STATE OF IDAHO

INTERIM STATE WATER PLAN

PRELIMINARY REPORT

JULY 1972

IDAHO WATER RESOURCE BOARD
STATEHOUSE
BOISE, IDAHO

STATE OF IDAHO

CECIL D. ANDRUS
Governor

"There shall be constituted a State Water Resource Agency composed as the Legislature may now or hereafter prescribe which shall have power to formulate and implement a state water plan for optimum development of water resources in the public interest . . . " **Constitutional Amendment**

IDAHO WATER RESOURCE BOARD

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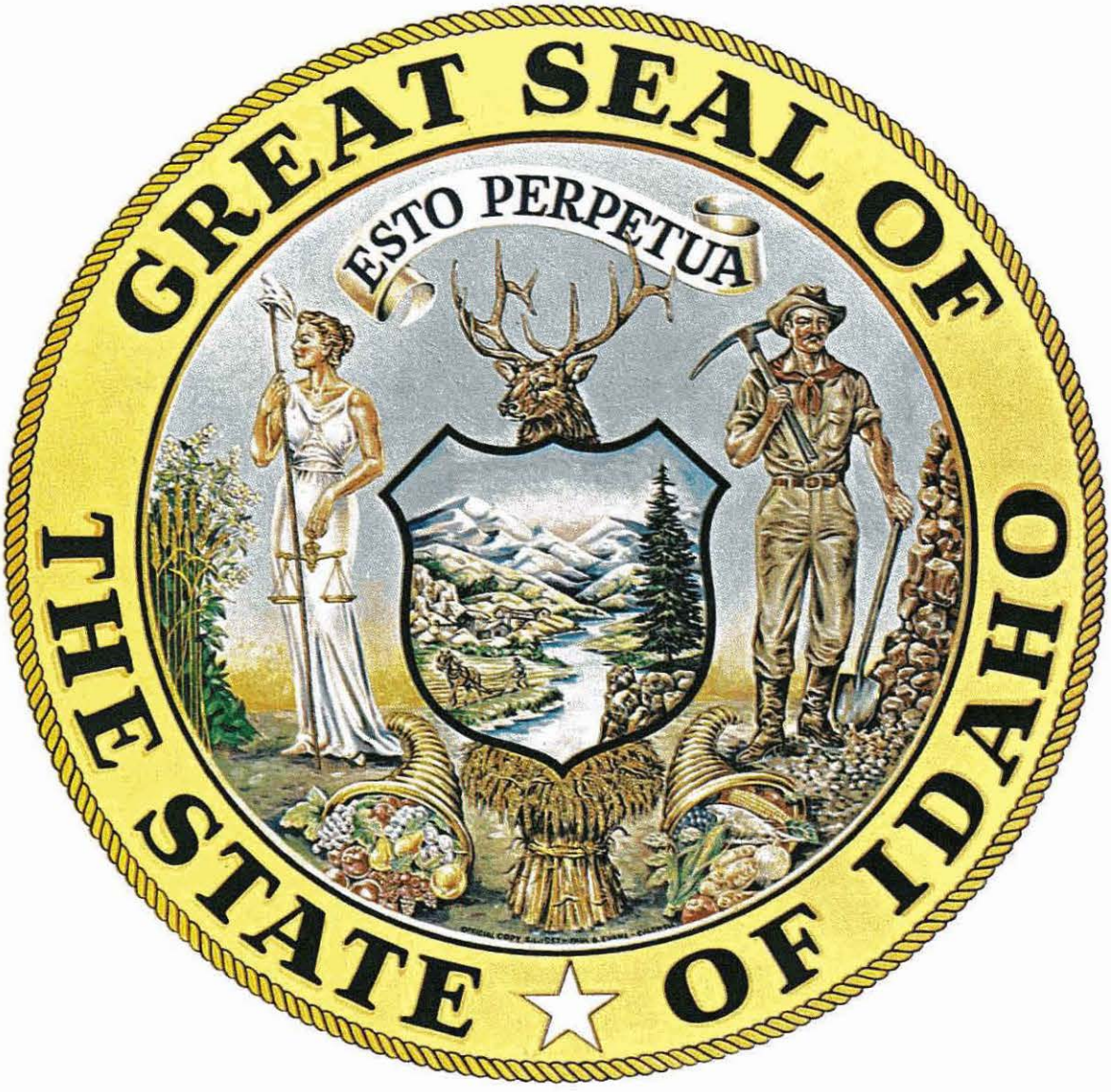

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FOREWORD

The objectives of the State Water Planning Program are to provide data and information to Idaho citizens and public officials as to how Idaho's water and related land resources can be used to meet future water needs for the benefit of its citizens.

There are many factors involved in the decision-making process. Economic, social, and environmental goals must be fully considered and carefully weighed. Decision-makers and the public must be aware of the options available for use of the resources.

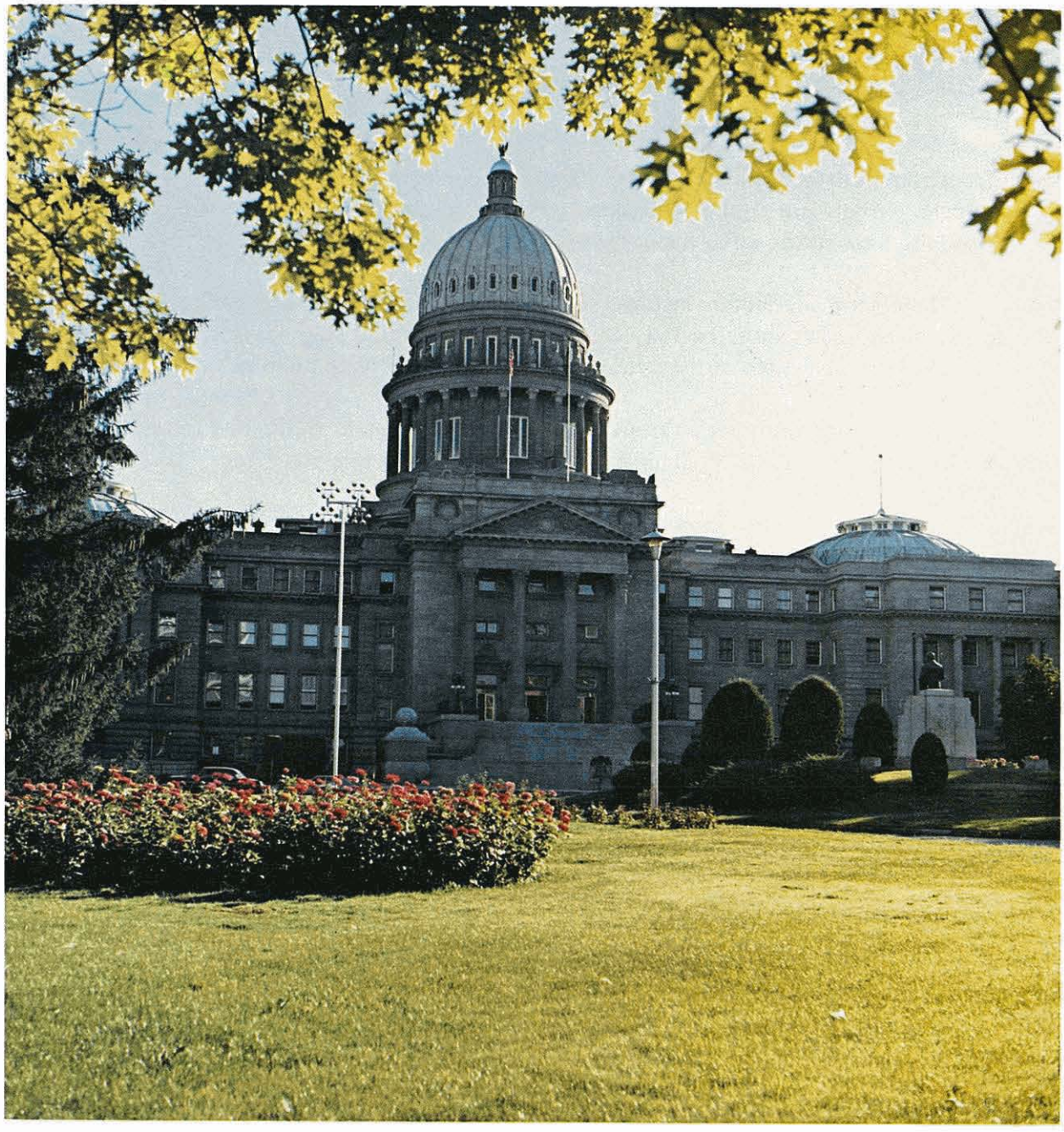
The data and information presented in this Interim State Water Plan Report does not constitute a plan – it is a "Preliminary Report" progressing to a State Water Plan.

The Water Resource Board has included information in this report on all identified projects and programs so that the people of Idaho may be informed of the choices to be made. Procedures necessary to formulate an Interim Water Plan are discussed in detail in Chapter 2.

This report is being made available to all state, federal, local, and special interests for review and comments. Following this, public information meetings will be held throughout the state to fully explain the information presented in the report and to obtain views and comments of the local people. Public hearings will be held following the public information meetings to obtain official comments from all interested parties in the state. Following the public hearings, the Idaho Water Resource Board will take action regarding an Interim State Water Plan and a revised report will be published which will form the basis for a State Water Plan to be published in 1976.

Conclusions and recommendations are included in Chapter 6 for the purpose of stimulating reaction and discussion. They have not been acted upon by the Board. When the Interim State Water Plan is finalized only officially approved conclusions and recommendations will be included.

The future use, management and conservation of Idaho's water and related land resources vitally affect all Idahoans. This report provides the basic information necessary to meet these needs.



DR. ROBERT R. LEE, Director

STATE OF IDAHO

IDAHO WATER RESOURCE BOARD
STATEHOUSE
BOISE, IDAHO 83707

July 1, 1972

The Honorable Cecil D. Andrus, *Governor*
State of Idaho;
Members of the Legislature, and
The People of Idaho:

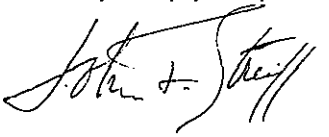
I am pleased to transmit on behalf of the Idaho Water Resource Board this first publication on the Idaho Water Plan entitled "Interim State Water Plan – Preliminary Report". This report is the first of several to be prepared as we formulate a State Water Plan according to our Constitutional and Legislative directive. It is our intent and purpose that the State Water Plan will be completed by 1976.

This report presents a comprehensive overview of Idaho's natural resources on a statewide and regional basis. Basic information obtained from our Water Needs Studies, Water Resource Inventory, Soils Surveys, the Bear River Basin Reconnaissance Study and our contribution to the Columbia-North Pacific and Great Basin Framework Studies is included. The state water planning program is outlined and water resource uses, problems, needs, and opportunities are discussed. Concepts for interbasin transfer of water and regional planning approaches for our river basins are presented. Conclusions and recommendations are stated to provide opportunities for public reaction.

Public meetings will be held throughout the state after publication to present information contained in this preliminary report. Following this, a series of public hearings will be held to receive direct testimony. The Board will take official action after the public hearings have been concluded and the testimony analyzed.

This report is the first step in the development of a State Water Plan for Idaho, which will provide a guide for action by the executive and legislative branches of government in the development, or nondevelopment, of the state water resources.

Very truly yours,



JOHN F. STREIFF, *Chairman*
Idaho Water Resource Board

JFS:kh

ACKNOWLEDGMENTS

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U.S. Soil Conservation Service
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U.S. Forest Service
U.S. National Weather Service
U.S. Environmental Protection Agency
U.S. Bureau of Reclamation
U.S. Bureau of Outdoor Recreation
Pacific Northwest River Basins Commission
Western States Water Council
Idaho Department of Water Administration
Idaho Department of Commerce and Development
Idaho Department of Fish and Game
Idaho Department of Parks
Idaho Department of Health
State Planning and Community Affairs Agency
University of Idaho
Idaho State University
Lewiston Port Authority
Idaho Power Company
Utah Power and Light Company
Great Basin Region State-Federal Interagency Group

Photographs in this report were provided by:

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Marshall C. Edson
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Idaho Department of Fish and Game
Idaho Department of Highways
Idaho Department of Commerce and Development
Idaho Water Resource Board

IDAHO WATER RESOURCE BOARD

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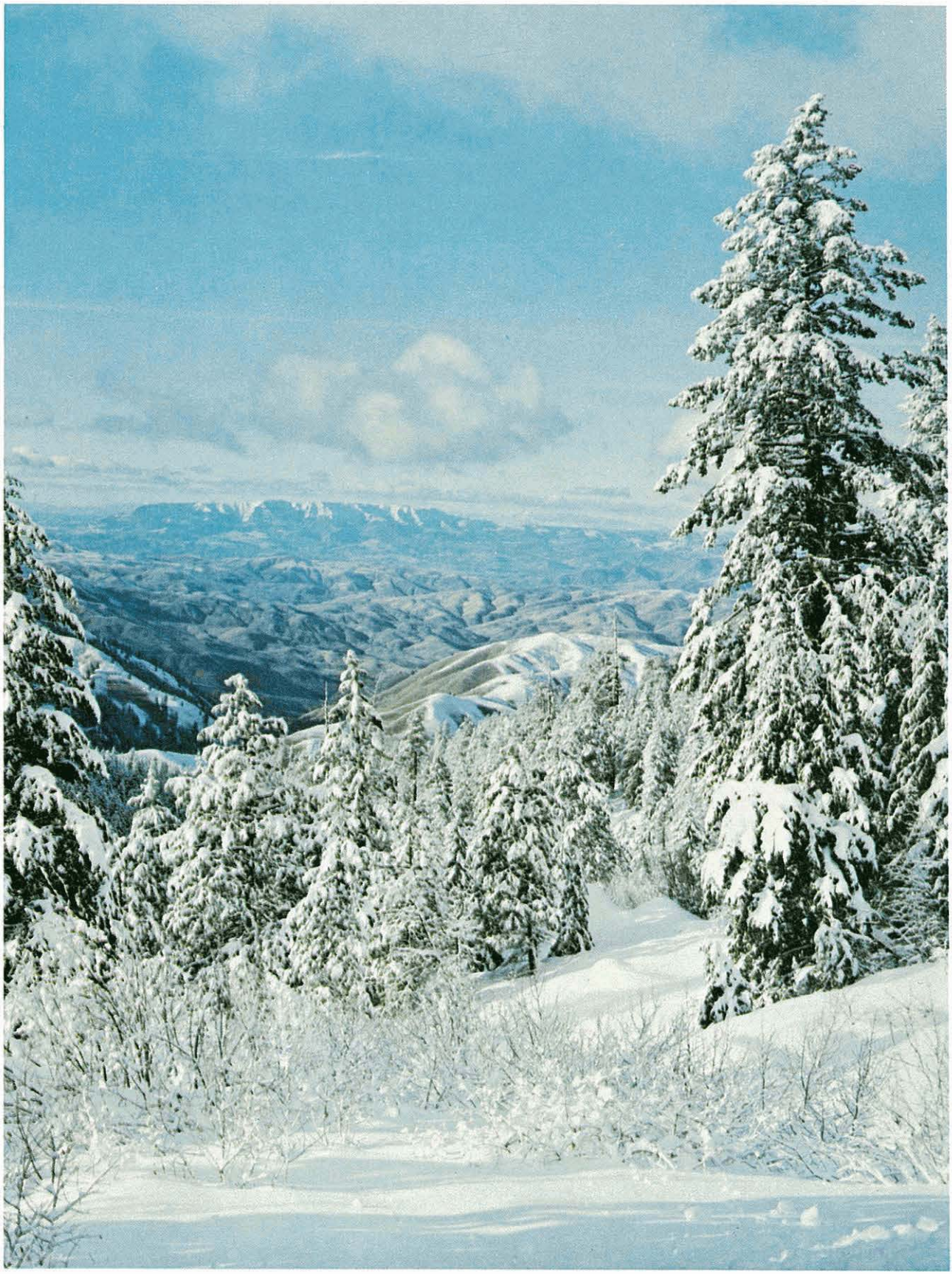


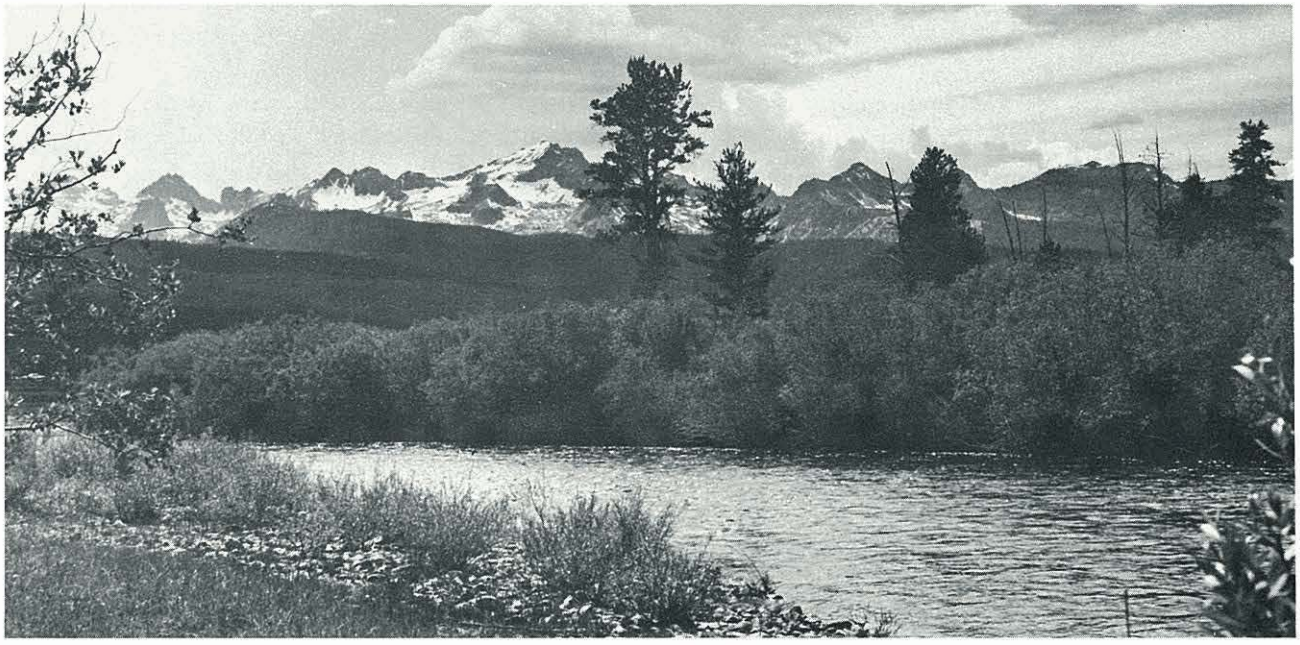
Chapter 1 / RESOURCES

Water, land, fish, wildlife, timber, minerals, and people comprise the resources of Idaho. A relatively young state (80 years), Idaho has not experienced the degree of economic growth and development of its natural resources that has occurred in other areas. These factors, coupled with a large federal land ownership, have acted to preserve the quality of natural resources.

The state is not prone to natural disasters such as cyclones, hurricanes, or prolonged temperature extremes. Yet, Idahoans enjoy four season weather and can participate in a variety of economic and social activities.

The citizens of Idaho and the nation are awakening to the vast potential of the state's natural resources. Recent studies indicate that already important timber, mineral, and agricultural contributions could increase tremendously. The state also has the potential for expansion in recreation and manufacturing opportunities.

Resource development, intensified management, preservation, or some combination of these alternate courses of action will require deliberate decisions at the local, state, and national levels. Virtually all of the natural resources in Idaho have common interests and, therefore, must all be recognized in the planning and decision-making process.



DESCRIPTION OF IDAHO

Idaho's natural attractions are varied and spectacular, including some of the nation's most rugged mountain ranges, highest waterfalls, and peaceful streams and valleys. Almost unique among the states in its vast stretches of primitive wilderness, Idaho is still a pioneering state.

TOPOGRAPHY

The state covers a vast mountainous area studded with peaks ranging from 5,000 to over 12,000 feet in elevation. Its lowest elevation, 747 feet, is found in the vicinity of Lewiston on the Washington border. Four of the 25 physiographic provinces in the United States come together in Idaho: the Columbia Plateau, Northern Rocky Mountain, Middle Rocky Mountain, and Great Basin and Range provinces.

The Columbia Plateau, encompassing an area of about 100,000 square miles, is located primarily in Washington and Oregon, but a segment of about 14,000 square miles extends into southern Idaho. The continuity of this area with the main Columbia Plateau was broken by the upsurge of the Blue Mountains in Oregon and the Seven Devils Mountains in Idaho, which are separated by Hells Canyon, a mile-deep gorge formed by the Snake River. Most of Idaho's portion of the Columbia Plateau forms the Snake River Plain, which extends across the state in a crescent shape part of which overlies one of the largest underground reservoirs of water in the world.

The Northern Rocky Mountain Province covers most of the state north of the Snake River Plain. Elevations within it range from 5,000 to over 11,000 feet. Although the Rockies in this portion of the state reach only moderate elevations, they form several well-defined mountain ranges containing peaks more than 11,000 feet in elevation. Canyons formed by the river systems in this area, particularly those cut by the Salmon River, are among the deepest on the continent.

The Middle Rocky Mountain Province stretches across southeastern Idaho and contains the Bear River Basin. The major topographic feature in this province is 21-mile-long Bear Lake, which bridges the boundary between Idaho and Utah. Mountain ranges lying within the area include the Bear River, Preuss, and Aspen ranges and the Caribou Mountains.

Only the northern fringe of the Great Basin and Range Province extends into Idaho, lying between the Columbia Plateau and the Middle Rockies. Most of this vast basin falls within Oregon and Nevada. The region is characterized by grassy plateaus and sage plains; groves of conifers and aspen grow along the gulches and slopes. Among the mountain ranges in the province are the Blackfoot, Chesterfield, Deep Creek, Sublette, and Albion ranges, separated by valleys filled with glacial residue. Peaks rise to elevations of from 8,500 feet to 10,500 feet.

Idaho's topography is distinguished chiefly by its mountains. The largest concentration is formed by the Clearwater Mountains which extend 125 miles from the St. Joe River on the north to the Salmon River on the south. The Bighorn Crags, located between Panther Creek and the Middle Fork of the Salmon, are the most rugged in the entire Northwest, with numerous peaks more than 10,000 feet high. Mount Borah, in the Lost River Range, is Idaho's highest peak at 12,655 feet.

The more than 2,000 lakes of all sizes scattered throughout the state were formed primarily through glacial or volcanic action and are mostly fed by melting snows and springs. Two of the largest lakes, Coeur d'Alene and Pend Oreille, lie within the northern panhandle, where the second major tributary of the Columbia River, the Clark Fork, passes through Idaho.

The state's major river systems, the Snake, Salmon, Clearwater, Clark Fork, and Bear, have had a major influence on its physiography, winding through and shaping the rugged moun-

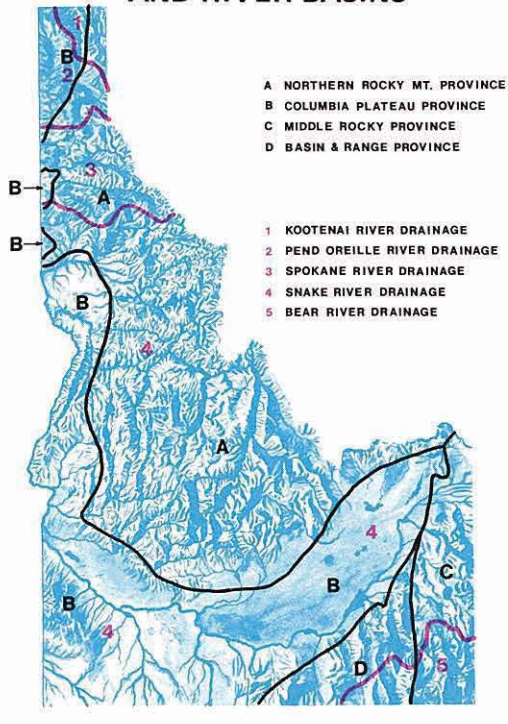
tain ranges. Many of the river systems have unusual characteristics. The Big and Little Lost rivers emerge from mountain valleys and disappear as they flow onto the Snake Plain. These waters enter into the Snake Plain aquifer and flow underground to reappear at Thousand Springs. In addition, irrigation diversions from the Snake percolate into an underground reservoir and also reappear at Thousand Springs, after which the river makes its way through the deepest canyon in the United States. The Salmon and Clearwater rivers have attained national interest because of their unique wilderness settings. The Bear River is the only river in Idaho outside the Columbia River system, and flows into an inland sea, (the Great Salt Lake) rather than the Pacific Ocean.

The accompanying map shows Idaho's general topography. (Figure 1)

GEOLOGY

The processes and materials that have combined to form the rugged mountain ranges, valleys, and plains of Idaho have a geologic history that spans more than one billion years. Four distinct eras of geologic time are recorded in the rocks of Idaho: the Precambrian, which spans earth history from the very beginning to about 600 million years ago; the Paleozoic, which began at the end of the Precambrian and lasted until about 230 million years ago; the Mesozoic, which lasted from 230 to about 65 million years ago; and finally the Cenozoic, which began about 65 million years ago and has continued to the present.

FIGURE 1. TOPOGRAPHIC REGIONS AND RIVER BASINS



PRECAMBRIAN TIME. The oldest rocks exposed in Idaho formed from sediments laid down in moderately deep seas that existed about one billion years ago. Volcanism and possibly some glaciation also make up part of this first chapter in the geologic history of Idaho. Towards the end of the Precambrian, much of the state was covered by a sea so shallow that it was dominated by extensive mud flats. Many thousands of feet of sediment accumulated as the sea floor sank, accompanied by the eruption of volcanic rocks at scattered localities. In most of Idaho, Precambrian time was brought to a close by the uplift and folding of the newly deposited rock layers. Central Idaho probably was uplifted to a higher elevation than the surrounding regions, a condition which persisted through most of the subsequent geologic history.

PALEOZOIC ERA. The Paleozoic Era lasted about 370 million years, and during this time, marine sedimentation was the dominant process in Idaho. Deposition was intermittent however, and during much of the era large parts of the state stood above sea level. The Paleozoic rocks attain a maximum thickness of about 30,000 feet and contain fossils that help to date them. This in turn helps to establish the chronology of events that took place during that time. The events included several periods of erosion, deposition, mountain building, and volcanism. The valuable phosphate beds of southeastern Idaho were formed near the close of the Paleozoic. The era was terminated by gentle warping and uplift of the earth's crust.

MESOZOIC ERA. Marine deposition was renewed during the Mesozoic Era, but was interrupted by large-scale igneous activity and episodes of mountain building. Many of Idaho's mineral deposits were formed as a result of the igneous activity and many of the state's scenic features had their beginning in the Mesozoic Era. The rock layers that had accumulated since Precambrian time were folded, broken, uplifted, and invaded by molten rock that cooled to form the Idaho batholith. This mass of granite and related rocks, which was formed more than 100 million years ago, is now exposed throughout central Idaho. The batholith underlies an area 300 miles long in the north-south direction by 180 miles wide. Much of Idaho was composed of mountainous terrain during the Mesozoic and intermittent episodes of volcanism continued.

CENOZOIC ERA. Idaho has been well above sea level since the beginning of the Cenozoic, and erosion has been sculpting the landscape for the last 65 million years. Continued mountain building, and volcanism accompanied by uplift of some areas and depression of others has resulted in the evolution of the state's present topography. The first half of the Cenozoic was characterized by uplift and erosion. Then about 30 million years ago there began a volcanic episode which produced rocks now known as the Challis volcanics. These lava flows spread over the area of Blaine, Butte, Custer, and parts of Valley and Lemhi counties. These lavas were later folded, faulted, and partially eroded. Erosion continued until the land surface of Idaho was reduced to moderate relief. Then another episode of volcanism occurred that formed the thick lava sequence known as the Columbia River basalt. In the vicinity of Lewiston these lavas are several thousand feet thick and the base of the sequence lies well below sea level. While the Columbia River basalts were being extruded, the central part of the state was being uplifted again. Eruption of the basalt flows brought

about great changes in the stream patterns in western Idaho, as the molten rock covered the lowlands and spread up valleys into the more mountainous terrain. During the eruption of the Columbia River basalt and for quite some time afterward, the earth's crust was in a state of disequilibrium. Fault and fracture systems were formed that trend northwesterly, northeasterly, and northerly. Many of the present streams in Idaho follow these fracture zones.

The present topography of the state has been strongly influenced by gentle warping of the earth's crust. The Snake River Plain is a down warp of the first magnitude and the mountainous area of central Idaho has been intermittently uplifted. These movements in the earth's crust produced many changes in the drainage systems of the state. The Salmon River is an outstanding example of a stream whose diverse trends are actually segments of several former streams.

The last great outburst of volcanism was centered in southern Idaho. The Snake River Plain and adjacent areas were covered first by flows of rhyolite, and more recently by flows of the Snake River basalt. The eruption of basalt has continued intermittently in the Snake River Plain until recent time. Originally, the Snake River flowed west following a lowland course. The basalt flows accumulated and eventually blocked the river, causing it to follow a new course farther south. During this time the Columbia River, which drains all but the southeastern part of Idaho, was flowing south. The Snake and Columbia rivers joined where Pasco, Washington is now located, and from there the Columbia flows westward to the Pacific. It was also during this time that the lava terrain known as the Craters of the Moon National Monument was formed. These lava fields contain some excellent volcanic features and have been used as a training site for astronauts. Thousands of tourists visit the area each year to observe the results of volcanic processes.

A large deposit of sedimentary material accumulated in southwestern Idaho during and after the volcanic episode. The sediments were formerly thought to have been deposited in one or two great lakes, but it is now known that the sediments are too heterogeneous and formed at too great a range in elevation to have had a common origin. The sediments composed mainly of gravel, sand, silt, clay, and volcanic ash accumulated in a long succession of scattered lakes, ponds, floodplains, and stream courses. The older deposits of this sedimentary sequence are referred to as the Payette formation. The younger sediments make up the Idaho group.

Most of the mountains of Idaho were glaciated intermittently during the last 3 million years. The last glaciers probably existed as recently as 10,000 years ago. In the Idaho panhandle great ice sheets as much as a mile thick moved down from Canada to sculpture the terrain. Scattered throughout the mountain ranges of Idaho were numerous alpine glaciers which eroded and deposited rock materials to form lakes, cirques, jagged peaks, and many other spectacular scenic features. Glaciation recurred two or three times in Idaho and it was during this same time span that much of Idaho's rich soil resource formed. Soils of good quality now being utilized for agriculture in the Snake River Plain include material deposited by winds and streams.

Idaho's topographic features, geologic structure, and mineral resources have thus evolved from a combination of geologic forces, processes, and events that have a history of perhaps a billion years.

Figure 2 shows the general geologic character of Idaho with features identified according to the geologic era in which they were formed. Profiles selected from across the state are also shown to delineate the subsurface character of Idaho's land forms.

(Editor's Note: This section "Geologic History of Idaho" was prepared by Dr. Ken Hollenbaugh, Head of the Department of Geology, Boise State College, Boise, Idaho.)

CLIMATE

Topography more than latitude determines Idaho's varied climate. Located on the western slope of the Continental Divide and exposed to Pacific Ocean winds, the area boasts a far milder climate than might be expected from geographic position. Relatively low precipitation, a high

rate of evaporation, low humidity, and an abundance of sunshine characterize Idaho's climate.

Mean annual temperatures are high in the Snake River Plain, with hot, dry summers and frequent daytime winds, while timbered mountain areas experience lower temperatures and high precipitation rates. Snow depths also vary widely throughout the state, ranging from infrequent light falls on the central plains to heavy, long-lasting accumulations in the mountains.

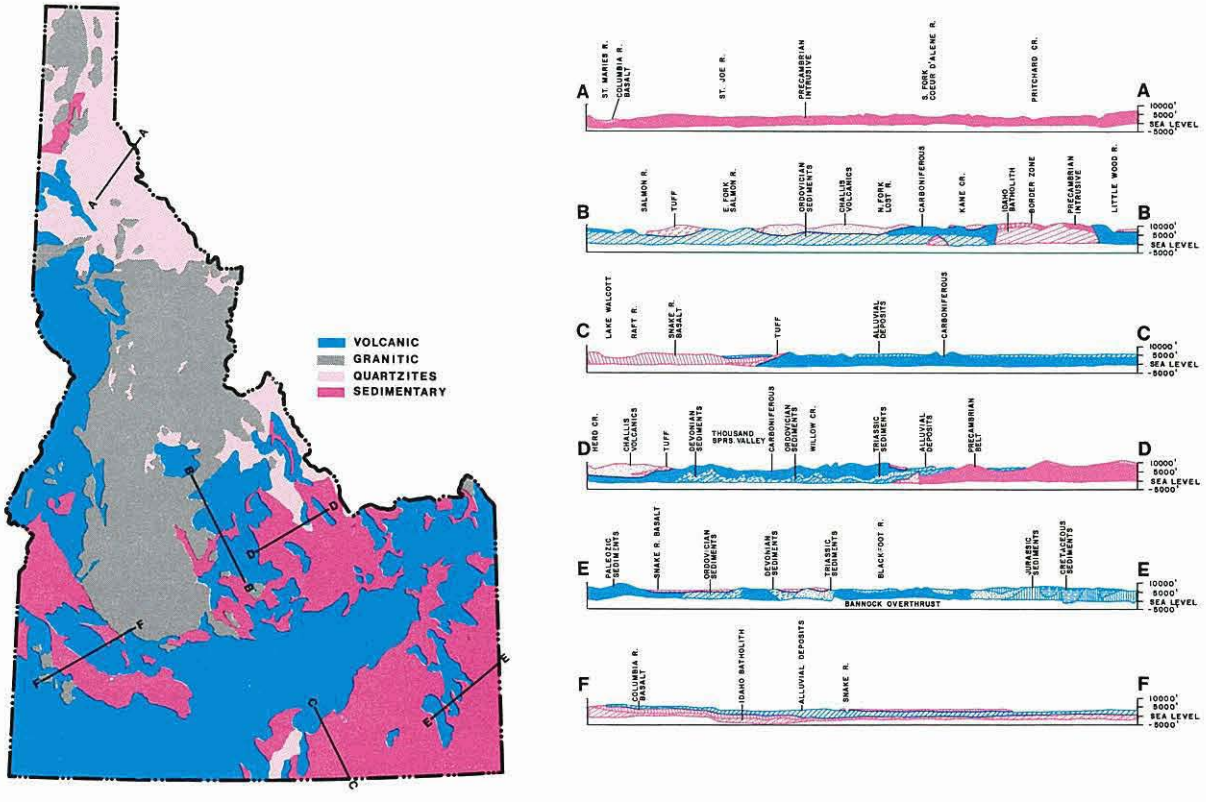
The Continental Divide acts as a barrier to the severe cold spells which are common further to the east and the destructive summer storms which plague other semi-arid regions.

Temperature

Elevation is the most important factor influencing temperatures throughout the state. Lower elevations of Clearwater and Little Salmon river basins and the Snake River Valley from Bliss to Lewiston record Idaho's highest annual averages. Swan Falls on the Snake has the warmest mean annual temperatures. Obsidian at 6,780 feet records the lowest annual average of 35.7 degrees. Idaho's record low was −60 degrees at Island Park Dam in January 1943 and the high was 118 degrees at Orofino in July 1934. Winters of 1937-38 and 1948-49 were the coldest on record for the state.

Monthly means hit 32 degrees or below for five months of the year at elevations of 5,000 feet or above; for four months between 4,000 and 5,000 feet; for three months at 3,000 to 4,000 feet; and for only one or two months of the year below 3,000 feet. Some low altitude stations, such as Riggins and Lewiston, seldom record mean monthly temperatures below 32 degrees.

FIGURE 2. GEOPHYSICAL CHARACTERISTICS



Daily temperature ranges are narrowest in the winter when skies are more likely to be cloudy and widest during the sunny summer months. The daily ranges are greater in the high valleys and on the Snake River Plain than in the rest of the state. The daily degree range in Boise, for example, is twice as great in July and August as it is in January.

Weather fronts usually cross the state quickly, resulting in frequent changes rather than prolonged hot or cold spells.

Differences in elevation and topography cause great variations in length of the frost-free growing season; but broad year-to-year fluctuations within the same area are also common. The Lewiston area enjoys the most favorable climate for agriculture, with an average 200-day growing season annually. A large portion of the central Snake and lower Boise, Payette, and Weiser river basins have a frost-free period of approximately 150 days a year, shortening to 125 days in the Upper Snake around Pocatello and Idaho Falls. Land use is limited almost entirely to grazing in a few high valleys which average less than one month per year without freezing temperatures.

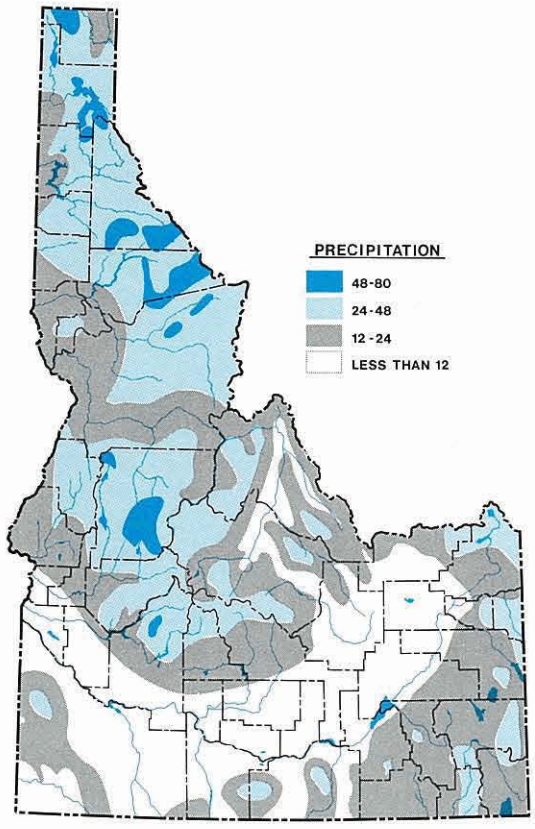
Table 1 shows annual temperatures for selected points.

TABLE 1
COMPARISON OF ANNUAL MEAN, MAXIMUM AND MINIMUM TEMPERATURES AT 8 SELECTED STATIONS, 1931 – 1960
(Degrees Fahrenheit)

	Mean	Maximum	Minimum
Bonners Ferry	46.1	57.6	34.5
Burley	49.6	63.3	35.8
Idaho Falls	45.1	57.7	31.5
Three Creek	43.7	60.9	26.4
Idaho City	44.8	62.1	27.3
Lewiston	51.3	66.1	39.9
Salmon	44.0	59.9	28.1
Grangeville	46.5	57.8	35.2

Source: Climatological Handbook, Columbia Basin States, Volume I, Part A

FIGURE 3. MEAN ANNUAL PRECIPITATION



Idaho's four-season climate and topographic variety create an ideal year-round recreational area. Swimming and boating are popular during the warm summers in the state's many lakes and reservoirs, skiing and snowmobiling during the winter, and hunting and fishing in season.

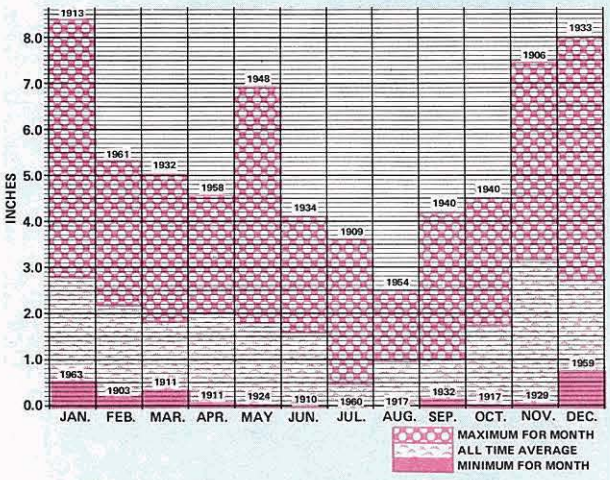
Precipitation

Most of Idaho's precipitation derives from the Pacific Ocean. Some summer thundershower activity in the eastern portions of the state is carried up from the Gulf of Mexico and the Caribbean.

Precipitation levels differ greatly with topography. The absence of natural barriers on the northwestern side of the state allows moisture-laden Pacific winds free access to the northern parts of Idaho, producing higher precipitation

levels than in southern sections. Large areas in the Clearwater, Payette, and Boise river basins receive from 40 to 50 or more inches of rainfall annually, while some arid plains in southern Idaho record less than 10 inches. (Figure 3)

FIGURE 4. MOSCOW PRECIPITATION (Moscow, Idaho)



Challis appears to have the lowest average precipitation at 7.09 inches, while a high of 98.6 inches was recorded at Deadwood Summit in Valley County in 1964-65. Table 2 records mean monthly precipitation totals for Pocatello and Caldwell and Figure 4 graphs variations in Moscow's precipitation throughout the year.

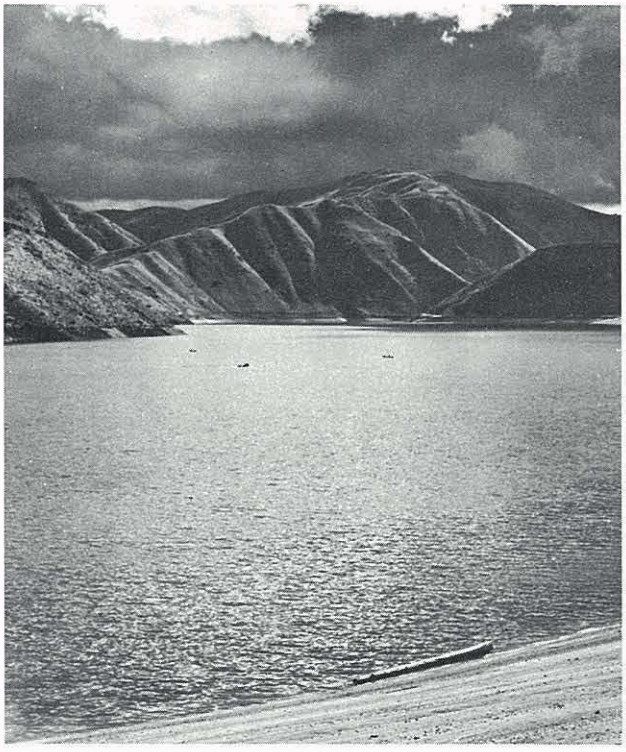


TABLE 2
MEAN MONTHLY PRECIPITATION FOR POCATELLO AND CALDWELL, 1931 – 1960

	Annual	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
POCATELLO													
Mean	10.85	1.21	.92	1.02	1.06	1.13	.96	.51	.55	.61	.89	.99	1.00
Maximum	16.15	2.92	1.87	2.63	3.30	3.11	3.39	1.19	1.51	3.80	3.17	2.44	2.95
Minimum	6.43	.42	.26	.10	.19	.05	.03	T	T	T	T	.02	.37
CALDWELL													
Mean	10.61	1.29	1.26	1.17	1.01	1.08	.78	.24	.11	.41	.79	1.21	1.26
Maximum	15.78	2.87	2.77	2.77	3.34	3.20	2.62	3.55	1.71	4.00	3.12	2.90	3.02
Minimum	5.13	.12	.04	.05	T	T	T	T	T	.00	T	.02	.15

T = Trace
Source: Climatological Handbook, Columbia Basis States Pacific Northwest River Basins Commission

NATURAL RESOURCES

A description of the state's land, water, mineral, timber, fish and wildlife resources is provided below. The sufficiency of the state's natural recources provides the base for an expanding economy and outstanding outdoor recreation.

LAND RESOURCES

Idaho is the 13th largest state with a land area of 52,910,000 acres. By way of comparison, its area is about the same as that of Great Britain. The natural climatic and soils conditions are dominant factors influencing land use. A description of the land resource are as follows:

COLUMBIA PLATEAU. Located south of Lewiston; covered with grassland and sagebrush; elevation 750 to 1500 feet; major land use dryland farming, some irrigation; precipitation 12 to 16 inches falling as rain and snow from November through April.

PALOUSE AND NEZ PERCE PRAIRIES. Located north and east of Lewiston; covered with grass, browse and scattered pine; elevation 1500 to 3500 feet; used for dryland farming; 17 to 20 inches precipitation falling as rain and snow from November through April.

SNAKE RIVER AND LAVA PLAINS. Located in the Weiser area; grass or sagebrush at elevation 1500 to 5500 feet, forest cover above 4500 feet; used for rangeland and forestland; 12 to 18 inches of precipitation falling as rain and snow, November through April.

OWYHEE HIGH PLATEAU. Located in the southwest corner of the state; grass and sagebrush at elevation of 4500 to 7500 feet, open forest cover above 6000 feet; used for rangeland and irrigated cropland on the valley bottom lands; 8 to 16 inches of precipitation falling as rain and snow, November through April.

BIG AND LITTLE WOOD RIVER FOOTSLOPES AND PLAINS. Located along the northern edge of the Snake River Plain between Boise and Arco; covered with grass and sagebrush; elevation 4500 to 6500 feet; used for rangeland with a few dry farmed area; 14 to 18 inches precipitation falling mainly as snow and rain, November to March.

SNAKE RIVER PLAINS. Extending in the form of a crescent, dipping south from Idaho Falls to Twin Falls; covered with grass or sagebrush; irrigated cropland and rangeland at elevations of 2500 to 3500 feet in the Snake River Plain east and west of Twin Falls at elevations of 4500 to 5500 feet; 7 to 12 inches precipitation falling as rain and snow, November to March.

LOST RIVER VALLEY AND MOUNTAINS. Located in a roughly triangular area with a base extending from the city of Salmon almost to Mud Lake, and its apex in the vicinity of Red Fish Lake in the Sawtooth Valley; covered with grass, sagebrush, pine and fir forests; elevation 4500 to 6500 feet; used for rangeland, some irrigated cropland; 8 to 16 inches precipitation falling mostly as snow, November through March.

EASTERN IDAHO PLATEAU. Located to the south and east of the Snake River around Pocatello; covered with grass or scattered pine forests; elevation 4500 to 6500 feet; used for dry farming, limited acreage irrigation, and the remainder in rangeland and forestlands; 12 to 20 inches precipitation falling mostly as snow and rain, November through March.

NORTHERN ROCKY MOUNTAINS. Extending in a wide band from north of the Snake River Plain to the Canadian border, including all land not previously mentioned plus a small area near the Wyoming border; covered with pine or fir forests with browse fir or tamarack at higher levels; elevation 2500 to 7500 feet; used for cropland on valley bottom lands and terraces; 20 to 50 inches precipitation falling mostly as snows or rain, November through May in the mountains, and 14 to 33 inches, October through May in valleys.

MIDDLE ROCKY MOUNTAINS (GREAT SALT LAKE AREA). Located in the southeast in the Bear River drainage; 50 percent of the area above 6,000 feet covered with grass, sage and other brush with Douglas fir, lodgepole pine and some spruce forest in the higher levels; elevation 4400 to 9000 feet; used for dryland farming, significant acres in irrigated cropland, some rangeland; 14 to 50 inches precipitation, the driest period occurring from midsummer to early autumn, two-thirds of precipitation falling as snow, January through April.

PRESENT LAND USE

Agriculture and forestry are the dominant land uses with irrigation farm land the most important economic use. The primary land uses in the state in 1970 are shown in Table 3 and illustrated in Figure 5.

Land Ownership

Ownership is an important factor affecting land use and management. About 64 percent of the land within the state is owned by the federal government. Private interests own about 30½ percent, and the remaining 5½ percent is owned by state and local communities. A breakdown of land ownership in the state is shown in Table 4. (See Figure 6)

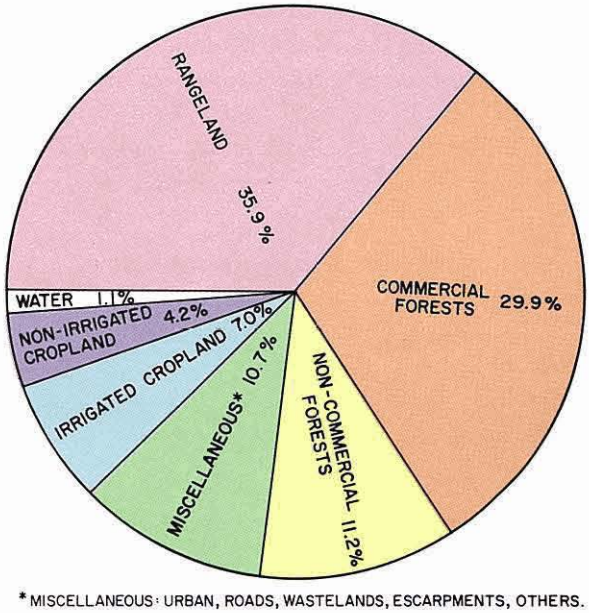
The Forest Service and the Bureau of Land Management are the dominant governmental land agencies in the state, owning over 96 percent of the 33,826,619.7 acres of federal land.

TABLE 3
LAND USE, 1970

USE	Acres (Approx.)
Cropland, irrigated	3,750,000
Cropland, nonirrigated	2,250,000
Forests, commercial	16,000,000
Forests, noncommercial	6,000,000
Rangeland[1]	19,200,000
Miscellaneous (urban, road, wastelands, escarpments, and other	5,710,000
Total land	**52,910,000**
Water area	565,000
Total land and water	**53,475,000**

[1] U.S. Census of Agriculture 1964 to reflect 1970 conditions
Source: Idaho Economic Base Study for Water Requirements

FIGURE 5. PERCENTAGE OF LAND USE



* MISCELLANEOUS: URBAN, ROADS, WASTELANDS, ESCARPMENTS, OTHERS.

FIGURE 6. LAND OWNERSHIP

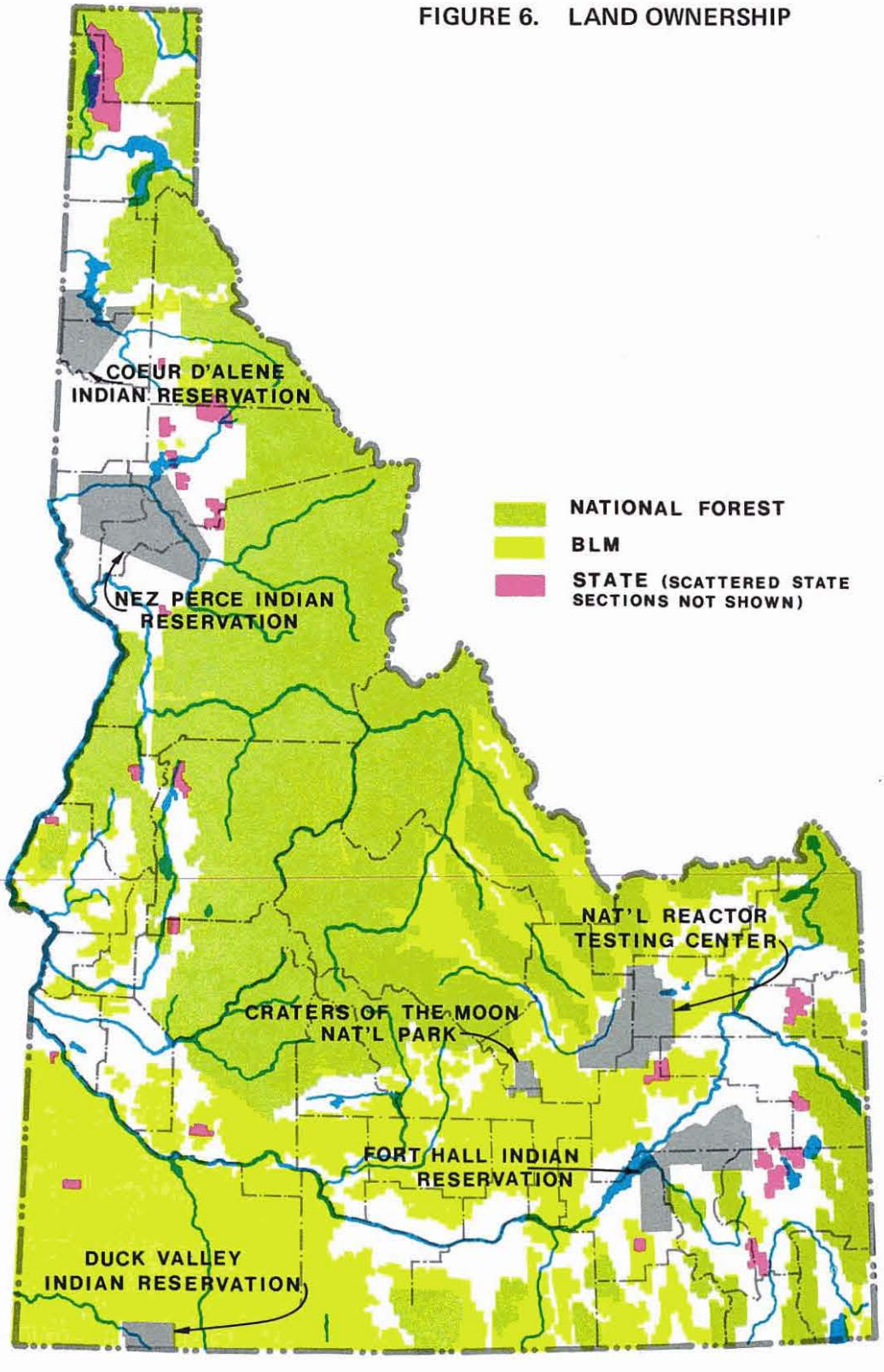


TABLE 4
LAND OWNERSHIP, JUNE 30, 1970

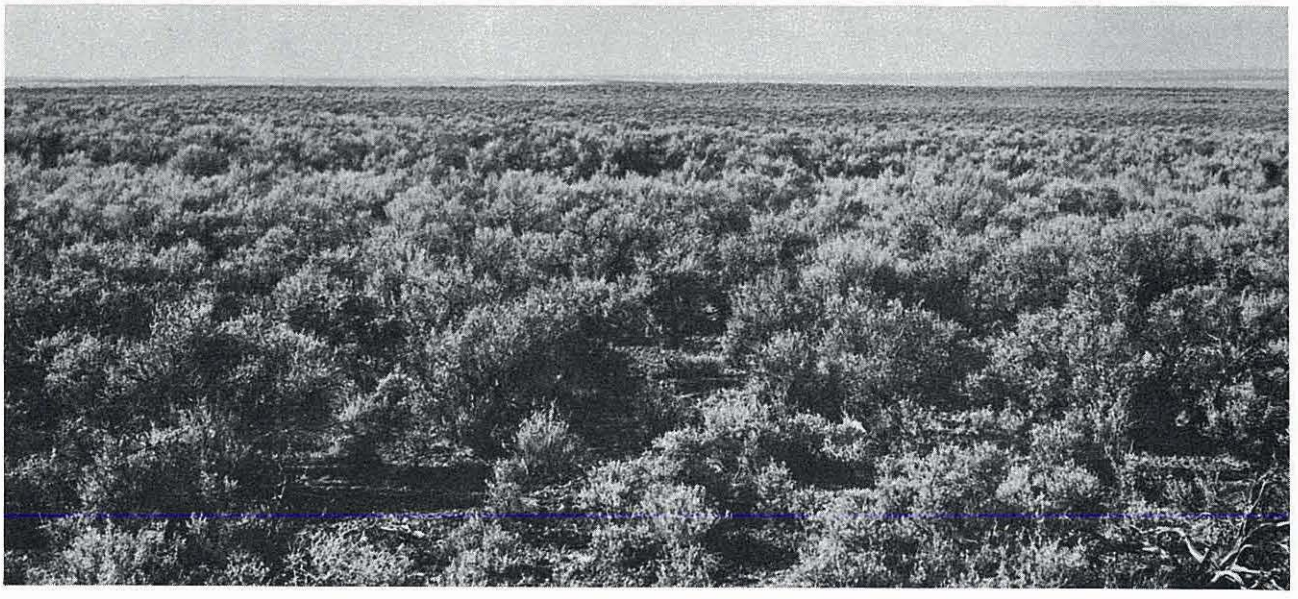
Entities	Acres
FEDERAL	
Department of Agriculture (USDA)	
Agricultural Research Service	32,744.3
Forest Service	20,351,874.0
Total (USDA)	**20,384,618.3**
Atomic Energy Commission	572,267.1
General Services Administration	18.6
Department of the Interior (USDI)	
Bureau of Land Management	12,113,193.4
Fish and Wildlife Service	23,008.5
National Park Service	85,268.1
Bureau of Indian Affairs	41,529.4
Bonneville Power Administration	34.4
Total (USDI)	**12,705,169.1**
Department of Justice — Immigration and Naturalization Service	4.1
Post Office — Bureau of Facilities	8.1
Department of Transportation — Federal Aviation Administration	634.2
Veterans Administration	75.6
Department of Defense (DOD)	
Air Force	114,674.1
Army	3,182.0
Navy	22.2
Corps of Civil Engineers	45,946.4
Total (DOD)	**163,824.6**
TOTAL (Federal Lands)	**33,826,619.7**
OTHER PUBLIC	
State	2,815,600.1
County	105,200.0
Municipal	40,000.0
TOTAL (state, county, municipal)	**2,960,800.1**
PRIVATE	16,122,600.0
GRAND TOTAL	**52,910,020.1**

Source: Public Lands Statistics 1970 Bureau of Land Management

Future Land Use

Future land use in Idaho is dependent upon a number of factors. The development of substantial acreages of new lands for irrigation is possible if this is the course of action the state elects to follow and positive steps are taken to implement that choice. Should the state choose to follow a policy of "preservation", major land use changes in the future will be slight. A full discussion of this issue is presented in Chapter 2.

Any major future land changes would be associated with new agricultural development. Development opportunities however are controlled or limited by federal ownership throughout the state. A good example of this is the sizable amount (340,000 acres) of potentially irrigable



land within the National Reactor Testing Station (NRTS) in eastern Idaho. These lands may not be entered or reclaimed under present conditions. Table 5 shows the potentially irrigable land within the NRTS, by land class and the estimated depth to groundwater, which would be the water supply for these lands. Table 6 shows the potentially irrigable land by county.

The relationship between grasslands or rangeland and potentially irrigable lands (8,581,000 acres) is important when considering possible

TABLE 5
POTENTIALLY IRRIGABLE LANDS WITHIN NATIONAL REACTOR TESTING STATION
(By depth to groundwater)

Feet	Acres		
Depth to groundwater	**Class 1**	**Class 2**	**Class 3**
Under 300	19,709	77,517	21,619
300-400	17,938	18,701	16,566
400-500	0	19,046	11,878
Over 500	6,246	50,850	79,592
TOTAL	**43,893**	**166,114**	**129,655**

TABLE 6
POTENTIALLY IRRIGABLE LANDS WITHIN NATIONAL REACTOR TESTING STATION
(By county)

	Class 1		Class 2		Class 3	
County	**Acres**	**% of Total**	**Acres**	**% of Total**	**Acres**	**% of Total**
Butte	33,547	50	79,510	90	82,486	35
Bingham	6,246	4	22,289	53	10,696	10
Jefferson	4,100	16	63,525	6	26,143	55
Clark	0	0	790	1	10,330	12
TOTAL (acres)	**43,893**		**166,114**		**129,655**	
TOTAL (acres, all classes)			**339,662**			

changes in land use. The present rangeland usage, on about 36 percent of the area in the state (23,200,000 acres), supports a thriving livestock industry. Since the expansion of irrigated cropland would occur primarily on lands presently used as rangelands, increased pressures on rangeland use will be felt in the future from both irrigation and livestock.

Some new irrigated development may occur on nonirrigated cropland which now occupies about 4 percent of the total area in the state. Sizable acreages of nonirrigated cropland however are presently being farmed successfully. A good example of this is the high yield wheat crops being grown in the Palouse Basin. It is unlikely that there will be any conversion of this type of dry farm cropland to irrigated cropland.

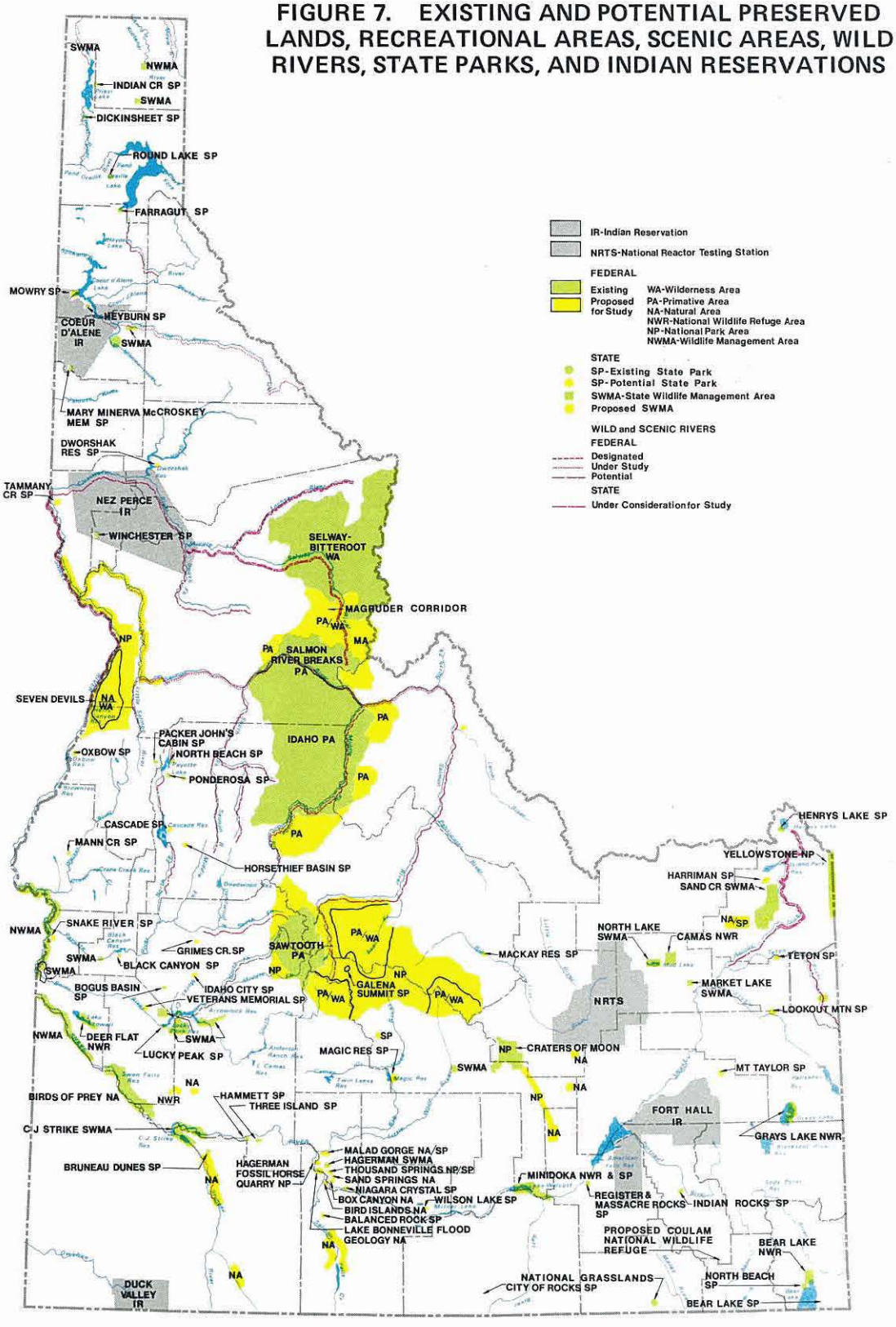
Preserved Lands

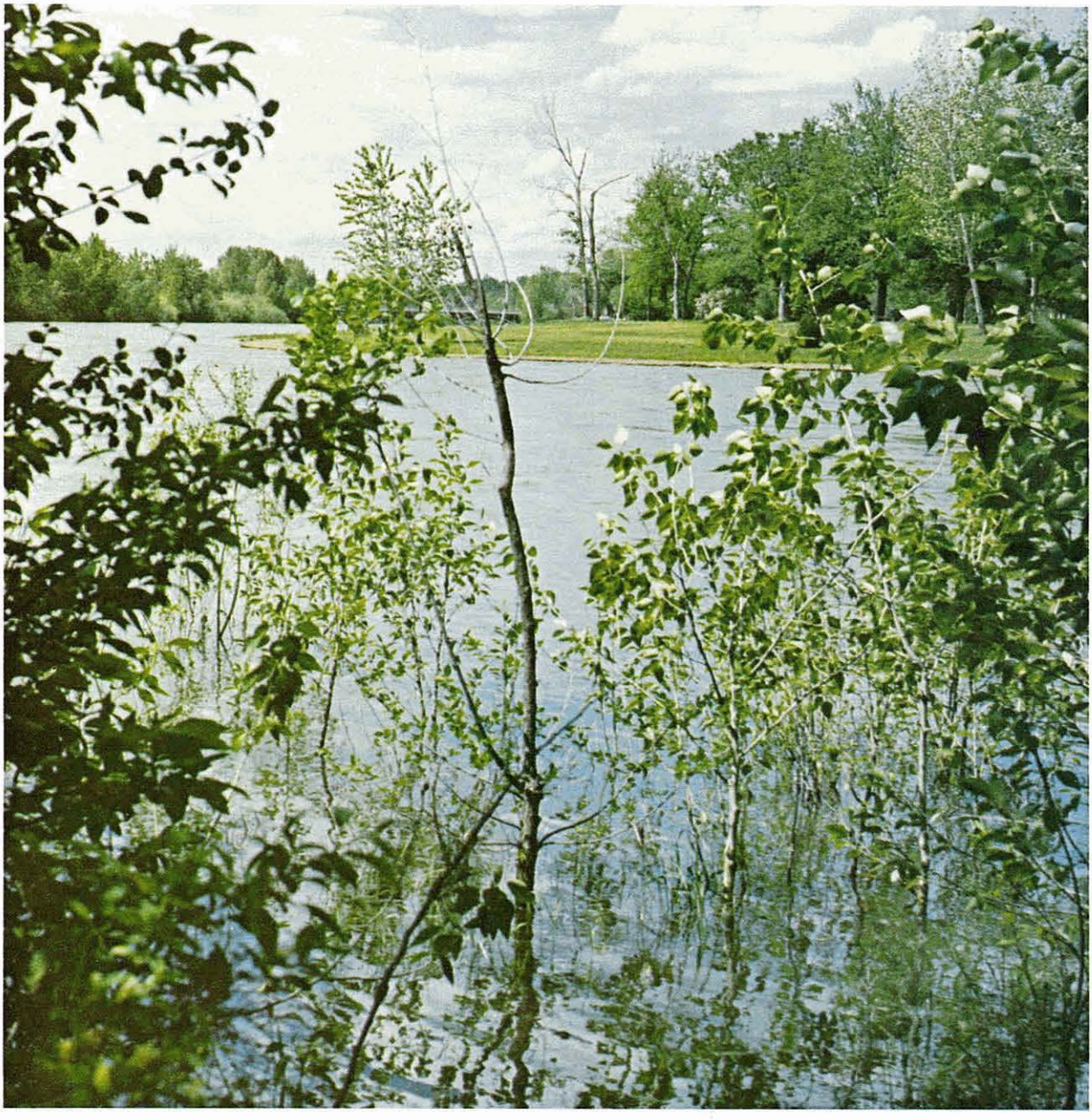
A considerable acreage of the federally owned land are preserved lands set aside as wilderness or primitive areas. Among these lands are the Selway-Bitterroot Wilderness, Idaho Primitive Area, Salmon River Brakes Primitive Area, Hells Canyon - Seven Devils Scenic Area, White Clouds Peaks Area, Nez Perce National Historical Park and Craters of the Moon National Monument. Other lands of specific use would be the Fort Hall, Duck Valley, Nez Perce and Coeur d'Alene Indian reservations and the National Reactor Testing Station. In the Malad area in the southeast corner of Idaho, the Department of Agriculture has purchased an area of dry farms and set them aside as a preserved grazing area known as the Curlew National Grass Lands. Preserved lands, recreational resources, and other scenic areas are located on Figure 7.

Recreational Lands

Recreational lands in the state are interlocked with designation of preserved areas and other specific land use programs. A large portion of Idaho is forested land and provides opportunities for hunting, fishing, camping and hiking. There are also several desert-like expanses. A partial listing of these areas include: the barren and desolate 80 square miles around Craters of the Moon National Monument; the "City of Rocks" in Cassia County where massive rock forms have been carved in granite mountains by erosion; the geyser area near Soda Springs; Bruneau River Canyon; Bruneau Sand Dunes and St. Anthony Sand Dunes. Each of these areas represent a recreational resource. Recreation and tourism are expanding rapidly as a major state industry. Future land use in Idaho will reflect the emphasis that recreation and tourism receives at the national, state and local levels.

FIGURE 7. EXISTING AND POTENTIAL PRESERVED LANDS, RECREATIONAL AREAS, SCENIC AREAS, WILD RIVERS, STATE PARKS, AND INDIAN RESERVATIONS





WATER RESOURCES

Idaho is fortunate to have significant quantities of both surface and groundwater. There are over 16,000 miles of streams and more than 2,000 natural lakes. The lakes range in size from large, readily-accessible ones, to small, alpine lakes in wilderness areas.

Surface Water

The principal supplier of consumptive water uses is the Snake River. With the exception of the Bear River Basin, all runoff in Idaho flows generally from east to west draining into the Columbia River.

Streams are fed mostly by snow melt; and, as a result, natural flows usually exhibit regular patterns of low flows during the fall and winter months and high flows during the spring and early summer months. Although rainstorms cause some streams in foot-hill areas to rise rapidly, the runoff contribution is not significant.

Little is known of the effect of development, such as the large irrigated tracts, on the pattern of precipitation in an area. At present we can only conclude that the average pattern of precipitation has not been changed significantly by the works of man.

This is not true of streamflow especially in areas such as southern Idaho where a high level of development has occurred. The magnitude and seasonal distribution of flows of the Snake River and many of its tributary streams are affected greatly by storage facilities, diversions and return flows from irrigation, and consumptive use of water by plants. In dry years flows of the Snake River above Milner Reservoir are almost entirely regulated. Flows generally are higher in the summer as releases are made for downstream irrigation but become low in the late fall as flows are stored for the next year. There are about 16,000 miles of free flowing streams in the state.

Figure 8 illustrates the mean annual runoff of the principal streams of the state and the uneven areal distribution of water occurrence. Figure 8 is based on streamflow records from 1929 to 1958 adjusted to reflect 1970 level of development. Stream widths are shown in proportion to the mean annual runoff.

Presented in Table 7 are streamflow summary data for selected points on the river systems.

The pattern of discharge during the year for regulated streams may vary widely from the pattern which existed before regulation, depending on the magnitude of storage facilities and diversions for irrigation and other purposes.

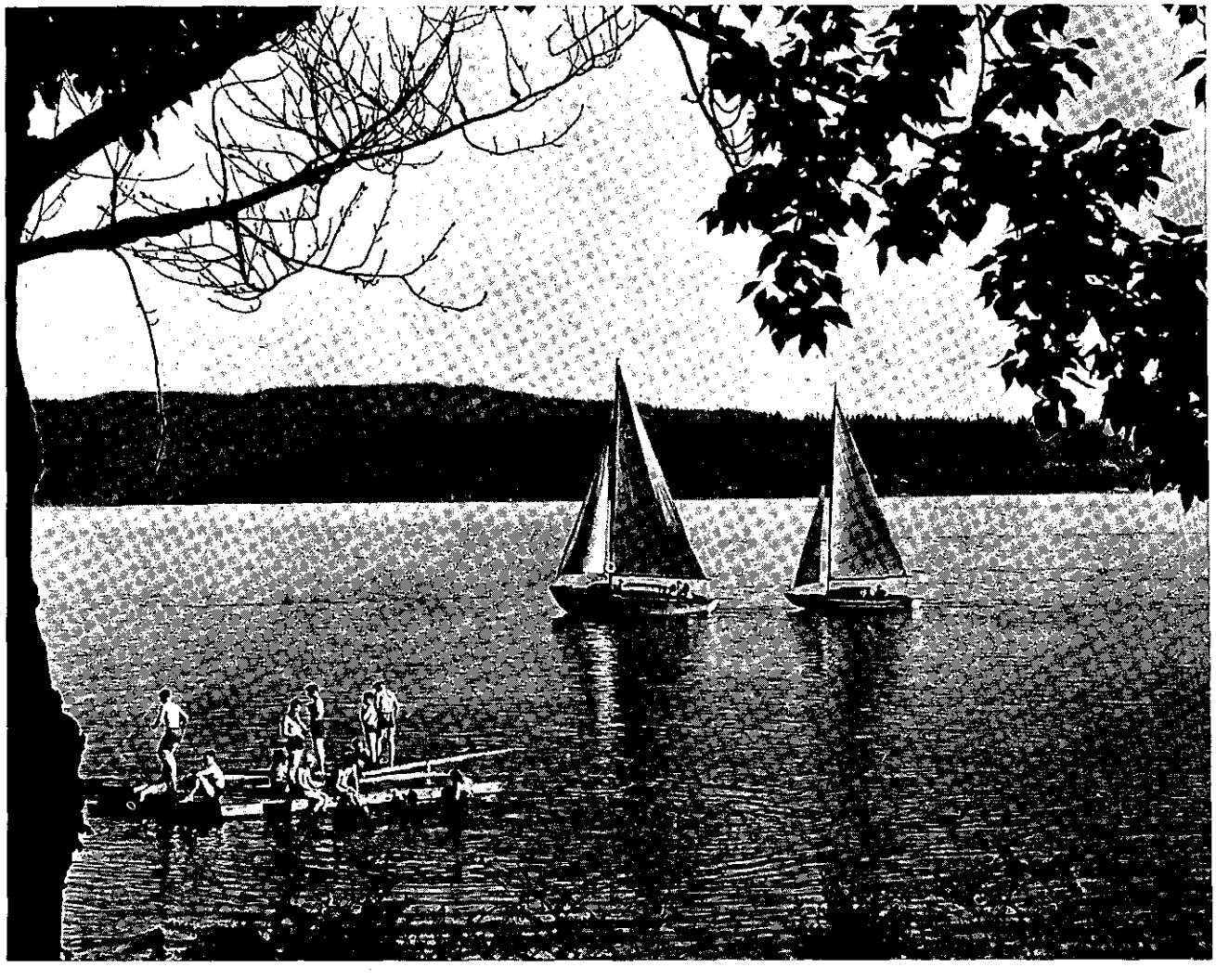


TABLE 7
STREAMFLOW SUMMARY FOR SELECTED POINTS ON RIVER SYSTEMS
(Periods of record, 1903-1970)

Stream	Station	Drainage Area (sq. mi.)	Period of Record	Annual Flows[1] (cfs) Mean	Maximum	Minimum	Momentary Flow[2] (cfs) Maximum	Minimum
Kootenai River	Leonia	11,740	28-65	13,277	18,950	9,174	123,000	996
Moyie River	Eileen	755	26-65	854	1,322	323	11,000	40
Kootenai River	Porthill	13,700	28-65	15,328	22,143	9,921	125,000	1,380
Clark Fork	Whitehorse Rapids	22,067	28-65	20,889	30,086	11,266	153,000	270
Pend Oreille River	Newport	24,200	03-41	24,457	35,269	14,408	136,000	1,280
Coeur d'Alene River	Caltaldo	1,200	20-65	2,471	3,862	1,043	67,000	122
Spokane River	Post Falls	38,400	12-62	6,350	10,030	2,580	50,000	104
Snake River	Idaho-Wyoming Line	3,940	45-54	4,780	7,075	2,980	28,200	1,050
Snake River	Heise	5,752	11-65	6,489	8,735	4,765	60,000	460
Henrys Fork	Rexburg	2,920	09-65	1,512	2,387	798	11,000	183
Blackfoot River	Blackfoot	1,295	13-65	154	294	41	1,710	0
Portneuf River	Pocatello	1,250	11-65	236	383	118	2,990	0.4
Snake River	Neeley	13,600	06-65	6,271	9,241	4,545	48,400	50
Snake River	Milner	17,180	09-65	1,545	4,583	244	40,000	2
Big Lost River	Mackay	813	19-65	279	418	128	2,990	18
Big Wood River	Gooding	2,990	16-65	198	688	21	8,860	0
Snake River	King Hill	35,800	09-65	8,590	11,999	6,909	47,200	1,250
Bruneau River	Hot Spring	2,630	44-65	342	586	113	6,500	25
Boise River	Near Boise	2,680	55-65	2,619	4,207	1,291	35,500	0
Boise River	Notus	3,820	20-65	960	2,325	289	20,500	10
Payette River	Horseshoe Bend	2,230	19-65	3,070	4,611	1,834	27,000	350
Payette River	Payette	3,240	35-65	2,707	4,521	1,430	30,900	180
Weiser River	Weiser	1,460	52-65	1,004	1,905	424	19,900	14
Snake River	Weiser	69,200	11-65	15,074	24,491	9,697	84,500	5,100
Snake River	Oxbow	73,150	58-65	16,338	26,037	11,124	76,800	441
Salmon River	Challis	1,800	28-65	1,459	2,344	855	15,400	160
Salmon River	Salmon	3,760	19-65[3]	1,898	2,911	1,157	16,500	242
Salmon River	French Creek	12,270	44-65	9,230	13,770	4,957	88,600	1,790
Salmon River	Whitebird	13,550	19-65	10,690	15,891	5,792	106,000	1,580
Selway River	Lowell	1,910	29-65[3]	3,604	4,926	2,233	48,900	100
Lochsa River	Lowell	1,180	29-65[3]	2,712	3,742	1,581	35,100	100
Clearwater River	Kamiah	4,850	10-65[3]	7,674	11,170	4,755	103,000	179
Clearwater River	Spalding	9,570	25-65[3]	14,573	22,447	9,826	177,000	500
Snake River	Clarkston	103,200	15-65	45,850	65,489	31,206	369,000	6,660[4]
Bear River	Border, Wyoming	2,490	37-70	247	528	44	3,680	30
Bear River	Oneida	4,400	21-70	480	1,010	301	5,480	10

[1] *Regulated values for base period* (1929-58) with estimated 1970 conditions of development, except Bear River (1931-60)
[2] Maximum and minimum observed instantaneous values for period of record
[3] Denotes other short periods of record prior to dates shown
[4] Caused by construction closure at Brownlee Dam; natural minimum about 10,600 cfs

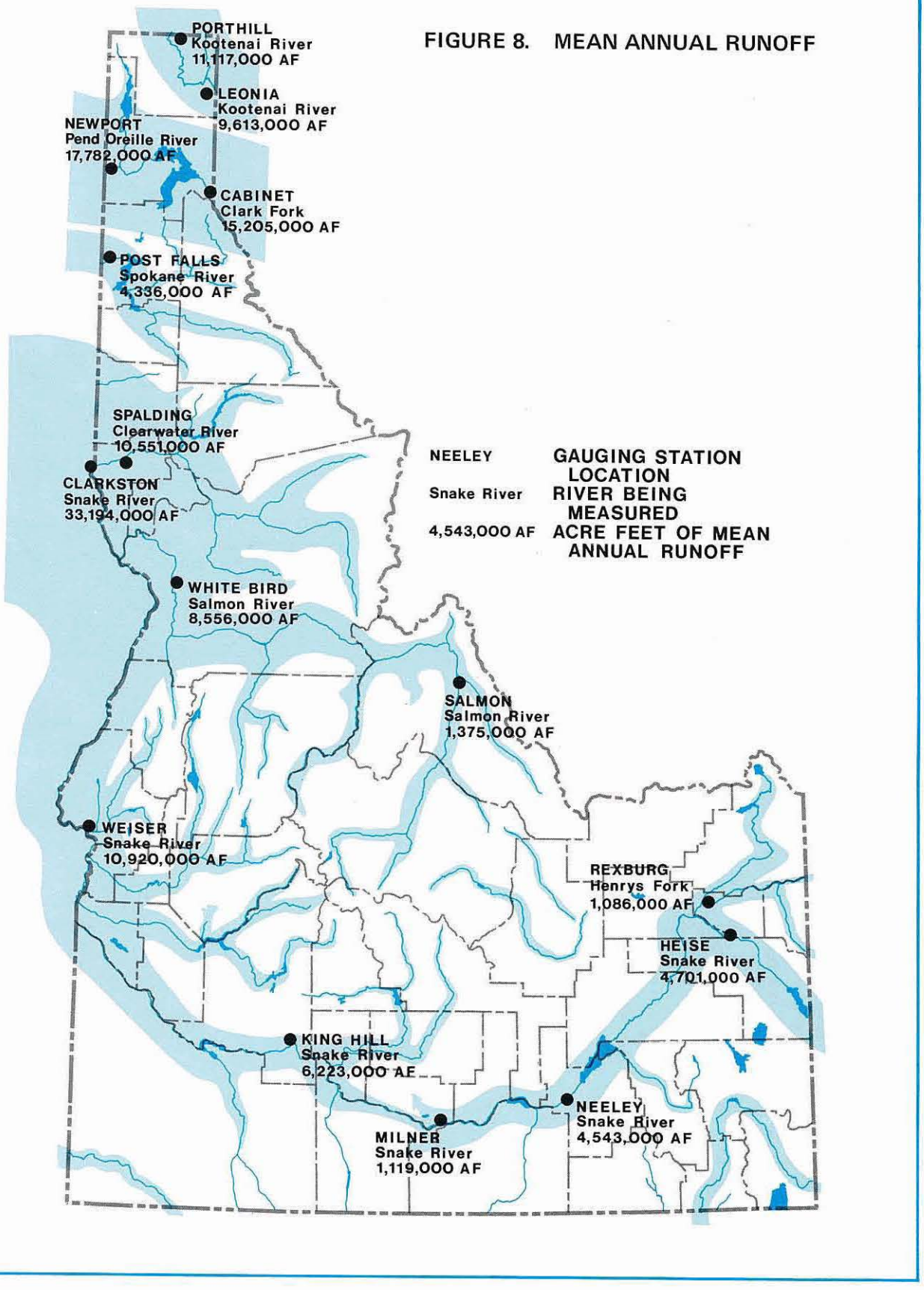
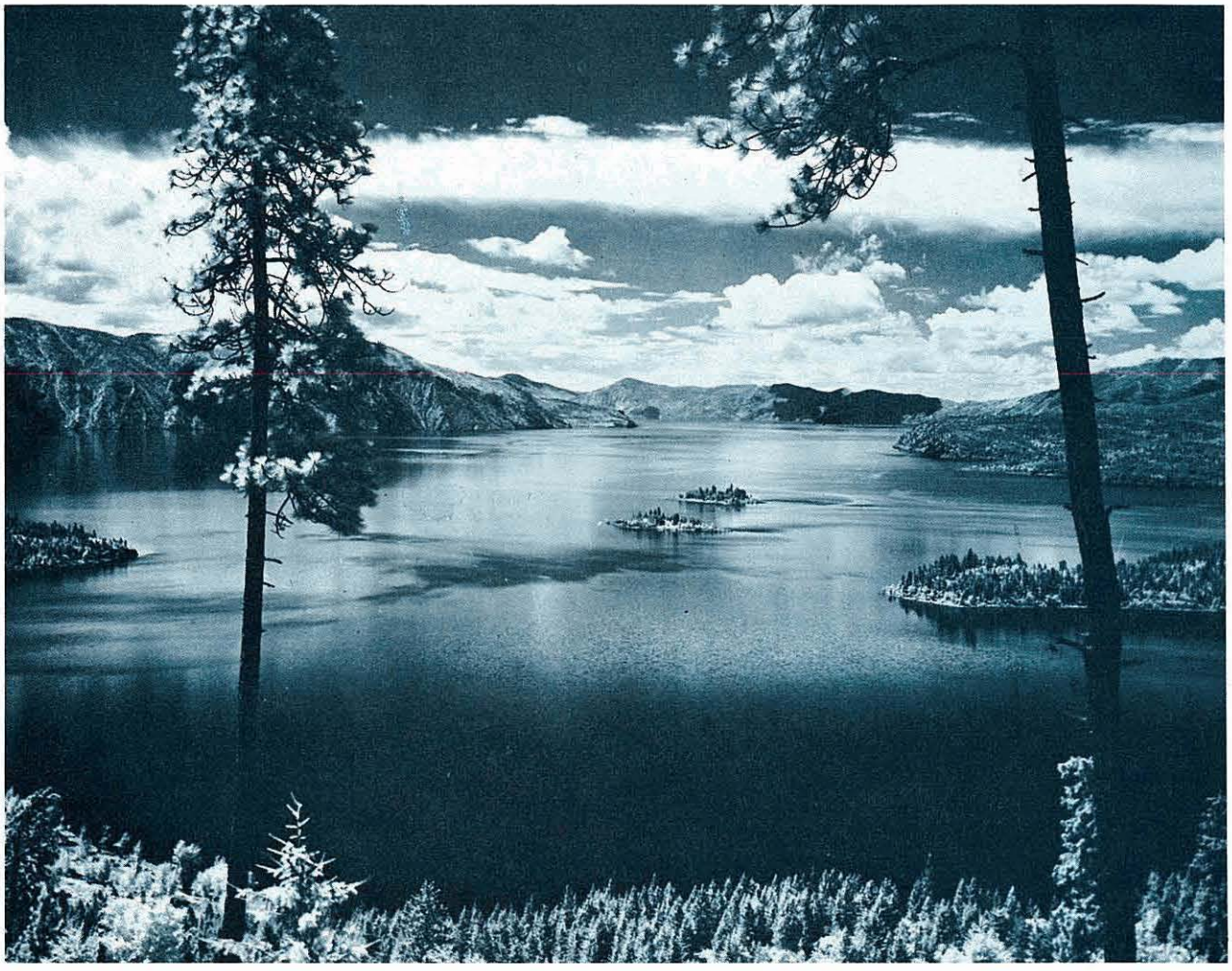


FIGURE 8. MEAN ANNUAL RUNOFF



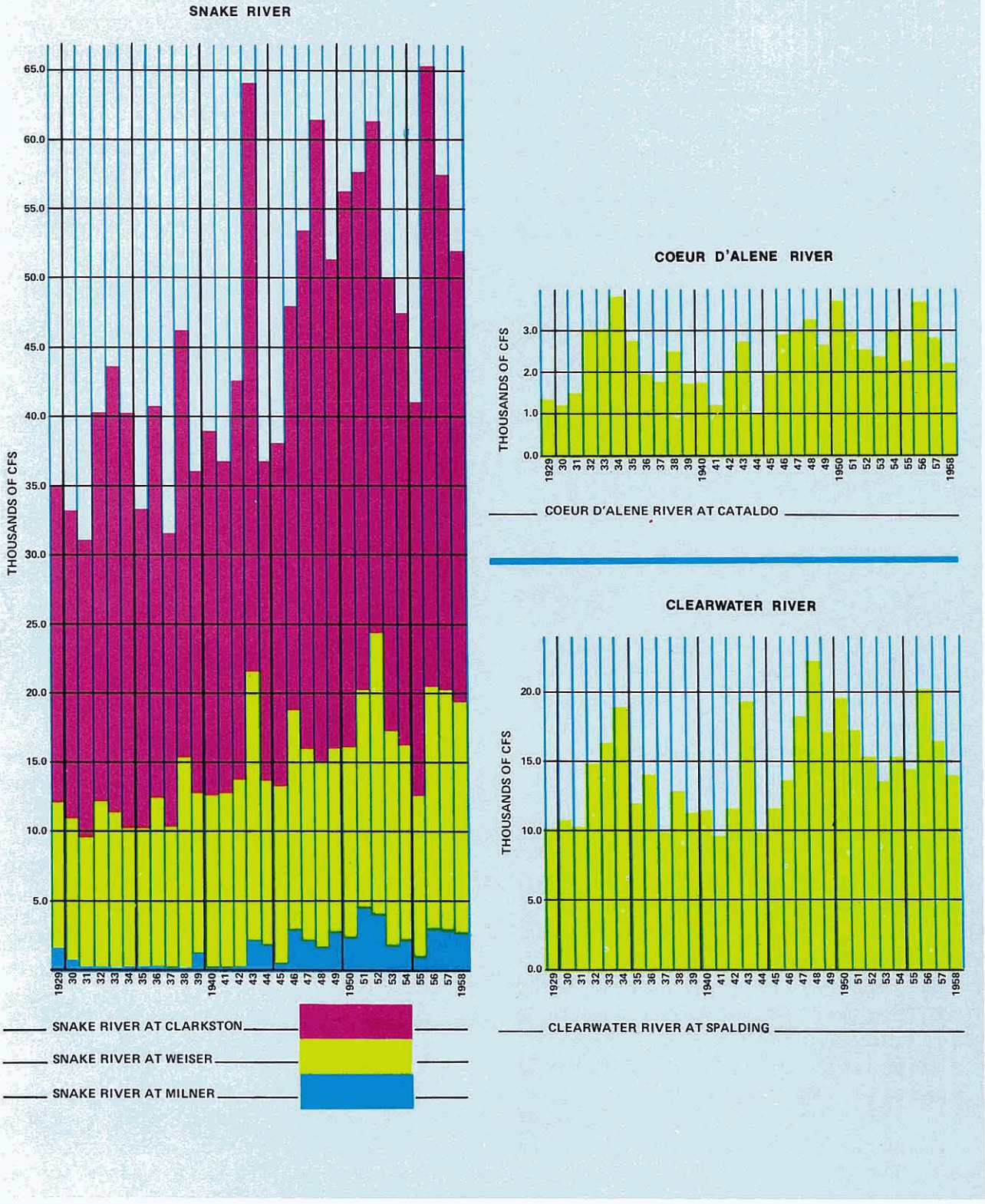
Planning for new water-use projects requires thorough knowledge of the available water supply. The hydrologic data necessary to estimate the probable future water supply and the dependable yield during drought periods must be based on a sufficient period of record to include the effects of variable weather. Thus, predictions of water availability in the future are based on runoff records of the past. If, during the period for which runoff was recorded, changes have occurred in the use of water, the effects of these changes are considered in estimating future supplies. To determine water availability under present levels of development records of runoff covering a period of many years are adjusted to a comparable level of water-supply development and water use. Figure 9 shows variations of annual streamflow at five selected sites under present conditions.

Although Idaho is not known as a "land of lakes" it contains over 2,000 lakes ranging in size from small alpine lakes to Pend Oreille Lake with a surface area of 148 square miles. By comparison the largest reservoir is American Falls on the Snake River with a surface area of 88 square miles.

A majority of the natural lakes occur in the central mountainous portion and the origin of most of these is associated with mountain-valley type glacial action. Others were formed as the result of volcanic activity and warping of the earth's crust. At least one lake (Roosevelt Lake, Valley County) was formed as the result of a large landslide.

A number of large natural lakes in Idaho are regulated within prescribed limits by dams at their outlets, and thus provide a certain amount

FIGURE 9. STREAMFLOW VARIATIONS



of water in storage that can be released as desired. In this way, they serve as artificial reservoirs. Examples are Payette, Bear, Coeur d'Alene, Priest, and Pend Oreille lakes. Also Jackson Lake in Wyoming is operated for water users in Idaho.

Natural lakes are better known for the recreational advantages they offer than for their direct contribution to the state's economy. These lakes contribute to Idaho's scenic beauty and many provide ideal sites for summer homes, tourist resorts, and other recreational facilities. Idaho has no saline lakes (lakes containing dissolved solids in excess of 1,000 ppm).

Very few depth measurements of natural lakes in Idaho have been reported. A detailed survey of Pend Oreille Lake was made by the U.S. Coast and Geodetic Survey; and, from the resulting map, the maximum depth of this lake is apparently about 1,200 feet. Israel C. Russel (1885) reported the depth of Payette Lake (Valley County) to be in excess of 300 feet.

Although many reservoirs have the outward appearances of natural lakes, there are important differences in the manner in which these bodies of water are used. Reservoirs, other than those constructed to provide powerhead, often contain little inactive storage. Most of the water stored is released to provide for specified needs. In contrast, almost all of the water stored in natural lakes is "inactive" in that it lays below the level of the natural outlet.

Many of the larger reservoirs were built to serve more than one purpose. The flood-control pool (space at the top of the reservoir above some specified level) is used to store flood flows. The stored flood water is released gradually so as not to exceed downstream channel capacity and the space made available to store further flood flows. Other allotted spaces in reservoirs include space for the power pool, the irrigation pool, the conservation pool, etc. The operation criteria established for each reservoir is dependent upon the purposes for which the reservoir was built and the relative priorities assigned to each. A list of reservoirs containing flood control space is found in Table 38, in Chapter 3.

As of January, 1963, Idaho had 51 reservoirs completed or under construction each having a usable capacity of 5,000 acre-feet or more (Martin and Hanson, 1966). The total usable storage represented by these reservoirs is 10,560,100 acre-feet and the total surface area is 532,343 acres. These reservoirs have inundated about 600 miles of the 16,000 miles of Idaho streams.

In general, the quality of surface waters is good regardless of which quality parameters are used as a yardstick. This is to be expected in an area of low population density with relatively little industrial activity. Pollution problems do exist in localized areas and are a threat to water quality.

Groundwater

Groundwater is one of the principal resources of Idaho. Since World War II the development of groundwater supplies for irrigation purposes has been increasing at such a rate that serious overpumping has occurred in some areas such as the Raft River Valley, portion of the Goose Creek drainage south of Burley, and the Blue Gulch area west of Twin Falls. New wells in these areas are restricted. However, in spite of the fact that mining of groundwater is occurring at localized areas, the state's overall groundwater potential has barely been tapped.

The principal aquifers occur in the Snake River Plain of southern Idaho, Rathdrum Prairie of northern Idaho, and along the western side of the state. The mountains in the central portion are composed largely of consolidated rocks with resultant low permeability. Intermontane valleys and basins which are partially filled with alluvial sand and gravel are important as seasonal groundwater reservoirs, storing water during periods of high rainfall or snow melt. Groundwater from these areas is not utilized to any great extent as a source of water supply.

Although groundwater is discussed herein as a special phase of the hydrologic cycle, it is not an isolated phase. Groundwater contributes to the flows of springs (Thousand Springs for example), lakes, and reservoirs, and streamflow.

Therefore, projects which influence the hydrologic cycle of groundwater — such as pumping or recharge projects — in turn affects the surface system. The total water resources of the state (surface and groundwater), can be utilized most efficiently through a "conjunctive operation" of surface and groundwater systems.

Discharge from the Snake River Plain aquifer is about 6,500 cubic feet per second in the Twin Falls — Bliss reach of the Snake River and about 2,500 cubic feet per second in the vicinity of American Falls Reservoir. Outflow from the Rathdrum Prairie aquifer is about 1,000 cubic feet per second.[1]

Throughout the Snake River Plain and in many areas southeast, south, and southwest of the Snake River, the principal supply of water is from wells which extend into consolidated rocks — mainly basalt. Wells in the lower part of the Clearwater Basin also extend into the basaltic lavas. In the large intermontane valleys and basins (such as the Lemhi and Pahsimeroi), and in the stream valleys of the major drainage basins, most wells draw water from the coarser parts of the unconsolidated alluvial materials which have been transported from adjacent mountains. Generally, these deposits consist of poorly sorted mixtures of gravel, sand, and silt, or clay. They usually are better sorted and are more permeable in the central parts of the valleys. Sedimentary deposits interlayered with basaltic lavas yield water to wells in some localities. Because many of these deposits are fine textured, they tend to restrict the vertical movement of water through the basalt flows.[2] Figure 10 shows the principal aquifer units and common depths of wells.

Approximately one million acres of land are presently irrigated with groundwater in the state.[2] In addition, nearly all water requirements for municipal, industrial, domestic and livestock uses are met from groundwater. Many of the uses of water have nearly constant demands, but

the largest use, that of irrigation, has a demand only during the growing season for crops. Because of this, and the fact that replenishment of groundwater aquifers is seasonal and sometimes cyclical, the availability of groundwater tends to vary throughout the year and from one year to the next. Small quantities of groundwater can be obtained from wells and springs overall in most years. However, only in specific areas are large quantities of suitable water available within present economic pumping limits. These areas are mainly in southern Idaho and along the western side of the state.

Adequate basic data are an essential prerequisite to understanding and evaluating the supply of groundwater available from an aquifer and the effect that increased withdrawal will have on water levels and on the quality of water in the aquifer.[1] Water levels in wells indicate the stage of the aquifers. Periodic measurements of these levels show the extent of depletion by drought or by heavy pumping; and the extent of renewal in seasons of abundant rainfall or melting snow. Effects of changes in the water regimen can be evaluated and future effects predicted by interpretation of water level fluctuations. Hydrographs of selected wells in Idaho are shown in Figure 11.

The U.S. Bureau of Reclamation has constructed and is now operating an electric analog

[1]Water Resources in Mineral and Water Resources of Idaho; Senate Committee on Interior and Insular Affairs; Special Report No. 1; 1964.

[2]Summary of Groundwater Conditions in Idaho; Idaho Department of Reclamation; Water Information Bulletin No. 1; 1966.

FIGURE 10. GROUNDWATER AQUIFERS

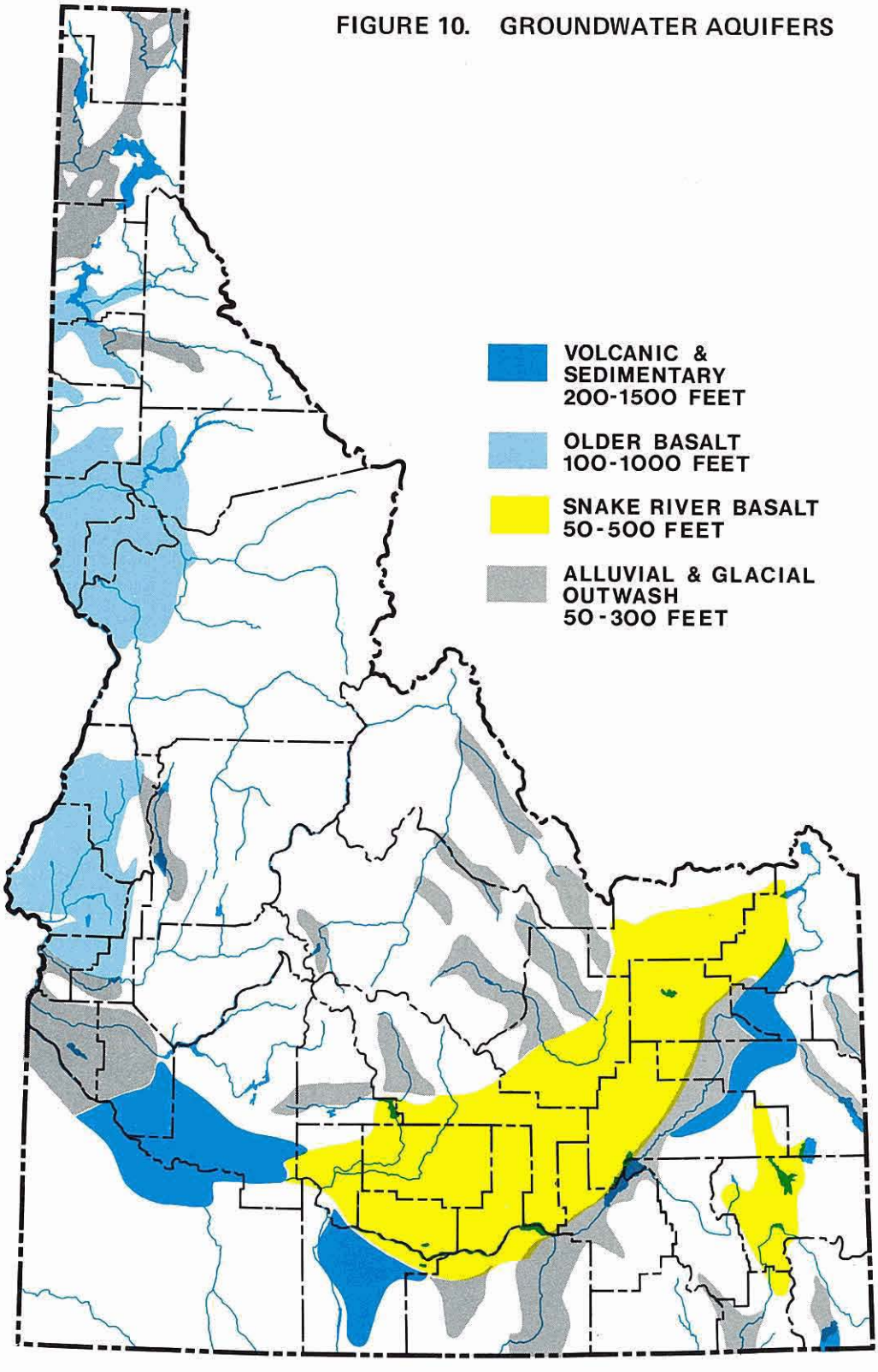
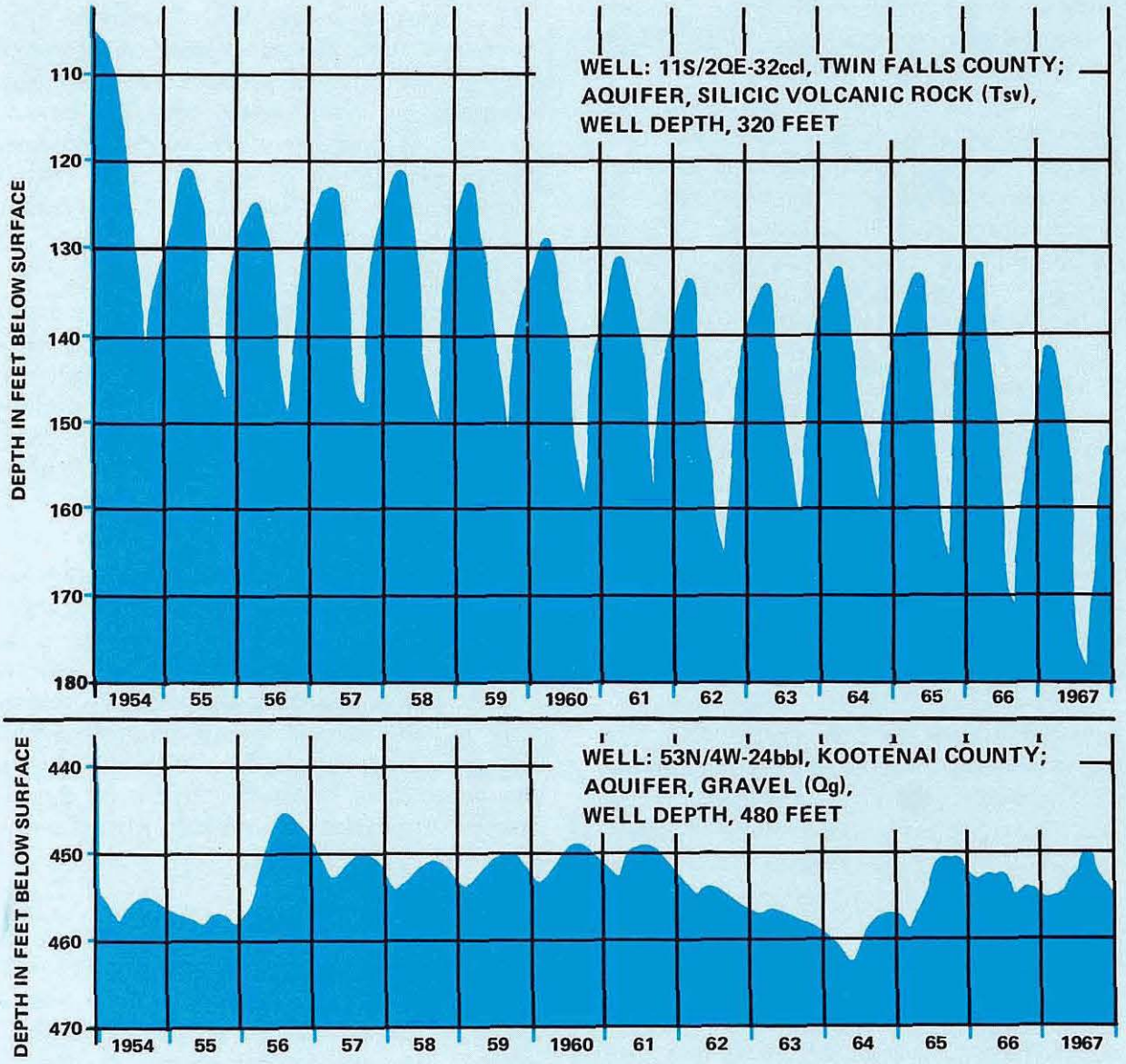


FIGURE 11. HYDROGRAPH OF WELLS



model of the Snake Plain aquifer to correlate existing geologic and hydrologic data and to guide future operation and development of water resources.[1] This model is used to study the possibility of developing the Snake Plain aquifer to supply pumped irrigation water and store excess surface flows as recharge. Another analog model, covering essentially the same area, has been constructed by the U.S. Geological Survey. In the latter model, the capacitors for handling storage effects are treated somewhat differently.

Data and information with respect to the quality of groundwater is somewhat easier to come by and usually quite reliable. The gross water quality characteristics are affected by the

[1]Progress Report, Snake Plain Aquifer Electric Analog Studies; U.S. Bureau of Reclamation; 1967.

geology of the aquifer from which the water emanates. Since most of the major aquifers in Idaho contain igneous materials which do not contain large quantities of soluble materials, the quality of groundwater is generally excellent, low in total dissolved solids and predominantly of the calcium bicarbonate type.

Groundwater conditions in the Bear River Basins are not well-known and the characteristics of natural recharge of the aquifers is even less established. More is known about groundwater in the Malad Valley, an area in which groundwater is being developed extensively, than in any other part of the Bear River Basins. Studies indicate that artesian aquifers in this area are naturally recharged through their outcrops around the flanks of the valley; by underflow from unconfined aquifers that are continuous with or in contact with the artesian aquifers; and by migration of water along faults that offset or are overlapped by the artesian aquifers. Unconfined aquifers are recharged by downward percolation from the surface, by underflow from adjacent sources, and by upward leakage from artesian aquifers.[1]

A determination of how much natural recharge now occurs is very difficult and has been done for only a few basins such as the Panhandle Basins. There has been no significant change in water level in most of the Panhandle Basins, and it is assumed that average annual recharge is about equal to the total of natural and pumped discharge.

