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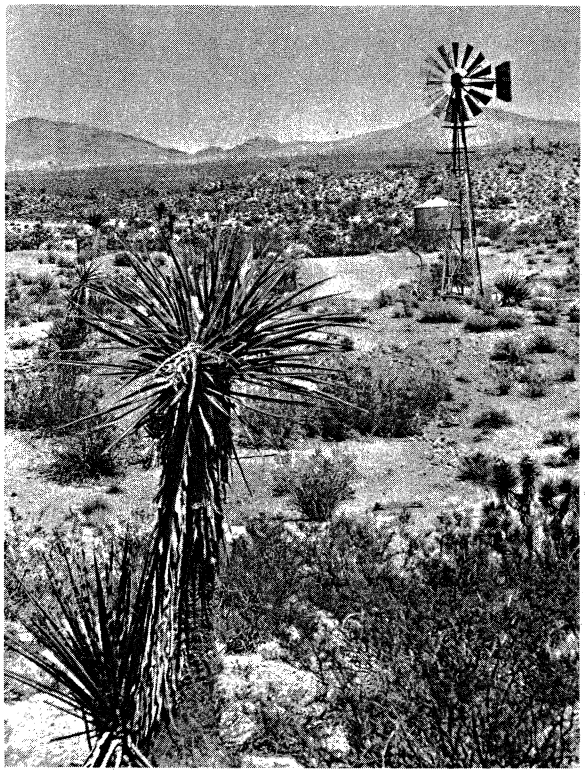
IBP

INLAND BASINS PROJECTS

CALIFORNIA - NEVADA



SUMMARY REPORT

RECONNAISSANCE INVESTIGATIONS

June 1972

UNITED STATES DEPARTMENT OF THE INTERIOR

Bureau of Reclamation

I. SUMMARY

A. Introduction

This report summarizes the Inland Basins Projects investigations of closed basins within the Lahontan and Colorado River Basins in southern Nevada and southeastern California. The purpose of the studies was to inventory the land and water resources, the present development, and the potential future needs of the basins on the basis of agriculture, municipal, and industrial water requirements. In these basins, there are several million acres of barren desert lands that could be transformed into fertile farms, industrial sites, national defense operations, or municipal areas provided a dependable water supply could be obtained.

The area inventoried was divided into nine separate study areas consisting of individual basins or groups of basins. An interim reconnaissance report was prepared for each study. These separate reports are summarized in this final report and include: Amargosa Project; Antelope and Fremont Valleys; Borrego Valley; Chuckwalla Valley; Indian Wells and Searles Valleys; Ivanpah-Piute Valleys; Mojave River Basin; Morongo-Yucca-Upper Coachella Valleys; and Pahrump-Mesquite Valleys.

Individuals and local groups have taken initial steps for development of agricultural areas in many of the valleys through the use of the ground-water resources. In some of the valleys, there are also surface-water supplies available. In some, there are

plans for importation of water from outside the basin. There is a need to prevent excessive overdraft of the ground water and to determine the best means of conservation, development, and management of these and other unexploited water resources in an orderly manner.

B. Authority for the Report

The preparation of this report is authorized by the Federal Reclamation Laws (Act of June 17, 1902, 32 Stat. 388, and Acts amendatory thereof and supplementary thereto).

C. Scope of Investigations

The investigations were conducted as an inventory of land and water resources and to examine existing conditions and determine potential future needs of the study area.

All information and data are of reconnaissance grade.

The investigations consisted of reconnaissance land classification and land use data, field examination of hydrologic and geologic conditions, and field observations of existing agricultural developments. In addition, a search was made of records, previous reports, and existing data pertaining to the hydrologic, geologic, and economic conditions in the various basins.

D. Cooperation and Acknowledgments

Data and information from various Federal, State, and local agencies have been used in the preparation of this report. All contributions are gratefully acknowledged and appreciated.

E. Basin Summary

The range of development varies greatly in the different valleys and is attributed to farming, ranching, mining, recreation, tourism, military operations, Government test facilities and supporting services. Several of the basins studied are presently developed to the limit of existing water supplies.

Table I-1 summarizes data pertaining to each of the basins studied. Part VII of this report outlines the study results for each of the nine study areas.

The reconnaissance land classification revealed a total of 2,175,000 acres of arable land in the nine areas studied. Out of this total, approximately 196,000 acres are presently being cultivated or only about 9 percent.

