

HYDROLOGIC ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY RELATED TO INDIAN WATER RIGHTS

by B.K. Gilbert and T.J. Buchanan



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ABSTRACT

The U.S. Geological Survey (USGS) has for many years been collecting and interpreting hydrologic data to provide information related to Indian water rights. In this regard the USGS has worked directly with the tribes, through the Federal-State Cooperative Program, and has assisted the Bureau of Indian Affairs on a reimbursable basis. A representative listing of Indian reservations, tribes, and bands for which the USGS has carried out water-resources investigations or hydrologic-data collection is presented.

The USGS has a variety of ongoing hydrologic activities related to Indian water rights in 14 States. Water-resources information can be obtained from the Survey's National Water Data Storage and Retrieval System, the National Water Data Exchange, and the Water Resources Scientific Information Center, as well as from local USGS offices. This report contains an extensive list of selected references on Indian water-rights issues and related matters.

INTRODUCTION

The United States has 269 Indian reservations, located in 27 States, with a total area of more than 52 million acres (Newspaper Enterprise Association, Inc., 1984). Arizona has almost 20 million acres of Indian lands and New Mexico has more than 7 million acres. Montana and South Dakota each have more than 5 million acres, and Nevada, Utah, Washington, and Wyoming each contain between 1 million and 3 million acres. The 19 remaining States contain less than 1 million acres each. Total Indian population living on or adjacent to the reservations was about 760,000 in 1983 (fig. 1).

In many areas, water rights for Indian tribes have been reserved by the Federal Government but have not yet been quantified. In some places, litigation in this regard is underway or has resulted in settlements with Indian tribes. In other places, all the water available has been appropriated. Some States do not recognize Federally reserved Indian water rights and are opposed to efforts to quantify and claim them. The Bureau of Indian Affairs (BIA), working with the Department of the Interior Solicitor's Office and the U.S. Department of Justice, has responsibility for these issues.

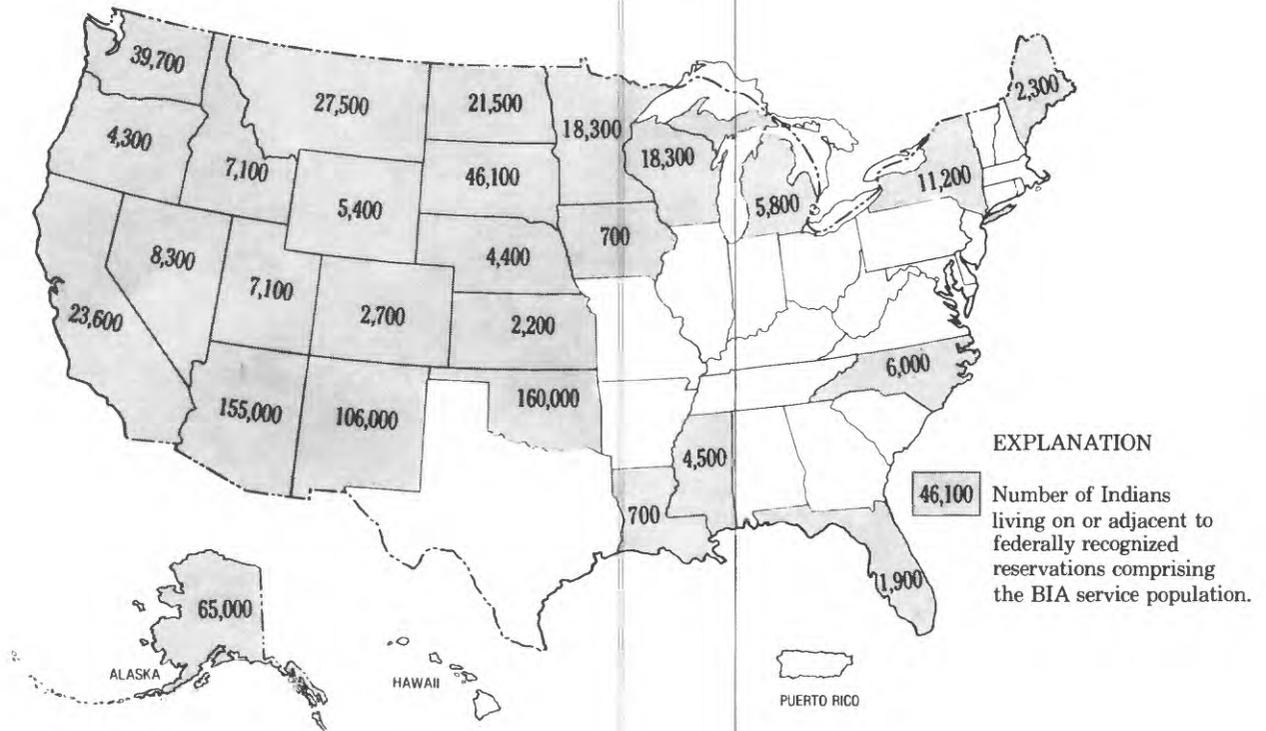


Figure 1.--Population of Indian reservations as of 1983, by State.
 (Modified from Newspaper Enterprise Association, Inc., 1984,
 p. 441).

Some tribes assert that all water on reservation lands is theirs--thus, they reason, there is no need to proceed with quantification. In New Mexico, for example, trespass suits have been initiated, holding that all water originally belonged to Indian tribes and that interlopers have usurped these previously established rights. Typically, the tribes are concerned as much about the degradation of natural water quality as they are about the distribution and availability of water in time and place.

In response to the perceived need to find a more efficient way to address the explosive growth in conflicts involving Indian water rights, the BIA has prepared a 10-year plan for the review of Indian water claims (Bureau of Indian Affairs, 1980). The plan includes technical criteria for the assessment of tribal water resources and future water requirements. The primary purposes are to prepare tribes for negotiated water claim settlements, to forestall further erosion of Indian water rights, and to produce information for tribes to use in planning, development, or litigation. The objectives of this plan are: "(1) to conduct technical studies on Indian reservations for the purpose of assisting tribes in obtaining favorable negotiated water rights settlements and providing comprehensive guides for the orderly development of water resources; and (2) to assist Indians in conserving, developing, and using their water resources with particular reference to water resource problems and uses of a special nature."

