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WHITE PINE COUNTY
WATER RESOURCES PLAN

WHITE PINE COUNTY COMMISSION
WHITE PINE COUNTY REGIONAL PLANNING COMMISSION
WHITE PINE COUNTY WATER ADVISORY COMMITTEE

AUGUST, 2006

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EXECUTIVE SUMMARY
2006 WHITE PINE COUNTY WATER RESOURCES PLAN

The 2006 White Pine County Water Resources Plan has been prepared to guide the development, management, and use of water resources within the County during the next fifty years. Decision makers in White Pine County can use the information in the Plan to achieve the goals of: 1) maintaining and improving environmental quality in White Pine County and 2) maintaining and improving quality of life for the residents of White Pine County. The 2006 White Pine County Water Resources Plan identifies the goals and objectives and the institutional framework for the planning process, the guiding principles, and the Water Resources Plan's relationship to other planning documents. The plan details the County's economic history; current conditions and water use; potential development and water use based on projects underway, in development, or under discussion; and possible future economic development. The Plan concludes with a discussion of the issues, goals and objectives, policies, and strategies for management of water resources. The Attachments to the Water Resources Plan provide additional detail on the statutory and regulatory setting, basic hydrographic information, an annotated bibliography on related topics, and the workbook for the GIS database. In addition, the Attachments provide an annually updated demographic profile, an annual evaluation of the progress made in accomplishing the County's water resource goals, and the White Pine County Water Resources Annual Action Plan to implement the Plan's recommendations.

The 2006 Water Resource Plan has been developed in a manner consistent with Nevada State water law and with the assistance and guidance of the state's Water Resource Planning Section.

The Plan envisions growth in the next five to ten years in traditional economic sectors including mining, agriculture, and tourism (which is based largely on outdoor recreational opportunities in the County). In addition it projects growth due to development of the White Pine Energy Station proposed by LS Power, the Ely Energy Center proposed by Sierra Pacific Power, proposed wind energy projects, residential growth including second and retirement homes, new facilities to accommodate increased tourist and business travel, growth of new small industrial firms locating in the area due

to the quality of life, industrial growth due to reinstatement of rail freight service, and increased acreage of irrigated crop land based on existing Desert Land Entry applications. The Plan projects possible economic development over the next fifty years in agriculture, mining and oil exploration and production, residential development, tourism, and industrial development based on the location, known resources, climate and soil conditions, existing land uses, and transportation and transmission corridors. The Plan identifies Steptoe, Spring, Snake, Butte, and White River Valleys as the primary valleys for development in the County. Newark, Railroad, Long, Jakes, Tippett, and Pleasant Valleys support agriculture and some mining and oil exploration activity. Small portions of Huntington, Ruby, Antelope, Deep Creek, Hamlin, Cave, Lake, and Little Smokey Valleys are located in White Pine County but their economic development and water use are tied to development in neighboring Counties. Steptoe Valley currently houses the primary municipal, commercial, and industrial sectors for the County plus historical use for agriculture, wildlife, and tourism. The development potential in Steptoe Valley may exceed its available water resources and the County has identified the need to consider future intra-county, inter-basin transfers of water to accommodate its potential for growth.

The County has identified the need to integrate its planning efforts including water resources, land use, economic development and community development. It identifies a critical concern that potential exportation of water to southern Nevada through the Groundwater Development project proposed by Southern Nevada Water Authority as well as the emergence of private water purveyors who view water as a commodity to be delivered to distant urban markets may conflict with the County's ability to accomplish its goals of maintaining and improving the area's environmental quality and quality of life for White Pine County residents. The need to respond to internal development pressures as well as those from outside the County prompted the plan's focus on an active approach to understanding and managing its water resources for White Pine's future generations. The Plan outlines strategies for conservation, importation and exportation of water resources, water quality, drought protection, monitoring and mitigation, and administrative structures.

The Water Resources Plan is not a static document. It is meant to be used, evaluated, and revised. The Plan calls for annual review of the progress toward accomplishing the goals and objectives; revision of the Plan's recommendations; and establishment of an annual Action Plan. The annual evaluation and revisions will be included as Attachment 5. The Plan will be completely revised at least once every five years to incorporate the annual changes in conditions, projections, and recommendations.

The 2006 Water Resources Plan has been developed through the efforts of the White Pine County Water Advisory Committee and reviewed in open public meetings from mid-2005 through mid 2006. The largely volunteer effort has been supplemented by a grant funded through the Water Rights Technical Assistance Fund which allowed the County to employ Lumos & Associates to provide the technical information and assistance needed for the socio-economic and hydrology portions of the plan. The Committee also relied on the assistance of Kurt Suchsland from the Nevada State Division of Water Resources, Water Planning Section, as well as Alan Welch and Jon Wilson from USGS and its

BARCASS project to assist with review of the 1999 Water Resources Plan and collection and evaluation of the data for the 2006 plan.

The Water Advisory Committee presented its preliminary recommendations to the County Commission at its meeting on June 28. The Draft Plan was reviewed at the Water Advisory Committee meeting on July 20. The Draft Plan was made available for public review and it was reviewed in public meetings by the County Commission on July 26 and Regional Planning Commission on August 2. Public hearings were held and both Boards approved resolutions adopting the 2006 Water Resources Plan as part of the County's Comprehensive Master Plan on _____ by the Regional Planning Commission and August 23 by the County Commission.

CHAPTER 1:

OVERVIEW, GOALS, AND GUIDELINES

The White Pine County Water Resources Plan is designed as a tool to help guide the development, management, and use of the County's water resources. The plan sets forth the goals and guidelines for planning, defines the water resources and issues related to those resources, and provides recommendations for the long-term (fifty year) management of those resources. The White Pine County Water Resources Plan is consistent with Nevada water law and the Nevada State Water Plan.

Introduction

In this chapter, the goals and objectives of the plan are presented along with the principles that guided its development; a history of the process that was used in developing the plan; and the relationship between this plan and other planning documents. Subsequent chapters detail the current and projected water use, the issues associated with the development and use of those resources, and recommendations. The socioeconomic history and baseline as of 2005, the hydrographic data for White Pine County, legal and institutional framework for decisions regarding water resources, and specific plans and management practices aimed at addressing water resource issues are included as attachments to the Water Resources Plan.

Statement of Purpose and Goals

Underlying Philosophy: White Pine County's water resources are its most precious natural resource and are basic to all efforts to preserve the environment and residents' livelihoods, and to meet the needs of area citizens by providing for their economic well being and improving their quality of life.

Goal: The White Pine County Water Resources Plan has been prepared to ensure that sufficient water quantity and quality are available in White Pine County for the next fifty years to maintain and enhance the quality of the environment, to improve the quality of life for residents and visitors to the County; and to expand and diversify the economy of the County.

The implementation of this plan is in the best interest of the County and provides the framework for cooperative .management of those resources.

Objectives:

1) Define the existing surface and ground water resources in the County

2) Identify existing water uses in the County

3) Identify forecasted growth and future water demands for the period 2006 to 2056

4) Identify water supply issues and management practices

5) Identify short and long-term strategies for the use of water resources in the County to benefit its environment and its citizens

6) Implement water resources strategies and evaluate progress in meeting goals and objectives on an annual basis

In addressing these objectives, this plan has adopted many of the principles used to guide the 1999 Nevada State Water Plan. The guiding principles that were adopted in the development of this plan are listed in Table l.

Table 1. Guiding Principles for the Development of the White Pine County Water Resources Plan
l. All of the water resources of White Pine County, whether above or below ground, belong to the public.
2. The water resources needs of future generations of White Pine County residents must be protected with a balanced approach that provides for the County's economic goals without detriment to the social, aesthetic, cultural and ecological values of the County.
3. The appropriation and beneficial use of White Pine County's water resources is administered by the Nevada State Engineer in accordance with the requirements of Nevada Water Law, and by state and federal court decrees and regulations.
4. Public education and public input are vital aspects of water resources planning and all units of local government, water users, and interested parties should participate in the planning process.
5. The White Pine County Water Resources Plan must be aimed at encouraging planned growth within the various economic sectors of the County,
6. Water rights in Nevada are treated like real property that may be bought, sold, or traded under free market conditions.
7. The White Pine County Water Resource Plan should integrate water supply, water quality, water use, and environmental issues, and should be used to guide decisions that affect the water resources of the County.
8. All water resource development and use in White Pine County should be conducted in a manner that is technically, environmentally, and economically sound, and consistent with state and federal laws.
9. The White Pine County Water Resources Plan is consistent with Nevada Water Law and the State Water Plan and prepared in consultation with the stakeholders in the County
10. Water conservation is an important component of the planning and management of White Pine County's water resources.
11. The White Pine County Water Resources Plan must be based upon an understanding of sound science and water resource evaluation and management principles.
12. The White Pine County Water Resource Plan is adopted as an element to the White Pine County Master Plan.

Institutional Framework:

Water resources planning in White Pine County is consistent with County policies and with existing state and federal laws, regulations, and court decrees. In general, the State of Nevada governs the allocation, planning, and management of the water resources, while the state and federal government have enacted a number of laws and regulations that govern key environmental issues that must be carefully considered in the planning and development of the County's water resources. See Attachment 1.

Development Process

The elected officials and volunteer community advisory boards in White Pine County have recognized the need for long-term resource and development planning and worked diligently to accomplish planning goals for several years.

When Las Vegas Valley Water District filed applications on unappropriated water in White Pine County valleys, and the community did not have the financial resources to participate in the efforts to monitor the situation, provide adequate information to analyze the issue, or formulate a response, the community responded by passing a special tax to raise the funds. The commitment of the citizens to provide the funding needed, and the commitment of the local staff and elected officials to attend meetings and participate in the program, is evidence of the importance White Pine County places on its water resources.

1999 White Pine County Water Resources Plan:

White Pine County's Water Resources Plan was written in 1997 through an effort initiated by the citizens of White Pine County. With no outside funding, the original plan was written by in-house staff and a volunteer committee. The following year, a HUD Community Development Block Grant provided the funding to hire an hydrologist to help the County complete the plan. The revised plan was completed and adopted in 1999. Preparation of the preliminary draft White Pine County Water Resources Plan occurred with extensive public input through meetings of the Water Planning Commission and the County Commission. Preparation of the final draft of the 1999 Water Resources Plan involved extensive interaction with members of the White Pine County Water Planning Commission and the public attending Commission meetings. The consultant team received input from the Water Planning Commission and members of the public at Commission meetings held December 16, 1998, February 16, 1999, April 1, 1999, and May 20, 1999. In addition, members of the planning team traveled to Baker and Lund for meetings with residents in those areas. A draft of this plan was circulated for review and comment between May 20, 1999 and June 20, 1999. This final plan reflects input received through this public participation process.

***2006 Revision of the Water Resources Plan*:**

Following the completion of the Water Resources Plan in 1999, White Pine County continued to work with its neighboring counties regarding the Southern Nevada Water Authority, Ground Water Development Project. The community realized the need for a forum to provide basic information on water resources and water rights law as well as an on-going review of the Water Resources Plan and recommendations for revisions. In 2004, the White Pine County Commission formed a Water Advisory Committee to assist it in developing and implementing water resources policies. The Committee identified the need to revise and update the 1999 Water Resources Plan as one of its first priorities and conducted a chapter-by-chapter review. The Nevada State Division of Water Resources, Water Planning Section staff provided assistance with review and revision of basic hydrographic data and a review of the 1999 plan. In early 2006, the County received funding from the Water Rights Technical Assistance Fund to hire a consultant to assist the Committee and County staff with collecting the information needed to revise the plan. The draft plan incorporates the comments on the 1999 Plan from the Division of Water Resources. The plan was reviewed by the Water Advisory Committee, submitted to the Division of Water Resources for their comments, and provided for public review prior to public hearings before the Regional Planning Commission and the County Commission. The draft 2005 Revision of the White Pine County Water Resources Plan was approved by the County Commission and Regional Planning Commission and it was made a part of the County's Comprehensive Master Plan by resolution on *August 23.*

Relationship to Other Plans

The need to plan for the wise use and development of the County's resources, including its water resources, is a theme consistent throughout the County's planning documents.

County and Community Plans **-** The goals and objectives, conclusions, and recommendations of the Water Resources Plan are consistent with the basic goals, objectives, and priorities established in the County's comprehensive planning efforts for industrial and business development, agriculture and mining, tourism and recreation, as defined in the following:

White Pine County Comprehensive Economic Development Strategy,
Annual Planning Documents, 2001 through 2006
White Pine County Overall Economic Development Plans, 1982 through1999
White Pine County Public Land Use Plan, 1998
White Pine County Land Use Plan, May 1998
McGill Highway Area Master Plan, 1998
City of Ely Master Plan and Business Plan, 1998
The Baker & Great Basin National Park Business Plan, September 1998
White Pine County 2002 Strategy for Tourism Development and Community Improvement, 1996-97
White Pine County Economic Recovery Program Action Plan, 1992
White Pine County Silver Star Community Plan, 1990

Each of these County plans has been reviewed and the pertinent portions included in this plan, either through direct incorporation, or by reference. White Pine County is in the process of completing the 2006 Comprehensive Economic Development Strategy and updating its Land Use Plan and Public Land Use Policy. It is a cooperating agency in the Bureau of Land Management, Resource Management Plan process which is in draft form and it is working with the U.S. Forest Service on its Forest Plan process which has just started.

The White Pine County Land Use Plan list nine specific policies regarding water resources:

1. The protection of existing water rights and water uses within White Pine County is of primary importance to the County's economic and cultural well being. Therefore, transfers in water use shall be carefully considered in relationship to the history, traditions, and culture of White Pine County.

2. White Pine County recognizes that the protection and development of its water resources are essential to its short and long term economic and cultural viability.

3. White Pine County shall consider the impact of water users on existing as well as future water rights for agricultural, municipal, industrial, and domestic purposes.

4. White Pine County shall encourage alternative uses of water, including but not limited to geothermal uses and hydroelectric power.

5. White Pine County shall actively engage in providing opportunity for the development of water based agriculture within the County.

6. It is the intent of the White Pine County government to be notified of all state, interstate and other actions that have any impact on the water of the County prior to such actions being initiated.

7. White Pine County shall develop its water use policy to ensure both water quantity and water quality.

8. White Pine County shall participate in the development of riparian management plans in concert and coordination with landowners, ranchers and the appropriate public agencies.

9. No Wild and Scenic Rivers shall be designated in White Pine County without concurrence by White Pine County.

State Water Plan - In 1999, the Nevada Division of Water Planning issued the Nevada State Water Plan. The State Water Plan provides a great deal of information on the water resources and their use in White Pine County at the countywide level. Thus the State Water Plan serves as a useful framework for the more detailed information presented in this plan. In fact, the State Water Plan specifically addresses the need for local water planning and encourages that this planning be done at the basin and watershed level, the approach used in the development of the White Pine County Water Resources Plan. The State Water Plan was developed over a five-year period to serve as a guide to the development, management and use of

Nevada's water resources. The State Water Plan made a number of recommendations concerning water resource issues. These recommendations are summarized in Table 2. Many of the issues identified in the State Water Plan are also issues to White Pine County and are reiterated in the appropriate sections of this plan.

Other Resource Management Plans and Planning Documents - The various state and federal agencies that have stewardship over areas in White Pine County have prepared a number of plans that must be taken into consideration in water resources planning:

BLM Resource Management Plan, in progress

USFS Humboldt Toiyabe National Forest, Ely Ranger District, Forest Plan, in progress

USFS - Humboldt National Forest Land and Resource Management Plan 1986

BLM - Draft Schell Grazing Environmental Impact Statement, undated
BLM - Proposed Egan Resource Management Plan and Final E>I>S., 1984
BLM - Egan Resource Area Record of Decision, 1987
BLM - White Pine Power Project Final Environmental Impact Statement, 1984

NPS - Final General Management Plan Development Concepts Plans Environment Statement Great Basin National Park, 1992
State of Nevada Water Conservation Planning Guide

Goshute Tribe - Deep Creek Watershed Coordinated Resource Management Plan

White Pine County Elk Management Plan, March 1999 (Nevada Board of Wildlife Commissioners)
As 93 percent of White Pine County's lands are under the stewardship of federal agencies, these documents are important in formulating the issues and management practices contained in this plan. Information contained in these documents related to water resources was incorporated into the White Pine County Water Resources Plan either through direct incorporation, or by reference.

USGS, Basin And Range Carbonate Aquifer System Study: In 2004, Congresses funding the BARCASS project through an appropriation in the Lincoln County Conservation, Recreation, and Development Act to study water resources in White Pine and Lincoln County. The study is underway and meetings are held in White Pine County on a regular basis to report its progress. The draft BARCASS study is scheduled for release in 2007 and results will be used to assist White Pine County to implement the recommendations of its Water Resources Plan.

Table 2		
Category	**Issues**	**Recommendations**
Water Supply and Allocation	Water Conservation	Establish state Office of Conservation; revise plan requirements; formalize credits for conservation; technical assistance to farmers; fund demonstration projects; meter public supplies; increase reuse of water; start water measurement pilot program
	Integrated Water Management	Refine perennial yield estimates; increase recharge/recovery projects; increase multiple source use
	Inter-basin and Inter-county Transfers	Recognize net value of transfers; ensure transfers are justified, environmentally sound, consistent with regional plans, and do not unduly limit growth; encourage mitigation plans; provide assistance to local government; additional research on water banking and water marketing
	Water Use Measurement & Estimation	Develop and fund a comprehensive water use measurement and estimation program
	Domestic Wells	Notify counties of impacts of parceling; inventory domestic wells; educate well owners; fund regional water supply and/or wastewater treatment where water quality is impaired.
Water Quality	Non-point Source Pollution	Continue non-point source program
	Comprehensive Ground Water Protection and Management	Support state groundwater protection program; develop monitoring network; support evaluation of gasoline additives; expand regional water supplies where septic tank pollution is an issue
Resource Conservation and Recreational Uses	Maintenance of Recreational Values	Continued resource evaluation and planning; continue acquisition of water rights for recreational purposes; increase watershed and water recreation research and management
	Water for Wildlife and Environmental Purposes	Develop integrated plan for management; adopt policy encouraging acquisition of water rights for wildlife; establish incentive based restoration programs; establish working group of experts to study alternative water supplies for wildlife
Flood Management	Flood Management in Nevada	Develop modeling capability; develop plan to update flood maps; basin planning; review watershed management plans
Water Planning and Management	Watershed Planning and Management	Develop planning strategy; support local planning; continue basin plans; fund planning
	Water Resources Data Management	Develop GIS; establish water use, water level, and water quality monitoring networks; support research projects to update perennial yield estimates
	Water Planning Assistance to Local Governments	Enhance assistance to local governments; improve water use measurements and estimates; improve data management and sharing; enhance management and planning
	Water Education	Expand water education funding and staffing; increase program evaluation and coordination with water education activities

CHAPTER 2
WHITE PINE COUNTY ECONOMIC TRENDS, PROJECTIONS, AND WATER USE

I. INTRODUCTION

Future population and future economic activity in White Pine County will determine future water use, therefore a careful description of the current economy and population, and identification of changes and emerging trends in economic activity and population are important for water resources planning. This chapter presents information on the economy, population, and water use of White Pine County. It is organized into three sections covering the history, the recent past and present (1975-2006), and potential future economy and population of the county (2006-2056). Attachment 2 provides a current demographic profile as well as detailed analysis of the County's historic socio-economic trends and potential development.

Trends in employment, in the mix of industries, and in population were identified through an evaluation of data gathered from various sources including the Nevada Department of Employment, Training, and Rehabilitation, the Nevada State Demographer, the U.S. Department of Commerce, and White Pine County.

II. ECONOMIC HISTORY

White Pine County's economic prosperity has traditionally been tied to the mining industry. In its earliest history, the County's settlements were gold and silver mining camps and boomtowns. In the early 1900's, copper mining and the construction of the Nevada Northern Railroad changed the pattern of employment. After initial development by a series of owners, copper resources in White Pine County were acquired by Kennecott Copper, which became the County's largest employer. From 1906 to 1978, White Pine County's economy was dominated by the copper industry. For many years, the value of White Pine County's mineral production was higher than all of the other counties in the state combined. Total production of the Robinson Mine during this period was more than 5 billion pounds of copper, 8 million pounds of lead, 14 million pounds of zinc, 15 million ounces of silver, and 3 million ounces of gold.

Kennecott provided more than simply jobs and revenue. The company developed and operated local housing including the company towns of Ruth, near the Robinson Mine, and McGill, near the smelter operation in the Steptoe Valley. Kennecott management provided leadership for local government and community activities. The company provided transportation, maintenance, recreation, and employee training.

In 1978, Kennecott closed the mine and began to cut the work force at the smelter until the smelter and the railroad closed as well in 1983. During this period White Pine County lost 1,600 jobs, an $18 million annual payroll, 25 percent of its population, and 24 percent of local tax revenue.

The loss of Kennecott operations led to deep and long-lasting changes in the economy of White Pine County. The local economy continues to evolve today, partly as a result of economic diversification efforts undertaken by County leadership, partly as a result of region-wide economic development and population trends.

Throughout the 1980's and 1990's, White Pine County's prosperity continued to fluctuate with the boom and bust cycle of the mining industry, but at the same time the County began to find ways to diversify its economy. Early projects to diversify the economy did not always provide immediate success, but provided the groundwork for an eventual transition to a local economy less dependent upon mining.

The community worked closely with Los Angeles Department of Water and Power to develop a coal-fired electrical power plant in North Steptoe Valley. The project secured critical permits including water rights,

air quality, and a Record of Decision to use BLM land for the project site and transmission corridor. A changing demand picture and regulatory climate in California brought the project to a close in 1997. However, water rights, community knowledge and support, and background information collected for the project provided resources for future power project efforts.

During the early 1980's the County established an industrial park and pursued location of a state medium security prison in the area. Early land sales in the industrial park were slow, and businesses locating in the park did not necessarily generate new jobs for the community. The medium security prison was eventually sited in Jean, but the effort prepared the community to pursue the location of a maximum-security prison in the county, and the Ely State Prison was built in White Pine County in 1989. The prison now provides a stable source of 380 jobs, purchases products and services locally, and its workforce contributes to the tax base.

In 1987, a cooperative effort of local, state, and federal officials led to the designation of Great Basin National Park. The donation of Nevada Northern Railroad historic buildings and rolling stock to the City of Ely provided the basis for a historic railroad museum and tourist train ride. Both projects provided media exposure, increased visitors, and established White Pine County as a tourist destination. These initial efforts to increase tourism in the area resulted in new special events and private sector investment.

In 1993, Magma Copper from Arizona purchased Alta Gold's interests in the East Robinson copper mine and began the permitting process to reinstate copper mining at the site. Magma began copper mining in 1994, projecting a 17-year mine life. Businesses invested in expansion and renovation and the area experienced its first major new housing construction in forty years. Rail freight service was reinstated to haul copper concentrate from the mine to Magma's smelter in Arizona. In 1996, the mine was sold to Broken Hill Properties (BHP) from Australia. By 1998, there were concerns about the stability of the copper market and in mid-1999 BHP closed all of its North American properties, laying off 433 employees, but effects on the local economy were less extreme than when Kennecott closed the mine and smelter 20 years before. With the closure of the copper mine, the lease to operate on the Nevada Northern track was terminated. The community was concerned that the owner of the track, Los Angeles Department of Water and Power might sell the track for scrap and the potential for future power project and industrial development requiring access to rail service would be lost. The community began to work with Los Angeles Department of Water and Power, state and federal officials, and granting agencies to develop the funds to purchase the track.

The County focused industrial development activity on its local entrepreneurs and its Home Grown Jobs program identified over forty local businesses creating products and services that were being marketed outside the area. Private civic and business improvement organizations also began to play a role in the effort towards economic diversification in White Pine County. The Ely Renaissance Society was established in 1999 to "bring about the introduction of culture and fine art into the community of Ely," and has directed the production of several outdoor murals and sculptures in Ely's downtown.

The energy crisis in 2000 and 2001 generated new interest in the area's potential as a site for a coal fired electrical power plant. Several energy producers expressed interest in the area, and in 2001, the County signed an agreement for the use of its permitted water rights with PG & E, Energy Development. The proposed project did not move forward and the agreement expired in 2003. Later that year, the County began to work with LS Power Development, LLC and in early 2004, it entered into a similar agreement for the use of the permitted water rights with LS Power to develop and construct a 1600-megawatt plant.

Historic Water Demand:

Estimated annual water use by type, by acre-feet per year shows that the primary use of water from 1985 through 1995 was irrigation followed by mining and domestic uses. Between 1990 and 1995, use of water for mining increased dramatically with the reinstatement of activity at the Robinson Copper mine at Ruth.

Table 3
Historic Water Demand

Category	1985	1990	1995	Percent
Domestic (including public Supplies)	2,543	2,856	3,148	3.16%
Commercial	280	3,271	246	.25%
Industrial	0	0	0	0
Thermoelectric	0	0		
Mining	1,098	3,831	11,560	11.60%
Livestock	3,562	269	269	.27%
Irrigation	99,223	89,276	84,187	84.47%
Public Use & Losses	314	314	258	.26%
TOTAL	107,019	99,817	99,668	100.00%

1999 Nevada State Water Plan

III. CURRENT ECONOMIC CONDITIONS:

Mining and Industrial Activity:
In 2004, the BHP interests in the Robinson Copper mine were purchased by Quadra Mining, of British Columbia. Mining activity was reinstated in July and it is currently at full operation with total employment of 500. The company is developing projects to process molybdenum as well as gold and copper and it is exploring potential to increase processing activity at the mine.

By 2006, the White Pine Energy Station, LS Power Development, has completed several of the critical steps in its development phase: the Draft Environmental Impact Statement is due for release in late summer, 2006; the air quality permit application has been accepted by Nevada Division of Environmental Protection, and the application for the project has been submitted to the state's Public Utilities Commission. Construction is anticipated by mid-2007. In addition, LS Power has purchased the permitted right-of-way for the Southwest Intertie transmission line from Twin Falls, Idaho through Las Vegas, and it is a partner in a 200 megawatt wind energy project proposed for the Egan Range on the West side of north Steptoe Valley. In early 2006, Sierra Pacific Power Company announced its intention to site a 1500-megawatt coal fired plant in North Steptoe Valley with the option to construct an additional 1000-megawatt coal gasification plant in the future.

Also in early 2006, the City of Ely reached an agreement with the City of Los Angeles and through a provision in the federal Transportation Bill, it acquired the land under the track from the Bureau of Land Management. Funds are in place to begin renovation of the track so that rail freight service can be reinstated. The acquisition of the rail line is a critical step in providing the infrastructure needed to support the coal fired electrical power plants, meet the needs of the mining and oil industry, and open the door for increased industrial development and diversification.

The County is beginning to attract new small, industrial firms to the area due to its resources and quality of life including two metal fabrication businesses located at the Industrial Park and they are manufacturing products for worldwide markets. A wood pellet manufacturing is locating in the area to utilize waste wood from fuels reduction projects on federal lands, a metal building contractor, and an electrical supply house are locating in the Park. New activity at the Industrial Park represents 45 to 50 new jobs in manufacturing and construction. There are only ten acres remaining for sale in the developed portion of the Park and the County is working with the Bureau of Land Management and Congressional Delegation for expansion of industrial property at the Industrial Park, Airport, and along the Nevada Northern track.

Agriculture:

Agriculture has been the most constant of White Pine County's economic sectors. The primary form of agriculture in the County is livestock grazing and irrigated hay land and pastureland. Agriculture makes a significant contribution to the area's economy and quality of life. It represents total annual sales of $14,264,704. An analysis of cattle farming and ranching is estimated to have a total direct and indirect economic impact of $14,700,000. Limiting factors that control the acreage under irrigation are the availability of land and pumping costs. Under today's economic factors, the cost of electricity for pumping water are moderately beneficial and according to Mt. Wheeler Power's Public Services Director, new equipment and improved efficiency will encourage ranchers to increase irrigation by pumping groundwater. According the to Bureau of Land Management, there are forty-eight Desert Land Entry applications pending in White Pine County for a total of 14,770 acres.

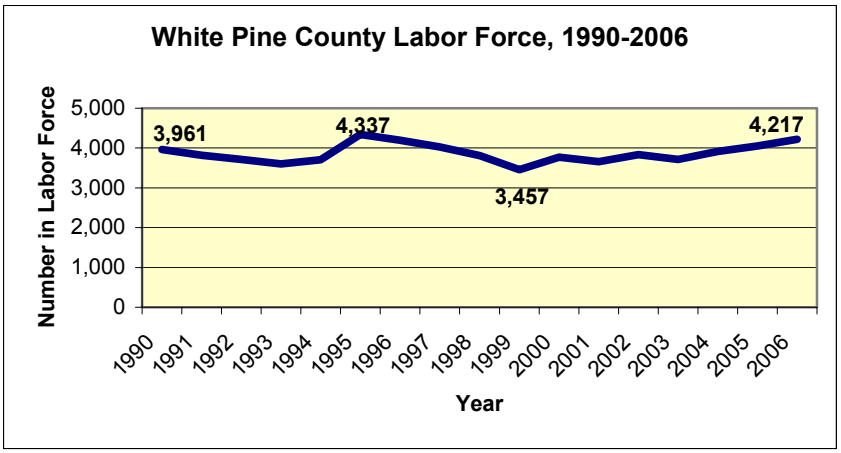
Tourism, Travel, Retirement and Leisure

Based on estimates from White Pine County Room Tax Revenues, visitation at Great Basin National Park and Cave Lake/Ward Charcoal Ovens State Park, and reports of angler and hunter days, tourism and travel generates between $25 and $30 million in revenue for White Pine County annually. Both the National and State Parks report 80,000 visitors per year. The Tourism and Recreation Board reports $481,500 in room tax revenue in 2005 that equates to approximately 96,000 visitors staying in motels in the County each year. Based on the Employment Security Department records, Leisure and Hospitality Industries accounted for 500 jobs in White Pine County in 2005.

The County has identified a developing leisure and retirement industry with the increased purchase of retirement and summer homes by southern Nevada residents wanting to take advantage of the area's outdoor recreation and quality of life. The County Assessor reports an increase in 123 housing units between 2003 and 2005, with over half of the buyers listing Clark County addresses. The average price for property purchases in the county has doubled since 2003, and the average three-bedroom home in White Pine County is now selling for $150,000. Land sales have almost tripled and land division activity has quadrupled between 2000 and 2004. Taxable sales in home improvement categories also increased, as new owners remodeled older homes purchased as second and retirement homes.

Employment Patterns:

As the line graph below shows, the labor force in White Pine County rose from 3,961 in 1990 to 4,270 in 2006, as of May 2006, the unemployment rate was 3.4 percent with 147 people unemployed and a total of 4,123 employed. The largest single employment sector is Public Employment with 1,474 employees representing 34 percent of the workforce. Public employment includes the regional offices of Bureau of Land Management and U.S. Forest Service in Ely, Great Basin National Park, Ely State Prison and Ely Conservation Camp, multi-county offices of federal and state agencies, White Pine County, City of Ely, and White Pine County School District. Services are the second largest sector with 1,379 employees for 32 percent of the workforce. Mining ranks third with 628 employees (14.5 percent); Trade, 567 employees (13 percent); Construction, 152 employees (3.5 percent); Finance/Insurance/Real Estate, 90 employees (2.3 percent); and Manufacturing, 30 employees (.7 percent).



SOURCE: Nevada DETR

Population

The table at right and the line graph below show the Nevada State Demographer's official population estimates for White Pine County from 1986 to 2006. The Nevada State Demographer annually estimates the population of Nevada cities and counties using one of two methods laid out in the Nevada Administrative Code: a housing unit model or a regression model. (NAC 360.335 and NAC 360.340)

White Pine County Annual Population Estimates			
1986	7,890	**1995**	9,609
1987	8,000	**1996**	10,134
1988	8,390	**1997**	10,185
1989	8,650	**1998**	9,991
1990	9,410	**1999**	9,767
1991	9,296	**2000**	9,181
1992	9,141	**2001**	8,783
1993	8,953	**2002**	8,863
1994	8,881	**2003**	8,842
		2004	8.968
		2005	9,275
SOURCE: Nevada State Demographer			

The line graph and chart show that the estimated population of White Pine County has fluctuated over the 1986-2002 period, reaching a high for the period of 10,185 people in 1997. While the population has fluctuated over the period, a trend line fitted to the data shows that the overall trend in population over the period is slightly upward.

Population estimates for 2003 through 2005 show a slight decline to 8,842, a .2 percent decrease followed by an increase to 8,966 in 2004 (1.4% increase) and 9,275 in 2005, a 3.4% increase. By mid-2006, White Pine County had been identified as the fourth fastest growing County in Nevada and the 46th fastest growing County in the nation. And, has been named the next boomtown by the National Association of Residential Real Estate Executives. The County is experiencing workforce and housing shortages, and its local governments are struggling with issues related to growth and development.

Current Water Demand and Commitments:

The current demand for water in White Pine County is not known precisely and has been estimated on the basis of information that is available. Water commitments have been compiled from the Division of Water Resource Data Base for Underground and Surface Water. Current water use falls into seven categories: Public Water Supply Systems, domestic wells, mining, agriculture (both livestock grazing and irrigation), business and industry, recreation and tourism, and environmental quality. Estimates of current water use have been derived from updating water use to current populations, contacting the mines for current water use, and identifying environmental factors and uses on public lands.

According to the records of the Nevada Bureau of Health Protection Services, there are 24 public water supply systems in the County. There are three municipal public water supply systems serving the needs of residents in the County.

The Ely Municipal Utilities System provides water and sewer services to residents of Ely and the immediate vicinity as well as operating the County's landfill; the McGill Ruth Consolidated Water and Sewer General Improvement District provides services to the communities of Ruth and McGill, and the Baker General Improvement District provides water and sewer services to the residents of Baker. The Ely municipal system serves approximately 2,000 residences and 180 businesses. This includes 209 connections outside the City limits, 176 of which are residential. The Ely system serves the County's Industrial Park, Airport, and Fairgrounds, all located outside the City limits. Ely's primary water source is Murry Springs and it supplemented by three high volume wells. Five tanks provide water storage, each with a capacity of 1.4 million gallons and a total storage capacity of over 7 million gallons. According to the quarterly reports to the Division of Water Resources, Ely Municipal Water system pumped 4,833 acre feet in 2004. The system is linked to the Ruth water system to provide back up water supplies at needed to meet peak demand. The City of Ely holds permits for over 14,000 acre-feet of water. There are two privately owned public water supply systems in Ely. The Valley View Trailer Park reports 40 service connections and a total population served of 100 people with an annual use of 48 acre feet or a per capita water use rate of 425 gallons per day. The Doutre Trailer Park has 22 service connections and serves a population of 50 with a per capita water use rate of 200 gallons per day and reports that it used approximately 13 acre feet in the past year.

The McGill Ruth General Improvement District serves 719 residential and 45 business customers in McGill and 250 customers in Ruth. The McGill system uses two wells with a combined capacity of 1.5 million gallons per year and the system operator reports that the community used approximately 400 acre feet in the past year. The community of Ruth draws its water from four springs on Ward Mountain. Although Ruth is located in the Steptoe Hydrographic Basin, its water source drains is in the Jakes Valley hydrographic basin. The system has 163 service connections and reports water use of 390 acre-feet per year. The community of Ruth cannot meet water demand at peak periods requiring severe watering restrictions in the summer and causing concerns for fire protection. A back up system is in place to allow the City of Ely to assist Ruth with water from Murry Springs.

The Baker General Improvement District provides water and sewer services to Central Baker and water to residents of South Baker. The District serves 72 connections or 180 people and water use is estimated at 98 acre-feet per year. Expansion of the water system to serve 17 existing homes and 32 home sites in the Lehman Creek residential area has been funded but the GID has not been able to secure water rights. Based on reported use by the operator, Baker GID customers used 34 acre-feet of water in the past year.

