IDAHO STATE WATER PLAN

ADOPTED BY

THE
IDAHO
WATER RESOURCE
BOARD

DECEMBER 1996

"There shall be constituted a Water Resource Agency, composed as the Legislature may now or hereafter prescribe, ... Additionally, the State Water Resource Agency shall have power to formulate and implement a state water plan for optimum development of water resources in the public interest. The Legislature of the State of Idaho shall have the authority to amend or reject the state water plan in a manner provided by law . . . ."

Idaho Constitution, Article XV, Section 7

State of Idaho

THE STATE WATER PLAN

Philip E. Batt, Governor

Idaho Water Resource Board

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Vice-Chairman

J. David Erickson
Secretary

Robert Graham
Joseph L. Jordan
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Terry T. Uhling

Adopted December 1996
Ratified by the Idaho Legislature March 1997
Statehouse
Boise, Idaho 83720

Former Members of the Idaho Water Resource Board

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Brent J. Bell, Rexburg
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James Shawver, Eden
LeRoy Stanger, Idaho Falls
John F. Streiff, Lewiston
Richard W. Wagner, Lewiston
J.D. Williams, Preston
George L. Yost, Emmett

To the Citizens of Idaho:

This is the fourth time the Idaho Water Resource Board has reviewed, reevaluated, and updated the Idaho State Water Plan. Idaho has seen many changes since the plan was first adopted in 1976. These changes point out the need for periodic update of all state plans.

Central to all the Water Board's planning activities is the recognition that many of the streams and aquifers in the state are highly developed and utilized. This simple fact complicates the task of planning for future water use immeasurably. New users will have to rely on legal changes in nature of use, rentals from recognized water banks, or other innovative approaches to the water supply question.

The Idaho Water Resource Board is placing great emphasis on developing comprehensive plans for basins, waterways, or other geographic areas. Comprehensive planning has been a State Water Plan policy since 1976. In 1988 the Idaho Legislature provided direction and authority for this detailed planning effort. Comprehensive basin and waterway plans approved by the legislature are identified in this State Water Plan.

Public input is an important factor in all Idaho Water Resource Board activity. The Board has appreciated the interest and concern shown by you, the citizens, in the past. We hope your active participation in our activities will continue.

Sincerely,

Clarence Parr

Clarence Parr
Chairman

BEFORE THE WATER RESOURCE BOARD
OF THE STATE OF IDAHO

IN THE MATTER OF THE STATE WATER PLAN) A RESOLUTION

WHEREAS, the Idaho Water Resource Board (the Board) conducted scoping meetings to gather public input concerning policies contained in the State Water Plan; and

WHEREAS, the Board, based on input from the scoping meetings, has proposed changes to existing policies and suggested new policies; and

WHEREAS, the Board has circulated these proposed changes; and

WHEREAS, the Board has provided a 60-day public comment period and has conducted public meetings and hearings providing opportunities for public input; and

WHEREAS, the Board has reviewed the public record consisting of oral testimony and written comments, and has modified their proposed changes accordingly.

NOW, THEREFORE, BE IT RESOLVED that, having considered the draft amended Plan and the public record, the Board hereby adopts the changes to the State Water Plan specified in Attachments A and B, and directs that these changes be provided to the Idaho State Legislature for their consideration.

PASSED AND APPROVED this 13th day of December, 1996.

CLARENCE PARR, Chairman

ATTEST:

J. DAVID ERICKSON, Secretary

ATTACHMENT NO. 7 MEETING 8-96
IDAHO WATER RESOURCE BOARD
December 13, 1996

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THE WATER PLANNING PROGRAM

The Idaho State Water Plan was adopted by the Idaho Water Resource Board to guide the development, management, and use of the state's water and related resources. The plan recognizes past actions, addresses present conflicts and opportunities, and seeks to ensure that future water resource uses will complement and supplement state goals directed toward serving the citizens of Idaho. The plan is a dynamic document, subject to change to reflect citizens desires and to be responsive to new opportunities and needs.

Constitutional Authority

Article XV, Section 7 of the Idaho Constitution provides the authority for the preparation of a State Water Plan. This constitutional amendment was adopted in November 1964 following a statewide referendum and states:

> *There shall be constituted a 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; to construct and operate water projects; to issue bonds, without state obligation, to be repaid from revenues of projects; to generate and wholesale hydroelectric power at the site of production; to appropriate public waters as trustee for Agency projects; to acquire, transfer and encumber title to real property for water projects and to have control and administrative authority over state land required for water projects; all under such laws as may be prescribed by the Legislature.*

Article XV, Section 3 of the Idaho Constitution provides for the appropriation and allocation of water. Section 3 provides that:

> *The right to divert and appropriate the unappropriated waters of any natural stream to beneficial uses, shall never be denied, except that the state may regulate and limit the use thereof for power purposes.*
>
> *Priority of appropriation shall give the better right as between those using the water; but when the waters of any natural stream are not sufficient for the service of all those desiring the use of the same, those using the water for domestic purposes shall (subject to such limitations as may be prescribed by law) have the preference over those claiming for any other purpose; and those using the water for agricultural purposes shall have preference over those using the same for manufacturing purposes. And in any organized mining district those using the water for mining purposes or milling purposes connected with mining have preference over those using the same for manufacturing or agriculture purposes.*
>
> *But the usage by such subsequent appropriators shall be subject to such provisions of law regulating the taking of private property for public and private use, as referred to in section 14 of article I of this Constitution.*

Although no legal confrontations have occurred, Section 7 probably tempers Section 3 in that future water development must be guided by the State Water Plan.

Legislative Authority

Article XV, Section 7 of the Idaho Constitution called for the creation of a "Water Resource Agency" but did not establish the agency. In 1965, the 38th Legislature established the Idaho Water Resource Board, and directed that (as amended):

> *The Idaho Water Resource Board shall, subject to legislative approval, progressively formulate, adopt and implement a comprehensive state water plan for conservation, development, manage-*

ment and optimum use of all unappropriated water resources and waterways of this state in the public interest.

Idaho Code 42-1734A(1)

To assist the Idaho Water Resource Board, the Legislature provided for the director of the Department of Water Resources:

To perform administrative duties and such other functions as the Board may from time to time assign to the Director to enable the Board to carry out its powers and duties.

Idaho Code 42-1805(6)

Article XV, Section 7 was amended by the electorate during the general election of November 6, 1984. This modification provides that:

The Legislature of the State of Idaho shall have the authority to amend or reject the state water plan in a manner provided by law. Thereafter any change in the state water plan shall be submitted to the Legislature of the State of Idaho upon the first day of a regular session following the change and the change shall become effective unless amended or rejected by law within sixty days of its submission to the Legislature.

Legislation in 1988 provided for the development of a "comprehensive state water plan" and authorized designation of highly-valued waterways as state protected rivers. Each comprehensive basin or water body plan becomes a component of Idaho's State Water Plan.

The board may develop a comprehensive state water plan in stages based upon waterways, river basins, drainage areas, river reaches, ground-water aquifers, or other geographic considerations.

Idaho Code 42-1734A(2)

As part of the comprehensive state water plan, the board may designate selected waterways as protected rivers as provided in this chapter.

Idaho Code 42-1734A(1)

The authority to designate "protected rivers" derives from the state's power to regulate activities within a stream bed including stream channel alterations, water diversions, the extraction of minerals or other commodities, and the construction of impoundments.

State Water Plan Formulation

Formulation of a State Water Plan is a dynamic process. Adoption of The State Water Plan - Part One, *The Objectives*, in 1974, and *The State Water Plan* - Part Two in 1976, provided an initial State water policy. Implementing the policies in Part Two required the combined efforts of government agencies, the legislature, private concerns and the public. Consequently, the report delineated those areas where legislative action was required, identified the programs to be pursued by the Board, and described the areas where cooperation of public and private interests was necessary.

The State Water Plan was updated and readopted in 1982, 1986, and 1992. The Plan continues to evolve as an instrument in the adoption and implementation of policies, projects, and programs that develop, utilize, conserve, and protect the state's water supplies. Changes were made in 1985 to reconcile any differences created by the Swan Falls agreement entered into by the State and the Idaho Power Company. The 1986 and 1992 updates involved changes in objectives and policy reorganization.

Legislation in 1988 directed preparation of comprehensive plans for specific geographic areas as components of the State Water Plan [Idaho Code 42-1734A(2)]. These plans are prepared within the framework of the policies established by the overarching State Water Plan.

PLANNING PROCESS

The planning process encompasses five steps:

1. A comprehensive public involvement program to determine public views and desires regarding resource problems, needs, and potentials;

2. An ongoing evaluation of the water and related resource base and an estimate of probable future conditions;

3. An evaluation of beneficial and adverse effects of protection and development programs and projects;

4. Adoption of the State Water Plan by the Idaho Water Resource Board as required by Article XV, Section 7 of the Idaho Constitution;

5. Approval by the Idaho Legislature as provided by law.

Public involvement is an important part of the planning process, and is necessary in assessing viewpoints and conditions. Scoping meetings and formal hearings provided opportunity for public criticism and suggestions.

Idaho Water Resource Board Programs and Duties

In addition to formulating and implementing the State Water Plan, the Idaho Water Resource Board:

1. Provides financial assistance for water development and conservation projects in the form of revenue bonds, loans, and grants.

2. Provides a mechanism for implementing legislative mandates such as the aquifer recharge program established by the 1995 Idaho Legislature.

3. Adopts rules for:

- Well Construction
- Well Drillers Licenses
- Construction and Use of Injection Wells
- Drilling for Geothermal Resources
- Mine Tailings Impoundment Structures
- Safety of Dams
- Stream Channel Alterations

The Department of Water Resources administers these programs.

4. Hears appeals of Department of Water Resources administrative decisions regarding programs administered under Idaho Water Resource Board rules.

5. Administers the Idaho Water Supply Bank.

6. At the request of the Governor, appears on behalf of and represents the state in proceedings, negotiations, or hearings involving the federal government or other states.

7. May file applications and obtain permits to appropriate, store, or use unappropriated waters, and acquire water rights subject to the provisions of applicable law.

8. May investigate, undertake, or promote water projects deemed to be in the public interest.

9. May cooperate and enter into contracts with federal, state and local governmental agencies for water studies, planning, research, or activities.

10. May study water pollution and advise the State board of health and welfare regarding the establishment of water quality criteria.

11. May formulate and recommend legislation for water resource conservation, development, and utilization.

STATE WATER PLAN

The State Water Plan emerges from a vision of Idaho in which water is used efficiently, and is allocated through laws that fully conform to the prior appropriation doctrine. Water resource planning involves the widespread participation of Idaho citizens.

Objectives

The following objectives of the State Water Plan are formulated for the conservation, development, management and optimum use of all unappropriated water resources and waterways of this state in the public interest [Idaho Code 42-1734A].

1. **Water Management** - Encourage and promote the quantification of water use and all water rights within the state. Encourage and promote integrated, coordinated, and adaptable water resource management, and the prudent stewardship of water resources. Encourage state protection of waterways or water bodies with outstanding fish and wildlife, recreation, geologic or aesthetic values where protection should take precedence over development.

2. **Public Interest** - Ensure that the needs and wishes of the public are appropriately considered in decisions involving water resources of the state.

3. **Economic Development** - Encourage optimum economic development of the water resources, with due regard for prior water rights, that promotes the integration and coordination of the use of water, the augmentation of existing supplies, and the protection of designated waterways [Idaho Code 42-1734A(1)(b)].

4. **Environmental Quality** - Maintain, and where possible enhance water quality and water-related habitats. Study and examine the quality of rivers, streams, lakes and ground water [Idaho Code 42-1734(15)], and assure that due consideration is given to the needs of fish, wildlife, and recreation in managing the water resources of the state.

5. **Public Safety** - Encourage and promote programs that will assure life and property within the state are not threatened by the management or use of our water resources.

Policies

State Water Plan policies are directed toward optimum management and utilization of the state's water resources. The policies provide a framework within which private enterprise and government entities can develop and propose water resource projects and water management scenarios. Specific water resource projects and programs are identified in the comprehensive plans developed for defined geographic areas. The Water Resource Board adopts the following policies for the conservation, development, management and optimum use of all the unappropriated water resources and waterways of this state in the public interest [Idaho Code 42-1734A].

Water Use Group

A goal of the State Water Plan is to secure greater productivity, in both monetary and nonmonetary terms, from existing water supplies. Water Use policies are concerned with improvement in practices, procedures, and laws relating to existing water use.

1A - STATE SOVEREIGNTY

It is the policy of Idaho that the state has sovereignty over decisions affecting the development and use of its water resources, and that the state opposes any attempt by the federal government, its management agencies, any other state, or any other entity to usurp the state's role in these areas.

Comment: The Idaho Water Resource Board is responsible for the formulation of state water policy through the State Water Plan. The state's position on existing and proposed federal policies and actions should be coordinated by the Water Board to ensure the state retains its traditional right to control the water resources of the state.

1B - PUBLIC INTEREST

It is the policy of Idaho that water be managed with due regard for the public interest as established by state law.

Comment: The constitution and statutes of the State of Idaho declare all the waters of the state, when flowing in their natural channels, including ground waters, and the waters of all natural springs and lakes within the boundaries of the state, to be public waters [Idaho Code 42-101]. Water allocation and management decisions must consider the public interest as established by state law. The State Water Plan is an expression of the public interest.

1C - BENEFICIAL USE OF WATER

It is the policy of Idaho that beneficial uses include certain nonconsumptive water uses.

Comment: This policy is affirmed by Idaho Code 42-1501 and is reflected in the policies adopted by the Idaho Water Resource Board that "beneficial use" includes, but is not limited to, water required for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetics, navigation, water quality, and managed ground water recharge as well as the traditional uses for agriculture, manufacturing, mining, hydropower, and human consumption.

1D - TRANSFERABILITY OF USE

It is the policy of Idaho that changes in the nature of use of a water right be allowed, including changes to nonconsumptive uses, provided other water rights are not injured.

Comment: The demand for water increases every year while the volume of unappropriated water within the state continually decreases. The purpose of allowing transferability of water rights is to provide flexibility in water allocation to meet changing conditions. Idaho Code 42-108 and 42-222 provide for changes in place of diversion, place of use, period of use, and nature of use. Provision is made to protect other water users, the agricultural base of an area, and the local public interest. Priority dates are retained if other water right holders are not injured.

In some instances, it is in the public interest to allow changes from traditional uses to instream flow purposes. In highly developed areas, the potential to protect or restore fish and wildlife, water quality, aesthetic, or recreation resources may depend upon the transferability of water rights. To make such transfers substantive, the priority date of the original water right should be retained if other water rights are not injured. Chapter 15, Title 42, Idaho Code needs to be expanded to enable the Idaho Water Resource Board to apply for a change in the nature of use when a water right is acquired that is best used for minimum or instream flow purposes.

1E - WATER MEASUREMENT

It is the policy of Idaho that the water resources of the state should be quantified and their uses should be measured.

Comment: Planning for the optimum use of the water resources of the state and optimal management requires adequate water supply assessment and water use measurement.

Idaho Code 42-1805 lists as a duty of the Director of the Department of Water Resources preparation of a present and continuing inventory of the water resources of this state. However, stream gaging in the state is sparse and many gaging stations have been abandoned due to rising maintenance costs and reductions in agency funding. The existing stream gaging program should be reviewed and enhanced in the most efficient manner to meet water planning and management needs. Many ground water systems have not been adequately studied. Assessment studies are needed to understand and evaluate the state's ground water resources.

Water use quantification is essential for water resource planning. Chapters six and seven, Title 42, Idaho Code, list authorities for water measurement. The State, through the Department of Water Resources, needs to be actively involved in water use measurement and reporting.

1F - CONJUNCTIVE MANAGEMENT

It is the policy of Idaho that where evidence of hydrologic connection exists between ground and surface waters, they are managed conjunctively in recognition of the interconnection.

Comment: Nearly all ground water aquifers in the state discharge to or are recharged by a surface body of water. Surface water seeps through stream beds, lake beds, and channel banks to aquifers. Aquifers, in turn, serve as underground reservoirs, and can stabilize stream discharge during dry periods. Irrigation practices, ground water pumping, and flood flows impact the relationship.

The goal of conjunctive management is to protect the holders of prior water rights while allowing for the optimum development and use of the state's water resources. The approval of new water-use applications and the administration of existing water rights must recognize this relationship.

1G - REASONABLE USE

It is the policy of Idaho to promote the reasonable use of water in accordance with state law.

Comment: As water use efficiencies are increased, reduced requirements in one water use sector could provide available water for new demands or help efforts to improve instream flows. State and local planning should consider water efficiency techniques, together with legislation or ordinances, that may help conserve water resources for drought periods and increase water supplies for other needed uses.

1H - GROUND WATER WITHDRAWAL

It is the policy of Idaho that average withdrawals from an aquifer should not exceed the reasonably anticipated rate of future recharge to that aquifer.

Comment: Excessive withdrawals of ground water may cause economic, environmental, and social problems nearly anywhere in the state. The state should seek to correct withdrawal/recharge imbalances in an orderly fashion, attempting to minimize negative impacts.

Idaho Code 42-226 allows full economic development of the state's underground water resources. The Director of the Department of Water Resources can establish reasonable ground water pumping levels when necessary to protect prior appropriations of ground water. It is important that all beneficial uses, including interdependent spring and surface water uses be considered in evaluating the full economic development potential of an aquifer. Section 42-237a provides that the Director may prohibit or limit the withdrawal of water from a well if withdrawal would result in diversion of the ground water

supply at a rate beyond the reasonable anticipated rate of future natural recharge. The director may allow withdrawals to exceed natural recharge if a program exists to increase recharge or decrease withdrawals and senior ground-water rights are protected.

There are areas within the state where withdrawal/recharge imbalances of the ground water resource have been identified by the Department of Water Resources. Idaho Code 42-233a and 233b give the Director of the Department of Water Resources the authority to designate areas as either Ground Water Management Areas or Critical Ground Water Areas. Designation and its associated management options provide a logical step in arresting excessive withdrawals from an aquifer. The Department of Water Resources should also require water-use reporting and the measuring of water levels.

1I - WATER SUPPLY BANK

It is the policy of Idaho that the sale or lease of water is critical to the efficient management of the state's water resources. Use of the State's Water Supply Bank shall be encouraged.

Comment: As the state approaches the situation where little or no water is available for new appropriations, the Water Supply Bank, established by Idaho Code 42-1761, affords an efficient mechanism for the sale or lease of water. By aggregating water available for lease, rental pools operating under the authority of the Water Supply Bank can supply the water needs of many potential users. The Idaho Water Resource Board has adopted rules and regulations governing the sale or lease of water through the Water Supply Bank. The Idaho Water Resource Board has authorized local entities to manage rental pools in Water Districts 01, 63, and 65. The Shoshone-Bannock Tribes are also authorized pursuant to state law, to operate a rental pool.

1J - RECHARGE

It is the policy of Idaho that managed recharge be encouraged, pursuant to state law.

Comment: Managed aquifer recharge may enhance spring flows and maintain desirable aquifer levels. Managed recharge should be monitored to document the beneficial effects on the state's water resources, and to minimize any concerns or issues.

1K - SPRING FLOWS

It is the policy of Idaho that the hydrogeologic relationships between ground water supplies and spring flows continue to be quantified to allow for the determination of optimal development of the water resources.

Comment: Spring flow is part of the natural discharge from an aquifer. Pumped ground water withdrawals from an aquifer change the original recharge-discharge relationship and affect spring flows. Where this relationship exists, it must be sufficiently quantified to allow for optimal utilization of the ground water supply while protecting established senior rights which depend on spring flows discharging from the aquifer. This requires continued funding for studies, such as the Upper Snake River Basin Study completed by the Department of Water Resources in 1996.

1L - WATER QUALITY

It is the policy of Idaho that water be protected against unreasonable contamination or deterioration in quality, thereby maintaining designated beneficial uses.

Comment: It is essential that the quality of Idaho's water resources be protected for public safety and economic stability and growth. The quality of surface and ground water depend in large degree on land-use practices within watersheds. Land managers and local units of government are urged to adequately consider means of reducing nutrient loading,

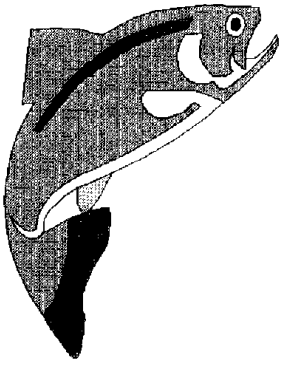
bacterial contamination, and soil erosion and deposition to protect water quality. Local units of government and special use districts should participate with Basin Advisory and Watershed Advisory Groups in the preparation of water quality management plans.

The Department of Water Resources administers a statewide ambient ground water quality monitoring network and the Environmental Data Management System. Regional and local monitoring networks are managed by the Division of Environmental Quality. The citizens of Idaho will be most efficiently served by cooperative water quality monitoring programs involving appropriate public and private entities, and establishment of an information distribution system for all water quality data.

1M - POLLUTION CONTROL

It is the policy of Idaho that the use of water to dilute pollution is not a substitute for adequate treatment.

Comment: State and federal water quality programs should provide protection for the current high quality of water associated with streams within the state. In most cases, allocation of water for instream flow use should be directed toward meeting fish, wildlife, and recreational needs and not to the dilution of pollution. One way to ensure sufficient water would be to obtain storage rights for water quality maintenance in reservoirs and stream reaches below impoundments.



Conservation Group

The Conservation policies focus on wise use and careful planning to accommodate important values. The purpose of the policies is to manage the use of water resources for the benefit of all Idaho citizens.

2A - SPECIES OF CONCERN

It is the policy of Idaho that the public interests be considered when decisions are made to maintain sustainable populations of plant and animal species whose existence is threatened by mankind's actions.

Comment: The state and federal government have identified species of concern and species that are listed or are candidates for listing as Threatened or Endangered. In most cases, action at the state level can identify management strategies that will insure sustainable populations of these species. The State will consider the public interest in determining its strategies and will encourage local leadership to this end. Exceptions to this policy will be made for efforts to eliminate noxious weeds and other pests.

2B - FEDERALLY LISTED SPECIES

It is the policy of Idaho to cooperate, insofar as allowed by state law, in efforts to conserve and restore plant and animal species listed by the federal government as Threatened or Endangered.

Comment: Actions taken by federal agencies under authorities created by the Endangered Species Act do not modify state law. Efforts by the citizens and agencies of the state to achieve federal goals may be constrained by existing state law, particularly the protection and preservation of state water rights.

The State should take an active role in the listing process. To the extent allowed by federal law, the State should be involved in developing and administering recovery and habitat management plans for species that are listed.

2C - LAKE AND RESERVOIR MANAGEMENT

It is the policy of Idaho that comprehensive management plans for surface use and water quality protection be developed for lakes and reservoirs in the state.

Comment: Idaho is a land of numerous lakes and reservoirs. Many lakes and reservoirs in the state have experienced declining water quality, surface crowding, losses in scenic values, and physical damage to the shoreline. Comprehensive management plans for surface use, relative to public safety, and water quality protection can address these problems.

Each lake or reservoir has its own set of needs and constraints which must be considered. County and city government, the local public, land managers, and user groups of the lake or reservoir and its watershed, must be involved in plan development and implementation. Where federal or private entities have regulatory control over water storage and releases, these entities are encouraged to cooperate in the development of surface use and water quality management plans.

The Idaho Water Resource Board supports implementation of the Clean Lakes Act passed by the Idaho Legislature in 1989 [Chapter 64, Title 39, Idaho Code]. The law provides for the creation of regional councils empowered to develop lake management plans. It further provides for technical advisory groups to support the council in its planning efforts.

2D - CLIMATE VARIABILITY

It is the policy of Idaho that climate variability be considered in planning for and in the management of the state's water resources.

Comment: Regional climate changes are uncertain, however, climate variability should be expected and planned for by the public and its agencies. Possible consequences of regional climate change are important to recognize. Winter snowpack in the mountains may be significantly affected, with consequent effects on water resources available for agriculture, power generation, forestry and fisheries. Even though uncertainties are considerable, we should not wait to put in place policies and procedures that could provide for flexibility and make use of new understanding as it develops.

Protection Group

The Protection policies deal with water and related resources with outstanding social, economic, and environmental values. The purpose of the policies is to safeguard these values and Idaho's citizens, and to provide for minimum stream flows, and the protection and preservation of waterways in accordance with Idaho Code 42-1734A(1)(d).

3A - INSTREAM FLOW

It is the policy of Idaho that when it is in the public interest the Idaho Water Resource Board should seek to appropriate waters in the state for instream flow purposes.

Comment: Instream flows protect many nonconsumptive uses such as fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, transportation, navigation, hydropower and water quality. Many of these uses have direct effects on the economy while others represent intangible values, and the public interest. Chapter 15, Title 42, Idaho Code, provides the authority and spells out procedures for the Idaho Water Resource Board to appropriate water for minimum stream flows.

The Idaho Water Resource Board supports efforts to obtain storage and natural flow rights to improve and maintain instream flows when in the public interest. Chapter 15, Title 42, Idaho Code, should be expanded to enable the Idaho Water Resource Board to transfer acquired water rights to instream flow water rights. By law [Idaho Code 42-108 and 42-222], provision is made to protect other water users and the agricultural base of an area.

3B - POTENTIAL RESERVOIR SITES

It is the policy of Idaho that potential reservoir sites be protected from significant land use change.

Comment: Future economic development and population growth will bring additional demands on Idaho's water resources. In future years the construction of additional reservoirs may play an important role in managing the water resources of the state. While the State recognizes the rights of existing land owners, improvements and new development within potential reservoir sites, which could increase reservoir costs significantly, should be discouraged.

Table 1 lists current potential reservoir sites which should be protected by the State. Sites will be evaluated or reevaluated for protection during the process of preparing comprehensive plans for basins or waterways.

Table 1. Potential Reservoir Sites

Potential Reservoir	Stream	Size	Purpose
Upper Snake			
Teton	Teton River	236,000 AF	Irrigation, Power, Flood Control
Medicine Lodge	Medicine Lodge	12,000 AF	Irrigation
Birch Creek	Birch Creek	24,000 AF	Irrigation
Boulder Flats	Big Wood River	61,000 AF	Flood Control, Recreation
Southwest Idaho			
Grindstone	Snake River	115,000 AF	Irrigation
Sailor Creek	Snake River	113,000 AF	Irrigation
Gold Fork	Gold Fork Payette River	80,000 AF	Irrigation
Twin Springs	Boise River	410,000 AF	Irrigation, Power, Flood Control
Lost Valley (enlargement)	Lost Valley Creek	30,000 AF	Irrigation
Galloway	Weiser River	1,220,000 AF	Irrigation, Flood Control
Monday Gulch	Little Weiser River	35,000 AF	Irrigation
C. Ben Ross (enlargement)	Little Weiser River	12,450 AF	Irrigation
Goodrich	Weiser River	350,000 AF	Irrigation
Tamarack	Weiser River	30,000 AF	Irrigation
Salmon			
Challis	Challis Creek	10,600 AF	Irrigation
Bear			
Caribou	Bear River	40,000 AF	Irrigation
Plymouth	Malad River	400,000 AF	Irrigation

3C - STATE PROTECTED RIVER SYSTEM

It is the policy of Idaho that a state protected river system be maintained to meet the desires of the citizens of Idaho. The system should provide for the protection of the unique features that exist on various rivers within the state, and should provide the necessary authority and funding to protect such rivers and related lands for recreational, scenic, and natural values.

Comment: Idahoans have expressed a desire to retain some rivers or river reaches in a free-flowing condition. Idaho Code 42-1734A(1) authorizes the Idaho Water Resource Board to protect highly-valued waterways as State protected rivers. The authority to designate "protected rivers" derives from the State's power to regulate the beds of navigable streams and the waters within the state. In 1991 the Idaho Legislature approved the first stream reaches for state protection.

Because of the comprehensive scope of state water planning, the Idaho Water Resource Board encourages the federal government to work within the state water planning process rather than independently pursuing federal protection of waters within Idaho. Federal protection adds another layer of bureaucracy to water planning and limits planning flexibility. State water planning provides a means for ensuring coordinated water planning by both federal and state governments.

3D - RIPARIAN HABITAT AND WETLANDS

It is the policy of Idaho to protect the ecological viability of riparian habitat and wetlands within the state in the public interest.

Comment: Riparian lands and wetlands are important components of a watershed. The State of Idaho encourages protection of public riparian lands and wetlands, and the practice of good stewardship in managing private lands. Riparian and wetland protection above the mean high water elevation should be implemented at the watershed level. The authority to control land use is set out in the Local Planning Act of 1975, as amended. The Idaho Stream Channel Protection Act [Idaho Code 42-3801 thru 3812] regulates alteration of stream bed below the mean high water elevation.

3E - STREAM CHANNEL REHABILITATION

It is the policy of Idaho that the costs and benefits of stream channel rehabilitation be evaluated where past activities currently or potentially affect the yield or quality of the state's watersheds.

Comment: Catastrophic flooding is often the outcome of heavy run-off combined with human disturbances, and may result in the destruction of stream channels. The functional loss of impacted channels may threaten public safety, private property, and the overall quality and quantity of water produced in the affected watershed. It is appropriate for the State to take action to rehabilitate impacted stream channels where public safety may be threatened, or where the remedial costs are less than the potential damages.

Many early mining projects have been built and later abandoned. Some of these projects have deteriorated to the extent that public safety and water resource values are threatened. Where liability cannot be established, and public safety may be threatened, the State should take remedial action.

3F - TAILINGS POND REGULATION

It is the policy of Idaho that the construction, operation, and maintenance of mine tailings impoundment structures be regulated by the state.

Comment: Chapter 17, Title 42, Idaho Code makes the regulation of mine tailings impoundment structures a function of the Idaho Department of Water Resources. The health and safety of the citizens of the state and the quality of the state's water resources in many areas depend on the proper construction, operation and maintenance of mine waste tailings ponds. Chapter 1, Title 39, Idaho Code, provides general water quality authorities to the Board of Health and Welfare.

3G - RADIOACTIVE WASTE MONITORING

It is the policy of Idaho to maintain a state program to monitor and regulate the use, handling, and storage of radioactive wastes.

Comment: The Idaho National Engineering Laboratory (INEL), near Arco, sits on top of the Eastern Snake Plain aquifer, the primary drinking water supply to half the state's population and the irrigation water supply for three million acres. Protection of this vital water supply from radioactive contamination is imperative for both the physical health of the population and the economic health of the state.

The State of Idaho INEL Oversight Program, provides independent information about the Idaho National Engineering Laboratory to the citizens of Idaho. In order to verify and complement the monitoring conducted by the U.S. Department of Energy and it's contractors, the Oversight Program has developed an environmental surveillance program to monitor potential impacts on air, water, soil, and biota resulting from activities at the INEL. Some of the monitoring sites are the same as, or are co-located with, federal monitoring locations, while others have been located so as to provide information that would not otherwise be available. Monitoring results are reported quarterly, with an annual summary and assessment of impact on the environment and people of Idaho.

The Division of Environmental Quality is Idaho's lead agency for regulatory control over the use, handling, storage, and disposal of radioactive materials. Regulatory control is also exercised over clean up of sites contaminated with radioactive materials and transportation of nuclear waste and spent fuel in Idaho.

The Idaho Water Resource Board supports the Governor's agreement on radioactive waste storage and removal at INEL, and supports continued negotiations to restrict further importation to Idaho. The transfer of all radioactive waste from Idaho to a designated national repository at the earliest date possible is strongly encouraged.

3H - SAFETY MEASURES PROGRAM

It is the policy of Idaho that a program should be established to assist local units of government in repairing and installing safety structures on or near canals, rivers, lakes, and reservoirs. The program should be established as a cost-sharing cooperative program.

Comment: Each year, numerous fatal accidents occur in the state's waterways because of the lack of preventive safety measures. Accidents are not confined to one area of the state nor one segment of the economy but are scattered throughout the state. Most Idaho cities are built on a water course and subsequently are plagued by hazardous canals, rivers, or shore lands. Fencing, signing, debris removal, covering and other structures should be installed to provide for human safety.

Local units of government should be encouraged to conduct annual public awareness campaigns concerning the dangers and hazardous nature of water bodies in their areas.

3I - FLOOD PRONE AREAS

It is the policy of Idaho to encourage the protection of flood plains and reliance on management rather than structural alternatives in reducing or preventing flood damages.

Comment: Flood damage can be limited by providing sufficient space in the flood plain to accommodate flood waters. Local government is encouraged to plan for floodways and protect flood plains from further development.

Prospective buyers should be made aware of identified flood prone areas. The pressures to develop areas subject to periodic flooding will continue to increase as population increases. Buyers should realize those flood prone areas require special construction provisions to avoid flood losses.

The National Flood Insurance Program should be adopted statewide. This program requires that

local units of government zone and control flood prone areas in order to be eligible for most federal assistance. Floodplain maps prepared for the Federal Emergency Management Agency are available through the Idaho Department of Water Resources.

3J - FLOOD CONTROL LEVEE REGULATION

It is the policy of Idaho that the construction and maintenance of flood control levees be regulated by the State.

Comment: The only standards applicable to the construction of flood control levees in Idaho are in the Rules governing Stream Channel Alterations. These standards apply only when all or part of the levee will be located below the mean high water mark.

Flood control levees are maintained by local entities. There are no maintenance regulations so the degree of maintenance varies with the capability and diligence of the responsible organization. This situation creates a potential hazard in that levees may be deteriorate to the point of being unsafe.

All new flood control levees should be required to be built to standards promulgated by the Department of Water Resources. The Department should also be authorized to develop maintenance criteria for flood control levees and to insure compliance with these criteria through an inspection program.

When a levee is scheduled to be rebuilt, a cost/benefit analysis should be conducted to determine if it is prudent to rebuild the levee in question or buy the property which the levee would protect.

Management Group

The focus of the Management policies is on improvement in the practices, procedures, and laws relating to existing water and energy resource administration and programs. The purpose of the policies is achievement of greater administrative efficiency.

4A - AGENCY CONSOLIDATION

It is the policy of Idaho that the administration of state programs for water allocation, planning, and water quality regulation be consolidated in one agency.

Comment: Planning and administration of water quantity and water quality are presently divided between two state agencies even though they are two directly interrelated properties of the same resource. The Department of Water Resources is primarily responsible for programs relating to water quantity, and the Division of Environmental Quality is responsible for protecting the quality of the state's water. Combining water quantity and water quality programs should reduce confusion and improve service to the public while preserving the goals of both programs.

4B - REVIEW OF FEDERAL RESERVOIR WATER ALLOCATION

It is the policy of Idaho that agreements be established with federal agencies to allow Idaho Water Resource Board review of any proposed water allocation from federal reservoirs in excess of 500 acre-feet annually.

Comment: This policy does not encroach upon the authority of federal agencies to operate their facilities according to congressional authorization, but would help to ensure that their actions occur with state review and concurrence. The Idaho Water Resource Board would be guided in such a review by the conformance of the proposed allocation with the State Water Plan.

Formal agreements are necessary for the State Water Plan to be implemented in a coordinated manner. The Idaho Water Resource Board and the U.S. Bureau of Reclamation reached an agreement in 1988 providing for Board review of proposed reallocations. An agreement should be negotiated with the Corps of Engineers regarding large water releases from their facilities.

4C - ENERGY PLAN

It is the policy of Idaho that the State Energy Plan set forth policies for energy use and development in the state and that the plan be updated at least every five years.

Comment: The Idaho State Energy Plan was finalized in February 1982, and adopted by the Water Resource Board on June 3, 1983. The Idaho Water Resource Board recognized this plan as implementation the original State Water Plan's Policy 13, which called for the formulation of a State Energy Plan.

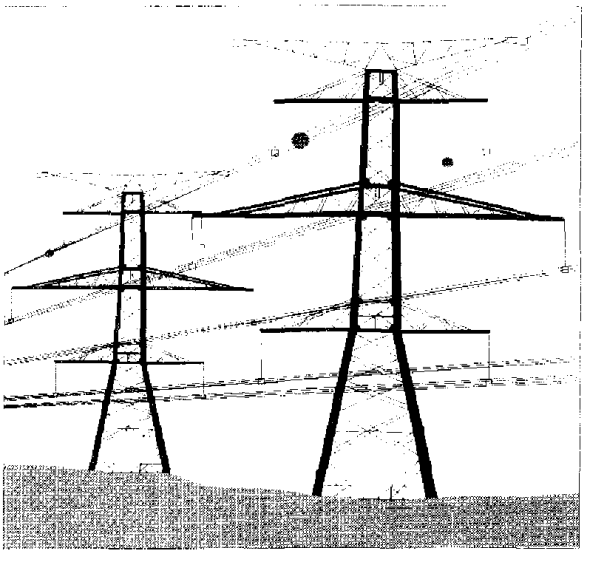
The Energy Plan needs to be updated at least every five years to be effective. This is increasingly important with the current move toward deregulation of the electric utility industry. The Idaho Water Resource Board urges legislative funding for an immediate update of the plan.

4D - HYDROPOWER LICENSING

It is the policy of Idaho to insure that public interest, existing water rights, related settlement agreements, and the future water and energy needs of the State are considered in hydropower licensing.

Comment: Hydropower water rights may be limited to a specific term and subordinated to upstream depletionary uses [Idaho Code, 42-203B(6) and (7)]. Water rights for power purposes may also be defined by agreement as unsubordinated to an established minimum flow [Idaho Code, 42-203B(2)]. Idaho asserts its traditional right to regulate the state's water resources. The federal government, in the hydropower licensing process, must recognize water rights and other constraints on water use established through state law. Hydropower licenses should be compatible with the public interest and outstanding power purchase contracts.

Many hydropower projects in Idaho are or soon will be undergoing relicensing by the Federal Energy Regulatory Commission (FERC). State review of existing water rights should occur in conjunction with the FERC relicensing process.



4E - HYDROPOWER SITING

It is the policy of Idaho that new hydropower developments be in conformance with the State Water Plan and the State Energy Plan.

Comment: The Idaho Water Resource Board is charged with the responsibility for planning for the optimum development of the water resources of the state through policies and water allocations which reflect the public interest. Specific hydropower siting issues are addressed in the Idaho Water Resource Board's comprehensive basin or river plans. The Federal Energy Regulatory Commission must consider State comprehensive plans in making hydropower siting decisions.

As a general policy, the Idaho Water Resource Board believes that energy conservation and efficiency improvements are the most desirable methods

to provide for additional power requirements. The State of Idaho will be best served through conservation and the upgrading of existing energy systems. These measures are attractive because of their low costs, short lead time, and flexibility.

Recognizing the future need for new generating capacity, the Board prefers that new hydropower resources be developed at dams having hydropower potential that do not currently generate power or do not generate at their maximum potential. New structures or projects should be carefully evaluated to insure that the benefits to the state outweigh any negative consequences associated with the proposed development. The Idaho Water Resource Board will evaluate specific hydropower developments in comprehensive plans for river basins or waterways.

4F - CONSERVANCY DISTRICTS

It is the policy of Idaho that where practical, the total water needs of a geographic area be satisfied by a legal entity having the authority and responsibility to address all water needs in a comprehensive manner.

Comment: Under present law the boundaries of irrigation districts, ground water districts, recharge districts, water measurement districts, drainage districts, and flood control districts need not coincide. Since coordinated planning is rarely undertaken, the possibility exists for good faith actions to have adverse impacts or be at cross purposes with the aims of other management entities.

A water conservancy district should have the authority to own and operate storage, diversion, and delivery systems to provide the total water needs of large geographic parts of the state (e.g., river basins, single or multi-county areas). It should have authority to levy taxes on all property benefitted by a program or project and to bond and contract for project construction. Water could be supplied for irrigation, domestic, municipal, industrial, recreation, and other purposes. Such districts could also sponsor ground-water recharge projects, distributing the costs over the affected area. They could also integrate the use of the surface and ground-water resources of a river basin for more efficient use of the total resource.

4G - RESEARCH PROGRAM

It is the policy of Idaho to encourage and conduct research on important water resource topics.