The U.S. Geological Survey (USGS) has participated in planning and deliberations with representatives of the Solicitor's Office and the Justice Department, as well as with representatives of BIA and the Indian tribes. In accordance with its mission responsibilities, the USGS collects and interprets hydrologic data to provide information to answer water-resources questions such as:

- o How much water is available; where is it located; and, what are the water-quality characteristics?
- o How does the supply vary in time and space in terms of quantity and quality?
- o What might have been the natural or historical condition of the resource in relation to its current, possibly modified condition?
- o What is the potential for further development of the resource, and what hydrologic and environmental impacts might result from alternative proposals for further development?

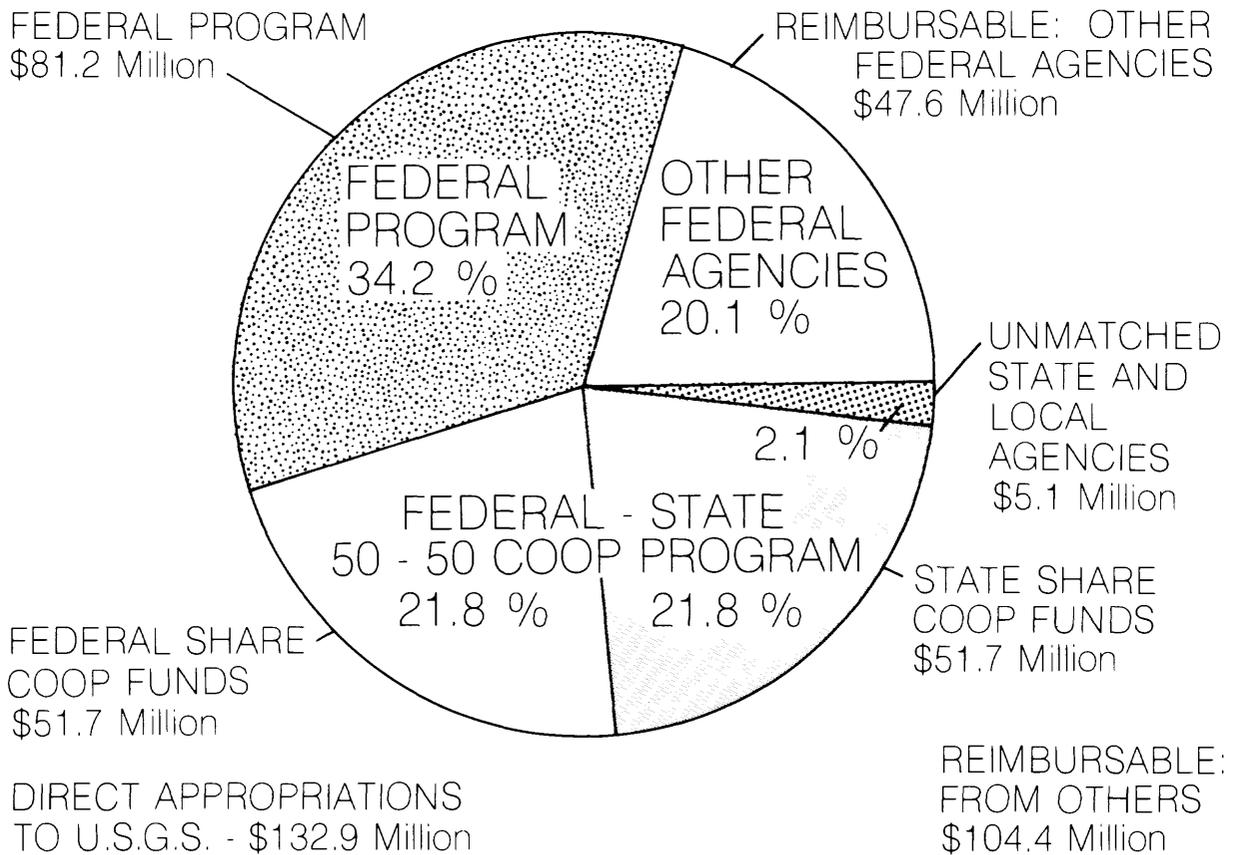
PROGRAM BACKGROUND

For many years, the Geological Survey has assisted the BIA, on a reimbursable basis, by collecting hydrologic data and performing water-resource investigations in the interest of Indian tribes. The USGS also has long carried out similar functions as requested by individual tribes through its Federal-State Cooperative Program, in which funds provided by the tribes are matched equally by the USGS (Gilbert and Buchanan, 1981). These activities have virtually all focused on the hydrology of Indian lands.

Details of the Cooperative Program are negotiated at the State or local level by representatives of the USGS and representatives of the Indian tribes. Implementation is under USGS direction and conducted principally by USGS staff, but there is an accountability for performance to the tribes. Advantages of this administrative arrangement accrue to both sides. The greatest advantage is that the cost-sharing could approximately double the activity that might be afforded by each side independently.

The USGS also has available a large and growing body of hydrologic data and information that relate to water-resources conditions contiguous to, or near, Indian lands. Support is furnished by various elements in the USGS Federal Program, other State and local agencies through their participation in the Cooperative Program, and by reimbursements from other Federal agencies.

Figure 2 shows the dollar amounts and relative sizes of the major sources of USGS funding for water-resources activities in fiscal year (FY) 1985. The total from all sources is almost \$240 million. Since 1980, the total funding for USGS hydrologic investigations and data collection on Indian lands has ranged from about \$1.0 to \$1.6 million annually. About one-third of the funding typically has been furnished by BIA and two-thirds has been derived from the USGS Cooperative Program. (That is, about one-third from tribes and one-third from funds appropriated to USGS.) For FY 1984, USGS field personnel identified a minimum of approximately \$21 million in additional hydrologic data-collection and investigative activities that could be undertaken to assist with Indian water-rights evaluations. Thus, it is evident that a relatively large amount of work in this area still remains.



FY 1985 TOTAL \$237.3 MILLION

Figure 2.--The fiscal year 1985 budget for the U.S. Geological Survey's Water Resources Division.

