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

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

AF ..... Acre-Feet (or Acre-Foot)
AFY ..... Acre-Feet per Year
AWWA ..... American Water Works Association
BFE ..... Base Flood Elevation (FEMA)
BIA ..... Bureau of Indian Affairs (USDI)
BLM ..... Bureau of Land Management (USDI)
CFS ..... Cubic Feet per Second
CORPS ..... U.S. Army Corps of Engineers (also USACE)
CWA ..... Clean Water Act (EPA)
DOW ..... Division of Wildlife (DCNR)
DWR ..... Division of Water Resources (DCNR)
DWP ..... Division of Water Planning (DCNR)
FEMA ..... Federal Emergency Management Agency
FIRM ..... Flood Insurance Rate Map (FEMA)
FIS ..... Flood Insurance Study (FEMA)
GIS ..... Geographic Information System
GPC ..... Gallons per Capita (Person)
GPCD ..... Gallons per Capita per Day
GPD ..... Gallons per Day
GPED ..... Gallons per Employee per Day
M&I ..... Municipal and Industrial
MGD ..... Million Gallons per Day
MSL ..... Mean Sea Level
NDOW ..... Nevada Division of Wildlife (DCNR)
NDSP ..... Nevada Division of State Parks (DCNR)
NDWP ..... Nevada Division of Water Planning (DCNR)
NFIP ..... National Flood Insurance Program (FEMA)
NPS ..... Non-Point Source [Pollution]
PWS ..... Public Water System/Public Water Supply
S.A. ..... Seasonally Adjusted
SDWA ..... Safe Drinking Water Act (EPA)
SFHA ..... Special Flood Hazard Area (FEMA)
SFIP ..... Standard Flood Insurance Policy (FEMA)
SNOTEL ..... Snowpack Telemetry (NRCS)
SPF ..... Standard Project Flood (FEMA)
USACE ..... U.S. Army Corps of Engineers (also Corps)
USBR ..... U.S. Bureau of Reclamation (USDI)
USDA ..... U.S. Department of Agriculture
USDI ..... U.S. Department of the Interior
USFS ..... U.S. Forest Service (USDA)
USFWS ..... U.S. Fish and Wildlife Service (USDI)
USGS ..... U.S. Geological Survey (USDI)
WRD ..... 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

REFERENCES

Anctil, R.J., Oesterling, W.A. and Willson, R.E., 1960. Areal Economic Geology, TWP 35N, RGE 61E & 62E, Elko. Southern Pacific Mineral Survey.

Anctil, R., and Oesterling, W.A., 1960. Areal Economic Geology, TWP 36N, RGE 61E &62E, Elko, Southern Pacific Mineral Survey.

Anctil, R.J., 1961. Areal Economic Geology, TWP 33N, RGE 55E & 56E, Elko. Southern Pacific Mineral Survey.

Avon, L. and Durbin, T.J., 1992. Evaluation of the Maxey-Eakin Method for Calculating Recharge to Groundwater Basins in Nevada: Las Vegas Valley Water District, Cooperative Water Project Report No. 7, 44 p.

Berger, D.L., 1999. Water Budgets for Pine Valley, Carico Lake Valley, and Upper Reese River Valley Hydrographic Areas, Middle Humboldt River Basin, North-Central Nevada – Methods for Estimation and Results. U.S. Geological Survey Water-Resources Investigations Report 99-4272.

Blackburn, P.W., 1986. Soil Survey of Elko County, Nevada, Central Part. USDA – Natural Resources Conservation Service, 3 Volumes with Accompanying Maps.

Blackwelder, E., 1931. Pleistocene Glaciation in the Sierra Nevada and Basin Ranges. Geological Society of America, Bulletin, v. 42.

Bouwer, 1978. Groundwater Hydrology. Prentice Hall, New York.

City of Elko, 1997. Population.
City of Elko Engineering Department, August, 1995. City of Elko's Wellhead Protection Program.
City of Elko Engineering Department, July 2000. Water System Data.
City of Elko Engineering Department, July 2000. Water Reclamation Facility data.
City of Elko Engineering Department, 2001. Sundance Well Data.
City of Elko Planning Department, July 2000. Existing and Planned Park and Recreational Facilities.
Coats, Robert S., 1987. Geology of Elko County, Nevada. Nevada Bureau of Mines and Geology, Bulletin 101.
Daly, C., R.P. Nielsen, and D.L. Phillips, 1994. A Statistical-Topographic model for Mapping Climatological Precipitation Over Mountainous Terrain. Journal of Applied Meteorology. V. 33, No. 2, p. 140-158.

Desert Research Institute – Western Regional Climate Center, 2001. Nevada Climate Summaries – Deeth 2 SW, Nevada – Period of Record Climate Data Summary 1951-2000.
Desert Research Institute – Western Regional Climate Center, 2001. Nevada Climate Summaries – Elko WB Airport, Nevada – Period of Record Climate Data Summary 1890-2000.
Desert Research Institute – Western Regional Climate Center, 2001. Nevada Climate Summaries – Lamoille PH, Nevada – Period of Record Climate Data Summary 1917-1972.
Desert Research Institute – Western Regional Climate Center, 2001. Nevada Climate Summaries – Lamoille YOST, Nevada – Period of Record Climate Data Summary 1975-2000.
Desert Research Institute – Western Regional Climate Center, 2001. Nevada Climate Summaries – Jiggs, Nevada – Period of Record Climate Data Summary 1948-1972.
Desert Research Institute – Western Regional Climate Center, 2001. Nevada Climate Summaries – Jiggs 8 SSE Zaga, Nevada – Period of Record Climate Data Summary 1978-2000.

Dott, R.H., Jr., 1955. Pennsylvanian Stratigraphy of Elko and Northern Diamond Ranges, Northeastern Nevada. American Association of Petroleum Geologists Bulletin 39(11):22.

Dohrenwend, J.C. and Moring, B.C., 1991. Reconnaissance photogeologic map of young faults in the Winnemucca 1 by 2-degree quadrangle, Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-2175.

Dohrenwend, J.C., Schell, B.A., and B.C. Moring, 1991. Reconnaissance Photogeologic Map of Young Faults in the Elko 1 by 2-degree Quadrangle, Nevada and Utah. U.S. Geological Survey Miscellaneous Field Studies Map MF-2179.

Driscoll, F., 1986. Groundwater and Wells. Johnson Filtration Systems Inc., 2nd Edition.

Eakin, T.E., and Lamke, R.D., 1966. Hydrologic Reconnaissance of the Humboldt River Basin, Nevada. Nevada Department of Conservation and Natural Resources, Water Resources Bulletin 32, 107 p.
Eakin, T.E., G.B. Maxey, T.W. Robinson, J.C. Fredericks and O.J. Loeltz, 1951. Contributions to the Hydrology of Eastern Nevada. Nevada Department of Conservation and Natural Resources, Water Resources Bulletin 12, 171p.

Elko County Assessors Office Records.

Emmons, W.H., 1910. Reconnaissance of some mining camps in Elko, Lander, and Eureka Counties, Nevada, Elko, Lander, Eureka, U.S. Geological Survey, Bulletin 408.

Erwin, John W., 1974. Bouger gravity map of Nevada: Winnemucca sheet. Nevada Bureau of Mines and Geology Map 47.

Evans, J.G., and K.B. Ketner, 1971. Geologic map of the Swales Mountain quadrangle and part of the Adobe Summit quadrangle, Elko County, Nevada. U.S. Geological Survey Miscellaneous Geol. Inv. Map I-667.

Fay, W.M., 1980. Elko 1 degree x 2 degree NTMS area, Nevada and Utah, data report, hydrogeochemical and stream sediment reconnaissance. E. I. du Pont de Nemours and Company, for US DOE, Report GJBX-163.

Fenneman, N.M., 1931. Physiography of the Western United States. McGraw Hill Book Co.

Flynn, D.B., 1957. Geology of part of the Dixie Flats quadrangle, Elko County, Nevada. University of California Los Angeles Master's thesis (unpublished).

Foglesong, M.T., 1999. Water-related scientific activities of the U.S. Geological Survey in Nevada, fiscal years 1997 and 1998: U.S. Geological Survey Open-File Report 99-206.

Fredericks, J.C., and O.J. Loeltz, 1947. Ground water in the vicinity of Elko, Nevada, in Eakin, T.E., Maxey, G.B., Robinson, T.W., Fredericks, J.C., and Loeltz, O.J., Contributions to the hydrology of eastern Nevada, 1951. Nevada State Engineer, Water Resources Bulletin 12, p. 35-63.

Freeze, R. Allan and John A. Cherry, 1979. Groundwater. Prentice-Hall.

French, R. H., 1983. A Preliminary Analysis of Precipitation in Southern Nevada. Water Resources Center, Desert Research Institute, 39 p.

Gibbs, J.F., Willden, Ronald, and J.E. Carlson, 1968. Gravity anomalies in the Ruby Mountains, northeastern Nevada. U.S. Geological Survey Professional Paper 600-B.

Granger, A.E., Bell, M.M., Simmons, G.C., and F. Lee, 1957. Geology and mineral resources of Elko County, Nevada. Nevada Bureau of Mines and Geology Bulletin 54.

Greeley and Hanson Consultants, 1998. City of Elko Water Reclamation Master Plan.

Haines, C.F., Van Sickle, D.M., and Ryals, W.G., 1949. Range Water Resources of a Part of the Elko Grazing District, Elko County, Nevada. U.S. Geological Survey Open-File Report 49-76, 84 p.

Harrill, J.R., and Prudic, D.E., 1998. Aquifer Systems in the Great Basin Region of Nevada, Utah, and Adjacent States--Summary Report. U.S. Geological Survey Professional Paper 1409-A.

Hope, R.A., 1972. Geologic Map of the Spruce Mountain Quadrangle, Elko County, Nevada. U.S. Geological Survey Geologic Quadrangle Map GQ-942.

Hurlow, H.A., 1987. Structural Geometry, Fabric, and Chronology of a Tertiary Extensional Shear Zone-Detachment System, Southwestern East Humboldt Range, Elko County, Nevada. University of Wyoming, Laramie, WY Master's thesis.

Iverson, B.G., 1991. Stratigraphy of Devonian-Mississippian Rocks, Northern Pinyon Range, southwestern Elko County, Nevada. University of Nevada Reno Master's thesis.

Iverson, B.G., 1992. Geologic map of the Northern Pinon Range, Southwestern Elko County, Nevada - in Structural Geology and Petroleum Potential of Southwest Elko County, Nevada, Nevada Petroleum Society Fieldtrip Guidebook, June 5-7, 1992.

Jaeger, K.B., 1987. Structural geology and stratigraphy of the Elko Hills, Elko County, Nevada. University of Wyoming; Laramie, WY. Master's thesis.

Johnson, M.J., 1995. Summer Evapotranspiration Rates, by Bowen-Ratio and Eddy Correlation Methods, in Boulder Flat and in Maggie Creek Area, Eureka County, Nevada, 1991-92. U.S. Geological Survey Water-Resources Investigations Report 95-4079.

Ketner, K.B.; Smith J.F., Jr., 1963. Geology of the Railroad mining district, Elko County, Nevada. U.S. Geological Survey Bulletin 1162-B.

Ketner, Keith B., 1970. Geology and mineral potential of the Adobe Range, Elko Hills, and adjacent areas, Elko County, Nevada. U.S. Geological Survey Professional Paper 700-B.
Ketner, K.B., 1973. Preliminary geologic map of the Hunter quadrangle, Elko County, Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-539.
Ketner, K.B., 1985. Preliminary geologic map of the Elko Hills, Elko County, Nevada. U.S. Geological Survey Open-File Report 85-713.
Ketner, K.B., 1990. Geologic map of the Elko Hills, Elko County, Nevada. U.S. Geological Survey Miscellaneous Investigations Series I-2082, supersedes OF 85-713.

Kennedy/Jenks Consultants, Spring 2000. City of Elko Water System Master Plan.

King, C., 1877 and 1878. Geological Exploration of the 40th Parallel. Professional Paper of the Engineering Department, US Army, No. K8, V. 1, 803 pp.

Knight, A.S., Jr., 1954. Stratigraphy of the Carlin Canyon area, Nevada. Columbia University, New York Master's Thesis.

Konakis, F.S., 2001. Personal Communication.
Konakis, F.S., Alford, D.E., Hermanson, L., and Simmons, R.L., November 2000. Water System Master Planning for the City of Elko, Nevada. Proceedings of the American Water Resources Association, November 2000.

Laczniak, R.J., Guy A. DeMeo, S.R. Reiner, J. LaRue Smith, and W.E. Nylund, 1999. Estimates of Ground-Water Discharge as Determined from Measurements of Evapotranspiration, Ash Meadows Area, Nye County, Nevada. U.S. Geological Survey Water-Resources Investigation Report 99-4079.

Larson, L.T.; Beal, L.H., 1977. Great Basin Geologic Framework and Uranium Favorability, Elko, Eureka, Lander, Humboldt, Pershing, Mackay School of Mines, Bendix Field Engineering Corp, Contract No. BFEC-GJO/76-020-E.

Loeltz, O.J., and Malmberg, G.T., 1961. The Ground-Water Situation in Nevada, 1960: Nevada Department of Conservation and Natural Resource, Water Resources – Information Report 1, 20 p.

Lush, A.P., 1982. Geology of Part of the Northern East Humboldt Range, Elko County, Nevada. University of California Santa Barbara Master's Thesis.

Maurer, D.K., and D.L. Berger, 1997. Subsurface Flow and Water Yield from Watersheds Tributary to Eagle Valley Hydrographic Area, West-Central Nevada. U.S. Geological Survey Water Resources Investigation Report 97-4191.

Maurer, D.K., and C.E. Thodal, 1999. Quantity and Chemical Quality of Recharge, and Updated Water Budgets for the Basin-Fill Aquifer in Eagle Valley, Western Nevada. U.S. Geological Survey Water Resources Investigation Report 99-4289.

Metcalf and Eddy, 1991. Wastewater Engineering -Treatment, Disposal, Reuse. Third Edition. McGraw Hill.

Moring, B.C., 1990. Map Showing Drill-hole Depths, Lithologic Intercepts, and Partial Isopachs of Basin Fill in the Winnemucca 1 Degree by 2 Degree Quadrangle, Nevada. U.S. Geological Survey Miscellaneous Field Studies MAP MF-1955.
National Oceanic and Atmospheric Administration. Climatological Data - Annual Summary: Nevada, 1997.

Nevada Department of Conservation and Natural Resources, 1996, Division of Water Planning, State of Nevada Water Plan. (NRS 540.101)
Nevada Department of Conservation and Natural Resources, 1992. Nevada Water Facts.
Nevada Department of Conservation and Natural Resources, Division of Water Planning, March 1998. Elko County Socioeconomic Overview: An Overview of Historic, Geographic, Hydrologic, Water Use and Socioeconomic Trends and Conditions for Use in the State Water Plan.
Nevada Department of Conservation and Natural Resources, Division of Water Resources, 2001. Internet Database (Access) of Well Logs.
Nevada Department of Conservation and Natural Resources, Division of Water Resources, 2001. AutoCAD Database of Hydrographic Basin Boundaries.
Nevada Department of Conservation and Natural Resources, US Department of Agriculture, May 1963. Water and Related Land Resources, Humboldt River Basin, Nevada, Report No. 3, Ruby Mountains Sub-Basin.
Nevada Department of Conservation and Natural Resources, US Department of Agriculture, June 1963. Water and Related Land Resources, Humboldt River Basin, Nevada, Report No. 4, Mary's River Sub-Basin.
Nevada Department of Conservation and Natural Resources, US Department of Agriculture, August 1963. Water and Related Land Resources, Humboldt River Basin, Nevada, Report No. 5, North Fork Sub-Basin.

Nevada Department of Conservation and Natural Resources, US Department of Agriculture, April 1964. Water and Related Land Resources, Humboldt River Basin, Nevada, Report No. 7, Elko Reach.

Nichols, W.D., 1994. Groundwater Discharge by Phreatophyte Shrubs in the Great Basin as Related to Depth to Groundwater. Water Resources Research, v. 30, no. 12, p. 3265-3274.
Nichols, W.D., 2001. Regional Ground-Water Evapotranspiration and Ground-Water Budgets, Great Basin, Nevada. US Geological Survey Professional Paper 1628.

Niswonger, R.G., Prudic, D.E., Constantz, Jim, 2000. Estimating Recharge and Flow from Mountain-Front Streams Using Temperature Measurements and Coupling Models of Surface and Groundwater Flow [abs.]: Eos, American Geophysical Union, Transactions, December 2000, San Francisco, California, v. 81, no. 48, p. F422.

Olympus Aerial Surveys, Salt Lake City, Utah, 1996. City of Elko Aerial Photo, 1" = 46,000' Scale.

Pendergast, M.A., 1981. Devonian and Mississippian stratigraphy of the Swales Mountain area, Elko County, Nevada. Oregon State University Master's thesis.

Percival, T.J.; Bright, J.H., 1982. National Uranium Resource Evaluation--Elko quadrangle, Nevada and Utah. Uranium Services Co., for DOE Report PGJ/F-046(82).

Plume, R.W., 1995. Water Resources and Potential Effects of Ground-Water Development in Maggie, Mary's, and Susie Creek Basins, Elko and Eureka Counties, Nevada. U.S. Geological Survey Water-Resources Investigations Report 94-4222.

Preissler, A.M., Roach, G.A., Thomas, K.A., and Wilson, J.W., 1999. Water Resources Data, Nevada Water Year 1998: U.S. Geological Survey Water-Data Report NV-98-1, 598 p.

Regnier, Jerome, 1960. Cenozoic Geology in the Vicinity of Carlin, Nevada, Geological Society of America Bulletin 71(8).
Riggs, H.C., and Moore, D.O., 1965, A Method of Estimating Mean Runoff from Ungaged Basins in Mountainous Regions. In Geological Survey Research 1965: U.S. Geological Survey Professional Paper 525-D, p. 199-202.

Robinson, T.W., 1970. Evapotranspiration of Woody Phreatophytes in the Humboldt River Valley Near Winnemucca, Nevada. USGS Professional Paper 491-D.

Roberts, R.J.; Montgomery, K.M.; Lehner, R.E., 1967. Geology and mineral resources of Eureka County, Nevada. Nevada Bureau of Mines and Geology Bulletin 64.

Schaefer, D.H., 1988. Gravity, Depth to Consolidated Rock, and Soil Temperature in the Elko Area, Northeastern Nevada. U.S. Geological Survey Miscellaneous Investigations Series MAP I-1900.

Scott, B.R., T.J. Smales, F.E. Rush, and A.S. VanDenburgh, 1971. Water for Nevada: Nevada Department of Conservation and Natural Resources, Water Planning Report No. 3.

Server, G.T., Jr.; Solomon, B.J., 1983. Geology and Oil Shale Deposits of the Elko Formation, Pinon Range, Elko County, Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-1546.

Sharp, R.P., 1939. Basin-Range Structure of the Ruby-East Humboldt Range, Northeastern Nevada. Geological Society of America Bulletin 50(6).

Sharp, R.P., 1940. Geomorphology of the Ruby-East Humboldt Range, Nevada. Geological Society of America Bulletin 51(3).

Smith, J.F., Jr.; Ketner, K.B., 1972. Generalized Geologic map of the Carlin, Dixie Flats, Pine Valley, and Robinson Mountain quadrangles, Elko and Eureka Counties, Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-481.

Smith, J.F., Jr.; Ketner, K.B., 1975. Stratigraphy of Paleozoic rocks in the Carlin-Pinon Range area, Nevada. U.S. Geological Survey Professional Paper 867-A.

Smith, J.F., Jr.; Ketner, K.B., 1976. Stratigraphy of Post-Paleozoic Rocks and Summary of Resources in the Carlin-Pinon Range Area, Nevada. U.S. Geological Survey Professional Paper 867-B.

Smith, J.F., Jr.; Howard, K.A., 1977. Geologic Map of the Lee 15-Minute Quadrangle, Elko County, Nevada. U.S. Geological Survey Geologic Quadrangle Map GQ-1393.

Smith, J.F., Jr.; Ketner, K.B., 1978. Geologic Map of the Carlin-Pinon Range Area, Elko and Eureka Counties, Nevada. U.S. Geological Survey Miscellaneous Investigations Series I-1028.

Smith, J.L., Reece, B.D., and R.L. Medina, 2001. Data Sets and Related Information Used for Estimating Regional Ground-Water Evapotranspiration in Eastern Nevada. U.S. Geological Survey Open File Report 99-242

Solomon, B.J., 1981. Geology and Oil Shale Resources Near Elko, Nevada. U.S. Geological Survey Open-File Report 81-709.

Solomon, B.J.; Moore, S.W., 1982. Geologic Map and Oil Shale Deposits of the Elko West Quadrangle, Elko County, Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-1410.

Solomon, B.J.; Moore, S.W., 1982. Geologic Map and Oil Shale Deposits of the Elko East Quadrangle, Elko County, Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-1421.

Stewart, J.H., and J.E. Carlson, 1976. Geologic Map of North-Central Nevada. Nevada Bureau of Mines and Geology, MAP 50.

Stone, W.J., 1992. Groundwater Recharge Estimates, Maggie and Mary's Creek Basins, Northeast Nevada: Carlin, Nevada. Newmont Gold Company, 34 p.

U.S. Geological Survey, May 2001. Nevada Hydrographic Regions – Humboldt River Basin

U.S. Geological Survey, 1962 (Photo-revised 1975). Elko West, Quadrangle, 7.5-Minute Series, Topographic Map.

Weight, W.D., and J.L. Sonderegger, 2001. Manual of Applied Field Hydrogeology. McGraw Hill, Pub.

Willard Owens Associates, Inc., 1970. Geologic Map of the Elko 1 degree by 2 degree AMS Quadrangle, Elko, Nevada, prepared for the NURE program & USDOE.

Willden, R., and R.W. Kistler, 1967. Ordovician Tectonism in the Ruby Mountains, Elko County, Nevada. U.S. Geological Survey Professional Paper 575-D.
Willden, R.; Kistler, R.W., 1969. Geologic Map of the Jiggs quadrangle, Elko County, Nevada. U.S. Geological Survey Geologic Quadrangle Map GQ-859.

Winchester, D.E., 1923. Oil Shale of the Rocky Mountain Region, U.S. Geological Survey, Bulletin 729.

Zietz, I., Stewart, J.H., Gilbert, F.P., and J.R. Kirby, 1977. Aeromagnetic Map of Nevada. U.S. Geological Survey Miscellaneous Field Studies Map MF-902

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City of Elko Councilman 1992-2000
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Elko County Water Planning Commissioner
Electrical Contractor - Owner Operator
Lifetime resident of Elko County

David Evetts

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2002-present: Hydrologist with the USGS/ Nevada Water Science Center/Elko NV. Primary focus: Surface water dynamics, data collection, and indirect discharge computation.
2000-2002: Hydrologist with the USGS / Nevada Water Science Center/Carson City. Projects Division, Primary focus: Groundwater pumpage and usage inventory
Publications: Second Author: Ground-water pumpage and artificial recharge estimates for calendar year 2000 and average annual natural recharge and interbasin flow by hydrographic area, Nevada
1999-2000: Student hydrologist with the USGS /Alaska Water Science Center/Fairbanks.
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Jonathan Gorman

Elko County Water Planning Commissioner
Manager of Reclamation and Regulatory Affairs for AngloGold Ashanti in Elko, Nevada.
Has worked in the mining industry and consulting for over 20 years, with a focus on water resources, hydrogeology, and environmental issues.
BS and MS in Geological Sciences.

Lee E. Hoffman

Elko County Water Planning Commissioner (Retired)
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City of Elko Councilman (Retired)
B.S (1973) / M.S (1975) in Metallurgical Engineering - University of Nevada, Mackay School of Mines
Metallurgist with 28 years experience in the mining industry.
Have served on the Elko City Council for 14 years with responsibility and liaison duties in the engineering, municipal water supply, and wastewater departments.

Chris Johnson

City of Elko Councilman 2004- Present
Elko County Water Planning Commissioner
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Owner / Operator Chester Plumbing Company
Lifetime resident of Elko County

Gerald K. Miller

Elko County Water Planning Commissioner
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Warren Russell

Elko County Commissioner 2000 - Present
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Tim Siroteck

Elko County Water Planning Commissioner
City of Carlin Councilman (Retired)
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B.S. Mine Engineering – Mackay School of Mines – University of Nevada – Reno 1993
14 years experience in Mine Engineering with 26 years of overall experience in Mining Industry.
Served 4 years on the City of Carlin Council with oversight of Parks and Streets.

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
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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 (25th) 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.

High Mountain Meadows - near Coon Creek Summit, Jarbidge Area

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 recommenced to Elko County that the creation and implementation of an Elko County Water Plan would be needed.

The letter was forwared 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.

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^{th}) year anniversary and a comprehensive review at the twenty fifth (25^{th}) 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.

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 5th 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 occuring in the spring.