Comment: While water programs in Idaho can incorporate information from research in other states, more research dealing with specific problems in Idaho is needed. Topics that need immediate attention include:

- water use efficiency
- optimum monitoring programs for water use
- ground and surface water relationships specifically with regard to the timing and spacial distribution of pumping and recharge efforts,
- ground water flow models, and
- cooperatively developed system operation modeling techniques for Idaho river basins.

4H - FUNDING PROGRAM

It is the policy of Idaho that state funds be available to support the development, preservation, conservation, and restoration of the water and related resources of the state.

Comment: The Idaho Water Resource Board's Revolving Development Fund, the Water Management Account, and the Conservation and Development Trust are mechanisms for partially achieving the goals of this policy. The funds or accounts rely on the appropriation of moneys from the state's general fund. These programs have provided financial assistance for more than 200 water development, conservation, or system rehabilitation projects and studies. They have not been funded with sufficient moneys to have a highly visible impact on the land, water and related resources of the state.

Idaho Code 42-1734(2) provides that the Idaho Water Resource Board may lend the proceeds of the sale of revenue bonds to a local water project sponsor or sponsors. The issuance of revenue bonds does not constitute a general obligation of the State of Idaho or the Idaho Water Resource Board. Since 1983, $75.7 million has been created by this pro-

gram to fund 147 projects, including $10.6 million to help irrigators switch from flood irrigation to sprinkler irrigation, and $54.3 million to improve municipal water systems. While the revenue bond program was used extensively from 1983 to 1986, the Tax Reform Act of 1986 placed a number of restrictions on the issuance of these bonds, making them practical only for selective large projects. Since 1986, only three projects have been funded through the Revenue Bond program.

The language creating the above funds and accounts should be amended. In most cases it is overly restrictive, providing for the expenditure of moneys primarily for development. Money should be made available for projects that would conserve, preserve, or restore the state's water and related resources

4I - PLANNING PROGRAM

It is the policy of Idaho that water management plans be prepared for the individual river basins.

Comment: Comprehensive planning is necessary to minimize conflicts between competing water uses and to ensure optimal protection of all beneficial uses of water. Detailed water management plans should be prepared for river basins and aquifers within the state to evaluate the specific interrelationship between ground and surface water and provide for the orderly protection and development of the state's water resources.

Idaho Code 42-1734A provides for the development of a "comprehensive state water plan" based upon river basins or other geographic considerations. Each basin or waterway plan becomes a component of the State Water Plan. The following comprehensive plans have been approved by the Idaho Legislature and accepted by the Federal Energy Regulatory Commission:

Priest River Basin
South Fork Boise River Basin
Payette River Reaches
Henrys Fork Basin
Snake River: Milner Dam to King Hill
Upper Boise River Basin
North Fork Clearwater Basin
South Fork Snake River Basin

These plans contain State protected river designations and recommendations concerning other aspects of water use. The positions and policies contained in an approved plan are the State's official position on water use in the affected areas. The plans also assure that the state's interests will be considered in federal management agency decisions.

4J -FEDERAL AND TRIBAL WATER RIGHTS

It is the policy of Idaho to quantify all federal and tribal water rights within the state.

Comment: Federal agency and tribal water rights claims in Idaho must be identified and quantified to plan for continued use of existing water rights and future needs. As a part of each effort to identify and quantify federal agency and tribal water rights, the protection of existing water rights must be considered. The State should seek to negotiate these rights whenever appropriate.

Executive Order No. 91-8 designated the Idaho Water Resource Board as lead agency to coordinate state activities related to the negotiation of reserved water rights with Idaho Tribes. The successful negotiations concluded with the Shoshone-Bannock over the Fort Hall water rights serves as an example of a negotiated settlement.

4K - WATER RESOURCE MANAGEMENT

It is the policy of Idaho that the diversion and use of water occur only in accordance with water rights issued by the state and federal reserved rights established by the courts. Adjudication of water rights through the state courts should be completed where necessary to fully define and quantify the rights.

Comment: The adjudication of water rights is often necessary to sort out overlapping or incomplete claims for the use of surface and ground water resources. These conflicts need to be resolved if the resources are to be managed effectively. Effective programs can then be applied to assure that water is diverted and used in accordance with valid rights.

River Basins Group

The River Basins Group contains resource management policies specific to the state's three major river basin networks: the Snake River Basin, the Bear River Basin in southeast Idaho, and the northern Panhandle river basins.

● *Snake River Basin*

5A - SWAN FALLS AGREEMENT

It is the policy of Idaho that the Swan Falls agreement between the state and Idaho Power Company establishes the framework for water management in the Snake River basin.

Comment: The Swan Falls Agreement was signed in 1985 by the State of Idaho and the Idaho Power Company. The Idaho Water Resource Board is committed to continued implementation of this agreement. Minimum flows in the Snake River are crucial to the Swan Falls Agreement. During portions of low water years, river flows downstream from Milner Dam to Swan Falls Dam consist almost entirely of ground water discharge. The Eastern Snake Plain aquifer which provides this water must therefore be managed conjunctively as an integral part of the river system. This agreement also calls for the adjudication of water rights in the Snake River Basin to enhance the state's water management capabilities.

5B - SNAKE RIVER MINIMUM FLOWS

It is the policy of Idaho that minimum average daily flows at the Murphy gaging station shall meet or exceed 3,900 cfs from April 1 to October 31 and 5,600 cfs from November 1 to March 31. The average daily flow measured at the Weiser gage shall not be less than 4,750 cfs. A minimum average daily flow of 5,000 cfs at Johnson's Bar shall be maintained and an average daily flow of 13,000 cfs shall be maintained at Lime Point (river mile 172) a minimum of 95 percent of the time. The exercise of water rights above Milner Dam has and may reduce flow at the dam to zero.

Comment: In licensing the Milner hydropower project, the Federal Energy Regulatory Commission (FERC) specified "target flows" for the Snake River at Milner. The target flow must be satisfied only when water in excess of prior irrigation rights is available. Water for target flows may be acquired from storage or may be leased from the Upper Snake Rental Pool. The State should seek to acquire water whenever it becomes available in order to mitigate the impacts of low flow below the Dam.

The minimum flows established for the Snake River at the Murphy and Weiser gaging stations are management and permitting constraints; they further insure that the State will be able to assure an adequate hydropower resource base and better protect other values recognized by the State such as fish propagation, recreation, and aesthetic interests, all of which would be adversely impacted by an inadequate stream flow.

The minimum flows established for Johnson's Bar and Lime Point are contained in the original Federal Power Commission (now FERC) license for the Hells Canyon hydropower complex. By adopting these flows, the Idaho Water Resource Board recognizes the importance of minimum flows to downstream uses and makes their maintenance a matter of state water policy. Lower flows may be permitted at Lime Point during the months of July, August, and September, during which time the operation of the Hells Canyon dams shall be in the best interest of power and navigation as determined by the Corps of Engineers and Idaho Power Company as owner of the Hells Canyon power facilities.

The Idaho Water Resource Board recognizes that FERC license requirements relate primarily to the provision of water for navigation and power and not to other instream uses. The Board realizes that the state has no authority to require releases of stored water by the power company, but believes the license conditions serve the public interest. When the Hells Canyon hydropower complex is relicensed, the Water Board will reevaluate the public interest.

Snake River flows above the hydropower right at any Idaho Power facility are considered unappropriated and therefore are not held in trust by the state. This distinction is further addressed in Policy 5C.

5C - SNAKE RIVER TRUST WATER

It is the policy of Idaho that water held in trust by the state pursuant to Idaho Code 42-203B be reallocated to new uses in accordance with the criteria established by Idaho Code 42-203A and 42-203C.

Comment: The agreement between the State of Idaho and Idaho Power Company dated October 25, 1984 provides that Idaho Power's claimed water right of 8,400 cubic feet per second (cfs) at the Swan Falls Dam may be reduced to either 3,900 cfs or 5,600 cfs during set periods of the year. The claimed water right of 8,400 cfs is deemed appropriated and the amount above the minimum flow established in Policy 5B up to the 8,400 cfs is held in trust by the state. The trust water area is defined by Rule 30 in the Idaho Department of Water Resources' Rules for Water Appropriation (see also Fig. 1).

The agreement further provides that Idaho Power's claimed water rights at facilities upstream from Swan Falls shall be considered satisfied when the company receives the minimum flow specified in Policy 5B at the Murphy gaging station. The 8,400 cfs claim of the power company has not historically been available during summer months.

The 8,400 cfs claimed right at Swan Falls is reduced by the agreement to that flow available after satisfying all applications or claims that demonstrate water was beneficially used prior to Oct. 1, 1984, even if such uses would violate the minimum flows established in Policy 5B. Any remaining water above these minimum flows may be reallocated to new uses by the state providing such use satisfies existing Idaho law.

However, due to continued spring flow decline in the Thousand Springs area since the late 1950s, water availability to satisfy additional beneficial uses is limited. A moratorium, as defined in Idaho Code 42-1806, on further water development has been in place since May 15, 1992.

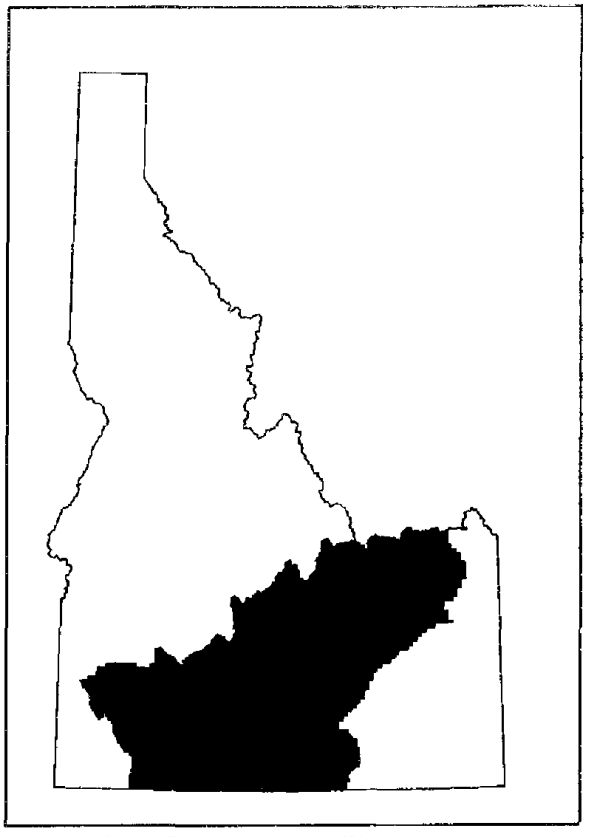


Figure 1. Snake River Basin Trust Water Area.

5D - SNAKE RIVER BASIN DCMI

It is the policy of Idaho that 150 cfs of the water held in trust by the state above Swan Falls Dam pursuant to Policy 5C be reallocated to meet future domestic, commercial, municipal, and industrial consumptive uses in accordance with state law.

Comment: While most DCMI (Domestic, Commercial, Municipal, and Industrial) water uses are negligibly consumptive, future growth in Idaho's population and commercial and industrial expansion will require an assured supply of water.

A continuous flow of 150 cfs provides approximately 108,600 acre-feet of water per year. This volume of water is assigned to consumptive uses within the basin for domestic, commercial, municipal, and other industrial purposes. Industrial purposes include processing, manufacturing, research and development, and cooling.

During the ten-year period from 1985 to 1995, about 120 cfs was developed for DCMI uses within the trust water area. Adequate records should be kept and reviewed so that this allocation can be modified as necessary. Increases in the DCMI allocation, if necessary, will reduce the amount of water available for agricultural uses. The allocation will be reviewed as part of every Water Plan update.

5E - SNAKE RIVER BASIN AGRICULTURE

It is the policy of Idaho that appropriated water held in trust by the state pursuant to Policy 5C, less the amount of water necessary to provide for present and future DCMI uses as set forth in Policy 5D, shall be available for reallocation to meet new and supplemental irrigation requirements which conform to Idaho Code 42-203A, 203B, 203C, and 203D.

Comment: During the ten-year period from 1985 to 1995, about 45,600 acres of new irrigation development occurred within the trust water area. Data are not available to estimate the number of acres that received supplemental water during this period.

Idaho Code Section 42-203C limits the rate of new development in the basin above the Murphy gaging station to 80,000 acres in any four-year period. Impact on existing water rights, mitigation for the impact of diversions on hydropower generation, and criteria placed on the reallocation of hydropower rights, however, limits the rate of new development.

5F - SNAKE RIVER BASIN HYDROPOWER

It is the policy of Idaho that hydropower use be recognized as a beneficial use of water, and that depletion of flows below the minimum average daily flows set forth in Policy 5B is not in the public interest.

Comment: This policy specifically recognizes hydropower generation as a beneficial use of water and acknowledges the public interest in maintaining the minimum river flow at key points.

By establishing minimum daily flows at Murphy and Weiser, stabilized flows are guaranteed for hydropower generation.

5G - SNAKE RIVER NAVIGATION

It is the policy of Idaho that water sufficient for commercial and recreational navigation is provided by the minimum flows established for the Snake River.

Comment: Commercial navigation en route to Lewiston via the Columbia River and Lower Snake River can be accommodated with the flows leaving Idaho in the Snake River at Lewiston. Above Lewiston, commercial and recreational navigation on the river should be accommodated within the protected flows on the Snake River and tributary streams.

5H - SNAKE RIVER BASIN SPRINGS

It is the policy of Idaho to seek to maintain spring flows in the American Falls and Thousand Springs reaches of the Snake River which will sustain beneficial uses of surface and ground water supplies in accordance with state law.

Comment: Spring discharge in the American Falls and Thousand Springs reaches of the Snake River are vital to the Snake River Basin and Idaho economy. The springs near American Falls provide an important part of Snake River flow appropriated by Magic Valley irrigators. In the Thousand Springs reach, spring flow is the only practical source of water for many of the state's aquaculture facilities.

During portions of low-water years, river flows downstream from Milner Dam to the Murphy gaging station consist almost entirely of ground-water discharge from the Thousand Springs reach. Maintaining these discharges should be the goal of water managers. Managed recharge of the aquifers and continued efforts to efficiently use ground water are two strategies for maintaining spring discharges in these reaches.

5I - SNAKE RIVER BASIN NEW STORAGE

It is the policy of Idaho that applications for large surface storage projects upstream from the Murphy gage be approved subject to the requirement that the use is in the public interest.

Comment: "Large surface storage projects" are those which have the potential for significantly impacting existing uses. Projects for which approval is required under Section 42-1737, Idaho Code, would be such projects. This policy addresses the approval of new surface storage in the basin, but does not apply to already approved projects. Approval of new storage projects that would divert water from the main stem of the Snake River between Milner and the Murphy gaging station during the period November 1 to March 31 should be coupled with provisions that mitigate the impact such depletions would have on the generation of hydropower.

5J - STORAGE ACQUISITION

It is the policy of Idaho that reservoir storage be acquired in the name of the Idaho Water Resource Board to provide management flexibility in assuring the minimum flows designated for the Snake River.

Comment: The Idaho Department of Water Resources is expected to allocate the unappropriated waters and the power rights held in trust by the state in such a manner as to assure minimum flows at designated key points on the Snake River. The impacts of ground water use within the basin on the timing of aquifer discharge to the rivers is such that at some time stored surface water may be necessary to maintain the designated minimum flows.

At this time there is little reservoir storage within the basin which could be acquired by the State. The State should act to acquire any available, feasible reservoir storage in order to provide flexibility for management decisions and provide assurance that the established minimum flows can be maintained. Until such time as these waters are needed for management purposes, they shall be credited to the Water Supply Bank and funds obtained from their lease or sale shall accrue to the Water Management Account. The Board should have priority in acquiring water from the Water Bank, if necessary, to meet the minimum flows established by the Swan Falls Agreement.

Flood control space at Brownlee Reservoir should be considered for salmon flow augmentation. If the 500,000 acre-feet evacuated for flood control purposes downstream could be held and released for flow augmentation during downstream salmon migration, this could replace valuable water supplies taken from the upper Snake River Basin.

● *Bear River Basin*

6A - BEAR RIVER COMPACT

It is the policy of Idaho that water use and management in the Bear River Basin conform to the allocations set forth in the Bear River Compact [Idaho Code 42-3402].

Comment: The Bear River Compact has been in effect since 1958, and water allocations for the entire basin were adopted in 1978. The compact must be reviewed at intervals of not less than twenty years and may be amended during the review process.

The goal of Idaho's representatives on the commission should be to urge conjunctive management of ground and surface water resources within the Bear River Basin and to seek as much of the unconsumed flow entering the Great Salt Lake as possible for Idaho while negotiating in good faith with the other states.

6B - INTERSTATE WATER DELIVERY

It is the policy of Idaho that Idaho water users in the Lower Division of the Bear River Basin must be protected from inequitable water allocation in the event of a water emergency and the scheduling of interstate water deliveries.

Comment: Article 4 of the Bear River Compact provides for the Bear River Commission to declare water emergencies and implement interstate water delivery schedules. If a downstream water user believes the flow of water in the Bear River or an interstate tributary is insufficient to satisfy their water right, due to diversions in an upstream state, that user may file a petition requesting water distribution under the direction of the Commission.

Water emergencies must be determined through comprehensive accounting processes and reflect true emergency conditions. Water emergencies should not be declared on an annual basis with the sole intent of advancing interstate water delivery schedules. Unless water accounting models include as many reaches as necessary to account for incremental changes in natural flows, and accurately reflect water rights as well as contractual arrangements, Idaho water users may be adversely impacted by interstate water delivery scheduling.

6C - BEAR LAKE

It is the policy of Idaho to recognize and preserve the outstanding values of Bear Lake while continuing to meet existing allocations for irrigation and hydroelectric power generation.

Comment: Bear Lake is a regional tourist attraction recognized for its unique water coloration and for its fishery. To protect these values, the Idaho Water Resource Board has obtained a minimum lake level water right for Bear Lake. The water right holds the lake elevation at or above 5902 feet.

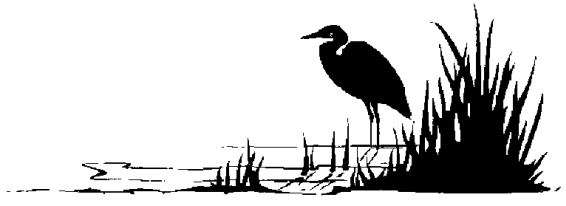
The State of Idaho also recognizes and supports the Bear Lake Storage Allocation and Recovery Plan. This plan was approved through the Bear Lake Settlement Agreement of April 1995 as the established guideline for the operation of Bear Lake. This document calls for a portion of the active storage in Bear Lake to be voluntarily retained to enhance recreation and water quality values.

Recent information indicates that the major contaminant problem in Bear Lake is suspended sediment. The primary source of suspended sediment is the Bear River during high flow periods when sediment-laden water enters Bear Lake through Mud Lake. The most effective way to further enhance the water quality of Bear Lake is to reduce the sediment load to the Bear River above Bear Lake.

6D - BEAR RIVER BASIN WATER PROJECTS

It is the policy of Idaho to encourage additional projects for the development of the water resources of the basin without regard to state boundaries.

Comment: The Bear River Compact provides for a signatory state to construct storage facilities in another state. In order to obtain the maximum beneficial use of water within the basin, it may be necessary to ignore state boundaries, providing that water rights generated by such projects comply with the basic allocations of the compact. The State of Idaho should participate with Wyoming and Utah in determining the feasibility of headwater storage projects to provide for additional irrigation and other uses in Idaho.



● *Panhandle River Basins*

7A - PANHANDLE BASINS

It is the policy of Idaho that the ground and surface waters of the Idaho Panhandle be managed to protect the environmental quality of the region.

Comment: While appearing water rich in comparison to the rest of the state, the water resources of the Idaho Panhandle are finite, and in some areas are fully utilized. Water is the key to the continued economic development in the region. The Water Board places a high priority on maintaining the quality of the water resource base.

7B - PANHANDLE MINIMUM FLOWS

It is the policy of Idaho to provide sufficient water to meet the minimum requirements for aquatic life, fish and wildlife, and to provide for recreation in the Panhandle Basins.

Comment: The minimum stream flow program provides the Idaho Water Resource Board with the authorities necessary to appropriate water for the purposes of this policy. Several streams in the Panhandle Basins have been examined and protected with minimum stream flows claimed by the Idaho Water Resource Board. As water consumption increases in the region, the minimum stream flow program will become increasingly important in the administration of water rights within the Panhandle Basins.

7C - PANHANDLE DCMI

It is the policy of Idaho to provide water for new domestic, commercial, municipal and industrial uses. A depletion of 14 cfs is allocated for these purposes.

Comment: The purpose of this policy is to set aside a significant amount of water for future DCMI (Domestic, Commercial, Municipal, and Industrial) development. The Panhandle population is projected to grow by approximately 2.9 percent annually to more than 200,000 people by 2015. This is a 73 percent increase over 1990 population. Based on current water-use data for the region, an allocation of nine million gallons per day or 14 cfs for consumptive use should be sufficient through the year 2015.

7D - PANHANDLE AGRICULTURAL WATER

It is the policy of Idaho that additional water be made available for irrigated agriculture in the Panhandle. A combined net depletion of 200 cfs is allocated for this purpose.

Comment: Agriculture is a major industry of the state, and Idaho provides an important share of the nation's food production. The Idaho Water Resource Board wishes to insure the availability of water for this purpose.

7E - PANHANDLE NAVIGATION

It is the policy of Idaho that water sufficient for commercial and recreational navigation be maintained in the streams and lakes of the Idaho Panhandle.

Comment: Water for navigation is not a significant problem at this time. If such appropriation appeared necessary, the minimum stream flow program can be used to appropriate water to provide a minimum flow or lake level for the protection of navigation and transportation. Navigation interests are further protected in that all new water appropriations must be in the public interest and an adverse effect on navigation would rarely be in the public interest.

IDAHO'S WATER RESOURCES

Overall, Idaho is rich in water resources with hundreds of square miles of lakes, over ninety-thousand miles of rivers and streams, and one of the largest underground reservoirs of water in the world. However, like most places around the globe, Idaho's water resources may be either excessive or scarce depending on time, place, or human activities.

Climate

Idaho's climatic regime is generally characterized by warm dry summers and cold moist winters. Approximately 500 miles inland from the Pacific Ocean and shouldered against the Continental Divide, the state spans seven degrees of latitude between 42° and 49° north. On the eastern flank, the Rocky Mountains protect much of Idaho from the more severe arctic cold spells and destructive summer storms which are prevalent on the Great Plains. Pacific maritime air masses, brought east by mid-latitude cyclonic storms, are the source of nearly all precipitation. However, the Cascade Range in Oregon and Washington is a major orographic barrier to maritime air masses. Consequently, Idaho receives significantly less precipitation than western Oregon and Washington or comparable inland locations such as Ohio or Michigan. Statewide, an average 22 inches of precipitation annually falls on Idaho. Climatic diversity throughout the state is notable, and is principally attributable to air movement direction with respect to latitude and mountain ranges, and to elevation.

Through June, July, and August, a stationary low pressure trough along the west coast of the United States positions a high-pressure ridge and its associated subtropical air over Idaho. This relatively dry air results in only modest rainfall over the state during most summers (Fig. 2). Occasionally, summer thunderstorms develop as moist air from the Gulf of Mexico or subtropical Pacific Ocean is circulated northward, especially in the southeastern part of the state. Salmon, located in the rain-shadow of Idaho's central mountain mass, derives most of its precipitation from spring and summer thunderstorm activity.

By September, intensification of the upper westerly winds results in a more west-to-east air movement aloft. At the same time, eastward migration of the Pacific longwave trough allows frontal systems to move into the state. November, December, and January are generally the wettest months of the year in most Idaho locations. Southward progression of dry polar air masses often results in decreased mid-winter precipitation. However, in the central and northern half of the state a second cycle of precipitation usually occurs during spring, as the polar front returns northward into Canada.

Orographic lift initiates much of Idaho's precipitation. Average annual precipitation in the central Idaho mountains may be as much as 60 inches, much

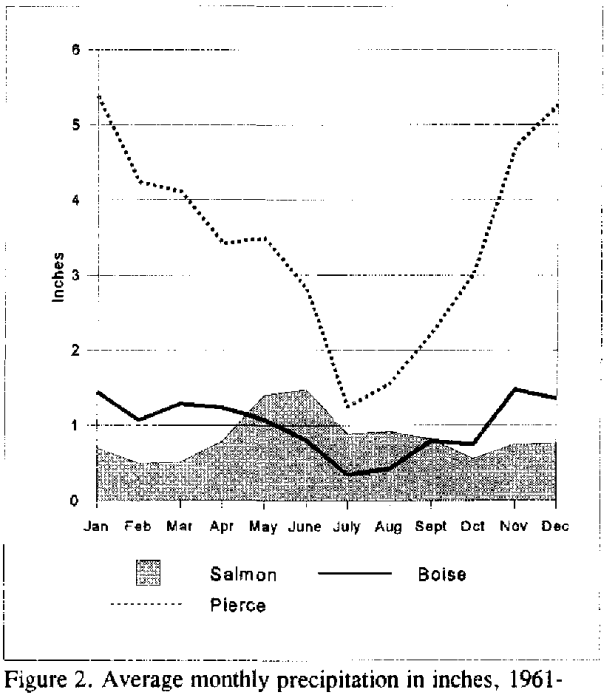


Figure 2. Average monthly precipitation in inches, 1961-1990.

of it as snow, while on the Snake River Plain, in southern Idaho, precipitation averages less than 10 inches (Fig. 3). Winter precipitation is about evenly divided between rain and snow at elevations below 3,000 feet, but above that level most of the precipitation arrives in the form of snow.

Elevations in the state vary from a low of seven hundred feet at Lewiston, where the Snake River leaves the state, to over twelve thousand feet in the Lost River Range. Total winter snowfall ranges from 20 inches or less in southwestern Idaho valleys or in canyon bottoms to perhaps as much as 400 inches in the higher mountains. The greatest normal annual snowfall for which there is actual record is 300 inches at Roland, southwest of Mullan Pass, at an elevation of 4,150 feet.

The highest annual temperature averages are found at the state's lowest elevations. Low altitude stations, such as Riggins and Lewiston, seldom record mean monthly temperatures below 32°F, while monthly means are 32°F or below five months of the year at elevations of 5,000 feet or above. Table 2 summarizes climatological data from several Idaho weather stations.

Lewiston and the valleys of southwestern Idaho have an average frost-free period of more than 140 days, with some of the warmer hillsides reaching 180 to 200 days. In the higher Pocatello-Idaho Falls area and in the lower valleys of extreme northern Idaho, the frost-free period is much shorter — 125 days or less. Frosts and freezes are possible at any time during the growing season in the high mountain valleys.

REFERENCES

Molnau, Myron, and Francis M. Winters, Jr., 1988. Mean Annual Precipitation Map for Idaho. Idaho Water Resources Research Institute, Research Technical Completion Report.

Molnau, Myron, 1992. Mean Annual Precipitation Map for Idaho: a GIS database. Idaho Water Resources Research Institute and the Idaho Agricultural Experiment Station.

U.S. Geological Survey, 1991. National Water Summary 1988-89. United States Geological Survey Water Supply Paper 2375.

Table 2. Climatological Summary Data 1961-1990

Station	Sandpoint	Lewiston	Pierce	Boise	Hailey	Pocatello	Salmon
Station Elevation (feet)	2100	1436	3190	2838	5306	4454	3930
Annual Precipitation (inches)	33.5	11	42	12	16	12	10
Average January Precipitation	4	1.3	5.4	1.4	2.2	1	0.7
Average July Precipitation	1.3	0.7	1.3	0.4	0.7	0.7	0.9
Avg. January Minimum (°F)	19	28	16	22	9	14	11
Avg. January Maximum	31	40	32	36	30	32	30
Avg. July Minimum	49	59	43	58	49	53	51
Avg. July Maximum	80	89	81	90	84	88	88

Source: Univeristy of Idaho, State Climate Services.

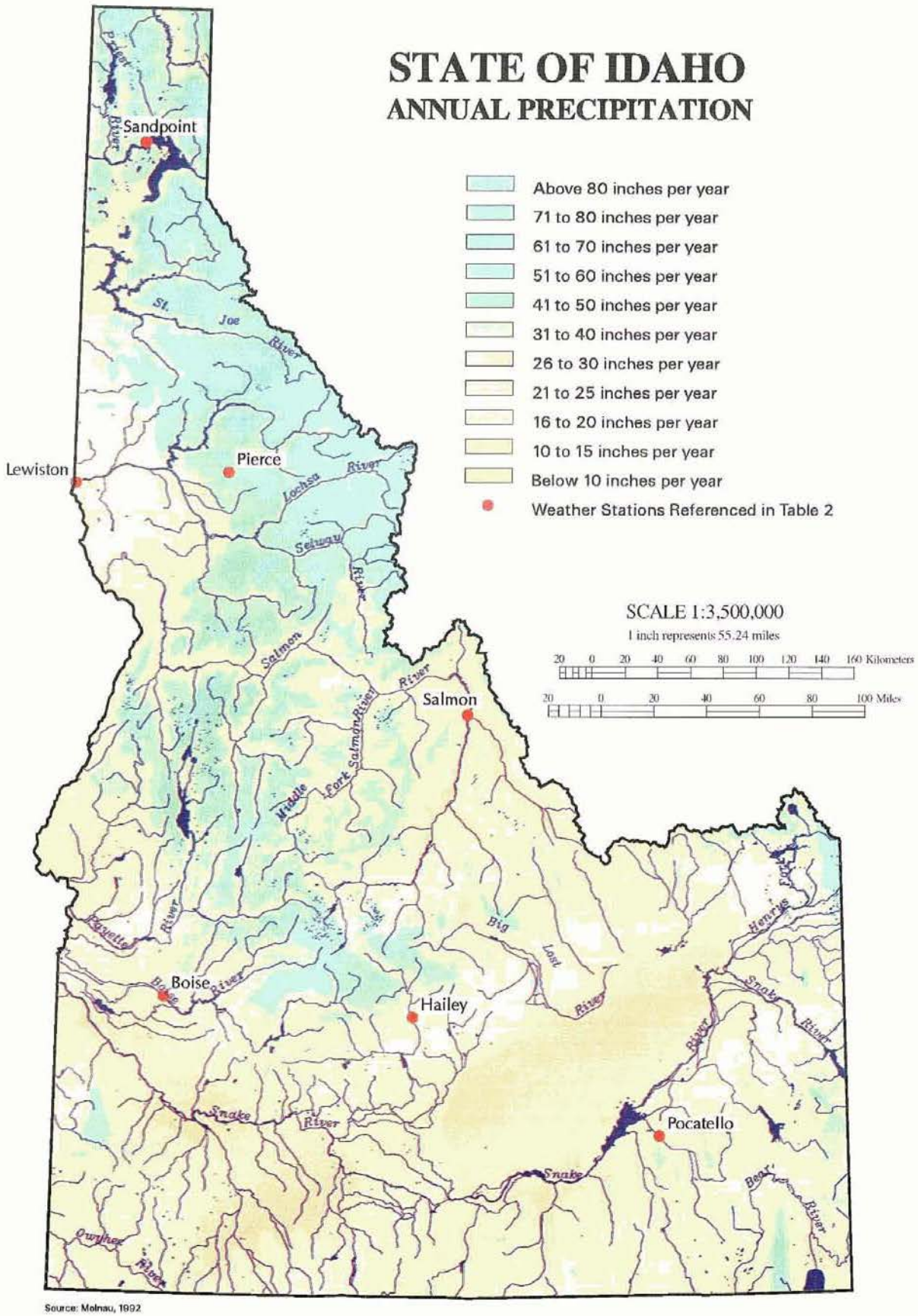


Figure 3. State of Idaho Mean Annual Precipitation

Surface Water

Precipitation constitutes three-fourths of Idaho's water supply, providing approximately 98 million acre-feet annually. However, an estimated 50 percent of the precipitation that falls on the state is used by native vegetation or lost through evaporation (U.S. Geological Survey, 1990). The remaining 49 million acre-feet runs off as surface water, or recharges ground water systems.

Surface water entering Idaho accounts for the remaining one-fourth of Idaho's water input, approximately 37 million acre-feet, principally via the northern Panhandle rivers (Fig. 4). Idaho's principal river basins are (1) the Snake River Basin, which encompasses approximately 87 percent of the state; (2) the Bear River Basin in southeast Idaho; and (3) the Spokane, Pend Oreille, and Kootenai river basins in the Panhandle (Fig. 5). Surface water outflows from the state amount to over 70 million acre-feet.

A major portion of the state's total stream flow originates as 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. However, seasonal stream flow patterns are altered in many parts of the state by storage projects.

Reservoir storage in Idaho totals over 12 million acre-feet. Between 1905 and 1930 many dams were built in the state to store water, primarily for irrigation. A second spurt of dam construction, primarily for power generation, between 1950 and 1969 significantly increased water storage capacity. Dworshak Reservoir, on the North Fork of the Clearwater River, is the largest reservoir in Idaho with a capacity of 3.4 million acre-feet. The reservoir is used for flood control, hydroelectric power generation, recreation, and navigation. Figure 6 locates reservoirs with at least 250 acre-feet of storage capacity and Table 3 lists the location, primary use, capacity and ownership of reservoirs with over 5,000 acre-feet of storage.

SNAKE RIVER BASIN

The single most unifying geographical feature of Idaho is the Snake River. Headwaters of the 1,000 mile long river are in Wyoming on the western slope of the Continental Divide. Crossing Idaho's eastern border, it flows 759 miles across southern Idaho, along the southern edge of the Snake River Plain and through Hells Canyon. The Snake River leaves Idaho at Lewiston, turning westward to its junction with the Columbia River near Pasco, Washington.

Average outflow of the Snake River near Lewiston, is 36 million acre-feet per year. Over one-half of Snake River discharge at its mouth is picked up from the Salmon and Clearwater rivers below Hells Canyon (Fig. 7). Other important tributaries are the Henrys Fork, Boise, and Payette rivers. Basins outside Idaho that contribute significantly to the river's flow include the upper basin in Wyoming, the Owyhee, Malheur, Burnt, Powder, and Imnaha rivers in Oregon, and the Grand Ronde River in Washington. Small portions of the Snake River basin also lie in Utah and Nevada. Table 4 lists average annual runoff at principal gaging stations in the Snake River Basin.

Seasonal variations in Snake River flow at four gaging stations are illustrated by Figure 8. Flows at Heise are the result of late spring snow melt runoff modified by reservoir storage operations for flood control and irrigation. Below Heise, irrigation diversions may completely deplete river flows in the summer months. Snake River flows are replenished between Milner Dam and King Hill. The King Hill hydrograph reflects the relatively consistent discharge of the Snake Plain aquifer in the reach between Milner Dam and King Hill. On an annual basis, over 50 percent of Snake River flow measured at King Hill is from ground water discharge. Weiser flows reflect the effects of storage, diversion, and ground water management in the irrigated areas of the Upper Snake River Basin, river regulation for hydropower production downstream, and inflow from the Boise and Payette systems. At Clarkston, the hydrograph is dominated by runoff from the vast unregulated areas of the Salmon and Clearwater basins.

