

# Salinity Update

January 1984

## Lower Gunnison Basin Unit- North Fork Area

Salinity control investigations are scheduled to begin in early 1984 on the North Fork area of the Lower Gunnison Basin Unit. The unit is located in west-central Colorado and its entire area encompasses the Lower Gunnison River drainage area downstream from the Black Canyon of the Gunnison National Monument and upstream from the confluence of the Gunnison and Uncompahgre Rivers near Delta.

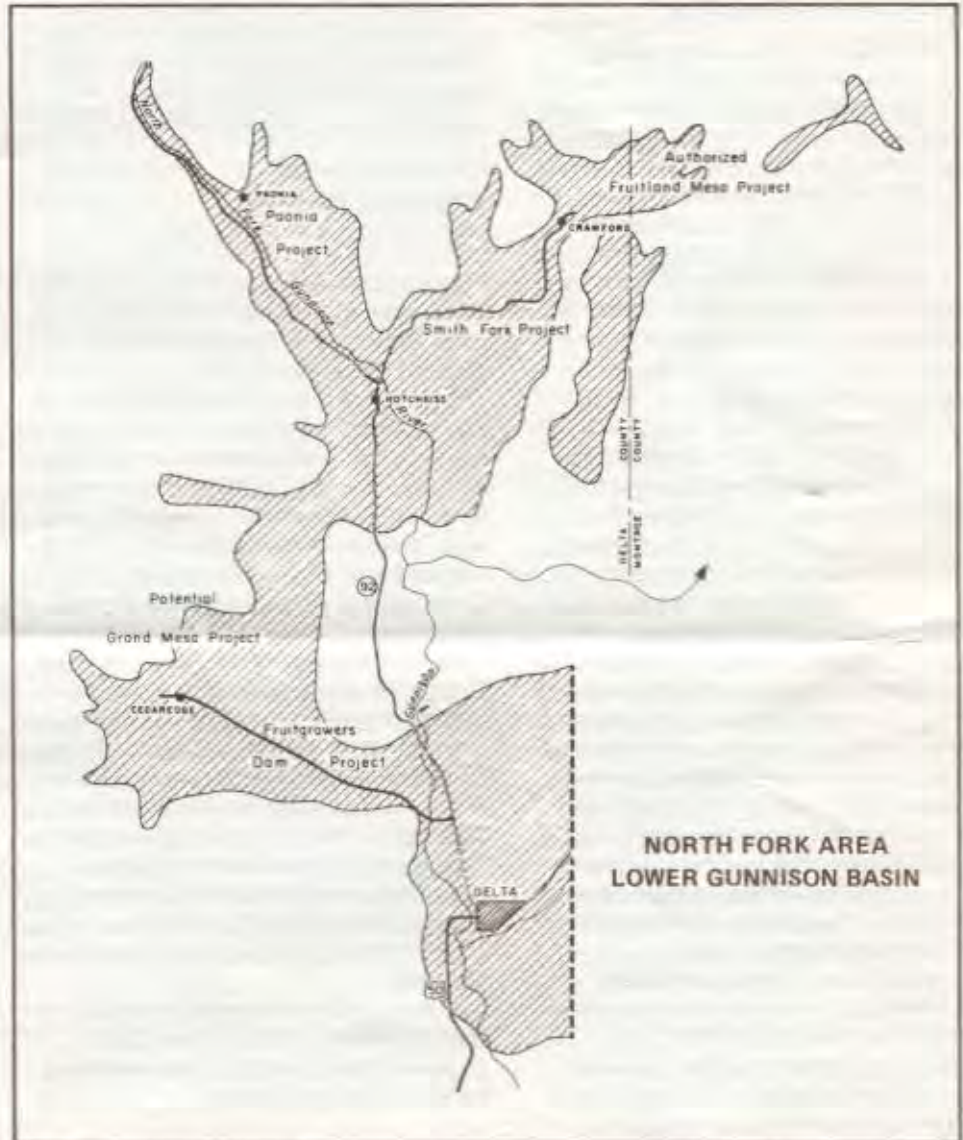
Planning studies on the Uncompahgre Valley portion of the Unit have been completed. Investigations on the North Fork area will be conducted separately under the authorizing legislation. The North Fork area consists of irrigated lands along the Gunnison River and North Fork of the Gunnison River within the boundaries of the North Fork, Smith Fork, Fruitland Mesa, and the Grand Mesa Water Conservancy Districts. The study will concentrate on identifying and quantifying the off-farm sources of salinity and formulating alternative solutions to diminish the salt loading to the river system.

