RIO PUERCO

WATERSHED MANAGEMENT PLAN

A TEST OF THE APPLICATION

OF WRC PRINCIPLES AND STANDARDS

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NEW MEXICO STATE OFFICE
DIVISION OF RESOURCES
WATERSHED STAFF

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Introduction

This report was prepared in response to Information Memorandum No. 74-154, dated October 22, 1974, and subsequent guiding correspondence which followed the meeting of field office representatives in Denver on November 25-27, 1974.

The data and plans contained herein were developed by Albuquerque District personnel as an action program to reestablish stability on a portion of the severely deteriorated Rio Puerco drainage. The area involved in the plan comprises about 7% of the total drainage and lies in the headwaters of the watershed where stabilization will have a strong influence on downstream reactions. Basic data was accepted from the plan and fitted to procedures of WRC Principles and Standards.

Summary

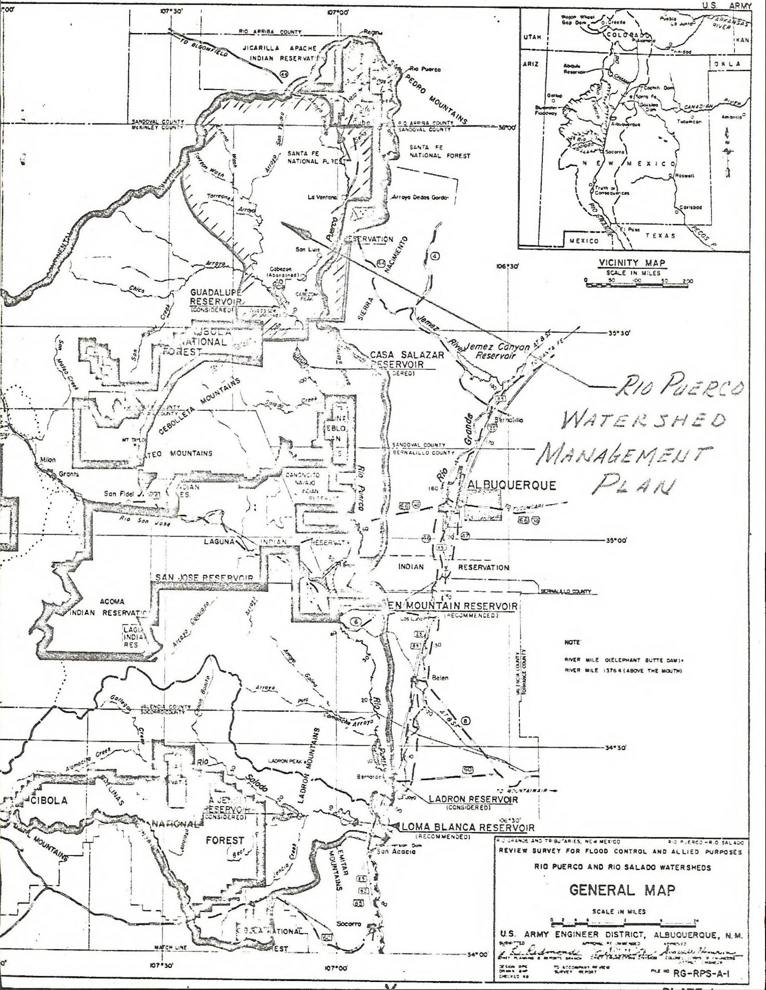
The contents of the Rio Puerco Watershed Management Plan have been coordinated with Range, Wildlife, and Recreation activities. It includes all direct watershed benefits and associated spillover benefits for these three activities. Significant programs in Forestry and Minerals exist in the area, but they have not participated in the preparation of this Plan beyond the determination that actions to be taken will not adversely affect the implementation of these programs.

The plan was prepared through the procedures outlined for Watershed Management Plans and a portion of the Allotment Management and Wildlife Habitat Plans. It consists of thirty (30) AMP's with the necessary watershed treatment facilities to meet the objectives of Watershed, Range, and Wildlife activities and environmental needs. The total installation cost is estimated to be $1,549,885 and $100,945 annual operation and maintenance cost by the seventh year. Per acre cost is $5.58 for construction and $0.36 for annual operation and maintenance.

Benefits expected on the 277,600 acre management area are:

1. Increase stable acres from 151,492 to 181,961 or a benefit of 30,469 stable acres.
2. Improve water quality for the 1,585 ac. ft. of water yield by reducing sediment 65 percent. No change is expected in dissolved solids.
3. Avoid reduction of 3,715 AUM's and provide for increase in 4,175 AUM's.
4. Increase Hunter Days by 1,880 days.
5. Increase Deer Days of Use by 315 days.

It is recommended that this plan be implemented over a six-year period because of the necessity to provide for present livestock grazing. Without the plan, 30 livestockmen may be lost because of diminishing forage supply and undependable water and other resources will continue to deteriorate.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TO ACCOMPANY REVIEW SURVEY REPORT
FILE NO RG-RPS-A-1

RIO PUERCO WATERSHED MANAGEMENT PLAN
NEW MEXICO

I. History

The area embraced by the Rio Puerco drainage was first settled by the Spanish about 1750. Tenure was assured through a number of land grants beginning in 1753 and ending in 1815. Numerous Indian ruins on both sides of the Rio Puerco below San Luis and on nearby mesas indicate that a rather large Indian population occupied the lands adjacent to the river prior to the coming of the Spanish settlers and irrigated plantings of squash, beans, and corn from the river. Indian agriculture had existed for perhaps 900 years before the area was abandoned (for reasons not clear to anthropologists), possibly 200 years before the arrival of the Spanish.

The Spanish introduced livestock to the area and developed simple irrigation systems for the production of crops on the flats bordering the river. The surrounding uplands provided grazing for domestic herds. These early settlements were subject to harassment by Navajo marauders. Abandonment of the smaller settlements began in 1774. Others followed, and about 1820 the remaining settlers were ordered to withdraw to the security of the Rio Grande valley where military protection could be provided.

Resettlement along the Rio Puerco channel began in the 1870's and was rapid once the Indian danger was removed. Most of the new settlements were at the same location as the old as many of the new settlers were heirs of the former inhabitants. Sheep and cattle again grazed the surrounding watershed in large numbers. Grazing reached maximum intensity in the decade between 1910 and 1920.

Much of the higher elevation timbered land in the upper portion of the watershed west of Cuba was homesteaded, primarily as stock raising homesteads following World War I. This placed further grazing pressure on the area. These ventures were largely unsuccessful, because a livelihood was impossible on the limited acreage, and most of the area was returned to Federal ownership in the mid-1930's under Title III of the Bankhead-Jones Farm Tenant Act.

Ponderosa pine stands in the accessible areas of the upper watershed were cut over for use as building materials from the time of Spanish settlement.