BEAR RIVER BASIN

The Bear River Basin is situated in the southeast corner of Idaho (Fig. 5). It comprises 7474 square miles and includes portions of three states: Utah (3255 square miles), Idaho (2704 square miles), and Wyoming (1515 square miles). Flowing over 500 miles, the Bear River has the distinction of being the largest river in the western hemisphere that does not flow into an ocean. Deep Creek, in Oneida County's Curlew

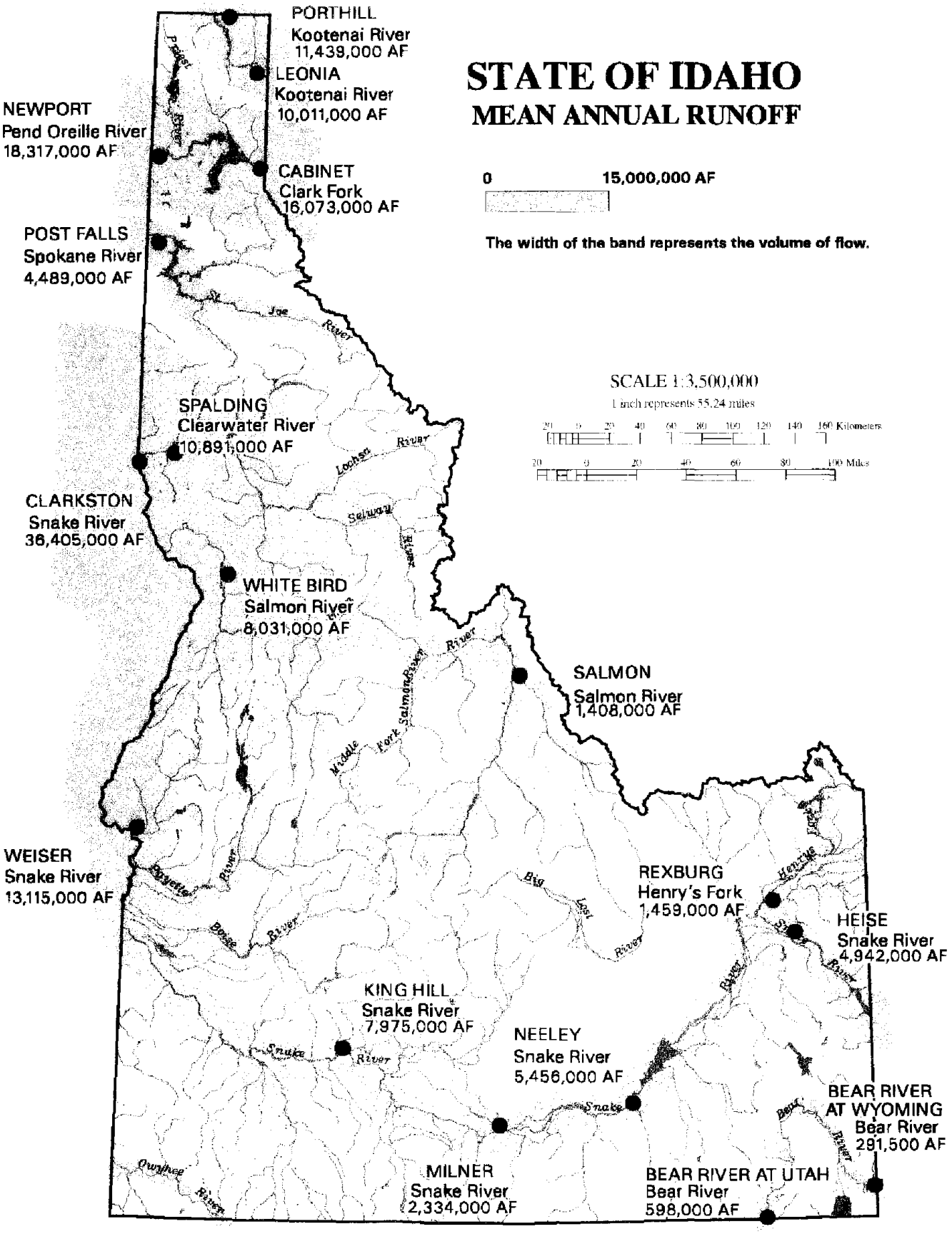


Figure 4. State of Idaho Mean Annual Run-Off

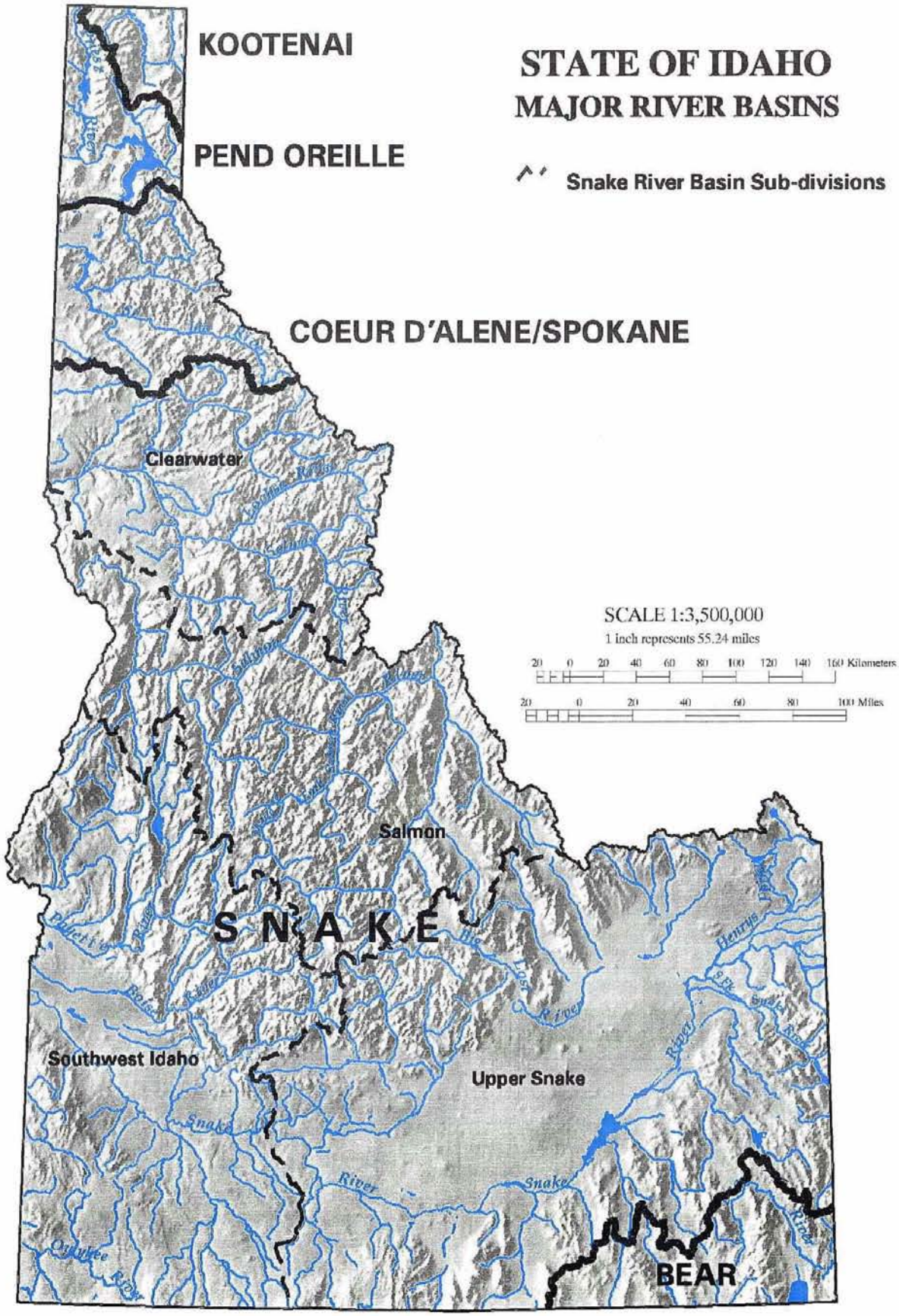


Figure 5. State of Idaho Major River Basins

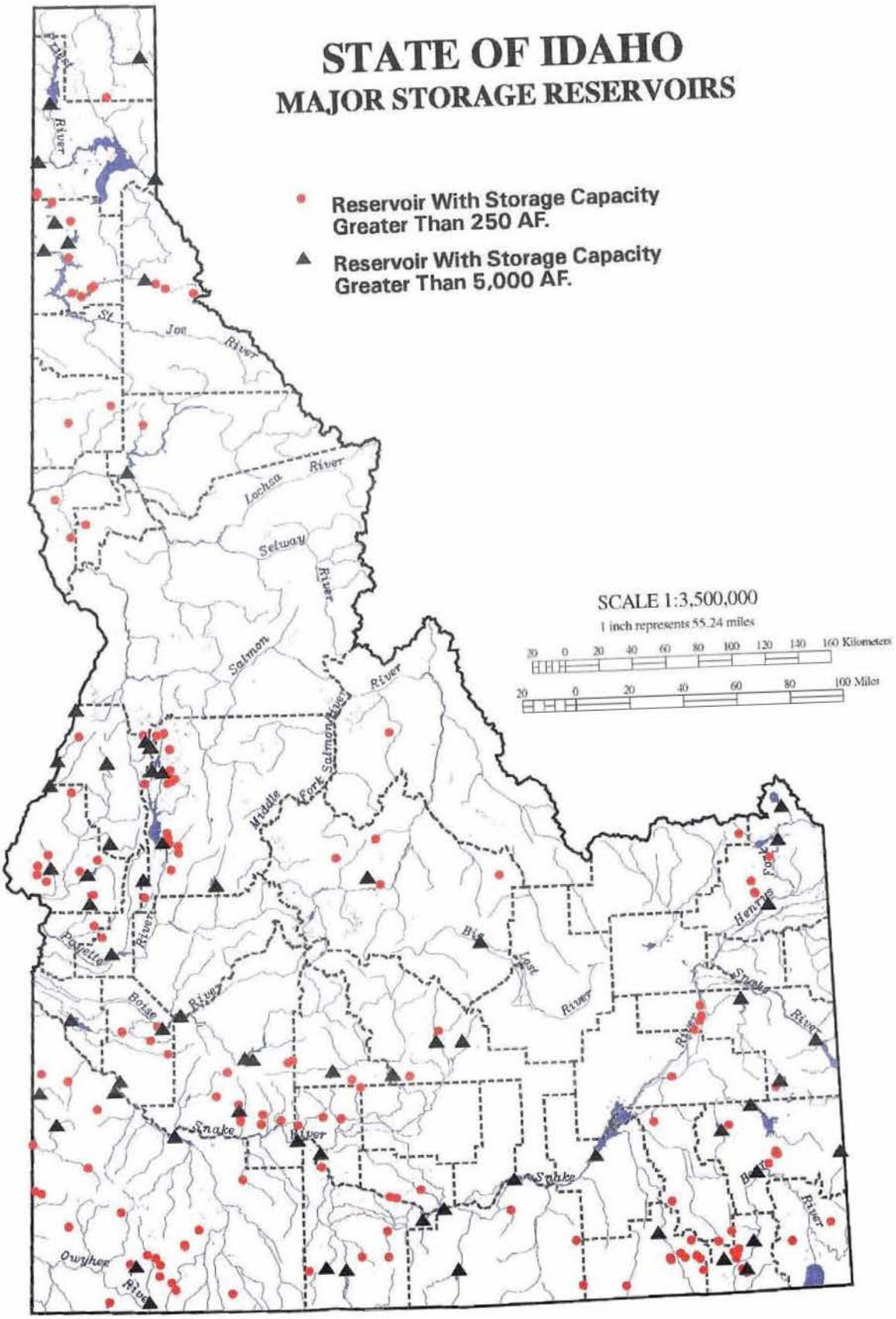


Figure 6. State of Idaho Major Storage Reservoirs

Table 3. Reservoirs in Idaho with Storage Capacity Greater than 5,000 acre-feet.

Reservoir	County	Stream	Use	Capacity	Completed	Owner
American Falls	Power	Snake River	IFP	1,671,300	1978	US Bureau of Reclamation
Anderson Ranch	Elmore	S Fk Boise River	IPF	493,200	1950	US Bureau of Reclamation
Arrowrock	Boise-Elmore	Boise River	DIFR	286,600	1915	US Bureau of Reclamation
Ashton	Fremont	Henrys Fork	P	9,800	1913	PacifiCorp
Bear Lake	Bear Lake	Bear River	IPR	1,452,000	1918	PacifiCorp
Black Canyon	Gem	Payette River	IPR	29,822	1924	US Bureau of Reclamation
Blackfoot	Caribou	Blackfoot River	DI	350,000	1911	US Bureau of Indian Affairs
Bliss	Gooding-Elmore	Snake River	P	11,000	1950	Idaho Power Co
Brundage	Adams	Brundage Creek	DIS	7,330	1987	Brundage Waterusers Association
Bruno Creek	Custer	Bruno Creek	T	89,500	1982	Thompson Creek Mining Co
Bunker Hill #3	Shoshone	SF Coeur d'Alene	T	12,000	1926	Pintlar Corporation
Bybee	Owyhee	Shoofly Creek	I	7,970	1987	Riddle Ranches Inc
C J Strike	Elmore-Owyhee	Snake River	P	250,000	1952	Idaho Power Co
C Ben Ross	Adams	Little Weiser River	DI	7,787	1937	Little Weiser River Irr Dist
Cascade	Valley	N Fk Payette River	IFP	703,200	1948	US Bureau of Reclamation
Cedar Creek	Twin Falls	Cedar Creek	I	30,000	1920	Cedar Mesa Res and Canal Co
Coeur d'Alene (Lake)	Kootenai	Spokane River	IP	225,000	1906	Washington Water Power
Crane Creek	Washington	Crane Creek	DIP	56,800	1912	Crane Creek Res Admn Board
Daniels	Oneida	Lower Malad	I	8,700	1967	St. John Irrigation Co
Deadwood	Valley	Deadwood River	IPR	161,900	1931	US Bureau of Reclamation
Deer Flat Lower	Canyon	Boise River	I	190,000	1907	US Bureau of Reclamation
Delamar	Owyhee	Henrietta Gulch-Jordan Creek	T	14,400	1977	Kinross Delamar Mining Company
Dworshak	Clearwater	N Fk Clearwater	PFR	3,453,000	1973	US Army Corps of Engineers
Fish Creek	Blaine	Fish Creek	I	12,743	1923	Carey Valley Reservoir Co
Gem State	Bonneville	Snake River	IPR	5,000	1988	City of Idaho Falls
Glendale	Franklin	Cub River	DI	6,000	1930	Preston-Whitney Irrigation Co
Goose Lake	Adams	Goose Creek	I	6,550	1919	Goose Lake Reservoir Co
Grays Lake Outlet	Bonneville	Grays Lake Outlet	IG	40,000	1924	US Bureau of Indian Affairs
Hayden Lake	Kootenai	Hayden Lake	FI	38,000	1910	Hayden Lake Watershed Improv Dist
Hells Canyon	Adams	Snake River	P	170,000	1967	Idaho Power Co
Henrys Lake	Fremont	Henrys Fork	DI	90,000	1923	North Fork Reservoir Co
Hot Springs No 2	Elmore	Hot Springs Creek	I	5,334	1968	Carl F Reynolds & Sons
Hulet No 2	Owyhee	Sinker Creek	I	6,787	1987	Jay H Hulet
Island Park	Fremont	Henrys Fork	DI	127,646	1938	US Bureau of Reclamation
Little Payette Lake	Valley	Lake Fork Creek	I	10,300	1926	Lake Fork Irrigation Dist
Little Wood	Blaine	Little Wood River	I	30,000	1941	Little Wood Irrigation District

Reservoir	County	Stream	Use	Capacity	Completed	Owner
Little Camas	Elmore	Little Camas Creek	I	18,400	1912	Mountain Home Irrigation Dist
Lost Valley	Adams	Lost Creek	DI	7,100	1910	Lost Valley Reservoir Co
Lucky Peak	Ada	Boise River	IFP	307,000	1954	US Army Corps of Engineers
Mackay	Custer	Big Lost River	IS	45,000	1918	Big Lost River Irrigation Dist
Magic	Blaine	Big Wood River	IP	191,500	1910	Big Wood Canal Co
Mann Creek (Spangler)	Washington	Mann Creek	I	12,950	1967	US Bureau of Reclamation
Milner	Cassia-Jerome	Snake River	I	36,300	1905	Milner Dam Inc
Minidoka (Lake Walcott)	Cassia-Minidoka	Snake River	IP	210,000	1906	US Bureau of Reclamation
Mormon (Twin Lakes)	Camas	Mckinney and Dairy Creeks	DI	19,280	1908	Twin Lakes Res & Irrigation Co
Mountain View	Owyhee	Boyle Creek	RD	5,500	1969	US Bureau of Indian Affairs
Moyie	Boundary	Moyie River	P	16,000	1949	City of Bonners Ferry
Murtaugh Lake	Twin Falls	Snake River	I	7,720	1905	Twin Falls Canal Co
Oakley	Cassia	Goose Creek	I	76,000	1916	Oakley Canal Co
Oneida Narrows	Franklin	Bear River	IP	11,500	1915	PacifiCorp
Paddock Valley	Washington	Little Willow Creek	I	36,400	1949	Little Willow Irrigation Dist
Palisades	Bonneville	Snake River	IFP	1,401,000	1957	US Bureau of Reclamation
Payette Lake	Valley	N Fk Payette River	IR	41,000	1944	Lake Reservoir Co
Pend Oreille (Lake)	Bonner	Pend Oreille River	PFO	1,561,300	1955	US Army Corps of Engineers
Portneuf	Caribou	Portneuf River	DI	23,695	1912	Portneuf-marsh Valley Canal Co
Priest Lake	Bonner	Priest River	PR	82,000	1978	Idaho Department of Water Resources
Ririe	Bonneville	Willow Creek	IF	100,500	1976	US Bureau of Reclamation
Sage Hen	Gem	Sage Hen Creek	DI	5,210	1938	Squaw Creek Irrigation Co
Salmon Falls	Twin Falls	Salmon Falls Creek	DI	230,650	1911	Salmon River Canal Co Ltd
Salmon Falls Lower	Gooding-Twin Falls	Snake River	P	18,500	1949	Idaho Power Co
Slack (Juniper Basin)	Owyhee	Juniper Creek	DI	5,000	1916	Petan Co
Smoky Canyon No 2	Caribou	Tygee Creek	T	20,450	1991	J R Simplot Co
Soda Point	Caribou	Bear River	P	15,500	1925	PacifiCorp
Swan Falls	Ada-Owyhee	Snake River	P	7,500	1901	Idaho Power Co
Texas Basin	Owyhee	Succor Creek	I	6,340	1979	Succor Ck Dist Improvement Co
Twin Lakes	Franklin	Mink Creek	I	12,297	1920	Twin Lakes Canal Co
Twin Lakes	Kootenai	Rathdrum Creek	DI	9,090	1909	Twin Lakes Rathdrum FCD 17

Use Codes:

D = Domestic **G** = Wildlife **I** = Irrigation **P** = Power **S** = Stockwater
F = Flood Control **H** = Fish Propagation **O** = Other **R** = Recreation **T** = Mine Tailings

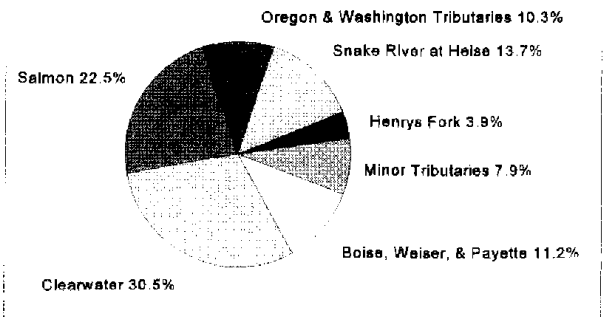


Figure 7. Average annual runoff of Snake River tributaries considered as percentages of the Snake River's average annual runoff at Lewiston.

Table 4. Average Annual Runoff of Major Snake River Basin Rivers at Selected Gages (base period 1928-92).

Gage	Runoff (acre-feet)
Snake River near Heise	4,942,000
Henrys Fork near Rexburg	1,459,000
Snake River at Neeley	5,456,000
Snake River at Milner	2,334,000
Snake River at King Hill	7,975,000
Snake River near Murphy	8,085,000
Boise River near Boise	1,955,300
Boise River near Parma	1,198,000
Payette River near Horseshoe Bend	2,288,000
Payette River near Payette	2,106,000
Snake River at Weiser	13,115,000
Snake River at Hells Canyon Dam	14,188,800
Salmon River at Whitebird	8,031,000
Snake River near Anatone	25,305,000
Clearwater River at Spalding	10,981,000
Snake River near Lewiston	36,405,000

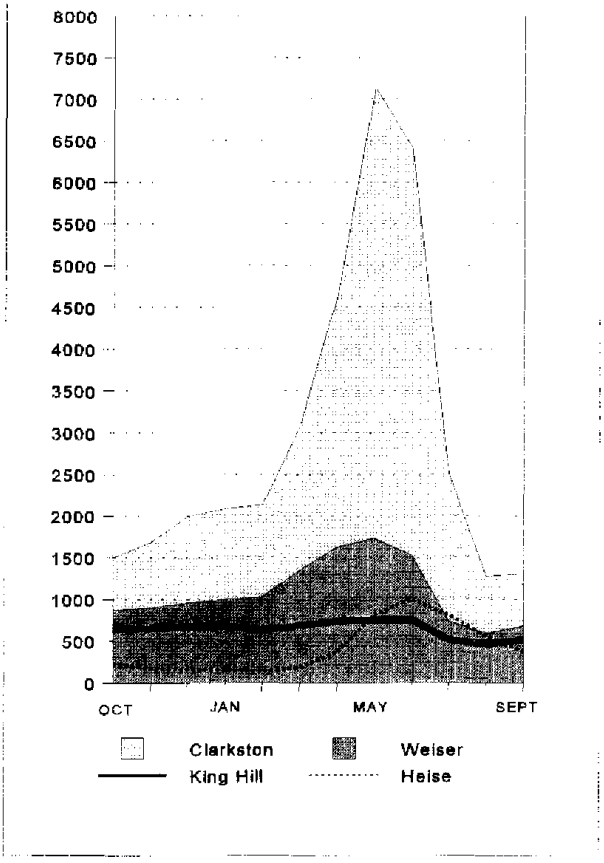


Figure 8. Seasonal distribution of Snake River long term average flows at four gaging stations, in thousand acre-feet.

Valley, is not a Bear River tributary, but like the Bear River flows into Utah and the Great Salt Lake Basin.

Elevations in the Bear River Basin range from 4400 feet in the valleys to over 9000 feet. About one-half of the area is mountainous and lies above 6000 feet. The major valley and mountain ranges trend north-south. Bear River stream flow is primarily the result of snow melt in higher portions of the watershed.

The Bear River enters Idaho near the community of Border, Wyoming. At Border, it has drained a 2500 square mile watershed and has an average annual flow of 291,500 acre-feet (Table 5). Forty-four miles downstream, at Stewart Dam near Dingle, Idaho, water from the Bear River is diverted to Bear Lake. Diverted water first enters Mud Lake, then Bear Lake via canal.

Bear Lake is the most striking physical feature in the basin. The blue-green waters of this large, deep lake extend about equally into Idaho and Utah. The lake is 20 miles long, eight miles wide, 208 feet deep at its maximum depth, and has a total volume of 6.5 million acre-feet. Since the last ice age, it has been isolated from the Bear River, and has acted as an ephemeral tributary. Isolation resulted in a unique water chemistry and the development of four unique fish species. Between 1909 and 1918, a diversion dam, an inlet canal, and an outlet canal were constructed to allow Bear River water to flow in and out of Bear Lake.

Water levels in Bear Lake are controlled by a dike between Mud and Bear lakes. Release of the top three feet of Bear Lake water (elevation 5,923.65 to 5,920.65) is made by gravity. The Lifton pumping plant is used to draw Bear Lake below the outlet level (from elevation 5,920.65 to 5,902.00). Present usable capacity of the lake is 1,421,000 acre-feet.

From Bear Lake, the river flows northwesterly toward the community of Soda Springs, where it turns south toward the Great Salt Lake. In Franklin county, Idaho, below the Oneida Narrows, the river meanders broadly in the ancestral Lake Bonneville bottom lands before leaving Idaho. Major Idaho tributaries of the Bear River are the Thomas Fork, Cub River and the Malad River. About 50 percent of the Bear River's flow at the Idaho-Utah state line, south of Preston, originates in Idaho.

Monthly flows at the gaging stations are influenced to varying degrees by reservoir regulations, irrigation diversions and return flows. High flows are common in May and June and very low flows in July, August, and September (Fig. 9). The Bear River at Border is regulated by upstream storage, and is depleted by irrigation diversions in Wyoming and Utah. The monthly flow regime in the reach below Preston (State Line) reflects the effects of reservoir releases for power generation, unregulated tributary inflow, and irrigation diversions. The Thomas Fork and the Malad River exhibit monthly flows typical of unregulated streams. Peak runoff occurs during the snow melt season and then declines throughout the summer months.

Table 5. Average Annual Runoff of the Bear River, 1927-1992.

Station	Runoff (acre-feet)
Bear River at Idaho-Wyoming state line	291,500
Bear Lake Outlet	306,100
Bear River at Alexander	533,800
Bear River at Idaho-Utah state line	598,000

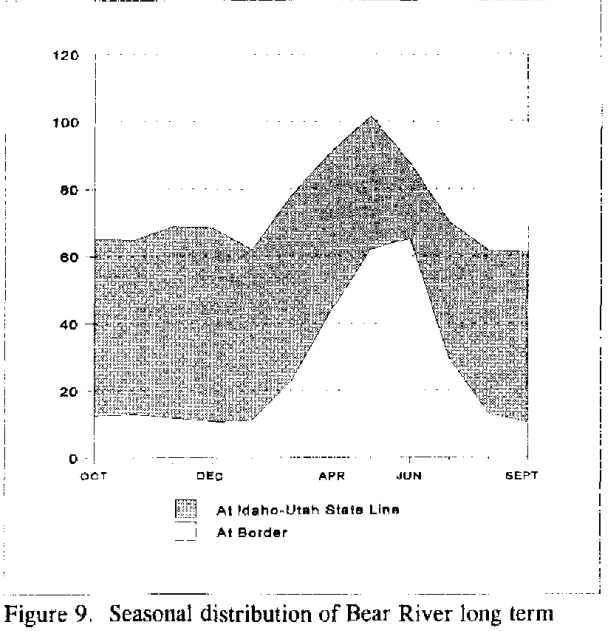


Figure 9. Seasonal distribution of Bear River long term average run-off in thousand acre-feet.

PANHANDLE BASINS

The Panhandle has, relative to other areas of Idaho, abundant water resources. Precipitation and runoff are generally greater than anywhere else in the state. Average annual runoff at principal gaging stations is listed in Table 6. The seasonal distribution of Panhandle river flows is shown in Figure 10.

Kootenai and Clark Fork flows are largely the result of runoff conditions in upstream Montana and British Columbia. The Kootenai River enters Idaho from Montana at Leonia and discharges about 10 million acre-feet per year into British Columbia at Porthill. It gains an average 2,000 cfs in Idaho, including approximately 700 cfs from the Canadian portion of the Moyie River. The average flow of the Moyie near its mouth is about 900 cubic feet per second.

The Clark Fork, largest of the Panhandle rivers, enters Idaho at Cabinet Gorge and leaves the state at Newport, Washington, where it is called the Pend Oreille River. Average annual runoff at Newport is 18.3 million acre-feet per year. The average gain in Idaho is about 3600 cfs. Principal Idaho tributaries are the Pack River and Priest River. The river flows through Idaho's largest lake, Pend Oreille.

The Spokane River flows west from Lake Coeur d'Alene and leaves the state at Post Falls. The average annual flow of the Spokane River at Post Falls is about 4.5 million acre-feet. Two major tributaries, the Coeur d'Alene and the St. Joe, originate in Idaho's Bitterroot Range and flow into Lake Coeur d'Alene.

There are no reservoirs on the Kootenai River in Idaho, but the Libby Project in Montana controls and modifies flows through Idaho. While flood flows are normally reduced to channel capacity, there is a longer period of high flows as power and flood control releases are made from late summer through the winter. The Clark Fork is regulated by Hungry Horse Reservoir, Flathead Lake, and many small reservoirs in Montana. Seasonal regulation by these reservoirs has increased natural fall and winter flows. Daily fluctuations are also imposed on the river by power operations at the Noxon Rapids Dam in Montana and at the Cabinet Gorge Dam in Idaho.

Table 6. Average annual runoff of major rivers in Idaho's Panhandle at selected gages for period of record.

Station	Runoff (acre-feet)
Kootenai River at Leonia	10,011,000
Moyie River at Eastport	502,500
Kootenai River at Porthill	11,439,000
Clark Fork at Whitehorse Rapids	16,073,000
Priest River near Priest River	1,202,000
Pend Oreille River at Newport	18,317,000
St. Joe River at Calder	1,701,400
St. Maries River near Santa	252,700
Spokane River near Post Falls	4,489,000

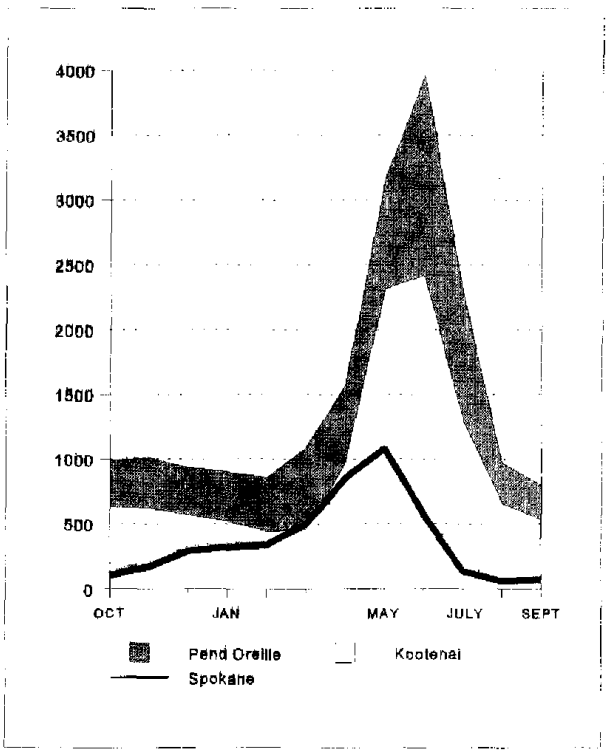


Figure 10. Seasonal distribution of long term average runoff for Idaho Panhandle rivers, in thousand acre-feet.

Panhandle Lakes

The state's largest lakes, Pend Oreille (148 square miles of surface area), Coeur d'Alene (50 square miles), and Priest (37 square miles), gouged out by great ice sheets as much as a mile thick, are located in the northern panhandle. A detailed survey of Pend Oreille Lake made by the U.S. Coast and Geodetic Survey reported the maximum depth at 1,200 feet. Mean depth at Lake Coeur d'Alene is 70 feet, and at Priest Lake 128 feet, with the deepest depths in both lakes lying 200-300 feet below the surface.

The lakes are regulated by dams at their outlets, and thus provide a certain amount of storage water that can be released as desired. Lake Pend Oreille is regulated by Albeni Falls Dam as part of the Columbia River system for downstream power and flood control. The dam has the effect of increasing the length of Lake Pend Oreille, along the river, by 20 miles. Prior to dam construction, the average annual variation between low water in the winter and high water in the spring was 13 to 14 feet.

The normal summer level is now held at elevation 2062.5 feet. Beginning in September, the lake is drafted at a nearly uniform rate to reach elevation 2060 by the end of October. A continuing draft to elevation 2051 may be made until December for system power purposes if needed. Normally, the lake is at winter flood control level by December 1. Between December and spring, the lake is held at a nearly constant level. When springtime flood inflows occur, the spillway is opened allowing free flow. The lake then rises as it would without a dam. As the flood recedes, the lake is allowed to return to the normal summer level.

Lake Coeur d'Alene is controlled by Post Falls Dam on the Spokane River nine miles downstream from the lake outlet. Post Falls Dam is operated by Washington Water Power Company for power generation on site and at several other plants in Washington. The normal summer level of the lake is elevation 2128. Beginning in September, it is drafted three to five feet for power generation purposes. This lowering of the lake elevation also provides winter flood protection for lake shoreline properties and downstream points. Winter lake levels are variable because of inflow fluctuations. Following spring runoff, lake levels decline to elevation 2128, the gates are closed and the dam is operated to hold the lake at that level through the summer.

Priest Lake is controlled by a small dam originally constructed in 1950 and rebuilt in 1978. This structure is used during the summer to hold the lake at a nearly constant level, about three feet above the natural lake summer level. Following the recreation season, the stored water is released for downstream power. The dam is operated by Washington Water Power Company under an agreement with the Idaho Department of Water Resources, owner of the dam.

Regulating the lake elevation for summer recreation use has reduced Priest River flows from July through November. The July and August flows have been reduced by approximately 40 percent, and September outflows by about 30 percent. The October and November discharges have been increased by about 250 percent due to evacuation of storage. Discharges during the remainder of the year are relatively unaffected.

REFERENCES

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Ground Water

Surface waters and ground water in the state are significantly intertwined. In many basins, some water may traverse between an aquifer and a stream several times. Influences which affect the water supply in one environment will likely affect supply in the other.

Aquifer discharge supplies a component of flow to all streams and varies seasonally. Generally the ratio of ground water to surface water in a stream becomes progressively greater as total stream discharge declines. Aquifer recharge is by infiltration of surface runoff. In southern Idaho, seepage from irrigation is a significant source of recharge. Historic rises in ground water levels are recorded in most surface water irrigated areas. The state's principal aquifer systems are mapped in Figure 11.

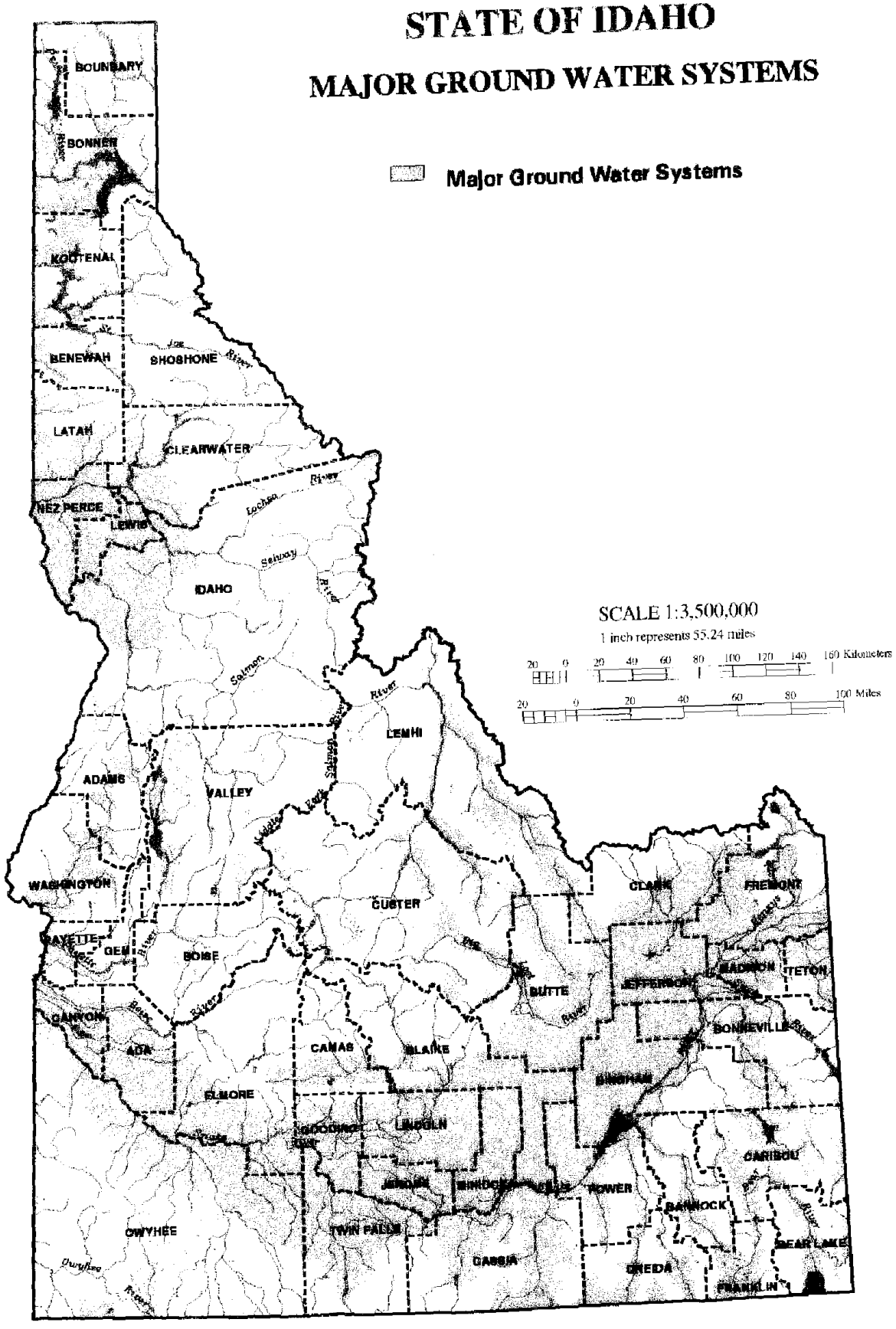

Figure 11. State of Idaho Major Ground Water Systems

SNAKE RIVER BASIN

In the Snake River Basin, significant ground water supplies are found in the alluvium of basin valleys and the Snake River Plain basalts. The mountains of central Idaho are composed largely of granitic rock, consequently, permeability is relatively low.

Rivers, streams, and glaciers have dissected Idaho's mountain ranges, and subsequently deposited the eroded material on valley floors. Alluvial sands and gravels are highly permeable. Unconsolidated alluvium supplies substantial amounts of water for domestic, industrial, and irrigation use in the Snake River Basin.

The Snake River Plain is a down warp filled first by flows of rhyolite, and more recently by flows of Snake River basalt. Contacts between flows are commonly rubble with high porosities and hydraulic conductivities. The Snake Plain aquifer, one of the largest ground water systems in the United States, underlies the Snake River Plain from the vicinity of St. Anthony in Fremont County, to the town of King Hill in Elmore County. It is estimated to contain roughly 250 million acre-feet of water in the fractured zones between successive basalt flows.

Seasonally, aquifer discharge varies only slightly. The highest flows occur in the fall as a result of the cumulative effects of recharge by surface water irrigation. Low flows occur in April or May before the effects of the new irrigation season recharge become significant.

The Snake River alternately contributes water to and receives water from the Snake Plain Aquifer. The aquifer currently discharges about 2,500 cubic feet per second (cfs) of water to the Snake River at American Falls and about 5,000 cfs between Milner and King Hill. Elsewhere, the river channel is above the regional water table and river flow recharges ground water.

Ground water discharge to the Snake River in the Milner-King Hill reach has varied as recharge conditions have changed. From 1902 to the early 1950s ground water discharge in the reach increased (Fig. 12). The gain has been attributed to increased recharge due to surface water irrigation in areas north and east of the springs.

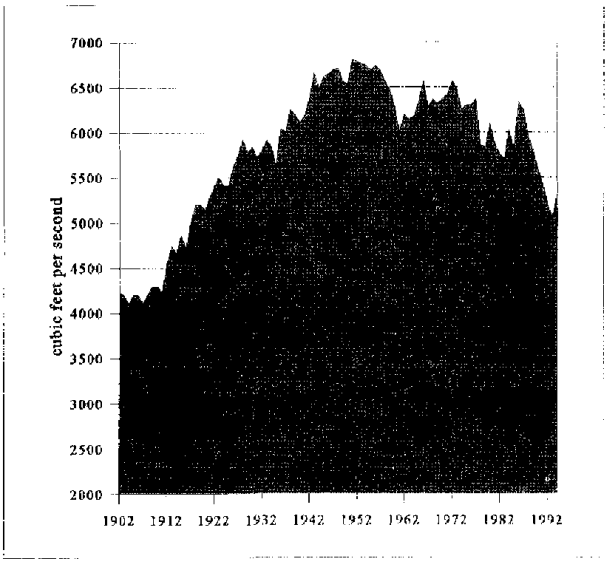

Figure 12. Average annual ground water discharge from the north side of the Snake River between Milner and King Hill. Discharge in cubic-feet per second for years 1902 through 1994.

Spring discharge has been in a state of slow decline since the mid-1950s when it exceeded an estimated 6700 cubic feet per second. Withdrawals from the aquifer and increasing efficiencies in irrigation application by surface water users on the plain are expected to result in continuation of the decline. When these stresses moderate at some relatively fixed level in the future, aquifer outflows will begin to approach equilibrium with inputs and up-gradient withdrawals.

Most wells in the Snake River Basin are located where depth to water is less than 300 feet (Figs. 13-15). Typically, wells on the eastern Snake River Plain have larger yields than wells elsewhere in the Snake River Basin. About 66 percent of wells in the Upper Snake, overlying the Snake Plain, yield more than 1,500 gallons per minute.

BEAR RIVER BASIN

Across southeastern Idaho, the provinces are typified by complexly folded or sub-parallel block-faulted ranges separated by open valleys.

Principal water-bearing deposits in the Bear River Basin are generally limited to the Bear River flood plain. Aquifers are mainly deep, alluvial deposits that consist of alternating layers of gravel, silt, and clay (State of Utah, 1992). Most of the Bear River flood plain has a high water table (Fig. 16).

