

# Water for Nevada



SPECIAL SUMMARY REPORT  
NEVADA STATE WATER PLAN



State of Nevada  
WATER PLANNING  
REPORT

WATER

# FOR NEVADA

Prepared by the State Engineer's Office  
Division of Water Resources

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ELMO J. DeRICO  
Director

STATE OF NEVADA

ROLAND D. WESTERGARD  
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES  
DIVISION OF WATER RESOURCES

201 South Fall Street, Carson City, Nevada 89701

In reply refer to  
No.

Address All Communications to  
the State Engineer, Division  
of Water Resources

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TO THE NEVADA STATE LEGISLATURE

This report on the state water planning effort includes a very brief summary of information contained in detailed reports and supporting material.

Hopefully, this procedure will facilitate your consideration of the results of this planning effort, as well as the conclusions and recommendations which are described in this report.

If you desire more detailed information on any subject or area, please inquire of the State Engineer's Office or refer to the reports submitted to you throughout the planning process.

Respectfully,

  
Roland D. Westergard  
State Engineer

SPECIAL  
SUMMARY REPORT  
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# SPECIAL SUMMARY REPORT NEVADA STATE WATER PLAN

## LEGISLATIVE BACKGROUND

Water resource planning has been involved in administrative and management decisions and in the formulation of necessary information and data for a basis of such decisions for many years in the State of Nevada.

However, there has been a general concern about the State's limited water resources and the adequacy of these resources to meet current and future needs. There was also an awareness of other state, regional, and national water planning efforts and a recognition of the necessity for the State of Nevada to be prepared to play her proper role in interstate and regional efforts and determinations.

Senate Joint Resolution No. 15 of the 1967 Nevada Legislative Session directed that the Division of Water Resources, of the Department of Conservation and Natural Resources, determine Nevada's future water needs and available water resources. Senate Concurrent Resolution No. 16, of the 1967 Session directed the Legislative Commission to study future Statewide Water Needs. A Legislative Subcommittee was appointed by the Legislative Commission to undertake this study.

The Subcommittee and the State Engineer subsequently recommended the establishment within the Division of Water Resources of a Water Resources Planning Branch and also recommended legislation to assure statutory authority for the planning function (Report to the Legislative Commission on Nevada Statewide Water Needs, January 31, 1969).

Development of a comprehensive water resource plan for Nevada was authorized by the 1969 Legislature

under the provisions of Nevada Revised Statutes 532.165.

The 1973 Legislature by an Act, Chapter 554, required the State Engineer to complete the comprehensive water resource plan and submit it to the 1975 session of the legislature.

## PROCEDURES

Development of objectives, principles, assumptions and procedures to be used in the planning process was essential at the outset. It was also considered advisable and necessary to provide for a review by the citizens of the State and their elected local and state officials of these proposed procedures and to seek any direction the public might suggest. Public meetings were held in 1969 and 1970 in all of the sixteen counties and Carson City. Views expressed were incorporated in the planning process.

It was also considered important to report the data and information to the legislators and other interested persons as it was developed. This was intended to serve several purposes including participation in the planning process, a continuing status report on the efforts and to avoid submitting large volumes of material all at one time just prior to a legislative session.

To accomplish this, two "series" of reports have been presented. One series, "Water for Nevada" addresses Statewide inventory and projection data and information, and certain specific areas or subjects. The

Photo by R. E. WALSTROM



other, "Alternative Plans for Water Resource Use" addresses the issues by regions of the State.

Reports and the supporting material have been developed by the staff of the Division of Water Resources, other state, local and federal agency personnel, consultants, and representatives of private entities. Acknowledgements have been included in the individual reports, but it is appropriate to express appreciation again for all assistance received.

Another phase of the procedure was to hold another series of public meetings in late 1973, and early 1974, to once again receive comment on the results of the planning effort. Views were solicited on the Alternative Plans for the particular region involved and also on the overall statewide policy and philosophy of water resource administration and management. Contributions were considered in the preparation of this Summary Report.

## **SUMMARY OF WATER PLANNING REPORTS "WATER FOR NEVADA"**

As previously noted, the detailed reports have been distributed and should be referred to for specific information. A brief description of each of the "Water for Nevada" reports follows:

### **REPORT NO. 1 GUIDELINES FOR NEVADA WATER PLANNING JANUARY 1971**

The purpose and scope of the State Water Planning Program are presented. The basic objectives including environmental quality, economic efficiency and area development are described as are the principles and assumptions. The procedures for inventories of available water resources, their present use and projected requirements are included.

### **REPORT NO. 2 ESTIMATED WATER USE IN NEVADA JANUARY 1971**

Estimates of water withdrawals and consumption by counties and hydrographic regions provide a basis for

making projections of future water requirements in Nevada for different types of uses. Irrigation, public supply, industrial, electric power, and rural uses are presented. Evaporation losses from lakes, streams and reservoirs are shown. Trends and changes in use are described for the period 1950-1969 and a history of water development in each category of use is given.

### **SPECIAL REPORT WATER FOR THE FUTURE IN SOUTHERN NEVADA JANUARY 1971**

Early attention has been given to meeting the needs of those areas of the state which are presently experiencing water shortages and those areas which may be water deficient in the near future.