In the Snake Plain aquifer, the alluvial deposits and basaltic lavas act essentially as a single aquifer. A great deal of recharge to the alluvium moves laterally and becomes underflow in the lavas. It is difficult to determine recharge to those units without accounting for the same water several times. Also, some of the water diverted from the Snake River percolates to the aquifer, and returns to the river or to American Falls Reservoir, where it is again diverted for irrigation. Some water cycles in and out of aquifers at least three times as it moves from the upper end of the Snake River Plain to the lower end. Thus, although 15 million acre-feet may be roughly the gross annual recharge to the aquifer units — the net annual recharge is more nearly on the order of 10 to 12 million acre-feet.[2]

Estimates of annual natural recharge in the Southwest Idaho Basins are based on a combination of estimates of precipitation percentages becoming groundwater and base-flow data for streams. At best, they are very approximate figures. According to the estimates, natural recharge in the Southwest Idaho Basins is about 1.7 million acre-feet a year.[3]

Few studies have been made of the natural recharge in the Salmon and Clearwater basins Since there has been no known significant change in water level in most parts of these basins, it is assumed that average annual recharge is about equal to the total natural and pumped discharge.

In southern Idaho, streamflow during wet years is generally in excess of the present ability to utilize or to store the water in surface reservoirs. The Snake Plain aquifers however contain a large storage capacity that is presently only partially utilized. Where conditions such as this occur the potential for artificial recharge of the groundwater reservoir to provide interim storage of excess streamflow merits serious consideration.

Obviously, many factors are involved in determining the feasibility of artificially recharging a given groundwater reservoir, not the least of which is the availability of recharge water at suitable locations for introducing it into the underground reservoir at acceptable rates and in sufficient quantity. Nevertheless, if the problems of water rights, cost of conveyance facilities, and location of suitable recharge sites can be solved, there are several areas in the state such as in the St. Anthony and Idaho Falls areas where the

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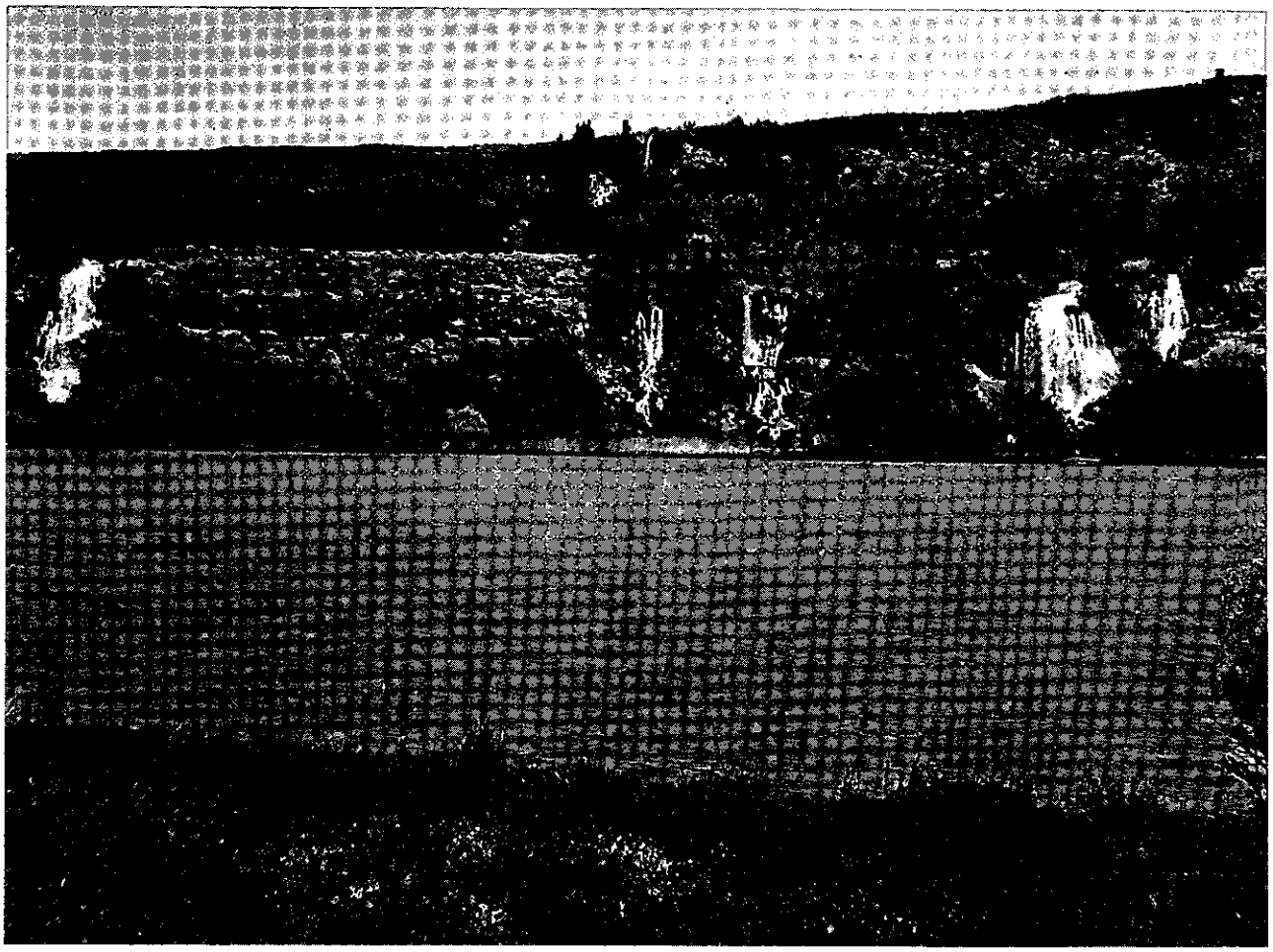
[1] Summary of Groundwater Conditions in Idaho; Idaho Department of Reclamation; Water Information Bulletin No. 1; 1966.

[2] Columbia-North Pacific Region Comprehensive Framework Study; Appendix V; 1970.

[3] Proportioned from Columbia-North Pacific Region Comprehensive Framework Study; Appendix V; 1970.



opportunity for artificial recharge should be seriously considered.

Wherever surface flows are diverted and applied for agricultural purposes, artificial recharge is going on now as excess irrigation water moves downward to the groundwater reservoir. In many areas in and adjacent to the irrigated lands the groundwater storage capacity is not now being utilized. In those areas where adequate groundwater storage is available and supplemental water supplies are needed, utilization of the underground reservoir storage capacity may offer sizable benefits if the geology is such that effective recharge can be accomplished.

All groundwater reservoirs have a natural inflow-outflow characteristic. Surplus streamflow during periods of excessive runoff can be artificially placed in groundwater storage for carryover storage (one to several years) to meet needs during dry periods and to help maintain water levels within the aquifer at economic levels for pumping. Other advantages of groundwater storage include elimination of evaporation losses and reservoir sedimentation. Numerous problems may also occur. The chemical compatibility of recharge water with that already in the aquifer requires study, as does the problem of how the recharge water moves from the recharge site, water-logging of adjacent lands, biological and mechanical plugging of recharge facilities, and other operational problems.

In summary, there are large groundwater reservoirs in some parts of Idaho that have storage capacities not being utilized under present conditions. Where these occur in close proximity to streams that carry excess flows, the opportunity for beneficial artificial recharge should be studied.

GEOTHERMAL RESOURCES

The geothermal resources of the state are receiving increasing interest.

The hot springs of Idaho are concentrated along two cells of sub-crusted convection and heat conduction. These cells extend beneath the continent and rifts from the Pacific Ocean floor. These same two rifts are associated with similar thermal zones in California, Nevada, and Oregon. Surface indications point to greater accumulation of steam in Nevada and California than here but the geothermal potential in Idaho should not be ruled out. A January 1970, report of the Idaho Bureau of Mines and Geology, "Geothermal Potential of Idaho" inventoried almost 400 thermal wells and springs.

The Geothermal Act of 1970 provides for the classification of lands valuable for geothermal steam and associated geothermal resources. Land is so classified in order to reserve or retain them in federal ownership and to determine for the Department of Interior which lands are included within the "known geothermal resources area" (KGRA) and thus subject to the competitive leasings provisions of the Act. Two areas in Idaho totaling 21,844 acres have been classified as KGRA. One area is in south-central Idaho and the other close to the western boundary of Yellowstone National Park.

Potential uses for geothermal resources include power generation, heating, raising certain kinds of crops and fish, desalinization of salty waters and mineral extraction.

The use of geothermal resources is just beginning to develop. What role it may play in Idaho is unknown at this time. Further study is needed to identify possible geothermal plant locations and to determine if new legislation is needed to manage this resource.

MINERAL RESOURCES

Mineral resources played a prominent role in the state's early settlement and economic growth. Many present-day towns and counties originated in the gold rushes which are a glamorous part of Idaho's history. Other once thriving settlements, such as Idaho City and Silver City, faded as the supplies of gold and silver dwindled.

Metal deposits which dominated the mining industry's early years, still produce valuable yields. Idaho currently leads the nation in silver mining and silver was the state's most valuable mineral product in 1970. Although annual production declined slightly in 1970, higher silver prices more than made up for the decrease. Idaho also produces major amounts of lead and zinc, and remaining deposits should permit continued production of silver, lead, and zinc at present rates.

By far the greatest part of mineral production occurs in the Coeur d'Alene mining district of Shoshone County in northern Idaho. The region is famous for its yields of lead, silver, zinc, and copper, but it also contributes small amounts of gold, antimony, and tungsten. In 1970, 18,580,000 of the 18,843,831 troy ounces of silver mined in Idaho (nearly 99 percent) were produced in the Coeur d'Alene district. The district also accounted for more than 90 percent of the total amounts of gold, copper, lead, and zinc mined in Idaho.

Southeastern Idaho contains the nation's largest phosphate resource, with possibly 50 percent of the total U.S. reserves. The industry is still in its infancy however and presently provides only 10 percent of national phosphate rock production. The areas of active mining in 1970 are shown in Figure 12.

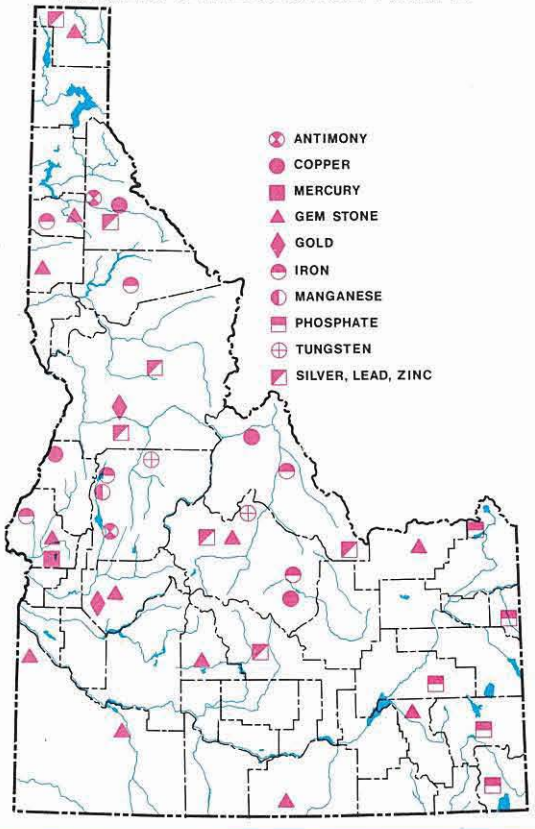
Mineral production in the state, including agricultural, construction, and strategic minerals as well as metals, declined slightly in 1970, to $116.5 million, from the 1969 record value of $118,300,000. In 1969 Idaho ranked 32nd among the 50 states in value of mining production.[1] In 1970, mining employment was also down, totaling approximately 3,500, but average hourly earnings increased somewhat.

Metals

Gold deposits are found throughout the state in streams, veins, and associated with other

[1] Idaho Inspector of Mines, 1971.

FIGURE 12.
MINERAL RESOURCE AREAS



minerals in complex deposits. Only dredging remains as an economically profitable method of gold mining since the larger deposits have been worked out. The nature of the deposits precludes the possibility of developing any large reserves, and all newly mined gold must be sold to the federal government for distribution to industry and the arts.

Ores containing primarily lead occur mostly in northern and south-central Idaho. One of the most useful metals known to man, lead has almost endless applications. Lead mining and smelting are among the most stable industries and reserves seem to be sufficient to last for some time.

Most bonanza silver lodes have been exhausted, but reserves of lower grade ore should sustain Idaho's record production levels for several more years, and considerable exploratory activity is being conducted for new sources.

Zinc is currently used for zinc-base alloys and for galvanizing in the manufacture of galvanized sheets, wire rope, tubes, and pipe. Future production will probably depend more on prices and market than on any shortage of reserves.

Iron ore used in the production of cement is mined in Washington and Valley counties, but production was down 50 percent in 1970 from the 1969 total.

Copper deposits have not been fully exploited because of inaccessibility resulting in high transportation costs and the greater profits to be derived from other ores. Higher prices and better access could result in future expansion in copper mining. The deposits occur primarily in Shoshone County, with exploration drilling near Mackay in Custer County and near Cuprum in Adams County.

AGRICULTURAL MINERALS. The growth of a market for phosphate in recent years has caused a phenomenal increase in its production in Idaho. Phosphate is used primarily to make super-phosphate fertilizer and elemental phosphorous. Abundant quantities of phosphate rock are found in bedded sedimentary deposits throughout the southeastern part of the state.

Gypsum, found mainly along the Snake River north of Weiser, is added to agricultural soils to supply sulphur as a plant food and to improve the condition of the soil. The building industry also utilizes gypsum.

CONSTRUCTION MINERALS. Reserves of limestone and shale are sufficient to supply the state's principal cement plant for many years. The plant is located south of Pocatello at Inkom in Bannock County. Future demand for cement is expected to increase with the growth of urban centers.

Other construction materials mined include mica (which is used for heat and electrical insulation); pumice (an ingredient used in building blocks); cement; sand and gravel; perlite; stone (especially basalt); and volcanic cinder.

Clay produced in Cassia, Minidoka, and Bonneville counties provides the raw material for brick plants at Burley and Idaho Falls and for other heavy clay products. Since the supply is

almost inexhaustible, future clay production will depend primarily on market demand, but it could become one of Idaho's most important nonmetallic industries.

STRATEGIC MINERALS. Uranium deposits are found in several locations, but only the deposit near Stanley has been actively mined. All ores mined must be sold to the Atomic Energy Commission for the production of fissionable material.

Beryllium, a mineral of growing importance for a variety of industrial, research, and strategic uses, has been discovered in several places in Idaho.[1] The largest deposit is in the Sawtooth Mountains northwest of Sun Valley. Titanium (used in the manufacture of pigments), antimony (an ingredient in lead and tin-base alloys), and mercury are found as are tungsten, cobalt, thorium, columbium-tantalum, vanadium, and cadmium.

[1] Minerals Yearbook; Vol. I; U.S. Bureau of Mines; 1969.

Precious and Semi-Precious Stones

Among the 72 varieties of precious and semi-precious stones present are agates, jasper, opals, sapphires, rubies, and garnets. Primarily collected by individuals, many of these gems are suitable for cutting and polishing. The most popular stones are star garnets from Fernwood in Benewah County and opals from Clark County. The star garnet was adopted as the official state gem stone in 1967. Gems worth about $90,000 were gathered in the state in 1969 and again in 1970, but these figures

TABLE 8
MINERAL PRODUCTION, 1969 – 1970

Mineral	1969 Quantity	1969 Value (thousands)	1970P Quantity	1970P Value (thousands)
Antimony ore and concentrate (short tons, antimony content)	922	$ W	985	$ W
Clays[1] (thousand short tons)	23	51	22	36
Copper (recoverable content of ores, etc. — short tons)	3,332	3,168	3,634	4,264
Gemstones	NA	90	NA	90
Gold (recoverable content of ores, etc. — troy ounces	3,403	141	3,069	110
Lead (recoverable content of ores, etc. — short tons)	65,597	19,541	59,661	18,771
Mercury (76-pound flasks)	1,012	511	1,014	416
Peat (short tons)	1,000	W	W	W
Pumice (thousand short tons)	21	62	39	82
Sand and gravel and stone (thousand short tons)	12,305	14,009	11,000	12,300
Silver (recoverable content of ores, etc. — thousand troy ounces)	18,930	33,897	18,844	34,188
Tungsten ore and concentrate (60 percent WO_3 basis — short tons)	27	63	W	W
Zinc (recoverable content of ores, etc. — short tons)	55,900	16,323	42,098	12,898
Value of items that cannot be disclosed: Cement, fire clay, garnet, iron ore, kaolin, lime, perlite, phosphate rock, vanadium, and values indicated by symbol W	XX	30,453	XX	33,353

Note: Mineral production is as measured by mine shipments, sales, or marketable production (including consumption by producers

Key: P = Preliminary. NA = Not available. W = Withheld to avoid disclosing individual company confidential data. XX = Not applicable

[1] Excludes fire clay and kaolin; included with "value of items that cannot be disclosed"

represent a sharp drop from the estimated 1968 totals of $200,000.[1] Table 8 shows the quantities and values of principal minerals produced.

TIMBER RESOURCES

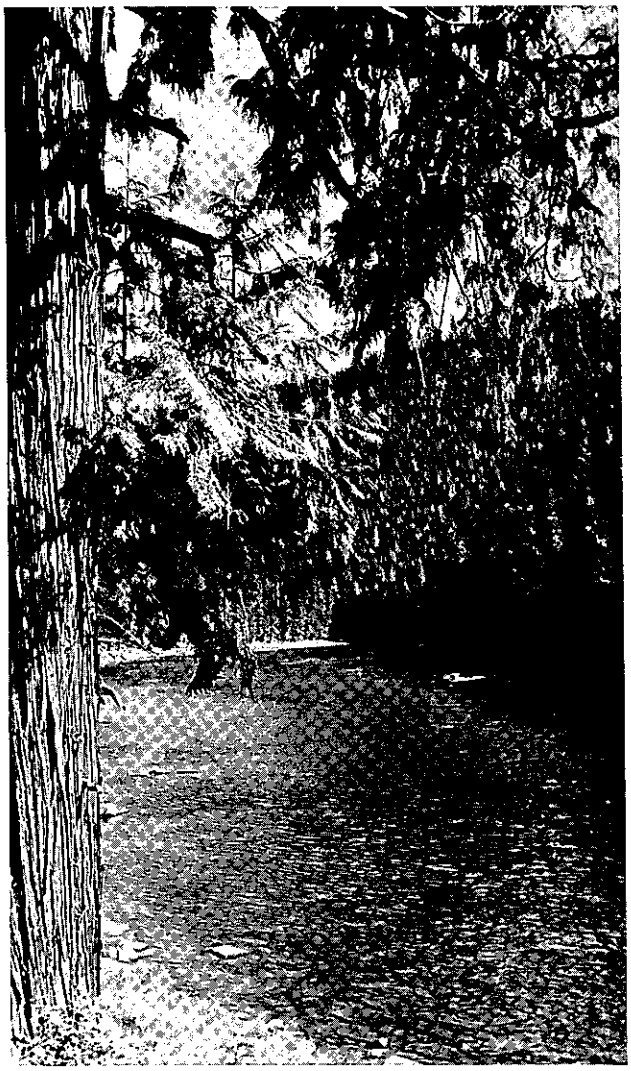
Idaho's forest products rank second only to its agriculture in economic importance. Approximately one-third of the state's 52,970,000 acres consists of forest land, placing the state fifteenth nationally in total commercial forest area. The most heavily forested state in the Rocky Mountain group, it ranks fifth nationally in volume of standing saw timber with 115 billion board feet. Unlike most other states, Idaho draws more than half of its timber output from federally owned land. A breakdown shows more than 15,000,000 acres of commercial forest land: 11,817,000 acres are federally owned; 3,066,000 are privately owned; and 889,000 acres belong to the state. Much of the federal forest land lies in the primitive areas, however, and is not available for commercial development.

Idaho, Shoshone, Clearwater, Valley, and Lemhi counties are the leaders in commercial forest land having more than 1,200,000 acres each. Clearwater and Idaho counties produce over 200 million board feet of lumber apiece per year and Bonner, Kootenai, and Shoshone counties each produce 100 to 200 million board feet.

Saw logs for lumber are the timber industry's principal product, with 82.2 percent of all roundwood cut used for this purpose. The remainder goes into veneer logs, pulpwood, and miscellaneous uses. The manufacturing of these forest products within the state adds more than $83,000,000 annually to the value of the raw materials used.

Although the number of sawmills declined nearly 50 percent between 1956 and 1966, increased efficiency made possible by larger mills and ownership by big corporations caused almost a doubling in mill productivity. Annual production per mill increased from 5.2 million board feet in 1956 to 9.7 million board feet in 1966.

Activities related to timber production account for $50,000,000 per year in wages — about 36 percent of the state's manufacturing payroll. Employment in northern Idaho is expected to decline slightly in the future, as the industry approaches the maximum allowable harvest in that region and as per capita productivity increases, but the industry should continue to grow in southern Idaho for some time to come.



The abundance of Idaho's forest resources is due to a favorable climate and mountainous topography. Trees are primarily conifers, with softwoods harvested predominating over hardwoods in a ratio of 2,000 to 1. Douglas fir, true firs, and white and ponderosa pine are among the most commercially significant native trees.

Douglas fir accounts for 30 percent of commercial forests and has been of continuing

[1] Minerals Yearbook; Vol. I; U.S. Bureau of Mines; 1969.

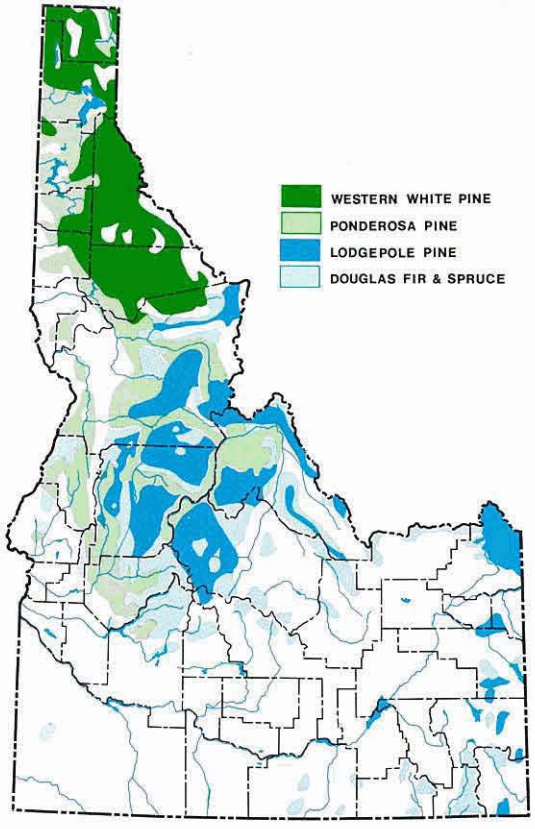
importance to the timber industry. Found in both northern and southern Idaho, it is one of the strongest softwoods and is valued for its usefulness, abundance, and accessibility. It is also the principal Christmas tree produced in Idaho. The counties in which it is most widely harvested include Clearwater, Idaho, Shoshone and Valley.

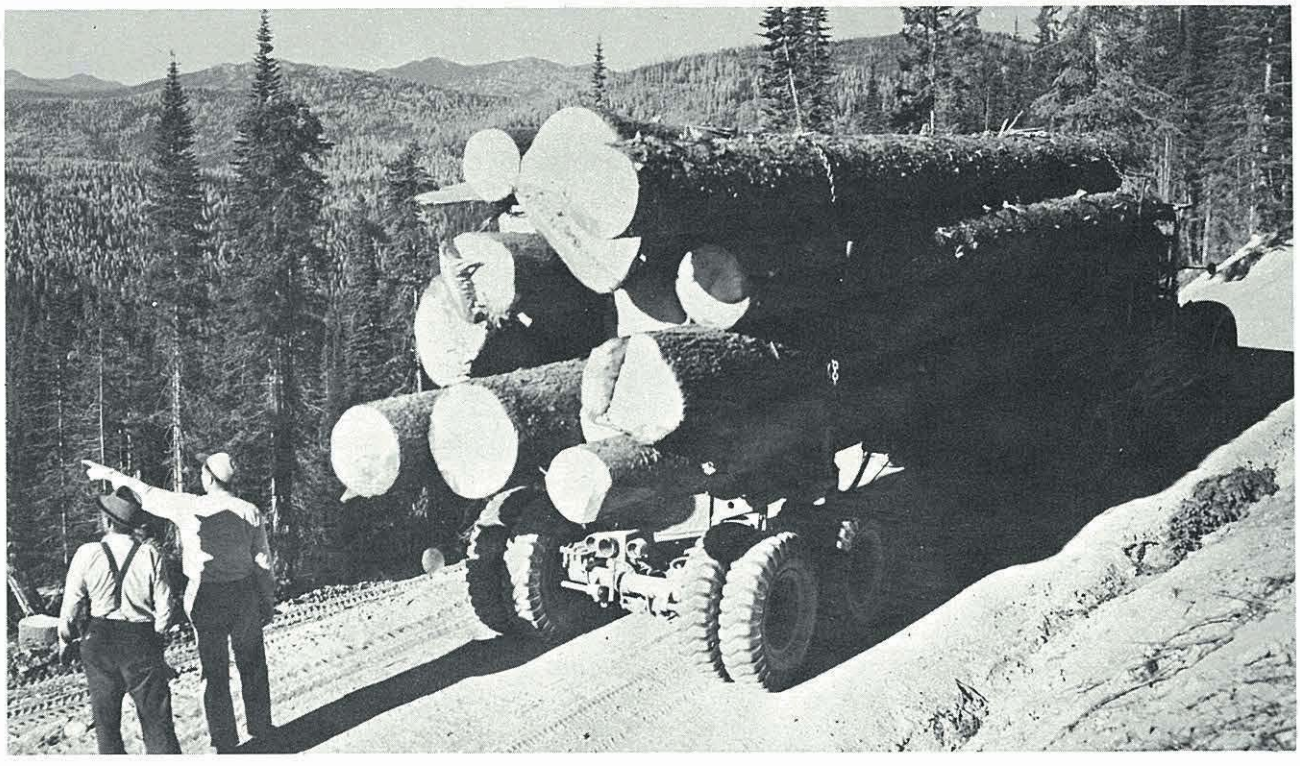
Ponderosa pine, produced chiefly in southern Idaho, is ranked third in extent, but second in timber harvest, accounting for 17 percent of the volume cut. Light, strong, easy to work with, and not readily split, it is used primarily for doors and sashes, veneers and packing boxes.

Other trees of commercial value include lodgepole pine, Engelmann spruce, grand and white fir, red cedar, hemlock, and western larch. Figure 13 shows the locations of principal forest types.

Heavy timber losses caused by tree-killing insects and diseases are becoming a serious problem. The state's sawtimber losses due to pests in 1960 were estimated at 500 million board feet. Overripe trees in the large virgin forest areas provide excellent pest breeding grounds.

FIGURE 13. PRINCIPAL FOREST TYPES





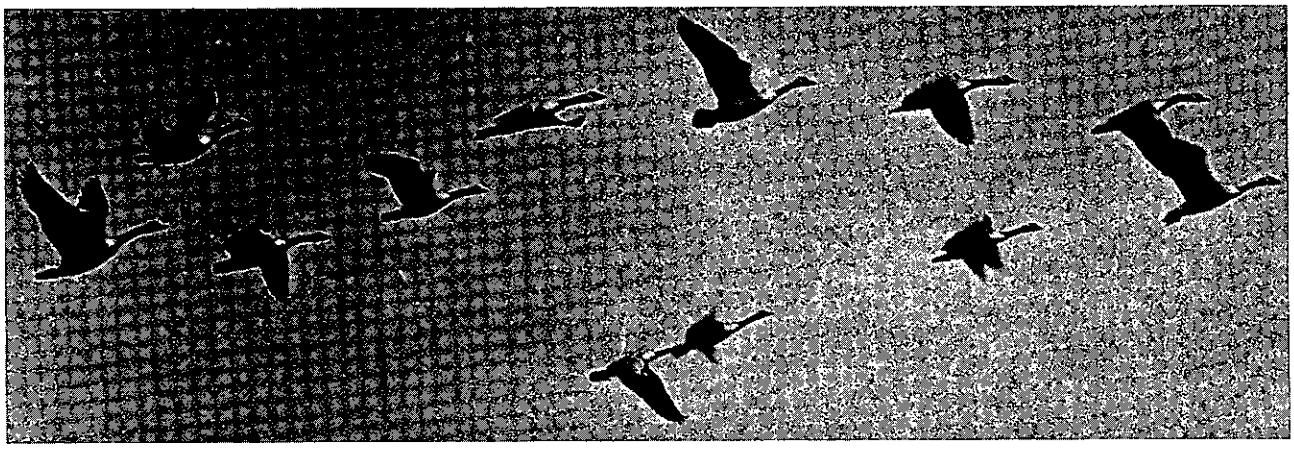
FISH AND WILDLIFE RESOURCES

Idaho's fish and wildlife resources include anadromous fish, resident fish, big game, upland game, fur bearing animals, waterfowl, and other forms of wildlife.

Wildlife habitat, which includes portions of all of the state's water, forest, range, and cropland areas, varies considerably in type, quality, and amount. Although statistics on habitat types are not available, fish and wildlife agencies believe that there are critical shortages of winter range in many areas for deer, elk, and other big game.

Other kinds of wildlife habitat are more abundant, but in many cases the quality has declined. Fish habitat provided by lakes and reservoirs is ample, although the quality varies. Summer range for deer and elk, the principal big game species, is ample in relation to winter range. Upland game habitat, occurring mostly on farm and range lands, is diminishing, but the supply is not yet critical. The state's many marshes, shallow lakes, and streams provide waterfowl habitat important for wintering, nesting, and resting during migrations. Almost all of the lands supporting vegetation provide habitat for some type of wildlife.

Anadromous fish spawning in Idaho waters include chinook salmon, steelhead trout, and sockeye salmon. Chinook salmon runs occur in spring, summer, and fall, while steelhead runs take place in spring and fall. These fish now spawn only in the Salmon and Clearwater river drainages in Idaho. The Snake River and its tributaries up to Shoshone Falls once provided spawning grounds, but dam developments on the Boise and Payette rivers and construction of the Hells Canyon Dam complex on the Snake River blocked all fish passage above that facility. Portions of these runs have been successfully



transferred to the Salmon River drainage. Only a few sockeye salmon, remnants of a large, annual migration, now spawn in Idaho waters.

Trout and char are more highly regarded in Idaho by most fisherman than are other resident fish. Rainbow trout are the most numerous and widely distributed species, living in lakes and streams in every region. Few resident fishermen need to travel far to fish for them. Large numbers are raised commercially on "trout farms", and streams are stocked with millions of them each year from state and federal hatcheries. Other native, resident coldwater game fish include cutthroat trout, kokanee, and Dolly Varden. Lake trout, eastern brook trout, and golden trout were all "imports" at one time or another. The closely related grayling and mountain white fish also require coldwater habitat.

Most low elevation streams and many lakes, ponds, and reservoirs support populations of warmwater game fish, including several species of catfish, largemouth and smallmouth bass, sunfish, crappie, and yellow perch. All of these species have been introduced into the state — none are native. Although excellent fishing is available for many of these species, fisherman are generally more interested in the coldwater types. The warmwater fish resource would benefit from a much larger catch.

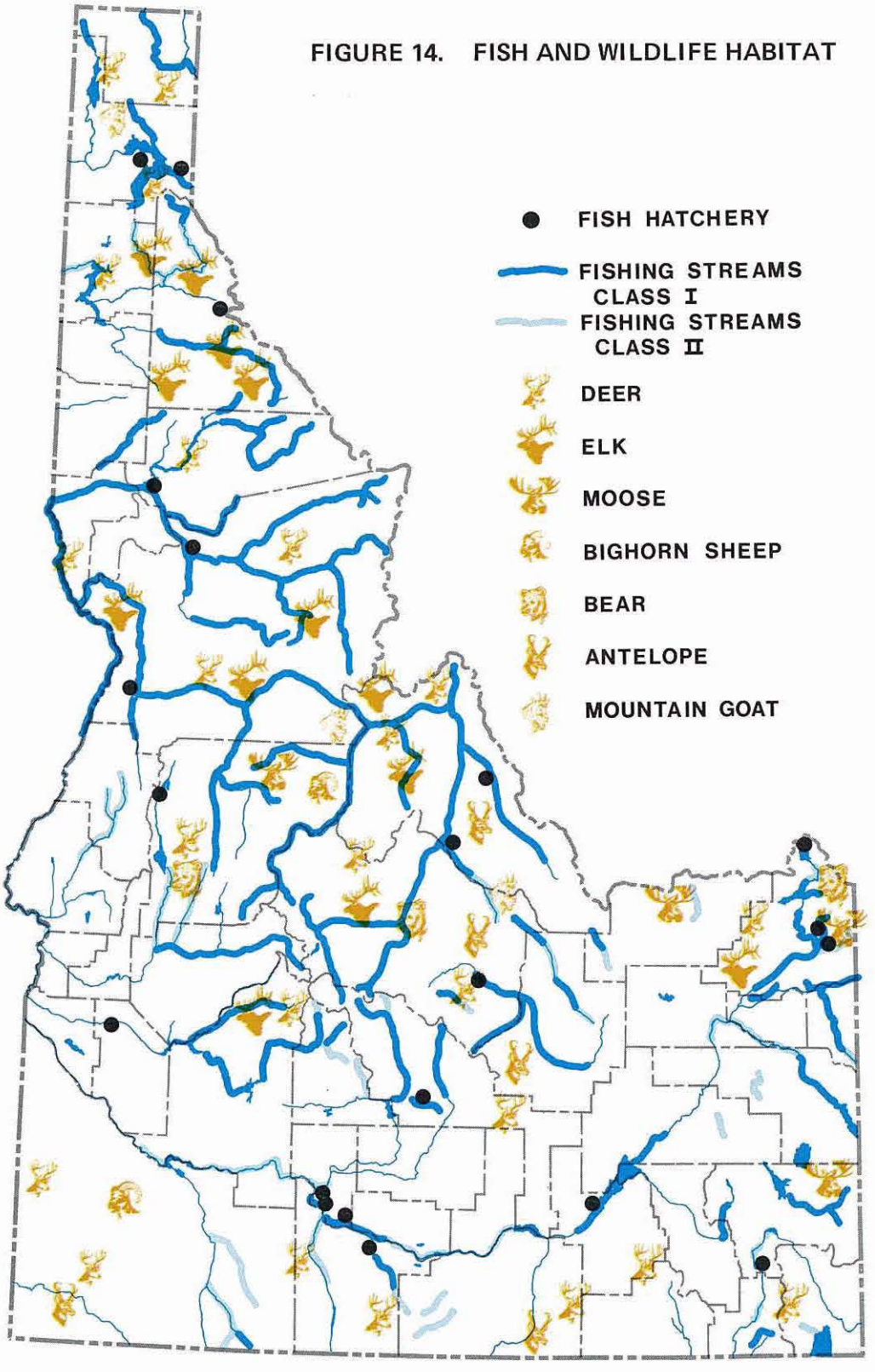
The Snake River once supported a productive sturgeon fishery from Shoshone Falls downstream to its confluence with the Columbia River. Following the construction of major dams throughout the Columbia system, and C.J. Strike, Oxbow, Brownlee, and Hells Canyon dams on the Snake River in the 1960s, the sturgeon population declined drastically since curtailment of its migratory habits seriously affect its reproductive cycle. Very few of these fish, if any, still survive above Hells Canyon Dam.

Undesirable resident species are found in most of the state's waters capable of supporting fish life. Many of these fish, particularly those found in cold water, are of little importance; others compete with or prey on game species and must be controlled. Principal species included in this category are squawfish, carp, tench, and several species of chub and suckers.

A 1966 inventory of Idaho fishing waters identified 11,946 miles of streams and rivers as possessing significant fishing values, rating them from Class I (most desirable) through Class IV (least desirable). An additional 3,722 miles of streams were not classified. Of the total 15,718 miles, 34 percent (5,227 miles) was rated Class I, approximately 10 percent (1,499 miles) was rated Class II, 21 percent (3,300 miles) was Class III, and 12 percent (1,820 miles) was rated Class IV. The most important streams and rivers are shown on Figure 14.

Idaho's big game resources include populations of elk, moose, white-tailed deer, mule deer, bighorn sheep, mountain goat, black bear, grizzly bear, pronghorn antelope, and mountain lion. Key habitat areas for big game are shown on Figure 14.

FIGURE 14. FISH AND WILDLIFE HABITAT



The state supports many species of upland game, some of which are native and some are introduced. These include ring-necked pheasant, Hungarian partridge, chukar partridge, bobwhite, mountain, valley, and Gambel quail, ruffed grouse, blue grouse, sage grouse, spruce grouse, sharp-tailed grouse, turkey, and rabbits and hares. The ring-necked pheasant, Hungarian partridge, bobwhite, chukar, turkey, and Gambel quail are introduced species. Trial introduction of other species is currently underway.

Idaho also contains many varieties of fur bearing animals. Beaver, muskrat, raccoon, and mink are found along most streams, lakes and ponds. Animals living in the semi-desert regions are badger, bobcat, coyote, skunk, weasel, fox and jack rabbits. River otter occur in the more remote and permanent mountain streams. Lynx, marten, wolverine, and fisher are found in primitive mountain areas.

Most species of waterfowl common to the western United States are found in Idaho at various times of the year. Canada geese, mallards, gadwall, pintail, baldpate, blue-winged teal, cinnamon teal, and redhead ducks are among the principal nesting species. Trumpeter swans, an endangered species, are year-round residents along a small portion of the Upper Henrys Fork of the Snake River.

Other forms of wildlife found in the state include the bald eagle, golden eagle, prairie falcon, ferruginous hawk, American osprey, and several species of owls, gulls and blackbirds.

POPULATION

Idaho's economy is based primarily on agriculture, lumbering, and mining industries, all of which can be carried on in sparsely populated areas. Since there are no major manufacturing industries to sustain metropolitan type cities and no bodies of navigable water with associated large trading centers, population size and recent growth rates have remained relatively low in comparison to most other states.

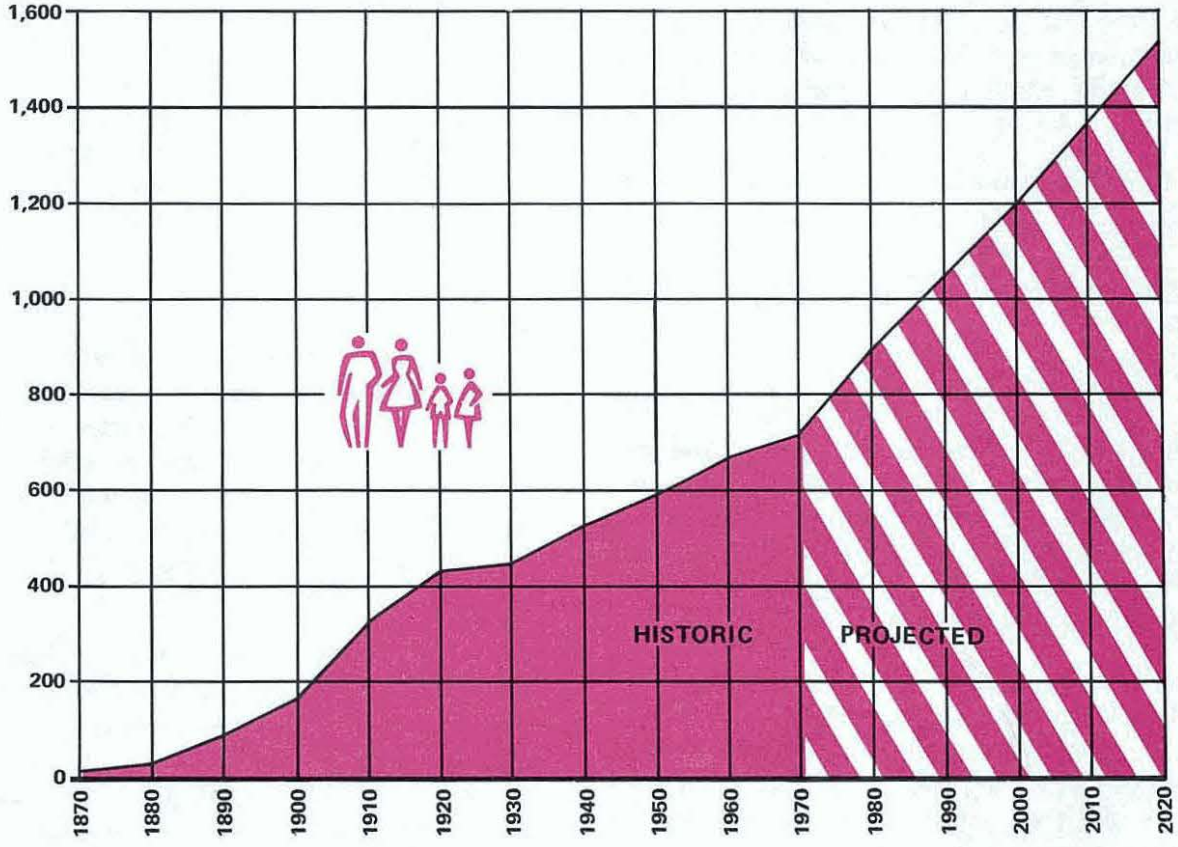
POPULATION GROWTH

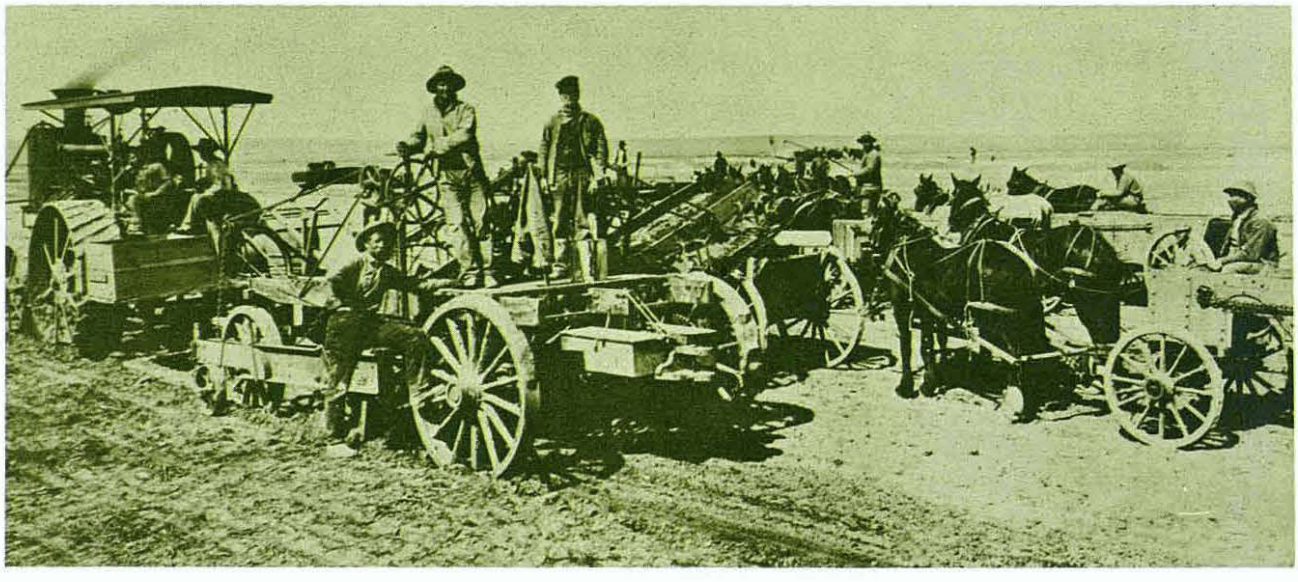
Before 1870, Idaho's population was made up mostly of itinerants, trappers, miners, traders, and adventure seekers who took advantage of rich fur and mineral resources. Between 1870 and 1920, population grew at an average ten-year rate of 94.2 percent; at the same time the population of the United States as a whole grew an average of about 21.6 percent. Discoveries of gold and other precious metals spurred the first large-scale migrations into Idaho, but the boom turned out to be short-lived. Miners quickly deserted the state for new finds as the easier claims were played out. About this time, settlers were moving in from Utah, bringing the techniques of large-scale irrigation. By 1920, initial settlement of agricultural land was nearly complete and the period of rapid population growth was over.

From 1920 through 1970, population growth and economic activity in Idaho became more stable. While the general economy was hurt by the great Depression of the late 1920s and early 1930s, the state agriculture suffered no "dust bowl". In fact, many midwestern farmers came to settle, with the result that population increased 17.9 percent during this period. Once again however, the boom faded. In the 1940s factories and war plants in other states drew people out of Idaho and population growth declined to 12.1 percent for the decade.

Population growth in the decade of the fifties, as shown in Figure 15, averaged 13.4 percent. Between 1950 and 1954, Idaho experienced a net loss of approximately 3,000 people, but by 1955, this trend was reversed and the state's population reached a total of 667,191 – 79,000 above the 1950 figure.

FIGURE 15. POPULATION GROWTH





Except for the 1920s, the 1960s were the decade of slowest recorded population growth, with an increase of 6.9 percent or 45,817 persons. Consolidation of small farms may have been an important factor, but population statistics indicate a definite trend toward out-migration of Idaho's young adults to larger cities and better employment opportunities in other states.

Population density in Idaho averages only 8.6 persons per square mile compared to 56.3 persons per square mile for the continental United States and 22.2 for the Pacific Northwest.

Principal areas of growth during the last two decades include the Lewiston - Moscow - Coeur d'Alene area in northern Idaho, the Boise area, and the Upper Snake River Valley from Burley to Rexburg. The mountainous counties of central and northern Idaho, the Gooding - Jerome area, and the extreme southeastern part of the state are the areas of greatest population loss.

Mountain Home Air Force Base and the National Reactor Testing Station spurred population growth in Elmore and in Butte, Bonneville, Bingham, and Jefferson counties in the 1950s, but their influence on growth rates has declined in more recent years.

Extensive irrigation development during the 1950s in Minidoka County caused a sudden growth spurt; by now, however, most of the county's irrigable land has been developed and population growth rates are more stable.

Between 1960 and 1970, only ten Idaho counties experienced net in-migration population gains. These included five northern counties: Nez Perce, Latah, Kootenai, Boundary, and Clearwater and five southern ones: Ada, Boise, Blaine, Power, and Madison. The remaining 34 counties experienced varying degrees of population out-migration. In all, 41,241 people left the state during the decade.

Recreational development in the Big Wood River Valley was responsible for population gains in Blaine County; Ricks College in Rexburg was the stimulus in Madison County; and Clearwater County's growth in the 1960s is attributed to construction of Dworshak Dam, which will most likely produce only temporary effects on the county's economy and population.

Current patterns of growth are resulting in increasingly uneven spatial distributions of populations: the more densely populated counties continue to gain residents, while many sparsely populated areas are experiencing continued low growth rates or population losses.

POPULATION DISTRIBUTION

Population densities vary widely among Idaho's 44 counties, depending largely on physiographic features. Favorable natural factors of topography, precipitation, average temperature, length of growing season, and availability of irrigation water, for example, tend to favor intensive land uses and, therefore, more dense population concentrations.

The Panhandle, which relies principally on dryland wheat growing, mining, and lumbering for income, is experiencing problems: surpluses, declining prices, etc., in the wheat-growing industry, and a general market decline in the last year in lumbering. With few significant non-agricultural industries, the Panhandle area's population has grown slowly, with 1,731 people or 2 percent of the population leaving the area between 1960 and 1970, as is shown in Table 9. In 1970, the population of the Panhandle was 82,324, averaging 10.8 persons per square mile and totaling 11.6 percent of the state's population.

The Upper Snake region, on the other hand, boasts a high degree of agricultural productivity resulting from a series of irrigation projects which provide water from the Snake River and its tributaries to large amounts of relatively flat and extremely fertile land. This region contains both the state's greatest population and its largest land area. With a population of 283,128 in 1970, the area's population density equaled 10.5 persons per square mile, the second highest ratio. Population is largely concentrated along the Snake River in the cities of Rexburg, Idaho

TABLE 9
POPULATION CHARACTERISTICS, 1960 – 1970

Area	1960	1970	Population Change[1]	Natural Change[2]	Net Migration[3]	1970 Population					
						Per-centage	Density	Urban		Rural	
								No.	Percent	No.	Percent
Panhandle	77,864	82,324	4,460	6,191	– 1,731	11.6	10.8	26,754	32.5	55,570	67.5
Salmon-Clearwater	83,561	91,429	7,868	9,768	– 1,900	12.8	4.0	50,643	55.4	40,786	44.6
Southwest	212,371	235,089	22,718	24,848	– 2,130	33.0	10.8	147,853	62.9	87,236	37.1
Upper Snake	274,187	288,128	13,941	44,045	–30,104	40.4	10.5	154,019	53.5	134,109	46.5
Bear River	19,208	16,038	– 3,170	2,206	– 5,376	2.2	5.6	5,914	36.9	10,124	63.1
TOTAL (State)	**667,191**	**713,008**	**45,817**	**87,058**	**–41,241**	**100.0**	**8.6**	**385,183**	**54.0**	**327,825**	**46.0**

Source: Number of Inhabitants, Idaho. Bureau of Census, 1970 Census of Population
[1]Population change = Population 1970 minus population 1960
[2]Natural change = Birth minus deaths
[3]Net migration = Population change minus natural change

Falls, Pocatello, Burley, and Twin Falls. In 1970, Idaho Falls, Pocatello, and Twin Falls contained 35,776, 40,036, and 21,914 people respectively.

The population of the Southwest Idaho Basins is concentrated in the valleys of Boise, Payette, and Weiser rivers and along those portions of the Snake River not entrenched in deep canyons. The area's agriculture consists mostly of intensive cropping and livestock raising. Heavily-urbanized Ada County supports a large and fast-growing segment of Idaho's population. About 10.8 persons per square mile on the average inhabit the region, with population totaling 235,089. Cities with more than 10,000 people in 1970 included Boise, Caldwell, and Nampa, which have populations of 74,990, 14,219, and 20,768 respectively.

The importance of the Snake River to Idaho's growth is reflected in the distribution of population. The 21 counties bordering the river contain 525,351 people — 74 percent of Idaho's total population. These counties also accounted for 90 percent of population growth during the past decade.

Vast size and varied terrain characterize the Salmon-Clearwater region. The most sparsely-populated and least urbanized region of Idaho, the basins contained only 91,429 people in 1970, averaging just four persons per square mile. During the last decade, however, the region experienced the state's second greatest population increase, 9.4 percent, compared to the state's average of 6.9 percent. Nevertheless, the area suffered a net out-migration of 1,900 people during the 1960s.

The Bear River region, the smallest of the state's drainage basins, had a population of 16,038 in 1970 and a population density of 5.6 persons per square mile, the second lowest ratio. During the last decade the area suffered a population loss of 3,170 persons or 16.5 percent.

During the past 30 years, Idaho's population has shifted from rural to urban areas at an average rate of 7 percent per decade. In 1940, 66.3 percent of the population was rural and 33.7 percent urban. The 1970 census reversed the balance with 54.5 percent of the population concentrated in urban areas and only 45.5 percent in rural areas. Counties containing the highest concentrations of urban population are: Nez Perce totaling 85.8 percent; Bannock with 82.3 percent; Ada with 78.2 percent; Elmore with 71.5 percent; and Bonneville with 69.8 percent.

Problems resulting from population distribution will continue in the future. The state will suffer economically more from too few people in some areas rather than from too many people. For example, 40 percent of Idaho's people live on farms and in towns with less than 1,000 residents. Only slightly more than half of its residents live in localities containing more than 2,500 people. Fourteen counties have no cities with more than 2,500 people, and of these, six have no town containing more than 1,000 people. Sparsely populated counties will likely continue to lose residents while the larger cities and counties will continue to grow.

Areas already encountering problems in providing adequate levels of social and commercial services can only deteriorate further as a result of continued heavy out-migrations. Further development of agricultural and recreational potentials could alleviate some of these problems and provide expanded economic bases in some thinly settled areas.

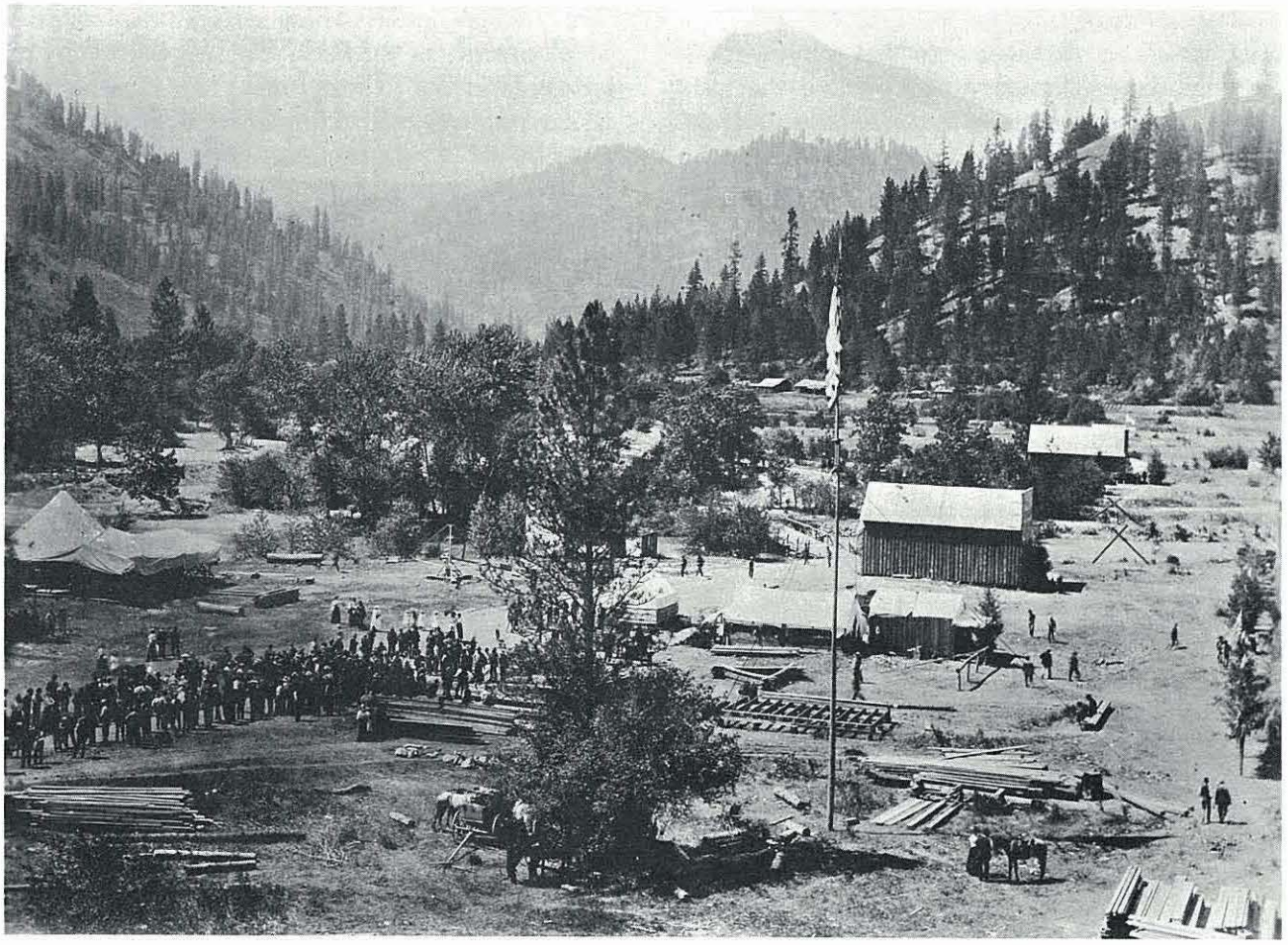
ECONOMY

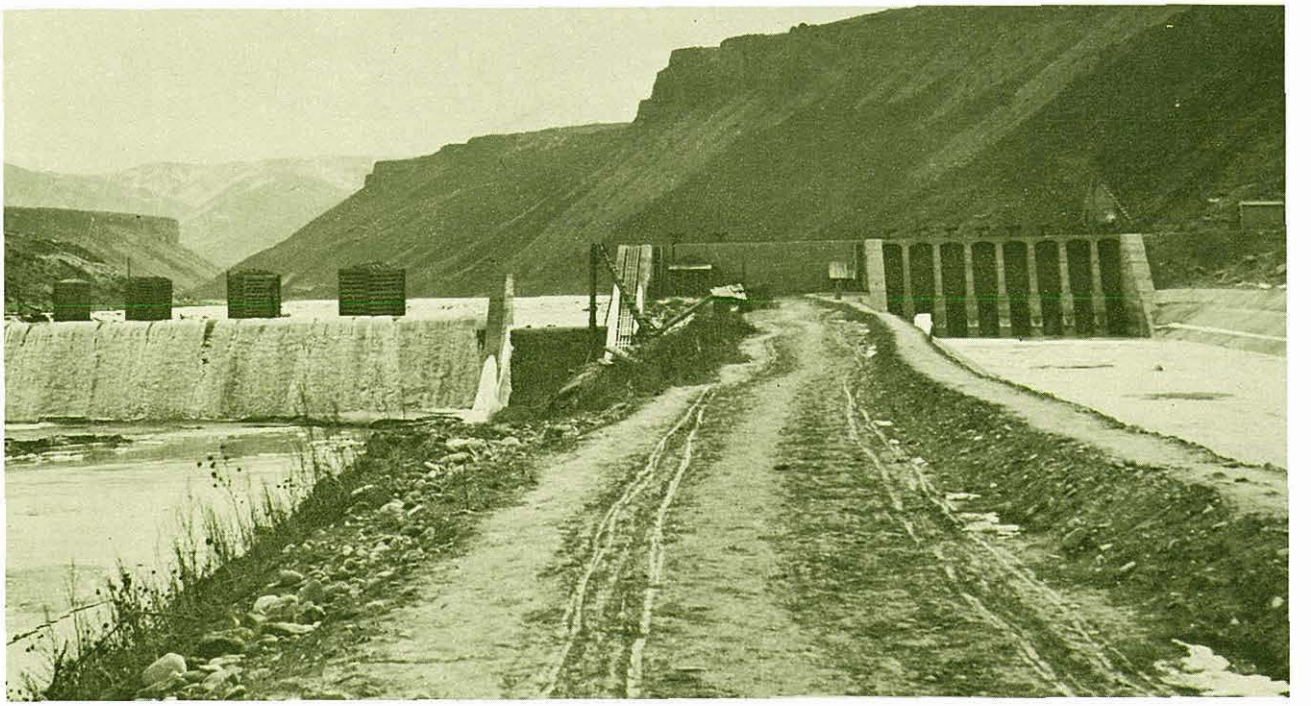
HISTORICAL DEVELOPMENT

Idaho's economy developed in four stages covering a relatively short period of time. First came the fur traders; then practically all economic activity centered on the collection of furs. This period was followed by the mining booms when the frenzied extraction of minerals dominated the economy. Toward the end of the nineteenth century, after the richest, most accessible ore deposits had been exploited, the ranchers arrived and grazing of grasslands became a major operation. The final stage consisted of the development of land into farms through irrigated agriculture.

During the earliest history of the territory which is now the state of Idaho, furs were the only important economic resource. In their search for beaver, trappers and fur traders explored much of Idaho, blazing the first trails. They also built forts and trading posts and established trade with the Indians. During the 1820s through '40s, thousands of men and millions of dollars were invested in the business of fur trading.

The discovery of gold attracted thousands of people and permanently changed the state's economic base. Idaho's gold boom, larger than both the California and Klondike strikes, provided the national treasury with much-needed revenue during the Civil War.





Discoveries of galena ore on the Wood River district in 1874 and in the Coeur d'Alene in 1885 provided the assurance that mining could be a permanent industry and marked the transition from small-scale to organized commercial mining. The mining era began with the Idaho Territory largely an uncharted wilderness, but by 1890 it had attracted enough people and capital to become a state.

Mining expanded from the Coeur d'Alene and wood river areas to southeastern Idaho, where a large phosphate industry was established around 1944. Construction of large plants in 1948-49, 1952, and 1959 and a decided decline in metal mining by 1960 helped to give phosphate an important position in Idaho's mining economy in recent years.

Between 1880 and 1890, agriculture captured first place as the state's largest employer; it has remained the chief industry since that time.

The agricultural era began with cattle and sheep raising encouraged by the vast amounts of open range for grazing. Development of irrigation systems was accelerated by passage of the Carey Act in 1894 and of the Federal Reclamation Act in 1902. These acts authorized the development of projects to supply water to private land and to government lands opened for settlement. Irrigated land increased to 3,750,000 acres by 1971. Idaho presently is second only to California among the 17 western states in irrigated acreage.

PRESENT STATUS

Potato processing, which really began during World War II, enlarged the market for Idaho's premium potatoes and enabled the state to become the nation's leading producer. Modern transportation and communication facilities have helped establish Idaho as a major producer and shipper to national and world markets. Idaho's national ranking for crops produced in 1970 is shown in Table 10. The crops had a market value of over $300 million. Food processing, including canning and freezing facilities, meat and dairy products, commercial trout hatcheries, and even what amounts to automated mass poultry production have contributed to the high level of agricultural production.

TABLE 10
LEADING CROPS, 1970
(Thousands of dollars)

Crop or Commodity	National Ranking	Market Value
Potatoes	1	$135,000
Sugar beets	2	46,000
Barley	4	21,000
Hay	5	26,000
Sheep and lambs	5	22,000
Wheat	10	51,000

Source: USDA Statistical Reporting Service

TABLE 11
LEADING AGRICULTURAL COMMODITIES, 1970
(Thousands of dollars)

Commodity	State Ranking	National Ranking	Market Value
Cattle	1	21	$187,000
Potatoes	2	1	135,000
Dairy products	3	26	70,000
Wheat	4	10	51,000
Sugar beets	5	2	46,000

Source: USDA Statistical Reporting Service

The irrigated farm segment provides the basic support for the state's growing industrialization. The bulk of the present industrial effort is associated with the processing of food and livestock products. Raw materials from the forest lands are the base for substantial wood products industries. The leading agricultural commodities in 1970 are shown in Table 11. It is significant to note that although cattle production is ranked only 21 nationally, it is ranked first for the state in value of agricultural commodity.

Three decades ago, the lumber industry shifted to modern sustained-yield cutting. Partly as a result of rising labor costs, the industry increasingly made use of what were formerly waste products in the production of laminated boards, plywood, wood pulp, soil-aid, and decorative bark. The lumber industry, which had a sales volume of $620 million in 1970, has national outlet for Idaho forest products.

New industries and increased tourism, in addition to federal installations such as nuclear reactors and missile bases, have contributed to the diversification of Idaho's economy in the past three decades. Recent expansion of the mobile home industry in southwestern Idaho indicates the advantage of an expanding western market for industrial products. Economic diversification resulted in the growth of related service industries and professions which will further stimulate development.

Idaho's economy has traditionally been centered on industries which were dependent on natural resources and raw materials. Industrial production originating from lands in Idaho have compiled an outstanding record of financial achievement. For many years, agriculture, lumber, and mining were the primary producers of weath. Today as shown in Table 12, agriculture is first in cash receipts, followed by forest products, manufacturing, tourism, and mining.

Several other industries have experienced substantial growth. Printing and publishing, wholesale and retail trade, finance, insurance, real estate, and some types of construction have expanded rapidly.

TABLE 12
MAJOR INDUSTRIES, 1970 ESTIMATES
(Thousands of dollars)

Industry	Unit of Value	Value
Agriculture	Cash receipts	$664,000
Forest products	Market value	620,000
Manufacturing	Value added	610,000
Tourism	Expenditures	220,000
Mining	Market value	119,000

Source: Idaho Department of Commerce and Development

Idaho faces many problems in its bid to attract industry. One problem is the distance to major markets; another is the lack of certain types of skilled labor. A major limiting factor has been the lack of supportive industries. Industry tends to cluster similar businesses because of the economic efficiencies gained from such arrangements. The mobile home and trailer industry is an excellent example. Once some of the supportive industries were operative, new companies moved in, and established firms rapidly expanded their operations.

Industrial development can take only two forms, establishment of new kinds of industries and expansion of already existing facilities. Businesses that have shown promise during the past decade will probably continue to lead during the next. Diversification promotes stability, however, so that potentially productive industries now present in limited numbers should thrive. Furniture and fixtures, stone, clay, and glass products, primary metal products, fabricated metal products, and apparel are only a few examples of areas where substantial future growth will probably occur.

EMPLOYMENT

Employment figures tell a slightly different story, however. During the period 1960 to 1970, agricultural employment declined, as is shown in Table 13.

Mining employment showed a more gradual decline during the same decade. These facts stress the need for new employment opportunities. The slack created by elimination of jobs in some basic industries must be taken up by growth in other areas, principally manufacturing. This has already occurred to some extent.

Manufacturing employment increased nearly 39.8 percent between 1960 and 1970 and certain industries have shown even greater growth rates. Two examples are food processing and transportation equipment, the latter consisting principally of mobile homes and recreational equipment such as campers and trailers. The number of persons employed by the food processing industry increased approximately 47.6 percent between 1960 and 1970, while employment in the production of transportation equipment jumped 250 percent, providing more than 1,500 additional jobs.[1]

In October of 1970, employment reached 300,000, a new high for the state. This figure represents a 1.5 percent increase over the boom year of 1969. From 1963 to 1970, employment increased about 2 percent each year.

Although agriculture is still Idaho's largest employer, manufacturing and services are capturing an increasingly significant share of the labor market. Agricultural employment decreased 24.1 percent between 1960 and 1970, largely because of consolidation into larger farm units, increased mechanization, better opportunities in other industries, and greater use of migrant workers to meet seasonal labor demands.

Employment in manufacturing industries increased 39.8 percent between 1960 and 1970 — a gain of 11,500 persons, as is shown in Table 13. Idaho's food processing industry is a natural outgrowth of the agriculturally-oriented economy. Already one of Idaho's most important industries, food processing provided jobs for 15,200 workers in 1970, approximately one out of every 20 workers in that year.

Mobile home manufacturing had its real beginning in Idaho in the late 1950s and continued to expand through the 1960s. Average employment in this growing industry rose 263 percent between 1960 and 1969. Many other manufacturing concerns are considering establishing branch plants here.

Employment in lumber and wood products manufacturing increased 7.6 percent during the 1960s, but in relation to the total manufacturing employment, the industry suffered a 9.5 percent decrease.

The nonmanufacturing category of employment covering retail trade, state and local government, services and miscellaneous experi-

[1] Numbers represent only those employees covered by the Idaho Employment Security Law.

TABLE 13
EMPLOYMENT CHARACTERISTICS, 1960 – 1970

Category	1960	1970	Numeric Difference	Percent Change
Civilian labor force	262,700	304,600	41,900	16.0
Unemployment	15,000[1]	15,400	400	2.7
Percent of labor force unemployed	5.4	5.1	–.3	–5.6
Total employment	247,700	289,200	41,500	16.8
Agricultural employment	61,500	46,700	–14,800	–24.1
Non-agricultural employment	186,200	242,500	56,300	30.2
Non-agricultural self-employed and domestic	31,000	34,700	3,700	11.9
Non-agricultural wage and salary workers	155,200	207,800	52,600	33.9
Total manufacturing	28,900	40,400	11,500	39.8
Durable goods	15,300	20,400	5,100	33.3
Lumber and wood products, except furniture	11,900	12,800	900	7.6
Stone, clay and glass products	700	1,100	400	57.1
Primary metal industries	500	1,300	800	160.0
Fabricated metal products	[2]	900		
Machinery	[2]	800		
Transportation equipment	[2]	2,200		
Other durable goods	2,200	1,300	–900	–40.9
Non-durable goods	13,600	20,000	6,400	47.1
Food and kindred products	10,300	15,200	4,900	47.6
Paper and allied products	700	1,100	400	57.1
Printing and publishing and allied products	1,200	1,700	500	41.7
Chemicals and allied products	1,300	1,500	200	15.4
Other non-durable goods	100	500	400	400.0
Total non-manufacturing	126,300	167,400	41,100	32.5
Mining	3,760[3]	3,500	–260	–6.9
Contract construction	9,600	10,900	1,300	13.5
Interstate railroads	5,600	3,500	–2,100	–37.5
Transportation except railroads	4,400	4,800	400	9.1
Communications	2,800	3,400	600	21.4
Electric, gas and sanitary services	2,300	2,600	300	13.0
Wholesale trade	8,300	9,900	1,600	19.3
Retail trade	30,800	39,300	8,500	27.6
Finance, insurance and real estate	5,800	8,000	2,200	37.9
Service and miscellaneous	21,500	32,400	10,900	50.7
Government, federal	8,200	10,000	1,800	22.0
Government, state and local (includes education)	24,500	39,100	14,600	59.6

[1] Includes 900 persons involved in labor disputes
[2] Data for 1960 included in "other durable goods" category
[3] This is an average for 1957, 1958, 1959, 1961, and 1962, due to labor dispute occurring in the mining industry in 1960
Source: Idaho Department of Employment

enced the most dramatic increases in the 1960s, gaining 41,100 employees (Table 13).

Idaho participated in the nationwide trend toward increased government employment in recent years, with total employment in federal, state and local governments increasing 81.6 percent between 1960 and 1970 as a result of expansions in education, federal services and state and local administration.

Construction of several large shopping centers and many supermarkets in the state, plus some new wholesale outlets, contributed to increased employment in trade totaling 10,100 persons or 46.9 percent in the ten year period.

More branch banks and expanded facilities for existing banks plus expansions in insurance and real estate to serve the growing industries boosted average employment in finance, insurance, and real estate 37.9 percent during the 1960s.

Idaho's total labor force comprised 41.5 percent of its population in 1950, 39.4 percent in 1960, and 42.8 percent in 1970. Historic patterns indicating a gradual decrease in employment in relation to total population have been used to project employment levels through 1980, when the work force is expected to comprise 40 percent of the state's population. This projection represents an employment total of 358,000 by 1980, an increase of nearly 53,400 over the 1970 level.

PERSONAL INCOME

Personal income for Idaho residents increased 83.2 percent between 1958 and 1969 — from $1,163,400 to $2,130,000 compared to a gain of 108.1 percent for the nation as a whole. The difference is probably due to Idaho's lower population growth rate. Per capita income averaged $1,801 in Idaho in 1958, increasing to $3,015 in 1969 for a gain of 67.4 percent. These figures were well below the national per capita averages of $2,068 in 1958 and $3,705 in 1969. National per capita income increased 79.2 percent during this period.

Table 14 shows that in four of the five planning regions personal income increased more than 80 percent between 1958 and 1969, although the different regions varied widely in the extent of their contributions to the state totals.

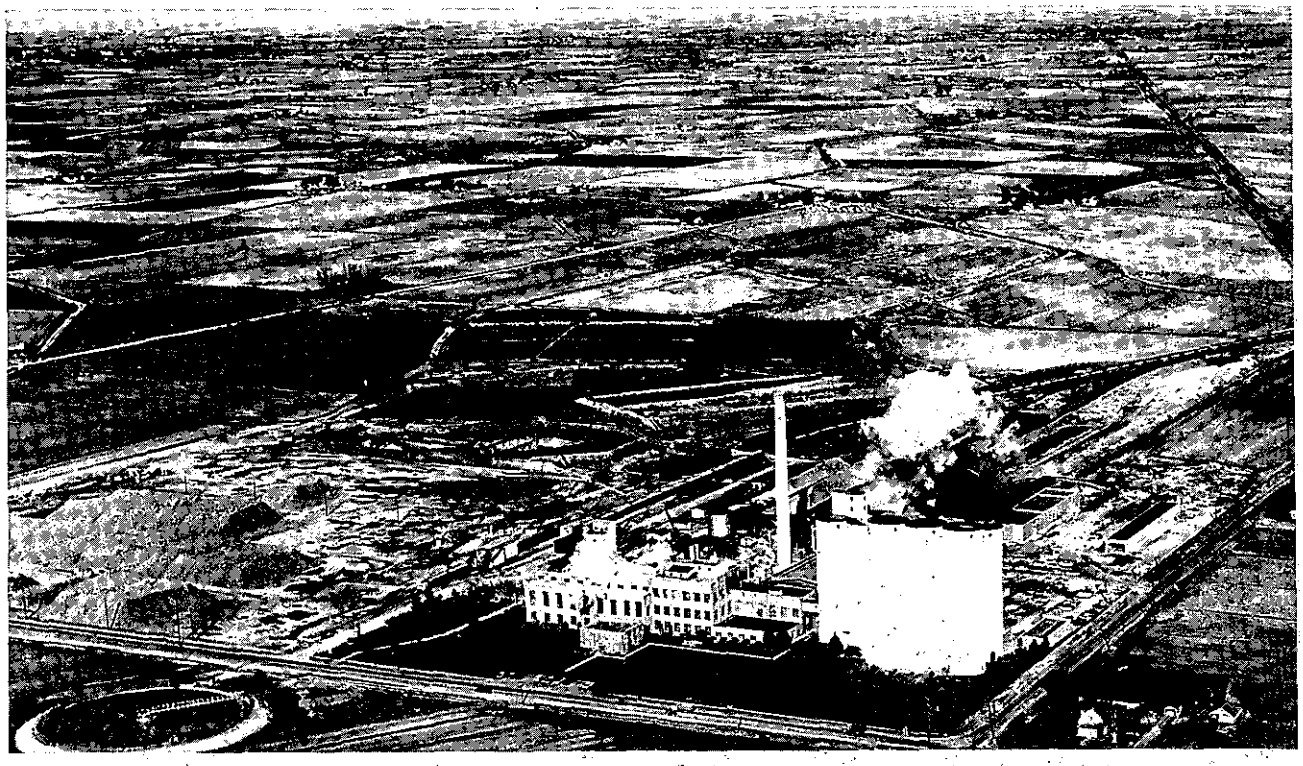
TABLE 14

PERSONAL INCOME

(In thousands)

Region	Year 1958	Year 1969	Increase	Percent change	Percent of state total
Panhandle	$ 120,247	$ 223,700	$103,453	86.0	10.5
Salmon-Clearwater	149,259	268,900	119,641	80.2	12.6
Southwest	387,916	715,700	327,784	84.5	33.6
Upper Snake	480,342	882,600	402,258	83.7	41.4
Bear River	25,610	39,900	14,290	55.8	1.9
TOTAL	**$1,163,374**	**$2,130,800**	**$967,426**	**83.2**	**100.0**

SOURCE: Personal Income in Idaho Counties 1958-1965, Bollinger, 1969; and Idaho Department of Commerce and Development



Wages and salaries accounted for approximately 60 percent of Idaho's total personal income, with most stemming from government, manufacturing, commerce, and services. Income from government employment has increased the most, but substantial income has also been generated by motels, business and repair services, and professional services. The slowest growth in service-based personal income has been in amusements, recreation, and personal services, although due to increased recreational demand, these categories are likely to increase sharply in the early 1970s. Personal income derived from manufacturing and commerce showed a slower rate of growth.

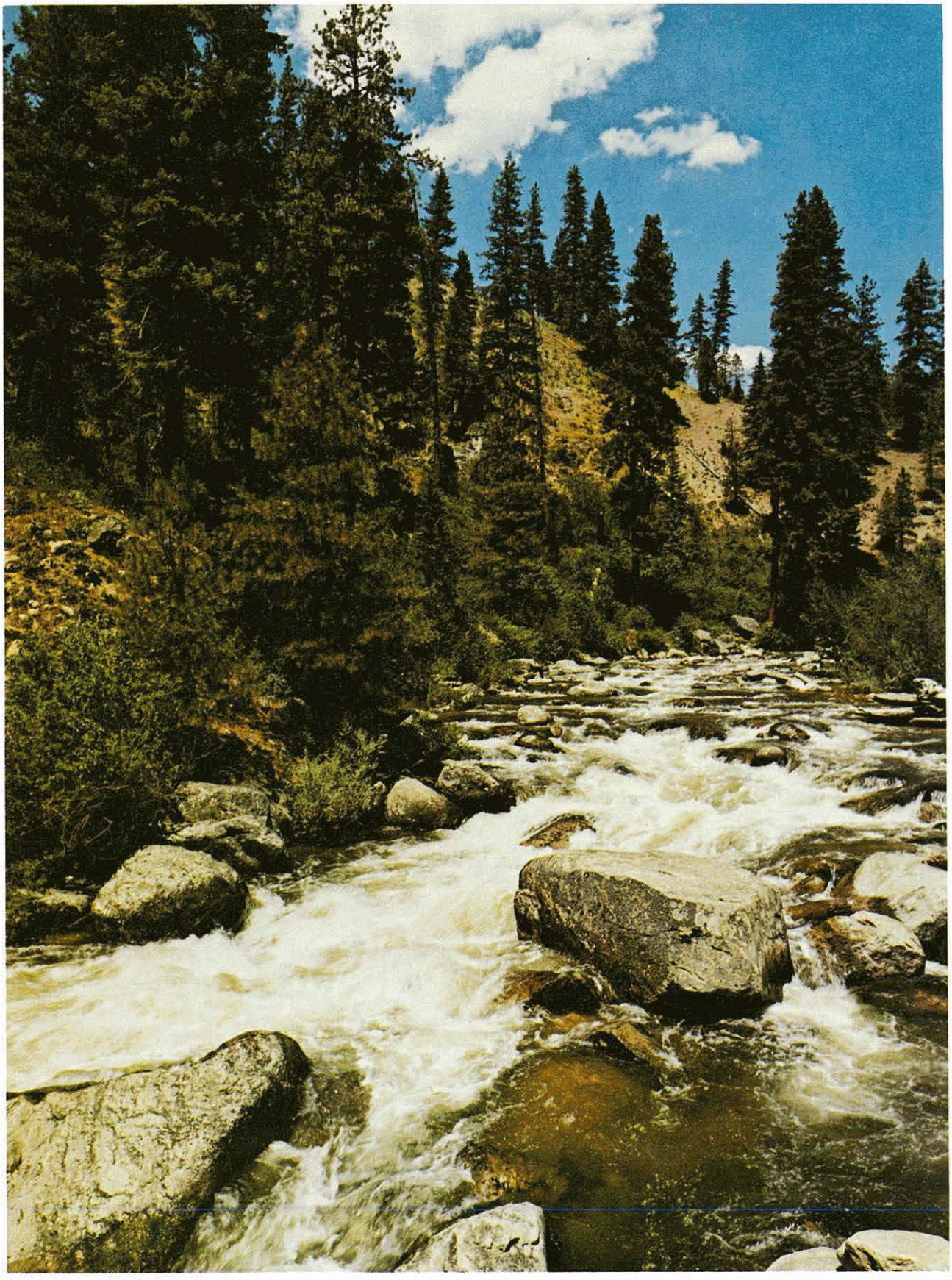
Income from proprietorship (largely farm production) and property and transfer payments makes up the remainder of total personal income in Idaho.

While farm income decreased slightly during the 1960s because of a reduction in the number of independent owners, income from farming increased slightly. Since farming contributes 15 percent of Idaho's total personal income (nearly four times the national average), it is not surprising that the average per capita income of $3,240 in 1970 lags behind the average of $3,921 for the nation.

Personal income grew at varying rates among Idaho's 44 counties between 1958 and 1969, as Table 14 shows. Income increased by more than 100 percent in eleven counties, with six of these, Clark, Caribou, Camas, Minidoka, Cassia and Bingham, located in the Upper Snake Basin. Only two counties, Washington and Butte, suffered decreases.

Fifty-five percent of total personal income is derived from seven counties each year: with Ada County producing 17 percent; Bonneville, 9.3 percent; Canyon, 8.2 percent; Bannock, 6.8 percent; Twin Falls, 5.9 percent; Nez Perce, 4.4 percent; and Kootenai 4.2 percent.

Diversification of Idaho's economy should create new jobs, particularly in manufacturing and tourism. Diversification along with optimum use of Idaho's water resources can help bring economic growth closer to regional and national levels and contribute substantially to personal and per capita income.



Chapter 2 / STATE WATER PLANNING PROGRAM

The objectives of the State Water Planning Program are to provide data and information to Idaho citizens and public officials as to how Idaho's water and related land resources can be used to meet future water needs for the benefit of its citizens.

There are many factors involved in the decision making process. Economic, social, and environmental goals must be fully considered and carefully weighed. Decision makers and the public must be aware of the options available for use of resources.

WATER RESOURCE PROBLEMS

A problem that must be faced is the effect that an increasing state population will have on land and water use. Although some may wish that state population would remain "as is", it is almost a certainty that population will at least double within the next 50 years. The question then remains — What can or should be done to accommodate the increased pressures on land and water resources which will occur along with more people? Since the status-quo cannot be retained, the available alternatives must be analyzed.

The following are illustrative of the difficult choices facing Idahoans:

Increasing urbanization of agricultural lands will eliminate associated habitat for upland game birds and waterfowl. New agricultural development with planned habitat areas equivalent to that lost through urbanization, would be needed to simply maintain the status quo. In order to provide a sufficient amount of new game habitat for the increased hunting pressures, more extensive agricultural development with planned wildlife management features will be required.

Increased population pressures will lead to congestion of flat water recreational areas, fishing streams, and wild rivers. This will likely lead to a reduction of taking limits and a rationing of outdoor recreational experience by a permit system. This cause and effect relationship has already been experienced in California; and permits are now being considered for implementation on the Middle Fork of the Salmon River.

Increased population pressures will serve to intensify the conflicts between water uses during future dry years. Recreational demands which are now met through use of existing water development facilities will suffer in increasingly greater proportion as the state population increases.

It should be evident that there is little likelihood that the status-quo will be maintained. Hence the problems noted above must be faced within the context of the State Water Plan.

The populace can influence the type of water and related land resource development it wishes to pursue. The state could, for example, choose to support new irrigation development and strive to bring into production vast acreages of desert lands. It is possible that as much as 2 million acres of additional lands could be developed by year 2020 if this course of action were chosen. This would provide new wealth, economic opportunities, food and fiber, new towns, upland bird habitat, and maintain the state's present share of national agricultural markets.

On the other hand, the state could elect to pursue a policy of maximum preservation of its water and related land resources, with little if any additional development of irrigated lands. Should this policy be followed, water resource programs would concentrate on the rehabilitation of existing water systems to meet supplemental needs, development of water supplies to meet minimum flows and provide replacement supplies for reservoirs which are increasingly used for recreation. Funds for these latter programs are not yet available. Present land uses such as grazing on desert lands would essentially continue and the future use of the state's water and related land resources would probably be directed to providing for instate and out-of-state recreational needs.

A third alternative involving a combination of new development and preservation is favored by the Water Resource Board.

The Water Resource Board has set forth in this document certain goals and objectives it feels should be attained in the State Water Plan. The public, the Governor, the legislature and other state and local agencies should carefully review these goals and objectives and inform the Board of their views. Thus the State Water Plan, when adopted, will have the support of Idaho citizens.

State goals need to be clearly spelled out by the legislature and a commitment made, both politically and financially, to take the steps required to reach the goals. Since the State Water Plan will be one of several state plans, it is essential that the various planning efforts be compatible.

STATE WATER PLAN

The Water Resource Board has determined that a State Water Plan should be completed by 1976. The 1976 date is important because the 10-year moratorium on diversion studies authorized by the Colorado River Basin Project Act of 1968 will terminate in September, 1978. Also the Pacific Northwest River Basins Commission has determined that its regional water plan should be completed by 1976; and the Department of Interior is required by law to complete its Western United States Water Plan (Westwide Study) by 1977. By having a common date for completion of these comprehensive plans, it is hoped that all of the major comprehensive water resource planning efforts can be coordinated and contribute one to another.

Other major studies, in addition to the Commission's plan and the Westwide Study, that need to be coordinated with the State Water Plan are the Wild and Scenic Rivers Studies of the Forest Service (particularly in the Salmon River Basin) and the Bureau of Outdoor Recreation; and the Type IV studies of the Snake River and Bear River basins by the Department of Agriculture. If coordinated, these federal water planning efforts can materially assist with the preparation of a State Water Plan.

The water and land resources of the state are fixed; however, thorough planning can provide a far more efficient use of the resources and minimize conflicts among uses. Conflicts between

competing uses of water will arise in the future and become even more critical as population grows. A State Water Plan can help resolve those conflicts.

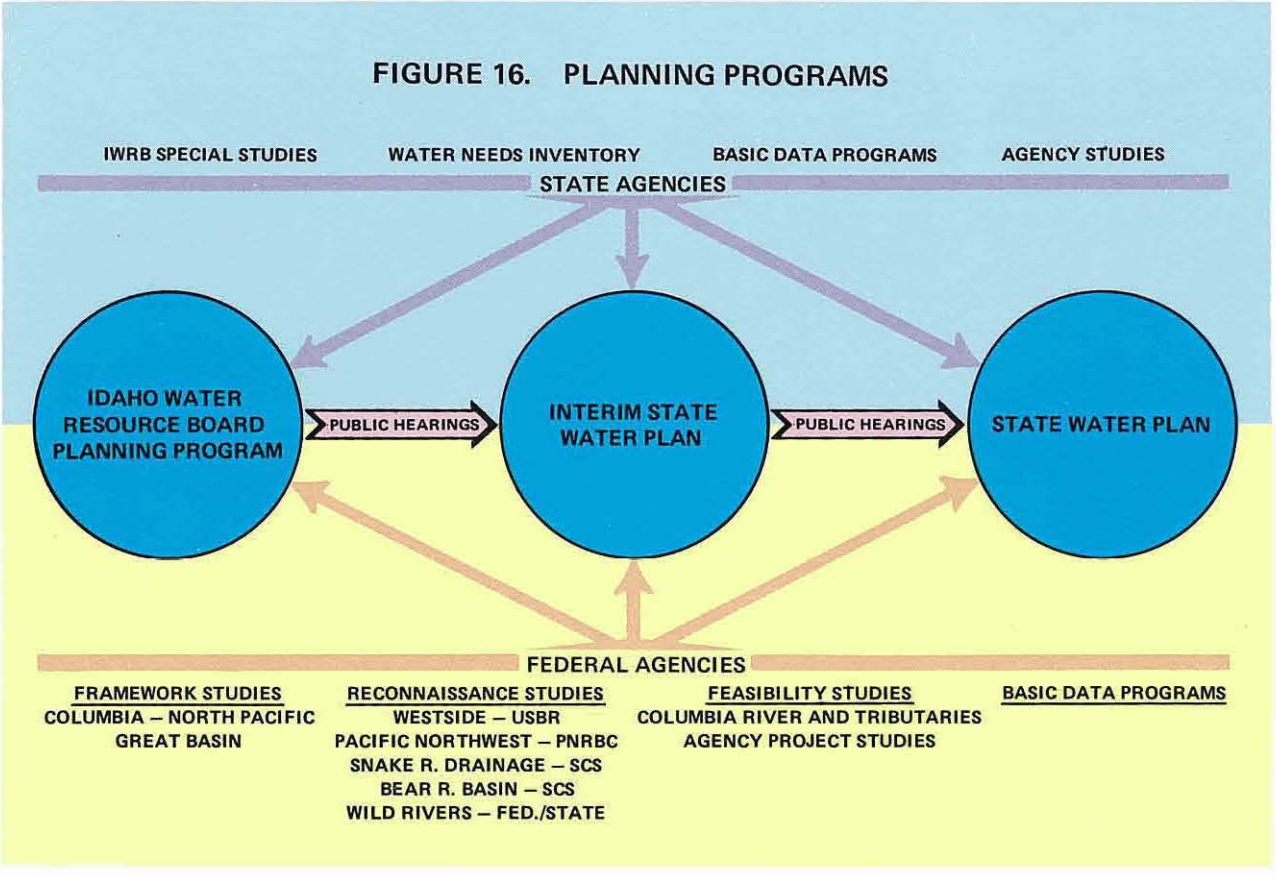
The State Water Plan, if it is to be effective, must be capable of being implemented. To plan for programs which, though desirable, are totally unrealistic from the standpoint of funding and commitment by people of the state, state legislature, or federal agencies, has little value and in the long run may do more harm than good. It is essential that the State Water Plan be endorsed by the legislature, executive branch, and citizens of the state so that implementation can proceed. This is of particular importance for management programs and development projects identified as necessary to meet needs and goals in the immediate time frame (five to fifteen years). Whenever possible, major decisions that do not need to be made at this time should be delayed and the options kept open for the future. Future decisions can be made based on then current information and issues.

Prior to 1965, local groups were served directly by private enterprise and federal agencies without a statewide perspective being given. The Water Resource Board was created in 1965 to set state water policy.

Major on-going federal planning studies such as those shown in Figure 16 deal with the water and land resources of the state. It is imperative that the Board continue to take an active part in these study efforts so that: (1) the state viewpoint is properly presented in the study reports presented to Congress; and (2) the state can help guide the study efforts to insure their compatibility with the State Water Plan.

In the meantime the Interim State Water Plan report is being prepared to give Idaho officials and citizens a statewide perspective of water studies to date and proposed water policy. Thereby the Board hopes to promote public involvement as part of the State Water Planning Program.

FIGURE 16. PLANNING PROGRAMS



INTERIM STATE WATER PLAN

This Interim State Water Report has been prepared to give Idaho officials and citizens a statewide perspective of water studies to date and proposed water policy thereby promoting public involvement as part of the State Water Planning Program. The State Water Plan will not be completed until 1976, yet some major water issues will need to be decided by then. Moreover, state and federal agencies need to receive direction as to the major alternative water plans to be studied by 1974.

To promote public involvement a Citizens Water Advisory Committee has been formed composed of groups representing different viewpoints; and county commissioners have been asked to appoint County Water Committees to work on the local level with Board members and staff. The ideas and concerns of these groups will be of great value to the Board in formulating the State Water Plan.

Much of the information presented in this report has been obtained from data and information contained in the Idaho Water Resource Board needs studies, the Columbia-North Pacific and Great Basin Framework studies and the study efforts by the federal, state and local entities. This information was supplemented by studies conducted by the Board staff.

This Interim State Water Plan Report is being made available to all state, federal, local and special interests for review and comments. Following this, public information meetings will be held throughout the state to fully explain the information presented in the report and to obtain the views and comments of the local people. Public hearings will be held following the public information meetings to obtain official comments from all interested parties in the state. Following the public hearings, Board action will be taken regarding an Interim State Water Plan and a revised report will be published.

The Interim State Water Plan will serve as a guide to decision makers until the State Water Plan is completed in 1976. To insure that the 1976 State Water Plan report also reflects the citizens' views and comments, a public involvement program will be continued during this period.

A chart illustrating the course of action to be followed in the preparation and approval of the Interim State Water Plan as well as the State Water Plan is shown (Figure 17).

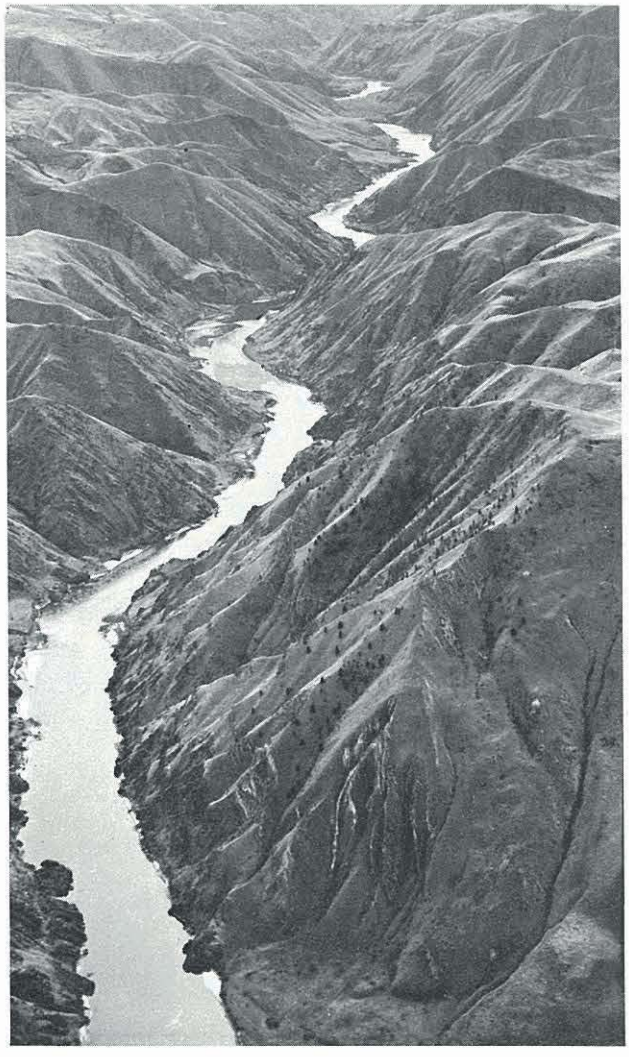
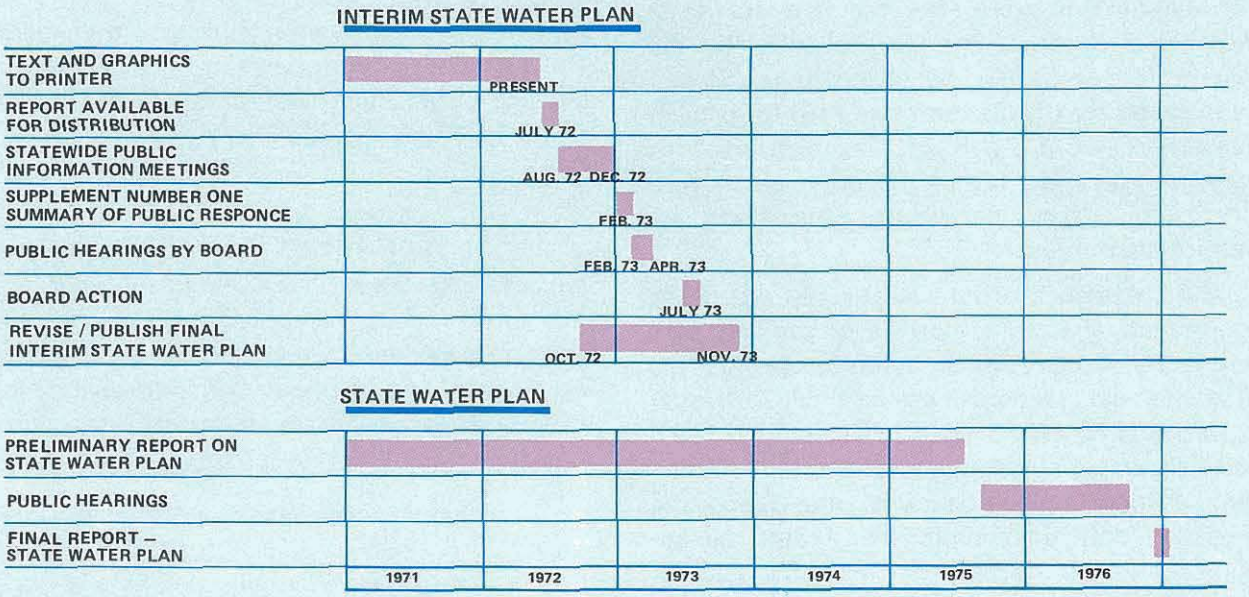


FIGURE 17. STATE WATER PLAN SCHEDULE, 1970-1976



PLANNING METHODOLOGY

The objective of the State Water Plan is to recommend programs for meeting the water needs of the citizens of the state of Idaho to the year 2020. The State Water Plan will include provision for all purposes such as: agriculture, recreation, municipal, industrial, fish and wildlife, preservation, water quality, minimum flows, power and navigation. Emphasis will be given to meeting the 1980 and year 2000 needs, keeping in mind requirements for the year 2020 and beyond. Funds to conduct additional studies needed to assist public officials and the public in making decisions to meet early water needs are included in the Board's budget. Studies directed toward long-range needs are of less detail.

A major planning consideration is the assumption that the State Water Plan will be updated at least every five years and that the plan is to be used as a flexible guide and not a rigid document.

In response to many public and congressional expressions of concern and dissatisfaction with evaluation practices now being followed, the National Water Resources Council established a Special Task Force to review and revise, as necessary, the principles, standards, and procedures for water and land resource planning.

The proposed new procedures were recently published in the Federal Register (December 21, 1971) and public hearings then were held in March 1972. The 1965 Water Resources Planning Act empowers the President to impose the new planning methods without further action by Congress.

The new procedures call for attainment of three objectives: to enhance national economic development, to enhance the quality of the environment, and to enhance regional development. However, the regional development objective can be used in plan formulation "only where approved in advance".

The most far-reaching change proposed by the new procedures involves the interest/discount rate. The discount rate would be set at 7 percent for the next 5 years after the new standards went into effect. It is quite probable that the rate would eventually be increased to 10 percent. Presently the discount rate used for project evaluation is 5-3/8 percent. The high discount rate means that future benefits are lower. Therefore, effects on future generations are heavily discounted.

The 7 percent discount rate would not apply to projects already authorized or projects proposed for Congressional authorization at the time the new standards became final. Authorized projects which Congress failed to fund for 5 years or longer however would require re-evaluation using the new discount rate. Since the proposed new planning criteria would be applicable to all federal or federally assisted programs and projects, it is a major planning consideration which Idaho must recognize. One need only reflect on the magnitude of federal water resource planning in Idaho to appreciate the significance of this action on Idaho's water and related land resource program.

The Board is structuring its study efforts to provide the data and information needed to formulate plans to meet the proposed federal multi-objectives planning criteria. In addition, the Board has elected to evaluate plans that are multi-objective from a state viewpoint. Although not formally identified, the following are indicative of the multi-objectives as they relate to the state:

STATE ECONOMIC DEVELOPMENT. To enhance the state economic development by promoting those programs and projects which would enhance the aggregate income to the state.

ENVIRONMENTAL QUALITY. To protect and enhance the quality of the environment of the state through management, conservation, preservation, restoration, or improvement of the quality of natural and cultural resources and ecological systems.

PUBLIC WELL-BEING. To enhance the public well-being as it relates to personal, group, and community goals by contributing to the security of life, health, and property and helping to provide an adequate and equitable distribution of personal income and employment opportunities.

LOCAL ECONOMIC DEVELOPMENT. To enhance local economic development by increasing local income, employment opportunities, and improvement in its economic base thereby slowing the loss of population in rural communities. Local economic development may or may not be at the expense of other locales in the state.

The State Water Plan will include a blend of economic development and environmental quality. The following approach will be used to accomplish this goal:

- Alternative plans will be developed including both structural and nonstructural measures such as land management, project construction, water quality management, and establishment of wild and scenic rivers, etc. Where information is not available, studies and research programs needed to solve problems will be recommended.
- The base year of the study will be 1970 with projections to 1980, 2000, and 2020.
- Existing state and federal law and policy, including compacts and treaties will guide the planning effort. If they place a constraint on the development of water necessary to meet the requirements under one or more alternative plans, steps will be taken to:

  A. Evaluate the impacts of the constraint on the plan,

  B. Identify the course of action required to modify or remove the constraint, or

  C. Discard the alternative.

- The intent of the State Water Plan will be to emphasize programs required prior to the year 2000 but identification of water requirements after this period will be fully considered including water uses on public lands and Indian Reservations.

- Adopted state and federal water quality standards will be used as a basis for necessary management measures and for planning.

- Reconnaissance level analyses of beneficial and adverse effects will be made to the extent required to delineate those programs proposed for implementation and for development to meet the year 2000 needs. Benefit and cost comparisons will be made for the various alternative plans in terms of the multiple objectives.

- Alternative plans will be formulated to clearly identify the choices that the citizens of the state of Idaho can make with respect to water and related land resource development. These alternatives will be analyzed to show the trade-offs between serving the different multiple objectives. In order to meet the timing of the Westwide Study, alternative plans must be developed for public review by November 1974. Following public information meetings, a final plan will be recommended by the Water Resource Board for public review by November 1975. Completed drafts of the State Water Plan should be available to the Bureau of Reclamation by April 1976 so that Idaho's portion of the Westwide Study can be included in the final draft which is scheduled for completion by August 1, 1976.

- The State Water Plan will be of a reconnaissance level scope, i.e., it will be conducted to a level of intensity less than project feasibility grade but greater than framework planning intensity. Reconnaissance benefits and costs will be identified for structural and nonstructural means of satisfying water requirements and related together on a systems basis by the use of hydrologic, water quality, and economic models. This will enable the system-wide effects of development versus nondevelopment to be clearly identified.

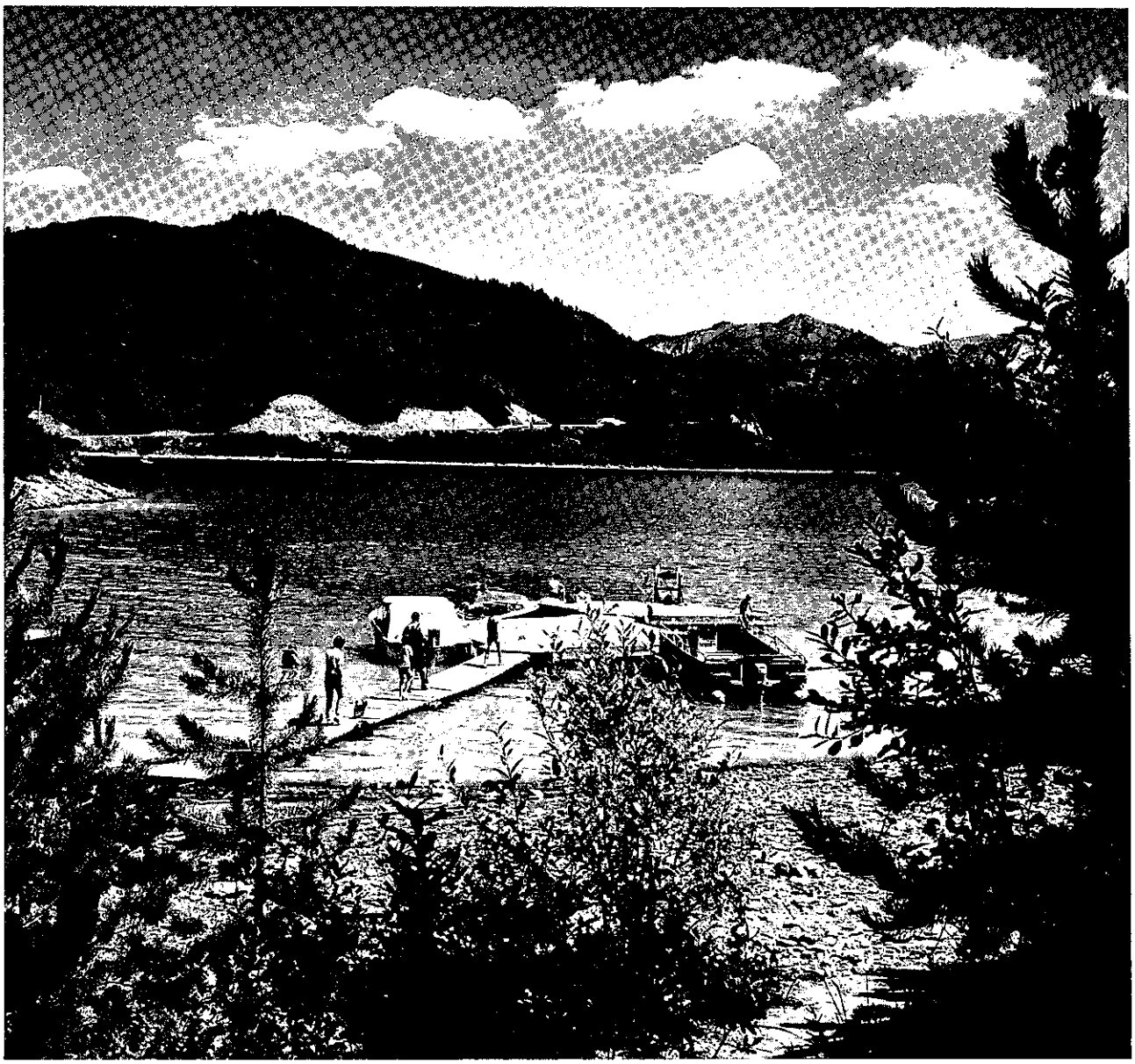
STUDY CONSTRAINTS

The preliminary Interim Water Plan Report presents an inventory of available resources, a definition of water problems existing today, projects some specific proposals to satisfy 1972-1985 needs, and lists alternatives identified to satisfy long-term needs. Limited time, funds and staff have not permitted the economic, engineering and environmental analyses necessary to formulate a State Water Plan. Nor has an extensive public involvement program been possible to date. During the next few years, with the combined efforts of state and federal agencies, the Board hopes to see alternative plans studied in sufficient depth so that agreement can be reached on a State Water Plan. If the Board and other state and federal agencies are not adequately funded the State Water Plan will be lacking in depth.

A lack of adequate data and studies associated with certain water use functions has hampered the Board's study efforts. This has been of particular significance in the environmental areas such as water quality, fish and wildlife, and water based recreation. Neither the time nor money available to overcome this study deficiency has been adequate. Funds have been requested to overcome this deficiency.

The Board recognizes that a State Water Plan must be developed within the context of total resource planning. All programs or projects should be evaluated as to their suitability, both environmentally and economically, within the context of the total hydrologic system. Some of the complex "tools" needed for comprehensive studies are still in the process of being developed. Perhaps the best illustration of this type of planning tool is the computerized simulation model of the Snake River system which the Board staff is developing. When fully operational, this tool will enable planners to study the hydrologic effect that one or more programs or projects would have throughout an entire river system.

Many innovative and "radical" proposals for meeting future water needs, such as weather modification, cannot be implemented under today's conditions but may well provide the key to solving future problems. For example: if stream flow could by augmented by 10 percent or more during the low flow years through a weather modification program, this would substantially affect the type of plan proposed to provide for needs during low flow years. Cloud seeding (weather modification) was carried out by the Bureau of Reclamation in three western states (Arizona, Texas and Oklahoma) in the summer of 1971 after these areas were hit by a severe drought. The results in Arizona were rated successful by local authorities but in Texas many complained that unprecedented rainfall caused considerable damage to agricultural and urban areas. Studies are being made for the federal water planning agencies by universities on weather modification. The option to apply innovative approaches to solving water needs should not be ignored or passed over. Intensive study efforts are underway which will help provide sound information on which reasonable decisions can be made.



MAJOR POLICY ISSUES

There are various types of issues which directly influence water planning efforts but are not necessarily subject to control at the state level. State and national goals can and do vary and national goals are sometimes achieved by overriding state goals.

