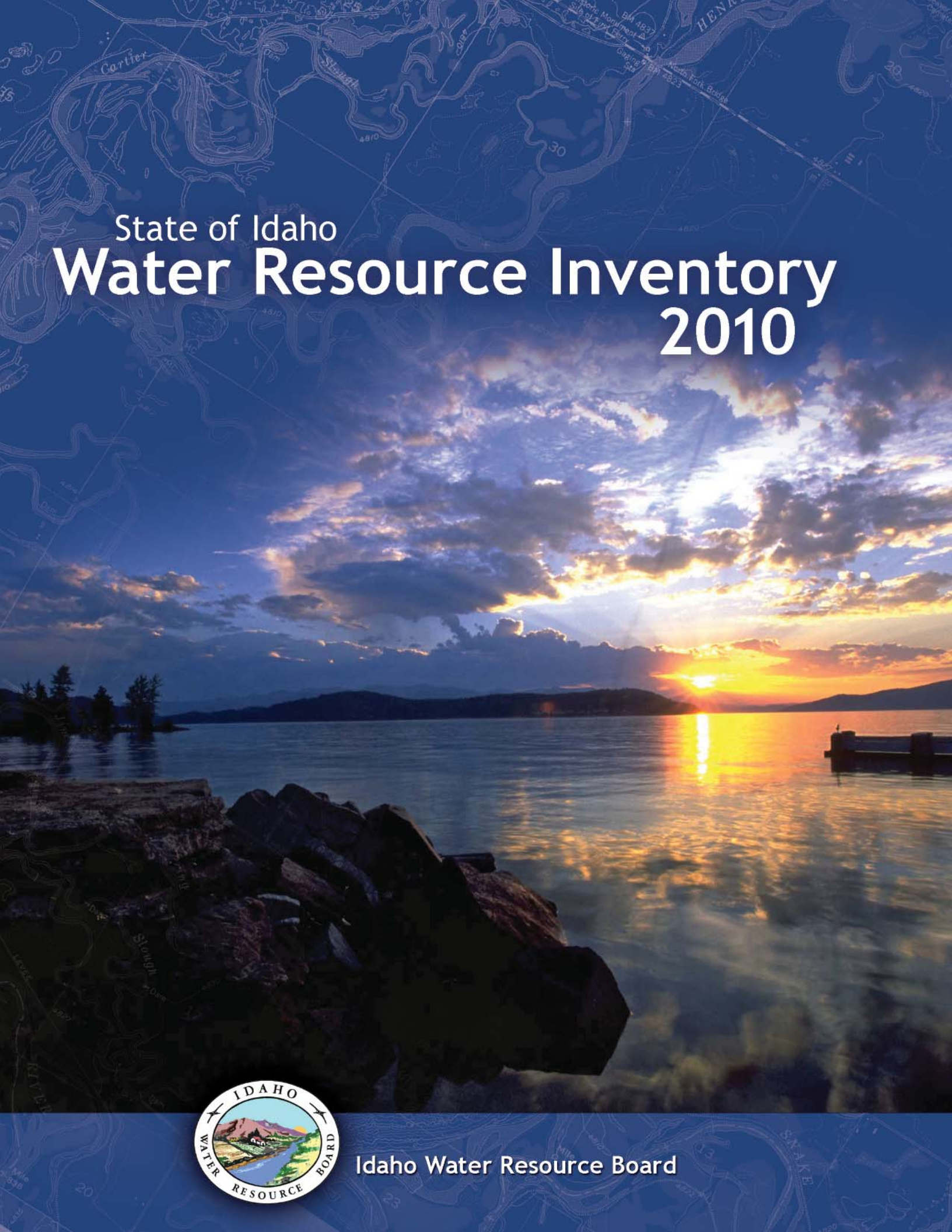

State of Idaho

Water Resource Inventory 2010

Idaho Water Resource Board

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CHAPTER 1: WATER RESOURCES

Climate

Idaho's climate is generally characterized by warm dry summers and cold wet winters. The state's western boundary is approximately 350 miles from the Pacific Ocean, and the eastern boundary is formed by the continental divide. The Rocky Mountains protect much of the state from the severe arctic cold and destructive summer storms that are common on the Great Plains. Pacific air masses are the source of most of Idaho's precipitation, but the state's climate is unlike that of western Washington and Oregon because the Cascade mountain range creates a barrier which decreases the amount of moisture reaching the state. Statewide. An average 22 inches of precipitation annually falls on Idaho. There is notable climatic diversity through the state, primarily due to air movement direction with respect to latitude and mountain ranges and to elevation.

The occurrence of precipitation varies greatly throughout the year and throughout the state. **Figure 1.1** shows the average annual precipitation throughout Idaho. The dry season occurs in the summer months of June, July and August as relatively dry air results in modest rainfall during most summers. Summer thunderstorms develop throughout the state and are most common in mountainous areas, where lightening may cause forest and range fires. The city of Salmon, located in the rain-shadow of Idaho's central mountains, receives most of its precipitation from spring and summer thunderstorm activity. **Figure 1.2** shows the average monthly precipitation for Salmon, Boise and Pierce, located in the Clearwater Mountains east of Lewiston. November, December and January are generally the wettest months of the year, when the majority of the state's precipitation falls on the mountains as snow. Precipitation generally increases with elevation, accounting for a range of values throughout the state. Total winter snowfall ranges from 20 inches or less in southwestern valleys to over 80 inches in the higher mountains.