Alternative ways were studied and evaluated to meet the potential water needs in southern Nevada which are expected to be over and above those which can be met with the importation of Nevada's allocation of mainstream water from the Colorado River through the Southern Nevada Water Project.

Much of the material developed could be applied to other areas and situations in the State.

### **SPECIAL REPORT RECONNAISSANCE SOIL SURVEY OF RAILROAD VALLEY MAY 1971**

The soils of the Railroad Valley area were identified, mapped, and named according to the U. S. Comprehensive System of Soil Classification, as part of a statewide reconnaissance soil survey. This progressive survey is designed to furnish basic soil data needed to evaluate a variety of potential uses. Soil Hydrologic Groups, Soil Materials Sources, Soil Erosion Potential and Soil Irrigability Classes are among the several interpretive evaluations made in Railroad Valley as a result of the survey.

In addition to being used in the development of the State Water Plan, the progressive reconnaissance soil survey will also contribute to an eventual soil map of Nevada which will be a basic resource data source for state, regional and local land evaluation and development planning. The summaries of the Railroad Valley and Dixie Valley reports are included here as examples of the type and form of material being developed.

**REPORT NO. 3**  
**NEVADA'S WATER RESOURCES**  
 OCTOBER 1971

This report constitutes an inventory of the water resources of the State and presents the total ground and surface water supply presently available in Nevada.

**SPECIAL REPORT**  
**HYDROLOGIC ATLAS**  
 JUNE 1972 AND SUBSEQUENT

Following is a table of contents for the Hydrologic Atlas which is a series of maps containing hydrologic data and basic information related to the State Water Planning effort.

<b>Map No.</b>	<b>State Maps</b>
S-1	General Map
S-2	Hydrographic Areas Map
S-3	Average Annual Precipitation
S-4	Average Annual Runoff
S-5	Average Annual Evaporation
S-6	Critical Ground Water Areas
S-7	Total Dissolved Solids in Ground Water
S-8	Natural Ground Water Discharge Areas
S-9	Valley Ground Water Reservoirs
S-10	Lithologic Units
S-11	Land Suitability for Food and Fiber Production
S-12	Vegetal Cover
S-13	Water Resources and Inter-Basin Flows
S-14	Freeze Free (32°F) Seasons
S-15	Irrigable Soils
S-16	Static Ground Water Levels
S-17	Water-Related Outdoor Recreation Areas
<b>Map No.</b>	<b>Lake and Reservoir Maps</b>
L-1	Existing Lakes and Reservoirs
L-2	Pleistocene Lakes
L-3	Bathymetric Reconnaissance, Lahontan Reservoir
L-4	Bathymetric Reconnaissance of Washoe Lakes
L-5	Hydrologic Reconnaissance of Soda Lakes
L-6	Bathymetric Reconnaissance of Pyramid Lake
L-7	Hydrologic Regimen of Walker Lake
L-8	Bathymetric Reconnaissance of Topaz Lake
L-9	Bathymetric Reconnaissance of Rye Patch Reservoir (including Pitt-Taylor Reservoirs)
L-10	Bathymetric Reconnaissance of Marlette and Spooner Lakes
L-11	Bathymetric Reconnaissance of Lake Tahoe
L-12	Bathymetric Reconnaissance of Weber Reservoir
L-13	Bathymetric Reconnaissance of Wild Horse Reservoir

**REPORT NO. 4**  
**FORECASTS FOR THE FUTURE — MINING**  
 JANUARY 1973

Estimates of future water needs for Nevada's mineral production are presented for hydrographic regions and counties. A summary by commodity for the entire state

is also given. Future mineral production is forecast for some thirty-five commodities ranging from gold and silver to sand and gravel.

In addition to the estimates of production by commodity, and the associated water requirements, the report also presents estimates of employment needs and value of production.

**REPORT NO. 5**  
**FORECASTS FOR THE FUTURE — POPULATION**  
 FEBRUARY 1973

Population projections are provided for counties and hydrographic regions in the 1970-2020 planning period. Additionally, open file small area population projections are maintained for over 100 portions of the state, including cities, towns, townships and rural areas. Consistency of projections among these various areas was obtained to gain an insight into when and where and in what amounts future water needs will occur.

**SPECIAL REPORT**  
**THE FUTURE ROLE OF DESALTING IN NEVADA**  
 APRIL 1973

A wide diversity of potential applications for desalting is considered, including possible preservation of Walker Lake's quality at a level better than exists today. The greatest potential for immediate application of desalting in Nevada is for an individual ranch domestic water supply or other small need where good quality water supplies are not available. In addition, Brady's Hot Springs, between Reno and Lovelock, is assessed as a source of geothermal energy to provide both desalted water and electric energy. Costs would probably be applicable to other geothermal areas.

**REPORT NO. 6**  
**FORECASTS FOR THE FUTURE — FISH AND WILDLIFE**  
 SEPTEMBER 1973

Estimates of water-based future use of Nevada's fish and wildlife resources are presented for the counties and hydrographic regions. Physical distribution of all game fish and animals are presented along with selected nongame species. Appendix D of the report, entitled, "Stream and Lake Inventory", is published under a separate cover, and is available from the Division of Water

Resources. A correlation is shown between minimum streamflow and biologic ratings made by the Nevada Department of Fish and Game for over 400 streams.