Figure 1 - Average Valley Floor Precipitation

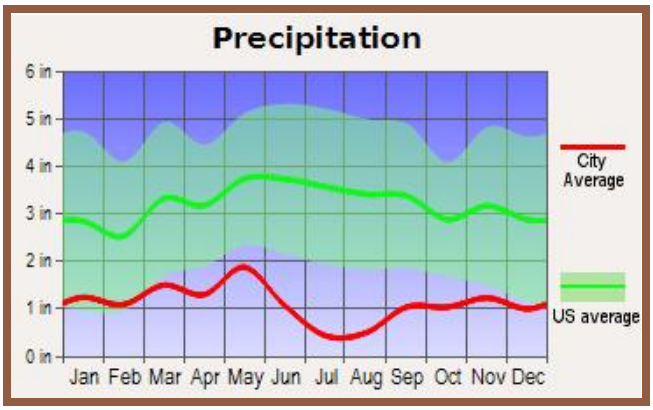


Figure 2 - Average Valley Floor Snowfall

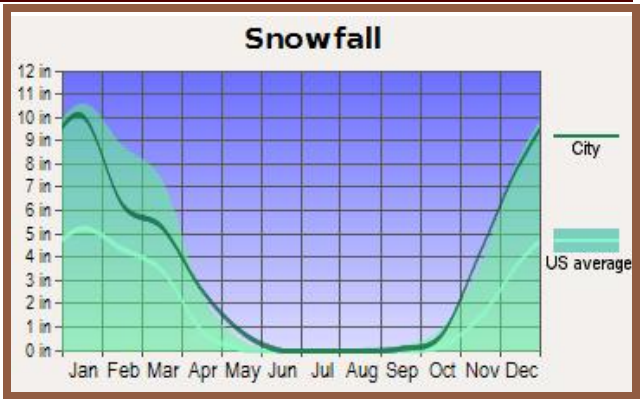


Figure 3 - Average Valley Floor Sunshine

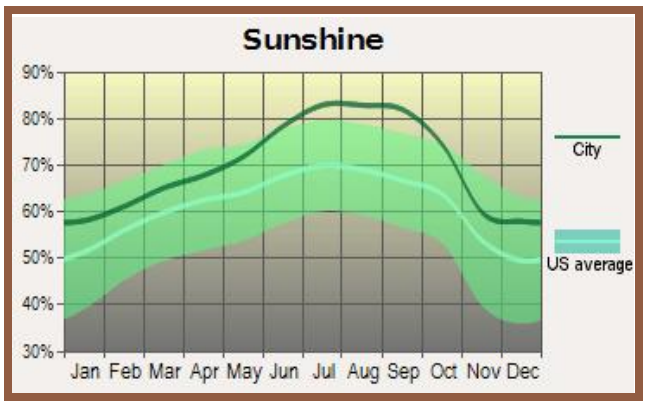
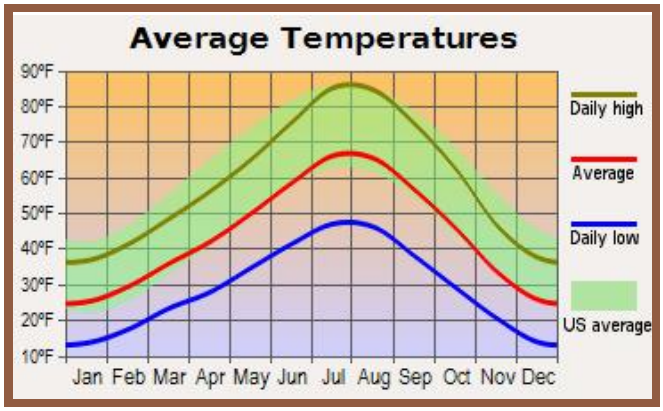


Figure 4 - Average Valley Floor Temperatures



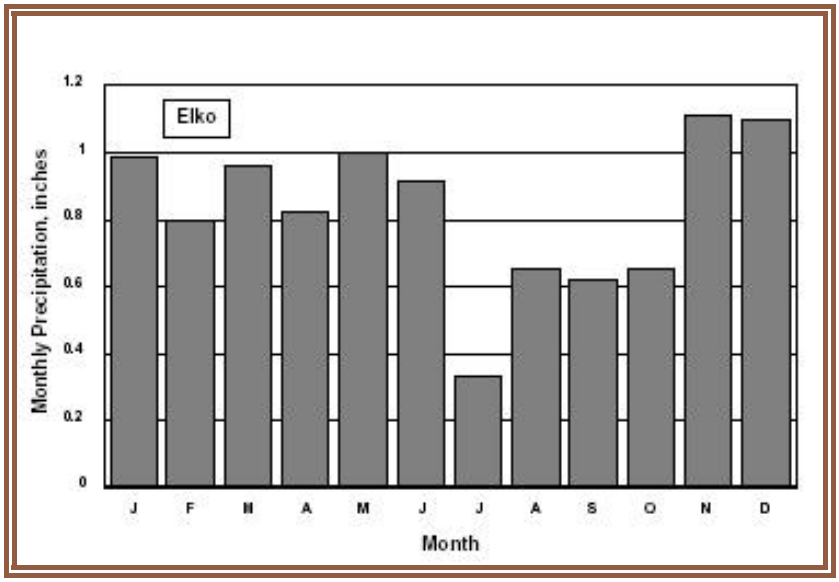
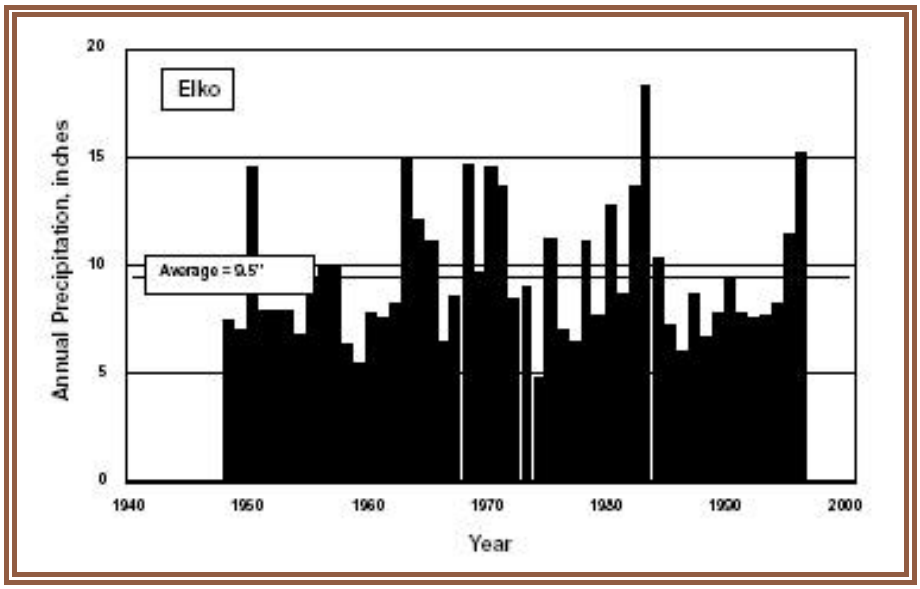


Figure 5 - **Monthly** Precipitation Inches Inclusive

Figure 6 - **Annual** Precipitation Inches Inclusive



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

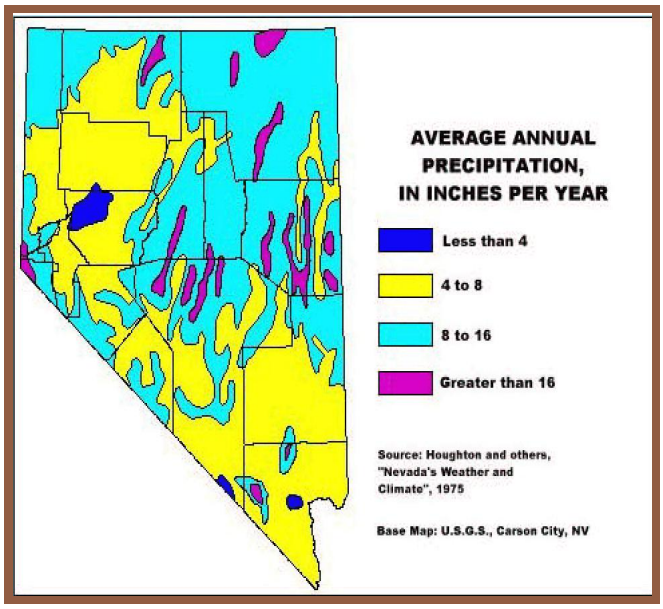
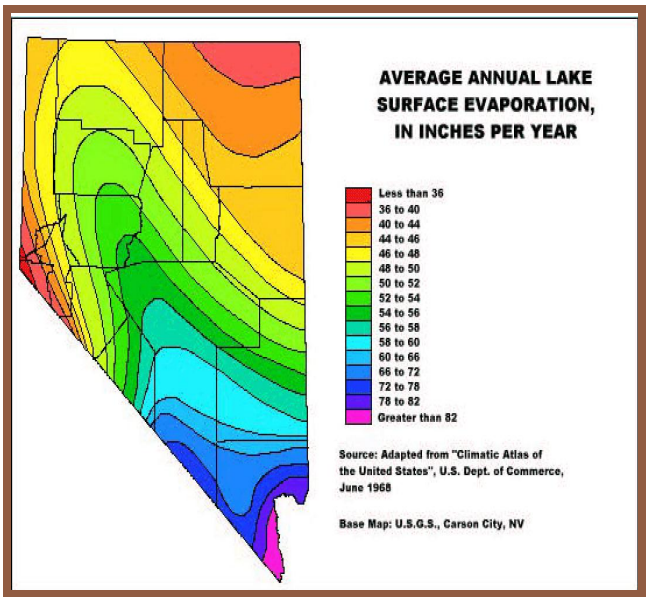


Figure 8 - Average Annual Lake Surface Evaporation



AVERAGE ANNUAL PRECIPITATION AT SELECTED LOCATIONS

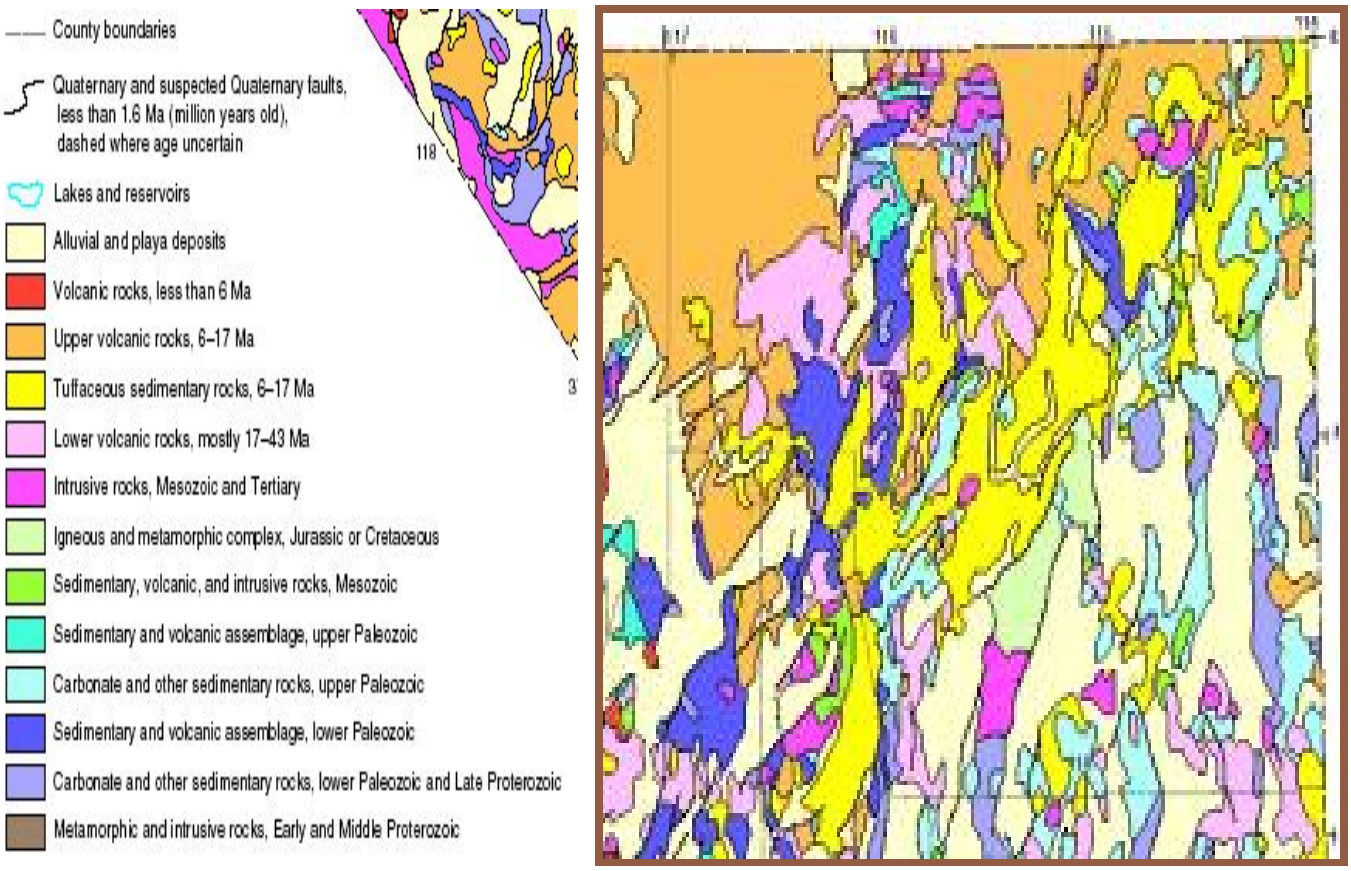
County	City	Average Annual Precipitation, in inches
Carson City	Carson City	10.8
Churchill	Fallon	4.9
Clark	Las Vegas	4.2
Douglas	Minden	8.2
Elko	Elko	9.3
Esmeralda	Goldfield	5.6
Humboldt	Winnemucca	7.9
Lander	Battle Mountain	7.5
Lincoln	Caliente	9.1
Lyon	Yerington	5.5
Mineral	Hawthorne	4.6
Nye	Tonopah	4.9
Pershing	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

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



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.

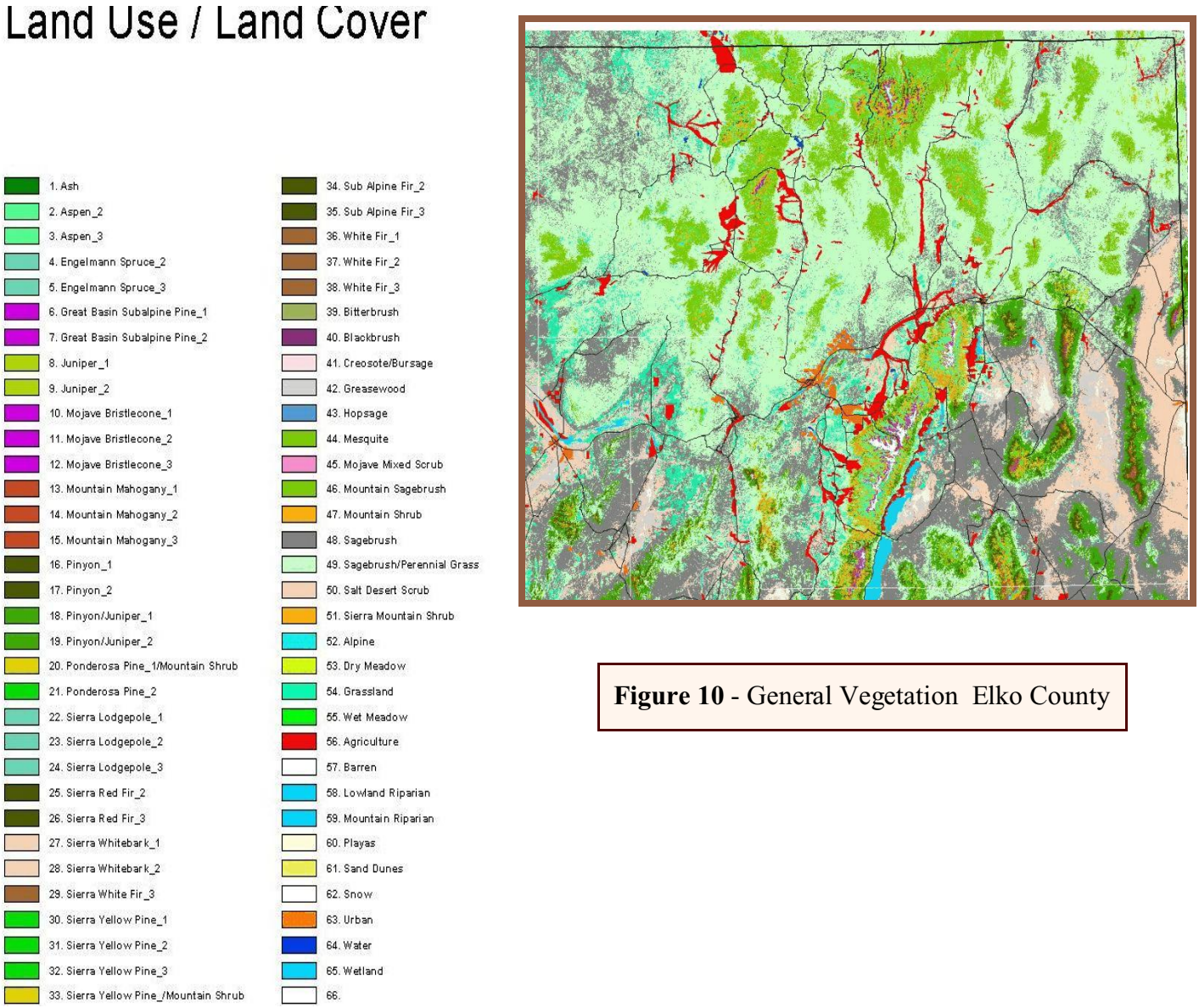


Figure 10 - General Vegetation Elko County

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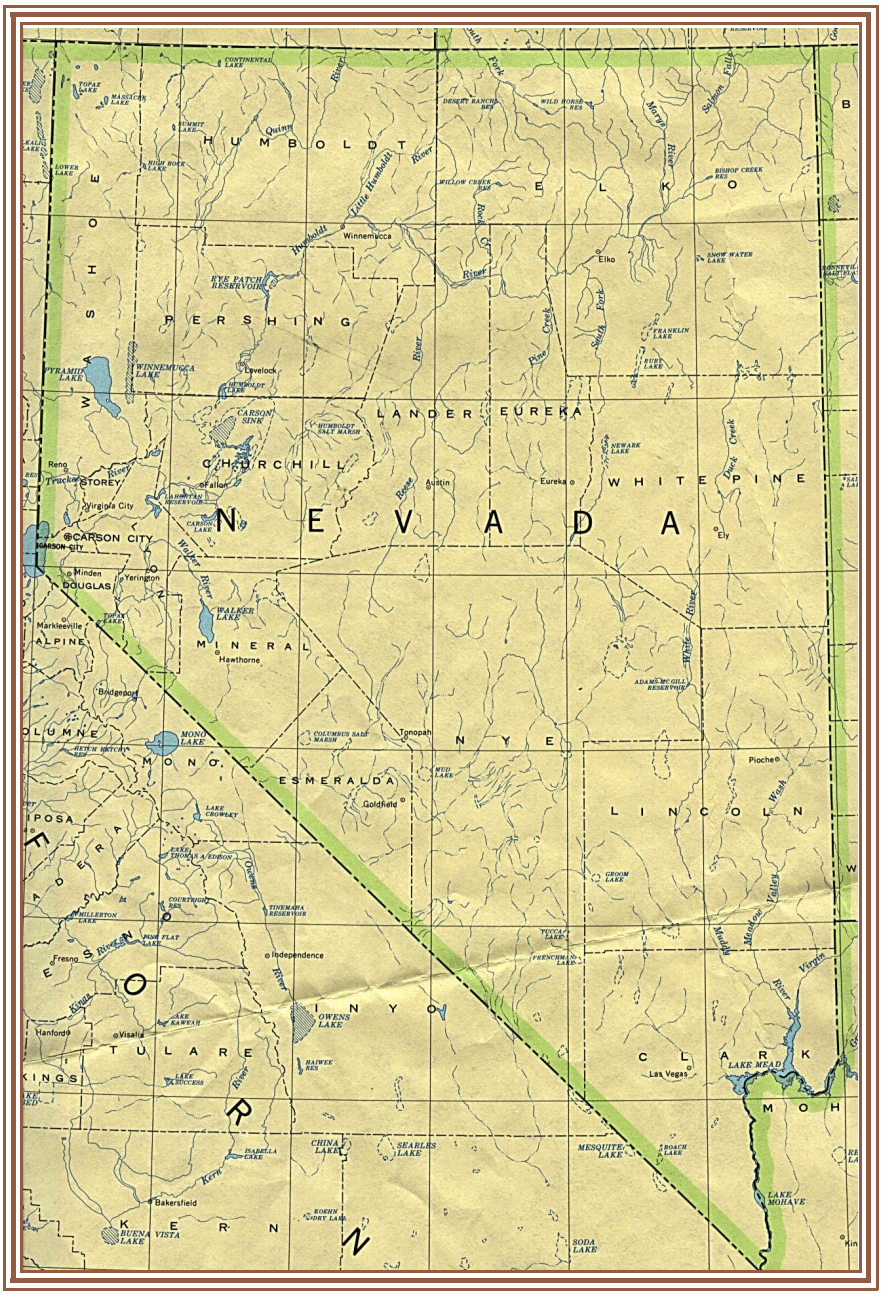
LAND MASS:

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

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**

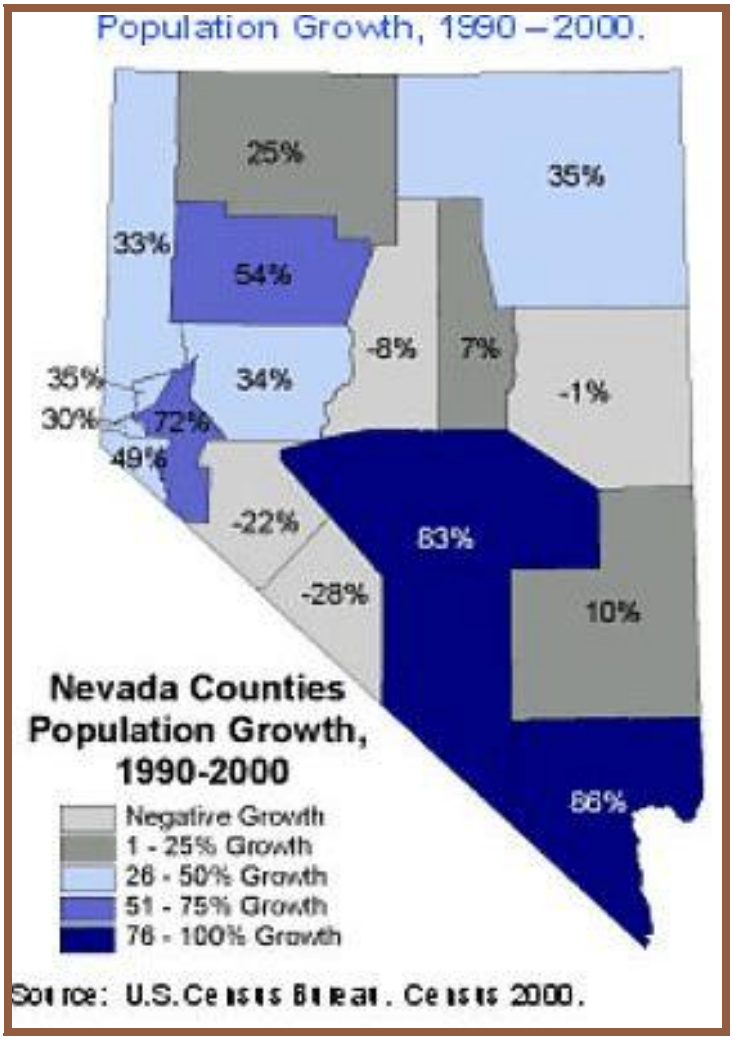


Figure 12 - Nevada Population Growth Percentages 1990 - 2000

MUNICIPAL BOUNDARIES:

Elko County has four incorporated cities. Lands within the municipal boundaries of the Cities of Elko, Carlin, Wells and West Wendover are approximately 33 square miles, 21,120 acres, or 0.19% of the total surface area or land mass. Uses within the incorporated cities include commercial, industrial, recreation, residential and some agricultural. Population counts in Elko County show that approximately 26,784 or 55.4% of the total population in Elko County live in the incorporated cities. It is also estimated that an additional 13,000 people, or 26.9% of the total population, live in the outlying areas around the City of Elko, including the Spring Creek, Lamoille and South Fork areas. After consideration of the unincorporated towns' population of 1,593 people, or 3.3%, that leaves a remainder of 6,962 people, or 14.4% of the total population, living in the rural areas outside of urban or adjacent communities.

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 [1]	U.S. Rank	Universe [1]
MARKET VALUE OF AGRICULTURAL PRODUCTS SOLD ($1,000)					
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
VALUE OF SALES BY COMMODITY GROUP ($1,000)					
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
TOP LIVESTOCK INVENTORY ITEMS (number)					
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 [3]	(D)	(D)	7	(D)	1,541
TOP CROP ITEMS (acres)					
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 [3]	(D)	(D)	1	(D)	215
Safflower [3]	(D)	(D)	3	(D)	112
Apples [3]	(D)	(D)	10	(D)	2,173

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 and1990'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.

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.

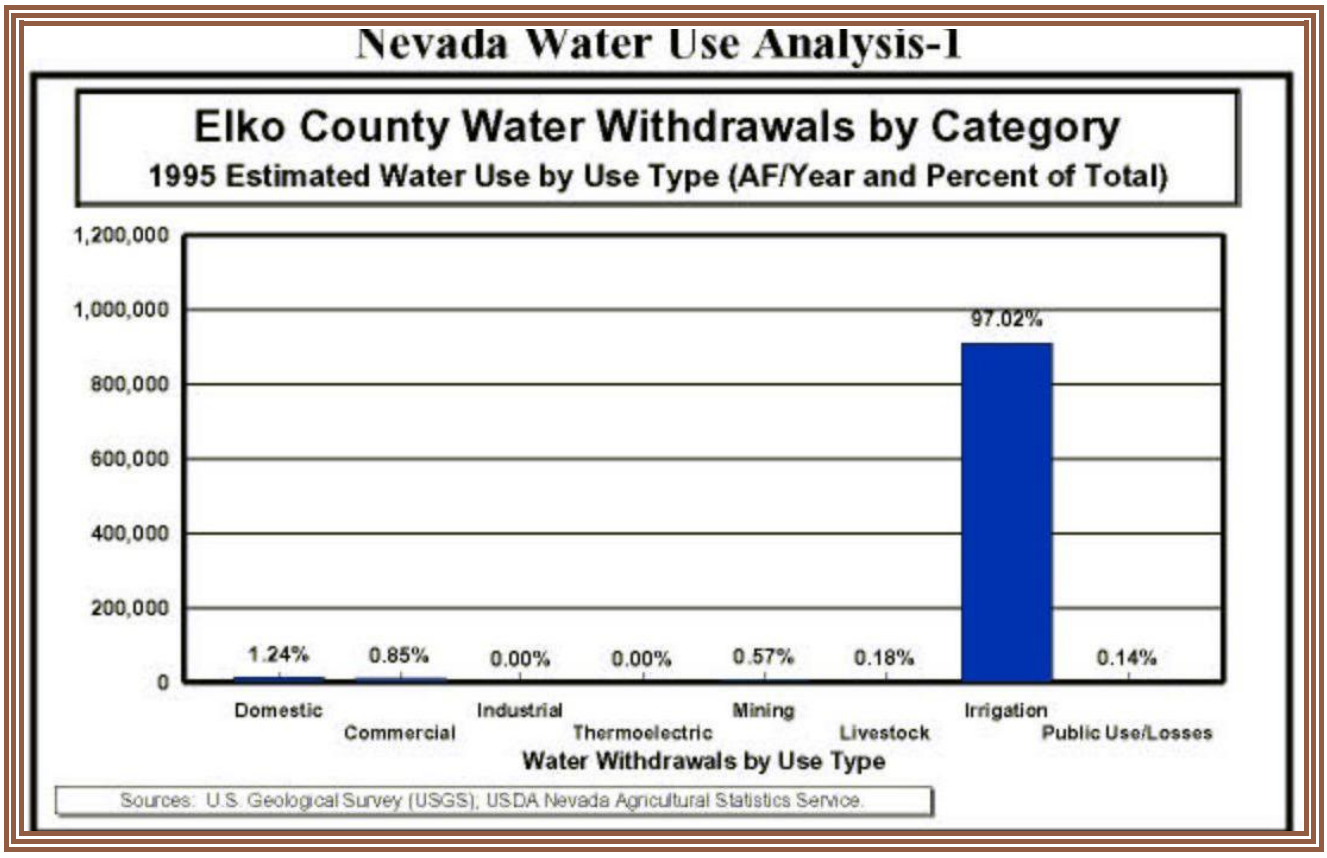
Lamoille Canyon - Beaver Ponds

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



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 subdivision 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

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.