The community of Cherry Creek is served by a privately owned water system and has approximately 23 connections. The Cold Creek Mobile Home Park, located in the northern portion of the County and housing employees of the Bald Mountain Mine serves 35 people and reports water use of 8 acre feet per year. The Lund Elementary School and High School serve 125 students ten months of the year. Great Basin National Park serves a population of 90,000 visitors per year and visitation is concentrated in a three to four month period during the summer. The park employs 45 FTE's which represent 30 full time, year round employees and approximately 36 seasonal employees. Park facilities include its shops, office building, the visitors' center at the park, campgrounds, and picnic area as well as employee housing and the Lehman Caves Café, a commercial venture housed in the Visitors' Center. A new Visitors' Center in Baker opened in 2005 and is served by the Baker General Improvement District. Total water use is estimated at 16 acre-feet per year and water supplies at the Park have been insufficient to meet peak summer demand. The park has adjudicated water rights of 109.5 acre-feet per year from Cave Creek.

The majority of the County's business and industrial use including tourism is accounted for under the public water systems. Recreational use includes the area's reservoirs Cave Lake (320 surface acres, 784 acre feet storage capacity), Comins Lake (400 surface acres, 290 acre feet storage capacity), Illipah Reservoir (15 surface acres, 300 acre feet storage capacity) and Bassett Lake (120 surface acres, 1,300 acre feet storage capacity). According to the Nevada Division of Water Resources, there have been at

least seventeen water wells drilled for industrial and commercial purposes since 1983. At an assumed rate of 3 acre feet per year, the total demand outside of public water supply systems is approximately 50 acre feet per year for the County.

Environmental use of water resources includes consumption attributable to wildlife, evaporation from surface water, and transpiration from plants. The Nevada Department of Wildlife estimates 2,500 elk, 27,000 mule deer, and 5,000 antelope live in White Pine County and the Bureau of Land Management estimates the wild horse population in the Ely District is approximately 4,500. Assuming that water consumption is approximately equal for cattle, elk, and wild horses and for sheep, mule deer, and antelope, wildlife consumption in the County is approximately 350 acre feet per year. The evaporation rate estimated for surface water in the County is 42 to 609 inches per year. Evapotranspiration rates in the County vary widely by vegetation types from a few inches to over three feet, but in most areas it is limited by lack of water available.

Ely State Prison and Ely Conservation Camp both operate public water systems for inmates and staff. The Prison houses 1,030 inmates and 370 staff while the Conservation Camp houses 150 inmates and employ 12 staff. Water use is estimated at 125 acre-feet per year.

The KOA campground near Ely operates a public water system for 17 residential service connections and 80 RV hook ups. The operator reports use of approximately 26 acre-feet per year.

There are 522 domestic water wells in the County including those serving the residents of Lund and Preston. The communities of Lund and Preston, 35 miles south of Ely, are zoned for one-acre parcels and the 450 residents rely on 58 domestic wells and septic systems. The Division of Water Resources Water Planning Section estimates 2.02 acre-feet annually per active well for 1,106 acre-feet for domestic well use in 2005. Based on contacts with the environmental staff at Quadra Mining Company, it uses 10,000 acre feet of water per year for mining operation and personnel and the State Engineer's office reports Bald Mountain Mine pumped 290 acre feet of water in 2004. Kennecott reports that its water use to irrigate the tailings has dropped to 18 acre-feet per year. Total mining use is approximately 10,308 acre-feet per year.

Agriculture represents the largest single water use in the County. Figures on agricultural acreage, acreage under irrigation, and pumpage vary widely from agency to agency. White Pine County is working with the County Assessor, USDA Natural Resource Conservation Service, and the State Engineer's Water Planning Division to develop an accurate estimate of water use and water commitments for agricultural uses. According to N.R.C.S., the county has 231,000 irrigated acres for a withdrawal of 117,900 acre-feet per year and consumptive use at 70,350 acre-feet. According to the 2002 Census of Agriculture the County has 33,592 irrigated acres. According to the State Engineer's Office, the County's use of water for agriculture may be as low as 49,450 acre-feet per year. The County's livestock industry has 24,000 head of cattle, 14,000 head of sheep, and 2,000 head of horses. In water use this converts to 562 acre feet per year for cattle, 146 acre feet per year for sheep, and 38 acre feet per year for horses, for a total of 746 acre feet per year for all livestock. Lack of reported data and the variables in agricultural use, efficiency, and consumptive uses makes it difficult to identify a specific water demand for the County's agricultural industry.

Table 4
Estimated Current Water Demand

Water Use	Estimated Acre Feet/Year	Source
Public Water Systems		
City of Ely, Municipal Water System	4,833	DWR
Valley View Trailer/RV Park	48	Est./Pop.
Doutre's Trailer Park	13	Operator
Ruth Water System, McGill Ruth GID	390	Operator
McGill Water System, McGill Ruth GID	400	Operator
Baker GID	34	Operator
Cherry Creek Private Water System	31	Est./Pop
Cold Creek Mobile Home Park	8	Est./Pop
Dept. of Corrections, Ely State Prison, Ely Conservation Camp	125	Operator
KOA Campground	26	Operator
Great Basin National Park	16	Operator
Lund Elementary and High Schools	21	Est./Pop
Total	5,945	
Business, Industry Outside Private Water Systems	50	Est./Pop
Domestic Wells Including Lund and Preston	1,106	DWR
TOTAL	7,101	
Mining		
Quadra	10,000	Operator
Bald Mountain Mine	290	DWR
Kennecott	18	Operator
Total	10,308	
Agriculture		
Irrigation	70,350	NRCS
Stock Watering	746	Ag Census
Total	71,096	
Wildlife/Environment		
Wildlife	350	BLM/NDOW
Total	350	
TOTAL DOCUMENTED WATER DEMAND	88,830	

Current water commitments total 561,117 acre feet per year with 67 percent of the water appropriated for irrigation, 12 percent for Industrial, and 8 percent for mining and milling. Surface water commitments are known to be overstated because the basins are not supplementally adjusted. See Table 5.

Table 5

CURRENT WATER COMMITMENTS, UNDERGROUND AND SURFACE WATER IN WHITE PINE COUNTY, 2005

Use	Ground Water	Surface Water	Total	Percent of Total
Commercial	25 AFA	0 AFA	25 AFA	--
Construction	0	0	0	--
Domestic Use	8	12	20	--
DomesticUseWell Logs	1,107	0	1,107	.20%
Environmental	146	0	146	.03%
Industrial	25,000	43,272	68,341	12.21%
Irrigation	133,110	235,044	373,154	67.22%
Mining/Milling	28,722	14,779	43,501	7.88%
Municipal	5,066	6,924	11,990	2.09%
Power	0	8,676	8,676	1.58%
Quasi Municipal	1,626	1,072	2,698	.49%
Recreation	32	2,178	2,210	.40%
Stock Watering	1,741	7,292	9,033	1.73%
Storage	0	1,591	1,591	.29%
Wildlife	24	32,095	32,119	5.80%
Other	0	495	495	.08%
Total	196,676	353,418	550,094	
As Decreed		11,023	11,023	
TOTAL	196,676	364,441	561,117	100.00%

Based on Division of Water Resources, Water Rights Database

IV. ON-GOING DEVELOPMENT, POTENTIAL POPULATION GROWTH, 2006-2056

While it is difficult to accurately forecast economic and population growth and changes over a 50-year planning period, trends in White Pine County over the almost thirty years since the Kennecott closure do indicate possible future directions for the county. Potential economic and population growth are based on projects that are currently in place and expanding as well as those in the development phase.

The County economy has diversified away from mining, and will probably continue to do so. Mining will remain important, however, for the County has documented mineral resources that will be developed as the regional and world economies and the demand for commodities and precious metals continue to grow. The two major mining operations in White Pine County continue to exploration for new ore bodies and expansion of existing operations to use new technology for extraction and processing. The Division of Mineral Resources reports moderate oil production potential throughout the County and strong potential on the southwestern border of the County including Railroad and White River Valleys. Several exploration wells have been drilled in White Pine County in the past year and the County's service sector is responding to the need for services to oilrigs and operations. Mineral and oil exploration and production will continue to play a significant role in the County's economy, they will always be volatile sectors with defined production life, and as the economy diversifies, the economic impact of mine and oil field closures will be less severe.

Tourism markets and resulting recreation and leisure activities have increased steadily during the last twenty years with the development of the railway and museum, the establishment of Great Basin National Park, and growing populations in western states. Travel, tourism, and leisure should continue to grow in White Pine County. Over the past ten years room tax revenues have increased and local hotels and motels often are full. Current projects include expansion of two existing motels that will generate thirty to forty new jobs depending on the season and construction of a new sixty-unit motel and restaurant resulting in over eighty new jobs. The County and City building inspectors report 18 building permits for homes in progress and four housing projects are in varying stages of review by the Regional Planning Commission, County Commission and City Council. The total projected housing construction for all four projects is 170 homes. New construction and sales includes housing for employees and their families as well as increasing home sales as second or retirement homes for southern Nevada residents. As visitors and new residents travel to or move to the County, business opportunities to provide the visitors and new residents with recreation, health care, cultural events, education, and other services will open up. New home construction and renovation of existing homes will offer increased opportunity for construction employment and increased demand for building supplies.

Perhaps the biggest impact on the future economy and population of the county will be from energy development. White Pine County is advantageously situated for coal and wind energy generation LS Power Development, LLC is in the final stages of development for the White Pine Energy Station, a coal-fired power plant to be located in North Steptoe Valley, 500 mile 500 Kv Transmission line from Twin Falls, Idaho to Las Vegas, and a 200-megawatt wind farm. Construction on the three projects is slated to begin in 2007. Sierra Pacific Power and Nevada Power have proposed another coal-fired plant and another wind farm in Steptoe Valley before 2020. County economic development officials expect that with the development of this "energy cluster," support industries will locate in the area. Construction for each of the coal fired power projects is based on a four-year construction phase with an average of 600 workers in the community throughout the project and a peak workforce of 1,300. Operations are estimated at 100 to 135 employees for a forty-year operating life. This is for direct employment and a fiscal analysis completed by the Commission on Economic Development estimates rail operation, maintenance, and indirect employment will total an additional 150 jobs. The wind energy project is based on a six-month construction time frame with 150 construction employees and an operations workforce of 55.

The County's Industrial Park has fourteen tenants (including sales in progress) for a workforce of 125 to 130 year round with an increase for seasonal employment during the summer. White Pine County has access to 200 additional acres of land for the Industrial Park through administrative processes and has requested the 200 acres plus an additional 800 acres through the Public Lands Bill. The initial 200-acre expansion will house up to forty new industrial sites of five acres each. With an average of five to ten employees per business, the expansion of the park will accommodate up to 400 new employees.

Agriculture continues to play a significant role in the local economy. According to the 2002 Census of Agriculture data for White Pine County, sales of all hay and livestock production totaled $14,264,704. An analysis of the impact of Cattle Ranching and Farming completed by the University of Nevada, Reno, Center for Economic Development showed that based on the 2002 Agriculture Census data, the total direct and indirect impact of the Cattle Industry was $14,172,000 and it supported 189 jobs in the County. The Ely District of the Bureau of Land Management reports 48 applications for Desert Land Entries on file for a total of 14,770 acres. Using applications for Desert Land Entries as a guide, if they were granted water permits and approved, annual alfalfa production would translate into an additional $7,000,000 in direct sales per year and use 50,200 acre feet of water (based on 3.4 acre feet per acre, State Division of Water Resources). Emerging markets that can potentially be met by White Pine County farmers or ranchers include raising organic, range-fed beef, seed oils for biodiesle fuels, and growing native plants and seeds for mine and other revegetation projects. The Cooperative Extension Service Office in Ely reports that it is already working with area ranchers to determine appropriate crops for seed oils for the County's soil conditions and climate. The White Pine County Lands Bill includes funding for the development of an Agriculture Research Center in the County. This facility may make the area a center for research and development of innovative agricultural products and techniques.

Relationship of On-going Development to Population Growth:

Since the population of White Pine County has historically fluctuated with mine openings and closing, projections of future county population that rely on past population numbers may not show a true picture of long term trends. This may be especially true as the industry mix in the county changes, and the new industries providing jobs –and hence population – behave differently than past industries. For example, state and federal public employment like the Ely State Prison is likely to keep a steady workforce for many years, unlike mines that open and close, hiring and laying off workers more frequently. Total new job generation based on projections underway or under development is 2,448. Using a multiplier of .74 for new indirect jobs generated for each direct new job created (based on UNR, Center for Economic Development Implan Model) total job generation is anticipated at 4,260. With an average household size of 2.58 (based on 2000 Census), the total new population due to job generation from potential projects will range from 7,327 to 10,992 depending on the number of dual income households. The University of Nevada, Las Vegas, Center for Economic Development reports a 1.67 multiplier for both indirect (additional support services) and induced (increased public and private sector services) job generation for every direct job generated (Riddel, Schwer, "The Potential Economic Impact of Nevada's Renewable Energy Resources") Using the figure of 1.67 for indirect and induced jobs, potential economic development projects could add up to 6,533 new jobs and a population of 11,237 to 16,800 the county's base population as defined by the Nevada State Demographer.

The Nevada State Demographer's office is responsible for producing population estimates and projections for Nevada counties on an annual basis. These population projections are used in rural Nevada counties for a range of planning purposes. The projections are based on a statistical analysis of previous population trends, employment patterns, and housing patterns. The State Demographer's most recent population projections for White Pine County, issued in July, 2006, show the County losing population over the years 2006 to 2026. If this rate of population loss were projected out to 2056, the County would have a population of only 5,256 people. The projections used in the earlier State Demographer's projection, which was used in the 1999 water plan, showed they County's population growing at a rate that would have increased to 25,205 by 2056. The projection used in the State's 1999 Water Resources Plan showed the County's population starting in 2006 at 11,616 and decreasing to 11,263 by 2020. The projections, based as they are on past trends, do not take into account the potential new jobs and population that will be added in the county by the changing mix of industries the County has experienced during the past two decades. In addition, the projections do not take into account the change in the County's employment to housing unit ratio. In 2005, the County Assessor showed 4,310 housing units compared to a total employed labor force of 4,123. The fact that the number of occupied housing units exceeds the number of jobs supports the trend toward increasing relocation to White Pine County for retirement.

The State Demographer's estimates from 1999 to 2006 show that there was a 17 percent loss in population between the State estimate of 11,150 in 1999 and the 2000 Census population of 9,181. To avoid the variation due to the difference between the two resources. Starting in 2000 with the County's population fell to 8,783 in 2001, rose to 8,863 in 2002, fell again to 8,842 in 2003, rose to 8,966 in 2004 and 9,275 in 2005 for a net gain of 1.18 percent. Using this figure as a guide, the County's population would increase to 15,000 by 2056. In the following tables, the potential population increase associated with specific development projects and potential development trends, called "Economic Growth Population," is added to two different "Baseline" populations – one from the 1999 projection, and one from the 2006 projection. The totals shows what the range of population in White Pine County might be over the 50-year planning time frame. Potential water use associated with specific economic development projects, as well as with general population growth, also are presented in these charts. The State Water Plan projected that in 2006, the County's population of 11,616 would use 4,222 acre-feet in non-agricultural uses. Based on actual experience, the County's current population of 9,275 uses 7,101 in non-agricultural activities. According to the projections of the Water Plan, when the County's population reaches 15,000 it would use 5,452 acre feet in non-agricultural activities but based on current usage, the use will be approximately 11,450 acre feet.

White Pine County Potential New Employment and Population From Future Economic Development, 2006-2056							
Project/ Development	**Number of Direct Jobs**		**Number of Indirect Jobs**	**Total Employment**	**Potential Added Population over baseline**	**Time Frame of project**	
Energy Development							
LS Power: Coal-burning power plant	Construction	600	444	1044	2694	Construction	2007-2011
	Operations	160	118	278	718	Operations	2011-2051
Wind Farm: 200 megawatts	Construction	150	111	261	673	Construction	2008
	Operations	55	41	96	247	Operations	2009 - ?
Southwest Intertie Project (powerline) (LS Power)	Construction	100	74	174	449	Construction	2006-2011
(This is a line between Boise and Las Vegas currently in planning stage, developer is LS Power. WPC had no workforce estimates available yet, so the estimate of 100 construction workers, given here, is very approximate)	Operations		0	0	0		
Potential 2nd Wind Farm: 200 megawatts	Construction	150	111	261	673	Construction	2020
	Operations	55	41	96	247	Operations	2021-?
Potential 2nd coal-fired plant: Sierra Pacific	Construction	600	444	1044	2694	Construction	2008-2012
(Only in preliminary planning stages. Employment estimates are taken from LS Power estimates.)	Operations	160	118	278	718	Operations	2013-2052
Biomass: pinyon-juniper pellets	Operations	60	44	104	269		2006-2020
(assume about 4 small businesses using waste wood from federal pinyon juniper thinning project, assume at least 15 employees per business, based on current employment in one existing business							
Oil exploration and development		60	44	104	269		2015
(There are 50-60 jobs currently in White Pine County is oil exploration. There is a recognized oil resource in the County, but it is difficult to exploit due to geology. However, it is assumed that all global oil resources, including those of White Pine will eventually be exploited as other more easily available sources worldwide diminish, and prices continue to rise. So assume that over the 50-year planning horizon the current workforce in oil exploration and development in White Pine County will at least double							
Energy Development Cluster		800	592	1392	3591		2020
(As White Pine County becomes a center of energy development with a potential 4 or more power plants and the Southwest Intertie Line, it is probable that energy-related support industries will locate in the area. Assume location of one company manufacturing wind turbine components. This company could employ 600-1000 people.)							
Mining							
Robinson Mine	additional	31	23	54	139	addl emps by	2008
(509 employees now with potential to expand to 540 within next two years)						projected mine life of 11 years	2006-2017
Bald Mountain Mine	additional	80	59	139	359		
("Currently Bald Mountain Mine is engaged in several development projects on the east side and southern end of the property, and these are expected to considerably increase the mineral resource" - Placer Dome website)							
Other gold/silver mine		200	148	348	898		2010-2030
(There was exploration work carried out in 5 White Pine County mining districts in 2004. Gold and silver exploration in Nevada has continued and accelerated as the price of gold has increased. Assume that the price of gold will continue to go up with worldwide economic development, especially of China and India, and that continued exploration results in establishment of one new gold mine in White Pine County.)							
Tourism and leisure							
Second Home		30	22	52	135		2010

development							
(New home construction in general as second home owners, retirees, and new workers use up WPC's existing housing stock, either remodel or build new houses. Assume equivalent of one moderate-sized homebuilding company locates in or expands to WPC by 2010.)							
2 resort hotels		150	111	261	673		2015
(Local econ development officials identify critical need for more hotel rooms in Ely - vacancy rates very low. Also assume development of "Border Inn" on h'way 50 east of Baker to serve Great Basin National Park visitors. Each assumed to have restaurant, gaming, 50 rooms. Assume 1.5 employees per room. Assume both hotels open by 2015							
Additional motel/hotel rooms							2020
(Assume about 50 new rooms every 5 years to meet demand, 1.5 employee per each additional room)		75	56	131	337		2025
		75	56	131	337		2030
		75	56	131	337		2035
		75	56	131	337		2040
		75	56	131	337		2045
		75	56	131	337		2050
		75	56	131	337		2055
Expanded Air Service		18	13	31	81		
Other industrial development							
Metal fabrication		45	33	78	202		2020
Small businesses related to metals fabrication have recently opened in the WPC industrial park. WPC econ development officials expect 40-50 new jobs in this sector in next 10-15 years							
Other industry		100	74	174	449		2030
200 more acres will be added to industrial park by pending White Pine County public lands bill. Assume 20 businesses with 5 employees per business							
Agriculture							
Agriculture Research Center		23	17	39.2	101		2020
White Pine County public lands bill includes development of agricultural research center. Assume base staff of 10-20, with 10-20 seasonals. Assume center will be open and fully staffed by 2020							
Increased irrigated agriculture and agricultural support industry		80	59	139	359		
Services							
Health: assisted living facility		50	37	87	224		2020
Estimate based on current employment in similar facilities: The White Pine Care Center employs 60 to 70 people. The assisted living facility in Elko employs 30 people							
Education: expansion of Ely campus of Great Basin College		3	2	5	13		201,520,252,035
Estimate from Great Basin College: "Great Basin College employs just over 200 people and that includes the off campus centers in Ely and Winnemucca. Based on our current employment and the potential for growth, I would guess we could say up to 30 full time employees in the next 20 years and up to 100 full time employees in the next 50 years." Count of current employees (May 2006, website employee listing) is 183: 6 of them in Ely, or about 3.0%. So assume 1 new employee in Ely in 2015, 1 in 2025, 1 in 2035							
Telecommuting		75	56	131	337		
from July 1999 Water Plan							
Employment and population multipliers taken from 1999 Water Plan as follows: Each direct job would cause 0.74 indirect jobs. Population effects based on 2.58 persons per created job.							

Economic Activity	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055
LS Power: Coal-burning power plant	2694	718	718	718	718	718	718	718	718	718
Wind Farm: 200 megawatts	920	247	247	247	247	247	247	247	247	247
Southwest Intertie Project (powerline) (LS Power)	449									
Potential 2nd Wind Farm: 200 megawatts			920	247	247	247	247	247	247	247
Potential 2nd coal-fired plant: Sierra Pacific		2694	718	718	718	718	718	718	718	718
Biomass: pinyon-juniper pellets	269	269	269	269	269	269	269	269	269	269
Oil exploration and development		269	269	269	269	269	269	269	269	269
Energy Development Cluster			3591	3591	3591	3591	3591	3591	3591	3591
Robinson Mine	139	139								
Bald Mountain Mine	359	359	359							
Other gold/silver mine	898	898	898	898						
Second Home development	135	135	135	135	135	135	135	135	135	135
2 resort hotels		673	673	673	673	673	673	673	673	673
Additional motel/hotel rooms				337	674	1011	1348	1685	2022	2359
Expanded Air Service			81	81	81	81	81	81	81	81
Metal fabrication			202	202	202	202	202	202	202	202
Other industry					449	449	449	449	449	449
Agriculture Research Center			101	101	101	101	101	101	101	101
Increased irrigated agriculture and agricultural support industry	50	62	78	96	120	150	186	232	289	359
Health: assisted living facility			224	224	224	224	224	224	224	224
Education: expansion of Ely campus of Great Basin College						13	13	13	13	13
Telecommuting	50	62	76	94	117	144	178	220	272	337
Total Economic Growth Population	5,963	6,525	9,559	8,901	8,835	9,242	9,649	10,074	10,520	10,992
Baseline Population estimate A*	12,200	12,970	13,918	15,216	16,636	18,188	19,885	21,740	23,769	25,205
Baseline Population estimate B**	8,545	7,816	7,445	7,084	6,740	6,413	6,102	5,806	5,524	5,256
TOTAL Baseline Plus Economic Growth, estimate A	**18,163**	**19,495**	**23,477**	**24,117**	**25,471**	**27,430**	**29,534**	**31,814**	**34,289**	**36,197**
TOTAL Baseline Plus Economic Growth, estimate B	**14,508**	**14,341**	**17,004**	**15,985**	**15,575**	**15,655**	**15,751**	**15,880**	**16,044**	**16,248**

*This baseline population estimate is taken from the 1999 Water Plan, which is "based upon average annual growth rate (1.18 percent) derived from 2010-2018 growth forecasted by Nevada State Demographer"

**This baseline population estimate is taken , for the years 2010-2020, from the Nevada State Demographer's Office April 20, 2004 population projections. For the years 2025-2055, the estimate is based on the average annual population loss projected by the State Demographer for the years 2003-2024, which is -0.99%

V. POTENTIAL ECONOMIC DEVELOPMENT, 2006-2056

In planning for a fifty year period and taking into consideration the potential for changes in local, state, national, and global issues, the County has identified possible areas of economic development based on known resources, climate, soil conditions, and location.
The potential has been identified countywide and for those basins with primary development potential.

The County has identified three levels of analysis:

1) ***Primary Analysis***: Those basins which are entirely or primarily within White Pine County, house current municipal or economic activity, and offer potential for economic development due to their resources and location:

   Steptoe Valley
   Butte Valley
   Spring Valley
   Snake Valley
   White River Valley

2) ***Secondary Analysis***: Those basins which are entirely or primarily within White County and do not demonstrate immediate economic development potential beyond current activity:

   Jakes Valley
   Long Valley
   Newark Valley
   Tippett Valley
   Pleasant Valley
   Railroad Valley

3) ***Peripheral Basins***: Those basins which are primarily in another County and activity will not substantially impact White Pine County unless changes in conditions within White Pine County or in the basins will impact activity in White Pine County. Basins identified as peripheral will not be analyzed in the 2006 plan.

   Huntington Valley
   Ruby Valley
   Antelope Valley
   Deep Creek Valley
   Hamlin Valley
   Lake Valley
   Cave Valley
   Little Smokey Valley

Primary Basins:

For the basins identified for *Primary Analysis*, the plan considers location, the acres of private land and land use; acres of public land identified for disposal; climate; population; current and potential economic activity including agricultural production, property sub-divided for development, transportation and transmission corridors, known mineral resources and oil exploration activity, and possible industrial development.

Basis for Consideration of Possible Economic Activity:
Identification of potential economic activity will be based on the following conditions:

Agriculture: current production, potential production based on climate and soil conditions, potential for processing agricultural produce, and agricultural activity displaced from more urban areas (dairies, for example).

Mining and Oil Exploration and Production: Known mineral deposits and previous mining activity, oil exploration and production activity as reported to the State Division of Mineral Resources.

Residential Development: Current land ownership and use patterns, recent trends in land divisions, property sales and development and growth patterns in surrounding areas.

Recreation and Tourism: Current and potential recreation and tourism use of the area based on existing attractions, attractions and activities with potential for recreational development

Industrial Development: potential projects under discussion, transportation corridors, and potential for production based on natural resource development and displaced industrial activity no longer desired near urban areas

Energy Development: potential projects in the development phase, transmission corridors

Public Sector Projects: projects under discussion, areas identified for projects in the future.

Regional Transportation Services: projects utilizing highway, airport, and rail services for the inter-mountain west.

If changes in conditions or activity in the secondary or peripheral basins warrant additional analysis and discussion, they may be added to the Primary Basins during the annual plan evaluation and recommendations.

Steptoe Valley:

Steptoe Valley is located in central White Pine County. It is bordered on the west by the Egan Range and Butte and Jakes Valleys, on the west by the Schell Creek Range and Spring Valley, on the south by White River Valley, and it extends north into Elko

County. The Valley houses the County's primary municipal, commercial, and industrial activity as well as mining, agriculture, and tourism attractions. It is home to the communities of Ely, McGill , Ruth, and Cherry Creek. It houses the Robinson Copper Mine at Ruth. Transportation routes include US Highway 50 east and west, US Highways 93 and 6 north and south; the Nevada Northern Railroad route, and the Valley houses one of the state's four commercial airports. It currently has access to 230 Kv Transmission lines to the west and a 345 Kv line to the east. It will house the 500 Kv Southwest Intertie line for the proposed coal fired electrical power plants. The Ely State Maximum Security Prison is in Smith Valley immediately west of Steptoe Valley. The White Pine County Industrial Park is located between Ely and McGill and houses fourteen tenants including an emerging metal fabrication industrial cluster. The Valley has known mineral deposits of gold, copper, silver, tungsten, iron, lead, garnet, gypsum, molybdenum, and barite; the Robinson copper mine is in full production for copper, gold, and molybdenum; and there have been several oil exploration wells drilled in the area. The state's Renewable Energy Task Force has identified the Egan Range as a strong potential for wind energy development. Steptoe Valley has both warm and hot geothermal resources. The Valley supports traditional agricultural activity of alfalfa and livestock production; it has one bottled water plant in operation; and it has a microbrewery in the development stages. The Ely area has over 600 motel rooms, and the Chamber of Commerce reports that they are full most of the summer and many of the weekends throughout the year due to business travel, providing transitional housing for the area's growing workforce, visitors to the Cave Lake State Park and Steptoe Valley Wildlife Management Area, visitors to the White Pine Historical Railroad museum and tourist train ride, and participants in conventions and special events. The Ely Campus of Great Basin College is one of the fastest growing segments of the college and provides the opportunity for future expansion of educational activity. The proposed White Pine Public Lands Bill also proposes an Agricultural Research Center that will provide additional opportunities for development of educational facilities and economic activity. The urban interface area in Steptoe Valley is experiencing substantial growth and new housing development now extends north of McGill to the Indian Creek and Mattier Creek areas and south to the Ward Charcoal Ovens State Park. The growth is also extending east into Duck Creek Basin and west into Smith Valley. In addition to the potential growth identified in the on-going development, Steptoe Valley can support industrial development along the rail corridor as rail freight service is reinstated. The County has already worked with development of a fire log wax production plant near Ely using the oil production from Railroad Valley and was not able to acquire the railroad in time to locate the plant. The rail corridor has the potential to support additional development in metal fabrication, production utilizing geothermal warm water, services to the coal and wind energy plants, and processing of auxiliary products for the oil industry. The City of Ely has the water resources needed to support additional bottled water operations. The County's airport is in the process of securing land to expand and extend the runway and will be able to support aviation related industry as well as regional air passenger and cargo services. In the area of energy development the Valley can support the proposed coal fired electrical power plants and the wind energy project as well as having potential for biomass development. Steptoe Valley has the potential to continue residential development including second homes, retirement homes, and assisted living facilities; commercial development; tourism and travel facilities including motels, restaurants, microbrewery/winery development, and convention facilities. The Ely State Prison has land for additional expansion. Steptoe Valley can support expansion of traditional economic sectors including mining and agriculture.

Steptoe Valley is a closed basin and future development to meet the needs of White Pine County residents may depend on water resources available. The County's goal is to maintain the balance of development, agriculture, and outdoor recreation in the Valley and it has identified the possibility that in the future it will need to consider importation of water from adjacent basins to help support the growth and development opportunities in Steptoe Valley. The primary basins that could export water to Steptoe Valley are Spring, Butte, and Cave Valleys.

Spring Valley:

Spring Valley is located in eastern White Pine County and is bordered on the west by the Schell Creek Range and Steptoe Valley, on the north by Antelope Valley, on the east by the Snake Range and Snake Valley, on the southwest by Lake Valley, and it extends south into Lincoln County. While there are communities in Spring Valley, it houses several ranches single-family homes. It is crossed by two major transportation routes, east/west on US Highway 50 and north/south on US Highway 93. It is also crossed by two 230 Kv transmission lines. Historically, Spring Valley has supported agriculture including alfalfa and livestock production and mining. There are known mineral deposits and historical mining activity for gold, silver, lead, zinc, tungsten, and copper; there is an active gold mine; and there has been limited oil exploration activity. The state's Renewable Energy Task Force has identified Spring Valley as an area with wind energy development potential and there are wind energy companies exploring the potential of development in that area. Recreational activity includes big game (mule deer, elk, and antelope) and bird hunting, fishing in the streams, and camping and hiking in the Cleve Creek Recreational site and the Mt. Moriah Wilderness Area. Spring Valley has been selected for development by the Long Now Foundation and they have purchased property in south Spring Valley at Mt. Washington for their Millennium Clock project with the potential for future development in the Valley. Spring Valley is beginning to attract investment for second and retirement homes and according to the County Assessor, there are over 3,000 acres of private land in Spring Valley that are currently taxed for single family residences. New activity can include renewed mining activity based on market and technology; expanded agricultural activity for traditional and new crops including seed oils, native seeds for revegetation projects, orchard, hops, or vineyard development; feed lots, and processing plants based on the agricultural produce. Water resources could be used for a bottled water plant. According to the Department of Agriculture, the trout farming industry is growing at a rate of 5 percent per year and cold-water aquaculture would be compatible with existing ranching activity. Spring Valley has the potential to attract new residential development in South Spring Valley from southern Utah and Nevada, and in the north from Steptoe Valley. There has been a proposal for a condominium project in north Spring Valley, and the area could support tourism develop through lodge or motel development, guide services, and historic ranches. Energy development could include wind, solar ponds and/or pumped storage projects, and biomass projects using the pinyon juniper resources.

Spring Valley has been identified as a potential source of additional water for Steptoe Valley if development of industrial and municipal projects create a shortage of water resources.

Snake Valley:

Snake Valley is on the eastern border of White Pine County and houses the community of Baker and Great Basin National Park. The Valley is bordered on the north by Pleasant And Tippett Valleys, on the South by Hamlin Valley, and on the West by Spring Valley. The basin extends into Utah on the east. The major transportation route through the Valley is the east/west route, US Highway 50. It is crossed by two east/west 230 Kv transmission lines. Historically economic activity has been based on agriculture, services to travelers and tourists, and mining. Agricultural uses have included alfalfa production and livestock. In the past there was an apple orchard near Baker. The area also supports commercial pine nut collection. There are known mineral deposits of gold, lead, silver, copper, and tungsten; there have been some oil exploration wells drilled in the valley, and it has substantial resources for crushed and dimensional stone production. The Great Basin National Park draws almost 90,000 visitors per year, primarily in the summer months. Additional tourist activity includes big game and bird hunting and the Hidden Canyon guest ranch. Snake Valley has the resources to support a wide range of dispersed recreation including rock climbing, mountain biking, hiking and backpacking, and cross-country skiing. The area has the potential for residential development from both southern Utah and southern Nevada. Washington County, Utah is one of the fastest growing counties in the United States and Snake Valley offers a cooler climate and mountain scenery for retirement and summer homes. The community of Baker has available land and capacity to support additional commercial development on its water and sewer system. New motel and restaurant services are proposed in the Valley and as the National Park continues to increase its visitorship, there will be the demand for services. There is a strong potential for development of stone quarries and production of crushed and dimensional stone for building materials. Potential for economic development includes alternative crops including seed oils for biodiesel fuels, orchard development, and food processing based on agricultural production. Water resources could be used for cold-water aquaculture, trout farming, which would be compatible with existing ranching activity. The area could also support a bottled water plant and in conjunction with agricultural production and tourism development, possibly a winery and/or microbrewery. Mining exploration and development will depend on market conditions. Two critical aspects to Snake Valley's development and its use of water resources are the developments in the Utah portion of the basin and the natural transportation of water out of the basin.

Butte Valley:

Butte Valley is located west of Steptoe Valley and extends south to US 50 and north into Elko County. It is bordered by Long Valley on the west, the Egan Range on the east and Jake's Valley on the south. While Butte Valley does not house any communities, it is included in the group of Primary Basins because it has experienced some activity sub-dividing land for residential development. Historic uses have been ranching, particularly livestock, cattle and sheep. Butte Valley has been the site of oil exploration wells, but none have gone into production, but has supported limited mining activity. Butte Valley has access to the Falcon Gondor transmission line on the southern boundary of the basin and will house transmission lines and the Robinson Substation for the White Pine Energy Station. The County has applications for 25,000 acre feet of water for power generation in Butte Valley as the alternate site for the original White Pine Power Project and Sierra

Pacific Power/Nevada Power have filed applications for the same points of diversion for the proposed Ely Energy Station. The County has suggested the potential of negotiating an agreement for the use of its applications for that project. Recreational use in Butte Valley centers on hunting including mule deer, antelope, elk in the northern portion of the Valley in White Pine County, and bird hunting. In previous industrial development activity, the Economic Diversification Council has worked with inquiries regarding potential use of ranch property for a hunting lodge. Potential development in Butte Valley includes agricultural use, residential development for commuters to Ely as well as retirement and second homes, energy development including potential for wind, biomass, and solar energy accessing the transmission systems at the southern end of the valley. Butte Valley could also supply water for coal fired electrical power development that could be located in Steptoe Valley to access the rail line. Butte Valley could also provide water to help support mining activity in adjacent valleys and growth of municipal and industrial activity in Steptoe Valley.

White River Valley

White River Valley is located in south central White Pine County and extends into both Nye and Lincoln Counties. It is bordered on the west by Railroad and Jakes Valleys, on the north and east by Steptoe Valley, and on the southeast by Cave Valley. White River Valley houses the communities of Lund and Preston. It is crossed by US Highway 6 to the south and State Route 318 which is the shortest north/south highway route to Las Vegas. Historically, primary economic activity has been farming, including alfalfa production and livestock. The Lund/Preston area has housed dairies. There are known mineral deposits for copper, lead, gold, and silver, there have been several oil exploration wells drilled and the southern portion of the Valley in White Pine County is in the area identified by the Division of Mineral Resources as high potential for oil production. The commercial activity in Lund and Preston includes agricultural equipment and supplies and transportation services. White Pine County School District maintains an elementary school and a newly constructed high school in Lund. The Lund/Preston area is attractive as a residential community because of its small town, rural lifestyle and the quality of the school programs. The community does not have water and sewer services and residents of both Lund and Preston depend on wells and septic systems. With an increase in population concentration, the communities may need to begin to plan for funding and development of a water and/or sewer system. White River Valley has begun to attract new property ownership by retirees and for projects including a guest ranch and a proposed youth ranch. Potential for economic development includes agricultural production including alternative crops and processing activity including dairies as supported by changing market conditions, oil production and services for oil production in White River and Railroad Valleys, transportation services, residential development, and tourism development capitalizing on proximity to fishing at the Krch Wildlife Management Area in Nye County immediately south of Lund, the White River/Ellison/Hamilton historic mining area to the west, and the southwestern portion of Ward Mountain.