Major floods on the Rio Puerco in recent history occurred in July 1895, August and September 1929, August 1935, August 1936, May, September and October 1941, September 1954, August 1955, and August 1967. The peak flow from the September 1929 storm was estimated at more than 35,000 c.f.s. Flows of 29,000 c.f.s.

(1935) have been measured since a gauging station was installed on the lower reach of the Rio Puerco in 1934. Severe damage occurred to irrigation structures, crops, transportation facilities and villages in the middle Rio Grande Valley when these flood flows poured out of the Rio Puerco into the Rio Grande.

The long history of land misuse, from a combination of sources, resulted in watershed deterioration of spectacular proportions. Perhaps nowhere in the Nation has a once productive area been so sorely depleted. More than 500,000 acre feet of soil was scooped out of valley fills and scalped from topsoils of surrounding uplands to be deposited in the middle Rio Grande and ultimately Elephant Butte Reservoir. Based on silt and water flow data collected in the Rio Grande, it was estimated that the Rio Puerco drainage produced more than 50% of the sediment and about 7% of the water going into Elephant Butte Reservoir. Six villages in the Rio Puerco valley have ceased to exist. Once productive irrigated croplands are now brushy, weedy, sunbaked flats. The channel of the Rio Puerco is deeply incised in the valley floor and many side drainages are trenched to the divide.

Because of the active deterioration and extreme soil losses occurring in the watershed and resultant damage to resources

in the middle Rio Grande and siltation in Elephant Butte Reservoir, the problem became a matter of public concern. Remedial programs were developed by the federal agencies having administrative jurisdiction, beginning with the CCC program in the late 1930's. L.U. lands in the watershed were transferred to BLM in 1959 and all previous interagency programs and proposals were consolidated under the Bureau's Rio Puerco Special Project which was first funded in 1963. Sizeable expenditures were made over the years for erosion control measures with significant results.

Progress has been made on controlling runoff and reestablishing a protective vegetative cover on many areas, but much remains to be done before rehabilitation of the watershed is complete.

II. Present Situation

A. Description of the Area

1. General

The Rio Puerco drainage encompasses a total area of 3,740,000 acres. It is one of the major tributaries of the Rio Grande in New Mexico, embracing approximately one-third of the drainage above Elephant Butte Reservoir which supplies irrigation water to the Elephant Butte Irrigation District, an area of 155,000 acres of highly productive cropland extending downstream to El Paso.

The area of development under the proposed plan involves 277,600 acres of the upper watershed or about 7% of the total Rio Puerco drainage.

2. Location and Land Status

The Rio Puerco Watershed Management Area is located approximately 40 air miles northwest of Albuquerque, New Mexico, in T. 15 through 21 N., R. 1 through 6 W., NMPM. The north boundary is formed by the Continental Divide. The west, south, and east boundaries are formed by the hydrologic drainage boundary or allotment boundaries in the management area. A summary of land status is as follows:

TABLE A

Land Status	Acres	Percent of Area
Bureau Administered	232,048	83.6
Private	37,312	13.4
State	8,240	3.0
TOTAL	277,600	100.0

2. Geology

The soils of the area are formed from parent material deposited during the Cretaceous, Tertiary and Quaternary Periods. Mesa Verde sandstone, Menefee formation (sandstone and shale), and Cliff House sandstone of the Cretaceous Age are exposed along the mesas and escarpments throughout the area.

The Lewis shale, which underlies most of the central and northern portions, is a fairly uniform, thin-bedded, moderately indurated, drab or gray marine shale containing thin lenticular beds of sandstone.

The valley bottoms are underlain by alluvial deposits of the Quaternary Period, consisting of mainly silt, loam and clay with scattered lenses of sandy material.

During the Tertiary Period, basalt flows from Mount Taylor covered the southern portion of the area. As a result of the volcanic activity, several volcanic plugs are prominent on the landscape.

4. Vegetation

Major range sites consist of several main vegetation complexes having forage production capability as shown below:

TABLE B

Site	Veg.-Complex	Acres	(Herbage Lbs/Ac/Yr)	Ac/AUM (Forage)
Drainages	Spai-Atco-Hija	93,400	1,800	4.0
Rolling Uplands	Hija-Spai-Jumo	68,600	400	6.0
Low Hills	Artrl-Hija-Bogr	16,100	500	5.0
Steep Mesas & Breaks	Pied-Bogr-Hija	65,500	100	11.0
Basalt Outcrops	Pied-Bogr-Pipo	34,000	600	8.0

The watershed is a portion of the transition between the woodland-brushland and cold desert biomes within New Mexico. In general, the area is characterized by shortgrass and salt-tolerant brush along drainages. Sagebrush overstory and shortgrass understory occupy some valleys and slopes in north portion. Pinon-juniper and Ponderosa pine are the overstory vegetation on ridges, mesas and Chivato Mesa. In the southern portion, cool-season grasses, snakeweed, little rabbitbrush dominate the understory vegetation.

A summary of the acreages for the vegetative subtypes is shown below:

TABLE C

Code No.	Subtype	Acres	Percent of Area
011	Shortgrass	141,700	51.1
041	Big Sagebrush	51,100	18.4
062	Conifer	4,500	1.6
075	Waste	5,600	2.0
091	Pinon-juniper	52,700	19.0
131	Saltbrush (Shadscale)	4,200	1.5
141	Greasewood	13,900	5.0
162	Desert Shrub (Cactus)	1,400	.5
171	Halfshrub (Snakeweed)	2,500	.9
	TOTAL	277,600	100.0

5. Soil

The soils are divided into six dominant soil associations, each of which consists of several textures. Their physical and chemical properties are shown in Table D. The Lewis shale, which underlies most of the northwestern portion, is a farily uniform, thin-bedded, moderately indurated drab or gray marine shale containing scattered thin lenticular beds of sandstone. The soil generally grades from a mixture of silt and clay at the surface to parent rock at a depth of 2-3 feet. The clay is bentonitic and exhibits distinct swelling and dispersion when wetted, resulting in little infiltration and rapid runoff. In contrast, the sandstone mesas have sandy soil of high infiltration rate, a general sparse pattern of drainage channels and little runoff.

TABLE D

Soil Association and Location	Surface Texture	Subsoil Texture	Effective Root Depth	Permeability[1]	Available Water-holding capacity[2]	Shrink-Swell Potential
Christianburg-Navajo Alluvial Bottom Land	Loam	Clay loam	10 inches	.00 to .05	.17	Moderate
Litle-Las Lucas Low Shale Hills	Silty clay Loam	Silty clay	8 inches	.05 to 2.50	.17	High
Cabezon-Torreon Basalt Outcrop	Stony Loam	Clay loam	8 inches	.50 to 2.50	.09 .17	Moderate
Travesilla-Persayo Association Rock-outcrop	Fine sandy Loam.	Sandstone	5 inches	.50 to 2.50	.17	Low
Billings-Persayo Steep, gullied foothills	Sandy loam	Clay loam	10 inches	.50 to 2.50	.17	Moderate-high
Penistajo-Berent nearly level to rolling hills	Fine sandy loam	Sandy clay loam	14 inches	.50 to 7.50	.10	Low-moderate

1/ inches per hour

2/ inches per inch of soil

The valley bottoms are underlain by alluvial deposits of the Quaternary Period, consisting of mainly silt, loam, and clay with scattered lenses of sandy material. Infiltration rates are generally low and when wetted exhibits distinct shrink-swell-potential.