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

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.

SECTION 1
Elko County Water Resource Management Plan
Plan Development Information

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

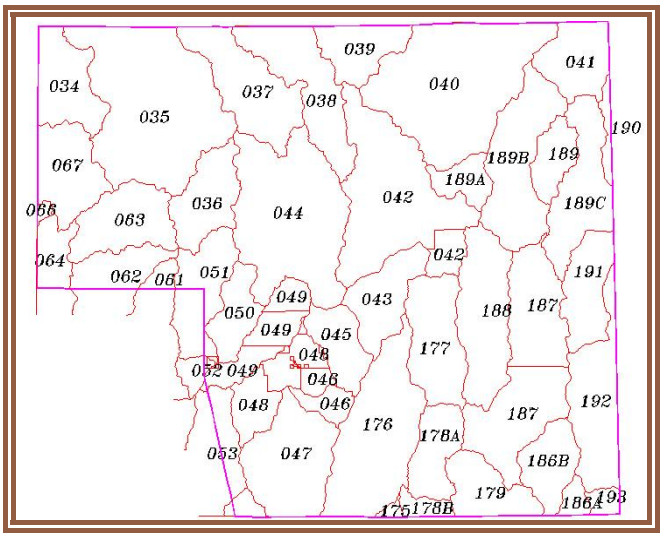


Figure 14 - Nevada Hydrographic Regions

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,

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

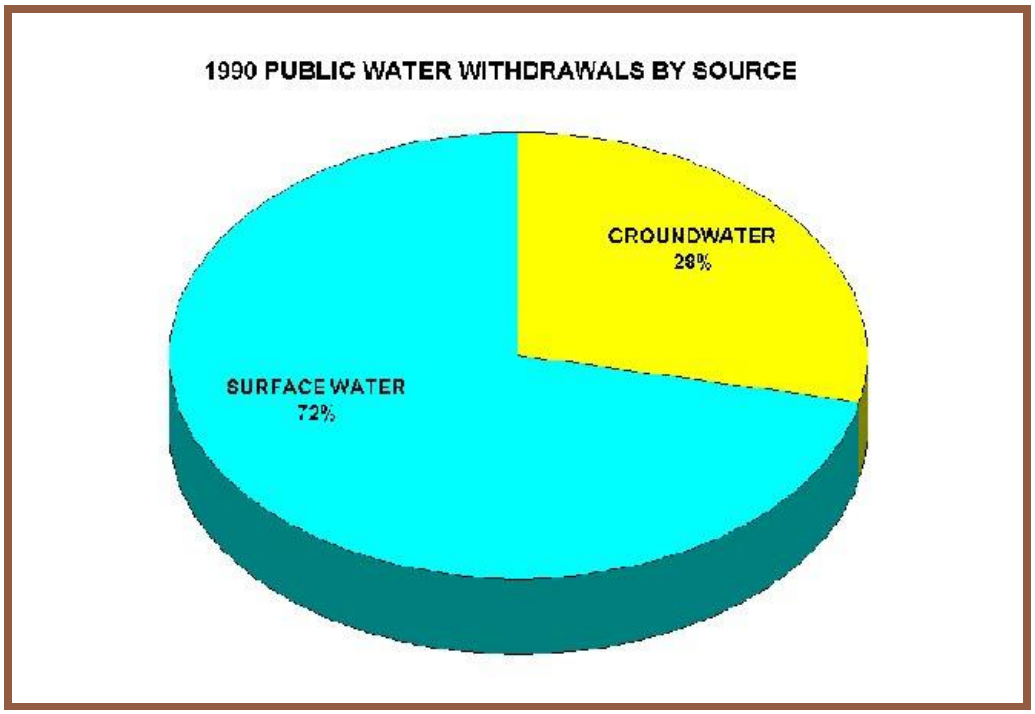
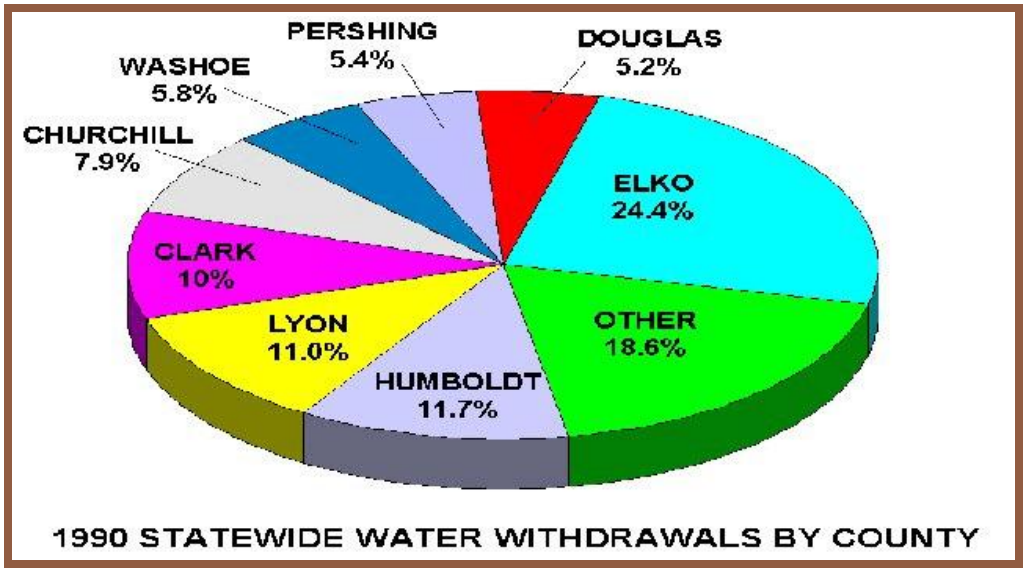


Figure 16 - Statewide Water Withdrawals



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.

Elko County
Water Resource Management Plan
Water Resource Management
Section 2

Lamoille Church & Ruby Mountains

EXECUTIVE SUMMARY

The Elko County Water Resource Management Plan has been prepared to guide the development, management, and use of water resources within the County during the next twenty-five years. Use by decision makers of information contained within this plan will help 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 Water Resources Management Plan will assist in maintaining the quality of life enjoyed by residents and visitors to the 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.

Preparation of the Elko County Water Resource Plan has involved extensive consultation with residents of the County, Local Governments, State and Federal agencies. The Elko County Water Planning Commission reaches conclusions, which differ, from what the State of Nevada may indicate on population growth and water resource utilization. This plan envisions continued population growth in Elko County, and in irrigated agricultural production and related water requirements. Thus water usage staying generally the same.

Studies by the United States Geological Survey are underway to update groundwater resource budgets in select groundwater basins in Elko County. Although research to date is characterized by considerable uncertainty and additional work is required, the results of these studies suggest that the perennial groundwater yield may be significantly greater than previously thought. The implications of this water plan are that more water than previously considered possible may be available for development and use within Elko County

The Nevada Division of Water Resources has reviewed draft versions of this plan and has offered important comments and guidance leading to the completion of the Elko County Water Resource Management Plan. 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.

Currently, water use (for all uses including domestic, commercial, industrial, mining, livestock and irrigated agriculture) in Elko County is estimated at ***933,041*** acre feet per year. Based upon the forecasted growth of population within the west, and given the abundance of natural resources in Elko County, we have developed seven key areas to focus future planning activities:

1. Integrate Water Planning with Elko County Master Planning and Zoning.
2. Identifying and Maintaining Forecasts of reasonably Foreseeable Future Water Demands.
3. Encourage City-County cooperation on growth issues in the I-80 Corridor between Carlin and Ryndon.
4. Obtaining Water Rights at Key Locations to ensure water for growth in rural areas.
5. Support USGS and NDWR Activities, such as hydrogeological studies and Spring and Well Monitoring
6. Encourage more recreational lakes/wildlife areas that the citizens of Elko County can enjoy and sustain our economy.
7. Encourage Elko County in hiring a Natural Resources Manager.

INTRODUCTION

Development of water resources within Elko County include both surface water and groundwater. Principal municipal supplies in the communities of Jarbidge, Jackpot, Midas, Montello and Mountain City are provided by both groundwater and surface water sources. Most all of rural Elko County has experienced slower growth rates versus the higher growth rates occurring in the City of Elko, West Wendover, Osino, Ryndon, Spring Creek and South Fork areas during the last decade. Although rapid development of the rural areas has not occurred in the past, emphasis has been placed on development, management and protection of water resources in rural Elko County.

While rural areas have remained virtually un-developed, areas such as Jackpot, Jarbidge, Midas, Montello, Mountain City and West Wendover have experienced light to heavy development. West Wendover being an incorporated City has by far experienced the fastest and heaviest population and development increases while the other areas have experienced light to moderate increases. The largest water usage in rural Elko County is from ranches and farms utilizing surface and groundwater sources for irrigation, stock watering and domestic use. Elko County is the largest water user in the State at approximately 24.4% of all usage. Agricultural use in Elko County accounts for approximately 97% of our total water usage. Rural water resource development dates back to original settlement of the area along the California Trail in the 1840's. Groundwater development didn't occur until the early 1900's.

With an arid climate, Elko County has always been dependent upon the successful development of water resources. During the early development of the State, settlement locations were restricted to areas with readily available water. Now population locations in Elko County have many more options than these early pioneers. Technologic advances have made it possible to deliver water to once remote areas, develop a variety of water sources, and meet the water needs of a growing population. Water is a primary ingredient for the continued prosperity of Elko County, but its availability is limited. The challenge is to wisely develop and use our most precious renewable natural resource. With a limited water supply, conservation and wastewater reclamation become more essential for responsible water management.

Education of the public about water, its use and conservation is necessary for wise water management in the future. It is the intent of this section to provide the public with a brief introduction to our water resources. This Section provides an aspect of our available water resources, followed by current and future water use estimates, forecasts and related information.

In 1998, The *Nevada Division of Water Planning* developed elements of a State Water Plan. The Draft State Water Plan included historic, geographic, hydrologic, water use, and socioeconomic trends and conditions for the State of Nevada, including Elko County. In response to recommendations and information presented in the Draft Water Plan, Elko County appointed a Water Planning Commission to review and make recommendations to the Elko County Commission on water related issues within the County's jurisdiction.

NEVADA WATER LAW

The water in Nevada on the surface and below the ground surface belongs to the people of the State. Entities within the State can apply for the right to use that water. Nevada Water Law is founded on the doctrine of prior appropriation - **"first in time, first in right."** Under the appropriation doctrine, the first user of water from a water course acquired a priority right to the use and to the extent of its use (Shamberger, H.A., Evolution of Nevada's Water Laws, as Related to the Development and Evaluation of the State's Water Resources from 1866 to about 1960, U.S. Geological Survey Water Resources Bulletin 46, 1991).

Nevada Water Law is set forth in Nevada Revised Statutes (NRS), Chapters 533 and 534. In addition, there are numerous court decisions which have helped define Nevada Water Law. The State Engineer is the water rights administrator and is responsible for the appropriation, adjudication, distribution and management of water in the State. To carry out these duties he is vested with broad discretionary powers.

As part of the duties of the office, the State Engineer reviews applications for new water rights appropriations. In approving or rejecting an application, the State Engineer considers the following questions as set forth in NRS 533.370: 1) is there unappropriated water in the proposed source?; 2) would the proposed use impair existing rights?; and 3) will the proposed use prove detrimental to the public interest? Public interest is not defined by statute and the State Engineer can consider different issues, depending upon the individual application.

All water rights are considered real property and thus are conveyed by deed. Water rights can be bought and sold, and the location and type of use changed. The attributes of appropriative water rights in Nevada are: 1) beneficial use is the measure and the 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 be lost by abandonment or forfeiture. Abandonment is determined by the intent of the water user to forsake the use of the water. A water right is lost by forfeiture if the right is not used for 5 years. Water lost through abandonment or forfeiture reverts back to the public and is subject to future appropriation.

The Nevada Division of Water Resources is responsible for administering and enforcing Nevada Water Law, which includes the adjudication and appropriation of groundwater and surface water in the state. The appointed administrative head of this division is the State Engineer, whose office was created by the Nevada Legislature in 1903. The purpose of the 1903 legislation was to account for all of the existing water use according to priority. The 1903 act was amended in 1905 to set out a method for appropriation of water not already being put to a beneficial use.

It was not until the passage of the Nevada General Water Law Act of 1913 that the Nevada Division of Water Resources was granted jurisdiction over all wells tapping artesian water or water in definable underground aquifers. The 1939 Nevada Underground Water Act granted the Nevada Division of Water Resources total jurisdiction over all groundwater in the state.

The 1913 and 1939 acts have been amended a number of times, and Nevada's Water Law is considered one of the most comprehensive water laws in the West. The above-mentioned acts provide that all water within the boundaries of the state, whether above or beneath the surface of the ground, belongs to the public, as referenced in NRS 533.025 and is subject to appropriation for beneficial use under the laws of the state (NRS 533.030 and NRS 534.020).

SOCIOECONOMIC CHARACTERISTICS

In terms of socioeconomic characteristics, a large percentage of Elko County's population tends to be concentrated in or vicinity of the incorporated City of Elko. The 2000 census estimated the county's total population at 45,291 persons. As of 2006, the state of Nevada Demographer estimated the county's population at 48,339. The county's population is divided by cities and communities as follows: City of Elko (18,183 persons, or 37.6 percent of the county's estimated 2006 total population); West Wendover (4,871 persons, or 10.0 percent of total county population); Carlin (2,281 persons, or 4.7 percent of county population); and Wells (1,449 persons, or 3.0 percent of Elko County's total population). Another important population and growth area is centered in the Spring Creek/ Lamoille / Southfork areas, located approximately fifteen miles east southeast of Elko. It is estimated that these areas have a population of 13,000 persons or 26.9 percent of the county's total estimated 2006 population.

Between 1990 and 1997, the county's population growth averaged 5.1 percent per year. By decade, Elko County's population has grown at annual average rates as follows: 1950's—0.3 percent per year; 1960's—1.5 percent per year; 1970's—2.2 percent per year) and 1980's—6.9 percent per year. During the entire 1950–1997 time period, Elko County's population has averaged a rate of growth of 3.0 percent per year as compared to a 5.2 percent annual rate of population growth for the entire state. The relatively slower rate of population growth in Elko County, particularly during the decades of the 1950's, 1960's, and 1970's, was due to the agrarian nature of the economy and the existence of little economic diversification. Beginning in the late 1980's, however, the mining boom along the Carlin Trend, particularly in adjoining Eureka County, began a period of rapid growth as the City of Elko served as a primary base of operations for many of the mining endeavors. Following the mining boom and resultant population increase, Elko also expanded rapidly in casino gaming, both in the City of Elko, Jackpot located on the Nevada-Idaho Border and in West Wendover, located on the Nevada-Utah border.

In 1997, Elko County's average age of its population was estimated at 31.7 years, significantly below the 35.6 years for Nevada's overall population's average age, making Elko County the second "youngest" of Nevada seventeen counties. Based on 2006 populations, Elko County's population density was approximately 2.8 persons per square mile, the eighth least dense of any county in Nevada. This figure compares to an average population density of 16.1 persons per square mile for the entire state.

Elko County's ratio of its 1997 covered employment (i.e., workers covered under state and federal unemployment insurance programs) to its 1997 total population (a proxy measure of the county's labor force participation rate) stood at 42.3 percent, the seventh highest of any county in Nevada. This compared to a statewide average labor force participation rate estimated at 49.9 percent. One explanation of the county's comparatively low ranking is due to the large portion of the county's population counted as being employed in the mining industry in bordering Eureka County, thereby causing the county's population to be overstated relative to local county jobs.

Based on Elko County's total covered employment of 20,182 workers (excluding agriculture) in1997, the 8,298 jobs in the county's service industry accounted for the greatest portion of total employment at 41.1 percent. Mining's 1,427 jobs in 1997 accounted for 7.1 percent of total employment. Elko County's service industry jobs also accounted for the greatest percentage of the county's payrolls at 33.0 percent while the county's mining jobs accounted for 14.5 percent of total payrolls, over twice as great as their share of employment. The highest

average annual salary in Elko County in 1997 was in the mining industry which, at $52,154 per worker per year, was 105.6 percent greater than the county average annual salary of $25,369 per worker. Based on U.S. Department of Commerce job classifications of full and part-time employment, Elko County's farming and agricultural services industry was estimated to have 942 workers in 1996, comprising 3.8 percent of all employment within the county as opposed to 1,002 workers, or 14.4 percent of all jobs in 1970.

In 1995, when Elko County's population was estimated to be 43,050 persons, it was estimated that total water withdrawals were approximately 936,593 acre-feet, or 23.2 percent 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 1995 was 2.1 percent greater than in 1990, but 11.5 percent below total water use in 1985. Of the total 1995 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 percent of the county's total water withdrawn for all purposes. Most of the water withdrawals in Elko County have been used for irrigation purposes (97.0 percent of total water withdrawals in 1995) while water withdrawals for domestic purposes, i.e., residential use from all sources, constituted only 1.2 percent of total water withdrawals in 1995. 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. Table 1 below presents a number of estimated water usage rates for Elko County for the years 1985, 1990, and 1995 based on water use per person, per worker, and per occupied household or housing unit.

Table 1 - Water Usage Rates by Type/Sector

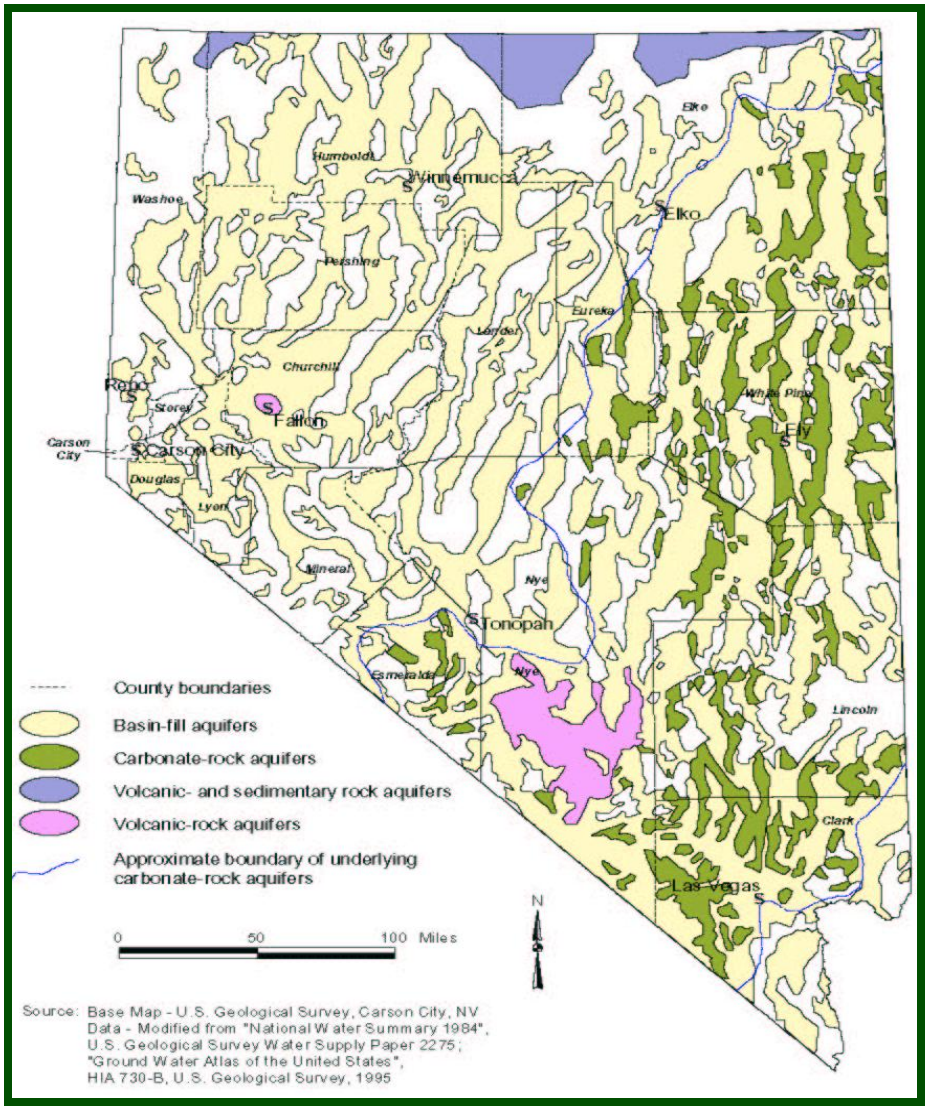
	1985	1990	1995
Municipal & Industrial Water Use per Person	456	348	332
Domestic Public Supplied Water Use per Person	307	267	242
Total Domestic (Residential) Water Use per Person	303	263	240
Total Commercial & Industrial Water Use per Worker	178	504	415
Total Domestic Water Use per Household	868	754	690

From a 1995 survey, it was 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 percent 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).

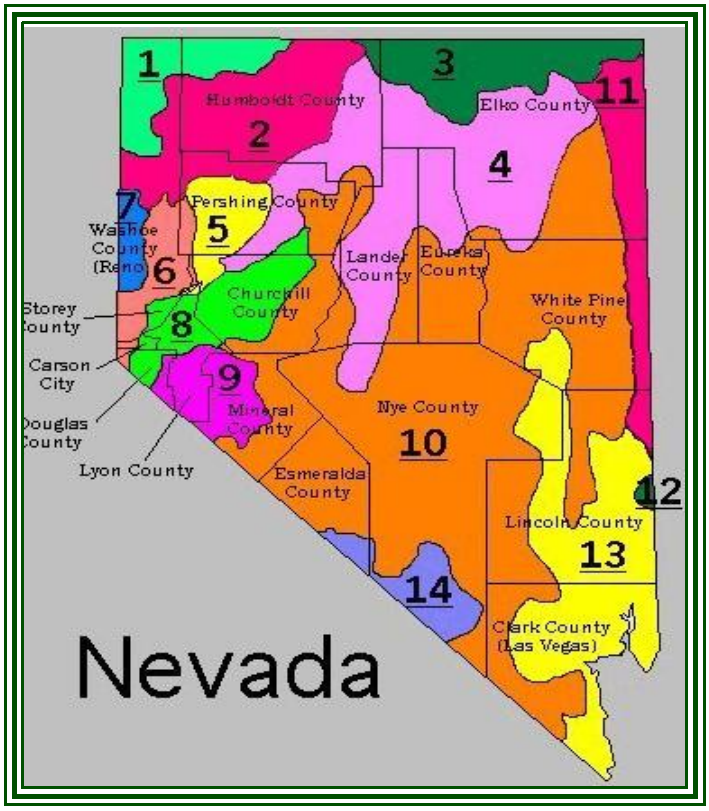
Based on 1995 estimates of both total irrigated acreage and total irrigation water withdrawals, the average water use (withdrawals) on irrigated acres in Elko County was estimated at approximately 4.2 acre-feet per acre per year. Elko County's 1995 irrigation conveyance losses were estimated at 0.9 acre-feet 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, Churchhill and into Pershing County, benefit from a continuous process of water diversion, 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 percent over $33.379 million in total farm marketings in 1985.

Figure 1 – Nevada Major Aquifers



REGIONAL HYDROGRAPHIC DATA



[1] Northwest Region
[2] Black Rock Desert Region
[3] Snake River Basin
[4] Humboldt River Basin
[5] West Central Region
[6] Truckee River Basin
[7] Western Region
[8] Carson River Basin
[9] Walker River Basin
[10] Central Region
[11] Great Salt Lake Basin
[12] Escalante Desert Basin
[13] Colorado River Basin
[14] Death Valley Basin

Figure 2 - Nevada Hydrographic Regions

REGIONAL HYDROGEOLOGIC FEATURES

The U.S. Geological Survey (Harrill and Prudic, 1998) has identified 20 flow systems and 282 hydrographic areas within the Great Basin Region of the southwestern United States. Of these, 14 flow systems and 252 hydrographic areas are wholly or partially within Nevada. Four flow systems are located in Elko County, three within the Great Basin (Humboldt River, Great Salt Lake Basin, and Central Region), with the fourth within the Snake River Plain (Figure 2). Within these four flow systems, there are 50 hydrographic areas in the county. The eight (8) hydrographic areas currently under evaluation by Elko County in partnership with the U.S.G.S. are within the Humboldt River Flow System, specifically identified by the USGS as the Upper Humboldt River Basin.

Although most flow systems are confined to one or two areas in the Basin and Range area, several areas are linked together in an extended ground-water flow system in places. In the majority of the areas, flow passes through the basin-fill sediments that cover the valley floors, as in the Humboldt system. However, where carbonate rocks underlie the basins, data indicate that some basins are hydrologically linked by the carbonate rocks and that large quantities of ground water flow through them and discharge through the overlying basin-fill sediments to large springs. Because few wells are drilled into the carbonate rocks, data is scarce and several assumptions have been made to account for flow in these rocks.

One assumption is that the carbonate rocks and the basin-fill deposits form a single hydrologic unit. At locations where wells have been drilled in both rock types, the water levels in each aquifer have been similar. Another piece of evidence that the two rock types act as one hydrologic unit comes from the Ash Meadows area in southern Nevada. Irrigation wells in that area that withdrew water from the basin-fill deposits drew down water levels in the carbonate-rock aquifers more than 1 foot from 1969 to 1972 (Harrill and Prudic, 1998).

The topography of the drainage area within each hydrographic area controls the movement of ground water at a regional scale. Because of the topographic effect of the mountains, the amount of precipitation increases as the altitude increases (Maxey and Eakin, 1958; and Avon and Durbin, 1992). Conversely, the amount of evapotranspiration decreases as altitude increases, as a consequence of lower temperatures at higher altitudes (Robinson, 1970). The distribution of recharge and discharge is additional evidence of interbasin flow.

Large local flow systems are characterized by predominantly interbasin flow and flow paths that are confined to a single basin. Springs connected to these systems have moderate to large discharges and moderate seasonal ranges in discharge. Very short flow paths generally characterize small local flow systems, usually no more than a few miles in length. Springs connected to these systems have highly variable annual ranges in discharge. (USGS, 2001).

