

**Nevada State Water Plan
SUMMARY**

**Section 7
Issues and Recommendations**

Introduction

The following issue papers represent a summarization of those issues contained in Part 3, Water Planning and Management Issues of the *Nevada State Water Plan*. All recommendations have been retained from the original issue papers. The numbers and titles used below are the same as those used in Part 3.

1 — WATER SUPPLY AND ALLOCATION

Water Conservation

Ensuring an adequate water supply for any use is no longer only a matter of developing new sources. Conservation has become an essential part of the water supply equation. Over the last 10 years conservation has been shown to be a cost effective way to reduce demands and to extend a given water supply. Conservation measures can be pursued by all water users regardless of the type of water system, i.e. municipal, irrigation, private home, commercial or industrial, etc. Water use measurement is a key component to any conservation program. Meters and other measurement devices are needed to evaluate program effectiveness.

At this time, the State has no comprehensive program for promoting and encouraging conservation, or for assisting water use entities in developing water conservation strategies. However, in recent years the State has instituted some statutes and regulations encouraging conservation. For example in 1991, the Nevada State Legislature enacted a law requiring that each “supplier of water” for municipal, industrial or domestic purposes adopt a water conservation plan based on the climate and the living conditions in its service area by July 1, 1992. Also, the Nevada Legislature passed Assembly Bill 359 in 1991 thereby imposing certain minimum standards for plumbing fixtures (toilets, showers, faucets and urinals) in new construction and expansions in residential, industrial, commercial and public buildings. In 1992, the U.S. Congress passed the National Energy and Policy Conservation Act which set nationwide minimum flow standards for plumbing fixtures.

Issues

1. At this time, the State has no comprehensive program for promoting and encouraging conservation throughout Nevada and for assisting water users in developing water conservation strategies.
2. Currently, state law requires municipal water suppliers to submit conservation plans, but provides

little incentive for compliance. Also, there are no requirements that these plans be periodically updated or reviewed for effectiveness. Water users other than public suppliers are not required to submit conservation plans.

3. The current law of “use it or lose it” does not encourage conservation. However, existing statutes prohibit the waste of water, and provide the basis for a “credit for conservation” program.
4. State law provides few requirements and no specific incentives to conserve.
5. There have been attempts to appeal the federal minimum flow standards for plumbing fixtures. Repealing the federal standards could adversely affect Nevada’s conservation efforts.

Recommendations

The following recommendations are offered as measures for improving conservation efforts in Nevada. In developing these recommendations, it was assumed that conservation would remain primarily a voluntary activity for water suppliers and users, with the State providing assistance and incentives. It is not the intent of these recommendations to advocate conservation purely for the sake of conservation. Conservation should be recognized as one of many water resource management tools that should be considered when it makes sense in terms of economics and overall resource management.

1. The State should add staff to the Division of Water Planning to provide technical, educational and financial assistance with water conservation. Duties of this staff could include:
 - review water conservation plans and provide technical assistance;
 - distribute grants;
 - prepare conservation plans for state facilities;
 - prepare and/or evaluate water audits for state facilities;
 - assemble a repository of water conservation information for distribution;
 - develop conservation education materials and provide educational seminars; and
 - compile a list of recommended best management practices for use in Nevada.
2. All municipal water suppliers are now required to implement conservation plans. It is recommended that the following steps be taken to improve this program:
 1. require municipal water systems over a certain population threshold to periodically update their conservation plans, and establish ongoing reporting requirements;
 - require municipal water systems over a certain population threshold to adopt, implement and update their water conservation plans prior to receiving any state grants or loans or State Revolving Funds (Safe Drinking Water Act);
 - require municipal water systems over a certain population threshold to adopt, implement and update their water conservation plans prior to the State Engineer’s approval of a water right application or transfer request; and
 - add staff to assist municipal water systems with developing their conservation plans and encourage compliance with conservation plan requirements.
3. On a trial basis, the State should require additional groups of water users (such as irrigators, and self-supplied commercial and industrial users) above a certain water use threshold to prepare water conservation plans. A cooperative agreement with other agencies could be set up to assist in developing and reviewing the plans.
4. The Department of Conservation and Natural Resources should develop a more formal “credit for conservation” program in order to encourage more conservation throughout Nevada. This

program would be voluntary. Water use measurement and enforcement would be essential for such a program to be successful.

5. The State, in cooperation with Cooperative Extension and Natural Resources Conservation Service, should assist agricultural users in implementing conservation measures through the following mechanisms: develop an irrigation management information system with weather stations in selected basins to provide real time evapotranspiration data for irrigation scheduling; establish mobile laboratories to visit farmers to help them evaluate their water management efficiency; and establish an irrigation training and research center.
6. If state government is to promote conservation throughout Nevada, it must lead by example and assist the various state agencies in becoming more efficient. The State Legislature and the Governor should promote statewide water conservation by:
 1. incorporating water conservation policy goals into all appropriate activities and programs of state government
 2. directing agencies responsible for constructing, leasing or maintaining state facilities and property to use water conserving plumbing fixture and devices, water efficient landscape practices and other programs to maximize water conservation
 3. providing appropriate funding to affected state agencies to retrofit existing state facilities with water conserving devices.
7. The State should establish a fund to help pay for water conservation projects to demonstrate the benefits of water efficiency measures and provide an incentive for conservation/
8. The State should encourage public supply systems to meter water deliveries. Refer to the “Water Use and Estimation” issue discussion for additional information on water use measurement in Nevada.
9. The State should encourage effluent reuse and greywater use where feasible.
10. The State should initiate a water measurement program for all water users to install water measurement devices, or implement water use estimation techniques (based upon power use, etc.) for certain users over a threshold use amount and for certain basins. Funding support would be a necessary component. Refer to the “Water Use and Estimation” issue discussion for additional information on water use measurement in Nevada.
11. The State should continue to support existing state and federal minimum flow standards for plumbing fixtures.

Integrated Water Management

Groundwater and surface water supplies in Nevada are finite resources, only replenished by the nine inches of average annual precipitation. The State’s rapidly expanding population is putting increased pressures on the available water supplies, thus increasing the need for integrated water management.

Surface water is used to meet approximately 60 percent of the water needs in Nevada, with groundwater making up the other 40 percent. Surface water in the State is fully appropriated, thus future development will rely heavily on groundwater resources. In many communities groundwater currently provides 100 percent of the water supply for municipal uses. In years of low surface water supply, groundwater is pumped to supplement surface water sources.

Water quality typically varies throughout the state, dependant upon the aquifer material, location relative to thermal areas, and point and non-point sources of pollution. Concentrations of naturally occurring contaminants such as TDS, metals, fluoride and sulfates vary but typically do not exceed State and Federal drinking water standards in the majority of aquifers used for drinking water supply.

Integrated water management in Nevada consists of three components:

- **Conjunctive Use** — The goal of conjunctive use of water systems is to maximize the use of surface water supplies when they are available, and minimize the use of groundwater to conserve the total resource.
- **Water Storage** — Storage of surplus surface water in aquifers underground or in above ground reservoirs enhances groundwater supply and can be withdrawn when available supplies are not adequate to meet demand.
- **Water Reuse** — Use of previously used water or treated waste water for commercial, industrial and irrigation uses is becoming more common in Nevada. Treated effluent is currently used for irrigation at many golf courses, while commercial uses include using previously used water for cooling tower make-up water at power generating station.

Issues

1. Effective management of the total water supply in the state depends on a clear understanding of the interaction of the water resources.
2. Groundwater and surface water are managed as two separate sources in Nevada. Water allocation and management decisions need to incorporate state-of-the-art knowledge regarding the relationship between groundwater and surface water.
3. Underground storage is a viable alternative to surface water storage, eliminating evaporative losses which can be significant in Nevada. However, few communities are actively exploring the potential for underground storage.

Recommendations

1. The State should continue groundwater and surface water monitoring to refine the estimates of perennial yield of hydrographic basins, and provide an improved estimate of water availability in the state.
2. The State should support funding and development of an enhanced groundwater level and quality monitoring network to better quantify groundwater availability and use throughout the state and especially in areas of rapid growth.
3. The State should fund integrated water resource studies to assess the effects of groundwater pumping on surface water flows on critical streams and springs where impacts have been identified.
4. The State should encourage development of aquifer recharge/recovery projects where feasible throughout the state, and evaluate surface water storage options where underground storage is not feasible.
5. The State should encourage installation of dual piping in new developments to facilitate use of treated water for irrigation and other uses which are not required to meet drinking water standards.
6. The State should encourage the preferential use of reclaimed water, surface water, and stored water.