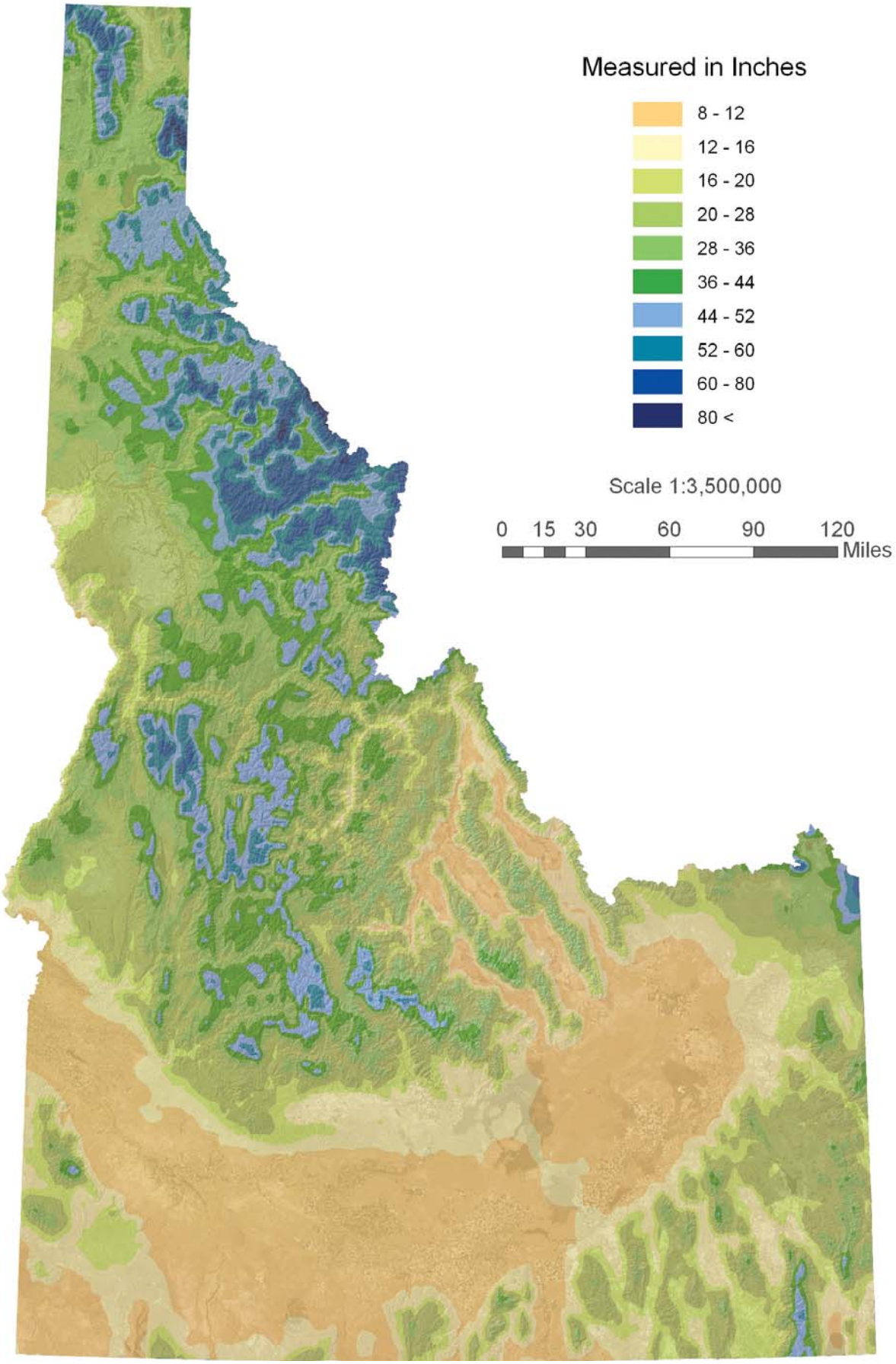


Figure 1.1 — Average Annual Precipitation

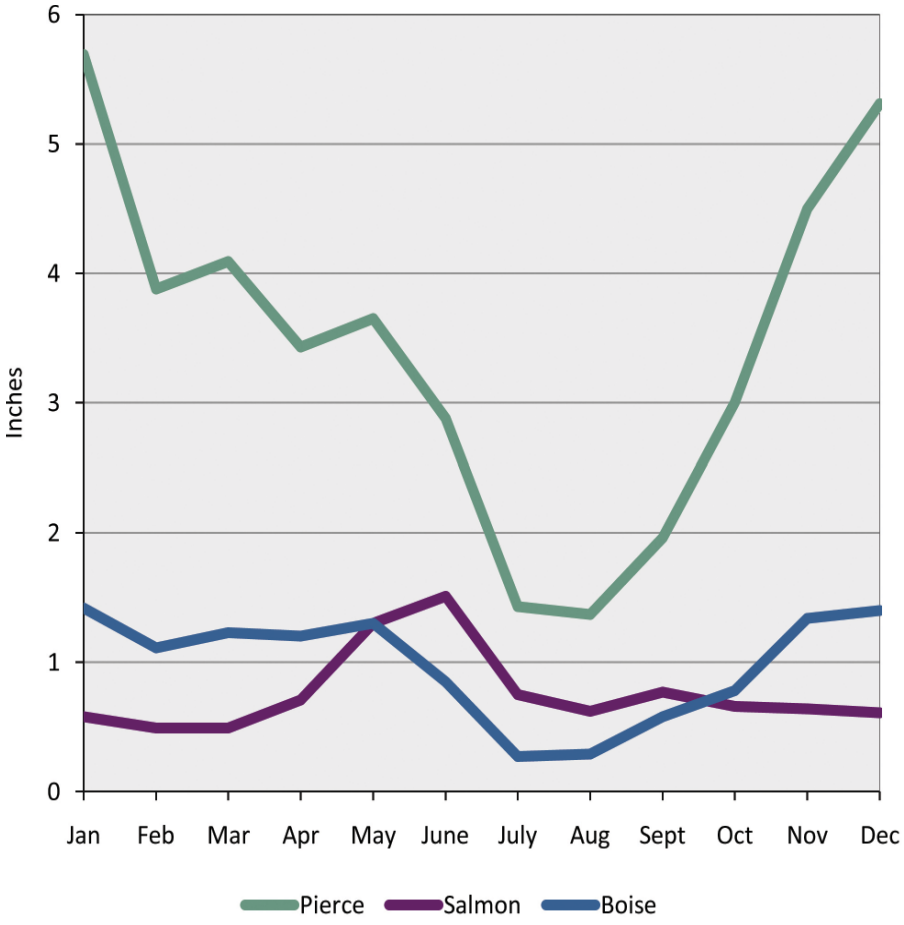


Figure 1.2— The average monthly precipitation for Salmon, Boise and Pierce

Temperature, like precipitation, is governed by elevation with a typical decrease of three degrees Fahrenheit for every thousand feet in elevation. The highest average temperatures are found in the state's lowest elevations. Lewiston and the valleys of southwestern Idaho have an average frost-free period of over 140 days. Some of the warmer hillsides may reach over 180 frost-free days. In the higher elevations of the Eastern Snake Plain, the frost-free period is much shorter. Frost can occur during any season in the high mountain valleys of central and northern Idaho. **Table 1.1** provides climate summaries for eight cities in Idaho.

TABLE 1.1 — CITY CLIMATE SUMMARIES

STATION	BOISE	HAILEY	IDAHO FALLS	LEWISTON	PIERCE	SANDPOINT	SALMON	TWIN FALLS
Elevation	2860	5350	4730	1440	3190	2100	4050	3960
Annual Total Precipitation	11.7	15.89	10.03	12.69	41.18	34.33	9.12	10.8
Average January Precipitation	1.42	2.58	0.76	1.23	5.69	3.98	0.58	1.22
Average July Precipitation	0.27	0.43	0.54	0.61	1.43	1.68	0.75	0.28
Average January Maximum	36.9	30.2	27	39.6	32.9	33.3	30	36
Average January Minimum	22.3	7.8	10	27	17.1	21.5	6.9	19.9
Average July Maximum	90.5	84.8	85.8	78.8	81.3	80.2	88.7	85.2
Average July Minimum	58.4	48.9	50.8	58.9	43.9	49.2	47.5	53.2
Growing Season Days	150	86	124	188	91	133	124	138

Source: Western Regional Climate Center

Elevation in the state varies from a low of seven hundred feet at Lewiston, where the Snake River leaves the state, to 12,668 feet at Mount Borah 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.

Land Use and Ownership

Idaho is the 14th largest state in the United States with a land area of 52.9 million acres. Topography, climate conditions and soil are major influences on land cover and land use. Rangeland and forest are the dominant land covers in Idaho. Rangeland covers most of southern Idaho except where land is irrigated or developed. Sagebrush, bunch and annual grasses are the predominant vegetation. Pine and spruce forest claim the state's higher elevations. Sixty-three percent of the state's forests lie north of the Salmon River. Agriculture accounted for about 11 percent of the state's land in 2006, a two percent decrease since 1992. Agricultural land includes land in crops, both irrigated and non-irrigated, and pasture. Incorporated areas totaled 431,023 acres, a 33 percent increase since 1990 and a 16 percent increase from 2000. **Table 1.2** lists the acreage for each classified land use.

TABLE 1.2 — LAND USE

LAND USE	AREA*	PERCENT
Land Area	83,541	miles^2
Land Area (Acres)	53,466,400	
Water Area	526,700	< 1%
Urban & Developed Land	887,500	2%
Land in Farms & Ranches	11,800,000	22%
Rangeland	20,163,000	38%
Forest	17,820,600	1%
Wetlands	685,100	1%
Barren Land	732,500	1%

**All areas list in acres.*
U.S. Department of Agriculture, 2007. Idaho Agricultural Statistics

TABLE 1.3 — LAND ADMINISTRATION

LAND ADMINISTRATION/DESIGNATIONS	AREA	PERCENT
Managed by the Federal Government	34,218,496	64%
Roadless	9,310,715	17%
Designated Wilderness	3,971,873	7%
Private	16,574,584	31%
Managed by the State & Local Governments	2,673,320	5%
Incorporated Areas 2007	431,023	0.8%
Tribal Land	887,230	< 2%