The process followed in planning and implementing water projects is unique when compared to the process followed for other national programs. Water projects are the only ones in which an economic benefit/cost study is made and used as the basis for authorization and funding. In other social programs (such as health, transportation, defense, education, etc.) programs and projects are authorized and funded on the basis that the social goal or objective is in the national interest. Also involved as a planning consideration is the fact that social goals vary with time. For example, in the 1930s the national goal was to achieve economic growth and environmental considerations were considered secondary to achieving this goal.

It is likely that future water resource projects and programs will need to be tied into social goals such as rural development and stabilization in order to obtain congressional authorization and funding.

Some of the key issues which could dramatically alter the options open to the state in formulating a State Water Plan follow.

DEVELOPMENT VERSUS PRESERVATION

Perhaps the major issue in the state today is that of development versus preservation. Those in favor of further development in the state point out that economic growth is essential in continuing to provide a decent wage, food and clothing, and enjoying the social benefits attributable to economic growth.

The "extreme developer" favors development almost at any expense arguing that in the past this has proved to be ultimately beneficial to the people. The preservationist on the other hand notes that although historically, the concept of growth at any price has been accepted, this policy is no longer adequate. The preservationist questions whether the government, that is the people, should seek to promote growth in view of the danger to an environment. He questions in many cases whether it is necessary to take action now and suggests that advances in technology may make it easier to meet future needs; hence, decisions should be delayed until technological advances have occurred. The very "extreme preservationist" is opposed to any type of development — for any purpose at any price. Further, he notes that the very reason people are moving to Idaho is that they are opposed to growth.

A typical issue which illustrates the conflict between development and preservation is that related to water based recreation in the state. The Board's policy has been that water development and water based recreation are compatible if properly planned. Studies to date indicate that where water and land development have occurred the general recreational opportunities have increased. Although this does involve a shift in type of recreational use (reservoir fishing as opposed to stream fishing) more people can be accommodated than was possible in the past. The expected increase in population will result in associated increases in recreational needs and these needs must be planned for or present recreational activities will diminish in quality.

The conflict between those wishing to preserve all streams for fishing and those who wish to develop storage facilities for the capture of flood flows to provide water to meet other demands is key to the type of issue involved in a preservation versus development controversy. Of the state's more than 15,000 miles of free flowing streams, approximately 600 miles have been lost to date as a result of reservoir impoundment. It is unlikely that more than 200 additional stream miles would, under any type of active development program, be inundated by

the year 2020. Those now inundated are covered by some of the better known recreational areas such as Henrys Lake, Island Park Reservoir, Palisades Reservoir, American Falls Reservoir, Blackfoot Reservoir, Mackay Reservoir, Magic Reservoir, Twin Lakes Reservoir, Anderson Ranch Reservoir, Lucky Peak Reservoir, Lake Cascade, Brownlee Reservoir, and others. A review of the recreational use in 1970 which these reservoirs received (see Chapter 3) is ample evidence that they provide a tremendous recreational resource for the citizens of Idaho and tourists.

The Water Resource Board seeks to take a balanced view of the two extremes, seeking neither development at any price nor total preservation of all the resources. The Board's policy has been that development is necessary and should occur but should be guided and confined to specific areas. In areas which offer unique natural benefits a nondevelopment policy should be planned and pursued.

In addition to the general issue of development versus preservation, other specific major issues which will have a tremendous influence on the future use of the state's water and related land resources are presented in this section.

PUBLIC LAND LAWS

Numerous bills are now pending in Congress which would involve Idaho along with other states in comprehensive land use management programs related to (1) nonfederal land use, (2) siting of power plants and facilities, (3) mined land regulation and reclamation, and (4) federal land use. These bills are proposed as being necessary to protect the environment, achieve orderly growth and improve the quality of life. However, the bills generally ignore existing state laws, and current state, interstate, and federal-state efforts to accomplish these very same goals.

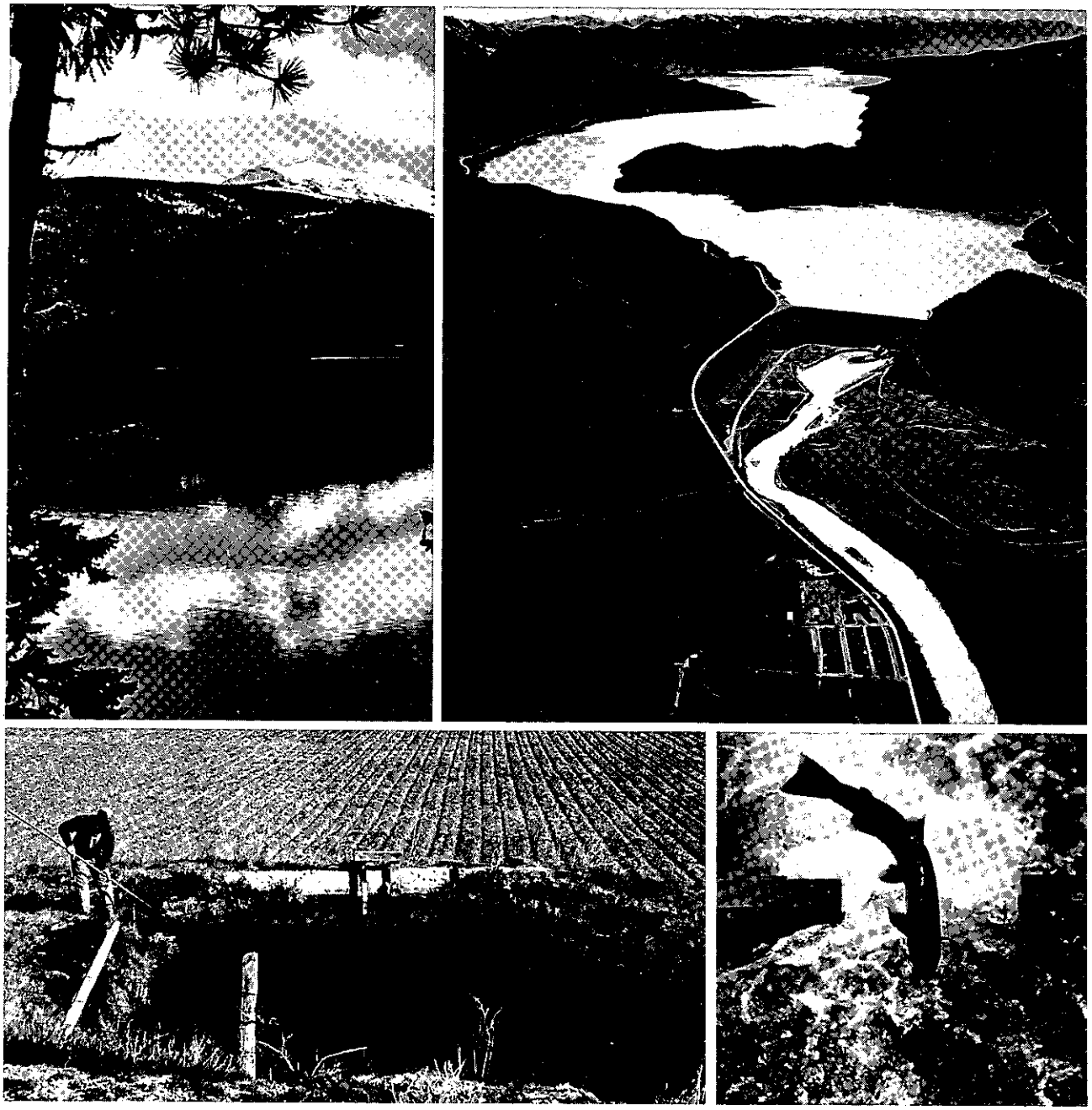
Of major concern to the Board is that some bills (such as the proposed National Land Use Planning Act) introduce the element of federal policy determination into the development and management of nonfederal lands. State compliance with vaguely stated federal policy is encouraged (if not compelled) by stipulations for severe economic sanctions through loss of federal funds.

The Board feels that state and local agencies should have primary responsibility for developing and implementing state land use plans and that land use plans must also be developed for federally owned lands.

The restraints placed on use of public lands in Idaho are of major significance in the formulation of a State Water Plan. About 90 percent of potentially irrigable lands in southwest Idaho are public lands. The program conducted by the Bureau of Land Management (BLM) under the Multiple Use and Classification Act of 1964 (the act expired December 31, 1970) is an example of the significance of federal land use programs and the restraints which can be imposed. Under the 1964 act which called for public lands to be classified for either retention or disposal, over 9.9 million acres were classified for retention and only 5,000 acres classified for disposal. Utilization of the Desert Land Act is now stopped on the 9.9 million acres.

The Desert Land Act is currently the only workable land law by which desert land can be reclaimed by nonfederal interests for irrigation. Proposed legislation would repeal this act and the Carey Act and substitute an auction procedure at which lands would be sold to the highest bidder including corporations. The Board is opposed to such legislation since it would eliminate the individual from acquiring these lands. Only the Carey Act can be used by the Board for public land development and it has a 160 acre limitation.

Since much of the state's undeveloped natural resources occur within public domain lands, this extends the decision making process regarding resource use beyond the political boundaries of Idaho. Recent actions such as those including federally designated wild and scenic rivers, primitive and wilderness areas, and multiple use areas are indicative of this factor.



The decision making process outside the state of Idaho involves a wide variety of agencies, special interest groups, and individuals. The Public Land Law Review Commission in its report, *One Third of the Nation's Land*, identified six categories of interest. They are: (1) the national public, (2) the regional public, (3) the federal government as sovereign, (4) the federal government as proprietor, (5) state and local governments, and (6) the users of public lands and resources. Thus the dilemma: while Idaho has tremendous undeveloped land areas, rivers, minerals, natural areas, and a quality environment, the majority of the resources are located on federally owned lands surrounded by a small population base of 713,000 (less than ½ of one percent of the United States total population). Consequently, the desires of Idahoans can easily be over-looked when decisions are made regarding development or nondevelopment of the resources within the state's boundaries.

BEAR RIVER NEGOTIATIONS

There are currently negotiations between the states of Idaho, Wyoming, and Utah regarding the status of unconsumed river flows of the Bear River Basin. Information and recommendation forthcoming will influence the future options of development open to the people in that basin. Present activities of the Bear River Basins are governed by the Bear River Compact which has been in effect since 1958. The professional staff of the Water Resource Board provides technical support to the Idaho Negotiating Team. Any decisions reached by this team are not binding upon the state of Idaho unless agreed to by the Idaho legislature, the Governor, and Congress. A full discussion of the Bear River negotiating issue is presented in Chapter 4, Bear River Basins.

WILD RIVERS

The Federal Wild and Scenic Rivers Act of 1968 designated the Middle Fork of the Salmon River, the Middle Fork of the Clearwater above Kooskia and the Lochsa and Selway tributaries of the Middle Fork as federal wild and scenic rivers. In addition the following rivers were identified in the 1968 act as rivers to be studied for possible inclusion in the federal system; (1) main stem of the Salmon River – from the North Fork to its mouth; (2) the Bruneau River; (3) the Moyie River; (4) St. Joe River; and (5) the Priest River. The Middle Snake River from Hells Canyon to Lewiston and the Henrys Fork of the Snake River were listed by the secretaries of Interior and Agriculture as having potential for addition to the wild and scenic rivers system. The effect of this latter designation by the secretaries is meaningful only from the standpoint that any water development proposals suggested for these rivers must include, as part of the study, consideration of the possibility of designating these river reaches as part of the federal wild and scenic rivers system. Since this type of study is also required for environmental impact statements, the designation does not have any particular significance at this time.

Of the total 818 miles included in the "present" federal wild and scenic rivers system in the United States, Idaho has contributed 312 miles through the rivers already named and another 484 miles are under study as noted above. The studies on the Salmon, Bruneau, Moyie, St. Joe and Priest rivers are being conducted as joint study efforts between the state and designated federal agencies.

The Water Resource Board is involved in the study efforts and has taken the position that the studies should be conducted as comprehensive river studies and not merely a survey of recreational potential. The Board's concern is that if the rivers systems are included in the federal system and should this designation preclude economic benefits to the local region or state, compensation should be sought from the federal government. Once rivers are in a national system, the likelihood is that they will never be available for other uses.

The Board has also requested the federal government to conduct a comprehensive post audit study of the rivers included in the federal system as "present rivers". Should the post audit study indicate that there were economic opportunities foregone on a state or local basis, the Water Resource Board would propose that compensation be provided by the federal government.

The Water Resource Board recommends that Idaho consider establishing a state wild and scenic rivers system including rivers under study by federal agencies. There are numerous rivers which possess unique recreational and environmental characteristics which could be included. By inclusion in a state system, the state could establish restrictions and management plans thereby insuring that benefits were retained for Idahoans. Furthermore, the state designation of these rivers would insure full compatibility with future actions the state might wish to take with regard to development or nondevelopment of the river reaches. It would also be possible to utilize this system to in essence "withdraw" identified development areas, thereby prohibiting uncontrolled uses which would forego future options. Until such time as comprehensive de-

velopment was to proceed, the state could capitalize on the use of this recreational resource as part of its own wild and scenic rivers system.

MIDDLE SNAKE RIVER DEVELOPMENT

The issue regarding development versus nondevelopment in the Middle Snake River below Hells Canyon involves many alternatives, side issues, and parties. In essence the alternatives facing the Board can be outlined as follows:

1. Should a dam be built in the Middle Snake reach above Salmon River by private and public entities for the purpose of generating hydroelectric power and making it possible to utilize surplus Salmon River water?[1]

2. Should a moratorium being proposed by Senators Jordan and Church be supported? (The moratorium would delay any decision for seven years until further studies could be made to ascertain the need for either development or nondevelopment of this reach of the river.)

3. Should the Middle Snake reach from the Hells Canyon dam to Lewiston be designated as a federal wild and scenic river? (This would totally preclude any future development opportunities in the reach as well as possibly have a significant effect on upstream development in the state.)

Unless a moratorium bill is passed by Congress or a bill is introduced in Congress which would designate and include the Middle Snake River as part of the federal wild and scenic river system, the decision with regard to development or nondevelopment of the Middle Snake rests with the Federal Power Commission (FPC). A recent ruling by the FPC examiner was in favor of hydroelectric development in the Middle Snake by the private and public utilities after a five year moratorium. In this time studies completed would indicate if the Middle Snake should be designated as a part of the National Wild Rivers System. A final decision by FPC has not been made but, depending upon action taken by Congress, could be issued at any time.

The conditions imposed by the Idaho Water Resource Board are:

1. If a project is to be built in the Middle Snake, the state should receive significant benefits; and

2. Downstream power rights should be subordinate to future upstream consumptive uses so as not to preclude future development opportunities in the Upper Snake.

The Board has entered into a contract with the private and public utilities which guarantees to the state of Idaho that the two conditions spelled out by the Board will be met should a dam be built.

The Board's position has not been opposed by Idaho's congressional delegation, the Governor's office, or the state legislature for in essence should a project be built on the Middle Snake (which is entirely possible should FPC issue a ruling on this) it is essential that state interests be protected. Should the Board oppose the project the agreement with the private and public utilities would be voided and any guaranteed protection for the people of Idaho would be lost.

If a project is not built the Board recommends that a small reregulation dam be built below Hells Canyon Dam to regulate flows and that motor boats be banned upstream from the mouth of the Salmon River.

Assuming a project, such as the High Mountain Sheep Project, was constructed in the Middle Snake reach, it would nearly double the existing hydroelectric capacity in Idaho and would be ten times as large as any other pending project in the state. Project benefits could contribute substantially to funding of other water resource programs and projects throughout the state. The monies available (only by virtue of the Board's agreement with the private and public utilities) could amount to over $200 million over a 50-year period.[2] The monies could be used for constructing new facilities, rehabilitation of old facilities, and

[1] The various alternatives with potential effects are discussed in depth in Chapters 4 and 5.

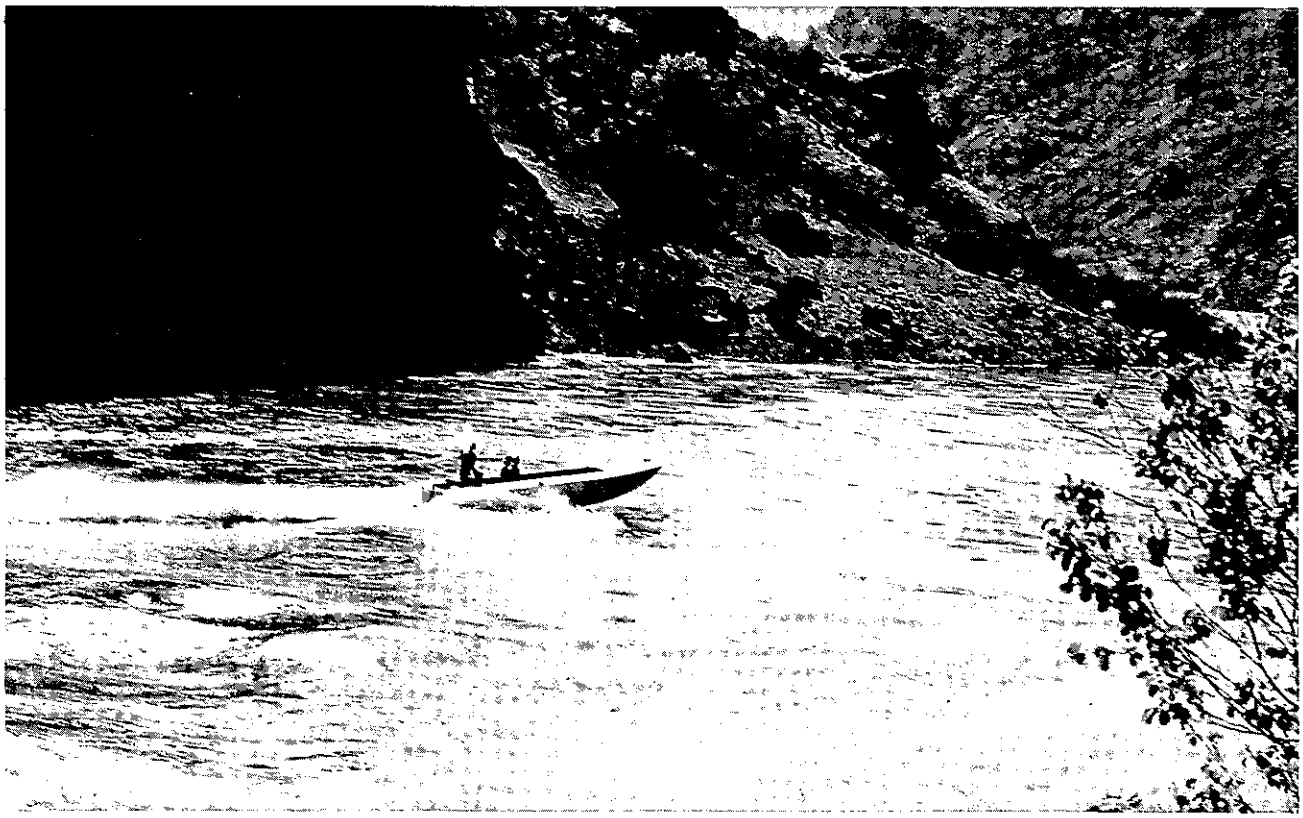
[2] Includes increased local taxes paid as a result of the project.

planning and management programs for all water use functions including water quality, fish and wildlife, irrigation, municipal and industrial water supply, flood control, land use planning and zoning, navigation, recreation and watershed protection.

Legislation

Senators Jordan and Church have proposed legislation which would establish a seven year moratorium against dam development in the Middle Snake River area. The purpose of the legislation would be to allow time to complete the State Water Plan which would in turn identify the manner in which the water resources of the state could be put to optimum use. This legislation has passed the Senate but has not been acted upon by the House. Representative McClure has suggested that the moratorium bill be amended to include a moratorium against any type of activity, such as wild or scenic river designation as well as construction of hydroelectric power dams. It is possible that some action by Congress may be forthcoming on the moratorium legislation in 1972.

In 1971, Senator Robert Packwood from Oregon introduced legislation in the Senate of the United States to designate the Middle Snake River as the "Hells Canyon Snake National River." This legislation was vigorously opposed by the Water Resource Board, Governor's office, and Idaho's Congressional Delegation, since it would require that the area remain in its natural state and presented the threat that river flows would remain at present levels. In essence the bill could have eliminated future upstream development in southwest Idaho or the Upper Snake region and the decision regarding future use of the state's water and related land resources would have been effectively handed over to the Secretary of Agriculture as the administrator of the National River. The Senate Parks and Recreation Subcommittee did not take action on the Packwood Bill and it died in committee. Legislation similar to the Packwood Bill will likely be introduced again. Should the Middle Snake ever be designated as a wild river, administration should be by the states and not the federal government so that state control of water resources is maintained.



Minimum Flows

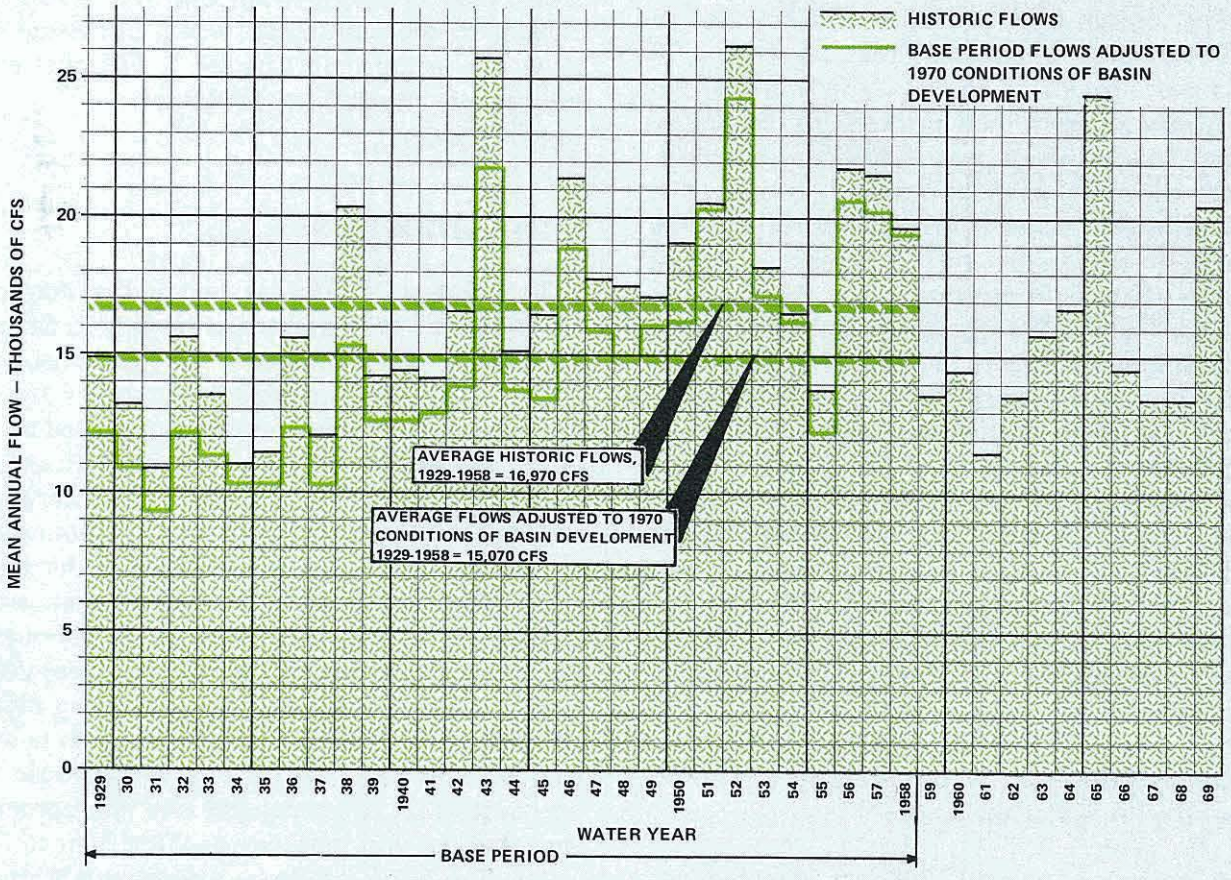
Another is the request of recreational boat users for substantial minimum flows (10,000 cfs) in the Snake River above the mouth of the Salmon River. The Corps of Engineers has calculated that 9,500 cfs is the required flow for boating that section of the Middle Snake. The concern is that a fixed requirement for a minimum flow of this magnitude could essentially stop or severely limit future upstream development. Figures 18, 19, and 20, provide information about river flows in the Middle Snake and illustrate the problem as flows vary during drought periods.

Figure 18 shows the average annual historic flows at Weiser[1] for the base period 1929-1958, and the average annual flows for the same period adjusted to reflect 1970 conditions of basin development.

Figure 19 shows in more detail the average monthly flows, adjusted to 1970 conditions of basin development, for the historic dry cycle – 1928-1937. It is important from a planning standpoint to consider flows during the dry cycle since there is the probability that this will occur again. In viewing the figure, one might assume that the average flow of 11,200 cfs for this period can be provided. This, however, would require total stream flow regulation which is not possible in that there are a limited

[1] Flows at Weiser were used since they are essentially the same as in the Middle Snake and have not been altered by the Hells Canyon operation.

FIGURE 18. MEAN ANNUAL HISTORIC FLOWS, WEISER



number of upstream storage sites available and some of these are being opposed. In addition, it can be seen that the minimum flow is already less than 9,500 cfs in some of the summer months during the dry period.

Figure 20 shows the average monthly flows at Weiser during the 1928-1937 dry cycle for the year 2020 assuming development of 1,720,000 acres of new land as projected by the Pacific Northwest River Basins Commission. Again, the conflict between use of the Middle Snake for recreational boating use (assuming 9,500 cfs minimum flow for boating) and future upstream development is clearly indicated. In future planning studies, benefits and costs of providing various flows downstream should be compared with the benefits and costs of utilizing various flows upstream.

THE DIVERSION THREAT

The Lower Colorado River Project Act of 1968 included a provision that there be a 10 year moratorium on studies by federal agencies of diversions from the Northwest to the Southwest. This provision was included at the insistence of the Northwest senators to allow the northwestern states time to identify future needs in the states and to combat diversion threats if it could be shown that there was no surplus water. The 10-year moratorium while providing some recognition by Congress of the rights of northwestern states such as Idaho to make full use of their own water resources, does recognize the possibility of some future diversions from the Northwest to the Pacific Southwest. The Lower Colorado River Project Act of 1968 also recognized a 2½ million acre-feet obligation to Mexico as being a national obligation rather than an obligation on the Colorado River system. By this action, Congress again recognized the distinct possibility that some future interbasin transfers of water from the Pacific Northwest might be necessary in order to meet the "national obligation."

A provision of the 1968 act directed the Department of Interior to prepare a Western States Water Plan which would identify the resources and needs of the 11 western states. All possible means of meeting the future needs, short of diversions, are to be considered. This study is underway and is being monitored by the Water Resource Board to insure that Idaho's needs are known and fully considered in the planning study. The Pacific Northwest River Basins Commission, of which Idaho is a member, will coordinate the Westwide Study effort for the Pacific Northwest states as part of the commission's comprehensive planning study efforts. The commission's study efforts and the Westwide Study effort will be presented to Congress and undoubtedly will serve as a guide when decisions are made with regard to water programs and projects in Idaho. It is essential therefore that the Board continue its involvement in these studies. Studies by the Idaho Water Resource Board clearly demonstrate that there are no surplus waters in the state of Idaho.

Several very general schemes have been presented for diversion from the Northwest or Canada to the Southwest. A full discussion of these are included in Chapter 5, National and International Water Transfer Schemes.

WINTERS DOCTRINE

The Winters Doctrine is based on the Montana court case of Winters versus the United States. Winters, a Sioux Indian, sued the government on behalf of the tribe contending that the treaty which established their reservation granted them rights to use the waters of the Milk River, at least to an extent reasonably necessary to irrigate their lands. The treaty set the boundary of the reservation at the middle of the Milk River. The court review revealed that even though the term irrigation was not spelled out in the treaty, irrigation and other water uses were factors which led to the boundary being designated at mid-stream. Winters sued when desert land development near the reservation began to use water that he contended was appropriated for tribal use and that they had first right to the water. The Supreme Court agreed with Winters and said "We are of the opinion that the court

FIGURE 19. MEAN MONTHLY FLOWS, SNAKE RIVER AT WEISER
(Adjusted to Year 1970 Development)

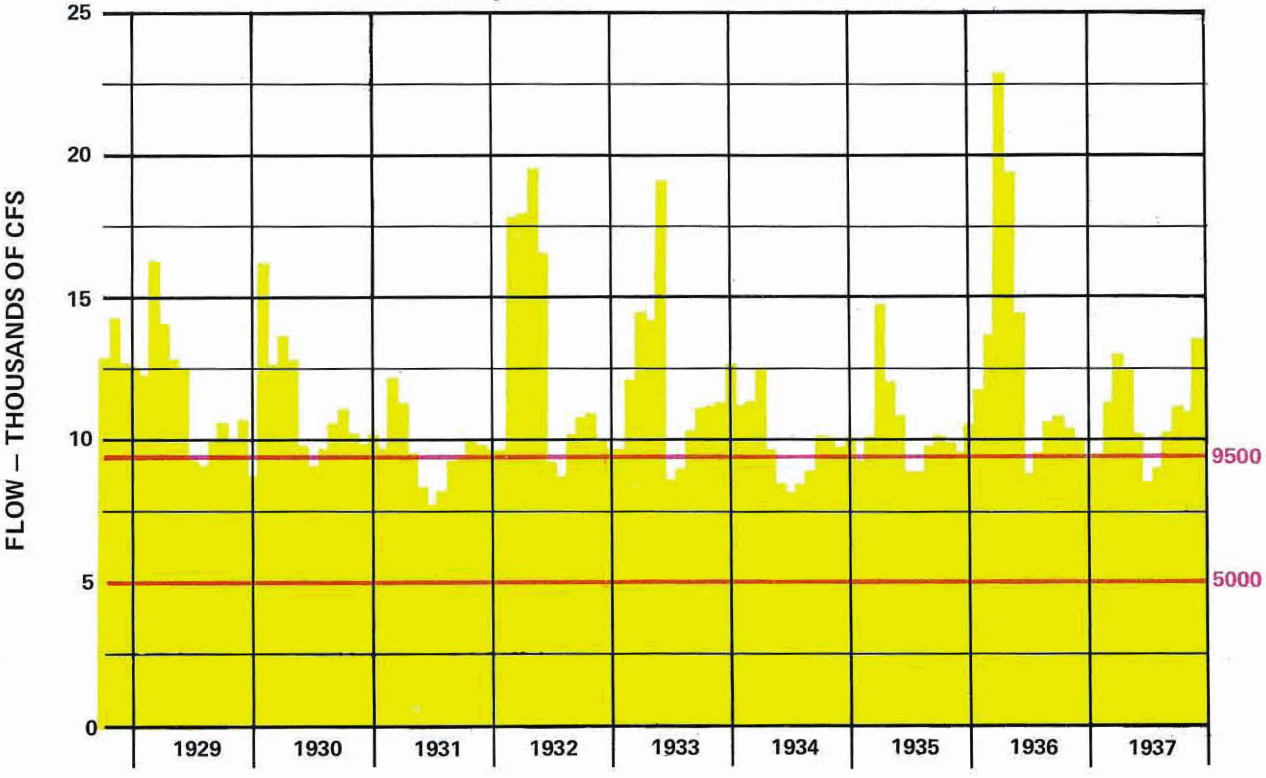
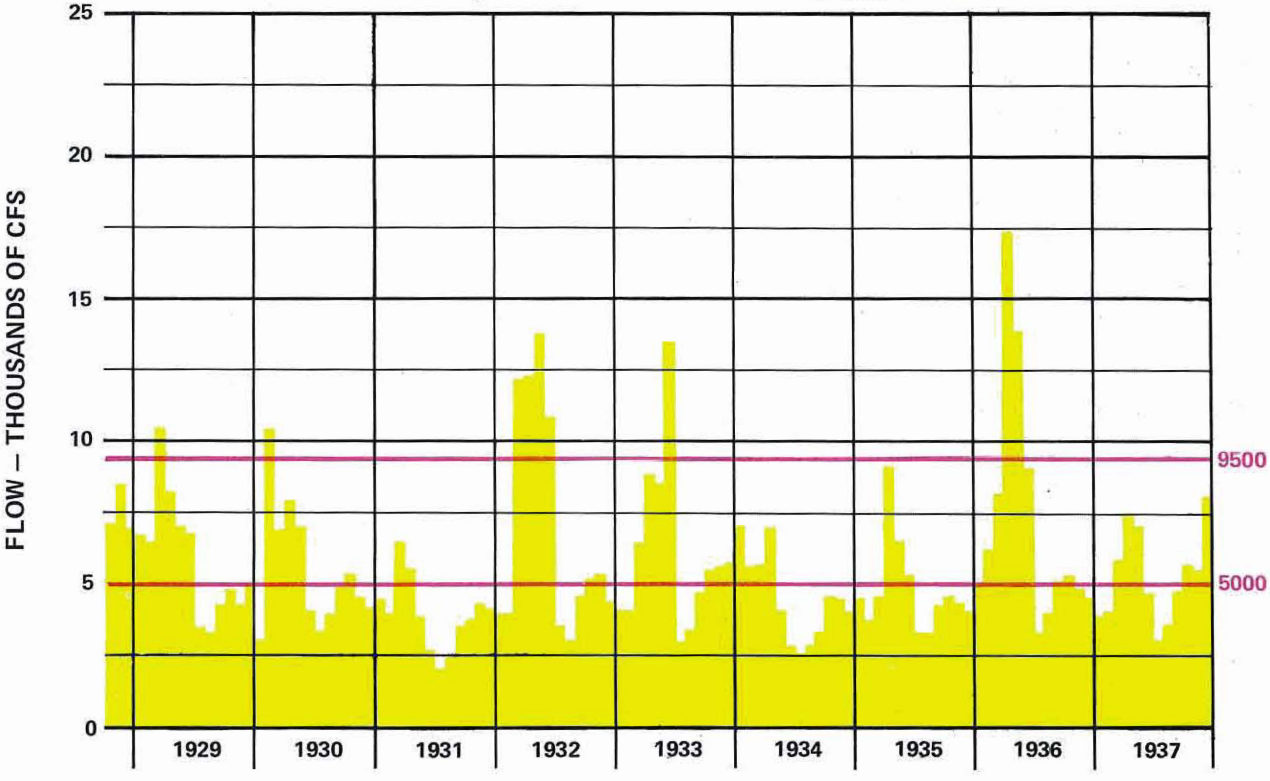


FIGURE 20. MEAN MONTHLY FLOWS, SNAKE RIVER AT WEISER
(Adjusted to Year 2020 Development)



below did not err in holding that when the Indians made the treaty granting rights to the United States they reserved the right to use the waters of the Milk River, at least to an extent reasonably necessary to irrigate their lands. The right so reserved continues to exist against the United States and its grantee as well as the state and its grantees."

The Fort Hall Tribal Council, as well as other Indian tribes in Idaho, plan to utilize water flowing through tribal lands to the extent necessary to develop their resources. The Fort Hall Indian Reservation encompasses or borders the Blackfoot River, Snake River (including American Falls Reservoir), Portneuf River, Lincoln Creek, Spring Creek, Sawmill Creek, Rattlesnake Creek, Bannock Creek and other small tributaries. This doctrine could have widespread implications on the planning and development of the state's water and land resources since water now appropriated under state law as well as future water rights would be affected.

RESERVATION DOCTRINE

From the effective date of the Water Commission Act in 1914, until 1964, the United States Government, through its various agencies, filed applications with the states to appropriate water in the same manner as other public and private agencies. By 1964, the United States had filed about 1,800 water right applications, of which approximately 1,500 were by the Forest Service.

In 1955 the Supreme Court of the United States delivered a decision in the Pelton Dam case. The Supreme Court decision states: the power company which had a license from the Federal Power Commission to construct a power project on lands withdrawn from the public domain for power purposes, did not need a state water right permit. However, the language in the decision was apparently not sufficiently clear to take as a general precedent that water might be developed for any use consistent with the purpose of the reservation, on any federal reservation or withdrawal, without reliance upon the state law.

This uncertainty was removed by the Supreme Court's opinion in the case of Arizona versus California in 1963. Following the issuance of the opinion of the Supreme Court in the Arizona v. California case, the federal government decided to rely upon the "reservation principle" in all national forests. It appears that other federal agencies will likewise assert the reservation principle where applicable.

Because of the large amount of federal lands in the state of Idaho, implementation of the reservation principle could create serious problems. Heretofore, all water right applications have been filed with the Department of Water Administration. Should the federal government be exempt from this procedure, present water rights could be subordinated to future federal development activities on public lands.

The U.S. Forest Service is presently conducting a study to determine current and future uses of water for national forests in Idaho.

INSTREAM WATER USES

The issues raised with regard to beneficial use of water as provided by state law pose a major planning consideration. Legislation is needed to resolve the beneficial use concept regarding recreation, water quality, and fish and wildlife. In addition, should action be taken to improve present water use efficiencies, the "rights" to water saved would need to be resolved.

The controversy surrounding development and nondevelopment of resources are further complicated by the fact that there is a lack of information on which to base sound decisions regarding instream flow needs to maintain satisfactory fishery and water quality uses. A direct relationship exists between the amount of flow required in the stream to meet fishery and water quality needs, and the options for additional development for new irrigation and industrial purposes. It is essential that data and information be obtained on which to make technically sound and reasonable decisions regarding instream flow needs.

The Water Resource Board is charged with the responsibility of providing for all water use functions including fish and water quality and has continually sought increased federal and state funding in this regard.

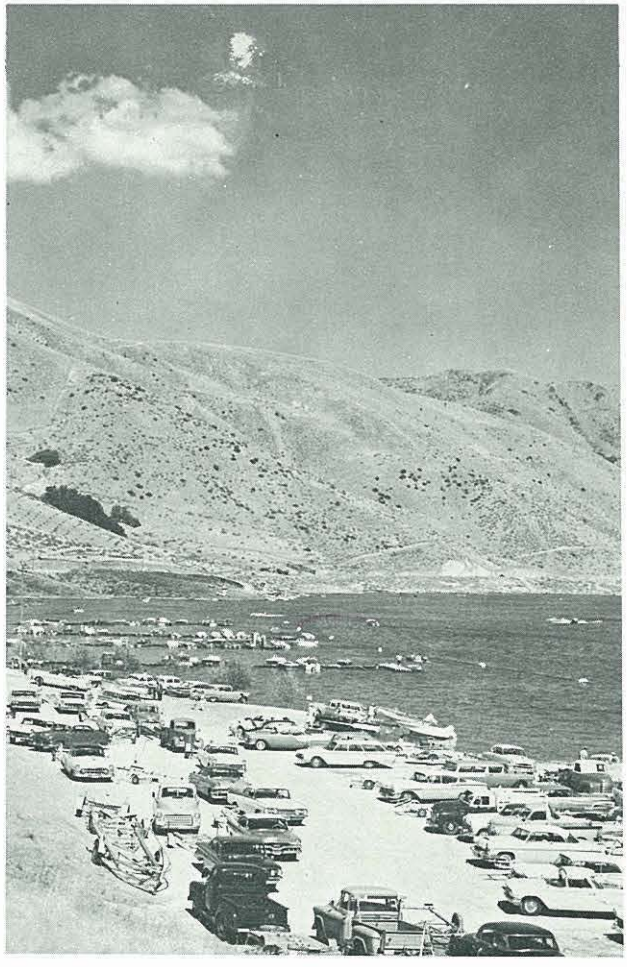
An example of the immediate need for adequate information on which to determine instream flow requirements is those river reaches where present diversions for irrigation essentially deplete the river flow and there is an inadquate water supply remaining to sustain aquatic life or provide suitable water quality. Future development or modified existing development could help to alleviate this situation if the problem could be clearly identified as to magnitude and extent. New storage facilities could then include a provision for the utilization of some of the storage to help meet or maintain identified minimum flows. It is also possible that intensive development of the Snake Plain aquifer could provide a means whereby the instream flow needs could be met if funds for this purpose are provided.

The determination of instream flow needs will provide the basis for determining the time sequence when interbasin transfers of water from the Salmon River may be necessary if the state elected to pursue development of irrigable lands at or close to the historic rate of about 50,000 acres per year.

RESOURCE POTENTIAL

Idaho's natural resources are essentially untapped in comparison to those of some other states. The state has the natural resource capability to increase agricultural production, mining, and timber output. In the past, large numbers of people have migrated because there was not sufficient development opportunity to provide jobs. Between 1960 and 1970, about 41,000 people migrated to other areas of the nation for this reason.

Natural resources must be utilized more efficiently if the native born population is to be provided the opportunity to work and reside in the state of Idaho. This will require additional development of water and land resources as well as industrial expansion in the near future. The cooperation of federal, state and local entities is essential. If Idaho does not choose to do so, it may become a state with absentee ownership of well-to-do citizens who wish to maintain second homes and property in rural and primitive environments. The state can avoid this situation if it plans and takes positive steps now.



FINANCING WATER RESOURCE PROJECTS

PRIVATE

Private water resource development is expending modest sums of money in Idaho each year. Development of land by irrigation involved approximately a $15 million expenditure for materials and labor to install irrigation works on approximately 50,000 acres of land. In addition to this direct expenditure for reclamation, additional sums of money are spent on homes, farm buildings and machinery.

Private electric utilities have invested an average of $19.1 million per year over the past ten years to provide electric power for growth and increased per capita use.

Water related recreation expenditures are increasing at a very rapid rate, particularly in those areas where summer homes can be built near a body of water, either lake or stream.

Expansion of municipal water systems owned by private entities is continuing on a demand basis and can be expected to increase dramatically as a result of population increases in the urban areas.

Large investments are being made each year by individual farmers and groups of farmers to improve on-farm and group irrigation systems. This voluntary program of utilizing water more efficiently is expected to continue at an increasing rate. Approximately 1,700 miles of ditch have been concrete lined to reduce seepage; 6,400 sprinkler systems are in use in Idaho and 610 miles of closed drains have been installed on lands having a "wetness problem."

PUBLIC

The public expenditures for water resource development in Idaho fluctuate from year to year. Major programs by the Bureau of Reclamation, the Corps of Engineers, and the Soil Conservation Service have dominated public development. For example, the Dworshak Dam construction on the Clearwater River involves a federal expenditure of about $210 million. There presently exists in the state, potential projects identified involving a total construction cost of about $2.5 billion. Many have not been studied to feasibility level and costs may increase tremendously when the final studies are complete.

State expenditures for water and related land resource development have played a minuscule role in development of resources amounting to only $500,000. One program that may help to change this historical pattern is the revenue bonding authority contained in the Idaho Water Resource Board legislation and which may be utilized to construct a dam or dams in the Swan Falls reach of the Snake River. This program may net the state approximately $1.5 million a year for use in other resource development activities.

The state needs to give serious consideration to alternative ways of funding state water resource projects and programs since adequate federal funds are not likely to be available in the future. For example, hydropower projects and municipal and industrial water supply projects could be financed using revenue bonds. If a sufficient bond reserve could be built up, state revenue bonds could also be used to finance irrigation development since project beneficiaries can repay costs.

State funds are also needed to pay for nonreimbursable functions such as recreation, water quality control, minimum flows for fish and wildlife, and other purposes for which beneficiaries cannot be identified or assessed.

The possibility of obtaining financial assistance from the Columbia River Basin Account to assist in repayment of state project costs should be investigated.

Columbia River Basin Account

The Columbia River Basin Account[1] was established to provide financial assistance for federal reclamation development in the Pacific Northwest. For the purpose of establishing eligibility for funds from the Basin Account, the entire state of Idaho is considered to be in the Pacific Northwest.

Surplus power revenues from the Columbia River Federal Power System comprise the Basin Account. Basin Account funds are not prorated to the eligible states; use of the funds is confined to the repayment of allocated irrigation construction costs determined to be beyond the "ability to pay" of the water users within the prescribed repayment period of each project. Limits placed on the use of Basin Account funds are as follows:

- Total assistance to all irrigation projects, both existing and future in the Pacific Northwest shall not average more than $30 million annually in any period of 20 consecutive years or a total of $600 million in any 20-year period.
- Financial assistance from the Columbia River Federal Power System will be only from net revenues.
- Construction of reclamation projects will be scheduled so that financial assistance requirements will not cause increases in the rates and charges of the Bonneville Power Administration (BPA).

At present, there are 10 irrigation developments in Idaho authorized to receive financial assistance. The total aid to these projects totals about $62 million. Potential federal reclamation projects such as Salmon Falls, Cub River, Oakley Fan, Raft River, and Southwest Idaho Project, (see Chapter 4) would likely qualify for financial assistance but the amount is not known. It is significant to note that since the account funds are not prorated to the various states, halting water development in Idaho will increase the amount of account funds available to others in the Pacific Northwest.

The availability of financing from the Basin Account is a key issue that Idaho must take into consideration in decisions regarding future management and development of water and related land resources.

[1] Basin Account Act, Public Law 89-448, as amended by Public Law 89-561.

WATER QUALITY STANDARDS

Recently, the Environmental Protection Agency (EPA) has contended that the Water Quality Standards established for free-flowing streams were in essence a recognition by the state and federal government that no action could be taken that would change the water quality characteristics of the free-flowing stream. Insofar as a dam would modify the existing water quality characteristics, it was stated by EPA that no dams could be built unless revised water quality standards for the stream reach affected were approved by both the state and federal government (EPA). Hence, EPA could veto construction of any further dams in the state.

The Water Resource Board is opposed to this interpretation of the application of water quality standards by EPA.

Water quality standards now in effect have little correlation to the quantity or quality of flow in the river systems. The degree to which these standards can and will be met is unknown at present. A periodic review of present standards is necessary with full recognition of all water use needs within a total hydrologic system analysis.

At the time water quality standards were adopted by Idaho, little if any thought was given to the type of application suggested by EPA. The state must fully consider the possible implication of this type of action and take appropriate action to allow state goals to be pursued.

COLUMBIA RIVER COMPACT PROPOSAL

A Columbia River Compact was approved by Idaho in 1967, but failed to obtain the approval of Washington and Oregon because of lack of agreement on upstream depletion allowances. Therefore, although Idaho's approval is still on the books, a Columbia River Compact has never been approved.

The Oregon Water Resource Board has asked its staff to investigate the possibility of pursuing a Snake River compact because of its interest in using Snake River water; and other proposals will likely be made to complete a Columbia River compact. The Board favors waiting on any action of this type until study efforts now underway by the Pacific Northwest River Basins Commission and the states are completed. These studies will clearly define the issues and identify the need for a compact if found necessary.

SUMMARY

The major alternatives and issues discussed above are indicative of the type of issues facing the legislature, Governor's office and the concerned citizens of Idaho with regard to use and development of water and related land resources of the state. The views and comments of the citizens of this state with regard to these issues are sought by the Board and will help guide and influence Board decision with regard to these matters.


Proposal Made To Defer Dam
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20 Lewiston Morning Tribune
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Judge Orders Halting Dams On Columbia
PORTLAND, Ore. (AP) — A
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F&G Plans To Protect Fish Runs
Says Water Will Be Important Issue In Coming Legislative Session
By State Sen. Reed Budge
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Morton Says U.S. Lags in Producing Fuel, Electric
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The Big Lost River, Bell
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'Gratified' by Vote to Build Sewers on Coeur d' Alene South Fork
By Associated Press
Atty. Gen. W. Anthony Park
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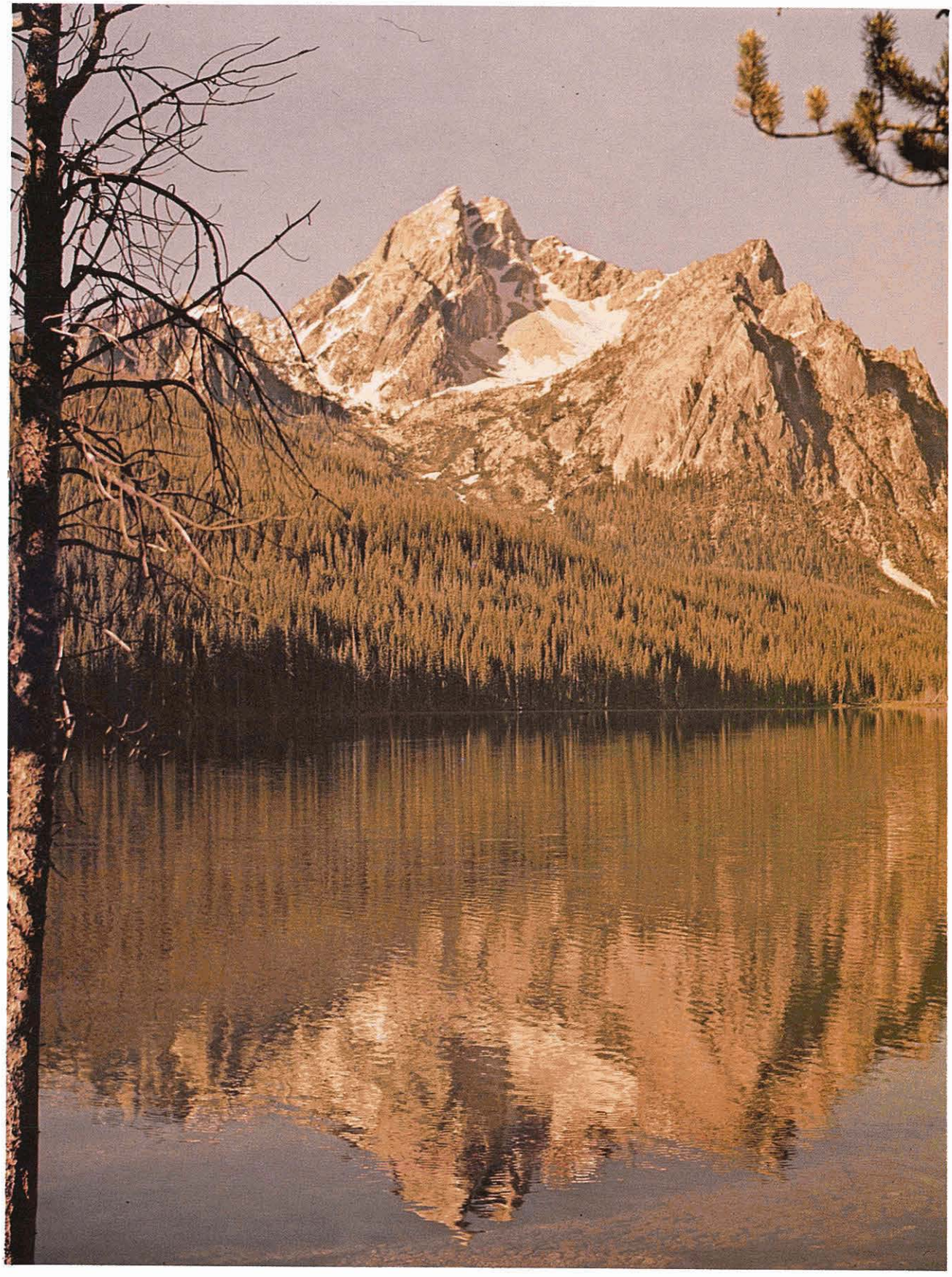


Chapter 3 / PRESENT WATER USES, PROBLEMS, NEEDS AND FUTURE REQUIREMENTS

The present water uses, problems, needs and future requirements are outlined in this chapter. Projections of need for the different water use functions, as shown herein, are conflicting in some areas. This is due to the manner in which needs were obtained. Generally, projections were made based primarily on historical growth patterns without regard to competing uses. The reconciliation of these conflicts will be a major objective of the State Water Plan.

Water withdrawals in 1966 to provide for municipal, industrial, and agricultural needs totaled about 23,800,000 acre-feet. Irrigation was the dominant use (23,100,000 acre-feet) accounting for 97 percent of total withdrawals. Much of this involves reuse since return flows to streams are rediverted and losses to groundwater serve to recharge the aquifer. Municipal-domestic water withdrawals accounted for 0.8 percent or about 189,100 acre-feet, and industrial withdrawals (including 264,400 acre-feet for fish hatcheries) accounted for 2.2 percent or about 510,300 acre-feet.

In addition to the consumptive uses, other major water uses include: fishing, boating, and other recreational sports; dilution and conveyance of pollutants; hydroelectric power generation; and navigation.

MUNICIPAL-DOMESTIC WATER

For the purpose of this report, municipal-domestic water use in Idaho is considered to include domestic uses in both municipalities and rural areas. Area usage can be categorized as: fire protection; household or commercial uses; lawn watering; and livestock consumption. Water supplied from municipal systems to industries is considered to be industrial water.

Construction and renovation of municipal-domestic water use facilities are encouraged by various state and federal agencies. The Farmers Home Administration provides assistance to counties by granting funds toward comprehensive water and sewerage plans for communities with populations of less than 5,500. The Idaho Water Resource Board, with the assistance of private consultants, is preparing reports for twenty-five counties involving over 150 communities. Private engineering consultants have completed or are working on water and sewerage plans for the other nineteen counties.

PRESENT STATUS

Approximately 61.6 billion gallons (189,100

acre-feet) of water were withdrawn from surface and groundwater sources in 1966 to provide municipal-domestic water.

Municipalities (excluding rural areas) used approximately a gross 40.4 billion gallons (124,100 acre-feet) during 1966 serving an estimated population of 474,800 persons. Total water withdrawal by municipalities in 1971 is estimated at a gross of 45 billion gallons with approximately 32.5 billion gallons (100,000 acre-feet) being subsequently returned to streams or groundwater aquifers; net consumption was 12.5 billion gallons.

Average daily per capita withdrawals reported by Idaho municipalities in 1966 ranged from a low of 45.1 gallons to a high of 1,320 gallons, with an average of 247 gallons. The Panhandle Basins and the Upper Snake Basins averaged higher withdrawal rates than did other sections of the state. Table 15 shows per capita withdrawals for fifteen locations in 1966. The low, which was based on a fully metered supply system, was reported at Oakley (45 gallons per capita) and the high reading occurred at Inkom (1,320 gallons per capita). The Inkom figure however represents an estimated rather than a metered volume. Middleton recorded the highest daily per capita withdrawal (807 gallons) for a fully metered municipal water system.

To estimate the amount of water used in households not supplied by municipal systems, it was assumed for the Municipal and Industrial Water Needs Study conducted by Idaho State University that the daily water withdrawal for a rural resident was the same as the statewide daily average for an urban resident. Therefore, based on an assumed daily per capita withdrawal of 233 gallons and a rural population of 248,800 in 1966, gross rural water withdrawal was computed to be 21.2 billion gallons (65,000 acre-feet) for that year.

Municipal-domestic water use fluctuates greatly from month to month. During July, the month of maximum withdrawal in 1966, withdrawals totaled 188 percent of the monthly average, as compared to 51 percent in February. Because of the broad monthly and even daily and hourly variations in use, municipal water systems must maintain capacities great enough to meet peak demands.

TABLE 15
AVERAGE GROSS WITHDRAWAL OF WATER — 15 SELECTED LOCATIONS, 1966

Municipality	Gallons per capita per day	Extent of metering
Sandpoint	369	No
Coeur d'Alene	269	Partial
Kamiah	66	Yes
Moscow	162	Yes
Lewiston	280	Yes
Salmon	79	No
Middleton	807	Yes
Parma	575	Partial
Boise	189	Yes
Pocatello	265	Yes
Oakley	45	Yes
Jerome	109	Yes
Inkom	1,320	No
Idaho Falls (1969 data)	426	No
Soda Springs (1970 data)	650	No
Weiser (1970 data)	233	Yes

SOURCE: Idaho Economic Base Study for Water Requirements, IWRB Planning Report No. Two, 1969, Vol. 1 and Cornell, Howland, Hayes and Merryfield Consulting Engineers, September 1971

PROBLEMS AND NEEDS

The problems and needs of municipal-domestic water users in Idaho are under study. State and federal programs have been initiated to investigate community needs throughout the state. Individual municipalities are also contracting with consulting engineering firms to determine needed water improvements, which can be funded through local bond issues and implemented under the supervision of the consulting engineers. Many of the communities completing the questionnaire for Idaho State University in 1966 stated that their present systems were inadequate and that additional facilities would be required by 1975.

Some spepecific problem areas have been identified for municipal-domestic water use. In suburban Boise, over thirty independent domestic water systems operate without any central

control or coordination. During peak use periods, low water pressures occur because the systems are not fully integrated. Municipal water shortages have been reported in various areas, including the Palouse River Basin, where groundwater tables are declining. Several alternatives are being considered to augment the short supply, including pumping from the Clearwater or Snake rivers and surface storage on the Palouse River.

Water quality is generally good throughout the state, but excessive amounts of fluoride, iron, and manganese, and bacterial contaminations have created problems in the past in the Boise area. These problems are likely to continue as increasing quantities of water are withdrawn to meet growing municipal-domestic needs. An alternative that should be considered for the Boise area is tapping a surface water supply for the base load and using wells for peak loads.

FUTURE REQUIREMENTS

Based on historical trends, municipal-domestic water requirements are expected to more than double between 1966 and 2020 for a total of 145.8 billion gallons (447,500 acre-feet). In the Bear River region, a withdrawal rate of 484 gallons per capita per day is expected to decrease as population grows and household water uses become more conservative. In all other regions, per capita daily water use rates are expected to increase from the base rate of 233 gallons per capita per day according to the following accumulative formula: (1) 10 gallons from 1966-1980; (2) 10 gallons from 1980-2000; (3) 10 gallons from 2000-2020; and (4) 25 gallons from 2020-2070.

Projections of municipal-domestic water requirements for each of Idaho's planning regions

are shown in Table 16. It is important to remember that projected rural domestic per capita water use is assumed to be the same as the state average urban per capita water use. Although rural use is usually considered to be lower than urban, water requirements for Idaho's large livestock industry (included as part of rural domestic use) tend to equalize the two.

The Upper Snake area is expected to have the most dramatic rise in municipal-domestic water use, with an increase of over 52 billion gallons (159,600 acre-feet) by the year 2020. Slower growth rates are expected in the Panhandle and Clearwater regions in northern Idaho than in other areas of the state.

TABLE 16

MUNICIPAL-DOMESTIC WATER REQUIREMENTS, 1966 – 2020

(Thousands of gallons)

Region	1966	1980	2000	2020
Panhandle	7,519,294	8,046,000	9,105,000	10,462,000
Clearwater-Salmon	7,431,422	7,293,000	8,875,000	10,665,000
Southwest Idaho	16,357,817	20,128,000	28,683,000	38,526,000
Upper Snake	27,479,961	38,651,000	57,101,000	79,770,000
Bear River	2,814,541	4,452,000	5,504,000	6,341,000
TOTAL	**61,603,035**	**78,570,000**	**109,268,000**	**145,764,000**

NOTE: 1 second-foot = 646,000 gallons per day
1 acre-foot = 325,810 gallons
Data presented on Economic Study Area Boundaries
SOURCE: Idaho Economic Base Study for Water Requirements, IWRB Planning Report No. 2, Vol. 1

INDUSTRIAL WATER

Industrial water supplies in Idaho are provided by both industrial and municipal systems. Most major industries provide their own water supplies, but small businesses often rely on municipal systems. The principal industrial water users in Idaho are food processing, mining, and forestry.

PRESENT STATUS

During 1966, Idaho's intensive water-using industries withdrew more than 166 billion gallons. Table 17 shows the relationship of water intensive-industrial employment to gross water withdrawal for Idaho in 1966. Excluding fish hatchery industrial use, slightly more than 86 billion gallons were withdrawn by industry. (See Table 18.) Water withdrawn by the hatchery industry in the Hagerman Valley is presented in another section, "Aquiculture".

Unlike municipal-domestic withdrawals, water used by industry is normally recycled several times before being discharged as waste. The 1964 Census of Manufacturers showed a reuse factor of 2.61 for Idaho. In other words, the original volume of water withdrawn is used over 2½ times before it is discharged. Applied to the 86 billion gallon withdrawal figure, this factor yields a water use figure of 224 billion gallons for 1966. Between 1959 and 1963, recirculation of water increased 107 percent, probably due largely to

TABLE 17
COMPOSITION OF WATER INTENSIVE-INDUSTRIAL EMPLOYMENT AND GROSS WATER WITHDRAWAL FOR THE STATE OF IDAHO, 1966

Classification	Percent of water intensive employment	Gross water withdrawal	
		Thousands of gallons	Acre-feet
FOOD PRODUCTION			
Fresh and frozen fish	0.2	80,289,394	246,400
Frozen fruits and vegetables	17.0	10,950,683	33,606
Beet sugar	3.4	5,812,827	17,839
Dehydrated foods	6.1	3,257,804	9,998
Dairy products	6.0	3,174,892	9,743
Meat products	3.4	1,845,356	5,663
Canned fruit and vegetables	1.7	237,549	729
Other food products	6.2	1,234,142	3,788
Subtotal	44.0	106,802,647	327,766
TIMBER			
Sawmills and planing	21.7	25,830,860	79,272
Paper, allied other lumber	16.7	16,375,405	50,254
Subtotal	38.4	42,206,265	129,527
Chemical and allied products	4.3	5,699,930	17,493
Primary metals and metal mining	11.2	9,297,407	28,533
Mining and quarrying	2.1	313,152	961
National Reactor Testing Station	NA[1]	1,978,509	6,072
TOTAL	**100.0[2]**	**166,297,910**	**510,351**

[1] Not available

[2] Does not include NRTS

SOURCE: Bureau of Business Research, Idaho State University, Pocatello, Idaho

TABLE 18
INDUSTRIAL WATER REQUIREMENTS, 1966 – 2020
(Thousands of gallons)

Region	1966	1980	2000	2020
Panhandle	20,166,803	18,636,000	19,912,000	19,225,000
Clearwater-Salmon	25,661,902	26,558,000	31,379,000	32,029,000
Southwest Idaho	12,004,841	20,449,000	30,173,000	40,988,000
Upper Snake	27,874,068	22,443,000	47,854,000	70,188,000
Bear River	300,901	3,993,000	8,235,000	10,356,000
TOTAL	**86,008,515**	**92,079,000**	**137,533,000**	**172,786,000**

NOTE: Data presented on Economic Study Area Boundaries
This projection table excludes the fish hatchery industry

SOURCE: Idaho Economic Base Study for Water Requirements
IWRB Planning Report No. 2, Vol. 1, Appendix A

improved recirculation methods in the dehydrated food products industry. The estimated reuse factor in 1971 is 3.0.

Table 19 compares the average annual gross water withdrawal per employee in Idaho (1966) with that in the nation as a whole (1964).

PROBLEMS AND NEEDS

Few problems are anticipated in providing a sufficient supply to meet future industrial water use needs in Idaho since groundwater is available in most areas. Industry is expected to continue to provide its own water supplies and to recirculate water. It was estimated that in 1971 the state reuse factor averaged over 3.0, and by 1975 Idaho could reach the 3.43 average reuse factor for the other mountain states.

Because of unequal distribution of Idaho's natural resources, individual regions usually show a predominance of one particular industrial water use over all other; for instance, the paper and pulp manufacturing industry in the Clearwater-Salmon region.

Different industries also show seasonal variations in the amounts of water withdrawn. For example, water use in the food processing industry is high in late summer and winter months, but declines in the spring.

The average cost of municipally-supplied industrial water in Idaho was $38 per million gallons in 1966 ($12.40 per acre-foot) while self-supplied water cost was only about $21 per million gallons ($6.85 per acre-foot). Because of increasing recirculation of water, these costs are expected to remain fairly stable in the future, even though operating costs and capital outlays are increasing.

FUTURE REQUIREMENTS

Estimated future requirements for industrial water use in Idaho are based on an employment-base model developed by Idaho State University. Idaho's share of the national market was analyzed and projected on the basis of historic data, although historic projections sometimes tend to underestimate future water needs in dominantly rural or undeveloped states.

TABLE 19
AVERAGE ANNUAL GROSS WATER WITHDRAWAL PER EMPLOYEE
(Thousands of gallons)

Industrial classification[1]	National 1964[3]	Surveyed employment State 1966[3]
Fresh and frozen fish	NA[2]	1,029,351
Frozen fruit and vegetables	1,268	1,867
Beet sugar	4,882	4,985
Dehydrated foods	773	1,538
Dairy products	76	1,537
Meat products	635	1,553
Canned fruit and vegetables	625	410
Other food	NA	572
Sawmills and planing mills	1,581	3,446
Paper and other lumber, paperboard mills	NA	2,838
Chemical and allied products	6,389	3,920
Primary metals and metal mining	NA	2,406
Mining and quarrying (except metals)	NA	427

[1]These data do not include the withdrawals recorded for steam electric power generation.
[2]Not available
[3]Water use — not employment
SOURCE: 1963 Census of Manufacturers and Bureau of Business Research, Idaho State University; Pocatello, Idaho

Based on changes in productivity and on historical trends in water use, industrial water use per employee is expected to increase as follows: (1) 1966 to 1980 — 10 percent; (2) 1966 to 2000 — 35 percent; (3) 1966 to 2020 — 40 percent.

Projected annual industrial water requirements are shown in Table 18. Industrial water use was projected to double to 172 billion gallons (528,000 acre-feet) per year by 2020. The Upper Snake region will continue to be the highest water-using area, with demands increasing to over 70 billion gallons by 2020. The Bear River region will continue to be the smallest industrial water user — although the rate of increase is projected to be greater than in any other region. In the Panhandle region, industrial water requirements were projected to decrease slightly because of recycling.

AQUICULTURE

Aquiculture in Idaho consists of producing trout in excellent quality-controlled waters for commercial purposes. Aquiculture in its broad definition covers the production of fish, frogs, oysters, rice, vegetables and other items. Although aquiculture is normally thought of as relatively new, fish-farming has been around 4,500 years. Bas-relief in an ancient Egyptian tomb depicts the artificial production of fish.

PRESENT STATUS

The first fish hatchery in Idaho was started about 1909 at the Devils Corral Spring near Twin Falls; it discontinued operations — probably because of problems in marketing the fish. The first successful commercial trout farm was started about 1919 also in the Twin Falls area.

Idaho is the only area in the world where fish are produced in large quantities using spring waters. The industry ranges from the large integrated business self-sufficient in producing fish food, growing, processing and marketing fish down to operations producing fewer fish in small farm ponds. The Idaho Department of Fish and Game issued licenses for 43 commercial trout producers in 1971.

The commercial trout harvest in Idaho for 1972 is estimated to be between 4 and 5 million pounds with an estimated value of $3½ to $4 million. An important factor affecting domestic production is trout imported from foreign countries; Japan and Denmark are the primary competitors for the U.S. market. Recently, trout disease problems in both countries have limited the quantity of fish imported.

In the United States, per capita consumption of fish averages about 11 pounds per year, however, consumption of trout is only about three-tenths ounce per person per year.

In addition to trout produced for commercial distribution, state and federal agencies produce for stocking programs. Approximately 1,700,000 pounds of fish were planted for sport fishing in Idaho between October 1, 1968 and September 30, 1969. These programs serve to propagate stocks of both resident and anadromous fish.

Interest in commercial fish enterprises is increasing and was reflected in 1970 by related construction: 5 new commercial fish ponds; 4,000 feet of raceways; and 98 farm ponds. Idaho commercial trout farmers produce approximately 60 percent of the total processed in the United States. Fish feedlot business in the Hagerman Valley provided some $60,000 annually to the small farmers in that community.

Adequate water quality is a major factor in the successful production of fish. One large Idaho commercial trout farm is fed by springs having an even temperature of 58 degrees F throughout the year. Lower temperatures produce slower growth but fewer disease problems; conversely, higher temperatures, within certain limits, produce faster growth but more disease. High concentrations of ammonia and nitrigen gas produced by the waste from the fish and the decomposition of waste feed can affect flavor adversely causing "hatchery taste". Generally Idaho spring flows are of ample quantities to permit water changing fast enough to eliminate gasses that cause the undesirable taste.

In 1966 an estimated 80 billion gallons of water (246,400 acre-feet) flowed through commercial fish farms in Idaho. The principal fish farming area is the Snake River Canyon near Hagerman; however, there is a possibility of aquiculture in the Blackfoot and Pocatello area.

PROBLEMS AND NEEDS

The primary requirement for successful production of fish is a dependable supply of water of sufficient quantity and quality. Although it is physically possible to treat and recycle the water used to raise fish, the capital cost of the treatment facilities appears to render this type of operation economically unfeasible at the present time.

Similarly economics prevent the utilization of water pumped from wells for fish propagation since the necessity of having a dependable flow of water would require that standby pump facilities be provided. Capital investment for the pumping equipment would be sizable.

Even though no commercial hatcheries in Idaho utilize direct stream flow to meet hatchery needs, streams which have sustained flows of high quality are suitable. Several states and federal hatcheries producing anadromous fish use streams as a water supply source.

A fish hatchery has an effect on quality in that additional nutrients and BOD are added to the receiving water. The Idaho Department of Fish and Game is evaluating the treatment needs of hatchery waters; at this time only preliminary information is available. Fish farms are subject to the provisions of the Refuse Act of 1899 which requires a permit be obtained from the federal government by all entities which discharge pollutants to streams.

Because of facility proximity to water courses, protection of streams should be considered before any approval is granted for locating and building a fish hatchery. In the past, damage to an estuary has sometimes been the result of short-sighted planning.

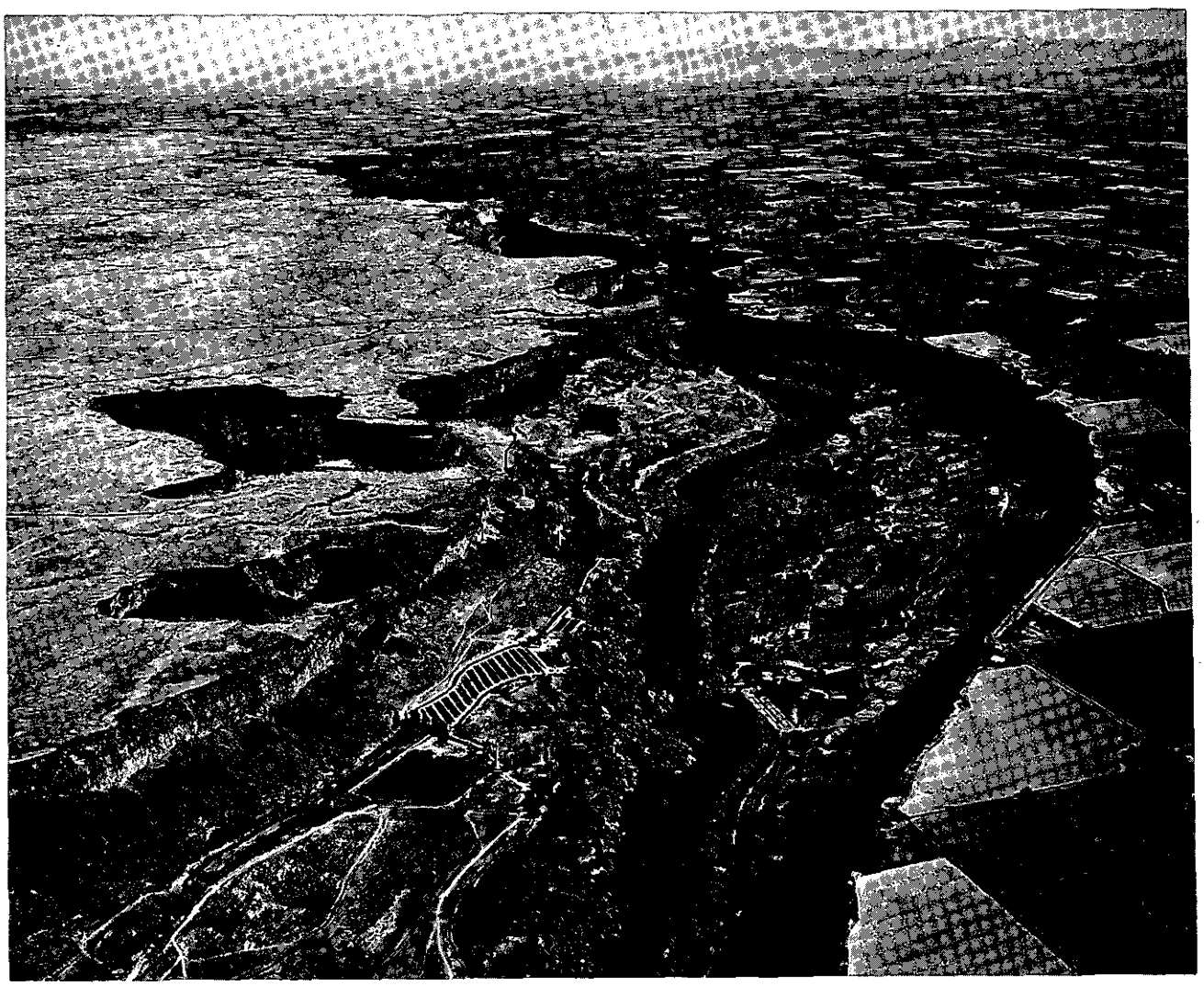
Key legislation was passed in 1971 legislative session which is of significant interest to the aquiculture industry in Idaho (Idaho Code, Section 67-4307 through 67-4312). This legislation authorizes and directs the State Parks Board to appropriate, in trust for the people of the state, the unappropriated natural spring flows in Malad Canyon, Niagra Springs, Big Springs, Box Canyon, and Thousand Springs area. In addition the legislation provides that the preservation of water in these areas for scenic beauty and recreational purposes is a beneficial use of water.

The act specifically limits the appropriation by the State Parks Board of the historic water flow, and states that future appropriation (above the historic flow levels) shall not be granted if it would involve a diversion which would detract or interfere with the geological interpretative value, historical significance, or the scenic attraction of the designated areas. It is significant to note that the historic level of spring flow at Thousand Springs was about 4,000 cfs, and the current spring flow averages about 6,000 cfs.

The legislation is likely to undergo a court test to determine the legality of such issues as the designation of water used in this manner as "beneficial use", appropriation of water without the construction of diversion work, and the legality of a state agency obtaining a valid appropriative water right without explicit constitutional authorization.

The legislation would appear to allow future depletion of spring flows of about 2,000 cfs in the designated areas such as Thousand Springs areas, where a substantial buildup over historic levels has occurred as a result of return flows from upstream irrigation. The legislation specifically prohibits diversion at the area (such as Thousand Springs) when it can be shown that the diversion would detract or interfere with the geological interpretative value, historical significance, or scenic attractions. The legislation does not specifically prohibit that type of diversion such as pumping from the Snake Plain aquifer which would affect the available spring flow at the designated area.

Use of the Snake Plain aquifer is clearly



recognized in the planning studies by the Board as a key feature in any state water plan formulated to meet future state water needs. Use of the aquifer would involve both pumping and recharge projects and therefore would ultimately affect to some degree the spring flows.

Studies are underway to develop the predictive models needed to determine the hydrologic effect. Future planning studies will need to clearly define the interrelationships of conjunctive groundwater-surface water operations on spring flows so that the effects on aquiculture if any, can be determined.

FUTURE REQUIREMENTS

There have not been any studies made of future requirements for aquiculture. A study is needed to better define growth trends of commercial fish farms. The possibilities of recycling water as well as usage of groundwater also needs to be studied, particularly with regard to long range operations.

The data and information needed to project future water requirements for aquiculture should be made available by 1975 so that this water use function can be fully considered in the State Water Plan.

AGRICULTURE

Varied agriculture plays a major role in the state economy. Principal crops were valued in 1970 at $405,159,000 with livestock and livestock products totaling $306,788,000. Agriculture is Idaho's largest employer accounting for 53,800 persons in July of 1971.

Farms range in size from small acreages to 25,000-acre cattle ranches; and in type from the highly mechanized wheat farms of the north to diversified irrigated developments in the southern and eastern portions of the state. The Department of Interior Federal Reclamation 1970 Crop Report lists 44 types of crops being produced on the irrigated lands in Idaho. Principal crops are potatoes, sugar beets, alfalfa hay, irrigated pasture, wheat, barley, corn, dry beans, and fruit. Specialized items include such crops as hybrid popcorn seed, hops, peppermint, spearmint, dry onions, cantaloupe, and seed production in alfalfa, lettuce, and onions.

Irrigation farming in Idaho generally enjoys a complementary rather than a competitive relationship with the whole of agriculture. Irrigated areas in the state contribute only a small percentage to the nation's crop surplus. The principal source of "surplus crops" produced are from nonirrigated areas of the nation where one-crop farming predominates. Placing of water on land being used for nonirrigated grain crops (surplus crops) usually results in a shift to more diversified farming involving crops that are not classified as surplus. The nonsurplus crops that can be grown on irrigated land are preferred because they offer greater economic returns to the farmer.

Some feed grains are produced on new land development because of the necessity of crop rotation. Feed grains are not considered in surplus in Idaho however because of the growing cattle feeding industry. In recent years, some cattle feeders have had to ship in feed grain because of an actual shortage within the state.

Projections of food and fiber needs for the nation indicate that the products from new land development will be readily absorbed by national markets and therefore will not contribute to crop surpluses.

PRESENT STATUS

Irrigation began almost a century ago on the Great Plains of the Snake River in southern Idaho and in the mountain valleys of its tributaries. It has played an important part in the rapid expan-

sion of settlement. Some of the earliest and largest irrigation projects in the United States have been developed in the state. Idaho ranks second only to California in the number of irrigated acres in the 11 western states.

During the last 20 years, more than 1,200,000 acres have been developed for irrigation through the cooperation of private, federal and state entities as shown in Figure 21. Private enterprise has been responsible for about 90 percent of this increase and the Bureau of Reclamation has supplied water to approximately 125,000 new acres since 1950.

The Desert Land Act of 1877 contributed greatly to the expansion of irrigation in Idaho resulting in the patenting of approximately 1,400,000 acres. Development under the Desert Land Act is slowing because of federal agency action. Idaho has been the most successful Carey Act state with development of 618,000 acres under this law.

Approximately 23 percent (12,113,000 acres) of Idaho's total land and water area of 53,475,000 acres is classified as having soil and slope characteristics suitable for irrigation. Of this total, about 3,750,000 acres (7 percent) are presently irrigated. Potentially irrigable lands are listed in Table 20 by region and land class.

Both gravity and sprinkler type methods of irrigation are used. Although the gravity type system predominates, accounting for 78 percent of state irrigation, the use of sprinkler irrigation

FIGURE 21. NEW LANDS IRRIGATED, 1960-1971

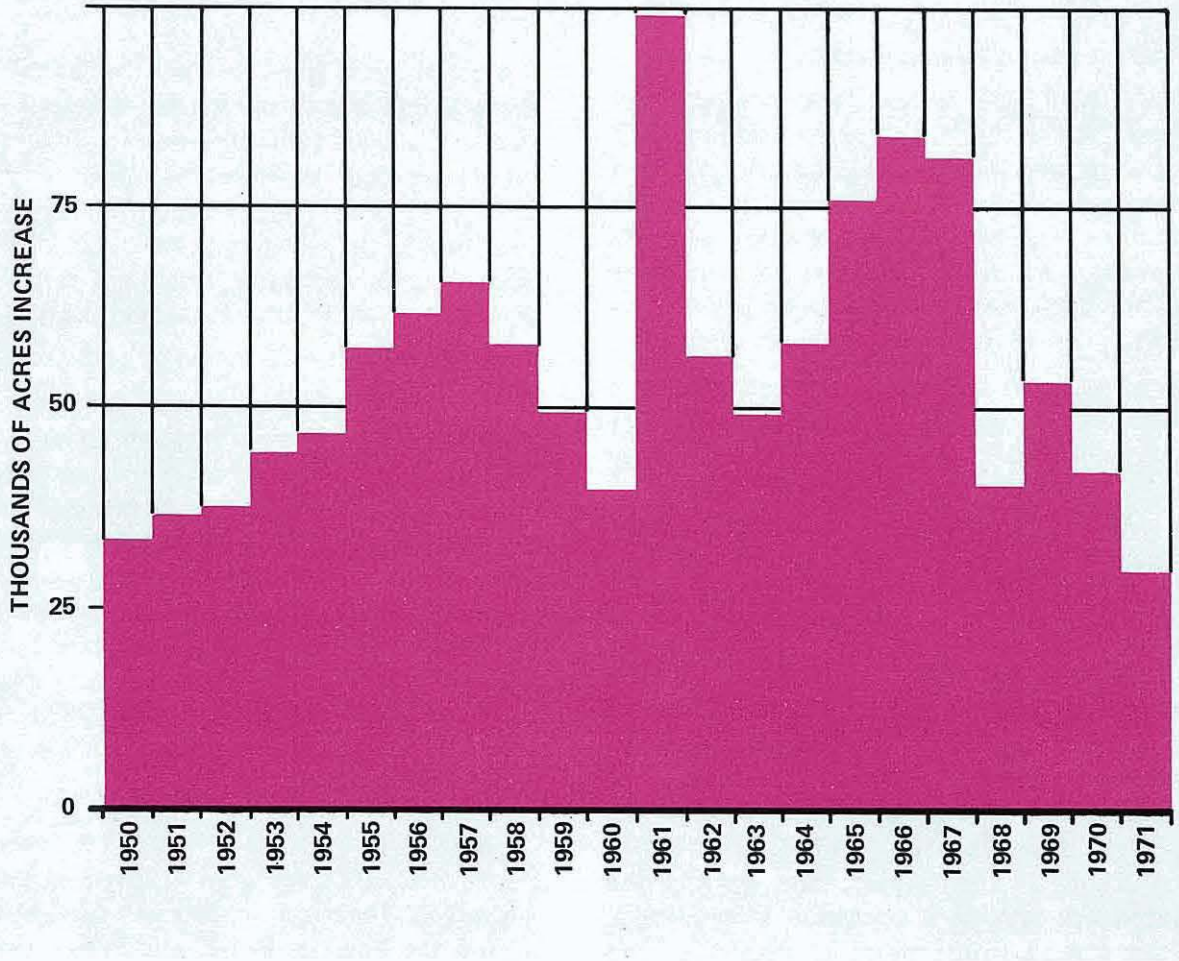


TABLE 20

IRRIGATED AND POTENTIALLY IRRIGABLE ACREAGE BY LAND CLASS, 1966

Region	Presently[1] irrigated	Potentially irrigable				Region total both acreages
		Class 1	Class 2	Class 3	Total	
Panhandle	24,270	40,370	206,140	269,950	516,460	540,730
Clearwater	2,300	53,700	284,621	600,405	938,726	941,026
Salmon	141,200	1,300	56,679	240,495	298,474	439,674
Southwest	880,300	352,300	1,035,600	949,900	2,337,800	3,218,100
Upper Snake	2,327,000	705,200	1,723,300	1,393,900	3,824,400	6,149,400
Bear River	157,143	65,980	427,212	173,920	667,112	824,255
TOTAL	**3,532,213**	**1,218,850**	**3,733,552**	**3,628,570**	**8,580,972**	**12,113,185**

[1] Data collected in 1966 as part of Statewide Soils Survey
Current estimates list Idaho as having more than 3,750,000 acres irrigated in 1971; however, no regional breakdown is available

SOURCE: Potentially Irrigable Lands of Idaho, IWRB, 1970

systems is growing rapidly and may eventually take the lead as farmers seek to increase efficiency of land use and irrigation practices.

PANHANDLE BASINS. There were approximately 25,000 acres of irrigated lands in 1970, located mostly in Kootenai County. Approximately half of the irrigated land in Kootenai County is supplied by groundwater with the remaining portion supplied by pumping water from the Spokane River or Hayden Lake. Water application is almost entirely by sprinklers.

Crop selection is limited by the elevation and growing season, and the area produces primarily small grains, alfalfa and clover. The feasibility of growing new types of crops is being investigated. The University of Idaho is conducting test plots on the production of hops; and flower seed production is being tested by the Future Farmers of America.

CLEARWATER AND SALMON BASINS. Irrigation has played only a minor role in the Clearwater Basin. Aside from the small tracts scattered along the Clearwater River and its tributaries, the area's only large irrigation development is the Lewiston Orchard project in Nez Perce County. This project was constructed privately but with the cooperation of the Bureau of Reclamation. Fruits, potatoes, vegetables, and forage crops are produced on the project's 1,380 acres.

Most of the irrigated lands in the Salmon Basin lie in Lemhi and Custer counties. Some smaller areas are clustered along the Salmon River and its tributaries and at New Meadows in Adams County. Practically all of basin irrigated land has been developed privately using direct diversions from streams and small reservoirs rather than groundwater. Virtually all water is applied by gravity irrigation.

Irrigation development has primarily been oriented to beef cattle production, either in the form of irrigated pasture or by the production of forage crops for winter livestock feeding. The area is very conducive to large cattle ranches which rely on the availability of grazing permits for range and forest lands. Cash crops are restricted by the short growing season and distance to market. The dry farms in the region have excellent production of soft winter wheat. The winter wheat is rotated with malting and feed barley, lentils and peas.

SOUTHWEST IDAHO BASINS. Approximately 900,000 acres were irrigated in 1970, in this region. The major irrigated areas are centered around the Payette, Boise, and Snake rivers in

Ada, Canyon and adjoining counties. The majority of these lands receive irrigation water through the Boise, Owyhee, Black Canyon or Manns Creek projects.

Several large pumping plants are located on the Snake River to lift water to the Dry Lake-Bruneau and Mountain Home areas. These lifts range from 200 to over 700 feet.

Water storage facilities for late season diversion on the Weiser, Payette, and Bruneau rivers and Jordan Creek would greatly increase the yields of the smaller affected irrigated areas. These areas currently receive direct stream diversions but suffer water shortages during the late irrigation months.

With a frost-free period of 120 days or more, the Southwest Idaho basins produce a wide variety of crops including alfalfa, corn, potatoes, sugar beets, fruits, and small grains as well as pasture. In addition, intensive crops such as hops, onions, cabbage, beans, mint, sweet corn seed, and popcorn seed are grown successfully. Eighty percent of the nation's production of hybrid sweet corn seed and sixty percent of the nation's sweet corn seed is grown on the Boise and Owyhee projects. Through irrigation, farmers have transformed the Southwest Idaho desert into one of the world's most productive farming areas. The extensive crop production also supports numerous processing facilities for agricultural products including the nation's largest sugar beet refinery at Nampa.

UPPER SNAKE BASINS. Irrigated lands in the Upper Snake River Basin totaled about 2,400,000 acres in 1970. The two largest areas of development are located along the Snake River between King Hill and Lake Walcott and between American Falls and St. Anthony and are supplied with water by the Minidoka project, The Minidoka project consists of five reservoirs with a combined active storage capacity of 2,784,600 acre-feet, and the project provides full or supplemental water supplies to more than one million acres of land. The areas that are served by the Minidoka project generally have an adequate water supply; however, land irrigated from tributaries south of the Snake River generally experience severe shortages.

Extensive irrigation development, supplied by pumping from the Snake River aquifer, has

occurred north of the Snake River in Bingham, Power, Bonneville, and Jefferson counties and south of the Snake River in Cassia County. Although this pumping has not lowered water levels noticeably north of the river, the Raft River and Oakley Fan areas in Cassia County have been declared critical groundwater areas and are presently closed to new groundwater development.

Many smaller irrigated tracts are scattered throughout the basin, including areas such as Big and Little Wood rivers, Camas Prairie, Big and Little Lost rivers. Henrys Fork, and Teton River drainage area. The irrigation of these areas has been developed using both direct stream diversions and storage facilities.

Principal crops produced on the irrigated lands of the Snake River Plain above American Falls include potatoes, sugar beets, alfalfa, forage crops, small grains, and irrigated pasture. The longer growing season below American Falls permits the addition of such crops as corn, green peas, and beans. Certified seed production of onions, alfalfa, beans, corn, peas and clover is also significant on the Lower Snake Plain.

Recent development in Clark County has occurred using pivot sprinkler systems as a method of irrigation application. These lands yielded an average of 370-hundred-weight per acre of potatoes — the highest county yield average in the state of Idaho for 1970. The Osgood project north of Idaho Falls is an excellent example of how a depressed farming area found a solution to its problems and changed into an efficient, prosperous operation by land reorganization and a shift from gravity to sprinkler irrigation.

BEAR RIVER BASINS. Approximately 160,000 acres in Bear River, Caribou, Franklin, and Oneida counties were irrigated in 1970 through diversion from the Bear River and its tributaries, along with some groundwater pumping. Idaho's first recorded irrigation development took place in Franklin County in 1860.

Many of the irrigated areas in Franklin County are irrigated from mountain streams which tend to decrease substantially and are inadequate for late season irrigation. The production of mink fur had been the leading income producer in the county followed by dairy products, wheat, livestock, sugar beets, peas, corn, beans, cabbage for sauerkraut, potatoes, poultry, sheep, and seed crops.

The irrigated lands in Bear Lake County are devoted mainly to pasture, small grains, alfalfa and other hay crops. The principal crop in Caribou County is dryland barley with 80,000 acres under cultivation in 1970. Large acreages of pasture and rangeland complement the cattle and sheep industry with spring and summer ranges. Sprinkler irrigation, the predominant water application method, produces high quality crops of certified russet seed potatoes in addition to alfalfa, small grains, and sugar beets.

Malad County economy is based on production of dryland grain, irrigated hay, small grains, and livestock in addition to corn, potatoes, and sugar beets. Increased farm mechanization and larger farm units have resulted in decreasing agricultural employment and reduced population in the area.

PROBLEMS AND NEEDS

The transformation of 3,750,000 acres from desert area to productive irrigated cropland has provided economic opportunity and improved the environment; but there are problems and needs associated with irrigation.

Many of the earlier developed lands have been reorganized into more efficient units during the last 30 years. Small, oddly-shaped fields have been leveled and reshaped into fewer units more adaptable to modern farming. Design and maintenance of some of the older distribution systems result in low efficiency with large water losses occurring through excessive seepage and growth of vegetation.

The rehabilitation or replacement of these aging systems often involves prohibitive cost. Individual farmers tend to be more progressive in updating their irrigation systems than do irrigation companies. An example of what can be accomplished through progressive action by individual farmers exists in the Emmett and Payette areas. The Rigby area is illustrative of another type of inefficiency whereby one company's canals often closely parallel those of another company. This situation came about in

the Rigby area because the older canal systems were constructed on a need basis, and the type of system that could be provided was subject to funding limitations of the time. Studies of the irrigation systems are needed to determine if a more efficient system is possible and/or practical both on an individual basis and canal company basis.

Areas of the state which are served by surface water distribution systems but have little or no storage to supplement natural stream flows suffer from uneven availability of irrigation water. Excessively cold water spring flows diverted to the land tend to reduce ground temperature thus retarding plant growth and over irrigating the soil. Late season water shortages result in reduced crop yields. The areas where storage facilities plus improved methods of irrigation are urgently needed (to hold stream runoffs and to conserve water for use in the dry late summer months) include the Upper Weiser River Basin, the tributaries of the Snake River in Owyhee County, and the state's higher mountain valleys. Areas identified as needing supplemental water are shown in Table 21 with land acreages short and water acre-feet required.

Delivery schedules maintained by some irrigation districts tend to cause over-watering and related losses. Unusually great spring season diversions, made to relieve river channel flooding, have been used to justify demands of water users for unnecessarily high amounts of irrigation water during nonflooding periods. As a result, annual diversion rates for some canal companies in the Upper Snake Basin can exceed 15 acre-feet per acre compared to less than 4 acre-feet per acre in areas covered by the Minidoka project, and only about 3.5 acre-feet per acre in some new enclosed private systems. Where diversion rates are high, studies are needed to determine: the relationship to groundwater recharge and surface run-off; the economic feasibility of system rehabilitation; the possibility of changing delivery schedules; and the amount of water which might be available for other uses.

High rates of diversion and application of irrigation water have created drainage problems

TABLE 21

AREAS OF SUPPLEMENTAL WATER NEED

Area	Land (Acres)	Water shortage (Acre-feet)
BEAR RIVER BASINS[1]		
Bear River Region	83,000	35,000
UPPER SNAKE BASINS		
Surface water		
Henrys Fork Basin	48,000	60,000
Stateline to American Falls East Side Tributaries	71,000	90,000
American Falls to King Hill North Side Tributaries and Snake Plain	69,000	150,000
South Side Tributaries	57,000	124,000
Groundwater	152,000	100,000
Subtotal	396,000	524,000
SOUTHWEST IDAHO BASINS[1]		
Payette River Basin	28,000	31,000
Weiser River Basin	11,000	13,000
Snake River — Minor North Side Tributaries	9,000	12,000
Bruneau and Owyhee River Basins and Minor South Side Tributaries	25,000	37,000
Subtotal	73,000	93,000
CLEARWATER-SALMON BASINS[1]		
Salmon and Clearwater River Basins	62,000	80,000
TOTAL	**614,000**	**732,000**

[1] Surface water

such as those in the Snake River Fan in the Rigby area. Other areas of the state are faced with similar drainage problems. The principal reasons for the increased water tables are excess canal seepage losses, excess irrigation application, poorly planned land development, and lack of natural or mechanical drains.

North of the Snake River, these high rates of diversion and application contribute to the underground flows which emerge at Thousand Springs to recharge the river. This recharge is looked upon in favor by some.

Throughout the state, there are but a few areas or projects where consumers feel there is a sufficient water supply. This probably stems from the problems encountered during the dry years of the 1930s and the desire to provide "insurance water" for a repetition of such dry years. There are some existing irrigated areas that have a real continuing need for additional water. Some of those areas could be provided additional water by interbasin transfers; and through exchanges of water many more could be aided.

The majority of the areas needing additional water are in the Snake River drainage of Southern Idaho. The 1971 Great Basin Region Comprehensive Framework Study and the 1971 Columbia-North Pacific Comprehensive Framework Study identified areas having a need for supplemental water. These areas are listed in Table 21.

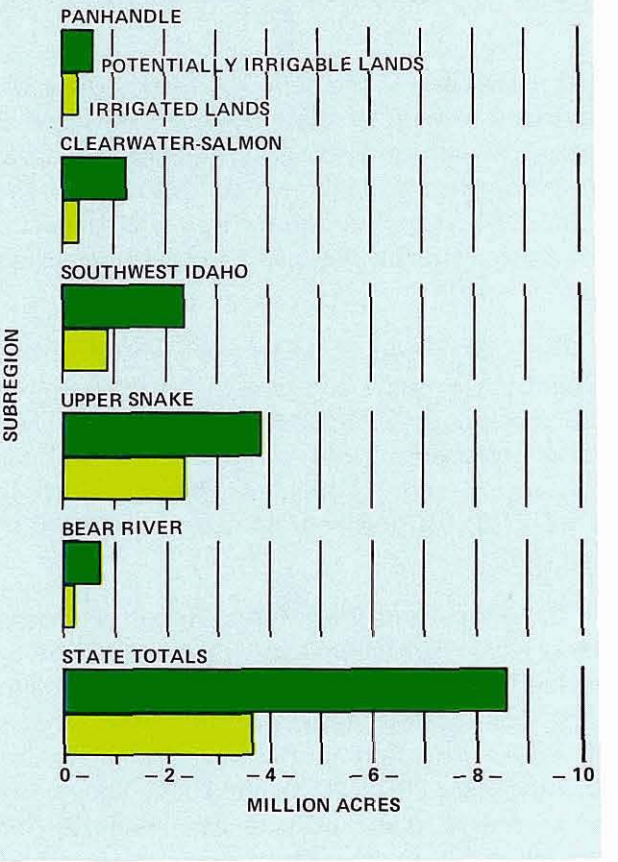
FUTURE REQUIREMENTS

Considerable increase in the production of crops, farm settlement and employment opportunities, new towns and taxbases within the state — all are possible by upgrading presently irrigated lands to fuller utilization and by expanding irrigation to vast areas of potentially irrigable land. Products from new land development can be absorbed within the state and national market potentially.

Studies by Washington State University[1] and the University of Nebraska, Bureau of Business Research[2] on the impact of irrigated agriculture versus dryland production provide an insight to the economic impact which irrigation can have in Idaho. In both studies the direct impact (or additional production per acre), while substantial, did not equal the associated or "induced" effects. These came from other sectors of the economy involved in processing and selling the increased production. The WSU study noted that for the Columbia Basin Project, about 17 times as many people were supported from the same area under irrigated cropland conditions, and federal income tax payments were 17 to 22 percent greater as opposed to dryland conditions. Public services were increased, the tax base expanded, and most importantly new employment opportunities were created to help stem the outmigration of the young people from the state.

Figure 22 shows both presently irrigated and potentially irrigable land acres in Idaho. Potentially irrigable lands lie mostly in the southern portions of the state with 45 percent of the total irrigable acreage in the Upper Snake Basins and 27 percent in Southwest Idaho Basins. The areas having potential are in the Mountain Home desert, Bruneau desert, Oakley Fan, Raft River, Salmon Falls Tract, Rexburg Bench, and lands overlying the Snake Plain aquifer. Remaining areas include the Clearwater-Salmon Basins with 14 percent, the Bear River Basins with 8 percent, and the Panhandle Basins

FIGURE 22. IRRIGATED AND POTENTIALLY IRRIGABLE LAND
(Acreages by Planning Regions)



[1] "The Economic Significance of Columbia Basin Project Development", Bulletin No. 669, Washington State University.

[2] University of Nebraska Bureau of Business Research, Report No. 4, 1968.

TABLE 22
PRESENT AND PROJECTED TOTAL IRRIGATED AREA, 1966 – 2070
(Thousands of acres)

Basins by method plans	1966[1]	1980	2000	2020	2070
METHOD A					
Panhandle	24	29	40	54	170
Clearwater-Salmon	144	155	158	160	211
Southwest Idaho	880	1,074	1,219	1,517	2,422
Upper Snake	2,327	2,504	2,603	2,959	4,255
Bear River	157	172	180	200	242
TOTAL	**3,532**	**3,934**	**4,200**	**4,890**	**7,300**
METHOD B					
Panhandle	24	43	102	168	348
Clearwater-Salmon	144	188	291	407	969
Southwest Idaho	880	1,104	1,443	1,784	2,476
Upper Snake	2,327	2,620	2,913	3,179	3,679
Bear River	157	177	217	263	313
TOTAL	**3,532**	**4,132**	**4,966**	**5,801**	**7,785**
OBE-ERS METHOD					
TOTAL (all basins)	**3,550**	**4,274**	**4,558**	**5,052**	[2]

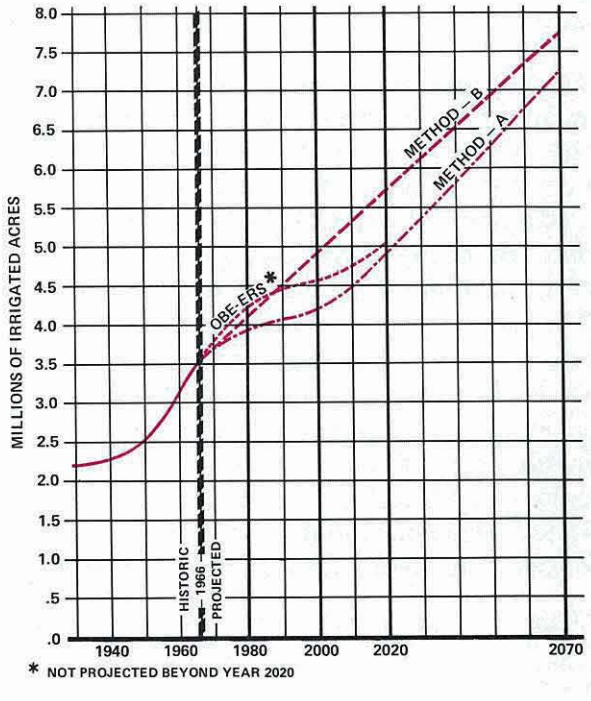
[1]SOURCE: Potentially Irrigable Lands of Idaho, IWRB, 1970
[2]Not projected to year 2070

with 6 percent of the state total irrigable lands. Fourteen percent of these lands are classified as Class 1, 44 percent Class 2, and 42 percent Class 3. Development will be limited depending upon the amount of water required for instream needs and amount of storage that can be provided to hold spring runoff.

Table 22 shows both presently irrigated and potentially irrigable land acres by planning region; and projects by 2 methods of utilization with a third projection based on Office of Business Economics and Economics Research Service (OBE-ERS). Visual representation is given in Figure 23.

The Agricultural Water Needs Report, Planning Report No. 5, prepared by the Department of Agricultural Engineering, University of Idaho under contract with the Board, presents estimates of future irrigation in the state of Idaho for periods 1980, 2000, 2020, and 2070. The report while not a plan, utilizes two methods for projecting future agricultural water use. Method

FIGURE 23. COMPARISON OF IRRIGATED ACREAGE PROJECTIONS



A, (National Efficiency) assumes that Idaho will continue to satisfy a proportionate share of the nation's future food and fiber needs much like it has in the immediate past. By year 2020, Method A indicates that about 4.9 million acres would be irrigated. Method B (Regional Development) considers the state resource development in water and land and assumes that it will be developed for irrigation at the rate whereby all reasonably good lands will be developed within the next 100 years. By year 2020, Method B indicates that about 5.8 million acres would be irrigated.

The Columbia-North Pacific and Great Basin Framework studies include projections of future irrigation needs required if the state was to provide its allocated share of the national food and fiber needs as projected by OBE-ERS. By year 2020, the OBE-ERS projections indicate that about 5.0 million acres would be irrigated.

In these studies of future food and fiber requirements, increased crop yield estimates provided by the University of Idaho were utilized. In addition, no restraints or limitations were placed on fertilizer or pesticide use in attaining increased crop yields.

If increased yields of the magnitude estimated are not realized (either through controls or use of pesticide, fertilizer or for other reasons), a larger acreage would be required to realize the same projected food and fiber production. The assumption that Idaho will continue to supply the same percentages of national food and fiber needs that it now supplies is also a key assumption. Idahoans could elect to follow a policy which would mean developing no new acres, less, or more acreage. Each choice would affect the Idaho percentage share of future national food and fiber production.

A discussion of opportunities in each region to meet these projected needs is presented in Chapter 4.

The water surplus regions such as the Clearwater-Salmon and Panhandle basins illustrate the basic paradox in state distribution of soils and water. The Clearwater-Salmon Basins has ample water for irrigation of all land area but the short growing season and forested mountain terrain strictly limits the agricultural potential. The abundance of water fulfills other purposes, however, for many miles of wild and scenic rivers lie

within the basins. The paradox is even more evident in the Panhandle Basins which has the largest water supply of any region in Idaho, but contains little potentially irrigable acreage.

Groundwater resources are an important key to state future economic development. The Snake River Plain and Rathdrum Prairie each overlie a large productive aquifer and other large but less productive groundwater aquifers lie along the western boundary and in the intermontane valleys of eastern Idaho.

The rate of groundwater development for irrigation has decreased recently in the Snake River tributaries above American Falls although new wells drilled have been increasing both in diameter and depth. Greatest potential groundwater source lies in the Snake River Plain, particularly in the southern section. Both large and small scale irrigation development are expected to continue rapid expansion in the Aberdeen, Springfield, Minidoka, Jerome and Wood River areas with increasing population and development of new lands. Groundwater irrigation development around the tributaries south of the Snake River (including Goose Creek, Rock Creek, and Raft River areas) has decreased sharply since 1968 because of local critical groundwater shortages. Any future drilling of irrigation wells must await changes in the status of these groundwater areas.

Idaho's most active area of groundwater development is in the southwest surrounding the Boise and Payette rivers and in the Mountain Home area. Stimulated by increasing urbanization, this will probably continue to be the area of greatest activity for some time to come. Most development seems related to small irrigation and domestic filings with domestic purposes predominating in the Boise-Nampa-Caldwell area, irrigation in the vicinity of Mountain Home, and a combination of the two near the Payette River.

Groundwater development in northern Idaho will be primarily for small irrigation and domestic purposes with large scale irrigation potential occurring only in the Rathdrum Prairie area. Little activity is anticipated in the Salmon and Clearwater River basins.

WATER QUALITY

Quality is a common denominator of all water uses — agricultural, aquicultural, municipal, industrial, and recreational. The stakes in water quality planning and protection are high. Meeting state water quality standards will require the establishment of minimum flows for dilution of wastes in conjunction with adequate waste water treatment practices.

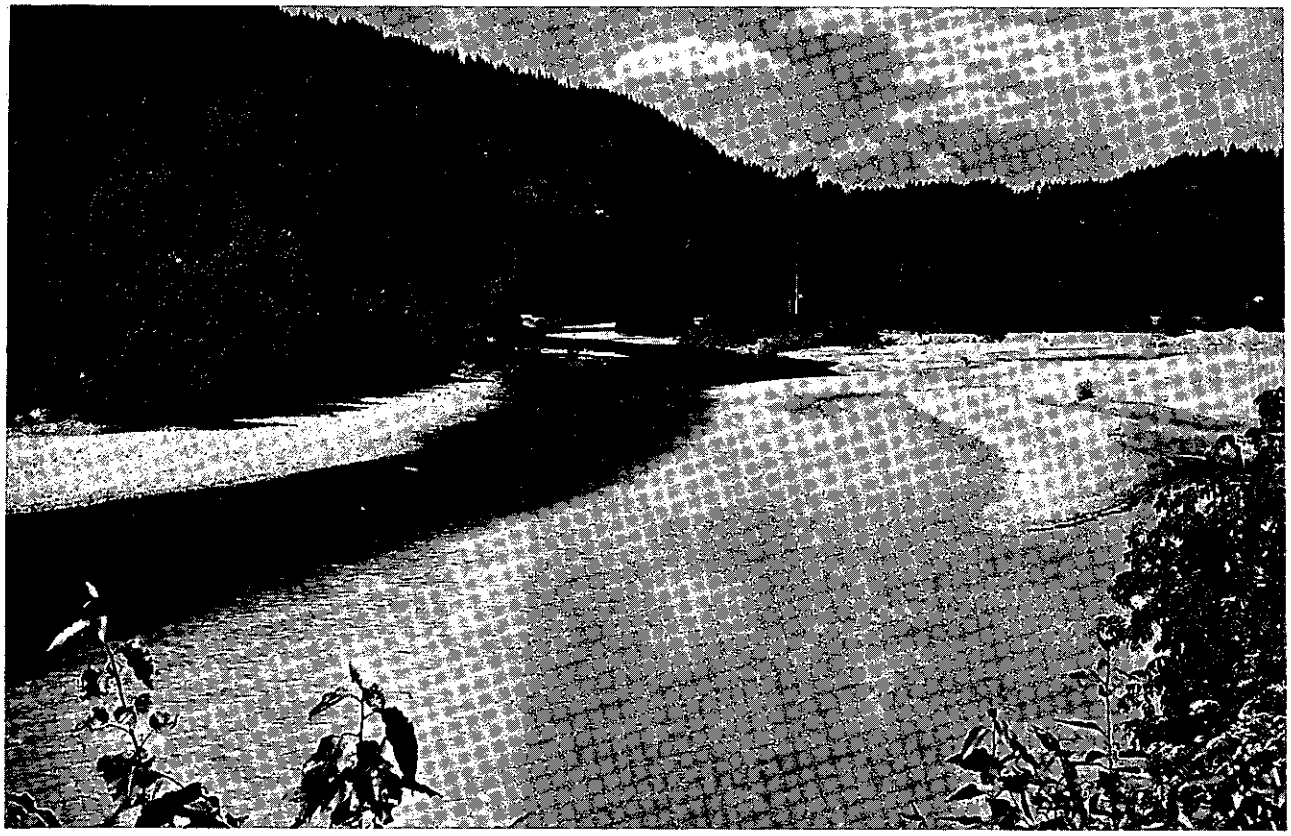
Compared with those of densely populated urbanized states, water quality problems in Idaho are not now severe. Great sums of money have already been spent by municipalities and industries to upgrade treatment to meet established water quality standards. The listing of remaining problems should not cause the public to overlook past efforts. Idaho has the unique challenge and opportunity to plan for and manage its water resources in a manner that will assure continued opportunities for all water uses.