The soils on Chivato Mesa are moderately deep with a very friable surface layer of loam that is underlain by basalt, volcanic debris, sandstone or shale. They are high in fertility, have moderate water intake and have a high water holding capacity in tree areas and low water holding capacity in open park areas.

6. Erosion

Past excessive grazing use has resulted in extensive sheet, rill and gully erosion in all areas except the slopes of the volcanic plugs and Chivato Mesa. This can be significantly reduced with proper management of livestock and watershed treatment in these areas.

Gully erosion is a serious hazard along the drainages. The vegetative cover has been depleted near livestock water locations. Some layers of the soil material contain so much alkali that they are of poor quality for engineering uses. The main drainages are eroded to bedrock, 10 to 25 feet deep and side drainages are eroded by small rivulets of a few inches to four feet deep.

Sheet and rill erosion are a serious problem on the strongly sloping shale and sandstone hills. Salt crystals are displaced throughout the soil profiles. The ground cover will not increase substantially due to low infiltration rate.

The slopes of the volcanic plugs and Chivato Mesa have a slight erosion hazard. The site has a cover of various sized basalt stones which help to retard erosion. The shallow slopes are broken by terraces and plateaus of scattered pockets of moderately deep soil. The natural fertility of the soil is high and is well drained to aid in maintaining the good cover of native grasses, shrubs and pinon-juniper trees. The present soil erosion situation is shown by the following table and watershed planning overlays available in district files:

TABLE E

Erosion Class	Acreage	Percent of Total
Stable	13,900	5.0
Slight	52,900	19.0
Moderate	83,200	30.0
Critical	105,500	38.0
Severe	22,200	8.0

Maximum erosion damage is from lands adjacent to the valleys and arroyos. Contribution according to type of erosion is:

TABLE E-1

Type of Erosion	Total Erosion Effect-Percent	Ac.Ft./Sq.Mi./Yr.
Gully	25	2.1
Sheet	65	.7
Wind (Abrasion)	10	.1

Most of these soils are derived from soft, cretaceous parent materials. Therefore, the watershed is eroding at a moderate to severe rate since there is an inadequate ground cover resulting primarily from a long history of poor livestock management.

7. Cover Condition

Hydrologic cover consisting of vegetation, litter and small rock is providing good cover to 52,700 acres, fair cover to 174,900 acres and poor cover to 50,000 acres. The cover was deteriorating rapidly on most of the area until the 1950's when a reduction in grazing use was implemented. The cover has been slowly declining in subsequent years. Eventually, 54,000 acres will be classified as having poor cover if the current management level is continued. There is the potential to improve the cover through better livestock management on 210,000 acres.

8. Elevation Ranges

The elevation varies from 5,700 feet at the point of departure of Rio Puerco Arroyo from the area to 8,200 feet on the Ignacio Chavez Grant.

9. Climate

There is a high correlation between precipitation and elevation. The average annual precipitation varies from 7 to 14 inches of which 70 percent occurs during the growing season in high intensity convective storms. Very little moisture occurs during the winter in the form of snow. This is less than 15 inches over most of the area. However, the Ignacio Chavez Grant and Continental Divide areas accumulate 30 to 40 inches of snowfall annually. Meximum annual precipitation recorded is 16.34 inches and the minimum is 6.04 inches at Torreon Navajo Mission.

A rain gauge has been maintained by the Rocky Mountain Forest and Range Experiment Station since March 1962. This gauge is located in southeast portion of the area. Average annual precipitation is 8.85 inches and growing season precipitation 6.8 inches.

Mean annual temperature for the area is approximately 50 degrees F. Frost-free temperatures prevail for approximately 150 days each year in lower areas to 100 days at

higher elevations. Records available at Cuba, located 10 miles northeast of the area, have recorded a maximum and minimum temperature of 102° and -40° Fahrenheit, respectively.

10. Hydrology

Average annual runoff is estimated to be .25 inches over the area, or 2,645 ac. ft. per year. The principal source of surface water is from summer thunderstorms. Water disappears quickly in the dry channels and sediment deposits. Less than 10 percent of the water is measured as streamflow at a USGS gauging station on Chico Arroyo that bisects the southern portion of the watershed.

The recharge of ground water table in the area is dependent upon precipitation in the San Pedro Mountains. The watershed is underlain by parent material of low water yield characteristics 0.1 to 0.5 inches per year. Most wells are in alluvial valleys and yield 1 to 2 gallons per minute of water with a high concentration of sulphate particles. However, there are two artesian wells in the area that are not in production. One of the wells has a sustained pressure of 80 pounds per square inch. The Rio Puerco River, an ephemeral stream, bisects the south portion of the area. Much of this stream flow contributes

to the ground water supply. However, during the summer torrential rainstorms, most of its flow enters the Rio Grande. The Torreon Arroyo bisects the west portion and the Chico Arroyo bisects the south portion. The Piedre Lumbre and San Isidro Arroyos bisect the north portion of the watershed area. These dry arroyos produce high sediment and water flows after each torrential rainstorm.

B. Economic Data

1. Livestock Forage

Use of the watershed is vital to ranching operations in the area. Historically livestock use was in common on large areas with little management or control. Individual allotments were established on most of the area after it came under federal administration. The area is being grazed by 4,450 cattle and 35 horses for a total of 37,300 AUM's annually. Seventeen AMP's have been developed covering 113,000 acres.

Livestock operations in the area are small, and many allottees supplement their income with jobs in Cuba or the Albuquerque area. Some have additional federal range use in adjacent areas.

Thirty-four low-income ranchers in the Cabezon area have reported high economic losses in below-normal rainfall years.

Sixty percent of livestock must trail to the Rio Puerco Arroyo where they drink from non-flowing stagnant pools having a high selenium content. Reports by the State Extension Range Management Specialist and the ranchers have shown 20 to 30 percent death loss and only 30 to 50 percent calf crops. Many of the shrubs and forbs in the area also contain a high amount of selenium which compounds the problem.

Forage production has been deteriorating since resettlement of the area about 100 years ago. Grazing was especially heavy in the early 1900's. In recent years the rate of deterioration has decreased slightly, but forage production, timber production, wildlife browse and watershed cover cannot be maintained unless the proposed watershed management plan is adopted. It is anticipated that forage production will diminish over the next 10 to 15 years until only 32,700 AUM's will be available if current conditions continue. The area has the potential to produce approximately 40,590 AUM's under proper management. (See Cabezon (01-04) URA, page 108, and Rio Puerco (01-03) URA, page 55.)