**REPORT NO. 7  
WATER-RELATED RECREATION IN  
NEVADA — PRESENT AND FUTURE  
DECEMBER 1973**

Estimates of future water-based recreational activity and associated water requirements, along with economic value, are provided for the counties and hydrographic regions. This information relates only to city, county, state and federal owned or controlled areas in Nevada. A map showing Water-Related Outdoor Recreation Areas is included. A data supplement containing detailed recreational data for Nevada is available under separate cover.

**REPORT NO. 8  
FORECASTS FOR THE FUTURE —  
AGRICULTURE  
JANUARY 1974**

Estimates of production by commodity and associated water and related land resources requirements are provided for the counties and hydrographic regions. Commodities listed include crops, forestry products, livestock populations and feed requirements.

**SPECIAL REPORT  
RECONNAISSANCE SOIL SURVEY OF  
DIXIE VALLEY  
FEBRUARY 1974**

The soils of the Dixie Valley area were identified, mapped, and named according to the Soil Taxonomy of the National Cooperative Soil Survey. For additional description, refer to the previous review of the special report of May 1971 entitled, "Reconnaissance Soil Survey of Railroad Valley."

**REPORT NO. 9  
FORECASTS FOR THE FUTURE —  
ELECTRIC ENERGY  
AUGUST 1974**

Basic planning for Nevada's future water and related land resources options, as related to electric energy, is provided from two viewpoints — Nevada's and that of the eleven Western States along with the nation.

Numerical electric energy projections are provided,

for Nevada, California, the eleven Western States and the nation, along with future water requirements for Nevada's electric energy needs. Separately published appendices describe a tentatively developed rating system, with economic and environmental considerations, for selecting valleys which might efficiently support electric energy generation.

**SPECIAL REPORT  
INPUT-OUTPUT ECONOMIC MODELS  
SEPTEMBER 1974**

Input-output analysis, an economic modeling technique, has been provisionally developed for Nevada. The technique may be used to examine Nevada's future alternatives involving the use of water and related land resources.

Foreseeable major problems are candidates for possible input-output analysis. To demonstrate the capabilities and limitations of the input-output technique, maintaining the level of Walker Lake was examined in terms of reduction in upstream water use and estimating associated reductions in production, employment and income.

**SPECIAL REPORT  
WATER — LEGAL AND ADMINISTRATIVE  
ASPECTS  
SEPTEMBER 1974**

Nevada's system of established surface and ground water rights has been evolving for more than 100 years. During this time, beneficial use has been defined by court decision and statute as the basis, measure and limit of the right to use water. History of water policy and administration, as well as amendments to the water law, are traced to the present.

**SUMMARY OF  
WATER PLANNING REPORTS  
"ALTERNATIVE PLANS FOR  
WATER RESOURCE USE"**

The three basic planning objectives were used in preparing the "Alternative Plans for Water Resource

Use." The aim of the respective objective is:

- a. environmental quality: to maintain or improve the quality of the State's environment. Emphasis is on ways to enhance the State's water and related land resources.
- b. economic efficiency: to find ways to bring as much economic return as possible to the State per unit of investment of water.
- c. area development: to create specified patterns of development through investments of water and related land resources.

Also, a "without plan" concept was developed to project the impacts on the water resources of Nevada without any conscious effort of the state to alter existing trends. With this plan, the impacts of the environmental quality, economic efficiency, and area development alternatives can be evaluated. The without plan is essentially a background upon which the three alternatives can be measured. Adoption of the "without plan" alternative as a recommended course of action would be a rational option if the people of Nevada desire no conscious effort to alter existing trends in any particular area.

The following is a summary of reports for each of the state's six water planning regions.

### **ALTERNATIVE PLANS FOR WATER RESOURCE USE — WALKER RIVER BASIN, AREA I**

SEPTEMBER 1973

This water planning report, the first in a series of six, considers the range of possible alternative uses in which the water resources of the Walker Basin could be employed. The report basically outlines environmental quality and economic efficiency objectives for use of the available water in the basin. To analyze the impact of either of these objectives, a without plan was developed which would show the expected future trends of the basin's major activities without intentional deviations based upon objectives. The center of attention is directed toward the decline of Walker Lake by 60,000 acre-feet per year, flooding throughout the basin, irrigation requirements, and recreation needs.

There were two environmental alternatives offered. The first would be a plan directed toward the maintenance of the lake at its present level, while the second emphasized development and use of water upstream without regard to the lake level. Both alternatives noted

that fishing was the main recreational activity in the basin.

The economic efficiency alternative discussed possible reservoir sites for recreation, irrigation, flood protection and fishery enhancement. The plan outlines the projected needs with and without the large water requirements projected for the mining industry in the basin. Several possibilities to save Walker Lake were also studied in the economic efficiency plan.

### **ALTERNATIVE PLANS FOR WATER RESOURCE USE — CARSON-TRUCKEE RIVER BASINS, AREA II**

DECEMBER 1973

This report is centered around the competing water needs on the Truckee and Carson River systems. Problems in this area are the declining of Pyramid Lake, floods, municipal, industrial, and agricultural water shortages, seasonal erratic flows of small streams, lack of adequate water for wildlife areas, and a need for more water-related recreation. Various schemes for water import, ground water augmentation, snow evaporation suppression, and land management are noted.

