

CHAPTER 3 - NUMERIC CRITERIA FOR SALINITY

Overview

As discussed earlier in this report, the EPA promulgated a regulation which set forth a basinwide salinity control policy for the Colorado River Basin. This policy required that the flow-weighted average annual salinity in the lower mainstem of the Colorado River be maintained at or below the 1972 levels. The Basin states, acting through the Forum, addressed this requirement in its first Review entitled Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control - Colorado River System dated June 1975.

In the 1975 Review, the Forum proposed three stations as appropriate points in the lower mainstem of the Colorado River at which to measure the flow-weighted average annual salinity. These stations are located at the following points: (1) below Hoover Dam; (2) below Parker Dam; and (3) at Imperial Dam. The basis for selecting these stations is their proximity to key diversion facilities on the lower Colorado River. Nevada diverts Colorado River mainstem water from Lake Mead for use in the Las Vegas area. The Metropolitan Water District of Southern California and the Central Arizona Project divert water from Lake Havasu, impounded behind Parker Dam, for millions of water users in southern California and central Arizona, respectively. The large agricultural areas in the Imperial and Coachella Valleys in California and the Yuma area in Arizona are served by diversions at Imperial Dam.

The flow-weighted average annual salinity for these stations was determined by Reclamation from daily flow and salinity data collected in 1972 by USGS and Reclamation and became the numeric criteria. The fact that 1972 was chosen as the basis for establishing the numeric criteria creates no inference that 1972 represented a typical or average year from either a hydrologic or water quality perspective. The numeric criteria for each of those stations is as follows:

Below Hoover Dam	723 mg/L
Below Parker Dam	747 mg/L
At Imperial Dam	879 mg/L

The criteria were established to protect infrastructure and crop production rather than human health or fish and wildlife values. The salinity concentrations that are anticipated in the future, even without salinity control efforts, have not been shown to have adverse effects on human health or wildlife. Thus, the Colorado River Salinity Control Program is different from most other water quality standards compliance programs.

Natural Variations

The standards require that a plan be developed which will maintain the flow-weighted average annual salinity at or below the 1972 levels while the Basin states continue to develop their compact-apportioned water supply. The plan is not, however, intended to offset the salinity fluctuations that are a result of the River's highly variable annual flows (natural variations in the hydrologic cycle). Analyses have shown that the impact of natural variations in the hydrologic cycle can have a significant impact on salinity. These natural variations in runoff can cause a fluctuation in average annual salinity concentration of as much as 450 mg/L TDS at Imperial Dam. Recognizing the variability of the river, the plan for maintaining the criteria is developed using a long-term mean water supply of 15 maf. When River flows are at or above the long-term mean, and reservoirs are full, concentrations are expected and have been observed to be below the numeric criteria. Conversely, when flows are dramatically below the long-term mean, and reservoirs are depleted, salinities may increase above the numeric criteria.

Temporary Increases

The federal regulations provide for temporary increases above the 1972 levels if sufficient control measures are included in the Plan of Implementation. Should additional water development projects take place beyond those anticipated to occur before control measures are brought on line, temporary increases above the numeric criteria could result. However, these increases will be deemed to conform with the standards if appropriate salinity control measures are included in the plan. During the next three years, or the period of this review, no increases above the 1972 levels are anticipated.

Provision for Reviewing and Revising Standards

The Forum, in its statement of "Principles and Assumptions for Development of Colorado River Salinity Standards and Implementation Plan," approved by the Forum on September 20, 1974, stated, under Principle 7:

"The Plan of Implementation shall be reviewed and modified as appropriate from time to time, but at least once every three years. At the same time, the (numeric) standards, as required by Section 303 (c) (1) of P.L. 92-5(K) shall be reviewed for the purpose of modifying and adopting standards consistent with the plan so that the Basin states may continue to develop their compact-apportioned waters while providing the best practicable water quality in the Colorado River Basin."

Considerable knowledge has been gained through a wide range of research, and technical studies since the Forum took this position. Procedures for reducing the volume of saline irrigation return flows have been developed. Reclamation and the USDA are implementing voluntary cost-sharing programs with individual farmers, irrigation districts, and canal companies in order to accomplish salt loading reductions to the river system by improving off-farm and on-farm water delivery and drainage systems as well as on-farm water management practices.

Reclamation and the USDA work in cooperation with the Forum's Work Group. The Work Group holds meetings on a more frequent basis than the Forum to review technical information which is generated by the federal agencies. Membership on the Work Group is composed of technical representatives from each of the Basin states and the Executive Director of the Forum. The Work Group keeps current with salinity control efforts and suggests revisions to the Plan of Implementation as appropriate. The Work Group operates under a schedule which enables the states to take action on any potential revision in a timely manner.

Review of the Numeric Criteria

Based on the Forum's statement quoted above, this document is the appropriate setting to review the numeric criteria and recommend any changes if necessary.

The existing numeric criteria were adopted nearly 27 years ago. Since then, the Forum has seen a shift in the water use patterns in the lower mainstem of the Colorado River. While agriculture still remains the predominant user there has been a shift within this sector from growing mostly low value salt tolerant crops to growing higher value, less salt tolerant crops. Current trends and discussions among the Basin states indicate there will be a continued shift in the use by the agricultural sector to the municipal and industrial sector. Because of this shift, the need for water conservation and efficiency within the agriculture sector continues to put an emphasis on reducing salinity. As this shift continues, there will likely be more pressure to remove additional salt from the water and more emphasis on maintaining the salinity below the current numeric criteria.

Because uses are changing over time, it is appropriate to review the numeric criteria to determine if they still adequately protect water uses in the Lower Basin. Both California and Arizona have begun to evaluate the effect of higher salinity on the municipal and industrial sectors in their states. As these efforts progress, it will continue to be appropriate to revisit the numeric criteria associated with the water quality standards for salinity in the Colorado River system.

Based on the current use patterns in the Lower Basin and the ongoing progress toward accomplishing all measures identified in the Plan of Implementation as described in this Review, the Forum finds the current numeric criteria are adequate for the next three years and recommend no changes at this time.

CHAPTER 4 - PLAN OF IMPLEMENTATION

Overview

The purpose of the Plan of Implementation is to offset the effects of water resource development and human activities in the Colorado River Basin after 1972. The Plan of Implementation is not intended to address the salinity of the River caused by human activity prior to 1972, nor salinity caused by natural variations in river flows.

The Forum assesses whether the Plan of Implementation maintains salinity at or below the numeric criteria at some interim point in time as the Basin states develop their compact apportioned waters. Historically, the Forum designed the Plan of Implementation to maintain the numeric criteria for a period of 15-20 years (e.g., the 1990 Review contained a Plan of Implementation through the year 2010). For this Review, the Plan of Implementation has been designed to maintain the salinities of the Colorado River at or below the numeric criteria below Hoover Dam through the year 2020. The Hoover Dam station was chosen because this point requires the most salinity control to accommodate the numeric criteria through this time period.

The Forum determined that 1.8 million tons of salt must be removed or prevented from entering the system annually to maintain the numeric criteria through 2020. The Plan of Implementation includes projects which remove the required salt tonnage. This will principally be accomplished by reducing the salt contributions to the River from existing sources and minimizing future increases in salt load caused by human activities.

The Plan of Implementation is composed of many actions contemplated by the federal government and many of its agencies, and by each of the seven Basin states and many of their agencies. For this Review, the Plan of Implementation can be briefly summarized as follows:

1. Completion of Reclamation, USDA, and BLM salinity control measures to the extent that the measures remain viable and appropriately cost-effective.
2. Implementation of the following Forum recommended and adopted policies (text of policies included in Appendix B of this Review).

“Policy for Implementation of Colorado River Salinity Standards Through the NPDES Permit Program”

"Policy for Use of Brackish and/or Saline Waters for Industrial Purposes;"

"Policy for Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program for Intercepted Ground Water;" and

"Policy for Implementation of the Colorado River Salinity Standards Through the NPDES Permit Program for Fish Hatcheries."

The Forum started with an initial NPDES policy and, from time to time, has considered amendments or additions to this policy. The Forum gave initial approval to a revised policy for NPDES discharges, in June 2002, and received public comments on the proposed revisions during the summer of 2002. After consideration of the comments received, the Forum modified the policy and formally adopted it on October 30, 2002. This revised policy replaces the "POLICY FOR IMPLEMENTATION OF COLORADO RIVER SALINITY STANDARDS THROUGH THE NPDES PERMIT PROGRAM" adopted by the Forum in 1977.

The revised policy is included as Appendix B of this Review. The major modifications in the revised policy include:

- A clarification of the provision for allowing a waiver of the "no salt return" requirement where the total salt load is less than one ton/day or 366 tons/year;
- New provisions addressing the discharge of water that has been used for once-through non-contact cooling water purposes;
- Provisions addressing new industrial sources that have operations and associated discharges at multiple locations;
- A new provision allowing a waiver of the "no salt return" requirement for "fresh water industrial discharges" where the discharged water does not cause or contribute to exceedances of the salinity standards for the Colorado River system; and
- Language encouraging new industrial sources to conduct or finance one or more salinity-offset projects in cases where the permittee has demonstrated that it is not practicable to prevent the discharges of all salt from proposed new construction.

Existing policies related to brackish water, intercepted groundwater, and discharges from fish hatcheries are also contained in Appendix B, and they remain unchanged.