2. Timber

The Ignacio Chavez Grant is in one of the most productive timber areas in the district. There are 3,700 acres

with 7,266 Mbf of which 2,585 Mbf were harvested from FY 1970 to 1973. Excellent stands of Ponderosa pine and Douglas fir occur on Chivato Mesa in the southwest portion of the watershed area. About one-half of the volume in accessible areas is being logged with practically no cutting along the north and east rims of Chivato Mesa due to poor access. An extensive timber stand improvement program is being implemented to improve timber-depleted areas, damaged trees, and provide young stands with more growing space. The area has the potential to produce approximately 55 million board feet of timber in a 100-year cycle with a present value of $1,650,000. Sales of firewood, fence posts and wildings amount to $4,000 to $6,000 annually. This is an average of 7-900 Mbf of firewood, 7-12,000 fence posts and 4-500 Ponderosa and pinon wildings.

3. Wildlife

The watershed area provides yearlong habitat for elk, Rocky Mountain mule deer and pronghorn antelope. Table F summarizes data for principal game species.

TABLE F

Species	Population Number	Hunter Success %	Limiting Factor
Elk	50	0-10	Excessive livestock grazing
Deer	600	10-45	Lack of browse
Antelope	70	No hunts	Poaching - lack of permanent water
Merriam's Turkey	50	10	Pinon-juniper invasion

Hunting pressure, generally, averages 55 hunter days per section each season on 38,000 acres of the area. Big game populations are limited by lack of permanent water and green vegetation during pre-natal and post-natal periods. Scaled quail are found throughout the area in numbers depending on the cyclic trend. Waterfowl use all water impoundments for resting and feeding areas during the spring and fall seasons.

4. Minerals

Much of the area is covered by active coal prospecting permits. These are located north and east of Chivato Mesa and in areas west of Piedre Lumbre Arroyo and near the Torreon Arroyo. Outcrops of weathered coal and shale beds are 15 inches to 6 feet thick. Considerable interest has been shown for coal gasification with the continuing demand for coal in electrical power generation.

The central portion of the area is under oil and gas lease: The active leases have oil production in small quantities at shallow depths. There are 5-7 wells that are not in present production. However, four wells in the Media Dome field are producing approximately 1,000 barrels per month.

The petrified wood areas are very small and are not of gem quality. Flagstone sales have been made in several areas, but available rock is marginal in quality and little is present.

The southeast portion has a high potential for sale of carbonaceous shale (fertilizer and soil conditioners). Most of the interest has developed in the last one to two years.

5. Recreation

The area offers a wide variety of opportunities for scenery, historical and archaeological sites, hunting, camping and picnicking. The Ignacio Chavez Grant and Continental Divide areas offer the highest overall scenic value as characterized by the volcanic plugs, geologic formations, and forest vegetation. There are several abandoned stagecoach stations along the Chico and Torreon Arroyos. An archaeological site, (Ojo

Azabache Stage Station) and a recreational complex (Ignacio Chavez) have been identified. Visitor days are estimated to be 11,600 annually. Recreation use is estimated to increase at least 100% with the development of proposed roads and recreation facilities, since a large metropolitan area (Albuquerque) is only two hours distance by automobile.

III. Problem

A. Erosion

The basic problem is restoring stability to the watershed. Livestock were brought in to the area more than 200 years ago and heavy livestock use, especially during the first quarter of the 20th century, severely depleted the protective vegetative cover. Gully and sheet erosion is rampant throughout the watershed. Currently, erosion is producing 350 ac. ft. of sediment per year from the area and is expected to increase to about 400 ac. ft. per year if remedial measures are not taken.

Data taken at the Chico Arroyo gauging station indicate an average sediment load of 1,365 ac. ft. per year. The bedload is estimated at 137 ac. ft. per year and the average annual sediment yield at 1.08 ac. ft. per square mile per year. Clay content varies from 36-60 percent, silt content is constant at 36 percent and sand content varies from 1 to 30 percent. Peak discharge from a torrential storm (August 5-9, 1957) at this station was recorded at 16,920 ac. ft. This amounts to 12 ac. ft. per square mile of watershed for a single storm. The average annual runoff is 12.9 ac. ft. per square mile for the area.

Records taken farther upstream near the old village of Cabezon indicated that the annual sediment yield was 1.6 ac. ft. per square mile per year during the nine year period of study.

Studies conducted by USGS on Cornfield Wash from 1951-1960 showed average sediment concentration during runoff was 395 parts per million, annual sediment deposition was 1.9 ac. ft. per square mile, and runoff was 17 ac. ft. per square mile. Reservoir capacities were reduced 52.4 percent for the period and evaporation loss was 43 percent of the permanent storage. Precipitation for the period was slightly lower than the long-term average.

A 20-year study (1952-1972) of the San Luis Watershed by the Rocky Mountain Forest and Range Experiment Station showed an average annual sediment yield of 0.7 ac. ft. per square mile and a water yield (runoff) of 36.5 ac. ft. per square mile.

The useful life of a reservoir in this area is one-half that of a reservoir in a stabilized watershed. Most fences and roads require annual maintenance at drainage crossings because of damage from runoff flow.

B. Livestock

Livestock losses are high in the area, ranging from 10 to 20 percent, primarily because of poor quality water supplies. During dry periods livestock are often forced to trail long distances to the channel of the Rio Puerco where they drink from stagnant pools having a high selenium content. Ground

water is not available at a reasonable depth. In 1971, the Bureau drilled to a depth of 1,354 ft. and encountered no water. Many selenium bearing plants also occur in the area and are ingested in disproportionate quantities because the better forage plants make up a small part of current plant cover.

Plant composition on about 18,000 acres is almost exclusively big sagebrush and pinon-juniper.

Forage production is low and erosion hazard high.

C. Wildlife

Historically Chivato Mesa, La Ventana Ridge, and the Continental Divide area were highly productive big game habitat. Numbers are low because low value plants have replaced better forage species.

The invasion of pinon and juniper has resulted in the loss of much the Merriam's turkey habitat. Scaled quail habitat has been reduced along drainages because of gully formation and excessive livestock grazing.

D. Access Roads

About 25 miles of access roads are in extremely poor condition because of improper placement and no provision for disposition of runoff accumulations. The situation is largely

a result of earlier unregulated exploration activities for uranium, coal, oil and gas. Poor access has a direct bearing on the development of recreation activity in the area. Road maintenance costs within the watershed are $60 to $150 per mile more than the average cost for maintenance for comparable roads in a stabilized watershed.