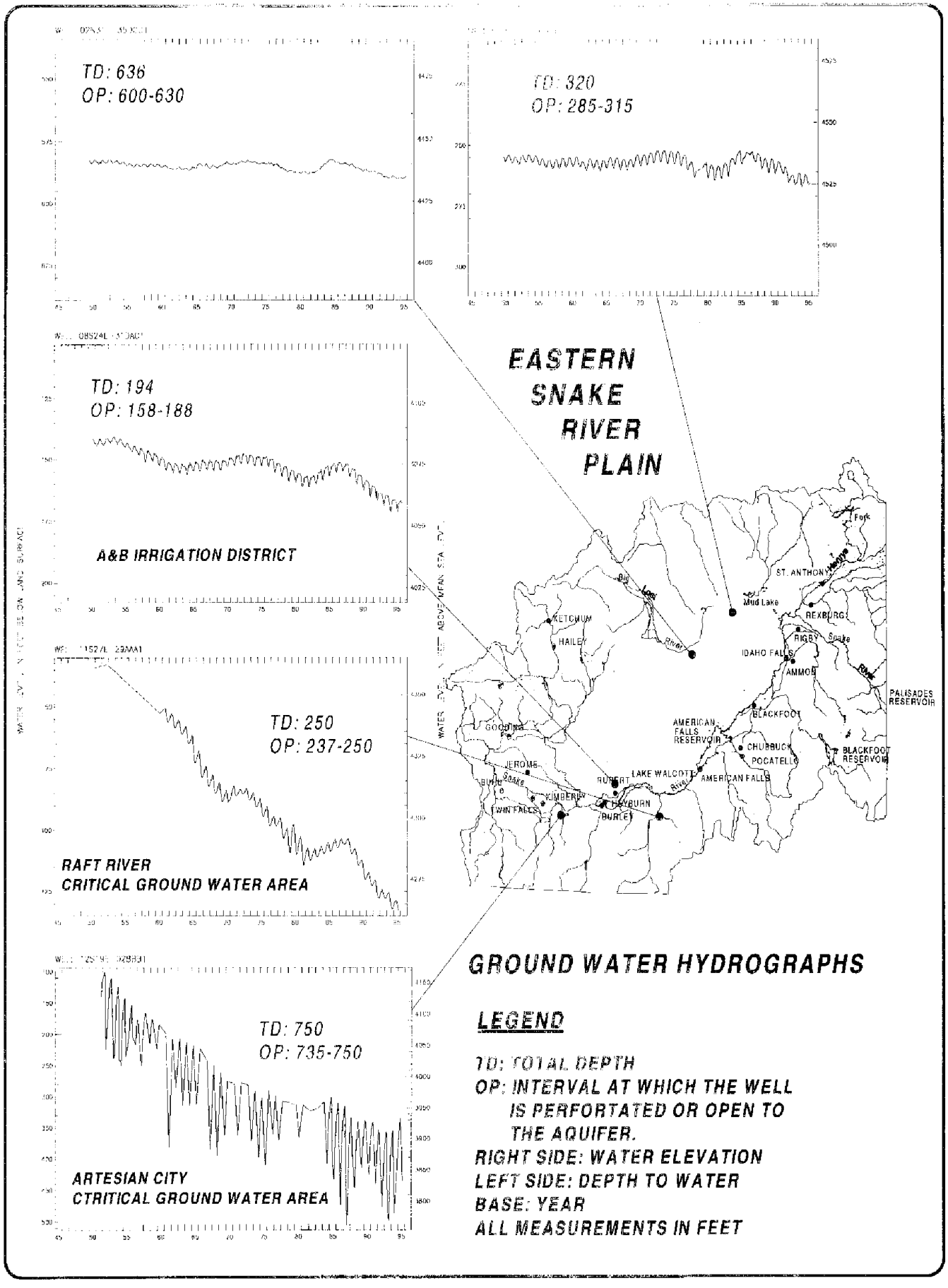

Figure 13. Upper Snake Ground Water Hydrographs

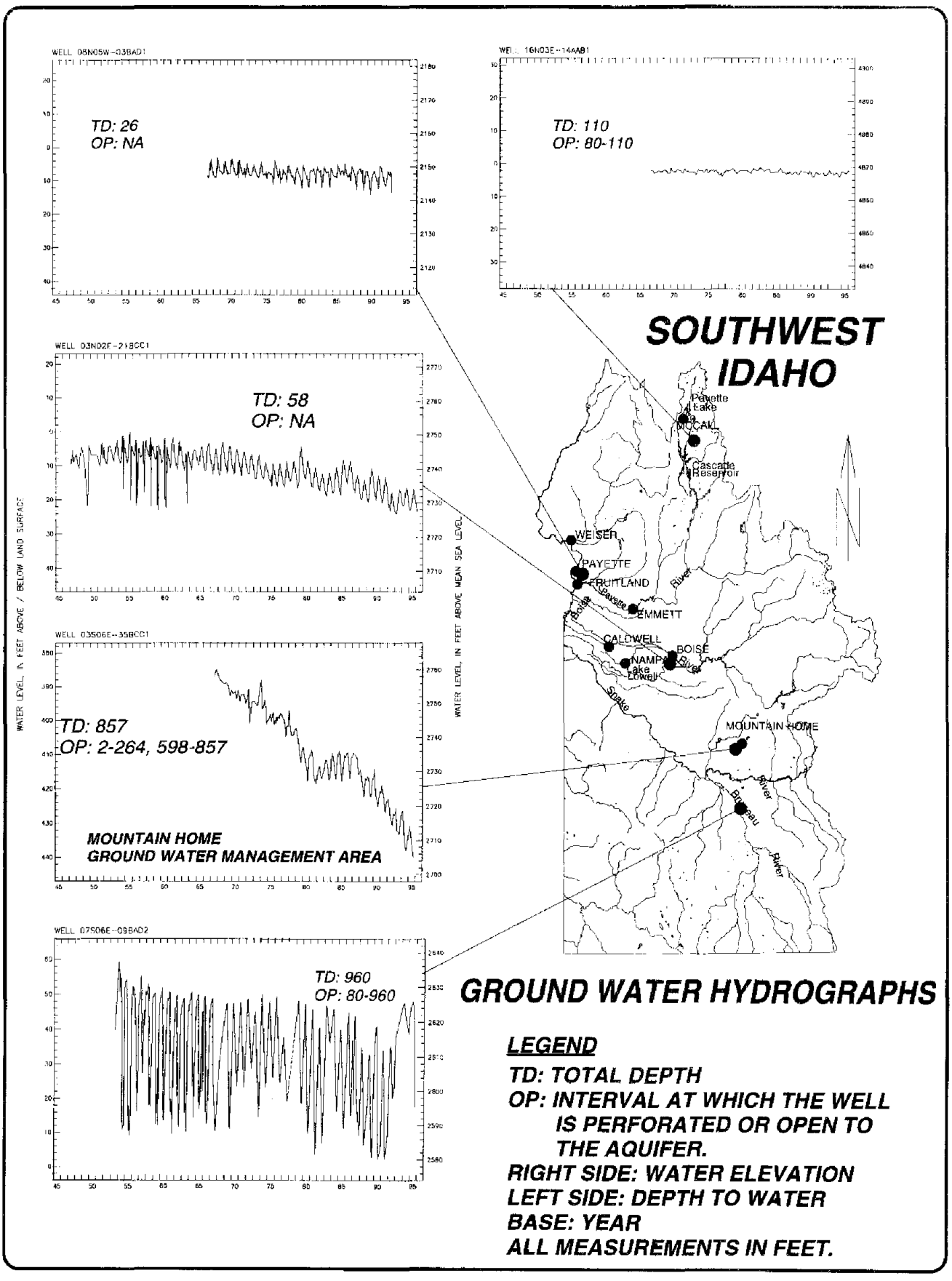

Figure 14. Southwest Idaho Ground Water Hydrographs

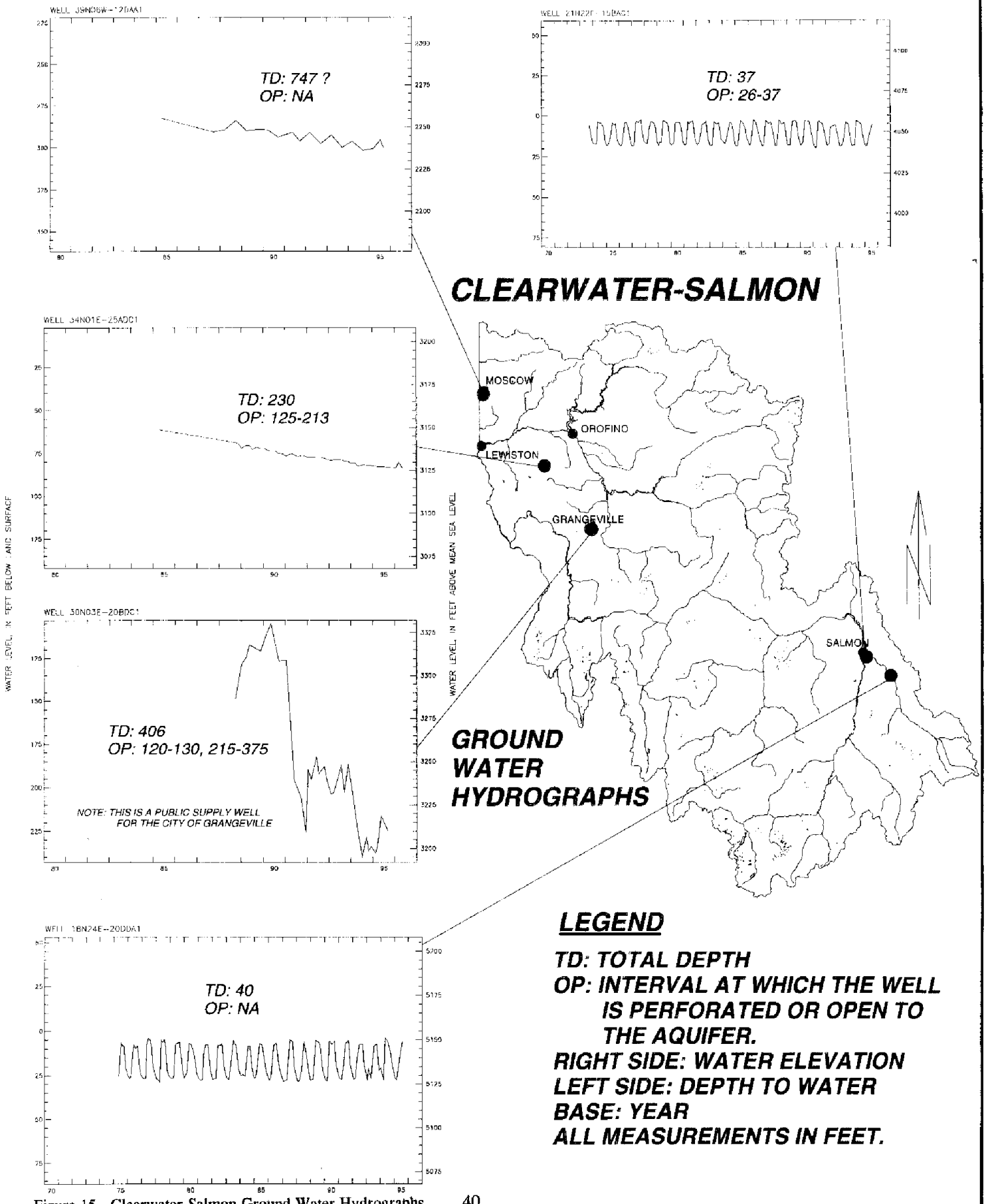

Figure 15. Clearwater-Salmon Ground Water Hydrographs

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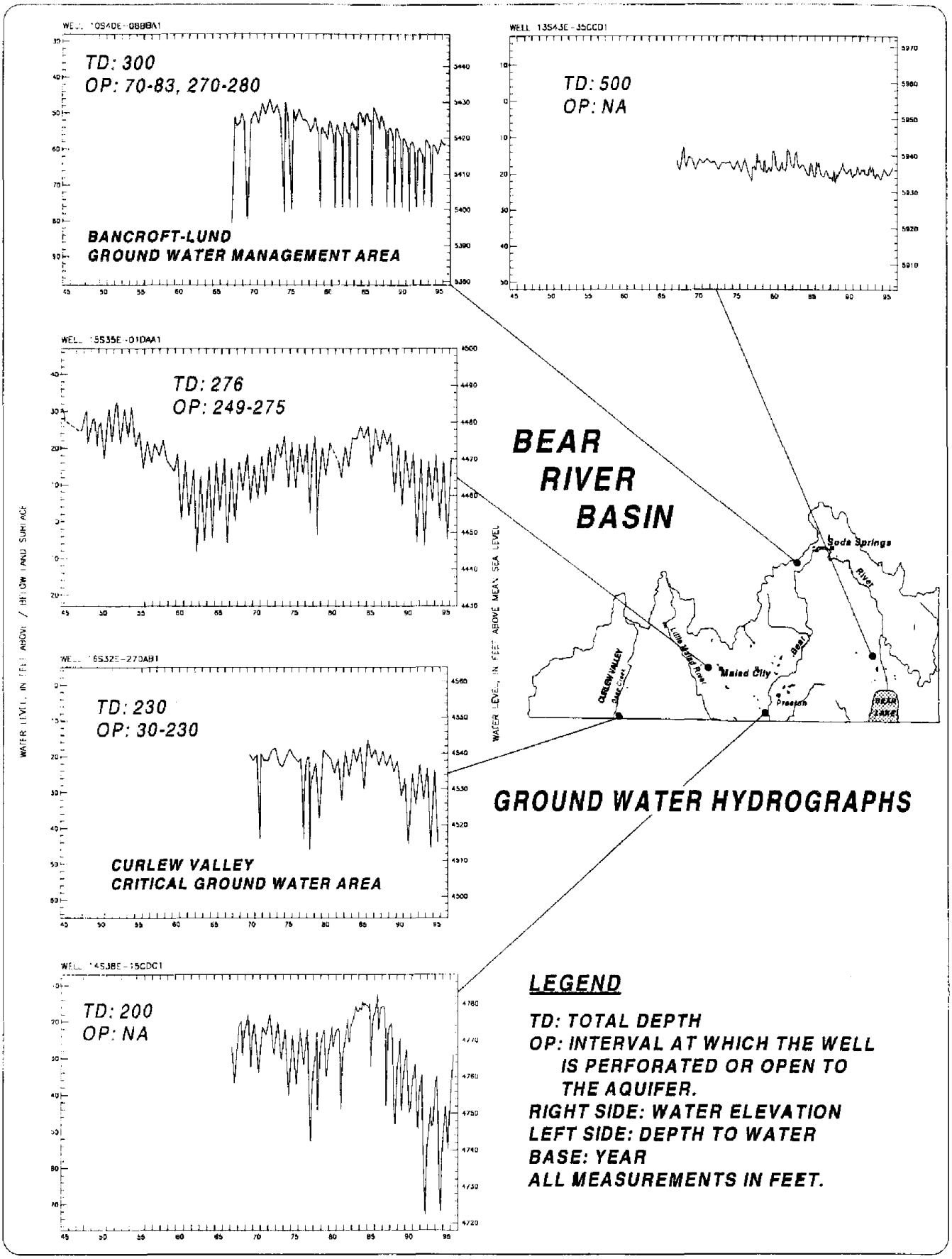

Figure 16. Bear River Basin Ground Water Hydrographs

Adjacent mountain ranges are underlain with clastic sedimentary rocks. Wells in these aquifers generally have low yields which vary from a few gallons per minute to several hundred gallons per minute in areas that are well fractured (State of Utah, 1992). Malad Valley appears to have significant ground water potential, with the major ground water recharge coming from the Little Malad River.

PANHANDLE BASINS

In the northern Panhandle, Precambrian metamorphosed sediments of the Belt Supergroup dominate. The most productive aquifer in the Panhandle area underlies the Rathdrum Prairie in northern Kootenai County. The prairie overlies a glacial basin filled with coarse sediments. Around the border of the prairie are depressions occupied by lakes with no surface outlet. No streams flow across the prairie, and only the Spokane River along the extreme southern edge maintains a perennial flow. An estimated half-million acre-feet per year of groundwater is discharged to the Spokane River from the Rathdrum Prairie.

Ground water recharge is by infiltration of rain and melted snow on the prairie, seepage from the marginal lakes, several small streams which drain onto the prairie, and by percolation of irrigation water. Depth to water ranges from 125 feet at the Washington State line to 500 feet near the northern edge of Kootenai County. Wells may yield 1,000 to 3,000 gallons per minute. Hydrographs of selected wells in the Panhandle are shown in Figure 17.

Ground water supplies in Panhandle valleys are generally reliable, but yields are small because of lower permeability. Fine-grained lake bed and glacial deposits in the Kootenai and Priest River valleys and in the Sandpoint area limit ground water development. Alluvium along the St. Joe and St. Maries River in Benewah County yields domestic and small municipal supplies from shallow depth. Abundant recharge keeps the water-bearing deposits filled during most years so that some areas become water logged.

GEOTHERMAL RESOURCES

The U.S. Geological Survey and the Idaho Department of Water Resources have each delineated geothermal resource areas in Idaho based on the location of known hot springs or wells and geology (Fig. 18). There are 258 hot springs and 641 hot wells identified in the state, chiefly in southern Idaho. Table 7 lists U.S. Geological Survey designated Known Geothermal Resource Areas. The majority of springs and wells in Idaho register surface temperatures under 90°C. Maximum subsurface temperatures range from 125° to 200°C.

Table 7. Known Geothermal Resource Areas in Idaho.

	Measured Surface Temperatures
Yellowstone/Island Park	26°C
Raft River	92°C
Bruneau	47°C
Mountain Home	60°C
Castle Creek (Grand View)	85°C
Crane Creek	92°C
Vulcan Hot Springs	84°C

Source: Mitchell, et al., 1980.

REFERENCES

Mitchell, J.C., L.L. Johnson, and J.E. Anderson, 1980. Geothermal Investigations in Idaho. Water Information Bulletin No. 30. Boise, ID: Idaho Department of Water Resources.

State of Utah, 1992. Utah State Water Plan: Bear River Basin. State of Utah Department of Natural Resources, Division of Water Resources. January 1992.

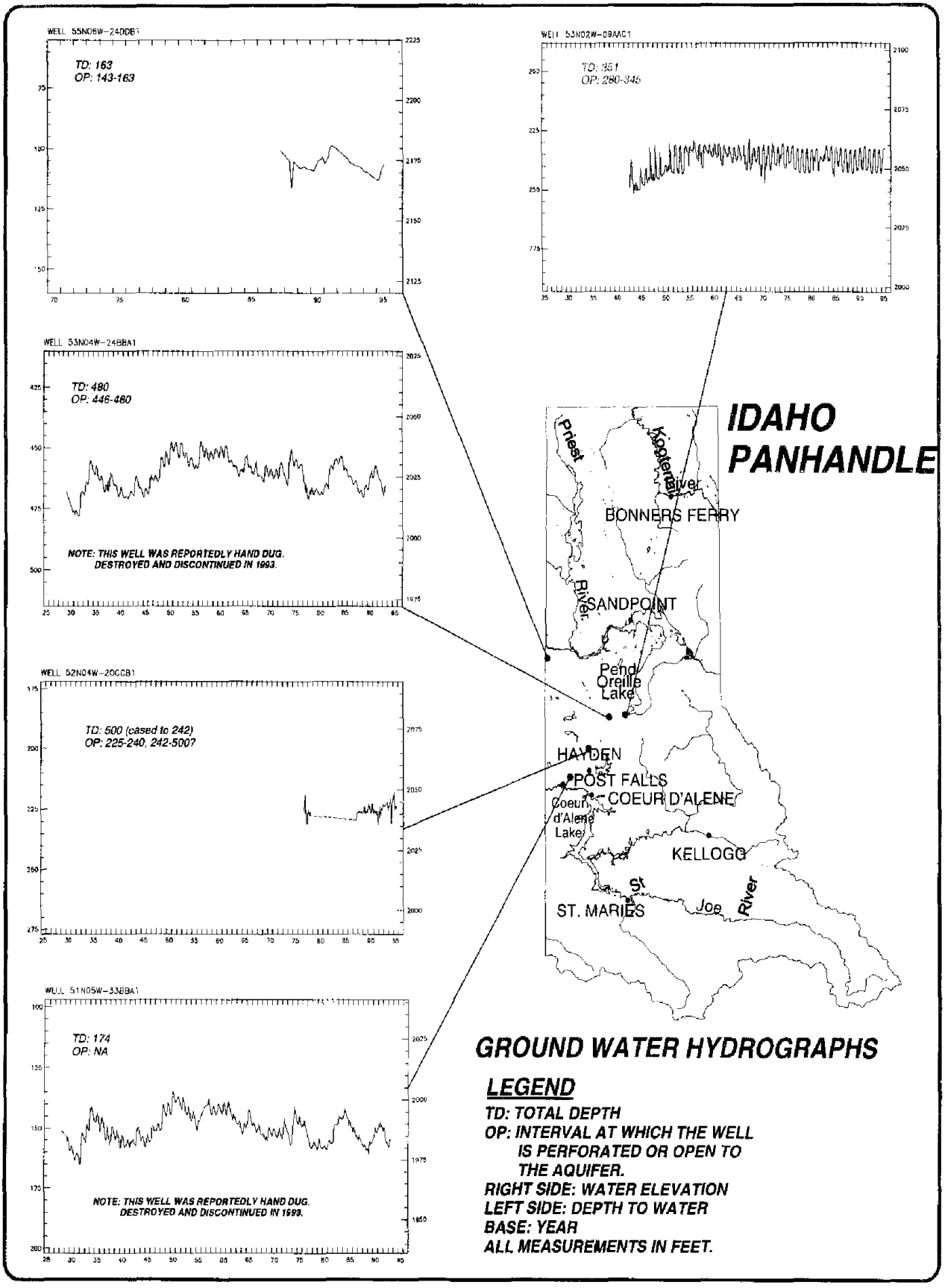

Figure 17. Idaho Panhandle Ground Water Hydrographs

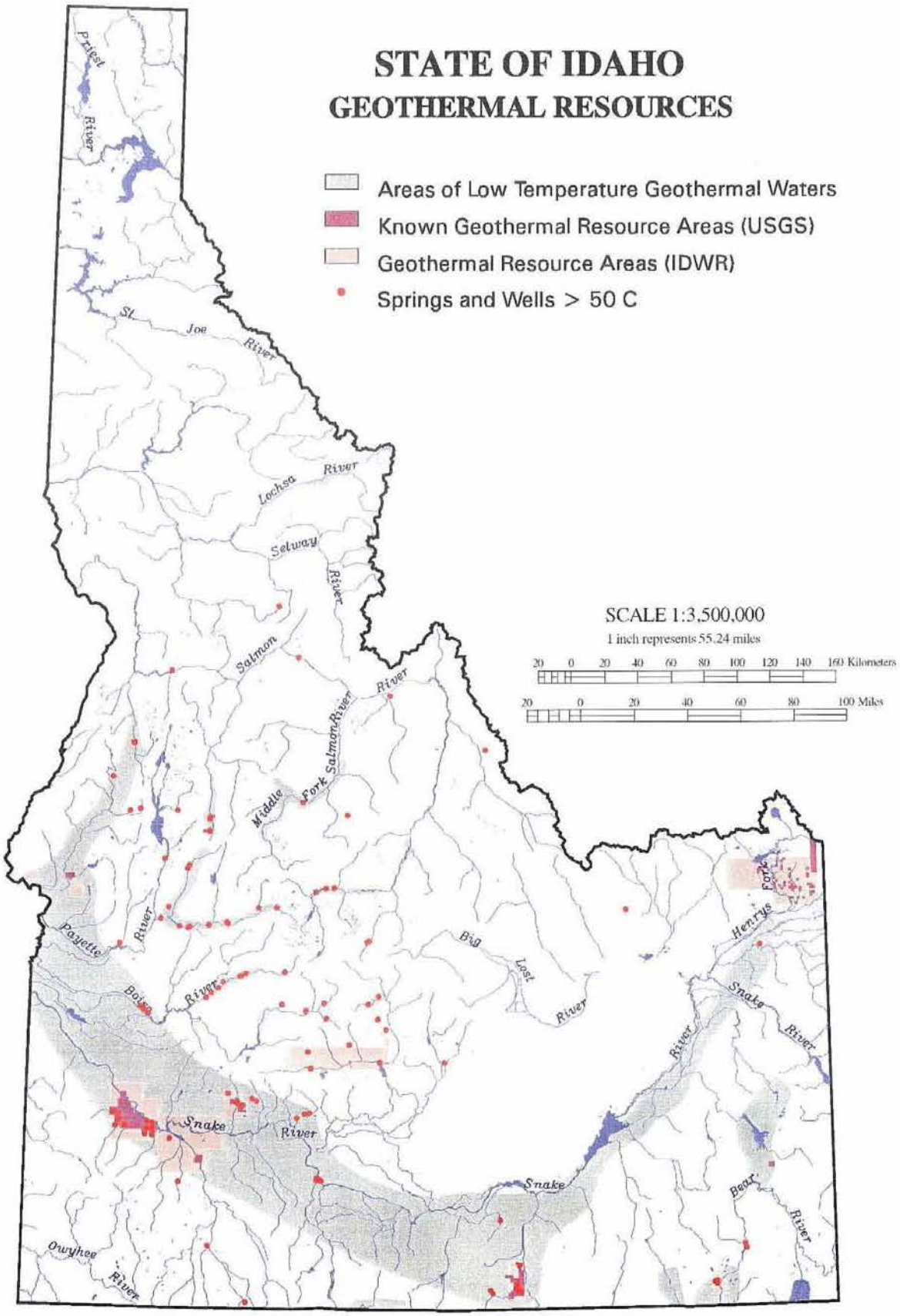

Figure 18. State of Idaho Geothermal Resources

Floods and Drought

Floods have been the most serious, devastating and costly natural hazard to affect Idaho. Most Idaho residents live near rivers which are subject to periodic flooding. Floods occasionally cause loss of lives and frequently damage roads, farmlands, and structures. Flood waters also erode sediments from hill slopes and transport the sediment in the river channel. The resulting siltation decreases the carrying capacity of the channel, decreases reservoir storage capacity, degrades fish habitat, and may change the course of a stream, or introduce chemicals into the stream.

Although the effects of a drought are more subtle than those of a flood, they are of no less concern. Droughts decrease stream flow, the availability of water for storage in reservoirs, and ground water storage. Farmers who rely on natural precipitation or stream flow for irrigation experience crop losses. Another drought concern is water quality degradation. Low stream flow and a subsequent increase in water temperature may cause fish kills. Finally, because most electrical energy in Idaho is generated by hydropower, droughts that cause decreased river flows and storage in reservoirs can result in increased power costs.

IDAHO FLOODS

Floods in Idaho vary greatly in cause, patterns of flow, frequency, and magnitude. A few streams in Idaho are subject to almost annual flooding, but in most areas flooding is much less frequent. Figure 19 shows the most flood susceptible areas in the state. Table 8 briefly summarizes flood events in Idaho.

Idaho floods are caused by frontal system or convective thunderstorm rainfall, spring snow melt, and ice jams in river channels. The major cause of flooding is spring snow melt. Floods caused by spring snow melt tend to last for a period of several days to several weeks, while floods caused by other sources persist for a much shorter duration. Floods that result from rainfall on frozen ground in the winter, or rainfall associated with a warm, regional frontal system that also rapidly melts snow at low and intermediate altitudes, can be the most severe.

Flooding from ice jams is relatively common in Idaho. Ice-jam formation depends on air temperature and physical conditions in the river channel. On small drainages, the most severe floods are usually a result of rainfall on frozen ground. Moderate quantities of warm rainfall on a snowpack, especially for one or more days, can result in rapid runoff and flooding in streams and small rivers.

Table 8. Major Floods in Idaho, 1894-1996.

Year	Area Affected	Recurrence Interval (Years)
1894	Statewide	Unknown
1927	Upper Snake Basin	Unknown
1933	Spokane River Basin	40 to >100
1943	Boise and Payette basins	Unknown
1948	Northern and western Idaho	20 to 50
1955	Southwest Idaho	Unknown
1959	Boise River Basin	>100
1962	Southern and eastern Idaho	20 to >100
1963	Portneuf and Clearwater basins	Unknown
1964	Statewide at low elevations	20 to >100
1974	(Jan) Northern and central Idaho	25 to >100
1974	(June) Statewide	40 to >100
1976	Eastern Idaho	Unknown
1984	Eastern and central Idaho	50 to >100
1986	Bear River Basin	50 to >100
1996	Northern Idaho	50 to >100

Source: U.S. Geological Survey, 1991.

Although meteorological conditions favorable for short-duration warm rainfall are common, conditions favorable for long-duration warm rainfall are relatively rare. Occasionally, however, the polar front becomes situated along a line from Hawaii through Oregon, and a flow of warm, moist, unstable air moves into the region. Most winter floods develop under these conditions as was the case with the northern Idaho floods of 1996.

Snake River

Only a relatively small portion of the Snake River Basin is susceptible to flooding, however, many of the flood-prone areas are intensively populated. Floods seldom cause loss of life, but can extensively damage land and buildings, highways, railroads, irrigation facilities, and utilities. Past flood events indicate that spring snow melt causes the most severe and extensive flooding. However, the largest recorded flood and most extensive flood damage in the basin occurred as

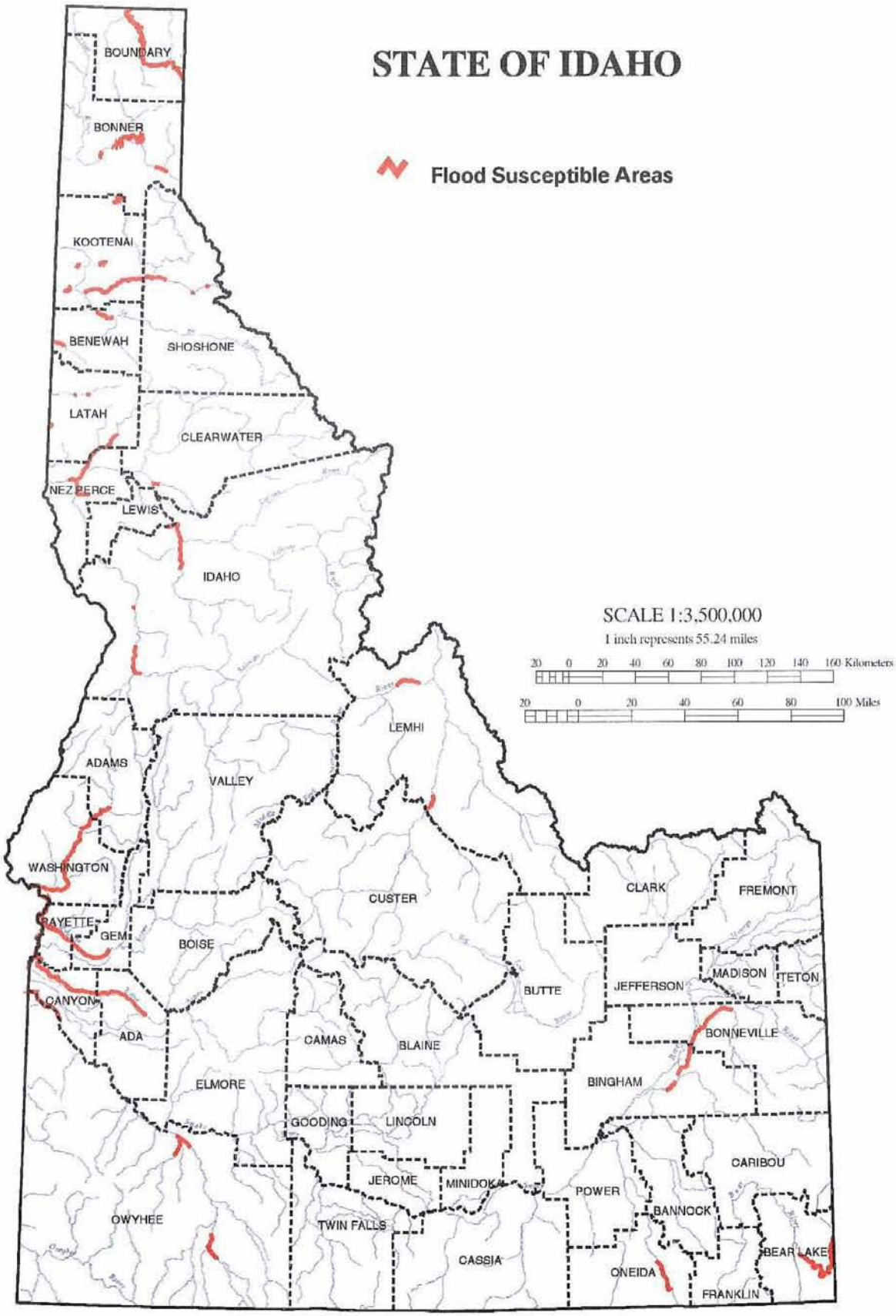

Figure 19. State of Idaho Flood Susceptible Areas

a result of the Teton Dam failure on June 5, 1976. Flood damage along the Snake River, for the most part, is confined to the flood plain between Heise and American Falls Reservoir. The safe channel capacity of the Snake River in this reach varies from 15,000 cfs to 30,000 cfs. Since the completion of Palisades Dam in 1957, flows in excess of 25,000 cubic feet per second at the Heise gauge have occurred on four occasions, with a maximum flow of 27,000 cfs on June 18, 1986. Near Shelley, flows have exceeded 25,000 cfs on eight occasions since 1957, (excluding the Teton Dam flood), with a maximum flow of 30,000 on June 13, 1984.

Snake River floods generally occur in the months April through June, primarily from snow melt in the upper basin. Late spring or summer snow melt floods typically occur as a series of high flows for periods of days or weeks. They can be compounded by warm spring rains that increase snow melt rates and contribute directly to runoff.

Regulation of the Snake River and some tributaries significantly reduces natural flood flows. Jackson Lake Dam, completed in 1909, was the first water project to help reduce flood peaks in the basin. Jackson Lake in Wyoming provides incidental reduction of Snake River flood peaks averaging about 5,500 cubic feet per second, varying from 0 to 8,500 cfs. The combined capacity of reservoirs in the basin is approximately 11 million acre-feet. However, only a few dams were constructed for stated flood management benefits. Reservoirs that function for other purposes reduce flood flows through informal flood control operation or incidental storage of flood waters. These projects have an aggregate storage capacity of 4.1 million acre-feet.

Under a plan formulated by the Bureau of Reclamation, the Corps of Engineers, and other interested groups, all but the larger Snake River floods are regulated to about 20,000 cfs or less near Heise, and the extreme flood will be reduced to the maximum practical extent. Jackson Lake Dam and Palisades Reservoir reduce the estimated 100-year unregulated flood flow of 68,000 cfs at Heise to about 30,000 cfs (U.S. Army Corps of Engineers, 1988). Palisades Dam, completed in 1957, provides flood peak reduction averaging about 16,800 cubic feet per second per year, varying from 0 to 30,000 cfs (Wirkus, 1996).

Levees protect flood-prone land between Heise and Roberts, near Shelley, and near Blackfoot. However, the stream bed materials, low banks, and gradient induce river meanders. Major channel shifts could unpredictably impinge the levees. Localized winter flooding caused by ice jams is also a problem in this reach.

American Falls has afforded major regulation of Snake River flood flows, although little flood damage is experienced from the dam to Milner. This stretch of the river consists of a series of irrigation diversion pools and canyon reaches. The Snake River, between Milner Dam and King Hill, flows through a deep narrow canyon cut in the Snake River Plain. Developed land adjoining the river is generally above the elevation of flood discharge. Idaho Power's reservoirs, or pools, within the reach are for power generation and have no flood storage allocation. There are no levees below American Falls Dam.

Most of the Snake River between King Hill and the Boise River confluence is located in a canyon with little flood plain for development. Storage reservoirs and diversions in the Upper Snake Basin reduce flood flows at the Swan Falls gage by approximately 40,000 cfs. However, major floods have inundated large areas of highly developed agricultural lands along the 65 mile reach between Homedale, and Weiser, Idaho. At the Weiser gage, discharge in excess of 70,000 cfs, which results in overbank stages, has been exceeded three times since 1960.

Major Snake River Tributaries

In the Henrys Fork area, flooding is usually the result of spring snow melt. Flood damage occurs along the lower 22 miles of the Henrys Fork and along the Teton River near Rexburg. Upstream irrigation reservoirs and large irrigation diversions reduce the magnitude of spring and summer flood peaks on the Henrys Fork. However, the bankfull capacity of the lower Henrys Fork is approximately 5,000 cfs, and a flow of 9,000 cfs causes a general inundation of this reach. Flows exceeding 9,000 cfs have occurred on 12 occasions since 1960. A May 1984 flood of 16,400 cfs is the largest recorded flow on the river.

Floods on the Teton River are almost an annual occurrence. The Teton River also has a history of ice jam flooding. With the exception of the Teton Dam failure, flood damage along the Teton River and in

several other smaller basins in eastern Idaho probably was the most severe ever recorded during February 10-14, 1962. Floods flows resulted from prolonged light rainfall, moderate snowpack at low altitudes, warm days and nights and deeply frozen ground.

Camas and Beaver Creeks are sources of surface inflow to Mud Lake, which has no effective outlet other than irrigation canals, evaporation, and seepage. Lands along Camas Creek near the lake and along the south side of the lake have flooded. If the volume of inflow exceeds the available storage capacity of the lake, locally constructed dikes around the lake fail and permit flooding of farm areas south of the lake. The Mud Lake flood plain is principally in crops. Portions of residential and associated developments in the communities of Terreton and Mud Lake, on the fringe of the flood plain, may suffer minor damages under extreme flood conditions.

Flooding occurs in reaches along the entire length of the Portneuf River downstream from Portneuf Reservoir and along Marsh Creek. Upstream floods damage agricultural lands as well as the towns of Bancroft, Lava Hot Springs and Inkom. Protection of the Pocatello area is afforded by a rectangular concrete channel through the city with riveted levees on both ends where development is less extensive. The normal bankfull channel capacity of 1,000 cfs has been exceeded 13 times since 1970, with a maximum flow of 2,870 cfs on May 17, 1984. A 1988 Army Corps of Engineers Preliminary Report on the Portneuf River examined constructing multiple purpose storage reservoirs, and enlarging the river channel. The study found that these proposals were not economically justified.

Flood damages in the Wood River basin have occurred primarily in a reach extending from Ketchum to Bellevue, near Gooding, and at Carey and Shoshone. The agricultural lands subject to flooding in the Big and Little Wood valleys are used primarily for pasture, hay, and grains. The more frequent flood problems and damages in urban areas, particularly at Gooding, have been due to ice in the channel severely constricting flows.

In the Boise River Basin the magnitude of flood flows have been diminished by irrigation diversions and storage reservoirs. However, agricultural lands downstream of Boise and flood plain homesites in the city are still subject to periodic flooding in high runoff years. Additionally, floods that emanate from drainages off the Boise Front can damage industrial, residential, and agricultural properties. Thunderstorms on the foothills north and east of Boise in August and September, 1959, carried large quantities of mud, rocks, and debris into the city. The foothill slopes had been denuded by fires.

Major flooding of the Weiser River has occurred five times since 1953. Fairgrounds at the town of Cambridge and a portion of the area south of town are located in the river's flood plain. However, the majority of the flood damage has been to agricultural enterprises in the lower 13 river miles of the Weiser River from the Galloway Diversion to the mouth of the river near the City of Weiser. Incidental storage in Crane Creek and Lost Valley reservoirs reduces peak flows by an estimated 3,600 cfs.

The largest flood of record on the lower Clearwater River is 177,000 cfs at Spalding on May 29, 1948. Significant flood events occurred in 1972, 1974, the year of greatest total runoff on record, and 1996. The 1974 and 1996 floods were similar; late winter mild weather with heavy rains on relatively low-elevation snowpacks. Ice jams contributed to extensive overbank flooding.

Flood flows In the Clearwater Basin frequently damage residential and commercial buildings in the cities of Orofino, Stites, and Kooskia on the main stem of the Clearwater. Towns on tributary streams, are also subject to damages. Highway and railroad bridges and roadbeds can be undercut and washed out. Lumber operations are frequently damaged and logs are lost.

Flood control is an important function of the Dworshak project on the North Fork Clearwater. The reservoir is managed to alleviate flooding below Ahsahka, and is a part of the regional flood control system of the Columbia River Basin. Dworshak regulation is considered essential in limiting flood waters to 150,000 cfs or less through Lewiston.

Bear River Basin

Flooding has been a common occurrence in the basin for many years, but the resulting damages have been moderate. Spring snow melt flooding in the Bear River Basin periodically exceeds stream channel capacity, and overflows onto adjacent low lands. More

serious damage occurs when heavy rain falls on frozen ground and/or a heavy snow pack. Thunderstorms are common during the summer and fall months. These produce localized cloudburst flooding. The total volume of water produced by this type of storm is relatively small, although the instantaneous runoff rate is high.

The Bear River and several tributaries had record floods in June 1986. The peak discharge of record for the Cub River near Preston on June 4 exceeded the discharge that is likely to occur once in 100 years. The discharge of the Bear River flowing from Idaho into Utah may have been the greatest since 1907.

PacifiCorp's regulation of flows at Bear Lake has reduced the impact of flooding virtually every year on the mainstem of the Bear River below Bear Lake. Bear Lake is operated to provide an annual pre-runoff storage volume equal to twice the average annual runoff. The Corps of Engineers (1991) estimated average annual damages from flooding, and analyzed structural control measures in the basin. Most of the damage from floods has been to agricultural land and property. Damages from thunderstorms are usually in the form of erosion and sediment deposition. Dry cropland areas in the basin are most susceptible to this type of damage.

Panhandle Rivers

Flood prone lands constitute a significant portion of the Panhandle basins. The Spokane, Kootenai, and Pend Oreille basins have a long history of major flood events. However, the greatest potential damage is usually not along major rivers, but along tributary streams. Minor tributaries have steep gradients and damages are generally the result of flash floods. Placer Creek, a tributary of the South Fork Coeur d'Alene River, has flooded the town of Wallace seven times in the last century.

Despite severe flood damage in 1996, the January 1974 flood was the largest of record in the Panhandle basins. Similar to the 1996 flood event, mild temperatures and intense rainfall on low-altitude snowpack caused extreme flooding in northern and central Idaho.

In the Spokane River Basin flooding occurs mainly along the low-lying lands adjacent to tributary streams above Coeur d'Alene Lake in the Coeur d'Alene and St. Joe River valleys. Property damage around Coeur d'Alene Lake has been negligible, but 25,000 acres were inundated in 1933; property in the city of Coeur d'Alene and a number of summer homes and resorts on the lake were damaged.

The Spokane River Basin above Coeur d'Alene Lake is unregulated by storage structures. The maximum flood of record on the St. Joe River occurred in 1933 and in 1974 on the Coeur d'Alene River. About 55 miles of levees along the lower Coeur d'Alene River, the St. Joe River, Pine Creek, and other minor tributaries protect over 4,000 acres of land adjacent to rivers and streams from flood events. However, levees in the vicinity of St. Maries failed in 1948, 1956, and 1996. A levee at Coeur d'Alene protects the city against high lake levels.