3. Implementation of nonpoint source management plans developed by the states and approved by EPA.

Item 1 of the list above is to be implemented by federal agencies in conjunction with state, local and private participants. The Forum participates with federal agencies in developing the measures to be implemented. The Forum also urges Congress to appropriate the funds needed for implementation, and recommends legislative changes when necessary. Items 2 and 3 above are primarily implemented by each of the Basin states.

Table 4-1 illustrates that the Program has controlled a total of 800,000 tons per year of salt. In order to meet the target of 1.8 million tons per year of salinity control through 2020, it will be necessary to fund and implement potential new measures which ensure the removal of an additional 1,000,000 tons per year. Over the next three years, cost per ton for salt control is estimated to be \$30 per ton for Reclamation and \$45 per ton for USDA.

Table 4-1
Colorado River Basin Salinity Control Program
Plan of Implementation Summary
 (Values in Tons Per Year)

AGENCY	MEASURES IN PLACE (2001)	NEW MEASURES PROPOSED (2020)	TARGET (2020)
Bureau of Reclamation	482,000	500,000	982,000
U.S. Department of Agriculture	318,000	437,000	755,000
Bureau of Land Management	-----	-----	-----
Unidentified	0	63,000	63,000
TOTAL	800,000	1,000,000	1,800,000

In order to achieve this level of salt reduction, the federal departments and agencies would require the following capital funding: Reclamation appropriation - \$10.5 million per year (bringing the total Reclamation program with cost-sharing to \$15 million per year); and USDA EQUIP appropriation - \$13.8 million per year (bringing the total on-farm program to \$19.7 million per year with Basin states parallel program). In addition, there is a need for an annual appropriation of approximately \$3 million for operations and maintenance of Reclamation measures in place. These estimated cost values are substantiated through salinity control expenditure experience to date and the technical ability to actually implement these efforts through the Salinity Control Program. No new measures for BLM are proposed in this review. Even though BLM has estimated potential salt retention measures, the Forum questions if other activities on BLM administered lands result in a net increase in salt contributions to the River. It is anticipated that when measures are identified they will be included in the Program. BLM has not yet submitted its status report to Congress on its basinwide salinity control program as required by P.L. 106-459. Estimates for cost-effectiveness of the BLM program has not been provided because past accounting procedures used by BLM have not allowed for an analysis to occur as to expenditures for salinity control measures being implemented by the agency.

**Table 4-2
Summary of Federal Salinity Control Programs**

UNIT	TONS PER YEAR REMOVED
MEASURES IN PLACE BY USBR (2001)¹³	
USBR Basinwide	129,300
Meeker Dome	48,000
Las Vegas Wash Pittman	3,800
Grand Valley	127,500
Paradox Valley	109,000
Lower Gunnison Winter Water	41,400
Dolores	23,000
SUBTOTAL	482,000
MEASURES IN PLACE BY USDA (2001)¹⁴	
Grand Valley	85,500
Price-San Rafael	13,200
Uinta Basin	106,000
Big Sandy River	37,000
Lower Gunnison	58,900
McElmo Creek	17,700
SUBTOTAL(rounded)	318,000
MEASURES IN PLACE BY BLM	
Nonpoint Sources	unknown
Well-Plugging	unknown
TOTAL	800,000
POTENTIAL NEW MEASURES	
USBR Basinwide	500,000
Price San Rafael (USBR/USDA)	133,700
Grand Valley (USDA)	46,500
Uinta Basin (USDA)	34,500
Big Sandy River (USDA)	15,900
Lower Gunnison (USDA)	127,100
McElmo Creek (USDA)	28,300
Mancos River (USDA)	9,000
USDA unidentified	41,700
Other Unidentified	63,000
New Well Plugging and Nonpoint Source (BLM)	unknown
SUBTOTAL(rounded)	1,000,700
TOTAL	1,800,000

¹³As reported by USBR, oral communication, 2002.

¹⁴As reported in Federal Accomplishment Report for Fiscal Year 2001

Federal Programs

Overview

Major components of this 2002 Review's Plan of Implementation are the federal programs. Table 4-1 summarizes the salinity control achieved by the federal participants under the original and current authorities and the salinity control measures which must be implemented in order to meet the goal of approximately 1.8 million tons of salt load reduction annually through 2020.

The involved federal agencies, working in close cooperation with the Forum, have identified salinity control measures that have been and may be implemented. The collective efforts of Reclamation, the USDA, and the BLM are identified and summarized in Table 4-2.

It should be recognized that over time some of the salinity control measures now in the Plan of Implementation might not remove all of the projected salt, and the costs of removal may increase. Other salinity control measures would then be implemented to maintain the numeric criteria while the Basin states continue to develop their compact-apportioned waters.

The following sections briefly describe Reclamation's, USDA's, BLM's and EPA's activities which constitute the federal portion of the recommended Plan of Implementation.

Reclamation/USDA Units

Since the original salinity control act passed in the 1970's, Reclamation's and USDA's participation in the Plan of Implementation has changed in several ways. Both programs were restructured in 1995-96 with changes to their authorizations. Reclamation's program now encourages open competition for all types of salinity control. The USDA salinity control program was incorporated into a larger, national program (EQIP) with multiple purposes.

Although Reclamation projects may address any type of effective salinity control, many Reclamation projects concentrate on improving the efficiency of irrigation delivery systems, while the USDA program concentrates on improving on-farm systems. The two programs have purposely been designed to be highly integrated. This has improved the overall performance of the combined program beyond what either agency might have done individually.

The following paragraphs briefly describe the Reclamation and USDA units included in the recommended Plan of Implementation. Detailed information on each unit can be found in the following reports:

Quality of Water - Colorado River Basin, Progress Report No. 20, January 2001, U.S. Department of the Interior, U.S. Bureau of Reclamation.

Monitoring and Evaluation Report-2001 - for each of the salinity control units currently being implemented by the USDA Colorado River Salinity Control Program.

Units Completed

Five Reclamation units (Meeker Dome, Las Vegas Wash, Grand Valley, Paradox Valley, and Dolores/McElmo) are all essentially completed.

Units Being Implemented

Paradox Valley (Reclamation): Local ground water comes into contact with the top of a natural salt formation where it becomes nearly saturated with sodium chloride and surfaces in the Dolores River channel in Paradox Valley, Colorado. The River picks up over 205,000 tons of salt annually from this saline ground water source as it passes through the valley.

The Salinity Control Program involves pumping the saline ground water, thereby lowering the water table and reducing saline inflows to the Dolores River. The pumped brine is injected into a deep well in the Paradox Valley. About 109,000 tons of salt are being removed annually by this unit. The injection well, the brine pipeline, the surface treatment building, and the injection building have been completed and tested. The facility went into operation in FY 1997.

Grand Valley (Reclamation and USDA): The area within the Grand Valley Unit in western Mesa County, Colorado, contributes 580,000 tons of salt annually to the Colorado River. Most of the salts are leached from the soil and underlying Mancos Formation by ground water that is recharged by deep percolation from canal and lateral leakage and on-farm application.

The Reclamation program in the Grand Valley Unit was implemented in two stages. Stage I, encompassing about 10 percent of the unit area, consisted of concrete lining 6.8 miles of the Government Highline Canal (GHC), consolidating 34 miles of open laterals into 29 miles of pipe laterals and installing an automated moss and debris removal structure. This work was completed in April 1983 to test and demonstrate the viability of the project. Stage II construction began on the GHC system in the fall of 1986. Construction of the Price and Stubb Ditch systems started in 1991 under cooperative agreements with the Palisade Irrigation District and the Mesa County Irrigation District. Work on the Stage II systems was completed in 1998. The Unit is expected to reduce salt loading by 127,500 tons per year.

USDA published its plan for the Grand Valley on-farm program in 1977, and in 1980 prepared a supplement to include improvements to lateral systems. The plan, updated in 1994, identified a salt load reduction goal of 132,000 tons. The USDA program includes the installation of on-farm salinity reduction practices and lining or piping certain off-farm lateral systems which are needed to support the on-farm improvements. Implementation was initiated in 1979 under existing USDA authorities, and in 1987 funding became available under the USDA Colorado River Salinity Control Program, and is continuing under the EQIP.

Uinta Basin (Reclamation and USDA): The area covered by the Uinta Basin Unit in northeastern Utah contributes about 450,000 tons of salt annually to the Colorado River. Return flows from 204,000 acres of irrigated land account for most of the salt contribution. Projects in this area may apply under Reclamation's new Basinwide Salinity Control Program. Several projects within the unit area are nearing completion and additional proposals are under consideration at this time.

USDA published the Uinta Basin Salinity plan in 1970, and in 1987 prepared a supplement to include lateral systems. In 1991, the Uinta Basin Unit was expanded to include treatment on adjacent irrigated land. The plan identifies a salt load reduction goal of 106,000 tons annually based on a projected treatment rate of 84 percent of the irrigated acres in the project area. In fact, participation has exceeded expectations. Consequently, USDA intends to continue implementing measures that are cost-effective. The USDA program includes the installation of on-farm salinity reduction practices and lining or piping lateral systems. The major emphasis is conversion of inefficient surface irrigation to sprinkler systems. Implementation was initiated in 1980 under existing USDA authorities, and in 1987 funding became available from the Colorado River Salinity Control Program and is continuing under EQIP.