7. The State should ensure that water users who use a combination of surface water, groundwater, or alternative water sources (reclaimed water, grey water, etc.) do not use more than the total amount of water necessary to meet their needs efficiently within the limit of their water right.

Interbasin and Intercounty Transfers

Water transfers involve withdrawing either groundwater or surface water from one basin or county for beneficial use in another. Water transfers have been around for a long time and are an integral part of the settlement of Nevada. There are over 20 interbasin transfers occurring in the state today. Growing urban areas are looking to appropriate available water rights and transfer them to the place of need or purchase existing water rights and change them to municipal use, frequently in a different basin or county. Water right transfers are also being viewed as an important way to augment instream flows.

State water allocation law does not contain special criteria for evaluating interbasin or intercounty transfers. As long as unappropriated water is available, existing water rights are not impacted, and the transfer does not threaten to prove detrimental to the public interest, the State Engineer may approve the transfer. However, other sections of state law contain special requirements for water transfers, including public noticing and the establishment of a water transfer tax and mitigation plans.

Water transfers have contributed to economic development, growth and prosperity in Nevada, but there are also costs associated with such transfers. A water transfer can enable a receiving area to meet current or projected water needs, or lead to economic development or expansion. An area-of-origin can benefit from a water transfer if the area has excess water resources not otherwise needed to meet future growth or resource conservation needs. Water transfer concerns center on whether a water transfer has the potential to impact the rights of existing water users, reduce instream flows, decrease flows to wetlands or lakes downstream of the point of diversion, or decrease recharge to aquifers. Social, economic and fiscal concerns center on potential losses of taxable income, social stability or the ability to economically develop in the future. Other concerns include the impacts that population growth may bring.

Interest in water marketing, and associated water transfers, is increasing as the demand and price for water rights increases. The 1994 Nevada Legislative Committee to Study the Use, Allocation and Management of Water recommended that the water plan include general criteria for the approval of interbasin water transfer applications. The 1995 Nevada State Legislature amended the water planning statute to require that the state water plan include provisions to protect water supplies in rural areas for future development and quality of life benefits.

Issues

1. Water transfers can impact third parties. It is sometimes difficult to determine who the affected parties are and to inform them about proposed water transfers.
2. Concerns have been expressed about water transfers and their potential impacts. Regional water planning enables local officials to be prepared when water transfers are proposed for their area, and to better capitalize on any benefits and mitigate any impacts water transfers may bring.

3. Water transfers may have relatively larger impacts on rural counties. Rural counties must carefully evaluate the potential social, fiscal and economic impacts of water right transfers.
4. Nevada has many threatened and endangered species and unique ecosystems, and has lost much of its wetland environments. Protection of water quality and recreation opportunities depend in large part on water availability. Because the water needs for these beneficial uses of water have not been adequately quantified and few water rights have been obtained to support them in the past, a thorough evaluation of the potential environmental impacts must precede any large scale water transfer.
5. Water markets are developing in various ways in different parts of Nevada. There are few, if any, mechanisms to bring buyers into contact with sellers or to bring order and rationality to the process. Therefore, transaction costs are high and water rights may not be appropriately valued.

Recommendations

The following recommendations were significantly influenced by recommendations made by Nevada county commissioners and the public at more than 25 public meetings and workshops on the state water plan held in 1998. The recommendations were also influenced by the recommendations found in the 1994 *Study of the Use, Allocation and Management of Water* prepared by the Legislative Commission of the Legislative Council Bureau, State of Nevada, and in *Water Transfers in the West – Efficiency, Equity and the Environment*, 1992, prepared by the National Research Council. The recommendations below are designed to balance the positive and negative impacts interbasin and intercounty transfers may have.

1. All levels of government should recognize the potential net value of water transfers as a way to respond to changing demands for water, and encourage voluntary transfers, as long as the public interest is protected. Efforts should continue to make information available to the public concerning water transfer proposals and to provide affected interests with an opportunity to participate in any proceedings.
2. In applying the public interest test (under NRS 533.370(3)) to an interbasin or intercounty water right appropriation or change request, the State Engineer should continue to consider whether:
 - the applicant for the water transfer has justified the need to import the water and demonstrated that an effective conservation plan has been adopted for the region in need and is being effectively implemented;
 - the transfer plan conforms to or conflicts with the substance of any adopted water plans for either the area-of-origin or the area to receive the water;
 - the project is environmentally sound; and
 - the project is an appropriate long-term solution which will not unduly limit future development and growth in the area-of-origin.
3. When in the public interest, the State Engineer should continue to place conditions on water right permits to mitigate impacts of interbasin or intercounty water transfers.
4. The State should continue to provide, and accelerate where funding allows, water planning assistance to local governments to help develop regional water plans and to identify future water needs. Regional water planning will enable local governments to better plan for their economic development and protect their natural resources, and prepare them to respond to proposals to transfer water into, or out of, their areas.
5. The Division of Water Planning, with the assistance of others, should conduct additional research on the opportunities and costs associated with water banking and water marketing in Nevada, and

develop additional recommendations to improve future water transfers.

Water Use Measurement and Estimation

One of the major obstacles to improved comprehensive water planning and management is the State's lack of an overall water use and estimation program. Approximately 65 to 75 percent of the total water withdrawn from groundwater and surface water sources in Nevada is either measured with detailed diversion records maintained by various entities or estimated by the State annually in detailed pumpage and crop inventories. Only a portion of these data are maintained in an electronic database. Much of the available water use data are collected for regulatory purposes (compliance with permits, decrees, etc.) and may lack the detail needed to fully characterize water usage for planning purposes. The lack of readily available and comprehensive water use data impedes local and state planning and management efforts, including the State Water Plan. Managing and planning water resources without accurate water use information is comparable to managing a checking account without tracking the outgoing checks.

Issues

The State of Nevada lacks a comprehensive water use and estimation program. At this time, the U.S. Geological Survey (USGS) is the only agency that estimates statewide water use for Nevada. The USGS program for Nevada had been cooperatively funded by the Nevada Division of Water Resources (State Engineer's Office) until funding was cut in 1991. Since that time, the USGS has continued the program with other limited funds and the State has had little involvement in the process.

Recommendations

The following is offered as a method for improving water use measurement and estimation, and ultimately future water planning and management efforts, in Nevada:

The State should develop and fund a comprehensive water use measurement and estimation program. Some elements of this program could include the following:

- Enter water use data and estimations currently being compiled by the State Engineer into electronic databases, and link these data with the water right permits database;
- Acquire more detailed public supply, commercial, industrial and thermoelectric usage data through one of the following mechanisms:
 - a. request that municipal water systems provide additional details of water usage data currently submitted to State Engineer's Office (for compliance with water right permit conditions) such as population served, number of connections, consumptive use estimates and breakdowns by domestic, commercial, industrial, thermoelectric deliveries, etc.;

OR

- b. require all of the following water users to submit detailed water use information (measured or estimated) if not currently submitted:
 - public supply systems;
 - self-supplied commercial/industrial/thermoelectric users with usage over a threshold value to be determined; and

- mining operations with water usage over a threshold value to be determined.

Information should include the following as applicable:

- number of persons served;
 - monthly/annual withdrawals by source;
 - monthly/annual deliveries by category (domestic, commercial, industrial);
 - estimated consumptive use;
 - anticipated future needs
- Expand existing program for estimating irrigated acreage and associated water use;
 - Encourage public supply systems to meter all water deliveries;
 - Initiate a water measurement program for all water users to install water measurement devices, or implement water use estimation techniques (based upon power use, etc.) for certain users over a threshold use amount and for certain basins. Funding support would be a necessary component; and
 - Provide State funding for the Division of Water Planning to match the USGS cooperative water use estimation program so that all of the water use information could be compiled in a comprehensive and integrated manner.

Domestic Wells

In Nevada, domestic wells serve approximately 6 percent of the population and withdrawal about 18,000 acre-feet per year (less than 0.5 percent of total state water use). Domestic well usage is projected to increase to about 28,000 acre-feet per year by the year 2020. Though current and projected domestic well usage accounts for a small portion of the State's total water use, some domestic well issues require consideration in the planning process.