PRESENT STATUS

The Water Quality Act of 1965 provided that each state must adopt water quality standards for all interstate and coastal waters and formulate a plan to implement and enforce those standards. The act further provided that if states did not act to set and enforce standards, the Secretary of the Interior would do so.

The Idaho Board of Health adopted, effective July 5, 1967, the "Rules and Regulations for Standards of Water for the Interstate Water of Idaho and Disposal Therein of Sewage and Industrial Wastes". These standards have been accepted by the Secretary of the Interior as meeting the requirements of the Water Quality Act.

The standards are applied to provide protection of Idaho waters for domestic, industrial, agricultural, recreational, livestock, fish, and other



aquatic life uses. The key provisions of the present standards set forth that waste discharges (either alone or in combination with other wastes) will not be allowed which cause: (1) the dissolved oxygen to be less than 75 percent at seasonal low or less than 100 percent saturation in spawning areas during spawning, hatching, and fry stages of salmonoid fishes; (2) any measurable temperature increase when stream temperatures are 68 degrees F. or above, or more than 2 degrees F. increase when stream temperatures are 66 degrees F. or less; (3) objectionable turbidity; and (4) the average coliform bacteria concentration to exceed 1,000 per 100 milliliters with 20 percent of the samples not to exceed 24,000 per 100 milliliters. Notwithstanding these standards, the highest and best practicable treatment under existing technology is to be applied to all waste discharges.

The standards now in force were adopted without the benefit of comprehensive water studies and do not necessarily reflect state goals with respect to use of water resources. The benefits and costs of having higher, lower or the established standards are yet to be evaluated. The question is raised then whether the standards now in force and the increments of benefits derived are realistically attuned to increased costs. In other words, a minor additional improvement in quality may be tremendously costly.

The Environmental Protection Agency (EPA) (in the FPC hearings on the Middle Snake hydro-projects) contended that Idaho Water Quality Standards precluded the construction of any more dams because water in reservoirs would be of a different quality than that now in the streams unless the standards are changed. This was not the understanding of the Water Resource Board or water users when hearings were held on the standards in 1967. This issue is more fully discussed in Chapter 2.

The Farmers Home Administration of the Department of Agriculture requires that county water and sewer plans be completed before water and sewer construction grants can be made to rural communities.[1] This requirement will be met by planning studies contracted for by

[1] Rural communities are defined by FHA as having less than 5,500 population.

individual counties; and by studies for 25 counties being carried out by the Idaho Water Resource Board and financed by the Farmers Home Administration.

In January 1971, the EPA issued a set of guidelines for water quality management planning. The guidelines established requirements which must be met by states in water quality planning to be eligible for federal funds for the construction of water pollution abatement facilities. The guidelines specify two planning periods. The first phase consists of preparation of interim basin and/or regional-metropolitan plans to be completed by July 1, 1973, after which time eligibility for federal grants will be based on fully developed plans.

The EPA guidelines state that the interim plans are to focus on point sources (primarily municipal and industrial wastes); and on the information and evaluation necessary to make critical decisions affecting regionalization and plant design for the immediate construction grant programs. The fully developed plans are to place emphasis on nonpoint sources of pollution, and on prevention of future pollution by improving and maintaining established water quality standards. Pertinent water quality data not available for the interim plans are to be included in the fully developed plans. To meet requirements of fully developed plans, the following study programs are to be carried out on a statewide basis:

- Development of water quality simulation models for all major river systems based on data from networks of continuous systematic water quality monitoring stations;
- Establishment of nutrient standards;
- Identification and evaluation of means of preventing water pollution caused by animal feedlots;
- Identification of water quality problems generated by irrigation return flows and the development of solutions;
- Establishment of minimum flow requirements for aquatic life and water quality needs.

The Board has requested funds to increase its water quality planning study effort and is proposing that minimum flows be determined for key stations (see Figure 24).

New federal water quality legislation is being proposed which calls for elimination of all pollutant discharges into waters by 1985. The proposed legislation would require the restoration and maintenance of the natural chemical, biological, and physical quality of the nation's waters, and would transfer much of the present state regulatory power to the federal government.

PROBLEMS AND NEEDS

PANHANDLE BASINS. Degradation of water quality in the Panhandle is associated primarily with wastes from municipalities and industries (especially the mining industries); however, recreation sites, rural sewage disposal, and land use practices also contribute significant quantities of wastes. Drainage and seepage from septic tanks and tile fields serving recreation sites, summer homes, and resorts on the shores of Priest, Pend Oreille, and Coeur d'Alene lakes pose a real threat to these prime recreational lakes.

Inadequately treated municipal wastes result in bacterial and organic contamination of the South Fork and main stem of the Coeur d'Alene River. The EPA in a December 19, 1971 report titled *"Report on Idaho's Environmental Problems"* lists five city areas in the Panhandle Basins where enforcement action is needed, by local or state authorities, or federal enforcement action will be required. They are listed in order of priority as follows: (1) South Fork Coeur d'Alene Sewer District; (2) Sandpoint; (3) Burke; (4) Gem; and (5) Priest River.

Mining and smelting operations have caused severe water quality problems in the South Fork and main stem of the Coeur d'Alene River. The three major industrial waste sources listed in the EPA report as the primary contributors to the problem are: Bunker Hill Company; Sunshine Mining Company; and Heccla Mining Company. The remaining sources are said to be contributing a small percentage of the heavy metal discharge to the river.

Water quality planning for the Spokane River Basin, which includes the Coeur d'Alene, St. Joe, and St. Maries rivers in Idaho, is underway by a prototype pollution abatement planning authority. The cooperative venture — Spokane River Basin Depollution Committee — is comprised of representatives of local, state, and federal government, industries, and public interest groups.

Solutions to the problems of the South Fork are currently being sought by the South Fork Coeur d'Alene River Sewer District which is a cooperative venture of both communities and industries in the drainage area.

CLEARWATER-SALMON BASINS. The Salmon and Clearwater rivers and their tributaries have excellent water quality and exceed the quality of the Snake River. Dissolved oxygen concentrations of the central Snake are usually near saturation, since the Brownlee Reservoir acts as a huge settling pond which releases water that has undergone the natural processes of decomposition of organics, settling of suspended matter, cooling and bacterial die-off. This water is reaerated as it flows toward Lewiston and provides an important recreational resource. Swimming, water skiing, pleasure boating and fishing attest to the high water quality. Trout, anadromous fish, and warm water fisheries are found along the Middle Snake.

Most major water quality problems occur in the Lewiston-Clarkston area and below. Untreated waste discharges from a pulp and paper mill, several food processing plants, and waste waters from the Clarkston and Lewiston primary waste treatment facilities render a portion of the Snake River unsuitable for water contact recreation.

The problem of super-saturation of nitrogen and its potential impact on anadromous fish runs has received great attention in recent months. In the spring of 1971, it was claimed by many public and private groups that the heavy flood flows spilling over the low head dams on the lower Snake and Columbia rivers in Washington had virtually destroyed the anadromous fish runs into Idaho. Others contended that the problem was of short duration and that with the installation of slotted gates and generators in the dams now under construction and completion of planned upstream storage, the problem would be largely eliminated. The anadromous fish runs into Idaho in 1971 were quite large and support the contention that the danger of extinction due to nitrogen problems may have been overstated. The impact on the downstream migrants, however, will not be known until their return three to four years hence.

FIGURE 24.
POTENTIAL MINIMUM FLOW STATIONS
(Water Quality)

The 1971 EPA report lists two communities (Donnelly and Lewiston Orchards) where improved waste treatment is needed and where federal enforcement action will be taken if required.

The major water pollution problems from industrial wastes are associated with Potlatch Forests, Inc. and Twin City Foods, Inc. at

Lewiston. Of major concern is the lack of a definite waste treatment construction schedule for the industries.

SOUTHWEST IDAHO BASINS. The most serious water quality problems in the Southwest Idaho Basins are associated with municipal and industrial wastes, agricultural animal wastes, low flows, and irrigation diversions.

The lower Boise River has become increasingly polluted because of municipal and industrial growth. Flows in the Boise River have been historically low in the late fall and winter months. Growing pollution loads from inadequate waste treatment, coupled with periodic flow interruptions connected with the maintenance of Lucky Peak dam, has caused water quality problems. Drainage from cattle feed lots has contributed to bacterial contamination and algal growths. It has been claimed by EPA that irrigation return flows are the major contributor to turbidity, increased stream temperatures, and enrichment of the Boise and Snake rivers. However, further studies are needed in this area to determine the validity of this charge.

The Snake River between the mouth of the Boise River and Brownlee Reservoir is characterized by settling and floating solids from the discharge of municipal and industrial wastes. These conditions have tended to form offensive and use-inhibiting nuisances. Bacterial contamination has also been evident in this reach. The states of Oregon and Idaho have done much to improve the situation by implementing stringent treatment programs. However, the problem still persists.

The waste materials from the Snake River are trapped in Brownlee Reservoir. The materials that settle include both silts and organics. As a result, Brownlee Reservoir has a periodic oxygen deficiency that becomes severe in the upper reaches of the reservoir in late summer and early fall and lush growths of algae occur in the upper levels of the pool during this period. Anaerobic decomposition of organic material that has settled to the bottom of the pool sometimes produces noxious odors when reservoir "turnover" occurs during late fall and winter.

The waters of the Bruneau River and some of its tributaries usually contain natural fluoride concentrations in excess of the limits set for drinking waters by the Public Health Service.

Concentrations of basic nutrients, nitrates, and phosphates are high in several tributaries. The Owyhee, Malheur, and Boise rivers have particularly high phosphate concentrations. High nutrient concentrations have stimulated heavy algal growths throughout the Owyhee and Malheur rivers and in the lower reaches of the Boise River.

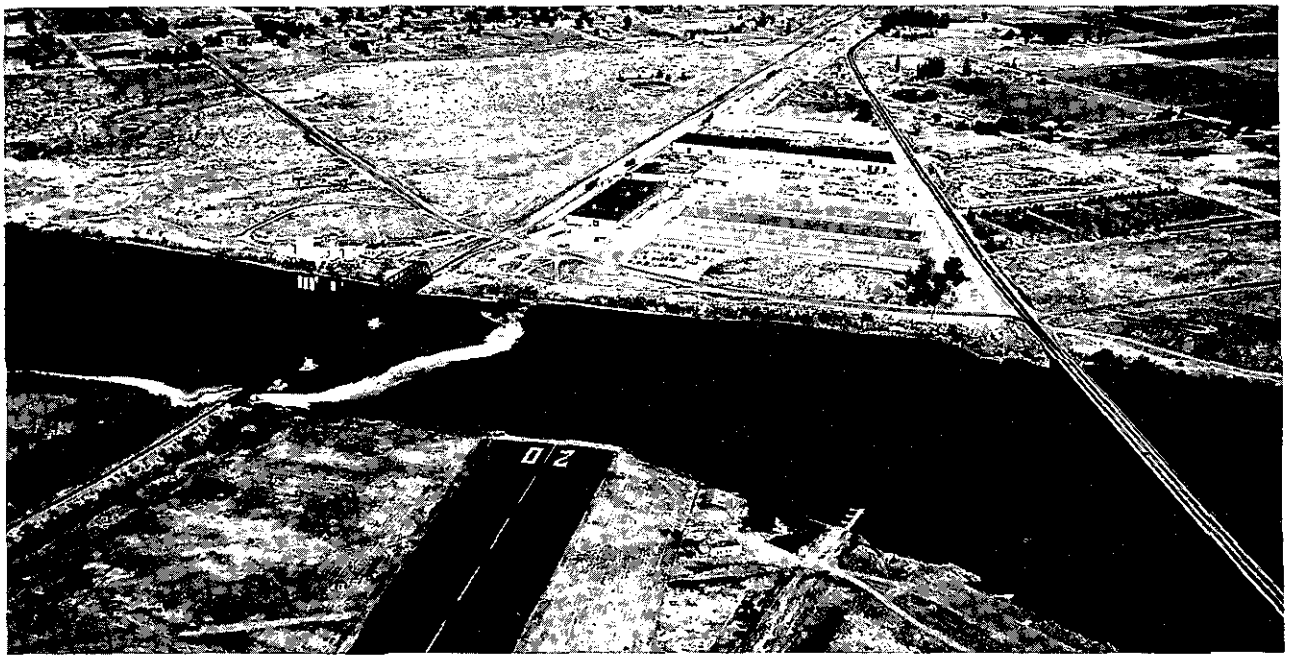
The 1971 EPA report lists four communities where improved waste treatment is needed and where federal enforcement action will be taken if required. They are listed in order of priority as follows: (1) Garden City, (2) Kuna, (3) Horseshoe Bend, and (4) Wilder.

The only industry listed in the EPA report is the M-K Pet Foods at Grand View. The report states that the company discharges strong industrial wastes to the Snake River.

UPPER SNAKE RIVER BASINS. The major waste sources in the Upper Snake River Basin[1] are the food-processing industries, particularly potato processing and sugar refining; municipalities; agricultural animals; and irrigation return flows. The magnitude of wastes from agricultural animals and irrigation return flows is not readily identifiable. The direct impact of agricultural activities on water quality is difficult to assess due to lack of water quality data on return flows.

Water quality declines moderately but progressively through the reach of the Upper Snake. Nutrient concentrations rise at a rapid rate, periodically causing dense algal and weed growths; and are accompanied by increases in dissolved solids, biochemical oxygen demand, bacteria, and temperature. Dissolved oxygen concentrations are usually above levels necessary to support salmonoid fish, although localized dissolved oxygen depressions have occurred. Considerable improvement in water quality occurs at Thousand Springs area near Hagerman which regenerates the river both in quality and

[1] Columbia-North Pacific Region Comprehensive Framework Study; Appendix XII, 1971.



quantity. About one-fourth of the spring flows have been attributed to subsurface return flows from upstream irrigation.

Twofold and fourfold increases in total dissolved solids concentrations and chloride concentrations have been measured in Raft and Blackfoot rivers and several other Upper Snake River tributaries used heavily for irrigation. The dissolved solids content of the Snake River increases from about 175 mg/l at the Idaho-Wyoming border to about 400 mg/l at Buhl, Idaho.

Agricultural animal waste drainages in the Upper Snake region are a major source of coliform bacteria and biochemical oxygen demand. The organic waste potential of the animal population is estimated to be equivalent to that from a population of 5.5 million people. An estimated 95 percent of the waste generated is reduced by deposit on the land and natural decomposition, so that organic waste of about 275,000 PE [1] eventually reaches waterways.

Water quality problems occur in the Snake River below Idaho Falls and in the South Fork Teton River. Low dissolved oxygen and high bacterial densities result from a combination of municipal and industrial waste discharges and insufficient streamflows depleted by irrigation diversions. Implementation of Idaho's Water Quality Standards, which call for secondary or equivalent treatment of waste discharges, would do much to alleviate these conditions.

Aberdeen Drain, Main Drain, and Rock Creek suffer from low dissolved oxygen levels, high bacterial densities, and nuisance aesthetic conditions. Each of these small waterways receives large quantities of inadequately treated municipal and industrial wastes and agricultural waste waters.

The Portneuf River is characterized by low pH levels, high phosphate concentrations, sludge beds, and high bacterial counts. These problems result from inadequately treated domestic wastes, phosphate-processing plant wastes, and land drainage. Problems associated with pH and sludge beds are expected to be eliminated when planned waste treatment and control facilities are completed. Improved treatment is expected to decrease bacterial and phosphate levels, but will not provide the complete control necessary to maintain these parameters within limits established by the state standards.

The Blackfoot Reservoir, located on the top of a seam of phosphate-bearing earths, is fouled with algae. It nevertheless produces good trout fishing. Downstream, the river is characterized

[1] Population equivalent.

by a thick silt bottom that is choked with growths of grasses and water weeds.

The maintenance of high quality water in the Snake River Plain aquifer is of major concern since increased aquifer usage is the key to obtaining optimum use of ground and surface water resources. The quality of water below Thousand Springs is dependent upon the maintenance of high quality water in the aquifer. Although the water is now of extremely high quality, drainage wells, radioactive wastes, and nutrient carrying waters infiltrating the aquifer could seriously alter this irreplaceable resource.

American Falls Reservoir periodically suffers from excessive aquatic growths, dissolved oxygen depressions, and high pesticide levels. Quality problems are caused by residual waste loads from upstream sources, phosphate-processing wastes from the Pocatello area, and agricultural waste water from the area immediately adjacent to the reservoir. Within the reservoir, excessive nutrient concentrations promote nuisance-level algal growth; this and normal plant respiratory processes, exert a demand on the dissolved oxygen resource during die-off and decay periods. Impairment of reservoir use for recreation and fishery purposes has occurred. In August of 1967, for example, decomposition of dead algal cells is believed to have caused dissolved oxygen concentrations to drop to zero in some portions of the reservoir causing a fish kill estimated at 20,000. As upstream waste treatment takes place, the water quality problems should diminish in the reservoir. Water quality below American Falls is good and sustains a trout fishery.

The 1971 EPA report lists four communities where improved waste treatment is needed and where federal enforcement action will be taken if required. They are listed in order of priority as follows: (1) Paul, (2) Heyburn, (3) Twin Falls, and (4) Chubbuck.

The seven major industrial wastes sources listed in the EPA report are: Idaho Potato Starch Company, Rogers Brothers Company, and Western Farmers Association which have elected to join with Idaho Falls in a combined municipal-industrial treatment system; Idaho Potato Foods at Idaho Falls; Colonial Concrete

at Twin Falls; Amalgamated Sugar Company at Twin Falls; and Remington Brothers at St. Anthony.

BEAR RIVER BASINS. Surface water quality in Idaho's portion of the Bear River Basin deteriorates as the Bear River flows from Wyoming through Idaho and into Utah. Dissolved solids at the point where Bear River enters Idaho from Wyoming above Bear Lake range from 160 to 450 mg/l; and, where the river again flows from Bear Lake, range from 400 to 500 mg/l.

There are major water quality problems in the area immediately surrounding Bear Lake. There is a need to provide adequate treatment facilities for small communities and the new recreation facilities being developed around the lake, as well as provisions for waste disposal facilities for the many small dairies and livestock feedyards which now drain into the lake. However, the present operation of the lake could create major problems if large drawdowns of lake water become necessary to meet future downstream water commitments.

Solutions to problems in the Bear Lake area are being sought jointly by Bear Lake County, Idaho, and Rich County, Utah, in cooperation with their respective state water resource agencies.

Large-scale phosphate mining and processing is conducted near Georgetown and Soda Springs on the Bear River. Provision for adequate disposal of mining and processing wastes is of major concern to both the phosphate industry and residents of the basin in order to maintain and enhance the quality of water in the Bear River drainage.

The communities of Montpelier, Soda Springs, and Preston are major sources of municipal sewage waste loads in the Bear River drainage. Each of the three communities have programs underway to reduce pollution loads. The 1971 EPA report lists Paris and Montpelier as communities needing waste treatment and where federal enforcement action will be taken if required.

An interstate effort to seek solutions to the establishment of water rights and minimum flows is underway by the Bear River Negotiating Team comprised of respresentatives of the states of Wyoming, Utah, and Idaho (see Chapter 4).

The Malad and Little Malad rivers, which originate in the Blue Spring Hills and Malad Range in Oneida County and flow into Utah where they join the Bear River, carry the highest dissolved solids of any rivers in the basin. The dissolved solids which originate from natural springs feeding the river reach levels of from 1,200 to 4,600 mg/l.

Summary

Idaho water quality is generally high. Indicative of the excellent water quality is the fact that of the 15,700 miles of free-flowing streams, 5,227 miles are Class I streams and 1,499 miles are Class II streams; both provide excellent trout and anadromous fishing opportunities. In addition, the hundreds of lakes and reservoirs throughout the state generally exhibit high water quality.

Nature probably has as much impact on water quality as does man. Rapid snow melt in the mountains causes streams to swell and great quantities of sand and silt are carried downstream during the spring runoff. During this period most streams are unfit for fishing; reservoirs often supply most of the fishing opportunities until July when the streams clear.

Water resource development has caused higher summer flows as stored flood waters are released for downstream use during the dry months. However, in some instances, river flows are reduced to practically zero flows during dry years in the Snake River at Blackfoot, below American Falls, at Milner Dam; and below Lucky Peak Dam on the Boise River. In the Upper Snake return flows regenerate the river within a short distance.

Low dissolved oxygen concentrations occur in a number of major tributaries and smaller streams in Idaho, normally as the result of heavy biochemical oxygen demand exerted by municipal, pulp and paper, and/or food-processing wastes. On the Snake River fish kills have occurred in Milner and American Falls reservoirs from low oxygen content. The dissolved oxygen level is depressed below

Brownlee Reservoir; and the Boise River experiences low dissolved oxygen levels during extreme low flow conditions.

Bacterial pollution from municipal wastes and livestock populations has seriously affected water quality for water contact sports in a few locations, especially below Boise on the Boise River.

Nitrates and phosphates from both natural and man-made sources are the major cause of excessive aquatic growths in parts of the Snake River Basin. However, there is some evidence that subsurface drainage water from irrigation has decreased phosphate loads and lowered water temperature. In addition to taste and odor problems, these growths have caused increased maintenance costs for irrigators because of clogged diversion and distribution systems. Intensive algal growths sometimes cause extreme daily fluctuations in dissolved oxygen concentrations in some streams and reservoirs such as Brownlee. The fish kill in American Falls Reservoir has been attributed to low dissolved oxygen levels resulting from decomposition of dead algal cells.

Surface waters in the state generally contain less than 250 mg/l of dissolved solids, and only in a few small areas does the dissolved solids content exceed 1,000 mg/l. The streams in the mountainous parts of the region generally have a dissolved solids content of less than 100 mg/l, and some have less than 50 mg/l.

Although irrigation is extensive in the Snake River basins the majority of the streams have a dissolved solids content of less than 500 mg/l. The chemical composition of the dissolved solids will vary, depending upon the soils of the area; but calcium and magnesium are usually the principal constituents. Sodium is a main constituent in some streams tributary to the Snake River.

Toxic elements and compounds are found in the waters in some areas. Some streams have been rendered biologically sterile and nonproductive because of mine wastes. This type of problem occurs in the South Fork Coeur d'Alene River and several of its tributaries. In 1966, fish caught below American Falls Reservoir showed accumulations of pesticides in livers and viscera. Other fish kills have been reported throughout the region from accidental spills of pesticides and other toxicants.

Generalized profiles (dissolved oxygen, BOD, water temperature, total phosphate, and bacteriological) for the Snake River are shown in Figures 25 through 29.

These figures show that water quality of the Snake River is excellent in its upper reaches but gradually deteriorates under the impact of man's activities and natural degradation. However, the heavy inflow from the Thousand Springs area greatly improves the water quality until the inflows of the Boise, Payette, and Owyhee rivers cause a marked decline. Below Brownlee Dam water quality improves until the Snake River reaches Lewiston.

The water quality of the northern Idaho streams and lakes is generally good with the exception of the South Fork and main stem of the Coeur d'Alene rivers and some lakeshore areas.

The existing water pollution control program measured in terms of industrial and municipal waste treatment facilities on a statewide basis are: [1]

[1] SOURCE: Idaho Department of Health.

FIGURE 25. BOD PROFILE (Snake River)

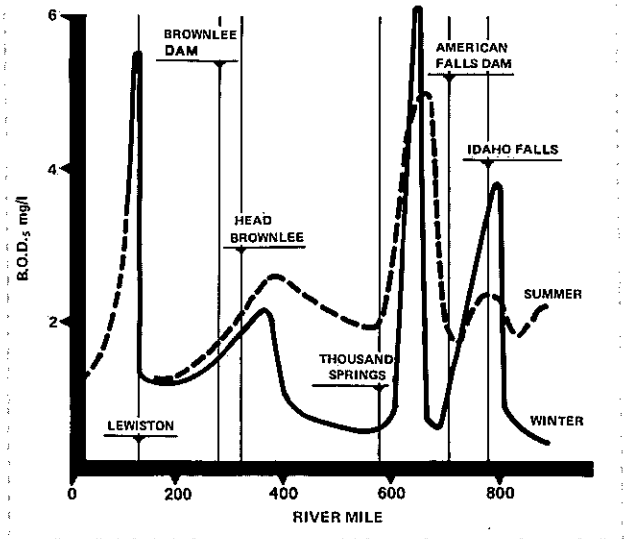


FIGURE 26. DISSOLVED OXYGEN PROFILE
(Snake River)

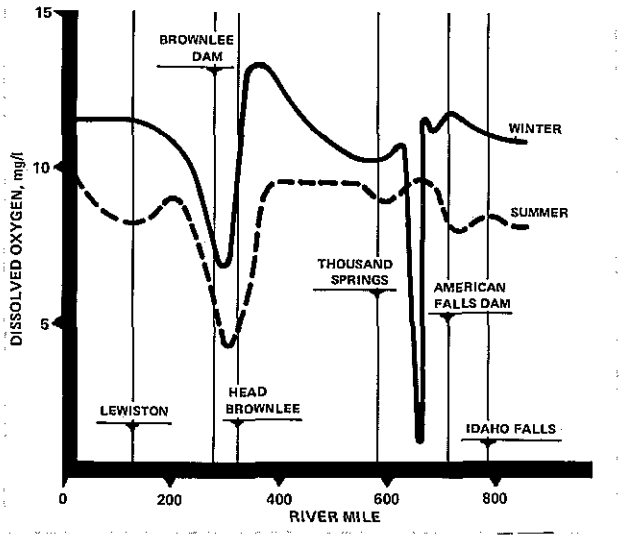


FIGURE 27. TEMPERATURE – PROFILE
(Snake River)

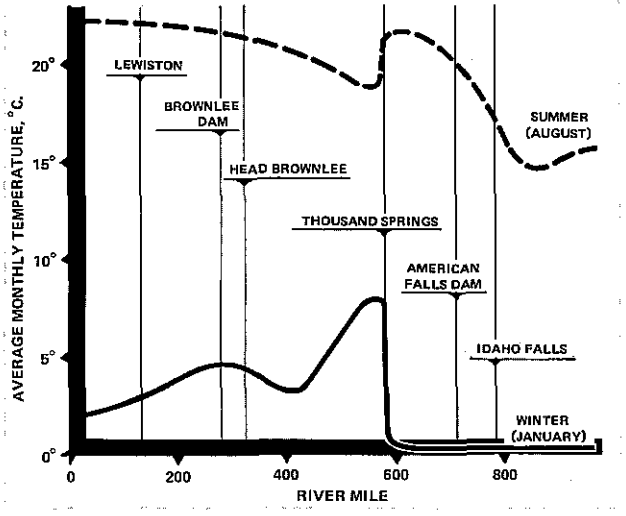


FIGURE 28. PHOSPHATE – PROFILE
(Snake River)

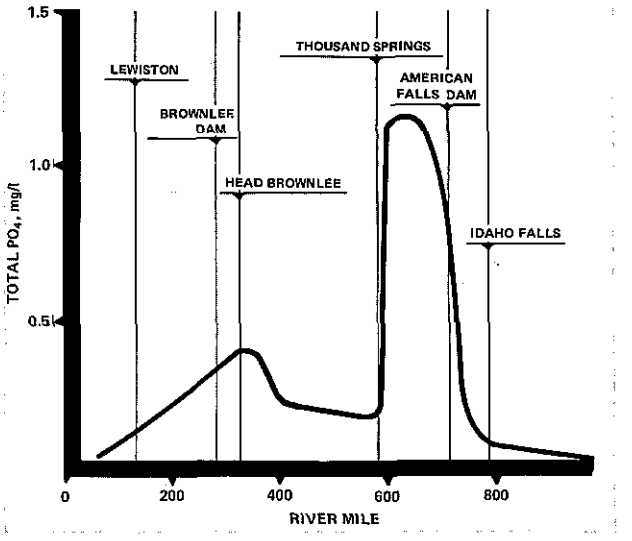
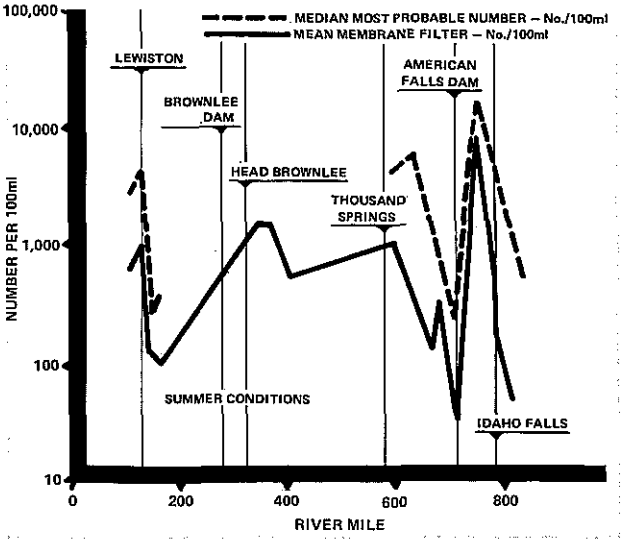


FIGURE 29. BACTERIOLOGICAL PROFILE
(Snake River)



Industrial

Total waste flow – 126,069,000 gallons per day

Type of treatment:

1. Primary – 45%
2. Secondary – 55%

Municipalities

Total population served – 386,900

Type of treatment:

1. Primary – 32%
2. Secondary – 63%
3. Sewered only – 5%

It is estimated that about $200 million have been spent to date to achieve this level of waste treatment and that over $150 million more will be required to provide secondary treatment to achieve the degree of control called for by the present Water Quality Standards. These figures are at best very rough estimates and reflect capital expenditures only.

FUTURE REQUIREMENTS

The type and magnitude of future needs and problems related to water quality is dependent upon the kind (and the success) of future development which Idaho chooses. For the purpose of illustrating the possible type and magnitude of future needs, it was assumed that projections as shown in the Columbia-North Pacific Framework Study (C-NP Study) would be applicable. Projections for eastern Oregon were included because of the impact that this area has on Snake River water quality.

Most of the projected economic development and population growth was projected as occurring along the Snake River in southern Idaho. The C-NP Study estimated that population in the Southwest Idaho-Eastern Oregon and Upper Snake regions would increase from 570,000 in 1965 to 1,130,000 in 2020. Future industrial development would be based on agricultural and phosphate resources. Food processing would dominate in the production of organic wastes; and inorganic phosphate processing wastes would more than triple by 2020. Future rural-domestic waste production could be expected to increase slightly due to population shifts from rural to urban areas. Septic tanks and some type of subsurface drainage systems are the most likely methods to be used in future waste disposal from individual rural residences. No widespread problems are anticipated from this source although corrective measure may be necessary in areas bordering lakes and streams or where the water table is high.

Approximately 3,965,000 acres are being irrigated in southern Idaho and eastern Oregon. By 2020, an additional 1,720,000 acres of irrigated lands were projected as being required to meet the projected food and fiber needs. In the Upper Snake, an estimated 13.5 million acre-feet annually are withdrawn from both surface and groundwater sources to serve the lands now under irrigation. This represents a diversion requirement of 5.4 acre-feet per acre. In southwest Idaho, approximately 6 million acre-feet are diverted annually from surface water to irrigate 1,465,000 acres of land for diversion requirement of about 4.0 acre-feet per acre. New land development would probably be served by sprinkler irrigation and have an annual diversion requirement of approximately 3 acre-feet per acre. By 2020, it was assumed that the diversion requirement for new lands under irrigation would be reduced by use of sprinkler irrigation systems. Improved irrigation efficiency would tend to minimize irrigation as a source of pollution.

The provision of stream flows during fall and winter months is important in that it would provide steady stream flows at the time food processing operations are discharging peak waste loads. The C-NP Study states that a sustained minimum flow of 600 cfs would be required to meet dissolved oxygen standards in the Snake River below Milner. About 140,000 acre-feet of additional water annually would be needed to provide the 600 cfs flow during low periods. The most likely source for this water is groundwater pumping from the Snake Plain aquifer.

The raw organic production by the livestock population in southern Idaho and eastern Oregon was projected to be equivalent to that from a population of 16,700,000 in 1980, 22,500,000 in 2000, and 29,600,000 in 2020. This would account for approximately two-thirds of the total raw organic waste loading by 2020. About 5 percent of the waste generated by the animal population could be expected to reach waterways. However, this is not the case when large numbers of animals are concentrated in small spaces as they are in feedlots and dairies. Economical methods of control and disposal of feedlot waste need to be developed and applied to all operations bordering surface waters.

As the demand for water-based recreation continues to outpace population growth, the waste resulting from these activities will continue to increase at a rapid rate. Construction and expansion of adequate waste disposal facilities must keep pace with the increased recreational use to prevent water pollution from this source. It is estimated that many of the lakes and reservoirs which now

receive heavy recreational use will be used to full potential by 2020. Lakes and reservoirs — especially Palisades, Island Park, Henrys, American Falls, Jackson, Lucky Peak, Anderson Ranch, Cascade, and Payette — are expected to receive particularly heavy use.

To meet the state water quality standards, it was assumed in the C-NP Study that industrial and municipal wastes would undergo tertiary treatment by 2020 resulting in 95 percent treatment efficiency.

The study includes rough estimates of flow by month necessary to maintain dissolved oxygen standards criteria under present and projected waste loadings and under various treatment levels. Table 23 shows approximate Snake River flow needs, for the maximum month, for the 1980, 2000, and 2020 time periods assuming 90 percent treatment.[1] Flows of these magnitudes would be available to meet projected needs for irrigation and most other uses. A possible exception is fish and wildlife needs. Much more study is needed before agreement can be reached on instream needs for water quality, recreation, and fish and wildlife.

Minimum flows are required since waste treatment alone cannot provide an economic solution for complete removal of contaminants from waste waters and waste discharges from nonpoint sources. The minimum flow requirement for assimilation of wastes is related to a number of factors including: the strength and deoxygenation capacity of the wastes; and the temperature; reaeration capacity; elevation; and minimum allowable dissolved oxygen for the stream.

The adequate treatment of municipal and industrial wastes, coupled with the maintenance of base stream flows to assimilate residual and noncollectible wastes will do much toward meeting the water quality standards criteria for the state. Control of nonpoint source pollution is also important to insure that water quality standards are maintained in the future.

[1]Columbia-North Pacific Region Comprehensive Framework Study; Appendix XII, 1971.

TABLE 23
PROJECTED MINIMUM SNAKE RIVER FLOWS TO MEET DISSOLVED OXYGEN STANDARDS
(Assumes 90% treatment)

Location	Projected flow (cfs)		
	1980	2000	2020
Henrys Fork below South Fork Teton	32	42	49
Snake River at Bliss	1,100	2,000	3,000
Snake River at Payette	1,600	1,000	2,000

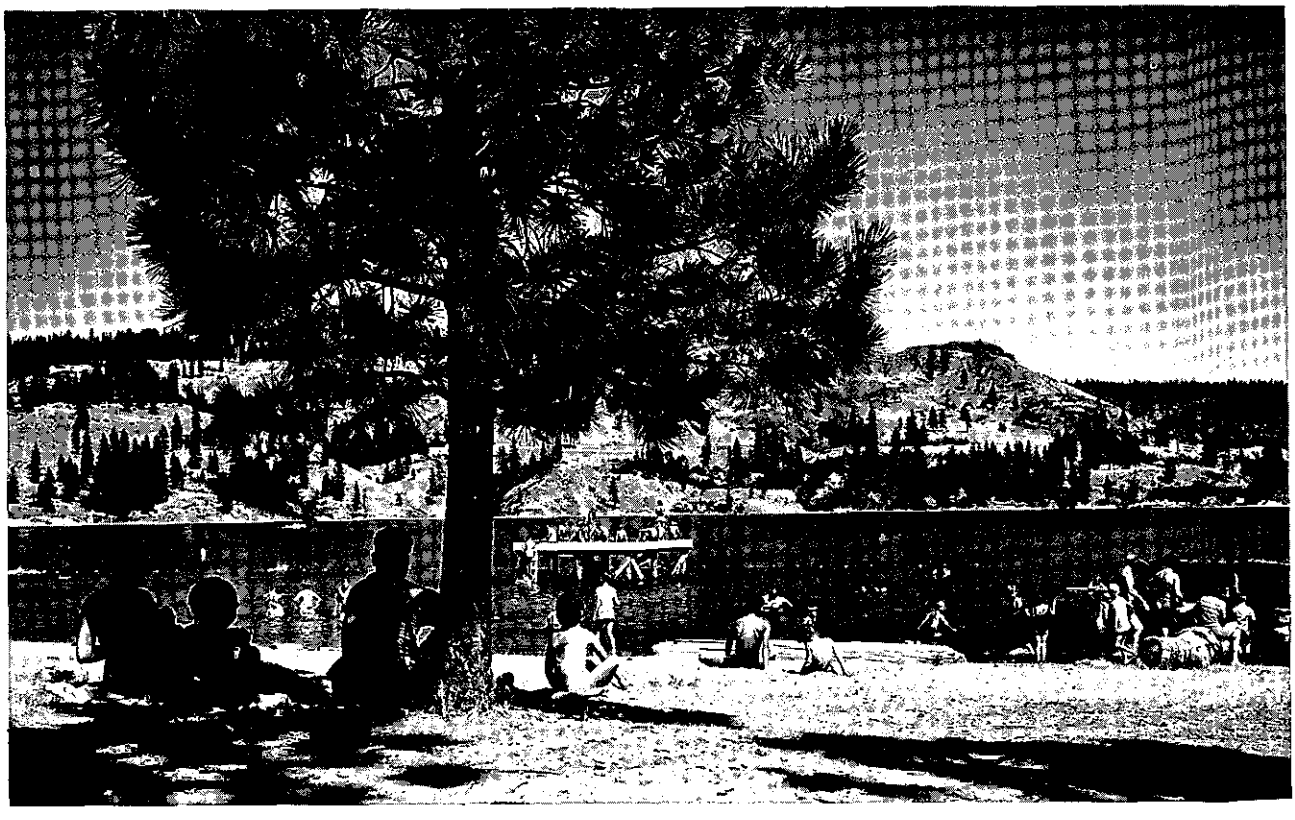
SOURCE: Columbia-North Pacific Region Comprehensive Framework Study; Appendix XII, 1971

Protection of the quality of the Snake Plain aquifer must be a major objective. The state has already taken steps to regulate discharge of wastes into the aquifer; and alternative means of disposing of radioactive wastes at the National Reactor Testing Station are being studied by the Atomic Energy Commission.

Improved distribution canal systems together with more efficient on-farm application will reduce the amount of dissolved and suspended materials reaching the Snake River and its tributaries through irrigation return flows. Interception and reuse of these return flows would be the best method of control. Where this is not practicable, it may be necessary to apply treatment and other controls to reduce the impact of these returns in critical reaches. Settling basins may be required to reduce the amount of suspended materials carried by agricultural waste waters before they are released to surface waters.

Controls to minimize land runoff of sediments, nutrients, and commercial toxicants are essential for maintenance of water quality. Soil stabilizing practices presently promoted for agriculture should be extended to include logging practices, construction, channel improvements, and other practices that bear upon disposition of soil and water bodies.

The large livestock population in the state, in particular those animals in sizable feedlots along surface waters, represents one of the main



sources of organic wastes in the state. Fences and simple retaining structures between the animal habitat and water courses should be provided in order to prevent bank erosion and to limit direct surface drainage so that wastes may decompose through soil processes. At some places, it may be preferable to collect the waste from cattle holding facilities for treatment or for planned distribution to the land as a fertilizer.

Recreation areas will be increasing in numbers, size, and intensity throughout the state. Sewage disposal systems adequate to cope with weekend loads from use by thousands will be needed in many recreation areas. Facilities for collection and pickup of litter and garbage must also be made available, since these items can add to the waterborne debris load. Restrictions on motorboats on heavily used lakes may be necessary to keep oil and gas pollution at a minimum. Sanitary waste treatment or holding facilities should be required on all watercraft. Facilities to receive the contents of boat holding tanks should also be available at all launching sites.

Detailed studies of the algae problem in American Falls Reservoir, Brownlee Reservoir, and in the Middle Snake are needed to better define the controls necessary to alleviate present conditions. The sources of nutrients and their point of entry into surface waters must be known to determine the potential for algae reduction through nutrient control.

Some method of maintaining the outlet at Lucky Peak Dam must be devised to avoid water quality problems caused by annual shutdown of flows to service the facilities. Construction of another outlet is an alternative that has been suggested.

Minimum flow needs for water quality control must be considered in planning future hydropower developments, or in altering the operation at existing sites. Future base power demands may be met with thermal installations, and the hydro plants used to meet peak loads to the extent possible. Reregulating reservoirs should be constructed below hydro installations used to meet peak power loads. Facilities will be required at all thermal power plants to prevent the discharge of excess heat to surface waters.

COMMERCIAL NAVIGATION

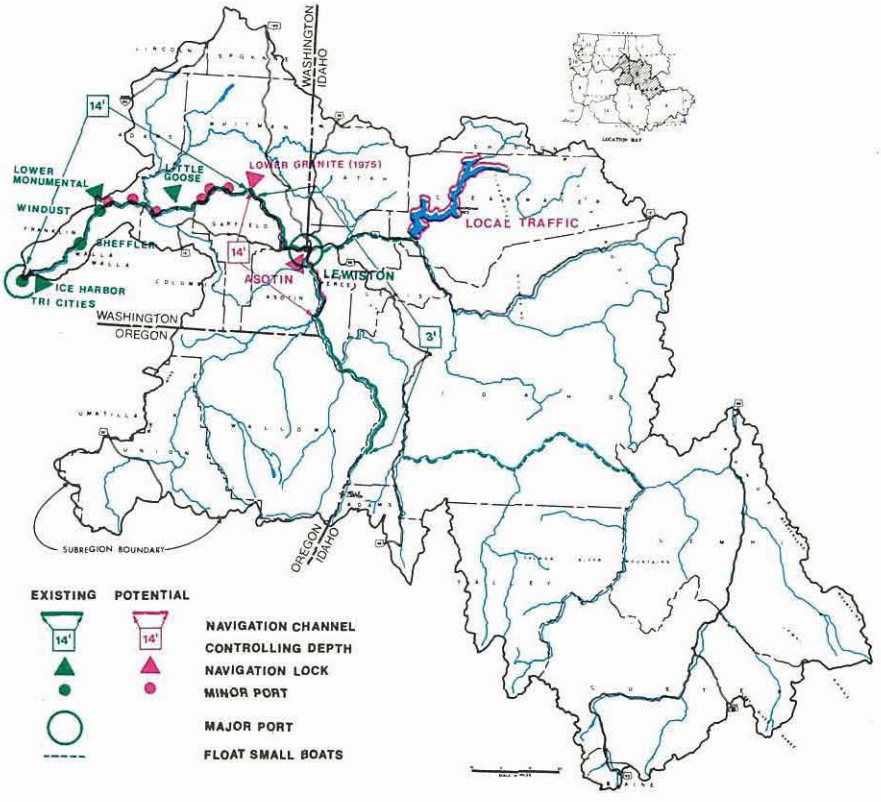
PRESENT STATUS

Idaho has two areas of significant commercial navigation. One covers the lower St. Joe River and Coeur d'Alene Lake, where an estimated 400,000 tons of logs per year are towed to mills at Coeur d'Alene. The other area centers around Lewiston, where barge navigation to and from coastal points is becoming possible through the construction of dams and navigation locks on the lower Snake River. Figure 30 shows navigation features on the Snake River.

An available reference on Idaho navigation problem is "Navigation Water Needs", IWRB Planning Report No. 7, April 1970. Presented therein is a study to determine needs for water resources due to ocean access at Lewiston for Idaho commerce, and to forecast the future impact which these navigation facilities might have. This report was prepared under terms of a cooperative agreement between the Board and the Port of Lewiston. Another reference work is "Columbia-North Pacific Framework Study, Appendix X", Pacific Northwest River Basins Commission, August 1971. It provides an inventory of existing problems and needs related to water transportation and some general indication of measures that could be constructed to satisfy those needs.

The Snake is navigable from its confluence

FIGURE 30. NAVIGATION FACILITIES



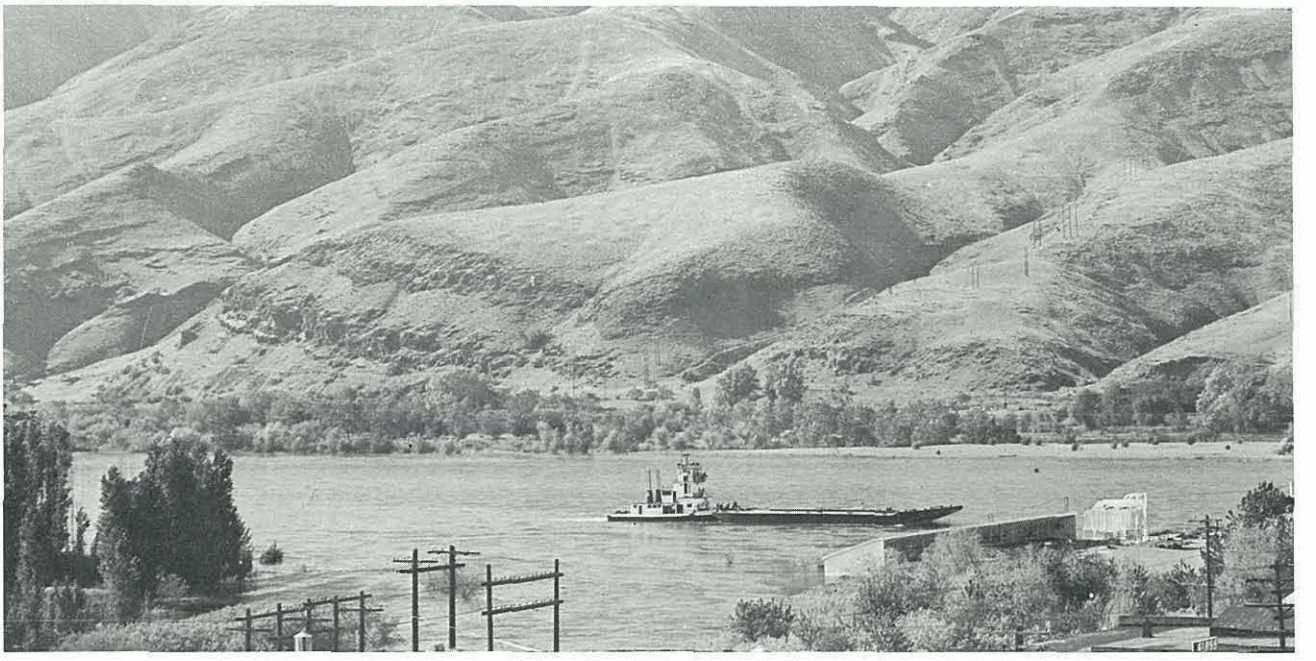
with the Columbia River to Johnson Bar 232 miles upriver. Runoff at the mouth of the Snake River averages approximately 33,000,000 acre-feet per year, but near Johnson Bar the flow averages only about 13,000,000 acre-feet per year. Between Lewiston and Johnson Bar, the river is navigable only by craft requiring less than three feet of water. Because of hazards to navigation in this reach of the river, boating interests have asked the Federal Power Commission to alter license provisions dealing with minimum releases from Idaho Power Company reservoir in Hells Canyon. A discussion of this minimum flow issue, which has major implications for upstream development, is provided in Chapter 2, in the section entitled "Major Policy Issues".

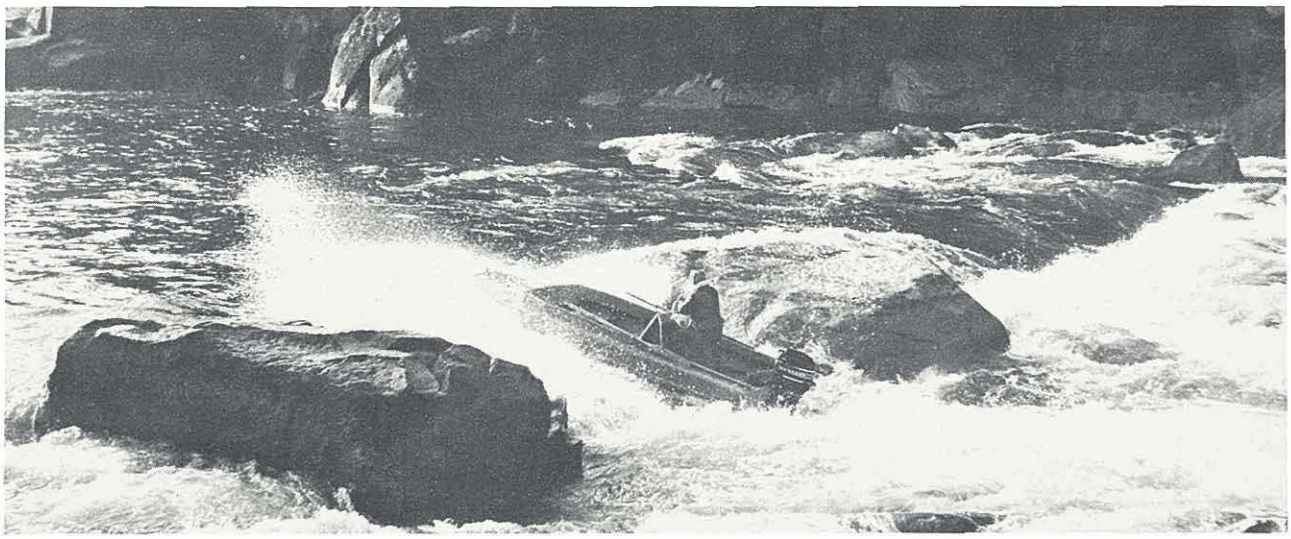
After completion of the Lower Snake River dams, a navigation channel 14 feet deep and 200 feet wide will be maintained to Lewiston. Progress has been made in the acquisition of land in negotiations for shipping facilities to serve barge line traffic by 1975, when the Lower Granite pool is scheduled to be filled. Commodity movements to and from Lewiston are expected to climb to 1.8 million tons per year by 1980.

PROBLEMS AND NEEDS

SNAKE RIVER TO JOHNSON BAR. Slackwater navigation created by the Asotin Dam would permit access to extensive limestone deposits located near the mouth of the Grande Ronde River. This limestone would then be competitive as basic material for a cement plant to serve the Columbia Basin. Population and per capita use projections indicate that a plant with an annual capacity of about 5 million barrels of cement would be needed by about 2000. The limestone requirements for a plant of this size would be about 1,050,000 tons per year.

SALMON RIVER TO SALMON. Except for truck routes along the principal valleys of the Salmon River, this area contains few roads. With resources including logs and other forest products, basic metal ores, and some nonmetallic minerals, the region has great potential for commercial shipments to coastal areas. Return shipments of petroleum and miscellaneous consumer goods are also needed. Without roads or navigable waterways, however, many of these resources will never be fully developed, and products that are exported will have to be moved at greater cost by other modes of transportation.





A Salmon River navigation project would significantly increase traffic on the lower Snake and Columbia rivers, but current projections do not economically justify such a project.[1]

SNAKE RIVER THROUGH HELLS CANYON INTO SOUTHERN IDAHO. Extension of the Snake River waterway through Hells Canyon into the central Snake River Valley of Idaho and Oregon could attract two to three million tons of commercial shipping annually, consisting mainly of agricultural products and lumber and mill by-products. Since other forms of transportation are already available, however, the high cost of extending this shallow draft navigation does not seem to be economically justified.

CLEARWATER RIVER TO KOOSKIA. Construction of a series of dams on the Clearwater River for the 80 miles from its mouth to Kooskia might make it usable for navigation. A waterway of this type could attract an estimated one million tons of commercial shipping annually, including agricultural and forest products downstream and petroleum products and miscellaneous consumer items upstream. These commodities are now mostly shipped by rail, or trucked into Lewiston and other shipping centers. Current studies indicate, however, that this projected volume would not be enough to make development of such a waterway economically feasible. Out of the expected one million tons, 300,000 would be shipped on the lower Snake waterway through Lewiston without the Clearwater extension.

FUTURE REQUIREMENTS

In relation to other water use functions, future needs and opportunities for commercial navigation are not great. If at some future date it is deemed desirable to mine the extensive limestone deposits located near the mouth of the Grande Ronde some means for providing navigation to this point would be necessary. The extent of this deposit (on both sides of the river) is estimated at 800 million tons of limestone.[2]

Water requirements for navigation to Lewiston are not in conflict with future upstream development proposals. The great inflow of the Salmon, Imaha, Grande Ronde and Clearwater rivers are sufficient to satisfy navigation requirements to Lewiston. There is conflict over flows above Lewiston and particularly in the Middle Snake above the Salmon River. This issue is discussed in more detail in Chapter 2 in the section entitled "Major Policy Issues".

Should navigation ever be extended up the Clearwater or Salmon rivers, slack water pools would be required which would in turn be an impediment to anadromous fish runs.

[1] "A Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers, Salmon River Basin"; Report of Navigation Study, John J. Peebles, 1970.

[2] Columbia River and Tributaries, Appendix B, House Document No. 403, 1963.

RECREATION

PRESENT STATUS

The recreational aspects of water resource planning and development will play a major part in Idaho's future economy. Consideration of the following facts brings into sharp focus the magnitude of recreational opportunities and points up the critical need for proper resource planning:

- Two-thirds of the land in the state nearly 34 million acres, is federally owned; and two-thirds of this federal land, nearly 21 million acres, is classified as prime recreational land.

- Idaho has an average population density of 8.6 persons per square mile — 713,008 persons occupying 82,708 square miles — compared with average densities of 130 persons per square miles for California and 55 persons per square mile for the entire United States.

- Idaho recreational resources are relatively undeveloped and unspoiled compared to those of more highly populated areas of the region and the nation.

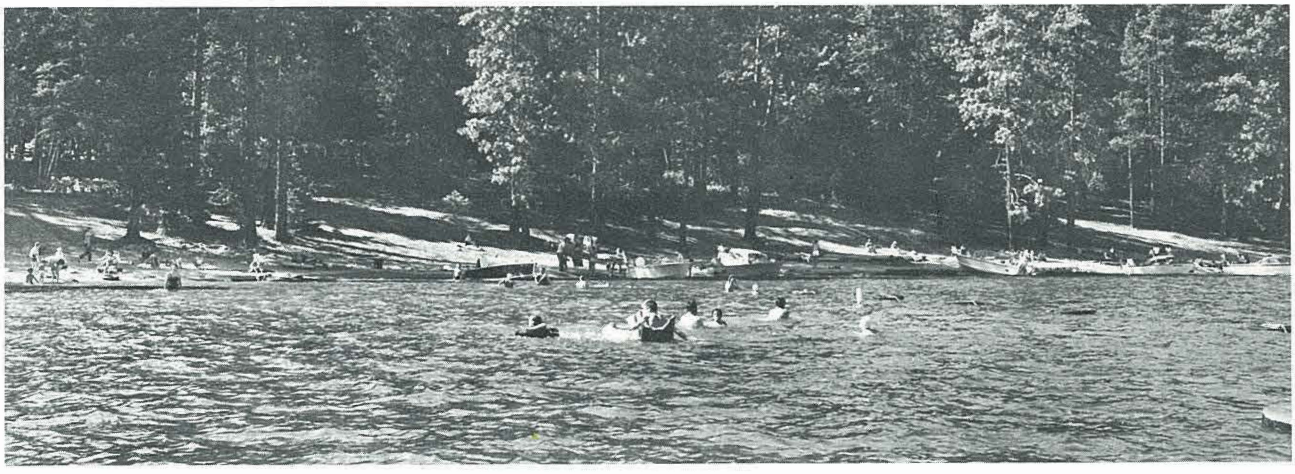
- The demand for outdoor recreation in Idaho is expected to increase significantly. Further studies are needed to determine future demands and ways to meet these projected needs.

Abundance of recreational land in uncrowded and unspoiled settings presents unique economic opportunities, but also points out the critical need for sound management policies in recreational planning and development. These factors also emphasize Idaho's dilemma in having to respond to regional and national as well as state and local demands for outdoor recreational opportunities.

While discussion of federal recreation lands in the state emphasizes the vastness of the available resource, it is by no means the whole story. Idaho has more than two and one-half million acres of state land, of which 15 percent, 435,808 acres, is classified as recreational land. In addition, there are 97,579 acres of private, 3,315 acres of municipal, and 817 acres of county recreational lands.

Most of these lands are adjacent to or are closely associated with streams, lakes, or rivers. Unlike many areas in the nation where climate or geographical setting are severely limiting factors, Idaho enjoys climatic and geographic diversity and seasonal variety which enhance its recreational opportunities.

The variety and extent of recreational resources and the economic opportunities they present are more easily comprehended when viewed in the context of the state's individual river basins. Figure 31 shows the principal lakes and reservoirs used for recreation.



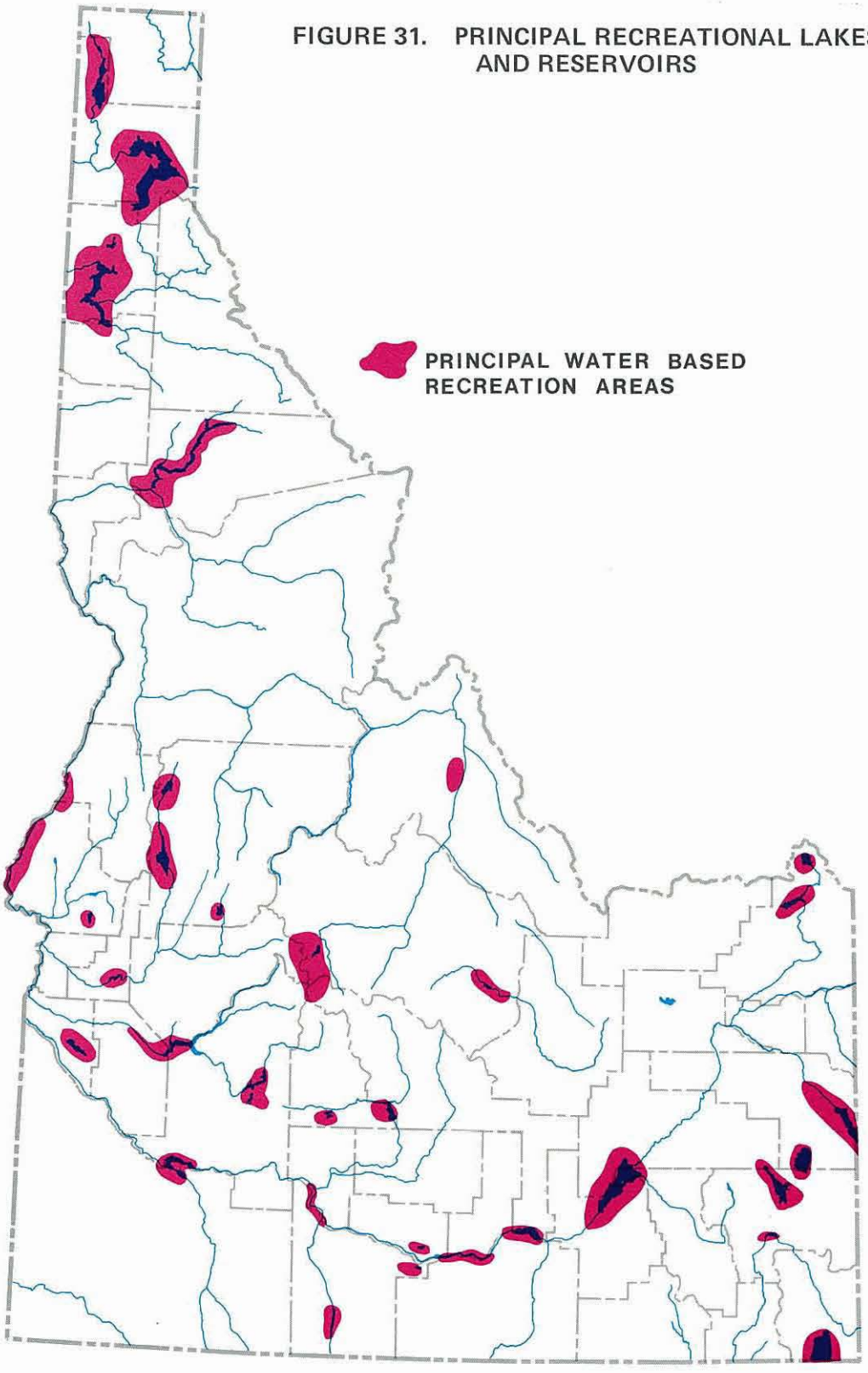


FIGURE 31. PRINCIPAL RECREATIONAL LAKES AND RESERVOIRS

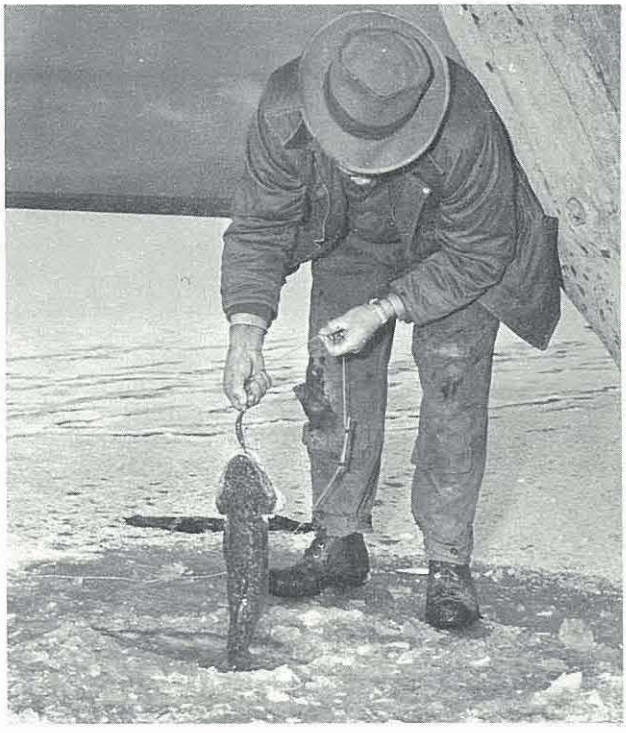
PROBLEMS AND NEEDS

PANHANDLE BASINS. Nearly 50 percent of the land in the Panhandle is included in the Kaniksu, Coeur d'Alene, and St. Joe national forests. In addition, the region contains: three of Idaho's largest lakes — Priest, Pend Oreille, and Coeur d'Alene; the largest state park — Farragut; and three potential wild rivers — the Priest, Moyie, and St. Joe; portions of four of Idaho's most scenic mountain ranges — the Selkirk, Cabinet, Coeur d'Alene, and Bitterroot mountains.

Priest Lake, Idaho's fourth largest, lies on the west flank of the Selkirk Mountains in northern Bonner County and is surrounded by dense stands of pine, fir, and cedar. The 37-mile lake is the site of several privately owned resorts, scattered summer homes, and nearly 200 improved public camping units. Considering the size of the lake, present facilities do not begin to realize its recreational potential.

Because of the lack of existing development and striking natural beauty, a total of 62 miles of the Priest River (extending above and below Priest Lake) was chosen for study for possible inclusion in the National Wild and Scenic Rivers System. Scheduled for similar study are: a 25-mile section of the Moyie River (from the Canadian border south to its confluence with the Kootenai River); and a 132-mile stretch of the St. Joe River (from its headwaters in the Bitterroot Mountains to its confluence with the St. Maries River). This brings the total to 219 miles of Panhandle rivers which may be included in the system.

Lake Pend Oreille in southeastern Bonner County is Idaho's largest lake, with a surface area of 148 square miles and a measured depth of 1,200 feet at its deepest point. At the southern end of the lake is the 4,500-acre Farragut State Park, which has a vast outdoor recreational potential. Currently, the park has 60 overnight camping sites with central water and sewerage facilities and 150 less improved campsites. Farragut was the site of the World Boy Scout Jamboree in 1967, accommodating 12,000 Scouts; and in 1969, the park hosted 40,000 Scouts during the National Boy Scout Jamboree.



In July of 1971, the park accommodated 15,000 campers during the unique Universal Life Church picnic. Special provisions for water and sewerage services and fire protection were necessary in each case to provide for the large numbers of people.

Serving the Spokane metropolitan area (and the nation as well through Spokane's new international airport), Coeur d'Alene Lake is Idaho's most popular recreational lake. Summer homes, resorts, and overnight camping are well developed around the lake, which covers 50 square miles in Kootenai County. The city of Coeur d'Alene at its north end is the focal point for Panhandle economy and recreational activities.

Coeur d'Alene Lake, however, is an excellent example of the problems that accompany unplanned and uncontrolled recreational growth. Local groups are working to alleviate the severe environmental problems in the lake. Various causes are: sewage effluents from summer homes with inadequate sewage treatment facilities; pleasure boats with improper sewage stowage equipment; communities and industries along the shoreline with inadequate sewage or effluent treatment facilities; and mining operations and communities upstream.

CLEARWATER-SALMON BASINS. The Clearwater-Salmon Basins are bounded by the Bitterroot Mountains on the north and east, the Arco desert and Boulder Mountains on the south, the Sawtooth Mountains on the southwest, and the Seven Devils Mountains and Hells Canyon of the Snake River on the west. Within the basins lies nearly 80 percent of the present river mileage in the National Wild and Scenic Rivers System. This total includes 22 miles of the Middle Fork of the Clearwater, 68 miles of the Lochsa, 111 miles of the Selway, and 111 miles of the Middle Fork of the Salmon. In addition, the main stem of the Salmon from its confluence with the Snake River to the community of North Fork is being studied for possible inclusion in the national wild and scenic system.

Of the 15,694,300 acres of land in the Clearwater-Salmon Basins, 66 percent (10,391,000 acres) is included in the national forests of Clearwater, Bitterroot, Salmon, Challis, and portions of the Payette, Boise, and Sawtooth. Nearly 75 percent of the land in the basins is owned by the federal government.

Recreational resources in the region also include the Idaho Primitive Area, Selway-Bitterroot Wilderness, Salmon River Breaks Primitive Area, Hells Canyon-Seven Devils Scenic Area, and portions of the Sawtooth Primitive Area and White Clouds Peaks Area.

Private land comprises only 21 percent of the total land area in the Clearwater-Salmon Basins. Much of the private land, primarily plots fronting on streams, rivers, or lakes, is rapidly being converted from agricultural to recreational use. This type of conversion — from small farms to dense concentrations of summer cabins, trailer sites, and second homes — without sound land use planning or adequate regulations or provisions for water and sewerage services, has created some severe aesthetic and water quality problems.

The 111-mile reach of the Middle Fork of the Salmon River, which was included in the present category of the National Wild and Scenic River System, presents an excellent illustration of the sort of problem that can become associated with this type of recreational use. Float trips on the Middle Fork have increased dramatically, from 1,300 persons in 1967 to 3,250 persons in 1971. It is essential that the carrying capacity of the river not be exceeded in order to preserve the very qualities for which the river was placed in the national system. Some type of permit system may soon be needed to regulate use on the river.

SOUTHWEST IDAHO BASINS. Although the geographic area known as the Southwest Idaho Basins is primarily a hydrologic sub-unit, it also approximates the area which supplies recreational resources for the densely-populated Boise and Nampa-Caldwell metropolitan areas. Ada and Canyon counties, which are included in the basins, contain 25 percent of the total population but only two percent of the land area in the state. It is no surprise then, that this region contains the highest concentration of both developed natural and man-made recreational resources.

The Southwest Idaho Basins include the Weiser, Payette, Boise, Owyhee, and Bruneau rivers — all tributaries of the Snake River which flows west and north through the basins.

Developed recreational resources associated with these rivers in the northern portion of the region include Oxbow and Brownlee reservoirs on the Snake River, Lost Valley Reservoir on the Weiser River, Payette Lake and Cascade Reservoir on the North Fork of the Payette River, and Deadwood Reservoir on the Deadwood River at the headwaters of the Payette River.

In the central portion of the region are Black Canyon Reservoir on the Payette River, Lucky Peak and Arrowrock reservoirs on the Boise River, Anderson Ranch Reservoir on the South Fork of the Boise River, and man-made Lake Lowell south of Nampa and Caldwell.

The Boise River, which flows through the city of Boise, is a prime "tubing" river from below Barber Dam to Boise's proposed Greenbelt in Julia Davis and Ann Morrison parks. This stretch of the Boise River is one of the West's few water-related recreational resources associated with a major urban area.

There are few developed recreational resources in the southern portion of the region. The C. J. Strike Reservoir on the Snake River is the principal facility. The river from C. J. Strike Dam west to Homedale is potentially a prime recreational area, but access roads, boat launching ramps, and improved facilities are very limited. This area also contains some of the finest Indian

petroglyphs in the Western Hemisphere. Lake Lowell, near Nampa, accommodated 287,000 recreational visitor-days in 1970.

The Bruneau River in the southeastern corner of the region has been chosen for study for consideration as a wild river for a stretch of 74 miles extending upstream (south) from the community of Bruneau through beautiful and precipitous Bruneau Canyon.

The well-preserved gold and silver mining community of Silver City, located on Jordan Creek at the headwaters of the Owyhee River drainage in the south central portion of the region, is a unique cultural resource. An estimated 15,000 to 20,000 persons visit Silver City during the three months of the year in which it is accessible via 25 miles of tortuous dirt roads.

Recreational facilities in the Southwest Idaho Basins are taxed by the heavy weekend recreational demand from the densely-populated Boise and Nampa-Caldwell metropolitan areas. Lucky Peak Reservoir, the Boise River, and Bogus Basin ski area exemplify the fine recreational opportunities which now exist, but even more facilities are needed.

The region also contains nationally-recognized mountain recreation resources. The headwaters of the Boise and Payette rivers form in the Sawtooth and Trinity mountains, which rival the Alps and Tetons in sheer beauty. For the 70- to 90-day period during which they are free of snow, these mountains are a backpacker's paradise.

The Owyhee Mountains bordering Oregon in the southwestern portion of the region are striking in their relief and beauty, but have very limited access and have not been developed for recreational use.

UPPER SNAKE RIVER BASINS. Stretching from Yellowstone National Park, Jackson Lake, and the Grand Tetons on the east to Craters of the Moon National Monument and Sun Valley on the west, the Upper Snake River Basins represent the epitome of diversity. Besides supplying recreational opportunities to Idaho Falls, Pocatello, and Twin Falls areas, the basins provide recreational resources which are enjoyed regionally and even nationally. This is especially true in the cases of Sun Valley and Grand Targhee ski areas and Craters of the Moon.

Also receiving regional and national tourist traffic, because of proximity to Yellowstone Park and Jackson Hole, are Henrys Lake, Island Park Reservoir, and Palisades Reservoir, all in the eastern portion of the region.

Local recreational needs are satisfied by these facilities as well as by American Falls Reservoir and Lake Walcott on the Snake River and Magic Reservoir on the Big Wood River. Blackfoot Reservoir and Grays Lake have great recreational potential, but are presently undeveloped.

A 39-mile stretch of Henrys Fork of the Snake River, extending from Big Springs to the confluence with Warm River, has been designated by the secretaries of Interior and Agriculture as having potential for inclusion in the National Wild and Scenic Rivers System.

BEAR RIVER BASINS. Although the Bear River Basins are the smallest of Idaho hydrologic sub-units in population and land area, it contains one of the state's greatest recreational resources — Bear Lake. The lake which lies mile-high and covers 110 square miles, straddles the Idaho-Utah border and provides prime water recreation for the region. Residents of the Salt Lake City, Ogden, and Logan metropolitan areas in Utah and the Pocatello metropolitan area in Idaho are its major users.

Most of the land bordering the lake and the existing recreational developments are privately owned. Recent acquisition of land by real estate firms and announced plans for major recreational developments along the lake have caused local concern over potential threats to the quality of the lake water. As a result of this concern, the water resource agencies and health departments of both states, as well as Utah State University, are currently conducting studies in and around the lake. The lake serves as a reservoir and, during low runoff years, is drawn down, exposing mud flats. Stabilization of lake levels, particularly during the recreation season, would permit high quality water-based recreation to continue.

North Beach State Park at the extreme northern end of the lake is a popular regional recreational area offering swimming, boating, and fishing. New sewage disposal facilities have been constructed at the park to further enhance recreational opportunities.

TABLE 24

STAYS AT NATIONAL FOREST CAMPGROUNDS IN IDAHO, 1970

Forest	Total seasonal capacity (Visitor-days)	Actual use (Visitor-days)	Percent of capacity (Capacity/usage)
Bitterroot	45,120	5,900	13.1
Boise	1,539,078	224,300	14.6
Cache	275,210	23,400	8.5
Caribou	655,947	81,300	12.4
Challis	864,380	118,200	13.7
Clearwater	298,172	108,100	36.3
Coeur d'Alene	181,340	61,300	33.8
Kaniksu	420,035	130,300	31.0
Nez Perce	484,845	107,200	22.1
Payette	329,170	53,100	16.1
St. Joe	279,080	66,380	23.8
Salmon	443,540	67,200	15.2
Sawtooth	1,141,936	232,000	20.3
Targhee	752,955	211,300	28.0
TOTAL	**7,710,808**	**1,489,980**	**19.3**

SOURCE: U.S. Forest Service

Summary

Only recently has there been any systematic analysis comparing total seasonal capacity with actual use of Idaho outdoor recreational resources. The U.S. Forest Service analyzes information of this kind annually for individual improved recreation sites in each of the national forests in Idaho.

Examination of the data reveals that most national forest recreational sites in Idaho are operating at considerably less than 50 percent of total available capacity, indicating that usage occurs primarily on weekends and holidays. Total seasonal capacity is based on the actual season at each site. Table 24 is a compilation of the Forest Service data on national forests for 1970, in Idaho.

Additional information has been published giving annual attendance totals at various water-based recreation sites operated by federal and state agencies. These data are of limited value, however, because in order to evaluate recreational needs or pressures on particular facilities, use and capacity figures must be compared, particularly for reservoirs. Annual attendance figures for selected sites operated by various federal agencies and the state of Idaho are given in Table 25 to illustrate the need for additional information. Unfortunately reliable recreation use data are not available for other facilities, particularly reservoirs.

The Idaho Department of Parks has established a statewide system of public parks, many with overnight camping facilities. Use of the state parks is increasing each year and, in the case of Lucky Peak, may have reached the saturation point already — 1,166,614 visitor-days in 1970. Table 26 lists the state parks and respective uses for 1970. The Parks Department is studying several areas for addition to the state park system.

TABLE 25

STAYS AT 12 SELECTED FEDERAL RESERVOIRS, 1969

Facility	Annual attendance (Visitor-days)
American Falls	59,954
Anderson Ranch	32,500
Arrowrock	10,800
Black Canyon	35,500
Cascade	80,000
Deadwood	12,430
Lake Lowell	168,343
Lake Walcott	17,523
Palisades	214,950
Grassy Lake	4,800
Island Park	106,100
Jackson Lake (Wyoming)	3,440,285

SOURCE: Summary Report of the Commissioner, Bureau of Reclamation, 1969. Data are for fiscal year 1969

TABLE 26

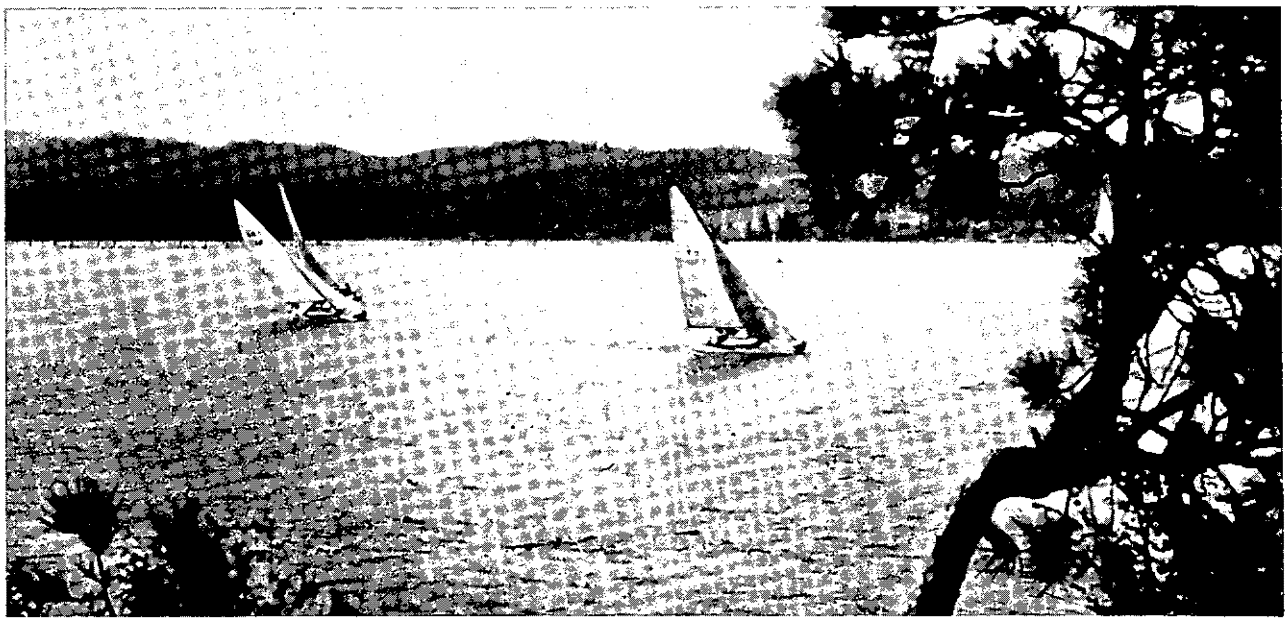
STAYS AT STATE PARKS, 1970

Park	Attendance (Visitor-days)
Ponderosa	62,564
Mann Creek	20,000
Black Canyon	28,665
Lucky Peak	1,166,614
Hammett	136,211
Bruneau	48,000
Massacre	10,594
Bear Lake	43,535
Henrys Lake	19,966
Indian Creek	37,556
Heyburn	109,935
Farragut	77,518
Round Lake	23,514
Winchester	31,777
TOTAL	**1,816,449**

SOURCE: Idaho Department of Parks

FUTURE REQUIREMENTS

The discussions of the Panhandle and Clearwater-Salmon basins point up a real dilemma concerning the future of Idaho public outdoor recreational resources — national forests, wild rivers, primitive areas, and public lands. While these valuable and diverse resources lie within the boundaries of the state of Idaho, nearly all of them are federally owned. As such, they constitute a national recreational resource. As a



result, decisions regarding the use and development or nondevelopment of these lands are usually made from a national point of view reflecting national needs and priorities.

Irreversible decisions involving the designation of wild rivers or national parks can be quite costly in terms of lost opportunities, particularly when the decisions — legislative, administrative, and private — are rendered at a great distance from the state by persons with limited knowledge of local and regional problems and priorities.

This is Idaho's dilemma in a nutshell: should the state capitalize on the national demand for recreational resources and simply respond passively to national designation of lands and waters within the state? Or, at the other extreme, should the state attempt to take the initiative in planning and setting priorities and in determining the disposition of lands and waters?

A compromise can be reached permitting consideration of both national and state needs, but the decisions to be made will be of paramount importance to the citizens of Idaho. Possible designation of the Hells Canyon reach of the Snake River and of the main stem of the Salmon River as wild rivers and of the Sawtooth, Boulder, and White Clouds areas as national parks or national recreational areas represent only a few of the major decisions facing Idaho which are imminent and which could be irreversible.

The state has the opportunity to provide for expanded recreational opportunities by establishing state recreational systems, such as a state wild and scenic rivers system. Through state systems, resources can be managed to meet the needs of Idaho citizens. The following rivers should be considered for study as the nucleus of a state wild rivers system:

- the Little Salmon, from mouth upstream to Boulder Creek;
- the South Fork Salmon River, including the East Fork of South Fork and Johnson Creek;
- the Salmon River from headwaters to Riggins;
- the Teton from headwaters to confluence with the North Fork (Bitch Creek);
- the free-flowing segments of the North Fork Payette from origin to the backwaters of potential Smiths Ferry Diversion Pool;
- the South Fork Payette's free-flowing segments from origin to the backwaters of the potential Garden Valley Reservoir;
- the North Fork Coeur d'Alene from headwaters to confluence with the South Fork Coeur d'Alene River;

- the Snake River from Hells Canyon Dam to Lewiston;

- Henrys Fork of the Snake River from Big Springs to confluence with Warm River.

Demand for water-based recreation (boating, water-skiing, swimming, fishing, sightseeing, picnicking, camping, nature walks, photography, and wildlife observation) was estimated at 20 million recreation days in 1970. Much of this activity occurs in urban areas at swimming pools and public parks or at private facilities. Projections of continued urbanization, high education, income levels, expanding population and federal land ownership in society indicate that recreational demand will probably quadruple by 2020 in Idaho. To accommodate increased need of this magnitude, present facilities will have to be expanded and many more must be developed.

Recreational facilities that can satisfy the growing demand by the general public are needed to absorb the "mass" usage. Unless this need is met, unique recreational resources such as "wild rivers" will be faced with ever increasing pressures.

One of the major problems facing recreation resource managers in Idaho therefore, is overuse. With designation of many rivers in the state as National Wild and Scenic Rivers, use of rivers for float trips has increased significantly. Unless future use is somehow limited, such heavy use may destroy the very qualities for which the rivers were chosen. A list of federally recognized wild rivers is given in Table 27; they are shown on Figure 32.

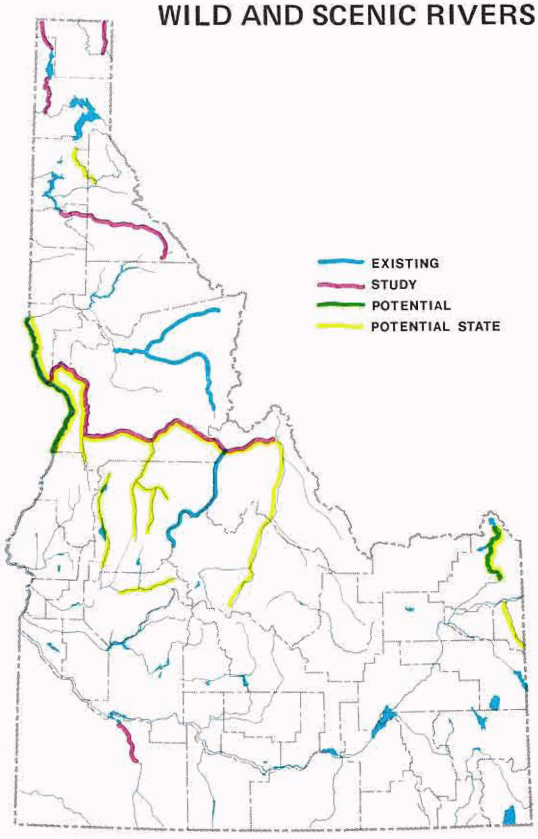
Recreational demand may also be satisfied through use of a reservoir constructed to fulfill another purpose. Virtually all water resource developments are planned to provide for as many water uses as possible. Potential recreational developments include Dworshak, Garden Valley, Tamarack, Swan Falls, and lower Teton reservoirs, as well as others scattered throughout the state.

TABLE 27
STATUS OF NATIONAL WILD AND SCENIC RIVERS IN IDAHO

River	Mileage by status		
	Present	Study	Considered
Bruneau	0	74	0
Clearwater, Middle Fork	22	0	0
Lochsa	68	0	0
Moyie	0	25	0
Priest	0	62	0
St. Joe	0	132	0
Salmon, Main Stem	0	237	0
Salmon, Middle Fork	111	0	0
Selway	111	0	0
Snake, Hells Canyon	0	0	107
Snake, Henrys Fork	0	0	39
TOTAL	**312**	**484**	**146**

Mileage total of all categories – 942 miles.

FIGURE 32.
WILD AND SCENIC RIVERS



FISH AND WILDLIFE

Idaho provides a variety of habitat for many species of wildlife. Animal populations vary from plains species such as pheasants, quail and pronghorn antelope to high mountain dwellers such as bighorn sheep and mountain goats.

Free-flowing rivers, natural lakes, reservoirs, and ponds all contribute to the sports fishery. Anadromous fish as well as warm and cold water resident fish provide the angler with a variety to select from.

PRESENT STATUS

Fish

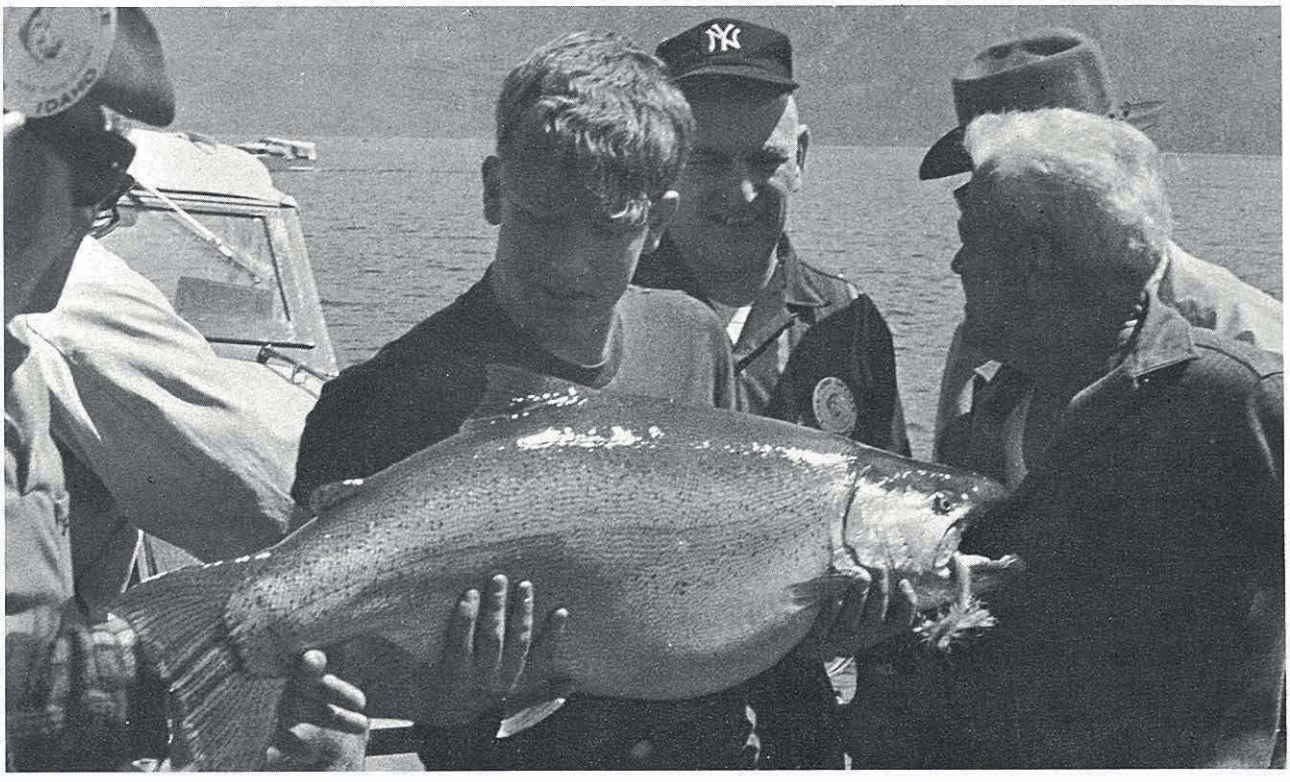
In 1965 Idaho waters were used a total of about 1,584,000 man-days for fishing for resident species. About half of this use represented stream fishing and the other half constituted fishing in reservoirs, lakes, and ponds.

Many cold, clear streams in the high elevations contain rainbow, cutthroat, brown, and eastern brook trout and Dolly Varden. High mountain alpine lakes sometimes contain the much-sought-after California golden trout as well as rainbow, brook, and cutthroat, and the recently introduced grayling species. Sections of large rivers in lower valleys support warmwater fish.

Pend Oreille and Priest lakes in northern Idaho provide fishing for "trophy" sized fish. Large Kamloops trout and Dolly Varden are taken from Pend Oreille and mackinaw (lake trout) from Priest Lake. The Bonneville Cisco is native only to Bear Lake.

Sturgeon fishing in Idaho is presently permitted on strictly a "catch and release" basis, in an effort to protect a declining population.

Eradication programs to reduce or remove undesirable nongame fish have been conducted in many waters to enhance populations of the more desirable game species.



Hatchery production and fish planting are important activities in maintaining the fishery resource. Fish plantings in Idaho for the season October 1, 1969 — September 30, 1970 are shown in Table 28.

Habitat conducive to successful reproduction and survival of anadromous fish requires accessible streams, minimum pollution, cool water (42 to 60 degrees F.), an abundance of gravel spawning areas, pools, and an adequate and stable streamflow. A series of events has jeopardized completion of the life cycles of these fish. Chinook salmon once traveled nearly 1,200 miles up the Columbia River to spawn in Canada downstream from Lake Windermere. With blockage of the river in 1938 by construction of Grand Coulee Dam, anadromous fish lost access to over 500 miles of the upper Columbia River and to many miles of tributaries. Dams have altered more than 450 miles of the Columbia downstream from Grand Coulee Dam changing a free-flowing river to impoundments. More than 50 percent of the Snake River has also been closed to anadromous fish because of dam construction. This change in habitat eliminated most spawning within the Columbia and Snake rivers which now serves primarily as a migration route to spawning grounds in tributary streams as much as 900 miles from the ocean.

Although Idaho provides an estimated 15-20 percent of the spawning grounds for the Columbia River, the catch in Idaho of anadromous fish is only a fraction of the total catch in the Northwest.

Anadromous fish hatcheries have been constructed near Dworshak Dam, on Rapid River at Niagra Springs, on Hayden Creek, and on Clear Creek to replace spawning grounds no longer available. Attempts are being made to reestablish steelhead runs in the Pahsimeroi River and salmon runs in the Clearwater River.

TABLE 28
FISH PLANTINGS BY SPECIES, SIZE — ALL AGENCIES
(October 1, 1969 — September 30, 1970)

Species	0-3"	3-6"	6"-up	Total	Pounds
Rainbow	2,738,979	2,449,728	3,334,550	8,523,257	1,147,921.75
Cutthroat	4,513,833[1]	563,937	16,455	5,094,225	28,003.25
Rainbow and cutthroat	132,852			132,852	96.00
Brook	113,030	17,652		130,682	1,033.50
Coho salmon	2,859,285		8,400	2,867,685	14,428.00
Spring chinook salmon	4,765,923[2]	3,597,547		8,363,470	171,115.00
Fall chinook salmon	497,298			497,298	2,316.00
Kamloops	412,333	71,230	18,012	501,575	8,849.00
Kokanee	2,119,427			2,119,427	3,478.45
Grayling	104,500			104,500	10.45
Golden	13,200			13,200	6.75
Steelhead	2,970,800[3]	575,247	2,984,051	6,530,098	505,477.00
Brown	260,523	74,240		334,763	2,021.00
Dolly Varden	642,179			642,179	398.00
Channel catfish	20,000			20,000	200.00
TOTAL	**22,164,162**	**7,349,581**	**6,361,468**	**35,875,211**	**1,885,354.15**

NOTE: Excludes all salvaged fish — these are reported in another table
[1] 528,680 planted as eyed eggs
[2] 4,744,823 planted as eyed eggs
[3] 2,007,500 planted as eyed eggs
SOURCE: Idaho Fish and Game Department Annual Report, 1970

The Rapid River hatchery near the Little Salmon River is operated to attempt to transfer chinook salmon runs stopped by construction of the Hells Canyon dam complex.

The summer run of chinook salmon has not been fished in Idaho since 1964, so that enough fish to propagate the species could be permitted to reach their spawning grounds. Sport fishing for steelhead and salmon is a popular activity in the state. Table 29 presents the estimated salmon and steelhead catch in Idaho.

The estimated annual net economic value of anadromous fish produced in the Salmon River drainage is approximately three million dollars.[1]

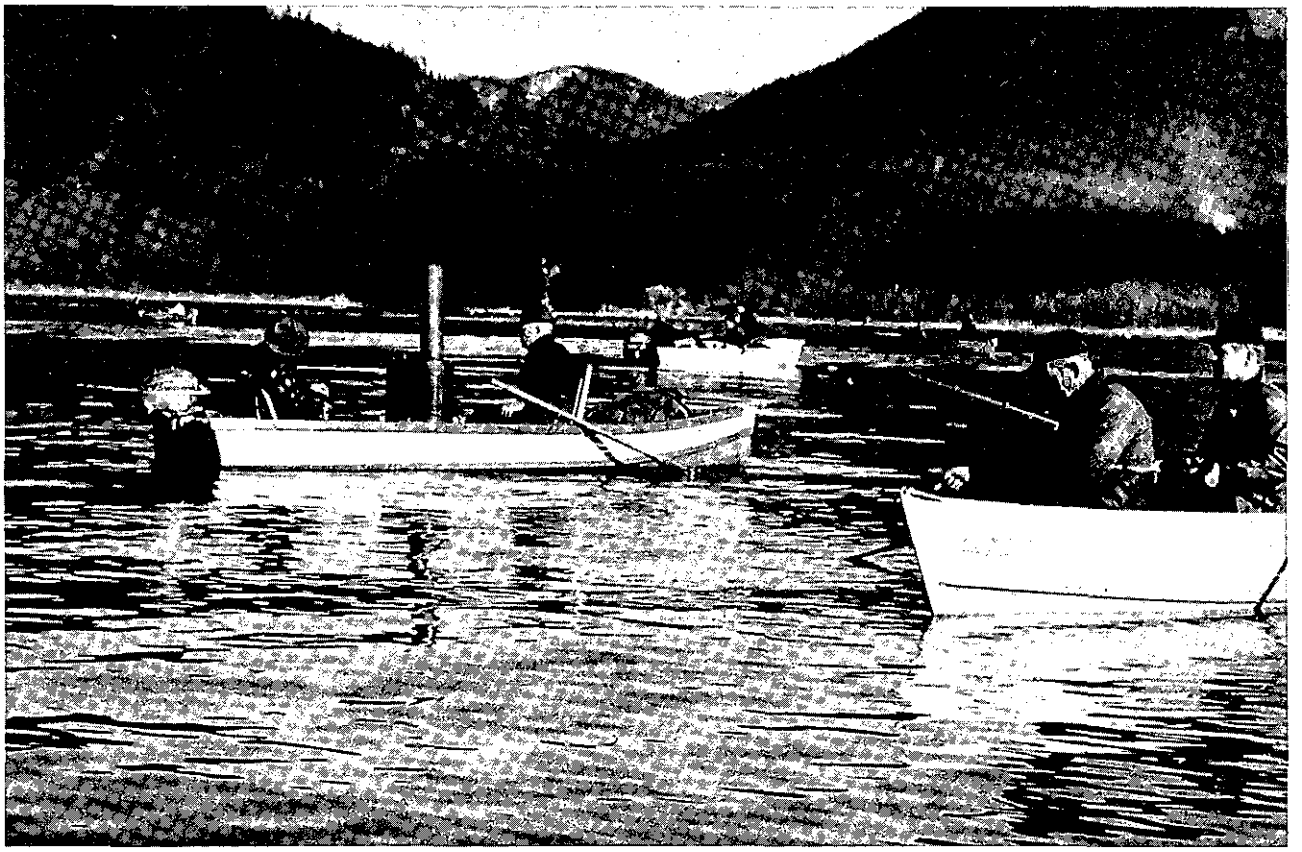
A study of the future of anadromous fish runs into Idaho is needed from the standpoint of planning programs for fishery management, evaluation of wild and scenic river proposals, and formulating the State Water Plan.

[1]Report of Sport and Commercial Fisheries Subproject — A Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers; Water Resources Research Institute, University of Idaho, 1971

TABLE 29
SALMON AND STEELHEAD CATCH ESTIMATES, 1954 — 1970

Year	Chinook salmon estimate	Steelhead trout estimate
1954	15,000	12,000
1955	19,000	13,000
1956	21,000	8,000
1957	39,000	20,000
1958	24,000	30,000
1959	20,000	31,000
1960	21,000	30,000
1961	13,000	25,000
1962	12,000	19,000
1963	12,000	26,000
1964	8,000	18,000
1965	Salmon season closed	20,000
1966	8,500	20,000
1967	7,500	24,500
1968	11,500	24,500
1969	13,000	17,000
1970	5,500	20,500

SOURCE: Idaho Fish and Game Department Annual Report, 1970



Big Game

Deer and elk account for most of the big game hunting in Idaho, but black bear, bighorn sheep, mountain goat, antelope, and moose are also hunted. Sprotsmen logged approximately 1,012,000 days of big game hunting in Idaho in 1965. The Idaho legislature altered the status of the mountain lion from predator to big game in 1971. Harvest data for big game are presented in Table 30.

Big game hunting is not only an important part of the Idaho residents' outdoor recreation, but also appeals to a large segment of non-residents, primarily for elk hunting. Substantial economic benefits accrue to Idaho from this outside source. For example, nonresident big game hunters contribute nearly $2 million yearly to the Fish and Game fund through the purchase of licenses, tags, and permits. Expenditures for service and supplies in Idaho account for several times this amount.

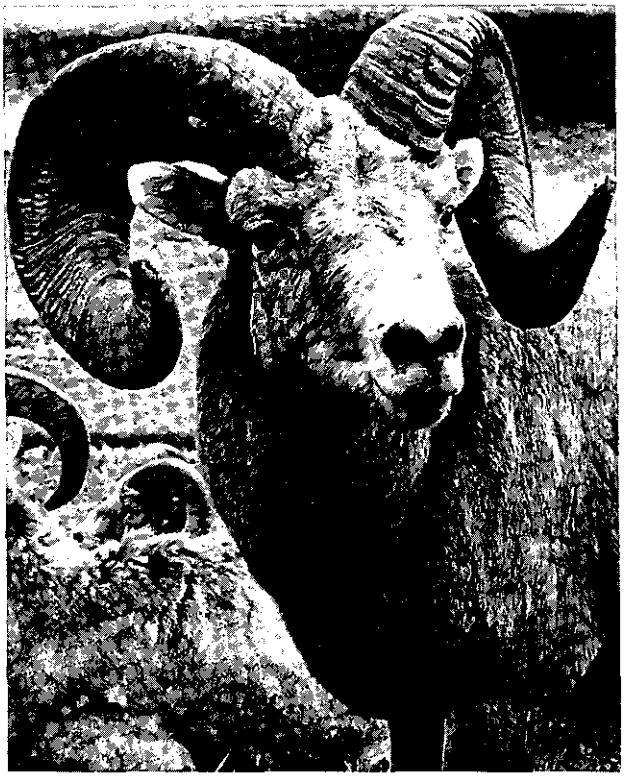


TABLE 30
ANNUAL BIG GAME HARVEST

Species	1966	1967	1968	1969	1970	Ten-year average 1961-1970
Deer	64,628	66,350	78,441	71,433	83,125	69,399
Elk	14,573	13,397	17,064	15,900	14,533	14,813
Bear	3,386	2,700	2,597	3,085	3,404	3,015
Antelope	1,219	1,286	1,294	1,472	1,551	1,054
Mountain goat	161	127	161	168	151	160
Bighorn sheep	14	32	47	46	64	46
Moose	55	50	53	74	81	57

NOTE: Deer, elk and bear data from post-season hunter questionnaire. Antelope, goat, sheep and moose data based on total return of hunter report cards, after followup letter, and personal contact by Conservation Officers.
SOURCE: Idaho Fish and Game Department Annual Report, 1970

Upland Game Birds and Waterfowl

Idaho offers outstanding hunting for upland game birds and waterfowl because of the relatively large number of game species. Hunters have an opportunity each fall to select from 11 upland bird species and numerous waterfowl. Pheasants are the most important upland game bird species harvested in Idaho.

Habitat utilized by upland game is extremely varied, ranging from semi-arid plains to dense forests to farmland used for crops, orchards, windbreaks, and ditch banks. Pheasant populations have been generally benefited in older irrigation developments where ditch banks and fence rows provide cover. Many of the newer developments, however, have been planned so that fences and ditches are kept to a minimum

for greater efficiency. Consequently, cover and forage needed for survival of an active pheasant population are in short supply.

Excellent chukar habitat is found in the Middle Snake River drainage and in some canyon areas in both the upper and lower Salmon River drainage.

Grouse species including blue, sage, ruffed, and sharp-tailed have been adversely affected in some areas by activities such as grazing, sagebrush removal, and agriculture.

Wild turkeys have been introduced into some areas of the state. Hunting of these birds is a new sport in Idaho. The first general hunting season on wild turkeys occurred in 1971.

About 857,000 hunter days were spent in 1965 in pursuit of upland game. Harvest data on upland game is presented in Table 31.

Mallard ducks and Canada geese are the most important migratory waterfowl species, although perhaps fifteen other species are found in Idaho.

Areas along the Snake River, Henrys Fork, American Falls Reservoir, Grays Lake, Market

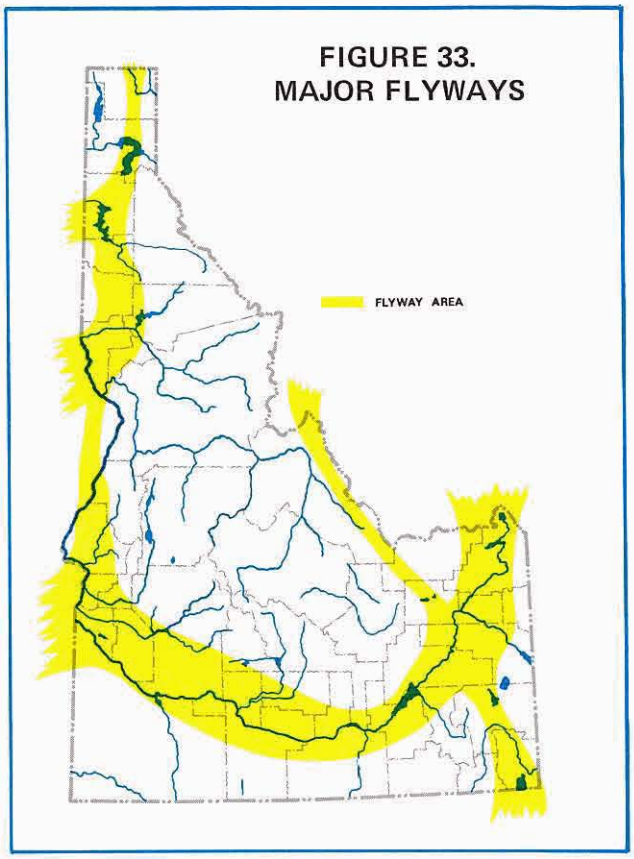


TABLE 31
UPLAND GAME HARVEST, 1954 — 1970
(Based on Annual Hunter Questionnaire Survey)

Species	1954-1958 average	1959-1963 average	1964-1968 average	1969	1970	1970 percent change: From 1964-1968 average	1970 percent change: From 1969
Pheasant	545,600	532,200[1]	491,300[1]	544,500	437,000[1]	— 11	— 20
Mourning dove	125,000	155,600	196,500	220,200	223,900	+ 14	+ 2
Forest grouse	99,400	132,800	117,900	132,200	132,900	+ 13	+ 1
Hungarian partridge	54,900	52,100	86,700	64,700	53,400	— 38	— 17
Chukar partridge	18,000	69,600	151,100	171,200	168,600	+ 12	— 2
Quail	47,500	59,200	105,000	105,600	108,800	+ 4	+ 3
Sage grouse	19,000	21,200	38,000	81,700	70,800	+ 86	— 13
Cottontail	80,600	85,500	71,300	159,000	119,000	+ 68	— 25
Turkey[2]	Closed	Closed	13	28	54	+315	+ 93
Wilsons snipe	—	—	—	—	2,500	—	—

1960 — 500,500 cocks; 25,100 hens
1961 — 495,400 cocks; 39,600 hens
1962 — 494,900 cocks; 59,300 hens
1963 — 602,700 cocks; 112,900 hens
1964 — 603,700 cocks; 153,500 hens
1965 — 483,900 cocks; 139,500 hens
1966 — 411,700 cocks; 3,200 hens
1970 — 437,100 cocks; 33,500 hens

NOTE: Figures rounded to nearest hundred

[1] These figures do not include hen portion of harvest

[2] Actual known harvest based on total return of hunter report cards after followup letter and personal contact by Conservation Officers

SOURCE: Idaho Fish and Game Department Annual Report, 1970

Lake and Bear Lake provide goose and duck habitat in southeastern Idaho. Prime goose habitat is found on islands in the Snake and Payette rivers and in Deer Flat National Wildlife Refuge in southwest Idaho.

The Island Park area in eastern Idaho and Red Rocks Refuge in Montana are important wintering districts for the rare trumpeter swan.

Waterfowl are managed on a flyway basis which requires interstate and international cooperation. Idaho is an important part of the migratory waterfowl flyway system in North America. As ducks and geese follow fairly well-defined paths from the northern breeding and nesting areas to the wintering grounds, some state rivers, lakes, reservoirs and marshlands provide nesting areas necessary for the long flights each year. The primary routes through Idaho are shown in Figure 33. Part of the huge flights from Canada and Alaska come through the Kootenai Valley to near Lewiston where they swing west along the lower Snake River and the Columbia Basin. The vast majority enter Idaho on the east, moving south and west along the Snake as the season progresses. Portions of these flights break off through southeastern Idaho to the Bear River marshes in Utah.

Additional harvests may be desirable for some species, but accurate estimates are difficult to achieve since capacities in all parts of the flyways are interrelated and thus must be considered. Harvest data for waterfowl are presented in Table 32. About 345,000 hunter days were logged in 1965 in pursuit of waterfowl.

