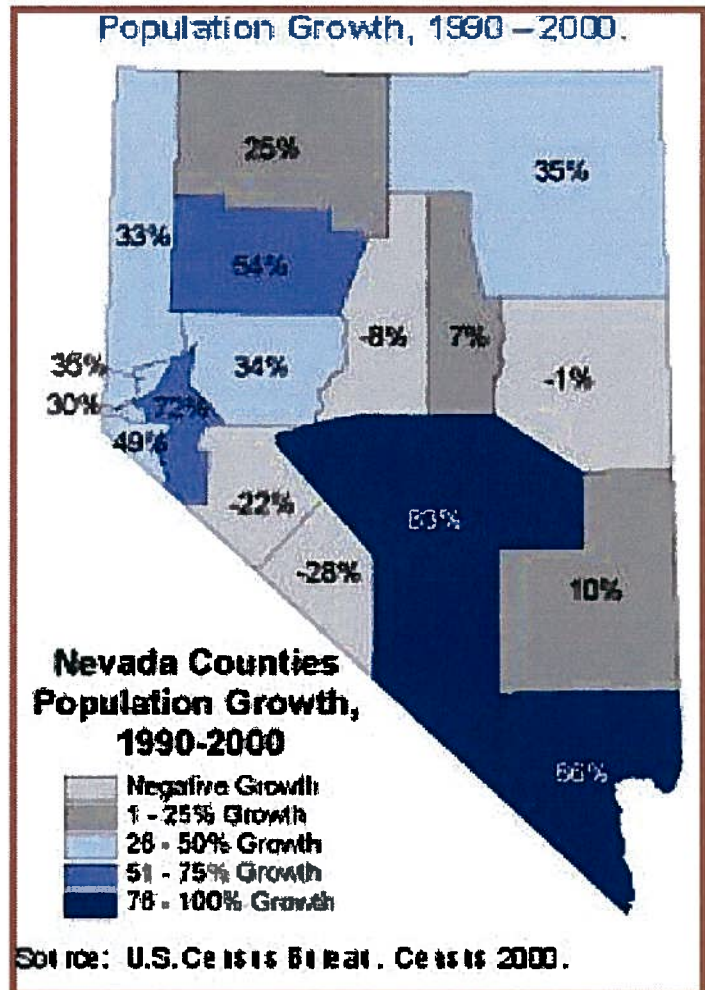
#### Unincorporated towns:

Town of Jackpot -	1,293
Town of Montello -	175
Town of Mountain City -	125

#### Unincorporated areas:

Elko County -	19,962
Elko County total -	48,339

**Figure 12 - Nevada Population Growth Percentages 1990 - 2000**



# SECTION 1

## Elko County Water Resource Management Plan

### Plan Development Information

#### LAND USES

##### *AGRICULTURAL USES:*

According to the Elko County Assessor, privately owned agricultural land comprises 22%, or 2.47 million acres, of the total land mass in Elko County. According to the 2002 United States Department of Agriculture census, there were 397 ranches/farms in the area. The average size is 6,250 acres. This acreage has shown a slight decline since 1997 when it was 2.53 million acres. The farms typically produce alfalfa hay for winter feeding. The ranches are cow/calf operations, and the current year's crop is generally sold in the fall and exported. The ranches commonly utilize public lands for seasonal livestock grazing. Spring runoff from the nearby mountains provides early seasonal irrigation. At higher elevations, small springs and seeps provide limited watering facilities for livestock. According to the 2002 United States Department of Agriculture census, the market value of all agricultural products sold in Elko County exceeds \$45 million annually.

Elko County typifies a true "Cow County" with vast lands amid rugged mountains. The county ranked first in the number of beef cows tabulated in the 2002 census of agriculture. Agricultural production is focused around the Ruby Mountains including Wells, Clover, Starr and Ruby valley, Lamoille and Jiggs. Other areas of agriculture include the areas of North Fork, Mountain City and Tuscarrora, along the Independence mountain range, the ranching communities of O'Neil and Jarbidge in the northeastern portion of the county and the areas along the Humboldt River including Metropolis, Elko, Deeth, Halleck and Carlin.