Lower Gunnison Basin (Reclamation and USDA): The Lower Gunnison Basin Unit is located in west-central Colorado. An estimated 360,000 tons of salt are contributed annually to the Colorado River. P.L. 98-569 authorized portions of the unit for construction by Reclamation. Construction of the winter water portion of the unit is designed to eliminate ditch seepage during the non-irrigation season by providing a piped delivery system for livestock water. This component was completed in 1996 and is estimated to reduce salt loading by 41,400 tons per year. Studies on ways to reduce costs of the canal and lateral lining portion of the project have been completed. These measures would potentially reduce salt loading by an additional 64,000 tons per year and may apply for funding under Reclamation's new Basinwide Program. A joint selenium/salinity control demonstration project at Montrose Arroyo, has been completed and proven effective based on monitoring by the USGS.

The Lower Gunnison Basin USDA plan, updated in 1994, identifies a salt load reduction goal of 166,000 tons. The USDA program includes the application of on-farm salinity reduction practices and improving off-farm irrigation laterals. Implementation was initiated in 1988 and is continuing under EQIP.

Big Sandy River (USDA): The Big Sandy River Unit is located in southwestern Wyoming. Below Big Sandy Reservoir, water is diverted to irrigate lands in the Eden Project. Irrigation seepage into shallow aquifers near the Big Sandy River is the source of saline seeps. These seeps and springs below the Eden Project contribute about 116,000 tons of salt, and tributaries contribute about 48,000 tons of salt annually to the Green River.

The USDA Big Sandy River Unit plan was published in 1988. The USDA salinity control program consists of converting 15,700 acres of on-farm surface irrigation to low-pressure sprinkler systems. When fully implemented, the on-farm program will reduce the salt loading by an estimated 52,900 tons per year. Implementation is continuing under EQIP.

Dolores Project/McElmo Creek (Reclamation and USDA): Irrigation and other nonpoint sources in the McElmo Creek area of southwestern Colorado result in an estimated salt load of 119,000 tons per year to the Colorado River.

Salinity control, as an added feature of the Dolores Project, already under construction by Reclamation in 1984, was authorized by the 1984 Salinity Control Act. Reclamation modified the design of Towaoc Canal to allow abandonment and consolidation of certain ditches, and has lined other ditches and installed pipe laterals and has reduced salt loading from ditch seepage. These improvements, completed in 1996, reduced salt loading by an estimated 23,000 tons per year.

The McElmo Creek Unit plan was described in the Natural Resources Conservation Service's (NRCS) 1989 Environmental Impact Statement. The plan, updated in 1994, will remove an estimated 46,000 tons per year of salt from the Colorado River. Implementation of the plan is continuing under EQIP.

San Juan River-Hammond (Reclamation and USDA): The San Juan River Unit drainage contributes approximately one million tons of salt annually to the Colorado River Basin. In the Hammond area, Reclamation has completed a planning report/EA and begun implementation. The project will line sections of the Hammond Project Irrigation system. The estimated salt load reduction would be about 48,000 tons per year. The project is scheduled for completion in 2002.

The NRCS completed an investigation in 1992 to explore the potential for a USDA program in the San Juan River Basin in the Hammond area. Investigations indicated that a USDA on-farm program is not cost-effective at this time.

Price-San Rafael Rivers (Reclamation and USDA): An estimated 430,000 tons of salt annually reaches the Colorado River from these two river basins. The Price and San Rafael Rivers, tributaries of the Green River, are 120 miles southeast of Salt Lake City. The final planning report/EIS was completed and issued in December 1993. The preferred plan would reduce salt loading to the Colorado River by an estimated 161,000 tons per year based on a projected treatment rate of 65 percent of the irrigated acres in the project area. In fact, participation has exceeded expectations. Consequently, Reclamation and USDA intend to continue implementing measures that are cost-effective. Portions of the project are under construction with funding from USDA's EQIP, and from Reclamation's new Basinwide Salinity Control Program (P.L. 104-20 which, in 1995, authorized the competitive "Request for Proposal" process).

USBR Basinwide Program: The Salinity Control Act as amended by P.L. 104-20 in 1995 and P.L. 106-459 in 2000 (see Appendix A), authorized the Secretary of the Interior to undertake a variety of salinity control measures without returning to Congress for individual construction authorizations and to implement salinity control measures by funding State, local, or private-sector initiatives which achieve salinity reduction. The Basinwide Salinity Control Program solicits a wide variety of proposals for salinity control efforts from both private and public sectors. On four separate occasions, Reclamation has formally asked for proposals thru a competitive Request for Proposals (RFP) process. In each case, a ranking committee made up of both state and federal representatives

convened to evaluate the proposals. The committee ranks proposals competitively based on their cost per ton (cost-effectiveness) and other performance risk factors.

Reclamation is nearing completion of 15 out of 16 construction cooperative agreements awarded in earlier RFP's and is negotiating 10 new agreements for proposals received in 2001. The cost of this new, competitive approach to salinity control is about \$30 per ton, as shown in Table 4-3. This is nearly a three-fold reduction when compared to Reclamation's old program at approximately \$80 per ton. The 1995 and 2000 amendments to the Act authorize federal appropriations of \$175 million to carry out the Title II Salinity Control Program. With cost-sharing from the Basin states authorized in 1996, the total funds available for Reclamation's Basinwide Salinity Control Program are \$250 million. It is anticipated that these funds will be expended over the next 10 to 15 years.

**Table 4-3
Reclamation Basinwide Salinity Control Project Summary**

Unit/Project	Method	BOR portion of Controls (tons/yr)	Proposed Total Controls (tons/yr)	Uniform Cost Effectiveness 6.375% 25yrs
Hammond	Canal Lining	48,130	48,130	\$22
Uncompahgre Demo	Pipe Lateral	2,295	2,295	\$31
Ashley	Sewage Lagoon	9,000	9,000	\$29
PRICE-SAN RAFAEL UNIT				
Allen Lateral	Combined System	2,031	8,125	\$33
North Carbon	Combined System	1,921	7,684	\$44
Cottonwood	Winter Water	8,506	8,506	\$20
Ferron	Combined System	11,852	47,407	\$29
Seeley-Collard	Combined System	226	905	\$26
Moore Group	Combined System	4,397	17,587	\$31
Wellington	Combined System	17,688	17,688	\$22
UINTA BASIN UNIT				
Burns Bench	Combined System	6,675	21,468	\$24
BIA - Ute Tribe	Line & Combined System	50,306	53,344	\$30
Duchesne County	Pipe Canals	20,417	20,417	\$36
Farnsworth	Pipe Canals	9,557	9,557	\$28
L. Brush Cr. (Sunshine)	Combined System	721	2,763	\$33
Western Uintah	Combined System	16,205	25,780	\$18
2001 RFP PROJECTS				
Duchesne Irr Co-S Canal	Pipe Canal	1,250	1,250	\$20
River Canal	Pipe Canal	4,060	4,060	\$25
Union Canal	Pipe Canal	5,255	5,255	\$25
Uintah Basin Irr Co	Pipe Canal	3,578	3,578	\$25
Dry Gulch E	Pipe Canal and Lateral	12,973	12,973	\$25
Dry Gulch C	Pipe Laterals	15,324	15,324	\$25
Tropic & East Fork	Pipe Canal	3,100	3,100	\$28
Lawrence South	Pipe Canal + USDA Sprinkler	1,304	5,217	\$29
Ouray Park Irr Co	Pipe Canal	10,131	10,131	\$29
Duchesne WCD	Pipe Canal + possible Sprinkler	42,800	42,800	\$30
	Total	309,702	404,344	\$27

USDA is implementing on-farm salinity control measures in six project areas in Colorado, Utah, and Wyoming. Approximately one-half of the total annual salt control has been implemented. Table 4-4 summarizes the salinity control and costs for the USDA project areas.

**Table 4-4
USDA Salinity Control Progress Summary**

Unit	Salt Controlled thru FY 01 (tons per year)	Planned Salt Control (tons per year)	Expenditure thru FY 01 (\$1000's)	Projected Total Cost ¹ (\$1000's)	Cost Effectiveness ² thru FY 01 (\$ per ton)
McElmo Creek	17,662	46,000	10,253	26,704	48
Lower Gunnison	58,870	166,000	31,235	88,076	44
Uinta Basin	106,040	106,800	52,748	53,126	41
Grand Valley	85,505	132,000	39,322	60,704	38
Big Sandy River	36,994	52,900	11,913	17,035	27
Price- San Rafael ³	13,278	120,220	2,569	23,260	16
Totals	318,349	623,920	148,040	268,905	39

¹ Total costs estimated as a ratio of existing costs and tons controlled to planned tons controlled.

² Cost-effectiveness computed using 6.625% planning interest rate over 25-year life.

³ Integrated Reclamation and USDA irrigation improvements program.

Bureau of Land Management

The Bureau of Land Management (BLM), it is felt, should have a commitment to help meet state and federal water quality standards within the Colorado River Basin. Included in this commitment would be the goal of reducing the contribution of salts to the Colorado River from BLM-administered public lands. Although salt reduction is achieved by controlling both point and nonpoint sources of salt contributions, the majority of salt derived from public lands is of nonpoint-source origin. The greatest reductions in salt may be achieved through management practices that minimize soil disturbances, repair disturbed surface environments, and protect water quality. It is recognized that due to the nature and behavior of nonpoint sources of salinity, the imprecise boundaries encompassed by many management decisions, the large areas involved, and the uncertainties concerning salt transport in arid environments, it is difficult to quantify actual impacts on total dissolved solids in the Colorado River with any reasonable degree of precision or accuracy. In contrast, the calculation of salt reduction from point-source control activities is relatively easy and precise. The BLM has used, in the past, a three-pronged approach to salinity control:

- Control of point sources, such as saline springs and seeps and abandoned flowing wells that yield saline water (larger projects are referred to the Bureau of Reclamation)
- Control of nonpoint sources through cost-effective land management techniques that result in multiple-resource benefits

- Prevention of nonpoint-source salt mobilization through land-use planning, permit stipulations, land-use authorizations, best management practices, watershed protection strategies, and ecological restoration

The BLM should establish and rely on a water-quality monitoring effort to determine suitable areas for nonpoint-source control projects and to assess individual project effectiveness and overall program effectiveness.