Furbearing Animals

Many species of furbearing animals exist in the state. Muskrat and beaver account for the majority of the animals trapped. Other animals taken include bobcat, lynx, coyote, red fox, otter, marten, badger, raccoon, weasel, and mink.

In addition to commercial value the fur bearers have aesthetic appeal and their presence affords opportunities for educational and scientific demonstration of ecological principles to the general public. The pleasure which people derive from observing wild animals in natural surroundings represents an important value in terms of human enjoyment.

Other Species

Many other kinds of wildlife are found in Idaho. For example, a large nesting concentration of the greater sandhill crane is located at Grays Lake.

The Snake River Birds of Prey Area in the Swan Falls reach of the Snake River was created in 1971 to preserve habitat important to survival of the golden eagle and prairie falcon.

Bald eagles commonly winter near the larger streams and reservoirs. Resident species whose status is still undetermined nationally include the ferruginous hawk, American osprey, and

TABLE 32
WATERFOWL HARVEST, 1954 — 1970
(Based on Annual Hunter Questionnaire Survey)

Species	1954-1958 average	1959-1963 average	1964-1968 average	1969	1970	1970 percent change From 1964-1968 average	1970 percent change From 1969
Duck	542,800	405,600	405,200	529,000	648,500	+ 60	+ 23
Canada goose	17,900	20,200	24,000	26,100	30,600	+ 28	+ 17
Snow goose	1,000	600	900	300	900	—	+ 200
Coot	16,200	10,300	19,100	27,000	22,800	+ 19	— 16

SOURCE: Idaho Fish and Game Department Annual Report, 1970

prairie falcon. Marmots and jack rabbits and hundreds of other wildlife species of some importance are found in the state. Included are various rodents and song, insectivorous, and rodent-killing birds.

PROBLEMS AND NEEDS

What is known as nitrogen supersaturation (nitrogen bubble disease) probably represents the greatest problem for anadromous fish migrating to Idaho today. Water plunging over dam spillways on the Columbia and Snake rivers entrains air which normally contains 79 percent nitrogen. The air is carried into the deep stilling basins below the dams where it is subjected to pressure greatly exceeding that of the atmosphere. This increased pressure causes the gaseous nitrogen to dissolve and the water becomes supersaturated. The excess nitrogen then remains in solution as long as it is kept under pressure. In a free-flowing river, with normal turbulence, the supersaturated water soon returns to normal saturation levels and poses no problems. When a fish is in supersaturated water the nitrogen is absorbed into its circulatory system. When the fish moves from the supersaturated zone the nitrogen returns to gaseous form and creates bubbles in the tissues and bloodstream of the fish. The effect is much the same as when a diver experiences the bends. This can kill or weaken migratory fish as they move up or downstream.

The problem can be reduced by: providing additional upstream storage to reduce spills during periods of fish migration; operation of existing storage to reduce spills during periods of fish migration; structural modifications which will reduce entraining of nitrogen; installment of slotted gates in generator bays in dams now under construction until generators are installed; and transporting downstream migrants around dams during periods of high runoff.

Man's activities have affected opportunities in fishing for Idaho's resident species as well as for its anadromous breeds. Activities such as dredge mining and highway construction that directly alter stream channels have caused damage to the fisheries resource. The effects of siltation from agriculture, overgrazing, and road building associated with logging are felt indirectly. In the southern part of the state, domestic and industrial pollution of some stretches of the Snake and Boise rivers have resulted in large kills of nongame fish; and evidence of mercury poisoning has recently appeared, affecting stretches of the Snake River. In irrigated areas, lowering of streamflows poses a direct threat to fish life.

An important requirement for meeting fishery needs is establishment of guaranteed minimum streamflows. This should eventually be done for all streams but is needed now for major river systems such as the Snake, Henrys Fork, Boise, and Payette rivers. It is important that existing water rights be recognized when establishing minimum streamflows. Figure 34 shows key river points where instream flows should be set.

It is possible that storage facilities will be required to provide adequate minimum flows. Since funds for this purpose are not now available, it is essential that state and federal funding be provided or needed storage facilities cannot be built.

Remaining natural habitat should be preserved

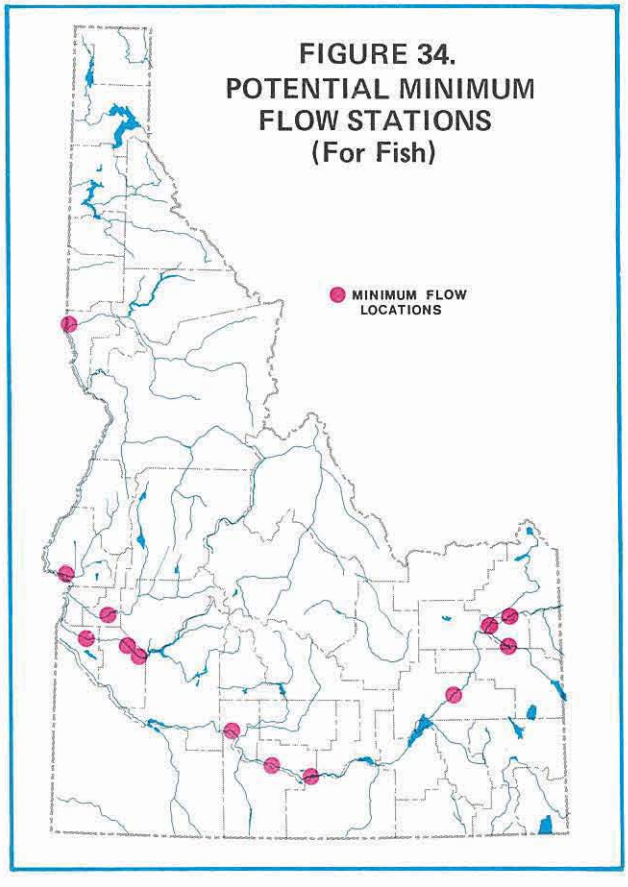
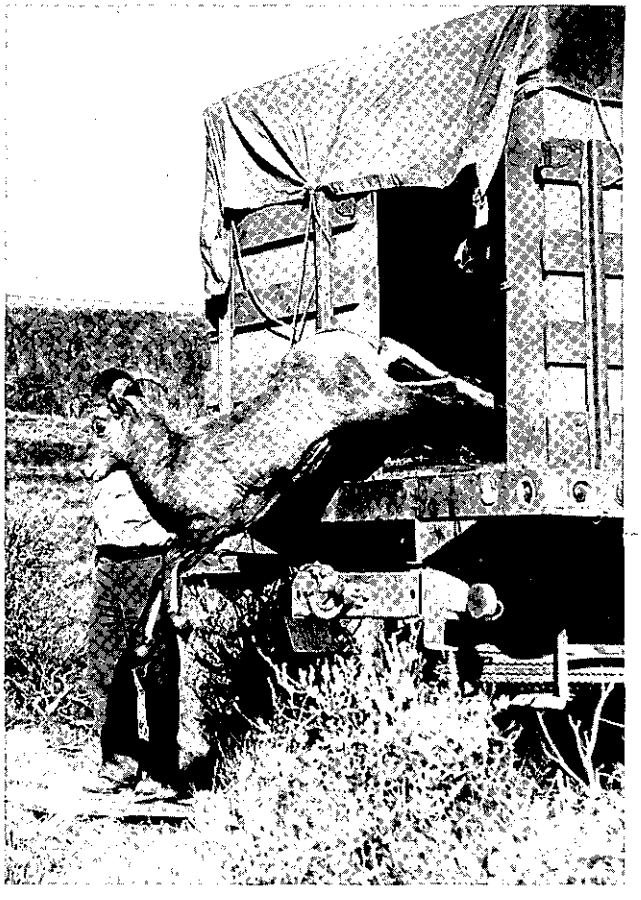


FIGURE 34.
POTENTIAL MINIMUM FLOW STATIONS (For Fish)

wherever possible. When developments encroach on the habitat, mitigation measures should be undertaken to replace and possibly enhance the resource. Proposed water resource developments should be planned, constructed and operated to minimize adverse effects on the natural nesting habitat of migratory waterfowl and to provide mitigation of areas if necessary.

The Salmon and Clearwater river systems should be managed to enhance the natural propagation of anadromous and resident fish by utilization of fish hatcheries. In future years, lakes and reservoirs would provide a larger share of fishing and recreational demand. It is estimated that one acre of reservoir-surface will provide four times the use of one stream-surface acre.

Although man's presence has in some instances benefited animal life, it has more often been detrimental. For example, water resource projects which have inundated or developed what was formerly winter range have resulted in smaller numbers of deer and elk because of reduced winter range areas.



Animals such as mountain goats and bighorn sheep apparently require more pristine environment to survive. Man's encroachment has left fewer such places. Disease contacted from domestic animals and direct competition for forage have caused wild goats and mountain sheep to disappear from some areas. Transplanting of these species into other suitable habitat has sometimes reintroduced them into areas where they formerly were native.

Before 1971, no limit was placed on the number of nonresident big game licenses sold in Idaho. The legislature enacted a law in 1971 limiting the number of out-of-state hunters to 5 percent of resident hunter licenses sold the previous year. In its report to the President, *One Third of the Nation's Land*, the Public Land Law Review Commission made recommendation opposing this type of limitation by states.

Preservation of key habitat is of major importance in satisfying present use and providing for future hunting needs. All critical habitat areas should be identified and protected. Alternate plans to satisfy general water needs will be formulated if critical habitat is involved so that decision makers will be aware of the costs and benefits of habitat protection. Planning will give consideration to zoning and greenbelt concepts to prevent intensive development which might destroy wildlife habitat.

Preservation of habitat for deer and elk (especially of winter range, which is usually the limiting factor for these species) is needed. These critical areas are usually located at lower elevations in flood plains or in canyon bottoms where relatively small portions of entire ranges may limit survival of big game. Pronghorn antelope have specific summer and winter ranges, plus vital fawning, or kidding, areas that should be protected from conflicting uses. Preservation of remote areas is vital if present numbers of mountain goat, mountain lion, bighorn sheep, moose, and grizzly bear are to be sustained.

Future hunting of upland game will depend upon retention and improvement of habitat on forest and range lands, and on planned management of habitat on agricultural lands and lands interspersed with agricultural areas. Where water development makes it possible to cultivate areas

which previously sustained native grass or timber, hunting of upland game will shift to pheasant and other species found on agricultural lands.

Small sanctuaries and feeding areas, interspersed with hunting areas, should be provided to facilitate better control of waterfowl movement and better distribution of the waterfowl harvest. These goals can be achieved through lease or purchase of lands to provide new hunting areas and access to existing ones. Suitable parcels of land should be reserved as waterfowl and pheasant habitat in areas opened to agriculture by new irrigation development. One example of planned wildlife enhancement is the proposed Long Tom National Wildlife Refuge Area. This facility has been proposed for development concurrently with a major reclamation project near Mountain Home. The refuge would provide approximately 650,000 hunting days annually.

FUTURE REQUIREMENTS

Improvements in quantity and quality of Idaho's fisheries resource will contribute to satisfaction of future fishing needs. This may involve increased numbers or sizes of fish stocked, more intensive harvesting of some species, or provision for additional fishing areas. Of major importance will be habitat preservation and enhancement, improved access, artificial propagation, and maintenance of certain natural fish species. Present and projected sport fishing demand is shown by region in Table 33.

The population of the state is expected to double by year 2020. Along with this trend of population growth, factors such as increased urbanization, higher education and income levels, and increased leisure time are expected to cause a fourfold increase in hunting pressures. Unless positive steps are taken, pheasant hunting opportunities, as now exist, will greatly diminish. The urbanization of agricultural lands important for bird habitat could be reduced somewhat by zoning. One positive approach would be to provide new pheasant habitat in conjunction with new agricultural development. It is recommended that where public lands are involved, at least 40 acres of each section be set aside and managed for wildlife usage.

Studies are needed to obtain data and information necessary to better identify fish and wildlife resource capabilities and future needs. At present only rough estimates are available and projections of future needs do not take into consideration the conflicts with other resource uses or the direction which Idaho's growth might take.

TABLE 33
PRESENT AND PROJECTED DEMAND FOR SPORT FISHING
(Thousand man-days)

Region	1965	1980	2000	2020
Panhandle	162	225	299	388
Clearwater-Salmon	243	337	449	583
Southwest Idaho	459	636	842	1,098
Upper Snake	605	842	1,114	1,453
Bear River	115	119	150	200
TOTAL	**1,584**	**2,159**	**2,854**	**3,722**

SOURCE: Columbia-North Pacific Region Comprehensive Framework Study, Appendix XIII, Appendix XIV, 1971

WATERSHED PROTECTION

There are 373 small watersheds in Idaho. Of these, 141 require some type of project action and are considered feasible to treat.[1]

Watershed protection programs involve land treatment practices and structures designed to achieve the best possible use and conservation of water and land resources through such means as: improved efficiency of irrigation water application; maintenance and improvement of soil productivity; reduction of soil erosion, gullying, and sedimentation; control of salts, plant nutrients (fertilizer) and other chemicals; control of runoff; removal of excess surface and subsurface waters; water yield improvement; and water pollution control and abatement.

[1] 1967 Conservation Needs Inventory, Soil Conservation Service.

Land treatment practices are those primarily associated with water use for conservation, irrigation, soil erosion, and drainage. A land treatment program includes three basic types of treatment: maintenance of land under present use; rehabilitation of land damaged through misuse; and development or adjustment of land for future needs. Structures are primarily those needed to provide flood protection, water quality control and water use development.

Land use, for purposes of watershed protection, is classified into cropland, forestland, rangeland, and other lands (urban and industrial areas, roads, railroads, farmsteads, canals and ditches, small bodies of water, and barren land). Serious land use problems requiring immediate attention can be found throughout most of Idaho. The problems vary in scope from those involving individual scattered pieces of land to large areas.

PRESENT STATUS

The Soil Conservation Service of the United States Department of Agriculture has established, with local assistance, 52 Soil Conservation Districts (SCD) in Idaho. These districts cover 50,541,629 acres or about 95 percent of the land base of the state. The purpose of the districts is to provide technical assistance regarding local resource problems to individual landowners and organized groups.

Solutions to watershed problems generally involve group action. Watershed projects completed or under construction, that were developed under Public Law 566 are summarized on Table 34 and include:

Fourth of July Creek Watershed — Kootenai County. The project area includes 17,100 acres of which 6 percent is cropland and 94 percent is forestland. The flood control-drainage project was authorized for construction in 1958. All planned construction of the flood water collection channels and the flood water disposal pumping plant have been completed at a total cost of $286,705. The project operated as planned during the severe 1964-1965 winter flood and there was only minor damage in this area.

Cedar Creek Watershed — Twin Falls County. The project includes 126,720 acres of which 5 percent is cropland, 91 percent range, and 4 percent forestland. Total cost of the project was $1,174,172 and included installation of 1½ miles of 54-inch concrete pipe, canal relocation, construction of a 125-acre-foot regulating reservoir and other associated structures.

Montpelier Watershed — Bear Lake County. The project is multi-purpose including flood control, irrigation, and drainage. The watershed includes 51,600 acres of which 9,335 acres are cropland. Project facilities include 7 miles of canal enlargement and floodway construction as

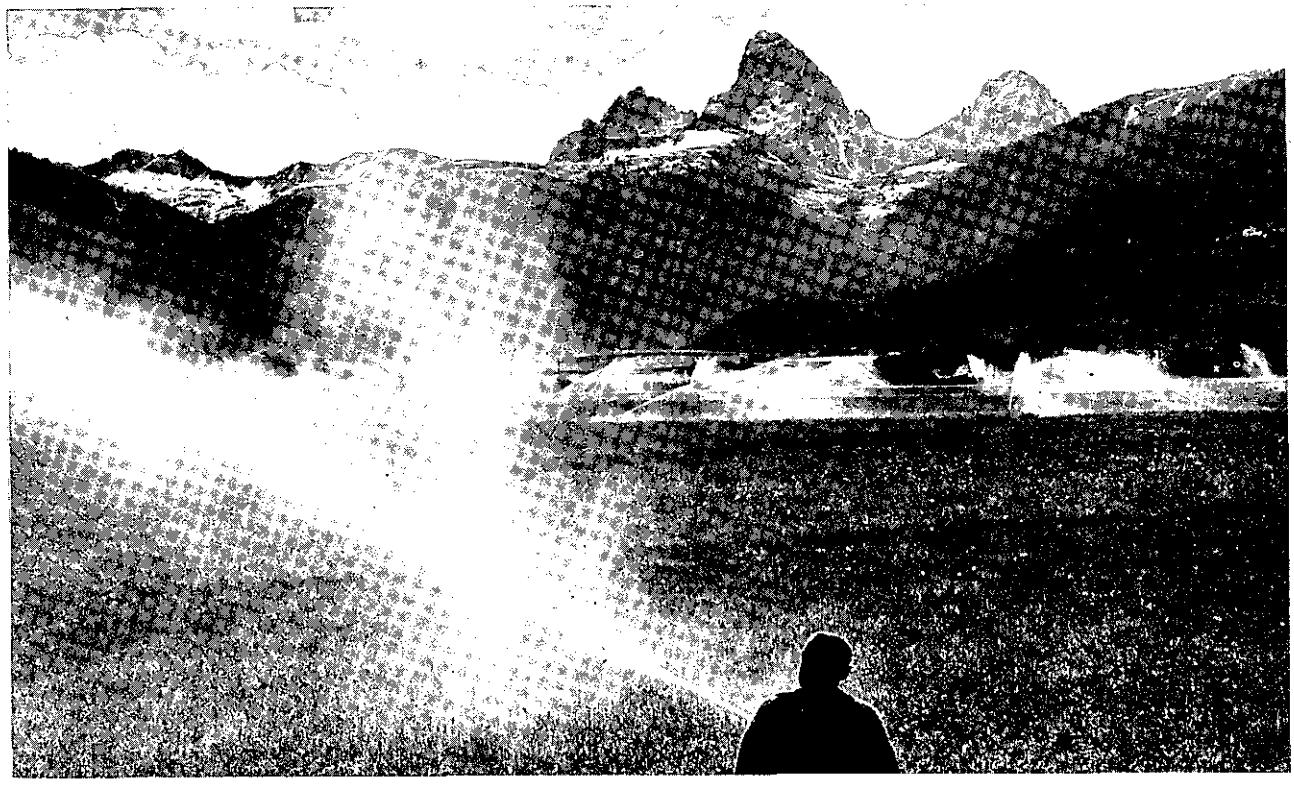
TABLE 34

P.L. 566 SMALL WATERSHED PROJECTS, COMPLETED OR UNDER CONSTRUCTION

Watershed	County	Percent complete	Installation cost		
			P.L. 566	Other	Total
COMPLETED					
Fourth of July Creek	Kootenai	100	$ 262,371	$ 24,334	$ 286,705
Cedar Creek	Twin Falls	100	529,372	644,800	1,174,172
UNDER CONSTRUCTION					
Montpelier Creek	Bear Lake	97	1,528,635[1]	348,614	1,877,249[1]
Trail Creek	Teton, Idaho Teton, Wyoming	72	526,500[1]	518,500[2]	1,045,000[1]

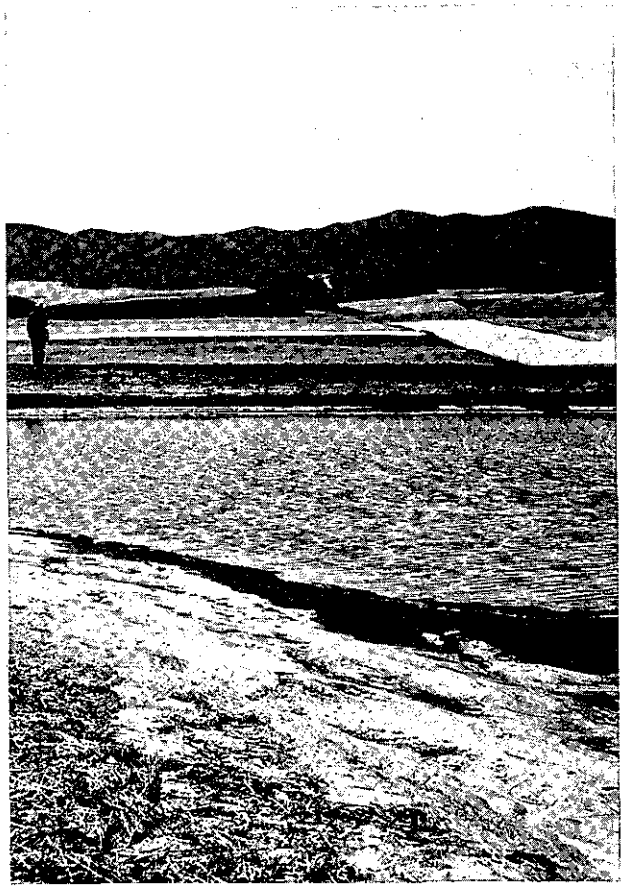
[1] As of 10/30/71

[2] Does not include approximately $53,800 local cost or $50,000 ACP cost-sharing for on-farm sprinkler system installation or $116,100 on-farm mainline installation costs.



well as a dam with water storage of 4,050 acre-feet for flood control and irrigation. Total project costs as of November 1971 are $1,877,249. The project is 97 percent complete.

Trail Creek Watershed — Teton County. The project includes 58,243 acres of which 27,483 are in Idaho and the balance in Wyoming and involves treatment of the flood source areas in the upper watershed, stream channel improvement, and installation of a gravity sprinkler irrigation system covering 7,000 acres in Idaho. The project is about 72 percent complete. Project costs as of November 1971 are $1,045,000.



Resource Conservation and Development (RC&D) projects sponsored by local SCDs in cooperation with the U.S. Department of Agriculture are gaining prominence and importance in watershed programs in Idaho. Four RC&D projects have been authorized and include:

Idaho-Washington Project. This project was authorized in 1965 and involves lands in Kootenai, Benewah, and Latah counties in Idaho and land in Spokane County, Washington;

Western Wyoming Project. This project was authorized in 1967 and involves 246,384 acres in Caribou and Bonneville counties in Idaho. A much larger acreage of this project is located in Lincoln and Uinta counties, Wyoming.

Box Elder-Oneida Cache Project. This project was authorized in 1969 and involves lands in Idaho and Utah. Approximately 762,240 acres in Oneida County are included involving the headwaters of Raft River and Pale Creek drainages, Little Malad River, and Deep Creek in Idaho. A majority of the lands in this RC&D project are located in Utah.

Wood River Project. This project was authorized in 1971 and involves 3,603,840 acres in Blaine, Camas, Gooding, and Lincoln counties, all in Idaho. Major rivers in this geographical area include the Snake River, Big and Little Wood rivers, and South Fork of the Boise River.

Utilizing the ASC program in Idaho, 24 special cost sharing projects have been completed involving hundreds of pooling agreements and conservation practices on private lands. An example is the Creason Lateral Community Conservation Resource Project (2 miles south of Star) in which a complete irrigation system for 24 farms was revised to better utilize the land area and to update irrigation systems. The total project cost was $90,000 and involved 8.8 miles of concrete ditch lining, 1,510 feet of irrigation pipeline, 25 structures, 29 measuring devices, and 630 acres of land leveling.

PROBLEMS AND NEEDS

The problems and needs associated with watershed protection are extensive. Conservation treatment needs are listed by county in the Idaho Soil and Water, Conservation Needs Inventory, 1967, which was prepared by the USDA Soil Conservation Service. Additional information is provided in Land Measures and Watershed Protection, C-NP Comprehensive Framework Study, May 1971, Appendix VIII.

The 1967 SCS inventory states that more than 1,100 groups concerned with agriculturally related water have been identified. A summary of groups identified, conditions of irrigation systems, and problems is shown below:

Groups Identified	Number	Acres Served
Irrigation districts	75	848,000
Organized irrigation companies	320	1,676,000
Informal irrigation groups	685	398,000[1]
Drainage districts and organized companies	46	326,000
Informal drainage groups	43	41,000

Condition of Irrigation Systems

36 percent of systems reported good to excellent.
13 percent of systems reported poor condition.
51 percent of systems reported fair condition only, or made no report.

[1] Another 11,650 acres is served by individual development, bringing the total irrigated land to 3,500,650 acres.

Problems

19 percent of groups were reported as having a shortage of late season water.

70 percent of groups were reported as having excess canal seepage.

86 groups serving 483,200 acres of irrigated land show a community drain of water disposal system as a major need. This is in addition to the 89 drainage groups.

Problems are not peculiar to cropland. Considerable forestlands and rangelands are also in need of extensive rehabilitation, with only 23 percent of the forestlands being adequately treated and 15 percent of the rangeland meeting current watershed standards.

The Georgetown Creek Watershed Project in Bear Lake County has been authorized but funds have not been appropriated to initiate construction. (The project is discussed in more detail in Chapter 4.)

The Bureau of Land Management is involved in watershed protection programs throughout the state on public domain lands. The BLM proposed and received authorization to implement a watershed protection project in Owyhee County involving some 5 million acres in southwest Idaho. The project has been authorized for eight years but has not received adequate funding necessary to implement the proposals in the planning report. This project has received wide support for individuals, public agencies, and special interest groups throughout the area of southwest Idaho. Under the study plan, the lands are to be retained and managed for multiple resource values, including forage production, erosion control, and wildlife habitat. An inventory and analysis of the available resources will be required to determine their interrelations and competitive aspects. Utilizing this basic information, a management program would be developed for the rehabilitation and development of the lands to enable the district manager of the BLM to realign uses of critical watersheds, game habitat, and recreational areas.

Data and information on watershed protection needs should be updated to conform with present (1972) conditions. Evaluation of future needs should be made in cooperation with the state water planning program to insure that study results are compatible. Much of the information now available on future needs is based on independent assessments of projected water and related land usage. Considerable difficulty arises when attempting to correlate the information from the various study reports such as the 1967 SCS inventory and the C-NP study.

Increased funding to permit construction of authorized projects such as the Georgetown Watershed Project is essential if the state watershed protection program is to be successful.

TABLE 35

PROJECTS AUTHORIZED FOR PLANNING AND HAVE STATE PRIORITY FOR INVESTIGATION IN IDAHO, OREGON, UTAH

Watershed	County	Acres	Status
WORK PLANS BEING PREPARED			
Upper Sand Creek	Bonneville	56,140	Draft work plan ready for review
Lower Sand Creek	Bingham, Bonneville	129,460	Draft work plan ready for review
Bancroft	Caribou	130,000	Basic data analyzed. Alternatives developed
Roberts-Kettle Butte	Bonneville, Bingham, Jefferson	120,000	Basic data being analyzed
Succor Creek (being planned by Oregon SCS Planning Party)	Owyhee Malheur, Oregon	247,000	Basic data accumulation completed, and in the process of being analyzed
PRELIMINARY INVESTIGATION IN PROGRESS			
Rock Creek (Twin Falls)	Twin Falls	166,000	Field data collected
Twin Buttes	Bingham	186,000	Collecting field data
Clarkston (being planned by Utah SCS Planning Party	Franklin, Oneida, Cache, Utah	44,100	Collecting field data
Pocatello Valley	Oneida, Box Elder, Utah	71,400	Feasibility of flood prevention by land treatment being analyzed
Rock Creek (Power)	Power, Oneida, Cassia	206,500	Sponsors developing data, local interest and support
Minidoka	Minidoka	220,000	Sponsors developing data, local interest and support
East Fork-Big Wood	Blaine	240,600	Sponsors developing data, local interest and support

SOURCE: Soil Conservation Service, 1970

FUTURE REQUIREMENTS

Projects that have been authorized for planning and have priority for investigation by the SCS are listed in Table 35. Future watershed protection requirements will be identified and evaluated through these project studies and in conjunction with the state water planning studies. Major federal study efforts such as the Pacific Northwest River Basins Commission Study, USBR Westwide Study, Corps of Engineers Columbia River and Tributaries Study, and SCS Type IV Studies in the Snake River drainage and the Bear River Basins will complement project studies and the state water planning studies.

ELECTRIC POWER

An adequate supply of electricity at a reasonable cost has become essential in modern life. Household electric appliances are regarded more and more as necessities rather than luxuries.

Electric power is a basic element in the processing and manufacturing of Idaho products; most new irrigated agriculture involves pumping, with electricity as the primary power source.

PRESENT STATUS

Electric power was first generated in Idaho in the late 1800s and use has grown steadily, until at the present time the state has an installed capacity of 1,832,339 kilowatts.[1] Virtually all of the state's electric power is hydroelectric.

Per capita energy consumption in the United States grew from 236.4 million btu in 1945 to 263.2 million btu in 1963. Idaho per capita consumption has lagged far behind the national average, with only 56.5 million btu per capita used in 1945 and 119.7 million btu in 1963. Per capita energy consumption in the state increased much more rapidly than it did throughout the nation from 1945 to 1963 because of two factors: the increasing use of electroprocessing; and agricultural expansion through irrigation pumping.

PROBLEMS AND NEEDS

Seasonal variations in power loads in the Pacific Northwest are minimized through interchanges of power within the region's predominantly hydroelectric system. Idaho electric power needs therefore must be considered in the context of power production in the Pacific Northwest.

Many opportunities for additional hydropower development still exist in Idaho, particularly in the Clearwater-Salmon and Southwest Idaho basins. Concern over effects of hydropower development on anadromous fish and conflicts with the National Wild and Scenic River System makes the possibility of developing much of this potential unlikely.

It is possible to install additional capacity at Dworshak Dam, however this would require that a reregulating dam be built downstream. The reregulating dam would adversely affect steelhead fishing.

There is also potential for hydropower development at the Asotin and China Garden sites on the Middle Snake below the confluence with the Salmon River. These developments have been opposed because of impact on anadromous fish runs into the Salmon River Basin. Several additional sites exist for possible hydropower development in the Middle Snake above confluence with the Salmon which would have little impact on the anadromous fish runs since the principal runs have been transferred to the Salmon River drainage because of the Hells Canyon development. Nevertheless, these projects have also been opposed by those who wish to preserve the Middle Snake as a free-flowing stream. The Federal Power Commission (FPC) is currently reviewing the various proposals for development versus preservation of the Middle Snake. The license for the Nez Perce Project was turned down by FPC because of the anadromous fish passage problems.

Recent unpublished studies by the Corps of Engineers and the FPC indicate that the numerous potential hydropower sites on the Salmon River are economical and have a combined dependable capacity in excess of 3,500 megawatts. (By way of comparison, the total state energy load in 1967 was 943 megawatts.) The annual net benefits (savings by constructing hydropower rather than thermal projects) were estimated to be in excess of $35 million. The annual net economic value of anadromous fish produced in the Salmon River drainage is approximately $3 million.[2]

Most of the remaining hydropower potential is in the Southwest Idaho Basins with two notable exceptions. The proposed Lynn Crandall project in the South Fork of the Snake River would include about 200,000 kilowatts and it is possible to install 30,000 kilowatts at American Falls Dam. Potential hydropower developments are listed in Table 36.

Because of the conflicts, as noted, it is highly unlikely that all or a substantial portion of the potential sites in Idaho will be developed. An increasing share of the state's future electric power requirements therefore will probably be supplied by thermal generation and by interregional power exchanges via interties.

[1] Including Oxbow and Hells Canyon generating facilities with powerhouses in Oregon.

[2] Report of Sport and Commercial Fisheries Subproject, Water Resources Research Institute, University of Idaho, 1970.

TABLE 36
HYDROELECTRIC RESOURCE DEVELOPMENTS UNDER STUDY

Plant	River	Installed capacity (KW)	Average annual generation (1,000 KWH)	Usable power storage capacity (1,000 Acre-feet)	Gross static (Head-feet)
Dworshak[1]	NF Clearwater	1,060,000	1,920,000	2,000	630
Teton[1]	Teton	22,000	75,500	115	180
High Mountain Sheep[2]	Snake	875,000	2,740,000	2,250	580
Garden Valley	SF Payette	175,000	621,400	1,940	415
Garden Valley Reregulating	SF Payette	36,000	157,200	6	120
Lower Scriver	Scriver Creek	120,000	377,100	U[3]	760
Upper Scriver	Scriver Creek	37,500	209,600	U[3]	473
Twin Springs	Boise	103,500	320,000	490	459
Lucky Peak[4]	Boise	40,300	269,000	63	225
Swan Falls-Guffey	Snake	164,000	505,400	U[3]	69
American Falls	Snake	30,000	120,000	1,700	107
Lynn Crandall	Snake	200,000	821,000	1,280	269

[1] Power plants under construction
[2] Considered representative of proposals on Middle Snake River
[3] Usable power storage capacity is less than 5,000 acre-feet
[4] Plant has reversible generating equipment in addition to that shown
SOURCE: Electric Power, Idaho Water Resource Board Planning Report 6, 1970

Thermal plants, unlike hydropower plants, consume resources and produce a certain amount of air and water pollutants. New thermal units, both fossil fuel and nuclear, will probably be large (500 to 1,000 megawatts) in order to achieve economies of size. Since these units may produce more than the load requirements of any single utility, output could be shared by utilities within the region, with construction timed to meet area requirements. Plants can be located at mutually optimal sites, and high voltage transmission lines built to coordinate with existing facilities to transmit power to load centers at minimum cost.

Although Idaho has no known reserves of fossil fuels large enough to supply the requirements of economically-sized generating units, there are abundant reserves in Wyoming and Montana to satisfy all projected needs. At the present time, economic studies appear to favor the construction of thermal plants near natural deposits of fossil fuel to minimize transportation costs.

Nuclear fuel thermal plants are not considered economically competitive in Idaho at the present time and have not been planned to meet future needs. Nuclear plants are being constructed on the coast; lack of readily available fossil fuels makes these plants economically feasible there.

A new energy source, geothermal power, may also help to supply future power demands in Idaho. This power source relies on super-heated steam produced beneath the earth surface. An application has been filed with the Department of Water Administration to develop a water and steam supply in the Raft River area. The project would involve drilling as many as 32 wells and developing up to 50 cubic feet per second of water, and the developers hope to produce about 250 megawatts at the plant. The proposed plant would lie within the Raft River critical groundwater area where no permits for drilling have been issued since 1963.

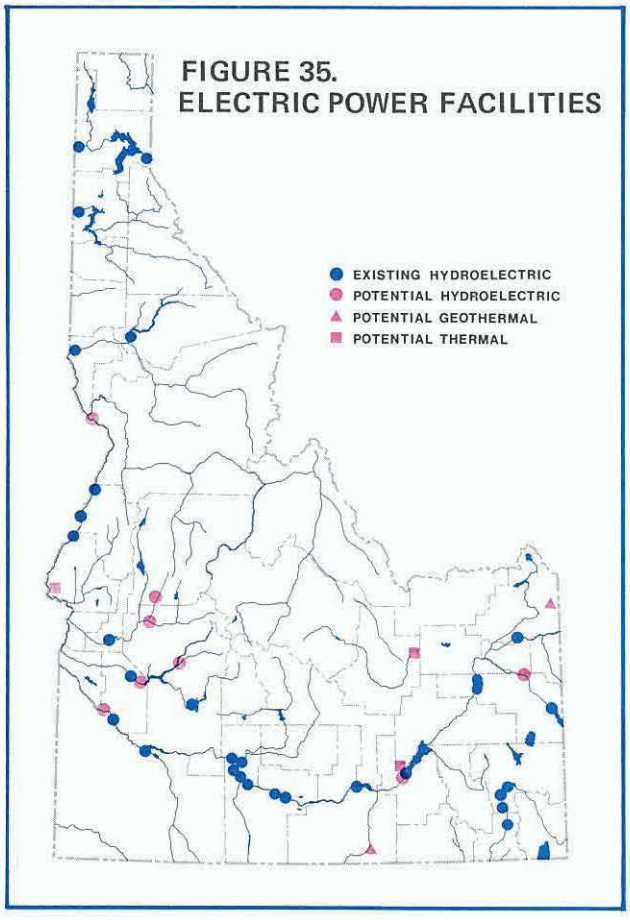
The USGS in a 1971 report classified 20,844 acres of federal land in Idaho as "being within known geothermal resources areas" (KGRA). Among the principal KGRA in Idaho are the Upper Raft River Valley and the Yellowstone area. Another 14,845,000 acres of federal land in Idaho are believed to have some value in

terms of geothermal resources. These lands are scattered throughout the state, except for a large area extending north from Mountain Home to the Clearwater River.

The locations of present hydroelectric plants and of potential hydro, fossil fuel, or nuclear thermal and geothermal plants are shown on Figure 35. Patterns of future development will depend upon the economic and environmental aspects of each individual situation.

FUTURE REQUIREMENTS

Users of electric energy are grouped into four categories: electro-processing, irrigation pumping, commercial-industrial, and residential. Commercial-industrial and residential uses account



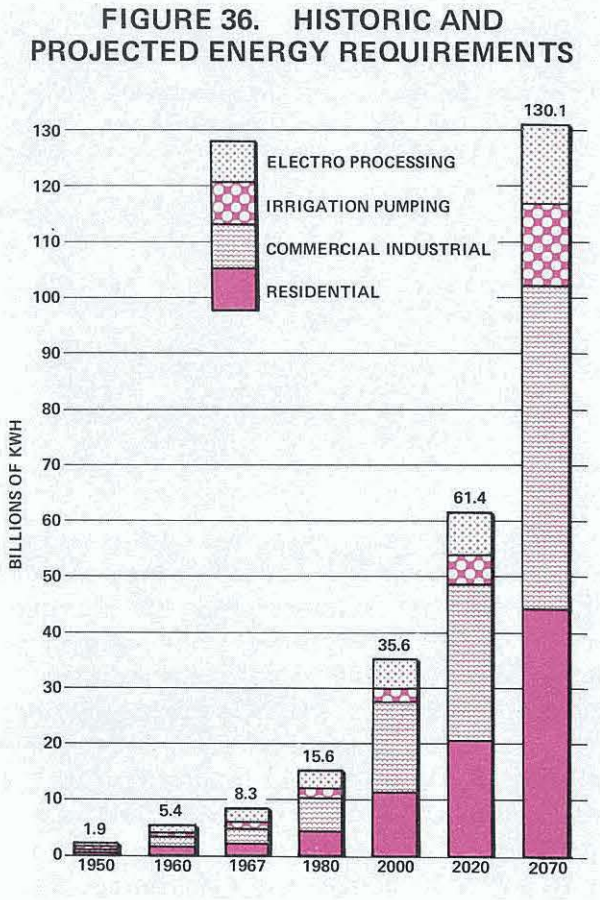


TABLE 37

PRESENT AND PROJECTED ELECTRIC ENERGY LOADS BY BASINS

(Average megawatts)[1]

Basins	1967	1980	2000	2020	2070
Panhandle	107	176	391	623	990
Clearwater-Salmon	101	194	465	764	1,305
Southwest Idaho	163	339	892	1,632	3,759
Upper Snake River	559	1,040	2,244	4,865	8,525
Bear River	13	30	77	132	281
TOTAL	**943**	**1,781**	**4,069**	**7,016**	**14,860**

[1] Excluding losses

SOURCE: Electric Power, Idaho Water Resource Planning Report No. 6, 1970

for 80 percent of current energy consumption and are expected to continue to do so in future years.

Electric energy loads are projected to increase 7½ times during the period 1967-2020. The Upper Snake Basins will continue to be the region of heaviest use in the state; by 2020, the area will require more than 69 percent of Idaho's electric energy. Electric energy consumption is expected to continue to increase after the year 2020.

Although no water is presently used consumptively in the production of electric power, water needs for thermal power production are estimated to be 17,000 acre-feet annually in 1980; 77,000 acre-feet by 2000; 164,000 acre-feet by 2020; and 453,000 acre-feet by 2070.

The historic and projected energy requirements of various use groups are shown in Figure 36. Table 37 indicates the distribution of these requirements within the state by region.

FLOOD CONTROL

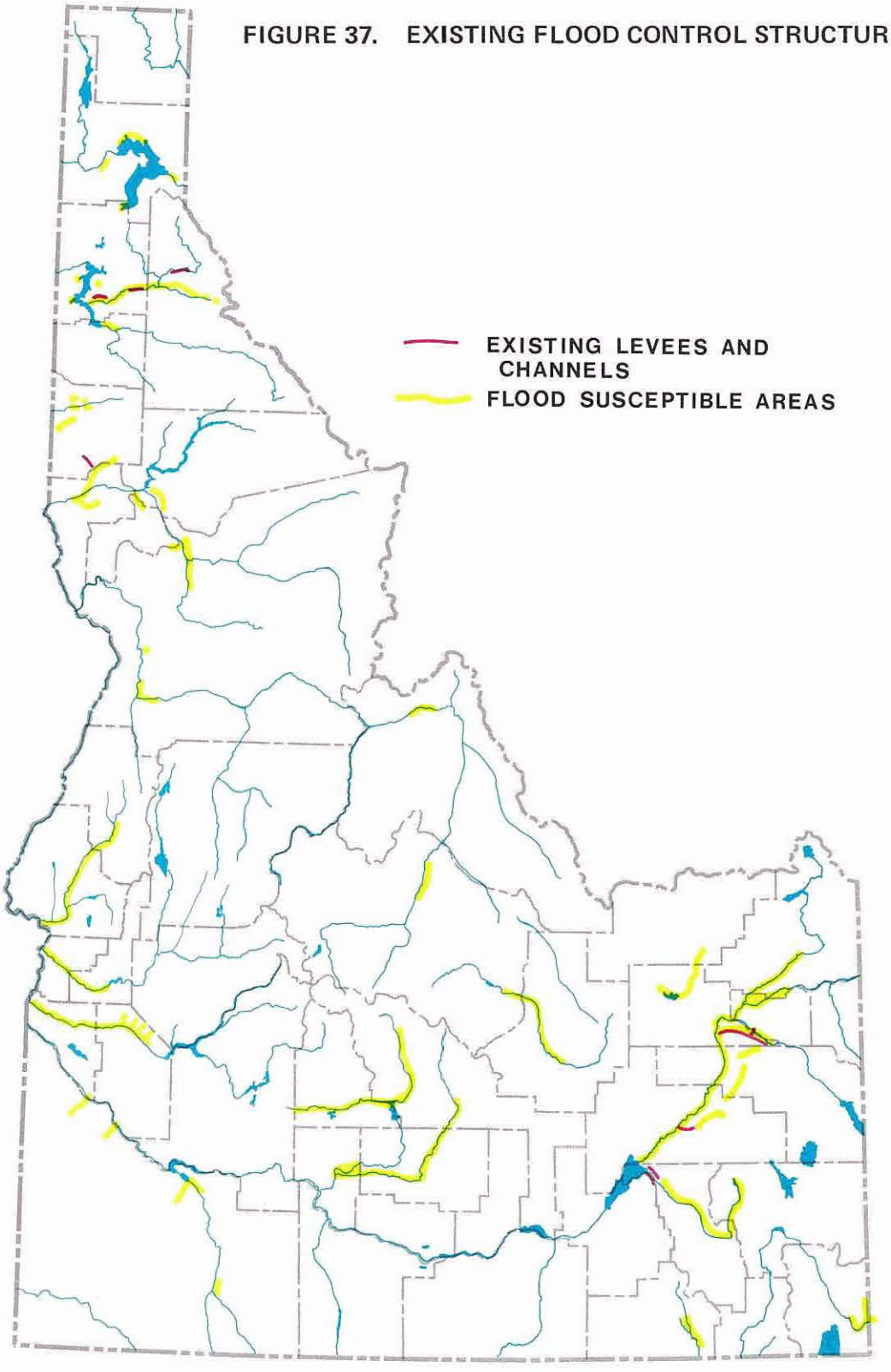
Idaho has few major flood problems and only rare cases of loss of life or total destruction of buildings or other facilities. Floods result from various natural conditions, including spring snowmelt, winter or spring rains (often on frozen ground), localized summer thunderstorms, ice jams, or shifting of stream channels due to excessive bed loads or accumulations of debris.

Existing flood control structures, in the form of levees and stream channel improvements, are shown on Figure 37. Approximately 21 miles of improved channels and about 200 miles of levees have been constructed in the state for purposes of flood control. Not included in these figures are the modifications to minor or intermittent streams.[1]

Although none of Idaho's major reservoirs was constructed solely for flood control, two pro-

[1] Columbia-North Pacific Region Comprehensive Framework Study, Appendix VII; 1971

FIGURE 37. EXISTING FLOOD CONTROL STRUCTURES



jects (Lucky Peak and Ririe) were built primarily for that purpose. Table 38 lists multipurpose reservoirs which provide some measure of flood control.

The magnitude and seriousness of flood damage could be reduced by controlling land use in flood plain areas. Flood plain zoning would be particularly useful for areas which are not yet developed, but have potential for homesite and commercial development.

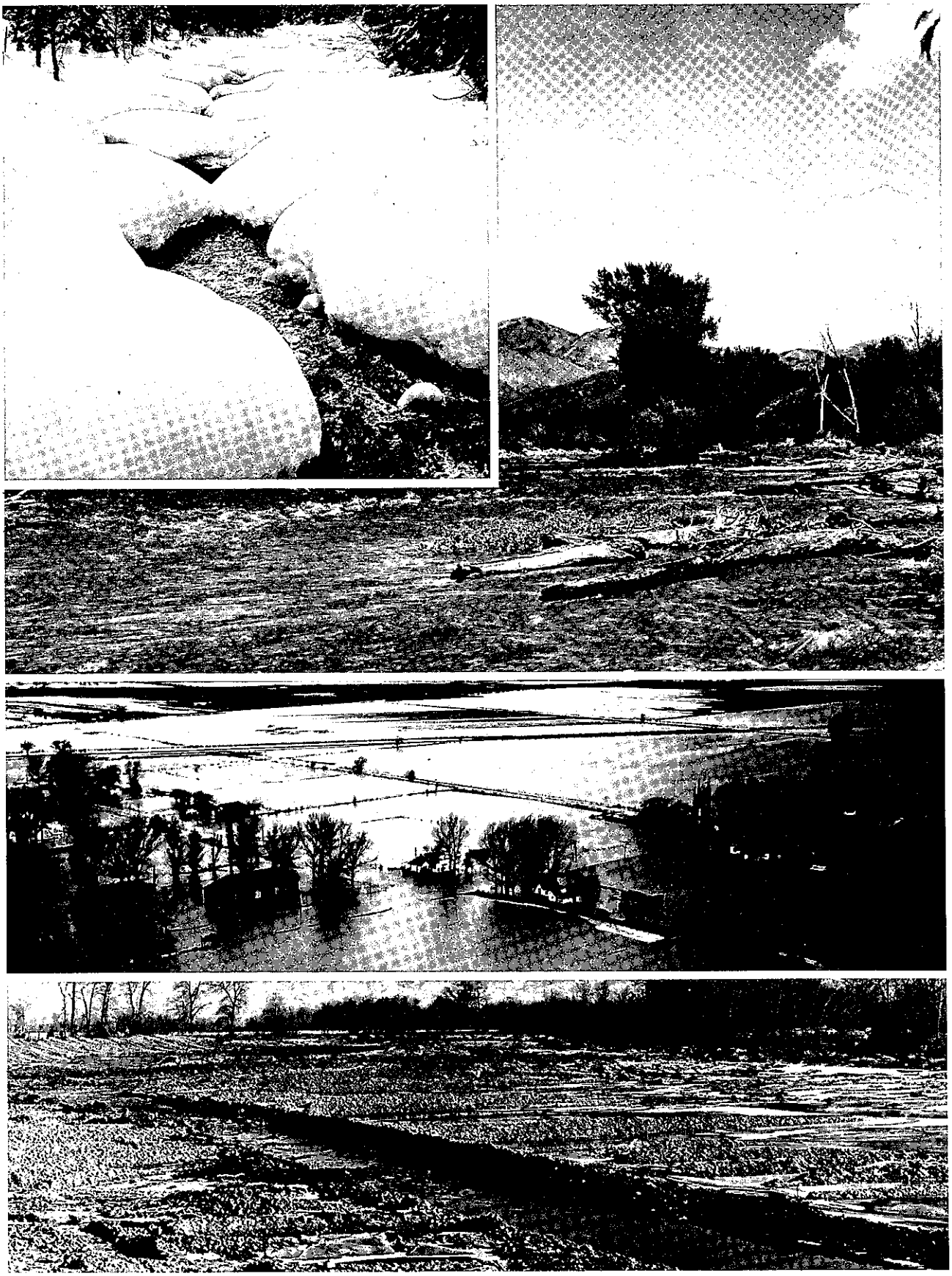
Flood hazard information can be provided by federal agencies through the Idaho Department of Water Administration. The Corps of Engineers has prepared flood plain information reports for six areas of Idaho, but so far only Blaine County has used this information to determine flood plain zoning. Other areas for which flood plain information reports are available include: Portneuf River — Pocatello and vicinity; Payette River — Payette and vicinity; Clearwater River — Orofino and Riverside; Big Wood River — Ketchum and vicinity; Big Wood River — Bellevue, Hailey, and vicinity; and Boise River — Boise to Ada County line. Information programs are also conducted by the U.S. Geological Survey and by the Soil Conservation Service. Information has been prepared by the

TABLE 38
MULTIPURPOSE RESERVOIRS WITH SPACE ALLOCATED FOR FLOOD CONTROL

Reservoir	Built by	Year	Stream	Drainage area (Sq. mile)	Normal total usable storage (1,000 Acre-feet)	Joint-use storage (1,000 Acre-feet)
Pend Oreille Lake	USCE	1952	Pend Oreille River	24,200	1,155.0	1,155.0
Palisades	USBR	1955	Snake River	5,208	1,201.0	1,201.0
Ririe	USCE	UC[1]	Willow Creek	620	97.0	87.0
Little Wood	USBR & Private	1959	Little Wood River	229	30.0	28.0
Teton	USBR	UC	Teton River	853	200.0	200.0
Anderson Ranch	USBR	1950	Boise River	980	423.2	423.2
Arrowrock	USBR	1917	Boise River	2,210	286.6	286.6
Lucky Peak	USCE	1955	Boise River	2,650	278.2	278.2
Brownlee	IPC	1958	Snake River	72,590	980.2	980.2
Dworshak	USCE	UC	N. Fk. Clearwater	2,440	3,400.0	2,000.0
TOTAL					8,051.2	6,639.2

[1] Under construction

SOURCE: Columbia-North Pacific Comprehensive Framework Study, Appendix VII, 1971



USGS for flood prone areas of St. Anthony, Caldwell, Weiser, and Kooskia.

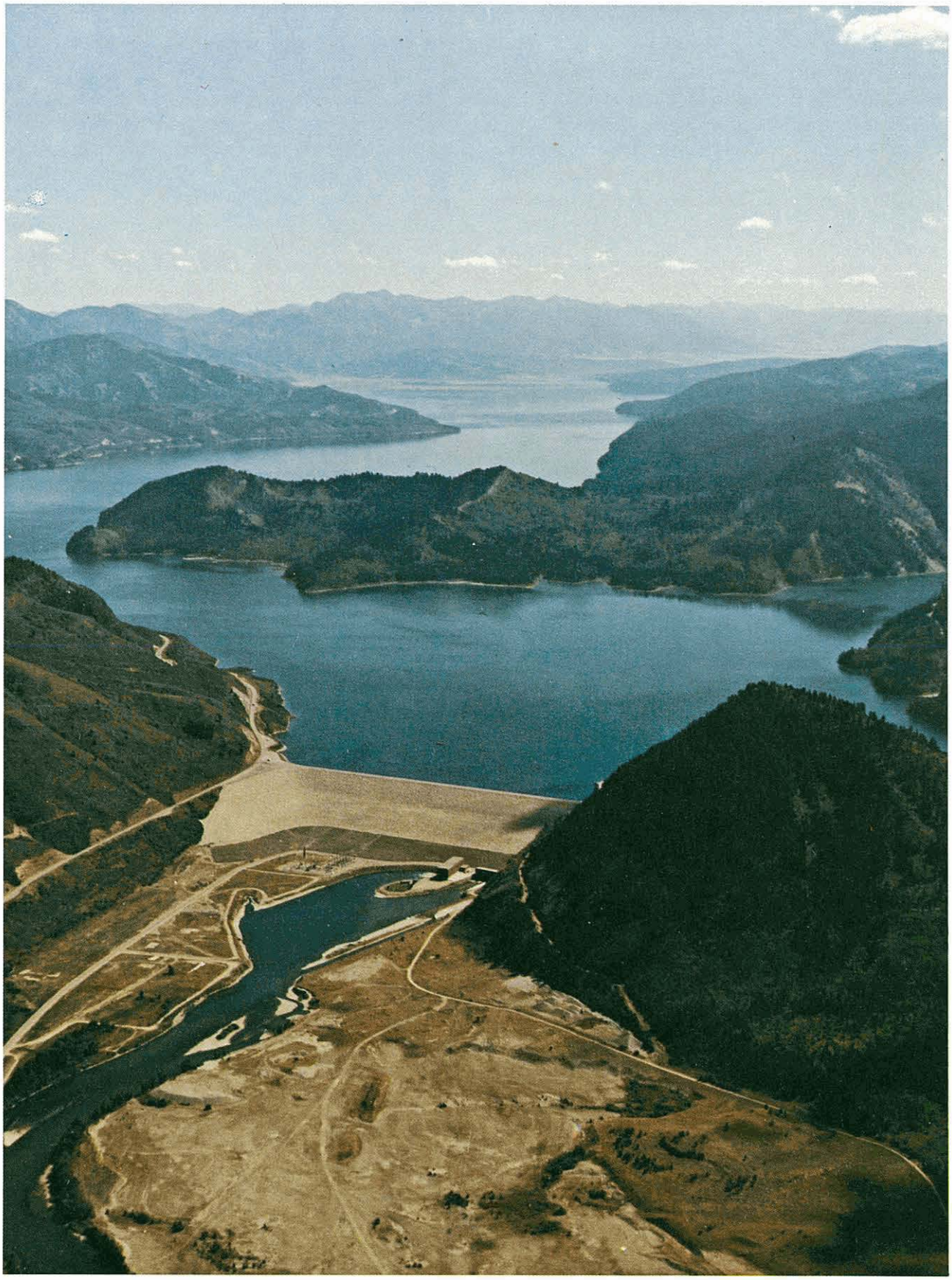
Flood problem areas are shown on Figure 37 and Table 39 lists damage figures for locations where estimates have been made. Average annual totals for each area do not necessarily reflect the relative importance of existing flood problems in Idaho. In some cases, the average damages are the result of rare but extensive flooding; in these situations, complete damage prevention would not be economically feasible. In others, the flooding may have covered a large area with only minor damage.

The need for flood plain management becomes obvious when projections of damages for a specific area, within a certain time period are considered. Where substantial increases in damages are projected, proper flood plain use regulation could eliminate much of the potential destruction.

TABLE 39
AVERAGE ANNUAL CURRENT AND PROJECTED FLOOD DAMAGE (1967 PRICE LEVELS)
(Thousands of dollars)

Stream and area	With 1967 economic development			Under projected economic development[5]		
	Rural	Urban	Total	1980	2000	2020
Placer Creek, Wallace	$ 0	$105	$105	$149	$267	$ 517
Snake River						
Heise-Roberts area	122	6	128	171	212	268
Blackfoot area	14	0	14	17	25	33
Shelley area	0+	0	0+	1	1	1
Henrys Fork	21	0	21	28	33	40
Teton[1]	69	11	80	108	139	180
Willow-Sand Creeks[2]	79	37	116	173	283	510
Blackfoot River[3]	4	0	4	5	6	8
Portneuf River	67	55	122	178	303	526
Lyons Creek	3	1	4	5	6	9
Mud Lake Basin	108	5	113	150	183	225
Big Lost River	114	18	132	179	229	300
Big Wood River	61	51	112	159	245	391
Little Wood River	54	134	188	277	472	814
Bruneau River	30	1	31	41	52	64
Boise River	66	34	100	138	208	321
Cottonwood Creek	0	34	34	62	142	320
Stuart Gulch	0	35	35	65	148	334
Hulls Gulch	0	6	6	11	24	55
Crane Gulch	0	38	38	69	159	360
Payette River	30	11	41	56	79	112
Weiser River	79	15	94	125	170	250
Salmon River	36	17	53	72	105	158
Clearwater River[4]	109	182	291	429	745	1,327

[1] Assumes Teton Project completed
[2] Assumes Ririe Project completed
[3] Assumes Blackfoot Reservoir enlargement completed
[4] Assumes Dworshak Project completed
[5] Assumes level of economic development required to provide regional share of national food and fiber needs
SOURCE: Columbia-North Pacific Region Comprehensive Framework Study, Appendix VII, June 1971



Chapter 4 / PLANNING REGIONS — PROBLEMS, NEEDS AND BASIC FRAMEWORK DEVELOPMENT ALTERNATIVES

Water resource planning in Idaho has been conducted on a regional basis since initiation of the Idaho Water Needs Studies in 1967 by the Idaho Water Resource Board. Five planning regions were established on the basis of hydrologic boundaries and were designed to match similar areas under study by the Pacific Northwest River Basins Commission. Since much economic and population data is available only by county, "economic regions" were also chosen, with boundaries based on county lines and matching the hydrologic regions as closely as possible. The five planning regions shown on Figure 38 are: Panhandle Basins, Clearwater-Salmon Basins, Southwest Idaho Basins, Upper Snake Basins, and Bear River Basins.

A general discussion of the resources, problems, and needs and the identification of independent local and public development alternatives is presented for each planning region. A similar statewide summary is also included.

PANHANDLE BASINS

The Panhandle Basins include all or portions of seven counties and the Idaho portions of three major river basins: the Kootenai; the Clark Fork-Pend Oreille, and the Spokane. County boundaries match the hydrologic boundaries between the basins quite well, allowing county data to represent basins adequately.

Lumbering, mining, and recreation are the principal industries. Significant amounts of water are used for irrigation only on Rathdrum Prairie in Kootenai County, and this use has little impact on the water supply available for other uses.

RESOURCES

The Panhandle contains Idaho's most abundant water resources. Precipitation and runoff on a unit basis are generally greater than anywhere else in the state. Mean annual precipitation ranges from 20 to more than 60 inches, occurring principally between October and June.

The Kootenai and Clark Fork rivers carry large flows into the area from Montana and British Columbia. The Kootenai River originates in the Canadian Rockies, flows south into Montana, then turns west into Idaho and returns to Canada at Porthill. Although it is the second largest tributary of the Columbia River in Idaho, it is smaller than the Clark Fork-Pend Oreille. The mean annual flow at Porthill totals about 11.5 million acre-feet. About 1.3 million acre-feet is contributed by runoff in Idaho.

The Clark Fork, which drains most of western Montana, carries about 15.8 million acre-feet per

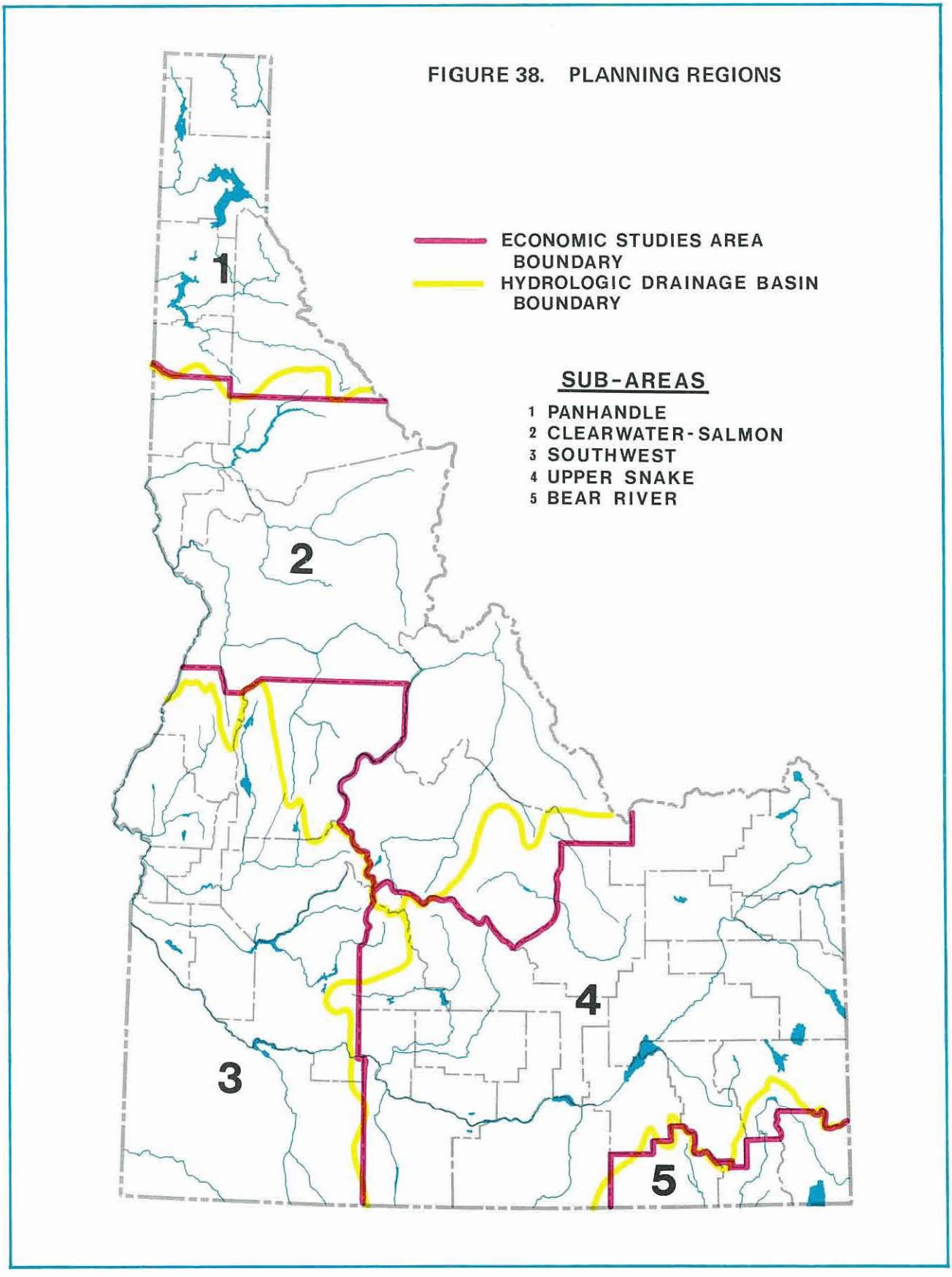


FIGURE 38. PLANNING REGIONS
ECONOMIC STUDIES AREA BOUNDARY
HYDROLOGIC DRAINAGE BASIN BOUNDARY
SUB-AREAS
1 PANHANDLE
2 CLEARWATER-SALMON
3 SOUTHWEST
4 UPPER SNAKE
5 BEAR RIVER
1
2
3
4
5

year at Cabinet — its point of entry into Idaho. When it leaves Idaho as the Pend Oreille River below Albeni Falls Dam mean annual flow increases to 18.5 million acre-feet.

The Spokane River originates in the Bitterroot Range in Idaho as the Coeur d'Alene and St. Joe rivers. Mean annual flow of the Spokane River at Post Falls is about 4.6 million acre-feet, nearly as great as that of the Snake River at Heise.

The Panhandle is famous for large lakes. The "big three" are Pend Oreille (148 square miles of surface area), Priest (37 square miles), and Coeur d'Alene (50 square miles).

Groundwater is a significant resource in the region. An estimated half-million acre-feet per year of groundwater is discharged to the Spokane River from the aquifer underlying Rathdrum Prairie. Irrigation wells on Rathdrum Prairie yield from 1,000 to 3,000 gallons per minute. Other valley areas in the Panhandle also contain good groundwater supplies, but well yields are generally smaller because of lower soil permeability.

Eighty-eight percent of the Panhandle land area is forested (4,099,000 acres) and about six percent (292,300 acres) is in cropland. The remainder consists of nonforested rangeland, urban and industrial areas, roads, and barren lands. Less than 10 percent (about 23,000 acres) of the cropland is irrigated; nearly all of it is on Rathdrum Prairie in Kootenai County.

The Coeur d'Alene mining district in Shoshone County is one of the most productive mining areas in the world, having yielded more than $2 billion worth of metals to date, principally silver, gold, lead, zinc, and copper.

The federal government is the largest landowner in the Panhandle, with about 53 percent of the land area or about 2,464,600 acres. Eight percent (373,700 acres), primarily forest lands west of Priest Lake, is owned by the state.

EXISTING DEVELOPMENT

The Panhandle's most significant water resource development projects were built for hydroelectric power. The largest plants are at Cabinet Gorge (Washington Water Power Co., 200,000 kilowatts), Albeni Falls (Corps of Engineers, 42,600 kilowatts), and Post Falls (Washington Water Power Co., 11,250 kilowatts). The city of Bonners Ferry operates a 2,380 kilowatt plant at Moyie Falls on the Moyie River. Libby dam and reservoir, presently under construction on the Kootenai River in Montana, will generate power and provide downstream flood control benefits. Both Libby and Albeni Falls are of major importance in the operation of the Columbia River system.

Levees in Kootenai Valley afford some flood protection to Bonners Ferry and to agricultural lands along about 50 miles of the river. There are also levees along the St. Joe River at St. Maries, and low level dikes provide partial protection for agricultural areas in the St. Joe Valley. A floodwall and levee shelter portions of Coeur d'Alene from high lake stages.

There are four small federally-constructed or rehabilitated irrigation projects on Rathdrum Prairie serving about 6,100 acres. Private irrigation systems supply another 17,000 acres, mostly from groundwater.

The Soil Conservation Service has constructed a small watershed project on the Fourth of July Creek watershed in the Coeur d'Alene River Basin, primarily to provide watershed protection and drainage facilities.

Lakes in the Panhandle receive heavy recreational use. Greater stabilization of water levels in the three largest lakes, resulting from controls for power production and other purposes, has had generally beneficial effects on their recreational potential.

The Moyie, Priest, and St. Joe rivers are under study by the U.S. Forest Service and the state of Idaho to evaluate suitability for inclusion in the National Wild and Scenic Rivers System. Those rivers or segments, if the study concludes that they should ultimately be included in the system, would be managed to preserve the values for which they were selected.

PROBLEMS AND NEEDS

Water-related problems in the Panhandle center on maintenance and enhancement of water quality and on recreational use of water resources. Water supply limitations prevalent else-

where in the state are virtually nonexistent in this region.

The primary concern in the Kootenai Basin is with possible problems in adapting to the changed flows after the Libby Project becomes operational. Agricultural drainage systems within diked areas in Kootenai Valley may have to be modified to handle local runoff and river seepage when river flows are high because of project releases for power and flood control. Portions of the valley may also lose some of the sub-irrigation which now results from high river stages during the early summer. These and other problems are being studied by the Corps of Engineers and other agencies so that any adverse effects caused by the project can be minimized.

The Kootenai River has enough water to irrigate lands in the Kootenai Valley and on the benchlands. Development costs will be substantial but may be feasible for high value cash crops. The University of Idaho Extension Service is evaluating interest in irrigation farming and examining potential for new types of crops in the area. The Idaho Water Resource Board has made preliminary studies to identify possible irrigation projects to serve some of the benchlands.

Possible long-range effects on the Kootenai Valley of the Columbia River Treaty with Canada should be recognized. The treaty provides that Canada will have the right at any time after 1984 (20 years from the date of treaty ratification) to divert up to 1.5 million acre-feet annually from the Kootenai River to the Columbia River in the vicinity of Canal Flats, provided that the flows on Kootenai River downstream from the point of diversion are not reduced to less than 200 cfs or natural flow, whichever is less.[1] If such diversion should ever take place, Idaho would retain enough water for irrigation and other consumptive purposes. Effects on recreation and fish and wildlife uses would probably be minimal.

Pend Oreille Lake is primarily managed for contributions to Columbia River system power and flood control. This has occasionally caused problems for fish spawning and for recreation and boating, but no feasible solutions have yet been proposed.

Summer homes and other lakeshore developments have contributed to water quality problems, particularly at Coeur d'Alene and several of the smaller lakes in the Spokane River Basin. Water and sewer plans are being prepared for rural communities in each Idaho county under a program of the Farmers Home Administration. These plans represent the first step toward solution of water quality problems caused by lakeshore establishments.

Lakeshore developments on Pend Oreille Lake occasionally experience flooding problems due to unusually large inflows resulting in high lake stages. A U.S. Army Corps of Engineers "Flood Plain Information Report" evaluating lake stage frequencies could help in forecasting and preventing flooding problems.

General land use plans are needed for all Panhandle basins to protect the region waterways.

In the Spokane River Basin, water quality and land use are the principal water-related problems. New sewerage systems are urgently needed along the South Fork of the Coeur d'Alene River, and research at the University of Idaho on effects of mine wastes on the South Fork should be continued and expanded. Water quality in the Rathdrum Prairie aquifer should be monitored to facilitate early detection of problems.

Additional public access to lakeshores should be provided, especially at Lake Coeur d'Alene, and land use along the lake should be controlled to prevent future flooding, control sewage disposal, and maintain scenic beauty.

Flood problems at Wallace and Pinehurst should be alleviated as soon as possible by channel reconstruction at Wallace and levee construction along Pine Creek at Pinehurst. Prevention of flooding of lowlands along the lower St. Joe River has been found to be infeasible by recent studies conducted by the Corps of Engineers. These and other lowland areas on tributaries to Lake Coeur d'Alene are subject to flooding during high flows because of backwater from the lake. Control would require increasing the lake outlet capacity, but this is infeasible due to the possibility of increasing

[1] Columbia River and Tributary; 87th Congress, 2nd Session; House Document No. 403.

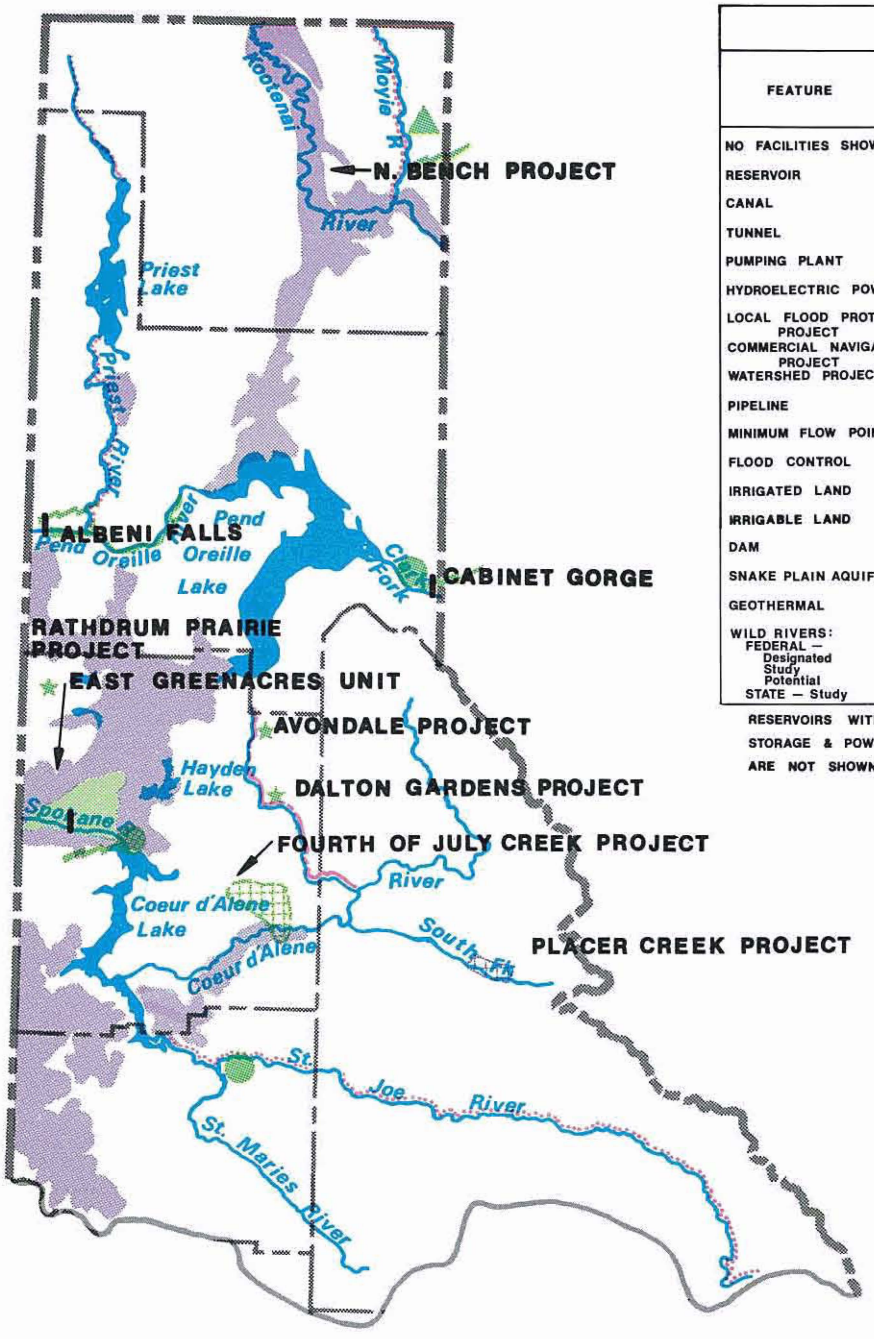
seepage losses from the river bed. Erosion of the St. Joe River banks through Chatcolet and Round lakes is occurring but no feasible means of prevention has been found.

The water supply for the East Greenacres Irrigation District is limited because of court-imposed restrictions on drawdown of Twin Lakes, the water source for the district. Irrigation water withdrawals have lessened opportunities for recreation at the Twin Lakes and much of this water is lost to seepage from irrigation canals. These problems underline the need to find a new water supply for the district.

BASIC FRAMEWORK DEVELOPMENT ALTERNATIVES

Independent local and public projects can help meet the problems and needs discussed. The activities of local communities and industries to reduce water pollution should continue. The Water Resource Board will cooperate with the Pacific Northwest River Basins Commission and other public and private agencies in water quality studies of the Spokane River Basin during the next three years as part of the State Water Plan. The Placer Creek Project and the East Greenacres Project are well underway and

FIGURE 39. PANHANDLE BASINS



LEGEND		
FEATURE	EXISTING OR UNDER CONSTRUCTION	POTENTIAL
NO FACILITIES SHOWN	★	★
RESERVOIR		
CANAL		
TUNNEL		
PUMPING PLANT		
HYDROELECTRIC POWERPLANT		
LOCAL FLOOD PROTECTION PROJECT		
COMMERCIAL NAVIGATION PROJECT		
WATERSHED PROJECT AREA		
PIPELINE		
MINIMUM FLOW POINT		
FLOOD CONTROL		
IRRIGATED LAND		
IRRIGABLE LAND		
DAM		
SNAKE PLAIN AQUIFER		
GEOTHERMAL		
WILD RIVERS: FEDERAL — Designated / Study / Potential; STATE — Study		

RESERVOIRS WITH LESS THAN 5000 ACRE-FEET OF STORAGE & POWERPLANTS OF LESS THAN 1 MEGAWATT ARE NOT SHOWN.

will be completed in the next few years. Additional studies are required to evaluate Kootenai Valley irrigation prospects. Because of the large quantity of water available, independent local irrigation projects in Kootenai Valley can proceed without conflict with the State Water Plan.

Independent Local Development

Predictions of development by local individuals, groups, or municipalities are subject to considerable change due to changing economic conditions, local needs and desires. Developments considered most likely to occur are presented.

Pollution control requires both local initiative and state and federal assistance. Waste water collection and treatment measures are matters of local responsibility. Financing and construction of a sewer system for the South Fork, Coeur d'Alene River Valley will probably be achieved in the near future.

The Spokane River Basin Depollution Committee, an interstate group involving industry, local governmental bodies, and state representatives has been formed to find ways of achieving water quality goals in the Spokane River Basin.

The Washington-Idaho Resource Conservation and Development Project, underway for several years, is aimed at improving economic conditions and achieving better care of natural resources. This project area included Kootenai, Benewah, and Latah counties in Idaho and Spokane County in Washington.

Public Development

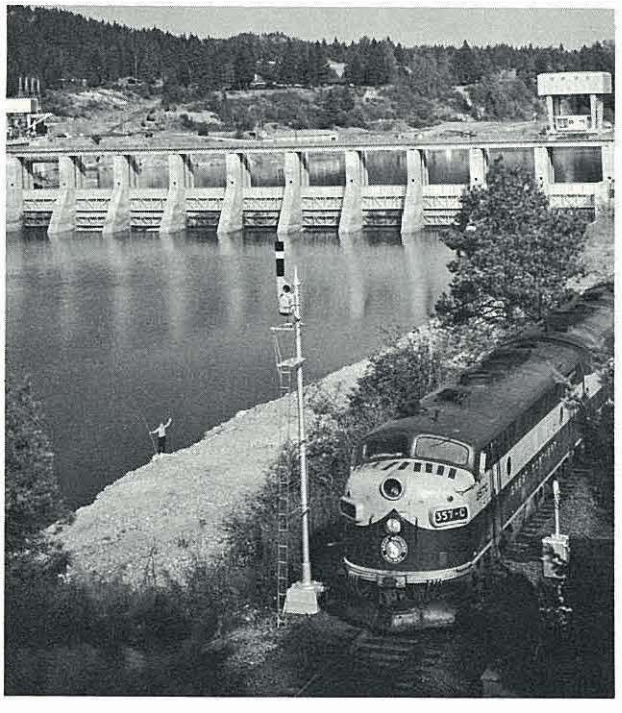
Structural Measures. Structural development alternatives involving state and/or federal agencies include irrigation, flood control, recreation, and small watershed projects. The locations of these projects are shown on Panhandle Basins Figure 39.

PLACER CREEK PROJECT. In 1968 the Corps of Engineers proposed to reconstruct the Placer Creek flood control channel at Wallace to provide adequate capacity for floods in that stream. The project, which would cost an estimated $2.2 million was endorsed by the Governor after review by the Board staff. The project was authorized by Senate and House Public Works Committees Resolutions in December 1970, but is yet unfunded.

EAST GREENACRES PROJECT. Replacement of the East Greenacres water supply by wells was studied by the U.S. Bureau of Reclamation as a means of limiting drawdown in Twin Lakes; thereby the Greenacres unit would supply water to about 3,425 acres of new land and 1,860 acres of dry farm land. This project was endorsed by the Board in 1969 and has received federal authorization. Initial construction funds were appropriated for fiscal year 1972. The estimated project cost is $6 million.

NORTH BENCH PROJECT. The North Bench Project is located in Boundary County. The purpose of the project is to irrigate about 10,000 acres of high bench lands directly north of Bonners Ferry. The lands are presently dry farmed and produce primarily small grains and forage crops.

Three alternate plans have been identified in a reconnaissance investigation by the Board. Kootenai River would be the water source for two alternatives and the natural flows of Mission and Rock creeks with storage on Mission Creek



would provide a water supply for the third alternative.

The University of Idaho Extension Service is assisting local interests in raising test plots of different crops that may be adaptable to that area. If the test plots prove favorable and local interest continues, project studies should be continued to the feasibility level. Preliminary costs for a 10,000-acre open lateral system are estimated to be about $6,950,000.

Nonstructural Measures. The St. Joe, Moyie, and Priest rivers are being studied by the U.S. Forest Service in cooperation with the state to determine whether they should be recommended for inclusion in the National Wild and Scenic Rivers System established by Congress in 1968. Management plans accompanying a favorable recommendation would treat existing problems, such as flooding, in the areas affected by inclusion.

The state should consider establishing a state system of wild, scenic, and recreational streams. Within the Panhandle Basins, the North Fork Coeur d'Alene River (from headwaters to confluence with South Fork Coeur d'Alene) has been suggested for possible inclusion in such a system, in addition to the St. Joe, Priest, and Moyie rivers.

The Corps of Engineers is preparing flood plain information reports for Wolf Lodge Creek and for the lower 13 miles of the St. Joe River and the lower 8 miles of the St. Maries River. These reports will provide counties with technical data on flooding and guidelines for zoning regulations which can prevent further construction in areas subject to floods.

Other forms of land use zoning are needed to protect scenic, wildlife, and recreational values along Panhandle waterways. Planning and zoning commissions are working on this problem in each of the counties. Five of the counties have recently formed a Panhandle Regional Planning Commission.

Potential Effects

Projects and programs being considered by both private and public entities are limited. No substantial direct economic effects would accrue to the region as a result of the projects being considered. Projects such as the East Greenacres Project and North Bench Project would provide economic benefits to the local area.

Implementation of the water quality and land use programs would assist in preserving and enhancing the environment of the region. Since a quality environment is the region's major asset, these programs should be vigorously pursued.

REMAINING PROBLEMS AND OPPORTUNITIES

These projects and programs would alleviate some of the most obvious problems in the area, but population growth and increasing pressures on resources will magnify others. Solutions have been proposed for only two of the many sites in the region where flooding causes damage.

Water quality will improve through efforts to collect and treat waste from communities. However, much of the pollution load comes from nonpoint sources and will be particularly difficult to keep out of lakes and streams. A study should be made to determine the sources of nutrients and pollutants entering Coeur d'Alene, Hayden, Spirit, and Twin lakes and necessary corrective action should be taken. Nutrients from otherwise adequate disposal systems will continue to enrich lakes; and residual effects from mining wastes may continue to affect aquatic life far into the future.

Modeling of water quality parameters of lakes and streams is needed to guide development of optimal collection and treatment systems. However, water quality modeling as a science is only beginning, and the necessary data are generally unavailable.

As was indicated under "Problems and Needs", new problems may arise in the Kootenai Valley as the old problem of flooding is solved by the Libby Project. Studies are underway to determine the magnitude of these new problems and to find solutions to them.

CLEARWATER-SALMON BASINS

The Clearwater-Salmon Basins include the drainage areas of the Palouse, Clearwater, and Salmon rivers and encompass 24,563 square miles, about 29 percent of the state. The division point between this region and the Southwest Idaho Basins is located about eight miles below Oxbow Dam on the Snake River.

Except for a small area near Lewiston, the region is rugged, mountainous and heavily forested. The Clearwater and the Salmon river mountains form the state's largest block of mountain ranges.

RESOURCES

Although population density is relatively low, totaling 4 persons per square mile in 1970, the region has a major forest products industry, a modest but important agricultural development, and a growing tourist-recreation industry.

Climate varies within the basins according to elevation. Temperatures in the higher elevations seldom exceed 90 degrees. Minimum temperatures of 32 degrees or less occur from 100 to 300 days per year, depending on elevation, and precipitation varies between 10 and 70 inches annually.

The region's river systems include the Snake, Salmon, Clearwater, Selway, Lochsa, and Palouse rivers. Average runoff from the Salmon and Clearwater basins is about 19 million acre-feet per year. The Salmon River experiences a very regular pattern of snowmelt runoff, usually beginning in April and declining to relatively low flows of generally less than 6,000 cfs by mid-August. Fall and winter flows seldom exceed that magnitude. The Clearwater basin is more subject to rainstorm floods and may produce relatively high flows anytime between November and July. Snowmelt runoff usually sustains large flows through July. Average flow of the Snake River at Clarkston totals 33,194,000 acre-feet annually.

The land resources range from hilly, stony, and shallow soils to basalt plateaus and steep canyons, with soil quality placing varying restrictions on land use.

Practically all of the acreage in the region suitable for nonirrigated agriculture (933,000 acres) is already successfully dry-farmed. Approximately 144,000 acres are presently irrigated, and 129,000 of these consist of small areas scattered throughout the Pahsimeroi and Lemhi valleys.

Very little irrigation has been developed using groundwater, although a few areas, notably the Pahsimeroi Valley, do have access to a good groundwater aquifer. Groundwater is the major source for municipal water in the Moscow area.

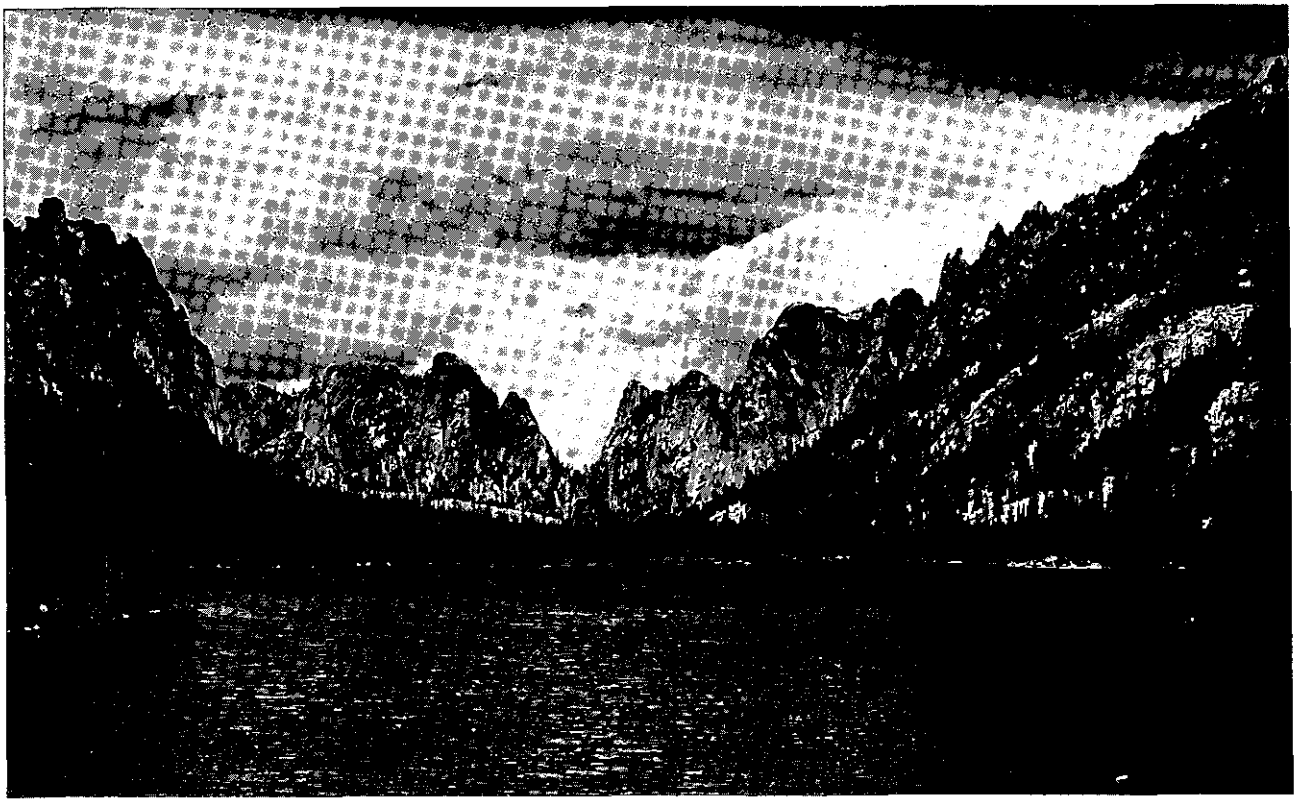
Major active reservoir storage in the region is provided by dams at Dworshak (2 million acre-feet) and Hells Canyon (20,000 acre-feet). The primary function of both facilities is power production.

The region is one of the last and largest recreational areas in the United States existing almost wholly in its natural state. The spectrum of plants, trees, fish, game, and other animals offers unlimited opportunities for relaxation in a primitive setting. Recreational resources include the Idaho Primitive Area, Selway-Bitterroot Wilderness, Salmon River Breaks Primitive Area, Hells Canyon-Seven Devils Scenic Area, and portions of the Sawtooth Primitive Area and White Clouds Peaks Area. There are 27,500 acres of water surface within the region.

About 72 percent of the area is forested. Timber production and grazing are among the major land uses, and because of severe erosion danger and federal ownership of most of this land, this general use pattern will probably remain the same in the future. Over 8.3 million acres are classified as commercial forest land, but another 1.7 million acres have been withdrawn from cutting. About 42 percent of the state's total lumber production occurs in this region.

Gold, silver, copper, lead, and zinc have been produced in substantial quantities. Although mining is currently being conducted on a greatly reduced scale, the potential for future mineral production is high.

The largest landowner in the region is the federal government with 11.8 million acres or 75 percent of the total land area. Private ownerships total 3.4 million acres or 22 percent of the region, and the remaining 3 percent consists of state, county, and municipal lands.



EXISTING DEVELOPMENT

Water resource development to date has centered around hydroelectric power production. The two major hydroelectric facilities in the Clearwater-Salmon Basins are Dworshak power plant (400,000 kilowatt installed capacity) and Hells Canyon power plant (450,000 kilowatt installed capacity). A small hydroelectric power plant at Lewiston has a plant capability of 10,400 kilowatts.

Dworshak Reservoir, now entering completion, has 2 million acre-feet available for flood control storage. The federal government and local interests have constructed improved channel and levee projects at five locations: Potlatch River and Bear Creek near Kendrick, Mission Creek at Mission Creek, and Lapwai Creek at Culdesac and Sweetwater.

The Port of Lewiston was organized in 1958. Navigation is possible from Lewiston to the Pacific coast during high water periods, and as soon as Lower Granite Dam is completed (now scheduled for 1975) slack water navigation will be available throughout the year.

The river reach between Lewiston and Johnson Bar is navigated primarily by recreation craft in the 16 to 20-foot class. Two large passenger boats and one tugboat which handles cargo shipments also use it.

A steelhead trout hatchery, the largest in the world, was constructed at a cost of $14 million in connection with Dworshak Dam to perpetuate the steelhead trout run. Other major fish facilities include the Rapid River fish hatchery and the Pahsimeroi trap; and fish-passing facilities have been completed at Dagger Falls and Selway Falls to restore and maintain anadromous fish runs.

The Lewiston Orchards irrigation project, located on a benchland adjacent to Lewiston, was built by private interests in the early 1900s. It was enlarged and extensively rehabilitated by the Bureau of Reclamation in 1947 to provide a water supply to about 3,600 acres. A large portion of the project lands have been taken over by suburban development.

Recreational facilities for camping, picnicking, and water sports are located at Stanley and Redfish lakes. Boating facilities have been developed at Lewiston and greatly expanded opportunities will be provided for recreation at Dworshak Reservoir when construction is completed.

Lewiston and Moscow are the only major urban centers in the region. Population growth between 1960 and 1970 totaled 9.4 percent, compared to 6.8 percent for the state and 13.3 percent for the nation. Net outmigration during the same period was about 1,900 people or approximately 5 percent of total state outmigration.

PROBLEMS AND NEEDS

More water originates within the basin than could possibly be used to meet all forecasted needs. The distribution of water in time and by location within the region, as well as conflicts among different water uses, are the chief causes of water problems.

There are no major flood problems in the region. Flooding is generally local, and usually results from heavy runoff from snowmelt or intense winter rains. Flood problems occur in the reach of the Salmon River between Challis and the North Fork of the Salmon River; around Kooskia, Stites, Juliette, Kamiah, Peck, and Orofino along the Clearwater River; and at Moscow on the Palouse River.

Idaho's share of the economic growth stimulated by water-borne transportation to the Pacific Ocean will also present problems, including a need for increased transportation and port facilities.

Pleasure boating in the reach of the Snake River from Lewiston to Johnson Bar has encountered difficulties with fluctuations in river levels and low flows. The Lewiston Chamber of Commerce has submitted a request to the Federal Power Commission for a change in the license of Idaho Power Company for operation of Hells Canyon Dam as a result of these problems. (This issue is discussed in detail in Chapter 2 in the section entitled "Major Policy Issues".)

Water quality in the region is generally excellent, but problems requiring action exist in specific areas. On the Snake River, supersaturation nitrogen levels have proved to be a threat to anadromous fish. Recreation and summer home development on lakes, reservoirs, and river reaches, including Williams Lake and areas near Salmon, are causing severe damage to water quality. Water and sewerage needs of rural communities are being studied through planning grants from the Farmers Home Administration. Where major facilities are needed, rural communities will require maximum assistance from federal and state financing programs.

The community of Moscow needs an alternate water supply to supplement or replace its existing system in order to keep pace with the community's growing population.

In spite of outstanding recreational resources, the region lacks adequate facilities for camping, picnicking, boating, and winter sports. Increasing demands for outdoor recreation could result in overcrowding and inefficient use of the region's resources.

The region is included in the coordinated power system serving the entire Pacific Northwest. Although the region's future power needs will probably be modest, the construction of power transmission lines may encounter strong opposition because of power line interference with the wild and scenic qualities of the region.

The Palouse River Basin is the highest sediment-yielding area in the state. The Nez Perce Prairie in Idaho also experiences moderate to severe erosion problems. In some places, loss of topsoil has caused a substantial reduction in crop yields.

About 78 percent of the region's irrigated land has an inadequate water supply, particularly the New Meadows, Challis, Texas Creek, and Lemhi River areas.

The "Winters Doctrine", involving Indian tribal rights to water, and the "Reservation Doctrine", concerning the question whether water originating on federal lands can be developed without reliance on state law, are not expected to be major issues in this region. (These two issues are discussed in Chapter 2, in the section entitled "Major Policy Issues".)

BASIC FRAMEWORK DEVELOPMENT ALTERNATIVES

This section discusses independent and local public projects which can help meet the problems and needs mentioned. The activities now underway by local communities and industry to provide new water supplies and prevent pollution of stream courses should continue.

A five-year moratorium on Middle Snake construction as proposed by the Federal Power Commission examiner, or a seven-year moratorium as proposed by Senators Church and Jordan will allow time to analyze the Middle Snake area: its relationship to downstream uses;

the possibility of utilizing surplus Salmon River flows via tunnel (Chapter 5); and the relationship to upstream water uses. All of the various alternatives will be subject to further review and reevaluation during the next three years as part of the State Water Plan.

The Pullman-Moscow water supply problem should receive continued evaluation by local, state, and federal agencies. If local agreement can be reached on a project, the project can go forward as part of the State Water Plan.

The Lapwai Creek project has been authorized and should be completed by 1980. Detailed studies should not be undertaken on the Lenore project, the Asotin Dam project, and Middle Snake River hydroelectric alternatives. These projects will be briefly reappraised in the state water planning effort. Projects that would affect the Salmon River such as Nez Perce, Lower Canyon, Freedom, Crevice, Pahsimeroi, Challis, and Tailholt should not receive detailed studies at this time but will be reevaluated during the state water planning program in the next three years. The purpose of this reevaluation will be to display clearly all alternatives to the public and provide a basis for possible compensation to the state in the event that the Salmon River is included in the National Wild and Scenic River System. The evaluation of instream needs below Hells Canyon Dam is of particular importance because of the potential conflict with future upstream uses in southern Idaho.

Independent Local Development

It is assumed that new water and sewerage facilities required in urban areas will be built through independent local development using available state and federal financial assistance A major exception may be a federal project to provide municipal water to the Moscow area from a storage reservoir on the North Fork of the Palouse, groundwater in the Palouse Basin, or direct pumping from the Snake. These alternatives are discussed in more detail in "Public Development" which follows. Areas where water and sewer facilities are needed in the near future include Moscow, Orofino, Cottonwood, Grangeville, and Salmon.

The Idaho-Washington Resource Conservation and Development Project, involving all or portions of Shoshone, Benewah, and Latah counties, is underway. The project encompasses 2,056,798 acres in Idaho. The purpose of Resource Conservation and Development projects is to improve economic conditions in the project areas.

Steps taken in the development of the Port of Lewiston include the acquisition of 60 acres of land by the Port Authority and negotiations for an additional 17 acres. Installation of shipping facilities is also being negotiated and extension of rail service to the port area has been assured.

Guidelines have been agreed on to control pollution at the Port of Lewiston and at Clarkston and Whitman County, Washington. The current schedule calls for filling of the Lower Granite Pool early in 1975. A suit was brought by Northwest Steelheaders Council of Trout Unlimited (NSCTU) to stop construction of the dam. The suit by NSCTU contended that the federal government had violated federal conservation laws in planning and building the dam and that irreparable damage would be caused by construction of the facility. The suit was dismissed by the court. Some interests in Lewiston have also recommended that the maximum pool elevation of Lower Granite Reservoir be 730 feet rather than the 738 feet authorized by Congress. This would eliminate the opportunity for a port at Lewiston. Without a congressional act changing the project plans, the Corps of Engineers must complete the project as authorized.

Additional facilities for pleasure boats at Lewiston will probably be provided through independent local development.

Several alternative hydroelectric projects have been proposed for development by the Pacific Northwest Power Company and the Washington Public Power Supply System on the Snake River between Hells Canyon and the mouth of the Salmon River. These include the High Mountain Sheep (HMS) project, the Appaloosa-Low Mountain Sheep (A-LMS) project, and the Pleasant Valley-Low Mountain Sheep (PV-LMS) project as possible development alternatives. Application for a license to construct a project has been submitted to the Federal Power Commission (FPC). The Idaho Water Resource Board believes

that if a project is to be built, the state should receive a share of the benefits. (A full discussion of this issue is presented in Chapter 2 in the section entitled "Major Policy Issues".)

Public Development

Structural Measures. Structural development alternatives in this region include projects for municipal water supplies, flood control, navigation, hydroelectric power, irrigation and watershed protection. The locations of these projects and facilities are shown on Clearwater-Salmon Basins Figure 40.

PULLMAN-MOSCOW WATER SUPPLY. In August 1966, the Pullman-Moscow Water Resources Committee (P-MWRC) was formed to find a mutually agreeable way of augmenting water supplies for four entities: Moscow, Idaho; Pullman, Washington; the University of Idaho; and Washington State University. Current supplies are obtained from groundwater, but groundwater levels have been dropping rapidly, particularly around Pullman.

The P-MWRC retained the consulting firm of Stevens, Thompson, and Runyan, Inc. (STR) to prepare a report on surface water sources which could possibly be developed to augment present water supplies. Alternative projects listed by STR include the following: Snake River Project; Palouse River Project; Troy Watershed Project; Potlatch River Project; Clearwater River Project; and USCE-Palouse Basin Project. The P-MWRC has not yet decided which of these projects, if any, should be developed. The Board has not taken positions on the various proposed projects, but has offered its assistance in meeting the needs of Idaho interests wherever possible. A summary of the capital costs for the alternative projects is shown in Table 40.

LAPWAI CREEK, CULDESAC. The project has been authorized for construction by the Corps of Engineers and would involve realignment and enlargement of the Lapwai Creek channel through Culdesac to provide flood protection. The project should be completed by 1980 at a cost of about $114,000.

ASOTIN DAM PROJECT. Authorized in 1962, the project consists of a dam on the Snake River at Asotin, a powerhouse with an initial installed capacity of 466,000 kilowatts, and fish-passage facilities. Plans also provide for construction of a navigation lock to extend navigation to the large limestone deposits in Idaho and Washington at Lime Point. Estimated construction cost is $132 million.

Funds have not been appropriated by Congress for the project and its fate is doubtful. Fish and wildlife interest groups have opposed the project as unnecessary and environmentally harmful. The Board has not supported construction of the project because of possible damage to the anadromous fish runs.

LENORE PROJECT. A dam on the Clearwater River about two miles upstream from Lenore, with fish-passage and power generating facilities, would provide power generation and

TABLE 40

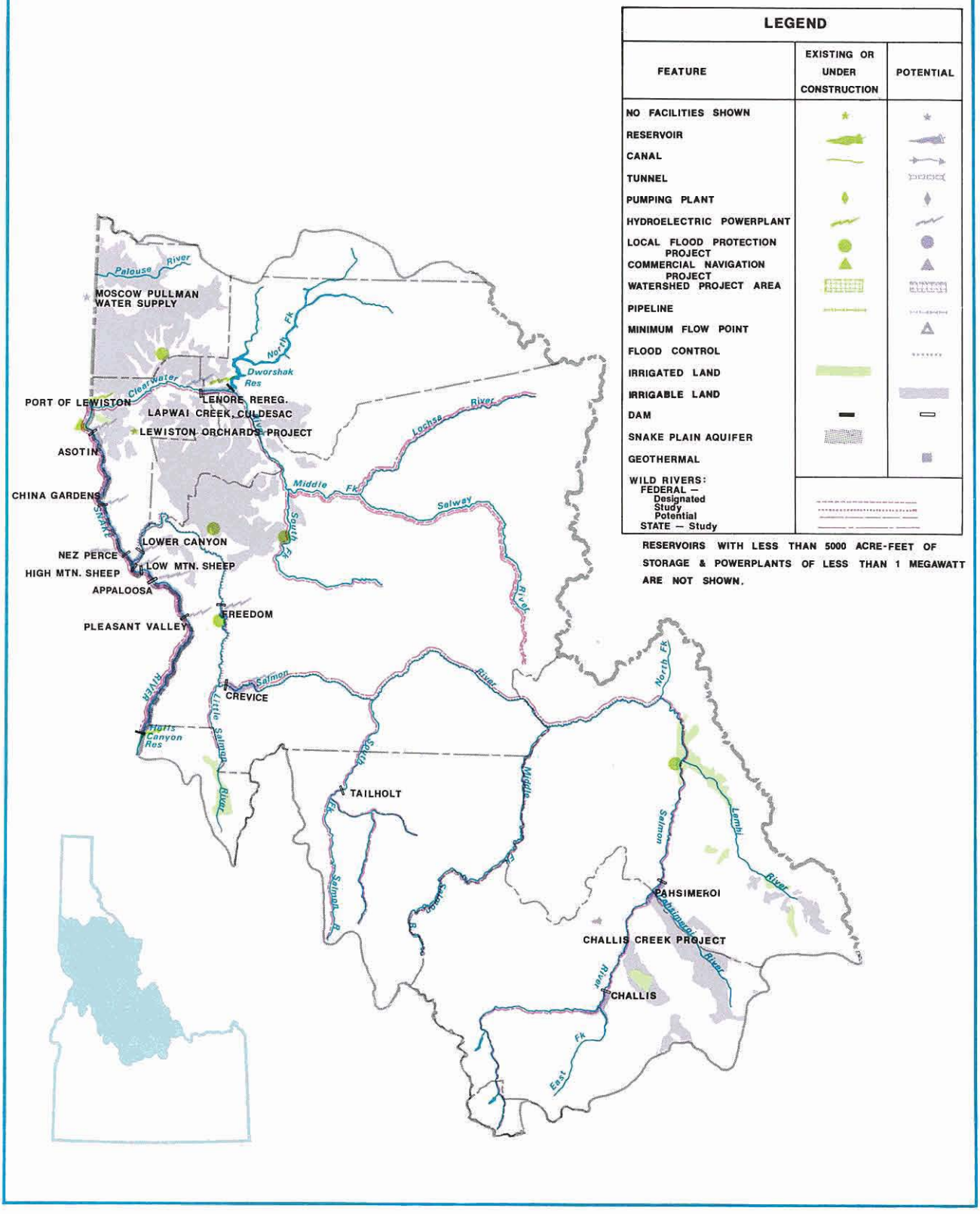
SUMMARY OF CAPITAL COSTS, PULLMAN-MOSCOW WATER SUPPLY

(Thousands of dollars)

Alternative Projects	First Stage	Second Stage	Third Stage	Total
Snake River	$ 9,014	$ 4,772	$ 896	$14,682
Palouse River Basin	14,600	345	4,062	19,007
Troy Watershed	14,544	9,149	5,572	29,265
Potlatch River	15,444	683	8,194	24,321
Clearwater River	14,498	683	9,506	24,667
USCE-Palouse Basin	12,260	301	3,068	15,629

SOURCE: Water Supply for the Pullman-Moscow Area; Pullman-Moscow Water Resource Committee; Stevens, Thompson & Runyon, Inc.

FIGURE 40. CLEARWATER-SALMON BASINS



reregulation of peaking power releases from Dworshak Reservoir. The 75-foot-high dam would provide about 11,000 acre-feet of active storage capacity with a 10-foot drawdown. It would inundate 11 miles of the Clearwater River.

The Board has not taken an official position on the project because Corps of Engineers studies of the Lower Clearwater Basin are not completed and because the project would interfere with steelhead fishing from Lenore to Dworshak Dam, a 29-mile reach of the Clearwater River. If the Lenore Project is not built, power capabilities at Dworshak would have to be significantly reduced to prevent wide variations in river flows, but steelhead fishing would be preserved. If the project is authorized and funded, it will probably be constructed during the period from 1980 to 2020. Estimated project costs total $60.5 million.

CHALLIS CREEK PROJECT. Near Challis, the project has been studied by the Bureau of Reclamation, but no action has yet been taken because of the lack of local support. It would involve a dam on Challis Creek which would provide supplemental water to about 2,600 acres and also supply about 140 acres of new irrigation. Project costs are estimated at about $4,260,000.

The Board has not taken any action concerning this project. It is unlikely that it could be authorized and funded before 1980.

MIDDLE SNAKE RIVER HYDROELECTRIC ALTERNATIVES. The Snake River reach from Hells Canyon Dam to Lower Granite Reservoir could be developed by at least four alternate plans for hydroelectric power. These plans are summarized in Table 41 and project sites are shown on Figure 41. The following description of the alternative plans is a direct copy of material included in Appendix XV, Electric Power, Columbia-North Pacific Framework Study. The Board has opposed the High Mountain Sheep-China Gardens and Nez Perce-China Gardens projects (Plans 1 and 4) because of the adverse effects to the anadromous fish runs up the Salmon River. The Federal Power Commission denied a license for the Nez Perce project because of the adverse effects on the anadromous fish runs and the project is no longer under active consideration. However,

TABLE 41

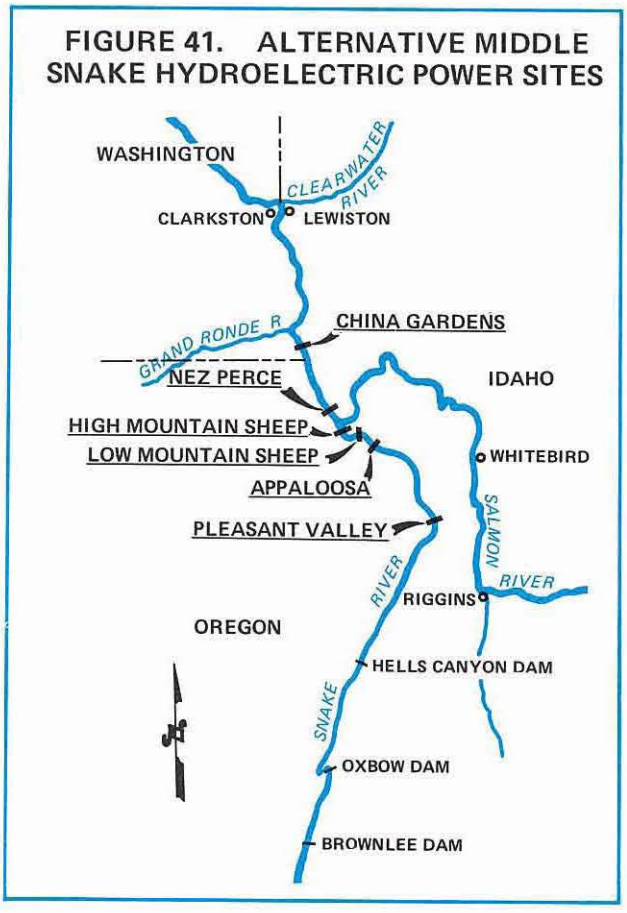
ALTERNATIVE HYDRO DEVELOPMENTS, MIDDLE SNAKE RIVER

Project	Usable storage (thousand acre-feet)	Gross head (feet)	Average annual generation[1] (average MW)	Ultimate plant capability (MW)
High Mountain Sheep	2,250	565.0	608	3,430
China Gardens	Pondage	102.5	190	625
Subtotal	2,250	667.5	798	4,055
Appaloosa	1,500	410.0	457	2,250
Low Mountain Sheep	Pondage	153.0	122	360
Subtotal	1,500	563.0	579	2,610
Pleasant Valley	622	382.0	391	2,170
Low Mountain Sheep	Pondage	181.0	188	600
Subtotal	622	563.0	579	2,770
Nez Perce	4,700	615.0	957	5,000
China Gardens	Pondage	52.5	100	325
Subtotal	4,700	667.5	1,057	5,325

[1] At-site generation based on 2010 irrigation diversions

SOURCE: Appendix XV, Columbia-North Pacific Framework Study

FIGURE 41. ALTERNATIVE MIDDLE SNAKE HYDROELECTRIC POWER SITES



should future studies show that anadromous fish runs face extinction, as some have suggested, the feasibility of the Nez Perce project would need to be re-examined. The material on these alternative plans is included in this report so that Idahoans are aware of the alternatives for use of the water resources of the state.