The basins in which more detailed studies have been authorized are Amargosa Project, Nevada-California; Mojave River Basin, California; and Morongo-Yucca-Upper Coachella Valley Project, California. Feasibility studies are presently underway in these three areas. The remaining basins should be considered for supplemental water in conjunction with any future regional water studies.

Table I-1

INLAND BASINS SUMMARY
Inland Basins Projects, California-Nevada
Reconnaissance Studies

Name of Basin (s)	State(s)	Approximate Length and Width Miles	Approximate Longitude and Latitude (Center)	Drainage Area Sq. Miles	Population at Time of Study	Total Arable Acres	Water Resource and Estimated Recharge	Status of Studies	Recommendations or Remarks	Other Reports
RECONNAISSANCE										
Amargosa	California-Nevada	50-30	116°30'W 36°30'N	9,600 1/	1,500 (1965)	93,000	Ground water 24,000 acre-feet per year recharge	Interim Reconnaissance Report Issued November 1968	Feasibility studies authorized. Initiated in FY 1971. Report due in FY 1975.	Geological Survey and Nevada Department of Conservation and Natural Resources
Antelope and Fremont	California	55-50	118°10'W 34°50'N	3,300	154,000 (1970)	689,000	Ground water 76,000 acre-feet per year recharge	Interim Reconnaissance Report Issued March 1967	Recommended that further studies be deferred until local interests indicate support.	Geological Survey and Antelope Valley-East Kern Water Agency
Borrego	California	40-30	116°20'W 33°15'N	1,000	1,300 (1968)	39,200	Ground water 40,000 acre-feet per year recharge	Interim Reconnaissance Report Issued June 1968	Recommended that development be reexamined when import water becomes available.	--
Chuckwalla	California	70-35	115°15'W 33°40'N	2,300	3,400 (1967)	92,100	Ground water very small amount of recharge	Interim Reconnaissance Report Issued June 1968	Recommended that supplemental water supply be considered in conjunction with any future regional water studies.	California Department of Water Resources and Geological Survey
Indian Wells and Searles	California	40-40	117°35'W 35°40'N	1,840	29,000 (1966)	117,000	Ground water 13,500 acre-feet per year recharge	Interim Reconnaissance Report Issued March 1968	Recommended that a supplemental water supply be considered in conjunction with any future regional water studies.	--
Ivanpah Piute	California-Nevada	50-15 45-15	115°10'W 35°25'N	1,620	500 (1969)	164,000	Ground water 3,300 acre-feet per year recharge	Interim Reconnaissance Report Issued November 1970	Recommended that further studies be deferred until import or exchange water becomes available.	Geological Survey and Nevada Department of Conservation and Natural Resources
Mojave River Basin	California	80-60	117°05'W 34°45'N	4,500	73,000 (1964)	795,000	Surface flow 59,000 acre-feet per year average plus ground water in storage plus importation	Interim Reconnaissance Report Issued March 1965	Recommended for detailed investigations. Feasibility studies were initiated in FY 1967. Report due in FY 1973.	Corps of Engineers. Geological Survey and California Department of Water Resources
Morongo-Yucca-Upper Coachella	California	60-50	116°20'W 34°00'N	2,910	84,000 (1966)	107,000	Importation and ground water	Interim Reconnaissance Report Issued July 1967	Recommended for detailed investigations. Feasibility studies were initiated in FY 1969. Report due in FY 1973.	Geological Survey and California Department of Water Resources
Pahrump-Mesquite	California-Nevada	50-30	115°55'W 36°05'N	1,500	750 (1965)	78,000	Ground water 23,500 acre-feet per year recharge	Interim Reconnaissance Report Issued October 1969	Basin presently developed to limit of available water. Further studies deferred until import water available.	Geological Survey and Nevada Department of Conservation and Natural Resources

1/ Total Amargosa Desert drainage area includes surficial drainage areas of the tributaries: Oasis Valley, Crater Flat, Fortymile Canyon, Jackass Flats, and Rock Valley.

BORREGO VALLEY, CALIFORNIA

The following is summarized from the interim report, Inland Basins Projects, Borrego Valley, California, Reconnaissance Investigations, June 1968.

A. General Description

1. Location. The Borrego study area is located about 60 miles northeast of San Diego, California. The area is almost surrounded by mountains. The Santa Rosa Mountains lie to the north and east. To the west is situated a series of mountains of which the San Ysidro Mountains are the nearest. To the south, the valley is bounded by the Vallecito Mountains. The location of the investigation area is shown on Map 1015-326-27.