Without supplemental sources for existing supplies, the Carson City area is projected to run short of municipal and industrial water in this century. Possible actions for additional water for Carson City are considered. Actions to enhance the Newlands area are briefly mentioned which include lining ditches, eliminating holding ponds, and phreatophyte eradication. Should Pyramid Lake be maintained at its level, the report estimates various upstream impacts in dollars and man years of employment.

Two environmental quality plans were presented. The first maintained the level of Pyramid Lake. The second disregarded the lake level while allowing development to continue within environmental constraints upstream. The economic efficiency alternative identified eight projects with twenty-seven reservoirs for flood protection, irrigation storage, power generation, recreation, fishery, and municipal and industrial uses.

### **ALTERNATIVE PLANS FOR WATER RESOURCE USE — HUMBOLDT RIVER BASIN, AREA III**

FEBRUARY 1974

This report analyzes the water resources situation for the Humboldt River Drainage, the Black Rock Desert

area, and the Northwest Region of the State. The Humboldt River is the largest river which begins and terminates within the State. Problems in Area III are floods, irrigation seasonal flows, sediment (both wind and water) and short growing seasons. The report indicates that the elevations in this planning area range from over 10,000 feet to less than 4,000 feet. Government is the largest employer with services second. The 1970 per capita income was slightly over \$5,000. Of the 18,300,000 acres in this planning area, over three-fourths are used as rangeland. There are no large lakes in the planning area, and the stream flows are very erratic.

The environmental plan discussed many components to help preserve the rather untouched environment. These include more wilderness type areas, and more scenic vistas. One environmental quality alternative stressed keeping streams free flowing without additional structures.

The economic efficiency plan stresses the three upstream storage project dams which provide flood protection, sediment detention, irrigation water storage, recreation, fish and wildlife, and channelization. Agricultural water management was identified for certain areas.

### **ALTERNATIVE PLANS FOR WATER RESOURCE USE — CENTRAL REGION, AREA IV**

**APRIL 1974**

Area IV, the largest single study area in Nevada, is over 400 miles long and 300 miles wide at the extremes. Three alternatives are presented concerning use of the water supplies in Area IV. The environmental quality plan stresses the protection and preservation of the fragile desert environment by informing the public concerning environmental problems, and spreading development over a large area to minimize severe damage to certain areas. The economic efficiency alternative stresses flood protection reservoirs, especially for Ely, Duckwater, and Beatty. Also, several reservoirs would be constructed for recreation and fishery.

This is the only planning region with an identified "area development" plan. This plan is designed to upgrade depressed economies and alleviate the lack of services, such as doctors, dentists and hospitals. Some of the possibilities in the area development plan include mining and agriculture co-ops, warehousing, small assembly plants, increases in recreation, better transpor-

tation and services, hydroponics, and solar generation experimentation.

### **ALTERNATIVE PLANS FOR WATER RESOURCE USE — COLORADO RIVER BASIN, AREA V**

**APRIL 1974**

This report identifies major issues and alternatives in the most populated planning region in Nevada. Toward the end of this century, existing water supplies for the Las Vegas Valley are expected to be fully used, and supplemental sources will have to be developed. Flooding of urban and agricultural lands, as well as isolated areas are recurrent problems.

The environmental quality plan discusses protection of rare and endangered fish and animals, informing the public, and improvement of streams, lakes, reservoirs, ponds, and springs. Additionally, the preservation and enhancement of Las Vegas Wash was considered.

In the economic efficiency plan, possible alternative solutions are presented for the projected water shortages. Projects are identified to relieve urban and agricultural flood problems, and brief discussion is provided concerning flood insurance and zoning.

A summary report covers the same material provided by the detail report.

### **ALTERNATIVE PLANS FOR WATER RESOURCE USE — SNAKE RIVER BASIN, AREA VI**

**JUNE 1974**

This report covers the Nevada portion of headwaters of the Columbia-Snake drainage in the Pacific Northwest. It is the least populated of the planning areas with about 1,700 people in 1970. Generally, water is relatively abundant in this region. Wild Horse Reservoir is the largest body of water in the planning region. Fishing is considered excellent in Area VI. Agriculture suffers from short growing seasons.

The environmental quality plan identifies five rare and endangered fauna, and discusses modernizing irrigation facilities.

Floods have been a problem in the past. The economic efficiency plan includes three reservoirs for flood control, irrigation releases and possible recreation. They are located on Goose Creek, Indian Creek, and Willow Creek.

## GENERAL FINDINGS

The water planning effort was not necessary to conclude that the State of Nevada as a whole has limited water resources and that this limitation applies generally within even the smallest of the hydrologic areas of the State. There are not areas of great abundance of uncommitted surface water that might be considered available for conveyance to areas of shortages.

Generally, the surface water sources; lakes, streams, and springs, have been appropriated and used for many years. There is, in some cases, water that may be available from these sources in some years. However, in most such cases, storage facilities would be required to capture the surplus quantities for later use.

Recent years have seen extensive development of available ground water supplies within the State. Again, however, the perennial yield or the supply that can be used on a year to year basis is limited. It is true that the State's ground water basins contain water in "storage," but this supply would be available on a one time basis only. It is also important that this ground water storage provides some latitude in management of the water resources.