**Table 2 - Agricultural Rating Nation Wide**

Ranked items among the 17 state counties and 3,078 U.S. counties, 2002					
Item	Quantity	State Rank	Universe <sup>1</sup>	U.S. Rank	Universe <sup>1</sup>
<b>MARKET VALUE OF AGRICULTURAL PRODUCTS SOLD (\$1,000)</b>					
Total value of agricultural products sold	45,311	5	17	1,279	3,075
Value of crops including nursery and greenhouse	1,680	15	16	2,566	3,070
Value of livestock, poultry, and their products	43,631	2	17	653	3,070
<b>VALUE OF SALES BY COMMODITY GROUP (\$1,000)</b>					
Grains, oilseeds, dry beans, and dry peas	-	-	12	-	2,871
Tobacco	-	-	-	-	560
Cotton and cottonseed	-	-	-	-	656
Vegetables, melons, potatoes, and sweet potatoes	-	-	10	-	2,747
Fruits, tree nuts, and berries	(D)	(D)	9	(D)	2,638
Nursery, greenhouse, floriculture, and sod	(D)	(D)	11	(D)	2,708
Cut Christmas trees and short rotation woody crops	-	-	2	-	1,774
Other crops and hay	(D)	(D)	16	(D)	3,046
Poultry and eggs	13	6	13	1,875	2,918
Cattle and calves	41,668	2	16	192	3,053
Milk and other dairy products from cows	-	-	9	-	2,493
Hogs and pigs	6	9	11	2,474	2,919
Sheep, goats, and their products	(D)	(D)	15	(D)	2,997
Horses, ponies, mules, burros, and donkeys	(D)	(D)	17	(D)	3,014
Aquaculture	-	-	9	-	1,520
Other animals and other animal products	16	3	12	1,640	2,727
<b>TOP LIVESTOCK INVENTORY ITEMS (number)</b>					
Cattle and calves	135,554	1	17	68	3,059
Sheep and lambs	19,627	1	14	58	2,867
Horses and ponies	4,375	1	17	82	3,065
Layers 20 weeks old and older	558	4	14	1,812	2,983
Pheasants <sup>1</sup>	(D)	(D)	7	(D)	1,541
<b>TOP CROP ITEMS (acres)</b>					
Forage - land used for all hay and haylage, grass silage, and greenchop	130,323	1	16	21	3,059
Oats	(D)	7	10	(D)	2,215
Flower seeds <sup>1</sup>	(D)	(D)	1	(D)	215
Safflower <sup>1</sup>	(D)	(D)	3	(D)	112
Apples <sup>1</sup>	(D)	(D)	10	(D)	2,173

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### **Elko County Water Resource Management Plan**

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##### ***RESIDENTIAL USES:***

Residential uses in Elko County vary from parcels of 6,000 square feet or smaller to larger parcels of more than 40 acres in size. Residential development increased during the boom years of the 1980's and 1990's to its current status of a deficiency of developable land. Platting of residential subdivisions in Elko County has primarily occurred through subdivision of lands previously used for agricultural purposes. Numerous subdivisions platted in the early 1960's, prior to N.R.S. subdivision law, did not provide legal access, roads or utilities. Many of these subdivisions to date have not been developed or are developing at a slower rate. Most residential development has occurred within the incorporated boundaries of Elko and the surrounding areas, such as Spring Creek, South Fork, Lamoille and areas directly adjacent to the City of Elko, or along the Interstate 80 highway corridor, including Osino and Ryndon.

Average lot sizes within City boundaries are approximately 6,000 s.f. and are restrictive to residential uses. Residential parcels in unincorporated Elko County average 2.5 acres permitting limited hobby (non-commercial) agricultural uses. Other residentially zoned properties in Elko County, such as Special Lands, encourage the development of agricultural uses to maintain the agricultural environment while providing residential uses.

##### ***COMMERCIAL USES:***

Commercial uses and developments in Elko County are primarily within the incorporated cities or highly developed subdivision areas. The commercial uses in Elko County are diverse in nature supplying a wide variety of professional and common services, as well as all types of commercial retail and wholesale sales. Gaming in Elko County is one of the County's largest sources of revenue. The total area of commercially zoned property within Elko County is approximately 1,000 acres, with less than 400 acres currently developed for existing businesses. Master Planned commercially designated property equals approximately 5,000 acres. Development of major commercial properties have been made within the City of Elko providing the city as a central regional retail hub for northeastern and east central Nevada .

##### ***INDUSTRIAL USES:***

Industrial uses and developments in Elko County are primarily within the incorporated cities or lands adjacent to their boundaries. The industrial uses in Elko County are diverse in nature supplying a wide variety of services. A large portion of the industrial business is specific to mining in northern Nevada. Several specific areas or parcels are zoned light or general industrial. These parcels are primarily used for small private businesses related to public services. There are two industrial subdivisions that provide areas of concentrated industrial type uses primarily for business specific to the local needs. The total area of industrial zoned property within Elko County is approximately 500 acres, with less than 200 acres currently developed for existing businesses. Master planned industrial designations equal approximately 2,000 acres for industrial zoning. To date manufacturing is not provided in Elko County, primarily due to the lack of sufficient water resources and our proximity to major urban areas.