REGIONAL HYDROGRAPHIC BASINS & AREAS

[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.

Figure 3- Regional Flow System **Snake River Basin**

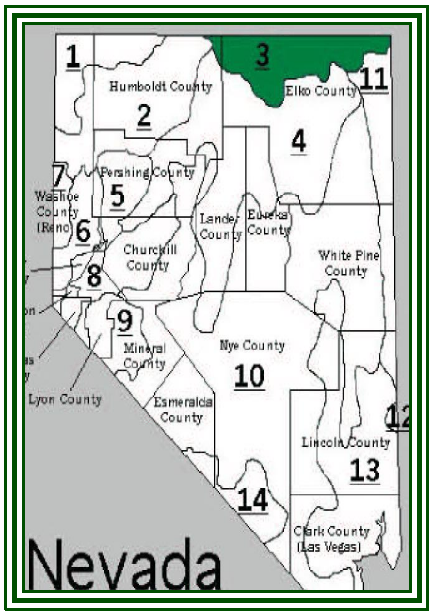


Table 2 - Snake River Basin Hydrographic Areas

Basin Num [1]	Area Num [2]	Size (sq mi) [3]	Size (acres) [4]	Hydrographic Area/Sub-Area Name	Counties Included [5]	Nearest Cities	Desig [6]
3	34	716	458,240	Little Owyhee River Area	Elko, Humboldt	McDermitt	No
3	35	1,310	838,400	South Fork Owyhee River Area	Elko	Jack Creek, Tuscarora	No
3	36	345	220,800	Independence Valley	Elko	Tuscarora	No
3	37	533	341,120	Owyhee River Area	Elko	Owyhee, Mountain City	No
3	38	514	328,960	Bruneau River Area	Elko	Mountain City, Jarbidge	No
3	39	278	177,920	Jarbidge River Area	Elko	Jarbidge	No
3	40	1,218	779,520	Salmon Creek Area	Elko	Jackpot, Contact	Yes
3	41	316	202,240	Goose Creek Area	Elko	Jackpot	No
	Total	**5,230**	**3,347,200**	**Square miles/acres**			

[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.

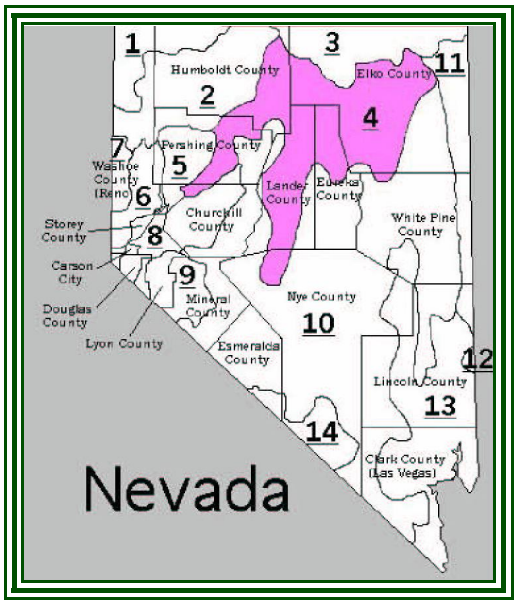


Figure 4 - Regional Flow System
Humboldt River Basin

Table 3 - Humboldt River Basin Hydrographic Areas

Basin Num [1]	Area Num [2]	Size (sq mi) [3]	Size (acres) [4]	Hydrographic Area/Sub-Area Name	Counties Included [5]	Nearest Cities	Desig [6]
4	42	1,073	686,720	Marys River Area	Elko	Wells, Deeth	Yes
4	43	332	212,480	Starr Valley	Elko	Halleck, Deeth	Yes
4	44	1,110	710,400	North Fork Area	Elko	North Fork, Halleck	Yes
4	45	257	164,480	Lamoille Valley	Elko	Lamoille, Elko	Yes
4	46	99	63,360	South Fork Area	Elko	Lamoille, Jiggs	Yes
4	47	787	503,680	Huntington Valley	Elko, White Pine	Jiggs	Yes
4	48	392	250,880	Dixie Creek Area-Tenmile Creek Area	Elko	Elko, Spring Valley	Yes
4	49	314	200,960	Elko Segment	Elko, Eureka	Elko	Yes
4	50	223	142,720	Susie Creek Area	Elko, Eureka	Carlin	Yes
4	51	396	253,440	Maggie Creek Area	Elko, Eureka	Carlin	Yes
4	52	61	39,040	Marys Creek Area	Eureka, Elko	Palisade, Carlin	Yes
4	53	1,002	641,280	Pine Valley	Eureka, Elko	Carlin	Yes
4	61	544	348,160	Boulder Flat	Eureka, Lander, Elko	Beowawe, Battle Mountain	Yes
4	62	444	284,160	Rock Creek Valley	Elko, Lander, Eureka	Battle Mountain	No
4	63	405	259,200	Willow Creek	Elko	Midas	No
4	64	720	460,800	Clovers Area	Humboldt, Lander, Elko	Battle Mountain	Yes
4	65	299	191,360	Pumpernickel Valley	Humboldt, Pershing	Golconda, Valmy	No
4	66	301	192,640	Kelley Creek Valley	Humboldt, Elko	Golconda	Yes
4	67	975	624,000	Little Humboldt Valley	Humboldt, Elko	Paradise Valley	No
4	68	167	106,880	Hardscrabble Area	Humboldt	Paradise Valley	No
4	69	600	384,000	Paradise Valley	Humboldt	Paradise Valley, Winnemucca	Yes
4	70	435	278,400	Winnemucca Segment	Humboldt	Winnemucca, Golconda	Yes
4	71	520	332,800	Grass Valley	Pershing, Humboldt	Winnemucca	Yes
4	72	771	493,440	Imlay Area	Pershing	Imlay, Humboldt, Mill City	Yes
4	73	635	406,400	Lovelock Valley	Pershing, Churchill	Rye Patch, Lovelock	Yes
4	73A	98	62,720	Lovelock Valley/Oreana Sub-Area	Pershing	Lovelock, Toulon	No
4	74	164	104,960	White Plains	Churchill, Pershing	Lovelock, Fernley	Yes

[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.

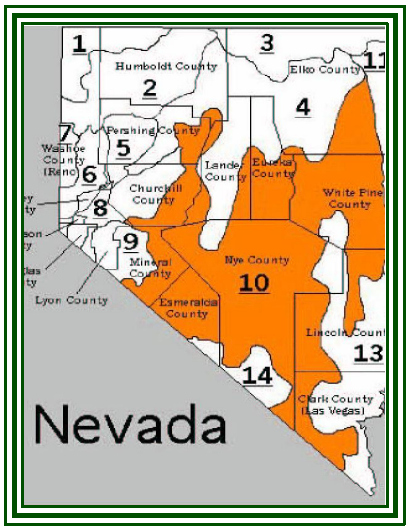


Figure 5 - Regional Flow System
Central Region

Table 4 - Central Region Hydrographic Areas

Basin Num [1]	Area Num [2]	Size (sq mi) [3]	Size (acres) [4]	Hydrographic Area/Sub-Area Name	Counties Included [5]	Nearest Cities	Desig [6]
10	175	651	416,640	Long Valley	White Pine, Elko	Ely, Eureka	No
10	176	1,004	642,560	Ruby Valley	Elko, White Pine	Elko, Ruby Valley	Yes
10	177	464	296,960	Clover Valley	Elko	Wells, Ruby Valley	Yes
10	178A	271	173,440	Butte Valley/Northern Part	Elko	Currie, Ruby Valley	No
10	178B	739	472,960	Butte Valley/Southern Part	White Pine, Elko	Cherry Creek, Ely	No
10	179	1,942	1,242,880	Steptoe Valley	White Pine, Elko	Ely, Cherry Creek	Yes

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.

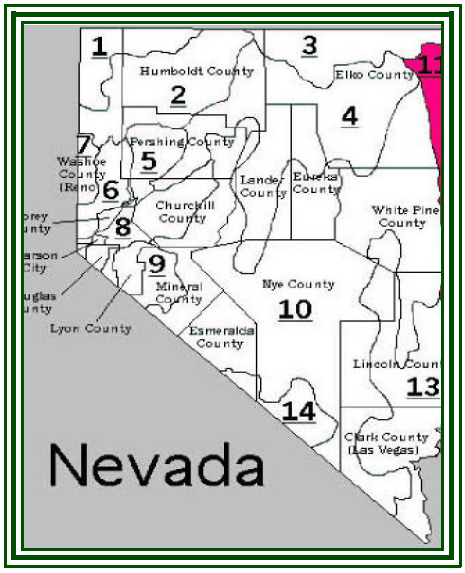


Figure 6 - Regional Flow System
Great Salt Lake Basin

Table 5 - Great Salt Lake Basin Region Hydrographic Areas

Basin Num [1]	Area Num [2]	Size (sq mi) [3]	Size (acres) [4]	Hydrographic Area/Sub-Area Name	Counties Included [5]	Nearest Cities	Desig [6]
11	189A	163	104,320	Thousand Springs Valley/ Herrill Siding-Brush Creek Area	Elko	Wells, Contact	Yes
11	189B	618	395,520	Thousand Springs Valley/ Toano-Rock Spring Area	Elko	Jackpot, Wells	Yes
11	189C	183	117,120	Thousand Springs Valley/ Rocky Butte Area	Elko	Montello, Jackpot	Yes
11	189D	482	308,480	Thousand Springs Valley/ Montello-Crittenden Creek Area	Elko	Montello	Yes
11	190	55	35,200	Grouse Creek Valley	Elko	Grouse Creek, Jackpot	No
11	191	326	208,640	Pilot Creek Valley	Elko	Wendover	Yes
11	192	507	324,480	Great Salt Lake Desert	Elko	Wendover	No
11	193	208	133,120	Deep Creek Valley	White Pine, Elko	Wendover	No

ELKO COUNTY HYDROGRAPHIC BASINS, AREAS & SUB-AREAS

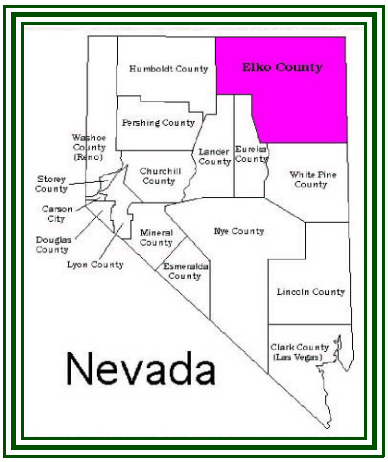


Figure 7 - Elko County

Table 6 - Hydrographic Areas

[3] SNAKE RIVER BASIN (Hydrographic Basin 3):							
3	34	716	458,240	Little Owyhee River Area	Elko, Humboldt	Mcdermitt	No
3	35	1,310	838,400	South Fork Owyhee River Area	Elko	Jack Creek, Tuscarora	No
3	36	345	220,800	Independence Valley	Elko	Tuscarora	No
3	37	533	341,120	Owyhee River Area	Elko	Owyhee, Mountain City	No
3	38	514	328,960	Bruneau River Area	Elko	Mountain City, Jarbidge	No
3	39	278	177,920	Jarbidge River Area	Elko	Jarbidge	No
3	40	1,218	779,520	Salmon Creek Area	Elko	Jackpot, Contact	Yes
3	41	316	202,240	Goose Creek Area	Elko	Jackpot	No
	Total	**5,230**	**3,347,200**	**Square miles/acres**			
[4] HUMBOLDT RIVER BASIN (Hydrographic Basin 4):							
4	42	1,073	686,720	Marys River Area	Elko	Wells, Deeth	Yes
4	43	332	212,480	Starr Valley	Elko	Halleck, Deeth	Yes
4	44	1,110	710,400	North Fork Area	Elko	North Fork, Halleck	Yes
4	45	257	164,480	Lamoille Valley	Elko	Lamoille, Elko	Yes
4	46	99	63,360	South Fork Area	Elko	Lamoille, Jiggs	Yes
4	47	787	503,680	Huntington Valley	Elko, White Pine	Jiggs	Yes
4	48	392	250,880	Dixie Creek Area-Tenmile Creek Area	Elko	Elko, Spring Valley	Yes
4	49	314	200,960	Elko Segment	Elko, Eureka	Elko	Yes
4	50	223	142,720	Susie Creek Area	Elko, Eureka	Carlin	Yes
4	51	396	253,440	Maggie Creek Area	Elko, Eureka	Carlin	Yes
4	52	61	39,040	Marys Creek Area	Eureka, Elko	Palisade, Carlin	Yes
4	53	1,002	641,280	Pine Valley	Eureka, Elko	Carlin	Yes
4	62	444	284,160	Rock Creek Valley	Elko, Lander, Eureka	Battle Mountain	No
4	63	405	259,200	Willow Creek	Elko	Midas	No
4	64	720	460,800	Clovers Area	Humboldt, Lander, Elko	Battle Mountain	Yes
4	66	301	192,640	Kelley Creek Valley	Humboldt, Elko	Golconda	Yes
4	67	975	624,000	Little Humboldt Valley	Humboldt, Elko	Paradise Valley	No
	Total	**16,843**	**10,779,520**	**Square miles/acres**			
[10] CENTRAL REGION (Hydrographic Basin 10):							
10	176	1,004	642,560	Ruby Valley	Elko, White Pine	Elko, Ruby Valley	Yes
10	177	464	296,960	Clover Valley	Elko	Wells, Ruby Valley	Yes
10	178A	271	173,440	Butte Valley/Northern Part	Elko	Currie, Ruby Valley	No
10	178B	739	472,960	Butte Valley/Southern Part	White Pine, Elko	Cherry Creek, Ely	No
10	179	1,942	1,242,880	Steptoe Valley	White Pine, Elko	Ely, Cherry Creek	Yes
10	186A	125	80,000	Antelope Valley/Southern Part	Elko, White Pine	Wendover, Ely	No
10	186B	270	172,800	Antelope Valley/Northern Part	Elko, White Pine	Wendover, Ely	No
10	187	954	610,560	Goshute Valley	Elko	Oasis, Shafter	Yes
10	188	562	359,680	Independence Valley (Pequop Valley)	Elko	Wells, Oasis	Yes
	Total	**46,783**	**29,941,120**	**Square miles/acres**			
[11] GREAT SALT LAKE BASIN (Hydrographic Basin 11):							
11	189A	163	104,320	Thousand Springs Valley/Herrill Siding-Brush Creek Area	Elko	Wells, Contact	Yes
11	189B	618	395,520	Thousand Springs Valley/Toano-Rock Spring Area	Elko	Jackpot, Wells	Yes
11	189C	183	117,120	Thousand Springs Valley/Rocky Butte Area	Elko	Montello, Jackpot	Yes
11	189D	482	308,480	Thousand Springs Valley/Montello-Crittenden Creek Area	Elko	Montello	Yes
11	190	55	35,200	Grouse Creek Valley	Elko	Grouse Creek, Jackpot	No
11	191	326	208,640	Pilot Creek Valley	Elko	Wendover	Yes
11	192	507	324,480	Great Salt Lake Desert	Elko	Wendover	No
11	193	208	133,120	Deep Creek Valley	White Pine, Elko	Wendover	No
	Total	**3,807**	**2,436,480**	**Square miles/acres**			

Hydrographic Regions, Areas, and Sub-Areas Table Notes:
A Basin is defined as a geographic area drained by a single major stream or an area consisting of a drainage system comprised of streams and often natural or man-made lakes. Also referred to as Drainage Basin, Watershed, or Hydrographic Region. The U.S. Geological Survey and the Nevada Division of Water Resources, Department of Conservation and Natural Resources, have divided the state into discrete hydrologic units for water planning and management purposes. These have been identified as 232 Hydrographic Areas (256 areas and sub-areas, combined) within 14 major Hydrographic Regions or Basins.

[1] Nevada Hydrographic Basin Number (1-14).

[2] Nevada Hydrographic Area/Sub-Area Number (1-232; hydrographic sub-areas designated A, B, C, etc.). There are a total of 256 hydrographic areas and sub-areas.

[3] and [4] Hydrographic areas and sub-areas in square miles and acres, respectively, and include acreage only contained within Nevada.
[5] Counties are listed in order of their share of the hydrographic area/sub-area.

[6] Desig = Designated Groundwater Basin (Area or Sub-Area). Designated groundwater basins are basins where permitted ground water rights approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration. Under such conditions, a state's water officials will so designate a groundwater basin and, in the interest of public welfare, declare preferred uses (e.g., municipal and industrial, domestic, agriculture, etc.). Also referred to as Administered Groundwater Basins. For 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 groundwater 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 groundwater basin. *source Data:* Office of the State Engineer, NDWR Department of Conservation and Natural Resources.

ELKO COUNTY HYDROGRAPHIC BASINS, AREAS & SUB-AREAS (CONTINUED)

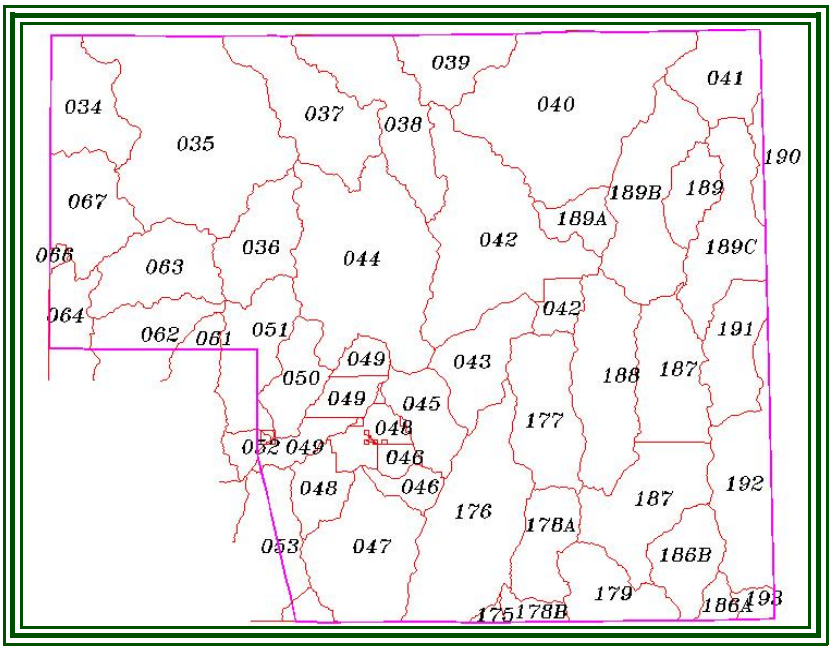


Figure 8 – Map of Elko County Hydrographic Areas

Central Region

153	-	Diamond Valley
175	-	Long Valley
176	-	Ruby Valley
177	-	Clover Valley
178A	-	Butte Valley North
178B	-	Butte Valley South
179	-	Steptoe Valley
186A	-	Antelope Valley South
186B	-	Antelope Valley North
187	-	Goshute Valley
188	-	Independence Valley

Great Salt Lake Basin

189	-	Rock Butte Area
189A	-	Herill Siding - Brush Creek Area
189B	-	Toano - Rock Spring Area
189C	-	Montello - Crittenden Creek Area
190	-	Grouse Creek Valley
191	-	Pilot Creek Valley
192	-	Great Salt Lake Desert
193	-	Deep Creek Valley

Snake River Basin

034	-	Little Owyhee River Area
035	-	South Fork Owyhee River Area
036	-	Independence Valley
037	-	Owyhee River Area
038	-	Bruneau River Area
039	-	Jarbidge River Area
040	-	Salmon Falls Creek Area

Humboldt River Basin

042	-	Mary's River Area
043	-	Starr Valley Area
044	-	North Fork Area
045	-	Lamoille Valley
046	-	South Fork Area
047	-	Huntington Valley
048	-	Dixie Creek - Tenmile Creek area
049	-	Elko Segment
050	-	Susie Creek Area
051	-	Maggie Creek Area
052	-	Mary's Creek Area
053	-	Pine Valley
061	-	Boulder Flat
062	-	Rock Creek Valley
063	-	Willow Creek Valley
064	-	Clover's Area
066	-	Kelly Creek Area
067	-	Little Humboldt Valley

Table 7 - Elko County Hydrographic Areas

REGIONAL & LOCAL DATA

COMMITTED & UN-COMMITTED GROUNDWATER RESOURCES

To acquire a water permit, an application must be made on an approved form and filed with the State Engineer (NRS 533.325). Pursuant to Nevada Water Law, the application must be supported by a map prepared in a prescribed form by a water rights surveyor. The supporting map must show the point of diversion and place of use of the water within the proper legal subdivisions. No application shall be for the water of more than one source to be used for more than one purpose (NRS 533.330).

When the application and map are properly completed, a notice must be sent to a newspaper of general circulation in the area where the application was filed. This notice is published for approximately 30 days (NRS 533.360). Interested parties may file a formal protest up until 30 days after the last day of publication explaining their objections to the application and requesting denial of the application or other appropriate action by the State Engineer (NRS 533.365).

After the expiration of the protest period, the application is ready for action by the State Engineer. When considering an application for approval or denial, the State Engineer must consider the following:

- Is there unappropriated water at the source?
- Will the use of the water under the proposed application conflict with existing rights?
- Will the use of the water under the proposed application prove detrimental to the public interest?
- Will the use of the water under the proposed application adversely impact domestic wells?

In addition to these items, other criteria within NRS 533.370 deal with impacts within irrigation districts, the good faith intent of the applicant to construct the works of diversion and put the water to beneficial use, and the financial ability and reasonable expectation to construct the works of diversion and put the water to beneficial use.

The State Engineer may require any additional information needed prior to approval or rejection of an application (NRS 533.375). The State Engineer also has the discretion to hold a hearing prior to any decision.

The State Engineer reviews any pertinent information and either approves or denies the application. When an application is denied, the State Engineer notifies the applicant of denial, retains the denied application for the record and will not pursue any further action under the application. The denial may be appealed in the appropriate court of jurisdiction within 30 days after the denial action (NRS 533.450). When a water permit is approved, the permit terms and limitations are specified as part of the permit. A fee is also required for any permit issued in accordance with NRS 533.435. Once a permit is issued, the applicant may initiate the work to divert and use the water established as the beneficial use.

Once granted, water rights in Nevada have the standing of both real and personal property - meaning they are conveyed as an appurtenance to real property unless they are specifically excluded in the deed of conveyance. When water rights are purchased or sold as personal property or treated as a separate appurtenance in a realestate transaction, the water rights are conveyed specifically by a deed of conveyance. It is possible to buy or sell water rights and change the water's point of diversion, manner of use and place of use by filing the appropriate application with the State Engineer.

Table 8 - Basin Resource Summary Perennial-Yield, Permitted Water and Pending Applications - **January 2006**

SNAKE RIVER DRAINAGE	Perennial-Yield AF/An USGS	Permitted GW AF/An	Pending Appl AF/An
Little Owyhee River - No. 34	1,400	28	0
South Fork Owyhee River - No. 35	8,000	3,317	11,424
Independence Valley - No. 36	12,000	12,905	4,917
Owyhee River - No. 37	7,000	5,439	320
Bruneau River - No. 38	10,000	16	0
Jarbidge River - No. 39	12,000	72	0
Salmon Falls Creek - No. 40	10,000	6,114	0
Goose Creek - No. 41	1,700	990	0

HUMBOLDT RIVER DRAINAGE	Perennial-Yield AF/An USGS	Permitted GW AF/An	Pending Appl AF/An
Marys River - No. 42	32,000	26,136	32
Starr Valley - No. 43	10,000	3,281	0
North Fork - No. 44	33,000	8,898	22
Lamoille Valley - No. 45	8,000	6,402	0
South Fork - No. 46	2,000	68	0
Huntington Valley - No. 47	15,000	9,133	53
Dixie Cr. / Tenmile Cr. - No. 48	8,000	16,027	302
Elko Segment - No. 49	11,000	25,874	1086
Suzie Creek - No. 50	2,200	765	31
Maggie Creek - No. 51	3,800	14,264	0
Marys Creek - No. 52	2,000	1,940	0
Pine Valley - No. 53	20,000	15,892	0
Rock Creek - No. 62	1,500	2,158	0

Willow Creek - No. 63	1,300	5,281	0
Clovers Area - No. 64	40,000		
Kelly Creek - No. 66	16,000		
Little Humboldt River - No. 67	19,000	10,215	0

CENTRAL REGION	Perennial-Yield AF/An USGS	Permitted GW AF/An	Pending Appl AF/An
Long Valley - No. 175	6,000	4,729	0
Ruby Valley - No. 176	53,000	32,559	8,985
Clover Valley - No. 177	20,000	17,568	0
Butte Valley - North - No. 178A	6,000	63	0
Butte Valley - South - No. 178B	14,000	298	26,064
Steptoe Valley - No. 179	70,000	95,111	13,926
Antelope Valley - South - No. 186A	800	638	0
Antelope Valley - North - No. 186B	1,700	629	7
Goshute Valley - No. 187	11,000	11,722	25
Pequop V.- No. 188	9,000	792	12

GREAT SALT LAKE BASIN	Perennial-Yield AF/An USGS	Permitted GW AF/An	Pending Appl AF/An
Thousand Springs V. - No. 189A	1,800	3,453	0
Thousand Springs V. - No. 189B	2,600	7,493	0
Thousand Springs V. - No. 189C	1,400	452	0
Thousand Springs V. - No. 189D	14,000	20,293	1,600
Grouse Creek - No. 190	350	33	0
Pilot Creek Valley - No. 191	4,500	1,701	0
Great Salt Lake - No. 192	5,000	2,901	0
Deep Creek - No. 193	2,000	0	0

Figure 9 - Nevada Committed Groundwater Resources

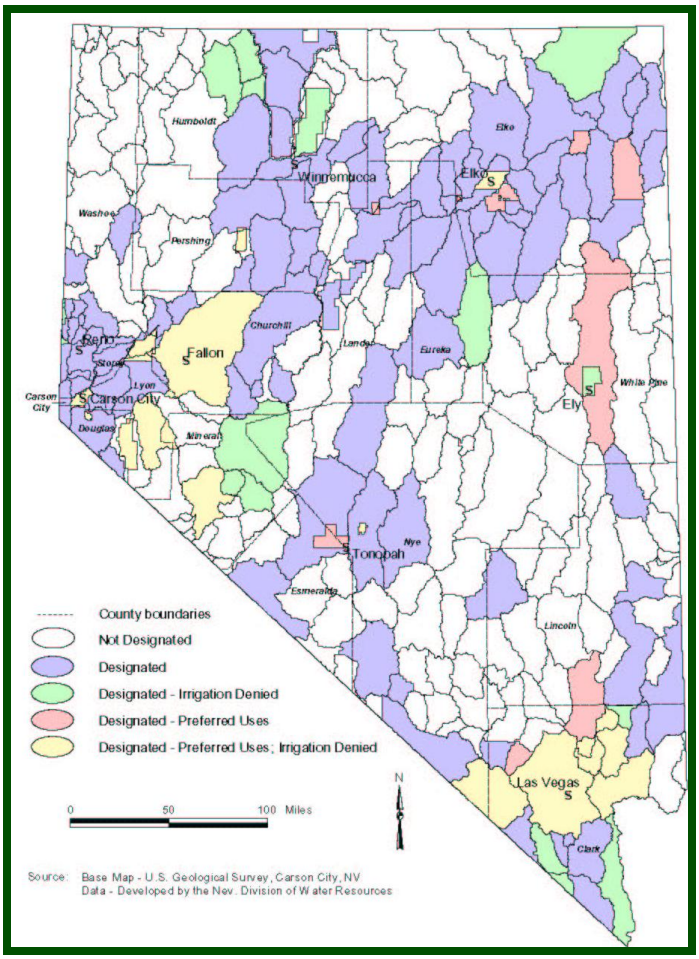
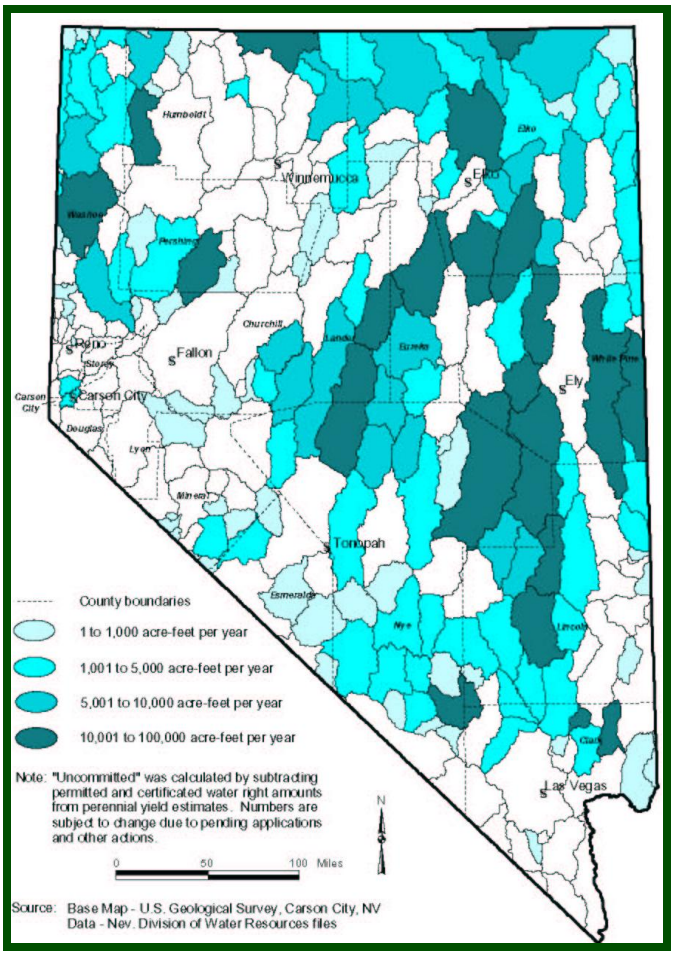


Figure 10 - Nevada Un-Committed Groundwater



As shown in **Figure 10,** the State of Nevada has identified sub-areas of available or un-committed water resources within the watershed or flow systems. The un-committed areas shown in Elko County are primarily located within rural un-developed areas of the county. Primarily the uses within the un-committed areas are agricultural irrigation or stock water. The un-committed water in the sub-areas represent potential future use whether for extended agricultural uses or for the transfer to adjacent areas of development.