Development and use of ground water supplies in some areas of the State have reached the point where no additional appropriations can be allowed. On the other hand, there are other areas where available supplies hold potential for development.

It is also very apparent that water supplies from outside Nevada's borders are not readily available. Each of our neighbor states and regions are keenly aware of the value of water within their area and its importance to their future. Interstate and Regional water transports may come to pass at some time, but certainly not in the immediate future.

Limitations of water supplies have been viewed from two rather extreme positions. On the one hand, it is considered an extreme handicap to the economic growth of the State and specific areas within the State. On the other hand, it has been heralded as almost a blessing as a means of preserving Nevada essentially as it is today.

These extremes can be applied to a consideration of direction for the future administration, management, and use of our State's water supplies.

For example, legislation could be enacted to: 1) encourage the development of surplus surface water supplies; 2) provide for mining of ground water which would

be a depletion of ground water in storage; 3) minimize consideration of adverse affects on existing water rights in allowing new appropriations; 4) establish preferred uses for available water.

The opposite extreme would be legislation to: 1) declare all surface water sources fully appropriated and preclude further development through storage facilities; 2) limit allowable diversion from ground water sources to something less than the perennial yield; 3) preclude transbasin diversions of water.

Adoption of either of these extremes could not be supported from the viewpoints of resource utilization and protection. Neither would it be in the best interest of the State or her citizens. Reaction and comment at the various water planning public meetings lead to the conclusion that the people of the State want our water resources to be developed and used, but not abused, and that this basic concept is important to and consistent with a maintenance of our State's environment.

With this general concept in mind, the following are conclusions and recommendations resulting from the planning process.

## GENERAL CONCLUSIONS AND RECOMMENDATIONS

### WATER LAW AND ADMINISTRATIVE PROCEDURES

The theory inherent in the state water law involving the appropriation doctrine commonly referred to as "first in time — first in right" and the concept that beneficial use is the measure of a right to the use of water have proven to be effective and in the State's interest. The law itself provides for changes in use as desire or demand dictate and thereby makes the law adaptable to varying conditions. Past legislative actions have provided necessary amendments all of which have been carefully evaluated for not only immediate but long term effects and ramifications.

No basic changes in the theory or philosophy of the law are recommended. However, it should be continually scrutinized for necessary modification of specific provisions.

## **FUNDING OF WATER RESOURCE PROJECTS**

It has been suggested that a fund be established to provide State participation in funding water resource development or flood control projects. Legislative consideration of funding in the past has been on a project by project basis; such as, an appropriation for non-federal costs for the Gleason Creek Project, near Ely. Also, the legislature, in the past, has acted to support bonding for certain projects.

Establishment of a separate construction or development fund is not recommended. Individual projects should continue to be considered by the legislature for partial or total funding or financial support.

## **LOCAL OPTIONS AND DISCRETION**

There is an inherent fear or reservation of people and officials at the local levels about the erosion of their authority in matters of direct concern to them. This exists to a degree as regards management of resources. The concept of state administration of the water resource through application of the provisions of the water law is generally not only accepted, but endorsed with an enthusiasm for continuance. There is precedent for effective local control such as that exercised by Irrigation and Conservancy Districts, and more recently the efforts by local agencies in Las Vegas Valley in the Las Vegas Wash-Lake Mead Water Quality considerations.

It is recommended that State authority over water resource administration be retained. Where and when possible, local options and discretion should be recognized in such matters as internal management, construction of projects affecting local interest, and financing of such projects.

## **MINING OR DEPLETION OF GROUND WATER**

Withdrawal of ground water is limited to that naturally recharged to the ground water basin. The only exception is covered under the provisions of NRS 534.120, which allows issuance of temporary permits to appropriate ground water which can be limited as to time and which may be revoked if and when water can be furnished by an entity. This provision has been applied only in Las Vegas Valley where the alternate source of the Colorado River is available.

Concepts have been advanced whereby ground

water in storage would be depleted over a given period of time. For example, this is one alternative presented in the Special Planning Report, "Water Supply for the Future in Southern Nevada." Interests in Pahrump Valley have also advocated depletion to support additional municipal growth in that area.

The concept of limited term permits may have merit in selected areas for such purposes as electric energy generation where the term of the project is in itself limited.

It is recommended that caution be exercised in any legislative changes to expand authorization for depletion of ground water in storage. Any authorization, in addition to that presently existing, should be on an area by area or case by case basis and should not be applicable statewide.

## **TRANSBASIN DIVERSIONS**

There is presently no specific statutory reference to transbasin diversions. This has not created any problems and existing or proposed transbasin diversions can be considered, evaluated, and regulated under existing statutory provisions regarding availability of supplies and affects on existing water rights.

It is recommended that no legislative amendments be initiated on this subject.

## **PREFERRED USES**

The only existing provision for consideration of preferred use in appropriation of water is NRS 534.120, which relates to new appropriations of ground water in basins being depleted.

The effectiveness of the time-priority system rather than type of use-priority, coupled with provisions for changing the manner of use of water supplies as need and desire arise, lead to the conclusion that no changes are required as regards preferred uses.

## **RESERVATION OF WATER QUANTITIES**

The idea of reserving quantities or "blocks" of surface or ground water and essentially setting them aside from appropriation for use for some specific purpose at some time in the future has been advanced. This has been specifically considered regarding future supplies for Municipal and Industrial purposes.