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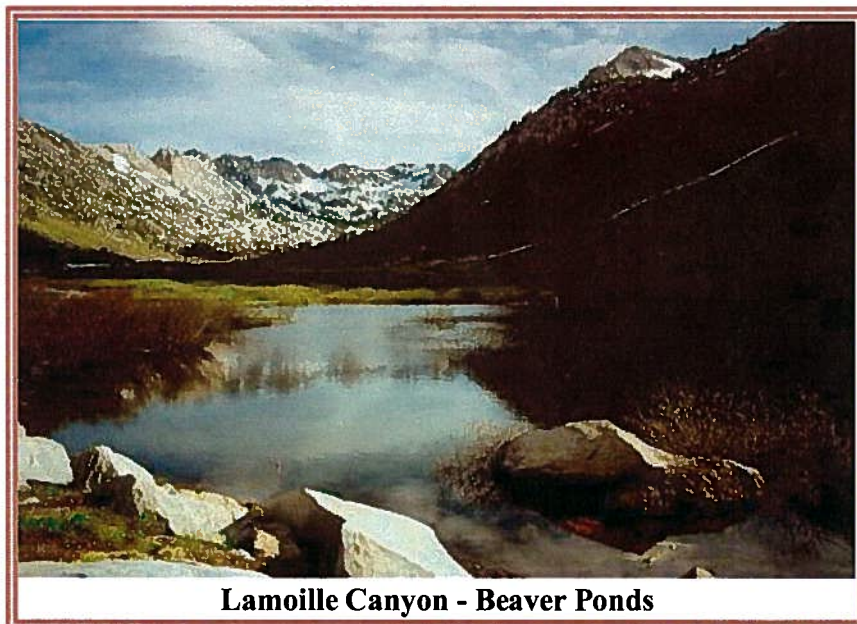
#### ***RECREATIONAL USES:***

Privately owned and operated open space recreation areas within Elko County including the incorporated cities, excluding gaming, is virtually nonexistent. Approximately 1,000 acres of privately owned land is dedicated and zoned recreational. The recreational uses of this zone primarily are the operation of Dude Ranches, Hunting / Fishing Guide Services, Helicopter Snow Skiing and Remote Gathering and Lodging Facilities.

Public water based recreational uses in Elko County are primarily state or federally owned and/or managed lands. The BLM currently manages approximately 25 camping sites totaling 8,218 acres. The Forest Service currently manages approximately 22 sites totaling 160 acres. The State of Nevada provides approximately 5,000 acres of recreation are, including the South Fork State Park and Wild Horse Recreation Area.

The BLM and USFS note that use of the developed recreational sites is decreasing. One of the reasons for the decrease in use is the increasingly use of undeveloped public lands for camping and other recreation. This trend is referred to as *Dispersed Recreation*. The land managers are now educating the public about the impacts of Dispersed Recreation.

It was calculated by the author of the 1971 Elko County General Plan that approximately 35% of the total land mass of Elko County was utilized for recreation. Recreation and tourism in the 1971 General Plan were considered “Bridge Traffic,” meaning while traveling from other points, travelers merely traversed Elko County with occasional stops. Recreation was primarily utilized by the local population and hunters that ventured to Elko County for hunting opportunities. Over the past 30 years, Elko County has become a nationally recognized destination due to the diversity of recreational, historical, cultural and ethnic special events and attractions. Recreation, as pointed out in the 1971 General Plan, was primarily hunting, fishing, equestrian use and camping in our many pristine nature areas. Recreational uses have expanded over the last 30 years to include all-terrain vehicles, cross-country motorcycle racing, long range highway auto racing, hiking, nature viewing, photography, snow skiing, cross country skiing, boating and numerous other uses.



**Lamoille Canyon - Beaver Ponds**



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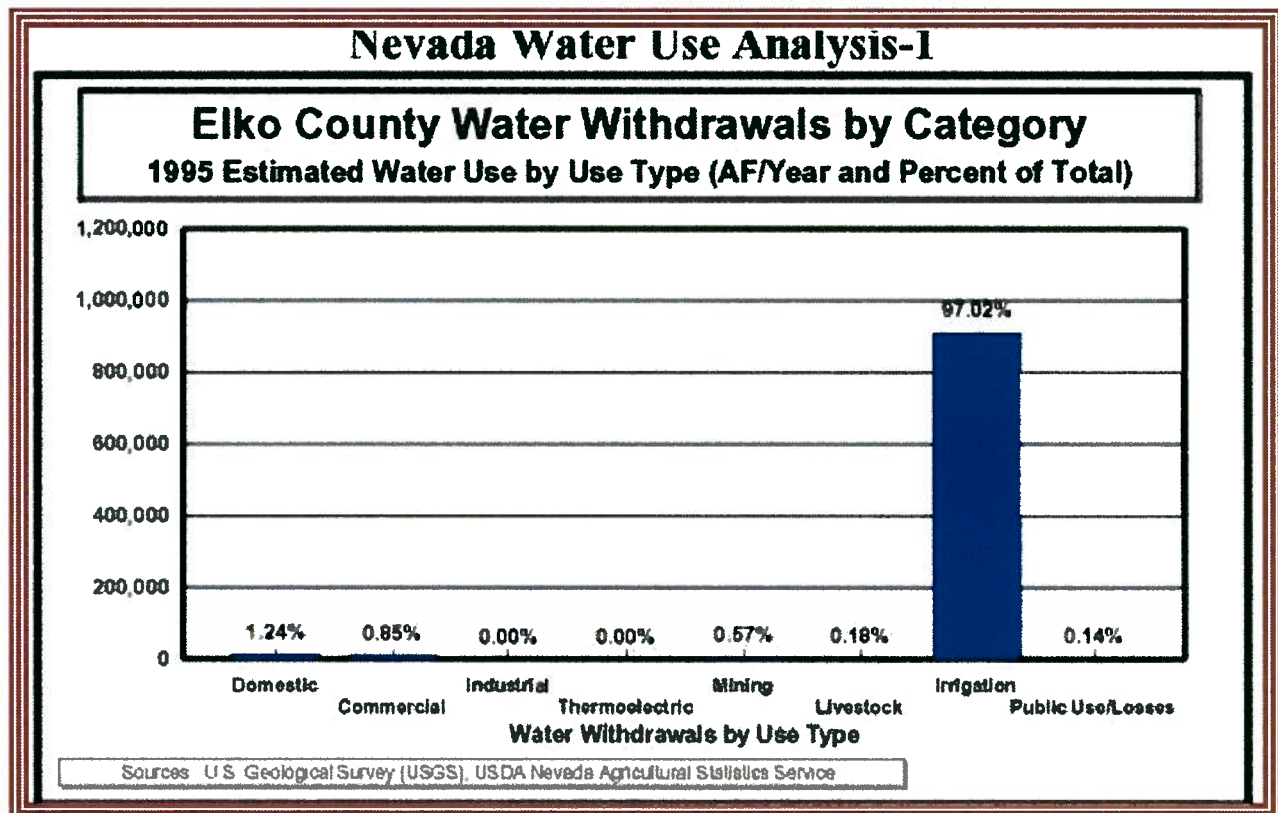
#### Plan Development Information