Secondary Analysis:

Jakes, Long, Newark, Tippett, Pleasant, and Railroad Valleys are all considered for secondary analysis. Primary historic economic activity includes mining with known mineral deposits of gold, copper, lead, and silver; oil exploration; and agriculture

including alfalfa and livestock production. In addition, Railroad Valley is located in the area identified by the Division of Mineral Resources as strong potential for oil production and Bald Mountain Mine is located at the northern end of Newark and Long Valley in the southern portion of the Ruby Mountains. The mine maintains an RV and Trailer Park for its workers and the small residential area of Cold Creek now maintains its own volunteer fire department. US Highway 50 crosses through Jakes and Newark Valleys. Economic development potential includes continued and increased agricultural activity including the potential for alternative crops as market trends dictate, expanded mining activity depending on exploration and market conditions, development of geothermal warm water resources, and expanded oil exploration and production.

LONG TERM POTENTIAL BENEFICIAL USE OF WATER IN WHITE PINE COUNTY

	Ag/Trad'l	Ag/Altern.	Mining	Oil	Energy	Res	M&I	Rec	Geo	Ag Proc	Export	Import
Huntington	X	X	X	X								
Ruby	X	X	X	X				X				
Antelope	X	X	X	X								
Deep Ck.	X	X	X	X								
Lt Smokey	X	X		X								
Cave	X	X		X				X				
Lake	X	X	X	X						X		
Hamlin	X	X		X		X		X		X		
Long	X	X	X	X						X		
Pleasant	X	X	X	X								
Tippett	X	X	X	X				X			X	
Jakes	X	X	X	X						X		
Newark	X	X	X	X				X		X		
Railroad	X	X	X	X			X					
Steptoe	X	X	X	X	X	X	X	X	X	X		X
Spring	X	X	X	X	X	X	X	X		X	X	X
Snake	X	X	X	X	X	X	X	X		X		X
Butte	X	X	X	X	X	X		X		X	X	X
White R.	X	X	X	X		X	X	X	X	X		

CHAPTER 3
WATER RESOURCE ISSUES, GOALS AND OBJECTIVES, AND POLICIES

ISSUES:

Issues impacting how White Pine County manages its water resources include the physical environment, the legal and regulatory framework, the planning context, the need to integrate water resource planning with the County's other planning efforts, economic development trends and strategies within White Pine County, and trends outside White Pine County on the regional, national, and global level.

Physical Environment/Hydrogeological Setting:

White Pine County's geology determines how water resources are stored and transmitted. Because of the area's geological history, the distribution of geologic units and the relationships between aquifers is varied. Because aquifers are not continuous and are broken horizontally and vertically into hundreds of discrete compartments that bounded by fault zones or rocks with contrasting hydraulic properties, the regional hydrologic conditions are poorly understood. For purposes of permitting water use, the Division of Water Resources considers the basins to be closed so that water will not transfer from one to the other. However the question of the relationship between the basins remains a concern in White Pine County. This is especially critical if large amounts of water are transferred out of one basin and transported out of the area. The Basin and Range Carbonate Aquifer System Study to be released in 2007 will help to answer basic questions about the geologic nature of White Pine County's water resources.

Climate:

White Pine County has a high desert, semi-arid climate and Basin and Range topography. The County's average annual precipitation is nine inches, which is average for the state of Nevada. Precipitation is normally light at lower elevations during all months of the year and at higher elevations, precipitation is much greater with snow accumulations to considerable depths. Much of the snowmelt irrigates crops in nearby valleys. Drought is common and expected. Historically, critical water sources in the County respond to drought conditions and climate changes with approximately four years' lag time. White Pine County's average potential evaporation rate exceeds the overall annual precipitation rate with actual average evaporation ranging from 45 to 51 inches. On an annual basis as much as 85 to 90 percent of the total annual precipitation is lost through evaporation and transpiration and only an estimated 5 to 10 percent recharges the ground water regime. In western White Pine County summers are hot, especially at the lower elevations and winters are cold. The length of the growing season ranges from 100 to 120 days impacting the type of agricultural production that can be developed.

Legal and Regulatory Framework:

White Pine County's latitude in managing its water resources is constrained by the provisions of Nevada state water law, federal and state environmental regulations, and the fact that over 90 percent of the land in the County is administered by federal agencies.

Available Data:

White Pine County's ability to understand and manage its water resources is further complicated by the lack of data available regarding environmental factors, water commitments, and water use. Further study is needed to fully understand and define evapotranspiration rates in White Pine County's basins to fully determine the perennial yield. In addition, the process to determine supplemental surface rights is tedious and requires substantial staff time available to review and adjust surface water rights to account for those that are supplemental to ground water rights. Without that determination, the surface water rights remain overstated in most of White Pine County's basins. Finally, White River, Spring, Snake, Steptoe, and Newark Valley's list substantial vested water rights that have been held by long time ranching families. Very few of the vested rights have been adjudicated and certificated. Before the County and state can accurately determine the level of water commitments in a basin, the vested rights need to be adjudicated and a determination made on the actual water rights held. Completing the three areas of data is costly. Neither the County nor the State Engineer's office has had the staff available to complete the steps needed to provide accurate information on supplemental adjustments to surface water rights, evapotranspiration rates, and vested rights.

Planning Context:

The Water Resource Plan is based on a 50-year time frame, making it the longest term planning process in the County. Predicting growth and development over a 50-year period is especially difficult in a County where the primary economic mainstay has been mining. Community and economic development planning has been subject to the boom and bust cycles of the mining industry, making it very difficult for the County to project long term strategies for development, maintenance, and improvement of its facilities.

Planning activity within the County has been grant dependent for the past two decades. The Water Resources Plan, the County's Land Use Plan, and Public Land Use Policy were all completed in 1998-99 and are all in critical need of revision. The County is working to update all of its planning documents. The County is working to integrate all of its planning efforts so that its natural resources, economic development and community development planning are consistent in their goals, objectives, and strategies.

Federal land management agencies have begun to renew their planning efforts. The Ely District Bureau of Land Management is completing the draft of its Resource Management Plan and the Humboldt Toiyabe National Forest is beginning its Forest Plan process. The

County is a cooperating agency with both planning processes. In addition, the County is participating in several Environmental Impact Statement processes for projects that will have economic and environmental impacts and it is working with the Congressional Delegation on the potential of a Public Lands Bill that will include designation of wilderness areas as well as disposal of public land for development purposes. Federal planning and environmental review activity on projects that may impact the County require substantial time to review documents and participate in the process.

Most of the County's basins are shared with other counties in the state of Nevada. Only four basins, Tippett, Pleasant, Newark, and Jake's Valleys are located entirely within White Pine County. In addition, Snake, Deep Creek, and Hamlin (east of Lincoln County) are shared with Utah. White Pine County's planning for water resource protection and use are further complicated by differing perspectives, needs, and issues in neighboring counties as well as differing state law in the basins shared with Utah.

Economic Development Trends and Strategies Within White Pine County:

Historically, White Pine County's economy has been natural resource based and the economic mainstay was mining supplemented by agriculture and in more recent years, Tourism. With the closure of the copper mine in 1978, the County was forced to look for ways to diversify and strengthen its economy. In the past twenty five years, the County has worked diligently to develop its stabilize its economic base and reduce its dependence on mining. By 1990, the location of Ely State Prison and growth of the tourism industry made noticeable inroads in the dominance of mining in the area's economy. In 1999, the County and City began working to acquire the Nevada Northern Railroad tracks to support existing and new industrial activity. The tracks and the land under them were acquired in 2006. In addition, grant funds have been secured to renovate the tracks and allow the reinstatement of rail freight service. The potential of rail freight service and the availability of permitted water rights for power generation put the County in an excellent position to attract interest from potential coal fired electrical power plants and it is currently working with two potential plants both identifying preferred and alternate sites in Steptoe Valley. With potential for transmission capacity to serve the coal-fired plants, the County is also working closely with wind energy projects to develop renewable energy resources along side the coal plants. The potential of an energy development industrial cluster opens the door for other renewable energy projects including biomass, solar ponds, and pumped storage; agricultural production for biodiesel, and continued exploration and development by the petroleum industry. By 2006, the County is again in a growth pattern with the full operation of the copper mine, increasing tourist trade, and the development of new housing for retirees moving to the area to enjoy the outdoor recreation, and new small industrial firms moving to the area for quality of life. In 2006, the County faces critical issues of workforce availability and lack of affordable housing with the potential of the initial phases of power project construction beginning in 2007.

Economic Development trends and strategies within White Pine County point out two underlying issues: 1) Continued growth of industrial sectors, primarily in the areas of

natural resources (mining and agriculture), energy development, and metal fabrication and increasing tourism activity now converting to a recreational sector investing in property and homes in the area highlight the need to achieve a balance between industrial growth and quality of life issues. 2) The variety of economic development potential in Steptoe Valley, which may all begin to compete for water resources in that basin may require the County to explore inter-basin, intra-county transfers of water to support the growth.

Factors Outside White Pine County:

On a regional level, the continued population growth of the southwestern United States and the desire to maintain lifestyles emphasizing outdoor activity including swimming pools and golf courses in the arid southwest, are placing a significant strain on traditional sources of water to support urban and suburban areas. The pressure to support growth with water resources from rural areas, inter-basin transfers, and the increased activity of private water purveyors viewing water as a commodity to be transferred to the customer are all issues that White Pine County is facing and will continue to have to address.

National factors include policy changes that could impact the economic viability of agriculture, mining, and industrial activity in the County. A focus on energy independence might encourage more oil exploration in the area. Efforts to encourage development of renewable energy source might place the County in the center of a renewable energy development cluster.

Over the next fifty years, global issues of market and technology will have significant impact on the County's ability to develop new products and strengthen its economic base. The County is well aware of the impacts created by the mining industry's responsiveness to changes in market conditions. Technology may enable area mines to reduce costs and withstand price fluctuations and it may allow the mining industry to expand into resources that at one time were not economically feasible to extract. Changes in market and technology can influence agricultural activity, transportation and communication, and development of new products all of which will not only impact White Pine County's economic development efforts but the manner in which it uses its water resources as well.

GOALS AND OBJECTIVES:

The County has identified two primary goals for management of its water resources:

1) Maintaining the quality of its environment
2) Maintaining the quality of life for its citizens

Objectives and Strategies:

The County has identified primary objectives and a short-term action plan for each of its goals.

Goal 1. Maintain White Pine County's environmental quality:

1. Establish a County Natural Resource Department to provide staff and expertise required to carry out the water resources program.

2. Complete the water resources inventory and baseline, identify areas of critical environmental concern, areas demonstrating loss of environmental quality, and standards of environmental quality

3. Improve available data to understand nature of White Pine County's water resources, commitments, demand, and availability for development by working with the State Engineer to define supplemental surface water rights in each of the County's basins, working with the State Engineer to conduct evaporation studies and to continually refine the evapotranspiration rates identified for each of the basins in White Pine County, and by working with water rights holders and the State Engineer to adjudicate vested water rights in the County's primary basins to develop an accurate accounting of committed water rights.

4. Initiate a monitoring program

5. Establish procedures for annual review and implementation of strategies to maintain and improve environmental quality

6. Complete the Update of the County Land Use Plan and Public Land Use Policy and integrate recommendations with the recommendations of the Water Resource Plan. Coordinate all natural resource, economic development, and community development planning.

Goal 2. Meet the needs of the Citizens of White Pine County

1. Identify economic development potential by industrial sector for each hydrographic basin in White Pine County

2. Identify Steptoe Valley as an area of special concern because of the range of potential economic activity requiring water.

3. Coordinate recommendations of White Pine County's land use plan, Open Space Plan, and Comprehensive Economic Development Strategy with the Water Resources Plan

POLICIES:

Water Quality, Public Health and Safety:

White Pine County has identified the protection of its water quality and drinking water supplies as a high priority. In the past two decades, the County, the City of Ely, McGill Ruth General Improvement District, and the Baker General Improvement District have

compiled millions of dollars in grant and loan funds and local matching funds to carry out development of new wells and water health protection issues that have been identified include sources of potential contamination, water quality of domestic wells, and wellhead protection.

The City of Ely has adopted a wellhead protection plan and is making progress is accomplishing the objectives it outlines. The McGill/Ruth GID is in the process of developing its Wellhead Protection Plan, Baker is working toward funding for a Wellhead Protection Plan, and the County Commission has approved development of a countywide Wellhead Protection Ordinance.

The City has identified the protection of Murry Springs as its most critical water quality issue. The springs are the City's primary water source and sit on the southwestern corner of the community where US Highway 6 makes a steep decline from Murry Summit on the west and the US 6/50/93 bypass approaches downhill from the east. As truck traffic south on US 6 and State Route 318 has increased significantly over the past five years, the Municipal Utilities Board has become increasingly concerned about the potential of a hazardous materials spill in the vicinity of the springs. It has completed a study to determine how best to protect the springs and the City is in the process of developing funding to implement the recommendations. In addition, the City of Ely has identified the need for an additional well to provide a sufficient back up water source if the springs are contaminated

The City of Ely closely monitors any potential impact of its wastewater treatment plant and sanitary landfill on groundwater in the vicinity. The City has recently invested $3 million in improvements to its wastewater treatment facility to allow it to operate at capacity without violating the standards set by the Division of Environmental Protection. It has established operations and monitoring standards for the landfill to protect groundwater resources and it is working toward the long-term solution of relocating the landfill.

As growth continues in the urban interface area in Steptoe Valley, there are an increasing number of homes being constructed on 2.5 to 5 acre lots in the area surrounding Ely. The County has identified the need to monitor any potential impact on groundwater quality as the concentration of septic systems continues to increase.

The collection systems in McGill and Ruth were undersized, they were poorly mapped and ran through private property, often through basements of homes, were subject to frequent breaks, and reports of raw sewage running through alleyways were common. The General Improvement District has recently completed at $7 million project to replace the aging and inadequate sewer collection lines in the two communities. It is currently upgrading the sewer ponds in Ruth and completing a back up water source in McGill. The most critical need remains improving the collection system at the Ward Mountain springs (the water source for Ruth), improving the pipeline to the community, and a new well as a back up water source for the community.

The Baker General Improvement District has adequate capacity to provide water and sewer service to allow growth in that community, but needs to secure water rights for expansion of its water supply. Its applications are junior to the Las Vegas Valley Water District applications. The communities of Lund and Preston are zoned for one-acre parcels and residents rely on wells and septic systems. The County secured funding to test the wells and explore the potential of a water system. Although no contamination was identified and the communities chose not to pursue a water system, the County continues to monitor the water quality issues in that area. The community of Cherry Creek is served by a privately owned water system and septic systems. Two years ago, the residents recently approached the County Commission with concerns about quality and cost of their water service. The Commission worked with the State Bureau of Consumer Health and Division of Environmental Protection to address the issues.

Countywide concerns about Pinyon-Juniper encroachment and the fire hazard it presents are of critical concern, especially in the urban interface areas surrounding the County's communities. Fire risk assessments show that there is the potential for large, devastating fires that could threaten population centers. The County has completed an urban interface study and established development policies regarding defensible space, available water supplies, and construction standards. Water supplies must be adequate to meet the needs for fire protection in White Pine County's valleys.

Conservation and Reuse:

White Pine County has historically identified water conservation as an important element in its management of water resources. For example, during Kennecott's operation of the smelter in McGill, it used 15.000 acre feet per year, 9,000 acre feet of new water and 6,000 acre feet per year in recirculated water. Kennecott continues to use its water resources to irrigate the tailings that were generated through decades of operation. Much of the tailings have been reclaimed as productive agricultural land for livestock. In addition, Kennecott is working with the County, the Division of State Lands, and Rocky Mountain Elk Foundation to sell 6,000 acres of land and 53 c.f.s. of water rights for development of a Wildlife Management Area encompassing Bassett Lake so that it can be restored as a prime fishery and to restore wetlands used by migratory waterfowl, deer, elk, and other wildlife. The Bassett Lake project will provide and recreational opportunities for residents and visitors, increase tourism opportunities, especially for the town of McGill, and improve wildlife habitat.

Agriculture is often cited as a source of inefficient uses of water. However, area ranchers installed 125 miles of pipeline that has increased water conservation over earthen ditches by 80 percent. Ranchers and farmers have completed 25,000 acres of land leveling or land smoothing and sprinkler irrigation; and all of the irrigated farm ground in the county has approved 1985 Food Security Act Conservation Plans for each farm or ranch over forty acres. The total agricultural land covered by conservation plans is 231,000 acres.

Both Ely Municipal Water System and the McGill Ruth GID have metering policies in place and are gradually converting new water connections to meters. All three communities have stringent policies in place to limit outside watering schedules during the summer months. The City of Ely maintains a lease for the use of overflow from Murry Springs for a bottled water plant. It treats the effluent from its wastewater treatment plant so that it can be used for irrigation on the city-owned George Ranch property. April through November, the treated water irrigates 90 acres of

farmland and during the winter months, December through March, the treated water is piped to two rapid infiltration ponds on the Georgetown Ranch.

Drought Conditions:

White Pine County experiences periods of drought conditions much the same as southern Nevada and Utah causing special concern for the availability of surface water. Surface water is almost fully appropriated in White Pine County, the primary water sources for the City of Ely and the town of Ruth are surface waters, and surface water is responsible for the majority of all water withdrawals. White Pine County supports storage of surplus surface water in aquifers underground or in above ground reservoirs to enhance surface and ground water supplies in years when drought conditions results in inadequate supplies of surface water. Aquifer recharge and recovery and aboveground storage can also support multiple purposes of recreation and improved wildlife habitat.

Water Supply and Allocation:

White Pine County supports utilizing water resources within the boundaries of White Pine County to achieve its goals of environmental quality and quality of life for its residents, including economic development and diversification to supply jobs, business activity, and public tax revenue. White Pine County views managed growth needed to enhance the local economy and ensure the economic welfare of area residents as beneficial. White Pine supports a balance of allocation of water among environmental needs, agriculture, industrial and energy development, residential development, and wildlife and outdoor recreation. Although not viewed by the State Engineer as a consumptive use, the County believes that it must account for evapotransipiration as a valid use of its water resources. White Pine County's environmental quality and diversity is a function of the delicate balance of surface water available to support vegetation, which feeds not only livestock and people, but also wildlife and wild horses.

Designated Basins:

In 1980, the State Engineer restricted access to water for irrigation as a non-preferred use and in 1983 designated industry as the preferred use for water in North Steptoe Valley.

Inter-basin Transfers:

White Pine County has identified the potential need for intra-county, inter-basin transfers to import water from adjoining basins in the County to Steptoe Valley to encourage the development of its municipal, commercial, and industrial opportunities that are beneficial to the entire county. The adjoining basins are Spring, Butte, and Cave Valleys. If the County determined the need to import water to Steptoe Basin from neighboring basins, its policy is to first ensure the environmental quality, protect the rights of senior water rights holders, and retain sufficient water resources to allow the basins of origin to develop to their full economic potential.

The County has expressed strong concern over the potential negative impacts to the environment and citizens of White Pine County due to proposed large scale, long-term inter-basin, inter-county transfers of water through the Southern Nevada Water Authority (SNWA) Groundwater Development Project. The SNWA proposal to export all unappropriated water from Spring Valley and much of the unappropriated water from Snake Valley is compounded by the purchase of property and water rights from private ranches by SNWA and the likelihood they will export the water in the pipeline, and water rights secured by private water purveyors with the intention

of exporting water for sale. The pipeline project promises minimal economic benefit to White Pine County. Economic benefits of operation will be limited and the benefits during construction will be short lived compared to the long-term impact of the project. Critical issues identified by the County include: 1) potential loss of vegetation due to the draw down of ground water resources; 2) potential loss of wildlife habitat; 3) potential negative environmental impacts including the project's visual impacts as well as air quality issues due to increasing dust; 4) potential negative impacts on senior water rights holders that cannot be adequately predicted because of the stated plans to file changes in the points of diversion as soon as the water rights are permitted; 5) potential negative impacts on current economic activity including agriculture, outdoor recreation related tourism, and residential development; 6) potential negative impacts on future economic activity that could occur if water resources were available in White Pine County; and 7) potential negative cultural impacts because of the loss of historic ranching activity.

The Las Vegas Valley Water District filed its applications for water from White Pine County in 1989. The hearings on the Spring Valley applications are scheduled for September 2006 and the Southern Nevada Water Authority representatives estimate that pumping will begin eight years following the award of permits for the water. Financing for the pipeline dictates a seventy-five year term before SNWA would re-evaluate the project. The total project from the date the applications were filed to the first time it would be re-evaluated is one hundred years. The County's primary goals in working with the issue since 1989 are to seek the strongest possible protections for White Pine County's environmental quality; senior water rights holders in the affected basins, and the County's long term economic potential as well as just compensation for the costs imposed by the project. The County protested the applications when they were filed. The County continues to maintain its protests as its only avenue to have a voice in the proceedings. It has entered into discussions with Southern Nevada Water Authority to determine if an agreement might provide stronger protections than might be available through the decision of the State Engineer. The County has determined that its courses of action to protect its environment, citizens, and economic potential are a sound understanding of its water resources, an active and independent program to monitor changes in its water resources, and implementation of a well thought out mitigation strategy.

Monitoring and Mitigation:

White Pine County has initiated a volunteer groundwater-monitoring program to collect groundwater levels from wells located in approximately ten hydrographic basins in the County. This is a vital first step for any comprehensive monitoring program that will support sustainable groundwater management. The only true way to ensure that a basin is not over drafted, while utilizing the groundwater resources, is to closely monitor hydrologic conditions, specific to that basin. This is best achieved through a comprehensive monitoring program that includes collecting groundwater levels that can be reviewed and analyzed annually. Another important component of a successful groundwater-monitoring program is the assessment of water quality trends. Specific constituents should be monitored annually to track potential changes in water quality and ensure water degradation does not occur. A comprehensive program of monitoring will then empower the County to implement the most appropriate mitigating actions, if necessary, in the future.

Short-Term Goals (2 – 5 years)

- Identify sensitive locations; characterized by springs, wells and/or riparian areas in select basins coupled with appropriate monitoring frequency. Early prioritizing of sensitive areas for data collection may become necessary to ensure consistent data is collected from the most critical areas.
- Document baseline data for use in comparing future data as pumping increases in the targeted hydrographic basins.
- Establish a quality control and quality assurance plan that will be reviewed annually to ensure the most accurate methods for data collection.
- Coordinate with neighboring County, State, and Government agencies on data sets and basin studies to ensure that the most efficient and accurate data is collected and analyzed without duplication.
- Develop a public relations outreach program to help collect historical data from the more development (stressed) hydrographic basins.
- Incorporate a water quality sampling and analysis protocol into the monitoring and mitigation program that follows the same quality control and quality assurance methodology as the groundwater level measuring protocol.

Long-Term Goals (5 + years)

- Established baseline of data for every sensitive area identified by the County for use in generating data set trends.
- Identify, evaluate and procure additional wells and springs that should be targeted and incorporate them into the monitoring program.
- Analyze the data and determine if adverse impacts warrants changes in extraction rates from a basin or portion of a basin.
- Establish a system of written procedures on the protocol for making recommendations to refine the monitoring and mitigation program to the Board of Commissioners.
- Improve understanding of the safe yield (perennial yield) of the basins targeted for monitoring.
- Protect the basins in White Pine County from over appropriation (over pumping) to ensure that a sustainable water resource is available for future generations and economic development in White Pine County.

Monitoring Protocol

The Monitoring system will be based on written records of exactly how data are collected to ensure consistency, comparability, repeatability, and traceability of scientific data; documented methods used to collect a specific data set; training programs for staff and volunteers; and standardized equipment. Monitoring activity will include both ground water levels and springs and riparian areas. See Attachment 4.

Mitigation Procedures:

The County has also approved a mitigation protocol to be used in response to changes clearly identified from the monitoring program. This mitigation protocol is the first step in determining trigger mechanisms for clearly creating actions designed to lesson or reduce adverse impacts, observed from the monitoring data collected from the hydrographic basins. Nevada water law

requires that any person/entity, who significantly effects a groundwater well of a senior water right holder provide mitigation for that impact. The determination of "*significant effect"* is made by the State Engineer and the burden of proof falls on the well owner who is being negatively impacted. White Pine County has setup a series of mitigation measures to be initiated in the event that a basin appears to be undergoing over-drafting, due to groundwater pumping. The mitigation procedure is based on three levels of increasing indication of negative impacts and identifies actions to be taken at each level.

Triggering Mechanisms and Actions:

Level–1:
Two consecutive years (or eight consecutive quarters) of groundwater level data and/or spring and riparian areas in a basin or portion of a basin indicating a negative impact.

Level–2:
Implementation of the mitigation measures outlined in the level-1 triggering mechanism and at least one to two more additional years (three to four years total of aquifer over-drafting) of well monitoring and/or spring and riparian area data validating the negative impacts to the basin, watershed, and/or aquifer(s).

Level–3:
The conclusions from the hydrogeologist's groundwater report along with at least one more year of depleting groundwater levels in the basin, watershed, and/or aquifer(s) suggests that excessive pumping is creating the negative impact.

See Attachment 4 for specific Mitigation Procedures for each Trigger Level.

ADMINISTRATIVE STRUCTURES:

The County has identified the need to take an active role in water resource issues. It has identified the need to monitor impacts, establish standards of environmental quality, and implement mitigation strategies to protect the environment, senior water rights holders, and potential for economic development.

The current Water Advisory Committee was established to provide the County Commission with review and advice on water resource issues and to assist in the revision of the Water Resources Plan. The Committee membership is representative of the County's population by geographic location; economic and recreational interests; local government, Municipal Utilities Board, and General Improvement Districts; and water users. In addition to its review of the 1999 Water Resources Plan, the Committee reviews applications for water rights in the County and makes recommendations to the County Commission on potential protests and recommends scoping comments on water resource issues in NEPA actions by federal agencies. It has no authority to implement the recommendations in the Water Resources Plan.

The County will explore the benefits of establishing an administrative structure within the avenues outlined in the Nevada Revised Statutes to assist with the implementation of natural resource and water resource recommendations. The Nevada Revised Statutes allow for creation of General Improvement Districts under Chapter 318, a Water Planning Commission under Chapter 540A, a Water Conservancy District under Chapter 541, or a Regional Water Authority through specific legislative action.

There are currently two General Improvement Districts (GID's) for water and sewer services in the County, the McGill Ruth Consolidated Water and Sewer General Improvement District and the Baker General Improvement District. A GID must, " serve a public use and promote health, safety, prosperity, security, and general welfare of the inhabitants thereof and the State of Nevada." The County Commission has jurisdiction and authority to create General Improvement Districts by adopting a resolution; holding a public hearing; as a result of the public hearing, determining that the creation of the district is economically sound and feasible and it is required by public necessity and convenience; and adopting an ordinance to create the district. A GID can furnish facilities for water; sanitary facilities for sewage, and facilities for storm drainage or flood control and can qualify for federal grants.

The Water Planning Commission authority outlined in Chapter 540A applies only to Counties between 100,000 and 400,000 population and legislative action would be required to provide authority for White Pine County to establish a Commission under this Chapter. The primary benefit of establishing a Water Planning Commission is to provide formal delegation of the authority for Water Resource issues and planning and the adoption of a formal Water Resources Plan that must be taken into consideration by federal agencies in the development of their resource management plans, environmental impact statements, and environmental assessments. The N.R.S. details the membership of the Commission and the representation on the County's current Water Advisory Committee is patterned after the voting and non-voting membership outlined in Chapter 540A. The N.R.S. requires a comprehensive regional plan that meets specific requirements, a public hearing must be held and the Water Planning Commission must recommend the plan to the Board of County Commissioners by a two-thirds vote, the plan must be reviewed and approved by the Regional Planning Commission for conformance with the Comprehensive Master Plan, and then it must be approved by the County Commission. Once an approved plan is in place, the Water Planning Commission has the authority to acquire and use water rights and other sources of water within or outside the region for current and future use. N.R.S. 540A.250 allows the creation of a Remediation District by the County Commission if conditions such as concentrations of septic systems or potential for contamination of ground water exist that affect or will affect the quality of water available for municipal, industrial, or domestic use in the region. To form a Remediation District, the County Commission must develop a remediation plan, the plan must be approved by the Division of Environmental Protection, the boundaries and costs of remediation must be identified, and a public hearing must be held prior to the establishment of the District. Once in place, the County can levy fees or taxes to recover the costs of remediation.

A Water Conservancy District has the authority to construct and maintain works including power, access roads, pipelines, canals, and other facilities; fix water rates; enter into contracts; acquire water and water rights, develop those rights, and transport water for sale or lease. Any municipality, irrigation district, or person or private corporation can petition the Water Conservancy District Board of Directors to purchase, lease, or otherwise obtain the beneficial use of the waters of the District. The Water Conservancy District is a legal alternative that can be established through the Court system. To establish the District, a petition is filed in the office of the Clerk of the Court and it must be approved and filed by the Board of County Commissioners with a bond of $1,000. A hearing time and place is set by the District Court to hear protesting petitions and if approved the Court declares the district a corporation and notifies the Secretary of State, County Clerk, and County Recorder. The Governor appoints the Board of Directors in accordance with the petition.

Formation of a Regional Water Authority would require enabling legislation and could be based on the Southern Nevada Water Authority model. The advantage of he Authority is it would

provide more local authority over water management decisions, qualification for grant monies, and increased cooperation between utilities. The additional layer of management could increase operating costs for all of the member utilities.

In formation of a Regional Water Authority, the legislation would establish a charter to specify that it would ensure water supplies are available to support growth, a healthy economy, and the protection of public water supplies and the environment. The Authority could provide liaison with state and federal agencies, other counties, and other water authorities on water related issues. It could provide assistance to the General Improvement Districts, Ely Municipal Water System, and public water systems in the County.

The County Commission will consider the legal and structural benefits of establishment of a General Improvement District, Water Planning Commission, Water Authority, or a Water Conservancy District as means to more effectively manage its water resources and natural resources programs.

RECOMMENDATIONS:
See Attachment 5 for 2006 Recommendations and Action Plan.

EVALUATION AND IMPLEMENTATION:

The White Pine County Water Resources Plan is not a static document. It will be reviewed annually by the Water Advisory Committee or administrative structure that may replace it, and a report of progress in meeting overall goals and objectives as well as specific annual recommendations will be provided to the County Commission. Each year's annual report and recommendations will be added to the Plan as part of Attachment 5. The Plan will be completely reviewed and revised at least once every five years.

ATTACHMENT 1

STATUTORY AND REGULATORY FRAMEWORK

The statutory and regulatory framework governing water resources, water quality, and environmental quality impact White Pine County's management of its water resources. In this section the major State and Federal laws that must be taken into consideration are identified and discussed.

County Jurisdiction: Local governments have jurisdiction over the development of master plans and regional plans as well as limited authority over some aspects of sewer facilities. Nevada state water law and federal law provide the primary guidance for water law and administration of water quality requirements. Several aspects of federal and state law govern environmental issues which relate to water resources.

State of Nevada:

Nevada Water Law - Nevada Water Law governs the administration of the waters of the State of Nevada. The Nevada Department of Conservation and Natural Resources is the branch of State government responsible for management of water resources and the Division of Water Resources, directed by the Nevada State Engineer, is responsible for the allocation of the public waters of the State, administering the law, and resolving disputes. The State Engineer's actions and decisions are bound by the water law and its implementing regulations:

Nevada Revised Statutes

Chapter 532- State Engineer
Chapter 533- Adjudication of Vested Water Rights; Appropriation of Public Water
Chapter 534- Underground Water and Wells
Chapter 534A - Geothermal Resources
Chapter 535- Dams and Other Obstructions
Chapter 536- Ditches, Canals, Flumes, and Other Conduits
Chapter 537- Navigable Waters
Chapter 538- Interstate Waters, Compacts, and Commissions
Chapter 540-Pllanning and Development of Water Resources
Chapter 349- State Obligations

Nevada Administrative Code

NAC 533-Adjudication of Vested Water Rights, Appropriation of Public Water

NAC 534-Regulations for Water Well and Related Drilling

NAC 534A-Geothermal Resources (The Division of Mineral Resources administers geothermal resources and Division of Water Resources is generally not involved in administration of geothermal resources unless there is a consumptive use.)

NAC 535-Dams and Other Obstructions

Statutory Guidance

All waters in the state of Nevada belong to the public and are managed by the State of Nevada in accordance with the provisions of Nevada Water Law (NRS 533 and 534). The Nevada State Engineer determines the limit and extent of appropriative water rights including the quantity of appropriative right and any conditions that must be met for the water to be placed to a beneficial use. Determination of prestatutory rights is subject to procedures provided in NRS 533 and 534. The state Engineer is prohibited by law from granting an application to appropriate the public waters where:

1) There is no unappropriated water at the proposed source;
2) The proposed use or change conflicts with existing rights; or
3) the proposed use or change conflicts with protectible interests in existing domestic wells as set forth in NRS 533.024; or
4) The proposed use or change threatens to provide detrimental to the public interest

According to NRS 533.370(1) c, "the State Engineer shall approve an application submitted in proper form which contemplates the application of water to beneficial use if the applicant provides proof satisfactory to the State Engineer of: (1) His intention in good faith to construct any work necessary to apply the water to the intended beneficial use with reasonable diligence; and (2) His financial ability and reasonable expectation actually to construct the work and apply the water to the intended beneficial use with reasonable diligence."

The 1999 Nevada Legislature, through Senate Bill 108, amended Nevada Water Law to add additional criteria governing interbasin transfers of water by adopting the following revisions to the provisions of NRS 533.370: In determining whether an application for an interbasin transfer of ground water must be rejected pursuant to the section, the state engineer shall consider:

(a) Whether the applicant has justified the need to import the water from another basin;
b) 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 carried out;
(c) Whether the proposed action is environmentally sound as it relates to the basin from which the water is exported;
(d) 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
(e) Any other factor the state engineer determines to be relevant.

The State Environmental Commission is responsible for developing water quality standards for specific water bodies within the State, and for developing a handbook of best management practices to control pollution from diffuse sources.

Additionally, the State of Nevada has adopted regulations that define State programs to implement the provisions of the Clean Water Act and Nevada Water Pollution Control laws. Nevada's Water Pollution Control laws, contained in Chapter 445A of the Nevada Revised Statutes establish several non-federal water pollution control programs. These programs, implemented by the NDEP, include programs for issuing Water Pollution Control Permits with zero-discharge performance standards, and State Ground Water Permits for infiltration basins, land application of treated effluents, large septic systems, and industrial facilities. The State Environmental Commission is responsible for developing water quality standards for specific water bodies within the State, and for developing a handbook of best management practices to control pollution from diffuse sources.

The Division of Water Planning, directed by the Nevada State Water Planner was created by legislation in 1977 and was responsible for water management and planning, conservation plans, planning assistance to local governments, and development of the 1999 State Water Plan. The State Water Planner also administered community assistance and flood mitigation assistance under the national Flood Insurance Program, and the Small Community Grant Program.

NRS 278 lists the components required and recommended for County Comprehensive Master Plans. The components include conservation and management of natural resources including water resources.

Three bills were passed during the 2005 Session of the Nevada State Legislature that impact the state's administration of water resources:

SB 35: Effective July 1, 2005, it redefined the transfer tax levied on water obtained through inter-county and interstate transfers as a fee rather than a tax and effective January 1, 2007, it increased the fee from $6 per acre foot to $10 per acre foot of water.

SB 62: Effective July 1, 2005, the bill contained several water resource measures including changes in the process for approving or rejecting applications for changes in point of diversion, use, and place of use for existing water rights; adding a procedure to transfer ownership and clarified how conflicts in ownership must be resolved; adding a Water Rights Technical Support fund to provide grants to local governments to obtain data and carry out projects to protect and enhance existing water rights; establishing the Section of Water Planning within the Water Resources Division in place of the separate Water Planning Division; adding specific criteria to be evaluated by the Section on Water Planning; requiring submission of water conservation plans (NRS 540.41) to be updated every five years by water purveyor; and increasing rural representation on the Advisory Board on Water Resources and Planning to a minimum of four members and reduced the of representatives from the County with the largest population.