Issues

1. For developments created through parceling, the counties have the sole responsibility for determining whether or not water rights need to be dedicated. Some counties have passed ordinances which set forth water right dedication requirements. When deemed appropriate, the State Engineer notifies county commissions of the need for water rights dedication requirements for designated basins, and encourages them to pass appropriate ordinances.
2. Under the existing system, domestic well information may be limited in some basins.
3. Domestic well owners may have limited protection from declines in water levels. Further, domestic wells may not be drilled deep enough to provide protection from drought or interference from other groundwater users.
4. The quality of domestic water supplies have been impaired by septic tank discharges and other contaminants in some areas in Nevada. Limited funding is available to mitigate these situations.

Recommendations

1. The State Engineer should continue, as necessary, to notify counties of the potential impacts on water resources due to multiple parceling activities, and recommend the implementation of water rights dedication requirements for designated basins.
2. The State Engineer, in cooperation with local governments, should establish complete domestic

- well inventories (location and number).
3. The Department of Conservation and Natural Resources should distribute educational material to existing and prospective domestic well owners regarding factors to consider when having a new well drilled or purchasing an existing well.
 4. The State should support the installation or expansion of regional water supply and/or wastewater treatment systems in areas where the quality of domestic wells supplies have been impaired. The Legislature should consider modifying the AB198 Grants to Small Water Systems program or establishing a new program to provide funding for these new installations or expansions.

2 — WATER QUALITY

Nonpoint Source Pollution

The leading cause of water quality impairment is nonpoint source (NPS) pollution. Assessments indicate all major rivers in Nevada are impacted. Urban, agricultural and grazing lands are major source areas. Flow regulation and wetland and riparian area losses are factors also. NPS pollution occurs wherever water flowing across the land or underground picks up nutrients, salts, metals, organic material, soil, or chemicals and delivers the accumulated pollutants to streams, lakes, wetlands or ground water aquifers in amounts greater than natural background levels. The excess pollutants may result in nutrient enrichment, undesirable algae growth, higher total dissolved solids, turbidity, lower dissolved oxygen, pH changes, higher temperatures and increases in pathogenic microorganisms. These conditions negatively affect water supplies by fouling water systems and increasing treatment requirements and operation and maintenance costs. Aquatic ecosystems may also be impacted by nonpoint sources.

The Nevada Division of Environmental Protection (NDEP) administers regulatory and voluntary NPS programs. Pollution control regulations and permit programs have been implemented for septic systems, storm water systems and soil grading activities. Regulation of large animal feed lots is pending. Other actions include public education, support for local Best Management Practices (BMPs), water quality monitoring and source assessments, and interagency cooperation. Potential management options include a NPS pollution credit trading program and participation in the federal Clean Water Action Plan (CWAP). The CWAP offers incentives to states undertaking an interagency watershed management process to control NPS.

Nevada's NPS management approach relies on local and federal agency cooperation. Local agency measures entail master planning to protect sensitive lands, ordinances encouraging cluster development and open space retention, wider setbacks along water courses, impervious surface limits, and ordinances requiring BMPs. Several federal agencies are involved. The Environmental Protection Agency administers Clean Water Act section 319 which promotes state NPS planning. Federal land managers address NPS pollution with land use planning and permits. The U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service protect and manage wetlands. The Natural Resources Conservation Service provides NPS project funding and technical assistance to agricultural and suburban communities through incentive programs. The USGS maintains a monitoring program for water quality, sediment quality, and aquatic biota, and conducts water quality investigations and

publishes related reports.

Issues

1. The 1998 Nevada Water Quality Assessment (305b) Report by the NDEP indicates that water quality does not meet some or all of the beneficial use standards on 775 miles of the 1,639 river miles assessed. NPS generally contributes the most to the impairment.
2. Cost is an obstacle to the implementation and acceptance of BMPs. Monitoring the effectiveness and costs of BMPs is essential to identifying least cost options. The Tahoe Bond Act of 1996 is the only state funding source for NPS projects.
3. The pollution control potential of wetlands and riparian areas has diminished. Regulations enhance agency efforts to halt wetland losses, but support for restoration is limited.
4. Expanding urban boundaries put pressure on wetlands, floodplains, and forest and range lands which adds to NPS pollution problems. Correcting NPS pollution after the fact is difficult and costly.

Recommendation

The management of nonpoint source pollution is an important water supply planning objective. To meet that objective, the following recommendation is offered.

1. The Nevada Division of Environmental Protection, in cooperation with other state agencies, should continue its nonpoint source program consisting of regulatory and voluntary measures, and coordination with federal, state, and local agencies, and the general public.

Comprehensive Ground Water Protection and Management

Aridity, complex hydrogeology, rapid population growth and diversifying public interests are factors driving a need for comprehensive ground water protection and management. Ground water provides about 40 percent of domestic, commercial, industrial, mining and agricultural water use. It also is a supply source for riparian, aquatic and certain upland ecosystems and recreational resources. Some aquifers are showing signs of water quality deterioration and increased use. Many different land uses release nitrates, pesticides, petro-chemicals and other pollutants. A pervasive contaminant from natural and human processes is dissolved solids (salinity). Naturally occurring contaminants also include metals, arsenic, boron, sulfates and radon.

Plans to increase ground water use often must address migration or contaminant concentration issues. The Nevada Division of Environmental Protection (NDEP) administers the Comprehensive State Ground Water Protection Program (CSGWPP). The program emphasizes interagency collaboration to meet objectives that complement existing regulations, address pollution control and remediation priorities, promote pollution prevention (e.g., wellhead protection program), and enhance public education. Mandatory and voluntary provisions of federal and state statutes, such as the Safe Drinking Water Act and Nevada Pesticides Act, are core elements of the CSGWPP.

The Nevada Division of Water Resources (NDWR) allocates, adjudicates, and manages ground water. Statutes emphasize protection of appropriative water rights and non-wasteful, beneficial use. The State Engineer may administer pumping limits or preferred uses where average annual recharge

does not satisfy all water rights. Aquifers are recharged by natural, incidental or artificial mechanisms. Natural replenishment occurs slowly in Nevada’s arid climate. Recharge areas are limited, so protective measures are an important land use planning consideration. Incidental recharge augments shallow ground water, but in the process may result in lower quality water in the aquifer. Artificial recharge projects have been permitted by the NDWR and NDEP for storage and recovery, control of water table declines, land subsidence management and quality improvement.

Shallow ground water may influence the quantity and quality of surface water available to flora and fauna. Ecological studies of some springs have found unique, long-lived aquatic species, a number of which are vulnerable or have become extinct due to ground water changes. Acquiring a better understanding and monitoring interactions between ground water and surface water, and ecosystem resiliency is a concern of the Nevada Division of Wildlife, the Nevada Natural Heritage Program and other agencies.

Water quality protections and appropriation of ground water rights by federal or local agencies is subject to Nevada water law. Federal and local agencies protect and manage ground water individually and cooperatively through the CSGWPP. Local governments may adopt ordinances, modify land use plans, and take other actions to protect ground water. Wellhead protection program work is ongoing in many communities, although some have encountered obstacles due to limited resources, data, and expertise. The U.S. Environmental Protection Agency created the CSGWPP framework in 1992 to encourage state action. The U.S. Geological Survey (USGS) conducts investigations and monitors levels and quality in some basins. The U.S. Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service and National Park Service address state ground water objectives in natural and recreational resource management plans and permits.

Issues

1. Water quality and quantity data is collected and stored by different agencies using varying formats. This creates access and use difficulties. Agencies acknowledge that improved data management is essential, but a comprehensive effort has been difficult to muster.
2. Water management decisions increasingly require monitoring data on ambient ground water conditions, trends, and interactions. A statewide monitoring network was proposed in 1978 by USGS and NDEP. Availability of agency resources has been an obstacle.
3. Ground water use has grown. A greater understanding of technical, scientific, economic and legal aspects of recharge/recovery options and recharge zone protections is needed.
4. Pollution from nonpoint sources may cause ground water quality impairment. Use of BMPs and other preventative measures can minimize impacts and contain higher, future mitigation and remediation costs. BMP implementation costs can be an obstacle to their acceptability.
5. High densities of septic systems and stock animals have been associated with ground water nitrate enrichment, often in developments approved through a review process known as “parceling.” Evaluation of water quality impacts usually is not required in this process.
6. Some evidence suggests lowering of shallow water tables can impact the ecological integrity and health of riparian and aquatic resources. Inadequate scientific understanding may lead to unanticipated natural resource degradation and losses.
7. Chemical and physical properties make MTBE a threat to drinking water supplies. Utilities with wells near fueling facilities are concerned about present and future contamination risks.