IV. Objectives

A. Conservation (Watershed)

1. Soil Resource - Specific Objectives Are:

To reduce erosion classification to a moderate condition through livestock management and land treatment. Reduce present SSF from an average of 60 to an average of 40 on the watershed area.

Allowing a ten-year period to realize the ultimate change, Table G shows the improvement that should be realized from the plan. Also shown is the estimate of anticipated situation without treatment.

TABLE G

Erosion Class	Present Acres	%	Future Without Plan Acres	%	Future With Plan Acres	%
Stable	13,900	5.0	---	---	13,500	4.9
Slight	52,900	19.0	52,700	19.0	40,400	14.6
Moderate	83,100	30.0	51,400	18.5	191,100	68.8
Critical	105,500	38.0	139,900	50.4	31,100	11.2
Severe	22,200	8.0	33,600	12.1	1,500	.5
TOTAL	277,600	100.0	277,600	100.0	277,600	100.0

Stabilize soil in all floodplains to prevent further channel erosion in the drainageways. Increase ground cover from 45 percent to 60 percent which will result in a reduction in SSF from 60 to 35 in the alluvial floodplains.

2. Water Quality and Yield - Specific Objectives Are:

a. Reduce sediment load in the runoff on watersheds above existing livestock reservoirs. The present sediment load of 350 ac.ft./yr. may increase to 400 ac.ft./yr. if present conditions prevail, or reduce to 121.5 ac.ft./yr. with the management plan.

b. Reduce annual runoff from the watershed from 2,645 ac.ft./yr. to 1,585 ac.ft./yr.

B. Development (Watershed)

Flood and Sediment Damage - The Specific Objectives Are:

1. Reduce the annual damage to fences and roads that is estimated at $29,000 to $17,400.

2. Reduce by 7 percent the average annual sediment load being delivered into the Rio Grande at Bernardo from the Rio Puerco (computed from water years 1948-71).

3. Reduce the channel erosion damage on Rio Puerco to Chico Crossing and adjacent roadway by reducing peak flows.

C. Development (Range)

Forage Resource - The Specific Objectives Are:

1. Increase the livestock forage supply by 4,175 AUM's.

2. Increase the average forage density of the short grass subtype from 21 percent to 30 percent and change the average composition of alkali sacaton and four-wing saltbush from 40 percent to 55 percent.

3. Develop a permanent water source for 970 cattle in Cabezon area which will reduce death loss by 10 to 20 percent and increase calf crop to 80 percent. The development of 4,175 additional AUM's, plus the prevention of a 3,715 AUM reduction, will result in an estimated 42,676 annual benefits.

Each additional marketable calf would contribute about $150 to gross incomes of economically depressed operators in the Cabezon area.

These benefits will be obtained with no additional cost to that needed to reach the conservation objectives of the plan.

D. Improvement (Wildlife Resource Habitat)

Objectives are to improve the wildlife habitat by increasing cool season grasses and browse, provide more summer forbs, and improve the density and vigor of key browse species of winter range.

Habitat Improvement - The Specific Objectives Are:

1. Increase deer populations from an average of .25 per section to .60 per section.

2. Increase the number of scaled quail coveys to two per square mile by increasing four-wing saltbush and forb density from 2 percent to 15 percent along floodplains.

3. Increase browse composition on 25,000 acres of winter elk range from 15 percent to 20 percent.

4. Increase mountain meadow park areas by 3,000 acres through controlling pinon-juniper invasion.

5. Convert warm season grasses on Chivato Mesa (2,000 acres) to cool season grasses and forbs for deer and elk.

6. Increase antelope populations from 70 to 200.

The improvement of the wildlife habitat will change the hunting days from 3,300 to 5,180 user days and the hunting success should improve from an average of 35 percent to 50 percent.

V. Expectations Without the Plan

It is estimated that by the end of ten years, sediment from increased erosion will be 50 acre feet greater than the present level, an increase of 14 percent.

Stable acres will decline by 16,392 acres. Critical and severe erosion condition classes will increase from 35,600 to 173,500 acres.

Production of livestock forage will be reduced by the equivalent of 3,195 AUM's. Thirty livestock operators will be lost due to the cumulative effect of continued death loss, low percentage calf crops and declining livestock forage conditions.

Wildlife habitat will continue to decline, with a detrimental affect on wildlife numbers.

Recreational visits will be decreased because of deteriorated road conditions.

VI. System of Accounts Display - Formulation of Plan

The following system of accounts displays the beneficial and adverse effects of the selected plan for Rio Puerco Watershed in North Central New Mexico on the components of National Economic Development, Environmental Quality, Regional Development and Social Well-Being Accounts.

Economic evaluations are based on an interest rate of 5-7/8 percent, a 50-year period of analysis and 1974 costs.

5/21/75

SELECTED PLAN
RIO PUERCO WATERSHED
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

COMPONENTS Beneficial Effects	MEASURES OF EFFECTS (Avg. Annual Dollars)[f]	COMPONENTS Adverse Effects	MEASURES OF EFFECTS (Avg. Annual Dollars)[f]
A. Value to users of increased outputs of goods and services:[a]		A. Value of resources required for plan:	
1. Forage Production[b]	42,676	1. Construction and installation of structures and practices[e]	92,276
2. Flood Damage Avoided[c]	14,262	2. Operation and maintenance	100,945
3. Recreation[d]	106,462		
Total Average Annual Economic Benefits:	163,430	Total Average Annual Economic Costs:	193,221

Average Net Benefit (Benefit - Costs): -29,791

SELECTED PLAN
RIO PUERCO WATERSHED
ENVIRONMENTAL QUALITY ACCOUNT

COMPONENTS	MEASURES OF EFFECTS
Beneficial and Adverse Effects:	
A. Areas of Natural Beauty	1. The Ignacio Chavez Grant and Continental Divide Areas offer significant scenic values as characterized by the volcanic plugs and geologic formations (e.g., Cabezon Peak). 2. Past histroy and culture can be traced in the old villages of San Luis and Cabezon and in several abandoned stagecoach stop stations along the Chico and Torreon Arroyos. 3. Increased traffic associated with hunting and other recreation opportunites (esp. 1 & 2 above) will be accompanied by increased noise, solid wastes and dust pollution from 11,600 additional recreation visits and 1,880 increased hunter days.
B. Biological Resources and Ecosystems	1. Increase deer population from an average of .25 per section to .60 per section, increasing deer days of use by 315 days. 2. Increase the number of scale quail coveys to two per square mile by increasing four-wing saltbush and forb density from 2 percent to 15 percent along floodplains. 3. Increase mountain meadow park areas by 3,000 acres through control of pinon-juniper invasion. 4. Increase browse composition on 25,000 acres of winter elk range from 15 percent to 20 percent. 5. Convert warm season grasses on Chivato Mesa (2,000 acres) to cool season grasses and forbs for deer and elk.