AB 80: Effective July 1, 2005, the bill provides for a procedure by which the State Engineer may approve a waiver from the requirement of plugging an abandoned well.

Federal Law:
Federal law and policy establish standards for clean water, control growth in flood plains, and protect the environment.

1. ***Safe Drinking Water Act****:* The Safe Drinking Water Act and its amendments require certain protection for sources of drinking water and the Clean Water Act establishes standards for surface and ground water protection. The Safe Drinking Water Act, an amendment to the Public Health Service Act, is the primary federal law enacted to protect underground sources of drinking water from pollution, and to ensure the quality of drinking water delivered at the tap. The Act established a program for setting primary and secondary standards for drinking water, a permit program for injection wells, and mandated a program of wellhead protection practices. Authority to implement the various programs of the Safe Drinking Water Act has been granted by the EPA to the Nevada Bureau of Health Protection Services (BHPS) and the NDEP (Nevada Division of Environmental Protection). The State Board of Health has promulgated standards for over 100 contaminants in drinking water, consistent with federal standards. BHPS implements permitting programs for public suppliers of tap and bottled water, which include routine sampling and monitoring of public water supplies to demonstrate compliance with drinking water standards. BHPS also implements a permit program for domestic septic systems to ensure underground water supplies are adequately protected. Industrial wastewater treatment systems, and waste and enhanced mineral and hydrocarbon recovery injection wells are permitted through the NDEP. The wellhead protection program is implemented by BHPS, in cooperation with local water supply systems. Elements of the wellhead protection program include delineating the wellhead protection area (WPA), identifying potential pollution sources within the WPA, defining constraints on siting of new wells, contingency planning and emergency response, and defining roles of state

and local governments, and water purveyors. Local governments are encouraged to support and participate in wellhead protection

2. **Clean Water Act** - The Clean Water Act is the primary federal law enacted to prevent pollution to surface waters. The act was established to "restore the chemical, physical, and biological integrity of the nation's waters." It requires that states establish standards for surface water quality, provides federal funding for sewage treatment plants, and sets goals of zero toxic discharges to, and realization of "fishable" and "swimmable," surface waters. The Clean Water Act also mandates a regulatory system for reporting of hazardous spills to surface waters, and a wetlands preservation program. The (NDEP) has been delegated the authority to implement programs of the Clean Water Act. Enforceable provisions o the Clean Water Act include permitting programs (National Pollution Discharge Elimination System), technology-based effluent standards for point sources of pollution, and water quality standards. NDEP also implements federally mandated programs for the management of non-point sources of pollution, and a construction grants program to build or upgrade
3. ***National Environmental Policy Act and Federal Land Policy Management Act*** determine how federal land management agencies can allow the lands they administer to be used. The City and County maintain good working relationships with the local offices of the Bureau of Land Management and U.S. Forest Service,
4. ***The Endangered Species Act*** protects certain species of plants, insects, fish, and birds that are native to White Pine County. The purpose of the Endangered Species Act is to ensure that any action, administrative, or real, does not unduly jeopardize the continued existence of an endangered or threatened species or cause the destruction or adverse modification of a critical habitat. With respect to the water resources of White Pine County, the Endangered Species Act provides protection not only to threatened or endangered species, but also to the water resources that support the habitat for these, and other sensitive species. There are a number of threatened and endangered bird species, and a fish species that has been relocated to a habitat in White Pine County to protect it from extinction, as well sensitive species and species of concern including the Bonneville Cutthroat Trout and the Relict Dace (if not already extinct). The State of Nevada has a number of statutes governing the protection of imperiled species that are administrated by the Division of Wildlife. The State has a listing of sensitive plant and wildlife species that have been designated as state protected species.

Policy of Compliance It is the policy of White Pine County to cooperate and comply fully with Nevada Water Law and its implementing regulations as well as federal law governing water resources, water quality, and environmental quality, to encourage business and industry to comply fully with applicable regulations; and to foster a spirit of cooperation between the regulatory agencies and all of the stakeholders in White Pine County. White Pine County believes that the sound long-term planning and management of the development and use County's water resources is in the best interest of both the County and the State.

ATTACHMENT 2:
DETAILED REVIEW OF SOCIO-ECONOMIC TRENDS AND PROJECTIONS, 2006 DEMOGRAPHIC PROFILE

I. 2006 DEMOGRAPHIC PROFILE

Population:

2005	9,275 *(Nevada State Demographer)*
2004	8,968
2003	8,842
2000	9,181 *(U.S. Census)*

School Enrollment:

2005-06	1,446
2004-05	1,450
2003-04	1,389

White Pine County School District

Workforce (May, 2006):

Total Labor Force:	4,270
Unemployed	147
Unemployment Rate	3.4 %
Total Employed	4,123

Nevada Department of Employment Security

Workforce by Industry (2005):

Mining	628	14.5 %
Government	1,474	34.0 %
Construction	152	3.5 %
Services	1,379	32.0 %
Trade	567	13.0 %
Manufacturing	30	.7 %
Finance/Insurance/Real Estate	90	2.3 %
	4,320	100.0 %

Nevada Department of Employment Security

Income:	*White Pine*	*Nevada*
Average Monthly Wage:	$ 2,950	$ 3,328
Median Household Income, 2005	$50,000	$59,550
Per Capita Income, 2005	$30,306	$35,883

Nevada Department of Employment Security

Housing Units:

Number of Housing Units:		New Housing Starts
2005	4,310	18
2004	4,256	12
2000	4,200	8

Housing Costs (Single Family Home, Ely):

2006 $133,675 Mean Housing Cost, Range, $23,625 to $243,000,
$130,000 Median Housing Cost

2005 $ 82,200 Mean Housing Cost, Range, $25,000 to $238,000
$ 75,000 Median Housing Cost

(*White Pine County Assessor)*

Land Divisions:

2004	95
2003	44
2002	80
2001	25

(*White Pine County Regional Planning Commission)*

Tax Revenue:

Assessed Valuation		Taxable Sales	
2006-07	230,740,743		
2005-06	132,852,000	2005-06	$ 145,288,821 (April, YTD)
2004-05	120,300,000	2004-05	127,928,232
2003-04	126,300,000	2003-04	81,263,598

(Nevada Department of Taxation)

Agricultural Production (2002):

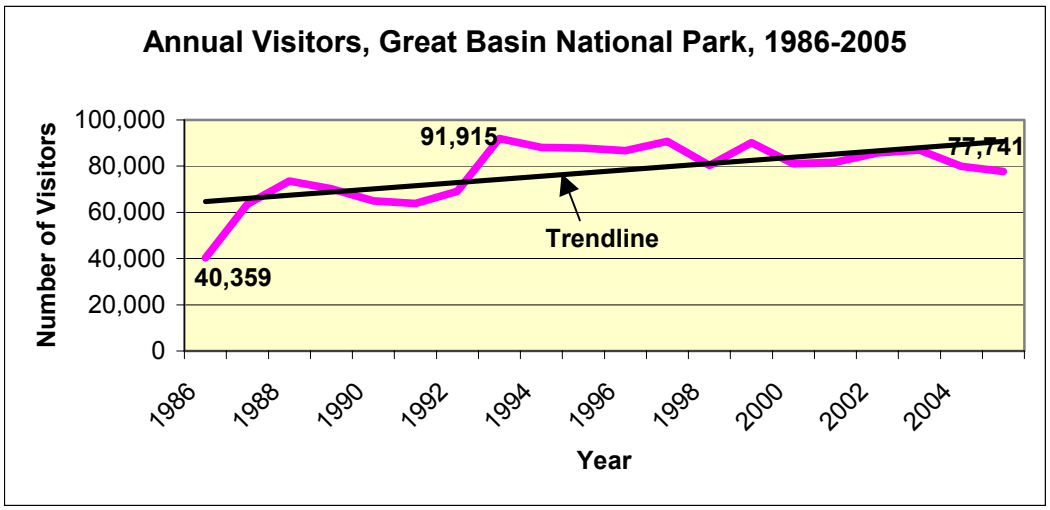
Irrigated Crop Land	29,487 acres
Crop Land	34,181 acres
Total, Alfalfa, Other Hay Sales	$ 6,935,200
Livestock, Cattle, Total Sales	$ 6,939,263
Sheep, Total Sales	390,240
Total Agricultural Sales	$14,264,704
Total Acres Agriculture	247, 446
Number of Farms/Ranches	115

(2002 Census of Agriculture)

II. DETAILED ANALYSIS OF TRAVEL AND TOURISM ECONOMIC CONTRIBUTIONS:

Great Basin National Park

Great Basin National Park was established in 1986. The park encompasses the former Lehman Caves National Monument and surrounding portions of the Snake Range including Wheeler Peak and its bristlecone pine grove. Visitation to the national park in 1986 was 40,359 visitors. Park visitation reached a high of 91,915 in 1993. Visitation in 2005 was 77,741 people. While visitation has fluctuated over the years since the park was established, as the trend line in the graph below shows, the overall trend of visitation has been upward. Based on the National Park Service's analysis, in 2003, the Park accounted for $3.83 million in total spending in White Pine County, a total direct and indirect economic impact of $4.12 million, and supported 104 jobs.

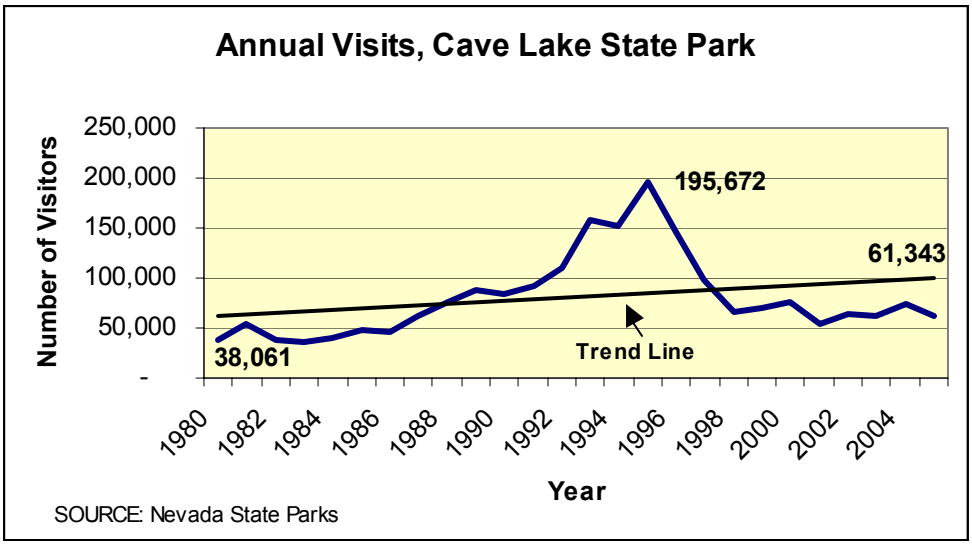


SOURCE: National Park Service

Cave Lake State Park:

Cave Lake State Park is located 15 miles southeast of Ely via U.S. 50/6/93 and Success Summit Road. The park is open year round. The 32-acre reservoir at Cave Lake State Park is popular for trout fishing, crawdadding, boating, hiking, picnicking and camping. Perched in the middle of the Schell Creek Range, adjacent to the Humboldt National Forest at an elevation of 7,300 feet, the park offers outstanding scenic views and opportunities for nature study and photography. Facilities include campgrounds, picnic areas, hiking trails and a boat launch. Visitation to the park increased 61 percent between 1980 and 2005, with a large spike in visitation in 1995.

In 1987 Los Angeles Department of Water and Power purchase the Nevada Northern Railroad from the Kennecott Copper Corporation and donated the historic rail yards, 28 miles of track, and and historic rolling stock to the City of Ely. The City formed a non-profit foundation, the White Pine Historical Railroad Foundation, which operates the East Ely yards and historic rolling stock as a heritage railway. Visitors can ride in restored cars and even operate the steam and diesel powered historic locomotives, including the railway's flagship Engine #40, dubbed The Ghost Train of Old Ely. In April 2006, Nevada's National Historic Landmarks Committee granted unanimous support to nominating Nevada Northern as a National Historic Landmark. The nomination now moves to the National Park System Advisory Board.

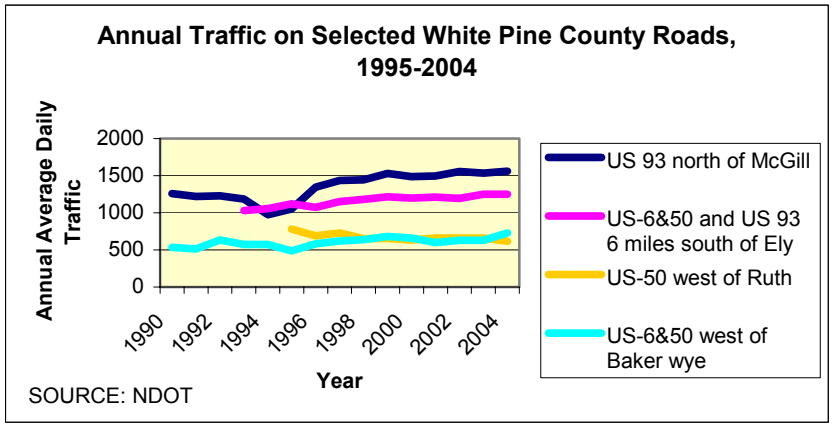


Outdoor Recreation, Hunting and Fishing:

White Pine County hosts the state's largest elk herd, second largest mule deer herd, and third largest antelope herd. Cave Lake and Comins Lake on the Steptoe Valley Wildlife Management area are becoming increasingly popular trout fisheries attracting visitors from southern Nevada and out of state. Nevada Department of Wildlife reports over 60,000 angler days in the County and based on its records of hunter days, big game hunting added almost $5.4 million to the County's economy.

Travel:

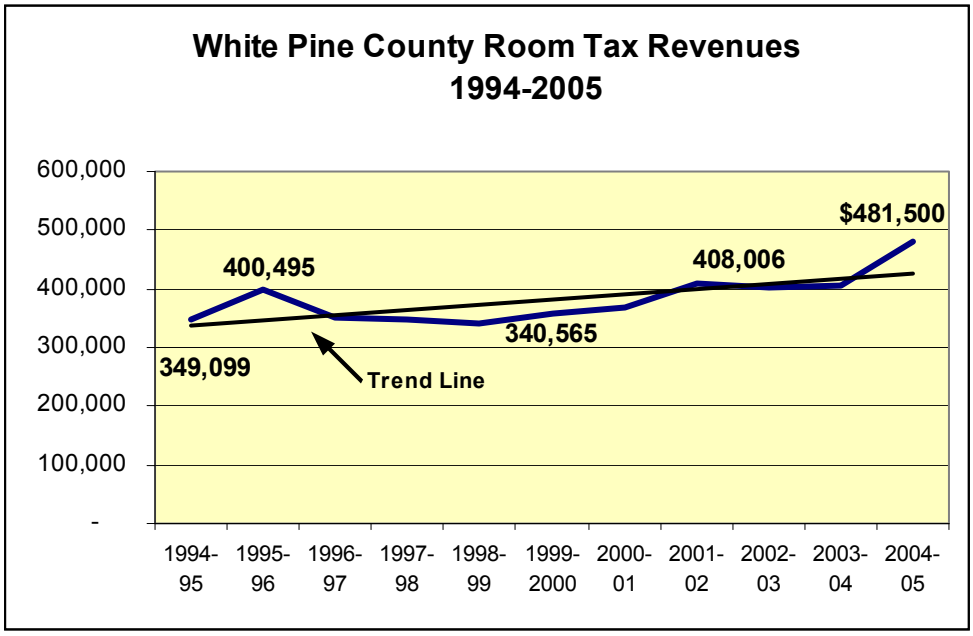
Another indicator of economic activity and potential economic activity in White Pine County is average daily traffic on state highways. The line graph below shows average daily traffic at selected traffic count stations on state highways in the county. Traffic on US-50 west of Ruth diminished by 21 percent between the years 1991-2004, while traffic on US-6&50 west of Baker, US-93 north of McGill, and US 6&50 and 93 south of Ely increased 51 percent, 49 percent, and 12 percent respectively. This increased traffic might be due to increased population in western cities such as Las Vegas, Boise, Reno, and Salt Lake City, all of which can be accessed by Nevada state highways in White Pine County. This increased traffic leads to increased opportunities to serve travelers with hotels and motels, service stations, restaurants, and convenience stores, further diversifying the White Pine County economy.



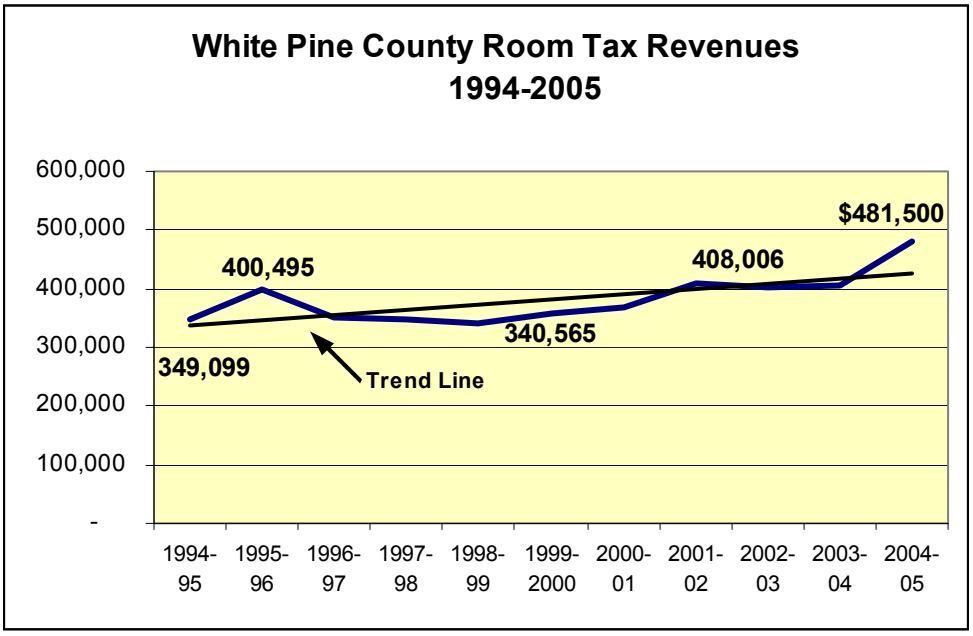
Room Tax Revenue:

Another measure of travel and tourism in White Pine County is room tax receipts. The following chart shows White Pine County room tax receipts between 1994 and 2005. As both the graph line and trend line show, room tax revenues have increased over the period. White Pine County

economic development officials report that existing hotels and motels in White Pine County are frequently full, indicating a need for additional motel rooms.



SOURCE: White Pine County



III. SOCIOECONOMIC TRENDS:

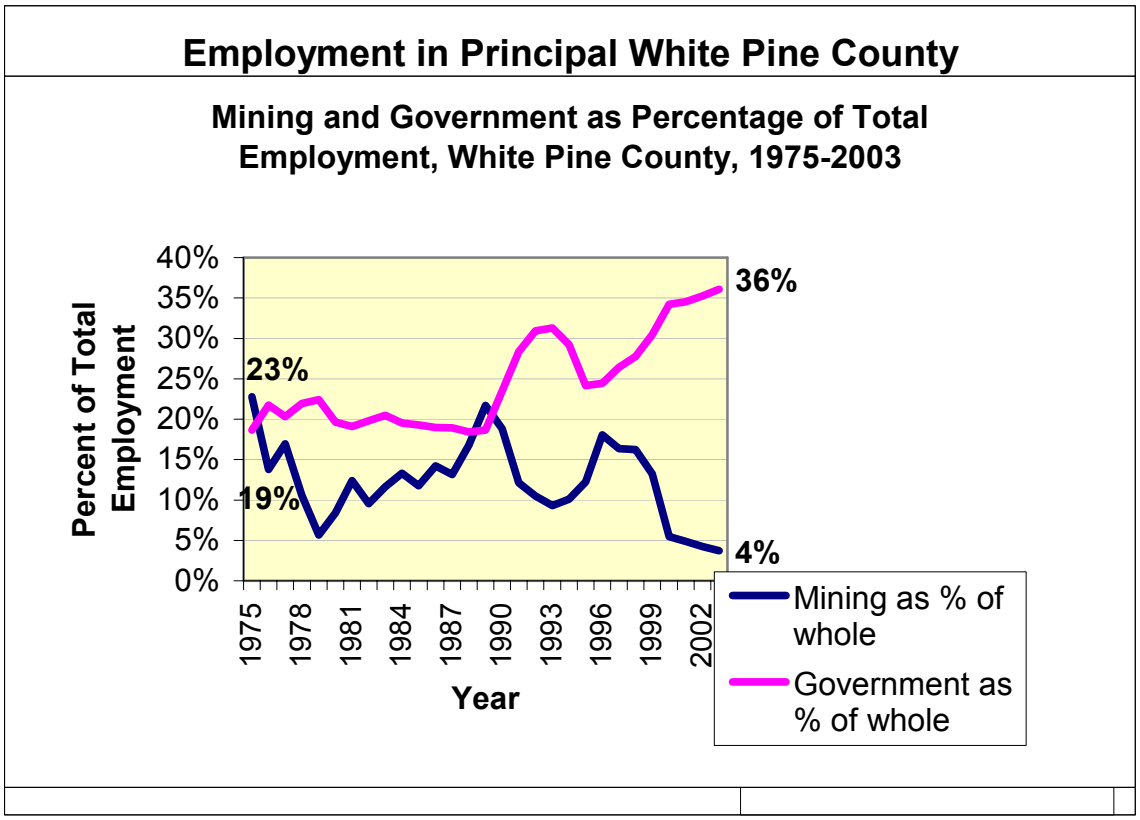
Industry and Mix of Industries in White Pine County, 1975-2006

The following line graphs, developed using statistics from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, show a local economy in transition from reliance upon a single industry to one that is becoming more diverse. As the line graph below shows, total employment in White Pine County in 1975 was 4,245 jobs; in 2003, 4,022 jobs, a drop of –5.0 percent over the period. This was not a steady drop however: as the line graph shows, overall county employment fluctuated significantly during the period, reaching a high of 5,326 jobs in 1995. This was a combination of a spike in construction jobs, upward-trending government jobs, a spike in retail, and a climb in mining jobs. In a pattern typical to mining areas, mining employment fluctuated greatly with the opening and closing of individual mines. Mining employment dropped from 967 jobs in 1975 to a low of 206 jobs in 1979. The highest number of mining jobs in the county during the 28-year period was 1,043 jobs in 1989. This fell back to a low of 150 jobs in 2003. Note how the shape of the line showing overall employment mimics the shape of the line showing mining employment – this is a graphic depiction of the continued importance of mining to the County economy during the period.

White Pine County never maintained a manufacturing sector independent of mining. Reflecting the closing of Kennecott operations, between 1981 and 1984 manufacturing employment in White Pine County dropped from 372 to 42 jobs. By 2003 there were still only 46 manufacturing jobs in the county. By 2006, manufacturing jobs began to increase due to new small industrial firms locating the area.

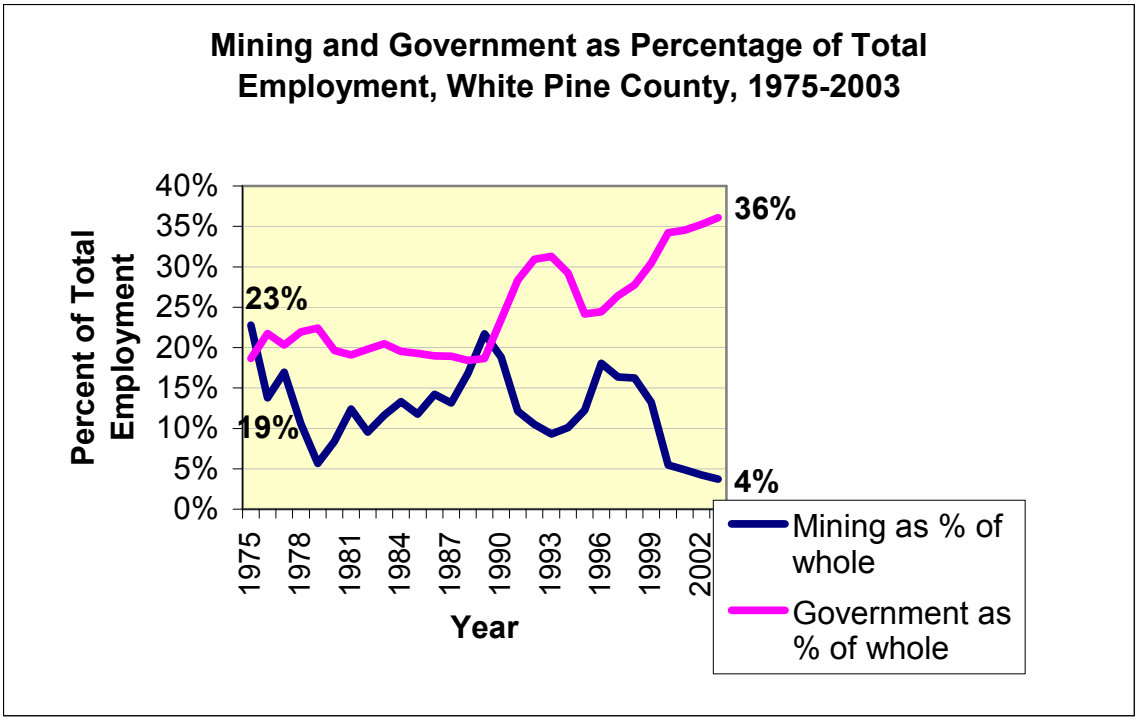
Construction employment in the county sharply peaked at 636 jobs in 1995, with local business expansion and renovation, as well as construction of the mill and housing construction that was undertaken when Magma Copper purchased and reopened the East Robinson copper mine near Ruth. By 2003 construction employment was back down to 197 jobs – only 90 more than in 1975.

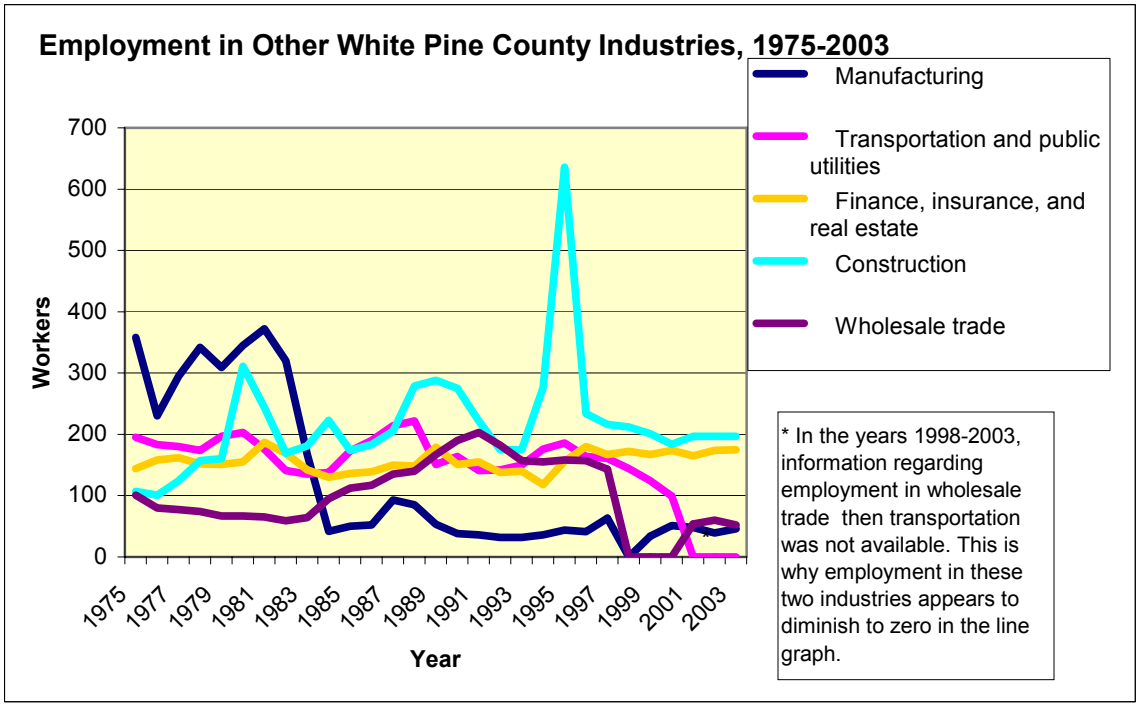
Employment in retail trade appears to somewhat mirror fluctuations in mining and other primary industries such as construction, reaching highs for the 28-year period of 825 jobs in 1981, 936 jobs in 1990, and 972 jobs in 1995.



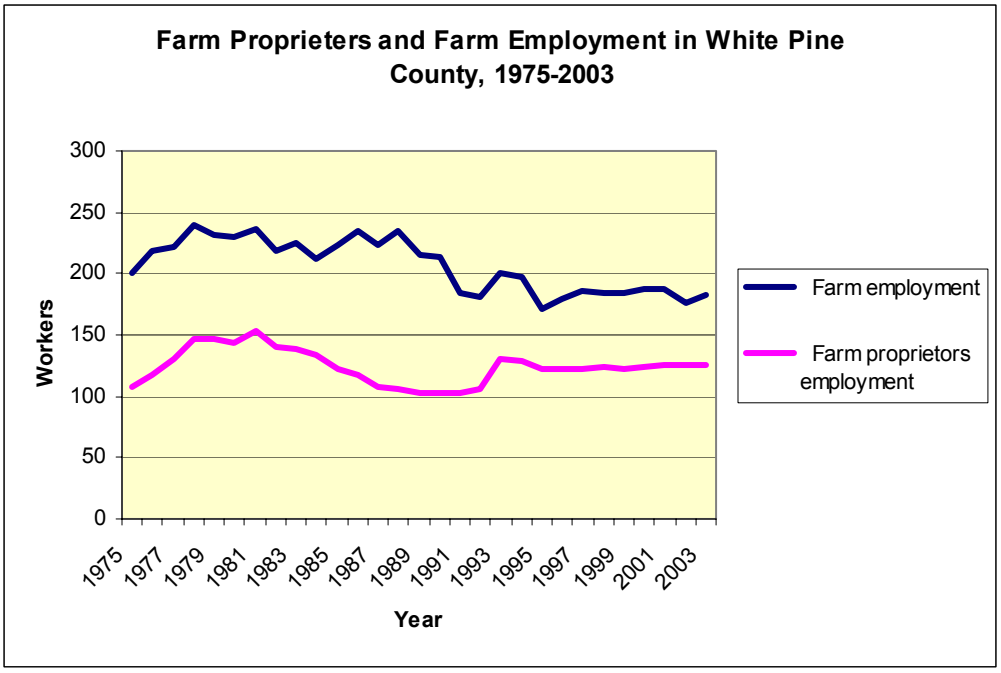
During the 28-year period mining and government switched places as top employers in White Pine County. Government employment increased steadily throughout the period, with a significant increase in government employment after the 1989 opening of the Ely State Prison. Overall, the number of government jobs almost doubled between 1975 and 2003, from 792 jobs in 1975 to 1451 jobs in 2003. Service employment also climbed during the period, from 609 jobs in 1975 to 926 jobs in 2003, a 52 percent increase in service jobs.

The following two line graphs illustrate the most significant change that took place in the White Pine County economy. During the 28-year period government enterprise became the principal White Pine County employer.


Mining and Government as Percentage of Total Employment, White Pine County, 1975-2003
Percent of Total Employment
40%
35%
30%
25%
20%
15%
10%
5%
0%
23%
19%
36%
4%
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
Year
Mining as % of whole
Government as % of whole

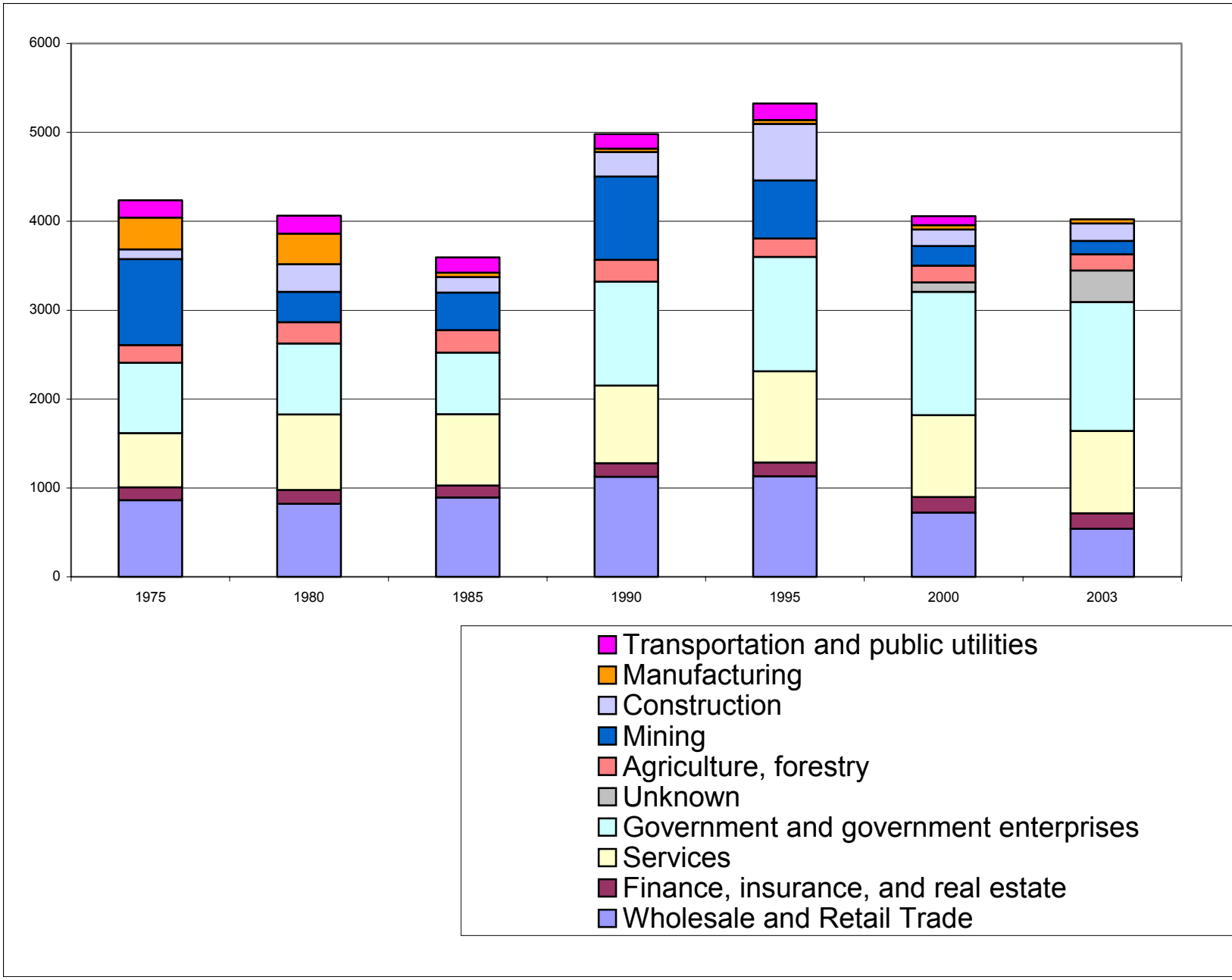

Employment in Other White Pine County Industries, 1975-2003
Workers
700
600
500
400
300
200
100
0
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
Year
Manufacturing
Transportation and public utilities
Finance, insurance, and real estate
Construction
Wholesale trade
* In the years 1998-2003, information regarding employment in wholesale trade then transportation was not available. This is why employment in these two industries appears to diminish to zero in the line graph.