Recommendations

1. The Department of Conservation and Natural Resources (Department) should continue to fully support the development and implementation by NDEP of the Comprehensive State Ground Water Protection Program (CSGWPP).
2. The Department should support the development of and funding for a more extensive, sophisticated and comprehensive ground water monitoring network as necessary to ensure that statutory water supply protection requirements and ground water management objectives are being met, including local recharge zone protection. The monitoring network should be a coordinated effort among state agencies, as well as cooperating federal and local agencies.
3. The NDEP should continue to evaluate MTBE and other gasoline additives with respect to the positive and negative impacts to both air quality and water quality, and the overall desirability of the use of such additives in Nevada.
4. The NDEP should continue to evaluate activities necessary to control sources of nitrate contamination, such as septic system discharges, which affect ground water.
5. The NDWP should research the possibility of modifying the AB 198 Grant Program or establishing a new program to fund the creation of new or expansion of existing public water systems where septic tank pollution of the ground water has become an issue.

3 — RESOURCE CONSERVATION AND RECREATION USES

Maintenance of Recreational Values

Water recreation in Nevada is growing. Nevada Division of State Parks (NDSP) reported about 3.2 million people visited state parks in 1997, a 22 percent increase over 1987. About 70 percent of the visits were to parks with water amenities. Estimated 1996 expenditures for fishing, hunting and wildlife watching were \$211.1, \$94.9, and \$262.8 million, respectively. About 150,000 people fish in Nevada each year, according to Nevada Division of Wildlife (NDOW). Their registration data shows boating has grown 75 percent over the past decade. Recreation preferences are also changing. The number of registered personal water craft (e.g., jet skis) rose from 1,326 to 13,451 in the past decade, and wildlife watching activity is trending upward. The number of recreational water bodies with amenities are comparatively rare, so state parks are important to urban and rural communities. Thus, providing adequate supplies of suitable water for recreation resources is vital.

Recreation value has both intrinsic resource and economic components. Fish and wildlife habitat condition, water quality, number of fish caught, hunting prospects, biological diversity, aesthetics, and solitude are examples of intrinsic values. The intrinsic value people place on recreational experiences is difficult to measure precisely, yet it is an important consideration in managing natural resources for recreation. Estimations of intrinsic resource and economic values concentrate on monetary measures, such as the average dollar amount people spend traveling to and using parks (a proxy for “valuing” the enjoyment recreationists place on certain resources). A common economic measure is total expenditures for recreational goods and services.

State agencies have varied responsibilities for maintaining water recreation values. NDOW administers laws to protect, manage and conserve game, non-game and sensitive fishes, migratory waterfowl and other fauna. NDSP has taken a lead role in past statewide recreation planning. The Nevada Board of Wildlife Commissioners and NDOW recently completed a strategic planning policy analysis for wetlands at state Wildlife Management Areas (WMAs) from which updated management plans will be developed. Strategic concerns identified by these agencies include: (1) competition among multiple users of public lands and land use changes to private land have resulted in impairment and loss of wetlands and riparian areas; (2) water management is the most important issue at most WMAs; (3) water resources are vital components of Nevada's recreational base and should be protected to maintain quantity, quality and accessibility; and (4) existing levels of outdoor recreation funding are inadequate to meet recreation needs. Efforts to address these issues are ongoing.

NDOW acquires strategic conservation easements, access agreements for private land with wildlife values (e.g., agricultural fields), and water rights. The State Engineer has approved state and federal water appropriation and water right transfer applications for recreation and wildlife uses, and works with NDOW to identify applications for uses that may impact recreation resources. Since 1987, \$28 million has been spent to buy and improve state parks, some coming from the 1990 Question 5 Bond Initiative. Purchases include three ranches along the Carson River below Fort Churchill, construction of the South Fork Reservoir boat facilities and campground, Little Washoe Lake and development of day use facilities, and sewer and water systems upgrades in several parks. In addition, the Nevada Division of State Lands has acquired 8,000 acre feet of water rights for the Lahontan Valley wetlands on behalf of NDOW.

Recreation has become a major management emphasis on the 62 million acres in Nevada managed by the U.S. Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Bureau of Indian Affairs, and National Park Service. Federal land managers have become more recreation-focused in their land and resource planning. State and federal agencies manage recreation values of these resources cooperatively.

Issues

1. Satisfying growing expectations for a range of water recreation choices, settings and amenities while protecting resource values presents significant management challenges.
2. Public interest in water supplies for recreation purposes has grown. Surface waters are fully appropriated, so innovative approaches to water allocation for recreation may be needed.
3. Urban areas are expanding up to public land boundaries, resulting in loss of access. More interagency cooperation with local planners could avoid or mitigate access issues.
4. The cost of agency operations per recreation user has increased while federal funding has fallen. Awards from the federal Land and Water Conservation Fund dropped from \$3.2 million in 1979 to zero in 1995. New recreation funding strategies are needed.
5. Competition between recreation and other beneficial users for water access is growing. Recreation values should be considered in agency review of water project proposals.
6. The type and intensity of recreation uses may detrimentally affect unique, sensitive or outstanding waters. More monitoring of uses and resource values may be desirable.
7. Most water recreation occurs on public land managed by federal and state agencies. Greater

interagency coordination may enhance recreation planning and management.

Recommendations

The *1992 State Comprehensive Outdoor Recreation Plan (SCORP)* contains discussion of specific issues, policy recommendations and suggested actions that pertain to the broader issue of maintenance of recreation values. Recreation issues applicable to the state water plan are found in Chapter IV of the 1992 *SCORP*, Issues and Actions for the Next Five Years. In 1997 NDSP produced the State Park System Plan which describes operations and resources within the park system and its future. Another source of guidance on recreation values is the policies and plans developed by the Nevada Board of Wildlife Commissioners and the NDOW presented in the *Wetland Conservation Plan Applicable to Nine State Wildlife Management Areas* (1998). This plan focuses on wetland protection at WMAs, but recommendations may have applicability to wetlands statewide.

1. The Department of Conservation and Natural Resources (Department) should continue to periodically evaluate the state's water-based recreation resources, assess public demand for this type of recreation, and apply this information to state recreation planning and management efforts to improve customer satisfaction while protecting natural resources.
2. The Department should encourage public agencies to consider impacts to recreation resources and their values relative to existing and potential recreation uses, whenever modification to existing or new public water-related projects, such as dams, weirs and reservoirs, are proposed.
3. The Department should continue to seek opportunities to acquire water rights from willing sellers for recreational purposes, including enhancements for fish habitat, wildlife habitat, flat water recreation and river-based recreation, where consistent with an agency's management plans.
4. The Department should continue to seek new and additional sources of funding to enhance opportunities and maintain resources for recreation.
5. The Department should research the feasibility of alternative mechanisms the state could use to meet public water-based recreation needs, such as purchasing land adjacent to state-owned water bodies, and obtaining development rights, conservation easements, and land use agreements.
6. The Department should encourage and support the efforts of state, federal and local agencies in managing watersheds for protection and enhancement of a full complement of recreation values, in addition to the other natural resource conservation considerations.

Water for Wildlife and Environmental Purposes

Nevada water law has recognized instream beneficial uses for many years. "Minimum" instream flow is a supply planning criterion describing the least amount of water to meet instream beneficial uses, such as habitat for aquatic flora and fauna; water quality; and recreation. A concern is whether instream flows in Nevada are adequate to sustain the quantity and quality of natural resources.

Diverting water for human use is essential, yet the public also places a high value on its natural resources. The number of extinct, threatened, endangered or sensitive fishes may indicate a deficiency in water available to some aquatic ecosystems. Of 98 native fishes in Nevada, 11 are extinct or extirpated, 23 are threatened or endangered and 43 percent are sensitive (December 1998).

Other sensitive species include amphibians, mammals, insects, gastropods and birds. The vulnerability of so many species reflects the need for instream flow protection in some areas. Inadequate supplies of suitable water for sensitive species may exacerbate their vulnerability, and may result in added regulations and costs. By considering the integrated relationships of instream flow to species vulnerability, water quality, and recreation in water allocation decisions, such outcomes may be avoided.

Methods to assess water supply requirements for biota, recreation, aesthetics, and channel maintenance have been developed and used in Nevada. Equivalent methods exist to estimate minimum water supplies for other aquatic resources and for channel maintenance purposes (e.g., revegetation, flood flow capacity). Most upper basin stream segments are free-flowing, so efforts to assess instream flow needs may focus on select portions of water bodies during low flow periods. Agencies and conservation organizations have conducted instream flow assessments on a number of water bodies. However, instream flow assessment has not yet become a commonly used tool.