Table 8 Depicts an inventory conducted by the Elko County Planning Division representing all sub-basins within Elko County. The inventory concerns Basin Resource Summary Perennial-Yield as per the U.S.G.S. and the State Engineer, Permitted Water and Pending Applications through 2005 as per the State of Nevada Division of Water Resources. As the table represents, many of the highly developed areas in Elko County are over allocated. The table also identifies areas adjacent to the developed areas as potential resources for future sustainability and growth.

Table 9 Represents all developed Domestic Wells in Elko County. Each domestic well represents 2.02 acre feet annually. Currently Elko County has 2,363 domestic wells equaling 4,773 acre feet of water annually.

ELKO COUNTY INVENTORY DATA

Table 9 - Domestic Well Inventories **- January 2004**

Hydrographic Basin	Sub Basin Number & Name	Domestic Wells
Snake River	034 - Little Owyhee River Area	0
	035 - South Fork Owyhee River Area	1
	036 - Independence Valley	5
	037 - Owyhee River Area	30
	038 - Bruneau River Area	0
	039 - Jarbidge River Area	3
	040 - Salmon Falls Creek Area	12
	041 - Goose Creek Area	0
	Total Basin	**51**
Humboldt River	042 - Mary's River Area	100
	043 - Starr Valley Area	19
	044 - North Fork Area	285
	045 - Lamoille Valley	185
	046 - South Fork Area	13
	047 - Huntington Valley	29
	048- Dixie Creek / Tenmile	307
	049 - Elko Segment	767
	050 - Susie Creek Area	9
	051 - Maggie Creek Area	12
	052 - Mary's Creek Area	8
	053 - Pine Valley	10
	061 - Boulder Flat	9
	062 - Rock Creek Valley	1
	063 - Willow Creek Valley	3
	064 - Clovers Area	49

	066 - Kelly Creek Area	4
	067 - Little Humboldt Valley	0
	Total Basin	**1,810**
Central Region	175 - Long Valley	1
	176 - Ruby Valley	71
	177 - Clover Valley	16
	178A - Butte Valley North	1
	178B - Butte Valley South	0
	186A - Antelope Valley South	333
	186B - Antelope Valley North	0
	187 - Goshute Valley	1
	188 - Independence Valley	2
	Total Basin	**425**
Great Salt Lake	189 - Rocky Butte Area	0
	189A - Herrill Siding - Brush Creek Area	2
	189B - Toano - Rock Spring Area	2
	189C - Montello - Crittenden Creek Area	0
	190 - Grouse Creek Valley	0
	191 - Pilot Creek Valley	73
	192 - Great Salt Lake Desert	0
	193 - Deep Creek Valley	0
	Total Basin	**77**
	Totals All Basins	**2,363**

Domestic Wells in Nevada are not required to be a permitted water right. The permitted consumption of a Domestic Well is 2.02 acre feet annually or 1,800 gallons per day as per N.R.S. 534.180.

Estimated yield from each Domestic Well is 275 gallons per day (gpd) during non - irrigation months, November - March, and 650 gallons per day (gpd) during irrigation months, April - October.

The estimated daily average yield from each Domestic Well is 493.75 gallons per day (gpd) or 180,219 gallons per year. Total estimated use for 2,363 domestic wells is 1,166,730 gallons per day (gpd) or 425,856,709 gallons per year. The total estimated use is1,307 acre feet, the permitted use at 2.02 (1,800 gpd) acre feet annually per well is 4,773 acre feet.

Table 10 - Elko County Population Estimates 1996 - 2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Elko County	46,543	46,818	45,727	45,633	46,668	46,577	45,805	46,499	47,586	48,339
Carlin	2,614	2,311	2,159	2,395	2,215	2,074	2,045	2,240	2,261	2,281
Elko	19,189	17,518	16,721	17,191	17,093	16,690	16,354	17,140	17,850	18,183
Wells	1,502	1,427	1,364	1,348	1,191	1,389	1,373	1,406	1,423	1,449
Wendover	4,192	4,421	4,518	4,814	4,614	4,839	4,732	4,830	4,848	4,871
Jackpot	1,005	951	1,120	1,204	1,287	1,288	1,271	1,281	1,273	1,293
Montello	195	200	191	199	181	181	181	179	181	175
Mt. City	146	143	136	138	132	127	125	123	121	125
Rural (1)	17,700	19,847	19,518	18,344	19,955	19,989	19,724 (2)	19,300 (3)	19,629 (3)	19,662 (3)

(1) County estimations approximately 13,000 people occupy the Spring Creek, Lamoille and South Fork Areas.
(2) 2003 Rural 19,724 - 13,000 = 6,962 estimated population Elko County Rural
(3) Calculated by Elko County Division of Planning, Zoning, Building & Safety

Table 11A - Forecasted Elko County Population 2005 - 2025
Data provided www.nsbdc.org/demographer/pubs/

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Elko County	47,586 Est.	48,339 Est.	*46,850 -0.6%*	*46,583 -0.6%*	*46,346 -0.5%*	*46,139 -0.4%*	*45,981 -0.3%*	*45,854 -0.3%*	*45,730 -0.3%*	*45,075 -1.4%*	*44,560 -1.1%*
Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Elko County	*43,657 -2.0%*	*42,984 -1.5%*	*42,470 -1.2%*	*42,105 -0.9%*	*41,877 -0.5%*	*41,733 -0.3%*	*41,698 -0.1%*	*41,739 +0.1%*	*41,844 +0.3%*	*41,998 +0.4%*	*41,656 -0.8%*

Population Forecast from State of Nevada Demographer **July 21, 2006** - www.nsbdc.org/demographer/pubs/
2006 State Demographer estimates represent a 1.6% increase from 2005.

Table 11B - Forecasted Elko County Population 2006 - 2026
Data provided Elko County

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Elko County	47,586	48,339 +1.6%	*48,301 +0.5%*	*48,543 +0.5%*	*48,786 +0.5%*	*48,981 +0.4%*	*49,128 +0.3%*	*49,275 +0.3%*	*49,423 +0.3%*	*49,571 +0.3%*	*49,695 +0.25*
Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Elko County	*49,819 +0.25*	*49,969 +0.3%*	*50,069 +0.2%*	*50,169 +0.2%*	*50,219 +0.1%*	*50,319 +0.2%*	*50,369 +0.1%*	*50,419 +0.1%*	*50,570 +0.3%*	*50,773 +0.4%*	*50,874 +0.2%*

Population Forecast from Elko County Division of Planning & Zoning
2006 State Demographer estimates represent a 1.6% increase from 2005.

Top of Merritt Mountain Viewing Westward

Table 12 - 2000 Census Housing Data

Subject	Number	Percent
Total housing units	**18,456**	**100.0**
UNITS IN STRUCTURE		
1-unit, detached	9,330	50.6
1-unit, attached	287	1.6
2 units	510	2.8
3 or 4 units	1,230	6.7
5 to 9 units	745	4.0
10 to 19 units	185	1.0
20 or more units	306	1.7
Mobile home	5,636	30.5
Boat, RV, van, etc.	227	1.2
YEAR STRUCTURE BUILT		
1999 to March 2000	531	2.9
1995 to 1998	3,352	18.2
1990 to 1994	2,509	13.6
1980 to 1989	5,002	27.1
1970 to 1979	2,883	15.6
1960 to 1969	1,307	7.1
1940 to 1959	1,739	9.4
1939 or earlier	1,133	6.1
ROOMS		
1 room	367	2.0
2 rooms	1,089	5.9
3 rooms	1,835	9.9
4 rooms	3,338	18.1
5 rooms	4,220	22.9
6 rooms	2,990	16.2
7 rooms	2,029	11.0
8 rooms	1,266	6.9
9 or more rooms	1,322	7.2
Median (rooms)	5.1	(X)
Occupied housing units	**15,638**	**100.0**
YEAR HOUSEHOLDER MOVED INTO UNIT		
1999 to March 2000	3,884	24.8
1995 to 1998	5,400	34.5
1990 to 1994	2,767	17.7
1980 to 1989	2,215	14.2
1970 to 1979	812	5.2
1969 or earlier	560	3.6
VEHICLES AVAILABLE		
None	767	4.9
1	4,780	30.6
2	6,403	40.9
3 or more	3,688	23.6
HOUSE HEATING FUEL		
Utility gas	6,151	39.3
Bottled, tank, or LP gas	4,268	27.2
Electricity	3,393	21.7
Fuel oil, kerosene, etc.	486	3.1
Coal or coke	-	-
Wood	1,116	7.1
Solar energy	-	-
Other fuel	223	1.4
No fuel used	11	0.1
SELECTED CHARACTERISTICS		
Lacking complete plumbing facilities	162	1.0
Lacking complete kitchen facilities	110	0.7
No telephone service	606	3.9

Subject	Number	Percent
OCCUPANTS PER ROOM		
Occupied housing units	**15,638**	**100.0**
1.00 or less	14,459	92.5
1.01 to 1.50	707	4.5
1.51 or more	472	3.0
Specified owner-occupied units	**6,387**	**100.0**
VALUE		
Less than $50,000	329	5.2
$50,000 to $99,999	1,344	21.0
$100,000 to $149,999	3,239	50.7
$150,000 to $199,999	920	14.4
$200,000 to $299,999	406	6.4
$300,000 to $499,999	107	1.7
$500,000 to $999,999	22	0.3
$1,000,000 or more	20	0.3
Median (dollars)	123,100	(X)
MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS		
With a mortgage	4,958	77.6
Less than $300	63	1.0
$300 to $499	158	2.5
$500 to $699	348	5.4
$700 to $999	1,367	21.4
$1,000 to $1,499	2,263	35.4
$1,500 to $1,999	618	9.7
$2,000 or more	141	2.2
Median (dollars)	1,086	(X)
Not mortgaged	1,429	22.4
Median (dollars)	257	(X)
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15.0 percent	2,154	33.7
15.0 to 19.9 percent	1,447	22.7
20.0 to 24.9 percent	961	15.0
25.0 to 29.9 percent	592	9.3
30.0 to 34.9 percent	306	4.8
35.0 percent or more	892	14.0
Not computed	35	0.5
Specified renter-occupied units	**4,589**	**100.0**
GROSS RENT		
Less than $200	198	4.3
$200 to $299	279	6.1
$300 to $499	1,074	23.4
$500 to $749	1,921	41.9
$750 to $999	581	12.7
$1,000 to $1,499	198	4.3
$1,500 or more	24	0.5
No cash rent	314	6.8
Median (dollars)	583	(X)
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1999		
Less than 15.0 percent	1,144	24.9
15.0 to 19.9 percent	826	18.0
20.0 to 24.9 percent	632	13.8
25.0 to 29.9 percent	497	10.8
30.0 to 34.9 percent	318	6.9
35.0 percent or more	828	18.0
Not computed	344	7.5

Table 13 - Un-Incorporated Town Rural Communities Municipal

Elko County Un-Incorporated Towns / Rural Communities Municipal / Quasi-Municipal / Domestic Well Water & Sanitary Sewer Sources - 2005							
Town / Community / Area	**Municipal Water System**	**Individual Domestic Wells**	**Sanitary Sewer System**	**Individual Septic System**	**High Projected Growth**	**Moderate Projected Growth**	**Low Projected Growth**
Jackpot (1)	✘		✘			✘	
Jarbidge (2)	✘			✘			✘
Midas (4)	✘			✘			✘
Montello (1)	✘		✘				✘
Mountain City	✘		✘				✘
Tuscarora (4)	✘			✘			✘
Clover Valley (5)		✘		✘		✘	
North Adobe (5)		✘		✘			✘
Pilot Valley (5)		✘		✘			✘
I-80 Corridor (5) Elburz - Wendover		✘		✘		✘	
Ryndon (5)		✘		✘		✘	
Wendover (3)	✘		✘		✘		

(1) Un-Incorporated Town Limits
(2) Un-Incorporated Water / Sewer Service
(3) Incorporated City Limits
(4) Private Water User Association or General Improvement District
(5) Rural Area no systems

Note: Projected Growth rates are based on growth patterns from the years 2000 - 2006

Table 14 - Elko County Un-Incorporated Towns / Rural Communities Municipal / Quasi-Municipal / Domestic Well Water Resources

Elko County Un-Incorporated Towns / Rural Communities Municipal Water Resources - 2005						
Town / Community / Area	Current Certificated Municipal Ground Water (afa)	Current Certificated Municipal Surface Water (afa)	Current Annual Duty(afa)	Potential Residential Build-out (residential lots)	Potential Addition to Municipal Annual Duty (afa)	Current Potential Total Municipal Annual Duty (afa)
Jackpot (1)	10,458	0	5,340.5	50	33.6	5,374.1
Jarbidge (1)	0	4,048.5	4,099.6	50	33.6	4,133.2
Lamoille (3)	1,810.6	0	233.6	25	16.8	250.4
Midas (1)	166.6	14.5	55.9	25	16.8	72.7
Montello (1)	0	5,967.7	5,882.4	50	33.6	5,916
Mountain City (1)	0	2,983.9	2,982.4	50	33.6	3,016
Tuscarora (3)	181.1	724.2	742.2	25	16.8	759
Wendover (2)	23,023	1,882	10,949	300	446.4	11,395.4

(1) Un-Incorporated Town System Limits
(2) Incorporated City System Limits
(3) Private Water User Association or General Improvement District (GID)

Notes:
(afa) - Acre Feet Annually
Information provided by State of Nevada Division of Water Resources

Table 15 - Elko County Rural Communities and Areas Domestic Water Resources

Elko County Un-Incorporated Towns / Rural Communities Domestic Well Water Resources - 2005					
Rural Area (Hydrographic) Sub-Area)	**Domestic Self Service Wells**	**Current Annual Allocation**	**Potential Residential Lots Build-out**	**Potential Increase Allocation**	**Potential Total Allocation at Build Out**
Jackpot (040)	3	6.1	50	101	107.1
Jarbidge (039)	3	6.1	25	50.5	56.6
Midas (061-064) (066, 067)	66	133.3	25	50.5	183.8
Montello (189C)	0	0	50	101	101
Mountain City (037)	30	60.6	50	101	161.6
Tuscarora (036)	5	10.1	25	50.5	60.6
Clover Valley (177)	16	32.3	100	202	234.3
North Adobe (050)	9	18.2	100	202	220.2
Pilot Creek Valley (191)	73	147.5	1,800	3,636	3,783.5
I-80 Corridor Elburz - Wendover (042,043,182, 187, 188)	122	246.4	900	1,818	2,064.4
Ryndon (044)	285	575.7	2,300	4,646	5,221.7
Remainder County	479	967.6	2,000	4,040	5,007.6
TOTALS	**1,091**	**2,203.9**	**7,425**	**14,998.5**	**17,202.4**

Note: All Information Shown in **Table 15** pertains to areas outside water system limits within the specified Hydrographic Area or Sub-Area

Municipal, Domestic, Commercial, Industrial & Agricultural Water Use Forecast

Rapid population growth in Elko County has been due in large part to trends in the mining industry, especially since the late 1980's. Between 1950 and 1970, Elko County's population grew by only 2,243 persons. However, over the next 27 years the population grew by nearly 30,000 persons. Much of this growth was due to mining, in Elko County and neighboring Eureka County. While gaming and tourism have had significant impacts on growth in Clark and Washoe counties, mining has had major influences on many of the rural counties' population and employment growth, demographic trends, and economic development. Since 1989, gold mining in Nevada has made a major contribution to a number of rural counties' economic growth, or specifically Elko, Eureka, Humboldt, Lander, Nye, and Pershing counties.

Table 11A and **Table 16A** represent forecasts prepared by the State of Nevada Demographer. In both tables a decline in population is represented. **Table 16A** also reflects a loss of agriculture use. However, trends and data recorded by Elko County from 1998 - 2005 reflects a steady increase in population and limited minimal loss of agricultural lands (Tables **11B** and **16B)**. These discrepancies make long term land use and water resource management difficult. The representation of a constant loss of population and decrease in water consumption also promotes the approximation that Elko County may currently have, and will have a future surplus of water resources. The State of Nevada Water Plan utilizes data provided by the State Demographer in 1997. This data represented increased population forecast in Elko County through 2020. Since that time the State Demographer has revised the data base and is now reflecting decreases in Elko County population. Therefore, total consumption data reflected herein does not concur with the total consumptive use tables of the State Water Plan.

The forecast methodology developed for the Elko County Water Resource Management Plan uses a forecast of key socioeconomic variables multiplied by a water use factor or coefficient to produce a water withdrawal forecast. This process is depicted in its simplest form in Flow Chart below, Basic Forecasting Methodology. Specifically, forecasts of population, employment (which itself is derived from the population forecast), and irrigated acreage provide the means to develop a number of water withdrawal forecasts by water use category, including withdrawals for domestic (both public and self-supplied), municipal and industrial (M&I), public use and losses, commercial and industrial, irrigation and livestock water withdrawals.

Table 16 - Water Withdrawal Forecast Equation

Table 17A - Estimated & Forecasted M&I, Domestic, Commercial, Industrial & Agricultural Water Use as per **State of Nevada Demographer 2006**

Elko County	Estimated 2005	Forecast 2010	Forecast 2015	Forecast 2020	Forecast 2025
Resident Population (persons) (3)	**47,586**	**46,139**	**44,560**	**41,877**	**41,998**
Percent Population on Public Supply (2)	93.30%	93.28%	93.27%	93.27%	93.27%
Population on Public Supply (2) (4)	44,398	43,038	41,606	39,059	39,172
Population being Self Supplied (3) (4)	3,188	3,100	2,954	2,818	2,826
Total Municipal & Industrial Use (1) (2) (4)	**16,493**	**15,991**	**15,444**	**14,514**	**14,556**
Public Use and Losses (2) (4)	**1,498**	**1,452**	**1,402**	**1,318**	**1,321**
As a Percent of Total M&I Water Use (2)	9.08%	9.08%	9.08%	9.08%	9.08%
Total Domestic Water Use (1) (2) (4)	**16,729**	**16,238**	**15,681**	**14,740**	**14,780**
Public Water Supply Use (1) (2) (4)	11,956	11,590	11,192	10,520	10,550
Domestic Wells (1)(4) 2.02 af each	4,773	4,648	4,489	4,220	4,230
Total Agricultural Withdrawals (1) (2)	**898,321**	**882,655**	**863,951**	**845,248**	**830,610** (4)
Irrigation Water Withdrawals (1) (2)	896,621	880,992	862,325	843,658	829,056 (4)
Livestock Water Use (1) (2)	1,700	1,663	1,626	1,590	1,554 (4)
Total Water Withdrawals (1) (2) (4)	**933,041**	**916,336**	**896,478**	**875,820**	**861,267** (4)

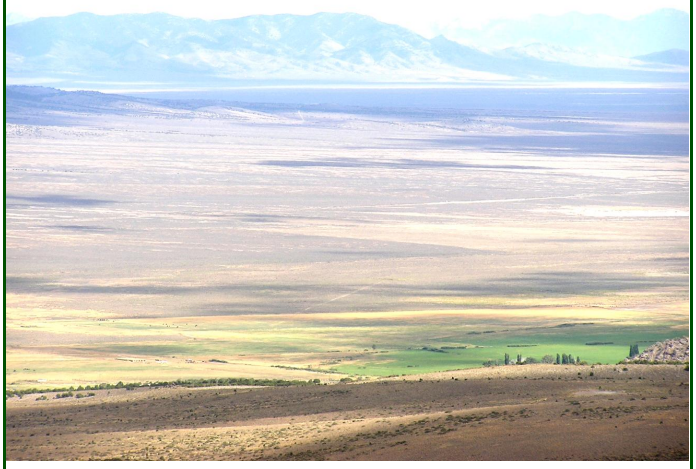
(1) Acre Feet Annually
(2) Information From State of Nevada Division of Water Planning
(3) Population Estimates & Forecast from State of Nevada Demographer
(4) Estimated, Forecasted and Calculated by Elko County Division of Planning & Zoning

Merritt Mountain Viewing Northeasterly

Table 17B - Estimated & Forecasted M&I, Domestic, Commercial, Industrial & Agricultural Water Use as per **Elko County Planning & Zoning Division 2006**

Elko County	Estimated 2005	Forecast 2010	Forecast 2015	Forecast 2020	Forecast 2025
Resident Population (persons) (3)	**47,586**	**48,981**	**49,695**	**50,219**	**50,773**
Percent Population on Public Supply (2)	93.30%	93.28%	93.27%	93.27%	93.27%
Population on Public Supply (2) (4)	44,398	45,689	46,351	46,839	47,356
Population being Self Supplied (3) (4)	3,188	3,292	3,344	3,380	3,417
Total Municipal & Industrial Use (1) (2) (4)	**16,493**	**16,976**	**17,224**	**17,405**	**17,597**
Public Use and Losses (2) (4)	**1,498**	**1,541**	**1,564**	**1,580**	**1,598**
As a Percent of Total M&I Water Use (2)	9.08%	9.08%	9.08%	9.08%	9.08%
Total Domestic Water Use (1) (2) (4)	**16,729**	**17,214**	**17,465**	**17,649**	**17,844**
Public Water Supply Use (1) (2) (4)	11,956	12,303	12,482	12,614	12,753
Domestic Wells (1)(4) 2.02 af each	4,773	4,911	4,983	5,035	5,091
Total Agricultural Withdrawals (1)(4)	**898,321**	**893,829**	**889,360**	**884,913**	**880,489** (4)
Irrigation Water Withdrawals (1) (4)	896,621	892,138	887,677	883,239	878,823 (4)
Livestock Water Use (1) (4)	1,700	1,691	1,683	1,674	1,666 (4)
Total Water Withdrawals (1) (2) (4)	**933,041**	**929,560**	**925,613**	**921,547**	**917,528** (4)

(1) Acre Feet Annually
(2) Information From State of Nevada Division of Water Planning
(3) Population Estimates & Forecast from Elko County Division of Planning & Zoning
(4) Estimated, Forecasted and Calculated by Elko County Division of Planning & Zoning



Clover Valley

DEVELOPMENT CONSIDERATIONS

WATER RESOURCE & CONSERVATION EDUCATION

As the driest state in the nation and one of the fastest growing, it is important that Elko County residents understand the fundamental science of water, how water is managed in the state, and the issues affecting water management. An educated populace is clearly a key to future management of water resources, and therefore, water education must become a priority.

Benefits of Water Education: The overall goal of water education is to develop more knowledgeable citizens who can participate in public discussion and debate about water issues. Information improves people's ability to examine and evaluate information presented and the information that is not presented. With a basic understanding of water, residents can respond intelligently to issues such as the need to develop water supplies or wastewater treatment facilities, the benefits and costs of conservation, the dangers associated with leaking contaminants, the risks posed by poor water quality and the benefits and costs of river restoration or flood control.

It is especially important that Elko County's young adults and children learn about water so that they develop an appreciation for the unique role water plays in the development of our state and become informed citizens who can think critically and evaluate information intelligently throughout their lives. Water as a topic has natural links to science, math, social studies, and language and is an excellent unifying curricular theme. Water attracts children and learning about it can be interesting and fun, encouraging both a greater appreciation of the environment and a greater interest in selecting science and math oriented careers.