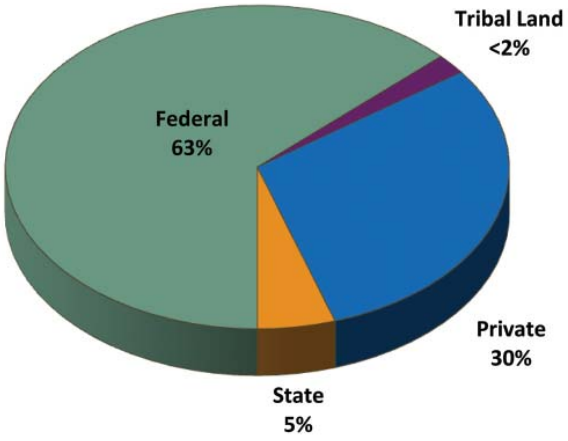


Figure 1.3 — Land Management

Federal agencies manage over 34 million acres. State and local governments oversee another 3.1 million acres. The Bureau of Land Management and the Forest Service are the largest land managers in the state. Other federal agencies with landholdings in Idaho include the Department of Energy, the National Park Service, the Bureau of Reclamation, the military, National Wildlife Refuge and the Corps of Engineers. There are 3.97 million acres of designated wilderness. In 2008 there were 9.31 million acres of identified roadless areas. The absence of roads is a key consideration used to identify areas as potential wilderness. Private land accounts for 16 million acres. **Figure 1.3** shows the percent of private and government owned land. A little over 431,000 acres are in incorporated areas. The Nez Perce, Coeur d'Alene, Shoshone-Bannock and the Shoshone-Paiute Tribes own roughly 800,000 acres. **Figure 1.4** shows land ownership throughout Idaho.

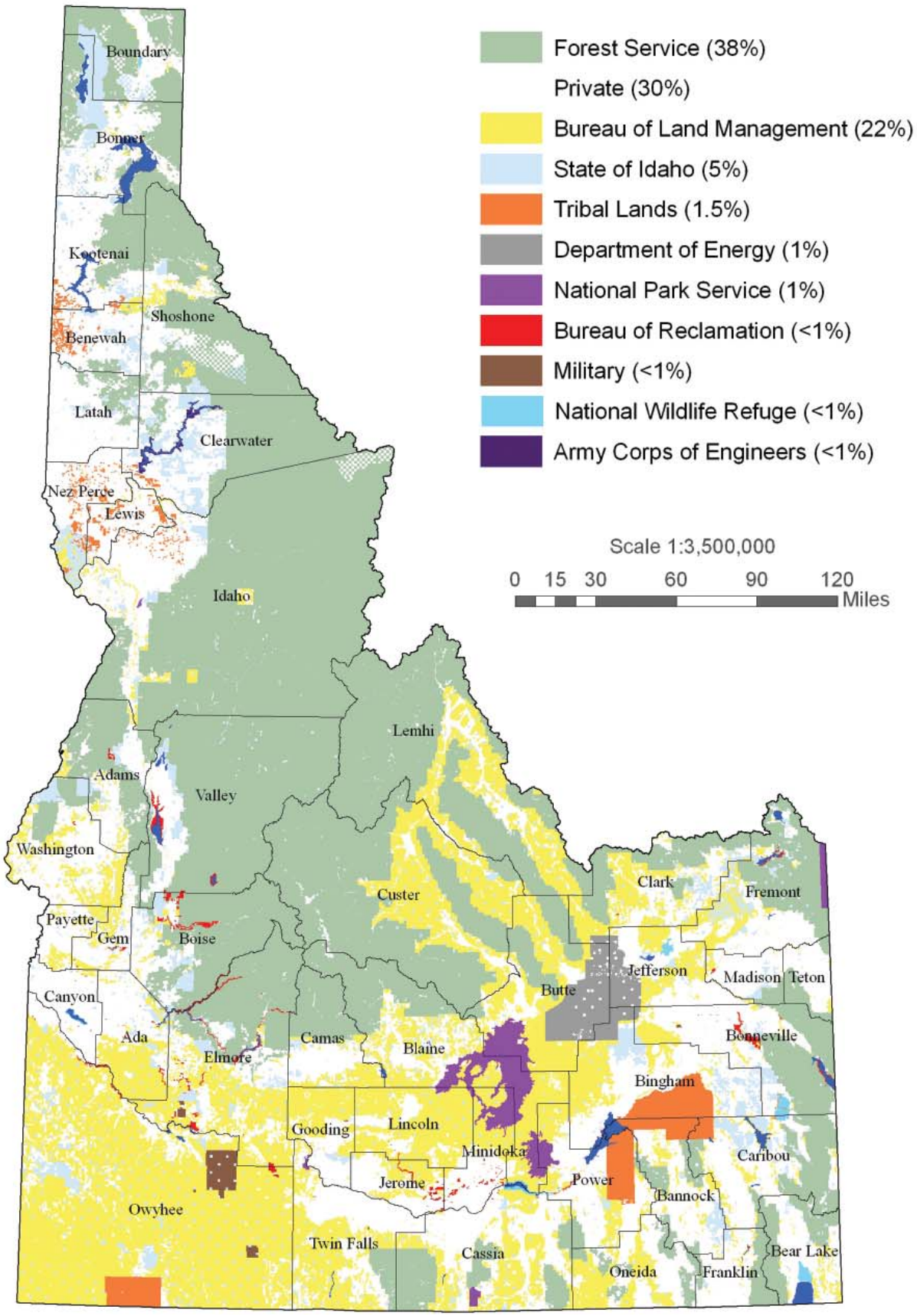


Figure 1.4 — Land Ownership

Surface Water in Idaho

Overall, Idaho has an abundant supply of water. There are over 95,000 miles of streams and rivers, and more than 2,000 natural lakes. These range in size from Lake Pend Oreille, the state's largest lake, to small alpine lakes in high mountain wilderness areas. Numerous aquifers, including the Snake Plain Aquifer, one of the largest underground reservoirs in the world, provide water to wells and help maintain river flows throughout the state. Annual variations in precipitation often cause either excessive flows or scarcity, making both floods and drought common occurrences.

Annual precipitation that falls within the state boundary accounts for over 75 percent, or an estimated 98 million acre-feet, of Idaho's water supply. An estimated 50 percent of the precipitation that falls on the state is used by vegetation or lost through evaporation (U.S. Geological Survey, 1990). The remaining 49 million acre-feet discharge as surface water or recharge ground water systems. Twenty-five percent of Idaho's water supply comes from surface water entering primarily from Wyoming and Montana. **Figure 1.5** shows the relative contribution of stream flow throughout the state.

A major portion of the state's total stream flow originates as snow melt, with a natural flow pattern of high flows during the spring and early summer, followed by lower flows in the fall and winter months. In many parts of the state, the natural seasonal flow patterns have been altered by storage projects.

Idaho's principal river basins, shown in **Figure 1.6**, are the Snake, Salmon-Clearwater, and Bear rivers in southeastern Idaho and the Spokane, Pend Oreille and Kootenai rivers in Idaho's Panhandle. Surface water outflows from the state amount to over 70 million acre-feet. **Table 1.4** gives a summary of the river basins.

Surface runoff from rain or snow drains to one of two basins. Ninety-five percent of runoff drains to the Columbia River Basin, and ultimately

