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EIGHTH ANNUAL REPORT

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

Fiscal Year July 1, 1971 - June 30, 1972

Issued under provisions of the
Water Resources Research Act of 1964 - P.L. 379-88

J. W. Clark, Director

New Mexico

Water Resources Research Institute

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EIGHTH ANNUAL REPORT
NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE
JULY 1971 - JUNE 30, 1972

DIRECTOR'S REPORT

by
John W. Clark^{1/}

Perhaps the greatest challenge facing New Mexico in the next decade is to provide an acceptable balance of economic and social well-being within a quality environment. We can only achieve this goal through adequate comprehensive planning. Such planning assumes a fundamental knowledge of the natural, physical and social sciences necessary to the political decision making process.

While science and technology are enlarging the range of possible alternatives in water management, momentous changes in society are creating new demands. The seriousness of this problem is noted by a recent study of the General Accounting Office which found that in every river basin studied the quality of water has deteriorated in recent years. This situation is symptomatic of the fact that we have not achieved a sufficient understanding of the basic dimensions of the problem. Much has been accomplished, much more research is necessary.

Water is the most limiting resource in New Mexico and the water that we have is the State's greatest asset. Surface and subsurface water is used to supply growing municipal and industrial demands and to irrigate the land. According to the Senate Select Committee Report of 1961 and the Water Resources Council Report of 1968, a major part of the State is facing the most critical shortage of water in relation to projected demands of any other area of the Nation.

Because New Mexico is primarily a semi-arid region, those few perennial streams within the State have considerable more influence upon the lives and livelihood of the region's inhabitants than any other element of the physical environment. Therefore, any alteration, modification, or subtle change of this resource must be carefully evaluated.

Although a large amount of ground water underlies the State, much of it is either of poor quality or too expensive to develop at present. In the areas where the ground water is of satisfactory quality and can be economically obtained, development and use is underway. The demands on the supply exceeds recharge in many areas and ground water levels are receding.

^{1/} Director, New Mexico Water Resources Research Institute

The Bureau of Reclamation in cooperation with other Federal and State agencies and eleven Western States is developing the Western United States Water Plan, commonly referred to as the Westwide Study. This will be a reconnaissance investigation, level B as defined by the Water Resources Council, for the purpose of developing a plan to meet the future water needs of the eleven western states. The main thrust of the New Mexico Water Resources Research Institute over the next five years is to contribute research information in support of New Mexico's portion of this plan.

A principal project B-026-NMEX, "An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande" is scheduled for completion June 30, 1972. This study represents a major cooperative effort between the three largest universities in New Mexico.

The surface water supply of the Rio Grande Basin in New Mexico is fully appropriated and utilized. This is also the area of the State where the greatest population increase is projected and consequently the municipal and industrial needs for water will be increasing more rapidly. The use of water in this basin is limited by State law, the Rio Grande Compact, and the treaty with Mexico.

One of the key elements of this study is the use of a technical advisory committee composed of representatives from State and Federal agencies that have significant interest and management responsibilities in the basin. Because of the technical advisory committee's participation throughout the project. Many of the ideas and findings are having impact on development, planning, and the State Water Plan even though the results have not been published. A U.S. Geological Survey proposal for a study of the water resources of the Mesilla Valley, New Mexico has as its first objective "1. Evaluation of the usefulness of the mathematical model constructed by Richardson (1971). This can be done with data now in the report and should show if the model could form the basis for future use in design, operation, and management of the system. The model may also indicate areas of concentration in collecting basic data." This model was developed as a subpart of project B-026-NMEX.

The Institute Director has exerted a considerable effort in support of the Rio Grande Regional Environmental Project (RGREP). This study is to provide the basic data and information on which to base a regional management plan that will include appropriate implementation procedures. The region under consideration is the lands along both sides of the 285 river-miles of the Rio Grande from Elephant Butte Reservoir, New Mexico, where the surface water supply for the region is stored, downstream to Fort Quitman, Texas, where the last of this water is used. The river forms the boundary between the United States of America and Mexico for 81 miles in the proposed project area and includes lands in two American states and one in Mexico. The problem is not merely one of drafting an apparently workable management plan, but is the considerably

more complex problem of developing the background information and theory on which the plan is to be based. The New Mexico Water Resources Research Institute has been delegated the responsibility of developing the proposal for the environmental management plan for this interstate and international region along with the responsibility of coordinating the efforts of all of the universities in New Mexico in all phases of the project. Texas has authorized 2.5 million dollars and New Mexico is expected to make available approximately one million dollars starting July 1, 1972 in support of this project. It is planned that the Institute will help develop similar projects for other areas of New Mexico in the near future.

The New Mexico Water Resources Research Institute sponsors the Annual New Mexico Water Conference, hosted several water related meetings involving State and Federal agencies and other organizations and participated in public meetings and hearings.

BACKGROUND OF THE INSTITUTE

The New Mexico State University Water Resources Research Institute was officially organized and approved by the New Mexico State University Board of Regents in February 1963. The Institute Office was opened on March 15, 1965 in the Agriculture Building on New Mexico State University campus.

The Water Resources Research Act, P.L. 88-379, approved by the President July 17, 1964, became effective for the first 14 institutes with \$75,000 allotted to each for FY-1965 effective as of February 1, 1965. The allotment to each of the 51 state institutes, or centers, for FY-1966 was \$87,500 and a similar amount to each institute for FY-1967. The FY-1968 allotment to each state was \$100,000.

New Mexico State University application for designation as the Institute University was among the first applications sent to Washington, D. C. for approval, being filed September 18, 1964 and resubmitted November 25, 1964. Included in the application was a letter dated September 3, 1964 from the Governor to the Secretary of the Interior, designating New Mexico State University as the location for the New Mexico Water Resources Research Institute.

New Mexico Water Resources Research Institute was the first institute to be officially designated among the 14 institutes authorized as of February 1, 1965 to operate under provisions of Section 100 of the Act. The remaining 37 state institutes were approved for funding May 1, 1965.

The Institute is essentially a planning and coordinating activity for research and graduate training in the area of water resources representing all of the universities and colleges in the State of New Mexico. The objectives of the Institute may be stated as follows:

- (a) To plan and coordinate the water resources research and training activities involving faculty and facilities of the various colleges and universities in the state.
- (b) To arrange and conduct water resources research appropriate to the role and scope of the state's colleges and universities for the benefit of the state and the nation including those sponsored by
 - (1) The Office of Water Resources Research
 - (2) Other Federal agencies
 - (3) State agencies
 - (4) Quasi-public organizations
 - (5) Industry
- (c) To arrange for seminars and conferences involving persons having interest and responsibilities in the water problems of the state.

- (d) To provide for publication and dissemination of the results of research conducted by the Institute and other information which bears upon the water resources of the state.

PROGRAM DEVELOPMENT AND REVIEW BOARD

This Board originally was designated as the Executive Board. However, the new title, adopted in January 1967 more accurately describes its function. It recommends areas for research concentration, reviews and recommends the relative importance and quality of research proposals, reviews the technical procedures suggested, and recommends means by which certain phases of one project may be coordinated with work being done in other projects in the state. The Board also recommends the projects which qualify on a technical basis, and recommends the priority for project funding each year.

The Board includes scientists at New Mexico State University, the New Mexico Institute of Mining and Technology, and the University of New Mexico. Their names and respective disciplinary areas are:

- | | |
|-------------------------|------------------------------------------------------------------------------|
| Dr. Nathaniel Wollman | - Economist and Dean, College of Arts and Sciences, University of New Mexico |
| Dr. Gerardo W. Gross | - Geophysist
New Mexico Institute of Mining and Technology |
| Dr. A. A. Baltensperger | - Agronomist
New Mexico State University |
| Dr. Fred Downs | - Economist
New Mexico State University |
| Dr. Frank B. Titus | - Geologist
New Mexico Institute of Mining and Technology |
| Prof. Albert Utton | - Professor of Law
University of New Mexico |
| Prof. J. W. Clark | - Civil Engineer, Chairman and Director of Institute, NMSU - Ex-officio |

The Board held two meetings during 1971-72 to consider research proposals and to discuss the total water resources research program. Also discussed was Operation and Publication objectives and procedures.

The procedure followed by the Board in reviewing project proposals is as follows:

1. All proposals are called and received by the Director's Office and copies are distributed to each member of the Review Board well in advance of scheduled meetings.

2. Each Principal Investigator is invited to appear before the Board to make a 10 minute statement on his proposal, with questions from the Board following his presentation. Usually one of these meetings is held at the University of New Mexico in Albuquerque, or New Mexico Institute of Mining and Technology, and the other at New Mexico State University, Las Cruces.
3. Following the hearings on all of the project extensions from the current year plus those proposed for the next fiscal year, the Board uses a rating process to select the order in which all worthy projects may be funded. Some projects usually receive outright rejections by the Board due to lack of water orientation or due to poor preparation and presentation.
4. From the group of projects recommended by the Board, the Director works up a schedule of funding which will fit within the money available. This procedure results in some quite acceptable projects not being accepted, due to lack of funds. Often there is considerable consultation between the Director and the Investigators and the Board members during the process of fitting projects into the limited budget.

INTERUNIVERSITY MEMORANDUM OF AGREEMENT

A memorandum of Agreement between the University of New Mexico, New Mexico Institute of Mining and Technology and New Mexico State University Water Resources Research Institute was entered into on the 8th day of July, 1966. The agreement forms a definite basis for accounting for the Federal and matching funds on the projects at the two institutions which have projects operating through the Water Resources Research Institute. The Agreement includes a copy of (1) Public Law 88-379, (2) Public Law 89-404 which Acts together established and funded the Water Resources Research Program, (3) Rules and Regulations pursuant to the Water Resources Research Act of 1964, (P.L. 88-379), (4) Policy Statement issued by the Office of Water Resources Research, and (5) a statement regarding Acknowledgement on Publications for use of Water Resources Research Act funds. A complete copy of the Agreement, including the several documents listed above, as signed by Presidents of each of the three universities involved was supplied to the Comptroller's Offices and the Office of Water Resources Research, and copies of the Agreement were made available to others as required in the project operations.

A supplement to the July 6, 1966 Agreement was signed effective July 1970 to provide for the administration and allocation of the State appropriations made by the 1970, 1971 and future Sessions of the New Mexico Legislature.

COOPERATION

Cooperation between Universities, State and Federal agencies, and others interested in water has been excellent. The use of a Technical Advisory

Committee on a project by project basis has proved to be an effective mechanism for optimizing cooperation. The following Technical Advisory Committee on project B-026-NMEX has met on several occasions jointly with the three University study group:

Technical Advisory Committee - B-026-NMEX

Mr. Robert F. Stephens	U.S. Bureau of Sport Fisheries and Wildlife
Mr. William E. Hale	U.S. Geological Survey
Mr. T. A. Garrity	U.S. Bureau of Indian Affairs
Mr. W. J. Anderson	U.S. Bureau of Land Management
Mr. James Kirby	U.S. Bureau of Reclamation
Mr. Rowland Fife	U.S. Bureau of Reclamation
Mr. Wayne Cunningham	Elephant Butte Irrigation District
Mr. Ralph Bell	U.S. Soil Conservation Service
Mr. Phil Mutz	New Mexico Interstate Stream Commission
Mr. Pete Metzner	Middle Rio Grande Council of Governments
Mr. Charles F. Youberg	Middle Rio Grande Council of Governments
Mr. Larry Bronaugh	U.S. Bureau of Indian Affairs
Mr. Mike Martinez	U.S. Bureau of Land Management
Mr. Edwin A. Lewis	U.S. Bureau of Reclamation
Mr. Robert Schembera	U.S. Bureau of Reclamation
Mr. Fred Allen	New Mexico State Engineer Office
Mr. Earl Sorensen	New Mexico State Engineer Office
Mr. Ed Gray	U.S. Soil Conservation Service
Mr. Clyde Wilson	U.S. Geological Survey

ANNUAL NEW MEXICO WATER CONFERENCE

The first Annual New Mexico Water Conference was held in 1956. Since then seventeen conferences have been held and the eighteenth is

scheduled for April 5 and 6, 1973. The Director serves as the chairman of the Advisory Committee.

The Advisory Committee

Fred Thompson N.M. Dept. of Game and Fish	L. P. Reinig, Head Los Alamos Scientific Laboratory
S. E. Reynolds N.M. State Engineer	Willis H. Ellis Professor of Law, UNM
Boyce C. Williams Agronomy-Soils, NMSU	Rogers Aston South Spring Foundation
Kim Allen N.M. Farm & Ranch Magazine	James Kirby Extension Service, NMSU
Frank B. Titus Hydrologist, NMIMT	James Anderson, Director N.M. Bureau of Land Management
W. P. Stephens, Director Department of Agriculture, NMSU	Col. James L. Sutton Corps of Engineers - U.S. Army
Mrs. Fred L. Ribe N.M. League of Women Voters	Charles M. Hohn Extension Engineer, NMSU
Rowland Fife, Area Engineer U.S. Bureau of Reclamation	Carrol Hunton N.M. Farmers Home Administration
Lloyd A. Calhoun N.M. Electric Service Company	Gene O. Ott, Management Specialist Extension Service, NMSU
Jesse V. Lunsford Civil Engineering, NMSU	Wm. E. Hale, District Chief U.S. Geological Survey
Wm. D. Hurst, Regional Forester Forest Service, USDA	Kenneth Williams State Conservationist, SCS
Eldon G. Hanson, Head Agricultural Engineering, NMSU	Peter Hanagan, Executive Director N.M. Oil and Gas Association
Dr. Carl F. Tarlowski N.M. Regional Health Director	George R. Dawson, Head Agricultural Economics, NMSU
Gary L. Cunningham Biology Department, NMSU	H. E. Gary Farmer, Rincon, N.M.
Ray Cauwet Information Services, NMSU	T. G. Gebhard, Jr. Civil Engineering Dept., NMSU
Ralph Charles Middle Rio Grande Flood Control	Wayne P. Cunningham Elephant Butte Irrigation District
Hoyt Pattison N.M. Representative, Curry County	

The Annual Water Conference serves a public service by bringing together 200 to 300 leaders each year to discuss water resources which are important to New Mexico and the Nation.

The water conferences are contributing materially to the growth and development of the Water Resources Research Institute and the Institute can greatly assist the water conference. Both are needed in the overall water research and development program in the State of New Mexico.

The annual conference is planned and conducted by an interdisciplinary New Mexico State University Committee with the assistance of a statewide committee of 25 members serving as a Water Conference Advisory Committee. Much credit for the success of the conference goes to dedicated members of these two committees.

EXAMPLES OF RESEARCH FINDINGS AND THEIR APPLICATION TO WATER RESOURCE PROBLEMS

A-031-NMEX - The Development and Field Testing of School Learning Materials on Water Problems of New Mexico and the Southwest

Mediated learning packages on water problems of New Mexico and the Southwest were developed for use at three distinct levels of instruction.

Through library and Educational Resources Information Center searches, and with the help of a qualified water expert, a list of principal water problems and concepts of New Mexico was prepared. Based upon those water problems and their terminologies, tests were prepared in both English and Spanish in order to help determine the level of knowledge and feeling about water problems exhibited by learners.

From these results, the following presentations were developed:

Elementary: 21 minutes, 100 slides, with taped and cassette recorded script. Bernard Beaver and Wendell Waterdrop discuss water. Suggestions to teachers include lab activities and puppetry.

Secondary: 50 minutes, slides with script and tape. To be used in at least two sessions. Includes students discussing their solutions to problems.

Adult: 27 minutes, 170 slides with script and tape. Comprehensive but non-technical treatment of water problems and their possible solutions.

Two commercial publishers and the New Mexico State Department of Education have asked to review the learning packages for possible future use.

There have been many requests from public school teachers for these learning packages and it is expected that children exposed to this program will continue to develop their basic interests in water and therefore become better informed citizens.

B-015-NMEX - Irrigability Classification of New Mexico Lands as a Guide for Water Importation

Irrigation classification has been completed for 26 of the 32 New Mexico counties. The results of this research have been used to construct a tentative map of suitability of New Mexico lands for irrigation. This map, which groups New Mexico lands into three classes--highly suitable, moderately suitable, and unsuitable--is to be revised on the basis of the initial review, and completed shortly after July 1, 1972. It will then become a part of the New Mexico Water Plan which is being prepared by the U. S. Bureau of Reclamation.

This work continues to supply information where none was previously available, and the demand for the published reports has been much greater than we expected. Important areas of land which are well suited to irrigation as well as large areas which are not suitable continue to be shown. Additional information about soil characteristics and suitability for various uses adds greatly to the usefulness of the reports.

B-029-NMEX - Utilization of Water in a Semi-Arid Region

Work accomplished during the 1971-72 fiscal year included harvesting of 1971 crops and planting of crops for the 1972 season. A new procedure was tried in planting the 1972 spring crops. Water was injected with the seed in order to improve seeding emergence. After planting, furrows below watershed areas were chiseled to enhance water infiltration.

The most significant results to date indicate that watershed areas comprising more than half the total area result in lower crop yield. Watershed areas need to be kept narrow to minimize wind and water erosion and to obtain weed control. A major problem with the spring seeded crops is to get adequate water for seed germination and crop emergence. The timing and frequency of subsoil chiseling to enhance water infiltration is critical. Sunflowers yielded well (up to 1200 lb/acre) under adverse conditions and have considerable promise as a dryland crop.

Water injection with the seed may be a means of increasing the cropping alternatives in semi-arid areas without significantly increasing water availability or cost.

B-026-NMEX - An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande Basin in New Mexico

This project was designed to test the effects of transfers of water, land,

and recreation on the economy of the several segments of the 400 mile long Rio Grande Valley from Colorado to Texas through New Mexico.

One of the major impacts of this study has been its influence on the state water plan. Information developed and questions raised by the various sub-phases of the project has either been used or produced modification in the plan as it is being developed. Because of the technical advisory committee's participation throughout the project, the results have been available prior to publication.