SELECTED PLAN
RIO PUERCO WATERSHED
ENVIRONMENTAL QUALITY ACCOUNT
(CONTINUED)

5/21/75

COMPONENTS	MEASURES OF EFFECTS
Beneficial and Adverse Effects:	6. Increase antelope population from 70 to 200. 7. Increase average forage density of shortgrass subtype from 21 to 30 percent and change average composition of alkali sacation and fourwing saltbush from 40 to 55 percent.
C. Quality Consideration of Water, Land and Air Resources	1. Increase stable acres from 151,492 to 181,961 or 30,469 stable acres. 2. Reduce annual runoff from 2,645 ac. ft./yr. to 1,585 ac. ft./yr., or 1,060 ac.ft./yr. 3. Reduce sediment load in runoff above existing livestock reservoirs by 65 percent by reducing present sediment load of 350 a/ft/yr (which may increase to 400/a/ft/yr) to 121.5 a/ft/yr, or 228.5 to 278.5 a/ft/yr. 4. Reduce by 7 percent the average annual sediment load being delivered into the Rio Grande at Bernardo from the Rio Puerco. 5. Reduce channel erosion damages on Rio Puerco to Chico Crossing and adjacent roadway by reducing peak flows. 6. Reduce erosion classification to moderate condition through livestock management and land treatment, reducing present SSF from average of 60 to 40.

SELECTED PLAN
RIO PUERCO WATERSHED
REGIONAL DEVELOPMENT ACCOUNT

COMPONENTS	MEASURES OF EFFECTS (Average Annual Dollars)[f] Region	Rest of Nation
A. Income		
Beneficial Effects:		
1. Value to users of increased outputs of goods and services:		
a. Forage Production	76,999[g]	42,676
b. Flood Damage Avoided	14,262	14,262
c. Recreation	147,773[h]	106,462
Total Average Annual Economic Benefits:	239,034	163,430

COMPONENTS	MEASURES OF EFFECTS (Average Annual Dollars)[f] Region	Rest of Nation
A. Income		
Adverse Effects:		
1. Value of resources required for plan:		
a. Construction and installation of structures and practices	--	92,276
b. Operation and maintenance	--	100,945
Total Average Annual Economic Costs	--	193,221
Average Annual Net Benefit	239,034	-29,791

SELECTED PLAN
RIO PUERCO WATERSHED
REGIONAL DEVELOPMENT ACCOUNT
(CONTINUED)

COMPONENTS	MEASURES OF EFFECTS		COMPONENTS	MEASURES OF EFFECTS	
	Region	Rest of Nation		Region	Rest of Nation
B. Employment: Beneficial Effects			B. Employment: Adverse Effects	0	0
a. Employment[1]	17 jobs permanently plus fuller utilization of underemployed ranch labor.	--			
b. Employment during project construction and implementation	6 skilled and 2 semi-skilled BLM jobs for 6 years; 2.5 private sector jobs for 6 years.	--			
c. Employment for project O&M	2 skilled permanent and 1 seasonal BLM jobs; 3 permanent seasonal private sector jobs.	--			
	Labor for maintenance of selected practices and improvements furnished by allottees by cooperative agreement.				
Total Beneficial Effects (Also Net)	19 skilled and 4 seasonal jobs permanently; 7 skilled and 3.5 semi-skilled jobs for 6 years; also fuller utilization of ranch labor.	--			

COMPONENTS	MEASURES OF EFFECTS	
	Region	Rest of Nation
C. Regional Economic Base and Stability		
Beneficial Effects	Provides more stable watershed, sedimentation reduction and increased forage supply to help stabilize 30 small low-income ranch operators. Development of permanent water supply will contribute to increased calf crop and reduced death loss.	--
	Increased hunting and recreation opportunities will have positive income and employment effects on Albuquerque and Cuba near the project area and may force major improvements in road systems in the area.	--
	Creating 7 skilled and 3.5 semi-skilled short term (6 years) jobs and 19 permanent and 4 seasonal long-term jobs will provide a strong economic boost to Cuba which had an unemployment rate of 12% in 1970 (9% in Sandoval County).	--
Adverse Effects	Increased hunting and recreation pressures will eventually force major improvement in 40 - 50 miles of roads with substantial costs being borne by local government.	--

5/21/75

SELECTED PLAN
RIO PUERCO WATERSHED
SOCIAL WELL-BEING ACCOUNT

COMPONENTS	MEASURES OF EFFECTS
Beneficial and Adverse Effects	
A. Real Income Distribution	1. Create regional income distribution of $239,034 annually by income class as follows:

Income Class	Families in Class %	Families in Class No.	% Benefits Accruing to Class
Under $5000	22	17,708	26
$5000 - $12,000	47	38,331	37
Over $12,000	31	25,573	37

B. Recreation Opportunities	2. Creates an additional 1880 hunter days and 11,600 general outdoor recreation visitor days for 36,000 rural inhabitants and a quarter million urban dwellers in the Albuquerque metropolitian area (within two hours of project area).

Footnotes for Account Displays
Rio Puerco Watershed - Selected Plan

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a. Assumes 10 year development period.

b. Priced at $4.39 per AUM, based on average bid price per AUM on McGregor Range, N.M., 1974-75.

c. Estimated reduction in annual damages to fences and roads.

d. Priced at $6.41 per recreation day, based on New Mexico data in Table 2, Recreation Participation and Expenditures in Western States, BLM, August 1974.

e. Includes manpower, practices and program administration costs over six year implementation period and one year pre-planning.

f. Ammortized over 50 years at 5.875 percent interest.

g. Based on adjusted average livestock earnings per AUM times livestock industry income multiplier (1.633) for livestock region (Sandoval County).

h. Based on average recreation day expenditure times industry (average services and wholesale and retail trade) income multiplier (1.388) for recreation region (Sandoval and Bernalillo Counties).

i. Based on adjusted average earnings per employee in two county region.

VII. Analysis of Alternatives

Three alternative plans were prepared. The alternatives were compared in three main objectives: Stable acres, erosion reduction in acre feet of sediment, and change in livestock forage in AUM's.

"Stable acre" is a term used to express an erosion condition. A number of categories are used to develop a numerical value or soil surface factor (SSF). The categories used in estimating the SSF in the field are: Soil movement, surface litter, surface rock, plant pedestalling, flow patterns, rills and gullies.

A numerical value is assigned to each category and these are totaled to give a number which is the SSF. This number may then by ranked by a table which interprets the value in a percentile, indicating the percentage of an acre which is in a stable erosion condition.

The SSF values range from zero to 100, 100 indicates severe erosion or complete instability and a zero percent stable acre. An SSF of 20 indicates essentially a stable condition and 100 percent stable acre, an SSF of 40 equals 75 percent stable, 60 equals 50 percent stable, etc. The number of acres represented by an SSF, multiplied by the percentage rating, gives the total number of stable acres.

