Section 17 Water Conservation

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17 Water Conservation

This section defines water conservation, discusses current programs, addresses prominent issues and makes recommendations to resolve the issues.

17.1 Introduction

Water conservation in the *State Water Plan* is defined as "wise use" which is broader in scope than many definitions. It includes strategies for reducing water demand, and for increasing water supply. Structural measures and non-structural means can be used to accomplish water conservation under both strategies. The resulting well-managed water conservation program may postpone the need for building new facilities. Water purveyors should implement three measures in an effective water conservation program. First, the systems should be designed and operated efficiently. Second, users should use water saving devices and practices to reduce usage. Third, the water purveyors should implement programs (incentives/penalties) to encourage people to use water wisely.

To understand water use and conservation, there is a need to distinguish the difference between depletions and diversions. Depletions consist of water put to desired end uses, consumed and unavailable for return to the system. Diversions consist of the depleted water as well as the carriage water needed for delivery. If diversions and depletions were the same, then theoretically, the system would be 100 percent efficient. However, anything close to this is not realistically obtainable under any but laboratory conditions.

Conservation of water through decreasing depletions can be accomplished to a limited degree through changes in economic activity, the environment and/or lifestyle. Conservation of water through decreasing diversions requires an increase in efficiency and is generally more effective than decreasing depletions.

Another factor to be considered in implementing water conservation measures is water quality. High quality water (suitable for potable or culinary use) is of greater value to municipalities than lower quality water (which is adequate for irrigation) due

to the difference in treatment costs and social acceptance by customers. Replacement of high quality water for outside uses with lower quality water will not reduce diversions or depletions. The higher quality water could be applied to other uses meeting Safe Drinking Water Act standards.

Temporary water shortages and growing demand place continuing stress on the available water supplies. Construction of additional projects is usually considered to develop additional water supplies and deliver water to demand areas. The size and cost of all of these projects will be reduced by water conservation measures.

In the long term, education is the major key to water conservation through more efficient use. The public will respond when convinced of the need for water conservation and given reasonable and practical means to conserve water. The water conservation process may require legal mandates and regulations to stimulate and encourage public acceptance.

17.2 Water Conservation Opportunities

Water use in the Kanab Creek/Virgin River Basin falls into two basic categories; municipal and industrial (M&I) and agricultural.

17.2.1 Municipal and Industrial Water

The basin M&I water diversions for culinary use average 347 gallons per capita day (gpcd), 63 gpcd higher than the state average of 284 gpcd. (See Section 5 for more detailed information). A large portion of this difference may be attributed to the basin climate which is hotter and drier than the rest of the state. The M&I use is the fastest growing demand. Effective conservation to reduce present use should be concentrated upon reducing residential per capita demand. As an example, reducing M&I water diversions by 50 gallons per capita day could save 56 acre-feet per year per 1,000 population. In 1990, this would have saved 14 percent of the M&I water reported delivered.

Residential Water Conservation Measures - A basic residential water conservation program might include providing flow restrictors for showers and faucets, toilet dams, leak detection kits and lawn watering guides to consumers. Estimates, using techniques developed by the State of California,[1] show the cost of water conserved in St. George City would be about $130 per acre-foot. (This cost includes the foregone revenues from decreased water sales as well as the cost of providing the conservation materials.) Some other typical residential conservation programs and estimated costs and savings were developed