STATE'S CONTRIBUTION

Stucky Hall, a building to house the New Mexico Water Resources Research Institute, was completed in 1970. This building was built entirely with state bond money and is located on the New Mexico State University campus. The New Mexico Legislatures have appropriated the following amounts to the Institute for research support:

1970 - \$104,000
1971 - \$108,000
1972 - \$113,000

These funds are being used for matching funds and for state supported projects.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> CLOUD CHAMBER STUDY OF WATER EVAPORATION	OWRR Project No. - - - - - <u>A-024-NMEX</u> NMSU Project No. - - - - - <u>3109-35</u> Agreement No. 14-31-0001- - <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month: July 1 ; Yr: 19 68 Scheduled Completion--Month: June 30 Yr: 19 72

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
William B. Good	Ph.D.	Physics
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Carl E. Dodge	M.S.	Chemistry
Steven E. Loftin	M.S.	Physics

A. Research Accomplishments

The results of the studies to date demonstrate that the cloud chamber can be employed to study evaporation processes. Direct evaporation rates cannot be obtained except for very particular substances, but it is possible to interpret cloud density data so that a measure of the resistance to evaporation generated by substances in or on a body of water can be determined. This interpretation required the development of an analysis which compares the cloud density obtained under a given experimental condition (resulting in a given surface tension) with that which pure water would yield at the same surface tension. While surface tension is a macroscopic quantity which tells us little about the process inhibiting or enhancing evaporation, it is a quantity which bears a relationship to diffusion and is also a quantity which can be easily determined 'in situ'. Efforts will continue toward relating the results obtained to the more physical process of diffusion.

B. Publications

Dodge, Carl E., "Cloud Chamber Design for Water Evaporation Studies,"
M.S. Thesis, New Mexico State University, December 1971.

Loftin, Steven E., "An Expansion Cloud Chamber Study of Water Evaporation,"
M.S. Thesis, New Mexico State University, May 1972.

C. Project Status

This project was completed June 30, 1972 and a report is in progress.

D. Application of Results

Information from this research is being utilized to build a new cloud chamber in which evaporation rate data will be obtained directly.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> THE IMPACT OF WATER TECHNOLOGY ON THE HISTORY OF NEW MEXICO	OWRR Project No. - - - - - A-026-NMEX NMSU Project No. - - - - - 3109-37 Agreement No. 14-31-0001- - 3531 FCST Research Category- - -
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Name and Location of University Where Project is Being Carried Out:
 New Mexico Institute of Mining and Technology, Socorro

Project Began--Month: July 1 ; Yr: 19 70 Scheduled Completion--Month: June 30 Yr: 19 72

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Paige W. Christiansen	Ph.D.	History
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Vincent Chavez	B.A.	History
Kevin Pearson	B.A.	History
Catherine Clayton	B.A.	History

A. Research Accomplishments

The two major aspects of the research on the Impact of Water Technology on the History of New Mexico, the search for published and unpublished source material and the field research, progressed well during fiscal 1971-1972. The data gathered from archival and printed sources is substantial, about four thousand 5x8 cards of notes accumulated to date. The size of the bibliography is surprising, totaling nearly one thousand items. The field research, which produces three basic things for the project, visual impressions and field notes, photographs, and 16mm movie footage, is sixty to seventy percent complete. Notes on nearly four hundred sites have been collected, 2500 feet of movie film has been taken of many of these sites, and 375 color slides have been made. The movie

camera utilized is a 16mm Kodak Cine Special, with 15mm, 25mm, 50mm, and 105mm lenses available. The slides are being made with a Topcon D 35mm camera, with through-the-lens focus and composition. When conditions allow, field sound (wild sound) is being recorded with a Sony cassette recorder.

Enough material has been gathered to write a "preliminary study" which will be complete by late summer, 1972. It will include a broad review of applied technology as it relates to water resource development in New Mexico. It will equate that technology to the level of scientific knowledge available. It will also try to equate the attitudes of the people of New Mexico, such as political, social and cultural attitudes, to the evolving scientific and technological levels. The blend of these is what goes into the making of public policy.

B. Publications

None

C. Project Status

This project is being carried forward for one additional year as State Project 3109-138.

E. Work Remaining

Assimilation of the large amount of field and library information into a report document.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> BIOASSAYS OF QUALITY IN WATER RESOURCES OF MAJOR IMPORTANCE TO NEW MEXICO	OWRR Project No. - - - - - <u>A-029-NMEX</u> NMSU Project No. - - - - - <u>3109-40</u> Agreement No. 14-31-0001- - <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month: July ; Yr: 1970 Scheduled Completion--Month: June Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
G. S. Smith	Ph.D.	Animal Science
<hr/>		
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
John Driver Tracy	M.S.	Animal Science
Stan Good	B.S.	Ag. Biology
Pat Trujillo	B.S.	Animal Science
Michael Galyean		Pre Veterinary
Gale Cupp	B.S.	Animal Science
Ken Smith	B.S.	Animal Science
Frank Hayes		Animal Science
Alfredo Diez-Gonzales		Animal Science
Albert Jaquez		Animal Science
George Lopez		Animal Science

A. Research Accomplishments

Water samples from 52 sources representative of several major water resources in New Mexico have been chemically analyzed for major mineral constituents and tested for effects on mouse growth and reproduction and for effects on digestibility of fibrous substrates by rumen microorganisms cultured in vitro. The samples represent 19 municipal supplies, 28 wells used by sizeable ranching or livestock production enterprises, and a few surface waters. Three major trials have been completed in terms of mouse bioassays (a major trial during the summer of 1971 was discontinued because of failure to obtain suitable reproduction in the main colony of mice), and a fourth trial with a limited number of water samples is presently in progress. Samples from a few sources of particular interest, including a "standard" sample of de-ionized (high purity) water, have been included in each of the trials.

In contrast to tentative conclusions drawn in the 1971 Progress Report, the results from all the mouse assays completed to date, considered together, support the conclusion that none of the water samples tested significantly affected mouse growth or reproduction. Sizeable differences originally associated with water sources have since been attributed mainly to variability of environmental conditions in the animal laboratory, as demonstrated by appropriate replications of water sources among various cage positions within the laboratory. Thus, water samples which varied in total dissolved solids from less than 100 to about 5000 milligrams per liter (ppm) did not differ significantly in effects on mouse growth and reproduction.

Microbial bioassays of the same 52 samples indicate that substrate degradation (fiber digestibility) was significantly affected by water sources, especially when purified substrate (alpha-cellulose and urea) rather than natural forage (alfalfa hay) was used. These assays are being repeated, however, using all 52 sources of water in simultaneous assays, in order to increase the precision of comparisons among sources.

B. Publications

Tracy, John Driver, "Mouse Growth and Reproduction in Bioassays of Water Quality from Certain Natural and Municipal Water Sources in New Mexico," M.S. Thesis, New Mexico State University, 1971.

Smith, G. S., John D. Tracy, E. C. Smith and A. L. Neumann, "Bioassays of Water Quality: Mice and Rumen Culture," J. Animal Sci. 33: 310 (Abstract), 1971.

C. Project Status

The project is completed and a final report is in preparation.

D. Application of Results

Agricultural Experiment Station and Extension Service personnel have shown a considerable interest in this project.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> ENVIRONMENTAL CONTROLS ON GROUNDWATER CHEMISTRY: I. THE EFFECT OF PHREATO- PHYTES	OWRR Project No. - - - - - <u>A-030-NMEX</u> NMSU Project No. - - - - - <u>3109-41</u> Agreement No. 14-31-0001- - <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico Institute of Mining and Technology, Socorro

Project Began--Month: July 1; Yr: 1970 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
F. B. Titus	Ph.D.	Geology
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Charles E. Williams	M.S.	Geoscience
Roger J. Allmendinger	Ph.D.	Geoscience
Daniel Blodgett	M.S.	Geoscience

A. Research Accomplishments

During the current fiscal year we have continued to study hydrologic and hydrochemical conditions at two phreatophyte groves in the Rio Grande valley near Socorro, one a mature cottonwood grove and the other a salt-cedar grove. Data being collected include water-level fluctuation, specific conductance of water, water chemistry, and the weather parameters that will allow calculation of evaporation potential. Hydrologic and chemical data are obtained at 32 piezometers, divided equally between the two groves; the piezometers are in nests of four, with one piezometer bottoming at the water table and three bottoming at roughly 10-foot increments below the water table. Each grove has a T-shaped array of nests, with nests separated by a few hundred yards.

Preliminary analysis of data indicates that specific electrical conductance (conductivity) of groundwater at all sample depths fluctuates markedly

both diurnally and in response to longer-term factors. The diurnal changes are cyclic and have a magnitude of about 10 percent of the average conductivity. At the time of this writing a continuous-recording conductivity meter is being installed in the cottonwood grove to further study diurnal and other short-term fluctuations. This instrument will be moved from piezometer to piezometer in both groves during and after the growing season.

The diurnal fluctuation of conductivity occurs in all piezometers in a nest, though the amplitude tends to decrease with depth, and the time of conductivity maxima and minima with respect to diurnal rise and fall of the water table varies rather regularly with depth. During daylight hours conductance is lowest. Our tentative conclusion is that at the water table conductivity changes are related to increased chemical concentration in the capillary zone (where most of the plant roots are located) coupled with induced upward flow due to water-table decline caused by transpiration. At night when the water table rises, it is suspected that the rise allows the concentrated water suspended in the capillary zone to be washed down into the zone of flowing groundwater, thereby causing an increase in conductivity of water sampled by the piezometers; this is particularly interesting in view of the fact that the normal diurnal water table rise is little more than 0.1 foot.

At depths of tens of feet below the water table this explanation can hardly apply because natural flow velocities are not sufficiently great to move shallow water to these depths at the required rate. A tentative explanation, which is not wholly satisfactory, may be that vertical components of gradient during daylight hours induce crossbedding flow bringing up less concentrated water from depth to the piezometers; whereas more nearly horizontal flow at night brings water to the piezometers that is more concentrated owing to the continuous dispersion and diffusion of salts downward from the water table. The problem of collecting data to explain this phenomenon will be of primary concern during the current growing season.

B. Publications

None

C. Project Status

This project has been funded as a state project through June 30, 1973.

E. Work Remaining

Collect data to explain diurnal fluctuations of conductivity at depths below 10 feet below the water table.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> THE DEVELOPMENT AND FIELD TESTING OF SCHOOL LEARNING MATERIALS ON WATER PROBLEMS OF NEW MEXICO AND THE SOUTHWEST	OWRR Project No. - - - - - <u>A-031-NMEX</u> NMSU Project No. - - - - - <u>3109-42</u> Agreement No. 14-31-0001- <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month: July 1 ; Yr:1971 Scheduled Completion--Month: June 30 Yr:1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Chris Buethe	Ph.D.	Secondary Education, Project Dir.
Alan Fitzpatrick	Ph.D.	Education Psychology
Nancy Boyd	B.A.	Art
Barbara Morrison	M.A.T.	Elementary Education
John Hernandez	Ph.D.	Civil Engineering
John Daily	M.A.T.	Elementary Education
Katy Milling	M.A.	English & Spanish
Jesse Reed	M.A.T.	Secondary Education
Raymond Pabst	M.A.T.	Chemistry
Rowena Sharp	M.A.T.	Elementary Education
Robertta Sparger	M.A.T.	Elementary Education
Wendell Gillett		Photographer
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Hugh Murray	B.S.	Arts and Sciences
Carrol Lockaby	B.S.	Engineering

A. Research Accomplishments

Mediated learning packages on water problems of New Mexico and the Southwest were developed for use at three distinct levels of instruction.

Through library and Educational Resources Information Center searches and with the help of a qualified water expert, a list of principal water problems and concepts of New Mexico was prepared. Based upon those water problems and their terminologies, tests were prepared in both English and Spanish in order to help determine the level of knowledge and feeling about water problems exhibited by learners.

Three target learners were chosen, including "average" fourth graders, "average" ninth graders, and their adult non-technical teachers. Preliminary testing in schools revealed a wide range of pupil interests in environmental problems and a need to learn water concepts and related terms. Early tests were analyzed and revised, and a single 58 item test over water problems was developed and used as one basis for the remainder of the study.

Three writing teams composed of leading teachers from the Las Cruces area were formed. Each writing team was instructed to base its creative efforts upon 72 water facts and concepts distilled from the literature, questions missed by groups in earlier testing, and ten water problems judged most important by a New Mexico citizens' group in a statewide project conducted by the New Mexico Water Resources Research Institute.

Each writing team elected its own emphasis and learning package format. All three teams used 2" x 2" color slides taken by a professional photographer and one writer to illustrate their recorded scripts. A staff artist illustrated many points that were not readily photographed. Final tape recordings were narrated by professional radio announcers. Each learning package was produced in a self-contained, mailable form that could be readily used in most schools by either teachers or students with minimal instructions.

Test results for learners using the learning packages were compared with results for learners using equivalent time periods to study conventional materials on water. Results were also compared to those of learners who had no special opportunity to study water problems. Tentative results encourage the use of the learning packages in schools of New Mexico and the Southwest, either with individual students or with classroom size groups.

Elementary: 21 minutes, 100 slides, with typed and cassette recorded script. Bernard Beaver and Wendell Waterdrop discuss water. Suggestions to teachers include lab activities and puppetry.

Secondary: 50 minutes, slides with script and tape. To be used in at least two sessions. Includes students discussing their solutions to problems.

Adult: 27 minutes, 170 slides with script and tape. Comprehensive but non-technical treatment of water problems and their possible solutions.

B. Publications

Two commercial publishers and the New Mexico State Department of Education have asked to review the learning packages for possible future use.

C. Project Status

The project has been completed and the completion report is in preparation.

D. Application of Research Results

See "B"

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> A TECHNICO-ECONOMIC FEASIBILITY STUDY OF THERMAL POLLUTION ABATEMENT BY ADIABATIC DEGASSING	OWRR Project No. - - - - - <u>A-032-NMEX</u> NMSU Project No. - - - - - <u>3109-43</u> Agreement No. 14-31-0001- - <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month: July 1; Yr:1971 Scheduled Completion--Month: June 30 Yr:1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Donald B. Wilson	Ph.D.	Chemical Engineering
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Hsien-yen Tsao	M.S.	Chemical Engineering
Andrew Garcia	B.S.	Chemical Engineering
Randy Foltz	B.S.	Chemical Engineering

A. Research Accomplishments

Three gases were considered: ammonia, hydrogen sulfide, and sulfur-dioxide. These gases occur in many industrial and domestic waste water streams. Good physical property data is only available for the hydrogen sulfide-water system. The other systems were treated in terms of Henry's law type solubilities. Physical properties on mixtures of these gases in water are not available. This information should be obtained because these mixtures occur in important industrial processes.

Flash calculations were programmed for each of the three binary systems. Five degree and ten degree temperature drop calculations were made. This data is being incorporated in cost calculations for the several types of prime movers mentioned previously.

A survey of waste water thermal pollution sources in New Mexico was completed. There is currently only one significant source - Four Corners Power operation. A survey of alternate methods of thermal pollution abatement was compiled. This information has been provided to the Agricultural Economics group for a study they are conducting on the Four Corners area. The tentative results of the computer calculations indicate that there is a range of gas concentrations for which adiabatic degassing would be a competitive thermal pollution abatement process, provided there is available a supply of low cost, low pressure steam. This circumstance exists in many power generation operations.

B. Publications

None

C. Project Status

The project is complete and a report is in process.

D. Application of Results

Information from this project has been provided to a research group operating under the Four Corners Commission that is studying the power generation in the Four Corners area.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> A METHOD OF DEMINERALIZATION USING STRONGLY BASIC ION EXCHANGE RESINS	OWRR Project No. - - - - - <u>A-033-NMEX</u> NMSU Project No. - - - - - <u>3109-44</u> Agreement No. 14-31-0001- - <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 New Mexico State University, Las Cruces

Project Began--Month: July 1; Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
William S. Midkiff	Ph.D.	Civil Engineering
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Dennis Blair George	M.S.	Sanitary Engineering
David Andrew Gurule	B.S.	Civil Engineering
Edward Timothy Davison	B.S.	Civil Engineering

A. Research Accomplishments

A new approach to demineralization of marginally brackish waters for individual domestic use is being proposed.

In order to be satisfactory for domestic use, water need not be completely demineralized. However, in many cases it is desirable to provide more extensive treatment than hardness removal by sodium ion exchange. A system which will selectively remove multivalent anions and cations with a net reduction in total dissolved solids is needed. Regeneration characteristics must be favorable for the system to be economical.

A unit composed of a weakly acidic ion exchange column in hydrogen ion form and weakly basic ion exchange column in hydrosyl ion form will convert

to water an increment of multivalent anions and cations, the magnitude of which is limited by the concentration of alkalinity in the water. Additional increments of multivalent ions can be removed if desired by multiple units of weak base and weak acid ion exchangers in series.

B. Publications

This work will provide the basis for a Master's Thesis being prepared by Mr. E. T. Davison.

C. Project Status

This project is completed and a report is in progress.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO	OWRR Project No. - - - - - <u>A-034-NMEX</u> NMSU Project No. - - - - - <u>3109-45</u> Agreement No. 14-31-0001- <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 Eastern New Mexico University, Portales

Project Began--Month: July 1 ; Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert G. Taylor	Ph.D.	Plant Sciences
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Paul D. Bigbee	B.S.	Chemistry-Biology

A. Research Accomplishments

This study has shown that pollution of the Ogallala Aquifer at Portales does occur. This pollution is probably a combination of several factors, mostly man made.

Bacterial contamination of the aquifer may be due to septic tanks, to feed-lot surfaces and to other factors. Periods of heavy rainfall appear to contribute to seepage of bacteria into the ground water.

High nitrate levels in ground water may be attributed to percolation of nitrates following heavy rainfall.

B. Publications

Two papers have been prepared for submission to technical journals.

C. Project Status

This project was completed June 30, 1972 and the technical completion report has been completed.

D. Application of Results

Copies of the technical completion report are being sent to the New Mexico Environmental Improvement Agency.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> A STUDY OF PHOSPHATE INDUCED ALGAL GROWTH IN ORDER TO SUPPRESS OR ELIMINATE THIS PHENOMENON	OWRR Project No. - - - - - <u>A-035-NMEX</u> NMSU Project No. - - - - - <u>3109-46</u> Agreement No. 14-31-0001- <u>3531</u> FCST Research Category - - -
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Name and Location of University Where Project is Being Carried Out:
 University of New Mexico, Albuquerque

Project Began--Month: July ; Yr: 1971 Scheduled Completion--Month: June Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
N. E. Vanderborgh	Ph.D.	Chemistry
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Nancy Schlener	B.S.	Chemistry
Chuan Chen	B.S.	Chemistry
Robert Rhyne		Pre Med
Dan Thiele		Chemistry

A. Research Accomplishments

These studies give fresh insight into ways in which phosphates are utilized after they are discharged into the environment. Uptake into the life cycle is accomplished by assimilation into algal systems. Our work has shown that algal systems do not effectively use pyrophosphate, the simplest phosphate polymer, but their growth closely follows the hydrolysis rate of pyrophosphate to orthophosphate.