By comparing areas which are relatively stable and are either in the watershed segment being rated or an adjacent, similar area, estimates can be made for: Future SSF without change in present management, future SSF with grazing management, future SSF with management and land or vegetative treatment. This process provides a tool for comparing the future erosion possibilities for a given area for several alternatives.

"Acre feet of sediment" is a common term. The suspended solids in stream flows are measured, as well as the volume of water flow. It is then possible to compute the volume of sediment in units of acre feet (43,560 cu. ft. equals 1 acre foot) which pass a given point in the drainage.

"Animal unit month" (AUM) is the term used to describe the amount of forage which will be required to feed one cow for one month.

The alternative plans prepared also considered a plan of no action, which was judged to be unacceptable because of accelerated loss of resource values and therefore was not considered further as an alternative.

The three alternatives considered were prepared on three different levels of investment. Schedules of implementation were also different in order to best utilize funds and manpower. A tabular

display of cost data and schedules for each alternative is shown on Tables H, I and J. Tables K, L and M compare the alternatives in respect to the three major objectives. Data for comparison of cost and effectiveness is summarized in Table N.

Cost Data for Alternatives

TABLE H

Alternate Plan No. 1

Practices & Planning Interval	Total Initial Cost $ 1/	Effective Life Years	Annual Equivalent Cost			O&M Cost	Tot. Annual Equiv.Cost $	Present worth Annual Equiv. Cost $
			Initial Cost $	Replace-mt.cost$	Total			
Year 1								
Water Development	191,620	25	11,110	3,811	14,921	9600	24,521	
Fences	17,800	50	1,032	----	1,032	425	1,457	
							25,978	25,978
Year 2								
Water Development	210,000	25	12,222	4,177	16,399	10,500	26,899	25,527
Year 3								
Fences	42,250	50	2,471	----	2,471	1050	3,521	
Water Development	120,700	25	7,060	2,401	9,461	6035	15,496	
							19,017	17,127
Year 4								
Fences - trail	165,600	50	9,732	----	9,732	4140	13,872	
Water Development	29,900	25	1,757	595	2,352	1495	3,847	
							17,719	15,143
	777,870						PLAN TOTAL:	83,775

1/ Includes practice costs only.

Cost Data for Alternatives

TABLE I

Alternate Plan No. 2

Practices & Planning Interval	Total Initial Cost $ 1/	Effective Life Years	Annual Equivalent Cost: Initial Cost $	Replace-mt.cost$	Total	O&M Cost	Tot. Annual Equiv.Cost $	Present worth Annual Equiv. Cost $
Year 1								
Water Development	191,620	25	11,100	3,811	14,921	9,600	24,521	
Fences	17,800	50	1,032	----	1,032	. 425	1,457	
							25,978	25,978
Year 2								
Water Development	210,000	25	12,222	4,177	16,399	10,500	26,899	
							26,899	25,527
Year 3								
Fences	42,250	50	2,471	----	2,471	1,050	3,521	
Water Development	120,700	25	7,060	2,401	9,461	6,035	15,496	
							19,017	17,127
Year 4								
Fences - trail	165,600	50	9,732	----	9,732	4,140	13,872	
Water Development	29,900	25	1,757	595	2,352	1,495	3,847	
							17,719	15,143
Year 5								
Upgrading roads - small erosion control	120,500	50	7,121	----	7,121	4,600	11,721	
Sage control	59,565	15	3,518	2,683	6,201	----	6,201	
							17,922	14,537
Year 6								
Brush control	66,900	15	3,973	3,014	6,987	-----	6,987	
Pitting	65,050	50	3,863	----	3,863	-----	3,863	
							10,850	8,351
	1,089,885						PLAN TOTAL:	106,663

1/ Includes practice costs only.

Cost Data for Alternatives

TABLE J

Alternate Plan No. 3

Practices & Planning Interval	Total Initial Cost $ 1/	Effective Life Yrs.	Annual Equivalent Cost			O&M Cost	Tot. Annual Equiv.Cost $	Present Worth Annual Equivalent Cost $
			Initial Cost $	Replace-mt.Cost$	Total			
Year 1								
Water Development	191,620	25	11,100	3,811	14,921	9,600	24,521	
Fences	17,800	50	1,032	----	1,032	425	1,457	
							25,978	25,978
Year 2								
Water Development	210,000	25	12,222	4,177	16,399	10,500	26,899	25,527
Year 3								
Fences	42,250	50	2,471	----	2,471	1,050	3,521	
Water Development	120,700	25	7,060	2,401	9,461	6,035	15,496	
							19,017	17,127
Year 4								
Fences - trail	165,600	50	9,732	----	9,732	4,140	13,872	
Water Development	29,900	25	1,757	595	2,352	1,495	3,847	
							17,719	15,143
Year 5								
Upgrading roads - small erosion control	120,500	50	7,121	----	7,121	4,600	11,721	
Sage control	22,950	15	3,518	2,683	6,201	----	6,201	
							17,922	14,537
Year 6								
Brush Control	66,900	15	3,973	3,014	6,987	----	6,987	
Pitting	65,050	50	3,863	----	3,863	----	3,863	
							10,850	8,351
Year 7								
Detention Dams	151,200	25	9,030	3,007	12,037	6,050	18,087	13,211
Year 8								
Detention Dams	141,600	25	8,506	2,816	11,322	5,665	16,987	
Upgrade Roads	1,250	50	75	----	75	125	200	
Pitting	6,590	10	396	----	396	----	396	
							17,583	12,189
	1,352,910						PLAN TOTAL:	132,063

1/ Includes practice costs only.

Physical Improvement Alternatives*

TABLE K

Geographic Area	Acres 100's	SSF #	Other AUM #	Acres Stabilized Percent stable	Acres Stabilized Present acres	Change in Acres
Central Rio Puerco	1440	56	21,670	54.50	78,507	
San Isidro	596	57	7,865	54.20	32,285	
Cabezon	740	56	6,880	55.00	40,700	
TOTAL OUTPUTS: (PRESENT)	2776		36,415		151,492	
Central Rio Puerco	1440	62	19,595	47.71		-9,799
San Isidro	596	55	8,070	55.95		1,064
Cabezon	740	64	5,035	44.38		-7,857
TOTAL OUTPUTS: (FUTURE WITHOUT CHANGE)	2776		32,700			-16,592
Central Rio Puerco	1440	49	23,050	64.00		13,687
San Isidro	596	55	8,070	55.95		1,064
Cabezon	740	49	7,485	63.75		6,475
TOTAL OUTPUTS: (FUTURE-ALT. 1)	2776		38,605			21,226
Central Rio Puerco	1440	47	24,000	65.96		16,480
San Isidro	596	47	9,105	66.78		7,514
Cabezon	740	49	7,485	63.75		6,475
TOTAL OUTPUTS: (FUTURE-ALT. 2)	2776		40,590			30,469
Central Rio Puerco	1440	47	24,000	65.96		16,480
San Isidro	596	37	9,105	74.18		11,925
Cabezon	740	49	7,485	63.75		6,475
TOTAL OUTPUTS: (FUTURE-ALT. 3)	2776		40,590			34,880