##### *NATURAL RESOURCE MINING AND EXPLORATION USES:*

Very little attention was given to mining in Elko County in the 1971 General Plan, due to most of the mining activities of the area being developed in neighboring Eureka County. However, very few envisioned the impact the mining boom of the 1980's and 1990's would have on the City of Elko and surrounding areas. Due to the proximity of the City of Elko, development of the Newmont, Barrick and Freeport mines produced urban sprawl. Extensive development of residential areas in the vicinity of the City of Elko occurred. Commercial and industrial development also expanded. Many such facilities and structures are vacant today.

Mining and exploration has become one of Elko County's most reliable and efficient economic stabilizers. The mining industry, even though primarily located outside of the Elko County boundaries, has provided thousands of jobs to the residents of our county. The mining industry also was responsible for the development of professional services such as engineering, surveying, land use development, construction, geology and many other related fields. These economic developments improved the condition of the area by providing infrastructure and revenue to our local governments and population. The mining industry is currently Elko County's largest employer. As a result average wages per household are among the highest in the nation. This helps provide economic stability and quality of life to our communities.

**Table 3 - 1995 Elko County  
Water Withdrawals by Category**



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### **Elko County Water Resource Management Plan**

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##### ***PRIVATE OWNERSHIP AND DEVELOPMENT:***

Private land ownership is diverse due to past history of subdivision and development. Development of residential areas has occurred through subdivision of lands previously used for agricultural purposes. Many of these subdivisions were created in the early 1960's, prior to N.R.S. subdivision law or Elko County ordinance and did not provide access, utilities or legal water rights. Many of these subdivisions have never been fully developed or inhabited.

Development of residential uses has historically been within municipal boundaries and areas surrounding the City of Elko, including Spring Creek, Lamoille, South Fork and areas directly adjacent to the City of Elko. A recent trend is division of land into large parcels of 40 acres or more. This trend has generated many residential parcels with agricultural potential. Most of these divisions of land occur in close proximity to incorporated cities.

The City of West Wendover is Elko County's second largest city. Since incorporation in 1991 the City of West Wendover has increased its population to 4,871. The development of legalized gambling, retail sales and services required residential development to accommodate the new employees and families. The City of West Wendover currently has limited expansion ability potential due to the lack of developed water supply. The City of West Wendover currently pipes water from a source approximately 35 miles to west to accommodate its water needs. Some non-potable water is available from ground locations within the corporate limits for irrigation use only.

Other areas that developed during the 1990's include the rural subdivision of Spring Creek. The area has commercial, industrial, recreation and residential uses. As of 2006 approximately 13,000 people live in the Spring Creek, Lamoille and South Fork areas. Other areas such as Osino, Ryndon and River Ranch have also developed with primarily residential uses.

##### ***TRANSPORTATION:***

Elko County has ten primary highway transportation routes crossing the county from east to west and north to south. Interstate 80 is a four-lane divided highway that extends approximately 130 miles from the eastern state line at West Wendover to the western boundary with Eureka County near Carlin. This route bisects Elko County. The second most traveled route is Highway 93 which is a two-lane highway 140 miles long from the southern boundary with White Pine County to the northern state line at Jackpot. State Route 225 begins in the city of Elko and traverses north approximately 90 miles to the Idaho border. State Routes 227 and 228 are primarily local area access routes. State Route 227 begins in the City of Elko and traverses southeast approximately 25 miles to the town of Lamoille. State Route 228 intersects State Route 227 in the most northerly portion of Spring Creek area, and trends southerly approximately 30 miles, providing access to the South Fork Recreation Area, the community of Jiggs and the Ruby Marshes Wildlife Refuge, to the base of the Ruby Mountains at Harrison Pass.