Divisions within the Department of Conservation and Natural Resources have administrative authority for state laws addressing water use and allocation, water quality, and fish and wildlife, and thus have a preeminent role managing water for resource conservation. The Nevada Division of Wildlife evaluates the potential instream flow impacts on fisheries due to proposed water use projects, and has bought water rights for reservoirs, wetlands, and streams. The Nevada Division of Water Resources has approved several applications from governmental agencies to appropriate new water or convert existing water rights to instream flow purposes. Federal agencies implementing environmental and resource management statutes on public lands and waters are important cooperators in instream flow protection, as are local and tribal agencies. Policies promoting measures to increase water supplies for resource conservation may need to include incentives or compensation to water right holders. Examples of current instream flow protection efforts in Nevada include:

- U.S. Fish and Wildlife Service (FWS) and Nevada Division of State Lands are implementing a plan to acquire water for 25,000 acres for Lahontan Valley Wetlands.
- Washoe County and the cities of Reno and Sparks have begun to purchase and transfer water rights to mitigate periodic water quality impairment on segments of the Truckee River.
- The Nature Conservancy, USFWS and Federal Water Master have worked out modified river operations to aid cottonwood regeneration on the lower Truckee River.
- U.S. Bureau of Land Management has studied Walker Lake inflow rates required to raise the water level and quality for at-risk native trout and habitat for waterfowl.

Issues

1. A large share of Nevada's biological diversity is associated with comparatively rare aquatic and riparian ecosystems. Difficulties stabilizing and reversing statewide trends in resource losses signals a need for greater conservation efforts.
2. The historic and potential future losses of sensitive aquatic, riparian and wetland species indicates that additional emphasis on proactive water supply planning and management for resource conservation is a matter of urgency.
3. Wildlife Commission policies direct NDOW to secure water to maintain adequate instream flow, minimum pools, wetlands, springs and seeps for wildlife and their habitats. Difficulties acquiring water rights may be encountered due to funding or staffing levels.

4. Obtaining instream flow rights may be a cost effective and durable approach to achieving many resource conservation objectives simultaneously. Appropriate incentives may stimulate implementation of measures that make water available for resource conservation.
5. Most surface water withdrawals are for agricultural uses. Acquiring water for instream flow would likely involve the agricultural industry and communities and impact their viability. An incentive program with technical assistance may facilitate a willing agricultural water user to undertake measures that make water available for resource conservation while minimizing or avoiding impacts on existing uses.
6. Management of threatened or endangered species has proven to be complex, controversial, and costly for the private and public sector. Proactive planning and actions could enhance the survival of sensitive species, thus avoiding difficult and expensive recovery strategies.
7. Assessments often focus on “minimum” instream flow for a particular resource objective rather than an “optimum,” multi-objective approach. Comprehensive, integrated assessments should lead to greater ecosystem integrity and longer term survival of sensitive species.

Recommendations

To enhance the ongoing efforts of the state to enhance water supplies for resource conservation purposes and to encourage and facilitate public support, the following recommendations are offered.

1. The Department should seek legislative support for:
 - development of a comprehensive and integrated management plan for the purpose of prioritizing and coordinating interagency and interdisciplinary assessments of critical water needs for wildlife and environmental purposes;
 - adoption of a policy that actively encourages the purchase, lease or donation of existing water and storage rights for transfer to instream rights or to maintain lake or wetland areas;
 - establishment of a Water Rights Trust Fund to fund acquisition efforts; and
 - incentive programs for the restoration of impaired aquatic and riparian resources (e.g., “conservation for credits,” see recommendations in the Conservation issue paper, Part 3, Section 1A).
2. The Department should convene a statewide working group of experts to identify alternative mechanisms for obtaining water supplies for resource conservation and examine the existing legal, institutional, and economic aspects of identified alternatives. In addition, the working group should develop guidelines and criteria to be used by the Department in planning and evaluating water resource projects, including dam construction, significant water transfers, and modifications to reservoir storage and operation plans.

4 — FLOOD MANAGEMENT

Flood Management in Nevada

All areas of Nevada are subject to flooding, either from rivers and streams or from flash floods emerging from canyon mouths at high velocities. As more land is built upon in the watersheds and alluvial fans, the severity of flooding and cost of flood recovery is increasing. Floodplain management consists of planning and implementing programs designed to alleviate the impact of flooding on

people and communities. A key component of effective floodplain management is implementation of the National Flood Insurance Program (NFIP) at the local level. In 1998, 15 of 17 counties and numerous communities participate in the NFIP. Participation allows property owners to obtain federally subsidized flood insurance. In participating communities, the Federal Emergency Management Agency (FEMA) performs Flood Insurance Studies, and provides Flood Insurance Rate Maps (FIRMs). The FIRMs show the areas of the community subject to flooding.

Floodplain management can be achieved through both structural and non-structural measures. Structural controls include levees, detention basins, and dikes. Non-structural approaches include:

- Development of regional flood management plans;
- Mapping and study of historic flood prone areas;
- Acquisition and removal/relocation of repetitively flooded structures;
- Floodproofing;
- Flood forecasting and warning systems;
- Providing education and information to the local communities.

Issues

1. Consistent state-level assistance in implementing and enforcing floodplain management has not been available to the counties and communities in the state for several years. Lack of state assistance, combined with turnover in personnel and lack of training have made it difficult for some communities to comply with NFIP regulations.
2. Alluvial fan or flash flooding is unpredictable, and results in high velocity flows with great erosive capability. Alluvial fan flooding risks are typically either over- or under predicted due to disagreement on effective model for predicting flood flows and mapping alluvial fan flood zones among engineering and planning professionals.
3. Many of the FIRMs used for planning and permitting development are over five years old, and don't reflect current existing conditions. Rapid growth in areas of outdated flood maps may result in construction of structures in harm's way.
4. Coordination between state agencies and between state and local agencies was often inadequate in the past. Increased coordination is clearly an essential element in improving flood program effectiveness.
5. Floodplain management and mitigation must be considered an essential, on-going element in local and regional planning. In a presidentially declared disaster, FEMA sets aside a portion of the total reimbursed damages to fund mitigation work. The State has a Disaster Relief Fund, but funds for preventive mitigation are not currently available.
6. The state's model ordinance contains the minimum NFIP requirements for obtaining flood insurance which are general standards applicable nationwide. The model ordinance needs to be updated and enhanced to reflect the unique flooding conditions present in Nevada.

Recommendations

To further enhance floodplain management in Nevada, the following recommendations are proposed.

1. The State Legislature should amend NRS 540 which describes the duties of the Nevada Division of Water Planning, to include floodplain management. Formal recognition of the role assigned to the Division by the 1997 Legislature would enhance the Division's ability to administer the CAP and FMA programs.
2. The Nevada Division of Water Planning should coordinate participation of local, state, and

federal agencies to develop a procedure for quantifying alluvial fan flooding that is acceptable to engineering and planning professionals involved in floodplain management, as recommended by the Western Governors' Association. The Division should coordinate with the Nevada Bureau of Mines and Geology (NBMG) to incorporate fluvial geologic information into mapping flood-prone areas in the state.

3. The Nevada Division of Water Planning should develop a plan for reviewing, updating, and maintaining flood maps and research the potential for the state to participate in FEMA's proposed map modernization program as a Cooperating Technical Community in conjunction with the NBMG. Several communities in the state already have the capability to develop and maintain their flood maps digitally. This capability combined with the rapid growth in the state would make Nevada a good candidate for the map modernization program.
4. The Nevada Division of Water Planning should take a leadership role in improving coordination with all involved agencies (Nevada Division of Water Resources, Department of Transportation, Division of Emergency Management, Clark County Regional Flood Control District, regional water management districts, local community development agencies, community and county building departments, public works departments, etc.) to accomplish the following flood management objectives:
 - a. Encourage complete statewide participation in the NFIP;
 - b. Encourage participation in the Community Rating System;
 - c. Encourage relocation of flood prone structures and restoration of natural floodplain functions;
 - d. Encourage local communities to take advantage of the FIRM revision process; and
 - e. Emphasize education on floodplain management strategies and flood-loss reduction.
5. The State should create a state-funded Flood Mitigation Fund separate from the Disaster Relief Fund (SB 218), as recommended by the Western Governors' Association. In a presidentially declared disaster, FEMA typically sets aside 15 percent of the total FEMA-reimbursed damages to be spent specifically on flood mitigation. Similarly, 15 percent of the state's \$4 million Disaster Relief Fund (\$600,000) should be set aside for preventive flood loss strategies.
6. The Nevada Division of Water Planning should continue development of a detailed statewide Flood Management Plan which addresses the unique flooding conditions experienced in Nevada. The plan will provide a guideline for communities to use in implementing their flood ordinances. A Flood Management Plan would be particularly helpful to the communities outside of the major urban centers.
7. The Nevada Division of Water Planning should revise the state's Model Ordinance (minimum standards) to include "lessons learned" from the 1997 flood event in northern Nevada and flash flooding events throughout the state, such as higher reference floor elevations for development in flood hazard areas, and more appropriate development and construction standards in known but unmapped alluvial fan areas. Further, the state should develop a set of recommended standards. At a minimum, local governments should adopt the revised Model Floodplain Ordinance and should be encouraged to adopt the recommended standards.
8. All communities should develop flood mitigation plans which identify flood hazards and flooding risks, and evaluate options for flood mitigation. High priority should be placed on relocation of flood-prone development, restoration of natural beneficial floodplain functions and the use of zoning and conservation easements to direct growth away from floodplains.