A preferred alternative plan will be recommended based on cost-effectiveness and acceptability. Very little information is available on salinity as it relates to the private irrigation systems in the study area. The numerous natural drainages appear to receive maximum use for diversions and return flow. An inventory of the irrigation systems is expected to comprise a major part of the effort in the early stages of the study.

A plan of study is now underway which will generally set the course for the study and outline study procedures. The investigation is expected to take about 5 years.

The Soil Conservation Service (SCS) has completed a study of potential on-farm improvements in a 171,000-acre study area which encompassed both the North Fork and Uncompahgre Valley areas, and their recommendations are presented in a report entitled Potential for On-Farm Irrigation Improvements, September 1981.

The salinity problem is believed to stem from irrigation flows seeping through unlined canals and laterals, dissolving the primarily gypsum salts and eventually entering the



North Fork Gunnison River and consequently the Gunnison and Colorado Rivers.

## EPA Key Personnel

John Welles has been appointed Regional Administrator for Region VIII of the Environmental Protection Agency. Mr. Welles was Vice President for Planning and Public Affairs at the Colorado School of Mines. Previously, he was the head of the Industrial Economics Division at the University of Denver Research Institute and

has also worked for General Electric and General Motors. Mr. Welles served as a consultant to the UN Conference on the Human Environment and also chaired the Colorado Front Range Project.

Jack Ravan has been nominated to succeed Eric Eidsness as Administrator for Water Programs. Mr. Ravan has been director of project development for the Clean Water Group at Wheelabrator-Frye in Atlanta. He has been chairman of the Southeastern Basin Commission, and from 1971 to 1977, he was Regional Administrator for EPA Region IV (Atlanta).

## Solar-Powered Desalting Advancing

In a recent report prepared for the Department of Interior, Office of Water Research and Technology, the prospects of using solar-powered Electrodialysis for desalting remote brackish water sources were examined.

The major thrust of the study combines the established technologies of water desalting by electrodialysis (ED) and power generation by photovoltaic (PV) collectors to design a plant that can literally follow the sun and directly utilize available solar energy with minimum losses and storage requirements.

The ED-PV water treatment/supply system would benefit remote, small communities (fewer than 500 people) in the Southwest which have water in short supply or water of poor quality. The study estimated the potential for water desalting in the five state area and found 15,000 to 20,000 public water systems, each serving fewer than 500 people. Many communities were using brackish water or relying on bottled/trucked water sources. Some community water systems will have to install water treatment facilities to meet Safe Drinking Water Act requirements. Still other communities, particularly in New Mexico, do not have access to three-phase electrical power required for conventional water treatment/desalting plants.

In the Southwest, typical solar energy radiation ranges over a yearly average of 0.2 to 0.3 Kilowatts per square meter. The collected solar radiation can be converted directly into DC electrical power for ED plant use. Although the energy conversion efficiency of available PV collectors is only 10%, the ED plant can produce about 50,000 gallons of fresh water per year per square meter of collector from brackish water sources.

In specific study cases, water costs for ED-PV system were about \$7.00 per thousand gallons (\$1.85 per cubic meter) of fresh water; the costs included all capital, operation and maintenance, and well pumping costs for a brackish ground water source. While the costs do not yet look attractive to the typical large city dweller (with residential/municipal water costs of about \$1.00 per thousand gallons), they do offer

hope for remote communities. In certain applications where grid power is unavailable or where fuel costs exceed \$1.50 per gallon, the solar-powered desalting plant is expected to provide lower cost water today.

## Billhymer Retires

Paul L. Billhymer retired October 1, 1983, from the Upper Colorado River Commission after serving on the Commission for over 24 years. He served as Executive Director and Secretary since March 1980.