Phosphate utilization is important for several reasons. Strategies are being sought to remove phosphate from sewerage effluents to help preserve surface water quality. Algal systems are being explored for this purpose. Then, the supply of phosphate ores is rapidly being depleted and ways must be sought to recycle phosphates. In New Mexico most of the aqueous effluent is discharged from the Albuquerque metropolitan area to be used as agricultural irrigation water. Here, ways should be sought to effectively utilize the phosphates as fertilizing agents.

B. Publications

Manuscript in preparation

C. Project Status

The project has been completed and a completion report is in preparation.

D. Application of Research Results

The New Mexico Environmental Improvement Agency has utilized the results from this study to help formulate policy on sewage wastes as agricultural irrigation waters.

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The results of this study will be valuable to all concerned with policy with respect to water supply and pricing in New Mexico. Researchers will find the inventory a valuable source of data and the summary analyses a source of hypotheses for future research.

B. Publications

The completion report and full appendix of raw data totaling approximately 200 pages has been reviewed by a committee and is to be published by the New Mexico State University as an official Experimentation Report.

C. Project Status

The project is completed and a report is being processed for printing.

D. Application of Research Results

The State Engineers Office and other state agencies have requested that extra copies of the report be made available for their use. This report will provide basic information for many New Mexico research projects.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> ENVIRONMENTAL TRITIUM AS A TOOL IN THE DETERMINATION OF HYDROLOGIC PARAMETERS IN THE ROSWELL ARTESIAN BASIN, N.M.	OWRR Project No. - - - - - <u>A-037-NMEX</u> NMSU Project No. - - - - - <u>3109-48</u> Agreement No. 14-31-0001- <u>3531</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 New Mexico Institute of Mining and Technology, Socorro

Project Began--Month: July 1 ; Yr: 19 71 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Gerardo Wolfgang Gross	Ph.D.	Geophysics
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
D. Dan Rabinowitz	Ph.D.	Geoscience
Yuksel Birsoy	M.S.	Geoscience
Jamie Ward		Geoscience

A. Research Accomplishments

From the tritium profiles in the sampled wells, it was determined that as early as 1959 and 1960 some post-bomb water (younger than 1954) was already at the center of the pumped area. The travel distance is estimated at about 18 to 20 miles, from which an average velocity of 60 feet/day was calculated. Using this value, and the known potentiometric surface for the San Andres Aquifer together with Darcy's law, an average porosity of one percent was obtained. In order to estimate recharge, and input function of tritium fallout was constructed. Knowing the tritium profile at each sampled well, the best fitting input profile was chosen. The product of tritium concentrations times inches of rain results in total fallout of tritium (in Curies/mile²) from which an effective recharge area was calculated. A problem not uniquely solved is the net amount of the total rain which eventually reaches the groundwater. From an approximate

tritium balance in the aquifer and assuming ten percent recharge we can estimate an effective recharge area of 1900 square miles.

B. Publications

Completion report in process
Basis of Ph.D. dissertation for Dr. Rabinowitz

C. Project Status

The project was completed as of June 30, 1972.

D. Application of Research Results

The New Mexico Bureau of Mines and the U.S. Geological Survey have shown considerable interest in this project.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> A COMPREHENSIVE WATER RESOURCES ANALYSIS OF A TYPICAL OVERDRAWN BASIN IN AN IRRIGATED SEMIARID AREA - PECOS RIVER BASIN, NEW MEXICO	OWRR Project No. - - - - - <u>B-011-NMEX</u> NMSU Project No. - - - - - <u>3109-107</u> Agreement No. 14-31-0001- <u>1925</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month: July 1 ; Yr: 1968 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
John W. Hernandez	Ph.D.	Civil Engineering
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Jeffrey Oakes	B.S.	Mathematics
Tom Nims	B.S.	Mathematics
Linden Gray	M.S.	Civil Engineering
Girish Asher	M.S.	Civil Engineering

A. Research Accomplishments

This project reviewed the existing situation in the Pecos Basin in New Mexico and the potential value of restudying some of the elements of the supply system. Many conventional techniques used in hydrologic work have been employed, but some of the newer and somewhat unproven methods have also been used--such as synthetic inflow-outflow studies, and the coupling of linear and dynamic programming models. Results of the analytical work are presented, a management-decision model for the Roswell Artesian Basin, and a stochastic model of the storage, routing, and use of available surface-water in the Pecos Basin, New Mexico.

The fundamental problem in the Roswell Artesian Basin is that the average annual rate of use of water has for many years exceeded, and continues to

exceed, the mean annual rate of supply. This over-production has resulted in declines in ground water levels and in the encroachment of saline waters into fresh-water zones. On the basis of the analysis performed, recommendations are developed for a method and program for the retirement of farm lands from production so as to reach a satisfactory equilibrium for the system.

A number of major water-supply development and salvage projects are planned or currently under way for the Pecos River in New Mexico that will alter the quantity and quality of the surface supply of the system. Synthetic routing studies were used to evaluate the effects of some of these activities on the amount of water available to the Carlsbad Irrigation District. Recommendations are made for the design and operation of certain project works based on analytical studies.

Four principal recommendations are offered:

1. The level of pumping in the Roswell Artesian Basin should be reduced by retirement of necessary lands from production.
2. Channel and delta losses between Alamogordo and the McMillan Dam should be reduced with projects to effect this reduction undertaken as soon as possible.
3. Deterioration of the quality of the surface supply in the reach from Anton Chico to Santa Rosa should be reduced; plans for any development work in the Santa Rosa area should include quality control structures for this reach.
4. A salinity-routing study should be undertaken to evaluate the combined effects of current and planned water-development projects on the quality of the surface-water supply.

B. Publications

This is the last of 5 major publications on this project.

Hernandez, John W., "Management Alternatives in the Use of the Water Resources of the Pecos River Basin in New Mexico," Dec., 1971, 196 pp.

C. Project Status

This project has been completed.

D. Application of Results

This project is having an input to the State Water Plan.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> IRRIGABILITY CLASSIFICATION OF NEW MEXICO LANDS AS A GUIDE FOR WATER IMPORTATION	OWRR Project No. - - - - - <u>B-015-NMEX</u> NMSU Project No. - - - - - <u>3109-109</u> Agreement No. 14-31-0001- - <u>3110</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 New Mexico State University, Las Cruces

Project Began--Month: July 1 ; Yr:1969 Scheduled Completion--Month:Dec.31 Yr:1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
James U. Anderson Harrison J. Maker	Ph.D. M.S.	Agronomy Soil Scientist
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Donald Neidigk Albert Jacques Steven Weaver Edward Avalos	B.S.	Teacher Education Business Agronomy Agronomy

A. Research Accomplishments

Irrigation classification has been completed for 26 of the 32 New Mexico counties.

B. Publications

In addition to the publications previously reported:

Maker, H. J., J. J. Folks, and J. U. Anderson. 1971 Soil Associations and Land Classification for Irrigation, Santa Fe County. N. Mex. Ag. Exp. Sta. Res. Rpt. 185.

Maker, H. J., V. G. Link, J. U. Anderson, and W. B. Gallman. 1971. Soil Associations and Land Classification for Irrigation, Quay County. N. Mex. Ag. Exp. Sta. Res. Rpt. 202.

Maker, H. J., G. W. Anderson, and J. U. Anderson. 1971. Soil Associations and Land Classification for Irrigation, Mora County. N. Mex. Ag. Exp. Sta. Res. Rpt. 205.

Maker, H. J., V. G. Link, W. B. Gallman, and J. U. Anderson. 1971. Soil Associations and Land Classification for Irrigation, De Baca County, N. Mex. Ag. Exp. Sta. Res. Rpt. 206.

Maker, H. J., M. T. Turner, W. B. Gallman, and J. U. Anderson. 1971. Soil Associations and Land Classification for Irrigation, Lincoln County. N. Mex. Ag. Exp. Sta. Res. Rpt. 212.

Maker, H. J., P. S. Derr, J. U. Anderson, and V. G. Link. 1972. Soil Associations and Land Classification for Irrigation, San Miguel County. N. Mex. Ag. Exp. Sta. Res. Rpt. 221.

Maker, H. J., R. Nehr, and J. U. Anderson. 1972. Soil Associations and Land Classification for Irrigation, Catron County. N. Mex. Ag. Exp. Sta. Res. Rpt. 229 (In press).

C. Project Status

This project is continuing through December 31, 1972.

D. Application of Results

The results of this research have been used to construct a tentative map of suitability of New Mexico lands for irrigation. This map, which groups New Mexico lands into three classes--highly suitable, moderately suitable, and unsuitable--is to be revised on the basis of the initial review, and completed shortly after July 1, 1972. It will then become a part of New Mexico Water Plan which is being prepared by the U.S. Bureau of Reclamation.

This work continues to supply information where none was previously available, and the demand for the published reports has been much greater than we expected. Important areas of land which are well suited to irrigation as well as large areas which are not suitable continue to be shown. Additional information about soil characteristics and suitability for various uses adds greatly to the usefulness of the reports.

E. Work Remaining

Six reports remain to be developed and finalization of the large state map for publication remains.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> MANAGEMENT OF REPLACEMENT FLOWS IN AGRICULTURAL AREAS	OWRR Project No. - - - - - <u>B-025-NMEX</u> NMSU Project No. - - - - - <u>3109-113</u> Agreement No. 14-31-0001- <u>3310</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 University of New Mexico, Albuquerque

Project Began--Month: July 1 ; Yr: 1970 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Micha Gisser	Ph.D.	Economics
Abraham Mercado	Ph.D.	Hydrology
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>

A. Research Accomplishments

A two cell model for the Pecos Basin aquifer was developed. One cell was for the confined aquifer and the other was for the shallow aquifer. The hydrological solution of the model gave two linear steady-state functions which related the water table in the two cells to other variables. The demand function for water was linked to the water table equations. Solutions were found for economic ranges of the price of imported water.

B. Publications

The manuscript has been accepted for publication by Water Resources Research.

C. Project Status

The project was completed June 30, 1972 and the completion report is in process.

D. Application of Research Results

The Bureau of Reclamation is currently making a study of the cost of importing water into West Texas and Eastern New Mexico. This analysis will contribute to that study.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE BASIN IN NEW MEXICO	OWRR Project No. - - - - - <u>B-026-NMEX</u> NMSU Project No. - - - - - <u>3109-117</u> Agreement No. 14-31-0001- <u>3617</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

University of New Mexico, Albuquerque
 New Mexico Institute of Mining and Technology, Socorro
 New Mexico State University, Las Cruces

Project Began--Month: July ; Yr: 1971 Scheduled Completion--Month: June Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert R. Lansford	Ph.D.	Agricultural Economics, NMSU
Shaul Ben-David	Ph.D.	Economics, UNM
Thomas G. Gebhard	Ph.D.	Civil Engineering, NMSU
Willem Brutsaert	Ph.D.	Hydrology, NMIMT
Bobby J. Creel	M.S.	Agricultural Economics, NMSU
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Robert Wheeler	B.S.	Civil Engineering, NMSU
David Wilson	B.S.	Civil Engineering, NMSU
Diane Coker	B.A.	Arts and Sciences, NMSU
Mohd Sualeh Qurashi	M.S.	Industrial Engineering, NMSU
Anthony J. Welker	B.S.	Civil Engineering, NMSU
C. L. Edwards	Ph.D.	Geophysics, NMIMT
J. Naijera	Ph.D.	Hydrology, NMIMT
Shao Chih Way	Ph.D.	Hydrology, NMIMT
Don D. Jones	Ph.D.	Civil Engineering, NMSU
Gary L. Richardson	M.S.	Civil Engineering, NMSU
Thomas Turney	B.S.	Civil Engineering, NMSU
Mohammed Q. Islam	Ph.D.	Civil Engineering, NMSU
Michael Smith	B.S.	Agri. Economics, NMSU
Eva B. Apodaca		Agri. Economics, NMSU
Lonnie E. Mahres	B.S.	Agri. Economics, NMSU
Evelyn Fletcher		Agri. Economics, NMSU
James F. Roach	Ph.D.	Economics, UNM
Catherine A. Sanchez		

A. Research Accomplishments

The four major sub-phases of the study are: the socioeconomic model section; the agricultural section; the ground water hydrology section; and the surface water hydrology section. The progress of each of these individual sub-phases is included.

The Socioeconomic Model

A socioeconomic linear programming model was developed to represent the economy of New Mexico with special emphasis on the Rio Grande Basin (RGB). The model consists of a combination of production and service activities divided into twenty-four sectors. Technical coefficients are based on an interregional statewide Input-Output table developed for this study from the New Mexico Input-Output Table (New Mexico Bureau of Business Research). This data for the state was divided into five regions, four of which are within the RGB and the fifth includes the rest of the state.

The model used is an optimization model where an objective function is to be maximized subject to a set of constraints. Positive contributions to the objective function are measured by the value added of the production sectors. The objective function also includes costs resulting from the need to develop additional recreation sites, costs to treat water pollution created by production activities, and costs of unemployment compensation.

The model can be used to obtain the optimal levels of production and service activities to satisfy a given population, resource availabilities, and a fixed proportion of imports. The same model is also utilized to simulate alternative situations and their impact on the economy and on resource utilization. The effect of population growth projections on the economy of New Mexico is simulated under alternative assumptions about water availability such as:

1. water importation,
2. interregional transfers within the state, and
3. transfers from agriculture to municipal and industrial uses by allowing increased imports of agricultural products.

Agricultural Economics

The initial objective of this sub-phase of the project to prepare an economic classification of the irrigated cropland in the Rio Grande Basin has been met. The irrigated croplands in the basin have been classified into three groups according to their economic productivity as influenced by soil characteristics and irrigation water quality and quantity, and modified by the economic indicators and budget information relevant to the

area. A map has been prepared for each sub-area of the basin which indicates the geographic distribution of the three economic land classes. These three classes are described as follows:

Class I -- areas with only slight if any limitations. These areas consist of farms which appear to have a sound future in irrigated agriculture. The land resource is highly responsive and will support heavy investments in buildings, equipment, and large expenditures for operating cost associated with intensive commercial agriculture.

Class II -- areas with moderate limitations. These areas consist mainly of farms with medium income expectancies, lower productivity, and smaller capital investments.

Class III -- areas with severe limitations. Chances for success in farming in these areas are small, and full-time commercial operations are not expected to continue for long due to the low productive potential and low economic returns.

In addition to the economic land classification, information on the present cropping patterns, crop acreages, management practices, farm earnings, and agricultural water use by sub-area was supplied for the socioeconomic model. This information was essential basic data for the agricultural sector of the socioeconomic model.

Ground Water Hydrology

The surface water-ground water conjunctive use simulation phase of the project was completed for the different regions of the Rio Grande basin. Analysis of the computer output resulted in a set of equations, one for each region, relating the depth to the water table as a function of time and water demand. Equations obtained were of the following form:

$$\Delta d = f (d_n, L)$$

where Δd = change in water table elevation for the time period (year) considered, d_n = water table elevation at the end of previous time period (year), and L = a lump factor combining surface water inflow and outflow, precipitation, and beneficial and nonbeneficial water uses.

These relationships do not reflect a variation in water table elevation along lines perpendicular to the river bed. This averaged lateral response was found adequate for the purpose of this study.

Accretion to or from the Rio Grande river was also extracted from the computer simulation runs. Results compared favorably with previous calculations based on historical records, where available. The amount of water

diverted from the Rio Grande either by decreasing the natural flow to the river or by river seepage, due to different amounts of pumpage, is thus determined for each region as a function of time. The results are represented as a family of curves, one for each pumpage level with accretion to (+) or from (-) the river in CFS/MI as a function of time.

Surface Water Hydrology

The basic objective of this phase of the project was to provide information on the surface water availability and water consumption within the four sub areas of the Rio Grande Basin. Records of surface-water flow for various gaging stations were compiled and analyzed. The water availability and water consumption data was estimated from statistical analysis of available water quantity measurements and from collected data on consumptive irrigation requirements. This compilation provided the surface water hydrology inputs to the socioeconomic model.

In addition, the surface water-ground water conjunctive use simulation phase, developed and explained in ground water hydrology section, was applied to the Mesilla Valley by this project section. This phase also provided input data necessary for the socioeconomic model.

Significant Results

One of the major impacts of the study has been its influence on the state water plan currently being developed. Information developed and questions raised by the various sub-phases of the project has either been used or caused modifications in the plan. Because of the technical advisory committee's participation throughout the project, many of the ideas and findings were having significant impact on development and planning being conducted by the member organizations even though the results have not been published.

B. Publications

Creel, Bobby J., "Monthly Consumptive Irrigation Requirements as a Guide to Efficient Management," Proceedings of the Sixteenth Annual New Mexico Water Conference, Water Resources Research Institute, New Mexico State University, March, 1971.

Haley, Eugene V., "A Computer Program for the Calculation of Consumptive Irrigation Requirements Utilizing the Blaney-Criddle Method," Unpublished Special Problem Paper, Department of Agricultural Economics, New Mexico State University, May 1971.

Lansford, Robert R., and B. J. Creel, "Irrigated Cropland Middle Rio Grande Basin, New Mexico," New Mexico Agriculture -- 1970, Agricultural Experiment Station Research Report 195, New Mexico State University, June 1971.

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1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> A COMPARISON OF RATES OF WATER LOSS, THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES	OWRR Project No. - - - - - <u>B-027-NMEX</u> NMSU Project No. - - - - - <u>3109-120</u> Agreement No. 14-31-0001- - <u>3618</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 New Mexico State University, Las Cruces

Project Began--Month: July 1; Yr: 19 71 Scheduled Completion--Month: June 30 Yr: 19 72

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Gary L. Cunningham	Ph.D.	Biology
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Helen Wolfe	Ph.D.	Biology
Joseph G. Fraser	Ph.D.	Biology
Frederick G. Gaffney	M.S.	Biology
Stephanie G. Moore	M.S.	Microbiology

A. Research Accomplishments

Transpiration measurements were made on six phreatophyte species occurring on our study site. Measurements were made at two hour intervals from sunrise to sunset. Each species was measured at least twice a month during the portion of the year that it had leaves. The six species were: Tamarix pentandra, Salix amigdaloides, Baccharis glutinosa, Prosopis pubescens, Lycium torreyi, Populus fremontii.