Since the early 1970's, there has been increasing focus on the need of the tribes for hydrologic information to be used in litigation and negotiation. As a result, it has been necessary for the USGS and BIA to work out an understanding as to the types of assistance to be provided by USGS and the terms under which resulting information might be held as privileged and confidential. In this regard an interagency agreement was approved by both Bureaus in early 1982, and appropriate guidance was issued by USGS to its field offices on May 5, 1982. Of principal importance is the stipulation that, although all data collected by the Survey will be made available to prospective users, analyses and interpretive reports will be provided to BIA for a maximum of 90 days prior to seeking approval for publication from the USGS Director. Some reports that will be used in litigation, as mutually determined prior to preparation, will not be released by USGS until they have been released to the presiding Court. Various stipulations of the interagency agreement have been extended on occasion to work carried out by USGS directly with Indian tribes under the Cooperative Program.

The role of the USGS as an objective third party has been and is being maintained. At times, the USGS position that all hydrologic data--and, after compliance with the terms of the interagency agreement, all interpretive reports--are properly part of the public domain, leads some tribes to contract with the private sector for water-resources investigations. Contracting can provide the tribe with sole custody of information to be held confidential as they see fit.

REPRESENTATIVE HYDROLOGIC ACTIVITIES, FISCAL YEARS 1973-85

The USGS has completed and continues to carry out hydrologic data collection and investigations for many Indian tribes in the western United States as well as in Florida, Minnesota, New York, and Wisconsin. Table 1 lists more than 100 reservations, tribes, and bands for which work was underway at various times in fiscal years 1973-85. Much of this effort was carried out through funding from BIA, as well as by cooperative arrangements with individual tribes and bands. Some activities of direct support to Indian water rights were funded by other Federal and reimbursable sources. A wide variety of additional USGS investigative and data-collection activities have produced water-resources information that will be of continuing benefit to the tribes. However, it is not within the scope of this report to attempt to document this type of work.

Representative USGS hydrologic data collection and investigative activities for Indian tribes, by State and fiscal years of operation from 1973-84 are shown in table 2. Information on investigations and data-collection continuing in FY 1985, including brief descriptions of the purpose and objectives of selected investigative work, is provided in table 3.

Table 1.--Indian reservations, tribes, and bands for which the U.S. Geological Survey has carried out water-resources investigations or hydrologic data collection at various times in fiscal years 1973-85

ARIZONA

Ak Chin Reservation
Fort Apache Reservation
Gila River Reservation
Hopi Reservation
Kaibab-Paiute Reservation
Maricopa Tribe
Navajo Reservation
Papago Reservation
Pima Tribe
Salt River Reservation
San Carlos Reservation
Yavapai Tribe

CALIFORNIA

Barona Band
Cahuilla Reservation
Campo Reservation
Capitan Grande Band
Cuyapaipe Reservation
Fort Mojave Reservation
Inaja Band
La Posta Reservation
Los Coyotes Reservation
Manzanita Reservation
Mesa Grande Reservation
Morongo Band
Pechanga Band
Resighini Rancheria
Rincon Reservation
Round Valley Reservation
Santa Rosa Reservation
Santa Ynez Reservation
Santa Ysabel Reservation
Sycuan Reservation
Twenty-nine Palms Reservation
Viejas Band
Yurok Tribe

COLORADO

Southern Ute Reservation
Ute Mountain Ute Reservation

FLORIDA

Seminole Reservation

Table 1.--continued

IDAHO

Fort Hall Reservation, Shoshone-Bannock Tribes

MINNESOTA

Chippewa Tribe
Fond du Lac Reservation
Grand Portage Reservation
Mille Lac Reservation
Red Lake Reservation
White Earth Reservation

MONTANA

Blackfeet Reservation
Crow Reservation
Flathead Reservation, Confederated Salish and Kootenai Tribes
Fort Belknap Reservation
Fort Peck Reservation, Assiniboine and Sioux Tribes
Northern Cheyenne Reservation
Rocky Boy's Reservation

NEVADA

Duck Valley Reservation
Fort McDermitt Reservation
Owyhee Tribe
Paiute Reservation
Walker Reservation

NEW MEXICO

Acoma Pueblo
Alamo Band
Jemez Pueblo
Jicarilla Apache Reservation
Laguna Pueblo
Mescalero Apache Reservation
Navajo Reservation
Pojoaque Reservation
Santa Ana Pueblo
Zia Pueblo
Zuni Reservation

NEW YORK

Allegheny Reservation
Onondaga Reservation
Shinnecock Reservation
Tonawanda Reservation

NORTH DAKOTA

Fort Totten Reservation

Table 1.--continued

OREGON

Umatilla Reservation
Warm Springs Reservation

SOUTH DAKOTA

Cheyenne River Reservation
Crow Creek Reservation
Lower Brule Reservation
Standing Rock Reservation

UTAH

Navajo Reservation

WASHINGTON

Chehalis Reservation
Colville Reservation
Hoh Reservation
Lower Elwha Reservation
Lummi Reservation
Makah Reservation
Muckleshoot Reservation
Nisqually Reservation
Port Gamble Reservation
Port Madison Reservation, Suquamish Tribe
Puyallup Reservation
Quileute Reservation
Quinault Reservation
Shoalwater Reservation
Skokomish Reservation
Spokane Reservation
Squaxin Reservation
Stillaguamish Reservation
Swinomish Reservation
Tulalip Reservation
Yakima Reservation

WISCONSIN

Bad River Reservation
Chippewa Tribe
Lac du Flambeau Reservation
Menominee Reservation
Mole Lake Reservation
Oneida Reservation
Potawatomi Reservation
St. Croix Reservation

WYOMING

Wind River Reservation, Shoshone and Arapahoe Tribe

Table 2.--Selected U.S. Geological Survey hydrologic data-collection and investigative activities on or near Indian reservations in cooperation with Indian tribes or the Bureau of Indian Affairs, fiscal years 1973-84.