Major flooding on the Kootenai River is usually the result of melting snow pack. Libby Dam regulation controls all but about one percent of floods originating from the Kootenai River. A 100-year flood can be controlled by the dam to a 27-foot stage at Bonners Ferry. Levees have been constructed at many locations on both major and minor streams in the basin. Over 95 miles of levees protect 32,000 acres along 51 river miles in the Idaho portion of the basin. Levees protecting Kootenai Flats are effective up to a river stage of 35 feet at Bonners Ferry.

Flooding in the Pend Oreille Basin occurs along the river lowlands and tributaries. Damages have been largely to grain crops and pasture land with some low lying road and buildings affected around Lake Pend Oreille. Calispell Creek, a tributary of the Pend Oreille, had major flooding in 1948, 1951, 1952, 1956, and 1996.

FLOOD MANAGEMENT

There are a number of structural and nonstructural measures in place to reduce flood caused damages. Structural measures refer to structures or facilities constructed to reduce or divert flood flows, while nonstructural measures refer to programs that do not rely on structures or facilities. Structural projects for flood damage reduction in Idaho consist of reservoirs, levees, and stream channel alteration. Storage projects and levees in the state protect an estimated 250,000 acres from damage by a 100-year flood event (PNRBC, 1971).

Thirteen Flood Control Districts exist in the state (Table 9). Flood Control District goals include (1) constructing or proposing projects to reduce flooding, (2) protecting and maintain present flood works, and (3) discouraging development in the flood plain. The first Flood Control District, No. 1, was organized in Jefferson and Madison counties in 1946. More recently Flood Control Districts have been established for the Raft and Goose Creek drainages.

Table 9. State of Idaho Flood Control Districts, 1996.

#	Stream	Counties
1	Snake River	Madison, Jefferson Bonneville, Bingham
2	Little Wood River	Blaine
3	Weiser River	Adams, Washington
4	Abolished	
5	Mud Lake	Jefferson
6	Whitebird Creek	Idaho
7	Blackfoot River	Bingham
8	Abolished	
9	Wood River	Blaine
10	Boise River	Ada, Canyon
11	Boise River	Canyon
12	Thomas Fork	Bear Lake
13	Dissolved	
14	Does not exist	
15	Raft River	Cassia
16	Goose Creek	Cassia
17	Twin Lakes-Rathdrum	Kootenai

Nonstructural flood damage reduction measures do not attempt to control flood flows, but try to reduce damage in other ways. Projects include flood forecasting, watershed improvement, land use zoning within flood plains, and the national Flood Insurance Program. Land use zoning within the flood plain is perhaps the most cost-effective method of reducing flood damages. By prohibiting inappropriate construction within flood plains, local communities can prevent future flood damages.

Watershed improvement projects experiment with land mangement methods and small water projects to reduce surface runoff and slow peak flood flows on rangeland, farmland, and forest land. The Natural Resources Conservation Service is currently undertaking a number of these projects.

Communities must adopt Federal Emergency Management Agency (FEMA) acceptable flood plain zoing regulations to participate in the National Flood Insurance Program. Most counties and incorporated cities with the state participate in this program (FEMA, 1996).

LANDSLIDES

In Idaho, landslides and debris flows related to flood events may damage property and infrastructure more than inundation by flood waters. Landslides in 1996 and 1997 destroyed numerous road sections along state highways and many other roads. Landslides and debris flows moving down side canyons also caused a considerable amount of damage to public and private property. Water plays an important role in landslides and debris flows; it is often the critical factor that triggers the downslope movement.

The role of water in causing landslides and debris flows needs to be studied. The Idaho Landslide Task Force, formed in 1997, will gather information on recent landslides, review this information, prepare maps of slide-prone areas, and develop a summary report containing recommendations to minimize future landslide damage.

DROUGHT

Droughts are less frequent than floods, but can be far more devastating to the economy of the state as a whole. The Palmer Drought Index shows that a meteorological drought has existed in the state during one-third of the period from 1931 through 1982 (Karl et al., 1983). Major droughts during the past several decades generally were the result of an unseasonable northward displacement of the Pacific high-pressure system or the positioning of a polar front at much lower latitudes than usual. Principal droughts in Idaho, indicated by stream flow records, occurred during 1929-41, 1944-45, 1959-61, 1977, and 1987-92. Table 10 summarizes major drought events in Idaho.

The most prolonged drought in Idaho was in the 1930s. Runoff in the Snake River at Weiser was less than average from 1931 to 1937. For most of the State the 1929-41 drought lasted for 11 years despite greater than average stream flows in 1932 and 1938. However, in northern Idaho, the drought was interrupted by greater than average stream flows from 1932 until

Table 10. Major Droughts in Idaho, 1894-1996.

Years	Area Affected	Recurrence Interval (Years)
1929-41	Statewide	>50
1944-45	Northern and central Idaho	10 to >25
1959-61	Southern and central Idaho	10 to >25
1977	Statewide	10 to >25
1987-92	Statewide	25 to >50

Source: U.S. Geological Survey, 1991.

1937. The drought ended in most of the State in 1942 but continued in northern Idaho until 1946.

Figure 20 illustrates the general sequence of wet and dry periods in the eastern portion of the Snake River Basin at Heise, in the southwestern portion at Twin Springs in the Boise River system, and in the northern portion of the basin at Whitebird on the Salmon River. These locations were selected because of their relatively long period of record. In each hydrograph the sequence of years of lowest runoff generally occurred between 1929 and 1942. Using the record of the Columbia River at The Dalles, Oregon, the longest record of stream flow data in the Columbia basin, it appears probable that the period in the 1930s was the driest in the past 100 years.

A mild drought during 1959-61 occurred in southern and central Idaho. A period of above normal runoff began in 1965 and continued through water-year 1976. Runoff in 1977 was the lowest of record at most gages in the state. Although the 1977 drought lasted only one year, water supplies were significantly affected. Snake River flow at Weiser on July 1 was 4,570 cfs, the smallest in 68 years of record. The Weiser gage minimum flow was not met on two days in 1977 due to large diversions from the Snake River and very low outflows from the Boise and Payette basins. Domestic wells in the Big and Little Wood River basins became dry early in April 1977, and many shallow wells in six western Idaho counties became dry in June.

Stream flows were again generally below normal from 1979 to 1981; wet conditions returned from 1982-86. From 1987 through 1992 water supplies were much below normal throughout the state. In southwestern and central Idaho, this six year drought was more severe than the 1930s drought. Scant winter

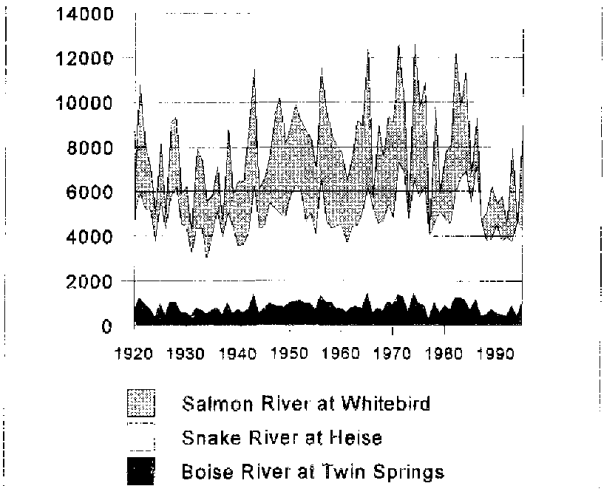

Figure 20. Snake River Basin: annual runoff of Snake River at Heise, Boise River near Twin Springs, and Salmon River at Whitebird, 1920-1995. Runoff in thousand acre-feet.

snowpacks and prolonged periods of greater than average temperatures resulted in unseasonable early snow melt, high water demands, and the lowest stream flows since 1977. Low-flow records were set for many days during the summer of 1987 and again in 1992 at long-term gages on the Boise River at Twin Springs and on the Salmon River at White Bird.

Summertime flows in 1992 at the Weiser gage were below the established minimum on two occasions totaling three days. The Department of Water Resources issued orders curtailing water use by appropriators junior to the 1976 Weiser minimum flow. Minimum annual flows at Weiser are affected by the outflows from the Boise and Payette rivers, which are usually large when Snake River diversions are near their maximums (Fig. 21). However, the 1977 and 1992 events demonstrate that flows can fall below established minimum stream flows in dry years.

Conditions in the Boise River drainage for the 1987 through 1992 period were drier than any other six-year sequence in the basin's hydrologic record. Reservoir contents in the Boise River reservoirs on June 30, 1992 were lower than historic or simulated contents for any June 30th in the record. Conditions in the Upper Snake reservoirs were nearly as bad.

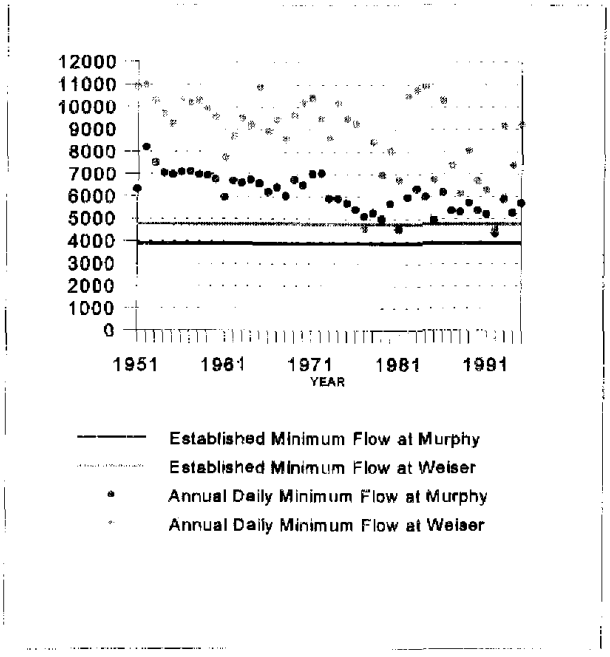

Figure 21. Annual minimum daily discharge of the Snake River near Murphy and Weiser, Idaho, 1951-1995. Flows in cubic feet per second.

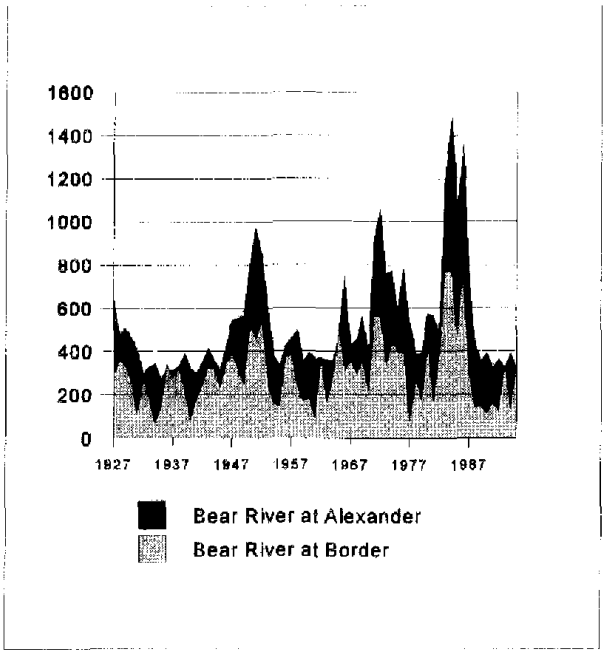

Figure 22. Annual runoff of the Bear River at the Border and Alexander gaging stations, 1927 - 1995. Runoff in thousand acre-feet.

Simulations suggest that in most cases reservoir contents on June 30, 1934 would have been lower than 1992 when current conditions of development are applied to the stream flow record. However, there was little or no carryover storage at the end of the 1992 irrigation season.

Annual runoff for two locations on the Bear River is shown in Figure 22. The period 1931 through 1945 represents one of below average stream flow. Runoff during the period 1966-76 was generally above normal but 1977 was extremely dry. Variable conditions occurred in the following two years, but these were generally also below normal. In 1980 through 1985 stream flows again exceeded the long-term average.

Some areas of the state have a greater potential for drought than other areas. Horn (1987) mapped drought potential for the state based on stream flow regression analysis (Fig. 23). There is a much greater potential for persistent, severe stream flow deficits in areas with larger Drought Potential Index values. Southwestern Idaho and the upper portions of the Snake River Plain appear to have the highest probability for persistent, severe stream flow deficits.

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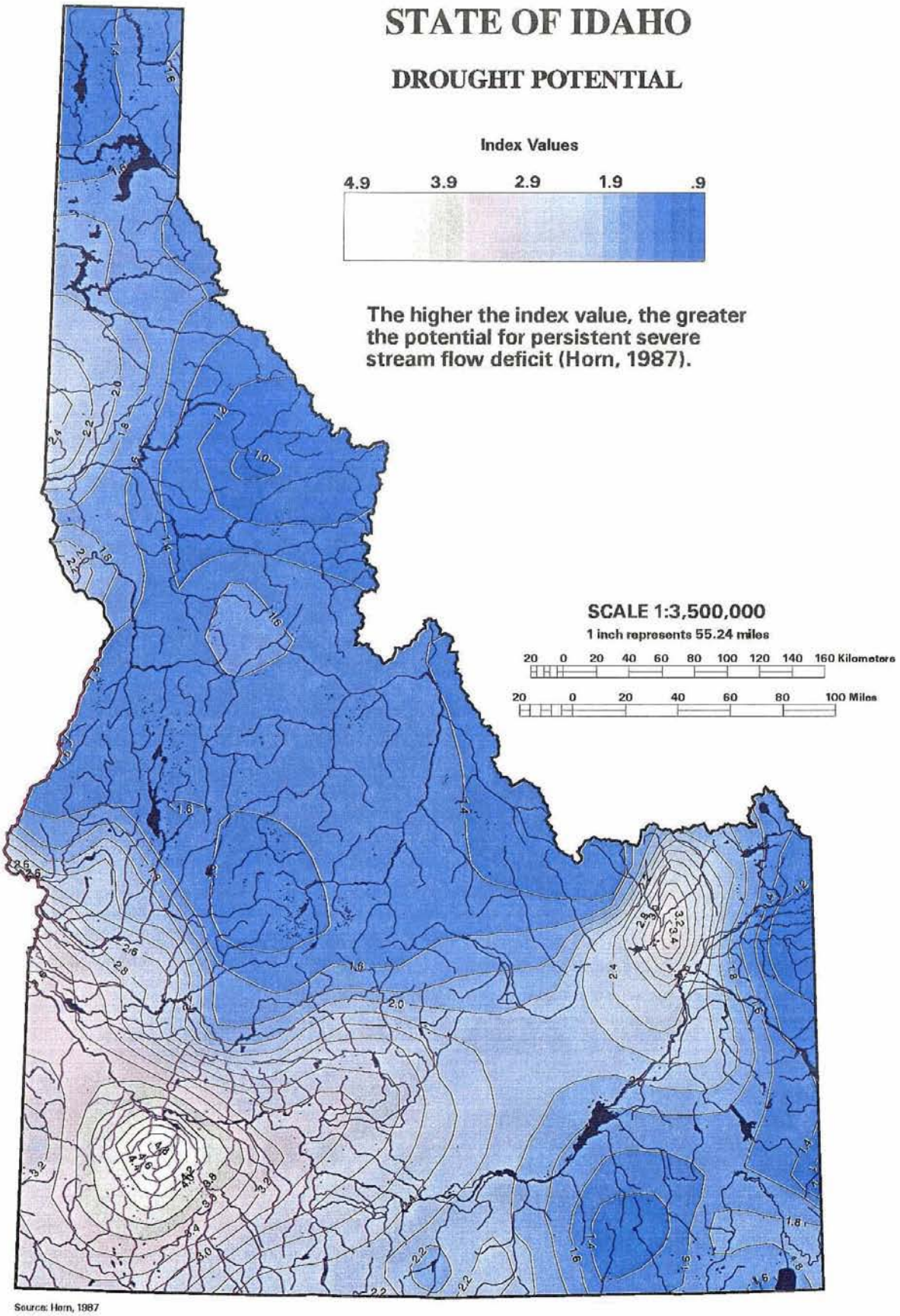


Figure 23. State of Idaho Drought Potential

Water Quality

The quality of water is related to the physical and chemical composition of the natural environment and is further affected through human impacts. Atmospheric water is mildly acidic due to airborne contact with carbon dioxide. As precipitation forms runoff or percolates into the subsurface, it dissolves minerals that are present in soluble forms. The natural or ambient chemical composition of water is formed through this process. Ground water typically contains higher concentrations of the soluble chemicals because of increased contact and travel time.

In general, the ambient quality of Idaho's natural water resources is excellent due to the high quantity of precipitation in the mountains, the relative brevity of travel and exposure times, and the predominance of rock types that are either carbonate-based, or only slightly soluble (silicic and ferro-magnesium rock types). Human activities such as agriculture (crop production and grazing), timber harvest, aquaculture, mining, manufacturing, road building, water storage and stream diversions have a major affect on the quality of Idaho's water resources.

SURFACE-WATER QUALITY

In 1992, the Idaho Division of Environmental Quality (DEQ) reported that two thirds of 16,000 miles of inventoried streams were "water quality limited," either not supporting or only partially supporting at least one designated beneficial use (IDHW-DEQ, 1992). A beneficial use is defined as, "The reasonable and appropriate use of water for a purpose consistent with Idaho state laws and the best interest of the people." Beneficial uses listed in Appendix A of the 1992 Water Quality Status Report include: Cold water biota, warm water biota, primary contact recreation, secondary contact recreation, salmonid spawning, drinking water supply, and agricultural water supply. In 1994, the U.S. Environmental Protection Agency's 303(d) water-quality limited streams list for Idaho included 962 water bodies, 10,700 miles of streams and 357 square miles of lakes (Fig. 24).

Consequently, the Idaho Legislature adopted new water quality statutes in 1995 that implement processes to prioritize watersheds needing pollution management, and to develop water quality action plans through community-based advisory committees (IDHW-DEQ, 1995). The legislation calls for a two-tiered committee approach: Basin Advisory Groups (BAGs) to develop recommendations to DEQ regarding water quality standards and monitoring, pollution budgets and prioritization of impaired waters; and Watershed Advisory Groups (WAGs) to develop and implement watershed action plans. Basin Advisory Groups have been organized for the six major basins of the state (Panhandle, Clearwater, Salmon, Southwest, Upper Snake and Bear River).

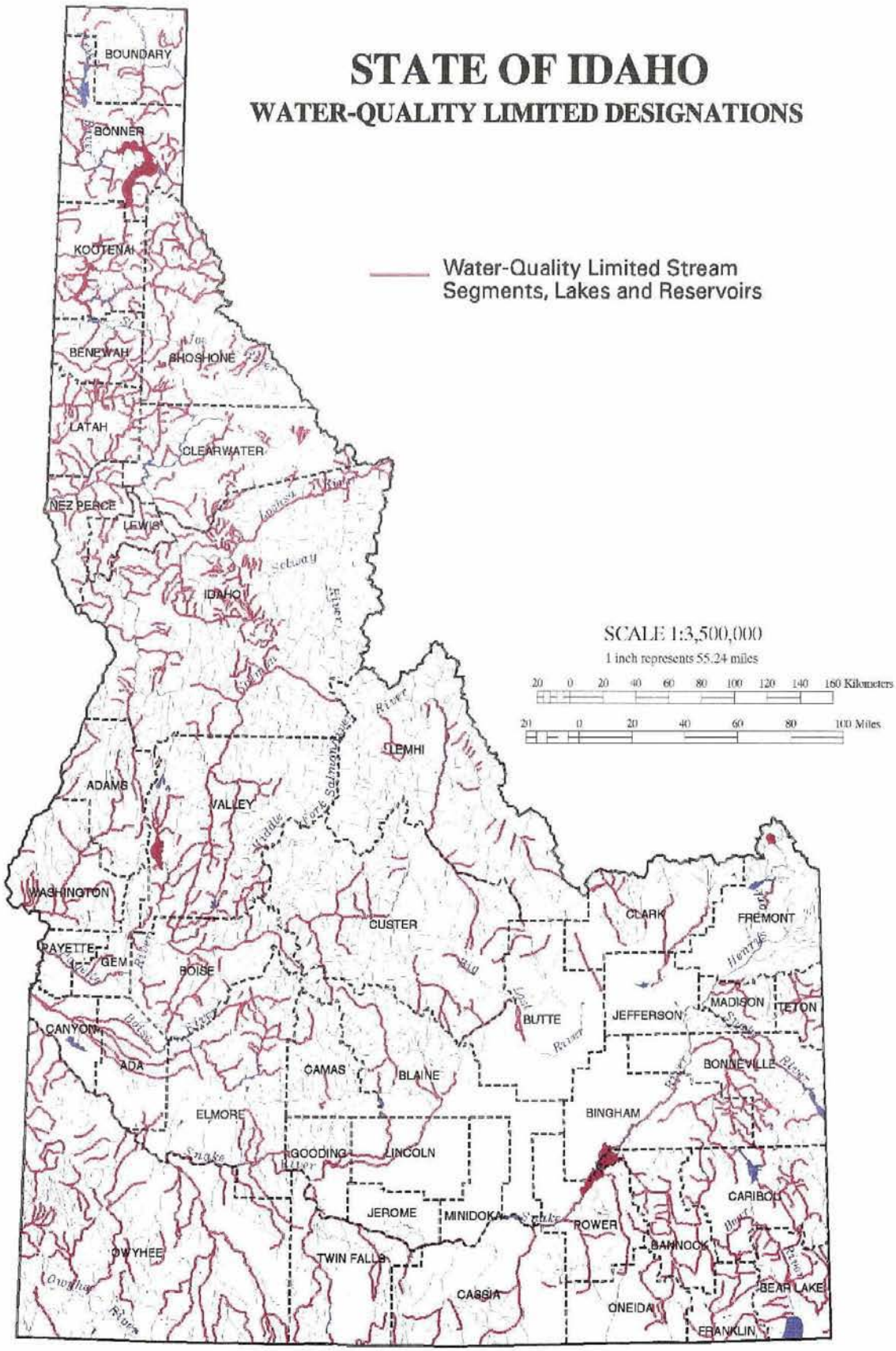
Sixty-two of the water-quality limited reaches were prioritized as high by DEQ, and are eligible for formulation of water quality action plans under the guidance of WAGs. To date, WAGs have been, or are in the process of being formed for the following watersheds:

Priest Lake	Payette Lake
Lake Pend Oreille	Cascade Reservoir
Lake Coeur d' Alene	Lower Payette River
Paradise Creek	Lower Boise River
Potlatch River	Middle Snake
Winchester Lake	Portneuf River
Lemhi River	Henry's Fork

The Idaho Division of Environmental Quality developed a water quality index (WQI) to measure the overall quality of surface waters at the watershed level (IDHW-DEQ, 1988). Constituents or indices of pollution included in the index are temperature, dissolved oxygen, pH, bacteria, trophic status (for system reservoirs), aesthetics, solids, metal toxicity and ammonia toxicity. Based on all station conditions, an overall rating of 0-20 is good, 21-60 is fair and 61-100 is poor (Fig. 25).

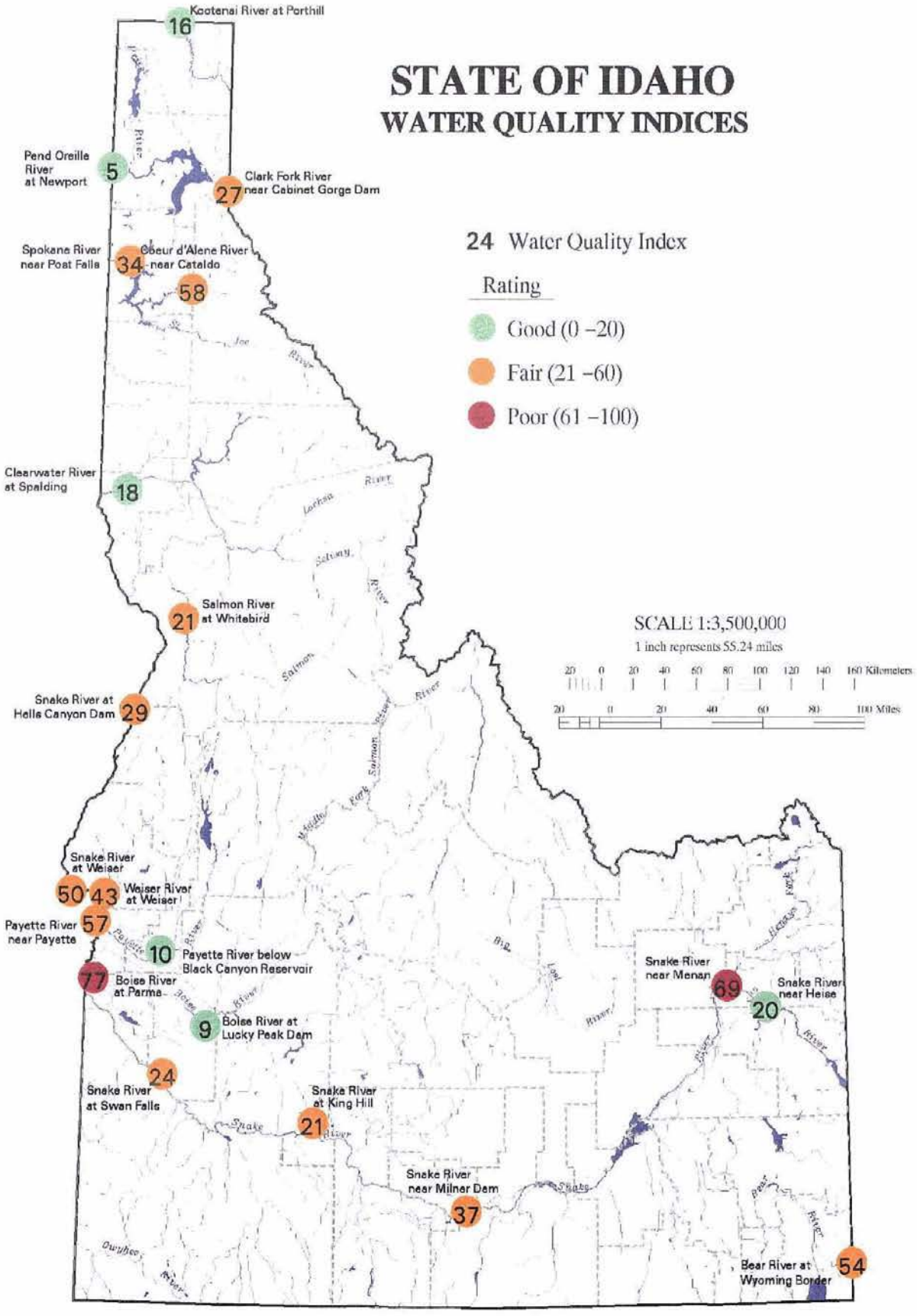
The WQI ratings illustrate surface water quality conditions for major basins and watersheds, and illustrate important spatial trends. In general, the quality of water in streams leaving mountainous headwater areas is rated good (Snake River near Heise, Boise River at Lucky Peak, and Clearwater River at Spalding). As streams then move through areas with a high level of human activities, water quality conditions are substantially degraded (Snake River near Menan, Snake River at Weiser, Boise River near Parma, Payette River near Payette and Coeur d' Alene River near Cataldo).

Water-Quality Index ratings also illustrate the effect of large lakes and impoundments on stream



Source: USEPA, 1996.

Figure 24. State of Idaho Water Quality Limited Designations



Source: IDHWDEQ, 1988; IDHWDEQ, 1992.

Figure 25. State of Idaho Water Quality Indices

water quality. Lakes and reservoirs retard river flow and reduce or eliminate sediment load capacity allowing substantial quantities of suspended material to accumulate in the influent reaches. Large lakes and reservoirs can have stream retention times of weeks or even months. As streams move slowly through these water bodies, nutrients are removed by biological activity and retained in the bottom sediments. The overall result is improved WQI ratings (Snake River at King Hill, Snake River at Hells Canyon Dam, and Pend Oreille River at Newport).

GROUND WATER QUALITY

The quality of ground water is generally suitable as a source of drinking water. However, pollution concerns have been identified within many of the hydrogeologic subareas of Idaho (Fig 26).

Natural constituents in ground water causing health concerns include arsenic, fluoride, uranium and selenium. Crockett (1995) reports routine observations of elevated arsenic concentrations in the North Owyhee, Twin Falls, Weiser, Payette, Boise Valley Deep and the Boise Valley Shallow subareas; elevated fluoride concentrations in the Payette, Mountain Home, North Owyhee, Salmon, Bear River and Boise Mountain subareas; elevated levels of gross alpha and radon radioactivity, both believed to be byproducts of uranium, in the Boise Valley Shallow, Boise Valley Deep, North Owyhee and Twin Falls subareas; and elevated concentrations of selenium in the North Owyhee subarea.

Constituents causing health concerns and related at least in part to human impacts include nitrate, volatile organic compounds, pesticides, cadmium and bacteria. Hydrogeologic subareas most affected by elevated nitrate concentrations were North Owyhee, Twin Falls, Boise Valley Shallow and the eastern portion of the Snake River Plain Alluvium. Subareas most affected by volatile organic compounds and pesticides were Boise Valley Shallow, Portneuf, Snake River Plain Alluvium, Payette and Twin Falls. Elevated levels of cadmium were observed in Silver Valley of the North Idaho subarea, and in one well from the Snake River Plain Basalt subarea. Fecal coliform bacteria, an indicator of warm-blooded fecal contamination, were detected throughout the State. Highest occurrences of fecal coliforms were in the Boise Mountains, Weiser, Boise Valley Shallow, Cassia/Power and Payette subareas.

Ground water vulnerability maps were prepared for two areas containing Idaho's major underground drinking water sources. The maps rate the relative ground-water pollution potential utilizing data layers characterizing depth-to-water, recharge and soil landscape characteristics (Rupert, *et al.*, 1991). The vulnerability maps were generated by merging the three data layers into one map and accumulating the point ratings from each layer to develop the total vulnerability rating. The final vulnerability map depicts four classes of relative vulnerability; low, moderate, high and very high. Areas of very high pollution potential overlie primarily shallow alluvial aquifers, while areas of high pollution potential are associated with deeper aquifers in permeable materials with little protection from downward-moving contaminants other than depth to water (Fig. 27).

The U.S. Environmental Protection Agency has designated three aquifers in Idaho as Sole Source Aquifers. A Sole Source Aquifer is defined as the sole or principal source of drinking water, and is to be managed to protect the ground water for that purpose. The designated systems in Idaho are the Rathdrum Prairie, Lewiston and Snake Plain Aquifers (Fig 28). A sole source designation may restrict federal supported activities within the area overlying the aquifer and its tributary sources.

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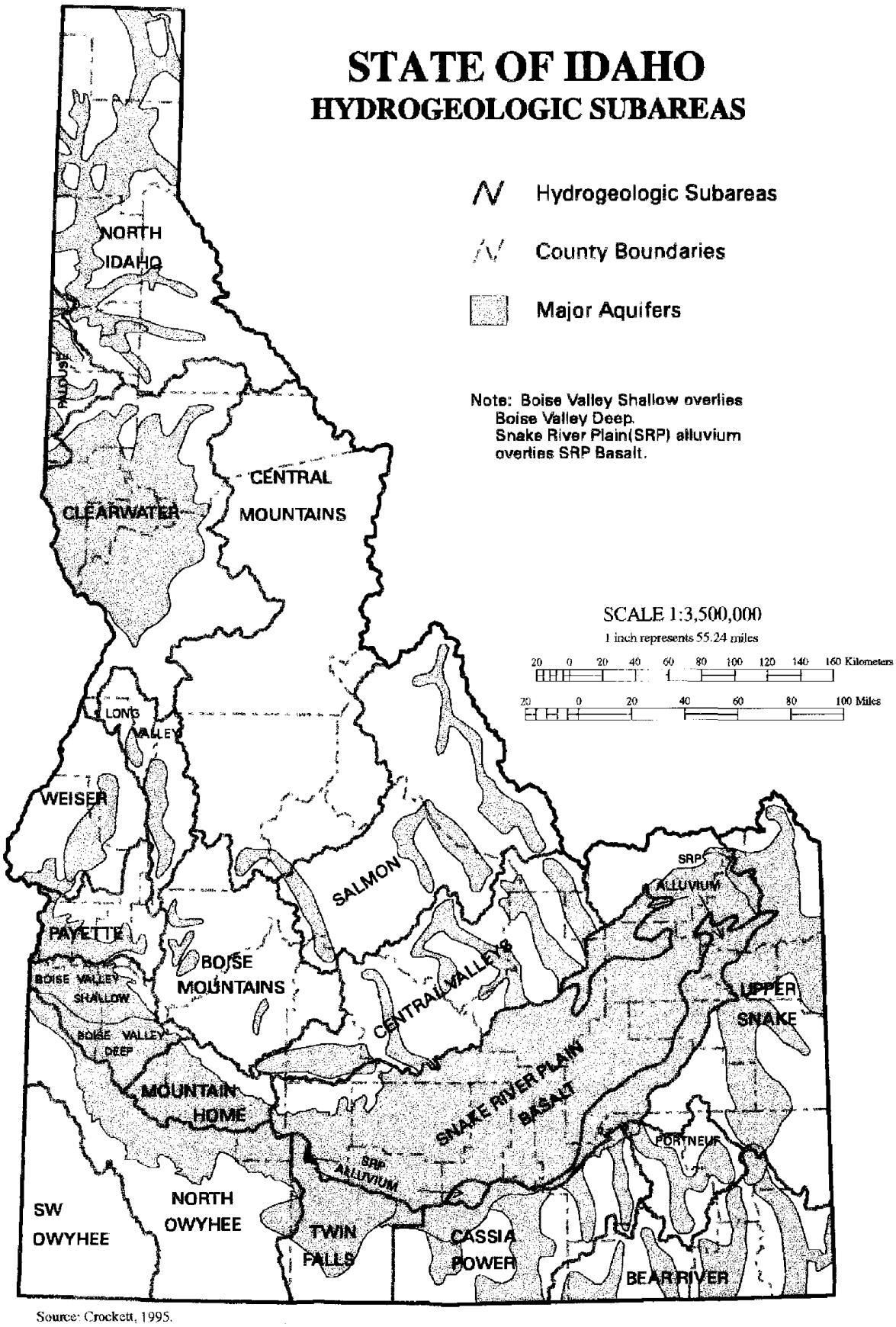
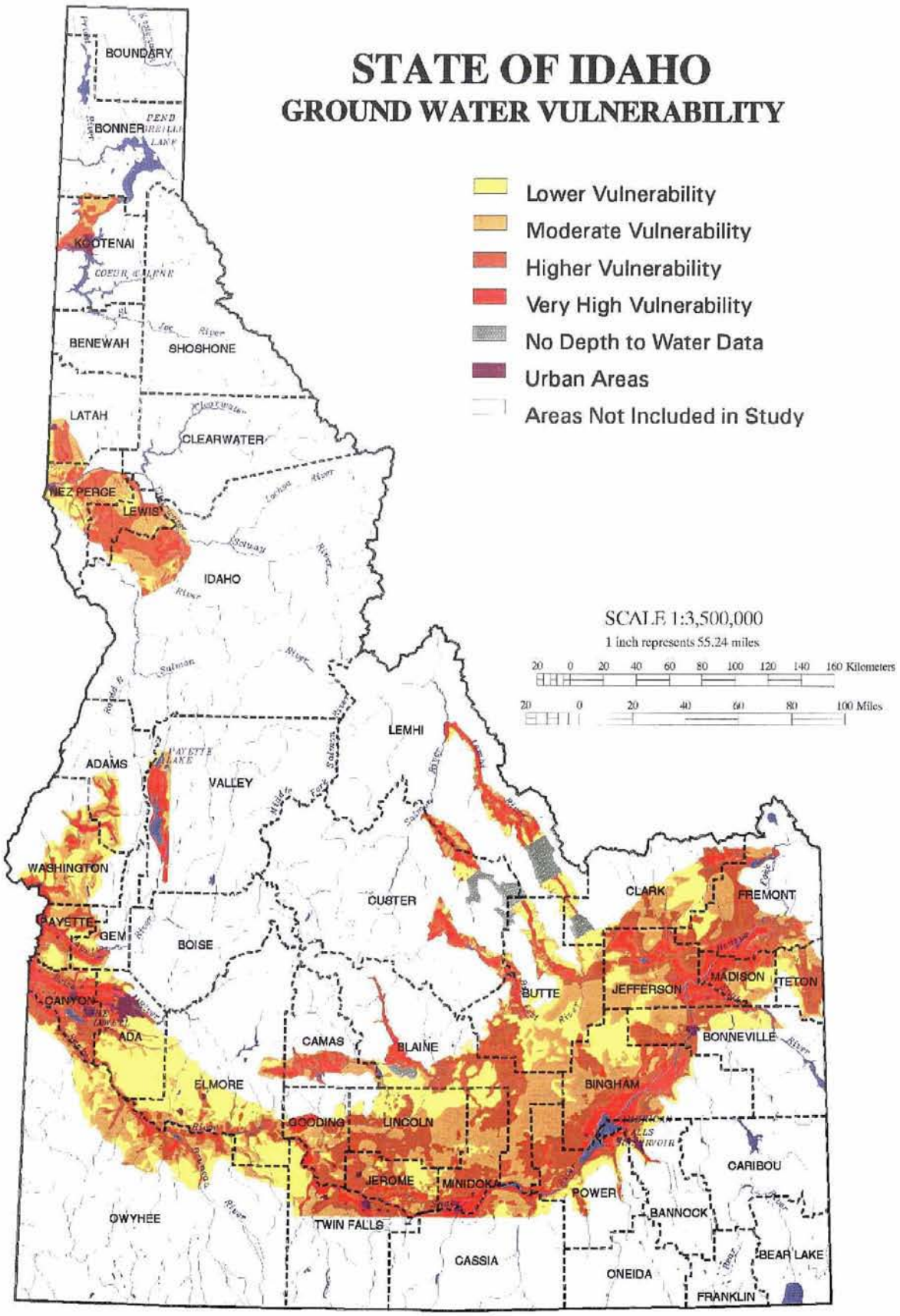


Source: Crockett, 1995.