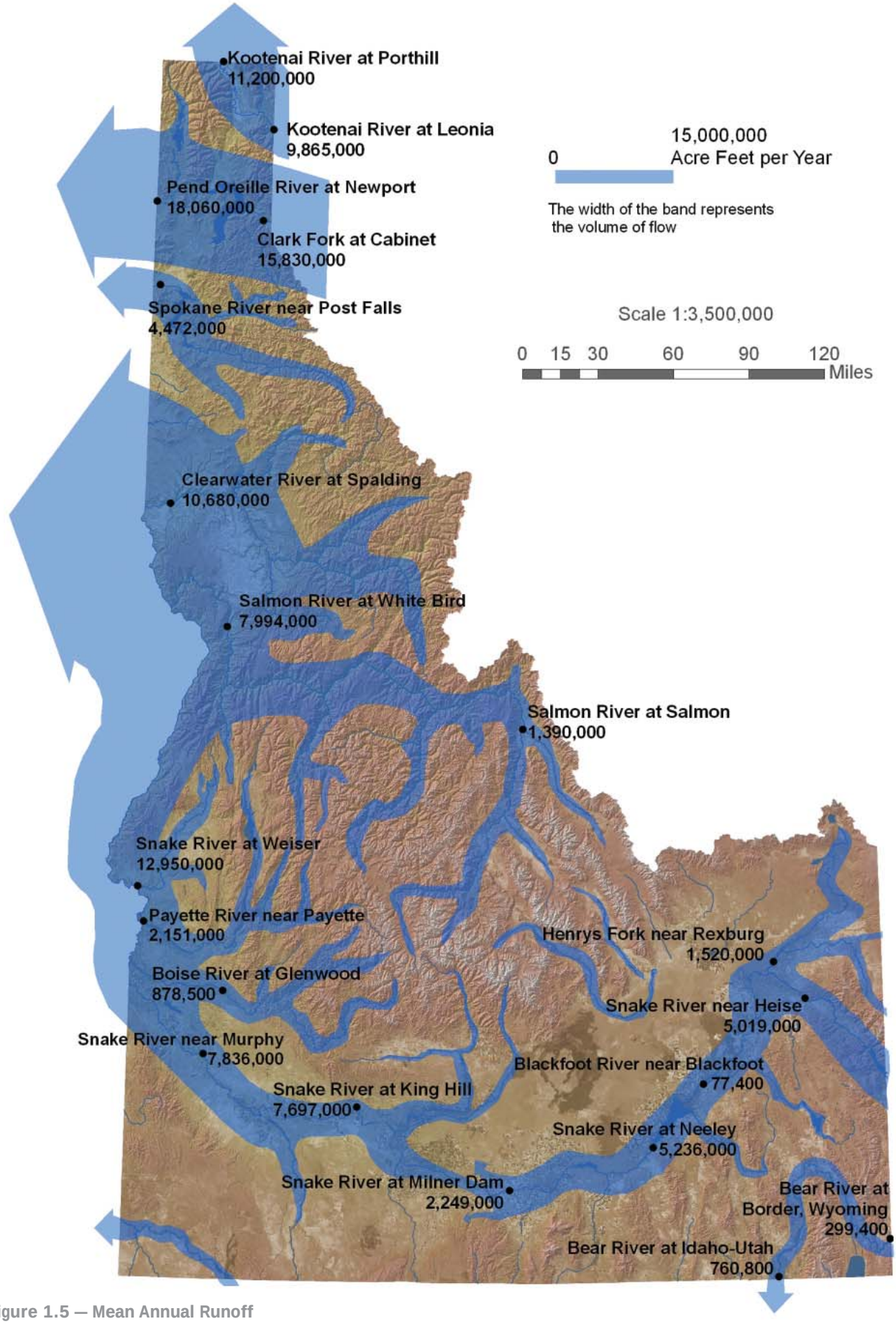


Figure 1.5 — Mean Annual Runoff

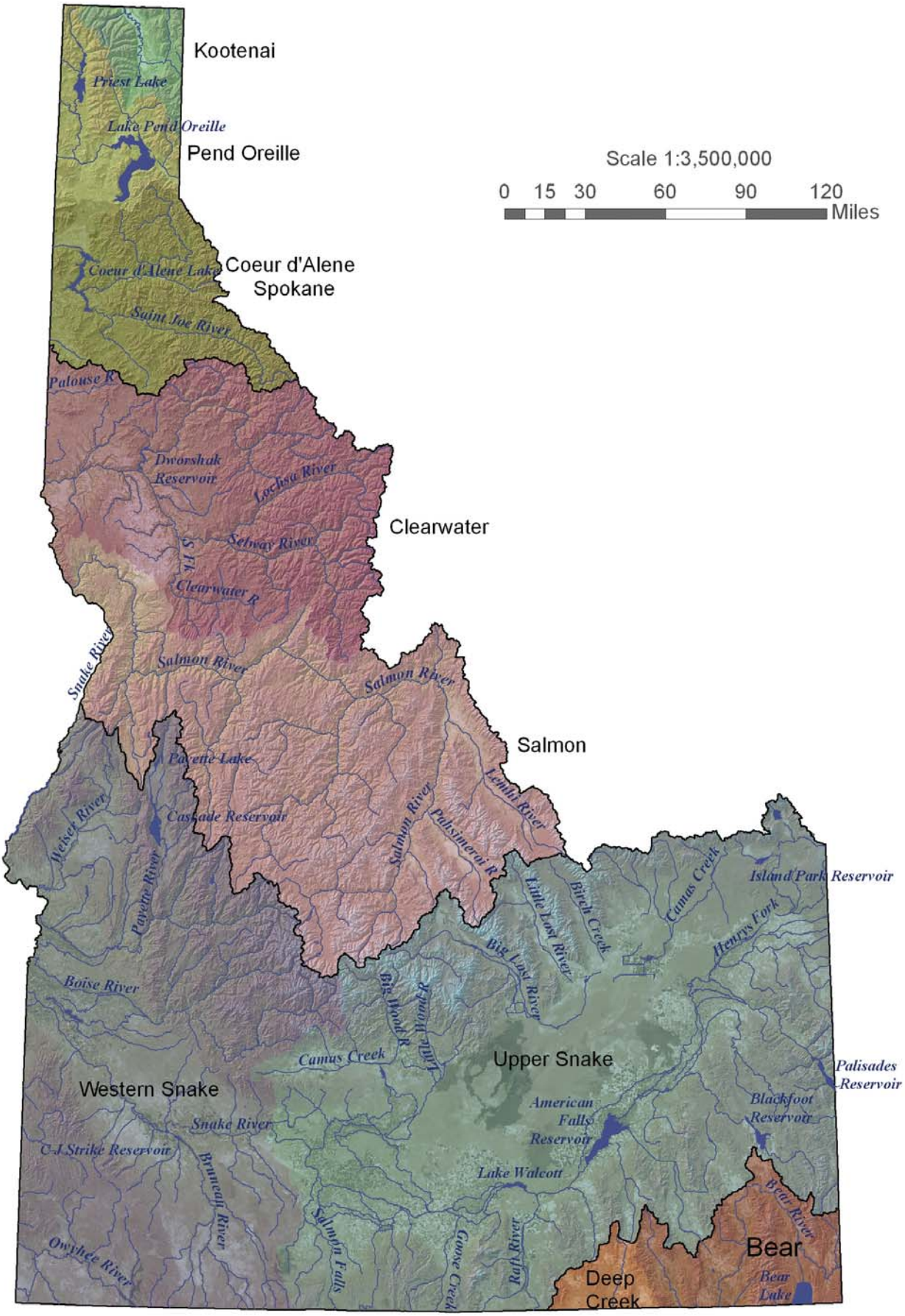


Figure 1.6 — Principal River Basins

TABLE 1.4 — SURFACE WATER SUMMARIES BY BASIN

	SNAKE RIVER	SALMON-CLEARWATER	PANHANDLE	BEAR RIVER
Percent of Idaho Surface Area	58%	29%	9%	4%
Stream Miles	60,386	30,243	7,920	3,585
Canal & Ditches Miles	7165	172	110	516
Number of Natural Lakes	987	805	280	73
Lakes Square Miles	69	20	243	60
Dams*	716	191	119	79
Reservoir** Capacity Acre-Feet	7,545,021	3,577,445	2,266,615	124,224

Source: IDWR Dam Safety database of Active Dams
***At Maximum Water Storage Elevation*

discharges to the Pacific Ocean. The Great Basin in Idaho receives the remaining five percent from the Bear River and Curlew Valley basins. **Figure 1.7** shows the amount of water leaving the state in acre-feet per year.

Few of Idaho's rivers systems are free flowing. Early dam construction, 1905 through 1930, created storage primarily for irrigation and/or generation of power. Later, during the 1950s and 1960s, larger capacity dams functioned as flood control and additional irrigation storage. Many of these structures also operate for power and recreation.

The Idaho Department of Water Resources regulates dams greater than or equal to ten feet high or reservoirs with a storage capacity greater than or equal to 50 acre-feet. Based on these criteria the state has a reservoir storage capacity of over 15 million acre-feet.