1. High Mountain Sheep — China Gardens. The High Mountain Sheep damsite is located at river mile 189.0 on the Snake River about one-half mile above the confluence with the Salmon River and about 2.7 miles below the mouth of the Imnaha River. The development proposed by Pacific Northwest Power Company and Washington Public Power Supply System in a joint application to the Federal Power Commission consists of a concrete arch type dam approximately 670 feet high to provide a full reservoir elevation of 1,510 feet extending 58 miles up the Snake River to Hells Canyon Dam. The project would provide 2,250,000 acre-feet of usable storage for flood control and power generation. Penstock intakes would be set at an elevation low enough to permit maximum withdrawal of 3,100,000 acre-feet if needed. The initial installed capacity has been tentatively established at 1,290,000 kilowatts in three units and an ultimate generating capacity in seven units of 3,010,000 kilowatts. The plant capabilities (at overload rating) would be about 15 percent higher. The gross head for power with tailwater elevation 940 feet, China Gardens pool elevation, would be 565 feet. Under 2010 irrigation depletions, the project would generate an average of about 608,000 kilowatts annually. Facilities for trapping adult salmon at High Mountain Sheep and transporting them elsewhere for propagation would be incorporated in the development.

While China Gardens was not included as a part of the 1969 amended application, it would be required for full development of this reach. The damsite is located on the Snake River at mile 172.5, about 16 miles below the mouth of the Salmon River. The dam would develop 102.5 feet effective head between High Mountain Sheep and Asotin. The dam would be a straight concrete-gravity type with a normal pool elevation 945 feet. The initial installation would be three 110,000 kilowatt units, giving a total plant capacity of 375,000 kilowatts. The ultimate installation would be five units, giving a total plant capability of 625,000 kilowatts. Average annual generation under 2010 conditions would be 190,000 kilowatts.

2. Appaloosa-Low Mountain Sheep. This development is an alternative to High Mountain Sheep development. The Appaloosa damsite is located on the Snake River at mile 197.6, approximately 8 miles upstream of the High Mountain Sheep damsite. The dam would be a concrete arch structure, having a maximum height of about 600 feet. At normal full pool elevation 1,510 feet, the project would provide 1.5 million acre-feet of usable storage for flood control and power generation. The initial installation would consist of a four-unit powerhouse having a total installed capacity of 1.3 million kilowatts and plant capability at 15 percent overload of 1.5 million kilowatts. Ultimately, two more units

would be added giving a total installed capacity of 1,950,000 kilowatts and a capability of 2,250,000 kilowatts. Under 2010 conditions, the project would generate on the average about 457,000 kilowatts. Since the Appaloosa project is located farther upstream on the Snake River than High Mountain Sheep, less land would be flooded. The plan also leaves an open stretch of the river from the Low Mountain Sheep reregulator, past the mouths of the Imnaha and Salmon rivers, and down to the head of the pool behind Asotin Dam. Facilities for trapping adult salmon at Low Mountain Sheep and transporting them elsewhere for propagation would be included in the development.

An integral part of the Appaloosa alternative, as proposed in the amended joint application filed by PNPC and WPPSS, the Low Mountain Sheep reregulating dam would be a concrete gravity structure, located at mile 192.5 on the Snake River, about 0.75 miles upstream from the mouth of the Imnaha River. About 30,000 acre-feet of reregulation storage would be provided in 70 feet drawdown between maximum pool elevation 1,100 feet and minimum pool elevation 1,030 feet. The initial installed capacity would be 156,000 kilowatts and the ultimate capacity 312,000 kilowatts. At 15 percent overload, the plant capabilities would be 180,000 and 360,000 kilowatts, respectively. Average annual generation under 2010 conditions would be about 122,000 kilowatts.

3. Pleasant Valley-Low Mountain Sheep. This plan, which also includes reregulation at Low Mountain Sheep, was the plan proposed by Pacific Northwest Power Company in their original license application in 1955. Now included again, as one of the three alternatives in the 1969 joint application, the Pleasant Valley damsite is located on Snake River at mile 213.0, about 15½ miles upstream from the Appaloosa damsite. Like High Mountain Sheep and Appaloosa, the dam would be of concrete arch construction and would be about 550 feet high. At normal full pool elevation 1,510 feet, usable storage totaling 622,000 acre-feet would be provided with a 124-foot drawdown. Plans call for the initial installation of four units, having a total installed capacity of 1,088,000 kilowatts (plant capability of 1,240,000 kilowatts). Ultimate installation would be seven units, totaling 1,890,000 kilowatts (2,170,000 kilowatt capability). The average generation would be 391,000 kilowatts.

The Low Mountain Sheep reregulator included in the Pleasant Valley plan would be located at the same site as the Appaloosa reregulator and would also be of concrete gravity construction. However, the Pleasant Valley reregulator would have a maximum pool elevation of 1,128. Reregulation storage of 28,000 acre-feet would be obtained with a 15-foot drawdown. Initial installed capacity would be two 175,000 kilowatt units giving a total plant capability of 400,000 kilowatts at 15 percent overload. The ultimate capacity would depend on downstream developments. Average annual generation under 2010 conditions would be about 188,000 kilowatts.

4. Nez Perce-China Gardens. Although no longer under active consideration, Nez Perce is the fourth alternative for development of the Middle Snake. The damsite is located on the Snake River at approximately river mile 186, about 2½ miles below the mouth of the Salmon River. As proposed by Washington Public Power Supply System in their amended application of August 10, 1960, the reservoir would have a maximum pool elevation of 1,510 feet and provide 4.7 million acre-feet of usable storage for power production and flood control with 213.5 feet drawdown. The reservoir at full pool would extend 63 miles up the Salmon River, 61 miles up the Snake River to the Hells Canyon tailwater, and about 10 miles upstream on the Imnaha River. The dam would be a concrete, double-curvature arch type, approximately 700 feet high with the length along the crest being about 1,950 feet, including thrust block and adjoining spillway. As proposed, the project would initially have 10 units, giving an installed capacity of about 2 million kilowatts and a maximum plant capability at 15 percent overload of 2,290,000 kilowatts. Under ultimate development, six more units would be added, giving a maximum plant capability of 3,550,000 kilowatts. Using present criteria, fewer, larger units would be used and the ultimate plant capability would be greater, on the order of 5 million kilowatts. Based on 2010 irrigation

depletions, the project would generate about 957,000 kilowatts annually. Because a high dam located below the mouth of the Salmon River would block and perhaps destroy the important anadromous fish runs in the Salmon, Imnaha and Middle Snake rivers, the Nez Perce project has been abandoned in favor of High Mountain Sheep or alternative project located above the mouth of the Salmon River.

Although not included in the license application, China Gardens would be required to fully develop the reach under this plan also. The dam would be a concrete gravity structure located at mile 172.5 and, with a normal pool elevation of 895, would develop 52.5 feet of head. Average annual generation and ultimate plant capability would be 100,000 and 325,000 kilowatts, respectively.

SALMON RIVER HYDROELECTRIC ALTERNATIVES. The Salmon River offers some of the greatest potential for hydroelectric power development in the United States. Development of the power would adversely affect the anadromous fish runs and is opposed by the fish interests.

A summary of the six major hydropower development projects that have been proposed is provided below. The following descriptions of the projects are a direct copy of material included in Appendix XV, Columbia-North Pacific Framework Study. The Board has not supported detailed feasibility studies of these projects because of the adverse effects they would have on the anadromous fish runs up the Salmon River.

1. Lower Canyon Project. The damsite is located at river mile 0.5 on the Salmon River. The development proposed in House Document 403 consists of a rockfill type dam approximately 700 feet high, having a crest length of 2,200 feet. At normal pool elevation 1,575 feet, the reservoir would extend about 70 miles upstream to the Freedom damsite. The project would provide 2.5 million acre-feet of usable storage for flood control and power. Installed capacity, based upon present criteria, would be approximately 2.5 million kilowatts. The gross head for power with tailwater at elevation 940 feet, pool elevation of China Gardens, would be 635 feet. In a system providing for maximum development of the Salmon River (including 2.3 million acre-feet of storage at Crevice), the Lower Canyon project would generate an average of 503,000 kilowatts annually. In this system the Crevice project would provide the necessary storage regulation for power, and therefore the Lower Canyon storage would not add any appreciable generation at downstream projects. Because of the importance of the Salmon River runs of anadromous fish, it was recommended in House Document 403 that authorization and construction of Lower Canyon project be delayed pending development of adequate fish passage facilities. The site is located within the segment of the Salmon River designated for study for possible inclusion in the National Wild and Scenic Rivers System.

2. Freedom Project. The damsite is located on the Salmon River at mile 69.3, about 17 miles downstream from Riggins, Idaho. At normal pool elevation 1,780 feet, the effective head would range from 205 feet to 413 feet depending on the drawdown at Lower Canyon. The reservoir would extend to a point about 7 miles upstream from Riggins, Idaho, or about 6 miles downstream from the Crevice damsite. The powerplant capability (overload) under ultimate development would be approximately 800,000 kilowatts, and the average annual generation would be 162,000 kilowatts. As in the case of Lower Canyon, the Freedom project would block the important salmon runs and construction should be delayed pending development of adequate fish passage facilities. The project is located within the segment of the Salmon River designated for study for possible inclusion in the National Wild and Scenic Rivers System.

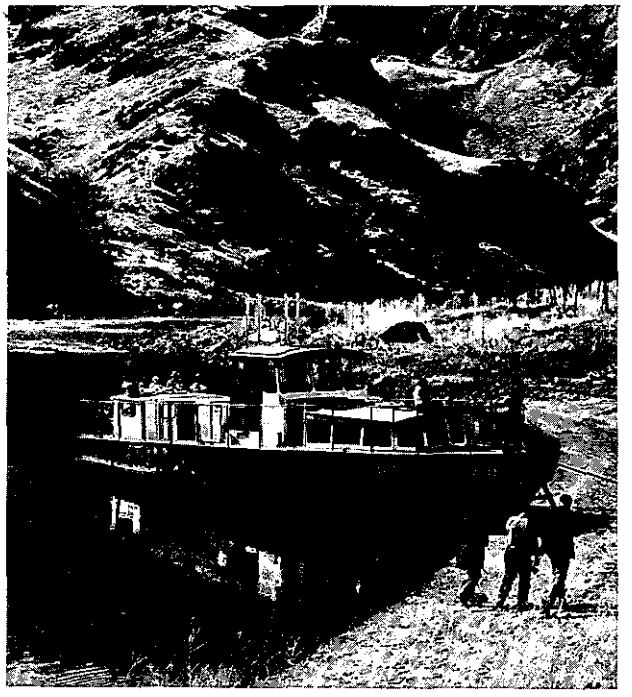
3. Crevice Project. The damsite is located at mile 99.7, about 13 miles upstream from Riggins, Idaho. As proposed in House Document 403, the dam would be a rockfill type structure providing an effective head of 725 feet. The reservoir, at normal pool elevation 2,570 feet, would extend upstream 65 miles and provide 2.3 million acre-feet of usable storage based on 30 percent drawdown. The project would generate on the average about 435,000 kilowatts at-site and add about 20,000 kilowatts at downstream plants. On the basis of present criteria, the powerplant capability would be approximately 2.2 million kilowatts. The project is located within the segment of the Salmon River designated for study for possible inclusion in the National Wild and Scenic Rivers System.

4. Pahsimeroi Project. The damsite is located on the Salmon River at mile 301.5, about 3 miles below the mouth of Pahsimeroi River. As reported in Senate Document 51, 84th Congress, 1st Session, the river is about 250 feet wider at low-water level. Geological conditions appear favorable for a dam 300 feet high creating a reservoir with 1,042,000 acre-feet of usable storage based upon 35 percent drawdown. This reservoir would afford almost complete regulation of Salmon River at the site, would eliminate local flood damages, reduce downstream flood damages an appreciable amount, firm up low flows for power generation at downstream plants, and make possible a power generating capability of about 125,000 kilowatts based on present criteria.

5. Challis Project. The damsite is located on the Salmon River at mile 333.3 between Challis and Clayton at river elevation 5,100 feet. As limited by the elevation of the town of Clayton, a dam 350 feet high at this site would provide about 530,000 acre-feet of gross storage capacity. Based on 35 percent drawdown, about 350,000 acre-feet of usable storage would be available for power, irrigation, and flood control. Most of the flood control benefits would accrue from the protection of the agricultural lands which intermittently border the Salmon River for 90 miles downstream. Based on present criteria, it is estimated that the powerplant capability would be approximately 125,000 kilowatts. The average annual generation would be about 25,000 kilowatts. This project should not be confused with the Challis Creek Reservoir, a small irrigation reservoir proposed by the Bureau of Reclamation for Challis Creek, a tributary of the Salmon River.

6. Tailholt Project. The damsite is located on the South Fork Salmon River at mile 32.3 about 4 miles downstream from the mouth of Secesh River. As reported in Senate Document No. 51, 84th Congress, 1st Session, the site appears geologically sound and topographically favorable for construction of a high dam. Total storage of about 700,000 acre-feet could be obtained with a dam about 550 feet high. Based on a drawdown of 35 percent, approximately 470,000 acre-feet of usable storage would be available. Storage on South Fork would be desirable as it is a high runoff-producing tributary of the Salmon River. Based on present criteria, it is estimated that the project generating capability would be approximately 250,000 kilowatts.

Nonstructural Measures. Flood plain management surveys prepared by the Corps of Engineers provide a useful tool in solving flood problems. The Corps has prepared information reports for a 6-mile reach of the Clearwater River in the Orofino and Riverside areas and for a five-mile



reach of Paradise Creek through the University of Idaho and Moscow area. This information should be used by the counties and communities in determining zoning to control residential and commercial development in flood plains.

The National Wild and Scenic River System presently includes the Middle Fork of the Salmon River from origin to confluence with the main Salmon River (90 miles), the Middle Fork of the Clearwater from Kooskia to Lowell, the Lochsa River from its junction with the Middle Fork of the Clearwater at Lowell to the Powell Ranger Station, and the Selway River from Lowell upstream to origin (167 miles). In addition, the Salmon River from North Fork to its confluence with the Snake River (212 miles) is now being studied for possible addition to the system. The Middle Snake River from Hells Canyon Dam to Lewiston (102 miles) has also been recommended for designation as a national river.

The Board is cooperating with the Forest Service on the Salmon Wild River Study. The study is a comprehensive look at all possible uses of the river ranging from full development to preservation. Identified will be the corresponding environmental, economic and social impacts. After the study is completed and public hearings have been held, the Board will take an official position on inclusion of this river reach in the national system.

The benefits and costs involved in establishing a state wild and scenic river system should be carefully considered by the legislature, Governor's office, and concerned citizens. High quality streams in the region which might be studied for inclusion in such a system are: the Little Salmon River from mouth upstream to Boulder Creek (24 miles); the South Fork of the Salmon River including the East Fork of South Fork and Johnson Creek (72 miles); the Salmon River from headwaters to Riggins (303 miles); the Snake River from Hells Canyon to Lewiston (102 miles); and the Clearwater River drainage except Dworshak Pool (330 miles).

Areas suggested by various agencies for possible inclusion in the National Wilderness-Preservation System are shown on Figure 7, Chapter I. These areas include an extension of the Idaho Primitive Area, the Seven Devils Scenic Area, and Magruder Corridor. Studies are needed to determine suitability and feasibility for inclusion in the national system and to identify conflicts with other water and related land use functions.

Potential Effects

The precise projects and programs presented, with the exception of the Middle Snake hydro-

electric projects, will not have major economic effects on the region. Advent of year-round navigation to the Pacific Ocean will greatly improve the economy of the Lewiston area.

Environmental impacts from the projects would be minimal, and limited for most part to the local areas, again with the exception of the Middle Snake hydroelectric projects.

Increased recreational facilities would attract a significant tourist trade. New water and sewerage facilities in urban and rural areas, along with land use zoning by communities and counties, will help to preserve and enhance the environment in the region.

REMAINING PROBLEMS AND OPPORTUNITIES

The programs (Clearwater-Salmon Basins) discussed will not solve all of the water and related land resource problems of the region.

Opportunities for economic and environmental programs in the Clearwater-Salmon Basins will be largely dependent on studies and research now in progress by several federal and state agencies. Conflicts such as the one over Middle Snake hydroelectric development will be resolved by 1980. Major comprehensive water planning studies will also be completed by that date. The State Water Plan, to be published in 1976, will present Board decisions on state water policy, based on information available at that time.

Water is available to meet projected municipal and industrial water needs since most of the growth is expected to occur in the Lewiston area near abundant flows of the Clearwater and Snake rivers. The county water and sewerage studies being conducted under the Farmers Home Administration grant program will identify problem areas and alternative solutions in the rural areas.

The potential for irrigation development is limited by the extremely high pump lifts required to raise water to existing agricultural areas such as the Camas Prairie or the Palouse Basin. Dry farming has been quite successful because of sufficient precipitation.

Three miles of levee and channel works at Orofino. Kooskia and Stites would help eliminate flood damages in those areas. Flood plain information studies and flood plain zoning should be considered for the communities of Juliette, Stites, Kooskia, and Kamiah as well as at Orofino and Peck. Watershed protection is a continuing problem which should be met throughout the basin.

Navigation can play an important part in the development of Idaho's natural resources. The Port of Lewiston will become the upstream terminal of slack water barge navigation on the Snake River after the waterway is opened to barge traffic early in 1975. The extension of navigation beyond Lewiston depends upon: decisions affecting minimum flows below Hells Canyon Dam; requirements for supplemental flows from the Clearwater-Salmon Basins; and economic conditions.

Proposed new power developments in the region would create both opportunities and problems. The proposed Snake River Moratorium and existing and proposed wild river areas would stop construction of hydroelectric power dams. Opportunities for hydroelectric power development in the region are estimated at 8 million kilowatts of installed capacity, the largest undeveloped capacity in Idaho and nearly 4 times the existing installed capacity. Development of much of this potential would be economically feasible, but would interfere with anadromous fish runs up the Salmon and Clearwater rivers.

No detailed feasibility studies have been conducted for projects on the main stem of the Salmon River or on its major tributaries, nor are any programmed for the future. However, if minimum flow requirements on the Snake River approach 9,500 cubic feet per second at Weiser, attention should be given to ways of utilizing Salmon River surplus flows in order to satisfy water needs in southern Idaho. Decisions concerning wild and scenic rivers in the Middle Snake and the Salmon should leave open the option of using surplus Salmon River flows if such use is required.

Recreation and fish and wildlife present the region's greatest problems and opportunities. Outdoor recreation is a principal land use; the pressures of increased demands are becoming apparent and recreational opportunities are almost unlimited. The greatest advantages from recreational resources require comprehensive planning involving all levels of government. Such planning would maximize recreational land use and minimize restrictive laws and constraints.

Almost 75 percent of the basin is forested land, making this region a vast fish and wildlife habitat. Problems and opportunities are being studied through various research programs. The result of one study was a transplant of a bighorn sheep herd making controlled hunts possible. Coordinated studies of food habits, nutrition, winter range, and migrations can improve conditions for fish and game.

Preservation of land in a natural state is an important consideration in the region. Scenic beauty, striking land forms, wilderness and primitive areas, rugged mountains, and historical and archaeological sites are unsurpassed. Federal legislation has already taken the initial steps to preserve large areas through wild rivers or primitive wilderness areas. Conflicting issues between conservation and exploitative development can be resolved partly through studies establishing relevant economic and environmental values and criteria.

The possibility of interbasin transfers of Salmon River water is an important consideration in state water planning; several schemes have been outlined. (These are discussed in detail in Chapter 5, "Concepts for Interbasin Water Transfer".) The impact of transfers, separately or collectively, on the region's development cannot be overstated. Proposals aimed at moving Idaho waters to the southwestern part of the United States would have even greater effects.

SOUTHWEST IDAHO BASINS

The Southwest Idaho Basins comprise an area 105 miles wide and 220 miles long, encompassing all or parts of 12 counties. About 24 percent of the state is included, with water areas covering about 118,200 acres and land areas totaling 12,193,500 acres.

The region is a diverse one, with terrain ranging from desolate desert tracts in Owyhee County to rugged pristine settings near the headwaters of the Boise and Payette rivers. Rich productive plateaus developed with irrigation are interspersed with cities and towns throughout the region. The variety in landscape, the moderate climate, and the good transportation facilities make this area the state's most rapidly growing region.

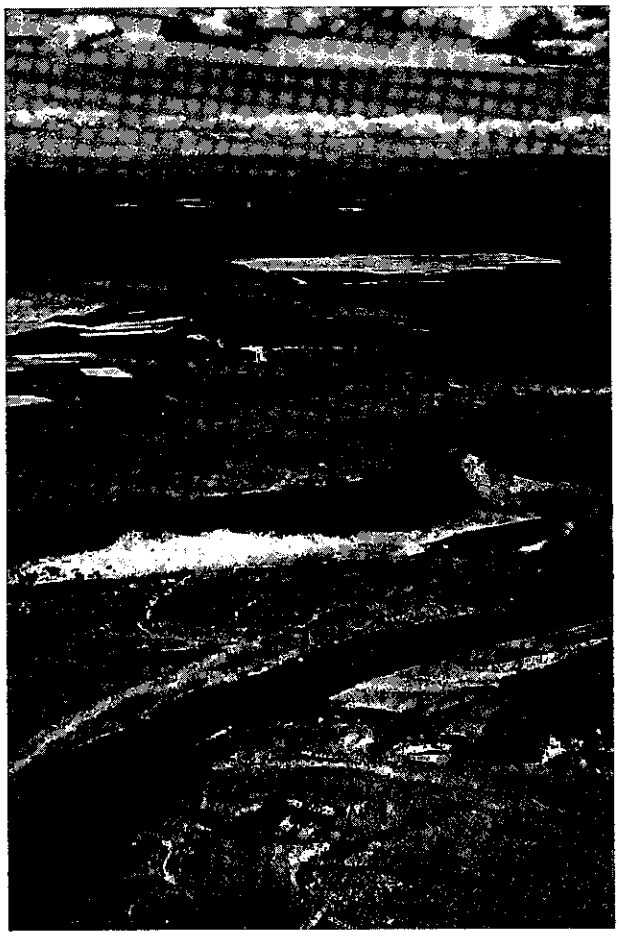
RESOURCES

Man's constant search for economic opportunity has guided development in this region. During settlement in the mid-1800s, the quest for gold and silver brought many to Silver City, Idaho City, Placerville, and Centerville. As the mines played out, forest products and agriculture gained prominence. With passage of the Reclamation Act in 1902, irrigated agriculture increased in extent and importance due to the combination of high quality water and rich soil.

Southwestern Idaho economy is diversified. Important industries range from agriculture, forest products, food processing, manufacturing, and construction to trade, transportation, services, and government employment.

About 900,000 acres in the region were irrigated in 1970. Another 2.3 million acres have been identified as being potentially irrigable. Crops valued at more than $50 million are produced annually on the 340,000-acre Boise Project.

The climate of the region is mild, with frost-free periods often exceeding 150 days in the area from Mountain Home to Wilder. Average annual precipitation is low on the desert plateaus. The highest recorded annual precipitation in Idaho, 98.6 inches, was noted at Deadwood



Summit high in the Payette River basin in 1964-65.

The main stem of the Snake River crosses the area from southeast to northwest, but at Weiser the river flows north, plunging into Hells Canyon. Major tributaries of the Snake in this region include the Payette, Weiser, Boise, and Bruneau rivers and numerous smaller tributaries. The Owyhee River flows through the southwest corner of the region, entering the Snake from the Oregon side.

The Snake River enters the region near King Hill, where it has an average annual flow of 6.2 million acre-feet. Counting inflows from tributaries, the average flow of the Snake as it leaves the region amounts to 11.8 million acre-feet.

Surface water provides the largest supplies of water used in the region. Economical groundwater supplies are generally available throughout the area, except in portions of the Bruneau desert, Mountain Home desert, and Weiser River basin. The Boise, Meridian, Nampa, and Caldwell areas and Emmett Valley contain exceptionally high water tables.

Reservoir storage capacity is provided principally by eight reservoirs with active capacities totaling 3.1 million acre-feet. The major reservoirs serve various uses, including irrigation storage, recreation, flood control, power, and fish and wildlife habitat. Principal reservoirs are Arrowrock, Anderson Ranch, Lake Lowell, Lucky Peak, Cascade, Deadwood, Brownlee, and Mann Creek. Although most of the reservoirs have been in existence for several years, approximately 550,000 acre-feet of storage space in reservoirs on the Boise and Payette rivers remain unsold which permits maintaining higher levels for recreation.

Besides agriculture, principal industries include mining and forestry. Employment in the forest products industry averages about 2,600 persons, with peak employment occurring during the summer months. Mining activity, centered near Cuprum in the Weiser River basin and near Stibnite in the Payette River Basin, is primarily exploratory. Gravel and sand, used for construction purposes, are found throughout the area. Rock hounding is a popular activity in southwest Idaho. Owyhee County contains numerous areas where opals, agates, jasper, and other semiprecious stones are found in abundance.

Rangeland covers nearly 64 percent of the total land area or nearly 7.8 million acres, of which 80 percent is publicly owned. Rangelands provide a stable base for the extensive cattle and sheep industries in the area. In addition, forest lands supplement range grazing during the summer months.

The largest landowner in the region is the federal government, with 8,281,000 acres or about 68 percent of the land area. The state of Idaho owns approximately 855,000 acres (7 percent of the land area); counties control 23,000 acres (0.18 percent); and 10,400 acres (0.08 percent) are occupied by urban development. About 25 percent of the land, 3,024,000 acres is privately owned.

The varied terrain promotes recreational opportunities and plentiful fish and wildlife. However,

certain species – anadromous fish and white sturgeon – are severely limited by construction of dams in Hells Canyon.

EXISTING DEVELOPMENT

Water resource development to date has been multipurpose. Miners were probably the first to purposely divert water in the Boise Basin near Idaho City in the mid-1800s. The first Boise River diversion right was granted in 1864 and provided water to the town of Boise and Fort Boise. Agricultural activity began in the early 1800s when Boise and Payette valley settlers filed on desert lands as potentially irrigable farms. By 1900, about 148,000 acres had been placed under irrigation.

Large-scale development includes the Arrowrock Division (276,000 acres) serving portions of the Boise and Snake river drainage areas. First construction was the Boise River diversion dam built in 1908 as multipurpose: to supply power for construction on the big Arrowrock Dam (operative in 1915) and water to Lake Lowell. Anderson Ranch Dam was completed in 1950. Concurrently, systems of canals, laterals and drains were constructed. Lucky Peak dam and reservoir, primarily for flood control, were added in 1955.

The Payette Division (81,000 acres) includes lands between the Payette and Boise rivers and north of the Payette River. Black Canyon Dam completed in 1924 on the Payette heads the irrigation system. Other works are: Deadwood Dam on the Deadwood River (1931); and Cascade Dam on the North Fork Payette (1948). The gravity distribution system was constructed between 1936 and 1940. A combination pump-gravity canal, called the "C" line, built in 1948, augments the gravity system.

In the Weiser River Basin, the Mann Creek Dam was completed in 1967. On the Oregon side, Owyhee Dam was completed in 1935, providing water to a rich agricultural area in Owyhee County, Idaho.

Numerous smaller storage facilities have been constructed throughout the region by private individuals, groups, and canal companies. A control structure at Payette Lake allows water level fluctuations of up to seven feet to supply irrigation needs south of McCall.

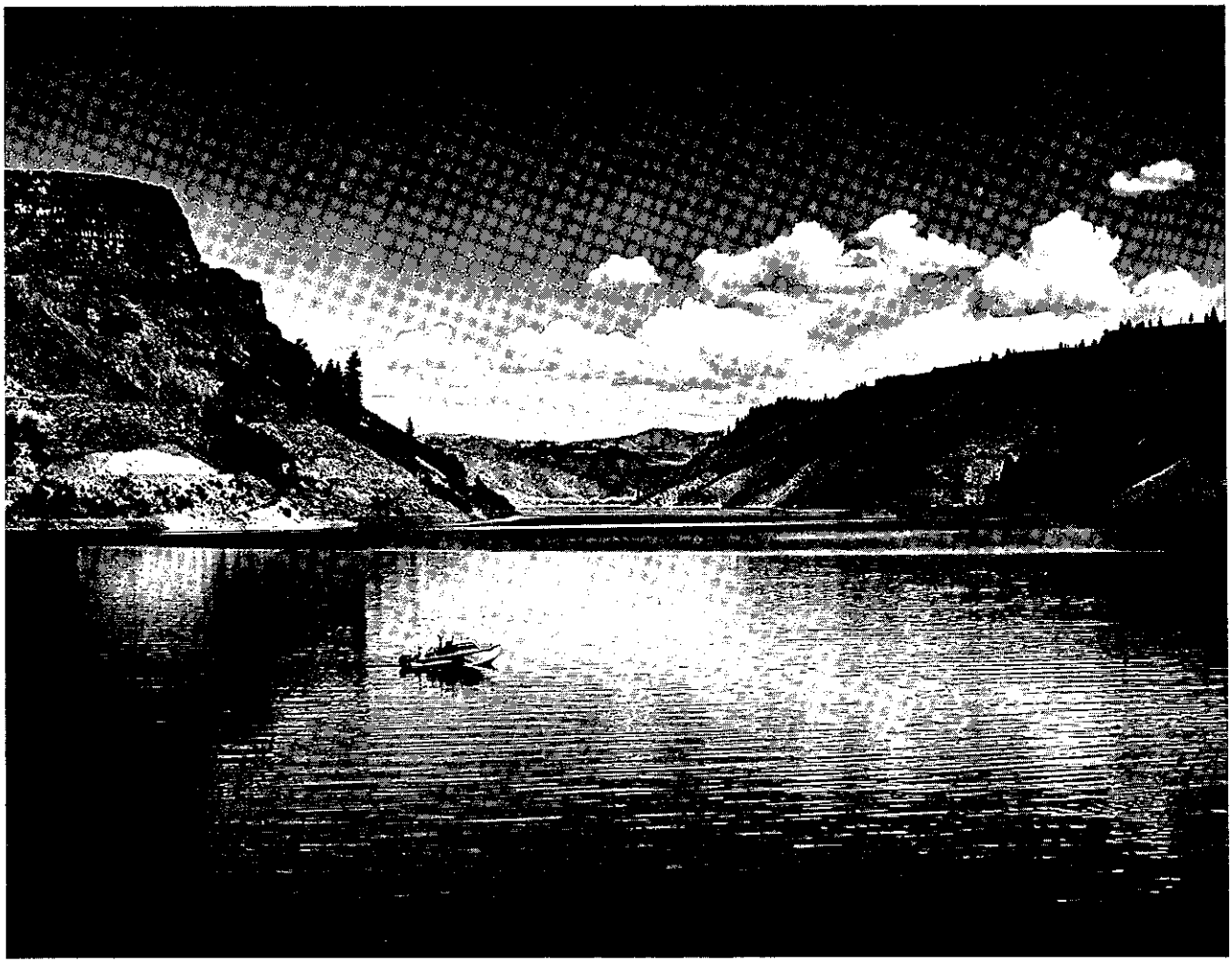
In many places, water is pumped directly from the Snake River to serve adjacent lands. The Gem Pumping Plant located two miles south of Marsing, Idaho involves pump lifts of 70 feet, 130 feet, and 178 feet. This plant, one of the oldest in the West, was built by a private firm and placed in operation in 1913.

In the early 1960s, substantial changes took place in pump diversions from the river. New pumping plants were installed with pump lifts of more than 700 feet. The Dry Lake Project, which involves 40,000 acres, was developed in 1962-65 with water pumped from the Snake River south of Nampa; it embodies changes brought about by modern reclamation technology and more efficient farming methods. Other high lift pumping projects from the Snake River include the Murphy Flats, Indian Hills, Flying H, Sailor Creek, and Black Mesa projects.

Payette Farms utilizes Payette River as a source, lifting water about 400 feet to a plateau between Emmett and Payette. Land is being irrigated throughout the region by individual reclamation efforts.

Idaho Power Company generates power at four facilities in the region: the C. J. Strike, Swan Falls, Brownlee, and Cascade reservoirs. Electric power is also produced at federal facilities including Diversion, Anderson Ranch, and Black Canyon dams. These power sites have a combined installed capacity of 665,000 kilowatts. The largest plant, at Brownlee Dam, produces 360,400 kilowatts.

Water-related recreation use is widespread in the southwest Idaho region. Lucky Peak Reservoir receives the greatest use, logging about 1.1 million visitor-days annually. Other federal reservoirs combined were used to a total of 345,000 visitor-days in 1970. Recreation use at private power facilities from June through October, 1971 totaled approximately 188,000 visitor-days. Although other bodies of water and streams, including some irrigation canals, do not report fisherman days and recreation visitor-days, virtually all provide some recreational use.



Except for isolated instances, flooding is not a serious problem in the Southwest Idaho Basins. The Corps of Engineers and Soil Conservation Service have done considerable work in the Boise area, including construction of Lucky Peak Dam and terracing on the Boise Front. Minor flooding occurred at Montour and Council and on the lower Boise River in 1971.

A voluntary water saving program is apparently being followed on irrigated lands in this area. These water savings result primarily from: conversion from gravity to sprinkler irrigation; improvements in gravity irrigation facilities, such as concrete ditch lining; and improvements in gravity irrigation management. Water use averages on the Boise Project have decreased from the 1956-1960 figure of 4.56 acre-feet per acre to 3.73 acre-feet per acre during the period from 1966 to 1970.

The population of the region was 235,089 in 1970 — a 10.6 percent increase over the 1960 total. Major urban areas are Boise, Nampa, and Caldwell, and smaller but regionally important cities include Mountain Home, Meridian, Weiser, and McCall. Although 2,130 persons left the region between 1960 and 1970, this loss was more than offset by an influx during the same period. It is presently the most rapidly growing area in the state. Ada County, Idaho's most highly urbanized area, had a population of 112,230 in 1971.

PROBLEMS AND NEEDS

Studies completed to date indicate that available water supplies will not be adequate to meet all projected future needs in the region.

With the exception of periodic aquatic growths in the Snake River and low flows in the Boise

River, there are few instances of major persistent or recurring water quality problems in the region. Effluents from summer home developments on Payette Lake could present major problems unless corrective measures are taken, and most other recreation developments need to have waste treatment facilities installed. Flow interruptions connected with the operation and maintenance of Lucky Peak Dam have had undesirable effects on downstream water quality. These interruptions occur every two or three years. Barber Dam, built about 1906 and no longer used, is located about two river miles below Diversion Dam on the Boise River. An inspection of the facility in November, 1971 revealed that the timber and rock crib dam had deteriorated badly and the small reservoir is virtually filled with silt. The Department of Water Administration is studying several alternatives to prevent the dam's collapse and to remove silt from the river bed.

Community water and sewage treatment facilities are needed throughout the region. A few communities still utilize wells to dispose of wastes, but this practice is being discouraged. Some modern dairies and feedlots are installing collection and distribution facilities to handle animal wastes.

High groundwater tables from Boise to Caldwell cause localized drainage problems. Two wells have been drilled to relieve groundwater drainage problems in the Meridian area.

The major areas of water shortage for agriculture include Round Valley, Long Valley, and Willow Creek in the Payette basin; the Council area; and lands adjacent to the main Weiser River in the Weiser basin; the Reynolds and Opaline areas; and numerous scattered parcels of land in Owyhee County.

Electric energy requirements are expected to increase from an average of 163 megawatts in 1967 to an average load of 1,632 megawatts in 2020. This increased demand cannot be met by hydropower facilities in the region.

Urbanization of agricultural land in the Boise Valley is bringing serious problems. The loss of high producing farm land hurts the agricultural economy. The in-moving suburbanites resent the irrigation-district water levy on home grounds – the district in most cases no longer provides water to subdivided tracts.

Because of the concentrated population in some parts of the basin, land use zoning practices are needed to protect environmental values. Recreational areas are being developed without sufficient safeguards at Payette Lake, Cascade Reservoir, South Fork Payette, and Weiser River; and old mining towns are being revitalized as summer home recreational areas in the Boise River basin. Although the Forest Service has developed numerous camp sites within the region, many are used at only a fraction of potential capacity ("Recreation", Chapter 3). However, during the peak of the recreation season they are heavily utilized.

The Soil Conservation Service (SCS) is authorized to conduct a Type IV soil and water study for this region. The study will delineate problem areas with regard to drainage, erosion control, streambank protection, channels, vegetative cover, water conservation, and runoff control. The Idaho Water Resource Board is cooperating with the SCS in this study.

Many of the fish and wildlife problems can be resolved through proper planning. Studies are needed to determine instream flow needs for fish, water quality and recreation in the Boise, Payette, and Snake rivers and game habitat should be maintained and improved throughout the region.

BASIC FRAMEWORK DEVELOPMENT ALTERNATIVES

The projects and programs discussed under this section consist of those independent local developments and public projects which can help meet the problems and needs discussed above. The Board policy calls for agricultural development of desert lands having outstanding potential for agricultural development because of soil, climate, and water availability. The prime areas in this category are on the Mountain Home desert and the Bruneau desert along the

Snake River. Alternatives for serving these lands will be evaluated as part of the State Water Plan. The Swan Falls-Guffey project will not be in conflict with upstream development because legislation directs that the water rights for power will be subordinate to future upstream development. The various divisions of the Southwest Idaho Project that have previously been identified will need to be re-evaluated because of the new "Principles and Standards, for Planning Water and Related Land Resources" being proposed by the Water Resources Council and the requirement for preparing environmental impact statements. Information from these updated studies plus new information on Bruneau Desert alternatives will be evaluated as part of the comprehensive studies for the State Water Plan. It is unlikely that development of lands within the Bureau of Reclamation designated Garden Valley and Bruneau divisions could take place before 1990 because of the long delay in getting major projects such as these underway. The definition of instream needs on the Snake River in Southwest Idaho is absolutely essential to the formulation of a long-range water plan. If high minimum flows are set at King Hill and Weiser and water from the Payette River cannot be stored at Garden Valley, then new land development in Southwest Idaho will be severely restricted.

Independent Local Development

Development by local individuals, groups, municipalities, or private companies cannot be predicted accurately. Fluctuating economic conditions and local needs and desires are dominant factors.

New water supplies for future municipal and industrial growth ("Municipal" and "Industrial", Chapter 3) can be obtained in most areas throughout the region by increased groundwater pumping or by diversion of surface supplies. These needs are expected to be met by independent local development aided by available state and federal financial assistance programs. Early action is needed to meet growing water and sewer facility needs in Boise, Meridian, Nampa, Caldwell, and Weiser.

In Boise, water quality problems associated with wells have caused increasing concern. In several of the public water systems which serve the Boise area, excessive concentrations of fluoride have been reported and high iron and/or manganese concentrations are causing nuisance conditions. These problems are expected to grow more severe as large quantities of groundwater are pumped to meet the needs of an increasing municipal population. It may be necessary to provide a surface water to help remedy this situation.

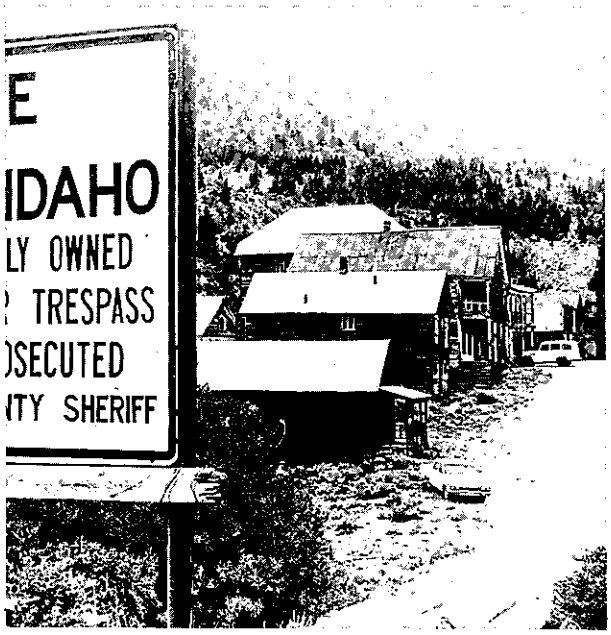
Many smaller communities and cities also need improved water and sewer systems. A growing need in this area is provision for summer home development near McCall and Cascade and in Garden Valley.

Irrigation development by private enterprise in this region is expected to continue primarily on the Bruneau and Mountain Home plateaus. Approximately 100,000 acres can be developed by pumping from the Snake River to adjacent lands south of Glenns Ferry and Hammett on the Bruneau Plateau. On the Mountain Home desert, pumping from the Snake River and individual desert entries near the Air Force Base can reclaim less ground. Desert entry development continues in the Grand View-Bruneau areas and in the Payette area. Some lands which have potential for private development have been withdrawn by the Bureau of Reclamation in the interest of planning and development of larger project areas.

Scattered lands lying adjacent to and south of Snake River between Bruneau River and Castle Creek provide opportunity for small project development. These lands are included in the Wichahoney Division of the Bruneau Project presented in the Upper Snake River Basin report dated 1961. Approximately 37,000 acres were originally included in this project study. Some of these lands have since been developed privately. However there still exists about 60 pending desert entries plus private lands within the area that have potential for private development.

Virtually all present hydropower facilities can be enlarged by adding additional generating units.[1] Although the capacity added would not be great, it would benefit the region. If additional generating units are added, reregulating facilities are required. The Idaho Power Company is the principal supplier of electrical energy in this region. The company has completed a reconnaissance study for construction of a thermal or nuclear plant in the Farewell Bend area to help meet future power needs. Such a project does not appear to be justified, however, under current economic conditions.

[1] Idaho Water Resource Board Planning Report No. 6, Appendix No. 1, 1970.



Private development will continue to provide many of the needed recreational facilities. Summer home development is expected to continue in all areas that are aesthetically pleasing and capable of providing retreats for the urbanized citizens of southwest Idaho. These include McCall, Cascade, Garden Valley, Weiser River basin, and old mining camps in the Boise River basin.

The city of Boise is creating a Green Belt on the Boise River both within and surrounding the city. Water quality is of paramount importance to the success of this program. Local organizations and the city are attempting to overcome water quality problems to provide a pleasing and attractive river through Boise. (A more extensive discussion of water quality problems and needs is included in Chapter 3.)

Farmers and ranchers are expected to continue conservation measures on private lands throughout the region. These practices make possible more efficient use of irrigation water and, more recently, reduce pollution and erosion resulting from agricultural activities. These ends can be achieved with the cooperation of the federal government under the Agricultural Stabilization and Conservation Service program.

Public Development

Structural Measures. Structural development alternatives involve both state and/or federal agencies and include irrigation, flood control, recreation, and small water projects. The locations of these projects and facilities are shown on Southwest Idaho Basins Figure 42.

SWAN FALLS-GUFFEY JOINT VENTURE. The existing Swan Falls dam and power plant, originally constructed about 1900 and now owned by the Idaho Power Company (IPC), is located on the Snake River about 30 miles upstream from Marsing, Idaho. The power company's license for the Swan Falls project expired on June 30, 1970; IPC has obtained an annual renewal of that license. In application for relicensing, the company has stated an interest in any development which may occur on this reach of the river, indicating two possible choices for development and a willingness to enter into joint venture development with the Idaho Water Resource Board (IWRB).

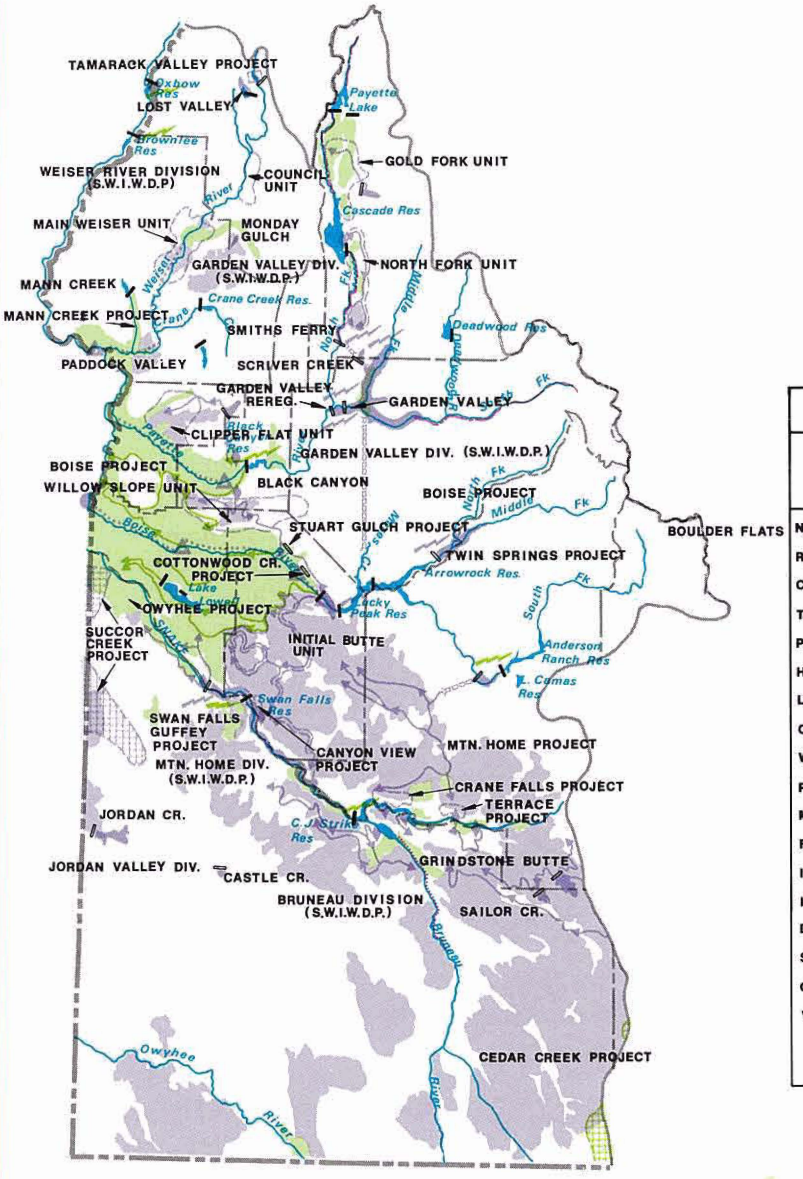
At the request of the IWRB, the company made a formal proposal to the Board on September 12, 1969 concerning joint venture development of this reach of the river. The power company's proposal provides for IWRB construction of the nonpower features of the project and IPC installation of power features. Under this proposal, the IPC would make an annual payment to the IWRB — equal to the cost of money, depreciation, and taxes on the capital investment — which IPC would have to make if the company had constructed the nonpower features. This arrangement would permit the IWRB to issue revenue bonds for construction of the reservoir and to take advantage of the state's tax-free privilege, thereby accruing additional monies for the state. The power company proposes that the IWRB use these additional monies to help defray the costs of irrigation development on the Mountain Home desert. The IPC preference is for construction of a high Swan Falls dam combined with a low dam at the Guffey site for reregulation. This combination would permit an ultimate installation capacity of about 135,000 kilowatts at Swan Falls and of about 29,000 kilowatts at the Guffey site, at a cost of about $60 million. Less pondage at the Guffey site would increase the pumping head required for irrigation exchange pumping at the proposed Guffey pump site but would avoid flooding of key archaeological sites.

Another alternative would be a single high Guffey Dam, as proposed by the Bureau of Reclamation, which would have an installed capacity of only 85,000 kilowatts if a reregulator is not provided downstream. The Bureau is updating its study of the Mountain Home Division from the standpoint of nonfederal development of the Grand View-Guffey reach of the Snake River.

After feasibility studies were completed by International Engineering Company, Inc. of San Francisco, a consulting firm hired by the Board, the IWRB presented its recommendation for joint venture development of the Swan Falls-Guffey project to the 1971 Idaho legislature. The legislature authorized the Board to participate in the project. An Interim Legislative Water Resources Committee was also established to review and approve contract negotiations between the Idaho Water Resource Board and the Idaho Power Company. The legislation directed the Board to investigate the possibility of state financing of the entire project in order to maximize benefits to the state and to work out a contractual arrangement, if possible, so that neither the Idaho Power Company nor its customers *would experience any additional costs over those involved in the joint venture proposal.* After studying this alternative in depth, the Board determined that increased state participation would probably have adverse financial effects on the customers of the Idaho Power Company and it again recommended adoption of joint venture financing as proposed by the power company. This alternative was accepted by the Interim Legislative Water Resource Committee and contract negotiations were conducted on that basis.

The contract has been approved by the legislative committee, and a joint license application for the project is being prepared for submittal to the Federal Power Commission.

FIGURE 42. SOUTHWEST IDAHO BASINS



LEGEND		
FEATURE	EXISTING OR UNDER CONSTRUCTION	POTENTIAL
NO FACILITIES SHOWN	*	*
RESERVOIR		
CANAL		
TUNNEL		
PUMPING PLANT		
HYDROELECTRIC POWERPLANT		
LOCAL FLOOD PROTECTION PROJECT		
COMMERCIAL NAVIGATION PROJECT		
WATERSHED PROJECT AREA		
PIPELINE		
MINIMUM FLOW POINT		
FLOOD CONTROL		
IRRIGATED LAND		
IRRIGABLE LAND		
DAM		
SNAKE PLAIN AQUIFER		
GEOTHERMAL		
WILD RIVERS: FEDERAL — Designated / Study / Potential; STATE — Study		

RESERVOIRS WITH LESS THAN 5000 ACRE-FEET OF STORAGE & POWERPLANTS OF LESS THAN 1 MEGAWATT ARE NOT SHOWN.

Annual surplus funds that would accrue to the state from the project are expected to be about $1.5 million.

The Snake River Birds of Prey Natural Area in the Swan Falls reach of the Snake River was created in 1971 to preserve habitat important to survival of the golden eagle and prairie falcon. This administrative order by the Secretary of the Interior withdrawing public lands for the area, recognizes that the proposed Swan Falls-Guffey development and further agricultural development of the desert lands which lie outside the area are compatible with the purpose for which the Snake River Birds of Prey Natural Area was established. This is due to the fact that the Swan Falls-Guffey development would result in a 40-foot increase of the present river elevation for a maximum of 65 feet,[1] whereas the golden eagle and prairie falcon nest in cliffs as high as 600 feet above the river. The greatest danger to the birds of prey in the area is indiscriminate shooting by hunters.

BRUNEAU DIVISION – Southwest Idaho Project. The Bureau of Reclamation is conducting feasibility studies on a plan for developing the land and water resources of the area south of the Snake River and downstream from the irrigated area at Twin Falls. These studies are scheduled to be completed by 1977. The Bruneau Division was designated one of the best potential irrigation developments in the entire basin in the 1961 U.S. Bureau of Reclamation-Corps of Engineers report entitled "Upper Snake River Basin". The Bureau's June 1966 report, "Southwest Idaho Development Project", also mentioned the excellent potential of the Bruneau Division.

The Bruneau Division, as defined in previous studies, would supply water to about 240,000 acres of new irrigation and supplemental irrigation service to about 3,000 acres. Fish and wildlife enhancement, increased recreation opportunities, and flood control were also included as project purposes.

[1]Present river elevation has been raised 25 feet by the existing Swan Falls Dam.

Project facilities described in the June 1966 report would include: 1,070,000 acre-feet of storage at the Clear Lake site; offstream storage of about 115,000 acre-feet at the Grindstone Butte or Sailor Creek sites; 8,700 acre-feet of storage at the Castle Creek site; 3,000 acre-feet of storage at the Sinker Creek site; 6 pumping plants; about 190 miles of main canals; fish protective measures; rehabilitation of existing irrigation works; and distribution and drainage works. The total cost for the plan as presented is estimated at about $340 million.

The Bruneau Division provides both an opportunity and a challenge to plan for a truly comprehensive and multi-purpose development. Development of the area provides excellent opportunities for new towns, new types of planned recreational facilities, and fish and wildlife enhancement in association with a major irrigation development. It also presents a challenge to the planner and the decision-maker in that this type of resource planning effort will require formulation and testing of new ideas and concepts.

There are more than one million acres of potentially irrigable land in the subarea. More than 400,000 acres are less than 600 feet above the Snake River making it the most likely source of water supply. Possible main stem storage sites such as Clear Lakes or Thousand Springs would have severe economic and environmental impacts, therefore, development of the Bruneau Desert will be dependent in large part on offstream storage. Pumps required to lift water approximately 500 feet into offstream storage would likely operate year around to save surplus flows on the Snake and to reduce the size of the pumps. Additional options include: continued expansion of direct river pumping to adjacent lands; exchange groundwater pumping from the Snake Plain aquifer upstream which would include a long canal from Milner Dam; and transbasin diversions from the Boise and Payette rivers.

The Water Resource Board endorses development of the Bruneau desert to the extent that there is available water and the development is compatible with minimum flow requirements in

the Snake River. Studies of the Bruneau Desert alternatives will be conducted during the next three years. As the studies are completed, the Board will review and officially comment on the specific project facilities and programs. No major public development of the Bruneau Desert is likely to commence before 1990. Potential conflicts with big game and sage grouse range exist; with proper land use planning these can be minimized.

MOUNTAIN HOME DIVISION – Southwest Idaho Project. The Mountain Home Division includes portions of Elmore, Ada, Canyon, and Owyhee counties. The Brueau's initial studies for the division were made at feasibility level and are presented in the June 1966 Bureau report, "Southwest Idaho Water Development Project".

As it is presented in the report, the Mountain Home Division would supply supplemental water to 26,000 acres of irrigated land and a new water supply to 105,000 acres, irrigation, power production, recreation, fish and wildlife, flood control, municipal and industrial water supplies, and water quality control were listed as project purposes. A major aspect of the plan is the proposed exchange of water between the Snake and the Boise rivers.

Project facilities mentioned in the report include: 332,000 acre-feet reservoir at the Guffey site; 85,000 kilowatt power plant at Guffey Dam; two diversion dams; seven-mile Long Tom Tunnel; pumping plants; canals; and associated distribution and drainage works. The capital cost for the plan is estimated at $200 million.

The Mountain Home Division is currently being reanalyzed by the Bureau of Reclamation in response to a request by the Idaho Water Resource Board. The analysis will include a revision of the earlier plan to accommodate the Swan Falls-Guffey joint venture discussed above. The irrigation aspects of the Bureau's original plan are being re-examined, and several possible alternative plans will be evaluated, including the feasibility of sprinkler irrigation of approximately 150,000 acres. The re-evaluation should be completed by July 1, 1973.

The Board's Swan Falls-Guffey joint venture is closely related to the Bureau's Mountain Home Division, and the two projects are considered complementary rather than conflicting. If the Board's joint venture project is successful, the cost of the Bureau's plan would be reduced, since the dam and power plant would be constructed as part of the joint venture. Excess revenue received by the Board through the joint venture could be used as a catalyst to stimulate early federal development of the irrigation aspects of the Mountain Home Division if total federal funding is not available.

The Board endorses the Mountain Home Division, with the necessary modifications to permit the Board's joint venture to succeed. It is assumed that construction of the Mountain Home Division will begin prior to 1980 but will extend over a 10- to 15-year period.

GARDEN VALLEY DIVISION – Southwest Idaho Project. The division consists of five project units and would provide for development of from 170,000 to 230,000 acres of new land and for supplemental irrigation service to about 30,000 acres in Valley, Boise, Gem, Canyon, and Ada counties. Four power plants would be constructed with an initial combined capacity of 285,750 kilowatts and an ultimate total capacity of 368,000 kilowatts. Feasibility studies have been completed by the Bureau on the storage and power facilities and the Bureau's investigations on the irrigation complex are scheduled to be completed by 1974.

The Garden Valley Division is a key feature of the Bureau of Reclamation's total proposed Southwest Idaho Development Project in that the power and water supplies provided by the division are needed to develop proposed project lands.

The major power and storage facilities include: a 2.4 million acre-foot reservoir and dam at the Garden Valley site on the South Fork of the Payette River; a power plant at the Garden Valley Dam; a reregulating dam and reservoir below the main dam also containing a power plant; a diversion dam and reservoir at the Smiths Ferry site on the North Fork of the Payette River; two tunnels to convey flows from the North Fork to the Middle Fork of the

Payette River, along with two power plants to make use of the 1,200-foot difference in elevation between the North Fork and the Garden Valley Dam; and a small reregulating dam and reservoir on Scriver Creek. Past studies include a plan for diversion of Payette River water from the proposed Garden Valley Reservoir through a 28-mile tunnel to Mores Creek and thence to the Boise River for use on the Initial Butte Unit; and for exchange of South Fork Boise River water used near Mountain Home.

Total cost of the Garden Valley Division (irrigation complex and power and storage facilities) is estimated to be about $485 million.

The Idaho Water Resource Board supports construction of the Garden Valley Dam and associated power facilities. However, the possible requirement of a high discount rate, coupled with congressional reluctance to authorize costly new projects casts serious doubt on the likelihood that the project will be developed for many years. If the dam is not built, the opportunities for utilization of the Payette River waters are severely limited. The Middle Fork and South Fork of the Payette are essentially unregulated and most of the water wastes to the ocean during spring runoff.

The Board supports development of the land areas described hereafter as part of the Garden Valley Division. During the next three years, alternatives for serving these areas will be identified to learn to what extent they can proceed without Garden Valley storage. Major irrigation facilities identified in the Bureau studies follow by unit.

Initial Butte Unit — would provide a water supply for irrigation of about 116,000 acres of new land in the Initial Butte area and of about 10,000 acres in the Willow Slope area. Water would be obtained by exchanging Payette River for Boise River water. Unit facilities would include: 3 pumping plants; about 130 miles of main canals, augmenting about 9 miles of existing canals; and distribution and drainage works. Total construction cost for the project, not including costs of storage facilities, is estimated to be about $165 million.

Willow Slope Unit — studies have not progressed to selection of size of the area served or method of providing a water supply. New irrigation would be the key feature, and the area could cover from 10,000 to 70,000 acres. The three water sources being considered are: pumping from the Boise River near Caldwell, Idaho; pumping from the Snake River below Nyssa, Oregon; and diversion from the Payette River at Black Canyon Dam. Studies have not progressed to the point where reliable estimates of total project construction costs are known.

Gold Fork Unit — would provide service to about 2,600 acres of new irrigated land and a supplemental supply to about 22,000 irrigated acres lying between Payette Lake and Cascade Reservoir. The water supply would be provided through construction of a dam on Gold Fork Creek with a reservoir storage capacity of about 80,000 acre-feet; about 25 miles of main canals; and rehabilitation of the existing Gold Fork South Canal. Total construction cost of the Gold Fork Unit is estimated at about $7.5 million.

North Fork Unit — would irrigate approximately 8,400 acres of new land and would provide a supplemental supply to about 8,100 acres in Long and Round valleys. Water would be obtained by pumping from Cascade Reservoir. Proposed North Fork Unit facilities include a main pumping plant; two relift pumping plants; about 47 miles of main canals; and associated distribution and drainage works. The total capital cost for the unit is estimated at about $20.5 million.

Clipper Flat Unit — would provide water to irrigate about 20,200 acres of new land between Black Canyon Dam and Willow Creek along the north side of the Payette River Valley. Source would be the Payette River, with the water pumped from Black Canyon Reservoir. Clipper Flat Unit facilities would involve: a main pumping plant at Black Canyon Reservoir; a relift pumping plant; enlargement of about 10 miles of the Canyon Canal; and distribution and drainage works. The total capital cost of the Clipper Flat Unit is estimated at about $34 million.

WEISER RIVER DIVISION — Southwest Idaho Project. The Weiser River Division, located in Washington and Adams counties, consists of the Council and Main Weiser units. The Weiser River Division would be a multi-purpose development involving irrigation, flood control, recreation, and fish and wildlife. Field studies have been completed by the Bureau of Reclamation and a report will probably be issued in 1972. Capital costs for the division were estimated in July 1970 at $17,877,000.

Council Unit – would provide new irrigation service to about 900 acres and supplemental irrigation to about 3,500 acres near the town of Council. Enlargement of the Lost Valley Dam would provide a storage capacity of 30,000 acre-feet. Council Unit facilities would include the enlarged Lost Valley dam and reservoir; West Fork diversion dam; about 23 miles of main canals, and associated distribution and drainage works.

Main Weiser Unit – would provide new irrigation service to about 9,000 acres and supplemental irrigation to 3,200 acres near the towns of Cambridge and Midvale. Little Weiser River water would be stored at an offstream storage site to provide the necessary water supply. Main Weiser Unit facilities involve: 35,000 acre-feet of storage at the Monday Gulch site, Little Weiser River and Cambridge diversion dams; Midvale pumping plants; about 24 miles of main canals; enlargement of the existing Middle Valley ditch; and associated distribution and drainage works.

Bureau studies indicate that recreational use of project facilities will reach about 27,000 visitor-days annually at first, increasing to about 80,000 visitor-days annually by the 50th year of the project. Angler-day use over the project's life is estimated at 47,000. Flood damages totaling $7,200 annually should be prevented through construction of the unit.

The Idaho Water Resource Board favors assisting people in the Weiser River Division in obtaining needed supplemental water. As a result, the Board has supported new development in the division.

Official Board action will be taken on the Weiser Division Project after the Bureau's report is released for review and comment.

TAMARACK VALLEY PROJECT. The Tamarack Valley Project near Council is a multipurpose resource development project which is under study by the Board. This project is an alternative to the Lost Valley Project of the Council Unit. It could furnish the basis for a major water recreation development near Tamarack in the Weiser River basin. The proposed dam would be an earth-filled structure and the reservoir would have a storage capacity of approximately 29,500 acre-feet. About 17,000 acre-feet would be used to irrigate 4,410 acres of project lands in the Council Valley. The remaining 12,000 acre-feet are proposed as reserve storage for recreation, fishing, and migratory bird uses. The reservoir would have approximately 15 miles of shoreline and 990 acres of surface area. The timbered area around the site is characterized by gently sloping valleys and hills rising to the surrounding mountains – highly conducive to home site development and recreational use.

The project has been proposed by the Idaho Water Resource Board for early development. Engineering, economic, and environmental consultants have been retained to prepare feasibility studies on this project. It is estimated that feasibility reports will be available in 1972 and construction could conceivably begin as early as 1973. Estimated costs for land acquisition, dam and reservoir, and project irrigation facilities are $7.5 million.

CRANE FALLS PROJECT. This would be an irrigation development of approximately 10 to 15 thousand acres lying southwest of Mountain Home and on the high bench lands north of the Snake River canyon.

A pumping plant located on the north bank of the Snake River would raise the water supply about 520 feet to project canals, booster pumps and a buried pipe system. A sprinkler irrigation pressure system will be implemented. The terrain is fairly flat and soils are excellent with approximately 80 percent class I and II. Federal lands under Bureau of Reclamation withdrawal comprise about 85 percent of the project area. The project area is part of the Mountain Home Division (Southwest Idaho Development Project) and USBR is now reviewing the impact that state sponsored development would have. Preliminary indications are that the smaller project would not materially affect the larger development.

The project is under study by the Board. The project would probably obtain financing under the Bureau of Reclamation Small Projects Program (P.L. 984) with the state sponsoring the project and the Bureau furnishing federal lands and supervising settlement thereon. It is possible that a feasibility study and loan application

could be completed early in 1973 and that construction might be completed in 1975. The estimated cost for a 10,000-acre project is approximately $6.6 million. If the project size is expanded to include about 15,000 acres, the cost will be nearly $10 million.

The Board has authorized a feasibility study but will not take a position on the project until studies are completed.

TERRACE PROJECT. The proposed 8,300-acre Terrace area lies southeast of Mountain Home and north of the Snake River canyon. Project facilities would consist of a pumping plant located on the north bank of the Snake River to lift an estimated 25,000 acre-feet of project water 470 feet to lower lying lands. A main canal along with booster pumps and a pipe distribution system would then provide sprinkler irrigation pressure to about 4,200 acres.

A relift pumping plant located along the main canal would raise water an additional 60 feet to serve the remaining 4,100 acres with the same type of distribution system. An offstream reservoir located on Dry Creek would permit a capacity reduction in the river and relift pumping plants.

A portion of the project is within the Southwest Idaho Water Development Project area being considered by the Bureau of Reclamation. Development of the Terrace Project does not appear to materially affect the larger proposal.

Lands of the project area vary from flat to rolling with some areas specifically adapted only to sprinkler irrigation. It is estimated that about 80 percent of the arable land would have class I and II soil characteristics. About 42 percent of the project area is federal land now under Bureau of Reclamation withdrawal. The remainder is either privately owned or is federal land on which desert entry applications have been filed. If private development removes land from the project area there are additional lands available that could be served with a small amount of relift pumping.

Construction of the project under state sponsorship and funding by a USBR Small Project Loan has been proposed. A feasibility study and loan application could be completed in 1973 with construction completion in 1976 if no major problems in review and funding are encountered. The total estimated cost of the 8,300-acre project is about $5.2 million.

The Board will take no position on this project until a feasibility study is completed.

CANYON VIEW PROJECT. The approximate 13,500 acres considered in this irrigation development lie on the high bench north of the Snake River and downstream from the Idaho Power Company Swan Falls power plant.

A pumping plant located on the north bank of the Snake would raise the water supply about 600 feet to distribution facilities. An alternative plan would include an offstream storage reservoir to reduce the size of the river pumping plant, extend the pumping period, and provide a recreational and homesite potential. The terrain is moderately rolling, well suited for sprinkler type irrigation; the soils are generally considered excellent. The area is a part of the Initial Butte Unit of the Bureau of Reclamation Southwest Idaho Water Development Project. State sponsored development would require Bureau development of other lands. The impact on the larger project is unknown at this time.

Financing of the project would probably be under the Bureau of Reclamation Small Projects Program with the state sponsorship. It is not expected that a feasibility study and loan application would be completed before 1974 or 1975 and project completion before 1977. The estimated cost of the project is approximately $9 million.

The Board will take no position on this project until the impact on the Initial Butte Unit is known and a feasibility study is completed.

COTTONWOOD CREEK PROJECT. Cottonwood Creek Dam is located 700 feet upstream from the mouth of the canyon below the confluence of Cottonwood and Freestone creeks near Boise City. This project was authorized by the Flood Control Act of 1966 (P.L. 89-789) to reduce severe flooding caused by sudden runoff from the Cottonwood Creek drainage. The

dam will retain and release flood waters at rates that will not exceed downstream channel capacity. There will be no permanent lake behind the dam.

The dam will be an earth-filled structure 117 feet high and 1,100 feet long. The spillway will be an unlined channel excavated in rock. Outlet works will consist of an ungated 36-inch concrete conduit with an intake structure and a trash and a stilling basin. The conduit will be placed low enough to drain the entire streambed behind the dam.

Estimated cost of the project to the federal government is $2.6 million. Nonfederal costs are estimated at $502,000. Pre-construction planning is scheduled for completion in 1973. Funds must be appropriated by Congress before construction can begin.

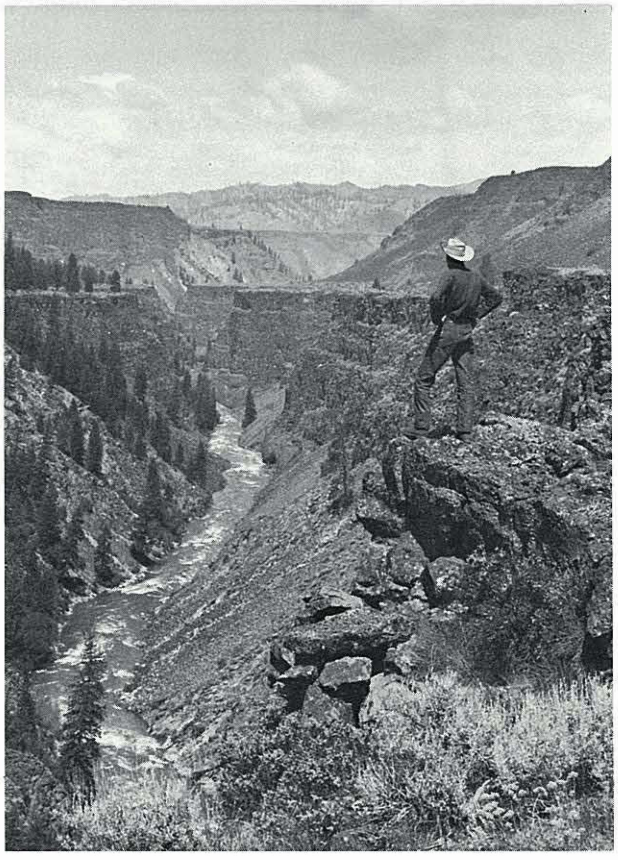
The Water Resource Board supports this project since it will reduce flood damages and the risk of loss of life in the Boise City area, and urges early appropriation of funds by Congress to construct the facility.

STUART GULCH PROJECT. A dam would be located on Stuart Gulch about 3,500 feet above its mouth. The reservoir, with a retention capacity of 510 acre-feet, would retain flood waters and release them gradually into the downstream channel. There would not be a permanent lake behind the dam.

This project, which is located in Ada County near the city of Boise, was authorized by the Flood Control Act of 1966 (P.L. 89-789). The dam would be an earth-filled structure 54 feet high and 1,054 feet long. The spillway would have a riprap-lined approach channel and a concrete-lined discharge chute. Outlet works would consist of an ungated 36-inch diameter concrete conduit with an intake structure, a trash rack, and an impact stilling basin. The conduit would be placed low enough to drain the entire streambed.

Estimated cost of the project to the federal government is $1,790,000. Nonfederal costs are estimated at $219,000. Pre-construction planning is scheduled for completion in 1972. Construction will be dependent on appropriation of funds by Congress.

The Water Resource Board supports early implementation of this project which would protect part of the city of Boise from severe



flooding resulting from heavy runoff in foothill areas.

TWIN SPRINGS PROJECT. In a report completed in March of 1968, the Corps of Engineers indicated that the combination of a power plant at Lucky Peak Dam with a reregulating dam downstream of Lucky Peak replacing the U.S. Bureau of Reclamation diversion dam, and a project at the Twin Springs site on the Middle Fork of the Boise River would be economically feasible for power, flood control, water quality control, and recreation. Power generating capacity at both dams would be 209,000 kilowatts and the lake behind Twin Springs would add 600,000 acre-feet of storage space to the Boise River system and increase the operating flexibility of the system. Combined construction costs of the two developments are estimated at $80 million.

The Idaho Water Resource Board passed a resolution on August 17, 1968 recommending disapproval of the Lucky Peak-Twin Springs projects unless: (1) integration of the plan with the Southwest Idaho Water Development Project is achieved before authorization is sought; (2) the state receives greater proportion of the benefits to accrue from the project; (3) the four "assurances" requested by the Corps of Engineers are modified, since the state has no authority to grant them; and (4) full mitigation of recreation and fish and wildlife losses is achieved. The Governor's position was essentially the same.

The Corps of Engineers has not fully resolved the questions posed by the Board resolution and the Governor; and the proposed project has not been submitted to Congress for authorization.

JORDAN VALLEY DIVISION. The Jordan Valley project consists of a dam on Jordan Creek about 12 miles upstream from the town of Jordan Valley, Oregon. Jordan Creek Reservoir would have a capacity of 65,000 acre-feet which would be used jointly for flood control and to provide a late season supplemental water supply for 8,950 acres now inadequately irrigated. The new reservoir would include facilities for recreation and for enhancement of fish and wildlife.

The dam would be located in Idaho, but the project would provide irrigation to only a small amount of land in Idaho. Most of the land served would be in Oregon. Project studies include appraisal of pumping exchange water to the existing Owyhee Project from the Snake River to replace additional water used in the Jordan Valley area.

The Bureau of Reclamation initiated a study on this project in 1967. Foundation exploration at the Jordan Creek damsite has been completed, land classification studies have been completed, and plans are being formulated. The report should be available for review in 1972.

Recent studies by the Bureau of Sport Fisheries and Wildlife concerning mercury poisoning of fish in Jordan Creek may result in a request by the Bureau that no fishery benefits be included in the project analysis. This would probably result in an unfavorable benefit-cost ratio.

The Idaho Water Resource Board has not taken a stand on this project.

FLOOD CONTROL LEVEES. There are three areas in the Southwest Idaho Basins that could benefit from the construction of flood control levees. These areas are located in the Weiser River basin, the Payette River basin, and the Boise River basin.

Weiser River Basin – Protection against floods at intermittent intervals on the 60-mile reach of the Weiser River downstream from Council and on the lower reaches of the lower Weiser River and Mann Creek was conditionally authorized by P.L. 516 of the Flood Control Act of 1950.

No project construction has been initiated and extensive emergency works by the Corps of Engineers, local agencies, and individuals have been effective only to a limited degree. Recent studies limit feasible protection to the lower six miles of the Weiser River. Local interests have requested increased protection, and a flood control district is attempting to meet sponsorship requirements.

Payette River Basin – A levee project has been proposed that provides for channel improvement and flood protection at 17 separate locations along the Payette River downstream from Emmett to the Snake. The project or projects would serve purposes of channel clearing, levee construction, and bank protection to prevent flood damage and erosion on valuable irrigated farm lands.

A negative justification report on the project was completed by the Corps of Engineers and the proposal has now been deferred pending clarification of the proposed Garden Valley Dam and Reservoir Project under study by the Bureau of Reclamation. Following the December 1964-January 1965 floods, local interests requested further flood control studies. Initiation of additional studies and of an analysis of the entire basin is dependent on appropriation of funds by Congress.

A flood plain information report was completed in 1968 at the request of Payette County for the lower eight miles of the Payette River.

Boise River Basin – Construction of Boise Valley levees was conditionally authorized by P.L. 516, the Flood Control Act of 1950. The original study provided for intermittent protective work along the Boise River from Diversion Dam above Boise to the Snake. The work included channel improvements, levees, and revetments. The channel was stabilized to increase capacity, to facilitate more effective operation of Lucky Peak Reservoir, and to provide increased protection against flood damage in Boise and on valley farm lands.

Construction of this project has not begun. Existing protective works at over 50 locations received emergency repairs from 1943 to 1959. Justification of this work was established in 1962. Plans and specifications for the proposed levees in Ada County have been delayed by problems experienced by fishery interests. The five-year limitation on authorization for the Canyon County unit expired on April 18, 1967. A flood control district has been formed along the Boise River from Boise to Caldwell and will take over sponsorship of the project.

SMALL WATERSHED DEVELOPMENTS. The Soil Conservation Service Program (P.L. 566) is in the initial stages in the Southwest Idaho Basins. The Succor Creek drainage in Owyhee County, Idaho, and Malheur County, Oregon is under study by an Oregon SCS planning group.

Nonstructural measures. Water resource problems can be prevented or alleviated through nonstructural measures implemented independently or in conjunction with one another. These measures can also be implemented jointly with major water resource developments.

Flood plain management is an extremely useful tool to help solve flood problems. Through such management, uses in flood plain areas can be limited to those not subject to major flood damage.

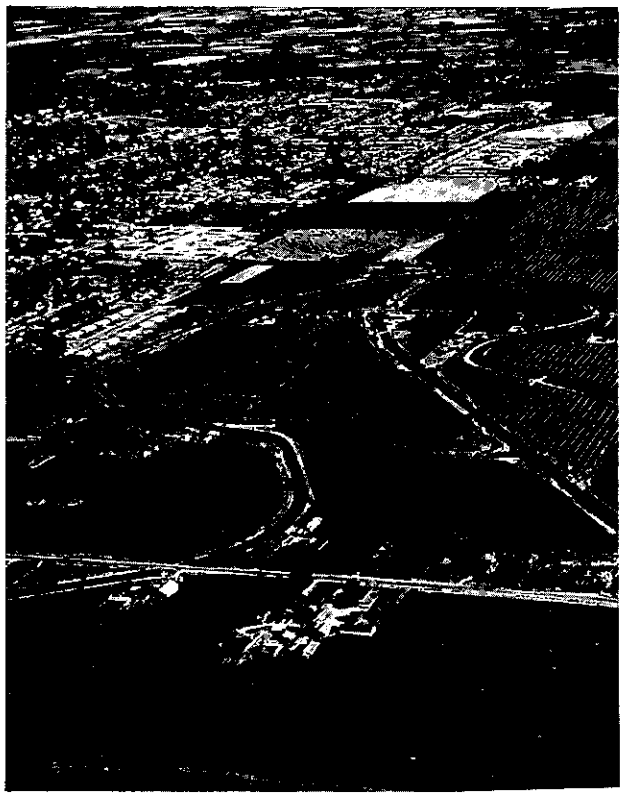
The Corps of Engineers has prepared flood plain information reports for the lower 8 miles of the Payette River and 26 miles of the Boise River upstream from the Ada-Canyon county line. Information contained in these reports would be used by communities and county planning commissions to determine flood plain zoning.

The state of Idaho and the Bureau of Outdoor Recreation are conducting a joint study on the entire main stem of the Bruneau River from the Idaho-Nevada border to confluence with the Snake to determine Bruneau's suitability for inclusion in the National Wild and Scenic Rivers System. This river is designated for study by the Wild and Scenic Rivers Act (P.L. 90-542, Section 5(a)), with the study to be completed before 1980.

Minimum flows should be established at key points on the region's river system so that management and planning for fisheries, water quality, and recreation can proceed on realistic bases. Detailed studies should be initiated immediately to establish official instream flows at the following key points: (1) Snake River at Weiser, (2) Boise River below Lucky Peak Reservoir, (3) Boise River at Boise, (4) Boise River at Caldwell, and (5) Payette River at Emmett. Recognition by the legislature that instream flows for fish, water quality, and recreation are beneficial uses of water will assist in establishing state policy and objectives in this area.

The Bureau of Land Management is implementing the Owyhee Project in Owyhee County to improve forage for grazing and wildlife production and to reduce erosion. The project includes structural and nonstructural measures, with structural measures consisting of fences and reseeding but not major water structures. The project is underway, but has not been adequately funded.

The Bureau of Land Management has classified a large amount of land in Owyhee County for retention under authority of the Multiple Use and Classification Act of 1964. A program for implementation has not been fully developed, but it will rely on fencing, reseeding, and improvement management to serve multiple uses.



Urban sprawl in the Boise Valley area and unchecked development near large bodies of water are providing the impetus for land use planning and zoning in the southwest Idaho region. Much agricultural land is being transformed into urbanized areas in the Boise, Meridian, Nampa, and Caldwell areas and this exchange is creating conflicts among agricultural, residential, industrial, and wildlife uses. In Ada County, city and county government have combined to form the Ada Council of Government in an effort to prevent unplanned development in the county. A more concentrated effort is needed among counties to encourage wise and proper use of water and land resources.

Modification of Existing Development. Lucky Peak dam and reservoir could be modified by construction of a power plant or construction of additional outlets to provide minimum flows for fish, water quality, and recreation. It could also be used as a reregulation reservoir for water imported from the Payette River if Garden Valley dam and reservoir are constructed. Lucky Peak could be operated to provide space for municipal and industrial water uses in the Boise area. Modification or revised operation of Lucky Peak would have to be studied in more detail before specific recommendations could be made.

The water exchange principle could be applied in any major reclamation development in southwest Idaho. Possibilities include exchange of: Snake River water for Boise River water; Payette River water for Boise River water; Snake River water for Payette River water; groundwater exchanged for surface water presently used by Boise Valley residents.

The long-range possibility of transbasin diversions and the impact on southwest Idaho and exchange principles could be significant. (Opportunities for future transbasin diversions are identified in more detail in Chapter 5.)

Potential Effects

The projects and programs as discussed here would, if implemented, have a major economic and environmental effect on the region. The most noticeable would be transformation of desert land to irrigated cropland and appearance of storage reservoirs. Construction of some projects, such as the dams on Cottonwood Creek and Stuart Gulch, do not appear to create economic booms or severe environmental losses. Other projects associated with irrigation development can create significant economic activity and, depending on the structural alternative, cause some changes in the natural environment. The changes in natural environment will vary from large multi-purpose reservoirs with correspondingly less free-flowing stream miles, to groundwater pump stations used specifically for irrigation with little impact on free-flowing streams.

Southwest Idaho will be faced with increasing urban and recreational demands. Ada County will probably increase in population faster than any other area of Idaho. The rapid increase will demand some water-related construction activities regardless of the effects; however, proper planning can reduce the adverse effects to a minimum. The activities include municipal water supplies, recreation, flood control, and provision of electric power.

Utilization of the Snake Plain aquifer in the Upper Snake region and the setting of minimum flows in Snake River at Weiser will in large part determine the magnitude of development that can occur in Southwest Idaho. Setting of minimum flows on the Boise, Payette, and Snake rivers will place a constraint on any water diversions for any purpose in the region. However, the instream uses of fish, water quality, and recreation will benefit. It does not appear likely that all the identified development could be implemented primarily because of short water supplies. Therefore, exact measurement of economic and environmental effects cannot be identified.

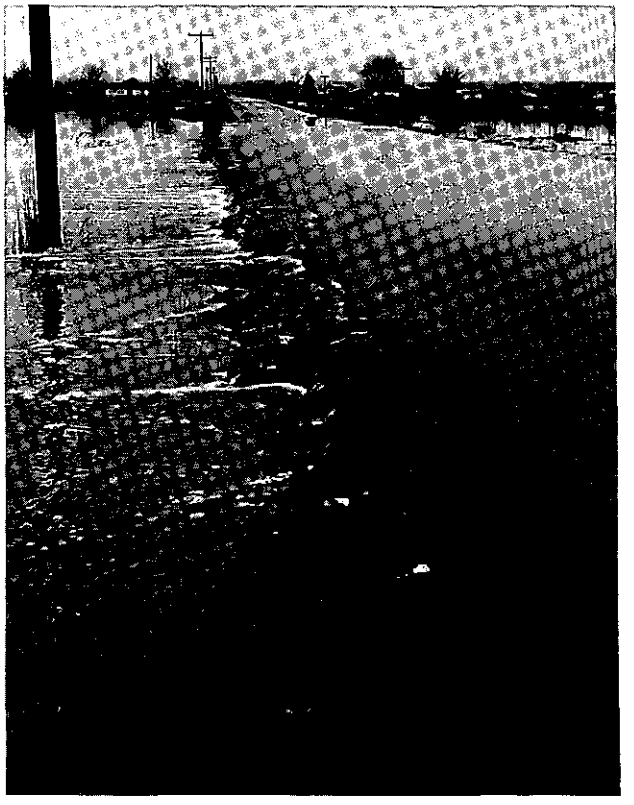
REMAINING PROBLEMS AND OPPORTUNITIES

The projects and programs discussed under "Basic Framework Development Alternatives" will not solve all of the water-related land resource problems of the Southwest Idaho Basins.

With increased population growth, the Boise Valley area will need additional recreational development. Many of the present facilities for water-oriented sports are heavily used and any additional pressure will decrease desirability and attractiveness.

Supplemental water for irrigation will continue to be needed in tributary areas and mountain valleys. Although alternative plans have been proposed to meet and partially solve some of these needs, it will not be possible to meet all completely.

Many problems associated with water resources could be eliminated through better planning and management. Land use zoning will play an important role in reducing urban sprawl in the Boise Valley area, as well as providing a



guide to flood plain management. Planning would guide industrial expansion as the population increases, as well as reduce the conflicts between recreation and other uses. Improper land uses have previously created numerous flooding and erosion problems between Boise and Caldwell; these could be significantly reduced with better planning.

Large acreages of desert and potentially irrigable land will remain undeveloped in the region even if all of the alternatives mentioned above are eventually implemented. Much of the acreage on the Bruneau plateau is at high elevations and far from available water supplies. Establishment of large minimum flows to provide for fish, recreation, and water quality needs in the Snake River would severely limit development of land in southwest Idaho unless water was imported from outside the region. This could involve major interbasin transfers from the Salmon River region or intensive use of the Snake Plain aquifer in the Upper Snake region.

Utilization of space in existing reservoirs could make possible both extensive development in the region and provision for adequate minimum flows. Deadwood, Lucky Peak, Cascade, and Arrowrock reservoirs all contain space that has not been sold even though it has been allocated. Water stored thus could be used for various purposes in future management of the region's land and water resources. More intense operation for irrigation and other purposes requiring drawdown of reservoirs early in the recreation season, however, could have adverse effects.

Many of the rivers or river reaches in the region are suitable for inclusion in a state wild and scenic river system. The South Fork of the Payette River (free-flowing segments from origin to the backwaters of the potential Garden Valley Reservoir) and North Fork of the Payette (free-flowing segments to the backwaters of the potential Smiths Ferry Diversion Pool) have been recommended for further study.

UPPER SNAKE BASINS

The Upper Snake Basins forms the largest of the five hydrologic planning regions, encompassing all or parts of 20 counties and about 35 percent of the state. The division point between this region and the Southwest Idaho Basins is located on the Snake River near King Hill.

The region includes a variety of topographic features: mountain ranges, valleys, and the Snake River Plain, and is characterized by highly productive irrigated lands, broad expanses of lifeless lava fields, and rugged mountains.

RESOURCES

Irrigated agriculture is the dominant industry, with about 2.4 million acres irrigated in 1970. Surveys have shown approximately 3.8 million acres with potential for irrigation development, and about 2.4 million of these acres have been identified as class I and II lands.

Recreation is of major significance near the headwater area of the Upper Snake, which includes portions of Yellowstone and Teton national parks, Palisades Reservoir, Island Park, and important reaches of free-flowing streams.

Average annual precipitation varies considerably throughout the region, depending on topography. On the Snake River Plain, where precipitation averages about 10 inches per year, irrigation water is required to grow most crops.

The river systems of the region include the Upper Snake main stem, Henrys Fork, Blackfoot, Portneuf and Big Wood rivers and numerous minor tributaries south and northwest of the Snake River.

The Snake River originates in the high mountainous country of western Wyoming. Average annual flow at the Idaho-Wyoming border is 3.4 million acre-feet and at Milner Dam only 1.1 million acre-feet. At King Hill the flow averages about 6.2 million acre-feet, approximately 80 percent of the Salmon River Basin runoff.

The Snake River Compact of 1949 requires that 4 percent of the river flow at the Idaho-Wyoming border must be reserved to satisfy Wyoming diversion needs.

Groundwater is a major resource of the region. The Snake Plain aquifer, one of the largest groundwater bodies in the nation, contains an estimated 250 million acre-feet in storage.[1] Discharges from the aquifer to the Snake River at Thousand Springs average about 4.7 million acre-feet annually.

Substantial amounts of land have been developed by groundwater pumping in recent years, especially north of the Snake River in Bingham, Power, Bonneville, and Jefferson counties and south of the river in Cassia County. Pumping from the Snake Plain aquifer has not caused any significant lowering of water levels north of the river; but south of the Snake, increased pumping in the Oakley Fan and Raft River areas has resulted in substantially lower water tables.

Reservoir storage capacity in the Upper Snake Basins totals about 4.5 million acre-feet of usable space. An additional 847,000 acre-feet in Jackson Lake is used to meet Idaho water needs. Henrys Lake and Island Park and Palisades reservoirs receive heavy recreational use.

Phosphate is the most valuable mineral in the region, which contains about 50 percent of the nation's estimated phosphate rock resource. The Big Wood, Little Wood, Big and Little Lost River, and Birch Creek drainages contain important deposits of silver, lead, zinc, gold and copper, which have been highly productive in the past. Coal fields in the Teton River basin have produced the highest yields in the state.

Forests cover about 14 percent of the total land area. Of the nearly 2.6 million acres of forest land, approximately 2.3 million acres are publicly owned. Although these lands do not contribute significantly to the employment base,

[1] Groundwater Conditions in Idaho; Idaho Department of Reclamation; Water Information Bulletin No. 1; 1966.

they represent an important segment of recreational resource.

The largest landowner in the region is the federal government, with 11.3 million acres or about 62 percent of the land area. Of this total, about 4.3 million acres are included in national forests and approximately 5.6 million acres are public domain. Private ownerships total about 5.8 million acres or 32 percent. State, county, and municipal ownerships totaling about 1.1 million acres make up the balance.

Headwater areas, in particular, contain spectacular scenic lands valuable for aesthetic qualities and opportunities for recreation including hunting and fishing.

EXISTING DEVELOPMENT

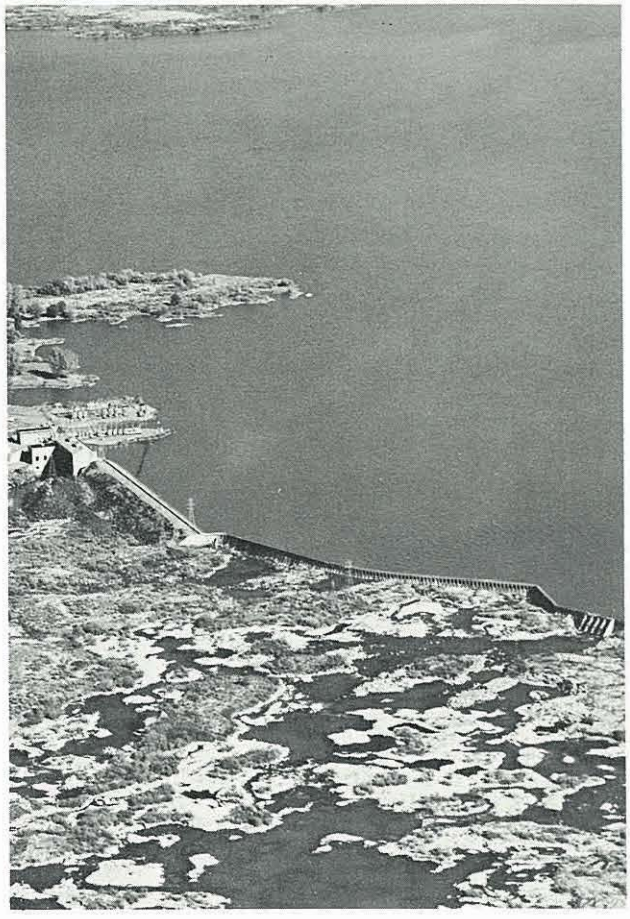
Water resource development in the region to date has centered around irrigated agriculture. Irrigation began over 100 years ago, and the two largest developed areas are located on the Snake River between King Hill and Lake Walcott and between American Falls and Ashton.

MINIDOKA PROJECT[1] — built under the Reclamation Act of 1902, was the first of many federally sponsored storage and distribution projects which have successfully expanded irrigation in this region. The project furnishes a full or supplemental water supply to over 1 million acres of land located along the Snake River between Ashton and Gooding some 300 miles downstream.

Project facilities consist of 5 reservoirs having a combined storage capacity of 2,784,600 acre-feet, 2 diversion dams, 293 miles of canal, 672 miles of laterals, 537 miles of drains, and 190 water supply wells. All storage and power facilities, together with the deep wells and related irrigation facilities of the North Side Pumping Division, are operated by the Bureau of Reclamation.

Minidoka Dam (Lake Walcott), completed in 1906, provides 95,200 acre-feet of project storage. The power plant at the dam has an installed capacity of 13,400 kilowatts. The North Side Canal diverts water from the dam into a gravity canal and lateral system, known as the Gravity Division, and serves about 72,000 acres of land in the vicinity of Rupert. The Gravity Division is operated by the Minidoka Irrigation District. The South Side Canal diverts water from the dam into a canal system which includes three large pumping plants and is known as the South Side Pumping Division. This system is operated by the Burley Irrigation District and serves about 48,000 acres of land adjacent to Burley and Declo.

In 1916, Jackson Lake Dam was raised to its present height, providing 847,000 acre-feet of project storage. American Falls Dam, completed in 1927, provides 1.7 million acre-feet of project storage. Storage at these two sites, in addition to providing a water supply to project lands, including the North Side Pumping Division and Michaud Flats Project, also furnishes supplemental water to about 750,000 acres of private land under the terms of the Warren Act.



[1] Reclamation Project Data, U.S. Department of Interior, Bureau of Reclamation, 1961.

The Upper Snake River Division of the project is comprised of Island Park Dam, Cross Cut Diversion dam and canal, and Grassy Lake Dam. Island Park Dam, completed in 1938, provides 127,200 acre-feet of project storage. The Cross Cut Diversion dam and canal, completed in 1938, furnishes water to about 112,000 acres of land in Fremont and Madison counties. Grassy Lake Dam, completed in 1939 provides 15,200 acre-feet of project storage. The Upper Snake River Division is operated by the Fremont-Madison Irrigation District.

The Gooding Division, which consists primarily of the 70-mile Milner-Gooding canal which extends from Milner Dam to the north Gooding main canal, furnishes a full or supplemental water supply to about 98,000 acres of land. The Milner-Gooding canal was completed in 1932. The Gooding Division is operated by the American Falls Reservoir District No. 2.

The North Side Pumping Division completed in 1961, irrigates about 77,000 acres of land near Burley from deep wells. It is operated by the Bureau of Reclamation.

PALISADES PROJECT[1] — was completed in 1957, and is operated and maintained by the Bureau of Reclamation. The project was designed to provide a supplemental water supply for about 650,000 acres of lands now irrigated in the Snake River Valley, and to provide a portion of the water supply for development of new lands in the Michaud Flats Project as well as in the North Side Pumping Division of the Minidoka Project. The project is multi-purpose in that it involves irrigating, power, flood control, recreation, and fish and wildlife conservation.

Project features are the 270-foot high dam, creating a reservoir of 1,202,000 acre-feet active capacity (1,402,000 acre-feet total capacity), and a power plant at the dam with an installed capacity of 114,000 kilowatts.

MICHAUD FLATS PROJECT[1] — was completed in 1958 and is operated by the Falls Irrigation District. It provides a water supply for about 11,000 acres of land along the Snake River adjacent to the town of American Falls. Surface flow of the Snake River is stored in space allocated to the project in American Falls (Minidoka Project) and Palisades (Palisades Project) reservoirs, and is pumped from below American Falls Reservoir into canals that serve about 60 percent of the project lands. Return flow is used on as much of the remaining land as it will serve and groundwater is pumped from wells to serve the remainder.

LITTLE WOOD RIVER PROJECT[2] — provides a supplemental irrigation water supply to about 9,500 acres of land located on both sides of Little Wood River, upstream and downstream from the town of Carey. The increased water supply was provided by raising Little Wood River Dam from 77 feet to 122 feet, thereby increasing the reservoir capacity from 12,100 acre-feet to 30,000 acre-feet. Enlargement of Little Wood River Dam was completed in June 1960. The project is maintained and operated by Little Wood River Irrigation District.

[1] Reclamation Project Data, U.S. Department of the Interior, Bureau of Reclamation, 1961.
[2] Reclamation Project Data (Supplement), U.S. Department of the Interior, Bureau of Reclamation, 1966.

LOWER TETON DIVISION (FIRST PHASE) — scheduled to be completed in 1977, will provide a supplemental water supply for about 110,000 acres. The second phase will provide a water supply for about 37,000 acres of new irrigation. Estimated cost of the project (first phase is $71 million.

TRAIL CREEK WATERSHED PROJECT — located in southeastern Teton County, Idaho, and western Teton County, Wyoming. It consists of 58,083 acres in the Teton River drainage.

Annual flooding occurs on irrigated lands adjacent to Trail Creek. Accumulations of silt, gravel, and debris block the channel. Waters flood adjacent cropland resulting in sediment and erosion damages. Similar problems occur on the upper Trail Creek watershed principally on lands within the Targhee National Forest.

Principal sponsors of the Trail Creek Watershed Project include the Teton Soil Conservation District, Trail Creek Sprinkler Irrigation Company, village of Victor, and board of county commissioners, Teton County, Idaho. The project is nearly 72 percent complete and will provide a modern efficient irrigation distribution system for 7,200 acres and reduce losses due to flooding. Estimated installation cost is $3.18 million and should be fully installed by 1977.

CEDAR CREEK WATERSHED PROJECT — located in Twin Falls County. It consists of 127,000 acres of which 91 percent is rangeland, 5 percent is cropland, and 4 percent is forestland.

The project is completed and involved installation of 1½ miles of 54-inch concrete pipe, canal relocation, construction of a 125 acre-foot reservoir, and associated structures. Total cost of the project was $1,174,172.

Local flood control works have been completed by the Corps of Engineers: on Lyman Creek; on the Snake River between Heise and Roberts, and about 4 miles downstream from Shelley and 7 miles southwest of Blackfoot; on the Blackfoot River; on the Portneuf River at Pocatello, Blackrock, and Inkom; and along most of Marsh Creek.

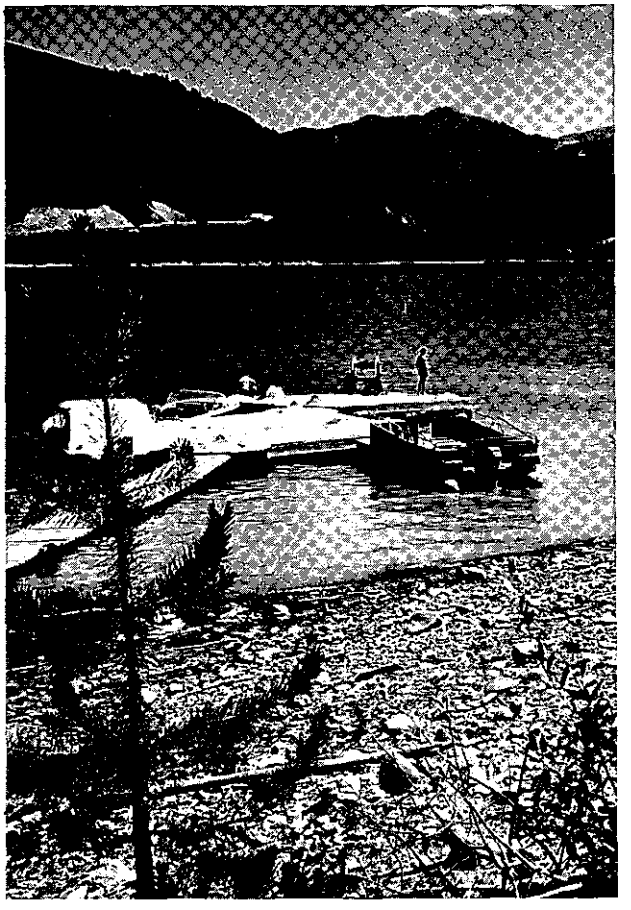
THE RIRIE DAM — located on Willow Creek above Idaho Falls, is now under construction by the Corps of Engineers, with completion expected by December 1974. It is designed primarily as a flood control project to solve flooding problems on Lower Willow Creek adjacent to Idaho Falls. Construction costs were estimated in July 1970 at $17.4 million.

There are numerous existing hydroelectric facilities in the region: Idaho Power Company facilities are located at American Falls (27,500 kilowatts), Bliss (75,000 kilowatts), Lower Malad (13,500 kilowatts), Upper Malad (7,200 kilowatts), Lower Salmon (60,000 kilowatts), Upper Salmon A (18,000 kilowatts), Upper Salmon B (16,500 kilowatts), Thousand Springs (8,000 kilowatts), Clear Lake (2,500 kilowatts), Shoshone Falls (12,380 kilowatts), and Twin Falls (13,500 kilowatts); the Utah Power and Light Company operates two small plants at St. Anthony (500 kilowatts) and Ashton (5,800 kilowatts); federal power facilities are located at Teton Dam[1] (20,000 kilowatts), Minidoka (13,400 kilowatts), and at Palisades Dam (114,000 kilowatts); the city of Idaho Falls operates three small plants having a combined capacity of 7,400 kilowatts; and small power producing facilities are operated at Felt by the Fall River Rural Electric Cooperative (1,870 kilowatts) and at Pond by Pond Lodge, Inc. (200 kilowatts). The existing power facilities have a combined installed capacity of 417,250 kilowatts. The largest is the federal plant at Palisades Dam which produces 114,000 kilowatts.

There are nine "trout farms" in the Hagerman Valley which rely upon Snake River water and/or spring flows from the Thousand Springs. Estimated commercial harvest in Idaho in 1972 is 4.5 million pounds. Snake River Trout Ranch which is the world's largest, will harvest approximately two million pounds of Rocky Mountain rainbow trout in 1972. Water quality, temperature, and quantity are extremely important to the success of this type of development.

Recreation use is made of all major water resources in the region, particularly in the headwater areas at Henrys Lake, Island Park, the Big Springs area, and Palisades Reservoir. Valuable recreation facilities and homes have been built in the Wood River Basin and the Sun Valley

[1] Now under construction.



area has gained national prominence as a summer and winter resort area.

Major urban centers in the Upper Snake Basins include Idaho Falls, Pocatello, Burley, and Twin Falls. The region lags behind Idaho and the nation in income and population growth rates primarily because of the lack of jobs and opportunities in the region. Population increased 5.4 percent between 1960 and 1970, compared to 6.8 percent for the state and 13.3 percent for the nation. Net outmigration from the region during this decade totaled about 30,000 people or approximately three-fourths of the state total outmigration.

PROBLEMS AND NEEDS

The available water supply is not adequate to meet projected needs for all water use functions in the region.

With the exception of aquatic growth and sedimentation, there have been few instances of persistent or recurring water quality problems in recent years, although Milner Reservoir and the lower Portneuf River have consistently exhibited undesirable water quality conditions for at least a portion of each year.

The region has no known major groundwater problems, but the National Reactor Testing Station practices of injecting short-lived radioactive materials into the Snake Plain aquifer and burying long-lived radioactive solid wastes in the surface soils pose a constant potential for contamination. Available information indicates that the liquid wastes do not move significant distances before dissipating; but close and continual monitoring of this situation is current and is absolutely essential.

Groundwater levels in the Raft River and Oakley Fan areas are receding and supplemental water may have to be provided for present users.

Water supplies for the Salmon Falls area are inadequate for the land area presently irrigated and supplemental water is required.

Flood problems exist in the Sand Creek drainages, the lower Willow Creek area, on the Portneuf River in the Bancroft area, the Lava Hot Springs area, around Inkom and Pocatello, along portions of the Snake River near Blackfoot, and on agricultural lands along the Big Lost River and tributaries to Mud Lake. A flood potential is also developing along the Wood River, where recreation facilities and homes are rapidly being built.

The dam at American Falls is in critical need of replacement. A three-man board of consultants, appointed in 1967, submitted a report in September 1968, confirming that the dam must be replaced or extensively rehabilitated.

Drawdown of Jackson Lake during the recreation season presents a major problem in dry years. Although the lake is located in Wyoming, part of storage capacity is used to provide for Idaho irrigation needs and any solution to the problem will involve Idaho interests.

Land use zoning must be established and implemented to protect recreational values and water quality in prime recreational areas such as Henrys Lake, Island Park Reservoir, the Big

Springs area, and Wood River basin. More planned facilities will be needed to meet the ever-increasing need for public outdoor recreation.

Improved water and sewer facilities are needed in many of the small communities, in rural settlements throughout much of the state and nation.

Intensive land measures and improved multiple use programs are needed to protect and improve the land base. Critical problems include drainage, erosion control, streambank protection, channel and vegetative cover improvements, and runoff control. A Type IV study presently being conducted by the Soil Conservation Service in cooperation with the Idaho Water Resource Board will help to identify specific problem areas.

Extensive pumping from the Snake Plain aquifer could affect the spring flows at Thousand Springs. Any programs or projects significantly altering the quality or quantity of water available at that point would have important effects on the trout farming industry. A Snake Plain recharge project should be considered including the concept of flood water diversion to aquifer storage as possible supply for pumping where needed.

Wildlife management programs are needed to improve winter range in the foothill areas for both big game and upland game. Nesting facilities and feeding areas should be developed for the protection of waterfowl.

Present conflicting needs in some areas — water for irrigation and instream flow needs for fish and water quality — will intensify with future increases in uses and needs. It is essential that these conflicts be resolved.

The "Winters Doctrine", involving the issue of Indian tribal rights to waters needed for irrigation and other uses on reservation lands, presents a possible conflict with state water rights. The Fort Hall Indian Tribal Council may seek to obtain favorable court action concerning application of the Winters Doctrine in Idaho. If the forecasted needs for water on the reservation are extensive court action could have major consequences for planning and development of the region's water and land resources. (This is discussed at greater length in Chapter 2, "Major Policy Issues".)

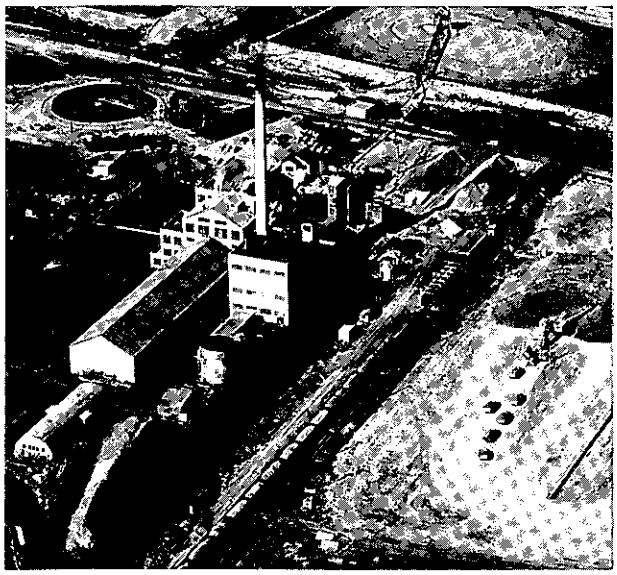
The "Reservation Doctrine" refers to the question of possible water development without reliance upon state law — for any use consistent with the purpose of the federal reservation. Since this issue involves state water rights, it presents a major "unknown" in future planning and development of the region's water resources. (A full discussion of this issue is presented in Chapter 2.)