Jarbidge Mountains Viewing West

STATUTORY PLANNING PROVISIONS

Planning and Development of Water Resources

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 States 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 non-wasteful 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.

NRS 540.051 Duties of Section. The Section shall:

1. Include in its planning:
(a) Recognition and protection of existing water rights consistent with chapters 533 and 534 of NRS; and
(b) Consideration of the factors relating to the quality of water in this State and the importance of considering the issues of quantity and quality simultaneously, but the State Environmental Commission and Division of Environmental Protection of the Department retain full responsibility for the management of water quality.

2. Suggest to the Legislature changes in water policy which may be necessary to meet new requirements of law or of the people of the State.

3. Assist the State Engineer in dealings with the Federal Government and other states, but the State Engineer is solely responsible for the allocation of water resources and litigation.

4. Review local and federal documents regarding water planning that are relevant to the use of water in Nevada, including, without limitation, local water and resource plans. Reviews conducted pursuant to this subsection must consider, without limitation:
(a) The accuracy of information relating to water use and water planning;
(b) Compliance with the water law of this State; and
(c) General advice relating to water planning.

5. Compile and update summarized data relating to hydrographic basins to support decisions that the State Engineer makes regarding such basins, and provide summarized information regarding such basins to the public. The Section shall cause to be generated and updated a summary for each hydrographic basin to show critical information regarding that basin, including, without limitation:
(a) Whether the basin is designated;
(b) All appurtenant or associated studies related to the availability of water;
(c) Rulings and orders affecting new appropriations of water;
(d) The availability of crop and pumpage inventories;
(e) The availability of data regarding water levels; and
(f) Current commitments of water from the basin that are attributable to existing water rights.
The information described in this subsection must, insofar as practicable, be provided in an electronic format and made available on the website of the State Engineer on the Internet or its successor.

6. Upon request, provide technical assistance to the Board for Financing Water Projects created by NRS 349.957, including, without limitation, the review of letters of intent and applications for grants.

7. Promote water conservation by:
(a) Consulting with suppliers of water concerning:
(1) Community water conservation plans; and
(2) The content and scope of water plans; and
(b) Reviewing plans for compliance with the applicable provisions of NRS 540.121 to 540.151, inclusive.

8. Assist federal, state and local governments and the general public in obtaining information regarding water planning, the availability of water and issues relating to water rights.

9. Support activities in response to drought as provided for under the drought plan established for the State.

10. Administer the statewide program established for the management of floodplains.

11. Upon request, provide updates to local governments on water issues relevant to this State, changes in policy and the availability of new information concerning water resources.
(Added to NRS by 1977, 1170; A 1987, 2280; 1991, 173; 1993, 1703; 1995, 2499; 2005, 2566)

NRS 534.0105 "Aquifer" defined. "Aquifer" means a geological formation or structure that stores or transmits water, or both.
(Added to NRS by 1987, 1770)

NRS 534.0115 "Area of hydrologic effect" defined. "Area of hydrologic effect" means the surface area of land covering the extent of hydrologic response of water recharged pursuant to a project to recharge.
(Added to NRS by 1987, 1770)

NRS 534.020 Underground waters belong to public and are subject to appropriation for beneficial use; declaration of legislative intent.

Transfer of Water From County of Origin to Another County

NRS 533.438 Imposition of fee on certain transfers of water by county of origin; review by State Engineer; limitation on use of money collected from fee. [Effective through December 31, 2006.]

1. Except as otherwise provided in subsection 4, if an appropriation of groundwater pursuant to a permit to appropriate groundwater results in the transfer to and beneficial use of water in a county in this State other than the county in which the water is appropriated or in another state, the county of origin may impose a fee of $6 per acre-foot per year on the transfer.

2. A county of origin shall not impose a fee pursuant to subsection 1 without the prior approval of the State Engineer. The county of origin shall notify the State Engineer in writing of its intent to impose the fee. The State Engineer shall review the notice of intent to impose the fee to determine:

(a) Whether the appropriation of groundwater pursuant to the permit specified in subsection 1 results in a transfer to and beneficial use of water in a county in this State other than the county of origin or in another state; and
(b) The amount of water, if any, that is:
(1) Subject to the proposed fee because of that transfer and beneficial use; or
(2) Not subject to the proposed fee pursuant to subsection 4.

3. Within 30 days after reviewing the notice of intent to impose the fee, the State Engineer shall send a written notice to the county of origin that includes the results of his review. If the State Engineer determines that the appropriation of groundwater pursuant to the permit results in a transfer to and beneficial use of water in a county in this State other than the county of origin or in another state, the State Engineer shall include in the notice the amount of water that is subject to the proposed fee. The county may, upon such a determination, impose the fee on the transfer.

4. A fee may not be imposed pursuant to this section on water that is appropriated and beneficially used pursuant to a permit to appropriate groundwater which is issued for a point of diversion and a place of beneficial use in the county of origin and which, after the water is diverted and beneficially used, is discharged or migrates into a county in this State other than the county of origin or into another state.

5. All money collected from a fee imposed pursuant to this section must be deposited in a trust fund for the county. The principal and interest of the trust fund may be used by the county only for the purposes of economic development, health care and education.

6. For the purposes of this section, if a basin includes land lying in more than one county, each county any part of whose land is included is a county of origin to the extent of the proportionate amount of water transferred from it. The State Engineer shall determine the respective proportions.

7. As used in this section:
(a) A “basin” is one designated by the State Engineer for the purposes of chapter 534 of NRS.
(b) “Origin” means the place where water is taken from underground.
(Added to NRS by 1991, 1368; A 2001, 1933; 2005, 497)

NRS 533.438 Imposition of fee on certain transfers of water by county of origin; review by State Engineer; limitation on use of money collected from fee. [Effective January 1, 2007.]

1. Except as otherwise provided in subsection 4, if an appropriation of groundwater pursuant to a permit to appropriate groundwater results in the transfer to and beneficial use of water in a county in this State other than the county in which the water is appropriated or in another state, the county of origin may impose a fee of $10 per acre-foot per year on the transfer.

2. A county of origin shall not impose a fee pursuant to subsection 1 without the prior approval of the State Engineer. The county of origin shall notify the State Engineer in writing of its intent to impose the fee. The State Engineer shall review the notice of intent to impose the fee to determine:
(a) Whether the appropriation of groundwater pursuant to the permit specified in subsection 1 results in a transfer to and beneficial use of water in a county in this State other than the county of origin or in another state; and
(b) The amount of water, if any, that is:
(1) Subject to the proposed fee because of that transfer and beneficial use; or
(2) Not subject to the proposed fee pursuant to subsection 4.

3. Within 30 days after reviewing the notice of intent to impose the fee, the State Engineer shall send a written notice to the county of origin that includes the results of his review. If the State Engineer determines that the appropriation of groundwater pursuant to the permit results in a transfer to and beneficial use of water in a county in this State other than the county of origin or in another state, the State Engineer shall include in the notice the amount of water that is subject to the proposed fee. The county may, upon such a determination, impose the fee on the transfer.

4. A fee may not be imposed pursuant to this section on water that is appropriated and beneficially used pursuant to a permit to appropriate groundwater which is issued for a point of diversion and a place of beneficial use in the county of origin and which, after the water is diverted and beneficially used, is discharged or migrates into a county in this State other than the county of origin or into another state.

5. All money collected from a fee imposed pursuant to this section must be deposited in a trust fund for the county. The principal and interest of the trust fund may be used by the county only for the purposes of economic development, health care and education.

6. For the purposes of this section, if a basin includes land lying in more than one county, each county any part of whose land is included is a county of origin to the extent of the proportionate amount of water transferred from it. The State Engineer shall determine the respective proportions.

7. As used in this section:
(a) A “basin” is one designated by the State Engineer for the purposes of chapter 534 of NRS.
(b) “Origin” means the place where water is taken from underground.
(Added to NRS by 1991, 1368; A 2001, 1933; 2005, 497, 498, effective January 1, 2007)

NRS 533.4385 Plan to mitigate adverse economic effects caused by transfer of water; contents of plan; modification of plan by State Engineer.

1. If a county of origin has not imposed a fee on the transfer of water pursuant to NRS 533.438, an applicant and the governing body of the county of origin may execute a plan to mitigate the adverse economic effects caused by the transfer of water from the county of origin to another county. If such a plan is executed, the plan is binding on the county of origin and the applicant or his successor.
2. A plan to mitigate the adverse economic effects caused by the transfer of water from the county of origin to another county may include, but is not limited to, provisions concerning:
(a) The reservation of designated water rights to the county of origin; and
(b) Compensation for the foreseeable effects of the transfer.

3. If a plan is executed pursuant to subsection 1, the applicant shall submit the plan to the State Engineer. The State Engineer may modify a plan executed pursuant to subsection 1 if a provision of the plan:
(a) Violates a specific statute; or
(b) Becomes impossible or impracticable to put into effect.
(Added to NRS by 1991, 1368; A 2005, 499)

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.
2. It is the intention of the Legislature, by this chapter, to prevent the waste of underground waters and pollution and contamination thereof and provide for the administration of the provisions thereof by the State Engineer, who is hereby empowered to make such rules and regulations within the terms of this chapter as may be necessary for the proper execution of the provisions of this chapter.
[1:178:1939; 1931 NCL § 7993.10]

DROUGHT CONDITIONS

As Nevada is the driest State in the Nation, drought is relatively common and expected. Every 6 out of 10 years, the major rivers in the State experience below average flows. For most of Nevada, which depends mostly on streamflow for water supply, a drought is considered to be a period of 2 or more consecutive years in which streamflow is much less than average. The most significant droughts were during 1928-37, 1953-55, 1959-62, 1976-77, and 1987-92. Droughts can magnify quality problems for surface and ground-water sources. By decreasing streamflow, droughts tend to lessen the quality of remaining water for human and wildlife uses. Droughts also can cause more reliance on ground-water sources which may stress the resource beyond its long-term potential.

In 1987 Governor Bryan formed the Drought Review and Reporting Committee (DRRC) to inform the citizens of Nevada about climatological conditions and the severity of the current drought. As the drought progressed, the DRRC helped produce a State Drought Plan that outlines the State and Federal actions that can be taken during various stages of drought. (*1987-1992 Drought Impact Summary)*

Smaller communities in Elko County have done very well coping with drought conditions. Midas and Tuscarora have had their springs dry up resulting in temporary water hauling operations to provide drinking water. Both of these towns are switching to more reliable ground-water supplies. Water management and water conservation efforts have allowed the citizens of Elko, Spring Creek and West Wendover to continue outdoor watering, even with their main source of water greatly reduced. Agriculture has also been severely impacted by the drought.

Fish and wildlife have been significantly stressed due to the drought conditions. Many of Elko County's wetland areas are either dry or are severely diminished. These wetlands are important resting stops for migratory birds. The limited availability of food and habitat will stress the birds during migration and increase mortality rates. The drought has resulted in minimum pools in most of our reservoirs. The fisheries in these pools are significantly stressed due to increases in temperature and oxygen depletion.

Water-based recreation has been severely impacted at Wild Horse Reservoir, South Fork Reservoir, Ruby Marshes and several other smaller reservoirs. Visitor counts at these reservoirs are lower than previous non-drought years, and boating access is limited or nonexistent.

The State of Nevada Division of Water Planning has created and implemented a State Drought Plan outlined as follows:

STATE OF NEVADA DROUGHT PLAN

PLAN SUMMARY:

Plan Title: State of Nevada Drought Plan

Type: The Drought Plan is a strategic operations plan that describes the procedural framework for initiating and maintaining State-level actions under three different stages of drought. Natural resources identified in the Drought Plan include water resources (e.g., stream flow, reservoir storage), fish and wildlife and soil.

Plan Description: (Purpose, Goals and Guiding Principles)

The Drought Plan establish an administrative coordinating and reporting system between agencies that should be involved in providing assistance to help mitigate drought impacts. Goals of the plan include:

To establish a formal framework for state agency response to drought impacts.
To establish a system for determining drought severity.
To establish a process for allocating state and for obtaining federal assistance, as determined to be necessary by the Governor.
To help provide an orderly system for activating the state response to drought.
To define state policies, procedures, intergovernmental assessment and response responsibilities for different drought scenarios and different impact mitigation needs.
To notify farmers and ranchers of potential drought conditions, assess and project likely impacts, identify alternative responses and sources of assistance and report data and recommendations to the Drought Review and Reporting Committee or Drought Response Center.
To address drought-related impacts to wildlife due to the threat of water reduction and wildfire.
To establish procedures and an organization to assess drought-related economic impacts and recommend and undertake specific responses.

Planning/Guiding Principles:

The following principles are inferred from the Plan.

The primary responsibility for drought response must remain with the individual, followed by local cooperative actions and the then state and federal assistance.

State resources will be used to supplement private and local resources. Federal resources will be necessary to supplement private, local and state resources under certain qualifying conditions.
The plan does not establish specific conservation measures for local entities.
The plan does not affect existing water rights.
Develop State response scenarios based on three stages of drought - Drought Warning Stage; Severe Drought Stage, and Emergency Drought Stage.
The Governor provides policy and resource allocation direction. However, the Drought Response Center makes policy recommendations and resource allocation requests to the Governor.
Three Drought Impact Task Forces will be set up as needed to make recommendations to the Governor.

Geographic Scope: -- Statewide (However, drought conditions often exist in a limited area, so the geographic scope of drought mitigation actions can be region specific).

Legislative Authority and/or Administrative Policies: Information in the Drought Plan indicates that the Governor of Nevada called for the establishment of a Drought Review and Reporting Committee in the late 1980's. Apparently the Division of Water Planning with the Division of Emergency Management were directed to coordinate the development of a State Drought Plan.

Cooperating Agencies: Involvement of agencies depends on the drought stage and impacted resources. State Climatologist is the lead responsible agency. Other directly involved agencies include the Department of Emergency Management, divisions in the State Department of Conservation and Natural Resources, agencies within the U.S. Departments of Agriculture and of the Interior, agricultural trade organizations, tribes, Natural Resources Conservation Service, irrigation and water (sub)conservancy districts, and the largest utility companies.

Participating Stakeholders: (See Cooperating Agencies above)

Public Communication and/or Participation Process: Task Force is only convened at the recommendation of the DRRC and under the direction of the Governor when severe or emergency drought stages exist. Each Task Force is to be made up of representatives of industry trade organizations, state agencies, federal agencies, tribal agencies, and local agencies.

Date Completed: Completed January 1991. Next update - not determined

Planning Process & Data Collection: The Drought Plan is a static process document. The actions laid out in the plan become implemented in reaction to the occurrence of a drought and subsequent impacts. Implementation of the Drought Plan begins once the Governor receives and concurs with a recommendation from the State Climatologist that conditions are sufficiently dry to declare that a drought warning stage exists.

Data Types Required and Used: Reservoir storage, precipitation, snowpack, stream flow, ground water levels, soil moisture, temperatures, and long term weather predictions. Data on the impact to crop production, livestock production, and fish and wildlife (game and nongame and endangered species) would be collected by the respective Task Forces. During the drought, Task Force agencies would also estimate potential impacts (losses) to fish and wildlife, especially on state controlled land and waters, and then recommend mitigation measures involving reservoir conservation pools, instream flows, construction of water ponds, etc. Funding and logistic resources needed would also be estimated, including an assessment of state held water rights and the need for additional resources.

Data Sources: It is the responsibility of the Division of Water Planning to insure that the required hydrologic data are being collected to effectively evaluate potential droughts and drought severity. Determination of drought stages are made by the State Climatologist after evaluating the hydrologic and climatic data.

Natural Resource or Environmental Indicators: Palmer Drought Severity Index (a measure of soil moisture deficiency or excess) is used to determine whether a drought exists and the stage, or degree of severity, of the drought conditions. Stages of drought are: a drought warning (Palmer Index between -1.0 to -2.0), severe drought (Palmer Index between -2.0 and -3.0) and emergency drought (Palmer index below -3.0) stage.

Funding Sources: Funding needs are considered special, and will be addressed at the time funds are requested. The Nevada Division of Emergency Management is the agency designated in NRS 414 that coordinates all state and federal assistance to jurisdictions in federally declared and non-declared emergency situations.

Figure 10 - Short Term Drought Indicator Map - April 2007

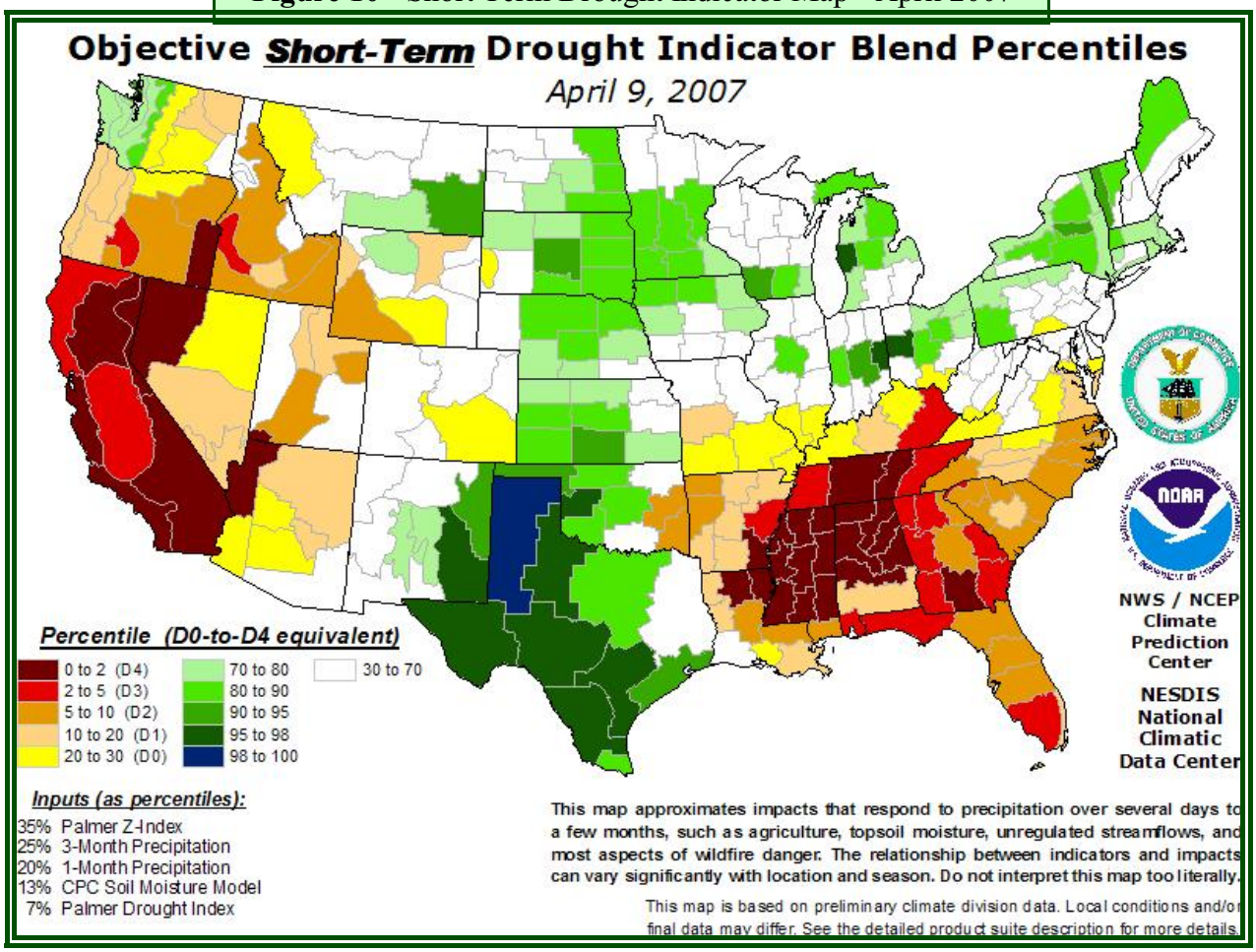
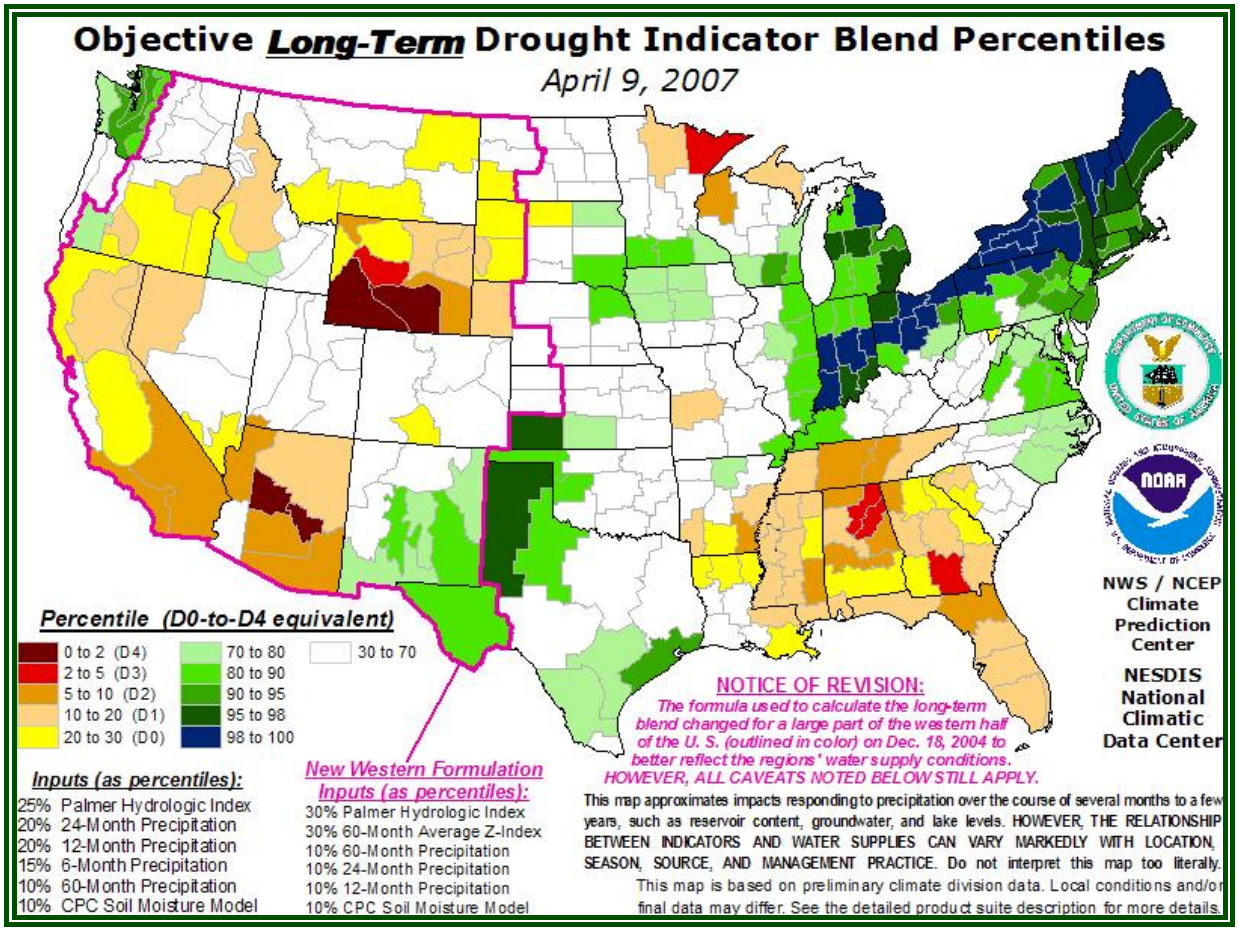


Figure 11- Long Term Drought Indicator Map - April 2007



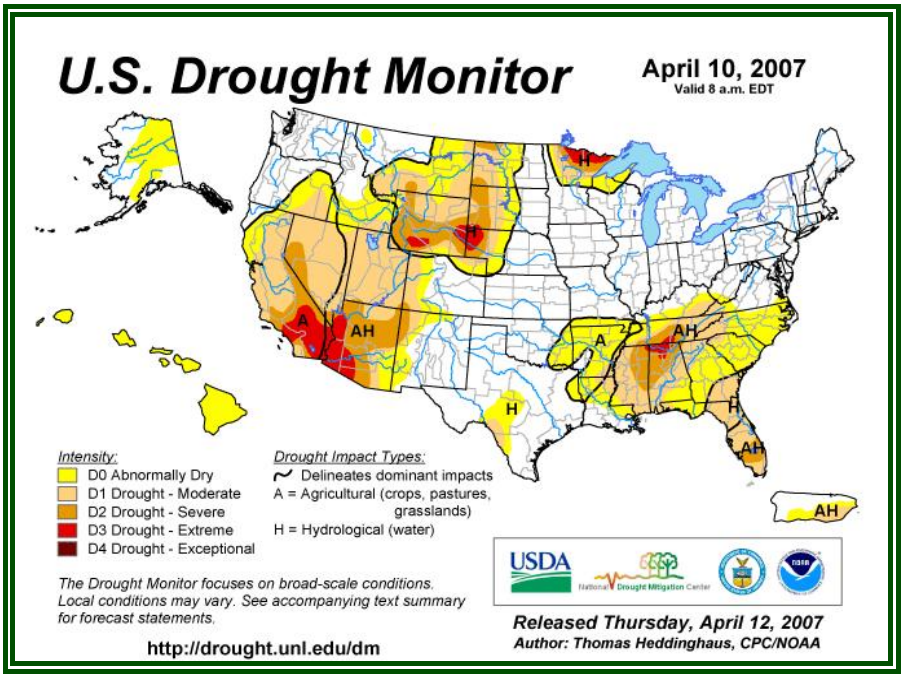


Figure 12- U.S. Drought Monitor Map - April 2007

WATER RESOURCE CONSERVATION

The growing population and economy of Elko County will require ever increasing amounts of water in the future, however available sources for meeting these needs are limited. Part of the solution is the implementation of water conservation measures. The ability of conservation measures to extend supplies, and delay and/or reduce the need for future supply development has been documented.

Water conservation will continue to be a critical component of overall water management. As William O. Maddaus ("Integrating Water Conservation Into Total Water Management", *American Water Works Association Journal*, Vol. 82, No. 5, May 1990) notes, "the time is past when [water supply] needs can be met simply by building more water storage and delivery systems." The challenge facing water suppliers in today's political, environmental, and economic climate is to fully integrate our findings on demand management into long-range water supply planning." For Elko County this means understanding population and development trends and matching current and future water conservation practices and policies.