In addition environmental data for the site were collected during the entire year for use in evaluating the transpiration data. Environmental data collected were:

1. Relative humidity and air temperature five feet above the ground.

2. Total incoming sun and sky radiation
3. Total wind at fifteen feet above the ground
4. Total soil water potential at three feet, two feet, one foot, and three inches below the surface
5. Matric component of soil water potential at three feet, two feet, one foot and three inches below the surface
6. Soil temperature at three feet, two feet, one foot, three inches and shaded surface.

Our analysis of the data has not yet been completed, but some of the preliminary results are interesting. Regression analysis of the data has shown that close to 70 percent of the variation in transpiration rate can be accounted for by linear relationships with relative humidity, air temperature and solar radiation. Non-linear regression should account for even more of the variation.

B. Publications

None - two thesis in progress

C. Project Status

This project was completed on June 30, 1972 and a report is under preparation.

D. Application of Results

It does appear that the tree species may be more efficient users of water than the shrubs. If this holds true, it may be that management practices leading to a park-like savannah along the river might offer a more efficient use of water than the tree and shrub "bosques". This type of vegetation might also increase the recreational and aesthetic value of the river.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> UTILIZATION OF WATER IN A SEMI-ARID REGION	OWRR Project No. - - - - - <u>B-029-NMEX</u> NMSU Project No. - - - - - <u>3109-119</u> Agreement No. 14-31-0001- <u>3619</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month: July 1 ; Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1975

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
H. D. Fuehring	Ph.D.	Agronomy (Soil Fertility)
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>

A. Research Accomplishments

The most significant results to date indicate that watershed areas comprising more than half the total area result in lower crop yield. Watershed areas need to be kept narrow to minimize wind and water erosion and to obtain weed control. Winter barley tends to winterkill during very dry winters and is less suitable as a crop than winter wheat. A major problem with the spring seeded crops is to get adequate seed germination and crop emergence. The timing and frequency of subsoil chiseling to enhance water infiltration is critical. Sunflowers yielded well (up to 1200 lb/acre) under adverse conditions and have considerable promise as a dryland crop. Sugarbeets as a crop depends on finding a way to insure seed germination and emergence of seedlings. Water injection with the seed is being tried as a means of solving this problem.

B. Publications

None

C. Project Status

This project is scheduled for completion on June 30, 1975.

E. Work Remaining

To develop a system by which the normal rainfall can be used more efficiently for crop production in arid and semi-arid areas.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> ANALYSIS OF WATER CHARACTERISTICS OF MANUFACTURING INDUSTRIES AND THEIR ADAPTABILITY TO SEMI-ARID REGIONS	OWRR Project No. - - - - - <u>B-032-NMEX</u> NMSU Project No. - - - - - <u>3109-118</u> Agreement No. 14-31-0001- - <u>3620</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:
 University of New Mexico, Albuquerque
 New Mexico State University, Las Cruces

Project Began--Month: July 1 ; Yr: 1971 Scheduled Completion--Month: June 30 Yr: 19 73

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Shaul Ben-David	Ph.D.	Economics
Harry G. Folster	Ph.D.	Chemical Engineering
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Naheed Hossein	M.S.	Industrial Engineering
Judy Nelson	M.A.	Economics
Wayne Dunlap	B.S.	Chemical Engineering
Rodger Melton	B.S.	Chemical Engineering
James Doty		Economics
Leland Griffin	B.S.	Chemical Engineering

A. Research Accomplishments

Two principle objectives existed for the first year of the project. The first objective was to develop a list of heavy water using industries with a potential for locating in New Mexico. A review of the studies made by different groups on the potential for industries to move into the area was undertaken. It was found that the screening processes used excluded all capital intensive industries in favor of those which are labor intensive. This type of screening effectively eliminated heavy water using industries, which are usually highly capital intensive, from further consideration. A different type of approach is being used to construct the list. Using Census data all industries have been ranked by their water using characteristics. The industries that show heavy water use patterns are being further studied to determine their potential for location in New Mexico. This list is expected to be completed by the end of June.

The second objective was to intensively study several of the industries on the list. It is hoped that from this kind of approach a model will be developed that can facilitate the study of the remaining industries. The two industries picked were petroleum refining and cottonseed oil production. All background information available has been gathered on these industries. It should be noted that the amount and type of information differ substantially. Most aspects of the petroleum industry are reported on in detail in various trade journals and government information sources. The cottonseed industry, on the other hand, is highly monopolized and few information sources are available. Except for one Bureau of Mines study no specific information on water use or water costs is available. An attempt was made to try to isolate what determined water use in the petroleum industry from the data available in this study, but no significant results were obtained.

A questionnaire has been sent out to all the petroleum refineries and cottonseed oil plants in the southwest. The questionnaire asks detailed questions on the components of water use in the various plants. So far fifteen have been returned for each category.

B. Publications

None

C. Project Status

This project is scheduled for completion on June 30, 1973.

E. Work Remaining

Completion of the questionnaires and development of the information on the rest of the industries.

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> SOIL AND WATER MANAGEMENT FOR SALINITY CONTROL	OWRR Project No. - - - - - <u>C-2165</u> NMSU Project No. - - - - - <u>3109-203</u> Agreement No. 14-31-0001- - <u>3376</u> FCST Research Category- - - <u> </u>
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Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month:Aug. 1 ; Yr:1970 Scheduled Completion--Month:July 31 Yr:1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
P. J. Wierenga	Ph.D.	Agronomy
<hr/>		
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Susan Gomez	B.S.	Chemistry
Dennis W. Westcot	M.S.	Agronomy
Jacob Dane	M.S.	Agronomy
David Brown	B.S.	Mechanical Engineering

A. Research Accomplishments

Considerable progress has been made toward measuring the rates of soluble salt movement in soils, and in predicting salt and water movement under unsaturated flow conditions. From actual measurements and from computer modeling it has been found that the redistribution of water in soil profiles after irrigation is a continuous process. With evaporation from the soil surface prevented, drainage rates at 150-cm vary from around 2 cm/day one day after irrigation to 0.1 cm/day 25 days after irrigation. With the drainage water a large amount of salts is moving down the soil profile. The composition of the drainage water is, to a large degree, dependent on the quality of the irrigation water and on the chemical properties of the soil, while it is for the present soil not dependent on the rate of drainage. After irrigation the soil columns for two years with 10-cm

water at four week intervals, the concentration of the drainage water is still about 8 meq/l or 25 percent higher than the concentration of the irrigation water. The main increase is in nitrate concentration (6 meq/l), apparently from breakdown of organic matter in the soil column.

The development of computer simulation programs for predicting salt movement under unsaturated conditions, has been very encouraging. A model is now available to predict nitrate movement in soil during and after irrigation. The model allows for dispersion, and takes into account negative adsorption of nitrate ions by soil particles. Where the chemical and physical characteristics of a soil, whether layered or uniform, are known, the model may be used to predict rates of movement of surface applied nitrates to the ground water table. Chemical or microbiological conversions of nitrate into other forms have not been taken into account, but could readily be included. The model has been tested under field conditions and has been expanded to include movement of cations such as calcium, magnesium and sodium.

B. Publications

Dane, J. H., "Effect of Hysteresis on the Prediction of Infiltration, Redistribution and Drainage of Water in Large Soil Columns," Unpublished Master's Thesis, Agronomy Department, New Mexico State University, June 1972.

Westcot, D. E., "Simultaneous Transfer of Heat and Water Vapor in a Closed Soil System, Agronomy Department, New Mexico State University, June 1972.

Wierenga, P. J., "Simulation of Water and Chloride Movement in Soil," Agron. Abst. ASA, 1971.

C. Project Status

This project will be completed on July 31, 1972.

PROJECT FUNDED BY BUREAU OF RECLAMATION, USDI

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> BIOLOGICAL CONTROL OF TAMARISK AND OTHER PHREATOPHYTES	OWRR Project No. - - - - -
	NMSU Project No. - - - - - 5700-305
	Agreement No. 14-06-500 - - 1517
	FCST Research Category - - -

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Project Began--Month:June 1 ; Yr:19 68 Scheduled Completion--Month:Oct. 31 Yr:1971

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
J. G. Watts	Ph.D.	Entomology
B. D. Linsey	Ph.D.	Plant Pathology
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
C. D. Liesner	M.S.	Entomology
D. C. Swenson		Ag. Biology

A. Research Accomplishments

A study of the phytophagous insect fauna of Tamarix pentandra Pallas in New Mexico indicated one key species and several species of lesser importance. A leafhopper, Opsius stactogalus Fieber, was found in large numbers in thirty counties during the growing seasons of 1968, 1969, and 1970. The leafhopper population obtained its culmination during the months of August and September, however, it was not causing substantial damage. Results of leafhopper population studies, life history review, host range studies, and salt cedar growth patterns gave some insight into the relationship of O. stactogalus to T. pentandra.

Field studies of T. pentandra growth patterns, as influenced by the leafhopper, O. stactogalus, were conducted. It was found by removing all

insects, through the use of insecticides, that the seasonal growth of salt cedar could be increased 76 percent. Conversely, it was found that a caged salt cedar plant could be killed or its growth significantly retarded by increasing the leafhopper population.

B. Publications

Liesner, Dan Raymond, "Phytophageus Insects of Tamarix in New Mexico,"
Master's Thesis, 73 pp.

Report to the Bureau of Reclamation in process.

C. Project Status

The project has been completed.

D. Application of Results

Salt Cedar is a major problem and this work has contributed to our knowledge of possible biological control.

SOURCE OF FUNDS - U.S. ENVIRONMENTAL PROTECTION AGENCY

1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<p><u>Project Title:</u> QUALITY AND QUANTITY OF RETURN FLOW AS INFLUENCED BY TRICKLE AND SURFACE IRRIGATION</p>	<p>OWRR Project No. - - - - - _____ NMSU Project No. - - - - - 5700-308 Agreement No. - - - - - 13030 GLM FCST Research Category - - - _____</p>
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Name and Location of University Where Project is Being Carried Out:
 New Mexico State University, Las Cruces

Project Began--Month:July 1; Yr:1971 Scheduled Completion--Month:June 30 Yr:1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
John W. Clark	C.E.	Civil Engineering, Project Director
P. J. Wierenga	Ph.D.	Soil-Plant Water Relations, Principal Investigator
T. C. Patterson	M.S.	Civil Engineering, Principal Investigator
E. G. Hanson	M.S.	Ag. Engineering
A. A. Baltensperger	Ph.D.	Agronomy
G. A. O'Connor	Ph.D.	Soil Chemistry
Donald K. McClanahan	M.S.	Civil Engineering
Dean C. Horn	B.S.	Ag. Engineering
James B. Littlejohn	B.S.	Ag. Engineering
Steven McClanahan	B.A.	Education
James L. Wood	B.S.	Ag. Engineering
Donald D. Curnutt	B.S.	Ag. Engineering
Jerry Jaramillo	B.S.	Agronomy
Francis Boyle	B.S.	Chemistry
Samuel Davis	B.S.	Agronomy
Martins Van Genuchten	M.S.	Soil Physics
David Brown	B.S.	Mechanical Engineering
Joel Mahill	B.A.	Economics

A. Research Accomplishments

The project is in the first year of a 3 year study and all of the experimental plots have been instrumented and planted.

The real interest in this research project is in the quality and quantity of irrigation return flow, as affected by trickle and surface irrigation. Trickle systems have great potential for high water-use efficiency. The systems can readily be automated and may be programmed to operate without excessive percolation losses inherent with border and furrow irrigation. At present, the overall irrigation efficiency in the Rio Grande Valley is around 40 to 50 percent. Thus as much as 50 percent of the water used for irrigation may be lost to the subsoil by deep percolation. Part of this water is used again by pumping from wells, and part of it is returned to the river as drainage return flow. However, the quality of this water has degraded considerably during its movements through the soil. It is expected that with trickle irrigation the quantity of irrigation return flow can be greatly reduced. What the effects will be on the quality of the return flow is uncertain. This project should yield valuable information on the quality of the return flow and on the changes in soil salinity resulting from trickle irrigation. The project will also be helpful in establishing management procedures for trickle irrigation for the soil, water and climatic conditions of the Middle Rio Grande Valley.

The surface irrigation treatments should yield information on the amount and the quality of water leaching from the surface plots. The experiment may prove that possibly less water may be used for maintaining a favorable salt balance than what at present is thought to be necessary for leaching of excess salts, based on steady state flow rates. A reduction in leaching water will reduce the volume of drainage return flow and thus have a favorable effect on the quality of the river water downstream.

B. Publications

Clark, J. W., "Salinity Problems in the Rio Grande Basin," Proceedings of National Conference on Managing Irrigated Agriculture to Improve Water Quality, pp. 55-66, May 16-18, 1972.

Wierenga, P. J. and T. C. Patterson, "Irrigation Return Flow Studies in the Mesilla Valley," Proceedings of National Conference on Managing Irrigated Agriculture to Improve Water Quality, pp. 173-180, May 16-18, 1972.

C. Project Status

This project is scheduled for completion on June 30, 1974.

STATE FINANCED
 1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
 ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> A STUDY OF THE CHEMICAL AND BIOLOGICAL CHARACTER OF RIO GRANDE WATER IN THE BOSQUE DEL APACHE REFUGE	OWRR Project No. - - - - - NMSU Project No. - - - - - <u>3109-122</u> Agreement No. 14-31-0001- - FCST Research Category- - -
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Name and Location of University Where Project is Being Carried Out:

New Mexico Institute of Mining and Technology, Socorro

Project Began--Month: July 1 ; Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Donald K. Brandvold	Ph.D.	Chemistry
James A. Brierley	Ph.D.	Biology
Carl J. Popp	Ph.D.	Chemistry
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Jerry F. Scott	B.S.	Biology
Richard Tamura	B.S.	Biology
Alan Branch	B.S.	Biology
Don Baker, III	B.S.	Chemistry
Christine Fox	B.S.	Chemistry
Mark Johnson	B.S.	Chemistry
David R. Jones, IV	B.S.	Basic Sciences
Tom Robinson	B.S.	Chemistry
David Davies	M.S.	Bio Chemistry
Reland Kane	B.S.	Chemistry
Charlotte Rogers	M.S.	Chemistry (B.S. Biology)
Michael Noce	B.S.	Chemistry

A. Research Accomplishments

Analyses have been performed for an exhaustive set of parameters to this point in order to thoroughly define the system. These parameters were pH, temperature, conductivity, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, dissolved solids, sedimentable material, SiO₂, Ca²⁺, Mg²⁺, K⁺, Na⁺, Hg²⁺, HCO₃⁻, CO₃⁼, Cl⁻, F⁻, SO₄²⁻, PO₄³⁻ (dissolved ortho), PO₄³⁻ (total as ortho), NO₃⁻, NO₂⁻, Kjeldahl nitrogen, and ammonia.

A computer program now stores the data on tape, prints out analysis sheets, and compares milliequivalents of cations and anions to check for completeness. The data so far indicate two major points, one: the waterfowl use contributes significantly to the total water nitrogen load and this shows up mainly in the Kjeldahl nitrogen fraction, and two: most of the phosphate present appears in the "total $\text{PO}_4^{=}$ " determination and not as dissolved orthophosphate as might be expected.

B. Publications

None

C. Project Status

This project has been expanded and is being continued until June 30, 1973 as A-038-NMEX (3109-49).

STATE
 1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
 ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> ANALYSIS OF MERCURIALS IN ELEPHANT BUTTE RESERVOIR	OWRR Project No. - - - - - NMSU Project No. - - - - - 3109-123 Agreement No. 14-31-0001- - FCST Research Category- - -
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Name and Location of University Where Project is Being Carried Out:

University of New Mexico, Albuquerque

Project Began--Month: July ; Yr:1971 Scheduled Completion--Month: June Yr:1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
John D. Garcia David E. Kidd Gordon V. Johnson	M.S. Ph.D. Ph.D.	Biology Psychology and Mycology Agri. Chemistry and Soils
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
John D. Garcia Sandra Bruner Susan R. Mazarr	M.S. B.S.	Biology Biology Biology

A. Research Accomplishments

Two nutrient enrichment experiments have been conducted in the field by supplementing Reservoir water in bottles with either a single nutrient salt or a complete Rhode's nutrient salt mixture. The bottles were then incubated in the Reservoir for two days. The effect of the nutrient additions were determined by measuring primary productivity by the ¹⁴C method and making algal counts at the conclusion of the experiment. Stimulatory effects of nutrient additions appeared to be slight in these experiments possibly because the experiments were limited to two days after the nutrient additions.

Laboratory experiments were conducted to determine the effect of nutrient additions on the growth of pure cultures of Scenedesmus dimorphus, Chlamydomonas debaryana var. cristata, and Anabaena flosaquae in sterilized water samples obtained from the lower end of the Reservoir in October, 1971.

Growth was measured by cell counts or by optical density measurements of the culture medium. Without addition of nutrients to the water very little growth was observed. Omission of K_2HPO_4 or $Ca(NO_3)_2$ from the complete Rhode's nutrient medium severely depressed growth of *Scenedesmus* and *Chlamydomonas* to approximately the level of the control. *Anabaena*, a nitrogen fixing blue green alga, failed to grow well only when K_2HPO_4 was omitted. Striking responses to these nutrients were obtained whether or not the water was filtered through a membrane filter to remove suspended material prior to sterilizing, hence water that had been filtered was used in subsequent experiments. Experiments with *Scenedesmus* and *Chlamydomonas* demonstrated that the growth response obtained was specifically due to the nitrate and phosphate ions.

Reservoir water near the outlet of this reservoir is typically less turbid, lower in nitrate and phosphate concentration and characterized by lower primary productivity at the surface than water near the inlet. Water samples from the inlet and outlet were compared in laboratory experiments by growth of pure cultures of *Chlamydomonas* and *Scenedesmus* on water that had been filtered and sterilized with supplements of the complete Rhode's nutrient medium or with the complete medium with the omission of a single nutrient salt. Growth of *Chlamydomonas* was severely limited on water from the outlet (Station 1) or the inlet (Station 6) if either K_2HPO_4 or $Ca(NO_3)_2$ were omitted from the supplemented medium.