2. History. It is believed that Pedro Fages was one of the first men to enter Borrego Valley. In 1772, he entered Coyote Canyon in pursuit of deserters from the Presidio of San Diego, California. In 1774, Juan Batista De Anza, explorer and colonizer of San Francisco, led an expedition of 100 men and women through Borrego Valley. His route lay across the Imperial Valley, through Borrego Valley, and thence into the mountain regions by way of Coyote Creek. Under his leadership, the expedition returned in safety to Mexico with stories of a land rich in resources. Accordingly, 18 months later, a second expedition was led across the desert by De Anza. This expedition, consisting of 240 people and a large number of mules, horses, and cattle, was the nucleus from which many of California's first settlements grew.

LOCATION MAP

EXPLANATION

- Proposed Pumping Plant
- Proposed Turnout
- Proposed Pipeline
- Existing Pipeline
- Existing Canal
- Gaging Station
- Anza-Borrego Desert State Park Boundary
- Hydrological Boundary

UNITED STATES
DEPARTMENT OF THE INTERIOR
STEWART L. UDALL, SECRETARY

BUREAU OF RECLAMATION
FLOYD E. DOMINY, COMMISSIONER

INLAND BASINS PROJECTS - CALIFORNIA
BORREGO VALLEY

GENERAL MAP

REGION 3
MAP NO. 1015-326-27

5 0 5 10 15
SCALE OF MILES

MAY 1968

SAN BERNARDINO BASE AND MERIDIAN

SAN BERNARDINO NATIONAL FOREST
SAN DIEGO COUNTY WATER AUTHORITY
COACHELLA VALLEY COUNTY WATER DISTRICT
RIVERSIDE COUNTY
SAN DIEGO COUNTY
IMPERIAL COUNTY
UNITED STATES
MEXICO
PACIFIC OCEAN
SALTON SEA
Coyote Creek
Borrego Palm Creek
Clark Lake
Lake Henshaw
Lake Hodges
Barrett Lake
Morena Lake
SWEETWATER RESERVOIR
LOWER OTAY RESERVOIR
SAN VICENTE RESERVOIR
EL CAPITAN RESERVOIR
LOVELAND RESERVOIR
CUYAMACA RESERVOIR
CUYAMACA RANCHO STATE PARK
FIRST SAN DIEGO AQUEDUCT
SECOND SAN DIEGO AQUEDUCT
ESCONDIDO-BORREGO ROUTE
OASIS-BORREGO ROUTE
WESTSIDE-BORREGO ROUTE
BORREGO SPRINGS RESERVOIR SITE
COACHELLA CANAL
WEST SIDE MAIN CANAL
ALL-AMERICAN CANAL
SAN ISIDRO MOUNTAINS
VALLECITO MOUNTAINS
FISH CREEK MOUNTAINS
COYOTE MOUNTAINS
CLARK VALLEY
COLLINS VALLEY
BORREGO VALLEY
CLEVELAND NATIONAL FOREST
IMPERIAL IRRIGATION DISTRICT
U.S. NAVAL GUNNERY RANGE
CAMP ELLIOTT NAVAL RESERVATION
MIRAMAR N.A.S.
Escondido
Valley Center
Fallbrook
Julian
Ramona
Warner Springs
Borrego Springs
Desert Lodge
Borrego
Oasis
Martinez
Torres
Westmorland
Brawley
El Centro
Calexico
Imperial Beach
Coronado
National City
Chula Vista
La Mesa
Lemon Grove
El Cajon
Alpine
Guatay
Barrett
Potrero
Campo
Benson Dry Lake
Ocotillo Wells
Badlands
Carrizo Impact Area
Pechanga Indian Res.
Ramona Indian Reservation
Santa Rosa Indian Res.
Coahuila Indian Reservation
Torres Martinez Indian Res.
Mission Indian Reservation
Pala Indian Reservation
Palma Indian Reservation
La Jolla Indian Res.
Rincon Indian Res.
San Pasqual Indian Res.
Mesa Grande Indian Res.
Santa Ysabel Indian Res.
Los Coyotes Indian Reservation
Barona Ranch Indian Res.
Capitan Grande Indian Res.
Viejas Indian Reservation
Inaja Indian Res.
Sequan Indian Res.
Cuyapaipe Indian Res.
La Posta Indian Res.
Manzanita Indian Res.
Indian Head Mtn.
Coyote Mountain
Grapevine Canyon
Earthquake Valley
Santa Rosa Mountains
Carrizo Impact Area
U.S. Naval Gunnery Range
R. 3 W. R. 2 W. R. 1 W. R. 1 E. R. 2 E. R. 3 E. R. 4 E. R. 5 E. R. 6 E. R. 7 E. R. 8 E. R. 9 E. R. 10 E. R. 11 E. R. 12 E. R. 13 E. R. 14 E.
T. 6 S. T. 7 S. T. 8 S. T. 9 S. T. 10 S. T. 11 S. T. 12 S. T. 13 S. T. 14 S. T. 15 S. T. 16 S. T. 17 S.
S.P. A.T.&S.F. S.D.&A.E. P.I.W.