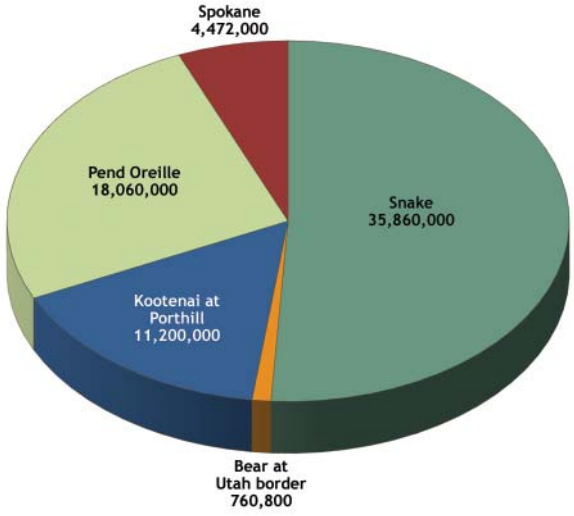


Figure 1.7 — Water Leaving the State

Figure 1.8 shows the locations of more than 230 storage facilities with a capacity of more than 250 acre-feet. **Table 1.5** lists the location, primary purpose, capacity and ownership of the 70 major reservoirs in the state with more than 5,000 acre-feet of storage.

PANHANDLE BASINS

Idaho's Panhandle region in north Idaho receives an abundant supply of water relative to the rest of the state. These river basins receive an average of 38 inches of precipitation a year, greater than anywhere else in Idaho. Average annual runoff at principal gaging stations is listed in **Table 1.6**. The seasonal distribution of Panhandle river flows is shown in **Figure 1.9**.

Kootenai River

The Kootenai River enters Idaho from Montana at Leonia and discharges over 11 million acre-feet per year to British Columbia. Although the river basin encompasses only 1,000 square miles in Idaho, it is the second largest tributary to the Columbia in runoff volume, after the Snake River. The entire basin encompasses about 18,000 square miles in British Columbia, Canada and Montana (Montana Watershed, 2008). There are no reservoirs on the Kootenai River in Idaho. The Libby Project in Montana controls and modifies the flow for power and flood control.

Pend Oreille River

The Clark Fork River, the largest of the Panhandle rivers, originates in Montana and enters Idaho at Cabinet Gorge. The Hungry Horse Reservoir, Flathead Lake and many small reservoirs in Montana regulate flow on the Clark Fork. After flowing through Idaho, it leaves the state as the Pend Oreille River. The entire drainage basin covers 24,000 square miles and has tributaries that include the Flathead, Bitterroot, Blackfoot and the St. Regis rivers in Montana, and Pack and Priest River in Idaho. The

TABLE 1.5 — MAJOR DAMS

DAM NAME	COUNTY	STREAM	PURPOSE	STORAGE CAPACITY	YEAR COMPLETED	OWNER
Albeni Falls	Bonner	Pend Oreille River	PF	1,561,300	1955	US Army Corps Of Engineers
American Falls	Power	Snake River	IFP	1,672,590	1978	US Bureau Of Reclamation
Anderson Ranch Dam	Elmore	South Fork Boise River	IPF	474,942	1950	US Bureau Of Reclamation
Arrowrock	Boise-Elmore	Boise River	LFR	272,224	1915	US Bureau Of Reclamation
Ashton	Fremont	Henrys Fork	P	9,800	1913	PacifiCorp
Black Canyon	Gem	Payetter River	IPR	29,822	1924	US Bureau Of Reclamation
Blackfoot	Caribou	Blackfoot River	L	350,000	1911	US Bureau Of Indian Affairs
Bliss	Gooding-Elmore	Snake River	P	11,000	1950	Idaho Power Co
Brownlee	Washington	Snake River	P	1,470,000	1958	Idaho Power Co
Brundage	Adams	Brundage Creek	K	7,330	1987	Brundage Water Users Assocation
Bruno Creek	Custer	Bruno Creek	T	89,500	1982	Thompson Creek Mining Co
Bybee	Owyhee	Shoofly Creek	I	7,970	1987	Riddle Ranches Inc
C Ben Ross	Adams	Little Weiser River (Os)*	L	7,787	1937	Little Weiser River Irrigation District
CJ Strike	Elmore-Owyhee	Snake River	P	250,000	1952	Idaho Power Co
Cabinet George	Bonner	Clark Fork	P	106,000	1953	Avista Corp
Cascade	Valley	North Fork Payette River	IFP	693,200	1948	US Bureau Of Reclamation
Cedar Creek	Twin Falls	Cedar Creek	I	30,000	1920	Cedar Mesa Res & Canal Co
Crane Creek	Washington	Crane Creek	LP	56,800	1912	Crane Creek Res Admn Board
Daniels	Oneida	Little Malad River	I	8,700	1967	Saint Johns Irrigation Co

TABLE 1.5 — MAJOR DAMS (CONT)

DAM NAME	COUNTY	STREAM	PURPOSE	STORAGE CAPACITY	YEAR COMPLETED	OWNER
Deadwood	Valley	Deadwood River	IPR	161,900	1931	US Bureau Of Reclamation
Deer Flat Lower	Canyon	Boise River (Os)	I	190,000	1907	US Bureau Of Reclamation
Delamar	Owyhee	Henrietta Gulch	T	17,700	1977	Kinross Delamar Mining Company
Dworshak	Clearwater	North Fork Clearwater River	PFR	3,453,000	1973	US Army Corps Of Engineers
Fish Creek	Blaine	Fish Creek	I	5,515	1923	Fish Creek Reservoir Co
Gem State	Bonneville	Snake River	IPR	5,000	1988	City Of Idaho Falls
Glendale	Franklin	Cub River	L	6,000	1930	Preston-Whitney Irrigation Company
Goose Lake	Adams	Goose Creek	I	65,500	1919	Goose Lake Reservoir Co
Grays Lake — North End Outlet	Bonneville	Grays Lake Outlet	IG	40,000	1924	US Bureau Of Indian Affairs
Grouse Creek South	Custer	Pinyon Creek	T	6,428	1994	Hecla Mining Company
Hayden Lake	Kootenai	Hayden Lake	FI	38,000	1910	Kootenai County
Hells Canyon	Adams	Snake River	P	170,000	1967	Idaho Power Co
Henrys Lake	Fremont	Henrys Fork	P	58,700	1923	North Fork Reservoir Co
Hot Springs No 2	Elmore	Hot Springs Creek	I	5,334	1968	Bennett Creek Farms
Hulet No 2	Owyhee	Sinker Creek (Os)	I	6,770	1987	US Bureau Of Reclamation
Island Park	Fremont	Henrys Fork	L	127,646	1938	US Bureau Of Reclamation
Little Camas	Elmore	Little Camas Creek	I	18,800	1912	Mountain Home Irrigation District
Little Payette Lake	Valley	Lake Fork Creek	I	10,300	1926	Lake Fork Irrigation District
Little Wood	Blaine	Little Wood River	I	30,000	1941	Little Wood Irrigation District

DAM NAME	COUNTY	STREAM	PURPOSE	STORAGE CAPACITY	YEAR COMPLETED	OWNER
Lost Valley	Adams	Lost Creek	L	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	J	45,000	1918	Big Lost River Irrigation District
Magic	Blain	Big Wood River	IP	191,500	1910	Big Wood Canal Co
Mann Creek	Washington	Mann Creek	I	12,950	1967	US Bureau Of Reclamation
Milner	Cassia-Jerome	Snake River	I	36,300	1905	Milner Dam Inc
Minidoka	Cass-Minidoka	Snake River	IP	210,000	1906	US Bureau Of Reclamation
Mormon	Camas	Mckinney & Dairy Creeks	L	19,280	1908	Twin Lakes Res & Irrigation Co
Mountain Home	Elmore	Rattlesnake Creek	I	5,468	1884	Mountain Home Irrigation District
Mountain View	Owyhee	Boyle Creek	RD	5,500	1969	Shoshone-Paiute Bus Council
Murtaugh Lake	Twin Falls	Snake River (Os)	I	7,720	1905	Twin Falls Canal Co
Oakley	Cassia	Goose Creek	I	76,000	1916	Oakley Canal Co
Oneida	Franklin	Bear River	PI	11,400	1913	PacifiCorp
Oxbow	Adams	Snake River	P	58,200	1961	Idaho Power Co
Paddock Valley	Washington	Little Willow Creek	I	22,300	1949	Little Willow Irrigation District
Palisades	Bonnerville	Snake River	IFP	1,401,000	1957	US Bureau Of Reclamation
Payette Lake	Valley	North Fork Payette River	IR	41,000	1943	Lake Reservoir Company
Portneuf	Caribou	Portneuf River	L	20,504	1912	Portneuf-Marsh Valley Canal Co
Post Falls North	Kootenai	Spokane River	IP	225,000	1906	Avista Corp
Priest Lake	Bonner	Priest River	PR	143,000	1978	Idaho Dept Of Water Resources