Growth of *Scenedesmus* on water from the inlet (Station 1) is seen to be severely limited by omission of $Ca(NO_3)_2$, omission of K_2HPO_4 was perhaps slightly less limiting compared to the complete supplement. *Scenedesmus* grown in water from the inlet (Station 6) omission of $Ca(NO_3)_2$ severely limits growth while the omission of K_2HPO_4 did not depress growth compared to the complete supplement.

The total dissolved phosphate and nitrate measured in the Reservoir water samples used in these experiments is given in the following table:

Date	Station	PO_4 mg/liter	NO_3 mg/liter
10/71	1	0.188	0.475
3/7/72	1	0.289	0.240
3/7/72	6	0.655	0.536

Significance of Results

Laboratory experiments with *Scenedesmus* and *Chlamydomonas* demonstrated that at the two sampling dates at the outlet the concentration of nitrate

and phosphate was very limiting to the growth of these algal species. A sample of water from the inlet was found to have limiting supplies of nitrate and phosphate for Chlamydomonas; however, only the nitrate concentration limited growth of Scenedesmus. Analysis of Elephant Butte Reservoir water has demonstrated that the concentration of phosphate is rather high for reservoir waters and is frequently similar to or may even exceed the concentration of nitrate. It is thus not surprising that nitrate would limit algal growth, however, the finding that phosphate also limits algal growth is quite unexpected. Possibly a major fraction of the total dissolved phosphate is in a chemical form that cannot be utilized by the algae. It is also apparent that Chlamydomonas and Scenedesmus differ markedly in their efficiency of utilization of phosphate present in Reservoir water.

B. Publications

None

C. Project Status

This project is being continued as A-040-NMEX - 3109-51.

E. Work Remaining

This project will be completed June 30, 1973. It is planned to determine the levels of the limiting nutrients in the upper and lower reservoir on a monthly basis. The effect of phosphate deficiency on the activity of the enzyme phosphatase will be investigated in the laboratory to see if it can be used as an indicator of the adequacy of the phosphate.

STATE
 1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
 ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE	OWRR Project No. - - - - - NMSU Project No. - - - - - 3109-124 Agreement No. 14-31-0001- - FCST Research Category- - -
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Name and Location of University Where Project is Being Carried Out:

New Mexico Institute of Mining and Technology, Socorro

Project Began--Month: July ; Yr:1971 Scheduled Completion--Month: June Yr:1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Marshall A Reiter Allan R. Sanford	Ph.D. Ph.D.	Geophysics Geophysics
<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Thomas Croxell Thomas E. Elliott	M.S. B.S.	Geophysics Geophysics

A. Research Project Accomplishments

The measurement of rates of groundwater flow by means of in-situ thermal probes has been investigated theoretically by Jaeger (1956). We have used Jaeger's equations to compute the theoretical curves. These curves show the increase in temperature at the center of the probe as a function of time and flow rates. The assumed values of thermal diffusivity, density, and specific heat are believed to be representative values for rock types likely to be encountered in water wells. The rate of heat supplied per unit length of the probe, 0.4 calories per cm., is a typical rate for the probe we have constructed.

The two sets of curves, one for a 2-inch diameter borehole and the other for a 4 3/4-inch diameter borehole, indicate temperature rise is quite dependent on borehole diameter. Theoretically, differences in flow rate can be distinguished more easily in small boreholes.

The central rod of solid aluminum has a helical wrapping of glass insulated nichrom wire which is the heating element. Inbedded midway down this rod are two thermisters for measuring the temperature rise of the probe. The central rod fits tightly inside an aluminum cylinder of 1.5 inches outside diameter. Electrical connections to the heating element and thermisters are made through the stainless-steel water-proof coupling.

The instrument rack contains (1) a unit for controlling the amount of power going to the probe (lowest panel), (2) a bridge network for monitoring the increase in temperature of the probe (middle panel) and (3) a Varian recorder for recording the increase in temperature of the probe as a function of time. The bridge is designed to measure temperature differences as small as 0.02° C. Power to the heating element can be adjusted from 0 to 300 watts.

B. Publications

No publications to date

C. Project Status

This project will continue under the annual allotment program for next year as A-042, 3109-52.

E. Work Remaining

The probe is to be tested in a specialty designed calibration apparatus and then field tested.

STATE FINANCED
 1972 ANNUAL REPORT - NARRATIVE PROGRESS REPORT RELATING TO EACH
 ANNUAL ALLOTMENT AND MATCHING GRANT PROJECT

<u>Project Title:</u> HYDROLOGIC-NUTRIENT CYCLE INTERACTIONS IN UNDISTURBED AND MAN-MANIPULATED ECOSYSTEMS (WATERSHEDS)	OWRR Project No. - - - - - NMSU Project No. - - - - - 3109-126 Agreement No. 14-31-0001- - FCST Research Category- - -
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Name and Location of University Where Project is Being Carried Out:

University of New Mexico, Albuquerque

Project Began--Month: July 1 ; Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
James R. Gosz	Ph.D.	Biology

<u>Student Assistants</u>	<u>Degree</u>	<u>Discipline or Academic Background</u>
Paul Krause	Ph.D.	Biology
Kit Williams	M.S.	Biology
Yvonne Rogers	M.S.	Biology
Wallace Covington	M.S.	Biology
David Dreesen	M.S.	Biology

A. Research Accomplishments

The preliminary data of this study clearly demonstrates the importance of studies on small watersheds dominated by a single vegetation type. Only by analyzing the hydrological cycle, nutrient budgets and intra-system cycling of these small watersheds can we hope to develop models of larger, management sized watersheds. Models of stream water chemistry are essential to evaluate land management practices as affecting water yield and quality.

B. Publications

None - thesis in progress

C. Project Status

This project is being continued as A-039-NMEX for the period July 1, 1972 through June 30, 1973.

E. Work Remaining

The extension of Water Resources Research Institute Grant No. 3109-126 is to allow further studies of mineral cycling in forested watersheds. This is necessary to understand the basic functioning of these natural ecosystems which affects water quality. It also is necessary to evaluate various land management procedures as they affect water quality and quantity. Since the type and quantity of nutrients leaving a watershed can indicate what functions have been disturbed, monitoring the chemistry of stream water from managed watersheds can be a diagnostic tool in evaluating man's affect.

ANNUAL REPORT - TRAINING AND EDUCATION ASPECTS
OF THE WATER RESEARCH PROGRAM UNDER P.L. 88-379

Name of University: New Mexico State University^{1/}

A. During period since last annual report was submitted provide information on:

(1) New Mexico resources related courses developed:

None

(2) Water resources related staff members added to fill new positions:

Bobby J. Creel, Assistant to the Director, M.S. Agricultural
Economics, small percent of salary from P.L. 88-379

Diane Coker, part time editor, B.A. English

(3) Water resources related staff members employed to replace those who retired, died, or moved.

None

(4) New water resources research and training facilities other than research equipment items:

None

(5) Interdepartmental interuniversity or regional agreements consummated with respect to improved research and training capabilities.

None

^{1/}These figures are for the three university units cooperating in the research program. Since there are no specific records available on some of these items, the most accurate judgment possible was made.

B. Number of students receiving employment as research project or program assistants through the P.L. 88-379 program.

Category of Students	No. by Scientific Discipline or Major Field of Study (Engineering, Biology, Economics, etc. ^{2/})	
	Scientific Discipline of Student	Number
(1) <u>Undergraduates</u>	Agricultural Biology	3
	Agricultural Economics	3
	Agricultural Engineering	4
	Agronomy	4
	Animal Science	7
	Biology	6
	Bio-Chemistry	1
	Business	3
	Chemistry	12
	Chemical Engineering	5
	Civil Engineering	7
	Education	2
	Economics	2
	Geophysics	1
	Geoscience	1
	History	3
	Mathematics	2
Mechanical Engineering	2	
	<u>68</u>	

^{2/} This refers to educational background prior to employment as research assistant on P.L. 88-379 projects--not to departments in which projects are being conducted.

B. (continued)

Category of Students	No. by Scientific Discipline or Major Field of Study (Engineering, Biology, Economics, etc.)	
	Scientific Discipline of Student	Number
(2) <u>Master's Students</u>	Agricultural Economics	1
	Agronomy	2
	Animal Science	1
	Biology	6
	Bio-Chemistry	1
	Chemistry	2
	Chemical Engineering	1
	Civil Engineering	4
	Economics	1
	Entomology	1
	Geophysics	1
	Geoscience	3
	Industrial Engineering	2
	Micro Biology	1
	Physics	1
	Sanitary Engineering	1
	Soil Physics	1
	30	

B. (continued)

<u>Category of Students</u>	<u>No. by Scientific Discipline or Major Field of Study (Engineering, Biology, Economics, etc.)</u>	
	<u>Scientific Discipline of Student</u>	<u>Number</u>
(3) <u>Doctoral Students</u>	<u>Biology</u>	<u>3</u>
	<u>Civil Engineering</u>	<u>1</u>
	<u>Economics</u>	<u>1</u>
	<u>Geophysics</u>	<u>1</u>
	<u>Geoscience</u>	<u>2</u>
	<u>Hydrology</u>	<u>2</u>
		<u>10</u>
(4) <u>Postdoctoral Students</u>		<u>None</u>

C. Employment status of majors in water-related fields who graduated during the school year ending about June and who receive P.L. 88-379 support.

EMPLOYMENT STATUS	CATEGORY OF SCHOOL YEAR GRADUATE BY DEGREE OBTAINED			
	Bachelor's Degree	Master's Degree	Doctoral Degree	Total
1. No. employed in water-related positions in: Total-----				
Federal Agencies-----	(2)	(4)	(0)	(6)
State & Local Agencies-----	(3)	(3)	(0)	(6)
University or College-----	(0)	(1)	(2)	(3)
Other - Including private enterprise-----	(2)	(2)	(1)	(5)
2. No. graduates returning to school for advanced degree ----	8	4	0	12
3. No. going into military service-----	7	5	1	13
4. No. unemployed or working in other fields-----	6	0	0	6
5. No. status unknown-----	14	11	0	25
6. Totals-----	42	30	4	76

D. Type of employment of those school year graduates who received P.L. 88-379 support and who are known to have gone into water-related positions.

Number of Graduates Engaged in Water-Related Work in:	CATEGORY OF SCHOOL YEAR GRADUATE BY DEGREE OBTAINED			
	Bachelor's Degree	Master's Degree	Doctoral Degree	Total
1A. Federal Agencies:				
a. <u>Primarily Research</u> -----		1		1
b. <u>Primarily Planning</u> -----		1		1
c. <u>Primarily Development</u> -----		1		1
d. <u>Primarily Operations</u> -----	1			1
e. <u>Primarily Management</u> -----	1			1
f. <u>Other or not known</u> -----		1		1
1B. State & Local Agencies:				
a. <u>Primarily Research</u> -----				
b. <u>Primarily Planning</u> -----	1	2		3
c. <u>Primarily Development</u> -----	1			1
d. <u>Primarily Operations</u> -----				
e. <u>Primarily Management</u> -----				
f. <u>Other or not known</u> -----	1	1		2
1C. University or College: 3/				
a. <u>Primarily Teaching</u> -----			1	1
b. <u>Primarily Research</u> -----		1	1	2
c. <u>Primarily Research & Teaching</u> ----				
d. <u>Other or not known</u> -----				
1D. Other - Including Private Enterprise:				
a. <u>Primarily Research</u> -----				
b. <u>Primarily Planning</u> -----			1	1
c. <u>Primarily Development</u> -----	1			1
d. <u>Primarily Operations</u> -----		1		1
e. <u>Primarily Management</u> -----		1		1
f. <u>Other or not known</u> -----	1			1
Totals -----	7	10	3	20

Selected summary of above data--from the "Total" column:

Research (1Aa, 1Ba, 1Cb, 1Cc & 1Da)-----	3
Planning (1Ab, 1Bb & 1Db)-----	5
Development (1Ac, 1Bc & 1Dc)-----	3
Operations (1Ad, 1Bd & 1Dd)-----	2
Management (1Ae, 1Be & 1De)-----	2

3/ Do not include here students working as research assistants and receiving course credits.

- E. Identify by name and discipline and briefly describe instances, if any, in which the institute program, in the past year, has resulted in individuals, other than students, doing research or teaching in the water resources field, who, previously, were not involved in water work.

None

- F. Cite any instances you know of, in which individuals who previously served as student research assistants on P.L. 88-379 projects, are now serving as professional investigators of P.L. 88-379 projects following graduation. Do not include individuals reported in this category last year or before.

B. J. Creel, Research Assistant on B-026-NMEX and B-011-NMEX

Principal Investigator on A-041-NMEX (72-73 F.Y.)

INFORMATION DISSEMINATION

Effective communications is an essential characteristic of our Institute program. The major area of concern is the communication of ideas relating to water problems and of possible alternative solutions to these problems to the general public. This portion of the program is not being adequately taken care of because of limited funds.

Item	Number of Events	Total Numbers Issued or Audience Size
Technical Publications Issued	32	24,000
Popular Articles Published		
News Letters	5	350
Press Releases	6	1,000,000
Technical Lectures	4	430
Popular Talks	5	410
Sponsorship of Seminars	1	300
Correspondence and Telephone Inquiries (Estimate)	300	300
Costs	Dollars	Source of Funds
Printing and Page Charges Distribution	16,500	State and Federal

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

NEW MEXICO STATE UNIVERSITY

EIGHTH ANNUAL FINANCIAL REPORT

ANNUAL ALLOTMENT PROJECTS

and

MATCHING GRANT PROJECTS

FOR THE PERIOD

July 1, 1971 - June 30, 1972

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FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<u>Project Title:</u> CLOUD CHAMBER STUDY OF WATER EVAPORATION	OWRR Project No. - - - - - <u>A-024-NMEX</u> NMSU Project No. - - - - - <u>3109-35</u> Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u>
<u>Principal Investigator(s)</u> William B. Good	
<u>Project Began--Month: July 1 Yr: 19 71</u>	<u>Scheduled Completion--Month: June 30 Yr: 19 72</u>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. SALARIES & WAGES: TOTAL - - - - -	6,404.00	5,970.99
Prin. Investigator - - - - - No. _____ Man-yrs _____	(2,981.00)	(_____)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants- - - - - No. <u>2</u> Man-yrs <u>.59</u> (Includes Student Technicians)	(3,423.00)	(4,392.99)
Undergrad. Student Assistants - No. <u>1</u> Man-yrs <u>.44</u> (Includes Student Technicians)	(_____)	(1,578.00)
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	300.00	838.81
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	730.00	593.35
<u>Computer</u>	(130.00)	(_____)
<u>Publication</u>	(300.00)	(300.00)
<u>Travel</u>	(300.00)	(293.35)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS:-</u> - - - - -	(7,434.00)	(7,403.15)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> THE IMPACT OF WATER TECHNOLOGY ON THE HISTORY OF NEW MEXICO</p> <p><u>Principal Investigator(s)</u> Paige W. Christiansen</p>	<p>OWRR Project No. - - - - - <u>A- 026-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-37</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p><u>Project Began--Month: July 1 Yr: 1971</u></p>	<p><u>Scheduled Completion--Month: June 30 Yr: 19 72</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1972</u>	<u>Actual Expenditures FY 1972</u>
A. SALARIES & WAGES: TOTAL - - - - -	5,750.00	5,871.50
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.20</u>	(2,800.00)	(2,932.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants- - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants - No. <u>4</u> Man-yrs <u>.82</u> (Includes Student Technicians)	(2,950.00)	(2,939.50)
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -	535.00	543.30
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	795.00	820.94
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	1,650.00	1,494.26
<u>Travel</u>	(1,600.00)	(1,494.26)
<u>Microfilm, Xerox, Photocopy</u>	(50.00)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS:-</u> - - - - -	(8,730.00)	(8,730.00)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> BIOASSAYS OF QUALITY IN WATER RESOURCES OF MAJOR IMPORTANCE TO NEW MEXICO</p> <p><u>Principal Investigator(s)</u> G. S. Smith</p>	<p>OWRR Project No. - - - - - <u>A-029-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-40</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p>Project Began--Month: <u>July</u> Yr: <u>1971</u></p>	<p>Scheduled Completion--Month: <u>June</u> Yr: <u>1972</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. SALARIES & WAGES: TOTAL - - - - -	4,049.00	3,365.71
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.07</u>	(1,500.00)	(1,044.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.19</u> (Includes Student Technicians)	(1,710.00)	(1,425.00)
Undergrad. Student Assistants - - - - - No. <u>7</u> Man-yrs <u>.25</u> (Includes Student Technicians)	(_____)	(896.71)
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	(839.00)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- - - - -		611.49
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- - - - -		71.80
<u>Computer</u>	(_____)	(4.00)
<u>Travel</u>	(_____)	(67.80)
_____	(_____)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS:- - - - -</u>	(4,049.00)	(4,049.00)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> THE DEVELOPMENT AND FIELD TESTING OF SCHOOL LEARNING MATERIALS ON WATER PROBLEMS OF NEW MEXICO AND THE SOUTHWEST</p> <p><u>Principal Investigator(s)</u> Chris Buethe</p>	<p>OWRR Project No. - - - - - <u>A-031-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-42</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p>Project Began--Month: <u>July 1</u> Yr: 19 <u>71</u></p>	<p>Scheduled Completion--Month: <u>June 30</u> Yr: 19 <u>72</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1972</u>	<u>Actual Expenditures FY 1972</u>
A. SALARIES & WAGES: TOTAL - - - - -	6,739.00	7,338.50
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.17</u>	(2,334.00)	(2,597.50)
Other Prof. Staff - - - - - No. <u>11</u> Man-yrs <u>.24</u>	(2,145.00)	(3,665.00)
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.09</u> (Includes Student Technicians)	(2,000.00)	(700.00)
Undergrad. Student Assistants - No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)	()	()
Technicians & Others- - - - - No. <u>2</u> Man-yrs <u>.08</u> (Non-Students)	(260.00)	(376.00)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	750.00	318.29
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	924.00	756.16
Travel	(200.00)	(70.00)
Communications	(54.00)	(54.00)
Computer	(220.00)	()
Publication	(450.00)	(627.00)
Unemployment Insurance	()	(5.16)
E. TOTALS:- - - - -	(8,413.00)	(8,412.95)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> A TECHNICO-ECONOMIC FEASIBILITY STUDY OF THERMAL POLLUTION ABATEMENT BY ADIABATIC DEGASSING</p> <p><u>Principal Investigator(s)</u> Donald B. Wilson</p>	<p>OWRR Project No. - - - - - <u>A-032-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-43</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p><u>Project Began--Month: July 1</u> Yr: <u>1971</u></p>	<p>Scheduled Completion--Month: <u>June 30</u> 72:19 <u>72</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1972</u>	<u>Actual Expenditures FY 1972</u>
A. SALARIES & WAGES: TOTAL - - - - -	<u>6,375.00</u>	<u>6,601.60</u>
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.33</u>	(4,500.00)	(4,960.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants- - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants - No. <u>5</u> Man-yrs <u>.46</u> (Includes Student Technicians)	(1,875.00)	(1,641.60)
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	<u>100.00</u>	<u>3.75</u>
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	<u>1,300.00</u>	<u>911.24</u>
<u>Computer</u>	(600.00)	(600.00)
<u>Publication</u>	(400.00)	(_____)
<u>Travel</u>	(300.00)	(291.30)
<u>Unemployment Ins.</u>	(_____)	(19.94)
_____	(_____)	(_____)
E. <u>TOTALS:- - - - -</u>	<u>(7,775.00)</u>	<u>(7,516.59)</u>