Figure 26. State of Idaho Hydrogeologic Subareas



Source: Rupert et al., 1991

Figure 27. State of Idaho Ground Water Vulnerability

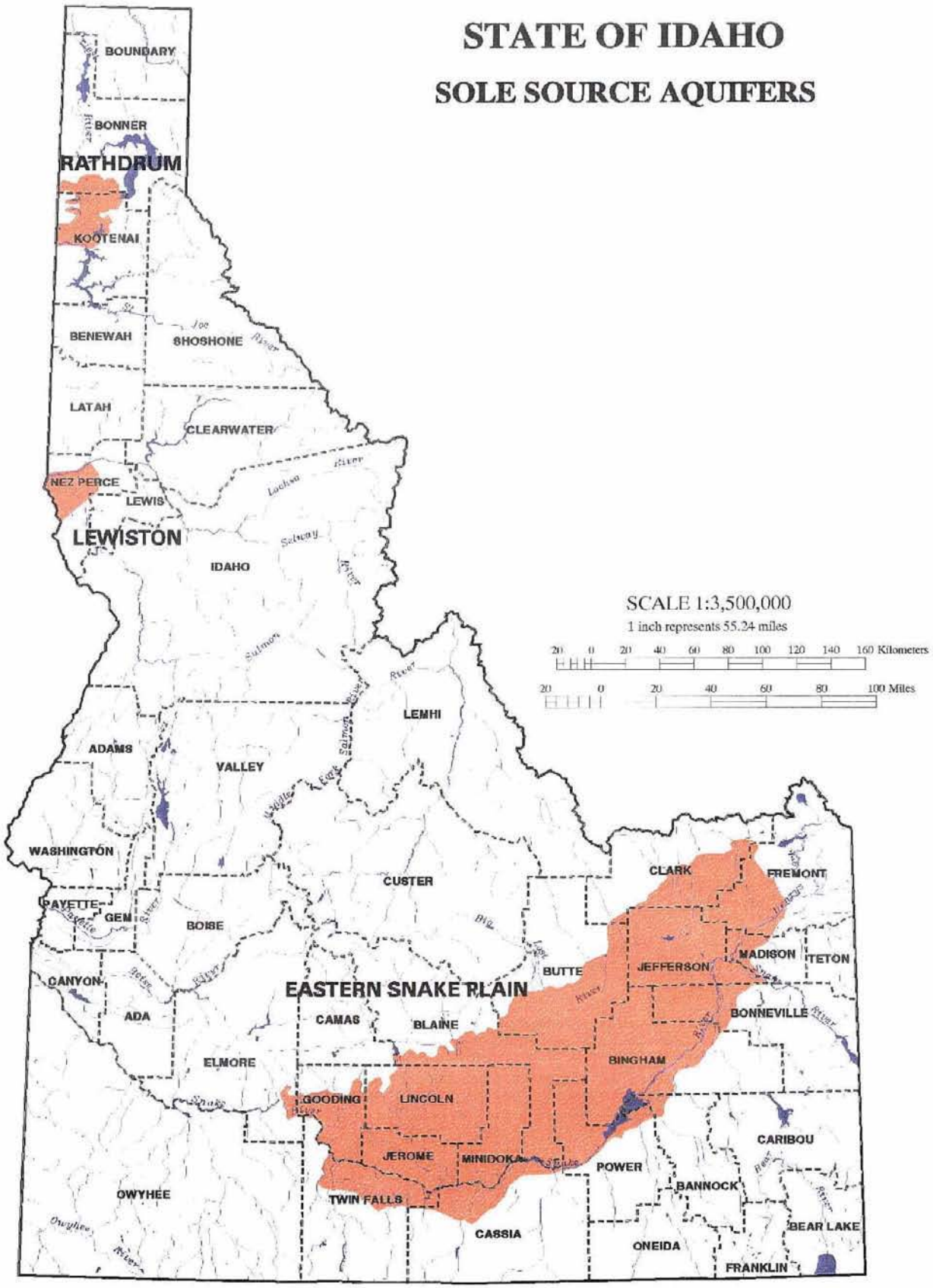


Figure 28. State of Idaho Sole Source Aquifers

WATER USE AND ALLOCATION

Idaho's water resources have been developed extensively for irrigation, power generation, aquaculture, and municipal and industrial supply. The primary water committment is to the production of agricultural crops. Although irrigation is by far the largest use of available water in the state, other offstream and instream uses are important to the economy. Idaho industries depend on an ample supply of good quality water. Hydroelectric power generation, aquaculture, and the recreation/tourism industry are dependent on river flows, spring flows, reservoir levels and good quality water. Though small relative to other uses, domestic, commercial, and municipal water use are indispensable.

Total water withdrawals for offstream use are an estimated 22.1 million acre-feet of which 5 million acre-feet is consumptively used. Surface water diversions are approximately 13.6 million acre-feet, and ground water withdrawals total an estimated 8.5 million acre feet. Agriculture is the largest offstream water use – 97 percent of total withdrawals and 99 percent of total consumptive use. Most instream water uses are not quantified, however, aquaculture and hydroelectric power generation use approximately 100 million acre-feet per year in Idaho.

Land Use and Ownership

Idaho is the 14th largest state in the United States with a land area of 52.9 million acres (Idaho Statistical Abstract, 1996). Topography, climatic conditions and soil are major influences on land cover and land use. Range land and forest are the dominant land covers in Idaho (Fig. 29). Range land covers most of southern Idaho where land is not irrigated or developed. Sagebrush, bunch and annual grasses are the predominant vegetation. Pine and spruce forests claim the state's higher elevations. Sixty-three percent of the state's forests lie north of the Salmon River. Agricultural land accounted for about 13 percent of the state's land in 1992. Agricultural land includes land in crops, both irrigated and non-irrigated, and identified pasture. Land in urban areas totaled 223,000 acres in 1992, up from 154,000 acres in 1980. Urban areas absorbed an average of 5,750 acres per year from other land uses during the 1980s. Table 11 lists acreage for each classified land use.

Ownership also affects land use and management. About 70 percent of Idaho is publicly owned. Federal agencies manage over 33 million acres; state and local governments oversee 2.7 million acres. The U.S. Forest Service and the U.S. Bureau of Land Management are the largest land managers in Idaho. Other federal agencies managing land in Idaho include the U.S. Bureau of Reclamation, U.S. Park Service, U.S. Fish and Wildlife Service, the U.S. Department of Defense and the U.S. Department of Energy. Private interests own and manage over 16 million acres in Idaho or about 31 percent of the total land area. Figure 30 delineates land ownership and management throughout Idaho.

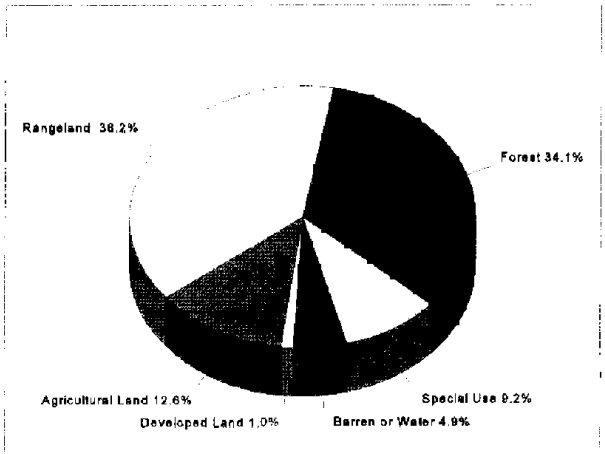


Figure 29. Land use in Idaho, 1992. Developed Land includes urban and built-up areas in units of 10 acres or greater, highways, railroads, and airports. Special Use includes State parks, national monuments, wilderness areas, wildlife management areas, and land administered by the U.S. Department of Defense and the U.S. Department of Energy.

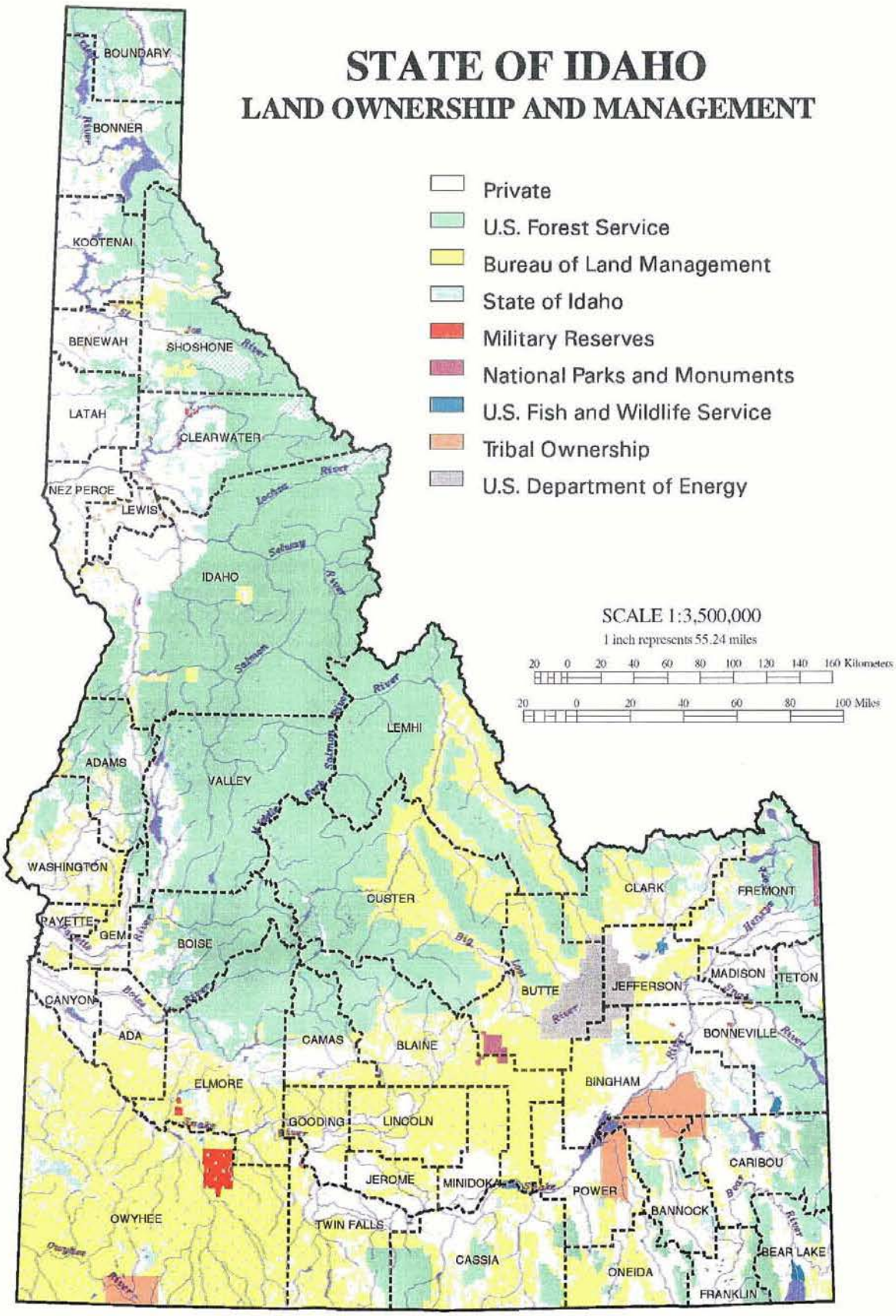


Figure 30. State of Idaho Land Ownership and Management 62

Table 11. Land and Water Area, Land Use, Ownership and Management in Idaho, 1992.

Land Area (square miles)	82,751
Land Area (acres)	52,961,000
Water Area (square miles)	823
Water Area (acres)	525,600
Urban or Built-up Land (acres)	223,000
Agricultural Land (acres)	6,677,000
Range (acres)	20,219,000
Forest (acres)	21,621,000
Wetland (acres)	262,100
Barren land (acres)	2,308,500
Tundra (acres)	11,400
Percentage of Land Managed by Federal Govt.	64%
Percentage of Land Managed by State	5%
Percentage of Land Privately Owned	31%
Percentage of Land Managed by City/County	0.2%

Source: U.S. Dept. of Agriculture, Economic Research Service, 1995.

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Water Allocations

Water allocations in Idaho follow the Prior Appropriation Doctrine, best described as "first in time is first in right." Water rights are administered by the Idaho Department of Water Resources. They are issued by date of appropriation, for specific quantities, diversion points, places of use, and purposes. Figure 31 identifies and juxtaposes U.S. Geological Survey surface water hydrologic units and Idaho Department of Water Resources administrative basins.

In most parts of southern Idaho, surface water resources are fully utilized, and ground water development is administratively limited where significant water level declines are evident. The Swan Falls agreement, 1984, between the State of Idaho and the Idaho Power Company, establishes certain rights and policies concerning water use in the Snake River Basin above the Swan Falls Dam upstream of Murphy, Idaho. The State agreed to assert that the Snake River is fully appropriated above Swan Falls Dam except for trust water held by the state and occasional flood waters. Consequently, the Idaho Legislature determined that an adjudication of the entire Snake River Basin was in the public interest, and should proceed subject to stated constraints regarding federal reserved right claims [Idaho Code 42-1406A].

The solicitation of water right claims began in February, 1988. The Idaho Department of Water Resources is presently ascertaining both surface and ground water rights for the Snake River Basin. This process is expected to determine approximately 135,000 claims to water rights.

A moratorium on further consumptive appropriations, from both ground and surface water, was established for the Snake and the Bear River basins in 1992. The order was tied to existing drought conditions when issued. Moratoriums were later rescinded for the Bear River Basin and the Boise, Payette, and Weiser drainages, Owyhee County, and the Mountain Home area in the Snake River Basin. In the Upper Snake, the moratorium was extended through December 31, 1997, by legislation (Fig. 32).

Water resources in northern Idaho are generally available for appropriation. The primary water uses in northern Idaho are non-consumptive. A moratorium in the Clearwater and Salmon River drainages is in effect to protect salmon spawning grounds. The moratorium does not apply to applications for domestic use or applications to use ground water.

Agriculture Water Use

As of 1992, Idaho had over 13 million acres in farms (U.S. Census of Agriculture). About one third of farm acreage is cropland - 4.2 million acres, 6.6 million acres are in pasture or range, and over 3 million acres are woodland or other minor classifications. Precipitation in northern Idaho is generally adequate for agriculture without irrigation, but cooler growing season temperatures generally limit crop production to

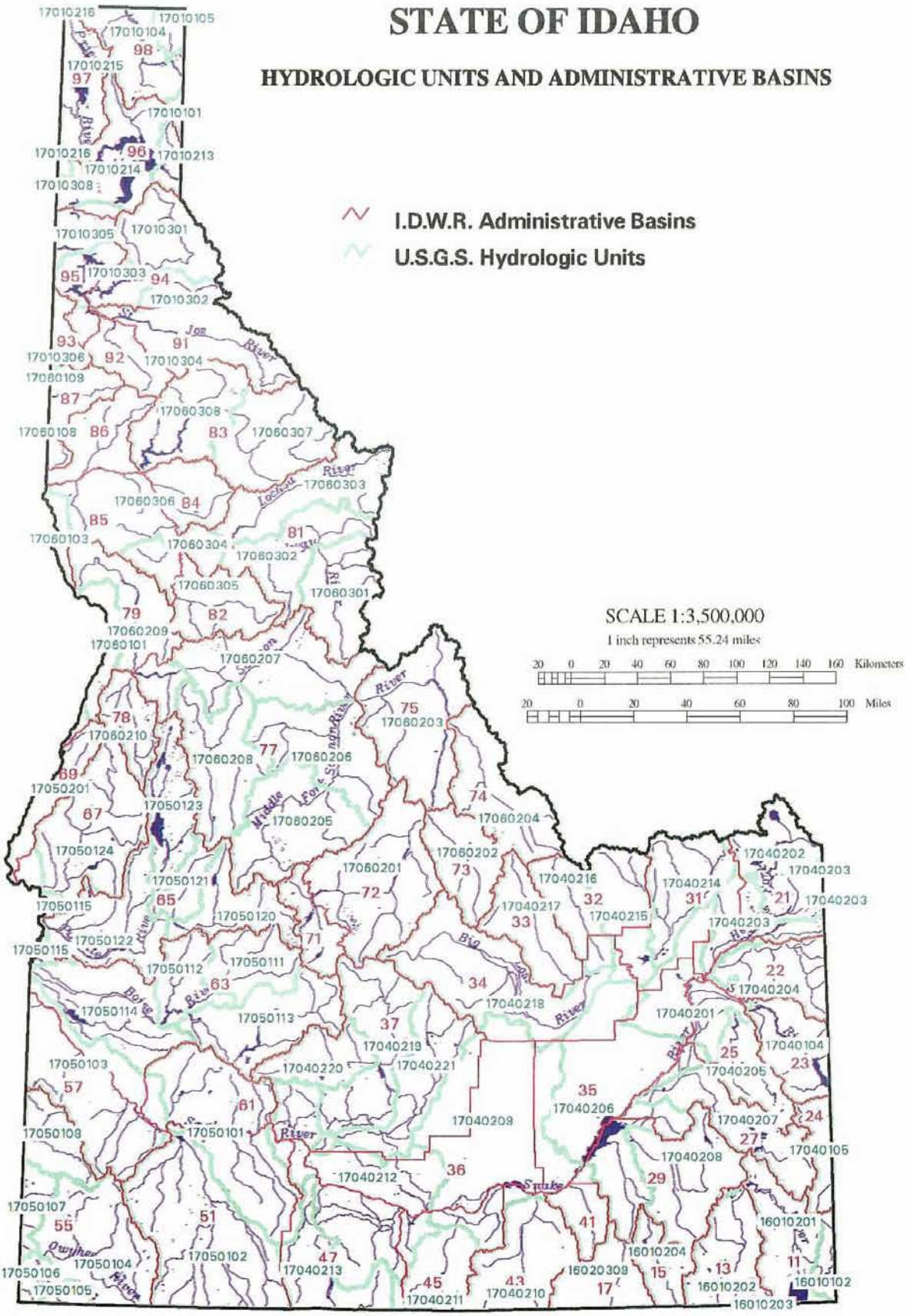

Figure 31. U.S. Geological Survey Hydrologic Units and Dept. of Water Resources Administrative Units

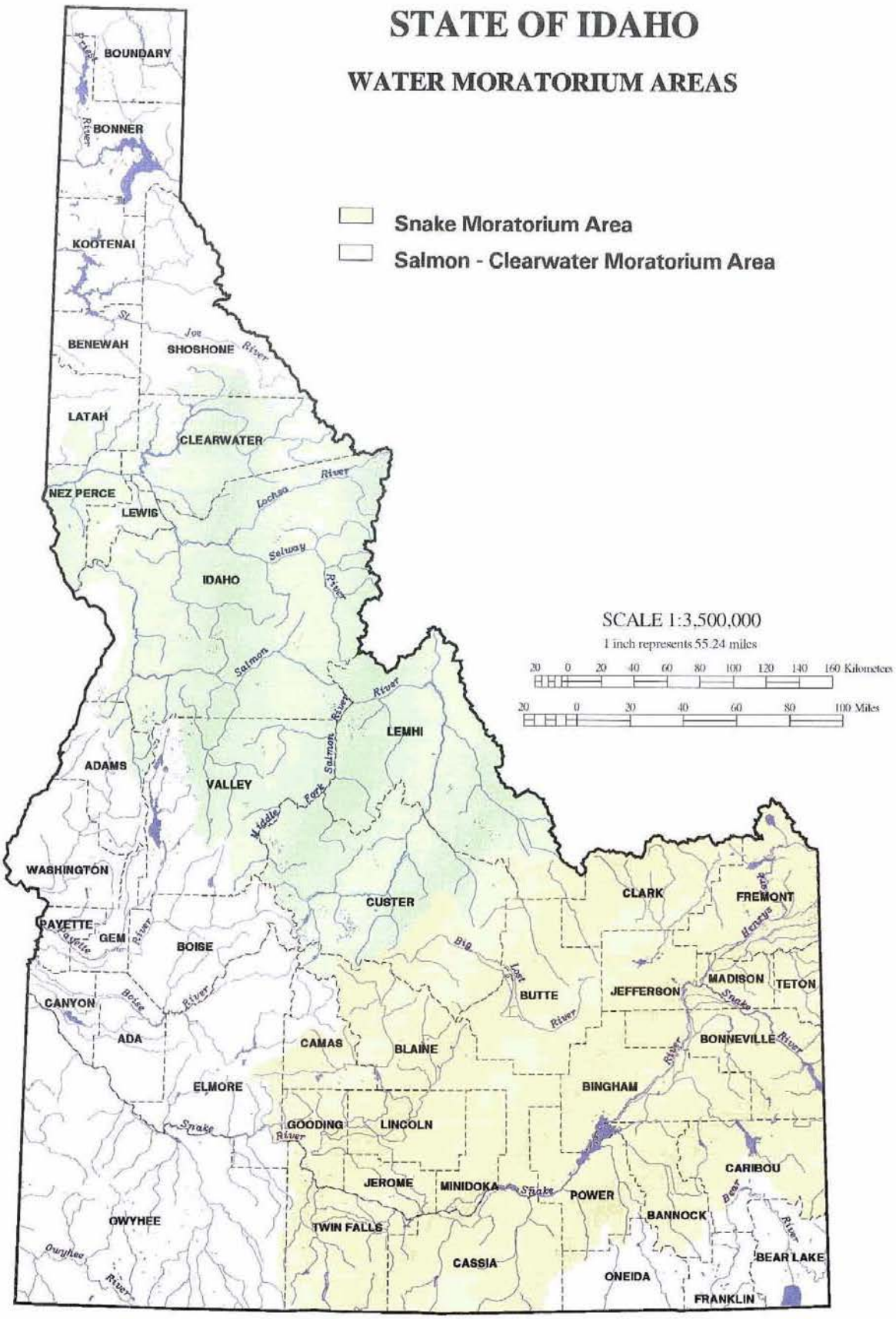

Figure 32. State of Idaho Water Moratorium Areas

grains, pasture, and hay. In southern Idaho, precipitation during the growing season is generally inadequate for agriculture. Irrigation is required for all crops except dry-farmed wheat.

IRRIGATION

At present, 3.2 million acres in Idaho are irrigated with an estimated 21 million acre-feet of water (Fig 33). About two-thirds of that acreage is irrigated with surface water and one-third with ground water. Since the 1940s, ground water use for irrigation has steadily increased. Use of ground water permits irrigation where surface water was not available or was not adequate or dependable.

Irrigation diversions from the Boise River began in 1843, and LDS settlers in the Lemhi Valley launched irrigation in eastern Idaho in 1855. Congressional passage of the Desert Land Act in 1877, the Carey Act in 1894, and the Reclamation Act in 1902 spurred irrigation development across the state. By 1905, irrigation demand left the Snake River dry for several days in a 10-mile reach near Blackfoot (Kjelstrom, 1986). Reservoir construction and surface water storage in the early 1900s increased the amount of water available for seasonal use.

Virtually all private land in the state that can be feasibly irrigated has been developed. Potentially irrigable land remains undeveloped because plausible financial returns are not great enough to attract necessary capital, land is in federal ownership, or water available for new irrigation is limited. In many areas of the state, new irrigation is dependent upon either ground water pumping, new storage construction, or the purchase of existing upstream water rights.

Sprinkler irrigation has steadily grown in Idaho with ground water development and in response to recent droughts. Today, about half of the state's irrigated acreage is watered by sprinklers (Table 12). Water application efficiency has aided Idaho irrigators in maintaining crop production levels even in extremely short water years.

Snake River Basin

Irrigated agriculture accounts for nearly 99 percent of all water use in the Snake River Basin. Two thirds of the three million acres of irrigated land in the

Table 12. Irrigated Acreage by County and Method.

	Gravity	Sprinkler
Ada	55,956	17,838
Adams	38,347	2,823
Bannock	12,664	26,910
Bear Lake	25,544	17,073
Benewah	----	1,293
Bingham	30,781	277,031
Blaine	10,928	53,355
Boise	2,345	609
Bonner	----	2,617
Bonneville	45,994	107,320
Boundary	----	1,399
Butte	7,891	48,243
Camas	1,198	6,288
Canyon	189,362	25,917
Caribou	14,665	55,536
Cassia	40,322	211,690
Clark	2,420	46,008
Clearwater	----	316
Custer	24,284	34,142
Elmore	15,556	59,552
Franklin	16,992	33,090
Fremont	37,945	92,900
Gem	28,783	9,894
Gooding	32,311	83,087
Idaho	----	2,418
Jefferson	93,818	90,138
Jerome	39,116	111,328
Kootenai	----	18,723
Latah	----	2,060
Lemhi	46,025	24,275
Lewis	----	337
Lincoln	28,056	31,638
Madison	42,101	85,660
Minidoka	42,604	134,912
Nez Perce	----	2,277
Oneida	13,300	15,606
Owyhee	59,388	41,061
Payette	46,541	10,051
Power	4,116	98,776
Shoshone	----	217
Teton	20,543	30,815
Twin Falls	179,496	51,855
Valley	20,259	884
Washington	31,186	9,041
State Total	1,266,393	1,996,394

Source: 1992 Census of Agriculture, Idaho Department of Water Resources, U.S. Bureau of Reclamation and Farm Service Agency.

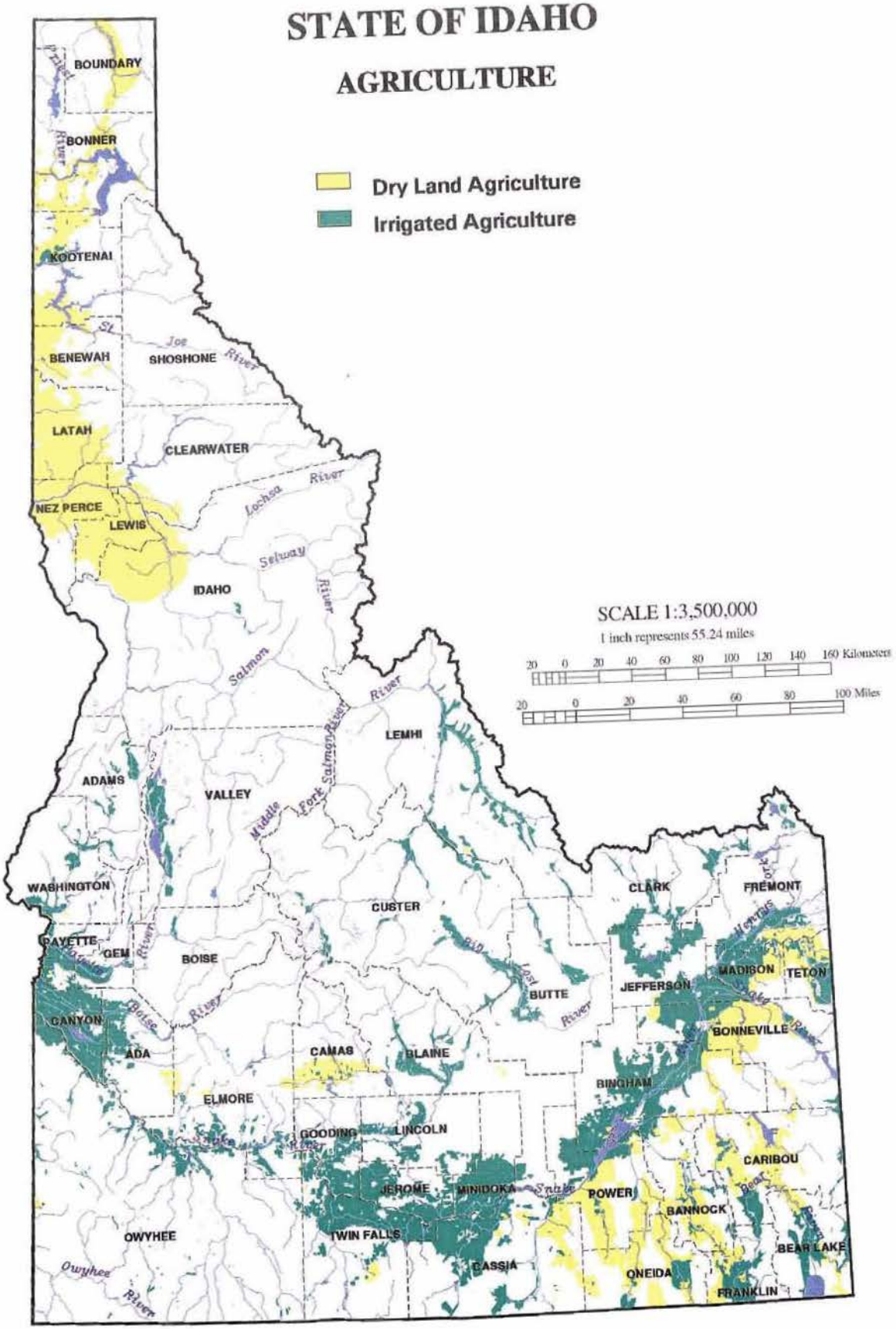

Figure 33. State of Idaho Agricultural Areas

basin is supplied by surface water, mostly by gravity diversions. An estimated 16.5 million acre-feet is diverted by gravity and conveyed by over 3,000 miles of canals and laterals. About 9.5 million acre-feet is diverted from the Snake River and 6 million acre-feet from tributaries. An additional one million acre-feet is withdrawn from rivers and streams by pumps. Ground water diversions supply approximately 3.5 million acre-feet to agricultural lands in the Snake River Basin. About 85 percent of Snake River Basin ground water withdrawals take place in the Upper Snake.

Idaho's famous potatoes are cultivated mostly in southeastern Idaho, where the summer days are sunny and the nights cool. South-central Idaho encompasses thousands of irrigated farms that grow grain, beans, corn, and sugar beets. Beef cattle, hogs, sheep, hay and wheat are also abundant in the region; much of the wheat is produced by dry farming. Sheep and wool production are prominent in Blaine, Gooding, and Minidoka counties.

With a frost-free period of 120 days or more, southwest Idaho produces a wide variety of crops including alfalfa, corn, potatoes, sugar beets, small grains, hops, onions, mint, and seed. Southwestern Idaho is also a major cattle and milk producing area. The region is significant in fruit growing - sweet cherries, apples, peaches, plums, apricots, and grapes, and supports a thriving wine industry.

Irrigation development in the central mountains 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. Other crops are restricted by the short growing season and distance to market. Irrigation in the Salmon River Basin relies almost exclusively on direct diversions from streams and small reservoirs. Dry farms in the basin have excellent soft winter wheat production. In the Clearwater Basin irrigation has played only a minor role. Aside from 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. Fruits, potatoes, vegetables, and forage crops are produced on the project's acres.

Total surface water diversions from the Snake River have been declining since the mid 1970s (Fig. 34). Currently irrigators in the Upper Snake are diverting about 800,000 acre-feet less than they did in

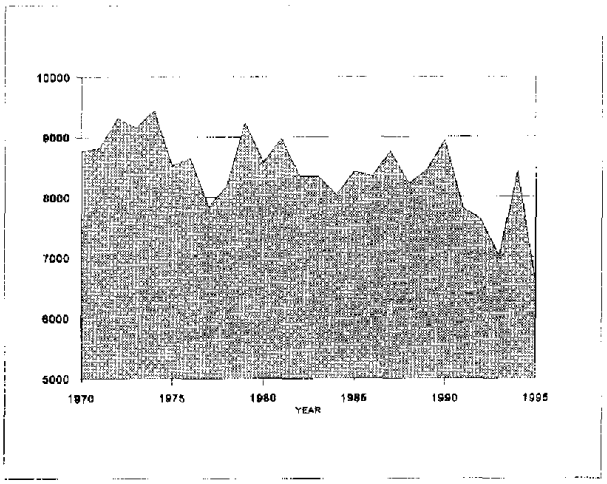

Figure 34. Total Surface Water Diversions above Milner 1970 to 1995 in thousand acre-feet.

1977. Diversions from the Snake River above Milner have decreased an average of 40,000 acre-feet per year over the last 15 years. Most of the surplus water is made available to other water users through the Idaho Water Bank.

Bear River Basin

Approximately 190,000 acres in Bear Lake, Caribou, Franklin and Oneida counties are irrigated with water diversion from the Bear River, its tributaries, and ground water. The irrigated lands in the Bear River Basin are devoted mainly to pasture, small grains, alfalfa and other hay crops. A smaller portion of the irrigated acreage is planted in sugarbeets and potatoes.

An estimate of average annual withdrawals for the portion of the Bear River Basin in Idaho is 230,000 acre-feet based on 1990 level of development. Withdrawals upstream from Idaho amount to an additional 100,000 acre-feet annually. Since irrigation diversions occur along almost the whole length of the Bear River, return flows are important in affecting the overall water resource.

Panhandle Basins

Irrigation is not a major water use in Idaho's Panhandle because precipitation is adequate for most crops. Crop selection is limited by elevation and growing season; wheat, peas, and lentils are cultivated. Grass seed is grown on the Rathdrum Prairie in Kootenai County and the western part of Benewah

County; wild rice is raised along the St. Joe and Coeur d'Alene rivers.

There are approximately 26,000 acres of irrigated land in the Panhandle. Irrigated acreage represents less than 10 percent of total cropland in the region; nearly all of it is on Rathdrum Prairie 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.

LIVESTOCK WATER

A cattle, calf, sheep and hog inventory for the state totals more than two million head. Fourteen percent of the cattle are dairy cows (Idaho Agricultural Statistics Service, 1996). Livestock enterprises are important in all parts of the state, but they are relatively more important in the high valley areas. In these areas, practically all agricultural activities are associated with livestock production, with hay and pasture produced on private lands, and grazing on public lands.

Livestock water use in Idaho is an estimated 50,000 acre-feet per year (Solley, et al., 1993). Dairy industry withdrawals are an estimated 11,000 acre-feet of that total. Livestock water use includes water for both stock watering and other on-farm needs aside from irrigation.

Livestock water supplies are usually developed by private individuals. However, in the Henrys Fork, Fall River, and Teton River basins, irrigation canals divert surface water throughout the year for stock water; average annual canal diversions from December through March total 100 acre-feet. On the range and in the mountains, livestock usually water freely at streams or springs unless watering stations have been developed.

AQUACULTURE

Aquaculture in Idaho uses, non-consumptively, an estimated three million acre-feet of water per year. There are 160 licensed commercial fish producers in Idaho with over 2,000 ponds or raceways. Additionally, 23 federal, state, and tribal hatcheries in the state raise trout and salmon for release in Idaho's streams, lakes, and reservoirs (University of Idaho, 1991; Idaho Department of Agriculture, 1996).

No two individual fish raising facilities are alike in pond design, water utilization, fish density per unit of water volume, or fish husbandry methods. However, most of the fish hatcheries are a series of flow-through raceways that continuously pass water through the units.

Devils' Corral Spring, near Shoshone Falls in Jerome County, was the site of the first commercial fish farm in Idaho. Started in 1909, the fish farming operations were discontinued one year later. In 1928 the Snake River Trout Farm at Clear Lake, the first modern raceway farm, began operation. Four trout farms were in production by 1935 and eight in 1950. The early 1970s saw an explosion in aquaculture facilities development and expansion.

The Idaho aquaculture industry ranks as the third largest food-animal producing business in the state (Brannon and Klontz, 1989). Most of the commercial aquaculture operations in the state are located in the Twin Falls-Buhl area and in the American Falls-Pocatello area, because of the presence of high quality spring water issuing from the Snake Plain aquifer. The constant flow of clean, cool (59°F) spring water, tributary to the Snake River in the Thousand Springs reach and the American Falls area makes these locations ideal for raising trout. It is estimated that 50 percent of the spring flow along the Snake River between Milner Dam and Bliss Reservoir is utilized for fish production.

Rainbow trout are the dominant commercial fish stock, but sources of cooler water and geothermal waters have been used to raise cutthroat trout, coho salmon, catfish, tilapia, and alligators. The hot water is mixed with cooler spring water for alligator, catfish and tilapia culture.

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Domestic, Commercial, Municipal and Industrial Water Use

Domestic, commercial, municipal and industrial (DCMI) water use is relatively small, but essential to human life and economic development. Domestic and commercial water use includes drinking, food preparation, washing, and lawn and garden watering. Municipalities supply water not only to residences and commercial enterprises, but also to schools, fire departments, and municipal parks. Industrial water use incorporates manufacturing processes, cooling, and employee sanitation.

At present, withdrawals for domestic, commercial, municipal, and industrial water use in Idaho total an estimated 800,000 acre-feet per year. Of that amount, approximately 150,000 acre-feet is consumptively used and the balance is returned to streams or ground water. Ground water supplies about 86 percent of DCMI water demand in the state. In the Panhandle, however, surface water supplies about 85 percent of DCMI water demand. Exact DCMI water use quantities are difficult to define because most individuals, businesses, and communities do not have water meters. Estimates are based on population, average water use per day, water measurements where they exist, and water rights.

The industrial water requirement in Idaho is approximately one-half of the total DCMI demand, 400,000 acre-feet. Industries in the state with high annual withdrawals include food processing, lumber, fertilizer, and concrete manufacturing. Food-processing industries withdraw relatively large volumes of water for meat packing; fruit, vegetable, and fish preparation and preservation; and beet sugar refining.

The INEL withdraws approximately 7,500 acre-feet per year from ground water. Ninety percent of the water used is pumped in Butte County and ten percent is withdrawn in Bingham County (Lindholm and Goodell, 1986). The INEL uses most of the water for cooling purposes.

Withdrawals for food processing have a distinct seasonal pattern. Water use for sugar refining and potato processing is highest from September through March. Water use for canning and freezing of fruits and vegetables peaks from July through October. Water use for milk- and meat/fish-processing industries is relatively constant throughout the year.

The forest products industry requires water for pulp and paper fabricating, lumber and wood products manufacturing and storing and moving logs. The primary use of water by the mining industry is in mineral processing. The mining industry diverts less than 10,000 acre-feet annually and recycles the same water several times (Solley, et al., 1993).

Most large industrial water users have developed independent ground water supplies, although approximately two percent of industrial water withdrawals were delivered by municipal or public-supply systems. The food processing, timber and mining industries are the primary industrial water users in the state.

Municipal water systems provide 70 percent of domestic and commercial water in Idaho (1990 U.S. Census). Many communities need to expand and up-

grade their water systems. Improvements range from new wells to storage tanks and pipelines. Some communities have paid for these improvements without outside help, but most have made use of public funding programs.

Domestic, commercial, municipal, and industrial water demand is increasing due to population growth. Idaho's population has increased over 40 percent in the twenty years between 1970 and 1990. The cities, which are the fastest growing areas, may require new water supplies to provide for additional people. As the industrial potential of the area is developed, water requirements for industrial use will also increase.

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Power Generation

Electricity is vital to almost all sectors of Idaho's economy. Idaho's emerging "high-tech" industries are especially dependent on the resource. Idaho's irrigators depend on electricity to pump ground water and pressurize sprinkler systems. About fifty percent of all electricity consumed in Idaho is generated by the state's waters.

Idaho has relied almost exclusively on hydroelectric facilities to supply electric power. The first electricity in Idaho was produced by hydropower during the 1880's in the Wood River Valley. With the exception of a small internal combustion generation facility near Hailey and some limited cogeneration applications, all electricity generation facilities within Idaho are hydroelectric.

Today, hydropower facilities on Idaho rivers and canals have an installed capacity of 2,998 MW and use approximately 100 million acre-feet of water annually to produce on average eight million mega-watt hours (IDWR, 1996). Approximately 90 percent of Idaho's hydropower electricity generation is produced in the Snake River Basin. The distribution of hydropower facilities in Idaho with installed capacities of at least 5 mega-watts is depicted in Fig. 35. Table 13 lists the owner, installed capacity, and the average annual generation for these facilities.

Hydroelectric generation facilities are owned by private utilities, the federal government, municipal utilities, electric cooperatives, and private corporations, partnerships, or individuals that sell power to the private utilities. The majority of the hydroelectric generation capacity within the state is owned and operated by three private utilities: Idaho Power Company, Washington Water Power Company, and PacifiCorp Utah Power and Light Division.

Idaho Power Company hydropower generation facilities are located, for the most part, on the Snake River between American Falls and Hells Canyon and have a total installed capacity of 1,588 MW (IDWR, 1996). This figure includes the three Hells Canyon dams which straddle the Idaho-Oregon border and have a combined capacity of 1,167 MW. Most of the remaining capacity, is located between Milner Dam and Bliss.

The Washington Water Power hydropower facilities are located in the northern part of the state on the Spokane and Clark Fork Rivers. Washington Water Power also owns and operates hydroelectric facilities on these rivers both upstream and downstream of Idaho. The PacifiCorp-Utah Power and Light hydropower facilities are all located in eastern Idaho. Two projects are located on the Henrys Fork, and four are located on the Bear River.

Federal powerplants, operated by either the U.S. Bureau of Reclamation or the U.S. Army Corps of Engineers, located within the state have a combined installed capacity of 753 MW. In addition, there are four powerplants owned by other entities that are located at federal dams. The largest federal hydropower facility in Idaho is Dworshak Dam and power plant, which is located on the North Fork Clearwater River near Orofino, with an installed capacity of 400 MW (U.S. Army Corps of Engineers, 1996).