TABLE 1.5 — MAJOR DAMS (CONT)

DAM NAME	COUNTY	STREAM	PURPOSE	STORAGE CAPACITY	YEAR COMPLETED	OWNER
Ririe	Bonnerville	Willow Creek	IF	100,500	1976	US Bureau Of Reclamation
Sage Hen	Gem	Sage Hen Creek	L	5,210	1938	Squaw Creek Irrigation Co
Salmon Falls	Twin Falls	Salmon Falls Creek	L	230,650	1911	Salmon River Canal Co Ltd
Salmon Falls Lower	Gooding-Twin Falls	Snake River	P	18,500	1949	Idaho Power Co
Slack	Owyhee	Juniper Creek	L	5,000	1916	Petan Co
Smoky Canyon No 2	Caribou	Tygee Creek	T	20,450	1991	JR Simplot Co
Soda	Caribou	Bear River	P	15,760	1925	Pacificorp
Spirit Lake	Kootenai	Spirit Lake	R	5,000	1909	John Sempre
Swan Falls	Ada-Owyhee	Snake River	P	7,500	1901	Idaho Power Co
Tainings Pond No 4	Caribou	Tr-Bear River	T	20,000	1985	Agrium Inc
Texas Basin	Owyhee	Succor Creek	I	6,340	1979	Succor Ck Dist Improvement Co
Twin Lakes	Kootenai	Rathdrum Creek	F	9,090	2005	Twin Lakes Rathrum Fcd 17
Twin Lakes SW	Franklin	Mink Creek (Os)	I	12,297	1920	Twin Lakes Canal Co

**(Os) — offstream*

Use Codes:
D = Domestic, F = Flood Control, G = Wildlife, H = Fish Propagation, I = Irrigation, L = Domestic & Irrigation, J = Stockwater & Irrigation, P = Power, R = Recreation, T = Mine Trailings

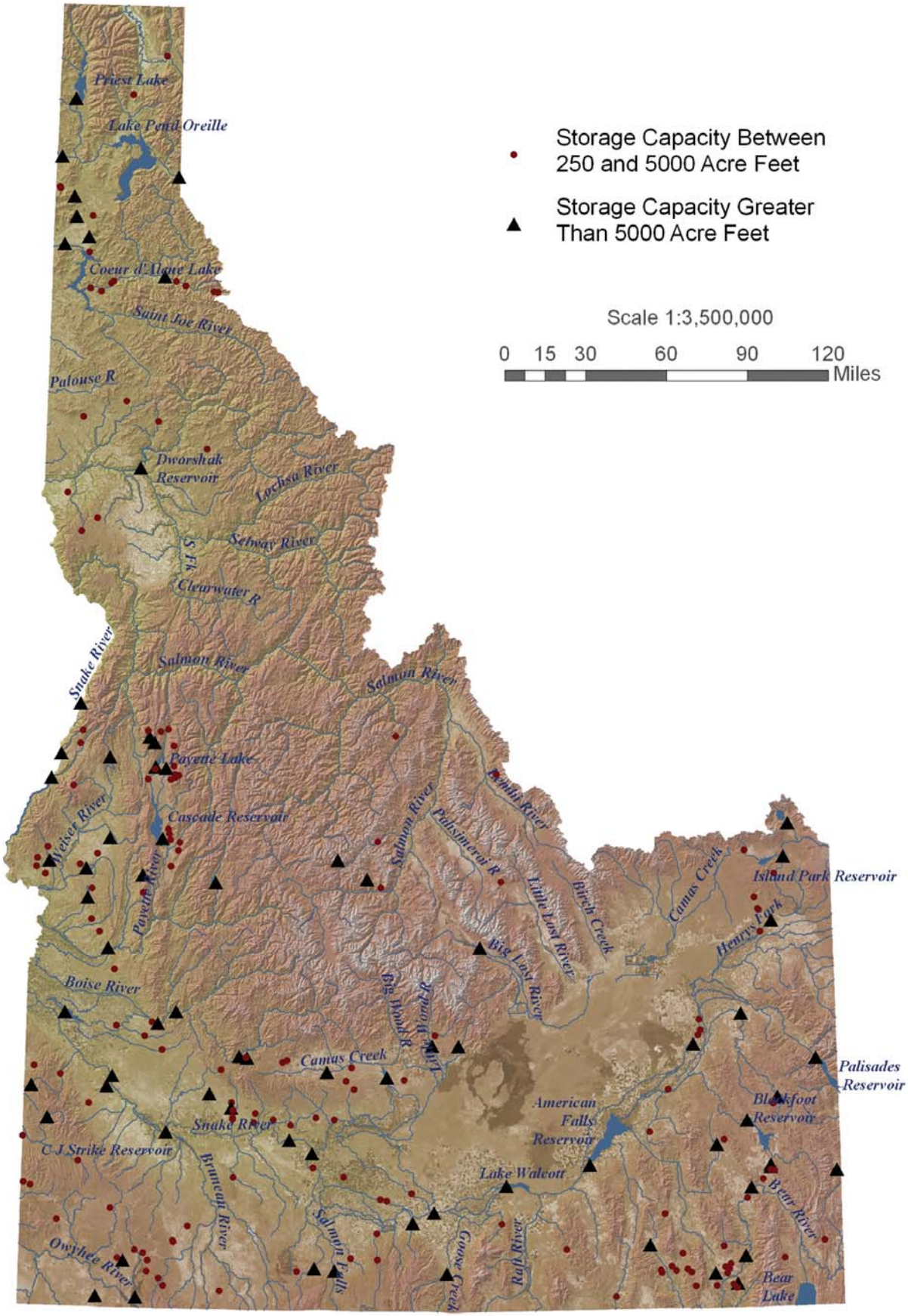


Figure 1.8 — Major Storage Reservoirs

TABLE 1.6 — AVERAGE RUNOFF FOR PANHANDLE RIVERS

RIVER	RUNOFF IN ACRE FEET PER YEAR	YEARS OF RECORD
Kootenai River Leonia	9,865,000	1972-2007
Moyie River at Eastport	497,700	1929-2007
Kootenai River at Porthill	11,200,000	1972-2007
Clark Fork at Cabinet	15,830,000	1929-2007
Priest River near Priest River	1,237,000	1950, 2007
Pend Oreille River at Newport, WA	18,060,000	1903-2007
St. Joe River at Calder	1,684,000	1911-2007
St. Maries River near Santa	253,000	1966-2007
Spokane River near Post Falls	4,472,000	1913-2007

average annual discharge of the Pend Oreille River at Newport, Washington (on the Idaho-Washington border) is over 18 million acre-feet per year. Daily flows are regulated by Noxon Rapids Dam in Montana and at the Cabinet Gorge Dam in Idaho.

Spokane River

The Spokane River begins as the outlet from Lake Coeur d'Alene. Major tributary include the Coeur d'Alene, the St. Joe and the St. Maries rivers, all originating in Idaho's Bitterroot Range and flowing into Lake Coeur d'Alene. The Spokane River flows west into Washington and leaves the state at Post Falls. The average annual flow of the Spokane River at Post Falls is 4.5 million acre-feet.