Point Source

Well plugging represents one of the few opportunities to eliminate salt from point sources. Occasionally, old or improperly abandoned wells deteriorate and discharge flowing saline waters to the surface. Where the operator is not known or no longer exists, these wells are referred to as orphan wells. Plugging these wells and stopping the discharge of large volumes of saline water results in considerable quantities of salt retained. For example, the Spring Creek well in Colorado was plugged in 2000, preventing approximately 160 tons/year of salt from reaching the surface.

The BLM will continue to identify saline springs and seeps through its water-source inventories. When identified, saline springs and seeps will be analyzed for potential salinity control projects.

Nonpoint Sources

The BLM should be committed to identifying, understanding, and controlling nonpoint sources of salinity on BLM-administered public lands. The BLM has used the results of the unified watershed assessment characterization process, soil salinity maps, watershed assessments, watershed analysis tools, reconnaissance water-quality studies, and water-quality monitoring to identify salinity “hot spots.” The BLM has been involved with nonpoint source control in the past using the following tools or activities.

Resource Management Plans: The Federal Land Policy and Management Act requires the BLM to prepare land use plans that provide management direction for the public lands. BLM’s planning process is the principal mechanism for making land-use decisions and the first step in implementing salinity control actions. The BLM has developed a resource management planning process to make basic land-use decisions. Although all resource values and land uses on BLM-managed public lands are included, the development of solutions to specific planning issues is emphasized in resource management planning. The Forum hopes that salinity goals and objectives will be used in a more focused way as Resource Management Plans are developed.

The BLM’s planning process is used to develop Resource Management Plans (RMP) that examine management alternatives for all resources and land uses on BLM public lands. All resource management programs must utilize the planning system to identify management options. Thus, a comprehensive approach to salinity control on public lands must first be addressed in RMP’s. Nonpoint sources are identified through water-use inventories, watershed assessments, and reconnaissance studies in high-priority watersheds. Land management actions tend to fit under one

of the following aspects of resource management: planning and administrative actions, vegetative management, construction and maintenance, or use authorizations.

Planning and Administrative Actions: These are broad, general management actions that establish a foundation or framework for future land-use decisions. They include planning documents of all types, studies, inventories and other commitments to data collection, and science-based management decisions. Although impacts on Colorado River Basin salinity are often not a direct consideration during the formulation of management strategies, salinity reduction is often a peripheral benefit that is realized as the strategies are implemented. The Forum would like salinity control to be directly addressed in the future.

Vegetative Management: Actions taken to improve vegetative cover result in slower runoff velocities, decreased amount of runoff, and decreased soil erosion. Decreasing the amount of runoff and soil erosion on upland areas results in a decrease in the potential amount of salt leaving the treated area. Vegetative management actions include; riparian area improvements, noxious weed control, reclamation or revegetation, and prescribed burns. More knowledge is needed about the favorable impacts related to salinity control by vegetation management.

Wild horse and burro herds can put additional pressure on fragile soils and riparian areas by disrupting soils and plants through their physical movements and by the removal of ground cover through grazing. The BLM can reduce such damage only by intensively managing the herds, by influencing their movements, or protecting fragile or vulnerable areas from exposure. Quantification of wild horse and burro herd control efforts has not been made with respect to salinity control.

Construction and Maintenance Activities: Construction and maintenance activities are concerned with engineering and construction of facilities that are primarily designed to decrease or intercept runoff and soil erosion, and thereby limit the offsite movement of saline water and sediment. Once these facilities are constructed, they require periodic maintenance in order to keep them working efficiently. Construction and maintenance activities include; road and trail maintenance and closures, protective fencing and access control, development of springs and water sources to improve livestock distribution, and erosion control and sediment-trapping structures. It is not known what the total impact is from these construction and maintenance activities as to salt contributions from BLM-administered lands.

Use Authorizations: The BLM must issue use authorizations before certain land-use activities can take place on the public lands. Where saline soils are present, these use authorizations contain stipulations designed to minimize offsite movement of water and soil. Some important uses that occur in saline areas and require authorizations; oil and gas development, grazing and off-road vehicle use. The impact of these uses on salt contributions to the river system needs to be better understood.

Analysis of BLM Effort

Congress has, by law, instructed that the BLM should prepare a report to Congress outlining a BLM program for salinity control. That report is in review and had not been released at the time

of the writing of this report. Future efforts planned by the BLM to control salt contributions from lands administered by the agency may be better understood upon the release of the report. In past triennial reviews, there has been reported tons of salt controlled by BLM efforts. It has now come to be understood by the Forum that the BLM does not know if its management of lands over the last several years has resulted in more or less salt being contributed to the river from these lands. If, in fact, more salt is being contributed then it would be inaccurate for the Forum to credit past favorable actions and to project, at this time, salt savings by BLM management in the future. Therefore, this report does not predict gains or losses with respect to salinity control by BLM efforts.

Environmental Protection Agency

National Pollutant Discharge Elimination System (NPDES) permits are issued by EPA for the two non-delegated states in the Basin (Arizona and New Mexico), and for all Indian tribes. In Arizona, the State drafts the permits for Arizona waters consistent with the Forum's NPDES policies. The State also provides the public notices. EPA Region IX issues the state-drafted Arizona permits and drafts and issues permits for tribal waters consistent with the Forum's policies. EPA Region IX issues permits for Navajo lands in all three EPA regions. EPA Region VI drafts and issues permits for Tribal and State waters in the New Mexico portion of the Basin consistent with Forum policies. EPA Region VIII issues the NPDES permits for Indian facilities in Region VIII's portion of the Colorado River Basin, and all federal facilities within the State of Colorado. Salinity requirements for these permits are reviewed and added where needed during the permit re-issuance process.

State Programs

Overview

A major element of the state programs is the ability of the Basin states to cost-share in the Reclamation and the USDA programs. This allows, for additional funds to be made available from the Basin states' fund through up-front cost-sharing to move the salinity control effort ahead. At current federal funding levels, the Basin states contribute about \$8 million each year. Basin states' funds are available to cost-share in a larger program if federal dollars were to be increased.

The states' portion of the Plan of Implementation, as set forth in this and earlier Forum Reviews, also includes effluent limitations on industrial point source discharges with the objective of no-salt return whenever practicable, as well as a program which parallels USBR and USDA efforts and which is funded from the Basin states' funds.

Forum's NPDES Policies

In 1977, the Forum adopted its "Policy for Implementation of Colorado River Salinity Standards Through the National Pollution Discharge Elimination System (NPDES) Permit Program." This policy provides guidance for the regulation of municipal and industrial point source discharges of saline water. In 1980, the Forum adopted a policy to encourage the use of brackish and/or saline waters for industrial purposes where it is environmentally sound, and economically feasible. A third

policy dealing with intercepted ground water was adopted by the Forum in 1982. In 1988, the Forum adopted a fourth policy which addresses the salinity of water discharges from fish hatcheries.

Important components of the Plan of Implementation for salinity control are the Basin states' activities associated with the control of total dissolved solids through the National Pollutant Discharge Elimination System (NPDES) Permit program, and the water quality management plans. As previously indicated, the Forum approved needed changes to its NPDES policies on October 30, 2002. The original policy allowed for a waiver to be granted by the permitting agency if the proposed discharge of water contained less than a ton of salt per day. In recent years, concern has been expressed where new development of resources, most likely in the energy industry, could result in many point discharges that would total much more than a ton a day but would not total more than a ton at any one discharge point. An example of this type of development is the growing coal bed methane industry where in discreet areas hundreds of wells are proposed. The Forum created a Policy Committee and that committee presented to the Forum on June 5, 2002 proposed policy changes. After undergoing public review, various revisions were made to the policy by the committee. The Forum accepted the committee's report and approved the policy on NPDES discharges at its October 30, 2002 meeting. The newly adopted policy is included in Appendix B.

Each of the states has adopted the Forum policies presented in Appendix B. A listing of the NPDES permits in force within the Colorado River Basin are presented in Appendix C. During the period of this review, the status of implementation of the NPDES permits and the water quality management plans in each of the states is as follows:

Arizona

NPDES Permits

The NPDES Program is currently administered by the EPA in Arizona, however, the Arizona Department of Environmental Quality has submitted a program primacy package to EPA Region IX and anticipates receiving the program delegation on July 1, 2002. Until full program delegation, the permitting workload is shared between the two agencies, each drafting permits which are then issued by EPA. EPA is responsible for issuance of all permits on tribal lands, including the Navajo Nation, who like the State, assist EPA in drafting permits. The State and EPA follow Forum policy in the administration of the NPDES Program.

There are currently 58 NPDES permits in the Colorado River Basin portion of the state. Nineteen of the facilities are on tribal lands: 17 are municipal wastewater discharges or water treatment plants; 3 are major facilities. The two industrial discharges, Peabody Coal Company and Energy Fuels, are both on the Navajo Nation lands and are "major" facilities with numerous outfalls. There are 37 non-tribal facilities in the basin: 8 industrial (1 major); one national fish hatchery and 28 municipal systems, of which 5 are majors. Many of the facilities discharge to ephemeral drainages many miles from the river.