Farm employment – both self-employment by proprietors and wage employment – was at its highest point in the 28-year period in 1980, with a total of 346 jobs. By 2003, there were almost exactly the same number of self-employed farm proprietors and farm employees as in 1975. The 2002 Agricultural census shows 121 farms in White Pine County with a total of 203,106 acres, and an average farm size of 1,679 acres. This represents a slight decline in the number of farms with irrigated acres from 104 farms in 1997 to 76 in 2002. There was also a slight decline in the number of cattle from 25,109 to 24,940.



These employment trends show a change in the overall mix of economic activity taking place in the county. The bar graph on the following page illustrates this. This graph shows the mix of employment in the county in the years 1975, 1980, 1985, 1990, 1995, 2000, and 2003. Over the period government and services became a larger part of the economy. Mining and manufacturing shrunk in importance, but fluctuations in mining and construction employment still have great influence on overall employment. Employment in retail and wholesale trade fluctuated somewhat with construction and mining. Finance, insurance and real estate, as well as agricultural activities, remained fairly steady through the period, although both contribute a relatively small number of jobs.

BHP's Robinson Mine property was purchased by Quadra Mining and reinstatement of copper mining activity began in July, 2004. Distribution of the White Pine County workforce among the industrial sectors shifted due to employment at the reopened mine. Government employment dropped from 47 percent of the total labor force to 40 percent. Mining increased to 13 percent of the labor force, services and trade accounted for 40 percent, construction increased to 6 percent, and manufacturing remained at 1 percent.



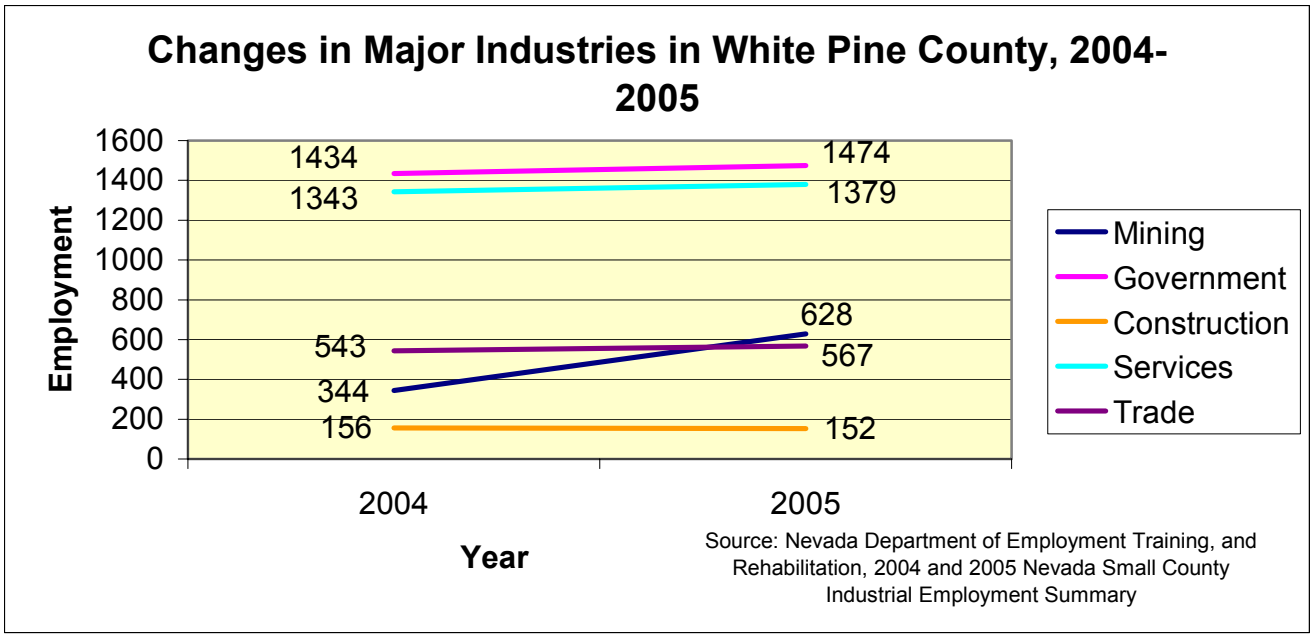
NOTE: Due to a change in 2000 in the method used by the BEA to classify industries, employment in a number of industry sub-sectors in White Pine County was not measured. This segment of employment is shown in the bar graph in gray as "unknown."

Changes in Employment by Industrial Sector, 2004-2005:

Employment figures:

	Total Employed	Mining	Government	Construction	Services	Trade	Manufacturing	FIRE	Trade/TPU
2002	3,655	133	1,416	110	1,298	543			
2003	3,530	171	1,425	109	1,241	511			
2004	3,795	344	1,434	156	1,343	543	30	90	
2005	4,120	628	1,474	152	1,379	567	30	90	
2006	4,049								

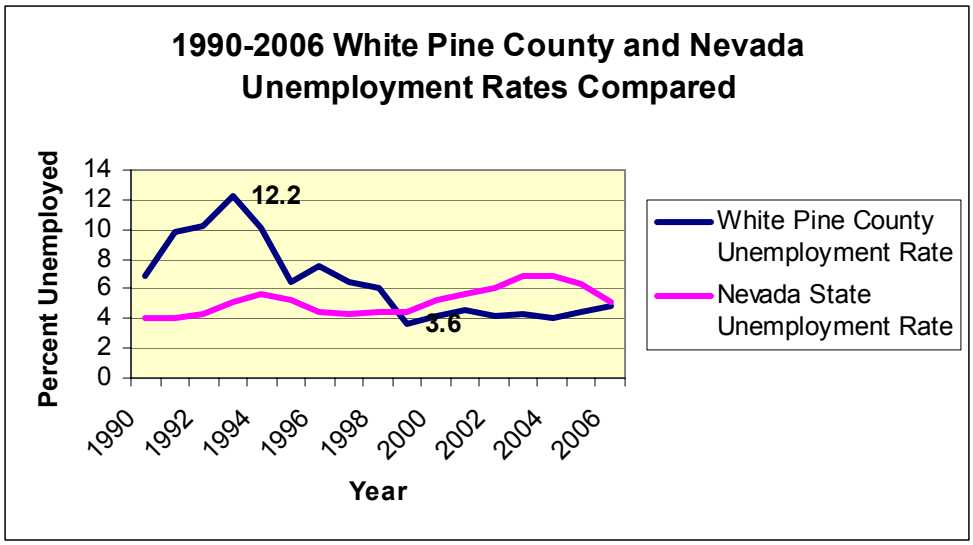
	2002	2003	2004	2005
Mining	133	171	344	628
Government	1416	1425	1434	1474
Construction	110	109	156	152
Services	1298	1241	1343	1379
Trade	543	511	543	567
Total	3655	3530	3795	4120



Source: Nevada Department of Employment Training, and Rehabilitation, 2004 and 2005 Nevada Small County Industrial Employment Summary

Labor Force and Unemployment

In the period 1990-2006, unemployment in White Pine County spiked to a high of 12.2 percent in 1993 – over twice the unemployment rate for the state of Nevada as a whole. By 1999, however, unemployment in White Pine County had fallen below that of the state as a whole, continuing to be lower than the state level through 2006.



SOURCE: Nevada DETR

Population Characteristics

U.S. Census 2000 data on population characteristics show that the percentage of male and female residents remained roughly the same as in the 1990 Census with 43.8 percent female and 56.2 percent male. Racial composition was the same as in the 1990 Census, with 88.4 percent Caucasian, 4.1 percent black, 3.3 percent Native American, 6 percent Asian, 3.1 percent other, and 2.1 percent two or more races. The total Hispanic population for all races is 11 percent. Median age increased from 33.8 years in 990 to 37.7 years in 2000, reflecting statewide (33.3 to 35 years) and national (32.9 to 35.5 years) trends, as well as the increase in adult male population due to inmates housed at the Ely State Prison.

Wages and income for White Pine County residents are approximately 80 percent of those statewide: average weekly wages in Nevada are $614, while they are $564 in White Pine County. The median household income in White Pine County is $31,004, seventy percent of the Nevada statewide median family income, and 76 percent of the national median income. Per capita income in White Pine County is $30,068, which places White Pine fourteenth in per capita income of the seventeen Nevada counties.

The 2000 Census shows the average household size in White Pine County as 2.42 persons. Of occupied housing units in White Pine County, the 2000 Census shows that 76.6 percent were owner occupied, and 23.4 percent were renter-occupied.

ATTACHMENT 3, WATER RESOURCE ASSESSMENT

This attachment contains a summary of the surface water and groundwater resources of White Pine County. The summary provides information on the sources, quantity, and quality of those resources, and the committed and applied for water rights.

Climate

The general climatic conditions are summarized in Figures 1 and 2. White Pine County has a semi-arid climate and its Basin and Range topography results in a cold desert climate where seasonal shifting of the sub-tropical high is influential less than six months of the year. Interior locations are dry because of their distance from moisture sources or their location in rain shadow areas on the lee side of mountain ranges. This combination of interior location and rain shadow positioning produces the cold desert. The dryness, generally clear skies, and sparse vegetation lead to high heat loss and cool evenings.

White Pine County's average annual precipitation is nine inches, the average for the state of Nevada (which is the driest state in the nation). Precipitation is normally light at lower elevations during all months of the year and land is mainly used for range. At higher elevations, precipitation is much greater and snow accumulates to considerable depths. Much of the snow melt irrigates crops in nearby valleys. Drought is common and expected. Historically, critical water sources in the County respond to drought conditions and climate changes with approximately four years' lag time.

In a mid-latitude, dry climate, like White Pine County's, the average potential evaporation rate exceeds the average annual precipitation, with actual average evaporation ranging from 45 to 51 inches. On an annual basis, as much as 90 to 95 percent of the total annual precipitation is lost through evaporation and transpiration; only an estimated 5 to 10 percent recharges the ground water regime.

In western White Pine County, summers are hot, especially at the lower elevations and winters are cold. The length of the growing season ranges from about 100 to 120 days with the shorter season in the western part of the County. The lowest temperature on record for Ely is -30 on February 6, 1989, and the highest recorded temperature was recorded in Ely on July 5, 1988 at 100 degrees.

Surface Water Resources

Although White Pine County has no major lakes, reservoirs, or rivers, there are important surface water resources in many locations. Surface water flows are important sources of irrigation water in the agricultural areas of Huntington, Railroad, Snake, Spring, Steptoe, and White River valleys. Groundwater that discharges to the surface at springs is also an important surface water resource. Many springs in White Pine County have been developed for irrigation, livestock watering, municipal and domestic water supplies, and the mining industry. The surface water resources of White Pine County are also extensively used for recreational purposes including fishing, hunting, boating and skiing, swimming, camping, picnicking, and relaxation. Finally, but of no less importance, wildlife cannot thrive without a dependable source of water and the many springs, streams, and lakes in White Pine County support the habitat for many desirable species.

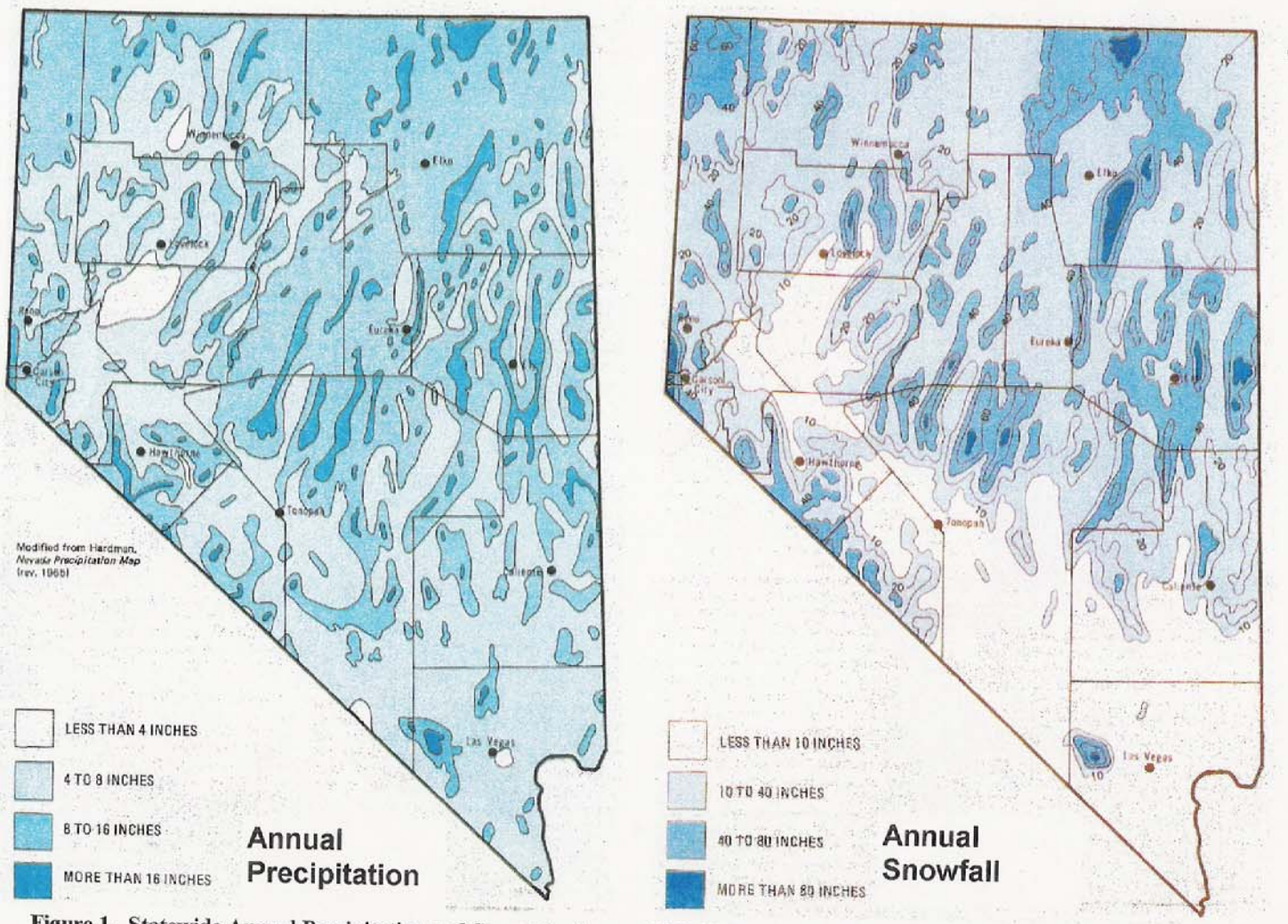
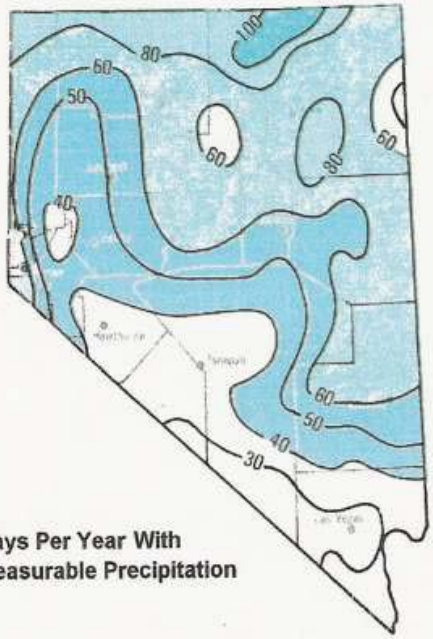
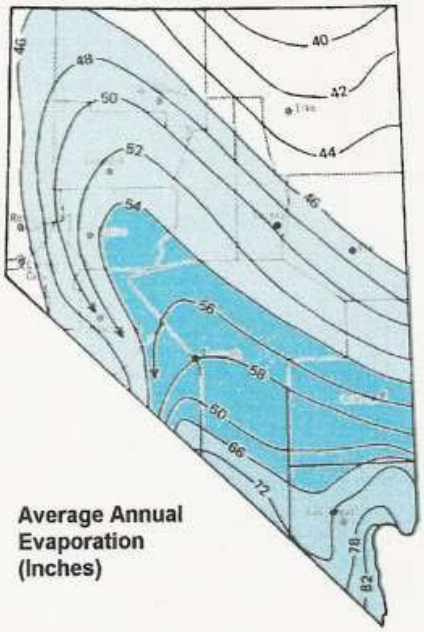


Figure 1. Statewide Annual Precipitation and Snowfall. Source: NBMG Special Publication 2, Nevada's Weather and Climate, 1975

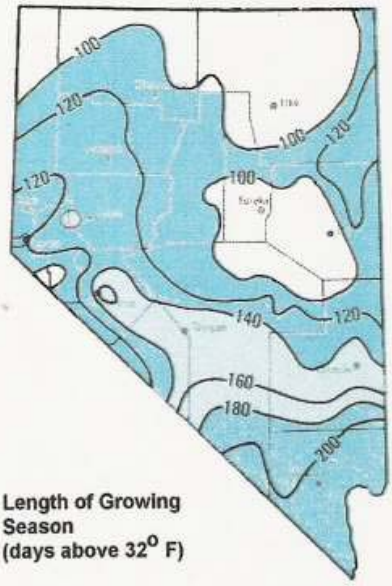


Days Per Year With Measurable Precipitation



Average Annual Evaporation (Inches)

White Pine County Climate Stations
Ely WSO Airport - Elev. 6,253 Great Basin National Park - Elev. 6,830 Lages - Elev. 5,960 Lund - Elev. 5,570 McGill - Elev. 6,300 Ruth - Elev. 6,840 Shoshone - Elev. 5,930
~~US Geological Survey High-Elevation~~ Precipitation Stations in White Pine County
Cherry Creek Range - Elev. 9,700 Northwest of Mt. Moriah - Elev. 9,300 Mt. Hamilton - Elev. 10,600 Cave Mountain - 10,650 Mt. Washington - 10,440



Length of Growing Season (days above 32° F)

Figure 2. Statewide Precipitation Days, Evaporation, Growing Days and White Pine County Climate Stations. Sources: BMG Special Publication 2, Nevada's Weather and Climate 1975, US Geological Survey Records, and NOAA data.

All of the surface water resources (and groundwater resources as well) are derived from the precipitation that falls over the County. Figure 3 shows a conceptual representation of the interrelationships between the precipitation that falls over the mountainous areas and the surface and groundwater regimes.

Lakes - A complete inventory of all lakes and reservoirs has not been completed for White Pine County. Table 3-1 lists the 18 lakes and reservoirs which are identified in various published sources and the files of the Nevada Division of Water Resources. Ruby Lake extends across portions of both White Pine and Elko counties and is the largest lake in the region. The largest reservoirs in White Pine County are Bassett Lake in Steptoe Valley and Preston Reservoir in White River Valley.

There are six subalpine lakes near the crest of the South Snake Range in Great Basin National Park: Baker Lake, Brown Lake, Johnson Lake, Stella Lake, Teresa Lake, and Dead Lake. These lakes, all at elevations above 9,500 feet, provide recreational water resources for Park visitors and, perhaps more importantly, water supplies for wildlife and habitat for a number of species of plants and fishes. Lakes of this type are a rarity in White Pine County (and elsewhere in Nevada) and they are especially susceptible to the inadvertent impacts of human activities. As the subalpine lakes of White Pine County are all with the boundaries of Great Basin National Park, they will be preserved in perpetuity by the National Park Service.

Streams - Although there are no major rivers in White Pine County, there are many streams that drain the upland areas. These streams derive their flow from three main sources: spring discharges, groundwater discharge along the stream channel, and snow melt.

The streams of White Pine County provide the aquatic habitat for many types of fishes including four types of trout (rainbow, brook, brown, and cutthroat), a number of native species such as the Steptoe Dace, the White River Mountain sucker, the White River Speckled Dace, the White River Springfish, the Duckwater Tui Chub, and many other types of fishes.

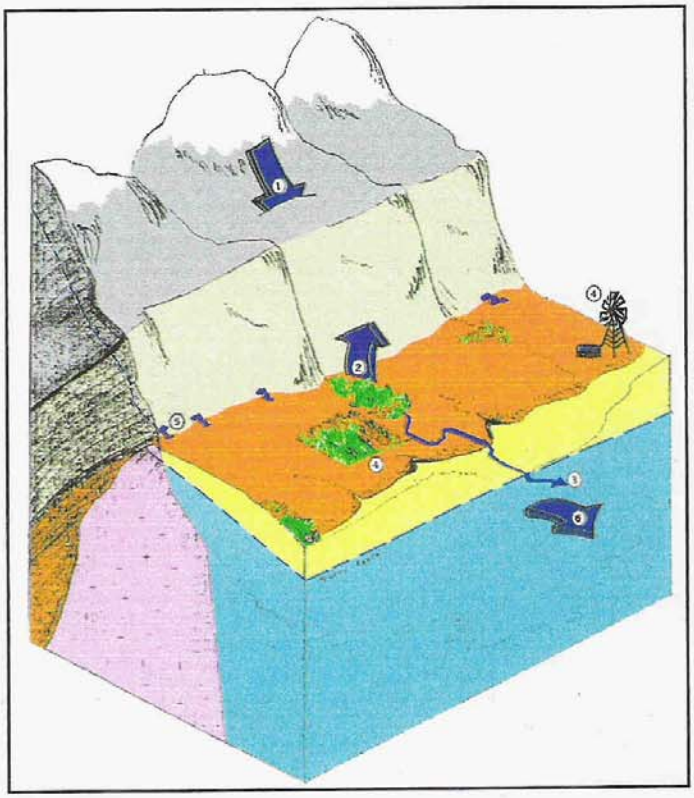
The streams also support extensive riparian and wetland areas. According to Bureau of Land Management documents, there are at least 62 streams in White Pine County that support more than 200 miles of riparian habitat. The riparian areas of White Pine County provide not only habitat for the fishes listed above and other aquatic species, they provide nesting for a number of bird species including the Black Tern and Long-billed Curlew and a number of important raptors including the Bald Eagle, Peregrine Falcon, Northern Goshawk, Golden Eagle, Prairie Falcon, American Kestrel, and several species of owls.

Springs –USGS records show over seven hundred springs in White Pine County. Springs occur wherever groundwater intercepts the land surface and discharges water to the surface water regime. The US Geological Survey conducted a survey of 100 springs in the County and reported a combined discharge rate of over 78,000 gallons per minute, equivalent to more than 126,000 acre feet per year. Data available to update spring inventories include the National Hydrologic Data Set springs and seeps, the National Water Information System springs and seeps monitoring sites for USGS, and the Death Valley Regional Flow System springs. Figure 4 shows the location of measurements in White Pine County for each of the data systems.

Figure 3. Conceptual Hydrogeologic Model for White Pine County

1. The water resources of White Pine County originate as the rain and snow that falls over the upland areas. Rain and snowmelt run off into the channels and into the fractures in the rock. Some of this water is consumed by the plants and some infiltraties downward to the water table, a process known as *recharge*. Most of the recharge occurs at elevations above 6,000 feet.

2. The streams in White Pine County are important water resources. The streams are fed by runoff from the mountains and by springs that discharge in the upland areas. The streams often support lush riparian areas and wildlife. Along the mountain front, additional recharge occurs through the channels that drain the upland areas. The vegetation that is supported by the streams and springs consume a considerable amount of water through *evapotranspiration*.



3. Surface water flows year round in some springs and streams, but the amount of flow is often quite variable. Following the snowmelt in the late spring, there is usually a surge of discharge in the streams and springs that drain the mountain areas. This surge of flow is also referred to as *rejected recharge* as it represents the excess water that the rocks are not able to intake. Streams that are fed by springs with seasonal flow may dry up completely in the dry months. Streams and springs that flow year round are called *perennial* and seasonal flows are referred to as *ephemeral*.

4. The water that is used by man for irrigation, stockwater, and quasi-municipal purposes is not completely consumed. Water stored in ponds and irrigation canals leaks back into the groundwater system. Some portion of the irrigation water (about 25 percent) infiltrates back into the ground. Even domestic septic systems may return a small quantity of water back into the ground. Collectively, the infiltration of water from these sources is called *secondary recharge*. Secondary recharge can be a large component of the water budget in basins where irrigation is widespread.

5. Spring lines often occur where geologic controls such as faults or contacts are present. These controls cause groundwater to rise to the surface and discharge. In some of the more water-rich basins of White Pine County, there are spring lines that are tens-of-miles long with hundreds of individual springs and seeps.

6. In most basins, the water that recharges the aquifers ultimately flows from up-gradient basins to down-gradient basins. Basins that are hydraulically linked in this manner are referred to as *flow systems*.

Table A 3-1. Lakes and Reservoirs of White Pine County (Modified from Scott et al, 1971 and the dam safety records of the Nevada Division of Water Resources)			
Lake or Reservoir	***Source***	***Surface Area (acres)***	***Storage Capacity (acre feet)***
Baker Lake	Natural Lake	10	50 (estimated)
Bassett Lake	Steptoe Slough	120	1,300 (estimated
Brown Lake	Natural Lake	5 (estimated)	Unknown
Bull Creek #3	Bull Creek	<5 acres	10
Cave Creek	Steptoe Creek	320	784
Cold Creek Reservoir	Cold Spring	20 (estimated)	Unknown
Comins Lake	Steptoe Valley Creek Willow Creek	400	290
Dead Lake	Natural Lake	3	10 (estimated)
Geyser Dam 2,3, and 5	North Creek	Unknown	89
Goshute Reservoir	Chokecherry and Weaver Canyons	200	300
Illipah Reservoir	Illipah Creek	15(estimated)	1,300
Johnson Lake	Natural Lake	5	25 (estimated)
Preston Reservoir	Jakes Valley Wash	109	1,271
Ruby Lake (with Elko County)	Natural Lake	9,000	30,000
Silver Creek Reservoir	Silver Creek	13	165
Spring Valley Wash	Spring Valley Creek	20 (estimated)	121
Stella Lake	Natural Lake	5	25 (estimated)
Sunset Reservoir	Chin Creek	10 (estimated)	Unknown

Table A 3-2 Estimate of Active Surface Water Commitment

Basin No.	Basin Name	NV Counties/ State**	Data Source	Duty, AFA																								Total Rights
				By Water Right Status								By Manner of Use																
				CER	PER	VST	RES	DEC	APP	RFA	RFP	COM	CON	DOM	ENV	IND	IRR	MM	MUN	PWR	QM	REC	STK	STO	WLD	OTH	DEC	IRD	
047	Huntington Valley	WP,EL	Basin	3904	725	11	3			315		24		2			4038						557		19	3	315		4,643
			WPC	318																			318						318
154	Newark Valley	WP	Basin	21359		1538		5560									27643	61					268					485	28,457
			WPC	21352		1538		5560									27643	61					261					485	28,450
155A	Little Smoky Valley (N.)	WP,EU,NY	Basin	6483	1536	43	454										7506	82	80				393			454			8,516
			WPC	291													200						92						291
173B	Railroad Valley (N.)	WP,NY,LI	Basin	10238	22158	11843	67										40504	499					631			61		2611	44,306
			WPC	179	8158	0											8188	27					123						8,337
174	Jakes Valley	WP	Basin	2199		68								2			783				8		174	1301					2,267
			WPC	2196		68								2			783				6		172	1301					2,263
175	Long Valley	WP, EL	Basin	286													132						155						286
			WPC	286										132									155						286
176	Ruby Valley	WP, EL	Basin	10675	23	269447	94240	4241		27403	66727						310805				27	62720	834			94233	4137		378,626
			WPC	29		26																	56						55
178B	Butte Valley (S.)	WP, EL	Basin	1315	2803	1619					3						5556				3		182						5,737
			WPC	1315	2803	1035					3						4971				3		182						5,153
179	SteptoeValley	WP,EL	Basin	89917	54267	6202	23			3289						42714	60298	10305	6924	4706	323	2068.979	966	290	25072	31			150,409
			WPC	89700	54267	6202				3289						42714	60164	10305	6924	4706	323	2069	882	290	25072	8			150,169
180	Cave Valley	WP, LI	Basin	775	80	47											787						115						901
			WPC	10		47																	57						57
183	Lake Valley	WP, LI	Basin	4075	50	4440											7038		977		10		540						8,565
			WPC	815		1234											1974						74						2,048
184	Spring Valley	WP, LI	Basin	48286	862	173890	467	1396		3524	9817			1			234299	2865			3		606			467			224,900
			WPC	48257	862	173882	461	1396		3524	9817			1			234299	2865			3		570			461			224,858
185	Tippett Valley	WP	Basin	475		12											384						103						487
			WPC	475		12											384						103						487
186A	Antelope Valley (S.)	WP, EL	Basin	96		119											56						159						215
			WPC	72		119											56						135						191
186B	Antelope Valley (N.)	WP, EL	Basin	498			6										40		326		11		121		6				504
			WPC	40													40												40
193	Deep Creek Valley	WP, EL, UT	Basin	711													682						28						711

			WPC	711													682						28						711
194	Pleasant Valley	WP, UT	Basin	924	180	236				1600							2793						146						1,340
			WPC	924	180	236				1600							2793						146						1,340
195	Snake Valley	WP, UT	Basin	11141	800	3694	26	16319	638	12670							14564			5430	14	109.5	215		5792	7266	11899		31,980
			WPC	11141	800	3294	26	16319	638	12670							14164			5430	14	110	215		5792	7266	11899		31,580
196	Hamlin Valley	WP, LI, UT	Basin	400	270	90											582						178						759
			WPC																										0
207	White River Valley	WP, NY, LI	Basin	44838	3137	23463				3	836			9		840	59467	72		2172	726		2921		6070				71,438
			WPC	26001	62	9170				3	36			9		840	27550	72		2172	724		2675		1230				35,233
	Total		Basin	258,593	86,890	496,760	95,285	27,516	638	48,803	77,384	24	0	13	0	43,554	777,957	13,884	8,307	12,308	1,125	64,898	9,289	1,591	36,959	102,514	16,351	3,096	965,045
			WPC	204,112	67,132	196,862	487	23,275	638	21,085	9,856	0	0	143	0	43,554	383,892	13,330	6,924	12,308	1,074	2,178	6,244	1,591	32,094	7,735	11,899	485	491,868
*DOML is the duty committed to DOM wells w/o an appropriative right issued based on well log data.																														
**Basin totals are for NV PODs only.																														
***Combined Yield for basins 46, 47, and 48																														

Water Quality - The general quality of White Pine County's surface water is in compliance with the 1972 Clean Water Act; however, surface water quality is subject to impacts from human activities and natural causes. The groundwater vulnerability assessments conducted for public water supply systems did not identify any contamination of surface water drinking sources in the County.

Committed Resources - The total quantity of surface water resources in White Pine County is not known and the quantity of committed resources is not known with precision. Table 3-2 lists surface water right data obtained from the Nevada Division of Water Resources. These data have not in all cases been supplementally adjusted, and may overstate the amount of surface water committed because they include water rights that are used supplementally with groundwater rights or with multiple points of diversion. Figure 5 shows the impact of pumping on springs. Figure 6 shows the general hydrologic characteristics of riparian areas and the management practices that can be employed for their protection.

Groundwater Resources:

In addition to their surface water resources, White Pine County has considerable groundwater resources. Groundwater occurs at various depths under the entire county and has been developed for municipal, agricultural, and mining supplies as well as for other purposes. In recent years, the demand on the groundwater resources has grown significantly, in part reflecting the growth of the various economic sectors of the County, and in part reflecting the interest in exporting water from White Pine County through large-scale inter-basin transfers of water. Because most of the surface water resources of White Pine County have already been appropriated, the groundwater resources represent the only remaining source of water that is available to support the future well being of the County, through diversification and expansion of the economy.

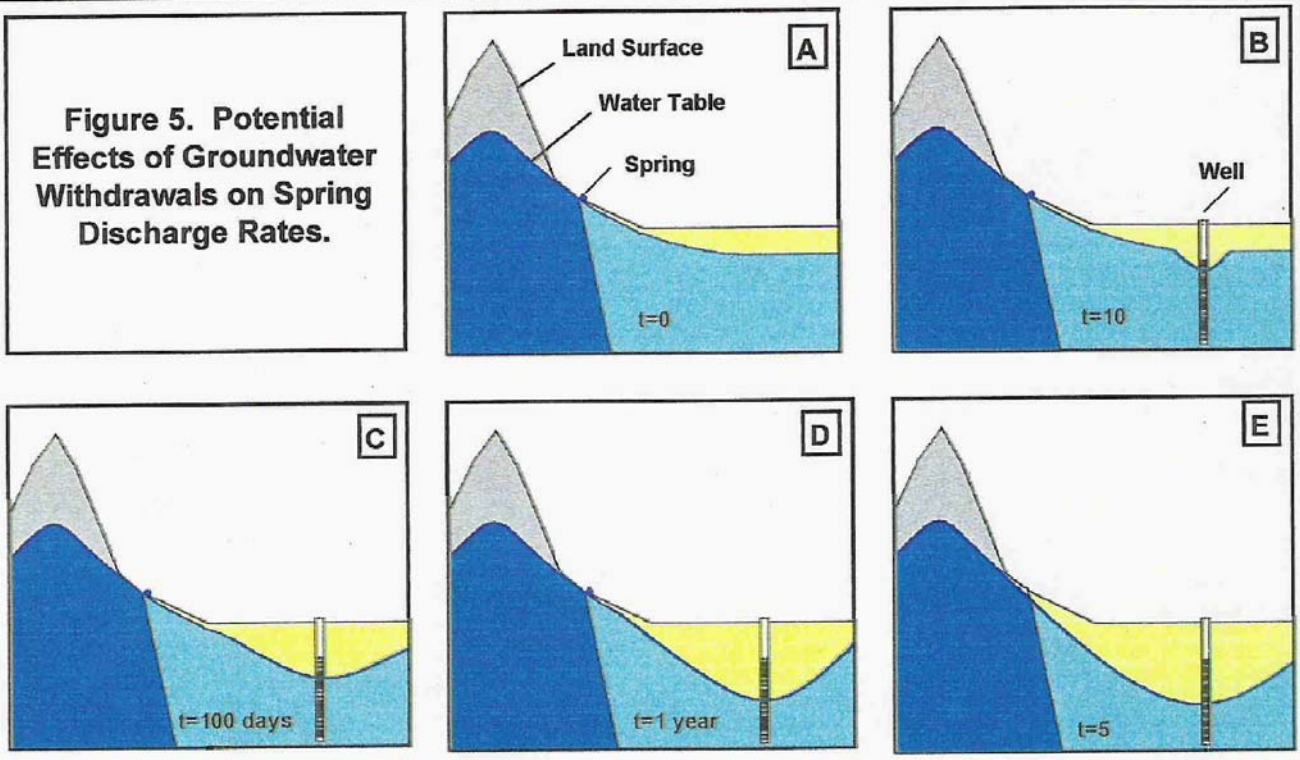
In this section, an overview of the groundwater resources of White Pine County is presented. This overview includes a description of the hydrologic conditions and sources of water, the quantity of water that is present, the quality of that water, and the committed groundwater resources.

General Geologic Conditions - With respect to their significance to groundwater, the geologic units of White Pine County may be grouped into seven categories: 1) the valley-fill deposits, comprising mixtures of gravel, sand, silt and clay that include the alluvial and playa deposits; 2) younger volcanic rocks, comprising ash-flow tuff and basalt; 3) older volcanic rocks, comprising dacite, latite, andesite, and tuffs; 4) Triassic sediments, comprising freshwater limestone, conglomerate, sandstone, siltstone, and tuff; 5) intrusive rocks, comprising granitic plutons; 6) upper Paleozoic carbonate rocks, comprising predominantly limestone and dolomite, but with inter-bedded shale and siltstone aquitards; and 7) lower Paleozoic and older rocks, comprising predominantly clastic rocks including shale and quartzite, but with some inter-bedded carbonate units. Figure 7 is a generalized geologic map that shows the distribution of these units in White Pine County. For a more detailed map and description of the geologic units present, the reader is referred to Nevada Bureau of Mines and Geology Bulletin 85, Geology and Mineral Resources of White Pine County, Nevada Part I Geology, 1976, by Richard Hose and M.C. Blake.

Figure 8 shows the vertical distribution of the aquifers and aquitards of White Pine County as a generalized hydrostratigraphic column. In general, the geologic units of White Pine County can be divided into eight aquifer systems. The regional carbonate aquifer is divided into six systems, an upper carbonate system, an upper clastic aquitard, a lower carbonate system, a Cambrian aquitard, a middle Cambrian carbonate aquifer, and a lower clastic aquitard.