Many municipalities within the state own hydroelectric generation facilities. These include Idaho

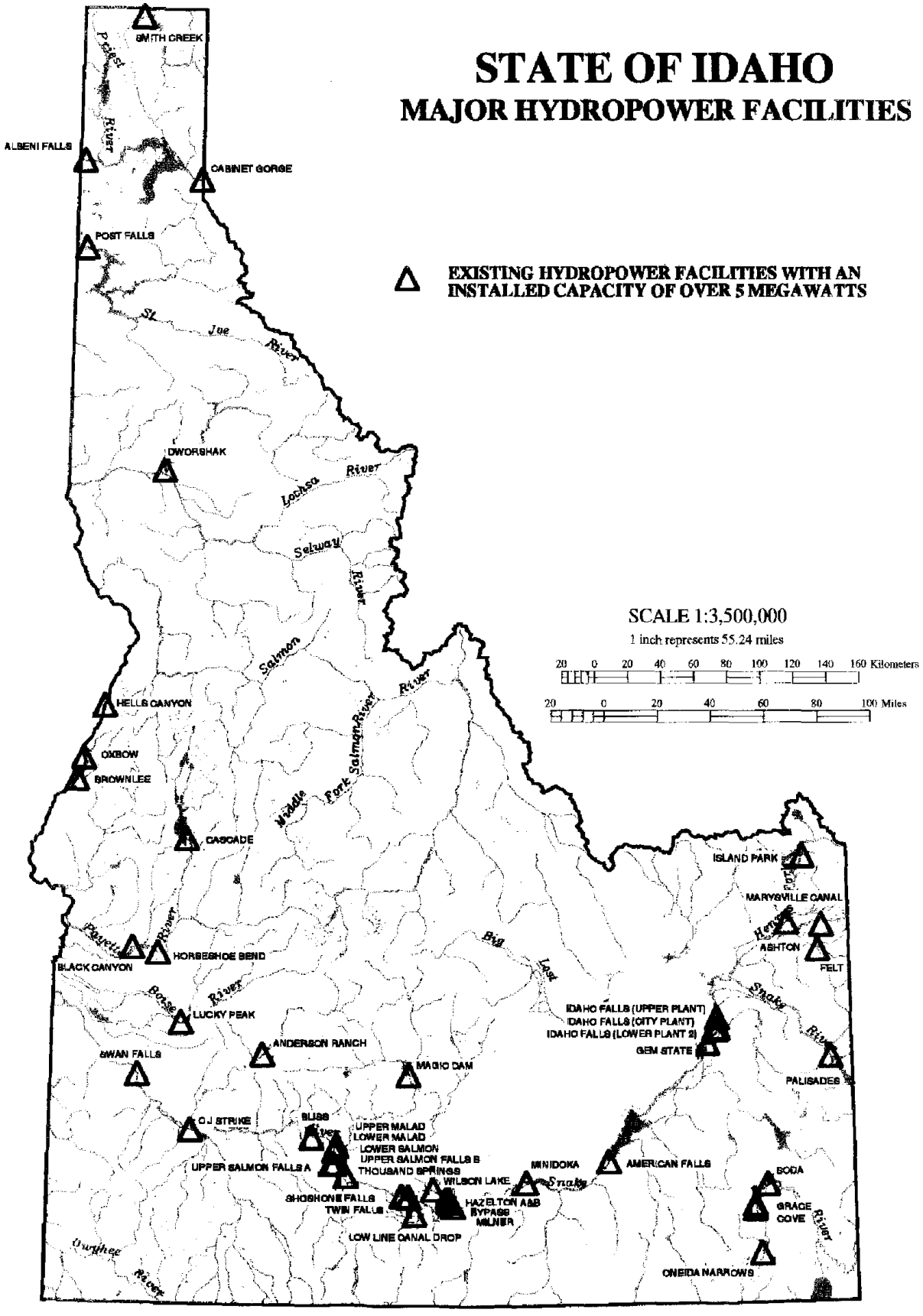

Figure 35. State of Idaho Hydropower Facilities

Table 13. Hydropower Facilities with Installed Capacities Greater than Five Mega-watts.

Power Plant	Stream	Owner	Installed Capacity (MW)	Average Annual Generation (MWH)
Albeni Falls	Pend Oreille	Federal government	45.0	201,000
American Falls	Snake River	Idaho Power Company	92.3	400,000
Anderson Ranch	South Fk. Boise	Federal governement	40.0	44,000
Ashton	Henry's Fork	PacifiCorp	5.8	36,200
Black Canyon	Payette River	Federal governement	8.0	46,000
Bliss	Snake River	Idaho Power Company	75.0	379,300
Brownlee	Snake River	Idaho Power Company	585.4	1,400,000
C.J. Strike	Snake River	Idaho Power Company	82.8	350,000
Cabinet Gorge	Clark Fork	Washington Water Power	230.0	1,050,000
Cascade	North Fk Payette	Idaho Power Company	12.4	30,000
City	Snake River	City of Idaho Falls	8.0	50,328
Cove	Bear River	PacifiCorp	7.5	33,000
Dworshak	NF Clearwater	Federal governement	400.0	1,000,000
Felt	Teton River	Fall River Electric Co-Op	7.45	26,500
Gem State	Snake River	City of Idaho Falls	23.4	125,000
Grace	Bear River	PacifiCorp	33	160,000
Hazelton A&B	Northside Canal	Northside Canal Company	16.2	55,000
Hells Canyon	Snake River	Idaho Power Company	392.0	1,200,000
Horseshoe Bend	Payette River	LB Industries	9.6	59,200
Island Park	Henrys Fork	Fall River Electric Co-Op	6.5	11,800
Low Line	Low Line Canal	Twin Falls Canal Company	8	46,800
Lower Hydro	Snake River	City of Idaho Falls	11.0	69,270
Lower Salmon	Snake River	Idaho Power Company	60.0	270,000
Lucky Peak	Boise River	Boise Project Board of Control	101.25	282,000
Magic Dam	Big Wood	J.R. Simplot Company	9.0	31,200
Malad	Malad River	Idaho Power Company	21.7	180,000
Marysville	Falls River	Marysville Hydro Partners	9.1	51,500
Milner	Snake River	Ida West-Northside Canal Co-Twin Falls Canal Co	50.0	180,000
Minidoka	Snake River	Federal government	12.4	94,000
Oneida	Bear River	PacifiCorp	30.0	73,000
Oxbow	Snake River	Idaho Power Company	190.0	600,000
Palisades	Snake River	Federal government	176.0	610,000
Post Falls	Spokane River	Washington Water Power	15.0	85,000
Shoshone Falls	Snake River	Idaho Power Company	12.5	102,000
Smith Creek	Smith Creek	Smith Creek Hydropower	37.8	85,500
Soda	Bear River	PacifiCorp	14.0	36,000
Swan Falls	Snake River	Idaho Power Company	9.47	77,000

Power Plant	Stream	Owner	Installed Capacity (MW)	Average Annual Generation (MWH)
Thousand Springs	Springs	Idaho Power Company	8.8	61,500
Twin Falls	Snake River	Idaho Power Company	51.9	275,000†
Upper Hydro	Snake River	City of Idaho Falls	8.0	50,328
Upper Salmon	Snake River	Idaho Power Company	34.5	312,700
Wilson Lake	Northside Canal	Northside Canal Company	6.3	27,500

†Installed capacity increased in 1995; figure represents potential generation
Sources: Idaho Department of Water Resources - Energy Division, 1994; Idaho Department of Water Resources, 1996.

Falls, Bonners Ferry, Preston, Hailey, and Soda Springs. Some municipalities use their hydropower facilities to supply their citizens with electricity, while others sell the electricity to the utility that services their area. The municipality owned hydropower facilities have a combined capacity of about 53 MW (IDWR, 1996).

The passage of the federal Public Utilities Regulatory Policies Act (PURPA) in 1978 mandated that all electric utilities purchase cost-effective independently produced power. This has led to the development of small hydroelectric projects in Idaho that contribute about 183 MW of capacity (IDWR, 1996).

Water used in hydropower generation is not consumptively used, after passing through a power generation plant, the water is available for downstream use. Consumptive water use upstream from a power generating facility may reduce the amount of water available for generation facilities at dams that previously lacked power generation. Continued instream flows are necessary to generate electricity at current levels.

FUTURE DEVELOPMENTS

Power generation facilities not owned by the federal government are regulated by the Federal Energy Regulatory Commission (FERC). Within the next ten years many hydroelectric projects in Idaho will be undergoing the FERC re-licencing process. The re licencing process allows for public and agency comment and has the potential to change the way that many of the facilities are operated.

A large amount of new hydropower capacity development will come from capacity upgrades at existing facilities. Capacity upgrades result from improved turbine and/or generator efficiencies that make better use of the flowing water than the old components. Another trend in recent years has been to construct hydropower hydropower facilities. It is not feasible to install power facilities at all dams, however. In the case of many dams, water releases are constrained by irrigation demands and have the potential to produce electricity only for short periods of time during the irrigation season.

Another energy trend that will affect future hydropower development is the production of electricity by natural gas fired combined-cycle turbines. Because of the "economies of scale," the natural gas turbines can produce electricity at a cost that currently rivals hydropower. Natural gas turbine generation is subject to the variability in the price of natural gas, which will likely affect production costs in the future.

Utility deregulation may have a significant effect on electrical power generation. FERC orders have allowed for bulk power users (such as manufacturing facilities) to purchase power from any willing supplier and require local utilities to transmit the power over their lines. Deregulation would allow for "retail wheeling" if states choose to implement it. This would allow power purchasers at any level to buy power from whomever they choose. If fully implemented, deregulation will likely have an overall "equalizing" effect on power costs across the country, lowering power costs in high rate areas and raising power costs in low rate areas. This could result in higher electrical energy costs for Idaho.

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Navigation

Idaho has two areas of significant commercial navigation: the lower St. Joe River and Coeur d'Alene Lake, and the Port of Lewiston. Sight-seeing boats cruise Coeur d'Alene Lake and the lower St. Joe, and logs are towed to mill on the lower river and across the lake. From the Port of Lewiston, barge navigation to and from Portland, Oregon and coastal points is possible. The Port of Lewiston handles about two million tons of goods annually.

Geothermal Water Use

Geothermal energy has been used in Idaho since human occupation. Uses range from power generation to catfish farming. Geothermal energy has been used for space heating in Boise since 1893. Irrigation has been a long-standing use of thermal water in the state, although it must be cooled before being applied to crops. Greenhouse operations using geothermal energy are located at Boise, Weiser, Grand View, Bliss, the Hagerman Valley, the Raft River valley, and on the South Fork Payette River. Aquaculture operations tap geothermal waters to raise warm water fish and reptiles. Stock watering in winter is another beneficial use, and hot spring resorts are numerous in Idaho.

Present geothermal water use in Idaho is summarized in Table 14. Potential uses for geothermal water in the state are many and varied. The greatest potential, as far as present knowledge of the resource in Idaho is concerned, is for space heating and greenhouses. Space heating is the most common geothermal development in the state. Aquaculture uses the greatest amount of geothermal water.

Table 14. Estimated Geothermal Water Use in Idaho, 1995.

Use	Developments	Est. Annual Use
Space Heating	300	8,600 AF
Greenhouse	10	6,200 AF
Resort/Devel. Recreation	38	14,200 AF
Aquaculture	25	40,000 AF
Stock Water	13	230 AF

Source: Idaho Department of Water Resources, 1996. Water Right database and Adjudication claim database.

Fish and Wildlife

Idaho's fish and wildlife attributes are well known; hunters, fishermen, wildlife watchers and photographers come from all over the world to take advantage of the state's natural wealth. Rivers and streams and their associated riparian communities are the home, whether permanent or temporary, for the majority of Idaho's fish and wildlife.

Populations of 83 different species of fish occur throughout almost 100,000 miles of rivers and streams and 464,000 acres of lakes and reservoirs in Idaho (Idaho Department of Fish and Game, 1995). The upper portions of most watersheds in Idaho are classified as *wild trout* habitat based on the natural reproduction potential of streams with good to excellent trout habitat.

Many of Idaho's aquatic and riparian species' habitats have deteriorated from their original natural state. Deterioration and loss of habitat are often the result of development. Agricultural development has reduced the forage base for many species, eliminated wintering grounds for big game, displaced species like sage grouse, eliminated raptor habitats in the vicinity of the Snake River Birds of Prey Natural Area, and contributed to spring flow decline in Bruneau snail

habitat. Urban development has displaced riparian habitat and winter ranges along the Boise River. Water withdrawal for domestic, commercial, municipal, and industrial use has impacted Boise Valley ground water levels which in turn may ultimately threaten instream flows for fish and wildlife in the Boise River. Governor Batt's *Bull Trout Conservation Plan* (June 24, 1996) maintains that threats to bull trout persistence are linked to habitat modifications caused by timber harvest, road building, grazing, mining, dams, hydroelectric development, and irrigation diversions.

Idaho does have several aquatic, riparian, or wetland species that have stable or expanding, but sometimes localized, native populations, including the cutthroat trout, Canada goose, river otter, moose, and bald eagle. In 1993, more than 60 pairs of bald eagles nested in Idaho. About 700 individuals wintered on the large Panhandle lakes, and the Clearwater, Kootenai, and Snake river systems, up significantly in the last few years (Idaho Department of Fish and Game, 1993). Non-native but popular species, such as the small-mouth bass and brook trout, have been successful either because new habitats have been created or native species have been displaced. Future trends for Idaho's wildlife will depend on the solutions to declining populations and habitat loss.

The Idaho Department of Fish and Game (IDFG) is charged with the preservation and protection of all wildlife in the state (Idaho Code 36-103). The department maintains lists of threatened or endangered plants and wildlife, protected nongame species, and species of special concern. IDFG also provides consultation to land management agencies and private landowners on habitat protection and improvement.

Twenty fish species have been identified by the Idaho Department of Fish and Game in their Fisheries Management Plan 1996-2000, as Species of Special Concern. These are native species or subspecies, which are either low in number, limited in distribution, or have suffered significant reductions due to habitat losses (Table 15). Fifteen priority terrestrial Species of Special Concern have also been identified including three species of amphibians, nine birds, and three mammals, eight of which are associated with aquatic, riparian, or wetland habitats (Table 16).

Table 15. Fish Species or Subspecies of Special Concern.

Snake River white sturgeon *(Acipenser transmontanus)*
Burbot *(Oncorhynchus mykiss gairdneri)*
Bonneville cutthroat trout *(Oncorhynchus clarki utah)*
Westslope cutthroatt *(Oncorhynchus clarki lewisi)*
Yellowstone cutthroat *(Oncorhynchus clarki bouvieri)*
Bear Lake cutthroat *(Oncorhynchus clarki ssp.)*
Fine-spotted cutthroat *(Oncorhynchus clarki ssp.)*
Bull trout *(Salvelinus confluentus)*
Bear Lake whitefish *(Prosopium abyssicola)*
Bonneville whitefish *(Prosopium spilonotus)*
Bonneville cisco *(Prosopium gemmiferum)*
Bear Lake sculpin *(Cottus extensus)*
Shoshone sculpin *(Cottus greenei)*
Wood River sculpin *(Cottus leiopomus)*
Leatherside chub *(Gila copei)*
Sand roller *(Percopsis transmontana)*
Pacific lamprey *(Lampetra tridentata)*

Source: Idaho Department of Fish and Game, 1995.

Table 16. Terrestrial Species of Special Concern in Idaho associated with aquatic, riparian, or wetland habitat.

Coeur d'Alene salamander *(Plethodon idahoensis)*
Spotted frog--south of Snake River *(Rana pretiosa)*
Northern leopard frog *(Rana pipiens)*
Common loon *(Gavia immer)*
American white pelican *(Pelecanus erythrorhynchos)*
Black tern *(Chlindonias niger)*
Trumpeter swan *(Cygnus buccinator)*
Harlequin duck *(Histrionicus histrionicus)*

Source: Idaho Department of Fish and Game, 1994.

The Endangered Species Act of 1973 as amended provides general responsibilities to the U.S. Departments of Interior and Commerce to implement a federal program to conserve species whose existence is threatened or endangered. The U.S. Department of Agriculture is given specific authorities relating to plants. Agencies with the most visibility in Idaho are the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Of the 17 species in the state of Idaho that are currently federally-listed as threatened or endangered, 12 are associated with aquatic, riparian or wetland habitats (Table 17).

Table 17. Federal Threatened and Endangered Species in Idaho associated with aquatic, riparian, or wetland habitat.

Bald Eagle (*Haliaeetus leucocephalus*)
Whooping Crane (*Gus americana*)
Sockeye Salmon (*Oncorhynchus nerka*)
Chinook Salmon (*Oncorhynchus tschawytscha*)
Kootenai River white Sturgeon (*Acipenser transmontanus*)
Valvata Snail (*Valvata utahensis*)
Bliss Rapids Snail (undescribed species)
Bruneau Hot Springs Snail (*Pyrgulopsis bruneauensis*)
Idaho Springsnail (*Pyrgulopsis idahoensis*)
Banbury Springs Limpet (*Lanx sp.*)
Snake River Physa Snail (*Physa natricina*)
Water Howellia (*Howellia aquatilis*)

The state has attempted to cooperate with federal efforts to protect and recover endangered or threatened species. Federal recovery requirements frequently have negative social and economic impacts or are in conflict with state law. Each federal listing has resulted in specific responses from the state.

Salmon - Snake River spring/summer chinook, fall chinook, and Snake River sockeye are all listed as endangered species. The state has pledged to support continued data collection and analysis. There is a clear need to better identify: (1) the best out-migration route for juveniles (i.e. in-river or barging), (2) the quality and availability of spawning habitat, (3) the impact of hatchery supplementation, and (4) the degree of ocean survival for salmon.

One proposed method to lessen the impact of dams and reservoirs on outward migrating juveniles is to increase water velocity by flow augmentation. Idaho does not support this practice as a long-term solution. The Idaho Legislature in 1996 passed a joint resolution opposing the use of Idaho water for flow augmentation. The Legislature has agreed to not oppose the use of up to 427,000 acre-feet from the Snake River above Brownlee Reservoir through 1999 (Idaho Code 42-1763B). The Governor has implemented a procedure which structures Idaho's recovery efforts on a yearly basis depending on water availability rather than subscribing to a rigid policy. The National Marine Fisheries Service has developed a recovery plan for Snake River Salmon and has issued a biological opinion governing operation of the Federal Columbia River Power System. The biological opinion specifies several studies to be completed in or prior to 1999. Recovery efforts and operation of the federal hydropower system are likely to change starting in the year 2000.

Bruneau Snail - Prior to listing as endangered, the Bruneau Snail was a little known species occupying a very small area in Owyhee County. At the time of listing it occurred in a narrow band of thermal springs and seeps along a 5.28-mile stretch of the Bruneau River and a tributary, Hot Creek. One of the largest springs had ceased to flow year round thereby eliminating a portion of the habitat and population. There is a general concern that continued lowering of the water table in the area will reduce the habitat even further. The aquifer was closed to all new consumptive uses except domestic and stockwater in 1992. The regional water table has continued to decline. Some of the decline may be attributed to the precipitation patterns of the late 1980's and early 1990's. It is assumed that the aquifer will stabilize at some level tied to the approved pumping amounts with fluctuations related to precipitation cycles.

Idaho law does not provide for protection of the snail. Therefore there is no opportunity to take express action for the protection or restoration of the snail under state law. As a federally listed species, the federal government has several options to maintain the snail population including the purchase of land and water rights.

Sturgeon - Isolated populations of white sturgeon exist in the Snake and Kootenai rivers in Idaho. The Kootenai River population of white sturgeon was listed as a federal endangered species on September 6, 1994.

The Kootenai River sturgeon range 168 miles from Cora Linn Dam at the outlet of Kootenay Lake, British Columbia to Kootenai Falls which is located 31 miles downstream from Libby Dam in Montana. This population is believed to have been isolated for approximately 10,000 years. Changes in stream habitat and water quality are likely having an impact on the population. The change in the stream flow pattern caused by operations at Libby Dam since its construction in 1972 is believed to have a direct impact on spawning and egg survival. Efforts are underway to modify the timing and size of releases from Libby Dam to provide a more suitable environment for natural reproduction. The Kootenai Tribe has a hatchery

supplementation program underway that will help maintain the population in the short term.

Snake River Mollusks - On December 14, 1992 five aquatic snails from the Snake River were listed as threatened or endangered species according to provisions of the federal Endangered Species Act. The Idaho Spring snail, the Utah valvata snail, the Snake River physa snail and the Banbury Springs lanx are listed as endangered, while the Bliss Rapids snail is considered to be threatened.

The U.S. Fish and Wildlife Service's recovery plan for the species takes an ecosystem approach to their habitat. Individual ranges when aggregated cover the river reach from American Falls Dam downstream to the C.J. Strike Reservoir, a distance of approximately 200 miles. The recovery plan is keyed to improving water quality, maintaining or increasing spring flows in the reach, and establishing minimum flows in the river at levels necessary to restore and maintain essential aquatic habitats. The expectation is that these actions will improve habitat for all riverine species.

Bull Trout - While not listed as a threatened or endangered species, bull trout are a candidate for listing. The U.S. Fish and Wildlife Service has stated that it warrants listing, but that the agency has other higher priority species to deal with. Once considered a nuisance fish because of its piscivorous feeding habits, the bull trout was widely distributed in the Pacific Northwest. Effective efforts at the state level to maintain and restore bull trout populations in Idaho, Montana, Washington, and Oregon might forestall federal listing.

The Governor of Idaho has formulated a plan for the state that seeks to maintain and where possible improve bull trout habitat. The Governor's plan takes advantage of existing authorities to establish land-use practices at the watershed level. Watershed Advisory Groups consisting of local residents are empowered to develop plans which hopefully will address the needs of the trout and the local populace.

The future for Species of Special Concern and federally-listed threatened and endangered aquatic and riparian species, including fish, amphibians, and molluscs, is uncertain. The Governor's *Bull Trout Conservation Plan* calls for additional water in streams for fish. Although a new concept, the Idaho Soil Conservation Commission's *Model Watershed Plan: Lemhi, Pahsimeroi, and East Fork of the Salmon River* is an excellent model for the future, giving attention to the total watershed, as well as riparian habitats and instream flows (Idaho Soil Conservation Commission, 1995). Another approach is through the Idaho Water Resource Board's individual basin planning process, which provides the opportunity to protect streams through the state river protection system, designating minimum stream flows, and offering specific recommendations for stream and riparian rehabilitation. The emphasis in all of these approaches is on the watershed or ecosystem rather than a single at-risk species.

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Recreation

The Idaho Department of Commerce estimates that recreation and tourism contribute $2 billion to Idaho's economy, serving 23 million travelers. An estimated 3.7 million nonresident motor vehicle parties visited Idaho for pleasure in 1993 and spent approximately $1.3 billion (Hunt et al, 1994). Residents recreating in the state expended another $972 million (Parrish et al., 1996).

Much of the recreation activity in the state is associated with water, occurring on or along waterways. People are attracted to streams, rivers, lakes and reservoirs when seeking recreation opportunities. Additionally, in a state covered with rugged, mountainous terrain, river canyons are often the transportation corridor. Roads, trails, campgrounds, and picnic areas are usually located along watercourses.

Idaho's water resources are an important resource base for the outfitting and guiding industry which earned *more than $22 million in gross revenues* for 1993 (Leidner and Krumpe, 1995). The combined revenue for boating and fishing trips comprised almost $14 million. Fishing comprised almost $3 million of the revenues, serving 54,246 clients. The remaining $11 million was generated from serving 95,073 boating clients. Fifty-seven percent of the clients took float trips and 43 percent took power boat trips. The boating segment of the industry has seen a steady increase in clients.

Studies conducted in 1993 and 1994 surveyed recreation use patterns and activities for resident and non-resident travelers while in Idaho. Water-based recreation comprised about 16 percent of outdoor recreation activity for residents and 21 percent for non-residents. Figures 36-38 summarize outdoor recreation survey data for residents and non-residents.

FISHING

Fishing resources in Idaho are significant, including more than 26,000 miles of fishable streams and 202 major lowland lakes and reservoirs (IDFG, 1995). Over 400,000 fishing licenses were purchased in 1995. Forty percent were nonresident licenses (Kochert, 1996).

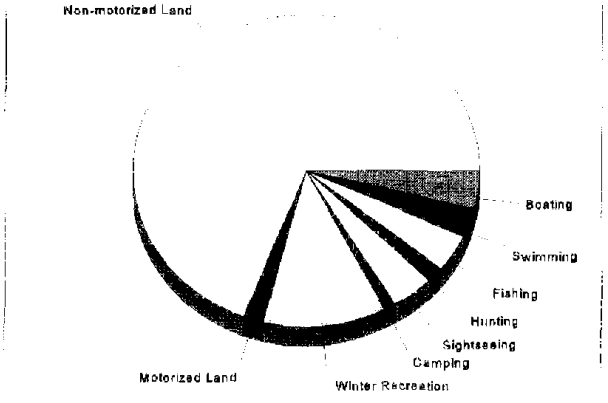

Figure 36. Idaho Resident Participation in Outdoor Recreation Activities within their communities. Non-motorized land recreation activities include biking, picnicking, hiking, horseback riding, backpacking, berry picking, nature observation and urban activities such as walking. Motorized land recreation activities include off-road vehicle use. Source: Parrish et al., 1996.

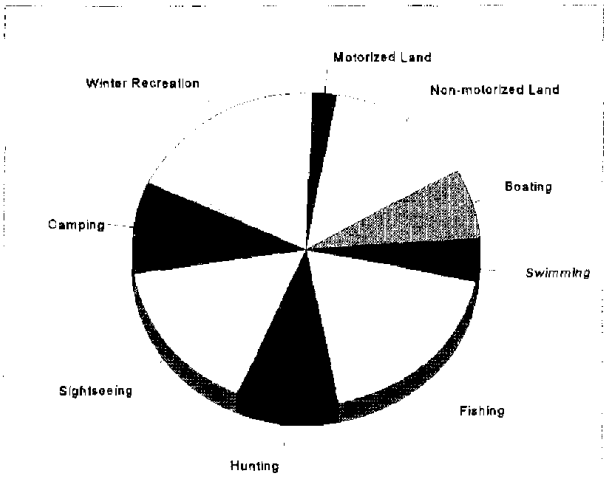

Figure 37. Idaho Resident Participation in Outdoor Recreation Activities outside their communities. Non-motorized land recreation activities include biking, picnicking, hiking, horseback riding, backpacking, berry picking, nature observation and urban activities such as walking. Motorized land recreation activities include off-road vehicle use. Source: Parrish et al., 1996.

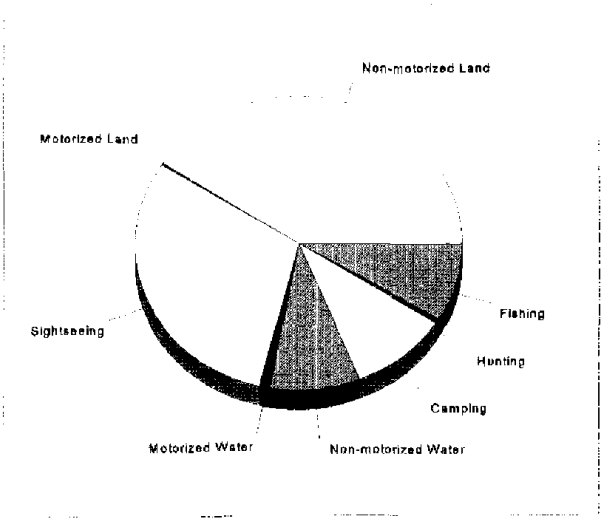

Figure 38. Non-resident Participation in Outdoor Recreation Activities. Non-motorized water activities include float boating, sailing, tubing, canoeing, kayaking, and rafting. Motorized water activities consist of motor boating and water skiing. Source: Hunt et. al., 1994.

Fishing license sales have increased about 8 percent over the past five years, but the ratio of resident to nonresident licenses has remained fairly constant (Idaho Statistical Abstract, 1996). Sport fishing contributed $400 million to Idaho's economy in 1995. The steelhead fishery alone generated $52 to $98 million for 1992-1993. The IDFG receives about $6.6 million annually from the sale of fishing licenses and fees, and taxes on fishing tackle, equipment, and motor boat fuels (IDFG, 1995).

Idaho anglers spent 60 percent of their time fishing lakes and reservoirs in 1994 (IDFG, 1995). The most popular lakes and reservoirs were Henrys Lake, Lake Pend Oreille, Brownlee, C.J. Strike and Cascade reservoirs. The most fished rivers included the Snake and Salmon rivers.

Half of the angling effort in the state was directed towards catching trout (IDFG, 1995). Of the top 100 fishing trout streams identified in the United States, nine were cited in Idaho: the Henrys Fork, Kelly Creek, Lemhi Creek, Lochsa River, Middle Fork of the Salmon, Silver Creek, South Fork Boise River, South Fork Snake River, and Wood River (Pero and Yuskavitch, 1989).

Boating and fishing access in the state was quantified from a 1995 inventory of recreation facilities managed by federal, state, local and private entities. Table 18 lists the number for each travel region. The Idaho Department of Parks and Recreation has determined 405 developed boating facilities are accessible to motorized boats (Brandt, 1996).

Table 18. Recreation Facilities for Water-Based Recreation Activities by Region

	Boat Ramps	Boat Docks	Fishing Access
Panhandle	816	1850	95
Clearwater	102	105	91
SW Idaho	649	415	24
So. Central	52	64	165
SE Idaho	107	183	11
Upper Snake	39	53	70
Upper Salmon	107	15	48
TOTAL	1872	2685	504

Source: Sanyal, 1996.

BOATING

Boating opportunities are numerous in Idaho. The state has more than 650,000 surface acres of boatable waters encompassing rivers, lakes and reservoirs. Table 19 summarizes surface acres for each region in the state. Idaho has the largest number of registered boats per capita in the West. Over 80,000 registered motor boats and sailboats used Idaho waters in 1995 (Hiatt, 1996). This is a 25 percent increase from 1990. The most popular boating areas, based on county designations by registered boaters, are Lake Coeur d'Alene, Pend Oreille, Priest Lake, Lucky Peak Reservoir, and Cascade Reservoir. Residents of the Idaho Panhandle are more likely to boat and swim in lakes than residents of any other region (Parrish, et al., 1996).

More than 3100 miles of whitewater occurs in the state on over 67 rivers and streams. Opportunities for all skill levels are available. Many of these rivers attract people from around the country and world. Popular whitewater runs include several reaches of the Salmon River, Payette and Snake River. Other whitewater opportunities are pursued on the Owyhee,

Bruneau, Jarbidge, Lochsa, Selway, Boise, Saint Joe, Teton, Fall, and Clearwater rivers and tributaries.

Table 19. Boatable Surface Acres in Idaho by Region.

	Surface Acres	Percent of State Total
Panhandle	167,856	25.7 %
Clearwater	61,004	9.4
SW Idaho	135,520	20.8
So. Central	29,635	4.6
SE Idaho	134,355	20.7
Upper Snake	80,075	12.2
Upper Salmon	42,812	6.6
TOTAL	651,257	100.0

Source: Murphey, 1996.

WATER MANAGEMENT

Recreation activities are affected by water management. Direct effects include the quality of boating and fishing, and the perceived scenic quality of the river for shoreline recreational use (Brown et al., 1991; Brown and Daniel, 1991). Instream flows determine boating craft size and type, required boating skills, length of trip, and safety of floating a river reach. For fishing, flows determine angler carrying capacity, habitat conditions and fishery quality (Brown, et al., 1991). Picnicking, camping, sightseeing and hiking are some of the recreation activities indirectly affected by changes in scenic quality along river corridors.

Water management can affect boating activities on reservoirs and lakes. Many are managed for irrigation, flood control and energy production, resulting in fluctuating lake levels. Drawdowns can restrict access to the reservoir when boat ramps become unusable at certain lake levels. Scenic quality effects are also experienced when bands of bare soils are exposed around the perimeter of the reservoir.

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Protection Programs

MINIMUM STREAM FLOW

A minimum stream flow, also called an instream flow, is a minimum flow necessary to preserve stream or lake values. Water is not diverted and used, as is the case with most other water rights in Idaho. Instead, the water remains in a given reach of a river channel or in a lake to protect fish and wildlife habitat, aquatic life or the water quality of the stream, or for navigation, transportation, recreation, or aesthetic beauty.

As early as 1925, the Idaho Legislature declared that the preservation of water in certain lakes for scenic beauty, health, and recreation purposes was a beneficial use of water. A statutory appropriation of water in Payette Lake, Lake Coeur d'Alene, Pend Oreille and Priest Lake, was made in trust for the people of the State of Idaho. The water right was issued to the Governor [Idaho Code 67-4301 to 67-4312].

Instream appropriations did not become an issue again in Idaho until the 1970s. In 1976 the Idaho Water Resource Board's first State Water Plan called for a statewide instream flow program. The Idaho Legislature adopted the State Water Plan in 1978 which established minimum flows on the Snake River at Murphy and Weiser. The Legislature also authorized the Idaho Water Resource Board to hold minimum stream flow water rights in trust for the citizens of the State of Idaho.

The State of Idaho holds 76 minimum stream flow water rights on stream segments, springs, or lakes, totaling 445 stream miles and over 4 million acre-feet in lakes. An additional 26 applications for minimum stream flow water rights have yet to be approved. Figure 39 displays the current distribution of minimum stream flow appropriations in Idaho. Minimum stream flow appropriations are also listed in Table 20.

If a pattern or relationship is to be discerned from the distribution of instream flow water rights within Idaho, it is a close association with popular recreation areas, and concern for the Snake River canyon springs below Milner Dam. The appropriations for springs in the Thousand Spring area are particularly conspicuous along the Snake River in south-central Idaho. Much of the outflow from the Snake Plain aquifer occurs in this area.

STATE PROTECTED RIVERS

Legislation in 1988 provided for the development of a "comprehensive state water plan" based upon river basins or other geographic considerations. Each basin or waterway plan becomes a component of the State Water Plan. The 1988 legislation also authorized the Water Resource Board to preserve highly-valued waterways as state protected rivers. River segments with outstanding fish and wildlife, recreational, aesthetic or geologic value, as identified in components of the Comprehensive State Water Plan, may be designated for state protection.

If the Board decides that the values of preserving an outstanding waterway in its existing condition outweigh the values of continued development, it can, subject to legislative approval, designate that waterway either a Natural or a Recreational River to protect existing resources and use. Designation may prohibit (a) construction or expansion of dams or impoundments; (b) construction of hydropower projects; (c) construction of water diversion works; (d) dredge or placer mining; (e) alterations of the stream bed; and (f) mineral or sand and gravel extraction within the stream bed.

Over 1,700 miles of Idaho's rivers are protected by the State (Table 21). Figure 40 shows designated stream segments in Idaho.

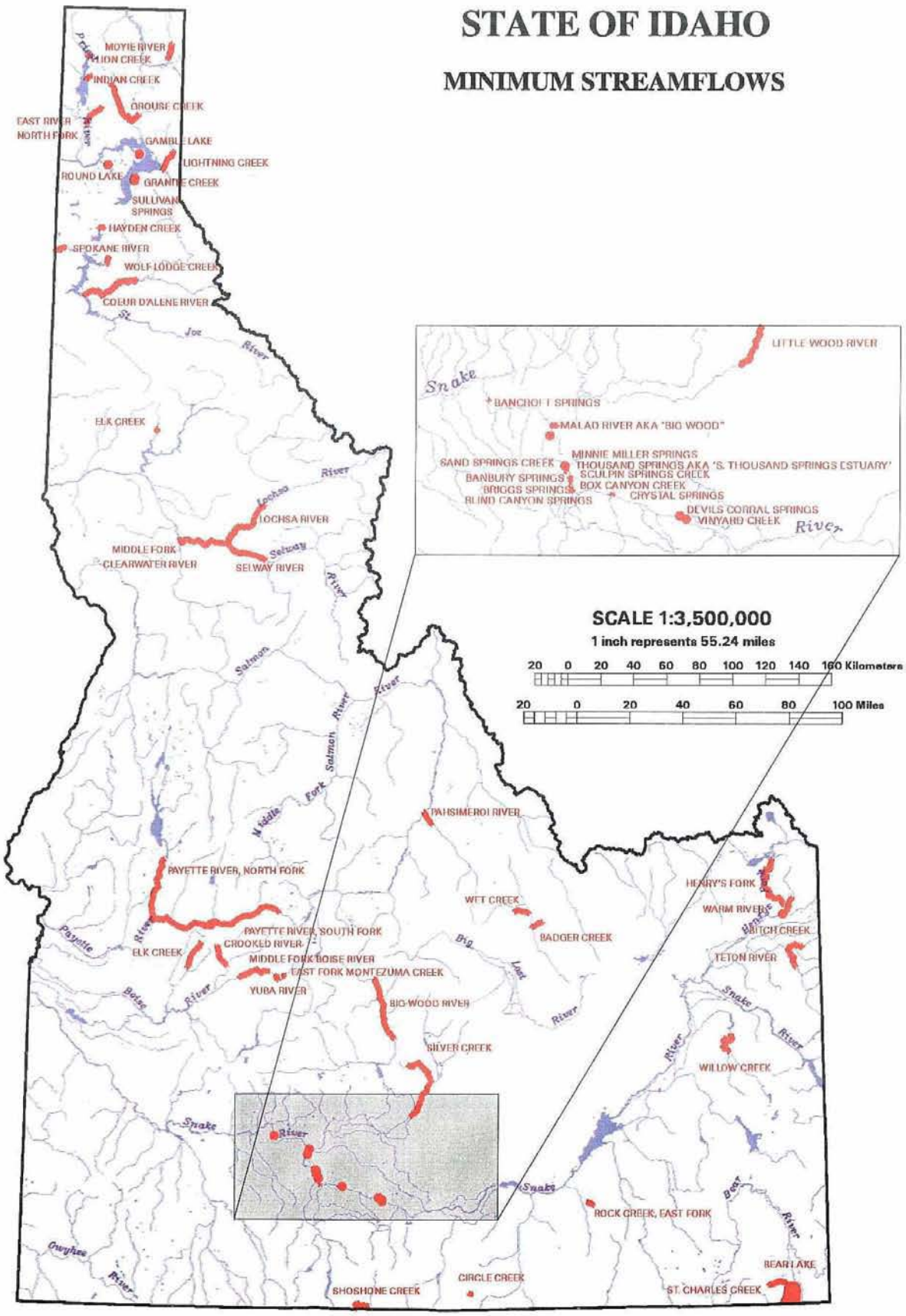

Figure 39. State of Idaho Minimum Stream Flow Appropriations

Table 20. Minimum Stream Flow Appropriations in Idaho.

Basin	Stream, Spring, or Lake	Water Right No.	Priority Date	Flow (cfs)	Volume (acre-feet)	Distance (miles)	Requestor or Authorizing Action
Payette	Big Payette Lake	65-02333	03/05/1925		25495	0	Idaho Code
Spokane	Coeur D Alene Lake	95-02067	01/24/1927		1000000	0	Idaho Code
Pend Oreille	Pend Oreille Lake	96-02118	01/24/1927		2400000	0	Idaho Code
Pend Oreille	Priest Lake	97-02020	01/24/1927		800000	0	Idaho Code
Snake	Big Springs	36-07199	12/07/1971	66.57		0	Idaho Code
Snake	Niagara Springs	36-07200	07/12/1971	264		0	Idaho Code
Snake	Malad Canyon Springs	37-07108	07/12/1971	900		0	Idaho Code
Snake	Snake River at Milner	02-00200	12/29/1976	0		0	State Water Plan
Snake	Snake River at Murphy	02-00201	12/29/1976	3300		0	State Water Plan
Snake	Snake River at Weiser	03-00006	12/29/1976	4750		0	State Water Plan
Snake	Snake River at Johnson Bar	03-00007	07/01/1978	5000		0	State Water Plan
Snake	Vinyard Creek	36-07818	09/13/1978	17		0.25	Idaho Department of Fish and Game
Snake	Briggs Springs	36-07819	09/13/1978	30		0.25	Idaho Department of Fish and Game
Snake	Blind Canyon Springs	36-07820	09/13/1978	8		0.5	Idaho Department of Fish and Game
Snake	Banbury Springs	36-07822	09/13/1978	97		0.25	Magic Valley Fly Fishers
Bear	St. Charles Creek	11-07152	09/13/1978	9-17		7	Idaho Department of Fish and Game
Little Wood	Silver Creek	37-07727	09/13/1978	99		11.0	Idaho Department of Fish and Game
Little Wood	Silver Creek	37-07728	09/13/1978	74		10.0	Idaho Department of Fish and Game
Snake	Bancroft Springs	37-07734	09/13/1978	17		0.1	Idaho Department of Fish and Game
Little Wood	Little Wood River	37-07739	09/29/1978	39		14.0	Idaho Department of Fish and Game
Spokane	Wolf Lodge Creek	95-07874	09/13/1978	7-30		3.0	Idaho Department of Fish and Game
Pend Oreille	Granite Creek	96-07771	04/17/1979	10		0.5	Idaho Department of Fish and Game
Pend Oreille	Sullivan Springs	96-07772	04/17/1979	45		0.1	Idaho Department of Fish and Game
Snake	Devils Corral Springs	36-07872	09/21/1979	48		0.5	Idaho Department of Fish and Game
Salmon	Pahsimeroi River	73-07045	12/19/1979	45-74		7.0	Idaho Department of Fish and Game
Upper Snake	Rock Creek, East Fork	41-07046	01/16/1980	11		3.0	Power County Commissioners
Little Wood	Silver Creek	37-07849	08/26/1980	74		13.0	Idaho Department of Fish and Game

Table 20 Minimum Stream Flow Appropriations in Idaho.