Panhandle Lakes

Idaho's Panhandle is known for the large lakes. Lake Pend Oreille covers over 148 square miles and has a maximum depth of 1,200 feet. The dam at Albeni Falls regulates the lake as part of the Columbia River system, managing the flow for power production and flood control. The completion of Albeni Falls in 1955

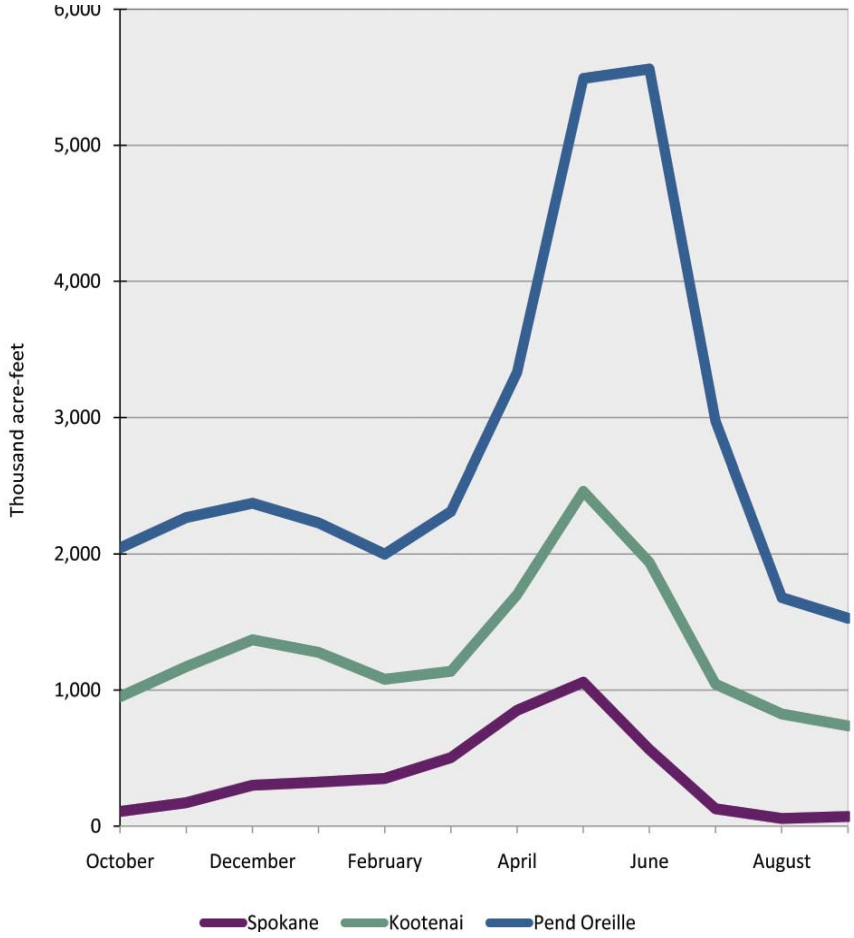


Figure 1.9 — Seasonal Distribution of Panhandle River Runoff

increased the surface area of the lake twenty miles downstream. The U.S. Army Corps of Engineers regulates the lake level of Lake Pend Oreille according to the season, allowing a maximum of 2,062.5 feet during the summer months and lowering it to 2,051 or 2,055 in the fall to accommodate flood storage (U.S. Corps of Engineers). Pend Oreille Lake has an active storage capacity* of 1,042,700 acre-feet.

*According to National Oceanic and Atmospheric Organization active storage capacity is the total amount of reservoir capacity normally available for release from a reservoir below the maximum storage level. More specifically, it is the volume of water between the outlet works and the spillway crest (NOAA, 2008).

Lake Coeur d'Alene encompasses 50 square miles and has a mean depth of 70 feet. The Post Falls Dam is located approximately nine river miles downstream of the lake on the Spokane River. The dam controls water levels and maintains a normal summer elevation on the lake of 2,128

feet. The dam, operated by Avista Utilities for power production, allows for 225,000 acre-feet for active storage in Lake Coeur d'Alene (Avista, 2008). In 2001, the United States Supreme Court recognized the Coeur d'Alene tribe as the owner of the lower one-third of Coeur d'Alene Lake and a portion of the St. Joe River.

Priest Lake, located on the Priest River, a tributary to the Pend Oreille River, is the third largest lake in Idaho. It is 18 miles long, covers 37 square miles, and has a maximum depth of 128 feet. A small dam originally constructed in 1950 and rebuilt in 1978 is owned by the State of Idaho and operated by Avista Utilities. Each fall, the Idaho Water Resource Board develops an operating plan for releases at the Priest Lake outlet. IDWR works with the power supplier Avista to give notice of the release schedule two weeks before the releases. This dam allows the lake to have an active storage capacity of 71,300 acre-feet of storage.

SNAKE RIVER BASIN

The Snake River basin drains about 108,000 square miles in five states-Idaho, Wyoming, Utah, Oregon and Washington. Most of the Snake River Basin (67 percent) lies within Idaho's boundaries; most of Idaho (87 percent) lies within the Snake River Basin. The basin receives an average of 18 inches of precipitation annually. The annual inflow to Idaho near the Wyoming border is more than five million acre-feet.

The entire length of the Snake River is about 1,000 miles, and about 779 miles of the river flows within Idaho. The river flows from its headwaters in the Teton Mountains of Wyoming, across the Snake River plain, through Hells Canyon. The Snake River leaves Idaho at Lewiston, a city with the distinction of being Idaho's only seaport. Downstream from Lewiston barges are used for shipping timber, grain and other products. The Snake joins the Columbia River near Pasco, Washington.

Throughout its journey across Idaho, numerous major and minor tributaries increase river flows. In the upper Snake region, tributaries

include the Henry's Fork, Willow Creek, the Blackfoot River, the Portneuf River, the Raft River and Salmon Falls Creek. The Big Wood River joins the Snake from the North, about 20 miles upstream of King Hill. Several streams, including the Big and Little Lost Rivers and Birch Creek, flow from the mountains into the northern portion of the Snake River Plain, never reaching the river as surface water. Most of the flow from these rivers is either diverted for irrigation or lost through seepage into the Eastern Snake Plain Aquifer.

The Snake is a working river. There are 24 dams on the Snake River in Idaho alone with a combined storage capacity of 5.3 million acre-feet. In addition to providing supply for irrigation, recreation, domestic and industrial uses, flow from the Snake River generates much of the hydroelectric power used within the state. **Figure 1.10** shows the amount of water contributed to the Snake River by major tributaries. Above Milner Dam, located about 10 miles west of Burley and 25 miles east of Twin Falls, much of the river's flow is diverted for irrigation. In an average year, irrigation diversions at Milner Dam may bring the river flow to zero.

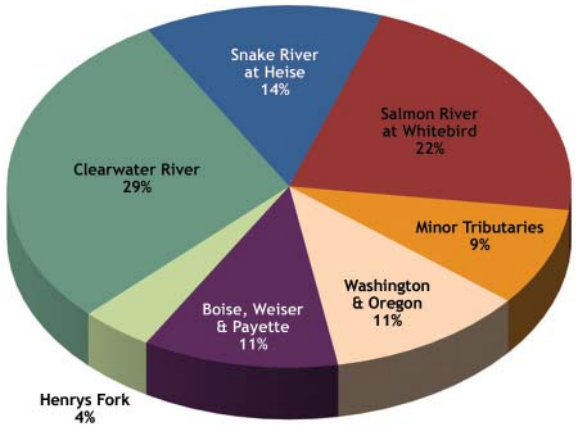


Figure 1.10 — Major Snake River Tributaries

Although most of the Snake River flow is diverted at Milner, springs along the north side of the canyon contribute 3.58 million acre-feet, or 70% of the river's water by the time it reaches King Hill (Blew, 2009). The Thousand Springs reach contains 15 of the nation's 65 springs that discharge more than 100 cubic feet per second (Johnson, et.al, 2002).