It has proven to be in the State and private interest to allow appropriation of available water for any beneficial

use to which it can be applied at the time it can be applied. Again, as demands or requirements change, so can the manner of use of water be changed. Transition of use of water from irrigation to municipal in the Truckee Meadows is an example of this procedure.

It is recommended that the concept of reserving water be rejected.

### **TERMED APPROVALS OF WATER APPROPRIATIONS**

Water rights, when perfected, are a right in perpetuity, subject, however, to forfeiture and abandonment. There is perhaps some authority for issuing water rights for a specific term, or time period, if it is demonstrated that the capability for beneficial use is limited to that time. There is some interest in the western states in expanding the authority for issuing termed water rights. It is not clear how this might be applied in Nevada water administration at this time.

It is recommended that this concept be further explored before any definitive action is taken.

### **WATER SUPPLIES AND RIGHTS FOR TEMPORARY CONSTRUCTION USES**

Generally, water supplies for temporary construction, such as highway projects, are available from existing sources and agreements can be reached for water use under some existing right. However, time is required to obtain a water right, and this can affect obtaining water, particularly in designated ground water basins. Limited problems created do not warrant the issuance of any type of "special permit."

It is recommended that the State Highway Department consider this matter in bid notices and other material furnished potential bidders or contractors.

### **WELLS FOR DOMESTIC USE**

Current statutory provisions do not apply in the matter of obtaining permits for underground water from a well for domestic purposes where the draught does not exceed a daily maximum of 1800 gallons.

A "permit system" for individual domestic wells has been considered; but it is estimated that use from such wells is about one percent of the total water use in the state. The merits and benefits to be derived do not, at this time, warrant the time, staff, and financing that would be required to administer a domestic well permit system.

This is a matter that warrants continuing consideration in the future.

### **TAXES ON WELL PRODUCTION**

In a previous session of the legislature, a bill was introduced to provide a tax on water produced from wells. There was serious objection from all areas of the State and the bill did not pass from committee.

It has since been proposed that such a tax be considered, not on a statewide basis, but in particular areas. Specifically there is interest by some local residents in taxing production from wells in Las Vegas Valley. The thought is that this would equalize the cost of well water with that served by the public entities.

It is recommended that any consideration of taxes on well production be limited to that under temporary permits which are subject to revocation within the Las Vegas Artesian Basin. It is also recommended that even this be approached only after thorough evaluation of legal ramifications and equity.

### **GEOHERMAL RESOURCES**

Nevada's geothermal resources are administered by the state engineer pursuant to the attorney general's opinion of August 12, 1965.

On a national scale, Nevada is estimated to be second only to California for potential geothermal energy development. Use and development of geothermal energy can be nearly pollution free under proper management.

Within existing Nevada water law, hot and mineralized ground water has been and may continue to be put to a number of beneficial uses. Just as with cooler and normally less mineralized water sources, the concept of multiple uses applies, but is not restricted to the uses listed: electric energy generation; home heating; agriculture; desalting; hydroponics; curative bathing; recovery of minerals.

The implementation of the federal geothermal leasing act makes no provision for compliance with existing State water law, or for protection of existing water rights on private or public lands. Designated critical ground water basins within the State require particular regulation by the state engineer. Unregulated exploratory drilling for geothermal resources in these designated basins and other basins could adversely affect existing rights, in that the federal geothermal leasing act makes no

provisions for exploration activity on private or corporate lands.

It is recommended that legislation be enacted to specifically provide that geothermal resources are subject to administration under the water law and to provide for establishment of rules and regulations for such control and administration (A proposed draft of legislation is included in the Appendix to this report).

### **WATER SUPPLIES FOR PROPOSED SUBDIVISIONS**

Legislation was enacted in 1971 (NRS 116. and 117.) giving the State Engineer the responsibility to confirm water supplies for proposed subdivisions. This was amended in 1973 to provide that the State Engineer was to prepare and provide a review of water quantity. Authority for final approval rests with the health division of the Department of Human Resources.

It is appropriate and necessary that the State Engineer be responsible for water quantity determinations in accordance with the provisions of the Water Law. Such provisions require that due diligence be exercised in any development of water to satisfy any proposed use. Subdivision approval does not include similar requirements.

It is recommended that consideration be given to time limits on subdivision approvals. That is, subdivisions would be approved for development within a given period, at the conclusion of which the undeveloped portion would be subject to reconsideration. An alternative to this approach would be a requirement that water supply and sewer or disposal service be available at each lot prior to sale.

### **STATE vs. FEDERAL JURISDICTION**

There has long existed questions about state or federal jurisdiction over water supplies on federally controlled lands. There have been numerous court decisions on this subject. However, there remain many uncertainties which can only be resolved through federal legislation. Such legislation has been introduced in the Congress in various forms in the past. It is expected that such legislation will be introduced again in the near future. There are currently concerted efforts by state water administrators throughout the country to insure that the legislation will not violate State jurisdiction.

It is recommended that officials and citizens of the State closely scrutinize any such legislation and offer

support or resistance in an effort to protect what should properly be the individual State role in administration of the resource.

### **FLOOD CONTROL**

Specific potential flood control projects are described in the six reports, "Alternative Plans for Water Resource Use." If there is local interest in pursuing these proposals, the State Engineer will review them to insure that they are compatible with the State water planning conclusions and are in compliance with the water law.