Recognizing the need for conservation, the 1991 State Legislature passed Assembly Bill (AB) 359 and Senate Bill (SB) 360. AB 359 requires each county and city to impose certain minimum standards for plumbing fixtures, by building codes or ordinance, for new residential, commercial, or industrial construction beginning on or after March 1, 1992 (*NRS 278.580, 244.3675, 444.340 through 444.430, 268.413*). In accordance with the amended Nevada Revised Statutes, each supplier of water for municipal, industrial or domestic purposes is required to adopt a water conservation plan based on the climate and the living conditions of its service area. The plan is to include provisions relating to:

1. Increasing public awareness of the State's limited water supply and the need to conserve;

2. Identifying and reducing leakage in water supplies, inaccuracies in water meters, and high pressure situations;

3. Increasing the reuse of wastewater treatment plant effluent;

4. Contingency plan for drought conditions that ensures an adequate supply of potable water; and

5. Adoption of a plan to provide incentives to encourage water conservation; to retrofit existing structures with reduced flow plumbing fixtures; and for installation of landscaping that uses a minimal amount of water.

Increasingly stringent wastewater discharge requirements coupled with scarce supplies of freshwater are inducing municipalities and industries to seek alternative uses of wastewater rather than treatment and subsequent discharge to a stream or to a ground-water aquifer. The most common use of treated wastewater is land application for irrigation of agricultural land or urban areas, such as golf courses.

The reuse of wastewater treatment plant effluent has increased in Nevada in recent years. In 1979 there were approximately 12 reuse application sites (Nevada Division of Water Planning, *Land Application of Wastewater in Nevada*, Information Series Water Planning Report 2, Carson City, Nevada, September 1979). By 1990 the

number had increased to over 20. Current uses of reclaimed wastewater effluent in Nevada include agricultural irrigation, golf course and landscape irrigation, industrial uses, wetlands applications, and construction water. In 1990 public wastewater treatment facilities discharged approximately 150 mgd (170,000 af/year). Of this amount, only about 9 percent was reclaimed directly for the above uses. However, if one takes into account the effluent that is discharged to a river, such as the Truckee and Colorado Rivers, and later diverted by other users, the effluent reuse percentage exceeds 90 percent.

EFFECTS OF GROUNDWATER PUMPING

Any withdrawal of ground water results in removal of water from storage. Large-scale withdrawals in many areas in the Southwest have resulted in wide spread lowering of water tables (**Figure 15**) which reflects a quantity of ground water that is no longer available. Several other aspects of lowered water tables affect future water availability. Lowering of watertables results in increased costs to lift water a greater distance. For some water uses such as agriculture, pumping costs from deep aquifers could be prohibitively high. Lowered water tables can result in loss of well productivity and adversely effect water quality. In most basins, shallower sediments are less compacted and more readily release water to wells than deeper sediments. Lowered water tables can result in the need to drill more and deeper wells to maintain a desired rate of ground-water withdrawal.

Figure 13- Effects of Groundwater Pumping Water Level Decline in Feet

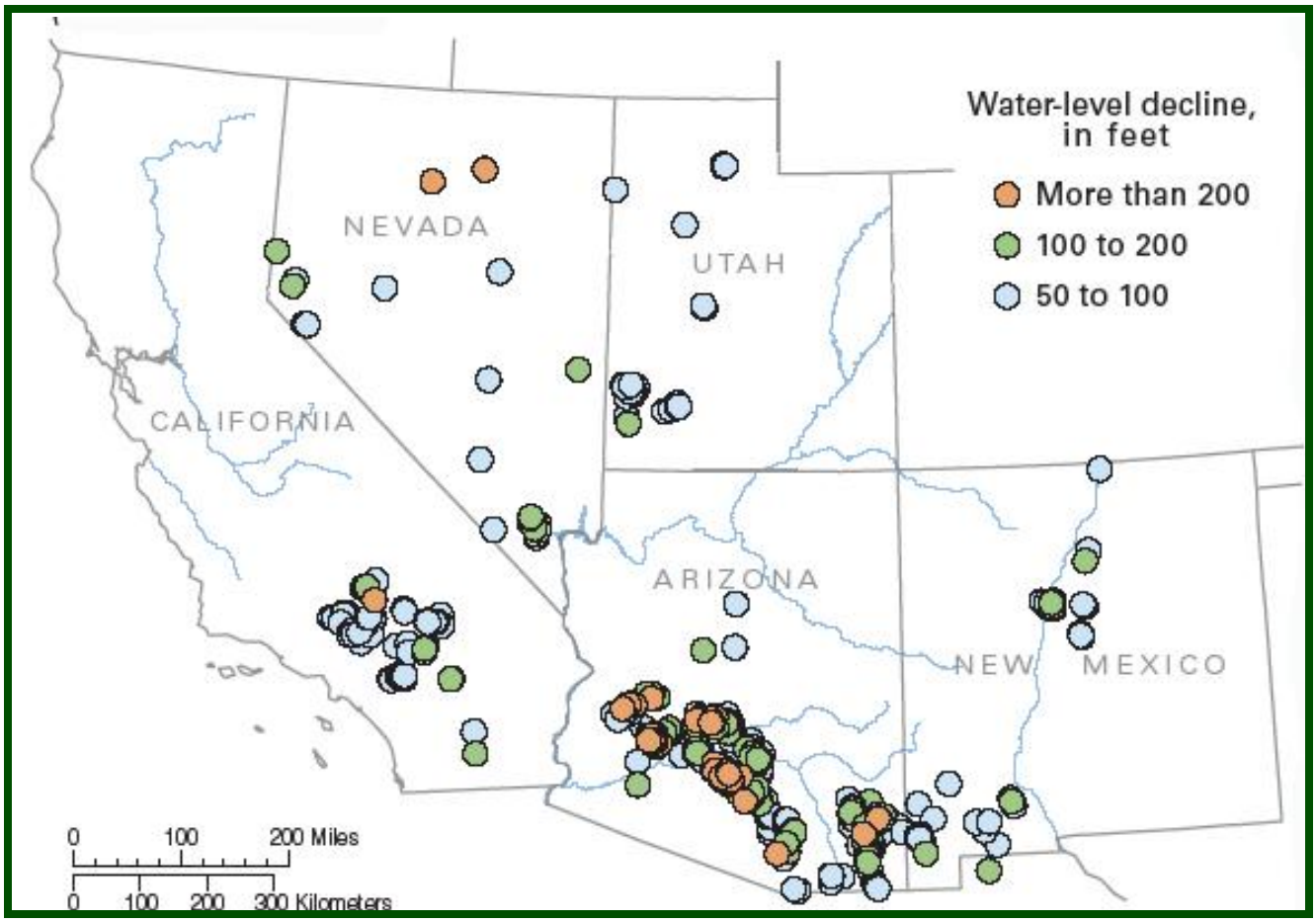
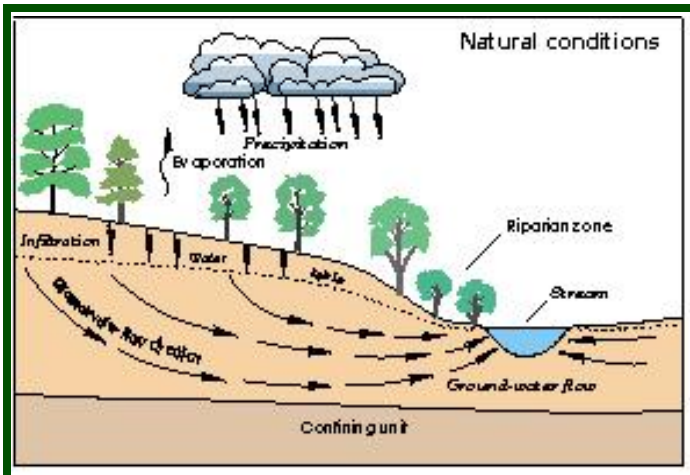
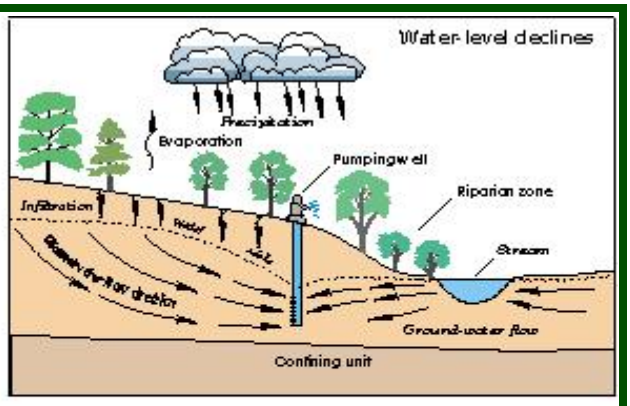


Figure 14A - Effects of Groundwater Pumping Natural Conditions



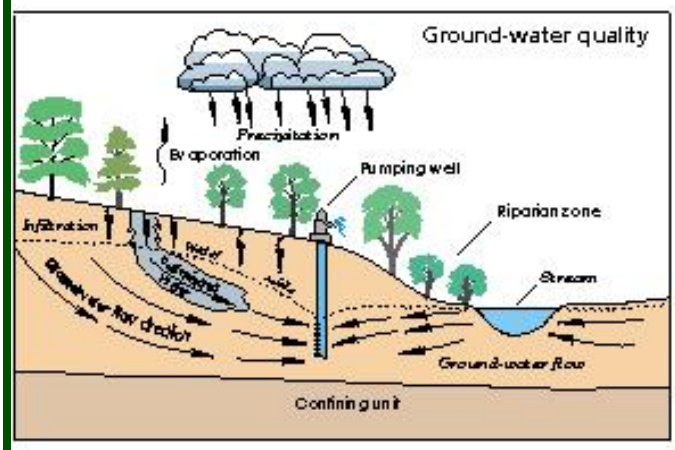
Water is recharged to the ground-water system by percolation of water from precipitation and then flows to the stream through the ground-water system.

Figure 14B- Effects of Groundwater Pumping Water Level Declines



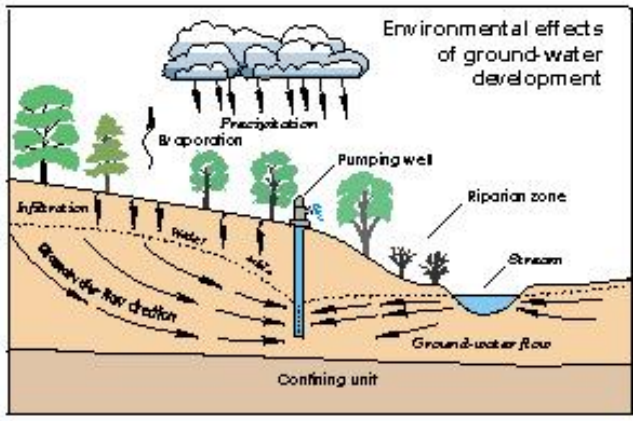
Water pumped from the ground-water system causes the water table to lower and alters the direction of ground-water movement. Some water that flowed to the stream no longer does so and some water may be drawn in from the stream into the ground-water system, thereby reducing the amount of streamflow.

Figure 14C - Effects of Groundwater Pumping Groundwater Quality



Contaminants introduced at the land surface may infiltrate to the water table and flow towards a point of discharge, either the well or the stream. (Not shown, but also important, is the potential movement of contaminants from the stream into the ground-water system.)

Figure 14D - Effects of Groundwater Pumping Environmental Effects



Water-level declines may affect the environment for plants and animals. For example, plants in the riparian zone that grew because of the close proximity of the water table to the land surface may not survive as the depth to water increases. The environment for fish and other aquatic species also may be altered as the stream level drops.

WELLHEAD PROTECTION

The Wellhead Protection (WHP) Program was established by the 1986 Amendments to the Safe Drinking Water Act (SDWA). The purpose of the program is to protect public ground-water supplies from contamination and prevent the need for costly treatment of water to meet drinking water standards. The program is based upon the concept that the development and application of land-use controls and other preventative measures can protect groundwater. A comprehensive WHP Program comprises several distinct and essential elements:

1. Specification of roles and duties of State agencies, local government entities, and public water suppliers;
2. Delineation of the wellhead protection area (WHPA) for each well;
3. Identification of potential sources of contaminants within each WHAP;
4. Development of management approaches to protect the water supply within the WHAP;
5. Contingency planning for the provision of alternate drinking water supplies in the event of well or well field contamination;
6. Consideration of all potential contaminant sources within the expected wellhead area of a new water well; and
7. Provisions for public participation.

The Nevada Division of Environmental Protection (NDEA) is encouraging water purveyors in the State to develop a WHOP Program for their area. As part of this voluntary program, NDEA is providing technical and possibly financial support for WHOP Program development. Well Head Protection Programs have been implemented in Jackpot, West Wendover, Wells, Carlin, Montello and the City of Elko. This Plan endorses and implements the State of Nevada Well Head Protection Program in and for Elko County.

NONPOINT SOURCE POLLUTION

Clean water is essential to all life. Yet every-day activities impair water quality and thus reduce the availability of good water supplies. Throughout the U.S. and Nevada water resource experts and agencies are finding that the leading cause of water quality impairment is nonpoint source (NRS)pollution. Pollution from nonpoint, or diffuse, sources is more difficult to control than pollution from point sources, which are discharges through pipes or channels from a distinct source. Almost any activity can increase runoff and add to NPS pollution. Commonly identified sources, activities and facilities such as mining, construction, grading, roads and trails, septic systems, underground storage tanks, modified water courses, feed lots, grazing and timber harvesting are commonly identified sources. These widespread activities can stir up, produce and release pollutants which are then picked up by runoff from melting snow, rain fall, or irrigation and deposited downstream in pulses.

NPS pollution occurs wherever water flowing across the land or underground picks up nutrients, salts, metals, organic material, soil, or chemicals and delivers the accumulated pollutants to streams, lakes, wetlands or ground water aquifers in amounts greater than natural background levels. The excess pollutants may result in impacts such as nutrient enrichment, undesirable algae growth, higher total dissolved solids, turbidity, lower dissolved oxygen, pH changes, higher temperatures and increases in pathogenic microorganisms. These conditions

negatively affect water supplies by fouling water systems and increasing treatment requirements and operation and maintenance costs. Aquatic ecosystems may also be impacted by diffuse sources.

The presence of wetlands and water availability are important factors determining the degree of NPS impact to water quality. One of the reasons wetlands and riparian zones are valued and protected by regulation is their treatment capacity, which is the ability to detain, trap, convert and assimilate sediment, nutrients, and organic wastes. The actual relationship between stream flow and water quality is complex, but in general where river flows are lowered by drought and/or up stream diversions and nonpoint pollution is present, the negative water quality impacts can be amplified.

An innovative approach to improving water quality with increased stream flow is the Water Quality Settlement Agreement for the Truckee River. State, local, tribal and federal agencies cooperatively developed a plan in 1996 to increase flows and dilute point and nonpoint source pollutant concentrations, primarily in the Lower Truckee River. Federal and local governments have agreed to share the cost of acquiring water and reservoir storage rights in the upper Truckee River system. The acquired water is intended to increase stream flow during periods when low water levels are likely to contribute to poor water quality conditions.

The dry climate, infrequency of rainfall events, and diversions from streams often are significant factors influencing the degree of nonpoint pollution impacts on water resources. For example, Steamboat Creek, a tributary of the Truckee River, collects urban and agricultural drainage. Below the creek's confluence with the Truckee River, water quality conditions deteriorate in late summer because river flows are lower, so the nonpoint source pollutant load from Steamboat Creek has a larger influence on river water quality. In the case of a large storm water runoff event that occurs after a long dry spell, larger quantities of NPS pollutants from urban development and suburban ranches can be mobilized and thus cause not only a short term water quality impact but also contribute to longer term levels of lower water quality as more solids become deposited in the creekand river channels. Circumstances vary on each river, so intensive field investigations are helpful in explaining site specific cause and effect relationships between nonpoint sources and hydrologic conditions that contribute to NPS pollutant discharges and water quality impairment.

Preventing and controlling NPS pollution is accomplished primarily by implementing Best Management Practices (BMPs). BMPs work on the principles that materials belonging on the land should be kept there, and that decreasing the distance runoff travels from the source minimizes control costs. Some general categories of BMPs applicable to many source activities are soil conservation, revegetation of disturbed areas, erosion and storm water controls, fertilizer management planning, integrated pest management, wetland protection and enhancement, and storm water treatment cells. Land use planning practices such as open space master plan designations, zoning controls, and subdivision development ordinances also have been used to ameliorate nonpoint source pollution potential of land development.

State agency water quality assessments, more fully described below, have found that urban areas, irrigation, grazing, and flow regulation practices are the largest nonpoint pollutant contributors. Statewide, the most common NPS pollutants of concern include suspended solids, total dissolved solids (salinity and chlorides), total phosphates, nitrogen species, turbidity, and thermal energy. In some waters, arsenic, boron, selenium, lead, and iron levels are elevated. These elements are areas associated with geothermal sources, and become concentrated in closed basins by high evaporation rates. Runoff and subsurface flow from irrigated agricultural land may

increase the amount of these contaminants. A special concern is mercury in the Carson River from historic mining and milling operations. Rapid population growth, changing land uses, urbanization, and changing public expectations regarding water quality add to the complexity of managing NPS pollution.

Given the prevalence of these factors in Nevada, it is not surprising that all major rivers are impacted to some degree by NPS pollution. Much is being done cooperatively by state, local, federal agencies and land owners to manage nonpoint source pollution through education. Encouraging and funding implementation of pollution prevention and BMP retrofit projects, installation of control technologies, monitoring and assessment of nonpoint sources, improving our understanding of the cause and effect relationships between water quality impairment and pollutant sources. Researching and implementing new, more effective strategies is an ongoing effort of all agencies within the Department of Conservation and Natural Resources.

Local Agencies Involvement with Nonpoint Sources

Nevada's nonpoint source control program places an emphasis on local management and enforcement. Local governments have a variety of tools available to accomplish this, including: 1)identifying environmentally sensitive lands during the Master Land Use Planning process; 2) adopting development ordinances with design criteria intended to minimize soil disturbance and erosion, retain wetlands and riparian zones, and preserve natural drainages and stream channels; 3) acquiring open space to achieve environmental objectives; and 4) adoption of ordinances requiring application of BMPs. Cities and counties also collaborate with conservation districts and the University of Nevada Cooperative Extension offices to enhance public education efforts on pollution prevention and to review development plans for NPS concerns. The two largest metropolitan areas located in Washoe and Clark Counties hold permits from NDEP for discharges from their municipal storm water systems. Under these permits, agencies within the metropolitan areas agree to monitor water quality, apply BMPs, correct illegal discharges to storm drains, and work to alleviate significant NPS discharges to storm drainage system segments within their jurisdiction.

Angel Lake - East Humboldt Mountains

SAFE DRINKING WATER ACT

The Safe Drinking Water Act of 1974 provides for the safety of drinking water supplies throughout the United States by establishing and enforcing national drinking water quality standards. Congress authorized the Environmental Protection Agency (EPA) to support State and local community drinking water programs by providing financial and technical assistance to undertake research and study efforts.

Under the Safe Drinking Water Act SDWA, EPA has the primary responsibility of establishing the national standards; the States are responsible for enforcing the standards and otherwise supervising public water supply systems and sources of drinking water.

In response to mandates of the 1986 amendments to SDWA, EPA is developing, proposing, and adopting new drinking water regulations that are significantly changing water treatment practices and water utility operations. Since passage of the 1986 amendments, regulations for volatile organic chemicals, fluoride, surface water treatment, total coliform bacteria, synthetic organic and inorganic chemicals, and lead and copper have been promulgated by EPA. Additional regulations regarding radionuclides (radon), other synthetic organic and inorganic chemicals, and disinfection are anticipated.

The cost of these new regulations to water systems in Nevada is significant. It has been estimated that $100 to $170 million in capital improvements are needed throughout the State for compliance with these latest regulations. Financial assistance for (SDWA) compliance projects is available through a State loan/grant program established by NAC and NRS. This program is administered by the State Board for Financing Water Projects.

NEW SYSTEM AUTHORITY: By October 1, 1999, each State must 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% of its DWSRF allotment unless the State has such authority. [1420(a)] Sec. 119

SYSTEMS IN SIGNIFICANT NONCOMPLIANCE: States must prepare and submit to EPA by August 6, 1997 (and periodically update) 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 must report to EPA in 5 years on the success of efforts to assist small systems in improving capacity. [1420(b)] Sec.119

STATE CAPACITY DEVELOPMENT STRATEGIES: States are required to establish capacity development strategies to assist systems in developing and maintaining technical, financial and management capacity. States not developing and implementing a strategy receive only 90% of their DWSRF allotment in Fiscal Year 2001; 85% in 2002; and 80% in each subsequent fiscal year. [1420(c)] Sec. 119. The total withholding for all capacity development provisions may not exceed 20%. [1452(a)(1)(G)]. Sec. 130

CONTENT OF STATE STRATEGY: In preparing its capacity development strategy, each State shall: consider the criteria it will use to identify public water supplies most in need of improved capacity; describe factors that encourage or impair capacity development; describe how the State will use its authorities to assist systems in complying, encourage partnerships between systems, and assist in training/certification of operators; describe how the State will measure progress; and identify parties interested in capacity development, [1420(c)] Sec. 119

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.

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.

FLOOD PLAIN MANAGEMENT

Flood plain management experience indicates that the best damage reduction plans are occurring in those counties that have provided leadership strong enough to stay the course between high profile flood events. The WGA Floods Task Force concludes that pre-disaster flood planning and floodplain management are "essential" elements in reducing flood risk. All levels of government should place greater emphasis on these two policy areas. Detailed local planning will play an essential role in river-basin management in the future. Leadership must focus on a balance of structural and non-structural flood plain management tools. With urbanization rapidly expanding in the west, decision makers must recognized that storm-water management planning is an integral component of an overall strategy to reduce flood losses.

Conditions for flooding in the west are much different than those in eastern states. The mountainous regions provide the environment for flash flooding, high velocity flows, excessive erosion, and torrent storm patterns. The gradual flood build-up of major rivers that devour small towns and remain high for weeks is a condition that exist primarily in the east. Alluvial fans, a common topographic feature in the west, will continue to present a tremendous challenge to local planners until an effective model for mapping alluvial fan flooding is developed and accepted by those in the engineering, urban and rural planning, and flood plain management professions. The great number of homes and businesses on alluvial fans pose high risk to western communities, a risk that must be better understood and mitigation strategies developed.

Accurate maps are vital to the local flood plain administrator to make sound management decisions. These maps are used by the flood plain administrator to determine if and how a structure can be built in a flood plain. In some western states, the Flood Insurance Rate Maps were last updated in the late 1970's and 1980's. FEMA is currently working to improve and modernize the flood mapping process. Currently, all maps are needed to reflect new growth and changes in flood plains to correct inaccuracies in the original maps and to show the annexation of new land that is not mapped.

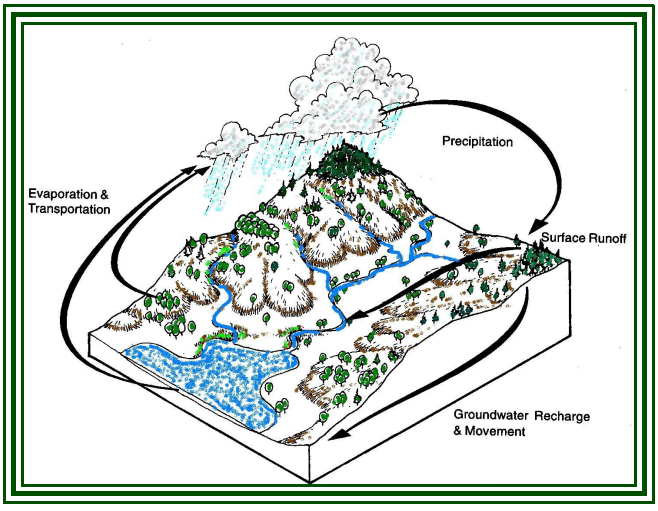


Figure 15 - Groundwater Recharge & Movement

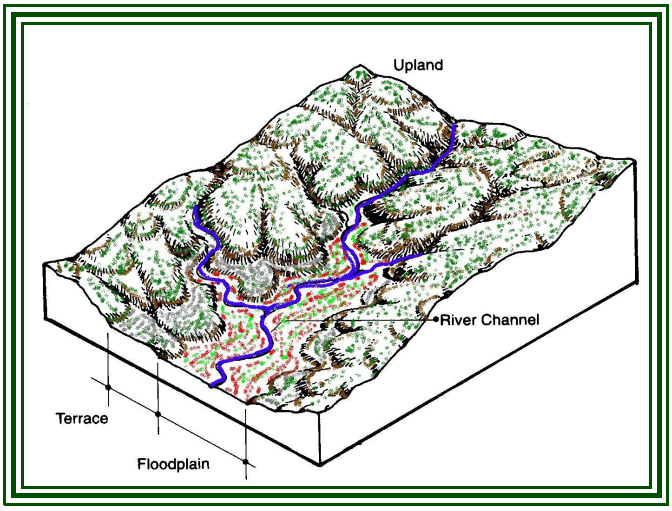


Figure 16 - Flood Plain & Terrace diagram

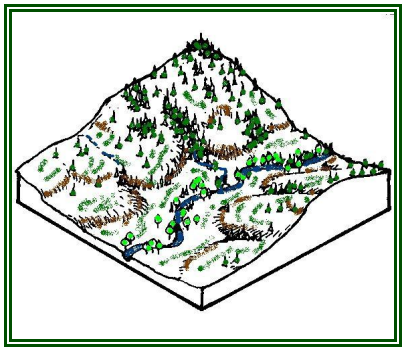


Figure 17A - Every community must recognize that decisions about flood plain resources are decisions about the communities future. With careful consideration and planning, rivers and streams can be aesthetic and functional assets that reflect community pride and ingenuity. However, a community that ignores the importance of natural flood plain functions may ultimately face flood losses and deteriorating water quality. In the end it would be less costly to plan well now.

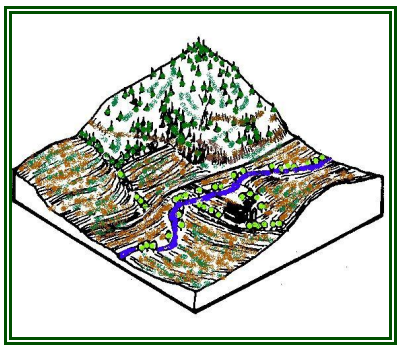


Figure 17B - Well placed parks and recreation areas that include vegetation are often ideal for maintaining flood plain storage capacity that help support flood plain functions that protect water quality and sustain wildlife habitat. Open space areas, such as agricultural lands, can help to rally functioning flood plains, such as protecting or planting vegetated buffer strips and creating channel alterations for fish habitat improvement.