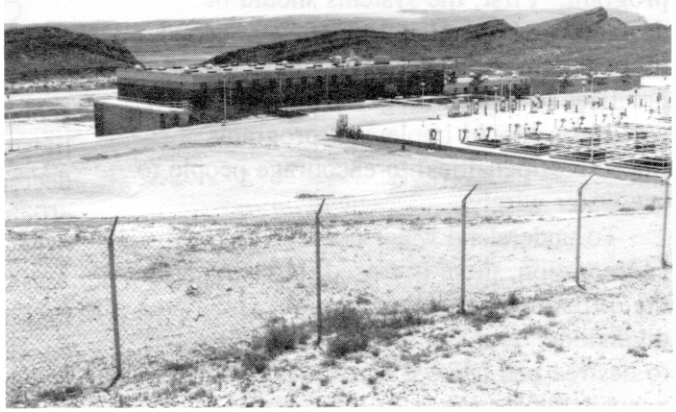


TABLE 17-1 ESTIMATED RESIDENTIAL WATER CONSERVATION COSTS AND RESULTS FOR ST. GEORGE, UTAH			
Item	Program Description	Annual Estimated Water Conservation (acre-feet)	Annualized Cost Per Acre-Foot Conserved
A	Minimal Kit Program (Deliver toilet dams, flow restrictors and leak detection kits, 4,000 kits per year for two years)	25	$ 190
B	Moderate Kit Program (Provide and install toilet dams, flow restrictors and leak detection kits and follow-up with customer contacts, 1,000 kits per year for eight years)	165	$ 125
C	Residential Water Conservation and Education Program (4,000 kits per year for two years repeated four times for eight years total)	110	$ 140
D	Toilet replacement with ultra low-flow toilets provided by St. George with customer installation (500 per year for eight years)	50	$ 350
E	Provide lawn watering guides to customers (8,000 per year every year)	15	$ 200
F	Requiring new residential construction to meet model landscape or Xeriscape ordinances (based on 100 new landscapes per year for eight years)	280	$ 85
	Combination of items B, C, D, E, & F listed above (eight-year program)	620	$ 130

using the California techniques. These are shown in Table 17-1.

Secondary Systems - Basin water purveyors are investigating the feasibility of installing secondary (dual) systems to supply landscape and garden irrigators plus some industry with water of lesser quality while the culinary system delivers more costly, higher quality water. Several communities are investigating the feasibility of pressurized

secondary systems. High quality water for culinary use is in short supply. The anticipated demand will constitute the largest segment of future water needs.

Currently, six golf courses in the St. George area divert 4,438 acre-feet of water annually[2]. The water supplies for the golf courses are a mix of lower quality irrigation canal water, well water, river water and city supplied M&I water. Since golf course watering is such a prominent and high profile use of water in the St. George area, water conservation measures and careful irrigation water management will have a wider scope of impact than just the saving of water on the golf course itself. This is an opportunity for public education and influence. The potential publicity and goodwill generated could provide a sound launching point for water conservation in the area.

17.2.2 Irrigation

Farmers have been installing sprinkler irrigation systems at an increasing rate over the last decade and finding them to be especially cost effective where gravity pressure can be used. The sprinkler irrigation systems in Gunlock and Glendale, for example, serve lawns and gardens as well as agricultural land. Other communities could also save acceptable high quality water for future culinary use by following their example.

Current irrigation practices allow room for improvement in distribution and irrigation efficiency. Recent data given in Sections 5 and 10 of this report show the following:

Irrigation Depletions = 51,300 AF
Irrigation Diversions = 123,300 AF
Overall Efficiency = 42 percent

Typically a flood irrigation system operates at less than 50 percent efficiency and sprinkler irrigation systems operate at about 65 percent efficiency. Some allowance is required for leaching of salts due to salinity problems associated with diverting irrigation water from the Virgin River below La Verkin Springs. This limits the amount of irrigation efficiency improvements possible in some areas. A one percent overall increase in irrigation efficiency basinwide would result in the conservation (reduced diversion) of approximately 2,500 acre-feet of water.

17.3 Policy Issues and Recommendations

The basin is experiencing rapid population growth and water conservation will be a vital component in the overall plan for meeting future water demands.

17.3.1 Residential Water Conservation Plans

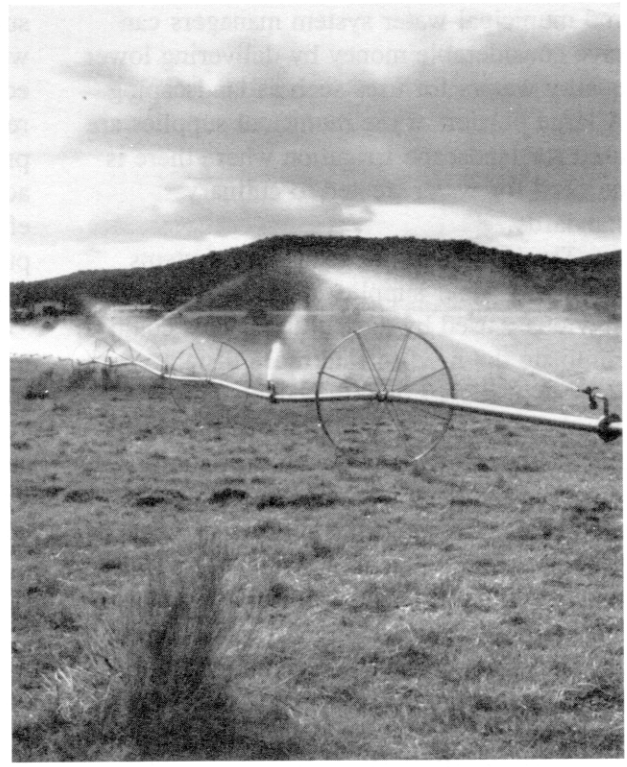
Issue - Residential water conservation can stretch existing supplies to help meet future growth demands.