State Routes 27B and 766 cross a small area of southwestern Elko County and both are two-lane roads originating in the City of Carlin. State Route 27B is a major transportation route to the Town of Eureka, in Eureka County. Highway 766 provides access to the mining areas in northern Eureka County and western Elko County. State Route 226 intersects State Route 225 near Lone Mountain Station in central Elko County and

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treks northwesterly approximately 40 miles providing access to the town of Tuscarora and Independence Valley. State Route 233 intersects Interstate 80 at Oasis Interchange going northeast through the town of Montello to the Utah border. State Route 93A begins in West Wendover and traverses southwest approximately 35 miles to the Elko and White Pine County border. Elko County currently maintains approximately 1,200 miles of gravel and asphalt surface roads. It is estimated that less than 40 miles of these roads are asphalt surfaces, the remainder is gravel and dirt surfaces. The average width of Elko County Maintained roads is 26 feet, providing for two way traffic flows.

Most all county roads commence at intersections with state or federal highways. These roads in most all cases are the primary accesses to remote areas, rural towns, ranches, farms, recreation areas or other rural developments. For the most part, all of the Elko County road system are maintained roads within an implied or prescriptive use right of way. Very few descriptive right of ways exists, most all of the descriptive right of ways are short stretches of less than a mile and were dedicated because of a land action or subdivision. The lack of descriptive right of way is primarily due to the historical location of the roads. For the most part the roads themselves have never been relocated or surveyed for location. Historical value can be given to most of Elko County's road system due to their very location and specific destinations.

Elko County also provides for air transportation and railway service. Commercial air freight and passenger service is provided by the City of Elko Municipal Airport. The passenger service is primarily to Reno, Nevada and Salt Lake City, Utah. Connections to any destination can be made from either location. A grant application is pending to provide air service to Ely, and Las Vegas. Railway service is provided by Union Pacific Railroad and Amtrak including both freight and passenger service.

#### ***NEVADA AND ELKO COUNTY PUBLIC LAND HISTORY:***

Until 1976, public lands in Nevada were available for private acquisition. The amount of public land in Nevada is a direct result of choices made by the territorial government at the time of statehood and the state government for a number of years thereafter and also private citizens between the mid-1800's and 1976. The United States government acquired lands in the area that is now Nevada through the Treaty of Guadalupe Hidalgo in 1848. This treaty ended hostilities between the United States and the Mexican governments at the close of the Mexican American War. Nevada was given sections 16 and 36 in every township as state land equaling approximately four million acres.

At the request of Nevada, the U.S. Congress changed this in 1870, to allow Nevada to select up to two million acres of land of their choice in lieu of the four million acres of the specified sections. The apparent reason for the State's request was their belief that at least half of the acreage in sections 16 and 36 was on mountaintops or otherwise unusable land. After 1870, the State selected lands based on requests by Nevada citizens, such as Pedro Altube, John Sparks and Governor Blasdel.



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#### ***WESTERN SETTLEMENTS OF PUBLIC LANDS:***

The Homestead Act was passed in 1862, the Desert Land Act in 1877, the Mining Law in 1872 and the Pre-emption Act in 1830, as well as other land laws to promote the settlement of the West. Although most of these laws were on the books until 1976, they were not taken advantage of in Nevada. The primary reason that more land was not homesteaded in this state was because of the arid nature of the lands and its general unsuitability for agriculture in many places. By contrast, most of Washington, Idaho and a major part of Colorado are private lands because they were largely successfully homesteaded for farming and ranching in the late 1800's and early 1900's. The passage of the Federal Land Policy and Management Act (FLPMA) in 1976 repealed the Homestead Act and other laws that provided for public entry.



**1800's Homestead - Ruby Valley**



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#### **SOCIOECONOMIC OVERVIEW**

##### ***HISTORY:***

Elko County was named for the town of Elko, which was first settled by George F. Paddleford in December of 1868. It is believed that the town of Elko was named by Charles Crocker, or some other official of the Central Pacific Railroad, for the name is a typical railroad name denoting stations in Alabama, Colorado, Georgia, Minnesota, South Carolina, Virginia, and British Columbia. Another theory holds that Charles Crocker named Elko for the elk which once roamed here.

As the source of the Humboldt River, the only major waterway in Nevada which is wholly contained within the state, Elko County was visited by many famous early explorers and emigrant trains headed for California and Oregon. Upon entering Nevada on the California (Humboldt) Trail, the springs of Humboldt Wells (presently the City of Wells) provided much-needed refreshment during the period 1845-1870 to thousands of travelers each year who rested and refitted from their arduous journey and prepared them for the grueling 300-mile trek along the Humboldt River and Valley through the present-day sites of Elko, Winnemucca, and Lovelock.