There are extensive flood insurance programs presently available through federal agencies, and State assistance is available to local authorities for securing information about such programs.

It is recommended that flood plain zoning ordinances or regulations be formulated and enforced by local government agencies. If this is not effective, flood plain zoning should be considered at the State level.

### **NAVIGABILITY AFFECTS**

There have recently been judicial determinations and legal opinions concerning navigability of some of the streams in the State. This has raised questions regarding State responsibilities and possible liabilities in maintaining stream channels and related issues. For example, if the course of a navigable stream is altered, either through natural processes or by design, what is the ownership status of the vacated area and resources, such as gravel aggregate within these areas?

It is recommended that proper authority analyze possible ramifications, not only for the protection of the State, but so that the public may be better informed.

### **ENVIRONMENTAL CONSIDERATIONS**

There has been an increasing public awareness and understanding regarding environmentally related concerns with respect to water and other natural resources within the State. Efforts to continue and extend this public awareness through dissemination of information and through the academic system should be encouraged.

Specific project or resource planning should include a consideration of environmental impacts, not only on the immediate area, but on a regional basis.

Watershed management programs should include such factors as sediment retention, vegetation manipulation and management, livestock and wildlife carrying

capacities, and other factors to enhance environmental quality within water availability.

Critical habitat and rare and endangered species should be considered and, if necessary for their protection, appropriate water rights should be acquired.

In most instances, water quality and quantity questions and issues must be jointly considered. Compatibility of administrative procedures and regulations must be retained.

### **CONTINUING PLANNING EFFORTS**

The planning effort does not end here. In the 1969 report to the Legislative Commission and in testimony before the Legislative Committees, it was emphasized that water planning would be a continuing requirement.

The State role and responsibility of review and evaluation of proposals by other agencies continues.

Also, there is a need to provide assistance in other planning efforts, such as land planning, and water quality planning.

Participation in federal, regional, and interstate investigation and negotiations is necessary to assure adequate consideration of the State of Nevada's interest and position in water transfer or related matters.

Data and information used in water resource decisions requires continuing attention to assure that it is current.

It is recommended that staff and funding for the Water Planning Section in the Division of Water Resources be continued at the current rate for the next biennium and that requirements be reevaluated periodically thereafter.

## **REGIONAL CONCLUSIONS AND RECOMMENDATIONS**

The six reports, "Alternative Plans for Water Resource Use," provide basic data and information for decisions on proposed projects of primarily local concern. The State, of course, has an interest in any or all proposed water development or flood control projects, but the options should also be explored at the local level with State support where appropriate.

There are issues and decisions inherent in the alternatives presented where the following conclusions

and recommendations are appropriate and worthy of specific mention in this Summary.

### **WALKER RIVER BASIN**

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

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

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

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

The potential for desalting at Walker Lake is described in the special planning report, "The Future Role of Desalting in Nevada."

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

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

### **CARSON-TRUCKEE RIVER BASINS**

The rights to use of water supplies of these two stream systems and Lake Tahoe are the subject of pending litigation. The State of Nevada is a party to some of the court actions; there should not be and is no attempt through this report to influence in any way the State's position or action in the litigation. In this context, several recommendations are in order.

The State should continue to pursue and support Congressional approval of the California-Nevada Interstate Compact concerning waters of Lake Tahoe and the Truckee, Carson and Walker River Basins as ratified

by the States of Nevada and California. Pending Congressional approval, the allocations of water and other provisions should be recognized and followed as State policy.

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

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

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

A reevaluation of Watasheamu Dam and Reservoir for possible recreation use and Municipal and Industrial use in Carson Valley and Carson City should be requested of the Bureau of Reclamation.

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

### **HUMBOLDT RIVER BASIN**

Occasionally, there are surplus waters in the Humboldt River system, as indicated by spills through Rye Patch Reservoir and excesses in the Humboldt Sink. Portions of this water could be salvaged for beneficial conservation and recreation uses upstream. Additionally, there is need for stabilizing flows, reducing flood damages and providing sediment detention by providing upstream storage.

The Humboldt River Storage Project includes Hylton Dam and Reservoir on the South Fork of the Humboldt River, below the mouth of Tenmile Creek, about 10 miles south of Elko; Devil's Gate Dam and Reservoir on the North Fork of the Humboldt River, about 18 miles northeast of Elko; and Vista Dam and Reservoir, on Mary's River, about 41 miles northeast of Elko.

Another one of the larger storage facilities proposed is Rock Creek Dam on Rock Creek, near Battle Mountain.

The 1973 Legislature passed a Resolution supporting the Humboldt Project, contingent upon a favorable environmental and fish and wildlife impact assessment and other beneficial aspects. A sum was also appropriated for an analysis of the impacts. The results will be furnished

in separate reports, and specific recommendations will depend upon these results.

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

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

### **CENTRAL REGION**

This area encompasses the large portion of Central Nevada where there are no large stream systems or surface water sources. Views of local people in this area ranged from pro- or antigrowth and development. They were also concerned about being "lumped" in such a large area. Some Pahrump Valley residents felt that population projections for that area were low.