Water Quality Management Planning

The Northern Arizona Council of Governments (NACOG) is the designated planning agency for the Colorado River and its tributaries in the northeast and north-central portions of the state. Along the lower mainstem of the river, Mohave, La Paz and Yuma counties, have each been delegated the planning responsibilities for their areas. NACOG and the three counties along the mainstem of the river are experiencing tremendous residential growth and have also been targeted for development of merchant power plants. With the delegation, each county must prepare and maintain a water quality management plan that addresses both point and nonpoint sources of pollution. The plans encourage local control and the voluntary use of Best Management Practices to reduce nonpoint source pollution. As the plans are updated, the State is encouraging inclusion of salinity control issues and the importance of working cooperatively with the Salinity Control Forum in implementing its policies.

To support both the Forum goals for a basinwide approach to salinity control and to ensure compliance with the numeric criteria set for the river through the NPDES Program, in the 2002 Review of its surface water quality standards, Arizona has adopted the Forum's Plan of Implementation contained in the "1999 Review of Water Quality Standards." Another key change in Arizona's water quality standards is the proposed repeal of the turbidity standard in favor of a Suspended Sediment Concentration (SSC) standard coupled with a narrative bottom deposit standard. The State's research has shown that the existing turbidity standard is not a good predictor of impacts to aquatic life in southwest arid environments and has proposed to replace that standard with a numeric standard for SSC and the narrative standard which includes implementation procedures.

Over half of the waters on the State's 1998 303(d) list are listed for turbidity and coliform bacteria. Nearly all of the watersheds on non-tribal lands within the Colorado River Basin have been assessed as Category 1 watersheds under the Clean Water Action Plan, Unified Watershed Assessment (UWA). The goal of the State's Nonpoint Source Management Program, developed pursuant to Section 319 of the Clean Water Act, is to develop and implement a program which will reduce human-induced pollutants from nonpoint sources from entering surface and groundwaters. Arizona's program has been in place for over a decade and steady progress is being made in identifying, controlling and abating Nonpoint Source (NPS) pollution from various activities. In support of the program, the State has entered into cooperative agreements with other state and federal land and resource management agencies to carry out portions of the NPS plan on their lands. The State will update its NPS Management Plan in FY03.

Section 319 also provides federal grants for demonstration projects which are reviewed by ADEQ for consistency with the NPS Plan. The State has recently revamped the Water Quality Improvement Grant Program to facilitate the funding of Section 319 eligible projects to improve water quality including projects such as well plugging, salinity control impoundments, and rangeland management.

Other Activities

Arizona continues to support a basinwide approach to salinity control through its participation in the Colorado River Salinity Control Forum and the Advisory Council. In addition to the Water Quality Improvement Grant Program, the State has recently amended the State Revolving Fund rules to allow use of funds for NPS projects consistent with the State's NPS Plan, including salinity control projects.

ADEQ has taken a lead role in the Colorado River Source Water Assessment Project which involves the seven Basin states developing and implementing an interstate source water plan to protect and sustain safe drinking water quality for the border states along the River. The primary goal of the project is to provide a common approach to delineate the watershed along the Colorado River and define the process for determining those land use activities that may impact the river. A secondary goal is to provide a forum for these states to meet, discuss issues and exchange information related to source water assessment and protection.

California

NPDES Permits

The California Regional Water Quality Control Board, Colorado River Basin Region (Regional Board), issues the NPDES permits for navigable waters and Waste Discharge Requirements for land discharges within the Colorado River drainage portion of the state. In issuing and reissuing waste discharge requirements, the Regional Board complies with all Forum policies. In addition, the Regional Board has included in the discharge permit requirements for land discharges, a prohibition against brine backwash from water softeners into evapo-percolation ponds which overlie ground waters which are in hydraulic continuity with the Colorado River System. Industrial discharges are to be confined in impervious evaporation basins.

Water Quality Management Planning

The Water Quality Control Plan for the Colorado River Basin was adopted by the Regional Board in November 1993. Following public hearings, the updated plan was adopted by the Regional Board and approved by the State Water Resources Control Board in February 1994. The revised plan became effective upon approval of the Office of Administrative Law in August 1994. The salinity control component of the Water Quality Control Plan is consistent with the Forum's Plan of Implementation for salinity control. The Regional Board is working with local entities and the Colorado River Board of California to ensure that implementation of the water quality plan is achieved.

The Colorado River Basin Regional Board initiated a Triennial Review of the Water Quality Control Plan in September 2001. The purpose of this review is to reaffirm and/or revise water quality objectives and beneficial uses for ground and surface waters, and evaluate the adequacy of the Basin Plan for protecting water quality. Several projects that require Basin Plan amendments are

underway and include Total Maximum Daily Loads (TMDL) for the Salton Sea, New and Alamo Rivers, and localized septic tank prohibitions.

Other Activities

State Water Resources Control Board policy 75-58 established priorities for the use of poor quality waters for cooling of inland power plants, and has been in effect since 1975. The State Water Resources Control Board has included salinity control in the Colorado River among its top priority items.

Colorado

NPDES Permits

The NPDES permit program has been delegated to the State of Colorado by the EPA since 1978. The Water Quality Control Division ("WQCD") of the Colorado Department of Public Health and Environment administers the NPDES program in Colorado. The Water Quality Control Commission ("WQCC") has adopted regulations which reflect all of the current Forum policies for implementation of the Colorado River Salinity Standards. Permits issued for discharges tributary to the Colorado River require compliance with these regulations and monitoring of discharged salt loads. Consistent with the Forum's policies, industrial and municipal permittees who cannot meet the no salt discharge objective of those policies, and do not otherwise qualify for a waiver of the objective, are required to conduct studies to demonstrate that meeting these standards is not practicable. The State of Colorado administers far more NPDES permits in the Colorado River Basin than any other Basin state. As of December 31, 2001, there were approximately 370 NPDES permits in the Colorado River Basin portion of the state, of which 44% were for domestic or municipal dischargers and 56% were for industrial facilities (which category includes discharges from municipal potable water treatment plants).

Water Quality Management Planning

Pursuant to Section 319 of the Clean Water Act, Colorado has developed a "Nonpoint Source Assessment Report" ("NSAR") which identifies stream segments impacted by nonpoint source pollution. The report recognized the impacts caused by salinity from nonpoint sources on several stream segments and principally attributed the elevated salinity levels in those segments to agricultural activities (i.e. irrigation and soil erosion due to grazing). It further recognized the significance of the salinity control efforts which have been made pursuant to the Colorado River Basin Salinity Control Act. The assessment report also recognized the need for development of best management practices (BMPs) to control nonpoint source pollution, and a handbook of BMPs was prepared. This information is included in the biennial Section 305(b) (of the CWA) report, "Status of Water Quality in Colorado". The "Colorado Nonpoint Source Management Program", completed by the State and approved by EPA, is intended to provide an implementation strategy for the future treatment of water quality problems identified in the NSAR. The program sets forth the roles and responsibilities of the various parties responsible for implementing the nonpoint source program in Colorado. The program includes: a priority system for reviewing, ranking and recommending

nonpoint source control projects for funding and BMP's that can be utilized to achieve water quality objectives. The program has been updated to include EPA's "9-Key Elements".

In the Colorado River Basin of Colorado there are four water quality planning regions. Region 9 covers primarily the San Juan Basin portion of Colorado. Salinity control projects in this area include McElmo Creek and portions of the Dolores Project. The Region 10 plan covers primarily the Gunnison and Dolores River Basins. Salinity control projects in this region include the Lower Gunnison and Paradox Valley units. Region 11 includes the Colorado main stem below Dotsero, and the lower reaches of the White and Yampa Rivers. Salinity control projects in this region are the Grand Valley and Meeker Dome units. Region 12 is comprised primarily of the high mountain headwaters of the Colorado River and produces little salt loading to the river system. Regional plans direct salinity control efforts towards control of point sources and local control of nonpoint sources in the form of urban runoff restrictions and contain lists of stream classifications and the NPDES permits within each area. Opportunities for salinity control have been identified in the management plans for all areas of the Colorado River Basin within Colorado. Critical salt yielding areas have been assessed by the USDA, the Colorado Soil Conservation Board, the local soil conservation districts, and in some cases the Bureau of Land Management. The USDA's Natural Resources Conservation Service and the WQCD's staff cooperated in preparing a Unified Watershed Assessment which identified watersheds to be targeted for water quality improvement projects. All of the high salinity load contributing watersheds in western Colorado were assigned the highest priority for the use of additional funds made available to the Nonpoint Source Program established by Section 319 of the CWA.

Other Activities

Colorado has continued its support of the basinwide approach to salinity control through its participation in the Colorado River Basin Salinity Control Forum and active promotion of participation in salinity control projects by local water users. The Colorado Water Conservation Board has been assisting Reclamation in refining and improving the data in the new CRSS model. The Colorado Soil Conservation Board (CSCB), with support from other state agencies, is continuing its work with the NRCS, FSA and local soil conservation districts, as appropriate, to direct available federal soil conservation programs towards improvement of on-farm irrigation practices and to identify additional areas for program implementation. The salinity control benefits of improved practices are one of the reasons for this effort. Since 1997 the CSCB has managed a program for the Forum that provides for the cost-sharing required for salinity control provided through the USDA EQIP.