Discussion - Residential water use is the fastest growing component of water demands. Future demands for additional water will be to meet increasing residential uses. Developing additional sources of water for residential use is increasingly costly as most inexpensive sources of high quality water are currently developed. Stretching currently developed high quality sources by conservation to serve portions of

future growth is and will be increasingly cost competitive with the development of new sources.

As additional sources of water are needed, residential water conservation is a valid component to meet the growing M&I demand. Water suppliers need to identify conservation goals in relation to supplies and demands. A conservation plan can identify alternatives to provide water to meet projected demands. The plan should contain an inventory of present water supplies developed for use and water demand projections with recommendations to meet future water needs.

Recommendation - A water management and conservation plan should be developed by each water purveyor. Conservation measures should be among the alternatives investigated.



17.3.2 Cropland Irrigation Efficiency Improvement

Issue - Improvement of irrigation efficiencies on cropland is the most effective water conservation measure in terms of the quantity of water conserved.

Discussion - Irrigation is the largest use of water in the basin. Improvement of irrigation efficiencies can result in the largest amount of water conservation. The technology for improvement of irrigation efficiencies is well proven and accepted. The biggest hurdle in improving irrigation efficiencies is the capital costs of improvements. Funding programs that aid irrigators in defraying these costs hold potential of increasing water conservation efforts in the basin. See Section 8 for a description of funding programs.

Recommendation - The Utah Department of Agriculture, the Cooperative Extension Service, the Soil Conservation Service and the Division of Water Resources need to continue providing technical and financial assistance to agricultural water users to upgrade and improve conveyance and delivery systems as well as provide on-farm irrigation management information and assistance for irrigators.

17.3.3 Secondary Water Systems

Issue - Secondary (dual) water systems can reduce the demand for high quality treated water.

Discussion - Water treatment is costly, and municipal water system managers can save considerable money by delivering lower quality waters for uses such as landscaping. A large portion of the municipal supplies are used for landscape irrigation where there is no need for water treated to culinary standards.

The installation of secondary systems can divert water supplies that were previously used by agriculture. This could eliminate the need to find more distant sources of higher quality water. This practice can delay, or in the case of smaller and slower growing communities, could eliminate the need for municipal system expansion and thus bring substantial financial benefits. The Division of Water Resources provides financial and technical assistance to communities considering the installation or upgrading of secondary systems. Additional help is also available from the Color Country Resource Conservation & Development (RC&D) program.

Communities may want to require developers to cooperate (cost share) in studies of the comparative costs of secondary systems versus a single culinary system as part of the permitting process.

Recommendation - Communities should undertake studies to determine the feasibility of installing and/or improving secondary (dual) systems.

17.3.4 Water Conservation Education

Issue - Public education on water conservation is the most effective way to insure that long-term goals are met.

Discussion - Ultimately, regardless of the conservation technology employed by water agencies, public acceptance of water conservation and correct use of water supplies by consumers is the foundation of water conservation. Water conservation education is relatively inexpensive, but it requires a long-term commitment to the program. Unless the public understands and accepts the need for water conservation, efforts will not be fully effective. The public needs to understand the full costs and consequences of their water use decisions.

Programs in public school systems can teach the upcoming generations about wise use of water. These can be implemented as part of the school curriculum. Currently the state of Utah has an active program for instructing teachers in the use of water education materials.

Purveyors need to keep the public informed concerning water issues so that the consumer will be cognizant of the results of use decisions. With this knowledge, the public will be able to provide valuable input in the decision making process concerning water resources.

Recommendation - Water agencies should support the state's water education efforts in the local schools by giving technical and financial support.