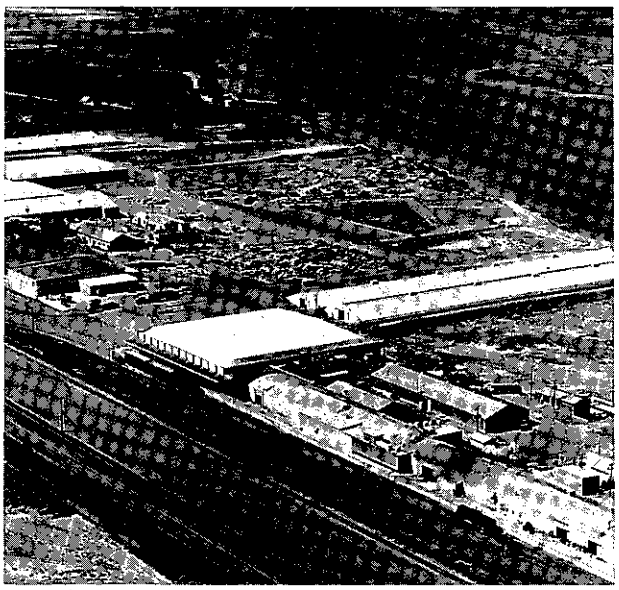
BASIC FRAMEWORK DEVELOPMENT ALTERNATIVES

The projects and programs discussed under this section include those independent local developments and public projects which can help meet the problems and needs discussed above. There are large areas requiring an additional water supply such as the Salmon Falls, Oakley Fan, and Raft River areas and the Board supports introduction of water into these areas. However, in dry years, the existing surface supply is totally committed. Water for these lands would need to come from some combination of groundwater pumping from the Snake Plain aquifer and surface storage. Lynn Crandall, American Falls enlargement, and Marsh Creek are the only large proposed storage projects remaining in the Upper Snake. If these are not built, complete reliance will have to be placed on the Snake Plain aquifer for development and recharge. Alternatives such as groundwater development and recharge, surface storage, and water savings programs will be analyzed as part of the State Water Plan. The Corps of Engineers is currently conducting a study of the Wood River Basin. Problems and potentials are being identified, as well as possible development alternatives.

Independent Local Development

Predictions of development by local individuals, groups, or municipalities are difficult to make since economic conditions and local needs and desires can change rapidly.





New water supplies to meet predicted municipal and industrial growth (Chapter 3) can be provided through increased groundwater pumping and diversion of surface water. These needs will probably be met through independent local developments aided by state and federal financial assistance programs. Urbanized areas in which early action is needed to meet growing water and sewer facility requirements include Idaho Falls, Blackfoot, Ketchum-Sun Valley, Hailey, and Twin Falls.

A large irrigation development is under construction near Hagerman which will serve about 30,000 acres of the high benchlands west of the river. A significant amount of new irrigation is expected to be developed by private parties in areas of the Snake River plain which have access to groundwater and, to some extent, on the Rexburg bench. By the year 2020, this private development could affect 300,000 acres. It will be limited by the restrictions placed on private individuals or groups seeking to develop potentially irrigable lands controlled by Bureau of Land Management and the Atomic Energy Commission jurisdictions.

The Raft River Electric Co-op has outlined plans for a geothermal electric power plant near Bridge. These plans tentatively call for as many as 32 separate wells in the area surrounding two natural hot springs. The project, which could produce an estimated 250 megawatts, would be the second of its kind in the country and the third largest plant in Idaho. No estimate of costs is now available and the feasibility of the project is not known. This type of project does not require Board approval.

An increasing share of the state's future electric power requirements will be supplied by thermal generation. Idaho has no known reserves of fossil fuel large enough to supply the requirements of economically-sized generation units. There are abundant reserves in adjacent states and it is assumed that the major suppliers of electrical energy for the region (Idaho Power Company and Utah Power and Light Company) will provide for increased power requirements through construction of plants outside Idaho. This is already being done in the case of the

1,500 megawatt Jim Bridger coal-fired plant in Wyoming, which is being built by the Pacific Power and Light Company and the Idaho Power Company. The plant is scheduled for completion in 1976, at a cost of $300 million. One-third of the power will be used by the Idaho Power Company to serve Idaho customers. It is possible that Idaho Power Company may build a thermal plant within its own system within the foreseeable future.

Resource Conservation and Development (RC&D) programs are underway in two areas of the Upper Snake Basins, the Western Wyoming area (Caribou and Bonneville counties in Idaho and Lincoln and Uinta counties in Wyoming) and the Wood River Resource area (Blaine, Lincoln, Camas, and Gooding counties). The western Wyoming RC&D program was authorized in 1967 and includes planning for and treatment of 246,384 acres in Idaho. The Wood River RC&D program was authorized in 1971, covering 3,603,840 acres in the Snake River, Big and Little Wood River, and South Fork of the Boise River drainage areas. U.S. Department of Agriculture sponsored RC&D projects are intended to improve economic conditions in the involved areas, with better care of natural resources as a primary objective.

Public Development

Structural Measures. Structural development alternatives involving both state and/or federal agencies include irrigation, flood control, recreation, and small watershed projects. The locations of these facilities are shown on Upper Snake Basins Figure 43.

LOWER RAFT RIVER PROJECT. The Idaho Water Resource Board received an appropriation of $37,500 to prepare a feasibility study on the Lower Raft River Project. The Board plans to prepare a loan application for a P.L. 984 (Small Reclamation Project) in order to obtain federal financing, if the project proves feasible.

The land for the proposed Lower Raft River Irrigation Project, totaling about 11,500 acres, is located in Cassia County on the east side of Raft River. These lands are presently dry-farmed or lying fallow. Water supply would come from the Snake River, with a well field south of Lake Walcott providing replacement water to the Snake.

The feasibility study was initiated in April 1970. The State Department of Water Administration had closed the area to pumping in July 1963 because of a serious decline in groundwater levels, but by the time the study was completed, about one-third of the northern lands had been reopened. The reopening of at least part of the area to pumping left local people uncertain as to whether they should proceed with the project as outlined or develop additional groundwater. The Board favors revising the project to include lands south of the proposed service area. These new lands lie in federal domain and are of high quality.

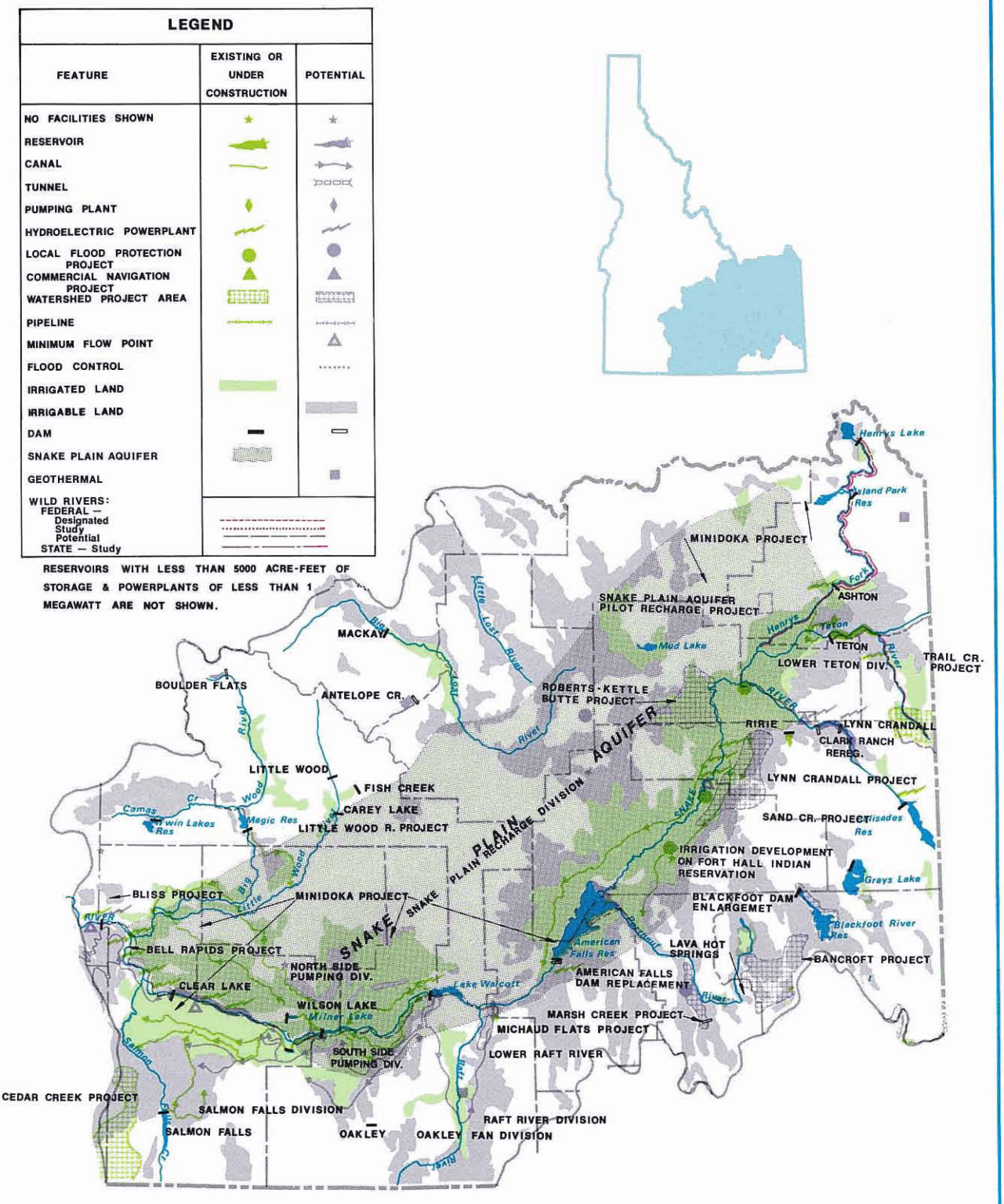
The Board considers early development of these lands to be compatible with state water policy and hopes to put the project into effect in the 1970-1980 time period if it is found to be feasible. Project costs are estimated at about $6 million.

RAFT RIVER DIVISION. The division, involving irrigation of about 96,000 acres in a triangular area on both sides of the Raft River downstream from Malta, was submitted for further study by the Bureau of Reclamation in 1961. The Bureau's irrigation proposal involved pumping from the Snake River and delivering through a conventional distribution system that includes some relift pumping. Use of Snake River water would be augmented by groundwater pumping in the project. Bureau studies indicated that during wet years, 70 percent of the project water would be supplied from the Snake River. During dry years the river would supply about 50 percent.

Project facilities would consist of two pumping plants, canals, some 300 groundwater wells, laterals, drains, and required exchange or replacement facilities.

The Bureau's proposed project includes lands within the Lower Raft River project area under study by the Board. However, if the Board's project is implemented, the Bureau's project area will be adjusted. The Bureau's detailed feasibility studies on the project will probably

FIGURE 43. UPPER SNAKE BASINS



be initiated about 1975 and completed around 1980. The Board supports development of the Raft River lands, but has taken no official position on the proposed Bureau project. If further study shows it to be feasible, the Board will hold public hearings and then take official action. Project costs would probably be in the neighborhood of $100 million.

NORTH SIDE PUMPING DIVISION EXTENSION. The Bureau of Reclamation is requesting authorization to conduct a feasibility study on the North Side Pumping Division Extension — Minidoka Project. During recent years, the A & B Irrigation District has had problems with silt carried in the return flows which is plugging the disposal drainage ways and drainage wells. Although the district previously opposed any additional irrigation in the North Side Pumping Division area because of declining groundwater levels, it now feels that since groundwater levels have stabilized and partially recovered, extension of irrigation to about 12,000 acres in the A & B District should be considered. This extension would use 6 deep wells that have been drilled but are not now being used. The project would cost an estimated $6.5 million. Congress authorized the Bureau of Reclamation to conduct the feasibility study in 1971.

OAKLEY FAN DIVISION. The Bureau of Reclamation is conducting a feasibility study on the Oakley Fan Division, located along Goose Creek south of Burley. This project would involve providing supplementary water to about 80,000 acres of irrigated land and a new supply to about 60,000 dry acres.

Supply could come from one or more of the following: water pumped from the Snake River; releases from Lynn Crandall Reservoir if it is built (see the discussion on the Lynn Crandall Division); and groundwater pumped both from within the Oakley Fan area and from the Snake Plain aquifer north of the Snake River.

Project facilities would probably include a large pumping plant at Lake Walcott on the Snake, large canals, relift pumps, groundwater wells, and distribution and drainage facilities.

The Water Resource Board believes that development of the Oakley Fan lands is compatible with state water policy. Studies should be completed by 1976 and, if it is found to be feasible, the project should be implemented before 1990. The cost of the project would probably exceed $140 million.

SALMON FALLS DIVISION. The division, supplying supplemental water to 49,400 acres of irrigated lands in the Salmon Falls Tract and a new supply to about 15,000 dry acres, is sponsored by the Bureau of Reclamation. The project area lies south of the Snake River, above the existing Twin Falls Southside Highline canal.

Water for the project could come from four sources: Salmon Falls Creek, Rock Creek, the Snake River, or groundwater pumping from local sources and the Snake Plain aquifer.

Project facilities would include the existing Salmon Falls Tract facilities plus a pumping plant located on the Snake River upstream from Milner Dam which would lift water about 120 feet to a canal. The 53-mile canal, which would extend into the Salmon Falls Tract, could be used jointly by the Salmon Falls and Oakley Fan Project for about the first 9 miles. Additional pumping plants, canals, and laterals would be included to serve the area.

The Board has determined that the project is compatible with state water policy and expects that it will be implemented by 1980 at a cost of about $57 million. Project construction was authorized by the U.S. Senate in 1971, but has not been acted upon by the House of Representatives.

LYNN CRANDALL DIVISION. This project, currently being studied by the Bureau of Reclamation, would involve construction of a dam on the Snake River just below the mouth of Burns Creek. A storage capacity of 1,620,000 acre-feet would be used to provide a water supply in the Raft River and Oakley Fan areas for new irrigation development; lands receiving supplemental water supplies; reregulation of power releases from Palisades Reservoir; and replacement storage for Jackson Lake. Other possible features include a 240,000 kilowatt power plant at the Lynn Crandall site, enlarge-

ment of the existing Palisades power plant to provide an additional 135,000 kilowatts, and a reregulating reservoir at the Clark Ranch site 7 miles below Lynn Crandall.

The project would create major conflicts however. The reservoir would flood out 32 miles of a prime fishing stream and inundate valuable big game winter range. The project would also cause mud flats to appear in the Swan Valley area during a substantial part of the recreational season, especially if it is operated to provide replacement storage for Jackson Lake.

The Board has taken no official action on the project. Results of studies on the Oakley Fan and Raft River projects will be an important determinant in the Lynn Crandall studies. After the Bureau has completed the Lynn Crandall feasibility study, the Board will decide on a course of action. The project, if found feasible, and endorsed by the Board, would fall in the post-1980 time period. Project costs would run about $190 million.

MARSH CREEK PROJECT. This project, under study by the Corps of Engineers would involve a dam and a 40,000 acre-foot reservoir on Lower Marsh Creek. It would reduce local flooding along lower Marsh Creek and along Portneuf River from Marsh Creek to its mouth, as well as provide water-based recreation along Interstate 15 in conjunction with the Indian Rock State Park.

The Board has not taken official action on the project, but it favors additional study to determine whether a multi-purpose project could be structured to provide benefits to the state. If a feasible project can be formulated, the Board will probably endorse it and early construction is possible. Project costs would probably be about $10.5 million.

SAND CREEK PROJECT. The project, covering the upper and lower Sand Creek watersheds, has been proposed by the Soil Conservation Service primarily for purposes of flood control. The Board has reviewed the study plan and offered support in seeking authorization and funding. The project is opposed, however, by some local property owners who object to a cross-cut channel needed to carry flood flows over private lands. Studies aimed at determining the optimum plan for development are continuing. Estimated project costs are $7.8 million.

BANCROFT WATERSHED PROJECT. The project lies wholly in Caribou County and involves about 130,000 acres. The principle problems under investigation include flood prevention and sheet and gully erosion. The problems stem from runoff of winter snow melt on frozen ground creating serious flooding conditions near Bancroft. Several businesses and homes have been damaged in previous years. Possible solutions include channel improvements and flood water retarding structures. The Union Pacific Railroad has recently built a new bridge near Bancroft and the county is also increasing the capacity of some bridges. This appears to have partially resolved the flooding problem in the immediate Bancroft area. There are no estimates of project costs available at this time.

ROBERTS-KETTLE BUTTE WATERSHED PROJECT. The project lies in Bonneville, Bingham, and Jefferson counties and comprises about 120,000 acres. The principle problems under investigation in this watershed are flood damages, sedimentation, and drainage problems from high water tables in the Roberts area. Part of the flooding problem is caused by man-made barriers across natural drains obstructing winter and spring runoff. The obstructions are causing sedimentation and ponding of water on farm lands in the lower areas. Possible solutions to prevent future damages include channel and drainage way improvements and also water retarding structures in the Kettle Butte area. In the Roberts area, containment type storage is being studied. Several storage sites are under investigation with possible storage of up to 5,000 acre-feet. There are no estimates of project costs available at this time.

FORT HALL INDIAN RESERVATION. The reservation includes about 524,000 acres of land and a population of about 3,000. The Tribal Council is applying for a grant from the Economic Development Administration to develop recreational facilities at the junction of Highway 30N and the interchange road to Rainbow Beach, and on Rainbow Beach at American Falls Reservoir. If studies now underway indicate that

these developments are feasible and if grant funds can be obtained, the project could be completed by 1980. Agricultural development will continue on reservation lands. Two percent of the total national potato crop is grown on the Fort Hall Reservation — as well as large numbers of livestock.

SNAKE PLAIN PILOT RECHARGE PROJECT. A state-sponsored pilot recharge project in the St. Anthony area has been proposed by the Board to divert excess flows in the Henrys Fork to the groundwater aquifer. If funds are provided, early action is expected.

The project would help to determine the feasibility of major recharge of the Snake Plain aquifer. About 20,000 acre-feet of surplus flows annually would be diverted. Agreement has been reached with local water users to use existing canals and for construction of about 2 miles of new canal. The project would also contribute to a possible federal, state, or local recreational development in the vicinity of the Sand Dunes near St. Anthony. The project would cost about $20,000.

SNAKE PLAIN RECHARGE DIVISION. The division is the subject of a feasibility study by the Bureau of Reclamation. The study is scheduled to be completed in January 1975.

The purpose of the study is to obtain detailed benefit and cost data of a plan for recharging the Snake Plain aquifer (Figure 44). The plan being formulated will identify diversion dams and canals that could be built to convey the surplus flood flows of the Henrys Fork and Snake River to recharge areas.

The Board supports this study effort by the bureau and considers this type of usage of the aquifer as the key for providing future needs for irrigation, water quality, fish and wildlife, and water based recreation.

The June 1962 Special Report on the reconnaissance-grade investigation of the project by the bureau estimated a total construction cost of $13,150,000. Total project costs, indexed to 1971, would be about $17.4 million.

BLISS PROJECT. The project would involve development of about 15,000 acres of public domain lands north of Bliss. The water supply would be provided using an offstream reservoir of about 80,000 acre-feet of storage, supplied by surplus flood flows from the Big Wood River, spills from the Northside Canal Company system, and groundwater pumping.

The project if found feasible and approved by the Board would take advantage of the Carey Act. Reconnaissance studies have not yet been completed by the Board staff; however, it appears that project costs would approach $7.5 million.

LAVA HOT SPRINGS FLOOD CONTROL PROJECT. Congress has authorized the Lava Hot Springs Levee and Channel Project, designed to alleviate flood damages in this area. Consisting of natural channel improvements, freeboard levees, and a rectangular concrete channel, the project would cost about $760,000 and should be completed by 1980.

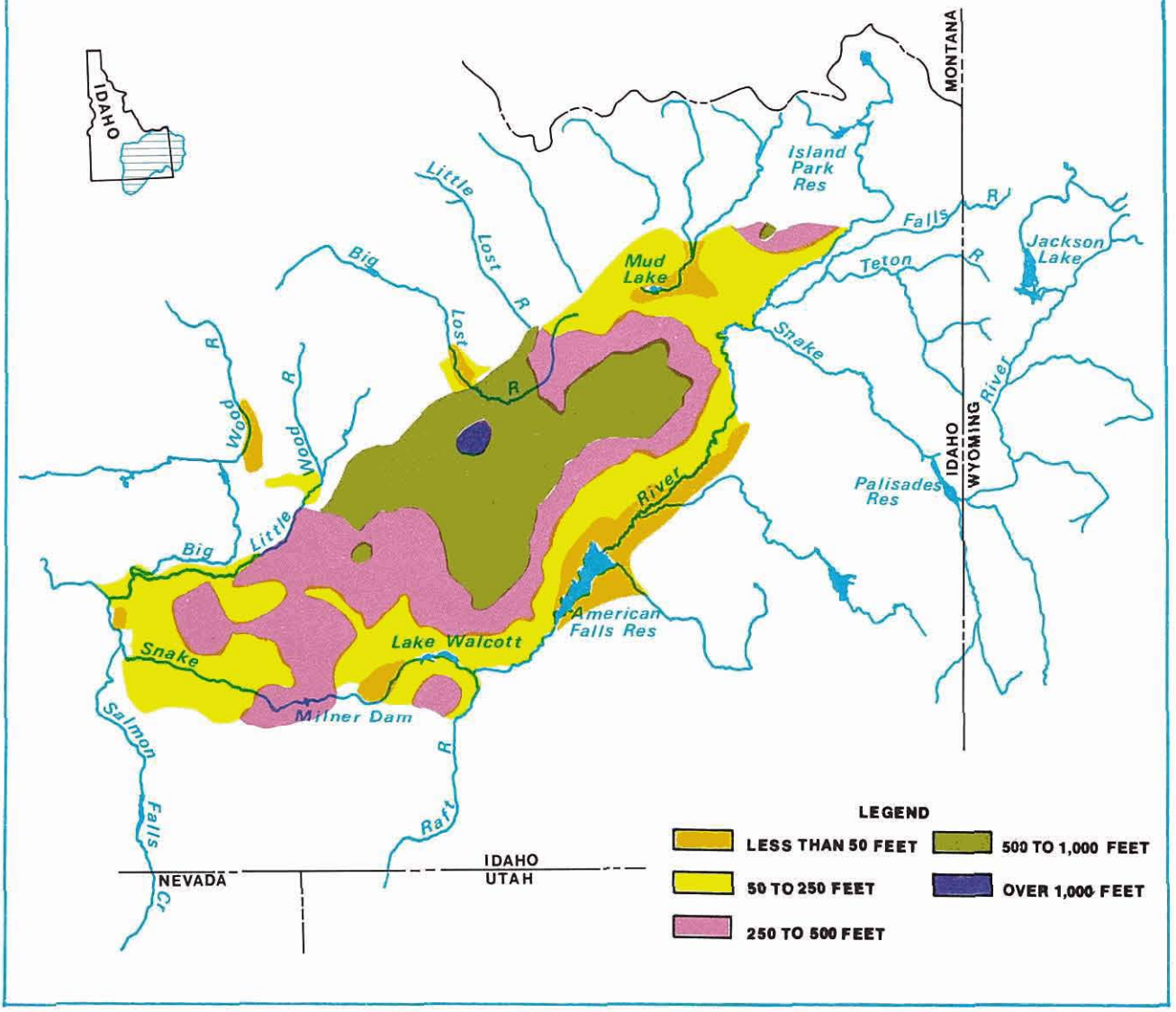
Nonstructural Measures. Flood plain management is a useful tool for solving flood problems by limiting land use in flood plain areas to uses not subject to major flood damages.

The Corps of Engineers has prepared flood plain information reports for the following areas: Portneuf River — Pocatello and vicinity; Big Wood River — Ketchum and vicinity; and Big Wood River — Bellevue, Hailey, and vicinity. This information should be used by local counties and communities to determine zoning.

The secretaries of Interior and Agriculture have named the Henrys Fork from headwaters to confluence with Warm River as a potential addition to the National Wild and Scenic Rivers System. As a result of this action, any river basin or project plan report by a federal agency involving this reach of the river must consider this possibility. Establishment of a state wild and scenic rivers system should be decided on as soon as possible. Not only the Henrys Fork, but also the Teton River from headwaters to confluence with the North Fork of the Teton should be considered for inclusion.

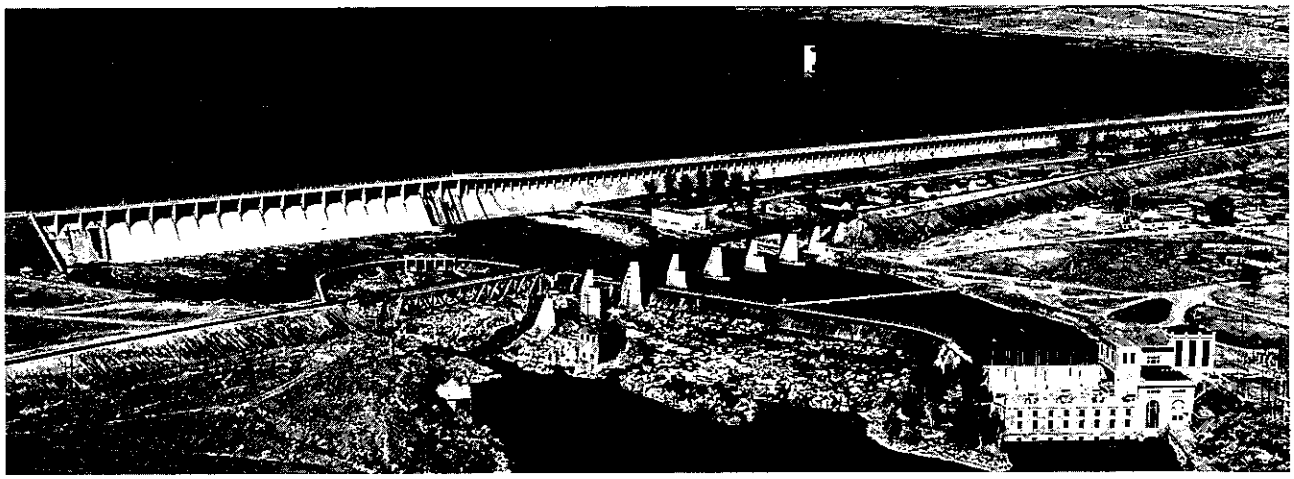
Areas suggested by various agencies for possible inclusion in the National Wilderness Pre-

FIGURE 44. SNAKE PLAIN AQUIFER



servation System are shown on Figure 7, Chapter I. These include the Targhee National Park, Snake River Plain Wilderness Area, Copper Basin — Big Lost Wilderness Area, Salmon Falls Wilderness Area, Kepuka Wilderness Area, China Cup Natural Area, and Thousand Springs National Park. No Board action has been taken on this proposal. The suitability of these areas for inclusion in the system and conflicts with other water and related land use functions should first be studied.

Minimum flows should be established at key points on the state's river system to provide a sound basis for planning and management for fish and water quality. Detailed studies should be initiated immediately to establish official instream flows at the 5 following points on the Snake River: Heise, Blackfoot, below Milner Reservoir, mouth of Rock Creek near Twin Falls, and King Hill. Legislative recognition of instream flows for fish, water quality, and recreation as beneficial uses of water is needed to establish state policy and objectives in this area.



Modification of Existing Development. Major modification of 2 existing developments should be considered as soon as possible.

American Falls dam has been found structurally deficient and should be replaced or rehabilitated as soon as possible. This action is supported by the Board. The Bureau of Reclamation has investigated the possibility of enlarging the dam to provide for increased storage. An enlarged dam would provide the most economical storage on the Snake River but would involve inundation of additional lands in the Fort Hall bottoms of the Indian Reservation. The Shoshone-Bannock Tribal Council, existing space holders of American Falls Reservoir and some environmental groups have opposed any enlargement of the project. The Board has recommended that additional storage be found in the vicinity of American Falls without inundating reservation lands. In a study of diking possible alternative sites, none have been found feasible. Environmental impact of enlarging American Falls appears to be far less than that of any new storage site such as the Lynn Crandall project. The estimated cost of replacement at the existing elevation is $24 million. Provision should be made for additional storage when the dam is replaced as such storage may prove necessary in the distant future.

The Corps of Engineers has proposed enlargement of Blackfoot dam and reservoir, owned and operated by the Bureau of Indian Affairs, to provide additional flood control to lands adjacent to the lower Blackfoot River and a water supply for new irrigation in the Fort Hall Indian Reservation. This project has received congressional authorization, but local support and endorsement by the Shoshone-Bannock Tribal Council are required before it can proceed. Estimated cost of the project is $2,790,000.

Potential Effects

Not all of the projects and programs mentioned can be implemented. Some conflict with other projects, others will not receive state and/or local support, and still others will not receive federal funding.

Nevertheless, these projects would provide substantial economic benefits to the region and state. Economic development would follow historic trends, with major emphasis on agricultural growth, recreational development could be enhanced in headwater areas, and flooding problems could be substantially decreased.

Environmental problems in the Upper Snake Basins could be substantially reduced through: establishment of minimum flows for fish and water quality; provision for adequate municipal and industrial water and sewer facilities; full recognition of environmental impacts in planning of all projects; and development and implementation of fishery and game management programs.

REMAINING PROBLEMS AND OPPORTUNITIES

The projects and programs discussed under Basic Framework Development Alternatives

would not solve all of the water and related land resource problems of the region.

The water supply for the Grays Lake National Wildlife Refuge is inadequate, since much of the area water is committed to irrigation through diversion to the upper Blackfoot River. It may be possible to transfer Blackfoot River water to the upper Portneuf Basin to meet supplemental water needs there; but this alternative is contingent on studies showing that an adequate water supply for Grays Lake and the Blackfoot commitments can be provided from other sources, primarily groundwater, and on the agreement of the Shoshone-Bannock tribes to the exchange.

Opportunities for large-scale storage in the region are limited. Enlargement of American Falls Dam could provide up to 790,000 acre-feet of economical storage, but local districts which hold rights to existing storage in American Falls Reservoir and the Shoshone-Bannock tribes object to this alternative. Provision should be made when the dam is replaced for raising it at some distant future date if it should prove necessary.

The possibility of solving the Jackson Lake replacement problem by a combination of Snake Plain aquifer development and recharge will be investigated in the next three years. It may be feasible to supply downstream irrigation demands by pumping from the Snake Plain aquifer during dry years thereby making it possible to maintain a higher recreational level in Jackson Lake. Following the end of the recreation season, Jackson Lake could be lowered and the water released downstream for recharge of the Snake Plain aquifer in the area of the well developments. Perhaps in this manner, a serious recreational problem could be resolved and at the same time facilities constructed for recharge of the aquifer since the same works would be available for utilization to capture flood flows in plentiful years.

The Corps of Engineers has studied the possibility of raising Magic Dam up to 27 feet to obtain about 100,000 acre-feet of additional storage. At present the economic feasibility of this project is questionable.

A possible project on the Wood River about 8 miles upstream from Ketchum has also been studied by the Bureau of Reclamation and the Corps of Engineers. The project, referred to as the Boulder Creek Project, would involve about 60,000 acre-feet of storage with primary benefits assigned to flood control and recreation. At present the economic feasibility of this project is questionable.

The Department of Water Administration (DWA), in its actions concerning the Palisades water rights held by the Bureau of Reclamation, has raised the issue of whether or not diversion rates in excess of 5 acre-feet per acre constitute a necessary and beneficial use of water. The project is completed and storage space in the reservoir has been allocated to canal companies and organizations throughout the Snake River Valley from Idaho Falls downstream to Milner Dam. Five years ago the Bureau submitted studies concerning beneficial use of the water. The DWA has withheld a license for 381,000 acre-feet of water and requested detailed studies documenting the need for diversion rates in excess of 5 acre-feet per acre or one second-foot for each 50 acres irrigated, as specified in the Idaho Code. The watermaster for the area has stated that several canal companies presently divert more than 12 acre-feet per acre.

About 210,000 acres of potentially irrigable land within the National Reactor Testing Station are presently unavailable for development. Private development of this resource should be allowed, consistent with security requirements for the testing station, since an adequate groundwater supply for the area is available.

The trout farming industry in the Thousand Springs area could be seriously affected by extensive development of the Snake Plain aquifer unless provision is made for adequate water supplies. Comprehensive studies are needed to determine possible effects and alternatives of major development proposals which would affect spring outflow in this area.

To insure that every effort is made to obtain optimum use of state resources, studies should be made to identify opportunities for water savings through more efficient irrigation facilities

and operation. Such improvements could result in reduction of system losses to seepage and evaporation, increased efficiencies in on-farm systems, improved watershed management, and revision of operation schedules for existing reservoirs to include multiple uses.

Interbasin water transfer schemes would affect the Upper Snake Basins either directly or indirectly; responsible water management leaders should be fully informed on these possibilities. (Chapter 5 presents possible interbasin transfers.)

The region will continue to experience fish and water quality problems resulting from low flows; the available water supply in dry years is not adequate to meet needs for all water uses. These conflicts can be minimized through proper planning.

The "Winters Doctrine" and the "Reservation Doctrine" raise serious questions regarding future problems and opportunities for planning and use of water and land resources. Constant attention to these by the Board and by local people, the legislature, and the executive branch will be essential.

Board planning studies are now being structured so that individual project proposals and alternatives can be evaluated within the context of the total hydrologic system. These studies will identify new opportunities for water use in the region and illustrate the effects water projects will have on downstream opportunities within the basin.

BEAR RIVER BASINS

The Bear River Basins comprise the smallest of the 5 hydrologic study regions, encompassing about 4 percent of the state and all or parts of 7 counties.

Elevations range from 4,000 feet in the valley to 9,953 feet at Meade Peak, which lies east of Georgetown. About one-half of the area is mountainous land above 6,000 feet in elevation.

RESOURCES

Agriculture is the region's dominant industry, accounting for about one-third of total employment. Principal crops, in order of decreasing importance, are alfalfa hay, wild hay, irrigated pasture, barley, and wheat. In Franklin and Caribou counties, potatoes and sugar beets are also important. There are presently about 157,000 acres of irrigated land and 406,300 dry-farmed acres in the region. Soil surveys indicate approximately 493,000 acres of class I and II potentially irrigable land, including both dry-farmed and desert lands. Livestock, particularly dairying, is of major significance.

Recreation and tourism are becoming increasingly important economic factors. The major recreation potential exists in fishing, boating, water-skiing, waterfowl hunting, camping, swimming, and general touring. Bear Lake is a splendid and unique national recreational resource.

Average annual precipitation ranges from about 14 to 50 inches throughout, depending on topography. About two-thirds of annual precipitation usually occurs between January and April, mostly as snowfall. The snowpack acts as a natural reservoir to sustain streamflow in the summer months.

The river systems of the region include the Bear, Malad, and Cub rivers and minor tributaries. The Bear River is unique in that it is the largest river in the western hemisphere that does not flow into the sea. It originates in the Uinta Mountains in Utah, and after a circuitous journey of 440 miles, including five crossings of state lines, the river terminates in the Great Salt Lake. Average annual flow under present conditions is about 500,000 acre-feet at Oneida. When this figure is compared to average flows of other major river systems in the state (Figure 8, Chapter I), it becomes obvious that the Bear River Basins is an area of limited water supply.

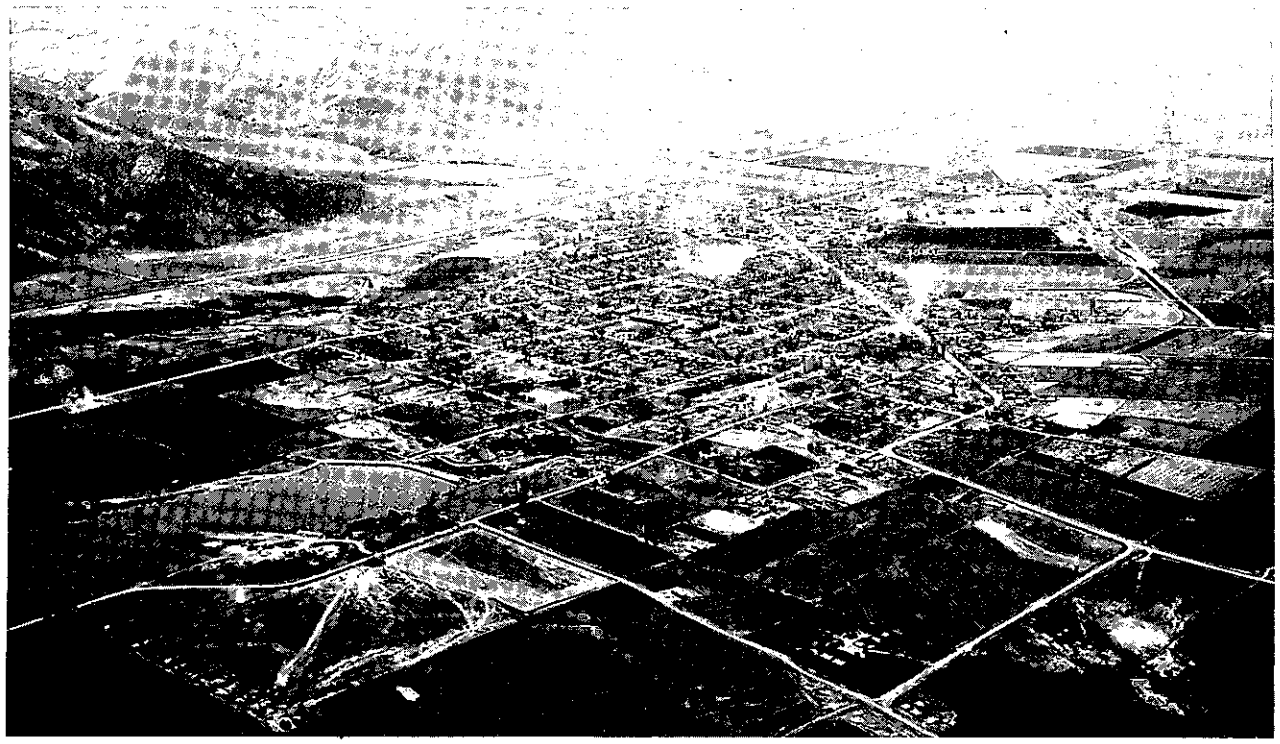
Bear Lake is about 20 miles long and an average of 7 miles in width. It is the most striking physical feature in the region. The lake offers, for all practical purposes, complete control of Bear River flows at that location. The Bear River does not "naturally" enter Bear Lake, but is diverted by man-made canals and diversion works.

Bear Lake facilities are operated by the Utah Power and Light Company for irrigation and power, but the lake also provides flood control and recreation benefits. Total storage capacity is nearly 6 million acre-feet, with 1,421,000 acre-feet of active or usable storage capacity. Reservoir storage in the region, not counting Bear Lake, totals about 65,300 acre-feet of usable capacity.

The Bear River Compact of 1958 is the dominant factor influencing use of the region's water and related land resources. This issue is discussed in more detail in the following section, "Problems and Needs".

Information on groundwater supplies and their potential for further development is limited. Areas believed to have further development potential include the area north of Soda Springs, Gem Valley, Cache Valley, and Malad Valley. Malad Valley appears to have the greatest potential, with the major groundwater recharge coming from the Little Malad River drainage and adjoining areas. Approximately 11,000 acres in Malad Valley are wholly or partially irrigated from groundwater supplies. With proper planning and development, another 25,000 to 30,000 acre-feet annually could probably be obtained from groundwater pumping in the valley. Minor amounts of groundwater development could occur in other areas, but because of the complexity of the water-bearing media, more intensive studies are needed to identify locations and probable yields.

Mining has played a significant but unreliable role in the economy. Phosphate is the region's most valuable mineral, and Bear Lake County in particular has experienced both the surge from expansion of phosphate development and the recession caused by plant closure. Production of crude phosphate rock in the region totaled 4.6 million tons in 1966. Potential commercial deposits of the following mineral commodities have also been found: silica, perlite (a lightweight building aggregate), gypsum, manganese, lead, silver, limestone, quartzite, sulphur, copper, sand and gravel, oilshale, peat, and lignite.



Timber harvest does not play a major role in the region's economy. The amount of standing timber on national forest lands is estimated at 982 million board-feet. Other public lands and private holdings contain 39 million board-feet. The approximate value of standing timber is $1.8 million, but net annual forest harvest in 1968 was valued at only $2,500.

There are over 600 miles of free-flowing streams. Although Bear Lake does not produce large amounts of fish, it does sustain numerous species, including the Bonneville Cisco which is native only to this lake. The recently-designated Bear Lake Wildlife Refuge (Dingle Swamp) and the Bear River Bird Refuge, located in Utah at the edge of the Great Salt Lake, are important nesting and staging grounds for migratory waterfowl and contribute substantially to Idaho bird hunting. Twin Lakes Reservoir is an example of a popular and successful reservoir fishery.

The federal government is a major landowner with 889,000 acres or about 42 percent of the land area. Of this total, about 490,000 acres lie within national forests and about 399,000 acres are in public domain. State, county, and municipal ownerships total about 57,000 acres and about 1,182,000 acres are privately owned.

EXISTING DEVELOPMENT

Water resource development in the region is based on hydroelectric power production and irrigation. The major influence on water development has been usage of Bear Lake.

Permission to construct a canal (1,000 cubic feet per second maximum safe capacity) to divert Bear River flows to Bear Lake was first granted in 1908 for "the development of power, as subsidiary to the main purpose of irrigation and drainage".[1] A second canal (Rainbow canal) was built in 1914 to divert up to 4,500 cubic feet per second. In 1969, Utah Power and Light Company (UP&L) constructed the Stewart diversion dam, followed by the Lifton Pumping in 1971 to allow Bear Lake to be emptied below the elevation of the outlet canal.

[1] Bureau of Land Management, No. BL 042924 "F" MN: USCA 951.

Utah Power and Light operates Bear Lake for irrigation and for power production at 5 hydroelectric power plants on the Bear River. These provide about 94 percent of the hydroelectric generating capacity in the entire Bear River drainage basin (including Wyoming and Utah). The plants and installed capacities are: Soda Plant 14,000 kilowatts; Grace Plant 44,000 kilowatts; Cove Plant 7,500 kilowatts; Oneida Plant 30,000 kilowatts; and Cutler Plant (Utah) 30,000 kilowatts. The Federal Power Commission license on the Oneida Plant expired on June 30, 1970 and a 5-year renewal was granted. The Soda Plant license expires on July 4, 1973.

The city of Soda Springs has 3 small plants on Soda Creek with a combined installed capacity of 570 kilowatts.

The Utah-Idaho Sugar Company serves about 65,000 acres of land in Box Elder County, Utah and has a right to natural flows of Bear

River, augmented by substantial amounts of Bear Lake water by contract with the power company.[1] Although this use does not occur in the Bear River Basins in Idaho, it is mentioned to point out that existing water developments as well as future developments are enmeshed in contracts, court decrees, the Bear River Compact, and water rights and cannot be dealt with on a "state area" basis.

The Black Otter and Peg Leg companies and the West Fork Irrigation Company in Bear Lake County divert water from Bear River to serve about 11,600 acres. About 24,000 acres are served by the Last Chance Canal Company in Caribou County, with the water supply obtained from the Bear River, augmented by Bear Lake water supplied by purchase from Utah Power and Light. The Twin Lakes Canal Company in Franklin County supplies approximately 17,500 acres, getting water from Mink Creek, augmented by Bear Lake storage supplied by purchase from UP&L. The Preston Whitney Irrigation Company irrigates 5,500 acres in Franklin County, utilizing Cub River water. The Cub River Irrigation Company in Franklin County serves 13,500 acres using Cub River and Bear River water. Water from the Bear River, augmented by Bear Lake water supplied under contract with UP&L, is used by the West Cache Irrigation Company in Franklin County to serve 3,300 acres.

The Montpelier Watershed Project is multipurpose including flood control, irrigation, and drainage. The project which was developed under Public Law 566, is 97 percent complete and the project includes 51,600 acres in Bear Lake County. Project facilities include a dam on Montpelier Creek with 4,050 acre-feet of storage for flood control and irrigation, 7 miles of canal enlargement, and floodway construction.

Table 42 shows existing storage reservoirs in the basins.

[1] Utah Power and Light Company vs. Last Chance Canal Company (Dietrich Decree); U.S. Eastern Idaho District Court; July 14, 1920.

TABLE 42
EXISTING STORAGE RESERVOIRS — BEAR RIVER BASINS

Reservoir	County	Water source	Active capacity (acre-feet)	Use[1] Symbol
Bear and Mud Lakes[2]	Rich and Bear Lake	Bear River	1,452,000	I.P.R.
Montpelier Creek[3]	Bear Lake	Montpelier Creek	3,840	I.R.
Soda Creek	Caribou	Soda Creek	2,500	I.
Treasureton	Franklin	Battle Creek	1,200	I.R.
Winder[2]	Franklin	Bear Lake and Mink Creek	1,920	I.R.
Condie[2]	Franklin	Bear Lake and Mink Creek	2,200	I.R.
Twin Lakes	Franklin	Bear Lake and Mink Creek	13,950	I.R.
Weston Creek	Franklin	Weston Creek	2,066	I.R.
Glendale	Franklin	Worm and Mink creeks and Cub Riv.	5,780	I.R.
Foster[2]	Franklin	Cub River	3,500	I.R.
Lamont[2]	Franklin	Cub River	2,400	I.R.
Daniels	Oneida	Little Malad River	7,800	I.R.
Upper Pleasantview	Oneida	Big Malad River	1,260	I.R.
Devil Creek[3]	Oneida	Devil Creek	3,800	I.R.
Crowthers	Oneida	Spring Creek	1,056	I.P.R.
Henderson	Oneida	Deep Creek	5,400	I.R.
Curlew	Oneida	Deep Creek	6,594	I.M.

[1] Symbols: I = Irrigation, P = Power, R = Recreation, M = Municipal
[2] Off-stream
[3] Under construction

SOURCE: Bear River Investigations, Status Report, Bureau of Reclamation, 1970

A state operated fish hatchery at Grace provides fish for basin streams. The 17,000-acre Bear Lake National Wildlife Refuge (Dingle Swamp) provides valuable habitat for waterfowl, particularly Canada geese.

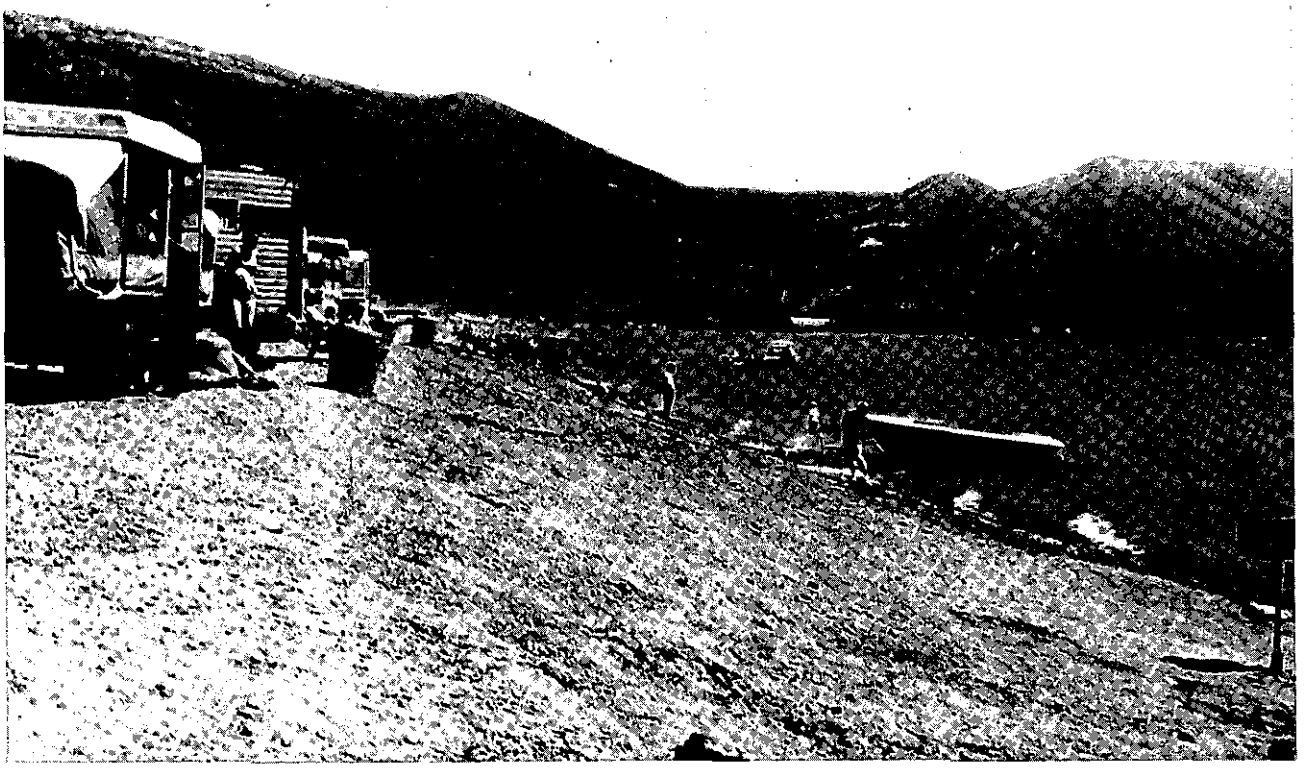
Vacation resorts and summer homes are located along the shores of Bear Lake. A new state park, covering 934 acres, is also located on the east shore of the lake. Campsites and picnic areas administered by the Forest Service are located in Caribou National Forest.

The Curlew National Grasslands was designated by the U.S. Department of Agriculture in 1960. It is administered by the Caribou National Forest and consists of 47,000 acres of public land in Oneida and Power counties. It is part of the former Southeastern Idaho Land Utilization Project which was purchased by the federal government during the 1934-1942 period because it was unsuitable for cultivation and subject to drought.

Major communities in the region include Montpelier, Soda Springs, Preston, and Malad City. The region lags behind Idaho and the nation in income and population growth rates, primarily due to a lack of jobs and opportunities. Population decreased 16.5 percent between 1960 and 1970, compared to an increase of 6.9 percent for the state and 13.3 percent for the nation. Net outmigration from the region during this decade totaled 5,376 people.

PROBLEMS AND NEEDS

The water supply of the Bear River Basins is limited. Additional development in the region is possible, but present uncertainty over the status of unconsumed Bear River flows will make it difficult. Efforts are currently being made by the three states in the Bear River drainage (Idaho, Wyoming, and Utah) to resolve these uncertainties. Negotiating committees have been appointed and are meeting to see if agreement can be



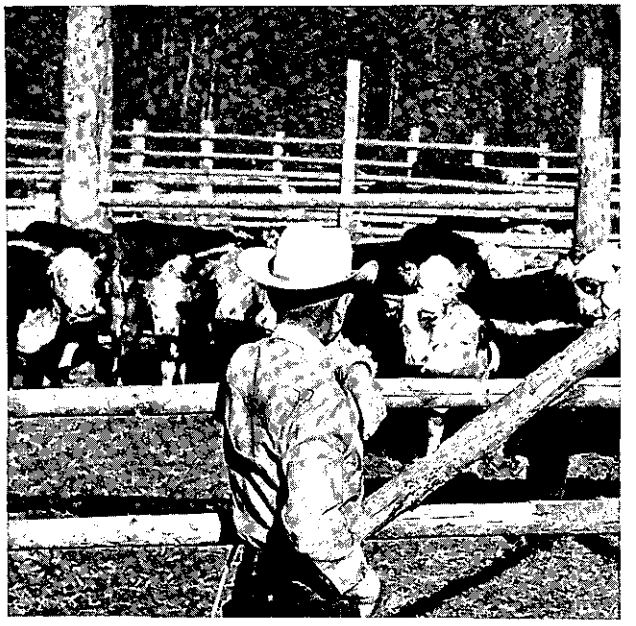
reached regarding the rights of the individual states to develop Bear River flows.

Bear River Negotiations

As noted previously, the waters of the Bear River are subject to the provisions of an interstate compact agreed to by Wyoming, Utah, and Idaho and by the Congress of the United States. The critically dry period of the 1930s resulted in a controversy which led to the negotiations that produced the Bear River Compact. This controversy concerned allocation of waters above Bear Lake and the use of Bear Lake storage. Since each state has its own water right regulations, water was allotted and delivered within each state without regard to priorities and needs of the other states. Release of water from Bear Lake for power production and irrigation left the lake virtually empty at the end of 1934.

After 20 years of negotiations, the President of the United States signed into law on March 17, 1958 the Bear River Compact, which has previously been approved by the legislatures of the 3 states and the Congress of the United States. Among the provisions of the compact were: (1) division of the waters above Bear Lake by state, (2) allowance for storage above Bear Lake even though virtually all water arriving at the lake is appropriated either for power or for irrigation, and (3) operating criteria for Bear Lake which prohibit release of water from the lake below a stated level for the exclusive generation of power (the irrigation reserve).

Extensive planning for further development in the basin has been done by various agencies and individuals. In 1962, the U.S. Bureau of Reclamation released a report outlining a proposal for development in the lower basin. Controversy arose, however, over the proposed division of water by states and the proposed project facilities. In 1965, the Bureau of Reclamation again proposed a plan for development; although this plan divided the waters delivered to each state differently, it contained essentially the same project facilities as were proposed in 1962. Once again, controversy surrounded the proposal, and without unified local support, the project died.



The Idaho Water Resource Board became involved in 1967, initiating a river basin investigation to identify resources, problems, and needs within the basins. In February 1970, the preliminary report on the Idaho portion of the basins was released and information meetings on the report were held at several locations within the region. The major conclusion of the Board's study was that there was a need for agreement among the states regarding development of the unconsumed flows of the Bear River. This conclusion was based on the fact that possible uses for additional water far exceeded the amount of water available for development, and that at the present time, the uncertain status of these flows makes implementation of any major water development infeasible. Since any major development project would affect more than one state and would undoubtedly require federal funds, all of the states involved must be in accord.

Negotiating committees were appointed by the three states and directed to try to reach agreement concerning the rights of the individual states to develop unconsumed Bear River flows. The Idaho negotiating committee is not empowered to commit the state to any course of action; instead, it is directed to work toward a satisfactory arrangement for submission to the Water Resource Board, the Governor and legislature for decisions.

The Idaho negotiating committee consists of the Idaho delegation to the Bear River Compact Commission, members of the Idaho Water Resource Board, and the director of the Idaho Department of Water Administration. The staff of the Idaho Water Resource Board provides technical support for the committee.

Major areas of concern which the committee must consider include:

Present Bear River Compact — will the provisions of the present compact allow for actions which the negotiating committee believes are needed? If not, the compact must be modified.

Water rights, both established and pending — protection is needed for the present users in the basin.

Fluctuating levels of Bear Lake resulting from irrigation and power uses and their impacts on growing recreation use — because of the increasing recreation value of Bear Lake, alternatives to stabilize water levels in the lake must be considered and drawdown limitations agreed upon.

Water quality in Bear Lake — degradation of the quality of water in Bear Lake is causing concern. Possible ways of protecting this resource should be identified.

Rights and needs of the Bear River Migratory Bird Refuge — the Bear River Migratory Bird Refuge located at the end of the Bear River in Utah is a large water user. A more accurate determination of its water requirements is needed.

Municipal and industrial needs — a determination should be made of future municipal and industrial requirements and alternative ways of meeting these needs.

Agricultural potential — there are substantial quantities of potentially irrigable land in the basin, as well as sizable amounts of land requiring supplemental supplies.

Instream water quality needs — instream flows needed for water quality and fish and wildlife should be determined and considered in plans for the basin.

Acceptability of additional storage reservoirs in the basin downstream from Bear Lake — the number and size of proposed storage facilities downstream from Bear Lake should be agreed on by the 3 states, since this will determine how much water can be made available for additional development.

GENERAL

Various problems and needs include water quality, flooding, land use zoning, community water and sewer facilities, land treatment measures, recreation, and fish and wildlife management programs.

Bear River is used for waste assimilation and transport, and at times receives high waste loads from feed yards, industrial processors and municipalities. During the summer, irrigation withdrawals and return flows cause increased salt concentrations and turbidity. Waters of the Bear River system are rich in nutrients and can, under the right conditions, produce algae blooms. At low flow periods, the Malad River can become unsuitable, or at best marginally suitable, for irrigation purposes due to high sodium concentrations. High salt concentrations are believed to be caused by development of alkali in waterlogged soils and emissions of certain springs located primarily on the western side of Malad Valley.

County water and sewer studies covering all communities with populations of less than 5,500 have been financed by a grant from Farmers Home Administration. These studies will identify problems and outline alternative solutions. Studies have been completed by consulting engineering firms for Franklin and Power counties and are being conducted by the Water Resource Board in cooperation with consultants for Bear Lake, Caribou, Bannock, Cassia, and Oneida counties.

Some water quality problems at Bear Lake are the results of effluent discharged into the lake from lakeshore developments and agricultural activities. The Bear Lake County water and sewer study suggests a combined sewer collection treatment facility for the west side of the lake and notes the need for cooperation between Idaho and Utah to mitigate pollution problems.

Flooding does not present a serious problem in the basin because of the almost complete regulation of Bear River flows by Bear Lake. There are local areas, however, which experience flooding problems. The Thomas Fork suffered flood damage in 1971, and in 1962 over

$200,000 damage occurred along the Malad River.

Land use zoning should be implemented by counties and communities to control and manage indiscriminate home and/or vacation developments. This is particularly important for lakeshore development around Bear Lake.

The U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) recently initiated a Type IV study of the entire Bear River drainage. The Board staff is cooperating with SCS in the study for the Idaho portion. The study will help identify problems and needed land treatment and water conservation measures.

Recreational problems, particularly fluctuation of Bear Lake water levels which was discussed under "Bear River Negotiations", need to be resolved.

Fish and wildlife management programs should be intensified to identify more accurately the needs and opportunities in the basins.

BASIC FRAMEWORK DEVELOPMENT ALTERNATIVES

The projects and programs discussed include local development and public projects which would help to meet the specific problems and needs. As noted previously, the uncertainty over the status of Bear River flows make impractical major projects planning at this time. Hopefully, negotiations will have proceeded far enough in the next 3 years to make firm recommendations for the State Water Plan. Projects and programs discussed will serve to illustrate to the people in the region the opportunities and issues and to provide estimated project costs. Major public projects will ultimately require Board approval and review, but most local independent developments can proceed without Board action.

Independent Local Developments

Predictions of development by local individuals, groups, or municipalities are difficult to make since economic conditions and local needs and desires can change rapidly.

New water supplies to meet predicted municipal and industrial growth (Chapter 3) can be provided through increased diversion of surface water and groundwater pumping. These needs will probably be met through independent local development aided by state and federal financial assistance programs. Urbanized areas where early action is needed to provide adequate water supplies and systems for domestic use and to meet sewer facility requirements include Paris, Georgetown, Bloomington, St. Charles, Fish Haven, Weston, and Franklin.

CARIBOU PROJECT. Construction of a dam on Bear River about 2 miles south of Soda Springs has been proposed by both local interests and the Bureau of Reclamation. The reservoir capacity suggested is about 40,000 acre-feet. The cost of dam construction has been estimated by local interests to be about $5 million; cost of the dam and reservoir, including compensation for power losses at existing plants, has been estimated by the Bureau of Reclamation at about $9 million. Project water could serve lands directly below the dam or above it by exchange, in addition to providing for municipal needs and anticipated industrial needs stemming from the expanding phosphate processing industry in the vicinity of Soda Springs. The project would also provide some recreation and fish and wildlife benefits. The water supply made available by the Caribou Project could also be provided by exchange from a new Oneida Project.

The Caribou filing by the Caribou Water Development Company has a priority date of April 19, 1963; this is of major importance to Idaho, since it precedes major filings in Utah, The Bear River Compact provides that priorities of water rights in the lower division will be followed without regard to state lines. The Board supports retaining the Caribou filing to protect Idaho interests.

The Board has taken no official position with regard to the Caribou Project itself. Should the project proceed, it would most likely be implemented in the late time period, 1980-2020.

A Resource Conservation and Development (RC&D) project is underway in Oneida County and in Box Elder and Cache counties, Utah. The RC&D executive board released a report in

October 1970 which outlined a program for water resource development in the 3 counties. The project is sponsored by the USDA and is intended to improve economic conditions in the project area, with better care of the natural resources a primary objective. Outlined in the RC&D project report[1] is a plan involving expenditures of nearly $88 million over the next 20 years on project measures to meet RC&D goals. The monies are to be provided primarily from local sources but would involve state and federal loans and grants funds.

Public Development

Structural Measures. Structural development alternatives involving state and/or federal agencies include as project goals irrigation, flood control, recreation, fish and wildlife, and municipal and industrial water uses. The locations of these facilities are shown on Figure 45.

THOMAS FORK PROJECT. The project has been proposed for consideration by the Bureau of Reclamation. The project would involve construction of a dam on Thomas Fork Creek in Wyoming about 4 miles upstream from the Idaho-Wyoming border. Reservoir capacity would be about 11,500 acre-feet, of which about 9,500 acre-feet would be active. Cost of the project would total about $4.5 million.

Water stored in the reservoir could provide for supplemental irrigation needs as well as for new irrigation on Thomas Fork lands in Idaho. At present, use in Idaho would be limited to 1,000 acre-feet annually by the Bear River Compact. The remaining reservoir yield could provide for replacement of waters diverted from the Bear River in Idaho or Wyoming. The possibility of additional storage above Bear River for Idaho users is being discussed in the Bear River negotiations.

The reservoir could also be beneficial for fish and wildlife, recreation, and flood control purposes.

Economic feasibility of this project is questionable at present. The Board has not taken a position on it because of current negotiations. This project, or some variation of it, constitutes an alternative for using Bear River water allocated to Idaho (and Wyoming). Should this project be implemented, it will probably be in the late time period, from 1980-2020.

GEORGETOWN CREEK WATERSHED PROJECT. Georgetown Watershed is located in the northern part of Bear Lake County. It consists of approximately 31,750 acres of the Bear River drainage within and adjacent to the Caribou National Forest.

The flow of Georgetown Creek frequently exceeds channel capacity flooding agricultural lands and parts of the village. Spreading of water over agricultural land during peak flow periods is practiced to avoid more frequent flooding in the village. Agricultural water management problems include: erosion from surface application of irrigation water; shortage of late season water supply; and low irrigation efficiencies.

Proposed works of improvement are designed to: reduce erosion on mining, range, forest and crop lands; improve the irrigation distribution system; increase on-farm irrigation efficiencies; and reduce floodwater and sediment damages to the village of Georgetown and the adjacent agricultural properties.

The estimated installation cost of the works of improvement included in the plan, prepared jointly by the Bear Lake Soil Conservation Project and Georgetown Irrigation Company, is $2,003,840. The federal share (P.L. 566 funds) will be $758,000. The share of costs to be paid from other funds is $1,245,845. The project is authorized and should be implemented before 1980. The Board has reviewed and supports this project as being in conformance with state water policy.

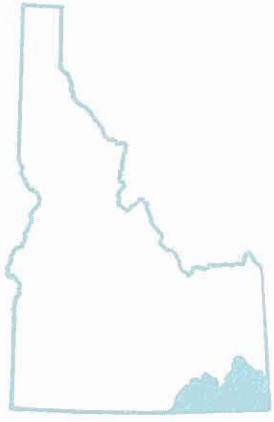
BEAR RIVER PUMP PROJECTS. Various pump projects could be implemented along the Bear River between Bear Lake and Oneida to provide both new and supplemental water. The key to this type of development is the need to provide replacement storage so that downstream water users in Idaho and Utah can receive water supplies to replace amounts pumped from the

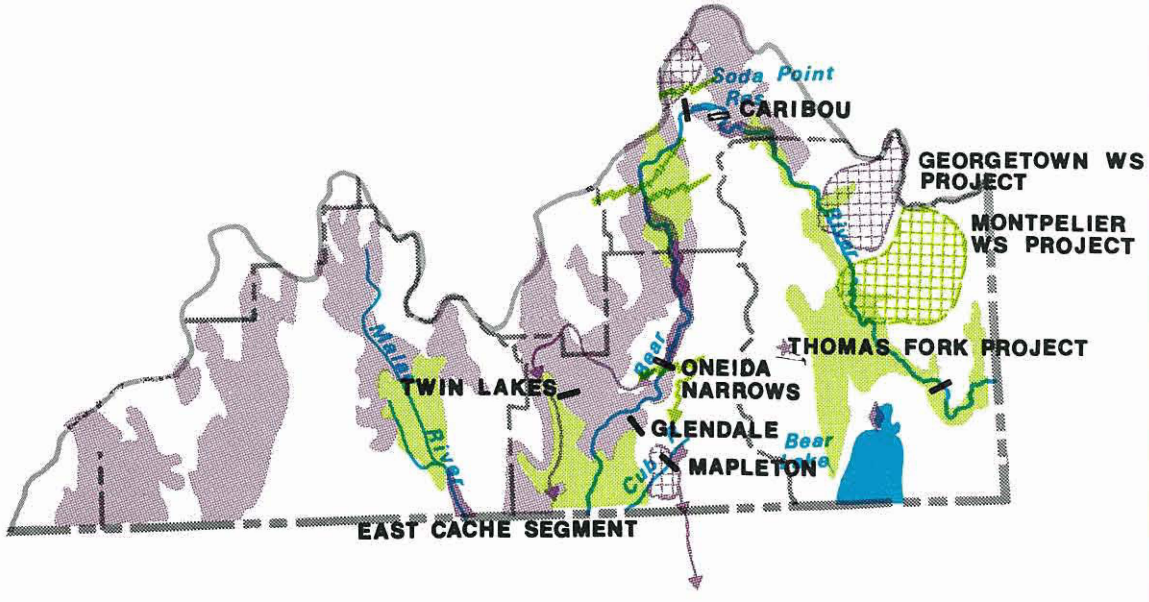
[1]Program of Action, Box Elder, Oneida, and Cache Resource Conservation and Development Project, Revised October, 1970.

FIGURE 45. BEAR RIVER BASINS

LEGEND		
FEATURE	EXISTING OR UNDER CONSTRUCTION	POTENTIAL
NO FACILITIES SHOWN		
RESERVOIR		
CANAL		
TUNNEL		
PUMPING PLANT		
HYDROELECTRIC POWERPLANT		
LOCAL FLOOD PROTECTION PROJECT		
COMMERCIAL NAVIGATION PROJECT		
WATERSHED PROJECT AREA		
PIPELINE		
MINIMUM FLOW POINT		
FLOOD CONTROL		
IRRIGATED LAND		
IRRIGABLE LAND		
DAM		
SNAKE PLAIN AQUIFER		
GEOTHERMAL		
WILD RIVERS: FEDERAL — Designated, Study, Potential; STATE — Study		

RESERVOIRS WITH LESS THAN 5000 ACRE-FEET OF STORAGE & POWERPLANTS OF LESS THAN 1 MEGAWATT ARE NOT SHOWN.





river. Major new storage projects which might provide replacement storage include Caribou, New Oneida, and Plymouth.

Possible Bear River pumping project areas include: new and presently irrigated lands east of the Bear River between the communities of Bennington and Georgetown; new irrigated lands east of Bear River between Cavanaugh and Soda Springs; new irrigated lands in the vicinity of Soda Point Reservoir; new irrigated lands in the Grace area in Caribou County; and new and presently irrigated lands west of the Bear River in Franklin County.

Costs for the pumping projects would vary, depending on pump lift, miles of canals and laterals required, and the cost of replacement storage provision. The Bureau estimated the construction cost of facilities to pump 14,200 acre-feet annually to serve lands in the Bennington-Georgetown area to be about $6 million.

The Board has not taken a position with regard to specific Bear River pumping projects since these projects are dependent upon the type of agreement reached in the Bear River negotiations.

Due to high project costs and the need to provide replacement storage, these projects would probably be implemented, if at all, in the late time period, 1980-2020.

ONEIDA NARROWS PROJECT. Three alternative plans have been proposed by the Bureau of Reclamation for an Oneida Project.[1] Each plan involves a dam on the Bear River about 10 miles northeast of Preston and each would serve the same general area. Alternative Plans I and II include a large reservoir of 435,000 acre-feet but differ with respect to water distribution facilities. In Plan I, water could be conveyed by gravity flow through a 75-mile-long Oneida canal and other canals to irrigated lands in the Cache, Malad, and lower Bear River valleys in Idaho and Utah. In Plan II, water would be distributed by a number of short canals and pumping plants instead of by gravity flow through a long canal. Plan III would serve the same general area, but would utilize a smaller reservoir at the Oneida site (140,000 acre-feet), supplemented by new storage at the Caribou site in Idaho and the Smithfield site in Utah. The distribution system in Plan III would be identical to that of Plan I, but water would have to be pumped from the reservoir to the canal, with the pumping lift varying from 10 to 135 feet depending on the water level in the reservoir. Under all 3 plans, the Utah Power and Light Company's 30,000 kilowatt Oneida power plant would be inundated and would therefore have to be acquired as part of the right-of-way costs.

[1] Bear River Investigations, Status Report; U.S. Bureau of Reclamation, 1970.

The Bureau assumed a selection of lands to be served under Plans I, II, and III as shown in Table 43.

The plans would provide benefits for fish and wildlife, recreation, and irrigation. A firm water supply of about 20,000 acre-feet annually would be provided to meet municipal and industrial needs in the Soda Springs-Montpelier area under all three plans.

Project costs under Plans I and II would be approximately $81 million and under Plan III, about $102.5 million.

The Board has taken no official position on the Oneida Project. The acceptability of this kind of project to state and local water users will be dependent upon the success of the ongoing Bear River negotiations. If some form of the project is implemented, it will probably be in the later time period, 1980-2020.

EAST CACHE SEGMENT. The East Cache segment would develop the flows of the Cub River to provide both new and supplemental irrigation, in addition to municipal and industrial service in northeastern Cache Valley in Idaho and Utah. Flood control, recreation, and fish and wildlife benefits could also be realized. The Bureau of Reclamation has completed feasibility studies on the East Cache segment and the project appears to be economically justified.[1] Project costs are estimated at $16,563,000, with annual operation, maintenance, and replacement costs expected to be about $28,000.

The Bureau's development proposal involves construction of a dam at the Mapleton site on the Cub River about 3 miles northeast of Franklin. The reservoir would have a total capacity of 34,386 acre-feet, of which 32,702 acre-feet would be active. A 19-mile East Cache canal would be built extending from the dam to Summit Creek near Smithfield, Utah. Laterals and drains would also be provided, along with recreation facilities at Mapleton Reservoir.

The project service area proposed by the Bureau would include 2,000 acres of new irrigation and 12,100 acres of supplemental irrigation in Idaho. In addition, about 1,000 acre-feet

[1] Bear River Investigations, Status Report; U.S. Bureau of Reclamation, 1970.

TABLE 43

ONEIDA PROJECT – PLANS I, II, AND III
ASSUMED LANDS SERVED
(Units in acres)

Lands served	Idaho	Utah	Total
PLAN I			
New irrigated lands	15,200	24,200	39,400
Supplementary water supply	46,500	2,700	49,200
TOTAL	**61,700**	**26,900**	**88,600**
PLAN II			
New irrigated lands	16,200	21,200	37,400
Supplementary water supply	45,400	2,700	48,100
TOTAL	**61,600**	**23,900**	**85,500**
PLAN III			
New irrigated lands	11,600	26,400	38,000
Supplementary water supply	46,500	2,700	49,200
TOTAL	**58,100**	**29,100**	**87,200**

annually would be provided for municipal and industrial use at Lewiston and Smithfield, Utah. Project depletions were estimated by the Bureau to average 13,600 acre-feet annually, with 4,200 acre-feet chargeable to Idaho and 9,400 acre-feet chargeable to Utah.

The Water Resource Board favors additional development in the Bear River Basin where supported by local interests. The East Cache segment, particularly the proposed allocation of project water, has never received official Board review and comment.

The East Cache segment will be considered within the context of the Bear River negotiations. Early action on the project is likely, with construction and operation possible by 1985.

PLYMOUTH PROJECT. A major storage site which could significantly reregulate Bear River flows and which could serve land in both Idaho and Utah is located on the Malad River in Utah about 11 miles south of the Idaho state line. Bear River flows could be conveyed to Plymouth reservoir for holdover storage by a canal running 17,000 feet from Cutler reservoir to the proposed new reservoir. Most of the water stored at Plymouth reservoir would consist of winter and early spring Bear River flows. The major advantage of a Plymouth reservoir would be location in the system, enabling the capture and reuse of return flows in the Malad River drainage above the reservoir and in the Bear River drainage above Cutler.

The Idaho Water Resource Board, in cooperation with the Utah Division of Water Resources, asked the Bureau of Reclamation to provide design details and cost estimates for the Plymouth Project.

Proposed project facilities and expenses include: a dam and reservoir at the Plymouth site; a 13,000-foot tunnel from Cutler reservoir aligned to result in the shortest practical tunnel and canal lengths; a concrete-lined canal from the tunnel outlet to Plymouth Reservoir; a pumping plant located at the terminal point of the canal to deliver water to Plymouth Reservoir when gravity diversion is not possible; relocation or replacement of roads, railroads, transmission lines, wells, and springs located in the reservoir area; and right-of-way costs. Costs reported by the Bureau were for: 2 possible dam and reservoir sizes (one with normal water surface elevation of 4,382 feet and 118,000 acre-feet of total storage and the other with normal water surface elevation of 4,404 feet and 460,000 acre-feet of total storage); 2 corresponding tunnel sizes (12 feet in diameter and 17 feet in diameter); 2 corresponding canal sizes (1,000 cubic feet per second and 2,000 cubic feet per second); 2 corresponding pumping plant sizes (a 1,000-cubic foot per second capacity plant to deliver water to a maximum water surface elevation in Plymouth Reservoir of 4,395 feet and a 2,000-cubic foot per second capacity plant to deliver water to a maximum water surface elevation in Plymouth Reservoir of 4,404 feet); replacement and relocation costs for both a small and a large reservoir; and right-of-way costs for both small and large reservoir sizes. A summary of costs provided by the Bureau is given in Table 44.

TABLE 44

COST SUMMARY – PLYMOUTH PROJECT

(In thousands)

Facility	Small Development	Large Development
Tunnel	$ 9,998	$16,173
Canal	4,056	4,642
Pumping Plant	3,205	5,879
Dam	6,198	8,791
Subtotal	$23,447	$35,485
Relocation:		
Railroad	$ 3,595	$ 5,308
U.S. Highway	830	3,000
State Highway	454	781
County Roads	538	1,319
UP&L Transmission Lines	645	1,392
Other	725	1,497
Subtotal	$ 6,787	$13,297
Rights-of-way	$ 3,221	$ 8,595
TOTAL	**$30,250**	**$57,377**

Assuming a takeline for rights-of-way at 300 feet beyond the normal water surface elevation, the area required for the small reservoir would be 2,335 acres in Idaho and 8,360 acres in Utah. Acre requirements for the large reservoir would equal 12,640 acres in Idaho and 11,500 acres in Utah.

Although the Plymouth Project is an efficient and effective increment from hydrologic water planning standpoint, it would inundate considerable land area in Idaho. People living in the area should voice their opinions as to the acceptability of the project. Possible benefits to be derived include development of water-based recreation as well as provision for new irrigation and supplemental irrigation service.

If the project is found acceptable by local interests in both states. it will probably be developed in the time period after 1985. The Board has not taken a position on the project pending further studies and comment from local people.

Nonstructural Measures. The Bureau of Sport Fisheries and Wildlife has recommended the establishment of the Coulam National Wildlife Refuge in Franklin County. The refuge would involve 4,693 acres, including Coulam Slough. As part of the Bureau's Oneida Narrows Project, a water supply of 12,000 acre-feet annually would be provided to the refuge.

Land use zoning studies should be prepared and used by Bear Lake County and the lakeshore communities to guide development along the shores of Bear Lake.

Bear Lake National Wildlife Refuge (Dingle Swamp) will provide a major boost to the state's waterfowl management program. Stabilization of Bear Lake water levels would enhance recreational opportunities in this area.

Modification of Existing Development. No major modifications of existing developments are being considered in the basins. It is likely that the Soil Conservation Service Type IV study now underway will identify opportunities for modification of existing irrigation facilities which would result in better water management and control.

Potential Effects

Most of the major projects and programs outlined above cannot be implemented until the status of Bear River flows is resolved through the negotiations. An exception is the Caribou Project which has an early water filing preceding major Utah filings.

The projects outlined would provide substantial economic benefits to the region and the state. Associated economic development would follow historic trends, with the major emphasis on agricultural growth. Recreational development in the area would be enhanced, particularly if emphasis is placed on problems associated with Bear Lake recreational use and if major reservoirs such as Plymouth are provided with recreational facilities.

Environmental problems in the basins could be substantially reduced by establishment of minimum flows for fish and water quality, provision for adequate municipal and industrial water and sewerage facilities, full recognition of

environmental impacts in planning for all projects, and continued emphasis on the development and implementation of fishery and game management programs.

REMAINING PROBLEMS AND OPPORTUNITIES

The projects and programs discussed under "Basic Framework Development Alternatives" will not solve all of the water and related land resource problems of the region. Successful completion of the negotiations underway is essential if early and major developments are to occur.

The problems caused by fluctuations in Bear Lake can be solved by providing replacement storage downstream. The extent of storage lost in the lake as a result of even a small limitation on lake fluctuations would have to be offset by construction of major new storage projects below Bear Lake. Since such new storage in the system would only be replacement space, additional development in the basin would be limited. Payment for replacement storage would be a problem.

Virtually all the water of the Bear River is already appropriated under existing water rights. Any major new project must involve water for which valid water rights are held by the Utah Power and Light Company for power generation in the basins and therefore would require the cooperation of the UP&L Company. Negotiations would have to be undertaken with the company concerning possible compensation.

Only 2 major filings give Idaho early priority for development of the unconsumed flows of the Bear River. These are: Idaho application No. 1162 by the Caribou Water Development Company for the Caribou site for 40,000 acre-feet with a priority date of April 19, 1963; and Idaho applications Nos. 19296 and 39297 by the U.S. Bureau of Reclamation at the Oneida site for 1,500 cubic feet per second and 325,000 acre-feet, with a priority date of June 14, 1963. These filings must be preserved since subsequent ones belong to Utah and since the Bear River Compact calls for adherence to the priorities of water rights irrespective of state lines in times of shortage. If the Caribou and Oneida filings were allowed to lapse, Utah would be able to develop and therefore control unconsumed inflows below Bear Lake.

Wherever possible, small project developments involving both surface and groundwater should be carefully studied by local interests. Under the provisions of the Bear Lake Compact, new developments having late priority dates might be ordered to permit flows to pass downstream during periods of water shortage.

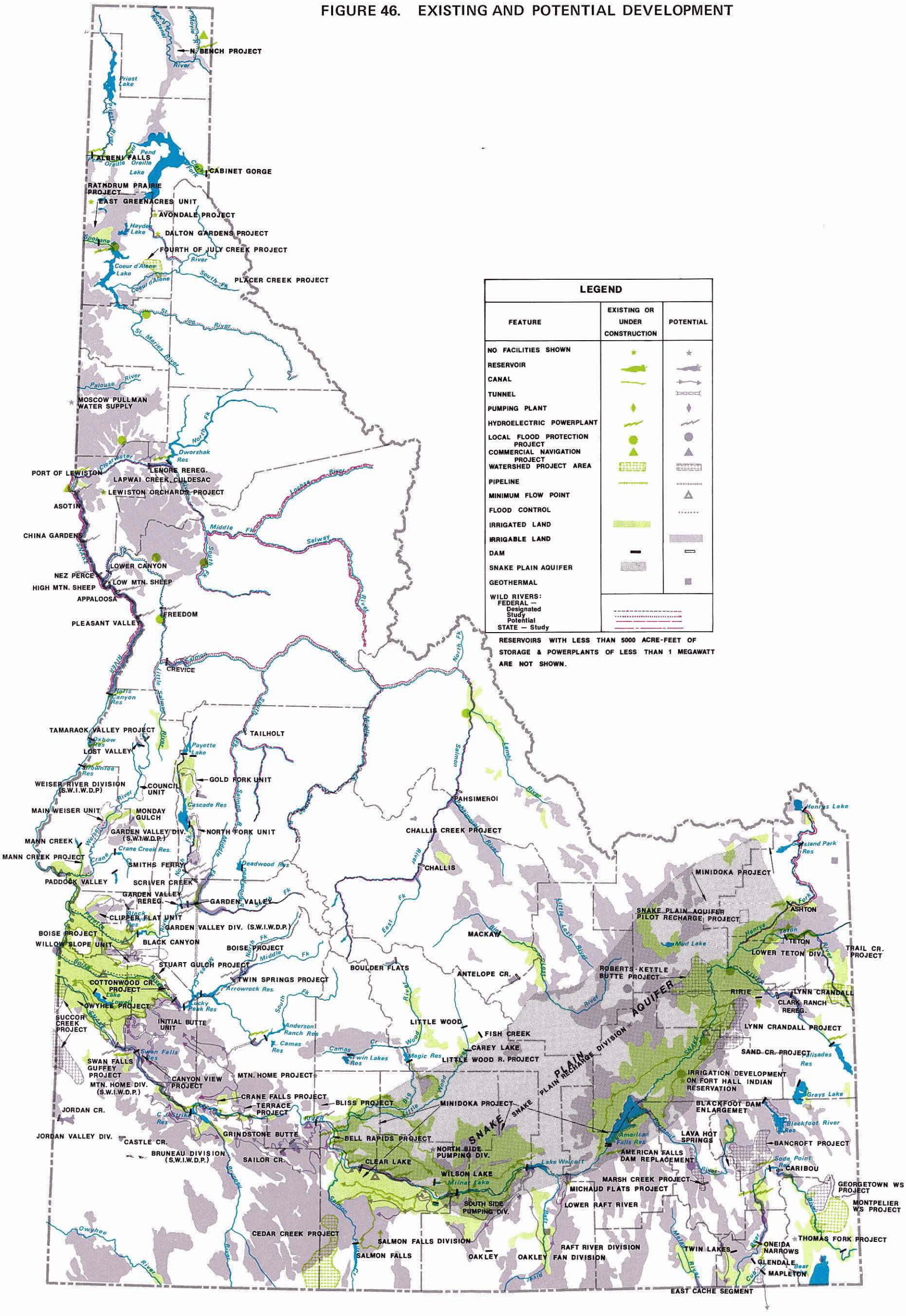
The Wyoming negotiating team is interested in obtaining additional storage above Bear Lake to supply new uses in Wyoming. The Idaho negotiating team will be considering the possibility of obtaining additional storage either independently or in conjunction with Wyoming storage to serve Idaho interests located above Bear Lake.

STATE SUMMARY

A State Water Plan, in conjunction with other state comprehensive plans for health, housing, transportation, social welfare, etc., establishes guidelines for unified action necessary to achieve an identified goal. Planning for the future use of water and land resources must be compatible with that goal.

The structural and nonstructural measures described in this chapter illustrate the alternative means available to provide for some water needs. These are shown in Figure 46. Needs and identified alternatives for meeting the needs are reviewed statewide. Conflicts will occur among the different water use functions particularly in the dry years; and there are conflicts among the identified alternative methods of meeting the needs of various uses.

FIGURE 46. EXISTING AND POTENTIAL DEVELOPMENT



LEGEND		
FEATURE	EXISTING OR UNDER CONSTRUCTION	POTENTIAL
NO FACILITIES SHOWN	★	★
RESERVOIR		
CANAL		
TUNNEL		
PUMPING PLANT		
HYDROELECTRIC POWERPLANT		
LOCAL FLOOD PROTECTION PROJECT		
COMMERCIAL NAVIGATION PROJECT		
WATERSHED PROJECT AREA		
PIPELINE		
MINIMUM FLOW POINT		
FLOOD CONTROL		
IRRIGATED LAND		
IRRIGABLE LAND		
DAM		
SNAKE PLAIN AQUIFER		
GEOTHERMAL		
WILD RIVERS: FEDERAL — Designated / Study / Potential; STATE — Study		

RESERVOIRS WITH LESS THAN 5000 ACRE-FEET OF STORAGE & POWERPLANTS OF LESS THAN 1 MEGAWATT ARE NOT SHOWN.

POPULATION

The population of Idaho in 1970 was about 713,000. The role agriculture has played in shaping economic growth and determining population centers is apparent. About 74 percent of total population is located in the 21 counties bordering the Snake River.

A study conducted for the Board by Idaho State University on projections of population and industrial growth indicates Idaho population will more than double — to 1,537,000 — by year 2020. The projects shown in Table 45 are based on the assumption that the growth rate will be similar to that experienced in the past. Figure 47 shows the population projections by planning regions. Projections of population growth should not be viewed as goals, or fixed "needs". This projection is an estimate of what the census data will show in the future, assuming certain conditions.

The state, by affecting growth conditions, can influence the future. Policies and programs at the federal level will influence what actually happens to a greater extent than will similar action at the state or local level. Decisions made at the federal level are often in conflict with — and may override — state goals.

As the population increases, certain issues will appear. A larger population will result in greater demand on fixed water and land resources. The state may wish to pursue policies which, in conjunction with federal policies, could either increase or slow down population growth in

FIGURE 47.
POPULATION PROJECTIONS

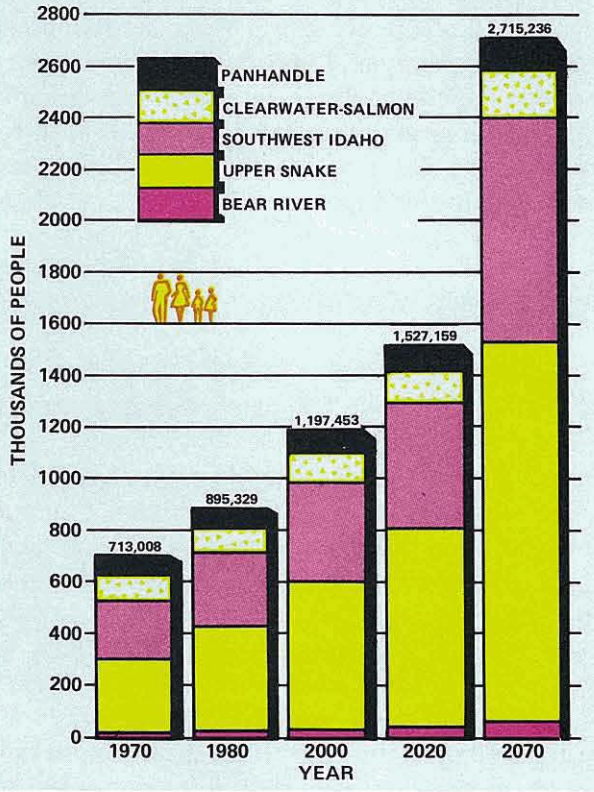


TABLE 45
POPULATION PROJECTIONS
1980 — 2020

Region	1970[1]	1980	2000	2020
Panhandle	82,324	82,558	90,050	99,875
Clearwater-Salmon	91,429	98,680	115,996	133,309
Southwest Idaho	235,089	281,348	381,468	488,660
Upper Snake	288,128	406,913	577,439	777,048
Bear River	16,038	25,830	32,500	38,267
TOTAL	**713,008**	**895,329**	**1,197,453**	**1,537,159**

[1] 1970 Census of Population
SOURCE: Bureau of Business Research, Idaho State University.

Idaho. The "way of life", which many Idahoans now enjoy and wish to maintain, will change.

MUNICIPAL-DOMESTIC WATER USE

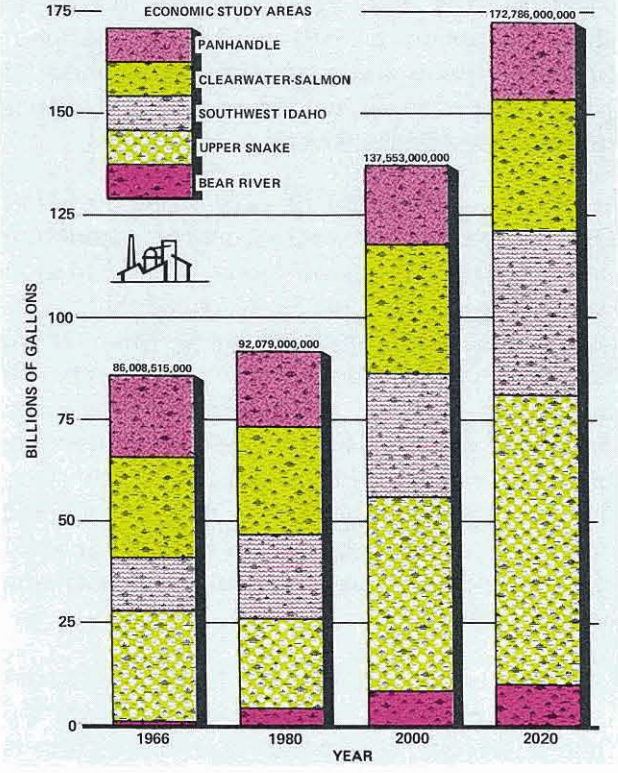
Assuming the projected population growth occurs, adequate water supplies can be made available, primarily by local development, to meet municipal-domestic water needs. This holds true for all planning regions. There are two problem areas where early action should be taken to provide municipal-domestic water supplies, the Moscow area and the Boise metropolitan area. Alternatives for meeting the needs have been identified in this chapter.

INDUSTRIAL WATER USE

Industry in Idaho in 1966 (1970 data not available), excluding fish hatcheries used slightly more than 86 billion gallons (264,000 acre-feet). Industrial water requirements are projected to more than double to 172 billion gallons (528,000 acre-feet) by year 2020. The projections of future industrial growth were developed for the Board by Idaho State University and were based on an employment-base model. In this model, Idaho's share of the national market was analyzed and projected on the basis of historical data. The actual industrial growth rate could vary substantially should the state elect to influence this type of development. It should be noted that historical projections sometimes tend to underestimate future water needs, particularly in a rural state such as Idaho. Figure 48 illustrates the growth in industrial water requirements by planning region.

Few problems are anticipated in providing an adequate water supply to meet future industrial needs in Idaho. Most industrial water use requirements are expected to be provided by local development. The Upper Snake region will likely continue to experience the greatest demand while the Bear River area should continue to use the least water for industrial purposes. The rate of increase in the Bear River Basins, however, is expected to be greater than in any other planning region.

FIGURE 48. INDUSTRIAL WATER REQUIREMENTS



AGRICULTURE

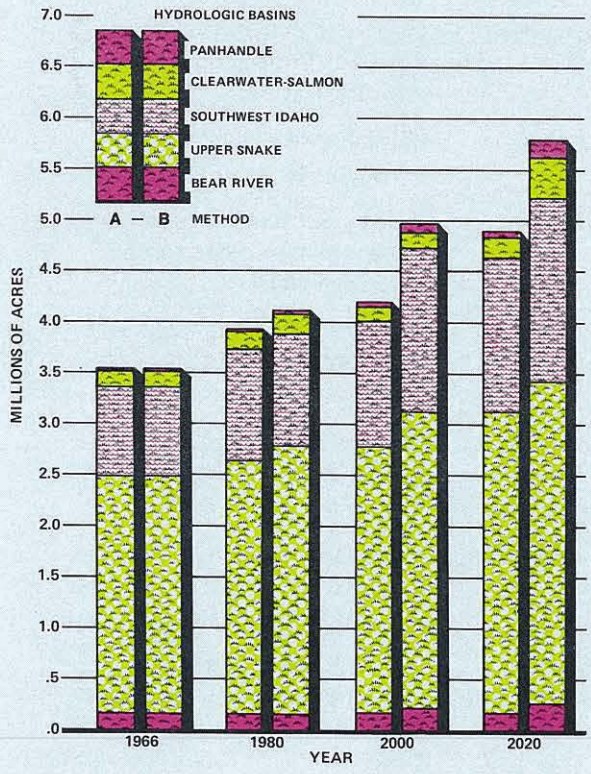
To date, agriculture has played the major role in shaping the state economy. Irrigation farming in particular, generally enjoys a complementary rather than a competitive relationship with the whole of agriculture.

Projections of national food and fiber needs indicate that products from new land development in Idaho could be readily absorbed by national markets and would not contribute to crop surplus. During the last 20 years, more than 1.2 million acres were developed for irrigation through the cooperation of private, state and federal entities. Private enterprise alone has been responsible for about 90 percent of this increase.

Approximately 23 percent (12,113,000 acres) of the land area is classified as having soil and slope characteristics suitable for irrigation. Of this total, about 3,750,000 acres (30 percent) are presently irrigated, leaving approximately 8 million acres of potentially irrigable lands.

Projections of irrigation growth were prepared by the University of Idaho under contract with the Board. A major assumption of the study was that Idaho would continue to provide a share of national food and fiber needs, as it has in the immediate past. Based on this assumption, the study indicated that a total of 4.9 million acres would be irrigated by year 2020. Assuming 3.75 million acres are presently irrigated, this would involve an increase of approximately 1.1 million acres. The report also estimated the amount of new irrigation based on a different assumption that new lands would be developed at the rate whereby all "reasonably good" lands would be irrigated within the next 100 years. Under this assumption, the study indicated that about 5.8 million acres would need to be irrigated by year 2020, an increase of about 2.1 million acres over present irrigated levels. Figure 49 illustrates the growth in irrigated acreage by planning region.

FIGURE 49. ESTIMATED INCREASE OF IRRIGATED LANDS



Since irrigation is by far the largest consumptive water use and, therefore, an important factor in water planning, considerable information is presented in this chapter regarding various alternatives that have been identified to develop new irrigated lands in Idaho. The projects identified and their relationship to projections of irrigation growth are summarized by planning region.

Panhandle Basins

In the basins, there are approximately 24,000 acres presently under irrigation. This was projected to increase to 54,000 acres by year 2020. (See Figure 49.)

The East Greenacres Project will provide a water supply for about 3,400 acres of new irrigated land. The North Bench Project could provide water for an additional 10,000 acres of new land in this region. There have been no other federal projects identified or suggested for this area. It would appear, therefore, that if an increase of 30,000 acres is to occur by year 2020 approximately 17,000 acres must be developed be private means. Table 46 presents a summary of identified public development projects for meeting projected irrigated land needs.

Private development of sizeable acreage does not appear likely at the present time. This could change if the results of a study underway by the University of Idaho Extension Service, shows a potential for new types of high-value cash crops that might successfully be grown.

TABLE 46

ALTERNATIVE PUBLIC DEVELOPMENT PROJECTS – PANHANDLE BASINS

(Irrigation features only)

Project	Acres	Location	Status
East Greenacres	3,400	NW of Coeur d'Alene	Authorized
North Bench	10,000	Kootenai Valley	Reconnaissance study completed by IWRB

Clearwater-Salmon Basins

Approximately 144,000 acres of land are irrigated. Based on the university study, this was projected to approximately 160,000 acres by year 2020, an increase of about 16,000 acres. (See Figure 49.)

Practically all nonirrigated agricultural lands (933,000 acres) are successfully dry-farmed. Of the 144,000 acres being irrigated, about 129,000 acres consist of small areas in the Pahsimeroi and Lemhi valleys. No specific projects have been proposed for new irrigation in the Clearwater-Salmon planning region because of limited land availability or remoteness from a water supply. Any increase in irrigated acreage will likely be the result of private development, utilizing both surface and groundwater supplies.

Southwest Idaho Basins

About 900,000 acres are irrigated in the Southwest region. The University of Idaho study projected irrigated acreage of about 1,517,000 by year 2020, an increase of 617,000 acres. (See Figure 49.)

Private development is expected to continue, primarily on the Bruneau and Mountain Home plateaus. It is estimated that about 100,000 acres will be irrigated by pumping from the Snake River to adjacent lands south of Glenns

TABLE 47

ALTERNATIVE PUBLIC DEVELOPMENT PROJECTS — SOUTHWEST IDAHO BASINS

(Irrigation features only)

Project	Acres	Location	Status
Bruneau Division — Southwest Idaho Project	240,000	South of Snake River, downstream from irrigated area at Twin Falls	Feasibility study underway by Bureau of Reclamation
Mountain Home Division — Southwest Idaho Project	150,000	North of Snake River, desert land in vicinity of Mountain Home	Feasibility study underway by Bureau of Reclamation on irrigation features
Garden Valley Division — Southwest Idaho Project	200,000	Valley, Boise, Gem, Canyon and Ada counties	Feasibility study underway by Bureau of Reclamation
Weiser River Division — Southwest Idaho Project	12,500	Washington and Adams counties	Field studies completed by Bureau of Reclamation. Report to be released in 1972
Tamarack Project	900	Council Valley	Proposed for early development by IWRB. Feasibility study to be initiated in 1972
Crane Falls Project	15,000	High bench lands north of Snake River canyon, southwest of Mountain Home	Reconnaissance study completed by IWRB. Project area is part of Mountain Home Division
Terrace Project	8,300	North of Snake River canyon southeast of Mountain Home	Reconnaissance study completed by IWRB, Portion of project area is within Mountain Home Division
Canyon View Project	13,500	High bench lands north of Snake River and downstream from Swan Falls powerplant	Reconnaissance study completed by IWRB. Project area is part of Garden Valley Division

TABLE 48
ALTERNATIVE PUBLIC DEVELOPMENT PROJECTS — UPPER SNAKE BASINS
(Irrigation features only)

Project	Acres	Location	Status
Lower Raft River Project	11,500	East side of Raft River in Cassia County	Reconnaissance study completed by IWRB
Raft River Division	96,000	Triangular area on both sides of Raft River in Cassia County downstream from Malta	Reconnaissance study underway by USBR. Includes lands in Lower Raft River Project.
North Side Pumping Division Extension	12,000	A & B District of North Side Pumping Division Extension — Minidoka Project	Feasibility study now underway by USBR
Oakley Fan Division	60,000	Along Goose Creek south of Burley	Feasibility study now underway by USBR
Salmon Falls Division	9,000	South of Snake River above existing Twin Falls Southside Highline Canal	Authorized by Senate in 1971. House hearing in 1972
Lynn Crandall Division	—	Could provide water supply to Salmon Falls Division, Oakley Fan Division and/or Raft River Division	Feasibility study now underway by USBR
Bliss Project	15,000	Public Domain lands north of Bliss	Preliminary study completed by IWRB

Ferry and Hammett. Much of this acreage is within the project area for the proposed Bruneau Division.

Table 47 presents a summary of identified public projects for new irrigation development.

These projects would provide over 600,000 acres of new irrigated lands. Public and private development could meet projections of irrigation growth for the region.

Upper Snake Basins

Irrigated agriculture is the dominant industry in the basins with about 2.4 million acres irrigated in 1970. The University of Idaho study projects irrigated lands in the region will be about 2,950,000 acres by year 2020, an increase of about 500,000 acres.

A private irrigation system near Hagerman, will serve about 30,000 acres of the high bench lands west of the river. A significant amount of new irrigation is expected to be developed privately in areas of the eastern Snake River plain from groundwater supplies. By year 2020, an additional 300,000 acres could be developed by private interests assuming that the area withdrawn for the National Reactor Testing Station can be developed.

Identified public projects could provide about 200,000 acres of new irrigation. This, coupled with the estimated private development of about 300,000 acres, would meet projections of irrigation growth.

Table 48 presents a summary of identified public projects for new irrigation development.

Bear River Basins

Agriculture is the dominant industry accounting for about one-third of the total employment. There are presently about 157,000 acres of irrigated land and 406,300 dry farm acres in the region.

The University of Idaho study indicates that approximately 50,000 acres of new land may be developed by year 2020 bringing the total to slightly over 200,000 irrigated acres.

Water supply of the Bear River Basins is limited. New irrigation development is possible but present uncertainty over the status of unconsumed Bear River flows makes it difficult to estimate the acreage or location. Efforts are being made by the three states (Idaho, Wyoming, and Utah) in the Bear River drainage to resolve these uncertainties. Negotiating committees have been meeting to see if agreement can be reached regarding the rights of individual states to development of Bear River flows. Once this issue is resolved, a clearer picture of future development opportunities for the basins will be available.

Although some new lands could be irrigated by private means through groundwater development, the amount is insignificant. The major development possible by private means is the proposed Caribou Project. This would call for a dam on the Bear River south of Soda Springs. Depending upon allocation of storage, it is possible that approximately 10,000 acres could be supplied with water.

Table 49 presents a summary of identified public projects for new irrigation development.

AQUICULTURE

There is little information available on future needs of the aquicultural industry. At present most of the fish hatcheries are located in the Snake River canyon from Twin Falls downstream to Hagerman.

Requirements are for a water supply of adequate quantity and good quality. Spring flows in the Thousand Springs area are the primary source of water supply, and any adverse effect upon these flows as a result of development, would affect the future needs of the industry.

Increased use of the Snake Plain aquifer has been identified in the Board planning studies as a key feature for meeting future water needs. Pumping and recharge projects could affect to some degree the natural flows emerging along the Snake River canyon near the hatcheries.

Additional data and information are required regarding future needs and the results of this water use to present in the State Water Plan.

TABLE 49
ALTERNATIVE PUBLIC DEVELOPMENT PROJECTS — BEAR RIVER BASINS
(Irrigation features only)

Project	Acres	Location	Status
Thomas Fork Project	500	Thomas Fork Creek lands	Economic feasibility of project appears questionable
Bear River Pump	Up to 35,000	Lands between Bear Lake and Oneida	Dependent upon negotiations — replacement storage necessary
Oneida Project	Up to 25,000	Franklin and Oneida counties	Reconnaissance study completed by USBR. Dependent upon negotiations
East Cache Segment	2,000	Cache Valley in Franklin County	Feasibility study by USBR completed. Dependent upon negotiations
Plymouth Project	Up to 20,000	Malad Valley	Preliminary studies by IWRB and USBR. Dependent upon negotiations

WATER QUALITY

On July 5, 1967, the "Rules and Regulations for Standards of Water Quality for the Interstate Waters of Idaho and Disposal Therein of Sewage and Industrial Wastes" were adopted by the Idaho Board of Health. These standards have also been accepted by the Secretary of Interior as meeting the requirements of Water Quality Act of 1965.

An important requirement for meeting water quality needs is adequate stream flows. There is a direct relationship between the amount of water required in the stream to meet this need and the options for additional development for new irrigation and industry proposed. At present there is a lack of data and information on which sound decisions can be made on establishing flows for water quality. Studies are recommended to overcome this problem.

Water quality needs are summarized by basins. (Additional information is presented in Chapter 3.)

Panhandle Basins

Water quality problems in the Panhandle are associated primarily with problems caused from waste loads of municipalities and industries. Recreation sites, rural sewerage disposal and land use practices also contribute significant quantities of wastes.

The EPA has listed five areas where improved waste treatment is needed and where federal enforcement action will be taken if necessary. They are: South Fork Coeur d'Alene Sewer District, Sandpoint, Burke, Gem and Priest River.

Clearwater-Salmon Basins

The Salmon and Clearwater rivers and tributaries generally have excellent water quality. Major water quality problems occur in the Snake River in the Lewiston-Clarkston area and below. Untreated waste discharges from a pulp and paper mill, several food processing plants, and waste waters from the Clarkston-Lewiston primary waste treatment facilities render a portion of the Snake River unsuitable for water contact recreation. In addition, the problem of nitrogen supersaturation with its potential impact on anadromous fish runs is receiving great attention.

The EPA report lists two communities in the Salmon-Clearwater region (Donnelly and Lewiston Orchards) where improved waste treatment is needed and where federal enforcement action will be taken if required.

Southwest Idaho Basins

The most serious water quality problems in Southwest Idaho are associated with municipal and industrial wastes, agricultural animal wastes, low flows and irrigation diversions.

Brownlee Reservoir has a periodic oxygen deficiency that becomes severe in the upper reaches of the reservoir in late summer and early fall. Waste materials from the Snake River are deposited in the backwaters.

The EPA lists four communities where improved waste treatment is needed and where federal enforcement action will be taken if required. They are: Garden City, Kuna, Horseshoe Bend and Wilder.

Upper Snake Basins

The major waste sources are the food processing industries (particularly potato processing and sugar refining); municipalities; agricultural animals; and irrigation return flow.

Twofold to fourfold increases in solid concentrations and floride concentrations have been measured in Raft and Blackfoot rivers and several other Upper Snake tributaries used for irrigation. The dissolved salt content of the Snake River increases from 105 milligrams per liter at the Idaho-Wyoming border to about 400 milligrams per liter at Buhl, Idaho.

Water quality problems occur in the Snake River below Idaho Falls and in the South Fork Teton River. Aberdeen Drain, Main Drain, and Rock Creek suffer from low dissolved oxygen levels, high bacterial densities, and new aesthetic conditions.

The Portneuf River is characterized by low pH levels, high phosphate concentrations, sludge beds and high bacterial counts. American Falls

Reservoir periodically suffers from excessive aquatic growths, dissolved oxygen depletion, and high pesticide levels.

The EPA lists 4 communities where improved waste treatment is needed and federal enforcement action will be taken if required. They are: Paul, Heyburn, Twin Falls and Chubbuck.

Bear River Basins

Surface water qualities in the Idaho portion of the basins deteriorate as the Bear River flows from Wyoming through Idaho and into Utah. Major water quality problems occur in the area immediately surrounding Bear Lake. Needed are treatment facilities for the recreation facilities around the lake and waste disposal facilities for the many small dairies and livestock feedyards which now drain into the lake.

Large scale phosphate mining processing is conducted near Georgetown and Soda Springs on the Bear River. Adequate disposal of mining and processing wastes in order to maintain and enhance the quality of water is of major concern to the industry and basin residents. The Malad and Little Malad rivers carry the highest dissolved salts in the basin. Dissolved solids which originate from natural springs feeding the river reach levels from 1,200 to 4,600 milligrams per liter.

The EPA lists Paris and Montpelier as communities needing waste treatment and where federal enforcement action will be taken if required.