Basin	Stream, Spring, or Lake	Water Right No.	Priority Date	Flow (cfs)	Volume (acre-feet)	Distance (miles)	Requestor or Authorizing Action
Upper Snake	Henrys Fork	21-07282	06/19/1981	300-1000		24.0	Idaho Department of Parks & Recreation
Henrys Fork	Warm River	21-07283	06/19/1981	141		0.5	Idaho Department of Fish and Game
Henrys Fork	Teton River	22-07369	06/19/1981	106		9.0	Idaho Department of Fish and Game
Teton	Bitch Creek	22-07370	06/19/1981	28		7.5	Idaho Department of Fish and Game
Big Wood	Big Wood River	37-07919	06/19/1981	70		18.0	Idaho Department of Fish and Game
Snake	Malad River	37-07920	06/19/1981	39		1.0	Idaho Department of Fish and Game
Pend Oreille	Lightning Creek	96-07979	06/19/1981	49-84		8.0	Idaho Department of Fish and Game
Pend Oreille	Grouse Creek	96-07980	06/19/1981	14-85		5.0	Idaho Department of Fish and Game
Upper Snake	Rock Creek, East Fork	41-07074	09/12/1984	11		1.0	Idaho Water Resource Board
Henrys Fork	Warm River	21-07355	09/27/1984	141		8.0	Idaho Department of Fish and Game
Priest	Indian Creek	97-07274	04/26/1985	26		3.0	Idaho Department of Parks & Recreation
Priest	Lion Creek	97-07275	04/26/1985	22		2.0	Idaho Department of Parks & Recreation
Payette	Payette River and SF Payette	65-12733	04/26/1985	212-1350		54.0	Idaho Department of Parks & Recreation
Snake	Snake River at Murphy	02-00223	07/01/1985	600		0	State Water Plan - Swan Falls Agreement
Snake	Snake River at Murphy	02-00224	07/01/1985	2300		0	State Water Plan - Swan Falls Agreement
Snake at Lime Point	Snake River	03-00008	07/01/1985	13000		0	State Water Plan - Swan Falls Agreement
Big Wood	Big Wood River	37-08258	01/16/1986	150-200		9.0	Blaine County Planning & Zoning
Snake	Minnie Miller Springs	36-08307	03/19/1986	200-450		0.5	Idaho Department of Parks & Recreation
Snake	Crystal Springs	36-08330	07/27/1987	50		0.25	Idaho Department of Fish and Game
Snake	Box Canyon Creek	36-08337	10/16/1987	75-162		0.25	U.S. Bureau of Land Management
Salmon Falls	Shoshone Creek	47-08073	10/16/1987	5-7		10.0	Idaho Department of Fish and Game
Spokane	Hayden Creek	95-08560	10/16/1987	4-20		3.0	Idaho Department of Fish and Game
Pend Oreille	Round Lake	96-08503	10/16/1987		EL 2125.09	0	Idaho Department of Parks & Recreation
Big Wood	Big Wood River	37-08307	10/26/1987	119		0	Idaho Water Resource Board
Payette	Payette River, North Fork	65-12822	12/17/1987	106-1400		10.0	Idaho Department of Parks & Recreation
Payette	Payette River, North Fork	65-12839	04/15/1988	100-294		0	Idaho Water Resource Board
Payette	Payette River, North Fork	65-12840	04/05/1988	1300-1800		17.0	Idaho Department of Parks & Recreation

Table 20. Minimum Stream Flow Appropriations in Idaho.

Basin	Stream, Spring, or Lake	Water Right No.	Priority Date	Flow (cfs)	Volume (acre-feet)	Distance (miles)	Requestor or Authorizing Action
Snake	Crystal Springs	36-08374	07/01/1988	25		0.25	Idaho Department of Parks & Recreation
Raft	Circle Creek	43-07295	07/01/1988	0.5-1.5		6.5	Idaho Department of Parks & Recreation
Clearwater	Elk Creek	83-07099	02/10/1989	40-120		1.5	Idaho Department of Parks & Recreation
Payette	Payette River, North Fork	65-13059	05/16/1989	400		0	Idaho Department of Fish and Game
Payette	Payette River, South Fork	65-13060	05/16/1989	700-763		0	Idaho Water Resource Board
Snake	S. Thousand Springs Estuary	36-08556	08/03/1990	500		0.5	Idaho Department of Parks & Recreation
Snake	Sculpin Springs Creek	36-08557	08/03/1990	33		0.5	Idaho Department of Parks & Recreation
Snake	Sand Springs Creek	36-08558	08/03/1990	34		0.4	Idaho Department of Parks & Recreation
Priest	East River, North Fork	97-07308	11/09/1990	18-70		9.25	Idaho Water Resource Board
Snake	Crystal Springs	36-08600	03/22/1991	59		0	Idaho Department of Parks & Recreation
Upper Snake	Willow Creek	25-07597	06/24/1991	22-50		18.0	Idaho Department of Fish and Game
Little Lost	Wet Creek	33-07207	10/03/1991	4-15		6.5	Idaho Department of Fish and Game
Little Lost	Badger Creek	33-07206	05/14/1992	5.5-3.0		5.25	Idaho Department of Fish and Game
Spokane	Coeur d'Alene River	94-07341	06/15/1992	413-1018		35.0	Idaho Water Resource Board
Spokane	Spokane River	95-08780	06/15/1992	951-2495		5.0	Idaho Water Resource Board
Pend Oreille	Pack River	96-08717	06/15/1992	54-129		22.0	Idaho Water Resource Board
Kootenai	Moyie River	98-07704	06/15/1992	149-354		6.9	Idaho Water Resource Board
Clearwater	Selway River	81-07160	07/30/1992	760-1500		19.0	Idaho Water Resource Board
Clearwater	Lochsa River	81-07161	07/30/1992	563-1140		24.0	Idaho Water Resource Board
Clearwater	Clearwater River, Middle Fork	81-07162	07/30/1992	1323-2640		23.0	Idaho Water Resource Board
Bear	Bear Lake	11-07406	05/13/1993		EL 5902.0	0	Bear Lake County Commissioners
Pend Oreille	Gamble Lake	96-08764	06/24/1993		EL 2081.8	0	U.S. Bureau of Land Management

Table 21. Streams in Idaho Designated for State Protection, 1996.

Basin	Reach	Designation	Length in Miles	Date Designated
Priest	Upper Priest River	Natural	19.6	1990
	Upper Priest Lake	Natural	5.9	1990
	Hughes Fork	Recreational	14.1	1990
	Rock Creek	Recreational	3.8	1990
	Lime Creek	Recreational	3.9	1990
	Cedar Creek	Recreational	4.2	1990
	Trapper Creek	Recreational	7.9	1990
	Granite Creek	Recreational	11.1	1990
	Priest River	Recreational	43.7	1990
	Lion Creek	Recreational	11.1	1995
	Two-Mouth Creek	Recreational	10.6	1995
	Indian Creek	Recreational	10.5	1995
Payette	South Fork	Recreational	57.5	1991
	North Fork	Recreational	27.3	1991
	Main	Recreational	14.8	1991
Boise	South Fork	Natural	10.0	1990
		Recreational	18.0	1990
	Lime Creek Drainage	Natural	104.0	1990
		Recreational	128.0	1990
	Big Smoky Creek Drainage	Natural	125.0	1990
	Boise River	Recreational	13.2	1992
	Sheep Creek	Natural	17.8	1992
	Middle Fork Boise River	Recreational	14.5	1992
	Roaring River	Recreational	5.6	1992
		Natural	17.0	1992
	North Fork Boise River	Natural	37.7	1992
		Recreational	17.5	1992
	Crooked River	Recreational	10.1	1992
	Bear River	Recreational	30.0	1992
	Johnson Creek	Natural	7.9	1992
Henrys Fork	Targhee Creek	Natural	12.5	1992
	Henrys Fork	Recreational	41.0	1992
		Natural	17.0	1992
	Golden Lake	Recreational	4.0	1992
	Buffalo River	Recreational	1.0	1992
	Warm River	Natural	14.5	1992
	Robinson Creek	Natural	10.0	1992
		Recreational	4.0	1992
	Rock Creek	Recreational	9.0	1992
	Falls River	Natural	7.0	1992
		Recreational	11.0	1992
	Boone Creek	Natural	4.0	1992
	Conant Creek	Natural	6.0	1992
		Recreational	3.0	1992
	Teton River	Recreational	25.0	1992
	Teton Creek	Recreational	11.0	1992
	Fox Creek	Recreational	2.5	1992
	Badger Creek	Recreational	3.0	1992
	Bitch Creek	Natural	12.5	1992
		Recreational	2.0	1992

Table 21. Streams in Idaho Designated for State Protection, 1996, Cont.

Basin	Reach	Designation	Length in Miles	Date Designated
Snake River	Palisades Dam to Henrys Fk	Recreational	63.9	1996
	Milner to Murtaugh	Recreational	7.0	1993
	Murtaugh to Twin Falls	Natural	9.5	1993
	Twin Falls to Hagerman	Recreational	35.0	1993
	Hagerman to King Hill	Recreational	20.0	1993
North Fork Clearwater	Isabella Creek	Natural	5.4	1996
		Recreational	3.1	1996
	Weitas Creek	Natural	27.7	1996
	Kelly Creek	Natural	31.6	1996
		Recreational	11.0	1996
	Cayuse Creek	Natural	34.9	1996
	Little North Fork	Natural	28.6	1996
		Recreational	11.2	1996
	North Fork Clearwater	Natural	15.0	1996
		Recreational	64.0	1996
	Reeds Creek	Recreational	13.5	1996
	Beaver Creek	Recreational	1.8	1996
	Elk Creek	Recreational	17.5	1996
South Fork Snake	Bear Creek Drainage	Natural	36.1	1996
		Recreational	16.4	1996
	Big Elk Creek	Natural	4.5	1996
		Recreational	0.4	1996
	Black Canyon	Recreational	9.1	1996
	Burns Creek Drainage	Natural	17.3	1996
		Recreational	0.6	1996
	Burns Creek (Reservoir)	Recreational	4.7	1996
	Cress Creek	Recreational	0.1	1996
	Fall Creek Drainage	Natural	13.1	1996
		Recreational	39.3	1996
	Fish Creek	Natural	5.2	1996
	Indian Creek (Reservoir)	Recreational	1.8	1996
	Indian Creek	Recreational	5.9	1996
	Little Elk Creek	Natural	3.5	1996
		Recreational	1.1	1996
	McCoy Creek Drainage	Recreational	62.9	1996
	Palisades Creek Drainage	Natural	29.7	1996
		Recreational	8.2	1996
	Pine Creek Drainage	Natural	2.8	1996
		Recreational	20.8	1996
	NFk Pine Creek Drainage	Natural	15.0	1996
		Recreational	8.1	1996
	West Fk Pine Creek Drainage	Natural	5.2	1996
		Recreational	0.8	1996
	Pritchard Creek	Recreational	6.5	1996
	Rainey Creek Drainage	Recreational	25.1	1996
	Sheep Creek	Recreational	5.4	1996
	Trout Creek	Recreational	4.6	1996
	Warm Springs	Recreational	0.2	1996
	Wolverine Creek	Recreational	3.4	1996

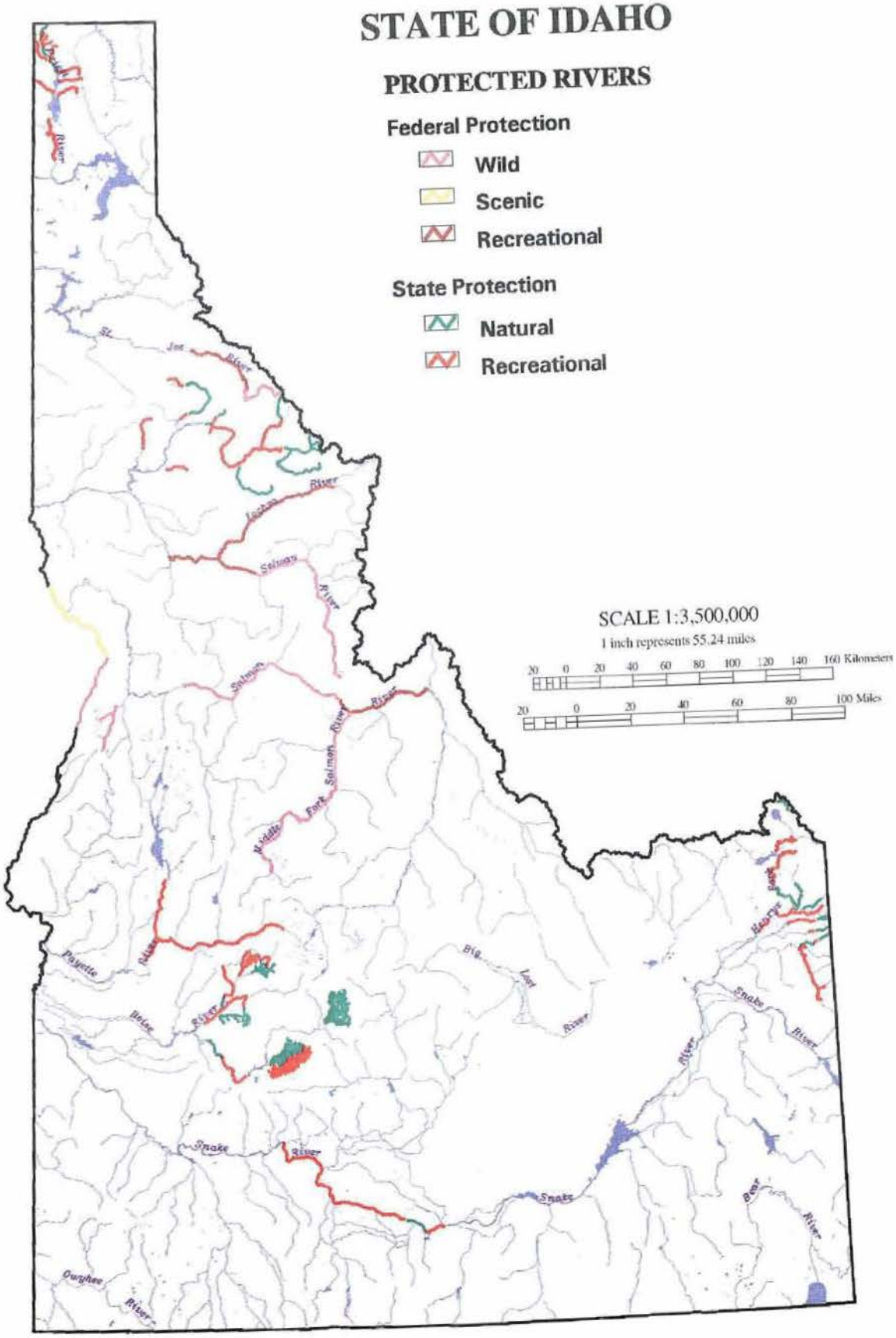

Figure 40. State of Idaho Protected Rivers

NATIONAL WILD AND SCENIC RIVERS

In 1968 the U.S. Congress passed the Wild and Scenic Rivers Act which seeks to protect free flowing rivers in the United States with outstandingly remarkable values. No dams or water projects can be built on the designated river segments. New mining claims are restricted. Ratification of the Act immediately protected the Middle Fork of the Salmon River, the Middle Fork of the Clearwater River above Kooskia, and the Lochsa and Selway tributaries of the Middle Fork with federal designations. In 1996, segments of eight Idaho rivers, a total of 577 miles, are protected by the Wild and Scenic Rivers Act (Table 22). Figure 40 shows designated river segments in Idaho.

Table 22. Rivers in Idaho Protected by the National Wild and Scenic Rivers Act.

River	Length (Miles)	Designation	Date
Middle Fk Clearwater	23	Recreational	1968
Selway	79	Wild	1968
	20	Recreational	1968
Lochsa	70	Recreational	1968
Middle Fork Salmon	106	Wild	1968
Rapid	24	Wild	1975
St. Joe	27	Wild	1978
	40	Recreational	1978
Salmon	79	Wild	1980
	16	Recreational	1980
Snake	32	Wild	1980
	24	Scenic	1980

The Act also directed all federal agencies to give consideration to potential national wild, scenic, or recreational river areas in planning for the use and development of water and related land resources. Federal agencies throughout the state have identified 75 additional river segments as either "eligible" for consideration and study or "suitable" for designation under the Wild and Scenic Rivers Act. Land along these stream segments is managed to protect the river's classification until suitability studies are completed or Congress acts on the designation proposal.

GROUND WATER MANAGEMENT

Where declining ground water levels become a concern, a Ground Water Management Area may be established by the Idaho Department of Water Resources. The Department must ensure that existing water rights in these management areas are not affected adversely by new well construction. Where ground water levels decline at a rate that threatens a reasonably safe supply for existing users, the Department of Water Resources may establish a Critical Ground Water Area. No new well permits are issued and a management plan may be developed to decrease ground water withdrawals. Currently nine Ground Water Management Areas and eight Critical Ground Water Areas have been designated in the state (Table 23; see also Fig. 41).

Table 23. Ground Water Management Areas and Critical Ground Water Areas in Idaho, 1996.

	Designated	Counties
Critical Ground Water Areas		
Artesian City	Jan. 1962	Cassia, Twin Falls
Blue Gulch	Dec. 1970	Twin Falls, Owyhee
Cinder Cone Butte	May 1981	Elmore
Cottonwood	Jan. 1962	Cassia
Curlew Valley	Mar. 1976	Oneida, Power
Oakley-Kenyon	Jan. 1962	Cassia
Raft River	July 1963	Cassia, Power, Oneida
West Oakley Fan	Jan. 1982	Cassia
Ground Water Management Areas		
Bancroft Lund	Oct. 1991	Caribou, Bannock
Big Wood River	June 1991	Camas, Blaine, Elmore, Gooding
Lindsay Creek	Mar. 1992	Nez Perce
Mountain Home	Nov. 1982	Ada, Elmore
Southeast Boise	Oct. 1994	Ada
Ground Water Management Areas (Geothermal)		
Banbury Hot Spgs	Apr. 1983	Twin Falls
Boise Front	June 1987	Ada
Grandview-Bruneau	Oct. 1982	Owyhee
Twin Falls	Jan. 1984	Twin Falls, Jerome, Gooding

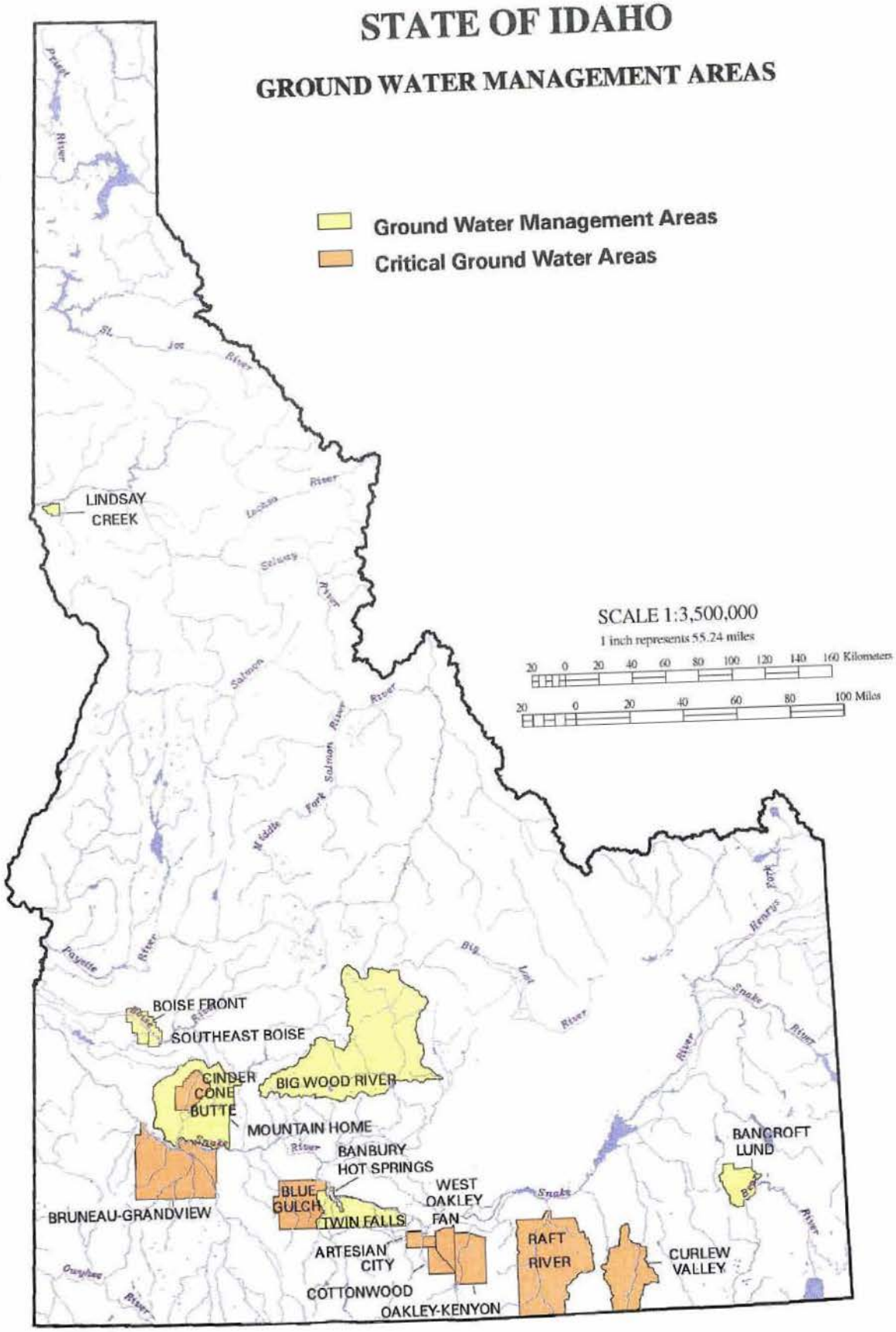

Figure 41. State of Idaho Special Ground Water Area Designations

The 1995 Legislature approved the establishment of ground water districts. These are established when the people who use the ground water resource desire to organize. They are much the same as the older, traditional irrigation districts, except they focus on ground water and include industrial, domestic, commercial, and municipal users as well as ground water irrigators.

An elected board of directors administers the ground water district. It has the authority to conduct ground water monitoring and implement programs to protect the district's ground water resources, and to comply with the requirement for annual reporting of diversions to the Department of Water Resources. The district can also develop plans to mitigate material injury to senior water users caused by ground water use, finance the repair or abandonment of faulty wells, operate water storage and recharge projects, and represent district members in general water rights adjudications.

WATER MEASUREMENT DISTRICTS

One of the most critical needs for making practicable water management decisions is the acquisition of reliable water diversion data. Availability of water use data varies greatly within the state. Irrigation diversion records exist for most surface water districts. Records are also available for hydroelectric project diversions, municipal use in the larger cities, and a few industrial enterprises. Elsewhere, measurements are poor or non-existent. Therefore, total water use must be roughly assessed by indirect methods.

During the 1995 Legislative session, the director of the Department of Water Resources was authorized to divide the state into water measurement districts in such manner that each defined public water source, or part thereof, would constitute a measurement district. Organized water districts were unequivocally excluded from water measurement districts. Ground water districts were excluded in 1996. Irrigation districts, hydropower users, aquaculturists, and instream flow uses could petition to be excluded provided they measure and record the diversions, using appropriate measurement methods, and agreed to provide detailed annual reports concerning their diversions to the Department of Water Resources.

Water measurement districts help ensure that all water diversions in the state are monitored. Water measurement districts were just being formed in late 1996 and monitoring results are not yet available. Once these water measurement districts become better established, and the reporting of diversions becomes consistent, the need for more and better monitoring of water diversions should be accomplished. Water measurement districts and Ground Water Districts formed in 1996 are listed in Table 24.

Table 24. Ground Water Districts and Water Measurement Districts, 1996.

Ground Water Districts	Date Formed	Counties
North Snake	Nov 1995	Gooding, Jerome, Lincoln
Magic Valley	Dec 1995	Minidoka, Jerome, Lincoln, Cassia, and Blaine
Aberdeen-American Falls	Feb 1996	Bingham & Power
Bingham	Aug 1996	Bingham

Water Measurement Districts		
Eastern Snake Plain Aquifer	Formed: Oct 24, 1996	
East Division		Fremont, Madison, Jefferson, Bingham, Bonneville, Caribou, Bannock, Power, and Blaine
North Division		Fremont, Clark, Jefferson, & Butte
West Division		Blaine, Lincoln, Gooding, Jerome, Minidoka, & Cassia

IDAHO'S DEMOGRAPHICS AND ECONOMY

Idaho's economic and cultural diversity is partly a product of its contrasting geography. The state's principal industries are agriculture, manufacturing, tourism, lumber, mining and electronics. The output of Idaho producers is largely exported out of state and the items consumed are largely imported (Holley, 1986; Arrington, 1994).

The 1970s saw Idaho become one of the nation's fastest growing states in population, employment, and income. The annual growth rate of Idaho's non-agricultural employment between 1970 and 1980 was almost twice the U.S. rate. In the 1980s, economic recession slowed population growth and cut employment. Economic gains in the last five years have again boosted income, employment and the state's population.

Population Growth

Idaho's population surpassed one million in the 1990 census and continued to grow faster than the national rate through 1995 (Table 25). From 1990 to 1995 Idaho's total population increased 15 percent, from 1.01 million to 1.16 million. Idaho's population density was 19.8 persons per square mile, compared with 70.3 persons for the nation (Idaho Department of Commerce, 1994; U.S. Bureau of the Census, 1993).

Idaho's population is expected to continue to increase (Fig. 42). In-migration will continue to be a large contributor to population growth because: (1) Idaho has a favorable overall quality of life, (2) costs of living are lower than in major population areas, and (3) unemployment rates are relatively low. In the remaining years of the decade, Idaho's population is expected to grow between 1.9 to 2.3 percent per year.

Idaho remains one of the least densely populated of the 50 states. However, sometime during the 1960s, Idaho changed from a state where most of its citizens lived in a rural setting, to a state of primarily urban or town dwellers (Table 26). The 1990 census identified only 44,869 people living on farms and ranches in Idaho. Forty-eight cities in the state have populations of more than 2,000 residents. Smaller cities and towns enjoyed widespread population gains in the early 1990s. Rural growth is depending primarily on commuters, retirees, vacationers, and manufacturers.

Employment and Income

As in any economy, employment growth in the state is uneven. Some industries have experienced strong growth; some remain unchanged; some have experienced declines in employment.

AGRICULTURE

Much of the state's activity is geared to agricultural production and related service industries. Idaho is a major national producer. The state ranks first in potato production — about 100 million hundred-pound sacks annually or 30 percent of total U.S. volume. The state also ranks first in barley production, third among the states in the production of sugar beets, hops, mint, and onions. Idaho is recognized for many livestock products. The state ranks number one in trout, fifth in American cheese, eleventh in honey, sheep and lambs, and wool. Cattle, potatoes, milk, wheat, barley, sugar beets, and hay, in that order, account for about 85 percent of all agricultural income (Arrington, 1994). Total agricultural income from all sources exceeded $2 billion in 1990.

The vast majority of Idaho's 24,000 farms are small and operated by families. About 40 percent of all Idaho farmer heads-of-households have non-farm occupations. Idaho relies more heavily than many states on non-family labor, partly because of the large number of farms along the Snake River that require labor to irrigate and cultivate row crops.

Table 25. Population Census and Projections, 1990-2000

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population											
Idaho (1000)	1,011	1,038	1,068	1,098	1,131	1,160	1,186	1,212	1,238	1,262	1,289
% Change	1.4%	2.6%	3.0%	2.8%	3.0%	2.6%	2.3%	2.2%	2.1%	1.9%	2.1%
Births											
Idaho (1000)	16.42	16.74	17.20	17.58	18.25	18.81	19.21	19.60	19.98	20.28	20.67
% Change	3.5%	1.9%	2.7%	2.2%	3.9%	3.0%	2.1%	2.0%	1.9%	1.5%	1.9%
Deaths											
Idaho (1000)	7.36	7.64	7.89	8.28	8.53	8.74	8.93	9.11	9.30	9.48	9.67
% Change	-0.4%	3.9%	3.2%	4.9%	3.1%	2.4%	2.2%	2.1%	2.1%	1.9%	2.1%
Net Migration											
Idaho (1000)	4.98	17.63	21.37	20.98	22.90	18.85	16.03	15.63	15.18	13.19	12.1

Source: Idaho Economic Forecast, Vol. XVIII, No.1, Division of Financial Management, Jan. 1996; 1996 Economic Forecast, Idaho Power Company.

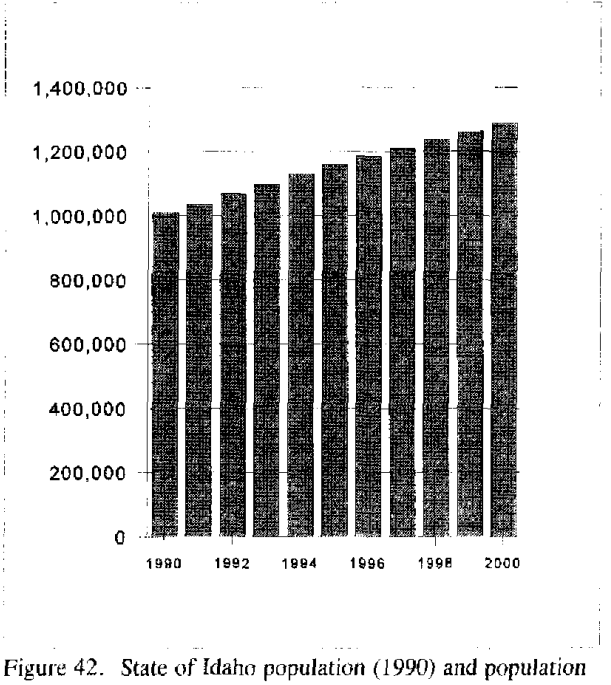

Figure 42. State of Idaho population (1990) and population projections, 1991-2000.

Table 26. Urban and Rural Population in Idaho

	Urban	Percent	Rural	Percent
1950	252,549	42.9	336,088	57.1
1960	317,097	47.5	350,094	52.5
1970	385,434	54.1	327,133	45.9
1980	509,805	54.0	434,233	46.0
1990	578,376	57.4	428,373	42.6

Source: Idaho Blue Book; 1990 U.S. Census

Farm employment declined 23.5 percent in Idaho over the period 1980 to 1992, posting a loss of 10,408 jobs. Productivity gains by more efficient machinery is the largest factor for this decline. Labor costs and an overall shortage of labor encourage agricultural producers to automate as much as possible. While farm employment declined, jobs in the agricultural services, forestry and fisheries sector increased 108.6 percent, posting a gain of 7,571 jobs in Idaho.

NON-AGRICULTURAL EMPLOYMENT

Recent population growth and net in-migration are responses to the opportunities offered in the region's labor market. Growth in non-agricultural employment has been positive in recent years (Table 27). From 1990 to 1995, Idaho's non-agricultural jobs increased by 91,600, or by 23.8 percent. In 1995, the number of non-agricultural jobs totaled an estimated 476,900. Throughout the past five years, most sectors have experienced growth.

Idaho mining employment is predicted to peak in 1996 then decline as the U.S. economy slows. Since the discovery of gold along the Clearwater in 1860, Idaho has been a leading national producer of metallic minerals. Idaho's mineral production, which varies from $200 to $500 million annually, depends on prices, foreign production, the value of the dollar, and technological developments (Arrington, 1994). Idaho is the leading U.S. producer of newly mined silver, accounting for almost half of national production, and the state is the second largest producer of rock phosphate. After suffering three years of decline (1991-93), mining employment, boosted by metals mining, grew 10.0 percent in 1994 and 12.5 percent in 1995. Mining employment is projected to be 2,732 in 1995 and 2,580 in 2000.

Population growth has had a major impact on Idaho's construction industry. Population inflows to Idaho helped drive the construction industry with demand for housing, commercial facilities, and infrastructure. Between 1990 to 1994, employment in this sector jumped 55.0 percent, and more than 10,000 jobs were added. This has been Idaho's fastest growing industry in the last five years. However, the rate of growth slowed in 1995. Idaho construction employment is projected to decline gradually between 1995 and the year 2000.

A predicted combination of less-than-favorable demand and supply factors is projected to check employment in Idaho's lumber and wood products sector. In the transportation, communication, and public utility industries, trucking was the area of greatest change. Several warehouse facilities have been built in Idaho resulting in more truck traffic and employment. The growth in this area has balanced the losses due to downsizing in the railroad, communication, and public utility sectors.

Employment has boomed in the retail trade sector in the last five years, with 24,400 new jobs added (25.1% of total non-agricultural employment; see also Figure 43). More than 28,100 jobs have been added in the service industry. The strongest area of growth was eating and drinking establishments.

Government employment will probably show growth but primarily in the education sector as federal and state budgets are tightened. The federal government employs approximately 12,000 people in Idaho and spends about 30 percent more in the state than it collects in taxes. Additional expenditures by the Department of Defense and the Department of Energy support Gowen Field, a National Guard training facility, Mountain Home Air Force Base, and the Idaho National Engineering Laboratory. State and local governments employ approximately 56,000 people in Idaho.

In recent years travel and tourism have become a significant contributor to the state's economy. Lodging, entertainment, restaurant and beverage establishments, sports facilities, transportation services, and consumer retail businesses have expanded and earn a substantial proportion of their total income from resident and non-resident recreation and tourism. Special events, such as the Boise River Festival, the Teton Hot Air Balloon Rally, or the Weiser National Old Time Fiddler's Festival bring large numbers of visitors to the state. Camping, boating, fishing, backpacking, and hunting attract thousands of people to visit Idaho. Professional river-runners operate on 22 of Idaho's rivers. Expenditures for travel and tourism were estimated to be $1.5 billion in 1990, $2 billion in 1994, and employment approached 30,000 workers (Arrington, 1994; Hunt et al, 1994; Parrish et al., 1996).

Table 27. Idaho Non-farm Employment (Thousands)

	1990	1995	(%)	2000	90-95%	95-00%
Total Non-farm	385.3	475.1	100.0%	546.6	23.3%	15.0%
Manufacturing	62.9	70.6	14.9%	78.9	12.2%	11.8%
Mining	3.9	2.7	0.6%	2.58	-30.8%	-4.4%
Construction	18.7	29.0	6.1%	27.0	55.1%	-6.9%
Fin., Ins., Real Estate	19.8	24.0	5.1%	25.0	21.2%	4.2%
Trans., Com., Utilities	19.8	22.3	4.7%	24.1	12.6%	8.1%
Trade	97.1	121.5	25.6%	143.9	25.1%	18.4%
Services	81.8	109.9	23.1%	141.6	34.4%	28.8%
State, Local Government	68.3	81.7	17.2%	91.7	19.6%	12.2%
Federal Government	13.1	13.2	2.8%	12.3	0.8%	-6.1%

Source: Idaho Economic Forecast, Idaho Department of Commerce, January 1996.

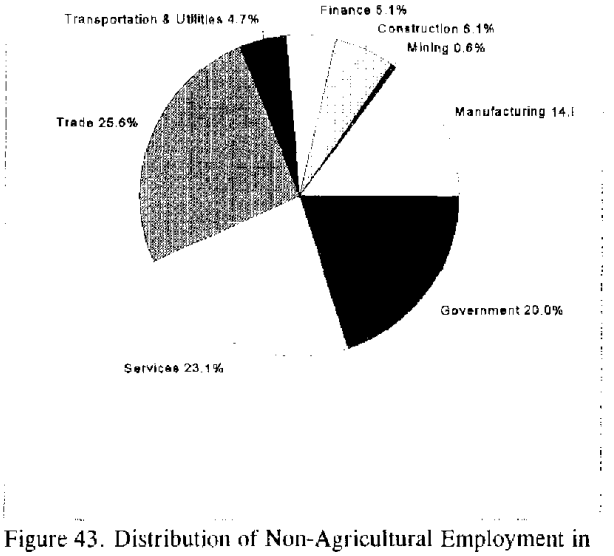

Figure 43. Distribution of Non-Agricultural Employment in Idaho, 1995.

Non-agricultural employment grew 3.4 percent in 1995, compared with 5.6 percent in 1994. Idaho experienced some high profile problems in 1995. Downsizing in the technology sector and bank mergers resulted in employment reduction. The employment outlook for 1996 is continued growth at a rate similar to 1995. Construction employment is showing signs of strong growth again in 1996.

Trade and service employment will most likely continue to expand. New establishments, large and small, across the state suggests that employers have confidence in the economy and the customer base. In the remaining years of the decade, Idaho's non-agricultural employment is forecast to advance 2.1 percent to 3.3 percent annually.

UNEMPLOYMENT AND INCOME

Table 28 provides a comparison of the annual average labor force and unemployment rates for 1990 through 1995. Since 1990, Idaho has added 105,100 people to the state's labor force. In 1994, Idaho added 41,700 people to the labor force, the largest growth in any one year period. In 1995, Idaho's labor force grew by only 1.4 percent (8,300 people), slower than any of the previous five years. Unemployment has gone up and down with the largest number of jobless in 1992, a record 34,700 people. Idaho's annual average unemployment rate decreased steadily from 6.5 percent in 1992 to 5.4 percent in 1995.

In 1995, the Idaho median family income of $32,900 per year, was lower than the national median of $39,700. Idaho's per capita personal income in 1995 was $19,144, an increase of 3.8 percent over 1994. The U.S. per capita personal income average is $22,957 with a national average growth rate of 5.1 percent. Historically, Idaho's per capita personal income has been below the U.S. average, partly due

to larger family size, but the gap has closed in recent years.

Total personal income in Idaho grew 7.5 percent per year during 1990-95, to total $22 billion in 1995. Personal income and per capita personal income are projected to grow 5.7 (to $29,353 million) and 3.5 percent per year (to $22,768) respectively, over the 1995 to 2000 period. In the remaining years of the decade, Idaho's personal income is predicted to grow between 5.1 percent and 6.3 percent per year.

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Table 28. Civilian Labor Force and Unemployment Rate, 1991-1995

	1990	1991	1992	1993	1994	1995
Idaho Labor Force	492,600	508,600	532,000	547,700	589,400	597,700
Idaho Unemployed	29,100	31,600	34,700	34,000	32,800	32,200
Unemployment Rate	5.9%	6.2%	6.5%	6.2%	5.6%	5.4%
U.S. Unemployment	5.5%	6.7%	7.4%	6.8%	6.1%	5.6%

Source: Idaho Employment, Table 2: Labor Force Data for the State of Idaho, Idaho Department of Employment, February 1996.

Cost records for this publication are available from the Department of Water Resources in accordance with Section 60-602, Idaho Code.
IDWR-2100-500-9/97