On December 29, 1868, representatives of the Central Pacific Railroad started laying out lots for the future town of Elko and the town grew up as a rail stop on the transcontinental railroad, which was completed in 1869. By 1870, the thriving town had 5,000 people. There was an immense volume of freight and passenger traffic over the stageline roads north and south from the railhead at Elko to the local mining areas. The University of Nevada was originally established in Elko in 1874 and remained here until 1885, when it was moved 290 miles west to its present location in the city of Reno. By the early 1870's, Elko became the marketing and economic center for northeastern Nevada. In the 1870's and 1880's, great ranching enterprises were built on Elko County's vast rangelands and were ruled over by such powerful and colorful cattle kings as L.R. "Broadhorns" Bradley, Nevada's second Governor and its first "cowboy" Governor; the French Garat family, Spanish Altubes, and John Sparks, Governor of Nevada in the early years of this century. To this day, Elko remains the economic hub of Nevada's greatest range area. In addition to mining operations in Elko County and in adjacent Eureka County to the west, the city of Elko has also become a major recreation and tourism center in northeast Nevada.

Since the county's formation in 1869, Elko County's mining industry has constituted a crucial underpinning to the county's growth and economic well-being. In addition to mining operations within Elko County, the town of Elko also serves as an important mining center for operations along the Carlin Trend in nearly Eureka and Lander counties. In 1997, Elko County's mines produced \$436.3 million in mineral resources, primarily gold, up significantly from \$232.5 million in 1996, making Elko County the second most important mineral producing county after Eureka County in the State of Nevada in 1997.

Early agricultural development in Elko County was bolstered to serve the needs of the various mining districts. Runoff from several large mountain ranges including the Jarbidge Mountains and the Ruby Mountains insured abundant water to serve the local farming and ranching industry. More recently, gaming has constituted a major industry sector in the county, primarily in Wendover, Elko, and Jackpot. Elko County's casinos brought in approximately \$198.3 million in total gaming win in 1997 with \$99.8 million, or 50.3 percent of that total accounted for by the Wendover gaming market. While Elko County's growth has been dependent on the health of Nevada's gold mining industry and the county's strategic location to mining operations in Eureka County in particular, also important to the county's well-being has been its growing strength as a gaming and tourism center serving markets in Idaho and Utah. Water availability, of course, plays a crucial role here.

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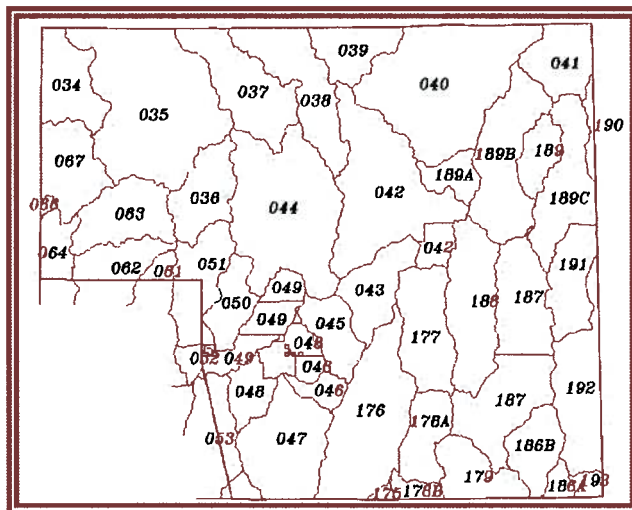
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##### ***GEOGRAPHY AND HYDROLOGY:***

Elko County is located in the extreme northeastern portion of Nevada and is bordered by Utah to the east and Idaho to the north. Elko County is the second largest county in Nevada (after Nye County) and covers approximately 17,181 square miles (44,500 square kilometers), accounting for 15.5 percent of Nevada's total surface area of 110,540 square miles (286,297 square kilometers). Of Elko County's 10,995,840 acres of surface area, 7,841,588 acres, or over 71 percent of the county's total area, are managed by the federal government. Of these federally-managed public lands, approximately 6,767,675 acres of Elko County are managed by the U.S. Bureau of Land Management (BLM), 1,067,987 acres are managed by the U.S. Forest Service (USFS), and 5,926 acres are managed by the U.S. Fish and Wildlife Service (USFWS). In addition, 164,714 acres of Elko County are contained in Indian Reservation (Bureau of Indian Affairs) and another 26,518 acres are owned and managed by the State of Nevada. The lands managed by the USFS include two large tracks of the Humboldt National Forest. The northern tract is located in the Jarbidge Mountains and includes one source of the North Fork of the Humboldt River; the southern tract lies in the Ruby Mountains and contains a primary source of the South Fork of the Humboldt River. Elko County ranks eleventh highest in terms of its percentage of federal land ownership and first in terms of acreage of federal land ownership among all of Nevada's counties.

Elko County stretches across four of Nevada's fourteen hydrographic regions or water basins (watersheds). However, a major portion of the county is contained within two river basins: the Snake River Basin (Hydrographic Basin 3), which drains to the north, out of the Great Basin and into the Columbia River System, and the Humboldt River Basin (Hydrographic Basin 4), which is the only principal river system wholly contained within Nevada. In addition, the extreme eastern edge of the county lies within the Great Salt Lake Basin (Hydrographic Basin 11) and the southeastern portion of the county lies within the Central Region (Hydrographic Basin 10). Within the four major hydrographic regions, Elko County also contains, either wholly or partially, forty-two hydrographic areas and sub-areas. These areas are defined as hydrographic units within a major water basin and typically consisting of a single valley or discrete drainage area.