Water purveyors should ensure that information is provided for consumer education through mail inserts, water use information sessions, conservation information opportunities and other avenues.

17.3.5 Water Reuse

Issue - Reuse of sewage effluent for limited agricultural, parks and golf course irrigation may help meet some future water supply needs.

Discussion - As population increases, the quantity of water available for reuse will increase. Currently, the major source of

water for reuse is the effluent from the St. George sewage treatment plant.

The principal accepted use in other areas of the country for reuse of effluent is in large landscape irrigation such as golf courses. (These are large water users in the St. George area). However, use of sewage effluent can pose a health risk unless precautions are taken. Social acceptance may hinder water reuse.

Opportunities to reuse agricultural water for new uses are limited because most of the return flows from agriculture are incorporated in downstream users' water rights.

Recommendation - City officials should explore reuse possibilities for golf courses and other large landscapes and promote reuse where it appears feasible. The Department of Environmental Quality and the Division of Water Resources should provide technical assistance.

17.3.6 Xeriscape

Issue - The use of water conserving landscapes can reduce the amount of water necessary to meet the increase in demand.

Discussion - Landscapes use a major portion of the water in the larger communities. Xeriscape type landscapes use a combination of native plants, low water use plants, mulched flower beds, hardscaping (decks, patios and rock gardens) and turf areas to achieve a pleasing mix in the landscape design. They can also meet the needs for recreation and entertainment areas as well as beautification. This type of landscape can consume up to 50 percent less water (depending on the mix of features selected) than the typical monoculture of turf grass.

While retrofitting an existing landscape from the traditional expansive grass areas to an aesthetic Xeriscape can be costly and time consuming (as most landscape projects are), new residential construction lends itself to more choices. Costs of installing an aesthetic, functional Xeriscape from scratch are comparable with normal landscape installation cost and will result in significant water and cost savings over the life of the landscape.

Recommendation - Communities should prepare and adopt model landscape ordinances for new construction which require water conservation and encourage Xeriscape landscaping.

17.3.7 Water Pricing

Issue - Water pricing rate structures can lead to high water use.

Discussion - Current water pricing practices of low, level rates for all water use or declining block rates for increasing use provide little, if any, incentive for the consumer to conserve water. The financial reward for water conservation is small while the effort involved can be significant.

Currently, revenues for water purveyors are linked or "coupled" to the quantity of water delivered. Enough water has to be delivered to recoup costs associated with water development and system operation. With this type of rate structure, water conservation decreases the water utilities revenues by decreasing the amount of water delivered and paid for by customers without proportionate decreases in fixed costs. This serves as a strong disincentive for water conservation.

Decoupling water purveyor revenues from the amount of water delivered and linking revenues to the number of customers

served at base rate levels, would provide protection of necessary water utility revenues while giving incentive for water conservation to decrease the marginal costs of additional water delivery. Allowances could be made by the purveyors to cover low income households similar to what other utility programs currently use to provide lifeline level services.

If base water rates covered the fixed costs of a water system and marginal rates reflected the cost of water delivery above the base amount, water conservation would provide financial incentives for the consumer and supplier. The supplier's revenue stream would be protected to cover fixed costs while the marginal price of water above the base amount would cover the additional costs of securing more expensive water sources to meet growing demands. As demand increased, prices would increase and this would provide the financial incentive for the consumer to reduce use.

Recommendation - Water purveyors in the basin should establish base rates to cover fixed costs and set increasing block rates for M&I water use above the minimum.

17.4 Conservation Implementation

Water conservation is best carried out under the auspices of the management of the local water purveyors with support from governmental agencies with needed special expertise. Political support is also needed from citizen groups interested in supporting the conservation programs. Establishing water conservation policies will require the input and support of the public. If the public feels that the policies are reasonable and reflect their input, then implementation will be facilitated. ■

17.5 References

1. Department of Water Resources, State of California, *Water Plan™ Version 1.00 Benefit/Cost Analysis Software for Water Management Planning*. Sacramento, California, October 1989.

2. Utah Division of Water Resources, *Municipal and Industrial Water Diversions and Depletions for the Virgin River and Kanab Creek Drainage Basins*. Salt Lake City, Utah, (In preparation).

3. USDA Soil Conservation Service and Utah Division of Water Resources. *Virgin River Basin-Utah Cooperative Study*. Salt Lake City, Utah, 1990.