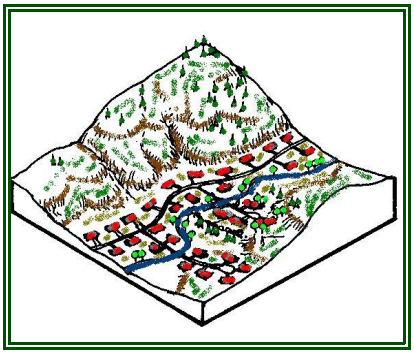


Figure 17C - Development within flood plains often occurs without consideration of the effects on flood plain natural resource functions. If an area is built up during a period when there have been few floods, the need for flood storage capacity of a naturally functioning flood plain may have been overlooked. The loss of natural flood plain functions in heavily developed areas not only impedes flood storage, but can also increase erosion and reduces the mitigating effects that vegetated areas can have on the pollution of water ways.

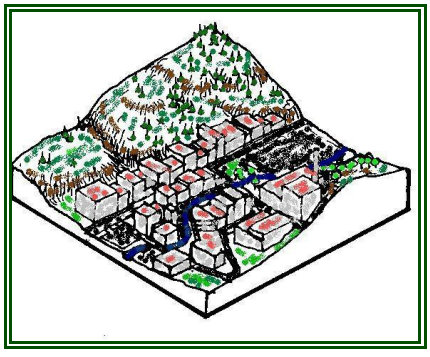


Figure 17D - Impermeable surfaces such as buildings and pavements replace vegetation as ground cover, increasing the runoff that would have infiltrated in a natural flood plain. The removal of vegetation, destruction of wetlands and paving in urban and suburban settings can thus increase the risk of flooding. Upstream development outside the floodplain can also increase erosion and sedimentation, which may cover spawning areas and bury food sources in streams. Loss of vegetation also removes sources of shelter and food for wildlife and human made structures may present barriers to migration and reproductive activity.

REPORT FINDINGS

POPULATION FORECAST: Most all of rural Elko County has experienced slower growth rates versus the higher growth rates occurring in the City of Elko, West Wendover, Osino, Ryndon, Spring Creek and South Fork areas during the last decade. The 2006 *State of Nevada Demographer* population **forecast** indicate a 11.5% decrease in county population for the years 2006 through 2022 . Beginning in 2023 a 0.8% increase per year is projected through 2026. However, population **estimates** from the *State of Nevada Demographer* show that the years 2003 through 2004 have depicted a positive growth rate of 1.5% and the years 2004 through 2005 have depicted a positive growth rate of 2.3%. In addition, Elko County development patterns indicate that the county will continue to experience positive growth through 2026. (**Table 11B**)

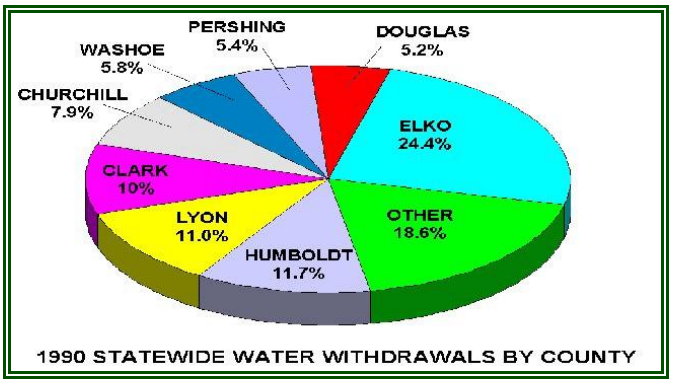


Figure 18 - Statewide Water Withdrawal by User/County

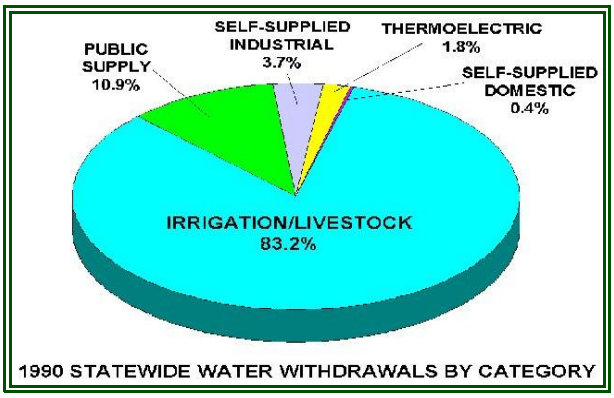


Figure 19 - Statewide Water Withdrawal by Type of Use

AGRICULTURAL WATER USE FORECAST: Elko County is currently the largest water user in the State of Nevada at 24.4%, predominantly due to agricultural uses. Agricultural uses in the State of Nevada is currently 83.2% of all waters within the state, by far the largest water user group. 2005 information from the Nevada Division of Water Resources indicates that Elko County withdraws approximately 898,321 acre feet annually for agricultural uses. Growth and development patterns indicates that agricultural uses in Elko County will minimally decrease or hold steady through 2025. It is estimated by the *State Division of Water Planning* that by the year 2025 Elko County total agriculture water uses will withdraw 830,610 acre feet annually. This represents a decrease from total water use in 2005 of 898,321 acre feet annually or a total loss of -7.5 %. **Elko County** data forecasts that by the year 2025 total agriculture uses will withdraw **880,489** acre feet annually a loss of 0.1 % annually or a total loss of 2.0%.

DOMESTIC WATER USE: It is estimated by the City of Elko, and other water purveyors as well as the Elko County Planning & Zoning Division that domestic water users of Elko County use approximately 250 gallons per day per person, including interior and exterior use. The State of Nevada Water Plan indicates that every person in Nevada uses 240 gallons of water per day. Nevada Revised Statutes (NRS) stipulates that every new and existing parcel in Nevada that utilizes an individual domestic well uses 1,800 gpd or 2.02 acre feet of water annually. The 2000 Census cites that households in Elko County equates to 2.6 persons per household. Using 250 gallons per day per person this would equate to 650 gallons per day per household, approximately one third of the water allocated for each domestic well by the State Engineer.

The *State of Nevada Demographer* and the *State of Nevada Division of Water Planning*, estimates total domestic water uses, including M & I, in **2005** are **16,729** acre feet. The forecasted domestic uses for **2025** will be **14,780** acre feet annually. This represents a decline in domestic uses of 1,949 acre feet or -11.65%. **Elko County** forecasts that over the same period domestic uses, including M & I, will increase by 6.67% or **17,844** acre feet annually in **2025**.

Table 18 - Household Water Usage	**Without Water Saving Fixtures**	**With Water Saving Fixtures**
Toilet, per flush	3.5 - 7 gallons	1.6 gallons
Showerhead, per 5 minutes	15 - 40 gallons	10 - 12.5 gallons
Kitchen/lavatory faucet, 5 minutes	14 - 35 gallons	11 gallons
Dishwasher, per load	14 gallons	9.5 - 12 gallons
Washing machine, per full load	55 gallons	42 - 47.5 gallons

Average annual residential use.....200 gpcd
Outdoor use.....110 gpcd
Indoor use..... 90 gpcd

Sources;
California Dept. of Water Resources, "Water Plan: Benefit/Cost Analysis Software for Water Management Planning - Water Conservation Assumptions", Oct. 1989.
Gupta, V.L. and D.E. Carlson, "Residential Water Consumption in Reno-Sparks, Nevada", Desert Research Institute Publication No. 41059, University of Nevada System, 1978.
Vickers, A., "Water-Use Efficiency Standards for Plumbing Fixtures: Benefits of National Legislation," American Water Works Association Journal, Vol. 82, No. 5, May 1990.
Westpac Utilities, "Water Conservation Plan for Reno/Sparks Metropolitan Area - Draft Report", Reno, Nevada, March 1992.

COMMERCIAL & INDUSTRIAL WATER USE FORECAST: Northeastern Nevada region is the third largest gold mining community in the world and is also home to many casinos, hotels/motels and recreational uses. While the mining industry is going to be a large part of this region's economy for the next 15 plus years, it is through strategic planning and forward-thinking that diversification will be accomplished. Economic diversify in this region while the economy is strong rather than relying on mining to be the prime underpinning of the region's economy is imperative. Mining and its supporting industries are a very important basis to begin from in diversifying the economy.

The City of Elko serves a five county area as a hub for retail, services, and housing, especially as it relates to the mining jobs located outside of this core area. Casinos or casino hotels employ approximately 4,800 persons in Elko County and are expanding. However, many of the people that work in Jackpot and West Wendover casinos live and/or spend their earnings in Idaho or Utah and exist to attract the target markets of those states for gambling. The City of Elko is experiencing moderate growth in the gaming industry. Forecast for

commercial and industrial uses in Elko County are primarily mining, transportation, recreation and gaming based types of business. Currently there are numerous vacant industrial and commercial lands. Industrial uses are anticipated to be primarily mining and transportation based due to our proximity to resources necessary for manufacture, including water.

Potentially, incorporated cities could provide necessary resources, such as water for manufacturing or beverage production. However, location and transportation issues have caused the manufacturing companies to locate elsewhere. The Elko County Board of Commissioners and the Elko County Economic Diversification Authority have implemented plans of a Multi-Modal Trans-loading Facility. The development of this facility could potentially open rail and transportation corridors to help establish Elko County as a manufacturing and transportation hub for Northeastern Nevada.

Elko County estimates, based on current growth and development patterns, indicate that Commercial and Industrial uses in Elko County will increase or hold steady through 2025. It is estimated that by the year 2025 Elko County total Commercial & Industrial water uses will withdraw **17,597** acre feet annually. This represents an increase from total water use in 2005 of **16,493** acre feet annually, or 6.3 %.

WATER RIGHTS: The water in Nevada on the surface and below the ground surface belongs to the people of the State. Entities within the State can apply for the right to use that water. Nevada Water Law is founded on the doctrine of prior appropriation - "first in time, first in right." Under the appropriation doctrine, the first user of water from a water course acquired a priority right to the use and to the extent of its use.

Nevada Water Law is set forth in Nevada Revised Statutes (NRS), Chapters 533 and 534. In addition, there are numerous court decisions which have helped define Nevada water law. The State Engineer is the water rights administrator and is responsible for the appropriation, adjudication, distribution and management of water in the State. To carry out these duties he is vested with broad discretionary powers. As state statute cites, entities within Nevada are permitted to file and acquire water rights. Elko County should utilize this as a tool to potentially protect exportation of ground and surface waters from the county as well as ensure that water rights are available for future uses. Filing for ground and surface water should be made and held by the county for application of future needs. It should not be the intention of the county to hold water rights for any other reason other than the protection of Elko County water for municipal uses associated with specific uses. The application and acquisition of water rights by Elko County will require the development of a county Water Resource Manager / Water Master or Natural Resource Manager.

DROUGHT MANAGEMENT: As Nevada is the driest State in the Nation, drought is relatively common and expected. Every 6 out of 10 years, the major rivers in the state experience below average flows. For most of Nevada, which depends mostly on stream flow for water supply, a drought is considered to be a period of 2 or more consecutive years in which stream flow is much less than average. The most significant droughts were during 1928-37, 1953-55, 1959-62, 1976-77, and 1987-92. Droughts can magnify quality problems for surface and ground-water sources. By decreasing stream flow, droughts tend to lessen the quality of remaining water for human and wildlife uses. Droughts also can cause more reliance on ground-water sources which may stress the resource beyond its long-term potential.

Communities in Elko County have done very well coping with drought conditions. Midas and Tuscarora have had their springs dry up resulting in temporary water hauling operations to provide drinking water. Both of these towns are switching to more reliable ground-water supplies. Water management and water conservation efforts have allowed the citizens of Elko, Carlin, Wells, Spring Creek and West Wendover to continue outdoor watering, even with their main source of water greatly reduced. Agriculture has also been severely impacted by drought conditions. The Elko County Water Resources Management Plan, by the document, adopts and implements the State of Nevada Drought Plan. The enforcement of all conservation methods and policies provided herein will require the development of a county Water Resource Manager / Water Master or Natural Resource Manager.

RURAL LAND USE AND WATER MANAGEMENT PLANNING: Historically, rural planning in Elko County has been based on development patterns and ***Local Area Master Plans***; Spring Creek / Lamoille Master Plan, South Fork Master Plan, Jackpot Master Plan and the 1971 Elko County General Plan and land use zoning. Land use patterns in Elko County now commands that a full comprehensive Land Use Master Plan be created that addresses Urban and Rural Development as well as to implement elements of the Water Resource Management Plan. Future land use planning and development criteria will ultimately need to address water consumption and usage. Most residential or domestic development in rural Elko County consists of the development of larger parcels between 2.5 acres and 40 acres. Specific build out Master Plans should be required prior to development to help identify the potential total water consumption of a proposed development along with the potential impacts to a specific area or basin.

Certain aspects of the Elko County Code, Titles 4 (zoning) and Title 5 (subdivision), require review and amendment to examine and provide methods of proper rural planning. Currently, NRS 278 subdivision code provides methods and provisions that permit local government to require land use / water planning and review during the planning process. These provisions should be included in the Elko County Code pertaining to zoning, subdivision and building criteria.

Water Resource Management and Conservation practices should be implemented within the development criteria. Elko County should also take an active role in the management of waters in Elko County. A share of this would be accomplished by the development and implementation of a Water Master position or a Natural Resources Manager. An active role in the protection of water in Elko County will require the filing of water rights applications by the governing body, either the county or specific incorporated city / unincorporated town. Filing and developing water rights for domestic/municipal/agricultural use for the future growth of Elko County will help promote orderly and affirmative development and will help discourage future loss of agricultural lands. Potentially the acquisition of water rights by Elko County will provide for a sustained growth in specific areas that currently provide infrastructure and will support future development. This concept would help to control the pocket, or spot development, that creates hardships to local services such as fire protection, police protection and emergency services.

CONSERVATION & MANAGEMENT: Conservation in Elko County has historically been utilized on a voluntary basis. Most of Elko County's incorporated cities have ordinances that employ water conservation methods as well as contain verbiage that mandates specific water conservation provisions. Current Elko County development criteria does not address water conservation issues. The development of specific mandatory and voluntary water conservation policies and standards code in Elko County is imperative for future development and protection of existing uses. As with all conservation issues, public education, acceptance and implementation are necessary. Ordinance and planning provisions should require a public education process that will promote the need of water conservation during development phases of all subdivisions and structures.

Implemented conservation programs have a potential to influence the State Engineer's policy of requiring 1,800 gpd or 2.02 acre feet annually per domestic well. As previously stated, the *Nevada State Water Plan* cites that per capita a person in Nevada uses 200 gallons of water per day. As cited by **Elko County Planning & Zoning Division**, 250 gallons per day for 2.6 persons per household equates to 650 gallons per day per household,. approximately 1/3 of the total allocated for a domestic well. This would indicate that the State Engineer could revise the state statute, thus, providing the potential of higher densities in areas currently restricted by local and state policies and/or ordinance.

Other conservation techniques include the re-use of treated wastewater for irrigation purposes. For the most part, the use of treated wastewater requires the development of sanitary sewer facilities or retrofitting exiting facilities to treat the water for irrigation use. This is a potential in several outlying areas and un-incorporated towns and communities such as Jackpot, Montello, Mountain City and Spring Creek. The City of Elko currently utilizes the use of grey water for irrigation of several agricultural fields as well as the municipal golf course.

Conservation programs and policies have been implemented and are enforced by the Incorporated Cities in Elko County. Education and voluntary conservation programs are to be developed and implemented by Elko County including, Planning, Zoning and Building Codes that encourage conservation in residential and commercial plumbing fixtures. The Elko County Water Resources management plan promotes that Elko County develop, adopt and implement a water conservation ordinance as well as enforcement policies and procedures. This is to be included within Title 4 and Title 5 of Elko County Code. Conservation should also be promoted within the policies and procedures of the adopted Elko County building code.

FLOOD PLAIN MANAGEMENT: Flood hazards in Nevada are typically underestimated due to the arid climate, few perennial streams, and low precipitation. This state is subject to two types of flooding; rivers overtopping their banks and alluvial fan or flash flooding. Alluvial fan/ flash flooding (*dry mantle*) is potentially more dangerous than riverine (*wet mantle*) flooding because it is unpredictable and the threat is often not apparent, particularly to new residents in the state unfamiliar with the desert environment.

Accurate maps are vital to the local flood plain administrator to make sound management decisions. These maps are used by the flood plain administrator to determine if and how a structure can be built in a flood plain. In some western states, the Flood Insurance Rate Maps were last updated in the late 1970's and 1980's. FEMA is currently working to improve and modernize the flood mapping process. Currently, all maps are needed to

reflect new growth and changes in flood plains to correct inaccuracies in the original maps and to show the annexation of new land that is not mapped.

Elko County Code Title 4 Chapter 13 adopts the Flood Plain Management Ordinance as approved by the State of Nevada Flood Plain Administrator. The ordinance provides procedures for aspects of development in a flood plain. Historically, enforcement of Title 4 Chapter 13 has been through the Building Permit process. This process is reactionary to a building permit application. As demonstrated through flooding of annual and perennial flow streams and rivers in Elko County, it is imperative that a pro-active approach be made to administration of flood plains in Elko County. Detailed local planning will play an essential role in river-basin management in the future. Leadership must focus on a balance of structural and non-structural flood plain management tools.

Coon Creek Summit - Mountain Lake Jarbidge Area

Recognition In Memory Of:

During the ten year development of the Plan two members of the Elko County Water Plan passed away. The two members were Mr. Jeffery Borhauer a representative from Carlin and Mr.Jerry Parker an Elko County at large representative. These two members provided a great deal of knowledge, experience and stimulus into the development of this document. Thank you Mr. Borhauer and Mr. Parker for all that you have provided to this document and to Elko County.

Elko County Water Planning Commission
Elko County Board of County Commissioners

SECTION 2 SUMMARY

Section 2 of the Elko County Water Resource Management Plan offers information and data on a wide range of topics. The Section 2 Summary is intended to briefly offer the reader a compilation of the data and information provided. The data compiled covers information supplied by various entities, including the State of Nevada and county departments. The purpose of the data is to provide the reader a thought or solution to Water Resource Management by providing specific data on growth and development potentials in Elko County. The fundamentals of Nevada Water Law are also discussed in Section 2. This provides basic information to the reader as to how the State of Nevada Division of Water Resources manages water rights and usage throughout the state.

Socioeconomic characteristics specific to Elko County are provided in Section 2. This information provides the reader data pertaining to economic studies developed by the State of Nevada Division of Water Planning. Historical demographics are provided that identify the county's current usage of water and natural resources. This also provides data specific to the economics of Elko County including industry, agriculture, commercial and residential uses while providing estimates of overall consumptive uses of water for each individual demographic.

The Regional Hydrographic Data and Regional and Local Data of Section 2 provides information as to the four hydrographic regions and forty four hydrographic areas located in Elko County. This data is provided by the State of Nevada Division of Water Resources. The data provides data sets such as committed and uncommitted water resources, hydrographic area perennial yields, water right permits and pending applications. The information also provides information pertaining to domestic and municipal uses in the listed areas. Population estimates and projections are depicted from the State of Nevada Demographer and Elko County. The estimates and projections offer a separate and completely different conclusion of future water requirements and demands. Development considerations and statutory planning provisions offer information to assist land use planning considerations of future water requirements. These provisions also discuss the need for planning, considering drought conditions, conservation measures, effects of groundwater pumping, non-point source pollution, safe drinking water flood plain management and other federal, state and local programs related to water resource management.

Report findings summarize all of the data and information of Section 2. The findings address Agricultural, Domestic Commercial / Industrial and Municipal water use estimates and forecasts in the county over the 25 year life of the plan. The findings summarize water rights and water law as well as state programs such as drought management, flood plain management, local interest in the creation of conservation programs, and Rural Land Use.

Based on the data and information provided in Section 2, the Elko County Water Planning Commission and the Elko County Board of Commissioners have developed the following Conclusions and Plan Directives. The Conclusions and Plan Directives offer solutions to fulfill the mission of the Elko County Water Resource Management Plan. The Conclusions and Plan Directives offer a method of implementation of the programs and solutions outlined in Section 2. Future compiled data and information will be included to augment the nature and comprehensiveness of this plan, including hydrographic area analysis and findings utilizing current science and technology.

CONCLUSIONS AND PLAN DIRECTIVES

Preamble: Based on the data and information provided in Section 2, the Elko County Water Planning Commission and the Elko County Board of Commissioners have developed the following Conclusions and Plan Directives:

I. Elko County Water Resource Management Policy:

A) The protection of existing water rights, water uses and un-appropriated water within Elko County is of paramount importance to Elko County's economic and cultural prosperity. Therefore, transfers of water use shall be carefully reviewed and considered in relationship to history, traditions and culture of Elko County.

B) Elko County recognizes that the protection and development of water resources are essential to its short and long term economic base.

C) Elko County shall review and consider the impacts of all existing water users as well as future water rights for all uses including:

1) Agricultural
2) Municipal
3) Quasi-Municipal
4) Commercial / Industrial
5) Domestic
6) Geothermal
7) De-watering

D) Elko County shall encourage alternate methods of water uses including but not limited to:

A) Geothermal
B) Hydroelectric
C) Conservation

E) Inter-basin transfers of groundwater must be approved or rejected by the State of Nevada Engineer. As per State Statute the State Engineer shall consider:

1) Whether the applicant has justified the need to import the water from another basin;
2) If the State Engineer determines that a plan for conservation of water is advisable for the basin into which the water is to be imported, whether the applicant has demonstrated that such a plan has been adopted and is being effectively implemented and enforced;
3) Whether the proposed action is environmentally sound as it relates to the basin from which the water is exported;
4) Whether the proposed action is an appropriate long-term use which will not unduly limit the future growth and development in the basin from which the water is exported; and
5) Any other factor the State Engineer determines relevant.

F) Elko County generally agrees with these provisions regarding inter-basin and intra-basin transfers and hereby adopts them in development of the Elko County Water Resource Management Plan with the following reservations and provisions:

1) State & Private Ownership Monitoring Program
2) Inter-basin & Intra-basin Transfers Monitoring program

II. Elko County Natural Resource Management:

A) Development and implementation of an Elko County Division of Natural Resources including but not limited to the following duties and responsibilities:

1) Track and administrate all Surface and Groundwater water rights, usage, annual duties and withdrawals in Elko County.

a) Governmental application and usage. (Surface / Groundwater / Other)

1) Applications made by all governing entities.

a) Local
b) County
c) State
d) Federal

2) Usage and annual duties

a) Current allocation, usage and withdrawal
b) Future forecasts of usage and withdrawal
c) Commercial and Industrial uses and annual duties
d) Residential uses and duties
e) Municipal uses and duties
f) Municipal recharges and alternate uses

b) Private application and usage. (Surface / Groundwater / Other)

1) Applications made by private parties.

a) Domestic Well
b) Quasi-Municipal
c) Commercial / Industrial
d) Agricultural

2) Usage and annual duties

a) Current allocation, usage and withdrawal
b) Future forecasts of usage and withdrawal
c) Agricultural uses and duties

c) Identify and track all water rights applications, requests for inter-basin or inter-county transfers and other considerations that would have any impacts to the hydrographic basins of Elko County.

1) Correspond and provide guidance to the Elko County Board of Commissioners and county staff regarding future impacts or potential withdrawals of ground or surface water within Elko County hydrographic areas.

2) Coordinate all planning efforts of all governmental agencies including:

a) Elko County

1) Public Works
2) Planning & Zoning
3) Assessor

b) City of Elko

1) Public Works
2) Planning
3) Engineering

c) City of Carlin

1) Public Works
2) Planning
3) Engineering

d) City of Wells

1) Public Works
2) Planning
3) Engineering

e) Bureau of Land Management

f) United States Forest Service

g) State of Nevada Land Use Planning

h) State of Nevada Division of Water Resources

3) Coordinate and track all Water Right applications made and certificated by and for Elko County.

a) Identify hydrographic areas with available ground or surface water rights.

b) Advise the Elko County Board of Commissioners of potential filings.

c) Coordinate, develop and implement a Public Education Program concerning Elko County filings for the acquisition of water rights.

4) Safe Drinking Water Act Compliance:

a) Track all Quasi-Municipal and Municipal water delivery systems for compliance with the Safe Drinking Water Act.

III. Elko County Land Use Planning:

A) Develop and implement a comprehensive Land Use Master Plan with the following considerations:

1) Land use development patterns
   a) Identify existing and potential areas of growth and development
   b) Identify existing local master plans (public & private)
      1) Review and identify master plans that may have conflicting or negative impacts to their respective plan areas concerning water usage, annual duties or projected forecasts.

2) Forecasted or designated land uses and population densities
   a) Commercial / Industrial
   b) Residential
   c) Domestic
   d) Agricultural
   e) Recreation

3) Hydrographic Areas
   a) Current allocation and annual duties
   b) Projected annual duties and necessities for development
   c) Perennial Recharge rates
      1) Hydrology studies or assessment
         a) Recharge rates as per study
         b) Recharge rates as per Nevada State Engineer

4) Flood Plains
   a) Identification of Flood Plains as per FIRM and FEMA
      1) Methods of mitigation
      2) Active enforcement of Flood Plain management as per Elko County Code.

5) Water Resource Conservation Programs:
   a) Develop and implement a county conservation education program
   b) Develop and implement a comprehensive county conservation program
      1) Building codes utilizing conservation materials
      2) Irrigation and outdoor use water conservation program

B) Adopt and implement the State of Nevada Drought Management Plan within all planning activities including:

1) Private Development Master Plan

2) Local Area Public Master Plan

3) County Land Use Master Plan

4) Any method of Subdivision or Re-division of Private Lands

C) Review and amendment of existing Subdivision and Zoning actions within Elko County Code, Title 4 and Title 5.

1) Title 4: all chapters of Land Use Zoning
   a) Create and implement conservation program

2) Title 5: all chapters of Land Subdivision
   a) Create and implement conservation program
   b) Identify potential water use impacts
   c) Identify potential impacts to the hydrographic area
   d) Develop and implement water right allocation and dedication program through the Natural Resources Division.

IV. Hydrographic Analysis:

A) Groundwater and Surface water Hydrographic Analysis Studies of all hydrographic areas of Elko County are to be conducted to provide water recharge rates and perennial yield rates using current technology and science.

B) Partner with the U.S.G.S. and the State Division of Water Resources to conduct and prepare comprehensive Hydrographic Analysis Studies of upper Humboldt River Basin.

C) The Elko County Water Resource Management Plan is to include and incorporate findings of all new studies upon completion and approval of the State of Nevada, the Elko County Water Planning Commission and the Elko County Board of Commissioners.

D) Provide presentation and representation of recharge rate and perennial yield rate data to the State of Nevada Engineer and Division of Water Resources.