**Figure 13 - Elko County Hydrographic Areas**



**Figure 14 - Nevada Hydrographic Regions**



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#### **WATER RESOURCES and WATER USES**

Much of the water for agriculture, ranches, recreation areas, and communities of the county is provided by snowfall from the high watersheds. The highest average precipitation in the River Basin is to be found in the Ruby Mountains. Some 44% of the total basin water yield comes from the Ruby Mountains and the East Humboldt Range. Water yield from 65% of the Basin is negligible while a 10,000 acre area in the Ruby Mountains yields more than 30 inches per acre of water annually. Some water from the west slope of the Ruby Mountains is diverted to the east slope due to fault planes and fractures in the limestone formation of the mountains south of Harrison Pass.

Three of Elko County's four incorporated cities, Carlin, Elko, and Wells lie within the Humboldt River Basin. The basin encompasses 15% of the state and is composed of approximately 20 sub-watershed areas. Through conservation these watersheds could yield more water resources. The Humboldt River Basin receives 9,285,000 acre feet of water per year resulting from rain and snow.

In 2000, when Elko County's population was estimated to be 45,251 persons, it was estimated that total water withdrawals were approximately 936,593 acre-feet, or 23.2 % of estimated total water withdrawals within Nevada. This makes Elko County the largest water user among all of Nevada's seventeen counties. Estimated water use in Elko County in 2000 was 2.1% greater than in 1990, but 11.5% below total water use in 1985. Of the total 2000 total water withdrawals, public supplied (i.e., municipal and industrial, or M&I) water withdrawals were estimated at 14,920 acre-feet, or 1.6 % of the county's total water withdrawn for all purposes. From the table below, it may be seen that most of the water withdrawals in Elko County have been used for irrigation purposes (97% of total water withdrawals in 2000) while water withdrawals for domestic purposes, i.e., residential use from all sources, constituted only 1.2% of total water withdrawals in 2000.

Based on the 1995 water use data, along with comparable period population and employment figures, it is estimated that Elko County's public supplied water use per person (also referred to as municipal and industrial, or M&I, water use per capita), based only on the estimated population served by public supply water systems, was 332 gallons per person per day as compared to a usage rate of 456 gallons per person per day in 1985 and 348 gallons per person per day in 1990.

It has been estimated that 213,903 acres were irrigated in Elko County (243,960 irrigated acres in 1985 and 210,150 irrigated acres in 1990). This amount of irrigated acreage comprised approximately 29.9% of the state's total 1995 irrigated acreage of 715,439 acres (843,760 acres in 1985 and 728,650 acres in 1990). This 1995 level of irrigated acreage placed Elko County as the highest in terms of county irrigated acreage in Nevada at that time (and well above the second-place county of Humboldt with 142,558 irrigated acres).

Based on 1995 estimates of both total irrigated acreage and total irrigation water withdrawals, the average water use (withdrawals) on irrigated acres in Elko County was estimated at approximately 4.2 acre-feet per acre per year. Elko County's 1995 irrigation conveyance losses were estimated at 0.9 acre-feet per acre per year, thereby leaving irrigation water available for consumptive use of 3.3 acre-feet per acre per year. Considered in its entirety, the Humboldt River system represents a highly efficient irrigation water conveyance and distribution mechanism.

Agricultural water users along this river system, stretching from the river's headwaters in Elko County through Eureka, Lander, Humboldt and into Pershing County, benefit from a continuous process of water diversion,

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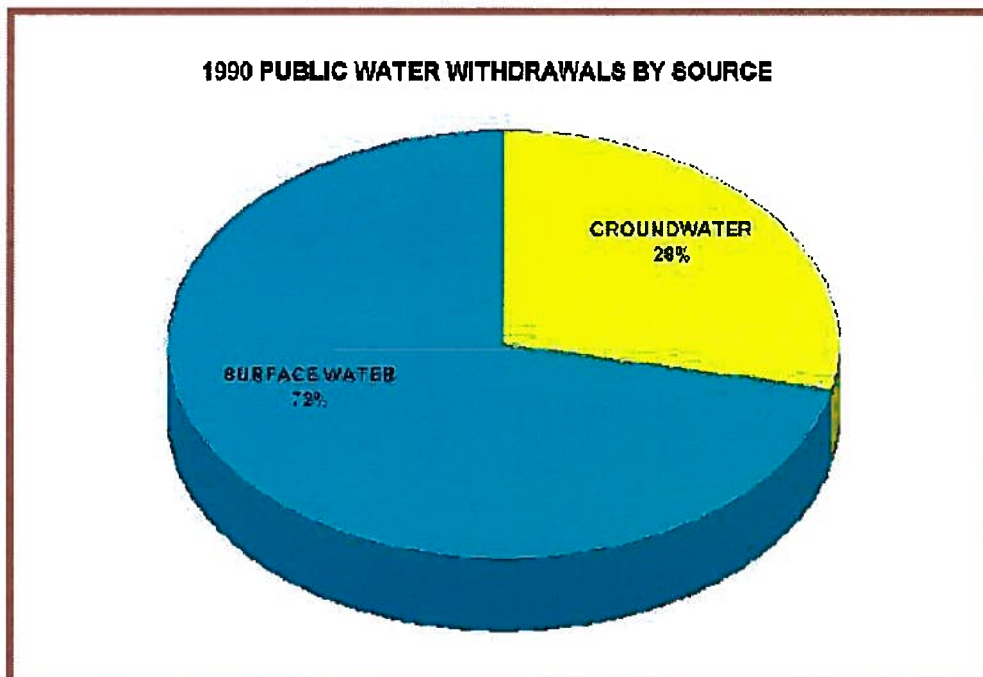
## Elko County Water Resource Management Plan