Summary. Idaho water quality is generally high. Nature probably has more impact on water quality than does man. Water resource development has resulted in higher summer flows as stored waters are released for downstream use during dry months. Diversions have in some instances resulted in river flows being reduced to practically zero, particularly during dry years in the Blackfoot River, Snake River below American Falls, and at Milner Dam.

The Boise River below Lucky Peak Dam experiences low flows in the fall and winter months. Bacterial pollution from municipal wastes and livestock has deleteriously affected water quality for water contact sports in a few locations especially below Boise on the Boise River.

Nitrates and phosphates from both natural and man-made sources are the major cause of excessive aquatic growths in parts of the Snake River basin. Toxic elements and compounds are found in the waters of some areas; and some streams have been rendered biologically sterile and nonproductive because of mine wastes.

It is estimated that some $200 million has been spent to date to achieve the present level of waste treatment which exists in the state and that over $150 million more will be required to provide secondary treatment to achieve the degree of control called for by present water quality standards. These figures are at best very rough estimates and reflect capital expenditures only.

Water quality problems can be solved if Idahoans are willing to spend the sums of money required to bring about waste treatment control and are willing to pass legislation to control future water quality degradations.

COMMERCIAL NAVIGATION

Idaho has only two areas of significant commercial navigation — the lower St. Joe River in Coeur d'Alene Lake and the Snake River in the Lewiston area. There appears to be little problem in meeting the projected water needs for commercial navigation in these areas.

RECREATION

The demand for outdoor recreation is expected to increase significantly. Some studies have indicated that outdoor recreation will increase more than four times by year 2020.

Of major concern is the problem associated with unregulated land and water utilization. The Coeur d'Alene area is an excellent example of the problems that accompany unplanned and uncontrolled recreational growth.

There appear to be only minor problems in providing for anticipated recreational growth. There are conflicts, however, between meeting certain water-oriented recreational needs and also providing new irrigated development. The irrigation of desert lands, additional reservoir storage, and associated development practices will be in conflict with some recreational uses. In other cases, irrigation development and recreational uses are compatible. An example of this is the increased recreational use associated with storage project facilities at Lucky Peak dam and reservoir.

The request for substantial minimum flows (10,000 cfs) in the Snake River above the mouth of the Salmon River presents a major conflict with future upstream development. The benefits and costs of providing for recreational flows must be compared with the benefits and costs of utilizing various flows upstream.

A major problem facing recreational resource managers in Idaho is over use. Public use of the Middle Fork Salmon since it was designated as a national wild and scenic river has increased to the point where a permit system may be required.

FISH AND WILDLIFE

Idaho provides a variety of habitat for many species of wildlife; free-flowing rivers, natural lakes, reservoirs, and ponds all contribute to the sports fishery.

In 1965, it was estimated that Idaho waters were used for fishing for resident species about 1,584,000 man-days. About half of this use represented stream fishing, and the other half constituted fishing in reservoirs, lakes, and ponds.

Although deer and elk account for most big game hunting, black bear, big horn sheep, mountain goat, moose and antelope are also hunted. Sportsmen logged approximately 1,012,000 days of big game hunting in 1965.

The state offers outstanding hunting for upland game birds and waterfowl. Idaho is an important part of the migratory waterfowl flyway system in North America. The ducks and geese follow well defined paths from the northern breeding and nesting areas to the wintering grounds; some of the rivers, lakes, reservoirs and marshlands provide resting areas necessary for the long flight each year. About 857,000 hunter days were spent in 1965 in pursuit of upland game birds.

Nitrogen supersaturation (nitrogen bubble disease) represents a major fishery problem. Efforts are being made to reduce the supersaturation by better operation of the existing storage to reduce spills during periods of fish migration. Structural modifications have been made by installation of slotted gates in vacant generator bays; other downstream migrants have been transported around dams during periods of high runoff.

An important requirement for meeting fishery needs is adequate stream flows. Guaranteed minimum stream flows should be established for all streams. This is of particular importance from a water planning standpoint for major river systems such as the Snake, Henrys Fork, Boise and Payette rivers. It is important that existing water rights be protected when establishing minimum stream flows.

There is a lack of data and information on which to base sound decisions regarding instream flow needs for fishery and wildlife uses.

Studies are needed to obtain data and information to better identify exact fish and wildlife resource capabilities and future needs. At present, only rough estimates are available and projections of future needs do not take into consideration conflicts with other water resource uses — or the direction Idaho growth might take.

WATERSHED PROTECTION

Of the 373 small watersheds, it is estimated that 141 require some type of project action. Projects under consideration and those that have been proposed are identified in Chapters 3 and 4. Of major concern is the meshing of watershed protection program goals with objectives selected by the state. For example, should the state elect to establish a policy of maximum development of irrigated lands, the watershed protection measures needed would be considerably different than if Idaho adopts a policy of nondevelopment of the water and related land resources.

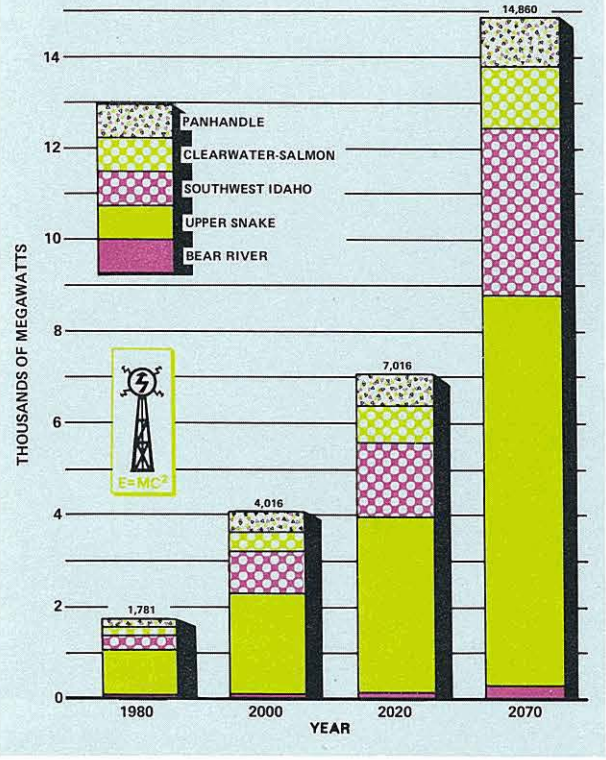
Data and information on watershed protection needs should be updated to conform with present conditions. Evaluation of future needs should be made in cooperation with the state water planning program to insure that study results are compatible.

ELECTRIC POWER

Electric power is the basic element in the processing and manufacturing of native products. Virtually all of the state's electric power is hydroelectric — at the present time, with an installed capacity of 1,832,339 kilowatts. There is considerable potential for additional hydroelectric development, particularly in the Clearwater-Salmon and Southwest Idaho basins. Concern over effects of hydroelectric power development on anadromous fish and conflicts with the National Wild and Scenic River System, however, make this possibility of new development unlikely in the Clearwater-Salmon Basins.

Electric energy loads are projected to increase some 7½ times during the period from 1967 to

FIGURE 50.
PROJECTED ENERGY GROWTH



year 2020. The Upper Snake region is expected to continue to be one of heaviest consumption of electric energy and by year 2020 would require more than 69 percent of Idaho's total. Figure 50 illustrates projected energy growth.

Idaho has the capability of meeting projected energy requirements. Electrical energy needs, however, must be viewed in context of the larger region the state connects with through power interties.

FLOOD CONTROL

Idaho has few major flood problems and in only rare cases is there loss of life or destruction of buildings and other facilities.

The magnitude and seriousness of flood damage could be reduced by controlling land use in flood plain areas. Flood plain zoning is particularly useful for those areas not yet developed but where the potential for home site and commercial development exists.

Flood problem areas are shown on Figure 37. Table 39 lists flood damage cost figures for locations where estimates have been made.

Flood damage reduction can be accomplished throughout the state if sound land use planning measures are taken in conjunction with selected structural development alternatives. An example of such structural measures are the Stuart Gulch and Cottonwood Creek projects in the Boise area.

SUMMARY

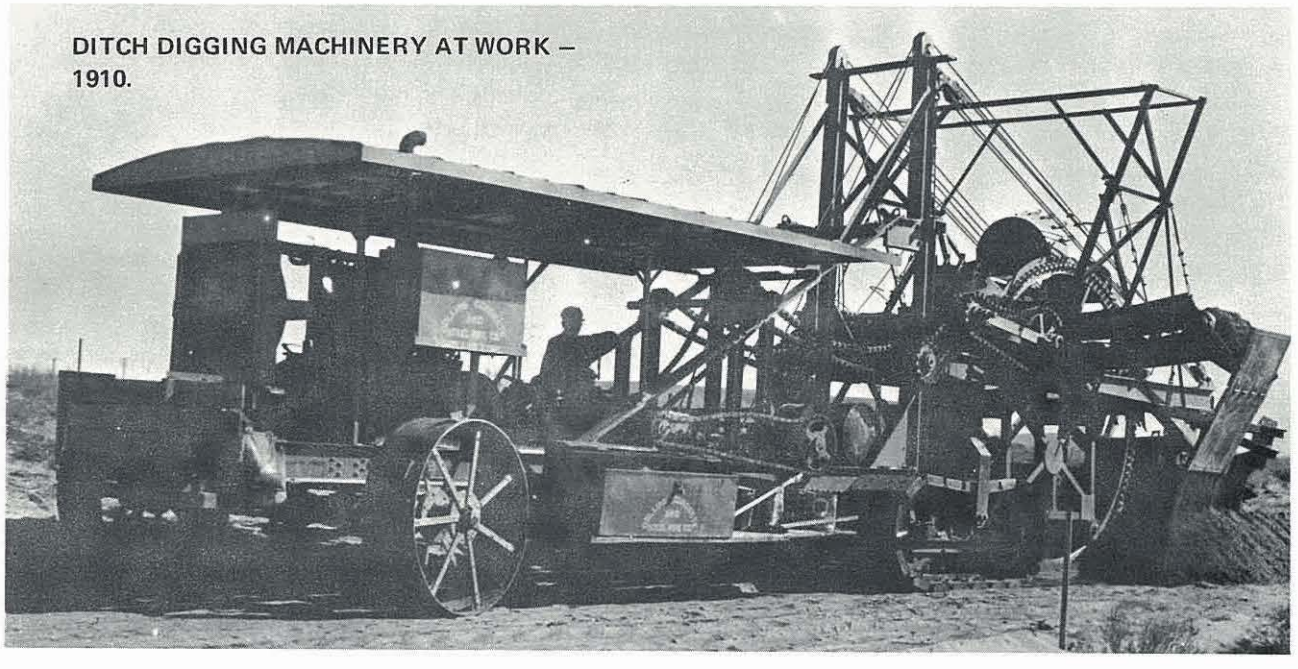
The water and land resources are sufficient to provide each man, woman, and child in Idaho a much higher standard of living than presently experienced. Attainment of a higher standard of living, however, will require planning to insure proper use of natural resources. Idahoans have a way of life that is becoming increasingly attractive to others within the United States. The effect of this on Idaho's future has yet to be fully evaluated and defined.

The lack of adequate comprehensive planning is responsible for many problems and controversies regarding the use of water and related land resources. The state can influence the way in which resources will be used. The vast acreage of federal lands — more than 64 percent of the total — is indicative that decisions will not always be made by Idaho residents.

Chapter 5 / CONCEPTS FOR INTERBASIN WATER TRANSFER

In the early years of irrigation development in Idaho, the principal areas irrigated were those lying adjacent to streambeds. Surplus flows were diverted through gravity canals to other drainages lacking ample water supplies. At that time, it was not economically feasible to pump to arable lands lying several hundred feet above the streambed in the basin of origin. Today with economical means of pumping water to these lands, it is essential that future needs of the area of origin be considered before exporting water to an area of deficiency.

The concept of transferring water from one river basin to another is not new. It has been practiced throughout the world, the western United States, and Idaho for a great number of years. Some such transfers are now in operation within Idaho, some are contemplated for the near future, and many merely long-range proposals lacking detailed studies and economic analyses. The basic purpose of interbasin transfers has been to divert water from areas of ample supply to areas with water deficiencies.



DITCH DIGGING MACHINERY AT WORK – 1910.

The Payette River for example, is an ample water area where development is presently limited mainly to lands adjacent to, and in the lower reaches of, the river. Detailed studies have been made of the possibility of exporting surplus Payette River water to water deficient areas in the Boise and Snake river drainages. There are some areas in the Payette River drainage which could be served by pump lifts when economic conditions warrant the expenditure of funds for this purpose. Present studies concerning construction of storage facilities on the Payette River and exportation of Payette water are considering the future needs of Payette lands in estimates of surplus flows.

The concept of exporting Snake River water out of Idaho to water-short areas in the southwestern states does not make provision for the future irrigation needs or instream water needs of this state. Transfer schemes have been based on the belief that large quantities of water now leaving the state are surplus to state needs and could be made available to other water deficient states.

The Interim State Water Plan clearly demonstrates that the water needs of Idaho are such that no surplus waters are available for diversion out of state. Figure 51 shows existing and proposed interbasin water transfers.

EXISTING WATER TRANSFERS

Transfer of water from one river basin to another has been practiced in Idaho for many years. The amount of water transferred varies from a few cubic feet per second diverted from a small stream to many hundred cubic feet per second flowing in large canals to irrigate several thousand acres. A few examples of existing water transfers in Idaho are:

PAYETTE DIVERSIONS, BOISE PROJECT. Waters of the Payette River are diverted at Black Canyon Dam to the Black Canyon Canal. A pumping plant located at Mile Post 20 of this canal lifts water 90 feet vertically to a distribution system serving about 25,000 acres in the Boise River drainage. At Mile Post 29, the Black Canyon Canal divides to form the "A" and "D" canals. These two canals serve about 26,700 acres, of which approximately one-half are in the Boise River drainage.

FALL RIVER DIVERSIONS. The Enterprise Canal, Crosscut Canal, Fall River Canal, and East Teton Canal convey water from Fall River to serve about 15,000 acres, much of which is in the Teton River drainage.

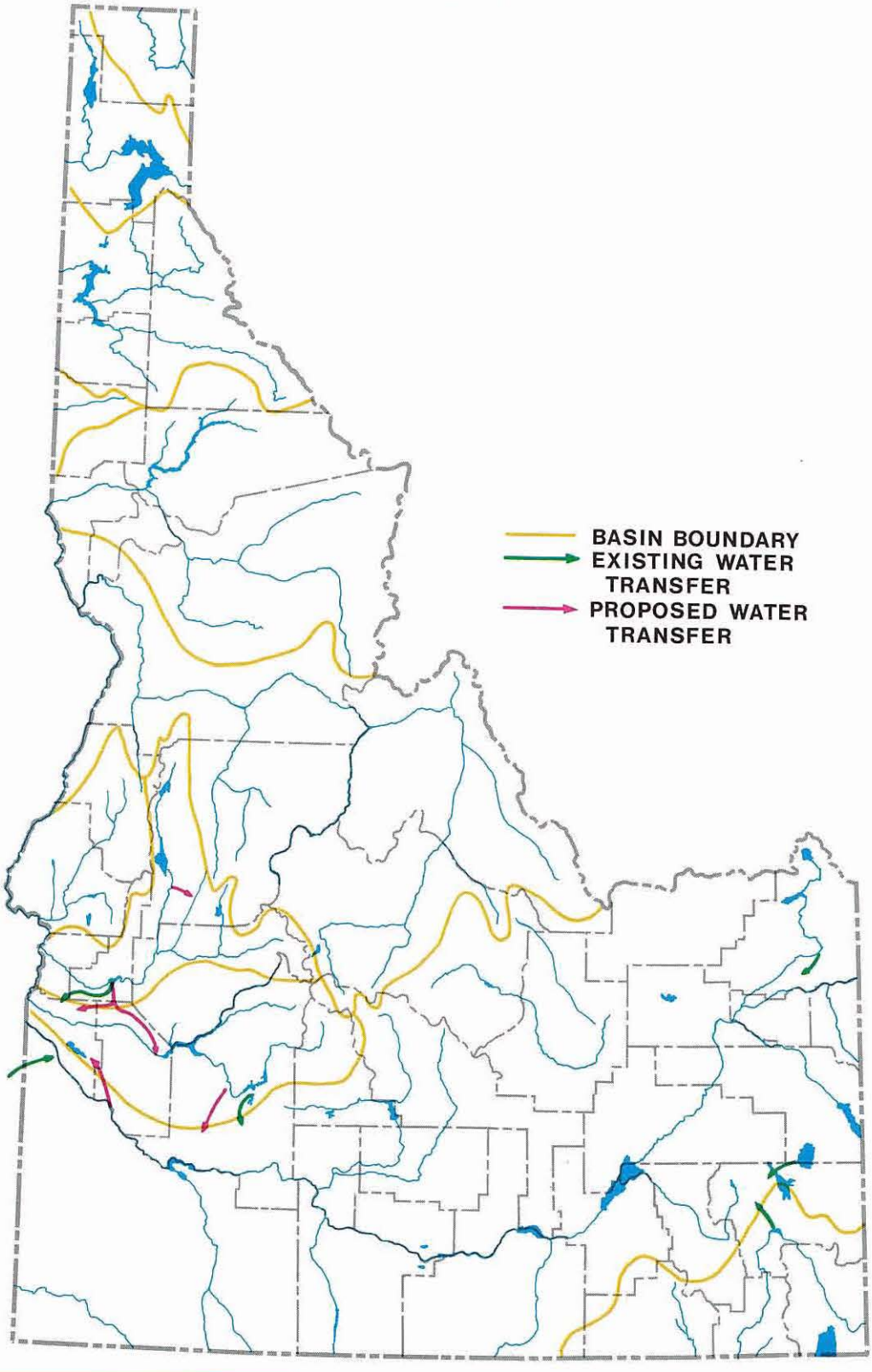
LITTLE CAMAS CREEK DIVERSION. Through a system of reservoirs and canals, water from this tributary of the Boise River is transported to the Snake River drainage and provides a supplemental supply for the 4,400-acre Mountain Home Irrigation District.

OWYHEE RIVER DIVERSION. Waters of the Owyhee River are diverted through a series of tunnels and canals to serve Owyhee Project lands in the Snake River drainage. About 21,000 acres of this land lie in Idaho.

BEAR RIVER DIVERSION. A small portion of the approximately 29,000 acres served by the Last Chance Canal Company lie outside the Bear River Basin.

GRAYS LAKE DIVERSION. By means of a control structure and canal, waters of Grays Lake are diverted to Blackfoot Reservoir for use on lands of the Fort Hall Indian Reservation. The water right for this diversion totals 50,000 acre-feet, but actual diversions between 1927 and 1950 varied from zero to about 37,000 acre-feet annually. A 1964 agreement between the Bureau of Indian Affairs and the Bureau of Sports Fisheries and Wildlife specifies that operating levels of Grays Lake must benefit both irrigation interests and the recently established National Wildlife Refuge.

FIGURE 51. EXISTING AND PROPOSED INTERBASIN WATER TRANSFERS



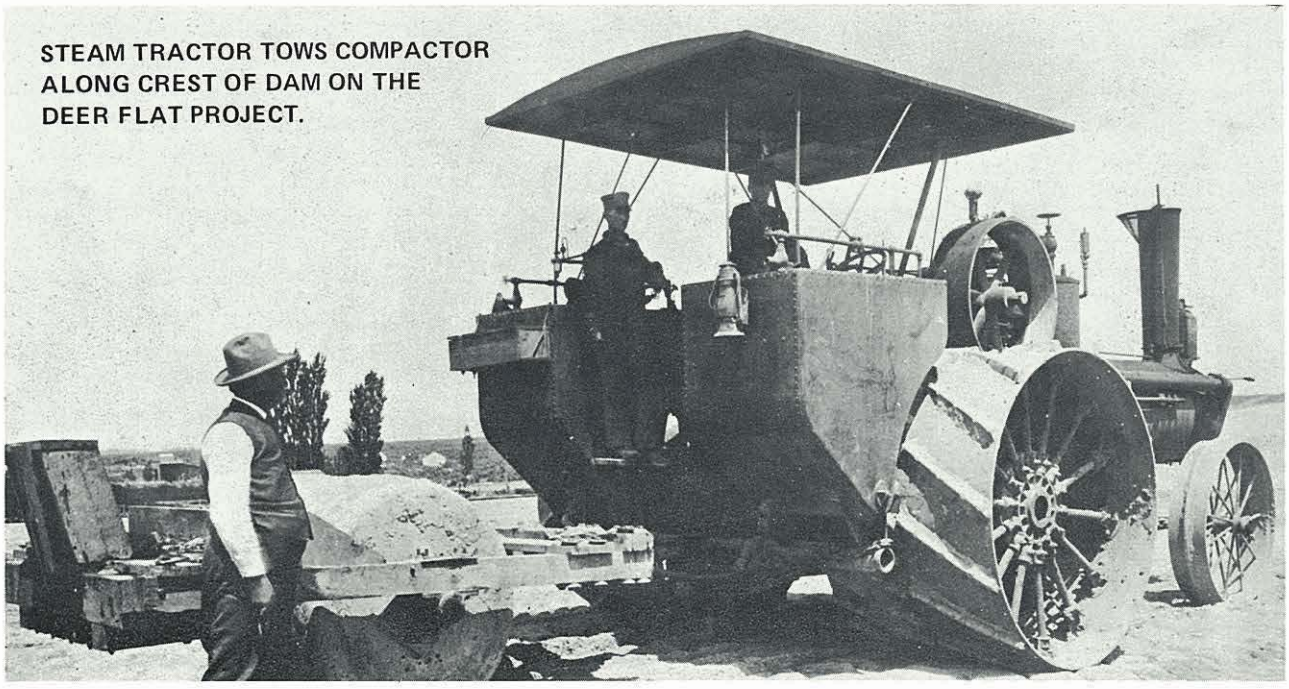
PROPOSED WATER TRANSFERS

The U.S. Bureau of Reclamation studies on the Southwest Idaho Water Development Project proposed two major basin water transfers. These would involve transfer of water from the Payette and Boise rivers under the following plans:

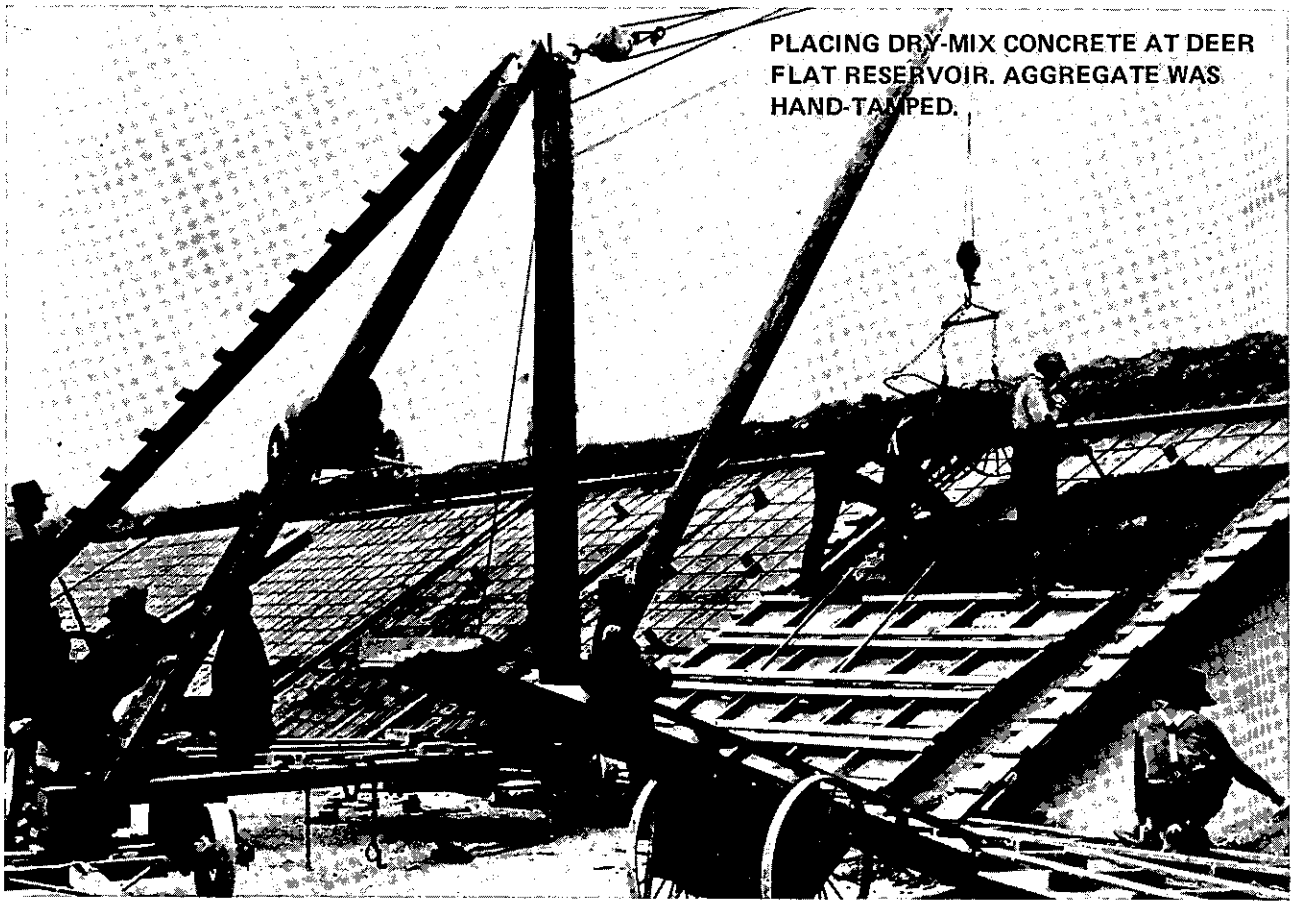
GARDEN VALLEY DIVISION. The Bureau of Reclamation plan would irrigate about 92,000 acres lying outside the Payette River Basin which would receive a full supply from natural runoff and storage on the Payette River. In addition to an enlarged Black Canyon Canal diverting water from the Payette River, a pumping plant would lift water over a divide to the Boise River drainage. A canal would then transport the water to the vicinity of Boise, where it would feed into existing systems of the Boise Project, Settlers Canal, and Ridenbaugh Canal. About 10,000 acres of the Willow Creek Unit near Middleton along the route of this canal would be served.

By feeding Payette River water into existing Boise Valley systems, Boise River waters would then be made available for irrigation of the 82,000-acre Initial Butte Unit located primarily in the Snake River drainage south of Kuna. Diversion requirements would average about 60,000 acre-feet annually for the Willow Creek Unit and 470,000 acre-feet annually for the Initial Butte Unit.

MOUNTAIN HOME DIVISION. Under the 1966 Bureau of Reclamation plan, an estimated 92,000 acres of land in the Snake River drainage near Mountain Home would receive a full supply of water from the South Fork of the Boise River. In addition, the 4,400 acres of the existing Mountain Home Irrigation District would be furnished a supplemental supply of 8,000 acre-feet annually. Re-evaluation studies are underway. Through recommended improvements in irrigation practices, these studies demonstrate a possible increase of irrigated acreage to about 150,000 acres. Facilities include a diversion dam on the South Fork downstream from Anderson Ranch Dam; and a seven-mile tunnel to transport the water to Canyon Creek, from which



STEAM TRACTOR TOWS COMPACTOR ALONG CREST OF DAM ON THE DEER FLAT PROJECT.



PLACING DRY-MIX CONCRETE AT DEER FLAT RESERVOIR. AGGREGATE WAS HAND-TAMPED.

diversions can be made to project lands. This transfer of water would be complemented by pumping a replacement supply from the Snake River to Lake Lowell and to existing canals of the lower division of the Boise Project.

The two plans described for diversion of the Payette and Boise river waters are the current proposals. Past studies include a plan for diversion of Payette River water from the proposed Garden Valley Reservoir through a 28-mile tunnel to Mores Creek and thence to the Boise River for use on the Initial Butte Unit, and for exchange of South Fork of the Boise River water used near Mountain Home.

Another proposal, which would have had about the same results as the Mores Creek tunnel plan, would involve transporting Payette River water to a divide near Horseshoe Bend and to the Boise River above Boise River Diversion Dam. The total length of such a waterway would be about 50 miles, of which approximately 24 miles would be through tunnels; and several miles would be through populated areas in the foothills north of Boise.

Another plan studied in the past included wells within the Boise Project lands to provide drainage as well as replacement of Boise River water diverted from the Boise River drainage.

Status of Proposed Water Transfers

The water transfer proposals associated with the Garden Valley Division and Mountain Home Division are being studied by the Bureau of Reclamation. Studies on the Mountain Home Division are being revised and updated so that they will be compatible with the Board's proposed Swan Falls-Guffey Joint Venture Project. The economic feasibility of the projects must still be demonstrated.

Transfer of Payette River basin surplus flows, as presented in the Garden Valley Division proposal, is essential to the success of the Southwest Idaho Development Project and has been endorsed by the Board in that the Board supports the Southwest Idaho Development Project.

CONCEPTUAL LONG-RANGE INTERBASIN TRANSFER SCHEMES WITHIN IDAHO

Numerous proposals have been suggested for interbasin transfers of water from the Salmon River. Such transfers would require study authorization and funding of detailed studies before any positive recommendations could be made. Some of the factors to consider are: the possible inclusion of all or a portion of the Salmon River as a wild and scenic river; the Wilderness Area designation; preservation of anadromous fish runs; preservation of free-flowing streams; protection of wildlife habitat; and the economics of such transfers. The timing of these studies will depend on instream requirements of the Snake River at Bliss, Weiser, and downstream.

The Idaho Water Resource Board supports the addition of the Sawtooth Primitive Area to the National Wilderness Preservation System. Although there are potential water development opportunities in this area, these projects would be costly and would have severe adverse impacts on anadromous fish runs and on the area's aesthetic qualities.

Many ideas have been proposed for long-range diversion of water from the headwaters of the Middle Fork and main stem of the Salmon River to the Snake River drainage, but these do not appear to be environmentally or economically feasible. Most of these schemes would intrude on the proposed Wilderness Area and would have adverse effects on the natural environment. A few of the proposals are presented here to illustrate the existing possibilities. Figure 52 illustrates long-range schemes for interbasin transfers in Idaho.

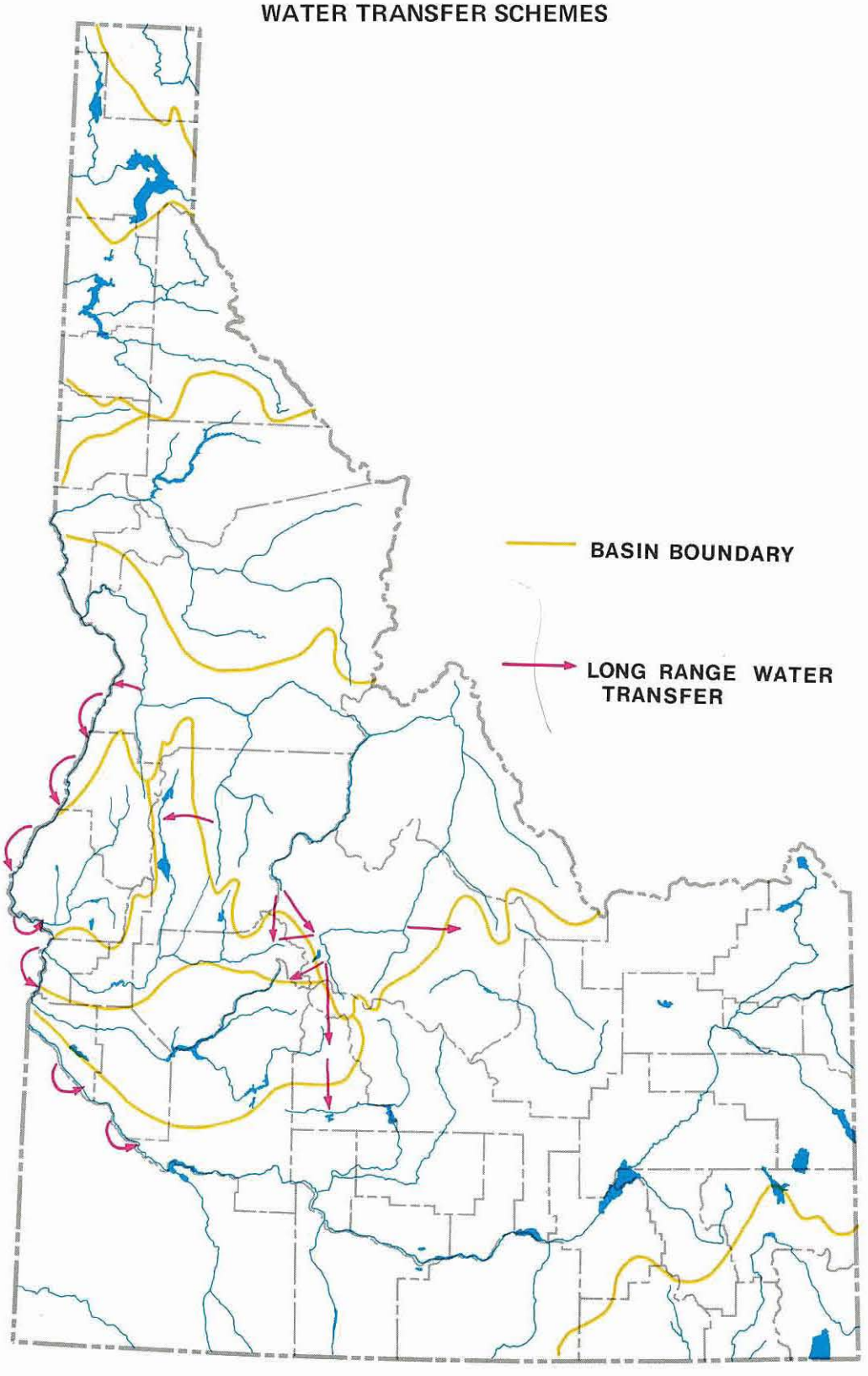
SALMON RIVER TO SNAKE RIVER. This proposal would involve a diversion dam on the Salmon River near Riggins and a tunnel to carry water to the Snake River. One alternative would be a tunnel about 23 miles in length ending at Hells Canyon Dam. Another would be a tunnel approximately 12 miles long outletting about 20 miles downstream from Hells Canyon Dam.

The average annual discharge at the mouth of the Salmon River is 8 million acre-feet. Assuming a 5 million acre-feet transfer, about 3 million acre-feet annually would remain in the river below Riggins to sustain fisheries and to be used for other purposes. Because of seasonal flows, it would be necessary to provide storage in the Salmon River drainage to realize the proposed transfer. Terminal storage might be required on the Snake River, depending on the method of transfer. Transferred water could be used for instream needs below Hells Canyon Dam, for upstream needs, or for a combination of both.

The major upstream areas that could be irrigated with Salmon River water are the lower lying lands now served by the Boise, Payette, Weiser, Owyhee, and Malheur rivers. Diverted Salmon River water would be pumped up the Snake River by pumpback facilities to Hells Canyon, Oxbow, and Brownlee reservoirs and to a distribution system serving about 500,000 presently irrigated acres, most of which are below 2,500 feet in elevation. Total pump lift would be about 1,000 feet. Present storage and natural river flows now serving these irrigated lands would be used to serve an equal number of new land acres lying mostly in the Mountain Home and Bruneau desert areas.

This general proposal has received considerable attention as offering the means for meeting future water needs upstream in the Upper Snake and Southwest Idaho basins. Only very preliminary studies have been made to date and

FIGURE 52. CONCEPTUAL LONG RANGE INTERBASIN WATER TRANSFER SCHEMES



more study is needed to clearly identify the alternatives, problems, and issues. Figure 53 provides a schematic illustration of diversion of Salmon River water to Southwest Idaho.

SALMON RIVER TO PAYETTE RIVER. One proposal involves a diversion of the South Fork of the Salmon River near Knox through an eleven-mile tunnel to Gold Fork, a tributary of the North Fork Payette River. Capacity of the tunnel was estimated to be 500 cubic feet per second. Another alternative includes dams on Bear Valley and Marsh creeks, tributaries of the Middle Fork of the Salmon River, and over 14 miles of tunnels to convey an estimated 330,000 acre-feet of water annually to Warm Springs Creek, a tributary of the South Fork of the Payette River. A third alternative includes a dam on the Salmon River just below Stanley and a 9-mile tunnel to Baron Creek, a tributary of the South Fork Payette River. It was estimated that about 390,000 acre-feet of water could be diverted annually. The reservoir under this alternative would inundate considerable amounts of existing development, including Stanley.

SALMON RIVER TO BOISE RIVER. Several proposals have been suggested for transporting Salmon River water to the Boise River drainage. All of the proposals involve lengthy tunnels, most include storage reservoirs and pumping plants, and a few plans include power plants. Two of these alternatives are discussed here to illustrate the magnitude of the proposals:

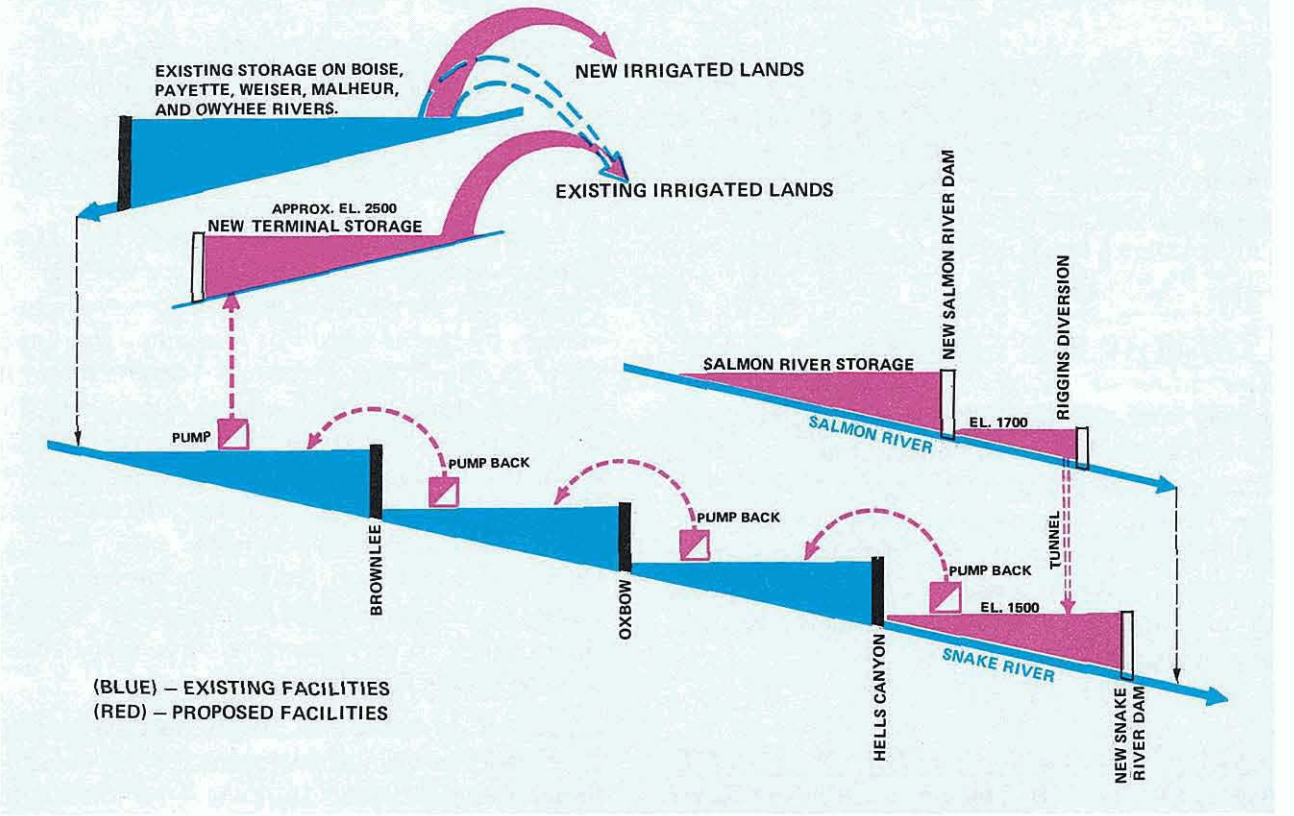
Redfish Lake to Ballentyne Creek. A 3-mile tunnel would convey water from the Salmon River to a storage reservoir at Redfish Lake. From this lake, about 14 miles of tunnels would convey the water to the South Fork Payette River and Ballentyne Creek, a tributary of the North Fork Boise River. At the time of the study, it was estimated that approximately 200,000 acre-feet of water could be diverted annually. This estimate was based on Redfish Lake reservoir capacity, flows of the Salmon River, available storage on the Boise River, and Boise Project water needs. Estimates under present conditions have not been made.

Middle Fork Salmon River to South Fork Boise River. Storage dams would be constructed on Bear Valley and Marsh creeks, tributaries of the Middle Fork Salmon River. A pumping plant at the Bear Valley site and a 4-mile tunnel would convey water to the Marsh Creek Reservoir. Another pumping plant located at this reservoir would lift water to a 49-mile canal which terminates in a storage reservoir at Redfish Lake. A pumping plant on Valley Creek, a tributary of the Salmon River, would lift water to the 49-mile Marsh Creek – Redfish Lake Canal. A diversion structure located on the Salmon River about 10 miles upstream from Stanley and 3-mile tunnel would also convey water to the Redfish Lake storage reservoir. From Redfish Lake, a 22-mile tunnel would extend southward to carry the transferred water to a power plant located on Johnson Creek, a tributary of the South Fork Boise River. Approximately 740,000 acre-feet of water are estimated to be available, of which about 600,000 acre-feet would be a dependable supply to the Boise River System.

SALMON RIVER TO BIG WOOD RIVER. An extension of the diversion scheme which puts water into Johnson Creek of the South Fork Boise River would enable Salmon River water to be transferred to the Big Wood River. Through this exchange, Snake River waters now used on lands near Gooding could be used elsewhere. Additional facilities needed to make the extension include a dam and reservoir on the South Fork Boise River near the mouth of Johnson Creek and a 9-mile tunnel from this reservoir to Soldier Creek, a tributary of the Big Wood River. Approximately 600,000 acre-feet could thus be transferred annually to the Big Wood River.

SALMON RIVER TO BIG LOST RIVER. This scheme includes a high dam on the Salmon River near the mouth of the East Fork and a pumping plant which would lift water to a 3-mile canal and an 11-mile tunnel which terminates in Chilly Sinks near the headwaters of Big Lost River. It is estimated that about 800,000 acre-feet could be diverted annually.

FIGURE 53. SCHEMATIC UTILIZATION OF SALMON RIVER WATER



NATIONAL AND INTERNATIONAL WATER TRANSFER SCHEMES

Since 1960, several proposals have been advanced by water planners in other states for the transfer of water through, and out of, Idaho to other states and Mexico. These schemes involve elaborate systems of pumping plants, storage reservoirs, power plants, and conveyance structures. However, detailed economic and environmental studies have never been conducted on these proposals.

The Western States Water Council, in the 1969 report entitled, "A Review of Interregional and International Water Transfer Proposals", pointed out that all of the proposals are lacking in essential basic data and thorough study. The report did indicate, however, that these proposals identify probable future sources of water and demonstrate various physical means by which large quantities of water could be moved.

At present, there is no active planning by any federal agency for transfer of water from the Northwest to the Southwest because of a Congressional moratorium extending until September 1978 on any federal studies of diversions from the Northwest.

If serious consideration is given by other interests to any out-of-state transfer of Idaho waters after 1978, federal authorization would be required and funds would have to be provided to make the necessary detailed studies to assure the protection of Idaho's present and future water supplies. Four of the major pro-

posals which are shown on Figure 54 are described briefly.

SNAKE-COLORADO PROJECT. S. B. Nelson of the Los Angeles Department of Water and Power in 1963 proposed a diversion of 2.4 million acre-feet from the Snake River near Hagerman through a series of pumps and aqueducts to Lake Mead on the Colorado River.

MODIFIED SNAKE-COLORADO PROJECT. This proposal by W. G. Dunn would divert water from the Columbia River at the mouth of the Snake River and convey it up the natural channel by means of pumping plants to Brownlee Reservoir near Weiser. From this point, additional pumping plants and aqueducts would convey the water through Oregon and Nevada to Lake Mead. An estimated 5 million acre-feet would be diverted under this plan.

YELLOWSTONE-SNAKE-GREEN PROJECT. A proposal by T. B. Stetson would divert water from the Snake River near the mouth of the Hoback River in Wyoming to Beaver Creek, a tributary of the Green River, and thus into the Colorado River. Water would be replaced in the Snake River by a diversion from the Yellowstone River near Corwin Springs, Montana to Henrys Fork of the Snake River. About 2 million acre-feet annually would be diverted to the Colorado River under this proposal.

WESTERN STATES WATER AUGMENTATION CONCEPT. This plan, proposed by L. G. Smith in 1968, is patterned after a similar proposal called the North American Water and Power Alliance.

Water would be obtained from the Liard River, a tributary of the MacKenzie River of Canada. By means of a series of reservoirs and pumps, the water would be backed up the Liard River to the Rocky Mountain Trench, where it would be transported to a large reservoir in the Centennial Valley of southwestern Montana. From this reservoir, water would be fed into the Upper Missouri River and the Upper Snake River, with secondary branches into Nevada, Utah, and southern California. Upper Snake water would be conducted southeast to the Green River to serve areas of Wyoming, Utah, and the Pacific Southwest.

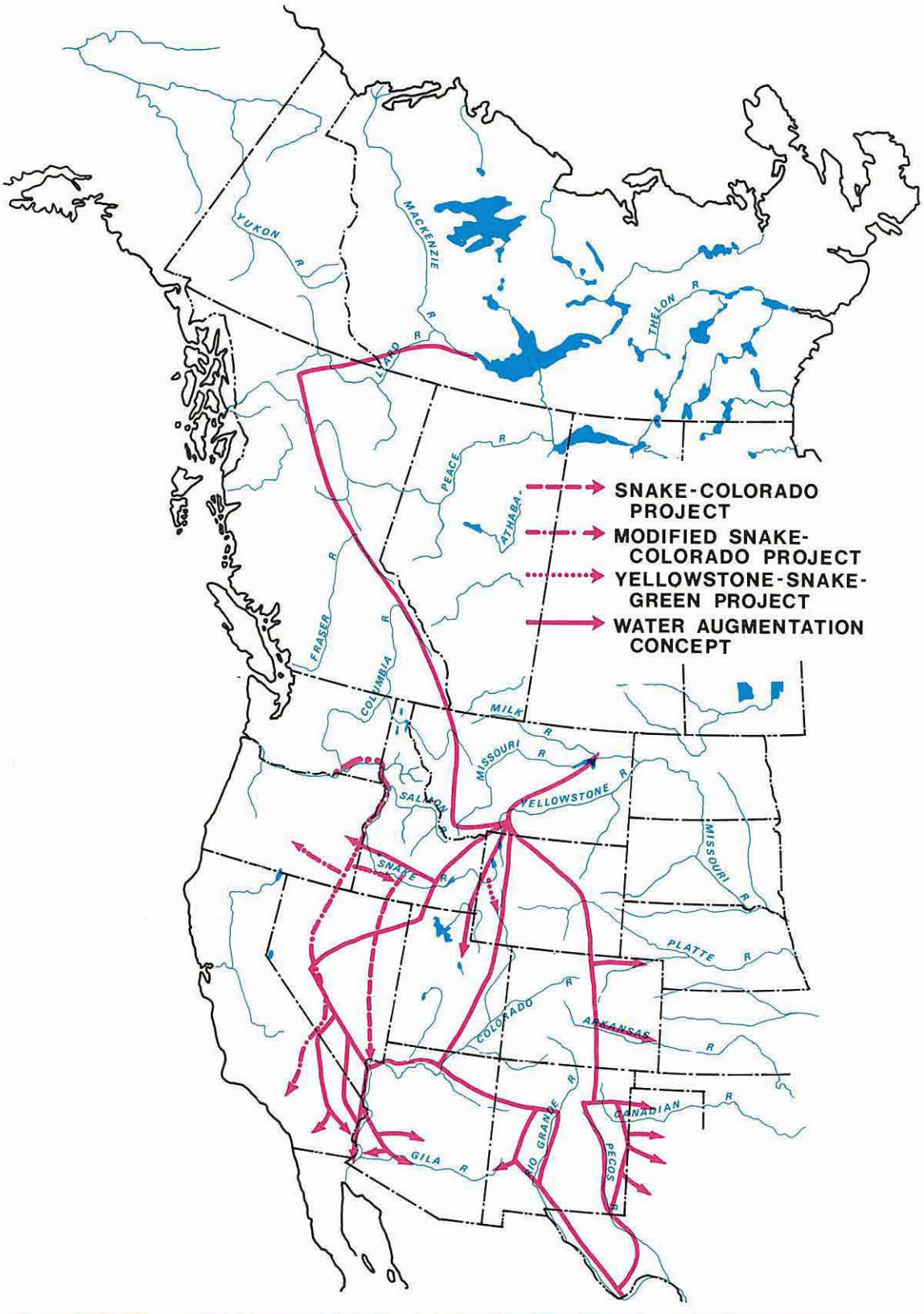
Also, from the Green River, water would be conveyed east via the Sweetwater River to Pathfinder Reservoir, then south to feed water into eastward-flowing streams serving the states of Wyoming, Colorado, Nebraska, Kansas, Oklahoma, and Texas. From the lower Colorado River, water would also be conveyed east into the Rio Grande River above Albuquerque, New Mexico. It was estimated that 40 million acre-feet of water would be provided.

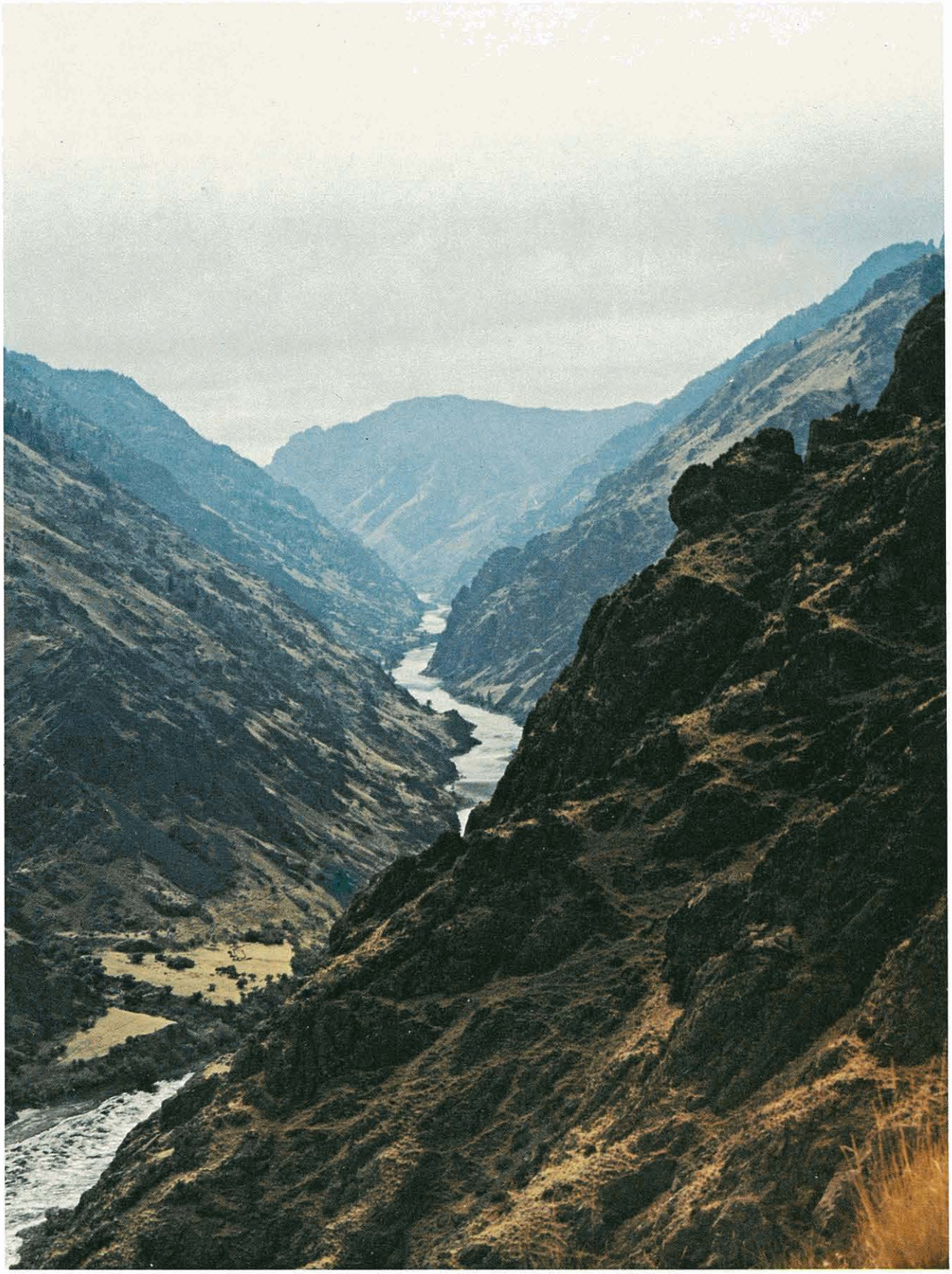
SUMMARY

The Idaho Water Resource Board is strongly opposed to authorization of studies of inter-regional water transfers until all the needs and resources of the state, other Pacific Northwest states, and the southwestern states have been identified and all reasonable alternatives for meeting water needs in other states have been evaluated. Instream flow needs for fish and water quality are of major importance to the state and require that minimum flows be set. Along with instream needs, the future development potential of the state must be considered.

Studies show that Idaho has approximately 8 million acres of potentially irrigable land, mostly adjacent to the Snake River. In the Snake River at Weiser, there are only about 11 million acre-feet of water per year, a deficit quantity, to irrigate Idaho land without allocation for other needs. On this basis, the Water Resource Board is opposed to any and all studies for diversion of water from the Snake River to other basins.

FIGURE 54. NATIONAL AND INTERNATIONAL TRANSFER SCHEMES





Chapter 6 / CONCLUSIONS AND RECOMMENDATIONS

The Preliminary Report on the Interim State Water Plan was prepared to bring to the attention of the executive and legislative branches and the people of Idaho the problems, conflicts and alternatives involved in use of state water resources.

The Idaho Water Resource Board authorized the preparation and release of this Preliminary Report. The report will serve as the basis for public hearings in 1972 and 1973. After the public has expressed its desires through public hearings, and after federal, state and local agencies and the state legislature have expressed their comments, the Board will adopt an Interim State Water Plan. The interim plan will serve as a flexible guide for decisions governing the best use of water resources until completion of a State Water Plan in 1976.

Water supply and water quality problems exist in Idaho. Many of the problems can be solved or mitigated. More important, future problems can be minimized or eliminated if there is foresight to plan ahead.

At present, less than one-half of one percent of state expenditures is allocated to the Board water planning and development programs. This level of funding places severe limitations on the state efforts in this area. A greater portion of state expenditures is required for allocation to water planning and development programs to permit comprehensive studies for all water uses and to implement selected development programs.

The problem areas, alternatives and planning studies identified in the report should be fully evaluated as part of the six major state-federal cooperative river basins planning studies underway. These studies are: Western States Water Plan Study; the Pacific Northwest River Basins Commission Comprehensive Water Planning Study; the Columbia River and Tributary Study; federal-state wild and scenic river studies on the Salmon, St. Joe, Priest, Moyie and Bruneau rivers; Snake River drainage Type IV study; and Bear River Basin Type IV study. Plans for Idaho, as identified in those federal planning studies, should be in basic agreement with the Interim State Water Plan. State support should be withheld for all proposed federal water planning and development programs and projects that are not compatible with the Interim State Water Plan.

The conclusions and recommendations are presented to stimulate public reaction. Some of the recommendations call for specific action by the legislative and executive branches. Others are directed toward local interests and other groups.

FUTURE PLANNING

CONCLUSION:

The Interim State Water Plan will provide the basis through which future water planning needs can be identified, defined and effectively coordinated. Detailed water needs studies covering many of the functional water uses have been completed. In specific areas, such as instream water uses, data and information are required to evaluate the role these needs will play in formulating the overall State Water Plan. These studies must be completed in the next four years.

A list of planning studies underway by the Board, as well as those proposed, is presented:

PLANNING STUDIES — UNDERWAY

State Water Planning — Accumulation of data and related activities leading to the formulation of a state water plan. (Continuing)

River Simulation Models — Study includes Snake River system and tributaries plus Bear River system. (Continuing)

Groundwater Simulation Models — Snake Plain aquifer relationship to pumping, recharge and surface system. (Continuing)

OWRR-Southwest Idaho Study — Research study to evaluate regional multi-purpose benefits resulting from resource development on Mountain Home desert; funded by Office of Water Resources Research. (Completion 1973)

Farm Budget Computer Program — Computation of farm budgets for use in evaluating water resource projects. (Continuing)

Wild River Methodology Study — Cooperation with Water Resources Research Institute, University of Idaho on methodology to use in evaluating rivers for inclusion in wild and scenic rivers system. (Completion 1973)

Bear River Negotiation — Technical support to Idaho Negotiating Team. (Continuing)

Kootenai River Basin — Reconnaissance study to identify development opportunities in area. (Completion 1973)

FHA County Water and Sewer Study — Provide county water and sewer studies for 25 counties which do not have similar studies underway or completed; funded totally by grant from Farmers Home Administration. (Completion 1973)

Coordination Activities – Provide leadership and coordination of state input into the Western States Water Plan Study, PNRBC Comprehensive Study, Columbia River and Tributary Study, federal-state wild river studies and SCS Type IV studies of the Snake River drainage and Bear River Basins. (Continuing)

PLANNING STUDIES – PROPOSED

Instream Flow Needs – Determine instream flows needed for fish, wildlife, water quality, and water-based recreation at key locations.

Boise Project Post Audit – Funding being requested from Federal Office of Water Resources Research to conduct post audit study of Boise project: to develop methods and procedures to measure the economic, social and environmental impacts resulting from major water development projects.

State Wild River Studies – Evaluate economic and environmental factors associated with inclusion of selected rivers into a wild and scenic rivers system.

Middle Snake Alternative Studies – Identify preservation / development options relative to Middle Snake. Identify and evaluate effects upstream and downstream.

Water Based Recreation/Carrying Capacity and Future Needs – Identify and evaluate resource capability and needs.

Snake Plain Aquifer Management Study – Study relationship between surface and ground water systems. Identify and evaluate future management alternatives.

Legal Studies Concerning Water Management Alternatives – Identify legal problem areas relative to alternatives identified for meeting future water use needs.

Environmental Overview – Work closely with an environmental consultant to prepare overview of key areas requiring special attention in state water planning efforts.

Project Evaluation Criteria – Develop criteria for use by state in evaluation of projects and programs affecting resource use. Uniform criteria are needed for use by all state agencies in evaluating federal, state and private proposals.

In addition to the planning studies being conducted by the Board, a number of planning studies underway by federal agencies are of major importance to the water planning of the state and require Board coordination and involvement. A list of these studies is shown in Table 50.

It is essential that liaison be maintained with these study efforts to insure that Idaho's viewpoint is properly presented. Most of these studies would proceed regardless of whether the Board were involved. Through Board involvement, redirection of some of these studies is possible if this is what Idahoans desire.

The water resource planning program of the state is the responsibility of the Idaho Water Resource Board. The Board believes that comprehensive water planning studies should be used to coordinate projects designed to provide solutions to specific water use functions, problems and needs. All water uses, both consumptive and nonconsumptive, must be considered within the context of the total hydrologic system if a practical plan is to be developed. A State Water Plan must be periodically updated if it is to serve as a meaningful guide for decision makers. Revision of the plan is expected at least every five years to insure a continuing adequacy and relevance.

Recommendation 1 . . .

The Idaho Water Resource Board planning program budget should be increased by $400,000 per year so that the proposed studies can be completed.

TABLE 50
PLANNING STUDIES — FEDERAL AGENCIES

Study	Purpose	Agency[1]	Completion
PANHANDLE BASINS			
St. Joe River	Wild river	FS	1973
Priest River	Wild river	FS	1974
Moyie River	Wild river	FS	1974
Coeur d'Alene Reservation	Soil and range inventory	BIA	1973
Spokane River Basin	Multiple purpose	CE	1973
Spokane River Basin	Multiple purpose	BR	1976
CLEARWATER-SALMON BASINS			
Payette, Salmon, Boise, Challis, Sawtooth, Teton, Targhee and Bridger national forests	Instream needs	FS	1974
Salmon River	Wild river	FS	1973
SOUTHWEST IDAHO BASINS			
Bruneau Division	Multiple purpose	BR	1977
Mountain Home Division	Irrigation	BR	1973
Garden Valley Division	Multiple purpose	BR	1974
Weiser River Division	Multiple purpose	BR	1972
Jordan Valley	Multiple purpose	BR	1972
Bruneau River	Wild river	BOR	1975
Boise Basin	Waste water management	CE	[2]
UPPER SNAKE BASINS			
Lynn Crandall	Multiple purpose	BR	1972
Oakley Fan	Multiple purpose	BR	1976
Snake Plain Recharge	Multiple purpose	BR	1975
Minidoka North Side	Irrigation, drainage	BR	1974
Big Wood River	Multiple purpose	CE	1974
Fort Hall Reservation	Water resource inventory	BIA	1974
Snake River Basin	Multiple land use studies	BLM	1974
Raft River	Multiple purpose	BR	Future
Henrys Fork	Multiple purpose	CE	[2]
STATEWIDE			
Western States Water Plan	Multiple purpose	BR	1975
Columbia River and Tributary	Multiple purpose	CE	1976
Comprehensive Water Plan Study for Pacific Northwest	Multiple purpose	PNRBC	1976
Type IV Study	Multiple purpose	SCS	[2]

[1] BR = Bureau of Reclamation; CE = Corps of Engineers; FS = Forest Service; BOR = Bureau of Outdoor Recreation; BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; PNRBC = Pacific Northwest River Basins Commission; SCS = Soil Conservation Service

[2] To be determined

DEVELOPMENT PROGRAM

CONCLUSION:

Economic growth in Idaho has lagged behind adjacent states such as Washington and Oregon and is much less than the national average. This is readily evident when comparing factors such as per capita income, population, net in- and out-migration data and employment rates. Between 1960 and 1970, over 41,000 people out-migrated in search of jobs. Thus the population net growth rate fell to 6.8 percent, compared to 13.3 percent for the nation. New water resource projects and developments could help to alter this trend.

Water resource programs have historically been dominated by federal agencies; only in recent years has Idaho become aware of its obligations to provide for the needs of citizens in this respect. The establishment of the Idaho Water Resource Board in 1965 provided a state agency to provide an overall state viewpoint with regard to future development proposals including federal proposed projects.

Development of state water resources has contributed significantly to the economic growth. Although the state has limited financial resources, the Board believes that the state should continue to actively pursue selected development projects independently or jointly with federal and private entities.

Numerous water resource development projects have been proposed and referred to the Board for consideration. Table 51 includes a listing of the projects proposed which the Board has either: reviewed and approved as being compatible with state water policy and objectives; or withheld its decision until additional studies are completed. Projects shown in Table 51 under "Require Additional Study" should not be viewed as a shopping list from which will be selected future Board-approved projects. The complete listing is included only to indicate the numerous projects under study.

(A description of the projects is included in Chapter 4.)

Recommendation 2 . . .

The state executive and legislative branches of government and the state congressional delegation should concentrate efforts on obtaining authorization and funding of "Board approved" projects. Studies should be completed for projects and programs identified as having the potential for meeting needs in the early action time period so Board review and action can be taken.

TABLE 51

PROPOSED WATER RESOURCE DEVELOPMENT PROJECTS

(Cost in thousands, 1970 base)

Projects	Principal Investigator	Planning Region	Function[2]	Estimated Cost
IWRB APPROVED				
Swan Fall-Guffey	IWRB-IPC	Southwest Idaho	P	$ 60,000
Mountain Home Division	BR	Southwest Idaho	I, F&W, R	200,000
Garden Valley Division	BR	Southwest Idaho	P, FC	246,000
Snake Plain Pilot Recharge	IWRB	Upper Snake	I	20
Salmon Falls Division	BR	Upper Snake	I	57,000
Lower Teton Division	BR	Upper Snake	I, P, FC	65,700
East Greenacres Unit	BR	Panhandle	I	6,000
Trail Creek	SCS	Upper Snake	I	3,180
Georgetown Creek Watershed	SCS	Bear River	I	2,004
Sand Creek	SCS	Upper Snake	FC	7,800
Placer Creek	CE	Panhandle	FC	2,200
Ririe	CE	Upper Snake	FC, I	17,400
Cottonwood Creek	CE	Southwest Idaho	FC	2,600
Stuart Gulch	CE	Southwest Idaho	FC	1,790
Lapwai Creek, Culdesac	CE	Panhandle	FC	114
REQUIRE ADDITIONAL STUDY				
Tamarack Valley	IWRB	Southwest Idaho	R, I	7,500
Weiser River Division	BR	Southwest Idaho	I, FC, R, F&W	17,900
Garden Valley Division	BR	Southwest Idaho	I	239,000
Bruneau Division	BR	Southwest Idaho	I, F&W, R, FC	340,000
Twin Springs	CE	Southwest Idaho	FC, P, WQ, R	80,000
North Bench	IWRB	Panhandle	I	6,950
Lava Hot Springs Flood Control	CE	Upper Snake	FC	761
Lower Raft River	IWRB	Upper Snake	I	6,000
Canyon View	IWRB	Southwest Idaho	I	9,000
Crane Falls	IWRB	Southwest Idaho	I	10,000
Terrace	IWRB	Southwest Idaho	I	5,200
Bliss	IWRB	Upper Snake	I	7,500
American Falls Dam Replacement	BR	Upper Snake	I	24,000
Challis Creek	BR	Clearwater-Salmon	I	4,260
North Side Pumping Division	BR	Upper Snake	I	6,500
Snake Plain Recharge Division	BR	Upper Snake	I, WQ, FC, F&W, R	17,400
Lynn Crandall Division	BR	Upper Snake	P, I	208,000
Lower Teton Div. -- Second Phase	BR	Upper Snake	I,P,FC	14,110
Raft River Division	BR	Upper Snake	I	100,000
Jordan Valley Division	BR	Southwest Idaho	I, F&W, R, FC	9,300
Thomas Fork	BR	Bear River	I, F&W, R, FC	4,500
Caribou	BR	Bear River	I, M&I	9,000
Bear River Pump	Private/BR	Bear River	I	[3]
Caribou	Private	Bear River	I, M&I	5,000
Oakley Fan Division	BR	Upper Snake	I	140,000
Bancroft Watershed	SCS	Upper Snake	FC	[3]
Oneida-Narrows	BR	Bear River	I, R, F&W, M&I	[3]
Roberts-Kettle Butte Watershed	SCS	Upper Snake	FC, D	[3]
Plymouth	BR	Bear River	I, R, WQ, F&W	[3]
Marsh Creek	CE	Upper Snake	FC, R, I, WQ	10,500
East Cache Segment (Cub River)	BR	Bear River	I, M&I, FC, R, F&W	16,563
Blackfoot Dam Enlargement	CE	Upper Snake	I	2,790
Pullman-Moscow Water Supply	Municipal/CE	Clearwater-Salmon	M&I	[3]
Asotin Dam	CE	Clearwater-Salmon	N, P	132,000
Lenore Dam	CE	Clearwater-Salmon	P	60,500

[1] BR = Bureau of Reclamation; CE = Corps of Engineers; FS = Forest Service; BOR = Bureau of Outdoor Recreation; BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; PNRBC = Pacific Northwest River Basins Commission; SCS = Soil Conservation Service

[2] FC = Flood Control; R = Recreation; WQ = Water Quality; F&W = Fish and Wildlife; I = Irrigation; P = Hydroelectric Power; D = Drainage

[3] See detail in Chapter 4

Recommendation 3 . . .

A permanent legislative water resources committee should be established to work closely with the Board in reviewing the State Water Plan and in pursuing implementation of selected water resource projects approved by the Board and the legislature.

Recommendation 4 . . .

The Revolving Water Development Fund legislation should be broadened to provide for: (1) the purchase of conservation storage; (2) grants for nonreimbursable project costs allocated to recreation and enhancement of fish and wildlife resources; (3) state grants for water quality control as part of multi-purpose projects; (4) purchase of scenic easements or lands required by or associated with a state wild and scenic rivers system; and (5) direct funding of projects to construct recharge facilities for groundwater replenishment. The Revolving Water Development Fund should be immediately augmented by $3 million and future appropriations made to provide for a total funding level of $25 million.

Consideration should also be given to legislation which would permit state endowment funds to be loaned for water resource development. Revenues to the state endowment fund could possibly be greater under this program than in alternative investments.

Recommendation 5 . . .

The legislature should investigate various sources of funding to help finance state and local water development projects. Included is the advisability of dedicating the revenue from the kilowatt hour generation tax and/or other new revenues to the Water Resource Board for use in providing loans and grants for water development. (Cash receipts from kilowatt hour tax collections for the period July 1, 1970, to June 30, 1971, amounted to $583,610.) In addition to the kilowatt hour tax, consideration should be given to enactment of conservancy district legislation to provide increased funds for needed programs and projects on a local basis.

Recommendation 6 . . .

A greater portion of state expenditures should be allocated to help implement selected development programs.

If additional revenues cannot be obtained through dedication of funds, such as the kilowatt hour tax, then a reordering of state priorities for expenditures of state funds should be undertaken.

ENVIRONMENTAL VALUES

Maintaining a satisfactory environment in Idaho is of paramount importance. A quality environment cannot be maintained by chance. An active and vigorous program dedicated to the maintenance of a quality environment is essential. The well-being of the people of Idaho should have the highest priority in all planning and development activities of the state. Planning for use of water and related resources should include a full analysis of the environmental impacts of all proposals and an outline of alternative courses of action.

Recommendation 7 . . .

Federal and state agencies and private entities should respond to and protect environmental values in accordance with state guidelines. Where it is deemed that some degree of environmental change is acceptable to accomplish state objectives, recommendations for the mitigation of any adverse effects should be fully spelled out. Where the environmental impact of a proposed project is judged unacceptable, state support for the project or proposal should be withheld.

Consideration should be given to establishing ecological reserves. Areas as small as five acres should be purchased if necessary by the state and set aside as "natural" areas.

Funding should be provided for archaeological surveys in those areas of the state which have been identified by acknowledged authorities as promising archaeological fields (or sites). Such studies should not be delayed until after development proposals are made.

Attention should also be given to the preservation of important historical areas, including the Lewis and Clark Trail along the Clearwater River and the Oregon Trail in the vicinities of Glenns Ferry and Boise.

LAND USE PLANNING

CONCLUSION:

Local communities and cities are facing unregulated growth problems involving residential, industrial and commercial activity. This type of growth is fostering regional problems involving two or more counties. Of particular concern is the apparently unregulated development of summer home recreation areas throughout the state.

Land use planning studies are needed at the local levels. In those areas where local planning entities do not have the capability to conduct the necessary studies, the state should assume responsibility. These studies are urgently needed to insure that water planning programs are adequate and compatible with present and projected land uses.

Important reservoir sites are being encroached upon by various activities which may preclude their future utilization for water storage.

Recommendation 8 . . .

The Idaho Water Resource Board as the state agency responsible for comprehensive water and related land resource planning, should be provided with the authorization and funds to complete the necessary related land use studies. Special emphasis should be placed on recreational areas where summer home developments would adversely affect water quality in rivers and lakes, such as: Island Park, Stanley Basin, the Salmon River above Salmon, Cascade Reservoir area, Payette Lakes, Lake Coeur d'Alene, Lake Pend Oreille, Priest Lake, the Big Wood River basin above Bellevue and Bear Lake.

Legislation and funds should be provided to acquire and protect key reservoir sites within the state.

STATE WILD AND SCENIC RIVERS SYSTEM

CONCLUSION:

Idaho has the option of developing a management plan for all the rivers within the state. One management alternative that should be considered is establishing a state wild and scenic rivers system. The state has the unique opportunity to set aside those river reaches which have natural scenic qualities worth protection and enhancement.

Recommendation 9 . . .

Legislative consideration should be given to the establishment of an Idaho wild and scenic rivers system so that unique stretches of undeveloped rivers can be preserved. Legislation should be enacted citing the rivers to be studied and designating the Board as the agency responsible for the studies. Adequate funds should be provided to conduct the necessary studies in order to insure prompt action. The studies should include a full evaluation of economic and environmental factors. Each recommendation for inclusion of a river into the state wild and scenic rivers system should include a management plan fully outlining the costs of acquiring land or scenic easements and annual operation and maintenance costs.

The following are representative of the streams in the state which should be studied for possible inclusion in a state wild and scenic rivers system:

- Little Salmon River from mouth upstream to Boulder Creek;
- South Fork of the Salmon River including the East Fork of South Fork and Johnson Creek;
- Salmon River from headwaters to mouth;
- Teton River from headwaters to confluence with the North Fork of the Teton River;
- Free-flowing segments of the North Fork of the Payette to backwaters of the potential Smiths Ferry Diversion Pool;
- South Fork Payette free-flowing segments from origin to the backwaters of the potential Garden Valley reservoir;
- North Fork of Coeur d'Alene from headwaters to confluence with South Fork Coeur d'Alene;
- Middle Snake from Hells Canyon Dam to Lewiston;
- Henrys Fork of the Snake River from Big Springs to confluence with Warm River.

Recommendation 10 . . .

A comprehensive impact study should be made of rivers within Idaho (312 miles) now included in the federal wild and scenic rivers system to evaluate the social, economic and environmental factors associated with such designation; and to determine whether the state should seek in-lieu payments from the federal government if local or regional inequities exist. No additional rivers should be committed to the federal wild and scenic rivers system until a study of this type has been completed.

FISH AND WILDLIFE RESOURCES

CONCLUSION:

Determination of instream flow requirements to maintain a viable fishery resource is urgently needed. Flows to meet instream uses must be fully considered in the State Water Plan, but sufficient information is not now available to identify flows needed. Flows in the major streams could diminish below a life-sustaining flow unless protected with adequate minimum flows.

The Aquatic Life Water Needs Study (Idaho Water Resource Board Planning Report No. 3, prepared by the Idaho Fish and Game Department under contract with the Board) represented the first step in obtaining information on instream flow requirements. The study, however, was limited in scope and intensity and the results must be viewed as preliminary.

The Attorney General in an opinion dated January 12, 1970, stated that instream flows for fish, water quality and recreation could be recognized as beneficial uses of water in Idaho, although the constitution does not specifically recognize these uses.

Recommendation 11 . . .

State legislation should be enacted which recognizes instream flows for aquatic life as a beneficial use of water, while protecting the priority of existing water rights. The legislation should clearly spell out the procedures for the Board to follow in setting minimum flows, and the guidelines to be followed by the Department of Water Administration in issuing water permits.

Recommendation 12 . . .

The Idaho Water Resource Board should be provided adequate funding to conduct comprehensive investigations to identify instream flow needs. Official instream flows should be established at the following key points:

- Snake River at Heise;
- Snake River at Blackfoot;
- Snake River below Milner Reservoir;
- Snake River at mouth of Rock Creek;
- Snake River at King Hill;
- South Fork Teton at Rexburg;
- Henrys Fork below South Fork Teton;
- Snake River at Weiser;
- Snake River at Lewiston;
- Boise River below Lucky Peak Reservoir;
- Boise River at Boise;
- Boise River at Caldwell;
- Payette River at Emmett.

Until comprehensive studies can be completed, interim minimum flow requirements should be determined by the Idaho Water Resource Board at key points on the river systems and be officially recognized by all state and federal agencies.

Recommendation 13 . . .

The anadromous fish runs of the Salmon and Clearwater rivers should be protected and enhanced. Expanded fish hatchery programs in the upper reaches of the Salmon and Clearwater river basins should be undertaken to stimulate greater returns and, therefore, greater opportunities for salmon and steelhead fishing in the state. Solutions to the nitrogen supersaturation problem should be vigorously pursued.

WATER QUALITY

CONCLUSION:

Numerous programs and studies are being conducted by federal and state agencies in order to overcome water quality problems in Idaho. No overview has ever been completed to identify where and how these various study activities can be coordinated thus avoiding duplication of effort and minimizing study and data gaps. To obtain maximum efficiency from state and federal efforts in the areas of water quality management and planning, a study of all ongoing water quality programs is needed. A coordinated work program answering the needs of the state on a priority basis could then be designed.

Water quality data and information are urgently needed to evaluate instream flows at key points in the river system, both at present levels of development and at estimated future levels. Studies to determine instream flow needs must be conducted on a system-wide basis to fully evaluate effects on all other water use needs. Most studies completed to date consider the effects only on a local or project basis.

Comprehensive county water and sewer studies are being conducted by the Idaho Water Resource Board and private engineering firms. Completion date is 1973. Communities having a population greater than 5,500 are not included in the study but should be encouraged to review municipal water and sewerage system needs.

Recommendation 14 . . .

Legislation should be enacted which recognizes the provision of instream flow sufficient to meet water quality standards as a beneficial water use while protecting the priority of existing water rights.

Recommendation 15 . . .

Adequate funds should be provided to the Idaho Water Resource Board to carry out the studies necessary to determine instream flows required at key locations to meet water quality needs. Detailed studies should be conducted to generate sufficient information to establish official minimum flows at the following key points:

- **Snake River at Heise;**
- **Snake River at Blackfoot;**
- **Snake River below Milner Reservoir;**
- **Snake River at mouth of Rock Creek;**
- **Snake River at King Hill;**
- **Snake River at Weiser;**
- **Snake River at Lewiston;**
- **South Fork Teton at Rexburg;**
- **Henrys Fork below South Fork Teton;**
- **Payette River at Emmett;**
- **Boise River at Boise;**
- **Boise River at Caldwell.**

Recommendation 16 . . .

Project costs associated with providing augmented river flows to help meet instream quality needs (beyond the level achieved by treatment under the state water quality standards) should be considered a state and/or federal nonreimbursable cost and funds provided for this purpose.

Those cities or communities identified as needing up-dated water and sewage systems should receive priority funding from state and federal sources.

RECREATION RESOURCES

CONCLUSION:

Idahoans consider maintaining quality outdoor recreation opportunities to be fundamental among the state's priorities. The use of Idaho lakes and rivers is expected to increase by more than 400 percent within the next 50 years. Some of this increased demand can be met by more effective use of present resources if additional facilities and access are provided. In some areas of the state, there are sufficient water-based recreational areas to meet present and foreseeable future needs. In other areas, particularly those adjacent to large metropolitan areas, additional water-based recreation facilities may be needed to maintain quality water-based recreation.

Recommendation 17 . . .

Studies should be made to determine the specific areas in the state where shortages of water-based recreation facilities may occur as a result of future population pressures and increased usage. Studies to determine instream needs for recreation should be undertaken similar to studies identified in Recommendations 12 and 15.

The state should take whatever action is required to insure that summer home subdivisions planned near new and existing reservoir developments, natural lakes and rivers, include environmentally sound water and sewage facilities.

Recommendation 18 . . .

The present land acquisition program in the Fish and Game Department to provide public access to the rivers bounded by private land should be continued and, if possible augmented.

The state should stimulate the development of "planned" high intensity recreation use areas to help meet future demands and bring added revenues to the state.

FEDERAL LAND POLICY

CONCLUSION:

The Public Land Law Review Commission (PLLRC) report entitled *One Third of the Nation's Land* included a number of specific recommendations concerning federal land use policy which could have a significant effect on Idaho. Separate and distinct pieces of federal legislation are now emerging as a result of the report, directed at implementing some of the recommendations and actions outlined in that study. Some of these proposed federal bills (such as the National Land Use Policy Act and the Public Lands Organic Act) would have a significant impact on the future use of the state water and land resources. Other PLLRC recommendations, such as the one calling for an end to the practice of permitting states to limit out-of-state hunters, would have a significant effect on current state wildlife management practices.

More than 64 percent of Idaho's land, including substantial amounts of potentially irrigable lands, recreational lands, mineral lands and other prime land areas, is owned and managed by the federal government. Any federal legislation enacted pertaining to land use on federal lands, therefore, has a significant impact on the state. The Board believes that the federal government should provide an opportunity for further state and private development of public domain lands.

The interests of Idahoans could be enhanced by disposal of some of the public lands. There are about 12 million acres of public domain lands in Idaho. This acreage contains the major portion of the potentially irrigable lands. A University of Idaho study conducted for the Idaho Water Resource Board estimates that about 1.14 million acres of new lands would be irrigated in Idaho by 2020 if Idaho maintains its share of national food and fiber marketing. Actual expansion could be even greater if national food and fiber requirements grow unchecked.

Recommendation 19 . . .

Idaho should actively encourage the development and use of the public domain lands in the state for multiple purpose use including intensive agriculture. Several federal laws, such as the Desert Land Act and the Carey Act, are important for the continued expansion of irrigation development and the state should oppose any attempt to repeal these laws. The economic well being of the state can be enhanced through optimal management plans for the public domain. This management should be funded by the federal government and should be aimed at the creation of permanent jobs and increased opportunities for the citizens of the state.

Recommendation 20 . . .

Legislation should be enacted making it mandatory that at least 6 percent of all public domain lands developed for irrigation by federal, state or private interests be set aside and managed by the appropriate federal or state wildlife agency for fish and wildlife purposes.

RIVER BASIN WATER TRANSFERS

CONCLUSION:

There are areas in the state where the in-basin water resources are not adequate or cannot be feasibly developed to provide for long range in-basin water needs. In other areas of the state, water supplies are more than adequate to meet all present and projected consumptive uses. Transfers of water from basins with water surplus to areas with water shortage have been used in the past as a means to help balance nature's provision of water supplies.

The flows of Snake River above Milner Dam are insufficient in dry years to sustain large-scale development or to provide for recreation, water quality, fish and wildlife needs without extensive augmenta-

tion. Should the instream flow requirements of the Snake River below Thousand Springs be determined to be 6,000 cfs and approximately 9,500 cfs at Weiser, major augmentation by transbasin diversions from the Salmon River or extensive groundwater pumping would be required in the near future. The time requirement when augmentations would be needed is directly related to the amount of instream flow needs in Southwest Idaho — the lower the instream need, the longer the time period before augmentation would be required.

Large transfers of water over long distances requiring major expenditures of monies are not anticipated before 1985. Major water transfers during the period from 1985 to 2020 have been proposed but are more likely to occur after year 2020. Comprehensive studies should be conducted to determine the feasibility of the proposed water transfers, taking into account engineering, environmental and economic factors.

Major policy issues are involved in river basin water transfer projects. Serious practical and legal considerations which will require legislative consideration include: reservation of water for projected development in the basin of origin; the right of water recapture by the basin of origin; exchange of water between areas and uses and the effects of such exchanges on water rights; the possibility of transferring water to higher preference uses, for example, from irrigation to municipal and domestic consumption; and condemnation or purchase of existing water rights, or the right to interfere with present use.

Recommendation 21 . . .

Consideration should be given to enactment of legislation reserving water for future needs in the basin of origin if and when major interbasin water transfers are necessary.

Recommendation 22 . . .

Every effort should be made by the state to insure that no federal legislation is passed which would make it impossible for the state to exercise its option to divert portions of the Salmon or Middle Snake surplus flows at some future date.

Recommendation 23 . . .

Planning studies of alternative interbasin water transfer schemes associated with the Garden Valley and Mountain Home dams should be actively pursued so that engineering, economic and environmental data and information will be available for input to the State Water Plan.

GROUNDWATER RESOURCES

CONCLUSION:

Coordinated use of the groundwater and surface water resources will be required in future years to make optimum use of the state water resources. Use of the groundwater resources of the Snake Plain aquifer will doubtless increase in the future. The areas south of the Snake River such as Oakley Fan, the Raft River and the Salmon Falls area are generally lacking in groundwater and several areas have been closed to further groundwater development because of declining groundwater levels. Water will have to be imported to these areas if the present economy is to be protected and if agricultural expansion is to occur. Surface storage and more efficient water use, operated in conjunction with development of the Snake Plain aquifer, will help provide the needed water supply.

Artificial recharge of the aquifer should be carefully considered. Through increased utilization of the aquifer, Idaho can provide for many future projected water uses.

The possibility of interchange of waters between the Snake Plain aquifer and Jackson Lake should be fully explored: Water could be pumped up from the aquifer to provide for irrigation uses during the recreational season allowing the levels at Jackson Lake to be maintained. When Jackson Lake is drawn down to provide flood control storage, this water could be used to recharge the aquifer.

Studies underway by federal and state agencies to determine the characteristics of the Snake Plain aquifer should be continued and intensified. A major development program involving both recharge and pumping of the aquifer should be formulated. The possible adverse effects on water quality and spring flows (especially at Thousand Springs) of such aquifer development should be identified.

Recommendation 24 . . .

The possibility of utilizing the Snake Plain aquifer to stabilize Jackson Lake should be studied in conjunction with the objectives of increased use of the aquifer for providing a firm water supply to water deficient areas and in-stream flow needs.

Recommendation 25 . . .

Little data and information is available regarding water requirements associated with the trout industry located in the Thousand Springs area. This information should be obtained so that the relationship of those needs to future water programs can be determined.

WATER MANAGEMENT PROGRAMS

Present water management programs were developed primarily on a project-by-project basis. No overall systems approach was instituted to determine if optimal use of resources was being achieved. Studies should be conducted to determine whether or not a water management system could be developed that would allow more effective use of the state water resources without detriment to the present users. The study is needed even though existing water rights and contractual arrangements might delay the implementation of desired programs.

Recommendation 26 . . .

The Soil Conservation Service and other involved federal agencies should be directed, as part of the Type IV studies, to identify the possibilities and effects of reorganization or renovation of existing and proposed canal systems to obtain more efficient water use. The effects of current water losses from canal systems on the Snake Plain aquifer should be fully analyzed so that natural recharge is not reduced without full consideration of the results of this action.

Recommendation 27 . . .

The state of Idaho should provide loans and grants to water-using entities for the purpose of improving existing water systems. The funds necessary to accomplish this kind of program should be appropriated by the legislature to the Idaho Water Resource Board Revolving Development Fund.

RESEARCH NEEDS

CONCLUSION:

More research is needed on the control, protection, development and use of water and related land resources to obtain maximum use of the state resources. Complex problems involving economic, social, engineering, environmental, hydrologic, financial and legal issues now exist or are anticipated in the future. Expanded research programs are essential to assist the Idaho Water Resource Board in developing and maintaining a sound, flexible guide for water resources in Idaho.

Recommendation 28 . . .

The federal government should be requested to support research into the possibility of weather modification. Augmentation of natural water supplies, particularly in dry years, might minimize the economic impact of low flow years in the state. This program should be developed at one of the state universities.

Recommendation 29 . . .

The state should seek to obtain increased research grants from the federal government so that better planning criteria can be developed and evaluated to assist in guiding future programs and projects in Idaho. Research topics that should be funded include a comprehensive post audit of the Boise Project, location of new towns in semi-arid areas, thermal power plant siting research, and geothermal plant locations.

Recommendation 30 . . .

Research is needed to determine the relative benefits of preservation versus development of streams. Extensive work is needed to develop efficient and practical methods for evaluation of this issue.

Recommendation 31 . . .

Consideration should be given to evaluating the idea of establishing a system of charges for future water uses. Included as part of such a system could be an incentive plan whereby increased efficiency of water use would be rewarded by a reduction in charges. Funds received from such a program should be dedicated to use in planning, protecting, managing and enhancing the water and related land resources of the state.

GLOSSARY OF TECHNICAL TERMS

ACRE-FOOT (ac-ft). A unit commonly used for measuring the volume of water; equal to the quantity of water required to cover 1 acre to a depth of 1 foot and equal to 43,560 cubic feet or 325,851 gallons.

AERATE. Process of supplying air to a liquid to supplement the oxygen supply.

ALGAE BLOOMS. A rapid proliferation of algae, an aquatic plant which rapidly reproduces in the presence of large amounts of nutrients.

ANADROMOUS. Fishes going from the sea up rivers for the purpose of spawning.

ANAEROBIC. Requiring, or not destroyed by, the absence of air or free oxygen.

ANALOG MODEL. A model which duplicates a sequence of hydrologic events using electrical current to represent flow of water.

ANGLER-DAY (FISHERMAN-DAY). A day or any part of a day spent fishing by an individual.

AQUATIC LIFE. As used in this report, refers to fishery population in streams.

AQUICULTURE. As used in this report, refers to production of fish for commercial purposes.

AQUIFER. A permeable rock formation, bed, or zone containing water. An aquifer may be referred to as a water-bearing formation or water-bearing bed.

ARABLE. Land capable of being cultivated and suitable for the production of crops. The Bureau of Reclamation is required by law to define arable land as: "Land which, in adequate units and when properly provided with the essential improvements of leveling, drainage, buildings, irrigation facilities and the like, will have a productive capacity, under sustained irrigation agriculture, sufficient to: meet all production expenses, including a reasonable return on investment; repay reasonable irrigation and improvement costs; and provide a satisfactory level of living for the farm family."

ARID. A term applied to a climate or region where precipitation is so deficient in quantity, or occurs so infrequently, that crop production is impractical without irrigation.

ARTESIAN. Groundwater under sufficient pressure to rise above the level at which the water-bearing bed is reached in a well. The pressure in such an aquifer commonly is called artesian pressure, and the rock containing artesian water is an artesian aquifer.

ASCS. Agricultural Stabilization and Conservation Service (U.S. Department of Agriculture).

BASE PERIOD. A period of time specified for the selection of data for analysis. The base period should be sufficiently long to contain data representative of the averages and deviations from the averages that must be expected in other periods of similar and greater length.

BASIN. See Water Drainage.

BIOCHEMICAL OXYGEN DEMAND (BOD). The quantity of oxygen utilized primarily in the biochemical oxidation of organic matter in a specified time and at a specified temperature.

BLM. Bureau of Land Management (U.S. Department of the Interior).

BPA. Bonneville Power Administration (U.S. Department of the Interior).

BTU. British Thermal Unit.

CAPACITY, GROSS RESERVOIR. The total amount of storage capacity available in a reservoir for all purposes from the streambed to the normal maximum operating level. It does not include surcharge, but does include dead storage.

CFS. Cubic feet per second.

C-NP. Columbia-North Pacific; the geographical region.

COLIFORM BACTERIA. A group of bacteria predominantly inhabiting the intestines of man or animal, but also occasionally found elsewhere.

COMPACT. An agreement between states, ratified by Congress, providing for the division and apportionment of waters of a river.

COMPREHENSIVE STUDIES. See Study.

CONJUNCTIVE OPERATION. As used in this report, refers to a coordinated operation of surface and groundwater system to optimize resource use.

CONSUMPTIVE USE. This use is generally effected three ways:

1. The quantity of water absorbed by the crop and transpired or used directly in the building of plant tissue together with that evaporated from the cropped area.

2. The quantity of water transpired and evaporated from a cropped area or the normal loss of water from the soil by evaporation and plant transpiration.

3. The quantity of water discharged to the atmosphere or incorporated in the products of the process in connection with vegetative growth, food processing, or an industrial process.

CROPLAND. Land regularly used for production of crops and pasture, except forestland, rangeland, and other land.

CUBIC FEET PER SECOND (cfs). A unit expressing rate of discharge. One cubic foot per second is equal to the discharge of a stream having a cross section of 1 square foot and flowing at an average velocity of 1 foot per second. It also equals a rate of 448.8 gallons per minute.

1. *Per Day* (cfs-day). The volume of water represented by a flow of 1 cubic foot per second for 24 hours. It equals 86,400 cubic feet, 1.09 acre-feet, or 646,317 gallons. It is also known in storage terms as a second-foot-day (sfd).

DISCHARGE. In its simplest concept, discharge means outflow; therefore, the use of this term is not restricted as to course or location, and it can be used to describe the flow of water from a pipe or a drainage basin.

1. *Average.* The arithmetic average of the annual discharges for all complete water years of record whether or not they are consecutive. The term "average" is generally reserved for average of record and "mean" is used for averages of shorter periods; namely, daily mean discharge.

2. *Sediment.* The rate at which dry weight of sediment passes a section of a stream or the quantity of sediment, as measured by dry weight or by volume, that is discharged in a given time.

DISSOLVED OXYGEN. The oxygen dissolved in water, wastewater, or other liquid usually expressed in milligrams per liter, parts per million, or percent of saturation. Abbreviated DO.

DISSOLVED SOLIDS. The anhydrous residues of the dissolved constituents in water.

DIVERSION. The taking of water from a stream or other body of water into a canal, pipe, or other conduit.

DIVISION (USBR). The first major breakdown of a Bureau of Reclamation identified project. Usually corresponds to a geographical area.

ECOLOGY. Totality or pattern of relations between organisms and their environment.

EFFICIENCY (IRRIGATION). The percentage of water applied that can be accounted for in soil moisture increase.

ENVIRONMENT. The complex of climatic, edaphic, biotic, social, and cultural factors that act upon an organism or an ecological community. Ultimately, this action determines an organism's form and survival, or influences the life of an individual or group of individuals.

EPA. Environmental Protection Agency.

EUTROPHICATION. A condition of water wherein an excess of nutrients promotes excessive algal growths, often leading to unsightly and odorous conditions.

FHA. Farmers Home Administration (U.S. Department of Agriculture).

FLOOD PLAIN. A strip of relatively smooth land bordering a stream that has been or is subject to flooding. It is called a "living" flood plain if it is overflowed in times of high water, but a "fossil" flood plain if it is beyond the reach of the highest flood.

GAGING STATION. A particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained.

HUNTER-DAY. A day or any part of a day spent hunting by an individual.

HYDROGRAPH. A graph showing stage, flow, velocity, or other property of water with respect to time.

HYDROELECTRIC POWER. Power produced using water power as a source of energy.

HYDROLOGIC CYCLE. The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages or processes such as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration. Also called water cycle.

IMPACT, ECOLOGICAL. The effect of a change on the interrelationship of organisms and their environments.

INSTREAM WATER NEED. See Requirement .

INTENSIVE CROPS. Crops generally grown under irrigation in the Western United States requiring large inputs of labor and capital. Examples include potatoes, sugar beets, fruit, and corn.

INTERBASIN TRANSFER. A transfer of water from one drainage basin to another.

INTEREST/DISCOUNT RATE. The cost of money (usually expressed as a percent) applicable to water and related land development investments. Also the rate at which future benefits (usually expressed as dollars) are discounted to the time of investment.

IWRB. Idaho Water Resource Board. State agency established by constitutional amendment and legislative act, ICA Sections 421731 through 421759.

KILOWATT (kw). The electrical unit of power which equals 1,000 watts or 1.341 horsepower.

1. *Hour* (kwhr). The basic unit of electric energy. It equals 1 kilowatt of power applied for 1 hour.

LANDS. References to federally owned lands are defined.

1. *Federal.* All classes of land owned by the federal government, which includes public domains, withdrawn and acquired federal lands.

2. *Acquired.* Lands acquired by the federal government through purchase, condemnation, or gift.

3. *Withdrawn.* Federal lands for which formal withdrawal action has been taken which restricts the disposition of specific public lands and which holds them for specific public purposes; also, public lands which have been dedicated to public purposes.

4. *National Forest.* Federal lands which have been designated by executive order or statute as national forests or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

5. *Public Domain.* Original public domain lands which have never left federal ownership. Also includes lands in federal ownership which were obtained by the federal government in exchange for public lands, or for timber on public lands.

MILLION GALLONS PER DAY (mgd). A rate of flow, 1.54 cubic feet per second; or 3.06 acre-feet per day.

MG/L. Milligrams per liter.

NET CONSUMPTIVE USE. The consumptive use decreased by the estimated contribution by rainfall toward the production of irrigated crops. Net consumptive use is sometimes called crop irrigation requirement.

NITROGEN SUPER-SATURATION. Water plunging over dam spillways entrains air which normally contains 79 percent nitrogen. The air is carried into the deep stilling basins below the dam where it is subjected to pressure greatly exceeding that of atmosphere. The increased pressure causes the gaseous nitrogen to dissolve and the water becomes supersaturated.

OBE-ERS. Office of Business Economics (Department of Commerce) and Economic Research Service (Department of Agriculture); often abbreviated OBERS in federal government report. See Projections, OBERS.

PE. Population equivalent. A figure showing comparative use by man opposed to that of another user of land, water, etc.

PEAK LOAD. The maximum load in a stated period of time. Usually it is the maximum integrated load over an interval of 1 hour which occurs during the year, month, week, or day. It is used interchangeably with peak demand.

pH. Measure of acidity or alkalinity of water. Distilled water has a pH of 7; values above 7, indicate the presence of alkalies while those below 7 indicate acids.

PLAN. Terms are defined within context of this report.

1. *Comprehensive.* A plan for water and related land resources development, that considers all economic, social, and environmental factors and provides the greatest overall benefits to the region as a whole.

2. *Framework.* A broad guide to the best use or combination of uses of water and related land resources of a region or subregion to meet foreseeable short and long-term needs.

3. *Formulation.* The continuing process for management, control, and utilization of all study elements culminating in the development of a plan.

4. *Multi-objective.* Plans developed to explicitly meet major social objectives. Three major objectives are presently recognized: national economic development, environmental quality, and regional development. Included in each of these objectives is an objective to increase the social well-being of the general populace.

PNWRBC. Pacific Northwest River Basins Commission. Established by Presidential Order No. 11331, March, 1967, under authority of the Water Resources Planning Act. Has objective to coordinate federal, state, and local water and related land resource planning.

PPM. Parts per million.

PRECIPITATION. As used in hydrology, precipitation is the discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface. It is the common process by which atmospheric water becomes surface or subsurface water. The term "precipitation" is also commonly used to designate the quantity of water that is precipitated.

PRIMARY WASTE TREATMENT. See Waste Treatment.

PROJECT. Any separable physical unit or closely related units, existing, undertaken, or to be undertaken within a specific area for control and development of water and related land resources, which can be established and utilized independently or as an addition to an existing project, and can be, or has been, considered as a separate entity for purposes of evaluation.

1. *Multipurpose.* A project designed to serve more than one purpose; for example, irrigation, flood control, recreation, and hydroelectric power.

PROJECTIONS. Visualizing future possibilities based upon accumulative data by specific formula.

1. *Baseline.* A projection to be used only as a guide. It is based on given assumptions such as population growth rates, technological advancement rates, etc. This type of projection will generally be used to develop or be part of a range of projections.

2. *OBERS.* A projection developed by the Office of Business Economics (OBE) and the Economic Research Service (ERS).

PUBLIC DOMAIN LANDS. See Lands.

QUALITY. The term has reference as follows.

1. *Environmental.* The measure of that level or degree to which positive value natural and man-made factors are present in a given place or area.

2. *Water.* A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

RC&D. Resource Conservation and Development. A federal program under leadership of SCS established indirectly through the Food and Agriculture Act of 1962.

REACH OF RIVER. Any defined length of a river.

RECHARGE. The introduction of water to an aquifer.

1. *Artificial.* The addition of water to the groundwater reservoir by activities of man such as irrigation or induced infiltration from streams, wells, or spreading basins.

2. *Groundwater.* The addition of water to the zone of saturation. Infiltration or precipitation and its movement to the water table is one form of natural recharge.

RECONNAISSANCE LEVEL. A level of study in which problems identified by framework studies and assessments are resolved. They are multi-agency studies involving federal, state, and local interests which will identify and recommend active plans and programs. Alternative plans will be formulated to meet a wide range of projected future needs.

RECLAMATION OF WASTEWATER. The process of treating salvaged water from municipal, industrial, or agricultural waste water sources for beneficial uses, whether by means of special facilities or through natural processes.

REQUIREMENT. That which is necessary to meet a specific objective.

INSTREAM FLOWS. Nonconsumptive water needs which do not reduce the water supply. Examples include:

1. *Aesthetics.* Water needs for maintaining flowing streams, lakes, and bodies of water for visual enjoyment.

2. *Fish and Wildlife.* That amount of water needed for fish and wildlife.

3. *Navigation.* Water required to maintain minimum flow for waterborne commerce.

4. *Quality Dilution.* Water required for diluting salt and pollution loading to acceptable concentrations.

5. *Recreation.* Amount of water required for outdoor water recreation such as fishing, boating, water skiing, and swimming.

RESERVOIR. A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

1. *Multipurpose.* A reservoir constructed and equipped to provide storage and release of water for two or more purposes such as flood control, power development, navigation, irrigation, pollution abatement, domestic water supply.

REVENUE BOND. A bond issued for a project which is secured by revenue generated by that project.

RIGHT. See Water Right.

RIVERS. Classification of waterways included in the National Wild and Scenic Rivers System as follows:

1. *Recreational.* Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shoreline, and that may have undergone some impoundment or diversion in the past.

2. *Scenic.* Rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive, and shorelines largely undeveloped but accessible in places by roads.

3. *Wild.* Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

RUNOFF. That part of the precipitation that appears in surface streams. It is the same as streamflow unaffected by artificial diversions, storage, or other works of man in or on the stream channels.

1. *Average Annual.* Average of water year runoff in inches or acre-feet for the total period of record.

SCD. Soil Conservation District.

SCS. Soil Conservation Service (U.S. Department of Agriculture).

SECONDARY WASTE TREATMENT. See Waste Treatment.

STATION. See Gaging Station.

STREAMFLOW. The discharge that occurs in a natural channel. Although the term discharge can be applied to the flow of a canal, the word streamflow uniquely describes the discharge in a surface stream course. Streamflow is a more general term than runoff, as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

STUDY. Various studies are being conducted at several levels.

1. *Type IV.* Defines a "Level B" study of an area by the Department of Agriculture (primarily SCS), authorized by Congress.

2. *Comprehensive Basin.* A study for the development of the water and related land resources of a river basin to make the best use of such resources to meet the basin needs and make the greatest long-time contribution to the economic growth, environmental quality, and social well-being of the people of the basin and the nation.

3. *Level A.* Framework studies and assessments of a multi-objective nature to evaluate and appraise, on a broad basis, the needs and desires of people for conserving, developing and using water and land resources. Regions and basins having problems requiring more detailed study will be identified. (Federal study designation.)

4. *Level B.* Reconnaissance-level evaluations of water and land resources, on a regional or river basin basis, prepared to resolve problems identified in Level A studies. These multi-objective studies are to involve federal, state, and local interests and will identify and recommend active plans and programs. (Federal study designation.)

5. *Level C.* Program or project feasibility studies to authorize or implement a plan of action. These multi-objective studies are to implement findings, conclusions, and recommendations of framework studies and assessments and regional or river basin studies which are needed in the subsequent 10-to 15-year period. (Federal study designation.)

SUB-BASIN. A portion of a subregion or basin drained by a single stream or group of minor streams.

TERTIARY TREATMENT. See Waste Treatment.

TURBIDITY. A condition of water relating to the scattering of light caused by suspended matter; a general measure of the clarity of water.

TYPE IV STUDY. See Study.

USBR. U.S. Bureau of Reclamation (U.S. Department of the Interior).

USCE. U.S. Army Corps of Engineers (Department of the Army).

USFS. U.S. Forest Service (U.S. Department of Agriculture).

USDA. U.S. Department of Agriculture.

USGS. U.S. Geological Survey (Department of the Interior).

USE. This term is commonly modified by one of the following.

1. *Conjunctive Water.* The integrated use of surface and subsurface water supplies and facilities, normally involving storage of surplus waters when available, for use during periods when water supplies are deficient.

2. *Consumptive Water.* The quantity of water discharged to the atmosphere or incorporated in the products in the process of vegetative growth, food processing, industrial processes, or other use.

3. *Consumptive Irrigation.* The quantity of water that is absorbed by the crop and transpired or used directly in the building of plant tissue together with that evaporated from the cropped area.

4. *Multiple.* The conscientious management of the various renewable resources such as water, wood, forage, wildlife, and recreation resources, to obtain sustained yield of products and services in the combination that will best meet the needs of the public now and in the future.

WASTE TREATMENT. A treatment process which leads to cleansing of waste-carrying waters.

1. *Primary.* The removal of settleable, suspended, and floatable solids from wastewater by the application of mechanical and/or gravitational forces. In primary treatment, unit processes such as sedimentation, flotation, screening, centrifugal action, vacuum filtration, dissolved air flotation, and others designed to remove settleable, suspended, and floating solids have been used. Generally a reduction in dissolved or colloidal solids has been obtained in primary treatment, but this effect is incidental and not the planned purpose of primary treatment.

2. *Secondary.* The removal of dissolved and colloidal materials that in their unaltered state, as found in wastewater, are not amenable to separation through the application of primary treatment. Secondary treatment is generally accomplished through unit processes such as bioabsorption, biological oxidation,

wet combustion, other chemical reactions, absorption on surface-active media, change of phase, or other processes that result in the removal of colloidal and dissolved solids from wastewaters.

3. *Tertiary or Advanced*. Selective application of biological, physical, and chemical separation processes to effect removal of organic and inorganic substances that resist conventional treatment practices.

4. *Turbidity*. Level of concentration of suspended particulate matter which can be removed through filtration.

WATER. Hydrologic terms which combine with the word water :

1. *Drainage.* Water which has been collected by a drainage system. It may derive from surface or from water passing through soil and may be of a quality suitable for reuse or it may be of no further economic use at the time and place of its occurrence. A natural river drainage is called a basin.

2. *Ground.* Water in the ground that is in the zone of saturation from which wells, springs, and groundwater runoff are supplied.

3. *Saline.* Water with a high dissolved solid content or brackish water. Less than 1,000 mg/l dissolved solids — fresh water. 1,000 to 3,000 mg/l dissolved solids — slightly saline. 3,000 to 10,000 mg/l dissolved solids — moderately saline. 10,000 to 35,000 mg/l dissolved solids — very saline.

4. *Table.* The upper surface of a zone of saturation. No water table exists where that surface is formed by an impermeable body.

5. *Year.* The 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends.

WATER RIGHT. A legally protected right to take possession of water occurring in a water supply and to divert that water and put it to beneficial use.

WATERSHED. All lands enclosed by a continuous hydrologic drainage divide and lying upslope from a specified point on a stream.

1. *Protection.* The treatment of watershed lands in accordance with such predetermined objectives as the control of erosion, streamflow, silting, floods, and management of water, forage, or timber.

WITHDRAWAL. Water diverted from a water source based on requirements. It may be consumptively or nonconsumptively used, beneficially or nonbeneficially used, or returned in part for reuse.