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> A METHOD OF DEMINERALIZATION USING STRONGLY BASIC ION EXCHANGE RESINS</p> <p><u>Principal Investigator(s)</u> William S. Midkiff</p>	<p>OWRR Project No. - - - - - <u>A- 033-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-44</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p>Project Began--Month: <u>July 1</u> Yr: <u>1971</u></p>	<p>Scheduled Completion--Month: <u>June 30</u> Yr: <u>1972</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1972</u>	<u>Actual Expenditures FY 1972</u>
A. SALARIES & WAGES: TOTAL - - - - -	<u>6,990.00</u>	<u>7,898.50</u>
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.36</u>	(4,262.00)	(5,444.00)
Other Prof. Staff - - - - - No. <u> </u> Man-yrs <u> </u>	(<u> </u>)	(<u> </u>)
Grad. Student Assistants- - - - - No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)	(<u> </u>)	(<u> </u>)
Undergrad. Student Assistants - No. <u>3</u> Man-yrs <u>.68</u> (Includes Student Technicians)	(2,728.00)	(2,454.50)
Technicians & Others- - - - - No. <u> </u> Man-yrs <u> </u> (Non-Students)	(<u> </u>)	(<u> </u>)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -	<u>1,000.00</u>	
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	<u>500.00</u>	<u>606.24</u>
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	<u>500.00</u>	<u>567.94</u>
<u>Travel</u>	(500.00)	(545.30)
<u>Communications</u>	(<u> </u>)	(2.85)
<u>Unemployment Ins.</u>	(<u> </u>)	(19.79)
<u> </u>	(<u> </u>)	(<u> </u>)
<u> </u>	(<u> </u>)	(<u> </u>)
E. <u>TOTALS:-</u> - - - - -	<u>(8,990.00)</u>	<u>(9,072.68)</u>

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> POLLUTION STUDIES OF THE REGIONAL OGALLALA AQUIFER AT PORTALES, NEW MEXICO</p> <p><u>Principal Investigator(s)</u> R. G. Taylor</p>	<p>OWRR Project No. - - - - - <u>A-034-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-45</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p><u>Project Began--Month:</u> <u>July 1</u> <u>Yr: 1971</u></p>	<p><u>Scheduled Completion--Month:</u> <u>June 30</u> <u>Yr: 19 72</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1972</u>	<u>Actual Expenditures FY 1972</u>
A. SALARIES & WAGES: TOTAL - - - - -	4,700.00	4,700.00
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.25</u>	(2,200.00)	(2,200.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	()	()
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.33</u> (Includes Student Technicians)	(2,500.00)	(2,500.00)
Undergrad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	()	()
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	()	()
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- -	700.00	700.00
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- -	700.00	700.00
<u>Travel</u>	(700.00)	(700.00)
_____	()	()
_____	()	()
_____	()	()
_____	()	()
E. TOTALS: - - - - -	(6,100.00)	(6,100.00)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u></p> <p>STUDY PHOSPHATE INCLUDE ALGAL GROWTH IN ORDER TO SUPPRESS OR ELIMINATE THIS PHENOMENA</p> <p><u>Principal Investigator(s)</u></p> <p>N. E. Vanderborgh</p>	<p>OWRR Project No. - - - - - <u>A-035-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-46</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p><u>Project Began--Month: July 1 Yr: 1971</u></p>	<p><u>Scheduled Completion--Month: June 30 Yr: 1972</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. SALARIES & WAGES: TOTAL - - - - -	6,600.00	6,897.66
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.25</u>	(1,300.00)	(3,722.00)
Other Prof. Staff - - - - - No. <u>1</u> Man-yrs <u>.11</u>	(5,000.00)	(1,680.00)
Grad. Student Assistants- - - - - No. <u>2</u> Man-yrs <u>.16</u> (Includes Student Technicians)	(300.00)	(1,213.66)
Undergrad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Technicians & Others- - - - - No. <u>1</u> Man-yrs <u>.06</u> (Non-Students)	(_____)	(282.00)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.) <u>TOTAL</u> - -	500.00	477.34
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) <u>TOTAL</u> - -	400.00	125.00
<u>Publication</u>	(400.00)	(125.00)
_____	(_____)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS</u> :- - - - -	(7,500.00)	(7,500.00)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<p><u>Project Title:</u> INVENTORY OF WATER DIVERSIONS AND RATE STRUCTURE FOR CITIES, TOWNS AND VILLAGES IN NEW MEXICO</p> <p><u>Principal Investigator(s)</u> Alan Randall</p>	<p>OWRR Project No. - - - - - <u>A-036-NMEX</u></p> <p>NMSU Project No. - - - - - <u>3109-47</u></p> <p>Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u></p>
<p><u>Project Began--Month:</u> <u>July 1</u> Yr: <u>1971</u></p>	<p><u>Scheduled Completion--Month:</u> <u>June 30</u> Yr: <u>1972</u></p>

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. SALARIES & WAGES: TOTAL - - - - -	3,300.00	3,834.33
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.05</u>	(750.00)	(732.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	()	()
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.09</u> (Includes Student Technicians)	(2,150.00)	(672.73)
Undergrad. Student Assistants - No. <u>1</u> Man-yrs <u>.31</u> (Includes Student Technicians)	()	(1,102.60)
Technicians & Others- - - - - No. <u>2</u> Man-yrs <u>.29</u> (Non-Students)	(400.00)	(1,327.00)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		38.40
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	100.00	105.21
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	852.00	237.30
Travel	(352.00)	(106.00)
Publication - Printing and Duplicating	(500.00)	(.50)
Unemployment Ins.	()	(26.06)
Communications	()	(104.74)
	()	()
E. TOTALS:- - - - -	(4,252.00)	(4,215.24)

FY 1972 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

<u>Project Title:</u> TRITIUM AS A TOOL IN THE DETERMINATION OF HYDROLOGIC PARAMETERS IN THE ROSWELL BASIN <u>Principal Investigator(s)</u> G. W. Gross	OWRR Project No. - - - - - <u>A-037-NMEX</u> NMSU Project No. - - - - - <u>3109-48</u> Annual Allotment Agreement No. 14-31-0001 - - <u>3531</u>
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Project Began--Month: <u>July 1</u> Yr: 19 <u>71</u>	Scheduled Completion--Month: <u>June 30</u> Yr: 19 <u>72</u>
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<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. SALARIES & WAGES: TOTAL - - - - -	4,280.00	4,503.33
Prin. Investigator - - - - - No. <u> </u> Man-yrs <u> </u>	(<u> </u>)	(<u> </u>)
Other Prof. Staff - - - - - No. <u> </u> Man-yrs <u> </u>	(<u> </u>)	(<u> </u>)
Grad. Student Assistants- - - - - No. <u> 1 </u> Man-yrs <u>.60</u> (Includes Student Technicians)	(4,280.00)	(4,463.33)
Undergrad. Student Assistants - No. <u> 1 </u> Man-yrs <u>.01</u> (Includes Student Technicians)	(<u> </u>)	(40.00)
Technicians & Others- - - - - No. <u> </u> Man-yrs <u> </u> (Non-Students)	(<u> </u>)	(<u> </u>)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- -	577.00	564.93
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- -	400.00	185.16
<u>Publication</u>	(200.00)	(<u> </u>)
<u>Travel</u>	(200.00)	(185.16)
_____	(<u> </u>)	(<u> </u>)
_____	(<u> </u>)	(<u> </u>)
_____	(<u> </u>)	(<u> </u>)
E. <u>TOTALS:</u> - - - - -	(5,257.00)	(5,253.42)

FY 1972 ANNUAL REPORT -- FOR THE INSTITUTE DIRECTOR'S OFFICE

State where institute is located: New Mexico Report as of June 30, 1972

Director's Name:

John W. Clark

Annual Allotment Agreement No. 14-31-0001-3531

<u>Cost Categories to Which FY 1972 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1972</u>	<u>Actual Expenditures FY 1972</u>
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	<u>25,090.00</u>	<u>25,100.88</u>
Institute Director: - - - - - Man-yrs: <u>.75</u>	(<u>18,372.00</u>)	(<u>18,380.88</u>)
Other Prof. Staff: - - - - - No. <u> </u> - Man-yrs: <u> </u>	(<u> </u>)	(<u> </u>)
Graduate Student Assistants: - - No. <u> </u> - Man-yrs: <u> </u> (Includes Student Technicians)	(<u> </u>)	(<u> </u>)
Undergrad. Student Assistants: - No. <u> </u> - Man-yrs: <u> </u> (Includes Student Technicians)	(<u> </u>)	(<u> </u>)
Technicians & Others: - - - - - No. <u>1</u> - Man-yrs: <u>1.00</u> (Non-Students)	(<u>6,718.00</u>)	(<u>6,720.00</u>)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	<u>600.00</u>	<u>600.00</u>
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u> - -	<u>1,400.00</u>	<u>743.74</u>
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u> - -	<u>4,410.00</u>	<u>5,302.35</u>
<u>Travel</u> - -	(<u>2,200.00</u>)	(<u>1,721.67</u>)
<u>Communications</u> - -	(<u>1,200.00</u>)	(<u>1,717.81</u>)
<u>Printing and Duplicating</u> - -	(<u>1,010.00</u>)	(<u>1,395.81</u>)
<u>Unemployment Ins.</u> - -	(<u> </u>)	(<u>129.14</u>)
<u>Maintenance - Repairs</u> - -	(<u> </u>)	(<u>147.00</u>)
<u>Periodicals</u> - -	(<u> </u>)	(<u>190.92</u>)
<u> </u> - -	(<u> </u>)	(<u> </u>)
E. <u>TOTALS:</u> - - - - -	<u>31,500.00</u>	<u>31,746.97</u>

SUMMARY SHEET FOR FY 1972 ANNUAL ALLOTMENT PROGRAM (SEC. 100) EXPENDITURES

Summary of information from forms OW-2 and OW-3 covering Institute Director's Office and annual allotment program projects utilizing FY 1972 allotment program (Sec. 100) funds

State: New Mexico Total no. of allotment projects underway, FY 1972: 10
 Of these, indicate no. completed during year, if any: 10 I/

Annual Allotment Agreement No. (FY1972): 14-31-0001-3531

Cost Categories to Which FY1972 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	80,277.00	82,083.00
Institute Director - - - - - Man-yrs <u>1</u> -	(18,372.00)	(18,380.88)
Principal Investigators - - - - - No. <u>8</u> Man-yrs <u>1.58</u> -	(22,627.00)	(23,631.50)
Other Professional Staff - - - - - No. <u>12</u> Man-yrs <u>.36</u> -	(7,145.00)	(5,345.00)
Graduate Student Assistants - - - - No. <u>9</u> Man-yrs <u>2.05</u> - (Includes Student Technicians)	(16,363.00)	(15,367.71)
Undergrad. Student Assistants: - - - No. <u>22</u> Man-yrs <u>2.96</u> - (Includes Student Technicians)	(7,553.00)	(10,652.91)
Technicians & Others - - - - - No. <u>6</u> Man-yrs <u>1.93</u> - (Non-students)	(8,217.00)	(8,705.00)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	2,135.00	1,181.70
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.)-TOTAL</u> -	5,722.00	5,790.74
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.)-TOTAL</u> -	11,866.00	10,944.56
Travel -	(6,352.00)	(5,474.84)
Communications -	(1,254.00)	(1,879.40)
Printing and Duplicating -	(3,310.00)	(2,448.31)
Unemployment Insurance -	()	(200.09)
Maintenance -	()	(147.00)
Computer -	950.00	604.00
Other Expense - Periodicals -	()	(190.92)
E. <u>TOTALS</u> <u>2/</u> - - - - -	100,000.00	100,000.00

1/ The OWRR Project numbers for completed annual allotment projects are as follows:
 A-024-NMEX, A-026-NMEX, A-029-NMEX, A-030-NMEX, A-031-NMEX, A-032-NMEX,
 A-033-NMEX, A-034-NMEX, A-035-NMEX, A-036-NMEX, A-037-NMEX.

2/ Ordinarily, the Total of "Amount Budgeted FY1972" should equal \$100,000

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1972

<u>Project Title:</u> A COMPREHENSIVE WATER RESOURCES ANALYSIS OF A TYPICAL OVERDRAWN BASIN IN AN IRRIGATED SEMI-ARID AREA - PECOS RIVER BASIN	OWRR Proj. No. B-011-NMEX
	NMSU Proj. No. <u>3109-107</u>
	Matching Grant Agreement Number 14-31-0001- <u>1925</u>
	Total Federal Amount of the M.G.A. -- \$ <u>43,441</u>

Principal Investigator(s): C. E. Jacobs, W. T. Summers, J. W. Hernandez, R. R. Lansford, H. E. Dregne, Ralph d'Arge, Nathaniel Wollman, W. H. Ellis, H. R. Stucky, et. al.

Proj. Began-Mo: July 1 ; Yr: 1968 ; Actual or Scheduled Completion--Mo: June 30; Yr: 1972

Cost Categories Man-Year Information FY 1972 ^{1/}	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	2,429.31	21.94	2,451.25
Principal Investigator(s) - - - - -	()	()	()
No: <u> </u> Man-Years: <u> </u>	()	()	()
Other Professional Staff: - - - - -	(390.00)	()	(390.00)
No: <u>1</u> Man-Years: <u>.03</u>	()	()	()
Graduate Student Assistants: - - - - - (Includes Student Technicians)	()	()	()
No: <u> </u> Man-Years: <u> </u>	()	()	()
Undergrad. Student Assistants - - - - - (Includes Student Technicians)	(30.00)	()	(30.00)
No: <u>1</u> Man-Years: <u>.08</u>	()	()	()
Technicians & Others - - - - - (Non-students)	(2,009.31)	(21.94)	(2,031.25)
No: <u>1</u> Man-Years: <u>.45</u>	()	()	()
B. NON-EXPENDABLE PROPERTY - - - - -	()	()	()
C. EXPENDABLE PROPERTY: - - - - - (Supplies, Materials)	()	47.52	47.52
D. OTHER COSTS (SPECIFY): TOTAL - - - - - (Travel, Indirect costs, Etc.)	()	2,419.23	2,419.23
Maintenance - - - - -	()	(42.00)	(42.00)
Publication, Duplication, Typing - - - - -	()	(1,115.20)	(1,115.20)
Indirect Cost - 40% x 2,451.25 - - - - -	()	(980.50)	(980.50)
Employee Benefits - - - - -	()	(281.53)	(281.53)
E. TOTALS FOR FY 1972: - - - - -	2,429.31	2,488.69	4,918.00

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1972 - - - Federal- \$ 43,441.00 Non-Fed. \$ 43,457.00

1/ Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico

Report as of June 30, 1972

Project Title:
AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO

OWRR Proj. No. B- 016-NMEX
NMSU Proj. No. 3109-108
Matching Grant Agreement
Number 14-31-0001-3109
Total Federal Amount
of the M.G.A. -- \$ 60,000

Principal Investigator(s): J. W. Hernandez, T. G. Gebhard, Jr., R. R. Lansford, B. J. Creel, Shaul Ben-David, Ralph d'Arge, J. W. Clark

Proj. Began-Mo: July 1; Yr: 1969; Actual or Scheduled Completion--Mo: June 30; Yr: 1972

Cost Categories Man-Year Information FY 1972 ^{1/}	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	9,216.26	397.07	9,613.33
Principal Investigator(s) - - - - -	()	()	()
No: <u> </u> Man-Years: <u> </u>			
Other Professional Staff: - - - - -	(5,244.08)	()	(5,244.08)
No: <u>1</u> Man-Years: <u>.35</u>			
Graduate Student Assistants: - - - - -	(570.00)	()	(570.00)
(Includes Student Technicians)			
No: <u>1</u> Man-Years: <u>.08</u>			
Undergrad. Student Assistants - - - - -	(819.25)	()	(819.25)
(Includes Student Technicians)			
No: <u>3</u> Man-Years: <u>.23</u>			
Technicians & Others - - - - -	(2,582.93)	(397.07)	(2,980.00)
(Non-students)			
No: <u>2</u> Man-Years: <u>.57</u>			
B. <u>NON-EXPENDABLE PROPERTY</u> - - - - -		100.00	100.00
C. <u>EXPENDABLE PROPERTY</u> : - - - - -			
(Supplies, Materials)		60.41	60.41
D. <u>OTHER COSTS (SPECIFY)</u> : TOTAL - - - - -			
(Travel, Indirect costs, Etc.)		8,705.69	8,705.69
Other expenditures	()	(386.31)	(386.31)
Travel	()	(1,041.90)	(1,041.90)
Maintenance	()	(188.36)	(188.36)
Computer	()	(1,310.00)	(1,310.00)
Communications	()	(189.29)	(189.29)
Publication-Duplication	()	(968.52)	(968.52)
Indirect Cost-40% x 9,613.33	()	(3,845.33)	(3,845.33)
Employee Benefits	()	(775.98)	(775.98)
E. TOTALS FOR FY 1972: - - - - -	9,216.26	9,263.17	18,479.43