5 — WATER PLANNING AND MANAGEMENT

Watershed Planning and Management

As the state rapidly grows, so too does the intensity and diversity of land use activities which places greater demand on the finite land and scarce water resources. To keep pace, over the past 20 years state agencies have implemented regulatory and voluntary programs to achieve significant reductions in point and non-point sources of pollution; prevent contamination from hazardous waste sites; more efficiently allocate and manage water resources; and provide assistance, information and funding to local organizations for management of watershed resources. Increasing agency support for a watershed approach stems from a recognition that water resource problems involve a multitude of land use activities that are dispersed and cross political boundaries, and that impacts on the environment can be cumulative and persistent.

A watershed is an area within a hydrographic or river basin consisting of interconnected water sources and drainages, bounded by topographic highs or water divides. In a planning context, it is an area with boundaries set by stakeholders having interests in the water resources of a watershed.

At its best, a watershed management plan is *comprehensive* in terms of basin geography, political units, and water resources; *inclusive*, created by all stakeholders and attentive to their environmental, social, regulatory and economic goals; and *integrated*, taking stock of relationships between the quantity and quality of water and other natural resources and environmental criteria. The basic steps in watershed planning include stakeholder participation and expression of interests, problem identification, strategy development and evaluation, action and monitoring plan development, and periodic progress assessments and plan reevaluation.

Advantages to implementing a watershed management approach include:

1. A watershed is a logical geographic unit for water resource planning, permitting, reporting, and problem solving.
2. Management decisions are improved as agencies collaborate more on problem resolution.
3. Data collection resources are pooled, so data is more comprehensive, integrated and available.
4. Resources are better directed to priority issues or those portions of the basin where the greatest problems exist.
5. Funding and human resources can be better leveraged. Volunteers can be involved.
6. Program efficiencies are enhanced by coordinating workloads. For example, monitoring can be done by participants closest to the sites and reporting requirements can be consolidated.
7. Public participation is encouraged and public support for management actions is enhanced.
8. A wider array of experts and citizens is involved in an integrated problem-solving process. A diversity of disciplines involved leads to expanded management choices.
9. The prospects of more stringent regulatory standards or programs may be averted.

A foundation for watershed planning is rooted in state water laws. In the 1960's, the Nevada State Engineer's Office and the U.S. Geological Survey recognized the need for a systematic identification of the hydrographic areas in Nevada in order to effectively study, develop, allocate and manage the state's surface and ground water resources. The first hydrographic map was developed in 1968, and

with minor revisions, continues to provide the basis for water planning, management and administration today. In the mid 1970's, the Nevada Division of Environmental Protection (NDWP) developed water quality management plans for the hydrographic basins under Clean Water Act (CWA), section 303. In the late 1970's and early 1980's, designated local agencies developed comprehensive wastewater management plans under CWA section 208 in Clark County, the Truckee River Basin, the Lake Tahoe Basin and the Carson River Basin using the basic principals for watershed planning.

The Department of Conservation and Natural Resources (Department) plays a leadership role in determining the extent to which watershed planning and management is instituted. Recently the Department coordinated various Divisions' involvement in watershed based actions include the Tahoe Presidential Forum and Truckee River Negotiated Settlement. Under the State Division of Conservation Districts' guidance and support, local Conservation Districts have facilitated plans and projects to conserve, protect, and enhance natural resources on a watershed basis. Examples of watershed planning include wellhead protection programs, the Truckee River Strategy Group, the Lake Mead Water Quality Forum and the Truckee River Water Quality Agreement. Another is the Nevada Ground Water Protection Task Force, a voluntary coordinating group of state, local and federal agencies which has begun efforts to define hydrographic basins with critical ground water quality concerns.

Most streams originate and ground water recharge occurs within upper and middle portions of watersheds managed by the U.S. Forest Service and U.S. Bureau of Land Management. In the past 30 years, several resource and land use laws have been enacted directing these and other federal agencies (e.g., Natural Resources Conservation Service) to make watershed management a high priority. The aim is to protect watershed values, such as riparian, wetland, and aquatic ecosystems, floodplains, water quality, water yield, soil stability, and agricultural lands. Since most water supply sources originate on watersheds managed by federal agencies, their participation in watershed planning and management is essential.

Issues

1. The watershed planning approach is already being implemented by various groups in Nevada. In order to apply these resources more effectively and efficiently, the Department of Conservation and Natural Resources is striving to improve coordination across divisions in a more integrated framework. It is anticipated that all agencies in DCNR could be involved in implementing certain recommendations listed below, as well as other agencies such as the Divisions of Health, Emergency Management, Agriculture and Minerals.
2. The application of a watershed planning approach to water resource problem solving is growing. Federal agencies and the Western Governors Association through the Western States Water Council promote and support it. Many local and regional planning efforts have been or will be initiated at a watershed level.
3. In principle, the watershed planning approach has applicability at the hydrographic basin level. Comprehensive and integrated water resource management can be accomplished by examining water resource linkages throughout a basin. The Department is well positioned to facilitate coordination across jurisdictions, land and resource management units, economic interests, and resource values. An integrated water basin plan provides a mechanism for focusing efforts,

disseminating viewpoints, summarizing actions, and articulating a set of goals and strategies with a timetable.

4. Department agencies and the Bureau of Health Protection Services are involved in federally co-funded grant and loan programs for watershed planning-related activities under the Clean Water and Safe Drinking Water Acts. In October 1997 the Clinton Administration announced the Clean Water Action Plan, which may provide federal funding to state, federal and local agencies implementing unified watershed assessments and restoration strategies. Other federal funding has been provided via direct Congressional appropriations. State agencies have supported watershed efforts through re-prioritization within programs, but few general fund appropriations have been made by the legislature to date to support these efforts. State funding could be used to train staff, and improve data gathering and dissemination, or as incentive grants to encourage local governments to participate in watershed planning.
5. Monitoring and assessment should be integral parts of all watershed management plans and can be used to determine:
 - whether planned restoration efforts have been implemented in the manner intended;
 - the effectiveness of implemented actions in achieving desired results;
 - the validity of the assumptions upon which management strategies were designed;
 - adjustments to restoration efforts that are needed due to changing conditions; and
 - the cost effectiveness of actions taken.

Recommendations

To further enhance watershed management and planning in Nevada, the following recommendations are offered:

1. The Department of Conservation and Natural Resources (Department) should develop an inter-division watershed planning and management strategy in order to more effectively play an active, participatory role in watershed planning when a water resource assessment indicates there is a need for this strategy or when a water planning group requests Department support.
2. The Department should support watershed planning at the local level.
3. The Department should continue to work together with local, regional and federal agencies and non-governmental organizations to develop and implement integrated water basin plans for Nevada's hydrographic regions.
4. The Department should support watershed planning groups with additional funding to assist in the development of integrated, broad-based and comprehensive watershed plans.
5. The Department should assist in the review of watershed management plans, evaluate whether goals or objectives are being achieved, strategic actions implemented and results monitored, and cooperatively recommend changes where monitoring results indicate a need for improvements.

Water Resources Data Management

Accurate and comprehensive water resource data are critical to planners and decision-makers at all levels of government, researchers, developers and the business community. Now more than ever, the increasing need to manage our precious natural resources is driving the need for more detailed water and natural resources data for many areas of the state.

At this time, state and federal agencies, counties, municipalities, universities and industries collect and maintain extensive water resource data. However, some of these data are not readily available to others, datasets may be missing information which decrease their usefulness to other agencies, or access is time consuming or cumbersome. As a result, planning and management efforts, such as development of the *State Water Plan*, become difficult. Many agencies are starting to address the data issue by providing data directories and data downloading capabilities through their Internet web sites. It is anticipated that the Internet will be the most significant tool for improving data sharing capabilities in the future.