Interior-Reclamation, B.C., Nev. 7-72

3. General Economy. The local economy, starting from a small agricultural base, has gradually added strong recreational and tourist segments. In recent years, the improved accessibility provided by paved roads into this once remote desert has greatly accelerated the construction of luxurious resort facilities, vacation and retirement homes, and tourist accommodations. Although the Anza-Borrego Desert State Park provides an attraction for tourists to Borrego Valley, the convenience of Borrego Valley accommodations within the vast reaches of the park contributes greatly to the increasing visitor-use days at the park. The proximity of Borrego Valley to the popular Salton Sea resort areas further enhances the valley's urban and recreational growth potential.

The construction industry is the largest single income producer and would likely remain so for several years as the valley's urban-recreation elements expand. Over 300 dwelling units for overnight, or longer, are available. Construction starts, particularly residential, have increased significantly in the past 10 years. A new shopping center and high school are among the latest projects.

Much of the existing urban development has been at the expense of agricultural lands that were already developed. This trend is expected to continue, but the 2,550 acres presently irrigated would probably not be appreciably diminished in the near future. There are 35,440 acres of undeveloped arable lands suitable for irrigation, and lands taken out of production can be easily replaced. In addition, there have been reports that a large-scale citrus planting will soon be attempted by one developer. If citrus production in the valley proves successful,

it could provide an incentive for additional plantings of this high-value crop. A long growing season, an ever-expanding market in nearby coastal areas, and an increasing demand for citrus acreage in southern California are favorable factors that would tend to encourage the expansion of irrigated acreage in the future if a dependable supply of good quality water could be developed.

B. Summary of Study Results

1. General. The interim report was based on reconnaissance level surveys and studies. The data presented represent a broad range of information concerning area economics, population, political and physiographic geography, geology, hydrology, soils, and agriculture. When available, data of other Federal, State, and local agencies were used.

Since the source of a future supplemental water supply is not known, development plans were examined utilizing several different conveyance systems believed to be representative of alternatives that may be available in the future. Two development plans based on the possible future sources of supplemental water were considered. One plan would supply only the projected municipal and industrial water requirements, whereas the other plan would also provide the additional water required for maximum potential agricultural development. Cost estimates were prepared for conveyance systems from three different points outside the study area. Although the ultimate selection of a conveyance system would depend on the source, availability and cost of a supplemental supply, the plans presented were considered representative of possible future alternatives.

2. Land Classification. It was found that development of agricultural land in Borrego Valley and Lower Borrego Valley has been on a very small scale. There was a total gross acreage of 67,130 acres in Borrego Valley and 21,370 acres in Lower Borrego Valley. Only about 3,200 acres were developed for irrigation in Borrego Valley in 1965, and Lower Borrego Valley had one alfalfa farm of about 550 acres.

Land classification studies made on a reconnaissance basis in 1964 and 1965 are summarized as follows:

Arable	Borrego Valley	Lower Borrego Valley	Total
Class 2	3,200	0	3,200
Class 3	26,320	5,670	31,990
Class 4F	0	4,000	4,000
Total Arable	29,520	9,670	39,190
Nonarable	37,610	11,700	49,310
Total	67,130	21,370	88,500

3. Water Resource Studies

a. Surface Water. Within the watersheds in Borrego Valley, there are three streams: Coyote Creek, Borrego Palm Creek, and San Felipe Creek. Some surface runoff is also attributable to canyon tributaries which discharge directly onto the valley floor. Some additional supply is produced from random desert storms that occur intermittently over the entire valley area.