The Upper Colorado River Commission, at a special meeting in Denver, Colorado, on November 30, 1983, expressed its gratitude and appreciation for Mr. Billhymer's untiring service and wise counsel in solving the many legal, technical, and political problems which had confronted the Upper Colorado River Commission during his tenure as General Counsel and Executive Director.

Paul L. Billhymer utilized his experience as an attorney in private practice and in the State of New Mexico Attorney General's Office to advise the Upper Colorado River Commission both in general legal matters and in areas of particular concern to the Commission and the Upper Basin States. The Upper Colorado River Commission transmitted a copy of the Resolution of Upper Colorado River Commission honoring Paul L. Billhymer to Mr. and Mrs. Billhymer.

At the meeting on November 30, 1983, Gerald Zimmerman, the current Chief Engineer of the Commission, was selected as the new Executive Director.

## Salinity Control in the Corps

Major General H.G. Robinson, Division Engineer of the Southwestern Division, U.S. Army Corps of Engineers, Dallas, Texas, spoke to the participants at the International Symposium on State-of-the-Art Salinity Control in July as his last official conference presentation before retirement. Major Robinson related that Secretary of the Army Gianelli supports the salinity control effort in the Corps of Engineers.

The salt pollution to the Red River in Texas was 27,000 tons per day. The loading to the Arkansas River from natural sources was

14,000 tons per day. It was determined the Arkansas River project was not economical from a benefit/cost standpoint.

The Red River chloride control/water supply project could proceed; however the issue of cost-sharing had not been resolved.

## USDA Personnel

The Soil Conservation Service welcomes Mr. Frank Riggle as he joins the field office staff at Grand Junction, Colorado. Frank will direct the SCS's Onfarm Monitoring and Evaluation Program that is getting underway in the Grand Valley. His name may be familiar to some because Frank comes from the Uinta Basin Salinity Control Program in Utah, where he spent two years assisting the SCS Onfarm Implementation Program there. Frank's experience in the Uinta Basin plus his Master of Agriculture Degree, including a broad background in Forestry Resources, Soil Science and Fertility, Agronomy, and Agricultural Economics, will be a great asset to the SCS's Grand Valley Salinity Control Program.

Other honors that have to come to Frank include receiving the SCS's Superior Service Award in 1981 for his work on the Price, Utah, Soil Survey and helping the Roosevelt, Utah, Field Office receive a Unit Award for work done on the salinity control program there.

## EPA Salinity Study

EPA is examining a number of potential innovative approaches to water quality management; and salinity control in the Colorado River Basin has been selected as a case study.

The study will include an evaluation of the technical and managerial approaches for control of salinity from point and nonpoint sources. The concepts of banking, offsets, point/nonpoint trading, and trading between nonpoint sources will be evaluated; and subsidy and other economic incentives to increase the use of best management practices will also be examined.



Cross section of Paradox Valley showing deep salt formations.

## Paradox Valley Unit, CO

The brine disposal plan using deep well injection has been evaluated and is considered the most cost-effective disposal alternative. Specifications for construction of a deep well brine injection well were prepared based on information by a consultant.

Two independent consultants, hired to review the specifications, advised against proceeding. They determined the specifications prepared by the contractor to be technically inadequate and did not take into account problems encountered in deep well drilling through 14,000 feet of fluid type salt formations which cause excessively high pressures.

Based on their recommendations, alternative deep well sites will be selected where the Paradox brine could be pumped into a formation at 9,000 feet or less. By January 1984, Reclamation will obtain geophysical data and investigate alternative injection locations.

A new engineering consultant will be hired to redesign a new deep well disposal system and prepare construction specifications. The changes in schedule will delay contract award by at least 14 months, to March 1985. This will also delay the Definite Plan Report Supplement with a new release date of April 1988.

## Water Quality Standards Regulations

On November 2, Administrator Ruckelshaus of the EPA signed the revised Water Quality Standards Regulations. These were published in the Federal Register on Tuesday, November 8, and will take effect after 30 days. The regulations are more consistent with the previous Water Quality Standards Regulations than were the changes proposed over one year ago.



Lake Powell

## Ion Data Base

A Reclamation research team has completed a one-year study to determine long-term trends and salinity streamflow relationship. The study is entitled, "Trends in Concentration, Load, and Mass Fraction of Major Solutes at Selected Sites in the Colorado River Basin."