USGS Project Number	Activity and fiscal years of operation
<u>ALASKA</u>	
AK067	Quality of Water Analyses 1973-75
<u>ARIZONA</u>	
AZ001	Surface-Water Data Collection 1983-84
AZ002	Ground-Water Data Collection 1983-84
AZ010	Navajo Ground-Water Studies 1973
AZ023	Special Site Studies for Other Federal Agencies 1975-80, 82-84
AZ026	Arizona Test Site Investigations 1973
AZ028	Monitoring Hydrologic Effects of Ground-Water Withdrawals and Strip Mining at Black Mesa 1973-84
AZ035	Test Well to Determine Ground-Water Potential in Part of the Kaibab-Paiute Indian Reservation 1973
AZ049	Water Resources of the Papago Indian Reservation 1978-82
AZ056	Contaminants in Drinking Water at Village of Pisinimo, Papago Indian Reservation 1980
AZ058	Ground-Water Supply for the Ak Chin Indian Reservation 1978-82
AZ060	Evaluation of Effects of Ground-Water Pumpage, Vekol Valley, Ak Chin Indian Reservation 1980-84
AZ072	Hydrologic Investigation of the Gila River Indian Reservation 1982-84
WR110	Hydrologic Effects of Phreatophyte Control on the Gila River Flood Plain, San Carlos Indian Reservation 1973-75
WR112	Hydrologic Effects of Vegetation Modification on Fort Apache Indian Reservation 1973
<u>CALIFORNIA</u>	
CA001	Surface-Water Data Collection 1978, 80-84
CA002	Ground-Water Data Collection 1973, 79-84
CA003	Water-Quality Data Collection 1980-84
CA004	Sediment Data Collection 1982-84
CA267	Water Resources of San Luis Rey Basin 1973
CA287	Geohydrology of Round Valley, Mendocino County 1973, 75
CA289	Water Resources of Indian Reservations 1975-81, 84
CA290	Water Resources of Cahuilla Indian Reservation, San Diego County 1973-76
CA300	Special Studies for BIA 1974
CA415	Redwood National Park Sedimentation 1978-80

Table 2.--continued

<u>COLORADO</u>		
C0001	Surface-Water Data Collection	1977-82, 84
C0003	Water-Quality Data Collection	1976-82, 84
C0043	Surface-Water Resources Study, Southern Ute and Ute Mountain Ute Indian Reservations	1973-74
C0059	Reconnaissance of Ground-Water Resources of the Southern Ute Indian Reservation	1974-76
C0168	Water Resources of the Ute Mountain Ute Indian Reservation	1982-84
<u>FLORIDA</u>		
FL003	Water-Quality Data Collection	1979
<u>IDAHO</u>		
ID142	Ground-Water Contamination in the Michaud Flats, Fort Hall Indian Reservation	1981-84
<u>MINNESOTA</u>		
MN060	Water Resources of Carlton, Pine, and Kanebec Counties	1981, 84
MN097	Hydrology of the Fond du Lac Indian Reservation	1983-84
MN099	Hydrology of the White Earth Indian Reservation	1984
<u>MONTANA</u>		
MT001	Surface-Water Data Collection	1973-84
MT002	Ground-Water Data Collection	1981-84
MT003	Water-Quality Data Collection	1973, 81-84
MT045	Hydrology of the Fort Belknap Indian Reservation	1974
MT086	Hydrology of a Buried Channel, Northeastern Montana	1982, 84
MT097	Ground-Water Resources of the Flathead Indian Reservation	1983-84
<u>NEVADA</u>		
NV001	Surface-Water Data Collection	1974-84
NV003	Water-Quality Data Collection	1978-80
NV063	Evaluation of the Ground-Water Resources of the Fort McDermitt Indian Reservation	1978
NV076	Topical Studies for BIA	1977
NV077	Water Resources of Walker River Indian Reservation	1981
NV080	Truckee-Carson Assessment	1980-81
<u>NEW MEXICO</u>		
NM001	Surface-Water Data Collection	1973-84
NM003	Water-Quality Data Collection	1981-84
NM004	Sediment Data Collection	1982-84
NM225	Water Resources of the Zuni Reservation	1978-84
NM231	Hydrologic Effects of Geothermal Power Development in the Jemez Mountains	1981-84
NM245	Alamo Band Water Resources	1983-84
NM246	Hydrology of the San Andres-Glorieta Aquifer System, Pueblos of Acoma and Laguna	1983-84
NM247	Water Resources on the Reservations of the Jemez, Santa Ana, and Zia Pueblos	1983-84

Table 2.--continued

NM312	Water Resources of Laguna Indian Reservation	1973-75
NM313	Water Resources of Acoma Indian Reservation	1973-75
NM317	Plan for Study of Part of the Jicarilla Apache Indian Reservation	1974
NM320	Analyses of Surface- and Ground-Water Flow in the Pojoaque River Drainage Area	1974-81
NM323	Water Supply Investigations for BIA	1975-80
NM326	Selective Hydrologic Investigations of the Acoma and Laguna Indian Lands in Parts of Bernalillo, Sandoval, and Valencia Counties	1976-80
NM329	Hydrologic Investigations of the Laguna Pueblo	1978-81
NM330	Hydrologic Investigations of the Acoma Pueblo	1978-80
NM335	San Juan Crownpoint Ground-Water Surveillance	1981-82
NM336	Estimation of Natural Streamflow in the Jemez River and Rio San Jose at the Boundaries of Indian Land, Northwestern New Mexico	1981-82
NM339	Effects of Mineral Development on Ground-Water Supplies, San Juan Basin	1983-84
<u>NEW YORK</u>		
NY118	Barium in Ground Water, Western New York	1982
<u>OREGON</u>		
OR001	Surface-Water Data Collection	1975-84
OR066	Water Resources of the Warm Springs Indian Reservation	1973-75
OR071	Water Resources of the Umatilla Indian Reservation	1973-76
OR080	Special Studies for BIA	1975
<u>SOUTH DAKOTA</u>		
SD001	Surface-Water Data Collection	1981-84
SD003	Water-Quality Data Collection	1982-84
SD028	Hydrogeology of the Cheyenne and Standing Rock Indian Reservations in North and South Dakota	1980
SD062	Planning Study for an Evaluation of the Water Resources of Indian-Owned Trust Lands in the Missouri River Basin	1982
<u>WASHINGTON</u>		
WA001	Surface-Water Data Collection	1974-84
WA003	Water-Quality Data Collection	1977-78
WA064	Sediment Characteristics of Selected Washington Streams	1975-77
WA147	Water Resources of the Yakima Indian Reservation	1973-80
WA154	Water Resources of the Lummi Indian Reservation	1973
WA155	Water Resources of the Muckleshoot Indian Reservation	1973
WA160	Water Resources of the Nisqually Indian Reservation	1973
WA161	Water Resources of the Skokomish Indian Reservation	1973
WA163	Water Resources of the Colville Indian Reservation	1973-74
WA173	Water-Quality Investigation of the Yakima Indian Reservation	1974-75