Improved data development, collection, management, coordination and sharing offer direct and indirect benefits to all Nevadans. For example, decision-makers, planners, regulators and the public can become better informed which may lead to improved decisions, future *State Water Plan* releases can be improved, and the State's ability to assist local planning efforts can be enhanced (See "Water Planning Assistance to Local Governments" discussion in the *Summary* and Part 3 of the *State Water Plan*). Also, improved data access and sharing between agencies can result in reduced duplication of efforts, thereby saving tax dollars.

Issues

1. The State lacks a comprehensive plan to coordinate development and dissemination of temporal, textual and spatial (GIS) information.
2. Data accessibility needs to be enhanced. Some datasets are stored on paper or electronic spreadsheets which reduce their usefulness. Other datasets are managed using database systems but access may be restricted.
3. Without a comprehensive data inventory, potential users have difficulties identifying, locating and obtaining needed data.
4. Metadata (data about the data) are lacking in some instances, making it difficult for potential users to determine the appropriateness of the data for their particular purpose.
5. Data gaps exist in some areas due to the lack of a statewide groundwater quality and level monitoring network and a comprehensive statewide water use estimation program.
6. The lack of a comprehensive water use estimation program may impede state and local water planning efforts.
7. The maintenance of a viable stream gaging program is an integral part of managing our water resources.
8. Ongoing research of Nevada's water resources is needed for improved water management and planning. Current perennial yield estimates may be inaccurate for some basins and could be updated using newer technologies and methodologies.

Recommendations

The following recommendations are provided as possible means for improving water resources data management in Nevada:

1. The State should encourage and support agencies and local governments in the development of electronic databases for data currently stored on paper copies and in electronic spreadsheet files, and for future data collected. Data stored in spreadsheet files are more useful than data on paper, however the spreadsheet format does not lend itself to the types of manipulations possible with databases.

2. The State should create a new GIS task force of local, state and federal interests to evaluate in detail GIS issues and management needs. Their main task should be the development of a strategic plan which would address data coordination, collection and sharing needs, staffing and funding considerations, and provide recommendations to address these issues.
3. The State should support federal agencies, such as U.S. Geological Survey (USGS) and U.S. Environmental Protection Agency, in their efforts to provide Internet access to data. For instance, the Department of Conservation and Natural Resources should cooperate with the USGS to provide public access to USGS water quality data.
4. The Division of Water Planning should develop and maintain a detailed inventory of water resource datasets with Internet access to the inventory and access information. State agencies should develop and provide Internet sites for data sharing to the extent possible.
5. The State should support efforts by all groups to provide GIS data information via Nevada's connection to the National Geospatial Data Clearinghouse.
6. The State should encourage the development of metadata (information about the dataset) so that potential users can more easily determine the appropriateness of the data for their particular purpose.
7. The Department of Conservation and Natural Resources should develop and implement a groundwater quality and level monitoring network for priority basins. In some basins, water level information collected more frequently than once a year would be useful.
8. The State should improve water use measurement and estimation efforts through the program defined in the "Water Use Measurement and Estimation" issue discussion.
9. The Department of Conservation and Natural Resources should continue to support the cooperative agreements with the USGS for the funding of the stream gaging station network. Future efforts to discontinue existing gaging stations must be closely scrutinized.
10. The Department of Conservation and Natural Resources should continue to support further research projects as necessary, and should support efforts to update perennial yield estimates for priority basins.

Water Planning Assistance to Local Governments

Water planning by local governments is becoming more common and more necessary in response to increasing population, increasing competition for water, and natural resource concerns. Local governments are also realizing the need to plan the future of their land and water resources in a more comprehensive manner, involving all stakeholders in the process. Without a comprehensive water planning process, decisions may be made without full consideration of potential impacts to the watershed, the water resources, and other future needs and projects. Local water plans are not only useful to guide decisions related to internal proposals, but they can also guide responses to the activities of others such as water rights transfers, proposed housing or industrial developments, federal environmental impact statements and environmental assessments, and state and federal planning efforts.

Comprehensive water planning can be time consuming and costly to local governments. Many local governments have limited personnel and funding resources for water planning. The State currently has some programs to provide local water planning assistance but more could be done to facilitate

local water planning efforts. State water planning assistance to local governments can occur in many forms. Examples of assistance include information and data sharing, financial support of local water planning efforts, review of local water planning documents, technical assistance, participation in local water planning efforts

Issues

1. Many smaller governmental entities have limited personnel and funding resources for the development of local water plans; participation in planning efforts by others, such as U.S. Bureau of Land Management and U.S. Forest Service, that may affect their region; and review and comment on federal environmental impact statements and environmental assessments for proposed projects in their area.
2. Because of limited funding and staffing at the State level, NDWP and other agencies are limited in their ability to provide a higher level of assistance to local water planning efforts.
3. Other issue discussions in the *State Water Plan* present related issues:
 - “Water Use Measurement and Estimation”: The lack of comprehensive detailed water use information for some regions may impede local planning efforts.
 - “Water Resource Data Development, Collection and Management”: Data availability and access limitations may hinder local planning.
 - “Watershed Planning and Management”: The State could further enhance watershed management and planning through additional measures.

Recommendations

The following recommendations are offered as mechanisms for improving the State’s support of local water planning activities:

1. The State should enhance local water planning assistance efforts through financial support and/or additional technical support from Division of Water Planning staff and other agencies.
2. The State should improve water use measurement and estimation efforts through the program defined in the “Water Use Measurement and Estimation” issue discussion.
3. The State should improve data management, coordination and sharing through the measures defined in the “Water Resources Data Development, Collection and Management” issue discussion.
4. The State should further enhance watershed management and planning in Nevada through the recommendation offered in the “Watershed Planning and Management” issue discussion.

Water Education

It is important that Nevada’s residents understand the fundamental science of water, how water is managed in the state, and the issues affecting water management. It is especially important that Nevada’s children learn about water so that they develop an appreciation for the unique role water plays in the development of our state and become informed citizens who can think critically and evaluate information intelligently throughout their lives. Water education must become a priority.

The state of Nevada has had a water education program in the Nevada Division of Water Planning since 1991. It includes components focusing on both children and adults, and incorporates a variety

of methods and teaching aids. Project WET (Water Education for Teachers) is a science and math education enhancement program focused on grades K-12. The program provides teachers with a foundation in the science of water and current information on water resource issues affecting Nevada, with the goal of generating teacher interest, enthusiasm and ability to teach about water. Approximately 700 of 12,000 K-12 teachers have taken the 15-hour, 1-credit Project WET course. Nevada Project WET has no dedicated staff and has been dependent on grant funding. Over the last 7 years, the Division has raised close to \$175,000 in grants, with a state contribution of about \$15,000. In 1997, the state increased its financial support to \$20,000 per year.

Other grant funded water education programs in the Division include: (1) *Nevada Riverwatch*, a student water quality monitoring program; (2) the *Water Education Calendar*, a publication of children's art work and water facts in a calendar format for distribution to elementary school classes; and (3) adult education including training seminars, conferences, events and specialty publications. Staff from other Divisions in the Department of Conservation and Natural Resources support water education as well, with seminars, conferences, grants and speaker's bureaus.

Issues

1. **Grant Funding – Administrative and Fiscal Support.** The Division of Water Planning's water education program has no staff and is dependent on grant funding. Grants require a large amount of administrative and fiscal support, both in applying for grants and tracking and accounting after a grant is awarded. State staff is necessary to coordinate and manage the water education programs, grants and contracts.
2. **Grant Funding – Match Requirements.** The limited availability of state dollars has limited the state's ability to qualify for grants because the Division cannot meet grant match requirements.
3. **Grant Funding – Start-Up.** Many federal grants are designed to provide startup funds, not long-term, continued funding. Federal granting agencies expect the state to pick-up support for the programs once they are up and rolling.
4. **Assessing the Value of Water Education.** According to a study recently published by the American Water Works Association, the cost of water education programs is quite low, ranging from 5 to 57 cents per household per year, especially as compared to the benefits provided. There is agreement that agencies must continue to look for ways to evaluate the effectiveness of their education programs, but that the long-term efficacy of such programs is probably not quantifiable.
5. **Coordination.** There are a number of groups working on water education goals throughout the state. Coordination of these groups could lead to greater effectiveness of the individual programs and increased funding opportunities.