The ability of the aquifer systems of White Pine County to store and transmit groundwater, and to yield water to wells, depends upon the type of aquifer and its characteristics. Typically, the alluvial deposits are more productive where they comprise coarse-grained gravels and sand deposits, but exhibit low well yields in the playa areas where clay predominates. The production of the consolidated volcanic and carbonate aquifers depends largely on the degree of faulting and fracturing. The limestone and dolomite units, where fractured, can be quite productive aquifers, with yields of 3,000 gallons per minute reported for some wells drilled into similar units in Clark County.

Figure 5. Potential Effects of Groundwater Withdrawals on Spring Discharge Rates.



A. Prior to pumping, the natural hydrologic system is in balance with flow from recharge areas over the mountains to discharge areas along the valley axis or out of the basin via underflow. Where the water table intercepts the land surface, groundwater discharges to the surface as springs.

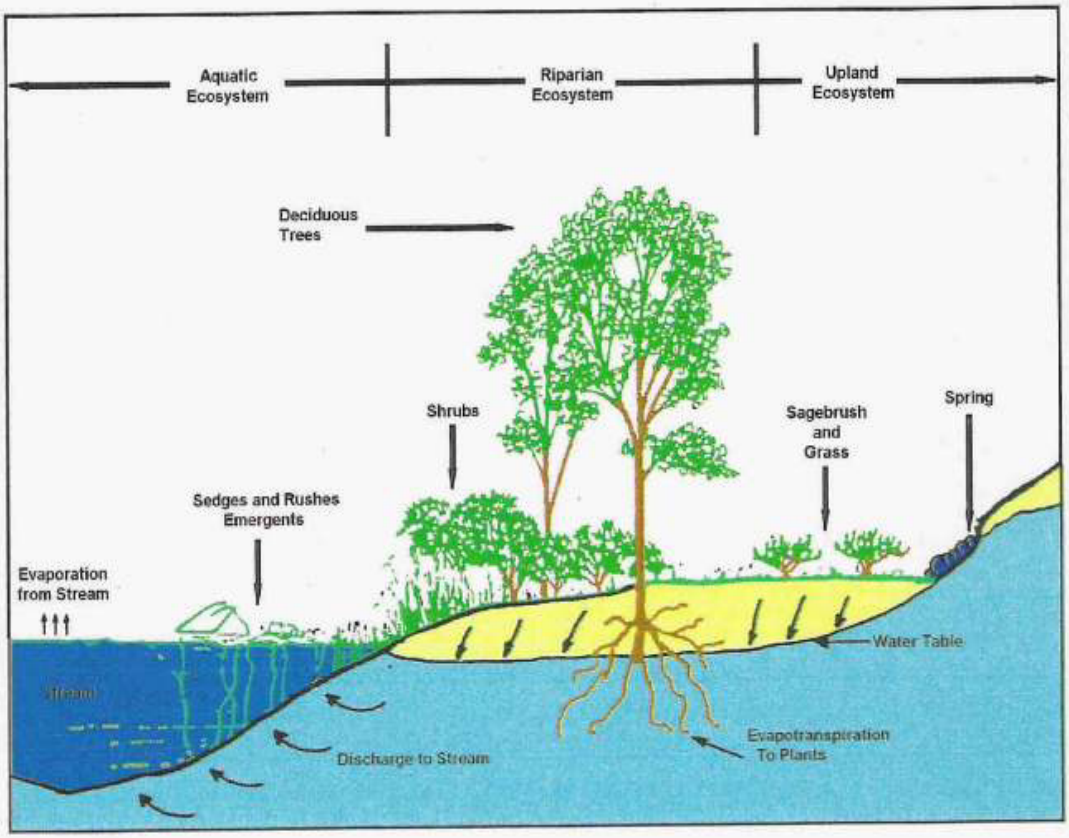
B. With the onset of pumping, water levels are lowered in the vicinity of the production wells. The amount of water level decline that will occur depends upon a number of factors, including the pumping rate and duration, and the abiltiy of the underground aquifers to store and transmit groundwater. If more than one production well is present a pumping center may develop where the cones of depression of each well begin to overlap.

C. With continued pumping, the area over which water level declines occur begins to expand outward from the pumping well or wells.

D. As water withdrawals continue over time, the area of influence of the wells begins to approach the edges of the valley-fill aquifer and spring discharges may begin to decline.

E. The effects of long-term withdrawals can expand beyond the valley-fill aquifer and can eliminate the natural discharge of springs. Springs have been dried up in this manner in a number of Nevada basins including Las Vegas Valley, Pahrump Valley, and Clayton Valley. Wetlands and habitats associated with the springs can also be eliminated or significantly reduced in size.

Figure 6. Riparian Area Issues & Management Practices



ISSUES

- o Livestock production is an important economic sector in White Pine County.
- o The ranching industry, in accordance with Nevada Water Law, has obtained the legal right to divert water from streams and springs and to withdraw groundwater for livestock watering.
- o Livestock and wildlife may trample vegetation and overgraze forage in riparian areas.
- o Livestock and wildlife may disturb the soils in riparian areas.
- o Wildlife may be trapped and drowned in troughs and spring developments.
- o Livestock and wildlife may impact water quality in riparian areas.

MANAGEMENT PRACTICES

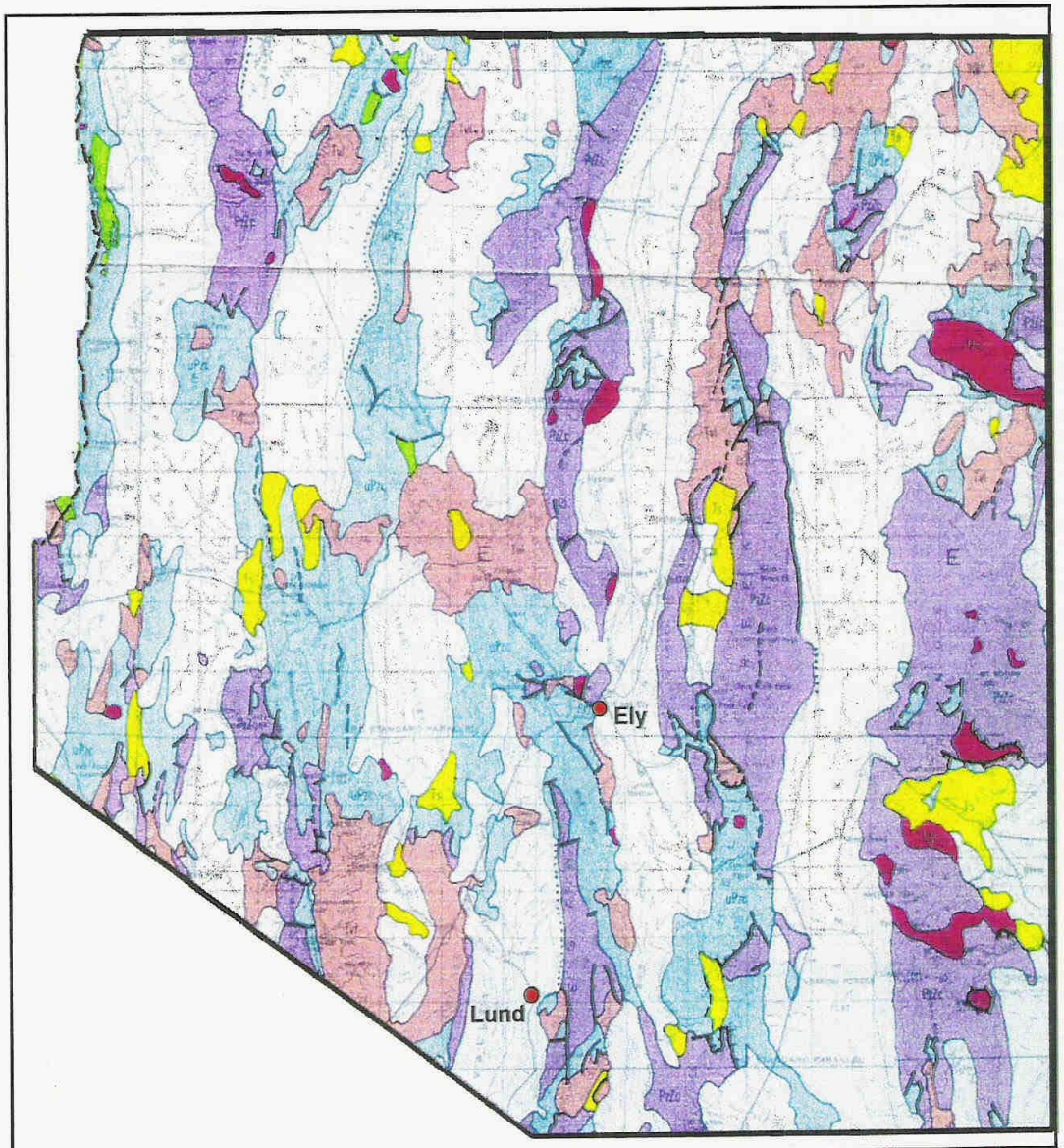
- o Convey water from streams to watering sites away from riparian areas.
- o Move salt blocks away from riparian areas.
- o Fence selected riparian areas on Great Basin National Park.
- o Monitor impacts of grazing on riparian areas.
- o Installation of walkways to prevent trapping and drowning.
- o Promote cooperation between the ranching industry and federal land management agencies for the long-term management of range lands outside of Great Basin National Park.

The ability of the aquifer systems of White Pine County to store and transmit groundwater, and to yield water to wells, depends upon the type of aquifer and its characteristics. Typically, the alluvial deposits are more productive where they comprise coarse-grained gravels and sand deposits, but exhibit low well yields in the playa areas where clay predominates. The production of the consolidated volcanic and carbonate aquifers depends largely on the degree of faulting and fracturing. The limestone and dolomite units, where fractured, can be quite productive aquifers, with yields of 3,000 gallons per minute reported for some wells drilled into similar units in Clark County.

Some geologic units have little or no productivity because of their fine-grained nature. These units include shale, quartzite, and granite. Where fractured, these units may be capable of producing only low to moderate well yields (a few tens of gallons per minute), but generally act as aquitards (units that tend to retard the movement of water horizontally and vertically between aquifers).

The distribution of geologic units and the relationships between aquifers and aquitards is quite variable because of the past geologic history of White Pine County. The carbonate and other sedimentary rock units that were originally deposited as flat lying sediments on the ocean floor have since been faulted, folded, fractured, and in some instances, intruded by granite rocks. Low-angle faults have resulted in older rocks being thrust over younger rocks while high-angle basin and range faults have resulted in significant offsets in geologic units. The intrusion of plutons has further disturbed the rocks and aquifers. The net result of this deformation is that the aquifers in White Pine County are not continuous. Rather, they are broken into discrete compartments that are usually bounded either by fault zones or contacts between rocks with contrasting hydraulic properties. This compartmentalization is an important, but poorly understood, aspect of the regional hydrologic conditions. The regional carbonate aquifer, for example, is commonly perceived as a continuous aquifer while in reality, it has been broken up both horizontally and vertically into dozens, and perhaps hundreds, of individual compartments. A better understanding of how these compartments interact can only be achieved through further testing and study.

Groundwater Occurrence and Flow - Figure 9 shows the conceptual hydrogeologic conditions in White Pine County. Recharge derived from precipitation over the upland areas replenishes the groundwater reservoir each year. Groundwater flows from the upland areas toward the valley floors. In undrained basins, all of the groundwater stays within the basin where the recharge fell and is discharged to the surface or consumed by plants (a process referred to as evapotranspiration). Where two or more basins are hydraulically connected, they form a flow system. The presence of a north-south "corridor" sixty to ninety miles wide of carbonate rock stretches from east central Nevada to south of the Spring Mountains in southern Nevada creating a major flow system that help to determine the water resources available throughout the region. The Colorado flow system (sometimes referred to as the White River flow system) links ground water beneath dozens of valleys over distances exceeding three hundred miles. The sources of ground water flowing into the aquifer are recharge from precipitation or mountain runoff and regional inflow from carbonate rock aquifers. The regional carbonate aquifer stores hundreds-of-millions of acre feet of water. However, the US Geological Survey has estimated that if the water stored in the upper 100 feet were extracted, the central carbonate aquifer could yield about six million acre feet of stored water. It is important to note, however, that the extraction of such huge volumes of water, and the subsequent lowering of water levels, could have significant adverse impacts on the groundwater regime of the basins where extraction occurs.



Alluvial and Playa Deposits

Tuffaceous Sediments

Volcanic Rocks

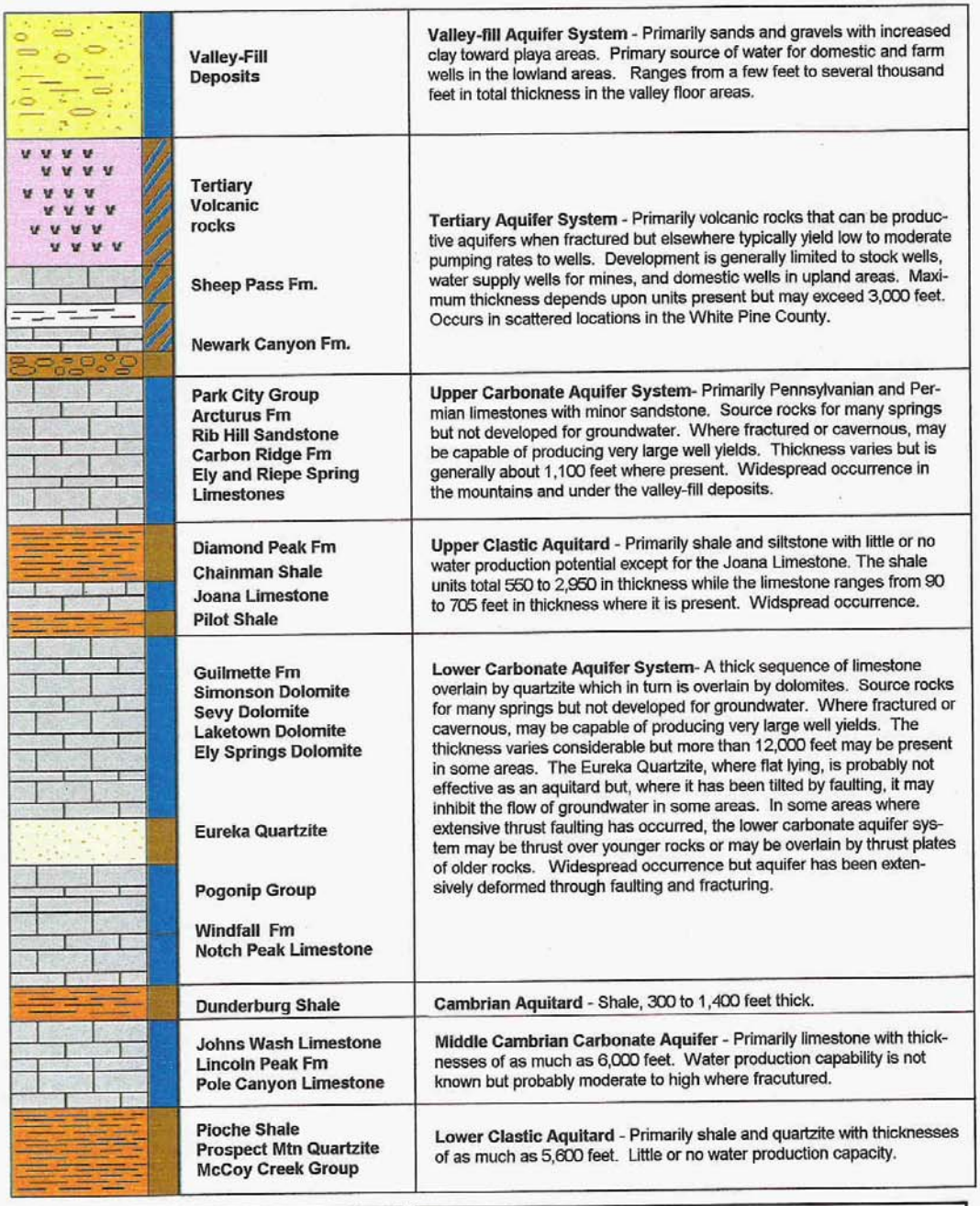
Intrusive Rocks

Triassic Sediments

Upper Paleozoic Rocks - Primarily Carbonates

Lower Paleozoic Rocks - Primarily Clastics

Figure 7. Generalized Geologic Map of White Pine County. Source: Scanned from 1:1,000,000 scale Geologic Map of Nevada by Stewart and Carlson, 1977, Map 57, Nevada Bureau of Mines and Geology.



Valley-Fill Deposits	**Valley-fill Aquifer System** - Primarily sands and gravels with increased clay toward playa areas. Primary source of water for domestic and farm wells in the lowland areas. Ranges from a few feet to several thousand feet in total thickness in the valley floor areas.
Tertiary Volcanic rocks **Sheep Pass Fm.** **Newark Canyon Fm.**	**Tertiary Aquifer System** - Primarily volcanic rocks that can be productive aquifers when fractured but elsewhere typically yield low to moderate pumping rates to wells. Development is generally limited to stock wells, water supply wells for mines, and domestic wells in upland areas. Maximum thickness depends upon units present but may exceed 3,000 feet. Occurs in scattered locations in the White Pine County.
Park City Group **Arcturus Fm** **Rib Hill Sandstone** **Carbon Ridge Fm** **Ely and Riepe Spring Limestones**	**Upper Carbonate Aquifer System**- Primarily Pennsylvanian and Permian limestones with minor sandstone. Source rocks for many springs but not developed for groundwater. Where fractured or cavernous, may be capable of producing very large well yields. Thickness varies but is generally about 1,100 feet where present. Widespread occurrence in the mountains and under the valley-fill deposits.
Diamond Peak Fm **Chainman Shale** **Joana Limestone** **Pilot Shale**	**Upper Clastic Aquitard** - Primarily shale and siltstone with little or no water production potential except for the Joana Limestone. The shale units total 550 to 2,950 in thickness while the limestone ranges from 90 to 705 feet in thickness where it is present. Widspread occurrence.
Guilmette Fm **Simonson Dolomite** **Sevy Dolomite** **Laketown Dolomite** **Ely Springs Dolomite** **Eureka Quartzite** **Pogonip Group** **Windfall Fm** **Notch Peak Limestone**	**Lower Carbonate Aquifer System**- A thick sequence of limestone overlain by quartzite which in turn is overlain by dolomites. Source rocks for many springs but not developed for groundwater. Where fractured or cavernous, may be capable of producing very large well yields. The thickness varies considerable but more than 12,000 feet may be present in some areas. The Eureka Quartzite, where flat lying, is probably not effective as an aquitard but, where it has been tilted by faulting, it may inhibit the flow of groundwater in some areas. In some areas where extensive thrust faulting has occurred, the lower carbonate aquifer system may be thrust over younger rocks or may be overlain by thrust plates of older rocks. Widespread occurrence but aquifer has been extensively deformed through faulting and fracturing.
Dunderburg Shale	**Cambrian Aquitard** - Shale, 300 to 1,400 feet thick.
Johns Wash Limestone **Lincoln Peak Fm** **Pole Canyon Limestone**	**Middle Cambrian Carbonate Aquifer** - Primarily limestone with thicknesses of as much as 6,000 feet. Water production capability is not known but probably moderate to high where fracutured.
Pioche Shale **Prospect Mtn Quartzite** **McCoy Creek Group**	**Lower Clastic Aquitard** - Primarily shale and quartzite with thicknesses of as much as 5,600 feet. Little or no water production capacity.

Figure 8. Aquifers and Aquitards of White Pine County.

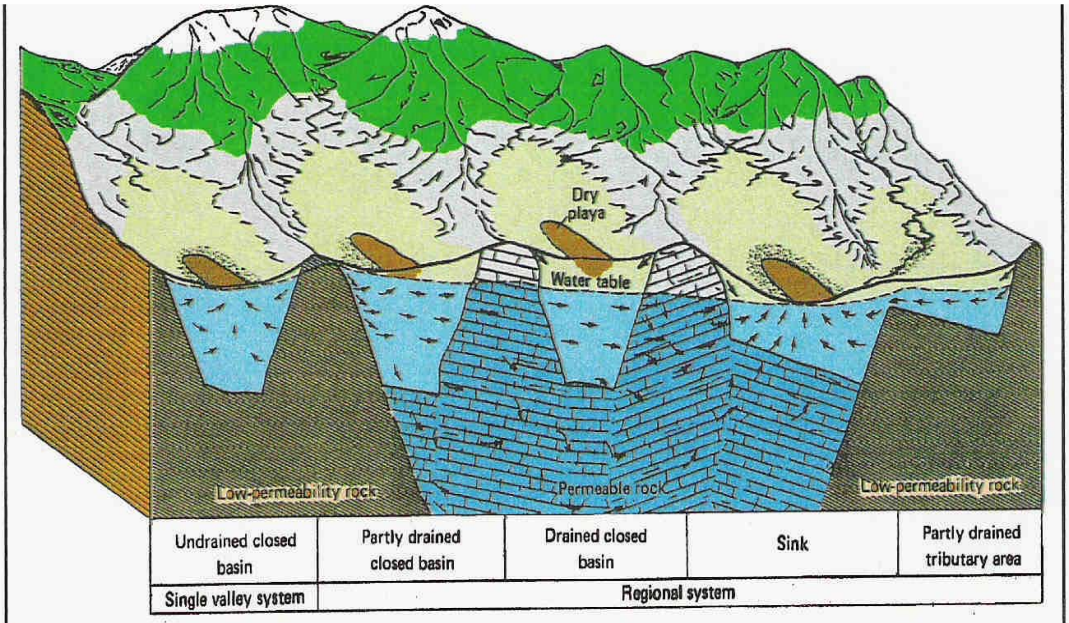


Figure 9. Conceptual hydrogeology of the basins of White PineCounty. Modified from U.S. Geological Survey Professional Paper 813-G.

General Basin Hydrology: White Pine County has all, or portions of 20 individual hydrographic basins. Figure 10 provides summary information concerning the water budget parameters for each of these basins. The water budget in its simplest form, is an accounting of the inputs to and outputs from a basin. The water budget is a balance where the groundwater recharge from all sources equals the total discharge.

Recharge to the groundwater system in each basin is derived primarily from the precipitation that falls above an elevation of about 6,000 feet above mean sea level. The figure at left shows the distribution of recharge areas in White Pine County and adjacent areas. The bulk of the recharge over the County occurs over the Schell Creek Range, Snake Range, the Egan Range, and the White Pine Range. Lesser recharge is contributed over the Diamond Range, Buck Mountain, the Ruby Mountains, and the Cherry Creek Range.

The quantity of recharge that is contributed each year is not known. Crude estimates of recharge have been developed based on estimates of discharge. Secondary recharge occurs where water used for irrigation infiltrates to the water table, from leakage from canals, ditches, and natural stream channels, and from septic systems. Secondary recharge can total several thousand acre feet per year in some basins

Groundwater flows from the upland recharge areas to discharge areas at springs and areas where shallow groundwater is discharged to evapotranspiration. In recent years, White Pine County has been the focus of studies by the US Geological Survey to better define evapotranspiration rates. These studies have found that the quantity of

groundwater being discharged to evapotranspiration is generally more than double that estimated in the old reconnaissance evaluations.

The results of these studies suggest that the recharge in White Pine County is significantly greater than previously thought. There is still considerable uncertainty, however, in these estimates, and a greater understanding of both recharge and discharge is needed to help guide water resources evaluations and planning in the region.

Groundwater Quantity and Availability - White Pine County has significant groundwater resources but they are poorly defined. The perennial yields listed in Figure 10 represent the 1971 estimates accepted b the Division of Water Resources and offer only a first order approximation of how much water can actually be drawn on an annual basis. The perennial yield, defined as the difference between inputs (deep percolation from precipitation, seepage from surface water, groundwater underflow into the aquifer, artificial recharge, and leakage between outputs including evapotranspiration, seepage, groundwater underflow from the aquifer, discharge to springs, and artificial discharge, is based on the best available data. The evapotransipiration rates accepted by the State Engineer reflect a conservative view of the combined evaporation from surface water and transpiration from plants. Recent evaluationas (Nichols, 2000) indicate that this rate may be higher but these evaluations are still under study.studies A more complete understanding of the groundwater regime is available, the existing perennial yield values must serve as the basis for planning.

Determining the quantity of water available within White Pine County is further complicated by the fact that only three basins (Newark, Jakes, and Tippett valleys) are wholly situated within the County. In the north, White Pine County shares eight hydrographic basins with Elko County. Of these, Long, southern Butte, and Steptoe valleys are largely within White Pine County while Huntington, Ruby, and Antelope Valley are largely within Eureka County. On the southeast, north Little Smoky Valley is shared with Eureka and Nye counties. Only about one-sixth of Northern Railroad Valley is in White Pine County; the remainder is in Nye County. On the south, White River Valley is shared with Nye and Lincoln White Pine County. Cave, Lake, Spring, and Hamlin Valleys are all shared with Lincoln County. Of these, only Spring Valley is largely situated within White Pine County. To the east, Deep Creek, Snake, and Hamlin Valleys all have significant recharge over a limited area within the County. Groundwater flow from these basins flows generally eastward toward points of discharge in Utah.

Because of the rural development of the counties in Nevada and Utah that share hydrographic basins, there have not been conflicts in the past over water ground commitments and use. This situation may change, however, as growth is expected to occur across the entire region and a number of entities are looking at the water resources of the shared basins as sources of water for exportation to urban areas.

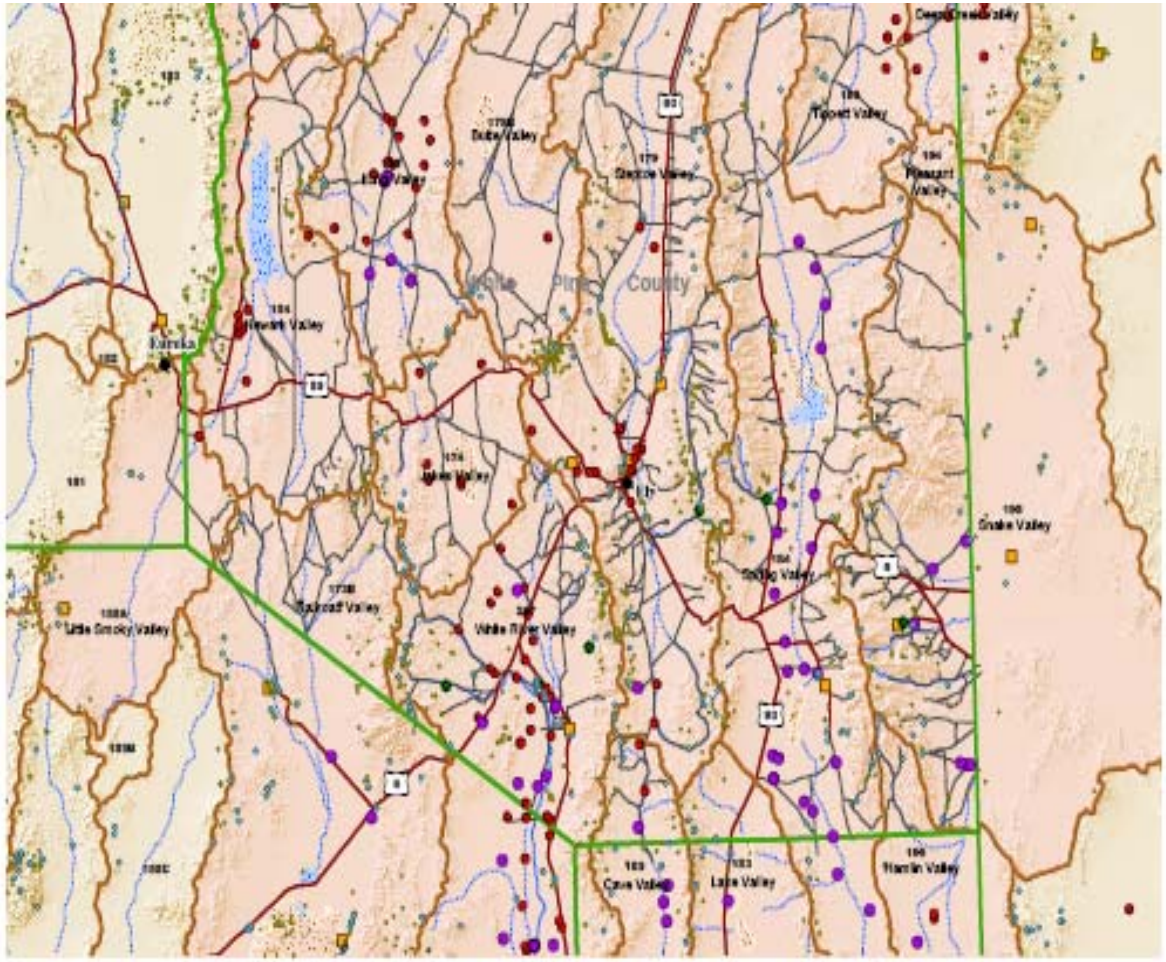
The estimated committed groundwater resources in White Pine County are large and the estimated total is summarized in Table 3-3. Table 3-3 lists the water rights by status and type of use category in each basin. The valleys with the highest level of committed water resources are Steptoe Valley with over 90,000 acre feet committed, Newark Valley with about 28,000 acre feet committed, and White River Valley with about 26,000 acre feet committed.

In addition to the water resource commitment shown in Figure 3-3, there are large water right filings in some basins that are ready for protest by the Division of Water Resources. White Pine County submitted applications for 25,000 acre-feet per year in Spring and Butte Valleys as alternate sites for the White Pine Power Project. In 2006, the Spring Valley applications were denied. The Butte Valley applications are still in place. The Las Vegas Valley Water District has nineteen applications for 78,192 acre feet in Spring Valley and nine applications for 50,680 acre feet in Snake Valley. In addition it has filed three applications for 13,032 acre feet in Spring Valley in Lincoln County and two applications with points of diversion in Lincoln County in Cave Valley for 11,594 acre feet of water. None of the applications for the County or the Las Vegas Valley Water District have received final action from the Nevada State Water Engineer.

The total current demand for water as defined by the sum of existing water rights, and applications that are ready for action, exceeds the perennial yields in eight basins. The greatest demand for water is in the water rich basins already

discussed above. The current demand also exceeds the established value of perennial yield in northern Little Smoky Valley, Long Valley, Lake Valley, and Hamlin Valley.

Groundwater Quality - The general quality of the ground water in White Pine County is suitable to marginally suitable with limited exceptions based on specific locations and proposed uses. With the exception of total dissolved solids in Spring Valley, Newark Valley, and Long Valley, the chemical concentrations do not exceed state or federal drinking water standards. In these basins, the total dissolved solids are elevated because of the natural process of salt buildup through evaporation in areas of shallow groundwater



2006 WATER RESOURCES PLAN REVISION

WELL AND SPRING LOCATION MAP

Figure 1

Table 3-3, Estimated Active Groundwater Commitments

Basin		NV Counties/ State**	Underground Supplemental Adjustments Completed	Data Source	Duty, AFA																												
					By Water Right Status									By Manner of Use																		Total Rights	Total Demand	Yield
No.	Name				CER	PER	VST	RES	DEC	DOML*	APP	RFA	RFP	COM	CON	DOM	DOML*	ENV	IND	IRR	MM	MUN	PWR	QM	REC	STK	STO	WLD	OTH			
047	Huntington Valley	WP,EL	Yes	Basin	3,024	6,117				91	4,000	1,252	192	271			91			8,350	329					155		19	18	9,233	14,676	25000***	
				WPC	0	5,249														4,920	329									5,249	5,249		
154	Newark Valley	WP	Yes	Basin	8,457	19,627				17		1,280				3	17		14	22,750	63			18		251		3		28,100	29,380	18000	
				WPC	8,462	19,627				17		1,280				3	17		14	22,750	63			18		251		3		28,106	29,386		
155A	Little Smoky Valley (N.)	WP,EU,NY	Yes	Basin	5,054		2			8		1,920					8			4,938						118				5,064	6,984	5000	
				WPC	4,781					4		1,920					4			4,757						24				4,785	6,705		
173B	Railroad Valley (N.)	WP,NY,LI	Yes	Basin	19,508	7,061	11			57		90,760	109,655	2			57		72	24,323	5				1,994	183				26,637	227,052	75000	
				WPC	5	16															5					16				21	21		
174	Jakes Valley	WP	Yes	Basin	50					2	15,204		16				2									50				52	15,272	12000	
				WPC	50					2	15,204		16				2									50				52	15,272		
175	Long Valley	WP, EL	Yes	Basin	344	4,405				6							6			480	4,000					270				4,756	4,756	6000	
				WPC	344	4,405				2							2			480	4,000					270				4,752	4,752		
176	Ruby Valley	WP, EL	No	Basin	18,794	7,148	77			187		8,974	11	4		34	187			23,745	1,457			18		759			2	26,206	35,191	53000	
				WPC	7	1,471															1,449					29				1,478	1,478		
178B	Butte Valley (S.)	WP, EL	Yes	Basin	298	0.4					15,204	26,064									172					126				298	41,566	14000	
				WPC	284	0.4					15,204	26,064									172					112				284	41,552		
179	SteptoeValley	WP,EL	Yes	Basin	46,790	50,103	49			736	20,313	1,479	575	18		7	736	146	25,056	42,651	21,280	5,066		2,483	32	199		2		97,677	120,043	70000	
				WPC	45,644	50,103	49			723	20,313	1,479	575	18		4	723	146	25,056	41,535	21,280	5,066		2,483	32	172		2		96,518	118,885		
180	Cave Valley	WP, LI	Yes	Basin	35					6		34	24,564				6									35				42	24,639	2000	
				WPC	0					2		11					2													2	13		
183	Lake Valley	WP, LI	Yes	Basin	23,080	1,607				25		640	29,294				25			24,125	217			13		331				24,712	54,646	12000	
				WPC	2,074															2,032						41				2,074	2,074		
184	Spring Valley	WP, LI	Yes	Basin	10,373	9,725				32	1,280	56,142	182,381				32			18,239	1,361			79		399		20		20,129	259,932	100000	
				WPC	10,286	9,725				32	1,280	56,142	128,210				32			18,239	1,361			79		313		20		20,043	205,675		
185	Tippett Valley	WP	Yes	Basin	475															466						9				475	475	3500	
				WPC	475															466						9				475	475		
186A	Antelope Valley (S.)	WP, EL	Yes	Basin	25	614							1								614					25				638	640	800	
				WPC	25																					25				25	25		
186B	Antelope Valley (N.)	WP, EL	Yes	Basin	622	7				2							2				506			11		111				631	631	1700	
				WPC																										0	0		
193	Deep Creek Valley	WP, EL, UT	Yes	Basin																										0	0	2000	

				WPC																										0	0		
194	Pleasant Valley	WP, UT	Yes	Basin	1,976															1,976									1,976	1,976	1500	
				WPC	1,976															1,976									1,976	1,976		
195	Snake Valley	WP, UT	Yes	Basin	3,212	7,200				81		5,793	50,720			2	81			10,325				56		29			10,492	67,006	25000	
				WPC	3,212	7,200				81		5,793	50,720			2	81			10,325				56		29			10,493	67,006		
196	Hamlin Valley	WP, LI, UT	Yes	Basin	377		20			2							2									388		9	399	399	5000	
				WPC						2							2												2	2		
207	White River Valley	WP, NY, LI	No	Basin	20,767	10,378				316		95,361		7			316			30,361				55	14	708			31,461	126,821	37000	
				WPC	18,163	4,777				244		24,081		7			244			22,472				40		422			23,184	47,265		
	Total			Basin	163,260	123,992	158	0	0	1,569	56,001	289,698	397,409	301	0	46	1,569	146	25,143	212,729	30,004	5,066	0	2,731	2,041	4,146	0	44	29	288,979	1,032,086	468500	
				WPC	95,787	102,573	49	0	0	1,109	52,001	116,770	179,521	25	0	8	1,109	146	25,070	129,953	28,658	5,066	0	2,676	32	1,762	0	25	0	199,518	547,809		
*DOML is the duty committed to DOM wells w/o an appropriative right issued based on well log data.																																	
**Basin totals are for NV PODs only.																																	
***Combined Yield for basins 46, 47, and 48																																	

ATTACHMENT 4
MONITORING PROTOCOL, MITIGATION PROCEDURES

Monitoring Protocol:

A comprehensive monitoring program is the key to sustainable groundwater management. The only true way to ensure that a basin is not over drafted while utilizing groundwater resources is to closely monitor hydrologic conditions from the hydrographic basin. This is best achieved through a comprehensive monitoring program that includes collecting groundwater and surface water levels annually and comparing them to previous data. Assessment of water quality trends is equally as important. Specific constituents should be monitored annually to track potential changes in water quality.