Table 2.--continued

WA174	Ground-Water Resources of the Squaxin Indian Reservation	1974-75
WA175	Water Resources of the Chehalis Indian Reservation	1975-76
WA177	Water Resources of the Tulalip Indian Reservation	1975-78
WA181	Water Resources of the Swinomish Indian Reservation	1975-77
WA184	Water Resources of the Areas Contiguous to the Nisqually Indian Reservation	1976-77
WA188	Water Resources of the Quileute Indian Reservation and Quillayute River Basin	1976-79
WA189	Water Resources of the Port Madison Indian Reservation	1976-77
WA190	Water Resources of the Port Gamble Indian Reservation	1976-77
WA191	Water Resources of the Makah Indian Reservation	1976-79
WA192	Water Resources of the Lower Elwha Indian Reservation	1976-77
WA193	Salmon Propagation in Ozette Lake	1976-78
WA201	Water Resources of No Name Creek Valley, Colville Indian Reservation	1977-78
WA210	Water Resources of the Hoh Indian Reservation	1978-80
WA211	Water Resources of the Shoalwater Indian Reservation	1978-80
WA217	Comparison of Regulated and Unregulated Streamflow for the Yakima River at Union Gap	1979-81
WA227	Investigation of the Availability of Ground Water in the Vicinity of the Nisqually Tribal Fish Hatchery	1979-80
WA229	Investigation of the Availability of Improved Source of Ground-Water Supply for Taholah, Quinault Indian Reservation	1979-80
WA231	Investigation of the Availability of Ground Water in the Vicinity of the Muckleshoot Tribal Fish Hatchery	1979-81
WA244	Water Resources of the Tulalip Indian Reservation and Surrounding Areas, Snohomish County	1980-84
WA245	Streamflow Temperature Model of the Yakima River	1981-82
WA277	Yakima River Basin Water Enhancement	1982-84
WA279	Water Resources of the Lower Puyallup River	1982-84
WA286	Stillaguamish River Basin Instream Flow and Water Quality	1983-84
WA288	Landslide Potential near Sherwood Uranium Mine, Spokane Indian Reservation	1983
WA296	Investigation of Hydrologic Conditions at the Midnite Mine and Vicinity, Stevens County	1983-84
WA301	Puyallup River Flood Capacity Study	1984
WR122	Puget Sound Urban Area Studies	1978, 84

Table 2.--continued

<u>WISCONSIN</u>		
WI003	Water-Quality Data Collection	1980-81
WI068	Chippewa Flowage Operation Analysis	1973-76
WI073	Maximum Flood at Chippewa Flowage	1976
WI086	Hydrology of the Mole Lake Reservation and Vicinity	1978, 80-81
WI111	Hydrology of the Forest County Potawatomi Indian Reservation	1981
WI123	Water Resources of Indian Reservations in Wisconsin	1982-84
<u>WYOMING</u>		
WY001	Surface-Water Data Collection	1979-84
WY003	Water-Quality Data Collection	1980-84

Table 3.--Selected ongoing U.S. Geological Survey activities related to Indian water rights, fiscal year 1985

ARIZONA

- o Collection of Basic Hydrologic Information -- Surface Water, Ground Water
- o Monitoring Hydrologic Effects of Ground-Water Withdrawals and Strip Mining at Black Mesa: Strip mining of the coal on Black Mesa has caused concern by several environmental groups and Federal agencies about the effects of this strip mining and associated ground-water withdrawals on water levels in the Navajo aquifer of early Mesozoic age. The objectives of this investigation are to determine the magnitude of any water-level changes in the aquifer near Black Mesa, and differentiate changes caused by strip-mining operations from those caused by pumpage for public supply at nearby communities.
- o Hydrologic Investigation of the Salt River Indian Reservation: Arizona is moving ahead with comprehensive, basinwide water-rights adjudications in the Gila River watershed. Water supplies of the Salt River Indian Reservation are being affected by activities such as ground-water withdrawals and upstream control and diversion of surface flows. Verification and documentation of hydrologic conditions prior to development are needed to support Indian water claims. This will be accomplished by preparation of a mathematical model. A comparison of the chemical quality of water in the pre-development and current systems also will be made.
- o Evaluation of Recharge Along the Gila River as a Result of the October 1983 Flood: Infiltration of surface water during the flood of October 1983 caused changes in ground-water levels along the Gila River. Data collected before and after the flood may allow evaluation of the response of the hydrologic system and quantification of ground-water recharge. This information is essential to successful management of water resources in the area.

CALIFORNIA

- o Collection of Basic Hydrologic Information -- Surface Water, Ground Water, Water Quality, Sediment
- o Water Resources of Indian Reservations in California: There are approximately 40 Indian reservations in California. From time to time, the Bureau of Indian Affairs requests assistance in assessing the reservations' water resources. Commonly, this involves locating a suitable well site or doing hydrogeologic reconnaissance to suggest where small supplies of good-quality water can be found. Inasmuch as the reservations are generally small (some having only tens of people) the work on each reservation is limited to hydrologic reconnaissance, qualitative hydrology, and well-site selection. Where present or potential water needs are large, areas beyond the reservation may be evaluated.

Table 3.--continued

COLORADO

- o Collection of Basic Hydrologic Information--Surface Water, Ground Water, Water Quality

IDAHO

- o Ground-Water Contamination in the Michaud Flats, Fort Hall Indian Reservation: High concentrations of chloride, sulfate, phosphate, nitrate, ammonia, arsenic, cadmium, manganese, and fluoride have been detected in numerous wells completed in the shallow gravel aquifer. Some concentrations exceed drinking-water standards. Identification of the source of the contaminants, and examination of management alternatives for their elimination or control, are necessary to prevent further degradation of the shallow ground-water system. The objectives of this investigation are to describe the degree and extent of ground-water contamination, identify major data gaps, and establish a ground-water monitoring network.