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

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

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

### **COLORADO RIVER BASIN**

Presently available sources of water for the Las Vegas Valley including ground water, Colorado River supplies, and return flows from use of these sources are projected to be adequate until sometime between 1990 and 2000. There may be a period of time before 1980 (prior to implementation of the second stage of the Southern Nevada Water Supply Project) when shortages could be expected. These times and dates will depend on growth of the area and resulting increases in water requirements.

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

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

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

The alternatives presented in the special Water Plan-

ning Report, "Water for the Future in Southern Nevada" should be considered in establishing goals and procedures for possible means of meeting future water requirements. This responsibility should be assumed by Clark County with necessary assistance provided by the State.

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

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

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

Discussions should be initiated with representatives of Utah and Arizona directed to formulating a Compact to allocate the waters of the Virgin River (A proposed draft of legislation is included in the Appendix to this report).

### **SNAKE RIVER BASIN**

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

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

The State is also currently a party in a suit involving water users in Idaho and Nevada. The question involves development and use of ground water in Nevada and the possible effects on surface streams in Nevada which flow across the state line into Idaho. It is recommended that the State's position in this suit be aggressively pursued and defended.

## **CONCLUSIONS AND RECOMMENDATIONS ON PROJECTED WATER REQUIREMENTS**

As with the region report series, the individual reports on water requirements for the future contain the basis for detailed considerations. However, some general conclusions and recommendations are included in this Summary.

### **MUNICIPAL AND INDUSTRIAL**

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

There are some areas such as Carson City, Las Vegas and Lemmon Valley where demand will exceed supply and either augmentation or limitation on potential growth will be necessary. The Reno-Sparks area could experience very serious water supply questions, depending on the results of matters presently before the courts.

Unexpected shifts in population or unanticipated influxes to specific areas could create water supply questions in other areas of the State.

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

### **ELECTRIC ENERGY GENERATION**

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

Private, state, and federal studies should continue for conventional fossil fueled plants, as well as nuclear plants, geothermal plants, and pumped storage facilities. New dams and reservoirs should be analyzed to see if

electric power generation would be feasible. Utilities should consider purchasing existing water rights to provide the additional necessary water supplies required for steam-electric generation of electric energy.

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

### **MINING**

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

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

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

### **RECREATION**

There is a general need for more water-based recreation in Nevada. Often fishing is not optimum because of streamflow fluctuations and corresponding temperature variations, sediment, poor food supplies for fish, and fish losses into irrigation diversions. Additionally, in some areas, fish are not able to spawn due to impassable dams constructed on major spawning rivers and streams. Private lands along fishable streams effectively remove some excellent fishing spots from the public.

In construction of new reservoirs, consideration should be given to minimum flows and maintenance of minimum pools. Diversions should be screened and fish ladders built at new and existing dams. As the demand increases for water-based recreation, new areas should be developed and new facilities should be established at existing lakes and reservoirs.

Requirements for minimum pools and minimum flows should not be imposed on existing facilities or projects unless water rights are acquired for these purposes, either through new appropriation or acquisition of existing rights.

### **AGRICULTURE**

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

Pending importation of water supplies (if in fact this occurs), significant advances in such technology as weather modification, or changes in law regarding mining or depletion of ground water in storage (which is not recommended), potential agricultural development cannot be realized.

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

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

### **FISH AND WILDLIFE**

Refer to section "Recreation" for information regarding fishery aspects.

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

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

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

## THE PLAN

The information and data compiled in the State Water Planning effort and available in the various reports provides the basis for Nevada's State Water Plan. That plan is to administer, manage, and use the State's Water Resources in accordance with legislative direction in the best interests of the State and her citizens.

## APPENDIX

### **DRAFT OF GEOTHERMAL LEGISLATION**

Add to Chapter 534 of Nevada Revised Statutes: NRS 534.240. Geothermal Resources, Appropriation:

1. Geothermal resources whether used to generate power or for any other beneficial use shall be subject to the appropriation procedure as provided in Chapters 532, 533 and 534 NRS.

NRS 534.250. Rules, Regulations and Orders of State Engineer for Control of Geothermal Resources:

1. The State Engineer is herewith empowered to make such rules, regulations, and orders as are deemed necessary for the proper development and control of geothermal resources, including but not restricted to defining geothermal areas, establishing security requirements which may include bonding, providing for casing and safety device requirements, providing for the prevention of pollution and waste, providing for well spacing, providing for the keeping of records and logs, and providing for the conducting of investigations and research which may be in cooperation with other governmental and private agencies.

### **DRAFT OF VIRGIN RIVER COMPACT LEGISLATION**

AN ACT relating to the Virgin River: The State Division of Water Resources is hereby authorized and directed to commence negotiations with the appropriate agencies of the states of Arizona and Utah leading to an interstate compact relating to allocations of water supplies of the Virgin River and tributaries.

### **DRAFT OF WATER FOR WILDLIFE LEGISLATION**

Add to NRS 533.370:

Any applicant who desires to appropriate water from a surface water source, will allow from that source a sufficient quantity of water for the wildlife which frequent that source if in the judgement of the State Engineer, after consultation with the applicant and the Nevada Department of Fish and Game, the necessity exists. The State Engineer may request, prior to the issuance of a permit, a detailed description of the access to the source or other means whereby the wildlife will be insured adequate drinking water. Nothing in this statute shall be construed to impair or effect existing water rights on the source.