Recommendations

1. The State should continue and enhance funding for the state water education program.
2. The State should create and fund a Water Education Coordinator position in the Division of Water Planning.
3. All organizations should continue to develop and implement methods to evaluate the effectiveness of their water education programs.
4. The Division of Water Planning should develop a water education coordination group to support water education programs, develop funding options, leverage dollars, share information, and

coordinate activities. Participants could include the University of Nevada – Cooperative Extension, public and private water utilities, the Nevada Rural Water Association, the U.S. Bureau of Reclamation, and the Nevada Department of Education and Divisions of Environmental Protection, Wildlife and Water Resources.

Index to Summary, Part 7:

Agricultural Conservation (7 – 3)
alluvial fan flooding (7 – 18)
American Water Works Association (7 – 26)
basin plans (7 – 22)
Best Management Practices (BMP) (7 – 9)
Bureau of Health Protection Services (7 – 21)
Bureau of Indian Affairs (7 – 13)
Clean Water Act (7 – 10, 7 – 20)
Clean Water Action Plan (7 – 21)
Comprehensive Ground Water Protection and Management (7 – 10)
 complex hydrogeology (7 – 10)
 diversifying public interests (7 – 10)
 Issues (7 – 11)
 rapid population growth (7 – 10)
 Recommendations (7 – 12)
Comprehensive State Ground Water Protection Program (7 – 11)
conservation program
 Water use measurement (7 – 1)
Cooperating Technical Community (7 – 18)
Credit for Conservation (7 – 3)
Department of Conservation and Natural Resources (7 – 14, 7 – 15, 7 – 20)
Domestic Wells (7 – 8)
 contaminants (7 – 9)
 declines in water levels (7 – 8)
 Issues (7 – 8)
 Recommendations (7 – 9)
 well usage (7 – 8)
Federal Emergency Management Agency (7 – 17)
Federal Water Master (7 – 16)
Flood Insurance Rate Maps (7 – 17)
Flood Insurance Studies (7 – 17)
FLOOD MANAGEMENT (7 – 17)
 Flood Management in Nevada (7 – 17)
Flood Management in Nevada (7 – 17)
 Issues (7 – 17)
 Recommendations (7 – 18)
Floodplain management (7 – 17, 7 – 18)
 Non-structural approaches (7 – 17)
 Structural controls (7 – 17)
grey water (7 – 5)
greywater (7 – 3)
Ground Water Protection Task Force (7 – 20)
groundwater level (7 – 4)

instream flows (7 – 15)
Integrated Water Management (7 – 3, 7 – 4)
 Conjunctive Use (7 – 4)
 Issues (7 – 4)
 Recommendations (7 – 4)
 Water Reuse (7 – 4)
 Water Storage (7 – 4)
Interbasin and Intercounty Transfers (7 – 5)
 concerns (7 – 5)
 impacts on rural counties (7 – 6)
 Issues (7 – 6)
 Recommendations (7 – 6)
 recreation opportunities (7 – 6)
 threatened and endangered species (7 – 6)
 water quality (7 – 6)
irrigation (7 – 5)
Lahontan Valley wetlands (7 – 13)
Lake Mead Water Quality Forum (7 – 20)
Land and Water Conservation Fund (7 – 14)
Low Flow Plumbing Standards (7 – 3)
Maintenance of Recreational Values (7 – 12)
 Issues (7 – 14)
 Recommendations (7 – 14)
 Wildlife Management Areas (7 – 13)
map modernization program (7 – 18)
Metadata (7 – 23)
Municipal Conservation (7 – 2)
National Energy and Policy Conservation Act (7 – 1)
National Flood Insurance Program (7 – 17)
National Park Service (7 – 11, 7 – 13)
Natural Resources Conservation Service (7 – 10, 7 – 21)
Nevada Board of Wildlife Commissioners (7 – 13)
Nevada Department of Education (7 – 26)
Nevada Division of Environmental Protection (7 – 9)
 diversifying public interests (7 – 11)
Nevada Division of State Lands (7 – 13)
Nevada Division of State Parks (7 – 12)
 1992 SCORP, Issues and Actions for the Next Five Years (7 – 14)
 State Comprehensive Outdoor Recreation Plan (SCORP) (7 – 14)
 State Park System Plan (7 – 14)
Nevada Division of Water Planning (7 – 25)
Nevada Division of Water Resources (7 – 11, 7 – 15)
Nevada Division of Wildlife (7 – 12)
 Wetland Conservation Plan Applicable to Nine State Wildlife Mana (7 – 14)
Nevada Pesticides Act (7 – 11)

Nevada Rural Water Association (7 – 26)
Nevada State Legislature (7 – 1)
 Assembly Bill 359 (7 – 1)
Nonpoint Source Pollution (7 – 9)
 Best Management Practices (BMP) (7 – 9)
 Clean Water Act (7 – 10)
 Clean Water Action Plan (7 – 9)
 Issues (7 – 10)
 Nevada Division of Environmental Protection (7 – 9)
 Recommendations (7 – 10)
perennial yield (7 – 4)
Project WET (Water Education for Teachers) (7 – 25)
recharge/recovery projects (7 – 4)
reclaimed water (7 – 5)
recommendations (7 – 6)
 county commissioners (7 – 6)
 public meetings (7 – 6)
RESOURCE CONSERVATION AND RECREATION USES (7 – 12)
 Maintenance of Recreational Values (7 – 12)
 Water for Wildlife and Environmental Purposes (7 – 15)
Reuse (7 – 3)
Safe Drinking Water Act (7 – 11)
State Engineer (7 – 11, 7 – 13)
 public meetings (7 – 6)
Tahoe Presidential Forum (7 – 20)
The Nature Conservancy (7 – 16)
Truckee River Negotiated Settlement (7 – 20)
Truckee River Strategy Group (7 – 20)
Truckee River Water Quality Agreement (7 – 20)
U.S. Army Corps of Engineers (7 – 10)
U.S. Bureau of Land Management (7 – 11, 7 – 13, 7 – 21, 7 – 24)
U.S. Bureau of Reclamation (7 – 13, 7 – 26)
U.S. Fish and Wildlife Service (7 – 10, 7 – 11, 7 – 13)
U.S. Forest Service (7 – 11, 7 – 13, 7 – 21, 7 – 24)
U.S. Geological Survey (USGS) (7 – 7, 7 – 11, 7 – 20)
 estimates statewide water use (7 – 7)
Underground storage (7 – 4)
University of Nevada – Cooperative Extension (7 – 26)
water banking (7 – 7)
Water Conservation (7 – 1)
 Issues (7 – 1)
Water Education (7 – 25)
 Issues (7 – 26)
 Recommendations (7 – 26)
Water Education Coordinator (7 – 26)

- Water for Wildlife and Environmental Purposes (7 – 15)
 - Issues (7 – 16)
 - Recommendations (7 – 16)
- Water Marketing
 - public meetings (7 – 7)
- Water Measurement (7 – 3)
- WATER PLANNING AND MANAGEMENT (7 – 19)
 - Water Education (7 – 25)
 - Water Planning Assistance to Local Governments (7 – 24)
 - Water Resources Data Management (7 – 22)
 - Watershed Planning and Management (7 – 19)
- Water Planning Assistance to Local Governments (7 – 24)
 - Issues (7 – 24)
 - Recommendations (7 – 25)
- WATER QUALITY (7 – 9)
 - Comprehensive Ground Water Protection and Management (7 – 10)
 - Nonpoint Source Pollution (7 – 9)
- Water Resources Data Management (7 – 22)
 - Issues (7 – 22)
 - Recommendations (7 – 23)
- WATER SUPPLY AND ALLOCATION (7 – 1)
 - Domestic Wells (7 – 8)
 - Integrated Water Management (7 – 3)
 - Interbasin and Intercounty Transfers (7 – 5)
 - Water Conservation (7 – 1)
 - Water Use Measurement and Estimation (7 – 7)
- Water use measurement (7 – 1)
- Water Use Measurement and Estimation (7 – 7)
 - Issues (7 – 7)
 - Recommendations (7 – 7)
 - water use and estimation program (7 – 7)
- watershed management plan (7 – 19)
 - Advantages (7 – 20)
- watershed planning
 - local level (7 – 22)
- Watershed Planning and Management (7 – 19)
 - Issues (7 – 21)
 - Recommendations (7 – 22)
- Western Governors Association (7 – 21)
- Western States Water Council (7 – 21)
- Wildlife Management Areas (7 – 13)