MINNESOTA

- o Hydrology of the Fond du Lac and White Earth Indian Reservations: These investigations are designed as appraisals of the water resources of the two Reservations. The various components of the hydrologic system are being studied to estimate (1) flow characteristics and availability of ground water and surface water, (2) quality of ground water and surface water, (3) current water use, (4) seasonal and annual fluctuations of streamflow, ground-water levels, and water quality, and (5) the annual water budget.

MONTANA

- o Collection of Basic Hydrologic Information -- Surface Water, Ground Water, Water Quality
- o Ground-Water Resources of the Flathead Indian Reservation: The ground-water system has high potential as a source of irrigation water throughout much of the area. As ground-water use increases, water levels will decline and water quality may be degraded. Because ground water is the primary source of domestic water supply in the area, protection of the ground-water system is important. An indepth knowledge of the resource is needed for the formulation of ground-water development plans. The first objective of this investigation is to acquire information on: (1) aquifer properties, (2) ground-water withdrawals, (3) water-level fluctuations, and (4) water-quality variations. The second objective is to develop a conceptual understanding of the ground-water system including: (1) recharge-discharge relationships, (2) areal and vertical distribution of aquifers, (3) patterns of ground-water flow, and (4) hydrogeochemical relationships. The ultimate objective is to develop a hydrologic model of the system capable of simulating the potential effects of various management plans.

Table 3.--continued

NEVADA

- o Collection of Basic Hydrologic Information--Surface Water

NEW MEXICO

- o Collection of Basic Hydrologic Information -- Surface Water, Ground Water, Water Quality, Sediment
- o Water Resources of the Zuni Reservation: The Pueblo of Zuni requires information on (1) the yield, variability, and quality of present water supplies, (2) the potential for developing new supplies, and (3) the effects of new development on existing water supplies. This information is needed to attract new industry and provide for the expansion of communities while preserving present water uses. The objective of this study is to provide a comprehensive analysis of the source, supply, chemical quality, and availability of water from streamflow, springs, and wells on the reservation. The analysis will include an estimate of the effects of developing additional water supplies on the water resources of the Reservation.
- o Hydrologic Effects of Geothermal Power Development in the Jemez Mountains: The construction of a geothermal demonstration power plant in a volcanic caldera of the Jemez Mountains, New Mexico, has been considered for several years. The plant may divert several thousand acre-feet of geothermal water per year, part of which will be consumed and the remainder returned to the aquifer. Thermal spring flow and the base flow of streams draining the Jemez Mountains might be adversely affected. The Jemez, Zia, and Santa Ana Pueblo Indians are concerned about possible depletions of water in the Jemez River, which flows across Indian land. This investigation is designed to assess the effects of developing a geothermal aquifer on the quantity and quality of water in streams, springs, and aquifers in areas surrounding the geothermal aquifer.
- o Water Resources of the Alamo Band Tribal Lands: The Alamo Band is interested in determining their water rights for potential agricultural and (or) industrial ventures on tribal lands. The objective of this study is to collect data that can be used to evaluate available water resources on the reservation.
- o The Hydrology of the San Andres-Glorieta aquifer system of Permian age, Pueblos of Acoma and Laguna: The Pueblo of Acoma has filed application of intention to explore for ground water for possible future use. Test drilling in the San Andres-Glorieta aquifer system and a study of effects of new ground-water withdrawals on present ground- and surface-water supplies in the basin are planned. Both Pueblos would benefit from having additional ground water available. The objectives of the investigation are to (1) determine the quantity and quality of water in the San Andres-Glorieta aquifer system near and beneath the Acoma and Laguna Pueblo lands and (2) provide hydrologic information for development of ground-water supplies adequate for irrigation and other uses. Information also will be collected to establish the effect of previous and new developments on the water resources of the area.

Table 3.--continued

- o Effects of Mineral Development on Ground-Water Supplies, San Juan Basin: Exploration and development of uranium, coal, and petroleum are taking place on Indian, public, and private lands in the San Juan basin. There is great concern about the possible adverse effects of mineral development on the ground-water resource, as well as concern about the future availability of ground water. The objectives of this investigation are to: (1) refine the descriptions of the aquifers and the ground-water reserves in the basin beneath and near Indian lands, (2) determine the effects of future ground-water use associated with irrigation of Indian lands and mineral development on aquifer water levels and the flow of the San Juan River.
- o Water Resources on the Reservation of the Jemez, Santa Ana, and Zia Pueblos: The Pueblos are concerned about increasing water use by a growing population in the Jemez River Valley. Some areas have experienced water shortages and water-quality problems. The purpose of the investigation is to inventory wells on the Pueblo lands and determine areas that may be suitable for additional ground-water development

NORTH DAKOTA

- o Collection of Basic Hydrologic Information -- Surface Water, Ground Water, Water Quality
- o Ground-Water Flow in the Warwick aquifer: It has been proposed to use the Warwick aquifer of Pleistocene age to irrigate crop land on the Fort Totten Indian Reservation. This investigation is designed to improve the knowledge of the hydrology of the Warwick aquifer so that it may be determined if the aquifer will sustain proposed irrigation withdrawals.

OREGON

- o Collection of Basic Hydrologic Information -- Surface Water
- o Ground-Water Contribution from the Warm Springs Indian Reservation to the Deschutes River: The Warm Springs Indian Tribe needs to know the total ground-water contribution from the Reservation to the Deschutes River and to the tributary Metolius River so that the Tribe can support its legal claim to that water right. The Tribe and the State of Oregon are particularly anxious to have a technically defensible study that will be accepted by both parties, so that they can reach agreement on the Indian water rights through negotiation rather than litigation. The objectives of this study are to (1) estimate the ground-water contribution to the Deschutes River from aquifers on both sides of the reach of river that bounds the Warm Springs Indian Reservation; and (2) determine whether a viable technique can be developed to estimate only the ground-water contribution from the side of the river that includes the Reservation. If such a technique can be developed, and more intensive data are required, a plan for a full-scale study will be prepared.