Selenium, a naturally occurring element that is essential in trace amounts, and yet toxic to fish and birds at slightly higher concentrations, is liberated by the same processes which load salt to the river systems. The Colorado Nonpoint Source Council has funded a Clean Water Act Section 319 grant to target selenium loading in the Gunnison and Uncompahgre Valleys, with the goal of reducing the selenium load. Selenium Task Forces have been formed in both the Gunnison/Uncompahgre and Grand Valley Basins to address selenium at the local level to facilitate meeting state water quality standards in the Uncompahgre, Gunnison, and Colorado Rivers and associated tributaries. The National Irrigation Water Quality Program (NIWQP), a Department of

Interior program comprised of representatives from the USBR, USFWS, USGS and BIA has been charged with identifying and remediating selenium loading as a result of the construction and operation of Federal irrigation projects. Two USBR projects, the Grand Valley and Lower Gunnison units have been identified by the NIWQP as contributing more than 50% of the total selenium load to the upper Colorado River Basin.

In 2000, a demonstration project placed 7.5 miles of earthen canals into piped laterals within the Lower Gunnison unit in an area identified as Montrose Arroyo. This demonstration project was built using a cost share of 44% of the total cost of the project provided by the NIWQP and Uncompahgre Valley Water Users Association (UVWUA) thereby, "buying down" the portion provided by the USBR's cost competitive salinity control program. Prior to construction of the project comprehensive baseline data were gathered to determine existing salinity and selenium loads emanating from the basin. Once the project was completed, extensive monitoring was instituted to quantify the amount of selenium and salt loading reduction. The first year's data showed a 28% decrease in downstream selenium loading and a 16% decrease in salinity loading (USGS Water Resources Investigation Report 01-4204, 2001). Selenium and salt loading from the basin is continuing to be monitored to determine long term effects. In addition, all wildlife habitat that was lost due to the reduction in seepage from the canals was replaced in kind as a portion of the cost of this project.

Due to the success of this demonstration project the UVWUA has put in a request through the Energy and Water Appropriations Bill for the Departmental Irrigation Drainage Program to provide \$750,000 to initiate and continue remediation of selenium loading from Federal irrigation projects in the Lower Gunnison River Basin. This proposal, if funded, will be part of a ten year 15 million dollar cooperative effort between the USBR Salinity Control Program, UVWUA and the NIWQP to aggressively reduce selenium loads within the Lower Gunnison River Basin, with benefits realized locally and downstream into the Lower Basin.

Nevada

NPDES Permits

EPA has delegated the Nevada Division of Environmental Protection (NDEP) authority to issue NPDES Permits. The industrial companies located at the Basic Management, Inc. (BMI) complex have eliminated industrial wastewater discharges to the Las Vegas Wash. The companies now pipe wastewater to lined evaporation ponds. Two of the companies have been issued permits which allow discharge of cooling water to Las Vegas Wash with a limit of no more than 75 mg/L TDS greater than the water supply. Another company has been issued a permit which allows discharge of surface stormwater runoff.

In the past, the Nevada Power Company discharged brackish cooling water from both the Clark and Sunrise Power Plants into the Las Vegas Wash. Permits now prohibit such discharges and the Company treats and recycles water for further cooling before final disposition into lined evaporation ponds. The new recycling process has reduced the cooling water requirement by about 75 percent.

The City of Las Vegas (CLV), Clark County Sanitation District (CCSD), and the City of Henderson (COH) were issued new discharge permits in July, 2001. The permits allow a flow up to 91 million gallons per day (MGD) for the CLV, 110 MGD for the CCSD and 42.5 MGD for the COH. The new permits continue the standards from the previous permits including Waste Load Allocations (WLA), for total phosphorus and total ammonia, whole effluent toxicity testing, chlorine residual limits, and an ambient monitoring program in Las Vegas Wash and Las Vegas Bay. The WLA for total phosphorus will apply from March through October and ammonia from April through September. The WLA does not apply to other periods of the year. The existing and proposed NPDES permits recognize that the WLA is based upon each Las Vegas Valley discharger's proportionate share of flow as approved by NDEP and agreed to by each Las Vegas Valley discharger.

Both the CLV and CCSD continue providing reclaimed water from their central treatment facilities. The CLV and the Las Vegas Valley Water District (LVVWD) completed a jointly owned 10 MGD satellite reclamation and distribution facility in 2001, and the CCSD and LVVWD will complete another jointly owned 5 MGD (expandable to 10 MGD) satellite reclamation and distribution facility in 2002. Both of these facilities will provide reclaimed water for turf irrigation.

The CCSD makes direct discharge of part of Laughlin's wastewater effluent into the Colorado River, and reuses the remainder on the local golf course. The CCSD estimates that by the year 2003, Laughlin, a resort area located adjacent to the Colorado River, will have 4,000 acre-feet per year of treated effluent available, of which 550 acre-feet per year will be reused, with the remaining 3,450 acre-feet per year being returned to the Colorado River for credit. An NPDES permit has been issued. The quality of the waters affected by this permit will be closely monitored and all necessary programs to protect water quality standards will be implemented.

Nevada is continuing to apply the policies adopted by the Forum.

Water Quality Management Planning

After passage of Senate bill 468 by the Nevada State Legislature in May 1975, area-wide water quality management planning duties and power were vested to certain counties. The Clark County Board of Commissioners (BCC) was designated the Area-Wide Water Quality Management Planning organization within Clark County. The initial 208 Water Quality Management Plan (208 Plan) was adopted by the BCC in 1978 and was approved by the EPA.

In 1997, the BCC adopted the Las Vegas Valley 208 Water Quality Management Plan Amendment. The Las Vegas Valley 208 amendment included updates to planning area boundaries, wastewater flow projections, reclaimed water demands, nonpoint source management, Las Vegas Wash Wetlands planning, integrated planning coordination, and overall water quality planning.

The main purpose of this 208 Plan Amendment is to:

- Revise the 1990 208 Plan Amendment
- Include effects of sustained regional growth and development

- Revise stormwater permitting to a more inclusive nonpoint section
- Provide water quality planning to a horizon year of 2020

Update aspects of the plan include the planning area boundaries, wastewater flow projections, reclaimed water demands, nonpoint source management, Las Vegas Wash Wetlands planning, integrated planning coordination, and overall water quality planning. The Las Vegas Valley 208 Water Quality Management Plan Amendment was further updated in 2002 to include the Areawide Reuse Study, and the Comprehensive Adaptive Management Plan for the Las Vegas Wash.

Clark County adopted the Northeast Clark County 208 Water Quality Management Plan in June, 2000. The amendment area is located in the northeast area of the county including the communities of Bunkerville, Logandale, Overton, Moapa and Moapa Valley, and the City of Mesquite. Two rivers are located in the area, the Muddy and Virgin Rivers. The Virgin River is currently listed on the State's 303d list. Both rivers have aquatic endangered species and drain into Lake Mead.

On December 17, 1998, the Southern Nevada Strategic Planning Authority (Authority) adopted a strategic plan for southern Nevada. The Authority was created in the 1998 State of Nevada legislative session. The Authority's task is to develop objectives and strategies to address growth related issues such as wastewater and water quality. The plan will be passed on to the 1999 legislative session.

Expansions of the CCSD and CLV wastewater treatment facilities are underway in accordance with approved 201 facilities plans. Industrial pre-treatment permits are being required by the CCSD for reverse osmosis treatment of shallow groundwater and on-site treated gray water to be used by the Mirage/Treasure Island development in its landscaping and decorative water features. This represents a new beneficial use of shallow saline ground water which is pumped for dewatering around building foundations. Local government entities within urban Clark County are also participants in the NPDES Stormwater Quality Management Committee to identify and implement measures to meet State stormwater permitting requirements. Future 208 amendments are expected to address gray water issues and shallow ground water issues, to update population projects, and to incorporate BMPs identified in the stormwater permit for the Las Vegas area entities.

In June 1998, the State Environmental Commission adopted revised water quality standards for the Las Vegas Wash and Lake Mead. The revision were based on data collected from 1991 through 1996 and include changes to total dissolved solids (TDS) requirements to maintain higher quality (RMHQs). RMHQs are established when the existing water quality is better than the criteria necessary to protect the beneficial uses. For the upper Las Vegas Wash, the TDS RMHQ was lowered from 2,300 mg/l to 1,900 mg/l; and for the lower Las Vegas Wash, the TDS RMHQ was lowered from 2,600 mg/l to 2,400 mg/l. The lower TDS concentrations seen in the Las Vegas Wash in recent years most likely results from dilution of the saline groundwater which discharges to the Wash by the increasing, but relatively low TDS flows discharged from the wastewater treatment plants.

Facilities Plans

The City of Henderson recently completed a Facility Plan which defines various stages of wastewater treatment expansion to address growth and potential changes in regulatory requirements. The existing Water Reclamation Facility was upgraded to 20 MGD in 1998 and will be expanded to 30 MGD by 2002. The Facility will have the capability of discharging to the Las Vegas Wash on a year-round basis. However, the City will continue to encourage the use of reclaimed water and will continue to use the existing rapid infiltration basins as a means of disposal.

The CCSD is nearing completion of expanding its treatment facilities to a capacity of 110 MGD. The expanded facility will continue to use biological nutrient removal processes to remove phosphorus and nitrogen. Advanced treatment consists of additional filters and ultraviolet light disinfection.