A theoretical model for describing concentration-streamflow relationships has been derived and compared to the widely used empirical power model. Both models were found to describe the relationship equally well and either can be used to correct for the variability of streamflow in testing the significance of long-term concentration trends.

Trends in solute concentration and mass fraction were evaluated for 12 gaging stations for time periods prior to major flow regulation. Concentrations of magnesium, sodium, and sulfate were found to have generally decreased in chemically balanced proportions. This resulted in an overall reduction of approximately 2 mg/L at the Lee's Ferry and Grand Canyon stations during the period of record (1925-1963).

Changes in concentration, load, and mass fraction following construction of the major Colorado River Storage Project reservoirs were evaluated using a statistical "t-test" of differences in mean values before and after development. Trends following development were analyzed using linear regression.

In general, mean concentration and load both decreased, particularly at Lee's Ferry and Grand Canyon, below Lake Powell reflecting reservoir filling effects. Trends since 1965 have not had as significant an effect. Where they were identified, most trends indicated decreasing loads and concentrations.

Below major reservoirs, concentrations and loads have generally decreased, and seasonal fluctuations in concentration and mass fraction have been reduced. Significant mean values changes which were obviously

not associated with reservoir development could be attributed to other human activities, such as coal mining in the Yampa drainage, plugging of the Meeker Well on the White River, and urbanization and salinity control in the Grand Valley area. However, the large reservoirs seem to be the major influence on salinity in the Lower Basin gage stations.

The results of this study will also be presented to the Forum Work Group in February.

## Reservoir Chemistry Study

Reclamation contracted in Fiscal Year 1982 for a two-dimensional reservoir model of Lake Powell and Lake Mead to improve temperature and salinity modeling capability for reservoirs.

The contract for development of a two-dimensional model has been completed, the models have been turned over to Reclamation, and Reclamation staff have been trained in their use.

The preliminary results indicate that the potential calcite precipitation in Lake Powell is less than 10,000 tons per year, and Lake Mead has a potential of 30,000 to 40,000 tons per year of calcite precipitation. This represents only the potential, not the actual precipitation, which would be less. Calcite precipitation potential is less than was estimated previously by other means.

Further work will be done by Reclamation staff in the next few months to firm up this estimate and to incorporate it into our long range salinity projections.

In February, this office will have a presentation on the models and their results for the Forum Work Group and interested Federal representatives.

## Clean Water Act

The Senate Environment and Public Works Committee approved a "Nonpoint Source Pollution Management Program" as a new section to the Clean Water Act amendments (S.431). Section 319 would authorize \$70 million in FY 1985, \$100 million in FY 1986, and \$130 million in FY 1987 specifically for nonpoint source control programs. The ultimate fate of this section is unclear, however.

## AQUATRAIN

Western Water Reserves, Inc., a Boulder, Colorado, corporation with experience in forming venture partnerships and building interstate pipelines, has purchased W.R. Grace & Co.'s interest in Aquatrain, Inc.

Aquatrain, Inc. is the private sector participant in AQUATRAIN, the cooperative effort between government and private industry to develop a pipeline system for transporting Colorado River saline water, coal, and other commodities.

The Bureau of Reclamation has been asked to release Grace from a November 1982 Aquatrain planning agreement and to consider approval of Western Water Reserves as its new private sector partner. Reclamation and Western Water Reserves are now discussing the commitments the company is willing to make toward Project planning.

Western Water Reserves, Inc., is a Colorado corporation backed by two individuals, Thomas P. Clark of Boulder, Colorado, and David Williams, Jr. of Tulsa, Oklahoma. They are now seeking to broaden industry participation in the AQUATRAIN Project through venture capital partnerships with other private sector interests. Through partnerships and bonding, the private sector would finance construction of the pipeline system and would receive returns on investments on an equity basis.

Under the sale contract, Ira McKeever, President of Aquatrain, Inc., will continue with the project.

The intensive AQUATRAIN planning effort including the development of innovative techniques for the pipeline system, is continuing. Currently, liquid carbon dioxide (CO<sub>2</sub>) appears to be the most promising medium to meet the critical project objective of competitive coal transport in a pipeline system. Pilot plant tests indicate that a slurry mixture of 85 percent coal/15 percent liquid CO<sub>2</sub> can be successfully transported long distances.