Training:

Employee training is an investment that has short-term and long-term benefits to a countywide groundwater-monitoring program. The immediate benefits allow confidence that the work is being performed correctly, accurately and in a timely manner. The long-term benefits ensure that technically competent personnel are bringing value to the monitoring and mitigation program. Because work in the scientific arena is receiving increased scrutiny, the qualifications/training of the technical personnel relative to the data collected must be well documented. Personnel training documents with annual refreshers will help to ensure that all data is collected in a manner consistent with the protocol and procedures, set forth in this document. All field technicians collecting groundwater data will be required to be trained on this manual, by a qualified person and receive annual refresher training. This will ensure consistency of the data collected. The initial training and refreshers will be documented in the employee's personnel files, in the event that the data collected is ever scrutinized or questioned. No personnel will be allowed to collect field data that has not been properly trained on all the procedures set forth in this monitoring and mitigation program.

Monitoring of Spring, Wetlands, and Riparian Areas

Sub-irrigated, wetland, and riparian vegetation typically is quite different than plant communities on adjacent uplands. Encroachment of upland and invasive species is an indication of changing or declining riparian environments. One efficient way to monitor the same representative areas is to take annual photographs. The following procedure has been established for the monitoring of identified sensitive locations involving springs and riparian environments. At a minimum, the monitoring of these areas will be conducted on an annual schedule.

- If this is not the first field visit to a specific site, a brief review should be conducted of the previous years photographs and notes to become familiar with the conditions observed at the last field visit.
- If this is the first field visit, establish a few photographic viewpoints easily accessible, recognizable and with permanent landmarks from which to shoot yearly photo's. Be sure to GPS the site and record the new data in the field notebook, designated for that site. The annual visits to the sites should be scheduled within a few weeks from the pervious year's field visit. Review of the previous year's monitoring photographs and field notes should be conducted prior to all scheduled field visits.

- Supplement the photographic data by providing notes on observations of the conditions and trends of riparian vegetation, stream banks, and stream channels. If justified, install measuring-devices in designated locals of the springs and riparian areas that can be photographed annually to help identify more subtle changes that may occur yearly.

- Enter the digital photographs and notes into the Arc View GIS database, immediately upon returning from the field. If a new GPS coordinate was taken during the field visit, be sure to enter that data also. Always allow enough time in the same day that the data was collected, to enter the data in the database. This is key to ensuring that the data entered is fresh in the mind of the technician and will be accurately entered. Take the field notes from the day and place the originals in a designated binder, being sure to verify that all the dates, times, and name of the technician person is correctly documented on the field forms. Back up digital data with hard copies on file. This will help to eliminate lost data or misplaced data.

Over time, the data records will clearly begin to reveal any changes (either positive or negative) around sensitive springs and/or riparian locations.

Groundwater Monitoring

Ground Water Level Measurements

Groundwater levels will be measured according to the USGS protocol as outlined in this program. If discrepancies exist between this document and the USGS protocol, a review of the procedures by competent County personnel will be conducted to determine the best course of action to resolve any discrepancies. Discrepancies will be brought to the attention of the Water Advisory Committee with recommendations for a resolution. The objective of utilizing the USGS protocol is to provide quality control and consistency of the procedures used to measure water levels in the wells. To ensure the consistency, comparability, and repeatability of the collected data, all electronic water level metering devices must be identified, calibrated, maintained and operated in an appropriate manner. The following is a delineation of the protocol including equipment, procedures, and frequency of measurements.

Equipment:

The equipment to be used to measure groundwater levels will be an electrical water level meter. The equipment will be selected to provide consistent measurements by staff and volunteers and will contain a polyethylene tape with units measured in feet. The polyethylene tape will contain permanent markings with 1/100-foot increments. The electronic probe at the end of the polyethylene tape will be of a type that reduces or eliminates problems associated with cascading water. All electronic water level meters will be designated with an I.D. number that will be recorded and documented whenever the instrument is undergoing maintenance, used in the field, or calibrated. Maintenance and calibration records will be kept in files labeled with the instruments I.D. number and located in a place designated by the County Officials.

Calibration and Testing of Equipment:

The type of water level meter identified in the monitoring equipment only requires limited calibration. The main procedure prior to operation of the water level meter is to check the conductivity or circuitry of the probe. This is to ensure that the meter is operating properly prior to using the equipment in the field.

To perform this test, turn the meter on using the sensitivity dial, rotating the dial clockwise. The sensitivity dial should always be switched to the highest sensitivity position before testing the meter. Submerge the electrode (probe) in tap water to activate the alarm. The alarm contains a high frequency pitch and indicator light next to the dial. If the alarm continues after removing the probe from water, adjust the sensitivity as required and repeat until the alarm shuts off when removed from water. Once the water level meter has been tested and calibrated for sensitivity, the meter is ready to be used to collect water level data. The calibration test should be performed and documented in the field instrument's I.D. file. This will ensure that good records are documented.

Collection of Water Level from a Well:

Verify the well location before beginning. If this is the first time to a well site, collect a GPS coordinate for the well location. Turn on the water level meter to the sensitivity level identified during the calibration and testing procedure. Press the test button indicator to verify that the water level meter is operating properly. Verify the measuring point on the well as described and photographed from previous visits to the well. If this is a new well location that is being measured for the first time, identify a measuring point on the wellhead and mark the spot with a white grease pen. Take a photo of the location to ensure a reference point for future soundings. If this is a well that has been measured historically, remark the measuring point with a white grease pen.

Soundings taken at domestic or municipal wells used as a source of drinking water require sterilization of the tape and probe, immediately prior to taking the measurement. This is easily accomplished by placing the probe and anticipated length of tape into a weak chlorine solution. Approximately ¼ cup of 5% chorine (regular bleach from a supermarket) in five gallons of water is adequate. Soak the tape and probe for about one minute before taking the measurement. Do not attempt to dry the unit before taking the sounding.

Begin lowering the probe down the well until the probe reaches the water level (as indicated by the alarm on the sounding device). When the alarm sounds, align the measuring tape with the measuring point identified for the wellhead and read the footage (to the 1/100-foot) on the embossed electrical conductor polyethylene tape. The conductor tape is marked in increments of 1/100-foot increments. Record the following information on the appropriate form:

- Date measurement was taken;
- Time measurement was taken;
- Water level measurement recorded to within 0.01 of a foot;
- Adjustment, if needed;

- Initials of technician;
- Instrument identification (I.D.) number;
- Calibration due date;
- Comment as to whether sterilization was required or not;
- Comments of unusual events, if any, in the comment column;
- Any security observations.

After completing water level measurement and recorded data, reel the probe to the surface and clean and rinse equipment with fresh water in preparation for next well.

MITIGATION PROCEDURES:

Level 1:

Two consecutive years (or eight consecutive quarters) of groundwater level data and/or spring and riparian areas in a basin or portion of a basin indicating a negative impact.

- Increase the monitoring data collected in the basin or portion of the basin by installing submersible digital data logger devices in all of the affected wells. The continuous data collected from these devices will be uploaded monthly into a field data receiver and then downloaded into the database that has been setup in the ARC View GIS software program. Selection of the continuous logging device and procedure for calibration and data collection will need to be addressed at the time of action and incorporated into the Monitoring and Mitigation Program.

- Review the precipitation data from the weather stations hyperlinked in the database for the associated basin or watershed of interest, to see if there has been a pattern of decreased precipitation for the last two or more years. Also, review all the precipitation data available for each of the weather stations to identify any cyclic weather patterns (i.e. drought and wet year cycles that may be normal).

- Supplement the data being collected by either acquiring additional data points (new well to monitor) or requesting the information from local government entities and/or ranchers in the area.

- Review the data from other Federal and State Agencies monitoring programs in the same basin to see if their datasets are consistent with the County's datasets, showing a negative impact to the basin, watershed, and/or aquifer(s).

- Begin requesting "mandatory" pumping data (flow rates and total duties) from all entities extracting groundwater from the basin, watershed, and/or aquifer(s). This should be collected quarterly either by the entities providing the data to the County or collecting it from the users through County personnel. The County will have to determine what will be the acceptable method(s) for receiving quarterly pumping reports (i.e. hour meters and flow rates and/or flow meter reports of the pumping data).

- Document these tasks and bring the data, with a brief report of the findings and recommendations, to the attention of the White Pine County Water Advisory Board. The Water Advisory Committee can determine the next course of action (i.e. bring to the attention of the County Board of Commissioners).

Level–2:
Implementation of the mitigation measures outlined in the level-1 triggering mechanism and at least one to two more additional years (three to four years total of aquifer over-drafting) of well monitoring and/or spring and riparian area data validating the negative impacts to the basin, watershed, and/or aquifer(s).

- Analysis of the pumping data collected during the prior year, incorporating increased monitoring of the basin, watershed, and/or aquifer(s).

- Evaluate all of the data available and provide a report on the analysis to the

- Notify the State Engineers Office through the proper protocol that the basin, watershed, and/or aquifer(s) in question may be undergoing over-drafting due to pumping.

- Notify all of the appropriated water right holders in the affective area of the County's concerns based on the data and analysis to date. Inform the water right holders of what the next level of mitigation will be, by the county and/or State Engineer's Office, and how it could affect their water use.

Level–3:
The conclusions from the hydrogeologist's groundwater report along with at least one more year of depleting groundwater levels in the basin, watershed, and/or aquifer(s) suggests that excessive pumping is creating the negative impact.

- White Pine County Water Advisory Committee will need to take steps in one or more of the following courses of action:

    1. Establish in ordinance form requirements for augmentation programs to either supplement the over-drafting of the aquifers or artificial recharge the aquifers through reuse water (rapid infiltration basins or injection wells) or imported water. This could include the development of a conjunctive use program for the region or basin. The junior water right users will fund all feasibility studies and implementation of approved projects if they want to keep withdrawing groundwater from the basin (possibly at a reduced production rate).

    2. Maintain inventories of well levels. Evaluate the need for alternative pumping schedules to allow a portion of the aquifer/basin to recharge if the diversion rate in a portion of the basin appears to be excessive. This may involve the drilling of replacement wells in other areas of the basin spaced farther apart.

    3. Request a "Call" to the State Engineer's Office to either reduce or stop production from junior water rights uses.

    4. Using existing data collected to date, determine if the aquifer system is being stressed too heavily in one portion of the basin or if the basin as a whole is being over-drafted.

    5. Drill strategically located monitoring wells in the basin and/or aquifer(s) that appear to be impacted the greatest. Continue to add continuous submersible digital data loggers to the wells and collect and download the data on a regular

schedule (i.e. monthly). Junior water right users should be responsible for assuming the financial liability.

6. Require the junior water right users to mitigate the effects of their groundwater pumping through one or more of the following: (1) deepen the affected wells of the senior water right users, (2) drilling replacement wells, (3) providing water from the junior water rights users infrastructure to the "place of use" of the senior water right users, (4) a financial settlement to the senior water right users. These are all temporary solutions to help mitigate the negative affects to the senior water right users.

- Have the Water Advisory Committee bring the issues to the County Board of Commissioners attention for approval of the Committee's recommendations or additional recommendations.

- Continue to monitor closely the effects of any approved augmentation or supplementation projects for positive impacts.

- Make a request to the State Engineer's Office to have the perennial yield in the basin reduced or generate sub-basins within the basin that does not allow any further appropriations.

Requirements for Export Water Supply Wells (Inter-County or Intra-County Inter-Basin Transfers:

The setback distances and monitoring requirements for any water exporter from a basin of origin in White Pine County serve as a guide for the location of water supply wells used for the inter-basin transfer of water.

1. Minimum of one-mile setback distance from all existing underground water rights and water supply wells. Monitor water withdrawals, pumping levels, and static water levels at all existing wells within two miles of the point of diversion. Reduce pumping rate if a water level decline of 10 feet is detected within two miles.

2. Minimum of three-mile setback distance from all springs, riparian areas, streams, and wetlands. Monitor spring discharges and stream flows within five miles of the point of diversion. Reduce pumping rates if a decline in spring discharge rates is detected.

3. Minimum of five-mile setback distance from all State and Federal Wildlife Refuges, State and National Park boundaries, Native American reservations, and all public water supply systems. Monitor all water withdrawals and water levels as required by State or Federal agencies and tie pumping rates to trigger levels for draw down and surface water flows.

In addition to these requirements, the water exporter must meet the following conditions prior to water withdrawals:

a. Develop a monitoring plan that specifies the points of diversion that will be used for exportation, all land and water right owners within the

distances specified above, the locations of sites that will be monitored, and the frequency of monitoring.

b. Conduct monthly monitoring of springs and water levels for one year prior to the operation of any water supply wells used for exportation. These data will establish the baseline pre-pumping conditions.

c. Enter into a cooperative agreement with White Pine County and Nevada Division of Water Resources, and U.S.G.S., regarding data reporting, roles and responsibilities, permit conditions, and dispute resolution.

ATTACHMENT 5

2006 WATER RESOURCE PLAN RECOMMENDATIONS

The following goals and objectives have been approved for the 2006 Water Resource Plan Recommendations. A preliminary Implementation Strategy identifying the activities, time frame, responsible entities, and resources required for each Goal and Objective has been developed. The preliminary Implementation Strategy will be refined once the Natural Resource Department has been established. The final strategy will be used to complete the annual evaluation of progress in meeting the goals and objectives outlined in the plan and establishing recommendations for 2007.

Goal 1. Maintain White Pine County's environmental quality:

Recommendations:

1. Establish a County Natural Resource Department to provide staff and expertise required to carry out the water resources program.

2. Complete the water resources inventory and baseline, identify areas of critical environmental concern, areas demonstrating loss of environmental quality, and standards of environmental quality

3. Initiate a monitoring program

4. Work with the State Engineer to refine information available to Identify supplemental surface water commitments.

5. Work with the State Engineer and scientific community to refine estimates of evapotranspiration rates as an indication of the water resources required in each basin to maintain existing environmental quality.

6. Work with the State Engineer and senior water rights holders to file appropriate requests and develop a time frame for adjudication of vested rights in White Pine County's primary basins as others as needed.

7. Establish procedures for annual review and implementation of strategies to maintain and improve environmental quality

8. Complete the Update of the County Land Use Plan and Public Land Use Policy and integrate recommendations with the recommendations of the Water Resource Plan. Coordinate all natural resource, economic development, and community development planning.

Goal 2. Meet the needs of the Citizens of White Pine County

Recommendations:

1. Identify economic development potential by industrial sector for each hydrographic basin in White Pine County

2. Identify Steptoe Valley as an area of special concern because of the range of potential economic activity requiring water.

3. Coordinate recommendations of White Pine County's land use plan, Open Space Plan, and Comprehensive Economic Development Strategy with the Water Resources Plan

Goal/Objective	Activity	Time Frame	Responsible Entity	Resources Required
Goal 1: **Maintain White Pine County's environmental quality**				
Objective 1: ***Establish a County Natural Resource Department***	Budget funding	July, 2006	White Pine Co/Dept of Taxation	Budgeted, $100,000
	Establish format to provide the natural resources program, develop the job description/RFP	September, 2006	Water Advisory Committee/County Commission/Dept of Taxation	Staff and Volunteer time
	Advertise/Hire, Contract Natural Resource Director	September, 2006	Water Advisory Committee County Commission/Department of Taxation	Advertising Costs Staff time, legal assistance, contract
Objective 2: Initiate the water resource inventory and baseline; identify areas of critical environmental concern, areas demonstrating loss of environmental quality and standards of environmental quality	a) compile water resource data, field study, collect public input b) Coordinate with BARCASS, USFS Spring inventory, other efforts to identify water resources c) Define Areas of Critical Environmental Concern, standards of environmental quality, criteria for designating loss of environ-mental quality d) Establish County GIS system for water resource baseline and monitoring using Lumos data base	October 1- June 30, 2007	Natural Resource Director Water Advisory Committee	Staff Time GIS equipment and software Travel expense, equipment, field study

Goal 1:	Activity	Time Frame	Responsible Entity	Resources Required
Objective 3: Improve data available to understand White Pine County's water resources	1. Work with State Engineer to define supplemental surface water rights in each of the County's basins	April-June, 2007 initiate effort	Natural Resource Director Water Advisory Committee	Staff Time
	2. Work with State Engineer and scientific community to refine estimates of evapotrans-piration rates for each of the County's basins	April-June, 2007 initiate effort	Natural Resource Director	Staff Time, potential need for grants to support studies
	3. Work with State Engineer and water rights holders to pursue adjudication of vested water rights in the County's primary basins and others as needed.	April-June, 2007 initiate effort	Natural Resource Director	Staff Time, potential need for outside funding to support legal efforts
Objective 4 Initiate a Monitoring Program	a) define monitoring goals and objectives, outline monitoring priorities, time frames	December 1, 2006-1-Mar-06	Natural Resource Director Water Advisory Committee	Staff and volunteer time
	b) implement monitoring program as defined	March 1-June 30 2007	Natural Resource Director	Staff time, travel and equipment expense
Objective 5 Establish and implement strategies to maintain and improve environmental quality, including annual review and evaluation	a) identify and implement strategies: 1) Coordination with Landscape Restoration efforts 2) Water Conservation Plans 3) Implementation of Mitigation Procedures	December 1 2006-March, 2007	Natural Resource Director Water Advisory Committee, County Commission	Staff and volunteer time
	b) Quarterly updates on issues,	March 31, June 30,	Natural Resource Director	Staff time

	implementation, progress to Water Advisory Committee, County Commission	2007		
	c) Annual evaluation of progress in accomplishing Goal 1 and objectives, annual recommen-dations for Water Resource Plan	June, 2007	Natural Resource Director, Water Advisory Committee County Commission/Regional Planning Commission	Staff and Volunteer Time
Objective 6 Complete update of County Land Use Plan, Public Land Use Policy, integrate recommendations with Water Resource Plan, Coordinate natural resource, economic dev. and community dev. Planning	Update Land Use Plan Update Public Land Use Policy Complete 2007 C.E.D.S. Integrate planning recommen-dations	July - November 06 July- December 06 April-June 2007 July 06-June 07	R.P.C., E.D.C. Staff State Land Use Planning Agency PLUAC, State Land Use Planning E.D.C., County Commission R.P.C., PLUAC, Water Adv. Committee, E.D.C. Staff	Staff and Volunteer Time, Assistance from State Lands Division
	Activity	Time Frame	Responsible Entity	Resources Required
Goal 2: Meet the needs of the Citizens of White Pine County				
Objective 1:				
Identify economic development potential by industrial sector for each primary hydrographic basin in White Pine County	a) coordinate research on economic development potential with state and federal agencies, 1) potential for alternative crops based on climate and soil 2) potential for mineral and oil development 3) potential for renewable energy And other industrial activity based On location, transportation, transmission, and natural resources	July 06-June 07	E.D.C. staff coordinating with Natural Resource Director E.D.C., Water Adv. Committee, PLUAC	Staff and volunteer time, Assistance from UNR Extension, Center for Economic Development

Objective 2:				
Identify Steptoe Valley as an area of special concern because of the range of potential economic activity requiring water	a) economic development potential analysis for Steptoe Valley including agriculture, residential, municipal, industrial energy development, mineral and oil, and recreation and tourism potential, current use, potential and possible development; population growth, and water use b) identify current and potential needs in Steptoe Valley and incorporate specific recommen-dations into 2007 Water Resource Plan evaluation, Land Use, and Public Land Use plans	October 1-2006 - March, 2007	E.D.C. Staff, coordination with Natural Resource Director E.D.C., Water Adv. Committee PLUAC, RPC	Staff and volunteer Time, Assistance from UNR Extension, Center for Economic Development
Goal 2:	**Activity**	Time Frame	Responsible Entity	Resources Required
Objective 3:				
Coordinate recommendations	Update Land Use Plan	July - November 06	R.P.C., E.D.C. Staff	Staff and Volunteer
of White Pine County's Land Use Plan, Open Space Plan,	Update Public Land Use Policy	July- December 06	State Land Use Planning Agency PLUAC, State Land Use Planning	Time, Assistance from State Lands
Comprehensive Economic Development Strategy with the Water Resources Plan	Complete 2007 C.E.D.S. Integrate planning recommen-dations	April-June 2007 July 06-June 07	E.D.C., County Commission R.P.C., PLUAC, Water Adv. Committee, E.D.C. Staff	Division

ATTACHMENT 6

LITERATURE REVIEW SUMMARY

Increased demands on water resources in White Pine County have sparked an increase in the demand for related water-resource data. This demand is being met, in part, through studies that range across the full gambit of surface and groundwater issues. Science based studies typically target specific factors such as water budgets and water use, albeit for large, regional or basin-wide areas. Still, this information is applicable to the more site-specific or local management challenges that may also include water quality, groundwater availability, instream flows, various recreational and environmental needs and in general, the increasing demand on the water resource.

White Pine County information regarding groundwater basins has also evolved with improved science. Advancements in communications, computational capabilities and particularly the ability to utilize large data sets all help in the analysis of resource trends. Trend analysis requires the establishment of appropriate baseline data. Successful research groups typically anticipate these needs and work to make information as useful as possible through the use of appropriate software. An example is the ongoing research presently underway through the U. S. Geological Survey's Basin and Range Carbonate Aquifer System Study (BARCASS). This study is expected to provide valuable baseline data upon its release in 2007. The study is the result of Federal legislation enacted in December 2004 (Section 131 of the Lincoln County Conservation, Recreation, and Development Act of 2004; short title, Lincoln County Land Act).

Although less information is available for other categories, such as water conservation, in that conservation planning typically requires the incorporation of local infrastructure details; several models are available as guides. Also, the greatest success and potential for water conservation can usually be seen at the agricultural production level. The Natural Resources Conservation Service (NRCS) is an excellent resource for agricultural water conservation assistance.

Although federal and state assistance is valuable, by far the greatest leverage for success is found at the local level. Empowering local jurisdictions and providing guidance for voluntary action has long been recognized as the most effective means to guarantee sustained programs. The White Pine Water Resource bibliography found in the Appendix is intended to streamline those efforts. Even though the bibliography cannot list the total of available literature, each entry has its own references that offer a direct path to related topics and studies.

BIBLIOGRAPHY
WHITE PINE COUNTY WATER RESOURCES PLAN

This bibliography contains water resource information, supplemental to the *Water Resource Plan* up-date for White Pine County. References have been selected and listed under the following four general categories: (1) Water Supply, Use and Quality (2) Environmental (3) Water Conservation and (4) History and Cultural. These are further broken down into those "Specific to White Pine County" and those "Of Regional Significance". A brief commentary on the literature is included with an abstract from that document when available.
Related internet websites (links) have also been included to facilitate further research of referenced literature and as a separate resource list (5) at the end of the bibliography. These links are accessible when this section is viewed as a Word™ document, on a computer linked to the internet. If when double-clicking on a selected web link, you are unable to pull up the website, simply copy and paste the entire link into the address bar of your browser to go directly to the site. You may also search the entire appendix for a specific category by using the "Ctrl+F" keys and entering a keyword, example, enter "*Steptoe"* to research all references with the word Steptoe in the title. The library systems at the two major Nevada Universities are major resources for most of the studies identified in the bibliography and may be searched at: http://www.library.unlv.edu/ for the library in Las Vegas and http://www.library.unr.edu/ for the Reno library system.
Finally, a glossary (6) is included at the end of the Appendix that is specifically intended to assist scientist and researches involved with water use projects. The glossary was taken from Chapter 11 of the *National Handbook of Recommended Methods for Water Data Acquisition*, a USGS handbook, also available on-line.

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Specific to White Pine County:

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Of Regional Significance:

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- Crompton, E.J., Frick, E.A., and Thiel, C.A., 1989, *How Nevada dealt its water in 1985* [abs.], *in* Foglesong, M.T., Bunch, R.L., and Myers, C.W., Water resources for expanding State needs: Annual Conference, Nevada Water Resources Association, Carson City, Nev., March 1989, Program Information and Selected Abstracts, unnumbered.
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2. Environmental:

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  Entire Document

  Water-resources data for the 2002 water year for Nevada consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; precipitation; and water levels in wells. This report contains discharge records for 175 streamflow-gaging stations on streams, canals and drains; Discharge data for 95 partial record stations and miscellaneous sites, and 16 springs; stage and contents records for 20 ponds, lakes and reservoirs; Water levels for 128 primary observation wells, and 818 secondary observation wells; Water-quality data for 120 streams, canal, spring and drain sites and 174 wells; precipitation totals for 38 stations; and water withdrawals for 11 wells.

- Brothers, K., Bernholtz, A. J., Buqo, T. S., and Tracy, J. V., 1994, *Hydrology and Steady State Ground-Water Model of Spring Valley, White Pine and Lincoln and Counties*: Las Vegas Valley Water District, Cooperative Water Project, Report No. 13, 69 p.
- Brothers, K., Buqo, T. S., Tracy, J. V., Stock, M., Bentley, C., Zdon, A., and Kepper, J.,
  1993c, Hydrology and Steady State Groundwater Model of Cave Valley, Lincoln and

  White Pine Counties, Nevada: Las Vegas Valley Water District, Cooperative Water Project, Report No. 11, 48 p.

- Eakin, T. E., 1962, *Groundwater Appraisal of Cave Valley in Lincoln and White Pine Counties, Nevada*, Groundwater Resources – Reconnaissance Series Report 13, U.S. Geological Survey in cooperation with the State of Nevada Department of Conservation and Natural Resources, 19 p.

- Eakin, T. E., 1961, *Groundwater Appraisal of Long Valley, White Pine and Elko Counties, Nevada*, Groundwater Resources – Reconnaissance Series Report 3, U.S. Geological Survey in cooperation with the State of Nevada Department of Conservation and Natural Resources, 35 p.
- Eakin, T. E., Hughes, J. L., and Moore, D. O., 1967*, Water-Resources Appraisal of*
  Steptoe Valley, White Pine and Elko Counties, Nevada, Groundwater Resources –

  6/22/2005 Reconnaissance Series Report 42, U.S. Geological Survey in cooperation with the State of Nevada Department of Conservation and Natural Resources, 48 p.

- Glancy, P. A., 1968, *Water-Resources Appraisal of Butte Valley, Elko and White Pine Counties, Nevada*, Groundwater Resources – Reconnaissance Series Report 49, U.S. Geological Survey in cooperation with the State of Nevada Department of Conservation and Natural Resources, 50 p.

- Katzer, T., and Donovan, D. J., 2003, Surface-Water Resources and Basin Water Budget for Spring Valley, White Pine and Lincoln Counties, Nevada, Report for the Las Vegas Valley Water District, 70 p.

- Maxey, G. B, and Eakin, T. E., 1949, *Groundwater in White River Valley, White Pine, Nye, and Lincoln Counties, Nevada*, Nevada State Engineer Water Resources Bulletin No. 8, 59 p.

- Rush, E. F, and Eakin, T. E., 1963, *Groundwater Appraisal of the Lake Valley in Lincoln and White Pine Counties, Nevada*, Groundwater Resources – Reconnaissance Series Report 24, U.S. Geological Survey in cooperation with the State of Nevada Department of Conservation and Natural Resources, 29 p.

- Rush, E. F, and Kazmi, S. A. T., 1965, *Water Resources Appraisal of Spring Valley, White Pine and Lincoln Counties, Nevada*, Groundwater Resources – Reconnaissance Series Report 33, U.S. Geological Survey in cooperation with the State of Nevada Department of Conservation and Natural Resources, 36 p.

- White Pine County Elk Management Plan, March 1999 (Nevada Board of Wildlife Commissioners)
- USFS - Humboldt National Forest Land and Resource Management Plan 1986
  BLM - Draft Schell
  Grazing Environmental Impact Statement, undated
- BLM - Proposed Egan Resource Management Plan and Final Environmental Impact Statement,
  1984 BLM - Egan Resource Area Record of Decision, 1987

- BLM - White Pine Power Project Final Environmental Impact Statement, 1984
- NPS - Final General Management Plan Development Concepts Plans Environment Statement
  Great Basin National Park, 1992

Of Regional Significance:

- DeMeo, G.A., 2004, *Estimating natural ground-water discharge in the lower Colorado regional ground-water flow system, Nevada*: Nevada Water Resources Association Annual Conference, Mesquite, Nev., February 24-26, 2004, Abstracts of Technical Presentations, p. 38
-
- Maurer, D.K., Lopes, T.J., Medina, R.L., and Smith, J.L., 2004, *Hydrogeology and hydrologic landscape regions of Nevada*: U.S. Geological Survey Scientific Investigations Report 2004-5131, 36 p.
  Entire Document

  In 1999, the U.S. Environmental Protection Agency initiated a rule to protect ground water in areas other than source-water protection areas. These other sensitive ground water areas (OSGWAs) are aquifers that are not currently but could eventually be used as a source of drinking water. The OSGWA program specifically addresses existing wells that are used for underground injection of motor vehicle waste. If the injection well is in a ground-water protection area or an OSGWA, well owners must either close the well or apply for a permit. The Nevada Division of Environmental Protection will evaluate site-specific information and determine if the aquifer associated with a permit application is susceptible to contamination. A basic part of evaluating OSGWAs is characterizing the hydrogeology of aquifer systems including the lithology, hydrologic properties, soil

permeability, and faulting, which partly control the susceptibility of ground water to contamination. Detailed studies that evaluate ground-water susceptibility are not practical in a largely unpopulated State like Nevada. However, existing and new information could be extrapolated to other areas of the State if there is an objective framework to transfer the information. The concept of hydrologic landscape regions, which identify areas with similar hydrologic characteristics, provides this framework. This report describes the hydrogeology and hydrologic landscape regions of Nevada.

- Seiler, R.L., Skorupa, J.P., Naftz, D.L., and Nolan, B.T., 2003, Irrigation-induced contamination of water, sediment, and biota in the Western United States—Synthesis of data from the National Irrigation Water Quality Program: U.S. Geological Survey Professional Paper 1655, 123 p.
  Entire Document

  In October 1985 the U.S. Department of the Interior (DOI), through the National Irrigation Water Quality Program (NIWQP), began a series of field investigations at 26 areas in the Western United States to determine whether irrigation drainage has had harmful effects on fish, wildlife, and humans or has reduced beneficial uses of water. In 1992 NIWQP initiated the Data Synthesis Project to evaluate data collected during the field investigations. Geologic, climatologic, and hydrologic data were evaluated and water, sediment, and biota from the 26 areas were analyzed to identify commonalities and dominant factors that result in irrigation-induced contamination of water and biota.

- *State of Nevada Wellhead Protection Program*, February 1994, Nevada Division of Environmental Protection, Bureau of Water Quality Planning, Department of Conservation and Natural Resources, State of Nevada.

  This technical manual presents information that can be used to guide Drinking Water utilities through the development and implementation of Wellhead Protection Programs.

- *Riparian Area Management: Grazing Management in Riparian Areas,* 1989, Bureau of Land Management Service Center, SC-658C, P.O. Box 25047, Denver, Colorado 80225-0047,

  This technical manual presents information that can be used to guide livestock management in riparian areas. Reference No. 1737-3 (free). 45-page

3. Water Conservation:

Specific to White Pine County:

- State of Nevada Water Conservation Planning Guide

Of Regional Significance:

- Morris R. L., Devitt D. A., Crites A. M., Borden, G., Allen, L. N., 1997, *Urbanization and water conservation in Las Vegas Valley, Nevada,* Journal of Water Resources

Planning and Management [J. WATER RESOUR. PLANN. MANAGE.], vol. 123, no. 3, pp. 189-196, Jun 1997.

Abstract: By the year 2010 southern Nevada, which is one of the fastest-growing urban centers in the West, will have committed nearly 100% of its water resources. Early in its history, Las Vegas developed a reputation for high per capita water use compared to other major cities in the arid West. This arose from a belief by its residents that the valley was situated on an inexhaustible supply of water, enticements by the state to drill wells for urban development, the attraction of tourists, and a lack of enforcement of passed or existing laws. The first water crisis in the 1940s was averted by allowing the principal aquifer to be overdrafted. Overdrafting of the aquifer has led to geologic problems for the valley and its residents. The second major water crisis was averted in the 1970s by the increasing availability of Colorado River water to area residents. Metering, local ordinances, research, and educational programming are impacting water use by addressing the problems of overdrafting and conservation.

http://dx.doi.org/10.1061/(ASCE)0733-9496(1997)123:3(189)

- Foster, k. E., DeCook K. J., 1986, *Impacts of residential water reuse in the Tucson area,* Water Resources Bulletin [WATER RESOUR. BULL.], vol. 22, no. 5, pp. 753-758

  Groundwater pumping constitutes approximately 100 percent of the water supply in the Tucson Active Management Area (AMA), Arizona. The current annual overdraft approaches 250,000 acre-feet, but the goal of the AMA is to eliminate the overdraft by the... http://www.nbii.gov/

- Cory, D. C., Evans, M. E., Leones, J. P., Wade, J. C., 1992, *Role of Agricultural Groundwater Conservation in Achieving Zero Overdraft in Arizona,* Water Resources Bulletin WARBAQ, Vol. 28, No. 5, p 889-901, September/October 1992. 4 fig, 3 tab, 16 ref.

  The elimination of groundwater overdraft was a key feature of the 1980 Arizona Groundwater Management Act. To achieve this goal, the Arizona Department of Water Resources identified several Active Management Areas and developed urban, industrial, and... http://www.nbii.gov/

- National Management Measures to Control Nonpoint Pollution from Agriculture (PDF, 746KB), 314 pages, 2003, (EPA 841-B-03-004)

  U.S. Environmental Protection Agency
  Office of Water (4503T)
  1200 Pennsylvania Avenue, NW
  Washington, D.C. 20460
  EPA-841-B-03-004

  http://www.epa.gov/agriculture/asur.html

4. History and Cultural

Specific to White Pine County:

- White Pine County 2002 Strategy for Tourism Development and Community Improvement, 1996-
  97 White Pine County Economic Recovery Program Action Plan, 1992

Of Regional Significance:

- Nevada Petroleum Society, 2002 Field Trip Guidebook, *Detachment and Attenuation in Eastern Nevada and its Application to Petroleum Exploration*, editors: Ehni, William; Faulds, James; 2002, 163 pages with illustrations.

  The NPS provides this forum as a mechanism for researchers to publish their work related to the exploration and development of oil and gas in Nevada. The guidebook is a series of papers that include abstracts and and references.

5. Websites

DRI – Arid-Land Spring Research in Nevada

Under sponsorship of the National Park Service, the Desert Research Institute's Don Sada, aquatic ecologist, has developed a series of investigative protocols aimed at surveying and monitoring desert springs scattered throughout the national parks and historic sites comprising the Mojave Network.

http://www.dri.edu/Home/Features/text/0705_springs.htm

The Goshute Tribe of Skull Valley

The Goshutes have inhabited the Southwestern part of the United States for thousands of years. They were here before the Mormons, the Mexicans, and even the Spaniards. At their peak the Goshutes numbered about 20,000. Today there are less than 500 Goshutes, of which 124 belong to the Skull Valley Band.

http://www.skullvalleygoshutes.org/

Humboldt-Toiyabe National Forest

http://www.fs.fed.us/r4/htnf/

The Humboldt-Toiyabe's spectacular 6.3 million acres makes it the largest forest in the lower 48 states. Located in Nevada and a small portion of Eastern California, the H-T offers year-round recreation of all types.

Nevada Division of Environmental Protection

http://ndep.nv.gov/index.htm

This website contains information designed to help individuals, companies, and governmental entities comply with environmental laws and regulations contained in the Nevada Revised Statutes (NRS) and the Nevada Administrative Code (NAC). Beyond regulatory information, the site contains a wealth of information about the quality of the human and natural environment in Nevada.

Nevada Division of Environmental Protection – Bureau of Safe Drinking Water

http://ndep.nv.gov/bsdw/index.htm

As the primacy agency to enforce the Safe Drinking Water Act in Nevada the Bureau's mission is to protect the public health by assuring safe community and non-community drinking water supplies. For the past 40 years, Nevada has had an active Safe Drinking Water Program to protect the citizens of the state and its numerous visitors and tourists. The program has been established in response to concerns of the citizens as to state and federal laws and regulations. Contact: (775-687 - 9515).