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1972 - - - Federal-\$ 60,000.00 Non-Fed.-\$ 60,047.16

1/ Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1972

<u>Project Title:</u> AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO	OWRR Proj. No. <u>B-019-NMEX</u>
	NMSU Proj. No. <u>3109-111</u>
	Matching Grant Agreement Number <u>14-31-0001-3308</u>
	Total Federal Amount of the M.G.A. -- \$ <u>71,115</u>

Principal Investigator(s): T. G. Gebhard, Jr., R. R. Lansford, B. J. Creel
W. C. Arnwine, Wm. Brutsaert, Shaul Ben-David, and J. Borrego

Proj. Began-Mo: July 1; Yr: 1970; Actual or Scheduled Completion--Mo: June 30; Yr: 1972

Cost Categories	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
Man-Year Information FY 1972 ^{1/}			
A. SALARIES & WAGES: TOTAL - - - - -	13,657.93	2,180.20	15,838.13
Principal Investigator(s)- - - - -	(6,950.00)	()	(6,950.00)
No: <u>3</u> Man-Years: <u>.46</u>			
Other Professional Staff:- - - - -	(917.00)	()	(917.00)
No: <u>1</u> Man-Years: <u>.06</u>			
Graduate Student Assistants: - - - - -	(5,790.93)	(489.11)	(6,280.04)
(Includes Student Technicians)			
No: <u>4</u> Man-Years: <u>.77</u>		1,441.13	1,441.13
Undergrad. Student Assistants- - - - -	()	()	()
(Includes Student Technicians)			
No: <u> </u> Man-Years: <u> </u>			
Technicians & Others - - - - -	()	(249.96)	(249.96)
(Non-students)			
No: <u> </u> Man-Years: <u> </u>			
B. NON-EXPENDABLE PROPERTY- - - - -			
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)		176.49	176.49
D. OTHER COSTS (SPECIFY): TOTAL - - - - -			
(Travel, Indirect costs, Etc.)		11,311.24	11,311.24
Travel -	()	(2,330.65)	(2,330.65)
Publication-Duplication		1,095.78	1,095.78
Computer -	()	(472.48)	(472.48)
Maintenance		128.34	128.34
Other cost -	()	(4.09)	(4.09)
Indirect Cost		6,489.88	6,489.88
Employee Benefits -	()	(790.02)	(790.02)
E. TOTALS FOR FY 1972:- - - - -	13,657.93	13,667.93	27,325.86

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1972- - - Federal-\$ 71,115.00 Non-Fed.\$ 71,125.00

1/ Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1972

Project Title: MANAGEMENT OF REPLACEMENT FLOWS IN AGRICULTURAL AREAS	OWRR Proj. No. <u>B-025-NMEX</u>
	NMSU Proj. No. <u>3109-113</u>
	Matching Grant Agreement Number <u>14-31-0001-3310</u>
	Total Federal Amount of the M.G.A. -- \$ <u>5,261.00</u>

Principal Investigator(s):
Micha Gisser

Proj. Began-Mo: July 1 ; Yr: 1970 ; Actual or Scheduled Completion--Mo: June 30; Yr: 1972

<u>Cost Categories</u> Man-Year Information FY 1972 ^{1/}	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	2,539.98	189.12	2,729.10
Principal Investigator(s)- - - - -	(1,891.82)	(32.18)	(1,924.00)
No: <u>1</u> Man-Years: <u>.13</u>			
Other Professional Staff:- - - - -	()	()	()
No: <u> </u> Man-Years: <u> </u>			
Graduate Student Assistants: - - - -	(648.16)	(156.94)	(805.10)
(Includes Student Technicians)			
No: <u>1</u> Man-Years: <u>.09</u>			
Undergrad. Student Assistants- - - -	()	()	()
(Includes Student Technicians)			
No: <u> </u> Man-Years: <u> </u>			
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: <u> </u> Man-Years: <u> </u>			
B. NON-EXPENDABLE PROPERTY- - - - -			
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)	163.76	316.83	480.59
D. OTHER COSTS (SPECIFY): TOTAL - - - -			
(Travel, Indirect costs, Etc.)	47.28	2,245.07	2,292.35
Travel - - - - -	(47.28)	(350.97)	(398.25)
Consultant - - - - -	()	(500.00)	(500.00)
Computer - - - - -	()	(150.12)	(150.12)
Indirect Cost - 41% x \$2,729.10		1,118.92	1,118.92
Employee Benefits - - - - -	()	(125.06)	(125.06)
E. TOTALS FOR FY 1972:- - - - -	2,751.02	2,751.02	5,502.04

F. Cumulative Total Project Expenditures from
 Start of Project to June 30, 1972- - - Federal-\$ 5,261.00 Non-Fed.\$ 5,261.00

^{1/} Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico

Report as of June 30, 1972

Project Title:

AN ANALYTICAL INTERDISCIPLINARY EVALUATION
OF THE UTILIZATION OF THE WATER RESOURCES
OF THE RIO GRANDE IN NEW MEXICO

OWRR Proj. No. B-026-NMEX

NMSU Proj. No. 3109-117

Matching Grant Agreement
Number 14-31-0001-3617

Total Federal Amount
of the M.G.A. -- \$40,000

Principal Investigator(s): T. G. Gebhard, Jr., R. R. Lansford, B. J. Creel,
W. Brutsaert, Shaul Ben-David

Proj. Began-Mo:July 1 ;Yr:1971; Actual or Scheduled Completion--Mo:June 30;Yr:1972

Cost Categories	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
Man-Year Information FY 1972 ^{1/}			
A. SALARIES & WAGES: TOTAL - - - - -	38,015.95	10,316.88	48,332.83
Principal Investigator(s)- - - - -	(24,552.52)	(2,268.07)	(26,820.59)
No: <u>4</u> Man-Years: <u>1.64</u>	(6,438.59)		(6,438.59)
Other Professional Staff:- - - - -	(6,294.70)	(1,465.46)	(7,760.16)
No: <u>1</u> Man-Years: <u>.43</u>			
Graduate Student Assistants: - - - - -		(3,651.86)	(3,651.86)
(Includes Student Technicians)			
No: <u>6</u> Man-Years: <u>.84</u>			
Undergrad. Student Assistants- - - - -	(730.14)	(2,931.49)	(3,661.63)
(Includes Student Technicians)			
No: <u> </u> Man-Years: <u> </u>			
Technicians & Others - - - - -			
(Non-students)			
No: <u>4</u> Man-Years: <u>.16</u>			
B. <u>NON-EXPENDABLE PROPERTY</u> - - - - -		119.00	119.00
C. <u>EXPENDABLE PROPERTY</u> : - - - - -		231.48	231.48
(Supplies, Materials)			
D. <u>OTHER COSTS (SPECIFY)</u> : TOTAL - - - - -		27,348.58	27,348.58
(Travel, Indirect costs, Etc.)			
<u>Travel</u> - - - - -	()	(1,214.25)	(1,214.25)
<u>Computer</u> - - - - -	()	(2,523.76)	(2,523.76)
<u>Communications</u>		.44	.44
<u>Maps, Charts, Duplication</u> - - - - -	()	(89.38)	(89.38)
<u>Indirect Cost- 41% of \$48,332.83</u>		19,816.45	19,816.45
<u>Employee Benefits</u> - - - - -	()	(3,704.30)	(3,704.30)
E. TOTALS FOR FY 1972:- - - - -	38,015.95	38,015.94	76,031.89

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1972- - - Federal-\$ 38,015.95 Non-Fed.\$ 38,015.94

1/ Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1972

Project Title:

A COMPARISON OF RATES OF WATER LOSS,
DROUGHT TRANSPIRATION OF SEVERAL NEW MEXICO
PHREATOPHYTE SPECIES

OWRR Proj. No. B- 027-NMEX

NMSU Proj. No. 3109-120

Matching Grant Agreement
Number 14-31-0001- 3618

Total Federal Amount
of the M.G.A. -- \$ 10,476

Principal Investigator(s): Gary L. Cunningham

Proj. Began-Mo: July 1; Yr: 1971; Actual or Scheduled Completion--Mo: June 30; Yr: 1972

Cost Categories Man-Year Information FY 1972 ^{1/}	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	8,587.19	2,440.81	11,028.00
Principal Investigator(s)- - - - -	(2,474.00)	()	(2,474.00)
No: <u>1</u> Man-Years: <u>.16</u>			
Other Professional Staff:- - - - -	()	()	()
No: <u> </u> Man-Years: <u> </u>			
Graduate Student Assistants: - - - -	(6,113.19)	(2,440.81)	(8,554.00)
(Includes Student Technicians)			
No: <u>5</u> Man-Years: <u>.82</u>			
Undergrad. Student Assistants- - - -	()	()	()
(Includes Student Technicians)			
No: <u> </u> Man-Years: <u> </u>			
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: <u> </u> Man-Years: <u> </u>			
B. <u>NON-EXPENDABLE PROPERTY</u> - - - - -		3.25	3.25
C. <u>EXPENDABLE PROPERTY</u> : - - - - -		486.99	486.99
(Supplies, Materials)			
D. <u>OTHER COSTS (SPECIFY):</u> TOTAL - - - -		5,656.14	5,656.14
(Travel, Indirect costs, Etc.)			
Travel - - - - -	()	(672.03)	(672.03)
Computer - - - - -	()	(235.99)	(235.99)
Indirect Cost - 41% x \$11,028 - - - -	()	(4,521.48)	(4,521.48)
Employee Benefits - - - - -	()	(226.64)	(226.64)
E. TOTALS FOR FY 1972:- - - - -	8,587.19	8,587.19	17,174.38

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1972- - - Federal-\$ 8,587.19 Non-Fed.\$ 8,587.19

1/ Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico

Report as of June 30, 1972

Project Title:

UTILIZATION OF WATER IN A SEMI-ARID
REGION No. P-1

OWRR Proj. No. B- 029-NMEX

NMSU Proj. No. 3109-119

Matching Grant Agreement
Number 14-31-0001-3619

Total Federal Amount
of the M.G.A. -- \$ 4,208

Principal Investigator(s):

H. D. Fuehring

Proj. Began-Mo: July 1 ; Yr: 1971 ; Actual or Scheduled Completion--Mo: June 30; Yr: 1972

Cost Categories Man-Year Information FY 1972 ^{1/}	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	4,208.00	582.80	4,790.80
Principal Investigator(s)- - - - -	(3,120.00)	()	(3,120.00)
No: <u>1</u> Man-Years: <u>.21</u>			
Other Professional Staff:- - - - -	()	()	()
No: _____ Man-Years: _____			
Graduate Student Assistants: - - - -	()	()	()
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Undergrad. Student Assistants- - - -	()	()	()
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Technicians & Others - - - - -	(1,088.00)	(582.80)	(1,670.80)
(Non-students)			
No: <u>2</u> Man-Years: <u>.24</u>			
B. <u>NON-EXPENDABLE PROPERTY</u> - - - - -		1,197.50	1,197.50
C. <u>EXPENDABLE PROPERTY</u> : - - - - -		571.95	571.95
(Supplies, Materials)			
D. <u>OTHER COSTS (SPECIFY): TOTAL</u> - - - -		2,696.78	2,696.78
(Travel, Indirect costs, Etc.)			
	()	()	()
Maintenance	()	(291.07)	(291.07)
Indirect Cost- 41% x \$4,790.80	()	(1,964.23)	(1,964.23)
Employee Benefits	()	(441.48)	(441.48)
E. TOTALS FOR FY 1972:- - - - -	4,208.00	5,049.03	9,257.03

F. Cumulative Total Project Expenditures from

Start of Project to June 30, 1972- - - Federal-\$ 4,208.00 Non-Fed.\$ 5,049.03

1/ Man-Years relate to time paid from Federal funds only.

FY 1972 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico

Report as of June 30, 1972

<u>Project Title:</u> ANALYSIS OF WATER CHARACTERISTICS OF MANUFACTURING INDUSTRIES AND THEIR ADAPTABILITY TO SEMI-ARID REGIONS	OWRR Proj. No. B- <u>032-NMEX</u>
	NMSU Proj. No. <u>3109-118</u>
	Matching Grant Agreement Number <u>14-31-0001-3620</u>
	Total Federal Amount of the M.G.A. -- \$ <u>10,000</u>

Principal Investigator(s): Harry G. Folster and Shaul Ben-David

Proj. Began-Mo: July 1; Yr: 1971; Actual or Scheduled Completion--Mo: June 30; Yr: 1973

<u>Cost Categories</u> Man-Year Information FY 1972 ^{1/}	Expenditures in FY 1971		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	9,126.23	3,037.95	12,164.18
Principal Investigator(s)- - - - -	(5,948.64)	(44.87)	(5,993.51)
No: <u>2</u> Man-Years: <u>.40</u>			
Other Professional Staff:- - - - -	()	()	()
No: <u> </u> Man-Years: <u> </u>			
Graduate Student Assistants: - - - -	(3,177.59)	(1,543.08)	(4,720.67)
(Includes Student Technicians)			
No: <u>3</u> Man-Years: <u>.42</u>			
Undergrad. Student Assistants- - - -	()	(797.50)	(797.50)
(Includes Student Technicians)			
No: <u> </u> Man-Years: <u> </u>			
Technicians & Others - - - - -	()	(652.50)	(652.50)
(Non-students)			
No: <u> </u> Man-Years: <u> </u>			
B. <u>NON-EXPENDABLE PROPERTY</u> - - - - -			
C. <u>EXPENDABLE PROPERTY</u> : - - - - -		117.53	117.53
(Supplies, Materials)			
D. <u>OTHER COSTS (SPECIFY): TOTAL</u> - - - -		5,970.76	5,970.76
(Travel, Indirect costs, Etc.)			
Travel - - - - -	()	(427.50)	(427.50)
Computer - - - - -		32.00	32.00
Duplication, Publication - - - - -	()	(22.25)	(22.25)
Indirect Cost-41% x 12,164.18 - - - -	()	(4,987.31)	(4,987.31)
Employee Benefits - - - - -	()	(501.70)	(501.70)
E. TOTALS FOR FY 1972:- - - - -	9,126.23	9,126.24	18,252.47

F. Cumulative Total Project Expenditures from
 Start of Project to June 30, 1972- - - Federal-\$ 9,126.23 Non-Fed.\$ 9,126.24

^{1/} Man-Years relate to time paid from Federal funds only.

SUMMARY SHEET FOR MATCHING GRANT (Sec. 101) PROGRAM ACTIVITIES - FY 1972

This sheet provides summary information covering all Sec. 101 projects in progress during FY 1972 using FY 1972 or prior years Sec. 101 funds. Hence, it is a summarization of information set forth on the separate project report forms OW-7

State: New Mexico Total No. of Sec. 101 Projects in Progress During FY 1972

Cost Categories Man-Year Information FY 1972	Expenditures in FY-1972		
	Federal	Non-Fed.	Total
A. SALARIES & WAGES: TOTAL - - - - -	87,780.85	19,166.77	106,947.62
Principal Investigator(s) - - - - -	(44,936.98)	(2,345.12)	(47,282.10)
No. <u>12</u> Man-Years: <u>3.00</u>			
Other Professional Staff: - - - - -	(12,989.67)	()	(12,989.67)
No. <u>4</u> Man-Years: <u>.87</u>			
Graduate Student Assistants: - - - - -	(22,594.57)	(6,095.40)	(28,689.97)
Includes Student Technicians			
No. <u>20</u> Man-Years: <u>3.02</u>			
Undergrad. Student Assistants: - - - - -	(849.25)	(5,890.49)	(6,739.74)
Includes student technicians			
No. <u>4</u> Man-Years: <u>.31</u>			
Technicians & Others: - - - - -	(6,410.38)	(4,835.76)	(11,246.14)
Non-students			
No. <u>9</u> Man-Years: <u>1.42</u>			
B. NON-EXPENDABLE PROPERTY: - - - - -		1,419.75	1,419.75
C. EXPENDABLE PROPERTY: - - - - -	163.76	2,009.20	2,172.96
D. OTHER COSTS (SPECIFY): TOTAL - - - - -	47.28	66,353.49	66,400.77
Travel - - - - -	(47.28)	(6,037.30)	(6,084.58)
Indirect (overhead) - - - - -	(// // // // //)	(43,724.10)	(43,724.10)
Employee benefits - - - - -	(// // // // //)	(6,846.71)	(6,846.71)
Maintenance	()	(649.77)	(649.77)
Publication - Duplication, Typing	()	(3,291.13)	(3,291.13)
Computer	()	(4,724.35)	(4,724.35)
Communications	()	(189.73)	(189.73)
Consultant	()	(500.00)	(500.00)
Other Miscellaneous Costs: - - - - -	()	(390.40)	(390.40)
E. TOTALS FOR FY 1972: - - - - -	87,991.89	88,949.21	176,941.10

F. Cumulative Total Sec. 101 Expenditures from Start of Projects to June 30, 1972: -Federal--\$239,754.37 ; Non-Fed-\$ 240,668.56

Annual Report - Title II Project

OWRR Project Number: <u>C- 2165</u>	Funding Agreement Number: <u>14- 31-0001- 3376</u>	Report as of: <u>July 31, 1972</u>
----------------------------------------	-------------------------------------------------------	------------------------------------

Name of Performing Organization: WATER RESOURCES RESEARCH INSTITUTE	Title of Project: SOIL AND MANAGEMENT FOR SALINITY CONTROL
----------------------------------------------------------------------------	-------------------------------------------------------------------

Status of Project as of Reporting Date: Completed : In Progress

Total Est. Proj. Cost: Fed. Funds: \$ 89,817.00 ; Non-Fed. Funds (if any): \$ 6,700.00

Project Cost Information (7/1/71 through 7/31/72)^{1/}

Cost Categories ^{2/}	Supported From:	
	Federal Funds	Non-Fed. Funds ^{3/}
Direct Salaries and Wages - - - - -	\$ 24,702.59	\$ 1,900.00
Employee Benefits (if not included elsewhere) - - -	1,742.13	225.00
Use, Rental or Depreciation Costs Included as Direct Charges - - - - -		
Non-Expendable Equipment - - - - -	3,105.90	
Expendable Equipment, Material & Supplies - - - - -	1,292.37	200.00
Travel Costs Included as Direct Charges - - - - -	704.25	200.00
Other Direct Charges (Specify): Computer	500.00	
Publication-Duplication	449.68	
Communications	186.00	
Maintenance - Repairs	830.02	
Consultant	75.00	
Indirect Costs - - - - -	10,128.06	740.00
Other Costs (Specify):		
Other Expenses		135.00
TOTALS - - - - -	43,716.00	3,400.00

^{1/} If necessary, project costs may be estimated.
^{2/} Whenever possible, provide costs for categories listed. If cost categories other than those shown above are used, provide concise explanations as may be deemed necessary to insure proper understanding of the content of such costs.
^{3/} Estimates for "Non-Fed. Funds" (\$ value of non-Federal contributions) should be provided if non-Federal contributions were contemplated by the funding agreement.