The preliminary Project plan calls for a 14-mile demonstration unit, followed by three distinct stages of pipeline construction. The demonstration unit, to be constructed by industry, would include a test loop for the slurry line and a cooling tower using saline



water, with construction projected for 1984-85. Following the demonstration unit, stages could be constructed based on investments and market demands. The coal/CO<sub>2</sub> slurry and the saline water each would be transported in separate but parallel pipelines.

### Water Rights Filing Withdrawn—Glen-Dot

At its November meetings in Phoenix, the Colorado River Basin Salinity Control Forum recommended that Reclamation defer construction or implementation of the Glenwood-Dotsero Springs Unit because the most logical disposal alternative is still evaporative disposal, and cost-effectiveness is considerably higher than other units being considered at this time.

The Forum also recommended that Reclamation withdraw its water rights request for the unit. Reclamation, in turn, requested that the Department of Justice withdraw the water rights filing with the State of Colorado.

A proposed planning report Advance Draft Environmental Statement is still scheduled from the field on May 17, 1984, and the report and environmental statement will be completed.

## Las Vegas Wash Unit, NV

A reevaluation of the original evaporation pond/desalting plan has resulted in consideration of new concepts for salinity control in the Wash area. An October 1982 status report recommended proceeding with a verification program in the Pittman area to convey low salinity industrial cooling water around highly saline soil, preventing groundwater infiltration and salt pickup.

Moreover, the salt pickup could be reduced by 79,000 tons per year by a 4.5-mile bypass channel which would convey, with minimal seepage, wastewater and minor storm runoff along the north side of the Wash flood plain.

A continuing ground-water monitoring program in the Lower Las Vegas Valley has been augmented by the addition of about 50 new wells in the Pittman area. These wells are being used to verify expected changes in groundwater levels and quality before and after the abandonment of unlined wastewater ditches in the area.

A contract to construct the 3.5-mile Pittman bypass pipeline is expected to be awarded in March of 1984. The wastewater is expected to be diverted to the Pittman Bypass Pipeline by October 1984. The curtailment of seepage from the unlined ditches is expected to cause a rapid drop in groundwater levels in the Pittman area,

resulting in reduced saline groundwater inflow to Las Vegas Wash. The monitoring of the resulting groundwater changes is expected to continue through Fiscal Year 1985, at which time an assessment would be made of the results of the Pittman Verification Program.

An effort is being made to coordinate the proposed salinity control action with plans of Clark County agencies. Opposition has been expressed to the proposed bypass channel by several local entities.

Although there are several issues of contention, the primary concerns appear to be two fold: (1) the possible impacts the bypass channel would have on the existing and proposed wetlands environment in the Las Vegas Wash and (2) the possible reduction of the nutrient stripping capability of the wetlands if the wastewater effluent is bypassed around the Las Vegas Wash, thereby increasing wastewater treatment costs.

The Bureau of Reclamation continues to work closely with the local entities in addressing these issues.

A Finding of No Significant Impact (FONSI) for the Pittman Verification Program and Environmental Assessment Report was signed in May 1983. This report outlines the concept of a vegetation test plot which would determine and demonstrate the feasibility of establishing and maintaining native

vegetation with available ground water. This concept was developed in consultation with the Fish and Wildlife Service. The test site is a means of obtaining data necessary for successful implementation of the salinity control project, demonstrating the compatibility of salinity control plans and wetland park plans, and securing public support of a salinity control project.

## Price - San Rafael Rivers, Utah

Reclamation and SCS held public meetings in Price and Castle Dale, Utah, during November to discuss cost effective alternative treatments with local water users and decision makers. There was considerable discussion on Reclamation's livestock watering systems proposals and SCS's land treatment and water management assistance proposals. It was determined that both programs should continue to move ahead as quickly as possible.

The USDA Draft On-Farm Report is presently undergoing in-house review.

The Appraisal Level Design & Cost Estimate Report prepared for Reclamation by CH<sub>2</sub>M Hill has been distributed for interagency review.

For questions concerning projects discussed in this newsletter, please contact the Public Affairs Office in the Region responsible for that project.

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