*Analysis previously completed using Analytical Mapping Units

Analysis of Alternatives for Soil Stabilization Objectives* TABLE L

Geographic Area	No. of Stable Acres	Change In No. St. Ac.	Period of Dev. or Degradation	Present Worth of Stable or Degrad. Acres Over 50 Yrs.	Dev.Per. Factors 5 3/8%	Annual Equiv. of Stable Acres 5-3/8%	Achieve Given Objective
Central Rio Puerco	68,708	-9,799	1-10	-125,108		-7,256	
San Isidro	33,349	1,064	1-10	13,788		800	
Cabezon	32,843	-7,857	1-10	-124,269		-7,207	
TOTAL	134,900	-16,592		-235,589		-13,663	43.7
(FUTURE W/O INVESTMENT)							
Central Rio Puerco	93,194	13,687	1-10			10,717	
San Isidro	33,349	1,064	1-10			833	
Cabezon	47,175	6,475	1-10			5,070	
TOTAL	172,718	21,226			.783	16,620	68.2
(FUTURE-ALT. 1)							
Central Rio Puerco	94,987	16,480	1-10				
San Isidro	39,799	7,514	1-10				
Cabezon	47,175	6,475	1-10				
TOTAL	181,961	30,469			.783	23,857	74.1
(FUTURE-ALT. 2)							
Central Rio Puerco	94,987	16,480	1-10				
San Isidro	44,210	11,925	1-10				
Cabezon	47,175	6,475	1-10				
TOTAL	186,372	34,880			.783	27,311	77.0
(FUTURE-ALT. 3)							

*Analysis previously completed using Analytical Mapping Units

TABLE M

Analysis of Alternatives for Complementing Livestock Objectives*

Geographic Area	No. of AUM's	Change In No. AUM's	Period of Dev. or Degradation	Present Worth of AUM's Over 50 Yrs.	Dev. Per. Factors 5 3/8%	Achieve Given Objective
Central Rio Puerco	19,595	-2,075		-29,580		-1,716
San Isidro	8,070	205		2,988		173
Cabezon	5,035	-1,845	1-3	-28,437		-1,649
TOTAL	32,700	-3,715		-55,029		-3,192
(FUTURE-W/O INVESTMENT)						
Central Rio Puerco	23,050	1,380				1,242
San Isidro	8,070	205				173
Cabezon	7,485	605	1-5		.895	541
TOTAL	38,605	2,190				1,956
(FUTURE-ALT. 1)						
Central Rio Puerco	24,000	2,330				2,236
San Isidro	9,105	1,240				1,087
Cabezon	7,485	605	1-5		.895	541
TOTAL	40,590	4,175				3,864
(FUTURE-ALTS. 2 & 3)						

*Analysis previously completed using Analytical Mapping Units

Comparison of Cost and Effectiveness

TABLE N

AVERAGE WATERSHED PRODUCTIVE CAPACITY: 800

Alternative	Total 1/ Annual Cost $	Effectiveness: Direct			Spillover 2/	Effectiveness per Dollar of Total Costs			
		Stable Acres		Erosion Reduction (Ac.Ft.Sediment	Change in AUM's (No.)	Stabilized Acres #	Erosion* Reduced Cu. Ft.	AUM's	
		Total Change	Percent Stable					Number	Market Value $ 3/
Objective			75.0	281.9	7,056				
1	83,775	30,283	68.2	256.3	5,148	.36	133.27	.061	.270
2	106,663	36,520	74.1	278.5	7,056	.34	113.74	.066	.290
3	132,063	40,974	77.0	289.4	7,056	.31	95.46	.053	.236

* Not discounted

1/ Includes practice costs only.

2/ Other spinoff benefits include recreation and hunter day increase, increased calf crop and flood damage avoided.

3/ Market value of comparable AUM's in local area is $4.39 per AUM.

VIII. Recommended Plan

The second alternative was selected as the plan providing the maximum of direct and indirect benefits compared with cost and effectiveness measures shown in Table N. Table O illustrates the practices, units and costs which are required by the selected plan. Table P lists the estimated direct and indirect benefits of the plan.

TABLE 0
ESTIMATED PROJECT COST*
RIO PUERCO WATERSHED MANAGEMENT PLAN
ALBUQUERQUE DISTRICT

Item	Units	No.	Installation Cost $	Aver. Annual Operation & Maintenance $
Manpower Required	M.M.	300	450,000	60,000
PRACTICE				
Fences	mile	93.6	188,900	5,565**
Wells & Equipment	no.	7	39,300	2,100
Springs	no.	6	11,200	300**
Sage Chaining-Seed	acre	12,065	59,565	--
Contour Pitting	acre	13,010	65,050	--
Pipeline	mile	110.45	456,270	24,080
Small Erosion Control	cu.yd.	150,000	60,000	--
Artesian Well	no.	2	20,000	600**
Cholla Control	acre	350	1,400	--
Pinon-juniper Burning-Seeding	acre	4,400	22,000	--
Pinon-juniper Chaining Burn-Seed	acre	2,000	27,500	--
Plowing-Seed	acre	2,000	16,000	--
Water Catchment	no.	3	22,250	300**
Livestock Trail	mile	1	1,500	50**
Access Road	mile	1.2	8,500	200
Upgrade Roads	mile	92	46,000	4,600
Reservoir Exclosure	no.	47	35,250	1,400
Maintenance of Existing Practices 1/				20,000** 1.500***
Upgrade Existing Erosion Control Structures	cu.yd.	15,000	6,000	--
Pit Reservoir (2)	cu.yd.	8,000	3,200	250
TOTAL PRACTICE COST			1,089,885	60,945
Program Services (1700)			10,000	2,500
Total Project Cost			1,549,885 2/	123,445

1/ Excluded in calculation of O&M shown in NED and RD displays (pp. 31 & 34).

2/ Practice Cost + Program Services + Manpower Required.

TABLE P

ESTIMATED BENEFITS

RIO PUERCO WATERSHED MANAGEMENT PLAN

ALBUQUERQUE DISTRICT

TYPE	UNITS	NUMBER
Stable acres - Annual Equiv.	Acres	36,520*
% of Project	%	74.1*
Protection from Gully Erosion	Acres	470
Water Quality Improvement Main Pollutant - (Sediment Reduction)	Percent	65.3
(Sediment Quantity)	Ac.ft.	228.5
Spillover		
Animal Unit Months - Annual Equiv.	AUMs	7056*
Deer Days of Use	DDU	315
Hunter Days	HD	1880
Livestock Production Gain	No.	485

*Discounting Procedures Used

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