The capacity of the City of Las Vegas' treatment plant is 66 MGD. The treatment plant provides secondary treatment, phosphorus removal, and nitrification to remove ammonia. The treatment facility treats the flows of both the Cities of Las Vegas and North Las Vegas. Construction permit applications are pending for expansion to 91 MGD.

The three entities, CLV, CCSD, and COH have joined together to form the Clean Water Coalition, and in 1998, began the Alternate Discharge Study, which is an effort to find alternative methods for disposal of increasing amounts of reclaimed wastewater back to the Colorado River System to insure return flow credits for Nevada while also insuring the environmental standards are met. The study, which has a 30 year planning horizon, has resulted in a number of options including improved treatment processes, pipelines to new locations and diffusers in Lake Mead or the Colorado River, which are currently under study and environmental review.

Other Activities

A program has been developed by CCSD, CLV, and CNLV to coordinate investigate, and encourage the implementation of management practices resulting in reduction of wastewater salinity. The principal emphasis of this program will be directed toward salinity control to meet the requirements of the NPDES permits issued to Clark County, the City of Las Vegas, and Henderson.

New Mexico

NPDES Permits

Authority for issuing permits has not been delegated to the state of New Mexico. Currently, the program is being administered by EPA, Region VI, except for facilities located on the Navajo Indian Reservation, which are administered by Region IX. EPA is following Forum policy in the administration of the permit program. All new or renewed discharge permits contain language requiring the permittee to adhere to Forum policy regarding salt discharges.

In the Colorado River Basin within the state, the following permits have been issued:

- a. Industrial permits: electric power generation (3), coal mines (6), uranium mines (3), sand and gravel operations (3), small domestic sewage treatment plants (3), small process water treatment facility (2), and a drinking water treatment plant (1).
- b. Municipal discharge permits: major sewage treatment plants (3) minor sewage treatment plants (2), and federal/Indian wastewater facilities (11).

Water Quality Management Planning

Work elements of the State of New Mexico Water Quality Management Plan (NMWQMP) and the New Mexico Nonpoint Source Management Plan (NPSMP) applicable to the Colorado River Basin are stream bottom deposits and sediment control from many different sources, including hydromodification, silviculture and irrigated agriculture. The New Mexico Water Quality Control Commission is required to approve and adopt the NMWQMP's for New Mexico. The initial Plan was adopted in two parts in October 1978 and May 1979. The most recent update to the NMWQMP was adopted in 1991. The most recent update of the NPSMP was in December 1999. Both plans recognize the importance of working cooperatively with the Colorado River Basin Salinity Control Forum.

The NMWQMP and the NPSMP cover the entire state except for that portion of the Navajo Reservation lying therein. Planning within the reservation is the responsibility of the Navajo Tribe. Much of the Colorado River Basin in New Mexico is within the reservation.

Both plans encourage the voluntary use of BMPs to control or reduce nonpoint source pollution. The NMWQMP currently designates the San Juan River Basin in New Mexico as one of the four priority basins for implementation of sediment control. Water quality segments 2405 and 2401 of the San Juan River are both listed on the State's 1998-2000 Section 303(d) list of impaired waters for stream bottom deposits, and for turbidity and fecal coliform respectively. Segments 2403 and 2404 of the Animas River are currently listed on the Section 303(d) list for stream bottom deposits. The San Juan River Basin is scheduled for an intensive water quality survey and possible Total Maximum Daily Load development by December 31, 2004 under a federal court order Consent decree stemming from the case of Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, U.S. Environmental Protection Agency, Civil Action No. 96-0826 LH/LHF. The San Juan Basin and its tributaries are also a Category 1 watershed under the Clean Water Action Plan, Unified Watershed Assessment (UWA). The UWA prioritizes the use of certain 319(h) monies and State Revolving Load Fund monies (SRF) toward the implementation of Nonpoint Source Management Projects in the various priority watersheds.

The NMWQMP includes designated management agencies responsible for implementation of the nonpoint source control programs set forth therein. The agencies designated for portions of New Mexico lying within the Colorado River Basin are:

- New Mexico Forestry Division for silviculture;

- New Mexico State Highway Department, New Mexico State Park and Recreation Division, and Jicarilla Apache Tribe for rural road construction and maintenance;
- New Mexico State Land Office and U.S. Bureau of Land Management for sediment control;
- U.S. Forest Service for sediment control, rural road construction and maintenance, and silviculture, and;
- U.S. Bureau of Indian Affairs for sediment control, rural road construction and maintenance, silviculture, and irrigated agriculture.

Additional management strategies used to control nonpoint source pollution were developed by the State under Section 319 of the 1987 Amendment to the federal Clean Water Act. Section 319 required each state to develop an assessment of its nonpoint source impacted waters and a management plan for controlling pollution from these sources (NPSMP). Both the assessment and the management program have been approved by EPA. The goal of the NPSMP is to develop and implement a program which will reduce human-induced pollutants from nonpoint sources entering surface and ground waters. The New Mexico Nonpoint Source Pollution Management Program has been in effect for nine years. The State is making steady progress in identifying, controlling and abating existing nonpoint source pollution problems, and in preventing additional nonpoint source concerns. Several State and federal land management agencies listed in the NMWQMP, such as the U.S. Forest Service, BLM, and the State Land Office, are participating, along with many other federal, State and Local agencies, in nonpoint source activities.

Other Activities

The State of New Mexico, through the Colorado River Basin Salinity Control Advisory Council and the New Mexico Water Quality Control Commission, supports the Colorado River Basin Salinity Control Program, and passed a motion in January, 1999, to support projects using State Revolving Loan Funds (Sec. 201 of the Clean Water Act) (SRF) and other funds. State actions include: (1) support of federal legislation including appropriations to implement the program, (2) inclusion of salinity control measures in the Section 208 plans, (3) dissemination of information on salinity sources and control measures to the water users and the public in the Colorado River Basin area of the state, (4) consultation with industries on potential salinity reduction measures, (5) implementation of Forum policy through existing legal and institutional mechanisms, e.g. NPDES permits, (6) providing matching funds to support the USGS water quality data collection program in the Colorado River Basin portion of the state, and (7) maintaining a continuous water quality planning program whereby new or additional salinity control measures can be addressed. A decrease in funding for item (6) above has caused a reduction in this program since 1986.

Utah

NPDES Permits

The Utah Division of Water Quality administers the discharge permit program. The State has the responsibility for issuance and compliance for all new permits and permit renewal applications received since July 7, 1987.

Thirty-seven discharge permits are in effect for industrial facilities in the Utah portion of the Colorado River Basin. Most of the permits are for facilities with no discharge, or for discharge of intercepted ground water from mining operations in accordance with Forum policy. Additional storm water permits have been issued for construction activities.

There are 16 (number to updated) active permits for municipal treatment facilities in the Colorado River Basin of Utah.

Water Quality Management Planning

Water quality management plans pursuant to section 208 of the Clean Water Act for the Uinta Basin, Southeastern Utah, and Wayne County certified by the State and approved by the EPA are in place, and portions of these plans have been implemented.

Other Activities

Utah's Nonpoint Source Management Plan was approved by EPA on September 15, 2000. The plan contains Utah's strategy for the control of nonpoint source pollution in the state. Utah has relied on USDA Natural Resource Conservation Service EQIP funds and Reclamation salinity control funding to implement salinity control projects in the Colorado River Basin.

Major construction of irrigation improvements for salinity control continues in the Price River and San Rafael River Drainages and the Uinta Basin. The principle funding source for the off-farm conveyance and distribution systems of these projects is Reclamation's Basinwide Program. The on-farm projects use EQIP funding along with local cost-share. The local cost-share for both programs is generally a combination of landowner monies and state program monies. Utah operates a low interest loan program which provides funding for soil and water conservation and water quality improvement practices for farms. Utah has committed a substantial amount of funding through this program to irrigation improvement projects which provide salinity reduction from on-farm sources. This program operates under the guidance of the Soil Conservation Commission and local soil conservation districts. In addition, low interest loans are available to irrigation companies from the Board of Water Resources for the improvement of irrigation transmission and delivery systems. These improvements increase efficiency and decrease seepage losses, thereby contributing less deep percolation water for salt loading to the Colorado River system.

Wyoming

NPDES Permits

The Wyoming Department of Environmental Quality, Water Quality Division administers the NPDES Program within the boundaries of the State of Wyoming. The Forum's "Policy for Implementation of Colorado River Salinity Standards through the NPDES Permit Program" is used and followed to evaluate industrial and municipal discharges. A total of forty-three active NPDES permits are associated with facilities in the Wyoming portion of the Colorado River Basin.

There are currently 24 active NPDES permits issued to industrial facilities located in the Wyoming portion of the Colorado River Basin. The primary industrial source of salinity in the Green River Basin introduced through a point-source discharge is Pacificorp's Naughton Plant which discharges approximately six tons of salt per day into a tributary of the Green River. The permit for this facility was issued on the basis that it was not "practicable" to implement the Forum policy of no discharge of salt from industrial sources, following a decision based upon a comparison of the costs of removing salt and downstream benefits associated with eliminating the discharge. The current permit, due to expire on July 31, 2003, requires the benefit/cost analysis to be reevaluated and resubmitted by July 31, 2001. However, as of the date of this report, this analysis has not been submitted and the DEQ will contact the facility requesting this information.