Comments:

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

IRRIGABILITY CLASSIFICATION OF NEW MEXICO LANDS

Principal Investigator(s)

J. U. Anderson - H. J. Maker

NMSU Project No. - - 5700-301

Project Began--Month:July 1 Yr:1971 Scheduled Completion--Month:June 30 Yr:1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		5,435.36
Prin. Investigators- - - - -No. <u>1</u> Man-yrs	()	(5,420.96)
Other Prof. Staff - - - - -No. <u> </u> Man-yrs	()	()
Grad. Student Assistants - - - -No. <u> </u> Man-yrs (Includes Student Technicians)		
Undergrad. Student Assistants- -No. <u>1</u> Man-yrs (Includes Student Technicians)	()	(14.40)
Technicians & Others - - - - -No. <u> </u> Man-yrs (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		1.65
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		562.99
Travel	()	(210.60)
Employee Benefits	()	(352.39)
	()	()
	()	()
E. <u>TOTALS: - - - - -</u>	(6,000.00)	(6,000.00)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

CITIZENS WATER CONFERENCE

NMSU Project No. - - 5700-302

69-002-002

Principal Investigator(s)

H. R. Stucky

OWRR Project No. 70-002-002

70-002-002

Project Began--Month: July 1 Yr: 1969 Scheduled Completion--Month: Jan. 31 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		
Prin. Investigators- - - - -No. ___ Man-yrs ___	()	()
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	()
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		4.68
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		943.41
Publications	()	(764.55)
Employee Benefits	()	(5.85)
Overhead	()	(173.01)
	()	()
	()	()
E. <u>TOTALS: - - - - -</u>	(948.09)	(948.09)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

RESEARCH OF THE POSSIBILITIES OF BIOLOGICAL CONTROL OF TAMARISK AND OTHER PHREATOPHYTES

Principal Investigator(s)

J. G. Watts

NMSU Project No. - - 5700-305

Project Began--Month: June Yr: 19 69 Scheduled Completion--Month: Nov. Yr: 19 71

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		1,585.60
Prin. Investigators- - - - -No. ___ Man-yrs ___	()	(456.00)
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	(276.00)
Grad. Student Assistants - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	(853.60)
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		410.16
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		1,070.97
Travel	()	(372.20)
	()	()
Overhead	()	(650.10)
Employee Benefits	()	(48.67)
	()	()
E. <u>TOTALS: - - - - -</u>	(3,068.94)	(3,066.73)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:
IRRIGABILITY CLASSIFICATION OF NEW MEXICO LANDS

NMSU Project No. - - 5700-306

Principal Investigator(s)
J. U. Anderson and H. J. Maker

Project Began--Month: July 1 Yr:1971 Scheduled Completion--Month: June 30 Yr:1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	1,767.00	1,652.93
Prin. Investigators- - - - -No. ___ Man-yrs ___	(1,167.00)	(972.06)
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	()
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	(74.87)
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	(600.00)	(606.00)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY:(Supplies,Materials,etc.) TOTAL</u>		20.14
D. <u>OTHER COSTS(SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL</u>		326.93
Truck charges - field work	()	(98.30)
Travel	(33.00)	(70.00)
Duplication	()	(8.18)
Employee Benefits	(200.00)	(150.45)
E. <u>TOTALS: - - - - -</u>	(2,000.00)	(2,000.00)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:
IRRIGABILITY CLASSIFICATION OF NEW MEXICO LAND

NMSU Project No. - - 5700-307

Principal Investigator(s)

J. U. Anderson
H. J. Maker

Project Began--Month: July 1 Yr: 19 71 Scheduled Completion--Month: Jan. 31 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		1,558.43
Prin. Investigators- - - - -No. _____ Man-yrs _____	(_____)	(1,309.23)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(249.20)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	(_____)	(_____)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		3.24
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		157.88
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		11.46
Duplicating	(_____)	(11.46)
Communications	(_____)	(3.00)
_____	(_____)	(_____)
Employee Benefits	(_____)	(143.42)
_____	(_____)	(_____)
E. <u>TOTALS: - - - - -</u>	(1,719.55)	(1,719.55)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

IRRIGABILITY CLASSIFICATION OF NEW MEXICO LAND

NMSU Project No. - - 5700-310

Principal Investigator(s)

J. U. Anderson
H. J. Maker

Project Began--Month:Feb. 1 Yr:19 72 Scheduled Completion--Month:June 30 Yr:1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		4,681.39
Prin. Investigators- - - - -No. _____ Man-yrs _____	(_____)	(3,967.75)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(197.64)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	(_____)	(516.00)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		113.81
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		604.80
Travel	(_____)	(28.60)
Duplication	(_____)	(4.81)
Employee Benefits	(_____)	(571.39)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS: - - - - -</u>	(5,400.00)	(5,400.00)

FY 1972 ANNUAL REPORT -- ENVIRONMENTAL PROTECTION AGENCY

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

QUALITY AND QUANTITY OF RETURN FLOW AS INFLUENCED
BY TRICKLE AND SURFACE IRRIGATION

NMSU Project No. - - 5700-308

Agreement Number. - 13030 GLM

Principal Investigator(s)

P. J. Wierenga - T. C. Patterson

Project Began--Month:July 1 Yr:1971 Scheduled Completion--Month:June 30 Yr:1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	40,576.00	38,243.14
Prin. Investigators- - - - -No. ___ Man-yrs ___	(10,848.00)	(11,592.00)
Other Prof. Staff - - - - -No. ___ Man-yrs ___	(7,924.00)	(10,318.80)
Grad. Student Assistants - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	(10,000.00)	(9,886.73)
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	(11,804.00)	(6,445.61)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	16,483.00	10,975.84
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	1,780.00	3,023.05
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	21,890.00	19,861.63
Travel	(527.00)	(1,125.50)
Computer	(1,000.00)	(-0-)
Other cost		418.42
Communications	(200.00)	(32.25)
Indirect Cost	(16,636.00)	(15,679.69)
Employee Benefits	(3,527.00)	(2,605.77)
E. <u>TOTALS: - - - - -</u>	(80,729.00)	(72,103.66)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title: HISTORY OF WATER UTILIZATION IN
NEW MEXICO AND THE SOUTHWEST - WITH PARTICULAR
REFERENCE TO THE IMPACT OF LEGAL AND INSTITUTIONAL
CONTROLS ON WATER MANAGEMENT
Principal Investigator(s)

NMSU Project No. - - 3109-115

Ira G. Clark

Project Began--Month: Dec. Yr: 1970 Scheduled Completion--Month: Sept. Yr: 1971

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		103.80
Prin. Investigators- - - - -No. ___ Man-yrs ___	()	()
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	()
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	()	103.80
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		6.06
Duplication	()	.67
Employee Benefits	()	5.39
	()	()
	()	()
	()	()
E. <u>TOTALS: - - - - -</u>	(109.86)	(109.86)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

BIOASSAYS OF QUALITY IN WATER RESOURCES OF
MAJOR IMPORTANCE TO NEW MEXICO

NMSU Project No. - - 3109-116

Principal Investigator(s)

G. S. Smith

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: Sept. 30 Yr: 1971

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		285.00
Prin. Investigators - - - - - No. _____ Man-yrs _____	()	()
Other Prof. Staff - - - - - No. _____ Man-yrs _____	()	()
Grad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)		285.00
Undergrad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	()	()
Technicians & Others - - - - - No. _____ Man-yrs _____ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		31.32
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		
_____	()	()
_____	()	()
_____	()	()
_____	()	()
E. <u>TOTALS: - - - - -</u>	(316.32)	(316.32)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

ENVIRONMENTAL CONTROLS ON GROUNDWATER CHEMISTRY
IN NEW MEXICO: I. THE EFFECTS OF PHREATOPHYTES

Principal Investigator(s)

Frank B. Titus

NMSU Project No. - - 3109-121

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	8,000.00	8,031.71
Prin. Investigators- - - - -No. _____ Man-yrs _____	(3,700.00)	(3,525.63)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	(200.00)	(177.12)
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)	4,100.00	4,319.36
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	()	(9.60)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	667.00	
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		281.40
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	1,495.00	420.78
_____	()	()
Computer	(1,000.00)	()
Travel	()	(26.62)
_____	()	()
Employee Benefits	(495.00)	(394.16)
E. <u>TOTALS: - - - - -</u>	(10,162.00)	(8,733.89)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

A STUDY OF THE CHEMICAL AND BIOLOGICAL CHARACTER OF RIO GRANDE WATER IN THE BOSQUE DEL APACHE REFUGE

NMSU Project No. - - 3109-122

Principal Investigator(s)

D. Brandvold, J. Brierly and C. Popp

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	<u>6,156.00</u>	<u>6,093.74</u>
Prin. Investigators- - - - -No. _____ Man-yrs _____	(1,984.00)	(2,028.31)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	()	()
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)		2,258.97
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	(4,172.00)	(1,806.46)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		<u>484.57</u>
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	<u>785.00</u>	<u>492.63</u>
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	<u>392.00</u>	<u>262.06</u>
Travel	(140.00)	(10.00)
	()	()
	()	()
	()	()
Employee Benefits	(252.00)	(252.06)
E. <u>TOTALS:</u> - - - - -	<u>(7,333.00)</u>	<u>(7,333.00)</u>

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

ANALYSIS OF MERCURIALS IN ELEPHANT BUTTE RESERVOIR

NMSU Project No. - - 3109-123

Principal Investigator(s)

J. D. Garcia, David E. Kidd and G. V. Johnson

Project Began--Month:July 1 Yr:1971 Scheduled Completion--Month:June 30 Yr:1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	8,484.00	8,387.85
Prin. Investigators- - - - -No. ___ Man-yrs ___	(3,812.00)	(6,023.61)
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		1,982.10
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	(4,672.00)	(382.14)
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	1,557.00	1,550.83
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	750.00	1,034.97
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	1,209.00	724.44
Travel	(725.00)	(410.82)
	()	()
	()	()
	()	()
Employee Benefits	(484.00)	(313.62)
E. <u>TOTALS: - - - - -</u>	(12,000.00)	(11,698.09)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU
THERMAL PROBE
Principal Investigator(s)

Marshall A. Reiter

NMSU Project No. - - 3109-124

Project Began--Month:July 1 Yr:19 71 Scheduled Completion--Month:June 30 Yr:1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	3,350.00	3,623.40
Prin. Investigators- - - - -No. _____ Man-yrs _____	()	()
Other Prof. Staff - - - - -No. _____ Man-yrs _____	()	()
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)	3,350.00	3,497.00
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	()	(126.40)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		551.02
C. <u>EXPENDABLE PROPERTY:(Supplies,Materials,etc.) TOTAL</u>	2,200.00	1,845.21
D. <u>OTHER COSTS(SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL</u>	500.00	30.37
<u>Travel</u>	(400.00)	(26.36)
_____	()	()
<u>Other Expenses</u>	(100.00)	(4.01)
_____	()	()
_____	()	()
E. <u>TOTALS: - - - - -</u>	(6,050.00)	(6,050.00)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

WATER AS A LIMITING FACTOR IN INDIAN ECONOMIC DEVELOPMENT

NMSU Project No. - - 3109-125

Principal Investigator(s)

Shaul Ben-David and John G. Borrego

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	4,500.00	4,505.03
Prin. Investigators- - - - - -No. ___ Man-yrs ___	(1,000.00)	(2,773.15)
Other Prof. Staff - - - - - -No. ___ Man-yrs ___	(1,500.00)	()
Grad. Student Assistants - - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	(1,500.00)	(699.00)
Technicians & Others - - - - - -No. ___ Man-yrs ___ (Non-students)	(500.00)	(1,032.88)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	100.00	131.63
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	781.00	438.88
Travel	(300.00)	(127.90)
Publication	(100.00)	()
	()	()
	()	()
Employee Benefits	(381.00)	(310.98)
E. <u>TOTALS: - - - - -</u>	(5,381.00)	(5,075.54)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:
 HYDROLOGIC-NUTRIENT CYCLE INTERACTIONS IN
 UNDISTURBED AND MAN-MANIPULATED ECOSYSTEMS
 (WATERSHEDS)
Principal Investigator(s)

NMSU Project No. - - 3109-126

James R. Gosz

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	6,315.00	610.78
Prin. Investigators- - - - -No. ___ Man-yrs ___	(2,335.00)	(1,835.00)
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	(2,400.00)	(4,475.78)
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	(1,580.00)	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	400.00	335.50
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	825.00	442.36
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	1,436.00	1,460.64
Travel	(875.00)	(1,311.90)
	()	()
	()	()
	()	()
Employee Benefits	(561.00)	(148.74)
E. <u>TOTALS: - - - - -</u>	(8,976.00)	(8,549.28)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

TRITIUM AS A TOOL IN THE DETERMINATION OF HYDROLOGIC
PARAMETERS IN THE ROSWELL BASIN

Principal Investigator(s)

G. W. Gross

NMSU Project No. - - 3109-127

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	1,800.00	1,815.21
Prin. Investigators- - - - -No. _____ Man-yrs _____	(1,200.00)	(1,200.00)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(615.21)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	(600.00)	(_____)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	1,000.00	1,387.98
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	1,000.00	596.81
Travel	(148.00)	(462.80)
Computer	(600.00)	(_____)
Publication	(100.00)	(_____)
Employee Benefits	(152.00)	(134.01)
E. <u>TOTALS:</u> - - - - -	(3,800.00)	(3,800.00)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

INVENTORY OF WATER DIVERSIONS AND RATE STRUCTURE
FOR CITIES, TOWNS, AND VILLAGES IN NEW MEXICO

NMSU Project No. - - 3109-128

Principal Investigator(s)

G. S. Smith

Project Began--Month: July 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	1,560.00	3,300.22
Prin. Investigators- - - - -No. ___ Man-yrs ___	(650.00)	(1,044.00)
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		855.00
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	(910.00)	(1,401.22)
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		466.35
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	3,508.00	471.82
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	883.00	542.83
Travel	(500.00)	(385.00)
Publication	(300.00)	(24.80)
	()	()
	()	()
Employee Benefits	(83.00)	(133.03)
E. <u>TOTALS: - - - - -</u>	(5,951.00)	(4,781.22)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:
INVENTORY OF WATER DIVERSIONS AND RATE STRUCTURE
FOR CITIES, TOWNS AND VILLAGES IN NEW MEXICO

NMSU Project No. - - 3109-129

Principal Investigator(s)

Alan Randall

Project Began--Month: May 1 Yr: 1971 Scheduled Completion--Month: Aug. 31 Yr: 1971

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		
Prin. Investigators - - - - - No. <u> </u> Man-yrs <u> </u>	(<u> </u>)	(<u> </u>)
Other Prof. Staff - - - - - No. <u> </u> Man-yrs <u> </u>	(<u> </u>)	(<u> </u>)
Grad. Student Assistants - - - - - No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)		
Undergrad. Student Assistants - - - - - No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)	(<u> </u>)	(<u> </u>)
Technicians & Others - - - - - No. <u> </u> Man-yrs <u> </u> (Non-students)	(<u> </u>)	(<u> </u>)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		6.20
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		
<u> </u>	(<u> </u>)	(<u> </u>)
<u> </u>	(<u> </u>)	(<u> </u>)
<u> </u>	(<u> </u>)	(<u> </u>)
<u> </u>	(<u> </u>)	(<u> </u>)
<u> </u>	(<u> </u>)	(<u> </u>)
E. <u>TOTALS: - - - - -</u>	(6.20)	(6.20)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

CROPLAND USES AND AGRICULTURAL DEPLETIONS IN
NEW MEXICO*

NMSU Project No. - - 3109-130

Principal Investigator(s)

R. R. Lansford

Project Began--Month: Nov. 1 Yr: 1971 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	696.00	719.03
Prin. Investigators- - - - - -No. ___ Man-yrs ___	(696.00)	(696.00)
Other Prof. Staff - - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	(23.03)
Technicians & Others - - - - - -No. ___ Man-yrs ___ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		100.00
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	100.00	5.30
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	1,254.00	1,010.95
Travel	(1,204.00)	(883.10)
Communications	()	(50.30)
	()	()
	()	()
Employee Benefits	(50.00)	(77.55)
E. <u>TOTALS: - - - - -</u>	(2,050.00)	(1,835.28)

FY 1972 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1972

Project Title:

ANALYSIS OF AMOUNTS OF LEAD AND THEIR ORIGIN IN
SURFACE AND GROUND WATERS IN NORTHEASTERN NEW MEXICO

NMSU Project No. - - 3109-131

Principal Investigator(s)

Sigfredo Maestas

Project Began--Month: March 1 Yr: 1972 Scheduled Completion--Month: June 30 Yr: 1972

	Amount Budgeted FY 1972	Actual Expenditures FY 1972
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -		
Prin. Investigators- - - - -No. ___ Man-yrs ___	()	()
Other Prof. Staff - - - - -No. ___ Man-yrs ___	()	()
Grad. Student Assistants - - - -No. ___ Man-yrs ___ (Includes Student Technicians)		
Undergrad. Student Assistants- - -No. ___ Man-yrs ___ (Includes Student Technicians)	()	()
Technicians & Others - - - - -No. ___ Man-yrs ___ (Non-students)	()	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -	2,500.00	2,375.00
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	500.00	616.70
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>		
_____	()	()
_____	()	()
_____	()	()
_____	()	()
_____	()	()
E. <u>TOTALS: - - - - -</u>	(3,000.00)	(2,991.70)