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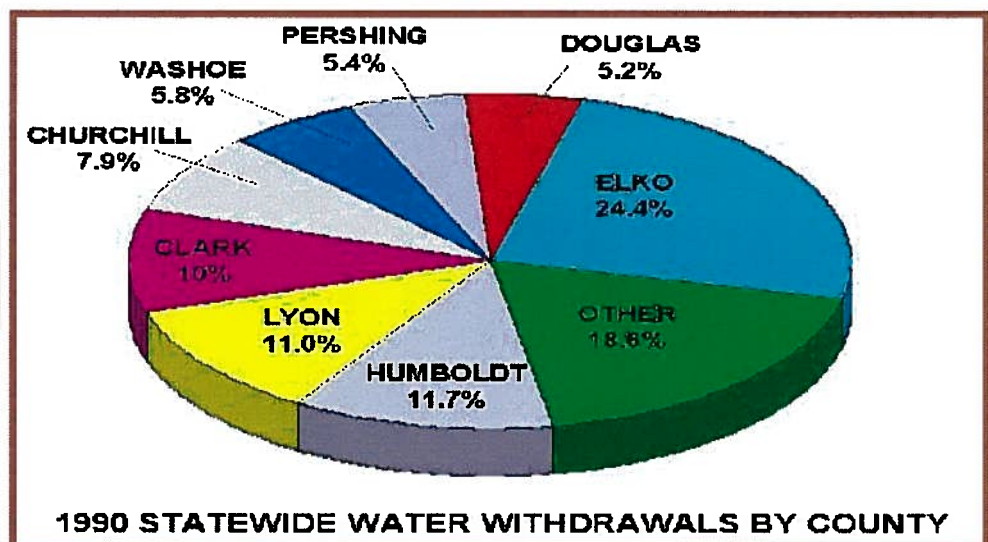
application, return flow, and reuse. Consequently, measures of irrigation conveyance losses and water withdrawals do not fully reflect the actual workings of the overall river system.

In 1995, the value of total farm marketings for Elko County was \$40.527 million, down 23.6 percent from \$53.071 million in farm marketings in 1990, but up 21.4% over \$33.379 million in total farm marketings in 1985.

**Figure 15 - Water Withdrawals by Source**



**Figure 16 - Statewide Water Withdrawals**





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#### SECTION 1 - SUMMARY CONCLUSIONS

Section 1 offers general information concerning the Institutional frame work of the Elko County Water Planning Commission and its creation and implementation of the Elko County Water Resource Management Plan. The Water Planning Commission was established with the sole purpose of the creation of the plan. Subsequent implementation will be at the instance of the Elko County Board of Commissioners. The plan is to be developed to provide a guideline of future water resource management by the general public and Elko County staff. The Water Planning Commission was charged with the development of the plan as well as establishing a mission statement, the plan areas, goals and objects and guiding principals.

Demographics were provided by the *State of Nevada Division of Water Planning, State of Nevada Demographer* and Elko County staff. The demographics represented in Section 1 and Section 2 depict the geographics, climate geology, vegetation, land mass, population and municipal boundaries. Demographic information concerning population provided by the *State of Nevada* indicates a decrease in population and a loss of agricultural lands in Elko County over the next twenty five years. In contrast Elko County staff indicates an increase in population and sustained agricultural lands. This is based on historical data representing development patterns and recent economic trends.

The Elko County Planning & Zoning Division, Elko County Assessor, Bureau of Land Management and U.S. Forest Service have provided information concerning land uses and development patterns. This information is based on a twenty year history establishing trends and development. Specific types of land uses are represented and explained as part of Section 1. Specific lands uses are as follows:

- Agriculture
- Residential
- Commercial
- Industrial
- Recreation
- Mining
- Private Development
- Transportation
- Public Land History
- Western Settlements

The socioeconomic overview is provided by the *State of Nevada Division of Water Planning* as part of the Nevada Water Plan. Some issues within the State Plan depict an evaluation by the State of Nevada and are not necessarily the views of the Water Planning Commission or County staff. The overview provides pertinent information related to History, Hydrology, Water Resources and Water uses.

The authors of the Elko County Water Resource Management Plan establish **Section 1** as general information concerning water resources, issues and data specific to the state, region and Elko County. Section 1 is not intended to project comprehensive data concerning hydrology analysis of any specific area. The Water Resource Management Plan is intended to encourage future analysis of hydrographic areas in Elko County utilizing current scientific methods.