The Geological Survey operates and maintains gaging stations on Coyote, Borrego Palm, and San Felipe Creeks. Coyote Creek is the only perennial stream. The mean annual discharges on Coyote, Borrego Palm, and San Felipe Creeks are 1,630, 280, and 200 acre-feet per year, respectively.

Most of the water from each of these streams either infiltrates into the ground-water basin or is evaporated.

b. Ground-Water Resources. Ground-water levels have declined an average of about 2 feet per year for the last 10 years. However, some wells in the study area have dropped as much as 10 feet in one year. The average precipitation for the last 20 years has been less than the long-term average. Analyses of precipitation records indicate that, under long-term average conditions, the upper ground-water basin would be in approximate equilibrium.

The occurrence of ground water in the Borrego study area was based on data from existing wells, most of which are located in the northwest part of the study area. The limited data indicate that high yields might be attainable with proper well construction. The present average depth to water ranges from 60 to 120 feet over most of the study area.

Estimates of present conditions of storage are given in the following tabulation:

Ground-Water Basin	Recoverable Water in Storage (Acre-Feet) 1/
Borrego Valley	1,300,000
Lower Borrego Valley	1,900,000
Collins Valley	30,000
Clark Valley	300,000

1/ Specific yield estimated to be 12 percent.

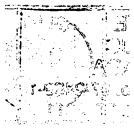
There is a wide variation in ground-water quality with the best quality, less than 500 parts per million dissolved solids, near the northwestern boundary of the study area. In Lower Borrego Valley, the water has total dissolved solids of about 1,200 ppm.

The State of California Department of Water Resources, in Bulletin 108, "Coachella Valley Investigation," estimated the recharge to Coachella Valley, which shares common hydrologic boundaries with Borrego Valley, at 80,000 acre-feet per year. A comparison of the drainage areas and weighted mean precipitation indicates that 40,000 acre-feet per year would be a reasonable estimate of recharge in Borrego Valley.

c. Possible Sources of Future Water Supply. It has been recognized by the California Department of Water Resources and Federal and local governments that the California State Water Project would satisfy the needs of southern California only until about 1990, after which time there would be a need for an additional supply of supplemental water. Borrego Valley might be able to participate, along with other desert areas of southeastern California, in plans to import water for demands beyond 1990.

At present, there is no readily available source from which a supplemental water supply could be imported. The area does not have a contract for water from the California State Water Project, and it is unlikely that import water could be obtained from the Colorado River under current conditions. Possible sources for future importation of water are:

(1) Desalination. Water could be furnished through exchange by a desalting plant at a location on the Pacific Coast.



(2) Demineralization. Each year over 1,000,000 acre-feet of brackish water flow from Coachella and Imperial Valleys into the Salton Sea. It might be possible to place an electrodialysis demineralizing plant within one of these areas to intercept some of this brackish water.

(3) Regional Water Plans. Borrego Valley might be able to participate with other desert areas of southeastern California in a regional plan to obtain a future supplemental supply.

(4) Annexation. Borrego Valley study area is in a location whereby it would be possible to annex to nearby water districts. These districts are the Imperial Irrigation District, the Coachella Valley County Water District, and the San Diego County Water Authority. However, none of these districts appear to have surplus water at the present time.

It is also possible that under some future water plan, one of these districts could convey a supply of water destined for Borrego Valley through its systems for a charge per acre-foot of water.

C. Findings and Conclusions

Conclusions based upon the findings of the interim report are:

1. A modest urban and agricultural base in the Borrego study area is provided a water supply by pumping local ground-water resources, which has resulted in declining ground-water levels in the areas of most rapid development.

2. There are 35,440 acres of undeveloped arable land in the Borrego Valley study area for which there is no present water supply.

3. It is unlikely that the Borrego Valley area could readily obtain a supplemental supply of water from outside its boundaries in the near future. There are, however, several points outside the Borrego Valley area from which it would appear feasible to transport a future supply of water to the valleys, if water at a reasonable cost could be made available at these points.

4. Further development, management, and conservation of local ground water, as long as the supply and quality remain acceptable, would be the most logical source of water to meet the area's municipal and industrial growth needs until import water can be economically obtained. Organizational problems and water rights questions, that would be involved in further ground-water development, can best be resolved at the local level.

5. It would be necessary to reexamine the study of the Borrego Valley development when it appears that an import supply of water could be made available to the area.