Table 3.--continued

SOUTH DAKOTA

- o Collection of Basic Hydrologic Information -- Surface Water, Water Quality

WASHINGTON

- o Collection of Basic Hydrologic Information -- Surface Water, Water Quality
- o Yakima River Basin Water Enhancement: The Yakima Valley has experienced problems of insufficient water supply since the early 1900's. In an effort to develop alternatives to litigation for resolving problems caused by water shortages, Washington State and the Yakima Indian Nation conceived the idea of the Yakima River Basin Water Enhancement Plan. Public Law 96-162 authorized the Bureau of Reclamation to conduct a feasibility study to study structural and nonstructural solutions to the problems of inadequate water supply. The Bureau of Reclamation has identified 5 elements in their work plan for technical review or participation by the U.S. Geological Survey: (1) develop a Yakima River monthly operations-planning model, (2) define and schedule the water-flow requirements for irrigation, municipal supply, and fish propagation, (3) evaluate the structural and nonstructural alternative measures that may be applied to conserve the available surface water, (4) formulate preliminary water-enhancement plans that are logical combinations of storage reservoirs, distribution systems and conservation measures, and (5) perform detailed monthly operations studies for selected water-enhancement plans and conduct a final monthly operations study.
- o Water Resources of the Lower Puyallup River Basin: This investigation is designed to determine the discharge characteristics of the Puyallup River and its tributaries within the boundary of the Puyallup Indian Reservation, and to determine the significant inputs that affect the discharge characteristics and quality. Specific objectives are to (1) define the availability and quality of ground water in the Puyallup River Valley, (2) define the relation between the Puyallup River and ground-water system and, (3) evaluate the short-term yields of aquifers in areas adjacent to the valley, to the extent available data allow.
- o Stillaguamish River Basin Instream Flow and Water Quality: A technique has been developed by the Instream-Flow Service Group (IFG) of the U.S. Fish and Wildlife Service to monitor and document physical habitat conditions. The Stillaguamish Tribe has requested that the USGS gather the required data for the IFG analysis and apply the IFG model to the Stillaguamish River. In addition, the USGS will collect and analyze baseline data to characterize the chemical quality of surface-water resources.

Table 3.--continued

- o Hydrologic Conditions at the Midnite Mine and Vicinity, Stevens County: Midnite Mine is an open-pit uranium mine near Spokane. Mining activity ceased in early 1982, and since that time, water has accumulated in the ore pits. All water from Midnite Mine discharges to Blue Creek, tributary of FDR Lake. The Bureau of Indian Affairs and the Bureau of Land Management are concerned about the hazards posed by the mine drainage. This investigation will (1) determine monthly and annual water budgets for the study area, (2) describe the quality of precipitation, ground water, and surface water, and (3) design a water-quality monitoring program that will allow the determination of annual loads of selected chemical constituents discharged from the mine into Blue Creek.
- o Puyallup River Flood Capacity Study: Approximately 20 miles of the Puyallup River, 10 miles of the tributary White River, and 5 miles of the tributary Carbon River have been channelized and leveed for flood protection. Pierce County is responsible for maintaining the flood capacity of those channels. However, the Puyallup Indian tribe has obtained an injunction against removal of vegetation from the channels and banks, claiming that such vegetation is fish habitat. Presently it seems that vegetation and accumulated sediment have increased to such an extent that channel maintenance may be necessary to reduce the risk that a major flood might top the levees. The injunction effectively prohibits Pierce County from fulfilling its responsibilities however. Major uncertainties, at present, are (1) the exact flood capacities of the three rivers, and (2) whether or not the application of certain remedies for flooding would be detrimental to fish production. The USGS is participating in studies to address these uncertainties and determine for the Lower Puyallup, White and Carbon Rivers: (1) the present channel flood capacity and whether it is changing, (2) the effect of bank vegetation and sediment deposition on channel flood capacity, and (3) the effect on fish habitat of altering bank vegetation or streambed elevation and composition.

WISCONSIN

- o Collection of Basic Hydrologic Information -- Water Quality
- o Water Resources of Indian Reservations in Wisconsin: To enable individual Indian tribes to assess the potential for developing their water resources, they must have an idea of the quantity, quality, and availability of water on reservation lands. A resource inventory is also needed to establish Indian water rights and claims. The potential effects of off-reservation activities, such as mining and acid rain, also need to be assessed. USGS is participating in investigations of water resources of selected Indian reservations to help meet these needs.

WYOMING

- o Collection of Basic Hydrologic Information -- Surface Water, Water Quality

AVAILABILITY OF INFORMATION

In addition to reporting work accomplishments to BIA and cooperating tribes, the USGS disseminates water data and the results of investigations through reports, maps, computerized information services, and other forms of public releases. Hydrologic data are contained in an annual series of reports published for each State, and interpretive and analytical material is published in a wide variety of media. Many of these reports are listed in USGS catalogs of publications, and information on other reports published elsewhere can be furnished by the USGS offices listed in the appendix.

Information collected from hydrologic-data sites also is stored in the USGS National Water Data Storage and Retrieval System (WATSTORE), and is available on request. These data can be retrieved in machine-readable form or as computer-printed tables or graphs, statistical analyses, and digital plots. In addition, the National Water Data Exchange (NAWDEX) is a confederation of Federal and non-Federal water-oriented organizations working together to improve access to water data. The offices listed in the appendix can provide local assistance in obtaining data from WATSTORE and in identifying other sources of information through NAWDEX.

The "Selected References" section of this report lists a variety of publications that relate to Indian water rights. Report titles were obtained from the Water Resources Scientific Information Center (WRSIC), which is a national program for acquisition, indexing, and abstracting of scientific and technical literature in the water-resources field, and for dissemination of information about this literature. The computerized WRSIC file comprises about 167,000 abstracts and is used as the authoritative United States bibliographic data base on water resources. Work has begun to increase the comprehensiveness of the literature covered by WRSIC, particularly of non-Department of the Interior, government-sponsored or produced reports.