Nevada Source Water Protection

http://www.unce.unr.edu/swp/

This page was created by the Source Water Protection Team of the University of Nevada in Reno, Cooperative Extension and the College of Agriculture, Biotechnology and Natural Resources & Environmental Science. Information includes such tools as the Water Test Interpreter. This program will help you interpret the results of routine domestic water analysis, performed by a certified drinking water analysis laboratory. The routine domestic water analysis tests for characteristics that could affect health and uses of water

Progressive Leadership Alliance of Nevada (Great Basin Water Network)

The Great Basin Water Network was created by organizations and individuals dedicated to insuring that decisions being made regarding current and future water development proposals are done cautiously and are based on the best available scientific information.

http://www.planevada.org/water_issues06.htm

Public Utilities Commission of Nevada – Water Home Page

Contains open and archived water/sewer dockets, as a calendar of the cases awaiting court action. Also contains annual reports, assessment forms and application information for water and wastewater rates.

http://puc.state.nv.us/water.htm

U. S. Environmental Protection Agency's Envirofacts Data Warehouse

http://www.epa.gov/enviro/html/qmr.html

Envirofacts provides tools to retrieve environmental information from several government agencies using preformatted query forms and mapping applications. The query forms allow you to type in search criteria (e.g., White Pine county) to retrieve facility and chemical information from federal government databases, regarding everything from water discharge permits to toxic release reports. Once you submit the query, a report containing environmental information is returned that matches the criteria you submitted.

U. S. Geological Survey Sites:

USGS - Water Resources of the United States

This is the USGS home page for their water resources information. Although national in scope, the useful search engine helps to narrow general research for Nevada of maps, publications and software etc.

http://water.usgs.gov/index.html

USGS – Earth Resources Observation and Science (EROS)

The Earth Resources Observation Systems (EROS) Data Center (EDC) is a data management, systems development, and research field center for the U.S. Geological Survey's National Mapping Division. The site allows access to scientific datasets or files that are use in geographical information systems (GIS) for analysis and integration with other geospatial data. Though not directly viewable using WWW browser or image viewing tools, the county does or will have software for viewing some digital cartographic products, including DLG-O, DEM, DLG/SDTS and DRG data.

http://edc.usgs.gov/geodata/

The National Park Service – GIS

This is the National Park Service's GIS data home page. Here too is a very good search engine for researching the parks information, available for GIS work. No current information is available for Great Basin National Parrk at this time, but this could change in the future.

http://www.nps.gov/gis/data_info/

USGS – The National Map

The National Map is the USGS's online, interactive map service. You can view high-quality, geospatial data and information from multiple partners. These maps can help support decision making by resource managers and the public at large by using your Web browser (no special software or download required).

http://nationalmap.gov/

USGS - Water Use
Chapter 11 of National Handbook of Recommended Methods for Water Data Acquisition

http://pubs.usgs.gov/chapter11/

The purpose of Chapter 11 of the National Handbook of Recommended Methods for Water Data Acquisition is to provide standards and guidance in measuring, estimating, collecting, compiling, and analyzing water-use data. This chapter includes a brief description of (1) water-use activities and commonly used water-use terminology, (2) approaches and methods used in measuring and estimating water use, (3) water-use-data-management systems, and (4) methods for determining water use for specific water-use categories. Where appropriate, descriptions include accuracy, quality assurance procedures, and water-use data collection instrumentation.

The National Atlas

This is the water page for the nationalatlas.gov's website that "shows us where we are". It allows you to use your imagination and, by probing and questioning, to choose the facts that fit your needs, including developing your own maps. This site is also in support of the general public for water resource information including arsenic in groundwater and hydrologic units.

http://nationalatlas.gov/water.html

The Utah Division of Water Rights

GIS data and related tables and downloadable shapefiles for statewide (Utah) Water Rights GIS data sets as executable files (.EXE extension). These files when executed uncompress into multiple files which make up a shapefile dataset. Static shapefiles are updated as major revisions are made. Other shapefiles are updated daily from Division tabular datasets.

http://waterrights.utah.gov/gisinfo/wrcover.asp

6. GLOSSARY

The following glossary was taken from Chapter 11 of the *National Handbook of Recommended Methods for Water Data Acquisition*, a USGS handbook available on-line and listed above.

Acre-foot [unit] (acre-ft): The volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot.

Advance time [irrigation]: Time required for a given stream of irrigation water to move from the upper end of a field to the lower end of the field.

Afterbay [power]: A lake or water impoundment downstream from a powerplant that receives the water after it has passed through the hydroelectric turbines.

Agriculture water use [water-use category]: Composed of livestock, animal specialty, and irrigation water use.

Animal specialties water use [water-use category]: Water use associated with the production of fish in captivity (aquaculture water use), except fish hatcheries (commercial water use), and other commercially raised animals such as horses, but excluding livestock. Activities included in SIC code 027. See also livestock water use and aquaculture water use.

Application efficiency [irrigation]: The ratio of the average depth of irrigation water infiltrated and stored in the root zone to the average depth of irrigation water applied, expressed as a percent.

Application rate [irrigation]: Rate at which water is applied to a given area. Usually expressed in units of depth per time.

Aquaculture water use [water-use category]: Water used for farming of organisms that live in water, such as fish, excluding fish hatcheries (commercial water use), shrimp, and other shellfish. Activities included in SIC code 0273. Subset of animal specialties water use.

Aquifer [hydrology]: (1) A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs (USGS); (2) A geologic formation, group of formations, or part of a formation having structures that permit appreciable water to move through them under ordinary field conditions (ASCE).

Aquifer depletion [management]: Condition of declining water levels within the aquifer's structure because natural recharging from surface water and precipitation is inadequate to maintain normal level. Can be caused by withdrawal rates exceeding recharge rates.
Beneficial use[management]: Any of a number of water uses that are recognized by a political entity as valuable to society and worthy of protection, are defined by statutes, and may need to be protected against quality or quantity degradation. These water uses include, but are not necessarily limited to, domestic, municipal, agricultural, and industrial supply; cooling in thermoelectric power generation; and instream uses that include hydroelectric power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.
Blowdown [power]: The continuous or intermittent discharge, or purging, of a small amount of circulating water to maintain an acceptable concentration of dissolved solids in the water.
Cesspool [wastewater]: An underground catch basin for liquid waste, such as household waste. Also called a septic tank.
Cistern [water supply]: A reservoir, tank, or vessel for storing or holding water or other liquid.
Clearwell [water supply]: A reservoir for the storage of filtered water of sufficient capacity to prevent the need to vary the filtration rate with variations in demand. Also used to provide chlorine-contact time for disinfection.
Commercial water use [water-use category]: Water used for motels, restaurants, office buildings, ski resorts, water parks, and other commercial facilities and institutions. Also includes fish hatcheries. The water may be obtained from a public water supply or may be self supplied. See also fish hatchery and institutional water use.
Conjunctive water use [management]: A practice whereby two or more independent sources of water are used in combination or alternately, for meeting one or more objectives, such as, improved reliability of supply, long-term cost effectiveness, and environmental protection.
Crop requirement [irrigation]: The volume of water required by the crop to maintain optimum growth.
Consumptive use [general]: (1) That part of withdrawn water that is evaporated, transpired, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment (USGS). (2) Water whose state, chemical, or biological characteristics are altered sufficiently to render it useless to further beneficial uses (BOR). Also referred to as water consumption or water consumed.
Consumptive use [irrigation]: The total amount of water taken up by vegetation for transpiration or building of plant tissue, plus the unavoidable evaporation of soil moisture, snow, and intercepted precipitation associated with vegetal growth (ASAE).
Conveyance [general]: The systematic and intentional flow or transfer of water from one point to another. Conveyance types include water instream conveyance, water distribution, and wastewater collection.
Conveyance loss [general]: Water that is lost in transit from a pipe, canal, conduit, or ditch by leakage or evaporation. If the water is lost due to leakage, it may be considered return flow if it percolates to an aquifer and is available for reuse. If the water evaporates, it is considered consumptive use.
Cooling pond [power]: A cooling pond is a shallow reservoir having a large surface area to allow heat to be removed from water.
Cooling tower [power]: A structure designed to remove as much heat from water as possible per unit of space occupied by the structure.
Cooling water [power, industry]: Water used for cooling purposes, such as of condensers and nuclear reactors.
Data collection [method]: Implementation of appropriate procedures for obtaining necessary information to monitor status of water quantity, quality, use or flow.

Data compilation [method]: Procedures used to develop necessary information products about water, including but not limited to, quality assurance, statistical analysis, mathematical manipulations, integration of data from several sources, and formatting for archiving.
Deep percolation [irrigation]: Water that moves downward through the soil profile below the root zone and cannot be used by plants.
Delivery [general]: The amount of water delivered to a point of use.
Desalination [water treatment]: Refers to the removal of salts from water. Desalination is primarily used to produce public-supply water that meets drinking-water standards. The primary types of desalination are (1) distillation, (2) electrodialysis, and (3) reverse osmosis. Additionally, many public water suppliers also dilute or blend saltwater with fresher water to produce potable water. Also see "Reverse osmosis."
Dewatering [hydrology]: (1) The draining, pumping, or removal of water that is affecting construction or mining site, or to lower the water table for agriculture. (2) The removal of water from a substance (sewage or waste screenings, for example).
Discharge: [Hydraulics] Measurement of the output from a water source such as a well, spring, pump, stream, or a storm or flood event. An area designed to receive the output flow from pumps or structures without erosion/cavitation.
Discharge point [wastewater]: A location at which effluent is released after use into a receiving stream or infiltration bed. Also referred to as an outfall.
Distribution conveyance [water supply[: The process of conveying water from a water supplier's points of withdrawal or treatment through the distribution system to the user or another water supplier. Water is "**released**" from the public water supplier into the distribution system and "**delivered**" to users. See also delivery and release.
Distribution uniformity [irrigation]: Measure of the uniformity of irrigation water distribution over a field.
Diversion [general]: Point of withdrawal from surface water.
Domestic water use [water-use category]: Water for household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens. Households include single and multi-family dwellings. Also called residential water use. The water may be obtained from a public water supply or may be self supplied.
Drainfield [wastewater disposal]: A network of buried piping or tubing where the liquid is discharged to the ground through the drain field. Most commonly used with septic tanks, but some are used for domestic or industrial wastewater disposal after treatment.
Drip [process]: Procedure that regulates an altering substance into a stream of water; for example, chlorination for drinking water, or the addition of fertilizer, pesticides, and herbicides into irrigation water.
End use [management]: Main, ultimate, or intended use for water as a result of certain process, delivery, or treatment.
Effective precipitation [irrigation]: That portion of total precipitation that becomes available for plant growth.
Effluent [wastewater]: Refers to the water that flows out of a wastewater treatment facility or other works used for the purpose of treating, stabilizing, or holding waste.
Evaporation [hydrology]: Process by which water is changed from a liquid into a vapor. See also evapotranspiration and transpiration.
Evapotranspiration [hydrology]: (1) A collective term that includes water discharged to the atmosphere, as a result of evaporation from the soil and surface-water bodies and, as a result of plant transpiration (USGS). (2) The combination of water transpired from vegetation and evaporated from the soil and plant surfaces (ASAE). See also evaporation and transpiration.
Exfiltration [general]: Leakage from a conveyance system or storage area into the surrounding and underlying materials. This process will occur if the ambient ground-water pressure is less than the internal pressure of the conveyance system or storage area at a breach.

Fish hatchery water use [water-use category]: Water used for raising fish for later release. Activities included in SIC code 0921. Subset of commercial water use
Forebay [power]: A lake or water impoundment (reservoir) at the end of a diversion canal or conduit and before the entrance to the powerplant.
Freshwater [hydrology]: Water that contains less than 1,000 milligrams per liter (mg/L) of dissolved solids. Water that contains more than 500 mg/L of dissolved solids may be undesirable for drinking and many industrial uses. Water that contains more than 1,000 mg/L is sometimes used for irrigation.
Gross head [power]: The difference between the upstream water surface (forebay elevation) and the downstream water surface (afterbay elevation) after the water has passed through the hydroelectric plant.
Ground water [hydrology]: Generally all subsurface water as distinct from surface water; specifically, that part of the subsurface water in the saturated zone (a zone in which all voids are filled with water).
Ground-water disposal [wastewater]: Refers to wastewater that is disposed of through the ground either by seepage or injection. This includes the following discharge methods, injection well, drain fields, percolation ponds, and spray fields (land application/spreading). Reuse systems and land disposal systems are considered a ground-water disposal method, such as the wastewater used to irrigate turf or crops is generally intended to filter through the soil.
Hydroelectric power water use [water-use category]: Water used in generating electricity at plants where the turbine generators are driven by falling water. Activities included in Standard Industrial Classification code 4911.
Hydroelectric plant capacity [power]: Maximum power generation that can be produced under normal head and full-flow conditions.
Hydroelectric turbine [power]: A machine, usually with vanes, blades, or buckets, that rotate about an axis driven by water. The mechanical energy produced can be used directly, or it can be converted to electrical power by linking the turbine's torque to an electrical generator.
Incidental use [management]: Beneficial uses made of water that were or are not the intended purpose.
Industrial wastewater-treatment facility [wastewater]: A facility that processes water following its industrial use to restore a specific level of quality to meet further beneficial uses or for release into wastewater-collection systems.
Industrial water use [water-use category]: Water used for industrial purposes, such as fabrication, processing, washing, in-plant conveyance, and cooling, and includes such industries as steel, chemicals, paper, and petroleum refining. The water may be obtained from a public water supply or may be self supplied.
Injection well [hydrology]: Refers to a well constructed for the purpose of disposing treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal into a designated aquifer. Injection wells are generally drilled into nonpotable aquifers, unused aquifers, or below freshwater (potable water) levels.
Infiltration [general]: Water that infiltrates into a low-pressure or unpressurized conveyance system, such as a wastewater-collection system. This process will occur if the ambient ground-water pressure exceeds the internal pressure of the conveyance system at a breach.
Infiltration [irrigation]: The downward entry of water through the soil surface into the soil (ASAE). See also seepage.
Instream use [general]: Water that is used, but not withdrawn, from a surface-water source, or a ground-water source, for hydroelectric-power generation, navigation, water-quality improvement or waste assimilation, fish propagation, wildlife preservation, recreation, and ecosystem maintenance, which includes freshwater circulation to the estuaries and maintenance of riparian vegetation and floodplain wetlands. Also referred to as nonwithdrawal use or inchannel use.

Instream conveyance [general]: Flow of water from one water body to another without using the water.
Intake [water supply]: (1) Point of diversion of stream flow into a conduit or irrigation system conveyance. (2) Water infiltration into the soil.
Interbasin transfer [general]: Conveyance of water across a drainage or river basin divide. Also called transbasin diversion.
Irrigable area [irrigation]: Area capable of being irrigated, principally as regards to availability of water, suitable soils, and topography of land.
Irrigated land [irrigation]: Land that has had water applied to sustain plants during the year of inventory or during two (2) or more years out of the last four (4) years (SCS NRI).
Irrigation District [irrigation]: In the United States, a cooperative, self-governing public corporation set up as a subdivision of the State government, with definite geographic boundaries, organized and having taxing power to obtain and distribute water for irrigation of lands within the district; created under the authority of a State legislature with the consent of a designated fraction of the landowners or citizens.
Irrigation efficiency [irrigation]: The ratio of the average depth of irrigation water that is beneficially used to the average depth of irrigation water applied, expressed as a percent. Beneficial uses include satisfying the soil water deficit and any leaching requirement to remove salts from the root zone.
Irrigation requirement [irrigation]: For planning purposes, the total amount of water required at the field to produce the crop—less natural sources of water such as precipitation or subsurface water.
Irrigation return flow [irrigation]: The part of water diverted for irrigation that migrates to a surface-water body or aquifer. Irrigation return flow is particularly important for flood irrigation as return flows become the source for next downslope application area.
Irrigation supply [water-use category]: Water withdrawn by public and private water suppliers, which is delivered to users primarily for irrigation. Subcategory of water supply. Activities included under Standard Industrial Classification code 4971.
Irrigation system [irrigation]: Practices and equipment used in providing and distributing water to the land/crop being irrigated. Main systems and some associated terms are listed (technological advances are ongoing to reduce cost and improve efficiencies:

> **Alternate set irrigation:** A method of managing irrigation whereby, at every other irrigation, alternate furrows are irrigated, or sprinklers are placed midway between their locations during the previous irrigation (ASAE).
> **Alternate side irrigation:** The practice of furrow irrigating one side of a crop row (for row crops or orchards) and then, at about half the irrigation time, irrigating the other side (ASAE).
> **Basin irrigation:** The flooding of an area of level land surrounded by dikes. Used interchangeable with level border irrigation, but usually refers to smaller areas (ASAE).
> **Border dike:** Earth ridge or small levee built to guide or to hold irrigation or recharge water in a field (ASAE).
> **Border ditch:** Small excavation used as a border of an irrigated strip or plot with water being spread from one or both sides (ASAE).
> **Border irrigation:** The flooding of strips of land, rectangular in shape and cross leveled, bordered by dikes. Water is applied at a rate sufficient to move it down the strip in a uniform sheet. Border strips having no downfield slope are referred to as level order systems. Border systems constructed on terraced land are commonly referred to as benched borders (ASAE).
> **Check irrigation:** Modification of a border strip with small earth ridges or checks constructed at intervals to retain water as the water flows down the strip (ASAE).

Continuous-flow irrigation: System of irrigation water delivery where each irrigator receives the allotted quantity of water continuously (ASAE).
Cutback irrigation: The reduction of the furrow or border inflow stream after water has advanced partially or completely through the field in order to reduce runoff.
Demand irrigation system: Irrigation water delivery procedure where each irrigator may request water in the amount needed and at the time desired (ASAE).
Drip irrigation: A method of microirrigation wherein water is applied to the soil surface as drops or small streams through emitters. Discharge rates are generally less than 8 Liters/hour (2 gal/hour) for single-outlet emitters and 12 Liters/hour (3 gal/hour) per meter for line-source emitters ASAE.)
Effluent irrigation: Land application of wastewater for irrigation and beneficial use of nutrients (ASAE).
Emitter types: Small microirrigation dispensing devices designed to dissipate pressure and discharge a small uniform flow or trickle of water at a constant discharge, which does not vary significantly because of minor differences in pressure head. Also called "dripper" or "trickler" (ASAE).
Compensating emitter: Designed to discharge water at a constant rate of a wide range of later line pressures (ASAE).
Continuous flushing emitter: Designed to continuously permit passage of large solid particles while operating at a trickle or drip flow thus reducing filter fineness requirements (ASAE).
Flushing emitter: Designed to have a flushing flow of water to clear the discharge opening every time the system is turned on (ASAE).
Line-source emitter: Water is discharged from closely spaced perforations, emitters, or a porous wall along the tubing (ASAE).
Long path emitter: Employs a long capillary-sized tube or channel to dissipate pressure (ASAE).
Multi-outlet emitter: Supplies water to 2 or more points through small diameter auxiliary tubing (ASAE).
Orifice emitter: Employs a series of orifices to dissipate pressure (ASAE).
Vortex emitter: Employs a vortex effect to dissipate pressure (ASAE).
Flood irrigation: Method of irrigation where water is applied to the soil surface without flow controls, such as furrows, borders, or corrugations (ASAE).
Full irrigation: Management of water application to fully replace the soil water deficiency over an entire field (ASAW).
Furrow: Small channel in the soil surface for conveying irrigation water (ASAE).
Furrow irrigation: Method of surface irrigation where the water is supplied to small ditches or furrows for guiding across the field (ASAE).
Gated pipe irrigation: Portable pipe with small gates installed along one side for distributing water to corrugations or furrows (ASAE).
Irrigation stream: Flow for irrigation of a particular tract of land. Flow or water distributed at a single irrigation. Sometimes called "irrigating head" (ASAE).
Irrigation check: Small dike or dam used in the furrow alongside an irrigation border to make the water spread evenly across the border (ASAE).
Irrigation interval: The average time interval between the commencement of successive irrigations for a given field. Sometimes called "irrigation frequency" (ASAE).
Irrigation set: The area irrigated at one time within a field (ASAE).
Limited irrigation: Management of irrigation applications to apply less than enough water to satisfy the soil water deficiency in the entire root zone. Sometimes called "deficit" or "stress" irrigation (ASAE).

Microirrigation: The frequent application of small quantities of water as drops, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line. Microirrigation encompasses a number of methods or concepts such a s bubbler, drip, trickle, mist, or spray (ASAE).
Mist irrigation: A method of microirrigation in which water is applied in very small droplets (ASAE).
Overhead irrigation: (See Sprinkler Irrigation).
Porous trickle tubing: (Microirrigation) Tubing with a uniformly porous wall. The pores are small and ooze water under pressure (ASAE).
Portable pipe: Irrigation system which is or can be moved between irrigation sets, such as sprinkler or gated pipe (ASAE).
Preplant irrigation: Irrigation applied prior to seeding. Sometimes called "preirrigation" ASAE).
Spray irrigation: The application of water by a small spray or mist to the soil surface, where travel through the air becomes instrumental in the distribution of water (ASAE).
Sprinkler irrigation: Method of irrigation in which the water is sprayed, or sprinkled, through the air to the ground surface (ASAE).
Sprinkler irrigation systems (ASAE):
Boom: An elevated, cantilevered sprinkler(s) mounted on a central stand. The sprinkler boom rotates about a central pivot.

> **Center pivot:** An automated irrigation system consisting of a sprinkler line rotating about a pivot point at one end and supported by a number of self propelled towers. The water is supplied at the pivot point and flows outward through the line supplying the individual outlets.
> **Corner pivot:** An additional span or other equipment attached to the outer end of a center pivot irrigation system that allows the overall radius to increase or decrease in relation to the field boundaries.
> **Lateral move:** An automated irrigation machine consisting of a sprinkler line supported by a number of self-propelled towers. The entire unit moves in a generally straight path and irrigates a basically rectangular area. Sometimes called a "linear move".
> **Permanent:** Underground piping with risers and sprinklers.
> **Portable** (hand move): Sprinkler system which is moved by uncoupling and relocating the pipes manually, requiring no special tools.
> **Side-move sprinkler:** A sprinkler system with the supply pipe supported on carriages and towing small diameter tailing pipelines, each fitted with several sprinkler heads.
> **Side-roll sprinkler:** The supply pipe is usually mounted on wheels with the pipe as the axle and where the system is moved across the field by rotating the pipelines by engine power.
> **Solid set:** System which covers the complete field with pipes and sprinklers in such a manner that all the field can be irrigated without moving any of the system.
> **Towed sprinkler:** System where lateral lines are mounted on wheels, sleds, or skids, and are pulled or towed in a direction approximately parallel to the lateral.

Stress irrigation: Management of irrigation water to apply less than enough water to satisfy the soil water deficiency in the entire root zone. (preferred term is "Limited" irrigation.) (ASAE).
Subirrigation: Application of irrigation water below the ground surface by raising the water table to within or near the root zone (ASAE).

Subsurface drip irrigation: Application of water below the soil surface through emitters, with discharge rates generally in the same ranges as drip irrigation. This method of application is different from and not to be confused with subirrigation, where the root zone is irrigated by water table control (ASAE).

Surface irrigation: Broad class of irrigation methods in which water is distributed over the soil surface by gravity flow (ASAE).

Surge irrigation: A surface irrigation technique wherein flow is applied to furrows (or less commonly, borders) intermittently during a single irrigation set (ASAE).

Trickle irrigation: A method of microirrigation wherein water is applied to the soil surface as drops or small streams through emitters. (preferred term is "Drip" irrigation) (ASAE).

Water spreading: A specialized form of surface irrigation accomplished by diverting flood runoff from natural channels or water courses and spreading the flow over relatively level areas (ASAE).

Irrigation water use [water-use category]: The artificial application of water on lands to assist in the growth of crops or pasture. May also be used in greenhouses. Irrigation water use may also include application of water to maintain vegetative growth in recreational lands such as parks and golf courses. Also includes water used for frost and freeze protection of crops.

Land application [wastewater]: Means the reuse of reclaimed water or the use or disposal of effluents or wastewater residuals on, above, or into the surface of the ground through spray fields, land spreading, or other methods.

Livestock water use [water-use category]: Water used for livestock watering, feed lots, dairy operations, and other on-farm needs. Livestock as used here includes cattle, sheep, goats, hogs, and poultry, but excludes horses (animal specialties water use). Activities included in SIC codes 021-025.

Low pressure/low volume irrigation, Micro or Tickle [irrigation]: Irrigation systems that apply water directly on or near the soil surface, either in discrete drops, small streams, mist, or sprays. They include drip, spray, jet, and bubbler application.

Major user [management]: A user who withdraws, distributes, or uses water, or collects or returns wastewater at a rate averaging more than 10,000 gallons per day 0.010 million gallons per day (Mgal/d).

Makeup water [power]: The water added to a closed system to replace the circulating water lost by evaporation, drift, blowdown, and leakage.

Megawatt-hour [unit] (MWh): A unit of energy, equivalent to one million watt-hours.

Measuring point [general]: Specific point where data is collected. It is usually marked and has some specific criteria that assure consistent data collection

Million gallons per day [unit] (Mgal/d): A rate of flow of water.

Mining water use [water-use category]: Water used for the extraction of naturally occurring minerals including coal, ores, petroleum, and natural gas. Includes water associated with quarrying, dewatering, milling, and other on site activities done as part of mining. Excludes water used for processing, such as smelting and refining, or slurry pipeline (industrial water use). Activities included in SIC codes 10-14.

Non-recoverable ground water [irrigation]: Water lost through deep percolation that is not available for further use.

Outfall [wastewater]: Refers to the outlet or structure through which effluent is finally discharged to.

Offstream use [general]: Water withdrawn or diverted from a ground- or surface-water source for use.

Per capita water use [management]: The average volume of water used per person (or other unit) during a standard time period, generally per day. (Other units may include various types of livestock, hospital beds, etc.).
Point of diversion [water supply]: The location at which water is diverted or withdrawn from a source.
Percolation pond [wastewater]: Refers to a pond (usually man-made) designed to allow wastewater to percolate slowly into the ground. The pond acts as a holding facility while gravity allows the water to percolate or seep through the soil or other unconsolidated medium into the local water table and lower aquifers.
Potable water [water supply]: Water suitable for drinking or cooking, from both health and aesthetics considerations. Potable water is considered safe for human consumption and is often referred to as drinking water.
Precipitation [hydrology]: The liquid equivalent (depth) of rainfall, snow, sleet, or hail. The data that is used is more correctly referred to as "Observed Precipitation" and in all cases is somewhat less than actual due to the imperfectness of measuring devices.
Preirrigation [irrigation]: Application of water to cropland before planting to assure adequate crop germination and early plant growth.
Price elasticity [management]: A dimensionless measure of the relation between a percent change in water use and a percent change in price when other factors affecting water demand remain unchanged. The same concept may be applied to express responsiveness of water use to changes in other variables.
Public supply [water-use category]: Water withdrawn by public and private water suppliers and delivered to users or groups of users. Public water suppliers provide water for a variety of uses, such as domestic, commercial, industrial, thermoelectric power, and public water use. USEPA definition specifies 15 connections or 25 people. Activities included under SIC code 4941.
Public-supply delivery [public water supply]: Water delivered to a user or group of users through a public-supply distribution system.
Public use [public water supply]: Water supplied from a public water supply and used for firefighting, street washing, and municipal parks and swimming pools.
Public use, losses, and transfers [water supply]: Water from a public water supply that has not been accounted for as being distributed to domestic, commercial, industrial, or thermoelectric uses. Includes public water use (firefighting, street washing, and use at municipal parks and swimming pools), system flushing, leakage, meter-errors, and may also include transfer of water between public water suppliers.
Pumped storage [power]: Storage in an afterbay that is pumped back to the forebay above the powerplant at a time when customer demand for energy is low, such as at night. Pumped storage is a method of keeping water in reserve for use during peak period power demands. In some cases, the forebay may be located offstream.
Raw water [water supply]: Untreated water.
Recharge [hydrology]: Process by which water is added to the zone of saturation to replenish an aquifer.
Reclaimed wastewater [general]: Public or industrial treatment-plant effluent that has been diverted or intercepted for use before it reaches a natural waterway or aquifer.
Recycled water [general]: Water that is used more than one time before it passes back into the natural hydrologic system, generally by the same user, or for similar purposes.
Release [general]: Water discharged by a user or group of users into a wastewater-collection system.
Reservoir [hydrology]: A pond, lake, tank, basin, or other space, either natural in its origin, or created in whole or in part by the building of engineering structures, which is used for storage, regulation, and control of water (ASCE).

Reservoir evaporation [hydrology]: The amount of water lost to the atmosphere through direct evaporation and sublimation losses during below freezing temperatures.
Residential water use [water-use category]: See domestic water use.
Resident population [management]: The number of persons who live in a State who consider it their primary place of residence. College students, military personnel, and inmates of penal institutions are counted as residents. Tourists and seasonal or part-time residents are considered nonresident population.
Return flow [general]: Water that is returned to surface or ground water, after use or wastewater treatment, and thus becomes available for reuse. Return flow can go directly to surface water, directly to ground water through an injection well or infiltration bed, or indirectly to ground water through septic systems. (2) That proportion of the water diverted from a stream that returns to the stream channel either as surface or underground flow (U.S. Department of Agriculture).
Reuse [general]: Use of water that has undergone wastewater treatment and is delivered to a user as reclaimed wastewater.
Reverse osmosis [water treatment]: Refers to the process of removing salts from water using a membrane. With reverse osmosis, the product water passes through a fine membrane that the salts are unable to pass through. This differs from electrodialysis, where the salts are extracted from the feedwater by using membrane charged with an electrical current to separate the ions. The positive ions go through one membrane, and the negative ions flow through another membrane, leaving the feedwater less mineralized.
Riparian [hydrology]: Pertaining to the banks of a body of water, a riparian owner is one who own the banks. A riparian water right is the right to use and control water by virtue of ownership of the banks (ASAE).
Rural water use [water-use category]: Replaced by the more specific terms of domestic (self supply) and livestock water use.
Safe yield [management]: Amount of ground water that can be withdrawn from an aquifer without degrading quality or reducing pumping level (ASAE).
Saline water [hydrology]: Water that contains more than 1,000 milligrams per liter (mg/L) dissolved solids.
Salinity [hydrology]: The concentration of dissolved solids or salt in water.
Seepage [hydrology]: (1) Water escaping through or emerging from the ground along an extensive line or surface as contrasted with a spring where the water emerges from a localized spot. (2) The slow movement (percolation) of water by gravity water through the soil.
Self-supplied water [general]: Water withdrawn from a ground- or surface-water source by a user and not obtained from a public water supply.
Septic tank [wastewater]: Refers to a buried tank for the separation in the absence of oxygen of solids, grease, and liquid components of wastewater. The liquid fraction from the septic tank is discharged to a drain field for disposal.
Service area [management]: (franchise area) A customer, group of customers, entity of group of activities which are served with water through a single delivery and or measuring/metering device from a main distribution system.
Spring [hydrology]: A surface where, without the agency of man, water issues from rock or soil onto the land or into a body of water, the place of issuance being relatively restricted in size. Springs are classified in accordance with many criteria, including character of the water, geologic formation, geographical location, and continuity of flow (ASCE).
Standard Industrial Classification (SIC) code [industry]: Four-digit codes established by the U.S. Office of Management and Budget (Executive Office of the President, Statistical Policy Division) 1987 or more current edition, and used in the classification of establishments by type of activity in which they are engaged.
Steam venting [power]: Release of steam into the atmosphere from a thermoelectric power generating plant. Usually occurs during shut down of a plant.

Stream [hydrology]: A body of flowing water. The term is usually applied to a body of water flowing in a natural surface channel, but is also applied to a body of water flowing in a well-defined open or closed conduit, a jet of water issuing from any opening such as a fissure in rock, a nozzle, or as a current in a still body of water such as a lake or a sea (ASCE).
Surface water [hydrology]: Water flowing or stored on the earth's surface (ASAE), such as a stream or a lake.
Surface water disposal [wastewater]: Refers to wastewater that is disposed of directly into a surface water body or wetland. This does not include water discharged into ponds for holding or percolation purposes.
Tailwater [hydrology/irrigation]: Water, in a stream or canal, immediately downstream from a structure. Excess irrigation water which reaches the lower end of a field (ASAE).
Thermoelectric power water use [water-use category]: Water used in the process of the generation of electric power from fossil fuel (coal, oil, or natural gas), geothermal, biomass, solid waste, or nuclear energy. Cogeneration plants, which simultaneously generate electrical energy and low-grade heat from the same fuel, are also included. The water may be obtained from a public water supply or may be self supplied. Activities are included in SIC code 4911 along with hydropower.
Transbasin diversion [hydrology]: See Interbasin transfer.
Transpiration [hydrology]: Process by which water from plants or animals is evaporated into the atmosphere, through a porous membrane. See also evaporation and evapotranspiration.
Unaccounted for water [water supply]: Water supplied from a public water supply that has not been account for as being distributed to domestic commercial, industrial, or thermoelectric uses. It includes public water use (firefighting, street washing, and municipal parks and swimming pools), leakage (conveyance loss), and meter-errors.
Wastewater [general]: Water that carries wastes from homes, businesses, and industries; a mixture of water and dissolved or suspended solids.
Wastewater-collection conveyance [general]: The process of conveying wastewater from users through a wastewater-collection system (sewer system) to a wastewater-treatment facility. May also include storm runoff. Wastewater is released by the user into the collection system and received by the treatment facility. Wastewater can also be released from a local collection system into a regional collection system.
Wastewater treatment [general]: The processing of wastewater for the removal or reduction of contained solids or other undesirable constituents.
Wastewater-treatment return flow [general]: Water returned to the hydrologic system by wastewater-treatment facilities. Also referred to as effluent water.
Water demand [management]: 1. Relation between water use and price, when all other factors are held constant. Demand is relation of increased prices results in decreased water use. (Boland) 2. Demand is a general concept used by economists to denote the willingness of consumers or users to purchase goods, services, or inputs to production processes, since the willingness varies with the price of the thing being purchased. (Kindler). 3. Refers to the schedule of quantities that consumers would use per unit of time at a particular price per unit of water used.
Water disposal system [wastewater]: The complete system for removing excess water from land with minimum erosion. For sloping land, it may include a terrace system, terrace outlet channels, dams, and grassed waterways. For level land, it may include only surface drains or both surface and subsurface drains.
Water impoundment [hydrology]: A body of water created or stored by impoundment structures, such as dams, dikes, and levees.
Water requirement [management]: Water needed for a particular purpose, such as irrigation, power generation, public water supply, plant transpiration, or storage, that no matter what the price, the same quantity of water is purchased. generally independent of price.

Water supply [general]: All of the processes that are involved in obtaining water for the user before use. Includes withdrawal, water treatment, and distribution.
Water table [hydrology]: The upper surface of the saturated zone below the soil surface where the water is at atmospheric pressure (ASAE).
Water transfer [general]: Artificial conveyance of water from one area to another.
Water treatment [general]: The processes that withdrawn water may undergo prior to use, including chlorinations, fluoridation, and filtration.
Water use [general]: (1) In a restrictive sense, the term refers to water that is actually used for a specific purpose, such as for domestic use, irrigation, or industrial processing. (2) More broadly, water use pertains to human's interaction with and influence on the hydrologic cycle, and includes elements such as water withdrawal, distribution, consumptive use, wastewater collection, and return flow.
Water-resources region [management]: Designated natural drainage basin or hydrologic area that contains either the drainage area of a major river or the combined drainage areas of two or more rivers; of 21 regions, 18 are in the conterminous United States, and one each are in Alaska, Hawaii, and the Caribbean.
Water-resources subregion [management]: The 21 designated water-resources regions of the United States are subdivided into 222 subregions. Each subregion includes that area drained by a river system, a reach of a river and its tributaries in that reach, a closed basin(s), or a group of streams forming a coastal drainage system.
Watt-hour [power] (Wh): An electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electrical circuit steadily for one hour.
Wellhead [hydrology]: The above-ground part of a well.
Withdrawal [general]: The removal of surface water or ground water from the natural hydrologic system for use, including public-water supply, industry, commercial, domestic, irrigation, livestock, thermoelectric power generation, water uses.