Two industrial permits, issued to the Wyoming Game and Fish Department have not submitted water quality data for total dissolved solids. Monitoring for the total dissolved solids concentrations is a requirement of the permit and the DEQ will contact the operator to gather this data. Discharges from these facilities will be evaluated in greater detail to determine compliance with the policy, and, if necessary, the permits may be modified such that policy compliance is achieved. The remaining industrial facilities are in compliance with the policy, have not discharged during the reporting period, or have permits that were allowed to expire. Several permits do not currently require TDS monitoring. These permits will be modified to incorporate monitoring necessary to assess compliance with Forum policy as the permits are renewed.

Nineteen permits are associated with domestic wastewater effluents. These permitted facilities serve a population of approximately 44,000. Of this total population, 33,000 are in Rock Springs and Green River. The wastewater treatment plant discharges at Rock Springs and Kemmerer/Diamondville are out of compliance with the policy in that their incremental increases are 433 mg/l and 600 mg/l respectively. The total population associated with these towns are 20,000 in Rock Springs, and 3900 in Kemmerer/Diamondville. The average flow volumes contributed to the system are 2.31 and 0.37 MGD respectively. For these permits, when the permits are renewed the DEQ will work with the municipalities to determine the feasibility of reducing TDS in conformance with the Forum policies.

Four permits (Fort Bridger Sewer District, Regency of Wyoming, LaBarge, and Mountain View) contain compliance schedules requiring the operator to submit an analysis of the ability to comply with the Forum policies. These reports were not required to be submitted this reporting period but will be evaluated in the future. There were several other permits that do not require monitoring for TDS. At the time of each permit renewal, DEQ will re-assess whether monitoring is necessary to assess compliance with Forum policy.

Water Quality Management Planning

The Water Quality Management Planning and Nonpoint Source Implementation Programs in Wyoming are under the direction of the Water Quality Division of the Department of Environmental Quality. The Clean Water Report for Southwestern Wyoming addressed water quality in Lincoln, Uinta and Sweetwater Counties. This report was adopted at the local level, certified by the Governor and conditionally approved by the EPA on October 9, 1980. The

Governor's certification recognized a salinity control program for the Green River Basin as a major water quality priority. The State strongly supports the ongoing USDA-initiated salinity control effort on the Big Sandy River Unit.

The Statewide Water Quality Management Plan establishes an institutional framework under which planning and implementation activities can proceed in Wyoming. Implementation of most aspects of the program depends on the availability of funds and the acceptance of responsibilities by the designated management agencies. The Wyoming Statewide Water Quality Management Plan is amended regularly through adoption of the triennial review.

After three years of effort, beginning in March, 1998 and final adoption in July, 2001, the Water Quality Division has established new water quality standards affecting all surface waters in the State. The surface water standards are contained in Chapter 1 of the Water Quality Rules and Regulations.

The new standards are substantially different than the rules that have been in effect since 1990. There are only a few sections of Chapter 1 that remain unchanged and four new sections have been added. In most instances, the revisions do not reflect a change in the philosophy or direction of the surface water program but have been made to clarify and enhance the meaning and application of the rules. The numeric criteria for toxic pollutants have all been updated to the nationally recommended 304(a) criteria, published by EPA in April, 1999.

Some of the modifications, however, are profound and will have a substantial effect in how the department assesses and regulates surface water quality. The most important of these are the revisions of the water classification approach and how protected uses are designated on individual waters. Because classifications are so basic to how a water is regulated, changes in water class affect both the criteria and regulatory procedures that apply to that water. Wyoming continues to support the salinity standards established by the Colorado Basin Salinity Forum and incorporates the Forum's numeric standards and implementation plans into its overall program. There were no changes made for salinity measures in the revised standards.

The last approved Wyoming 303(d) list of waters requiring the development of TMDLs was published in April, 1998. A total of 17 stream segments in the Colorado Basin appeared on that list. Only 2 streams in the Colorado drainage were listed with credible impairments and neither were salinity related. Exceedences of the pH standard were found on the Hams Fork River near Kemmerer and Haggerty Creek in the Little Snake Basin was listed for impairments associated with past hard rock mining activities. A draft 2002 list was published for public review in January 2002 and will be finalized and submitted to EPA for approval later in the year. In addition to the Hams Fork and Haggerty Creek, five new streams are proposed for priority listing. These include:

Bitter Creek, a tributary to the Green River, drains a large arid area (an outlying part of the Red Desert) in the eastern portion of the watershed, including a western fringe area of the Red Desert basin. Monitoring conducted by DEQ in 1998 on Bitter Creek near Rock Springs and a tributary, Killpecker Creek, indicates that both these streams are impaired for recreational use due to elevated fecal coliform bacteria counts. Bitter Creek is classified as a non-game fishery (Class 2C). A fish

kill was noted on Bitter Creek during sampling in 1998. Chloride samples collected by DEQ indicate that Bitter Creek below Killpecker Creek is partially impaired for its non-game fishery use due to chloride concentrations above the standard of 230 mg/L. Chloride has been added as a cause of impairment on the 303(d) List. Diurnal oxygen fluctuations and habitat degradation are also concerns on these streams.

The Blacks Fork from its confluence with the Hams Fork upstream to an undetermined point above the Smiths Fork is proposed for impairment of contact recreation uses due to exceedences of the standard for fecal coliform bacteria. The source of fecal contamination and the extent of contamination above and below the sample point is unknown at this time, so further monitoring will be planned to identify the sources. The Blacks Fork below the Granger WWTP has also been slated for re-evaluation of the TMDLs for ammonia, fecal coliform and chlorine associated with routine renewal of the discharge permit.

In the same area, the Smiths Fork is proposed for listing after DEQ monitoring determined the stream was only partially supporting its aquatic life uses as a Class 2 water due to loss of biological integrity and physical degradation of the stream. Smiths Fork from the confluence with the Blacks Fork upstream an undetermined distance is also proposed for listing because fecal coliform monitoring showed the stream was not meeting its use for contact recreation. Additionally, a reach of the Smiths Fork below the Mountain View WWTP is scheduled for a re-evaluation of the TMDLs for ammonia, fecal coliform and chlorine associated with routine renewal of the discharge permit.

Haggarty Creek is the site of an inactive copper mine, the Ferris-Haggarty/Osceola Tunnel, which dates from 1898. Haggarty Creek originates near the Continental Divide and confluences with Lost Creek to form West Fork Battle Creek. Haggarty Creek has been on past 303(d) lists due to metal exceedences (primarily copper with less toxic amounts of silver and cadmium) discharging from the Ferris-Haggarty Mine. Review of data during the TMDL process on Haggarty Creek revealed that copper standards are also exceeded on the West Fork of Battle Creek, downstream of Haggarty Creek, so this stream is proposed to be added as a priority on the 303(d) List.

In addition to the priority impairments mentioned above, there are a number of lower priority activities in the Green and Little Snake Basins to address various water quality issues. In the Green River Basin, Reardon Draw had a watershed improvement project in place to correct physical degradation of the stream channel, which reportedly was threatening aquatic life use support and impacting the Green River. Because there has not been a report documenting water quality improvements, the lower three miles of Reardon Draw is on Table C of the 303(d) List and the Green River below Reardon Draw has been scheduled for monitoring.

The East and West Fork of Smiths Fork, and Willow Creek above the Blacks Fork were placed on Table C of the 1998 303(d) List due to threats of aquatic life use support due to physical degradation of the stream channels. Currently, a Section 319 watershed improvement project is in place to improve the physical condition of the stream channels and riparian areas.

In the Little Snake Basin, recent monitoring indicates that aquatic life uses are fully supported on the portions of the Savery Creek and North Fork Little Snake drainages within the National Forest and much of the upper watershed of Little Savery Creek. However, physical degradation of lower Savery Creek and Loco Creek is threatening full aquatic life use support, and these streams are on Table C of the 303(d) List. Currently, a Section 319 watershed improvement project is in place in the lower Savery Creek drainage to address those threats.

The Upper Muddy Creek drainage currently has a Section 319 watershed improvement project in place to address threats from physical degradation of the stream channels and riparian areas. Muddy Creek below Littlefield Creek and McKinney Creek below Eagle Creek are listed on Table C of the 303(d) List. However, this project has resulted in considerable improvement to stream stability, aquatic habitat and riparian areas. As a result of this project, Muddy Creek and Littlefield Creek above their confluence, and McKinney Creek above Eagle Creek are now meeting their aquatic life uses. Because of the improved water quality, Colorado River Cutthroat Trout have been re-introduced into their former habitat in Littlefield Creek.

Another project was implemented on Muddy Creek, west of Highway 789, to address physical degradation of the stream channel, which threatens its aquatic life support. This reach of Muddy Creek is on Table C of the 303(d) List.

Other Activities

The Wyoming Nonpoint Source Management Plan was initially approved by EPA in September 1989. The Plan calls for a cooperative, voluntary approach in the implementation of BMP's targeted at water quality improvements. As with the Statewide Water Quality Management Plan, implementation hinges upon acceptance of responsibilities by designated management agencies and upon the availability of funding under Section 319. The State began a revision of the Nonpoint Source Management Plan in 1998 to conform to new EPA guidelines. The revised plan was completed and adopted in 2001.

Wyoming has experienced a boom in coal bed methane development over the past three years. Most of the activity is centered in the northeast quarter of the state in the Powder, Belle Fourche, Cheyenne, and Tongue River Basins, however, there remains a potential for similar development in the Green and Little Snake drainages. New salt loading to the Colorado River is a primary concern to the State as it reacts to proposals for exploratory development in that Basin. Wyoming is actively working with the other Basin states to develop innovative approaches and policies to ensure continued achievement of the goals of the Colorado Basin Salinity Control Program.