SUMMARY

The U.S. Geological Survey has for many years provided hydrologic information to assist Indian tribes, the Bureau of Indian Affairs, the Interior Solicitor's Office, and the Department of Justice in the quantification of Indian water rights. The USGS collects and interprets water-resources and related data on a reimbursable basis with the Bureau of Indian Affairs and by use of the Federal-State Cooperative Program with Indian tribes. During the past 5 years, total expenditures for USGS efforts in this regard have ranged from \$1.0 million to \$1.6 million annually.

The U.S. Geological Survey and the Bureau of Indian Affairs in 1982 entered into an interagency agreement that outlines the types of assistance to be provided by the USGS on Indian water-rights issues. The agreement also describes the procedures by which some information may be held as privileged and confidential until it has been released by the United States to the court. In all of its activities relating to Indian water rights, the USGS maintains its role as an objective third party. In addition, the USGS position is that, after compliance with the terms of the interagency agreement, all interpretive reports are properly a part of the public domain.

The hydrologic-information base of the USGS has been a valuable tool in the quantification of Indian water rights. Information collected from hydrologic-data sites are stored in the USGS National Water Data Storage and Retrieval System (WATSTORE) and are available on request. The National Water Data Exchange (NAWDEX), which is a confederation of Federal and non-Federal water-oriented organizations working to exchange water data, provides a means for identification and distribution of water data that can be useful in Indian water-rights activities. The Water Resources Scientific Information Center (WRSIC), which is a national program for acquisition, indexing, and abstracting of scientific and technical literature in water resources, is another valuable source of hydrologic information related to Indian water rights.

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APPENDIX

Inquiries about water-resources information for a particular State should be referred to the U.S. Geological Survey, Water Resources Division, at the appropriate address, as shown below. Questions regarding multi-state programs or policy matters should be addressed to one of the regional offices shown.

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Tuscaloosa, AL 35401

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Anchorage, AK 99501

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Federal Building, Room 301
West Congress Street, FB-44
Tucson, AZ 85701

ARKANSAS

Federal Office Building, Room 2301
700 West Capitol Avenue
Little Rock, AR 72201

CALIFORNIA

Federal Building, Rm. W-2235
2800 Cottage Way
Sacramento, CA 95825

COLORADO

Box 25046, Mail Stop 415
Denver Federal Center, Bldg. 53
Lakewood, CO 80225

CONNECTICUT

Abraham A. Ribicoff Fed. Bldg.
450 Main Street, Room 525
Hartford, CT 06103

DELAWARE

See "MARYLAND" Listing

DISTRICT OF COLUMBIA

See "MARYLAND" Listing

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227 N. Bronough St., Suite 3015
Tallahassee, FL 32301

GEORGIA

6481 Peachtree Industrial Blvd.
Suite B
Doraville, GA 30360

HAWAII

P.O. Box 50166, Room 6110
300 Ala Moana Boulevard
Honolulu, HI 96850

IDAHO

230 Collins Road
Boise, ID 83702

ILLINOIS

Champaign City Bank Plaza
102 E. Main Street, 4th Floor
Champaign, IL 61801

INDIANA

6023 Guion Road, Suite 201
Indianapolis, IN 46254

IOWA

P.O. Box 1230, Federal Building
Room 269, 400 South Clinton Street
Iowa City, IA 52244

KANSAS

1950 Avenue A - Campus West
University of Kansas
Lawrence, KS 66044

KENTUCKY

Federal Building, Room 572
600 Federal Place
Louisville, KY 40202

LOUISIANA

P.O. Box 66492, 6554 Florida Blvd.
Baton Rouge, LA 70896

MAINE

See "MASSACHUSETTS" Listing

MARYLAND

Carroll Building, Room 208
8600 LaSalle Road
Towson, MD 21204

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150 Causeway Street, Suite 1309
Boston, MA 02114

MICHIGAN

6520 Mercantile Way, Suite 5
Lansing, MI 48910

MINNESOTA

Post Office Bldg., Room 702
St. Paul, MN 55101

MISSISSIPPI

Fed. Office Bldg., Suite 710
100 West Capitol Street
Jackson, MS 39269

MISSOURI

1400 Independence Road, MS 200
Rolla, MO 65401

MONTANA

301 South Park Avenue
Federal Building, Drawer 10076
Helena, MT 59626

NEBRASKA

Federal Building and U.S Courthouse
Room 406, 100 Centennial Mall North
Lincoln, NE 68508

NEVADA

Federal Building, Rm 224
705 North Plaza Street
Carson City, NV 89701

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P.O. Box 26659, Western Bank Bldg.
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Albuquerque, NM 87102

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P.O. Box 1350, 343 U.S. Post Office
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Albany, NY 12201

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Post Office Bldg., Room 436
Raleigh, NC 27602

NORTH DAKOTA

821 East Interstate Avenue
Bismarck, ND 58501

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975 West Third Avenue
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215 Dean A. McGee St., Room 621
Oklahoma City, OK 73102

OREGON

847 NE 19th Avenue, Suite 300
Portland, OR 97232

PENNSYLVANIA

P.O. Box 1107, Federal Building
4th Floor, 228 Walnut Street
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200 Fourth Street, SW
Federal Bldg., Room 317
Huron, SD 57350

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Federal Bldg. & U.S. Courthouse
Room A-413
Nashville, TN 37203

TEXAS

Federal Bldg., Room 649
300 East Eighth Street
Austin, TX 78701

UTAH

Administrative Bldg., Room 1016
1745 West 1700 South
Salt Lake City, UT 84104

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200 West Grace Street
Richmond, VA 23220

WASHINGTON

1201 Pacific Avenue, Suite 600
Tacoma, WA 98402

WEST VIRGINIA

603 Morris Street
Charleston, WV 25301

WISCONSIN

1815 University Avenue
Madison, WI 53705

WYOMING

P.O. Box 1125
4007 Federal Center
Cheyenne, WY 82003

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Richard B. Russell Federal Bldg.
75 Spring Street, SW, Suite 772
Atlanta, GA 30303

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Mail Stop 406, Box 25046
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Lakewood, CO 80225

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Washington

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Menlo Park, CA 94025