Within the middle Snake region in Idaho, the major tributaries to the Snake River include the Bruneau, Boise, Payette and Weiser rivers. The major tributaries on the Oregon side of the Snake include the Owyhee, Malheur, Burnt, Powder, Imnaha and Grande Ronde rivers. Washington tributaries include the Tucannon and Palouse rivers. **Table 1.7** lists the

TABLE 1.7 — AVERAGE ANNUAL SNAKE RIVER BASIN RUNOFF

RIVER	RUNOFF IN ACRE-FEET PER YEAR	YEARS OF RECORD
Snake River near Heise	5,019,000	1911-2007
Henrys Fork near Rexburg	1,520,000	1909-2007
Snake River at Neeley	5,236,000	1927-2007
Milner	2,249,000	1908-2007
Snake River at King Hill	7,697,000	1914-2007
Snake River near Murphy	7,836,000	1914-2007
Boise River at Glenwood Bridge	878,500	1982-2007
Boise River near Parma	1,172,000	1971-2007
Payette River near Horseshoe Bend	2,318,000	1907-2007
Payette River near Payette	2,154,000	1935-2007
Snake River at Weiser	12,950,000	1911-2007
Snake River at Hells Canyon	14,252,000	1966-2007
Salmon River at Salmon	1,390,000	1913-2007
Salmon River at Whitebird	7,994,000	1910-2007
Snake River at Anatone	10,680,000	1972-2007
Snake River near Lewiston	35,860,000	calculated

average annual runoff at principal gaging stations in the Snake River Basin. **Figure 1.11** shows the seasonal distribution of the Snake River at selected gages.

SALMON-CLEARWATER RIVER BASINS

The Clearwater River Basin in north central Idaho covers roughly 9,600 square miles or 12 percent of the state. There are over 11,000 miles of streams including the major tributaries of the North Fork Clearwater, Lochsa and Selway rivers whose headwaters lie just west of the Continental Divide. The eastern side of the basin tends to have the highest snow fall in Idaho receiving an average of over 80 inches per year in the mountains. The average annual discharge of the Clearwater River measured at Spalding, 11 miles upstream from the confluence with the Snake River at Lewiston, is over 10 million acre-feet, making the river the largest single tributary to the Snake. The Clearwater

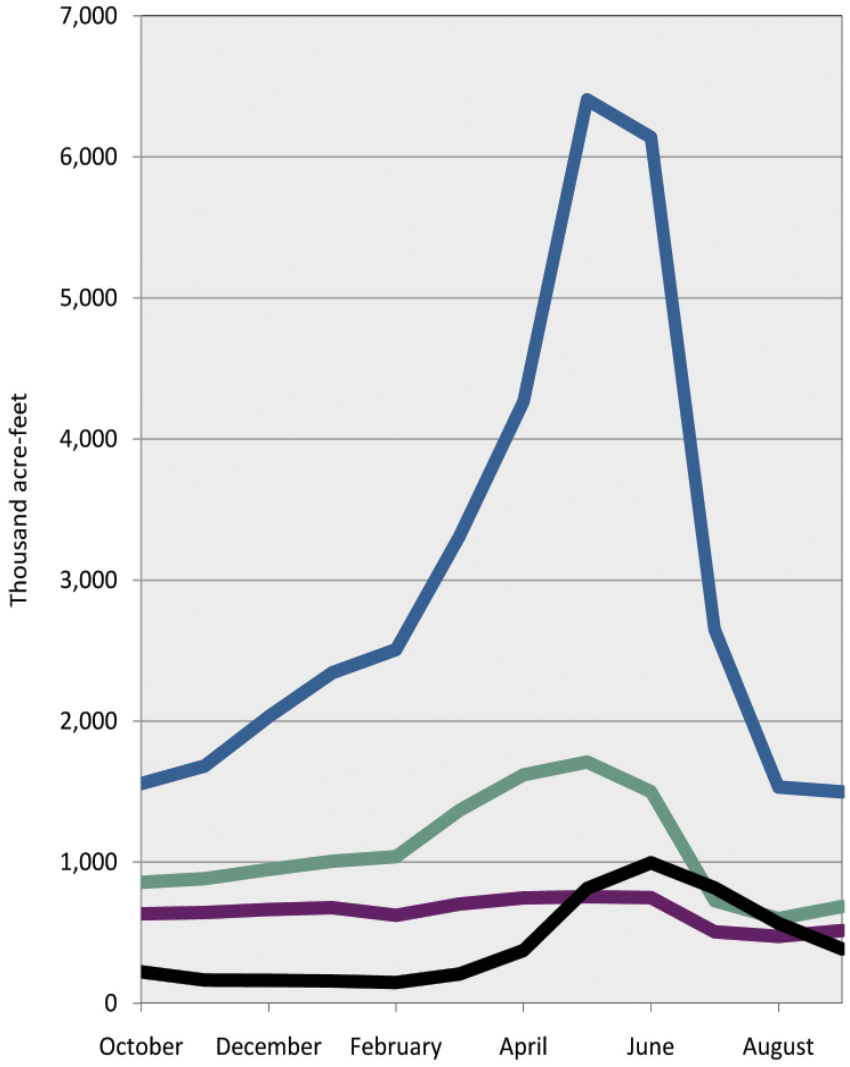


Figure 1.11 — Seasonal Distribution of Snake River Runoff

system includes the largest capacity storage facility in Idaho. Dworshak Reservoir, on the North Fork of the Clearwater, has a capacity of 3,468,000 acre-feet.

The Salmon River basin in central Idaho is among the longest undammed river systems in the continental United States. This river flows through several wilderness areas and contributes over 22 percent of the Snake River flows. The Salmon River basin drains more than 14,000 square miles of central Idaho with over 16,000 miles of streams. The Salmon

River is over 420 miles long, from its headwaters near the Sawtooth Mountains to its confluence with the Snake River near Whitebird. Major tributaries include the Pahsimeroi, Lemhi, South, Middle and North Forks and the Little Salmon River.

BEAR RIVER BASIN

Bear River in the southeast corner of the state drains to the Great Basin. The Great Basin is unusual because it has no natural outlet to the sea. All of the water that drains into the region either evaporates, or seeps into the ground. The water that leaves this small southeastern portion of Idaho drains into the Great Salt Lake in Utah. The Deep Creek drainage in the Curlew Valley, east of the Bear River basin, also drains into the Great Basin.

The Bear River basin encompass 7,474 square miles in three states, including 3,255 (43 percent) in Utah, 1,515 (20 percent) in Wyoming and 2,704 (36 percent) in southeastern Idaho. Elevations within the basin vary from 4,200 feet in the valleys to over 12,000 feet in the mountains. Bear River stream flows are primarily the result of snow melt in the higher elevations of the watershed.

The Idaho portion of the basin receives an average yearly precipitation of 36 inches. The river enters Idaho near the community of Border, Wyoming. Upstream from the state line, the watershed drains 2,500 square miles and has an annual average flow of 299,400 acre-feet. **Table 1.8** shows the average annual runoff at four gaging stations in the basin.

TABLE 1.8 — AVERAGE ANNUAL BEAR RIVER RUNOFF

RIVER	RUNOFF IN ACRE FEET PER YEAR	YEARS OF RECORD
Bear River at Wyoming border	299,400	1938-1986 2001-2007
Bear River at Utah border	760,800	1971-2007
Bear River at Pescadero	436,700	1922-1954 1970-2007
Club River near Preston	63,310	1940-1952 1956-1986 2006-2007

The Bear River is over 500 miles long. There are over 3,500 miles of streams within the Idaho portion of the basin.

Bear Lake, which has been separated from the Bear River since the last ice age, is the most striking physical feature in the basin. The lake, which is about 20 miles long and just over 200 feet deep, straddles the Idaho-Utah border and extends about equally into Idaho and Utah. Stewart Dam is 45 miles downstream from Border and was completed in 1920. The dam diverts water from Bear River to a canal that allows water to flow in and out of Bear and Mud lakes. A dike between Bear and Mud lakes controls the lake level of the natural Bear Lake.

Monthly flows at the gaging stations are influenced by reservoir regulations, irrigation diversions and return flows. High flows are common in May and June; low flows occur in July, August and September. At Border, the Bear River is regulated by upstream storage

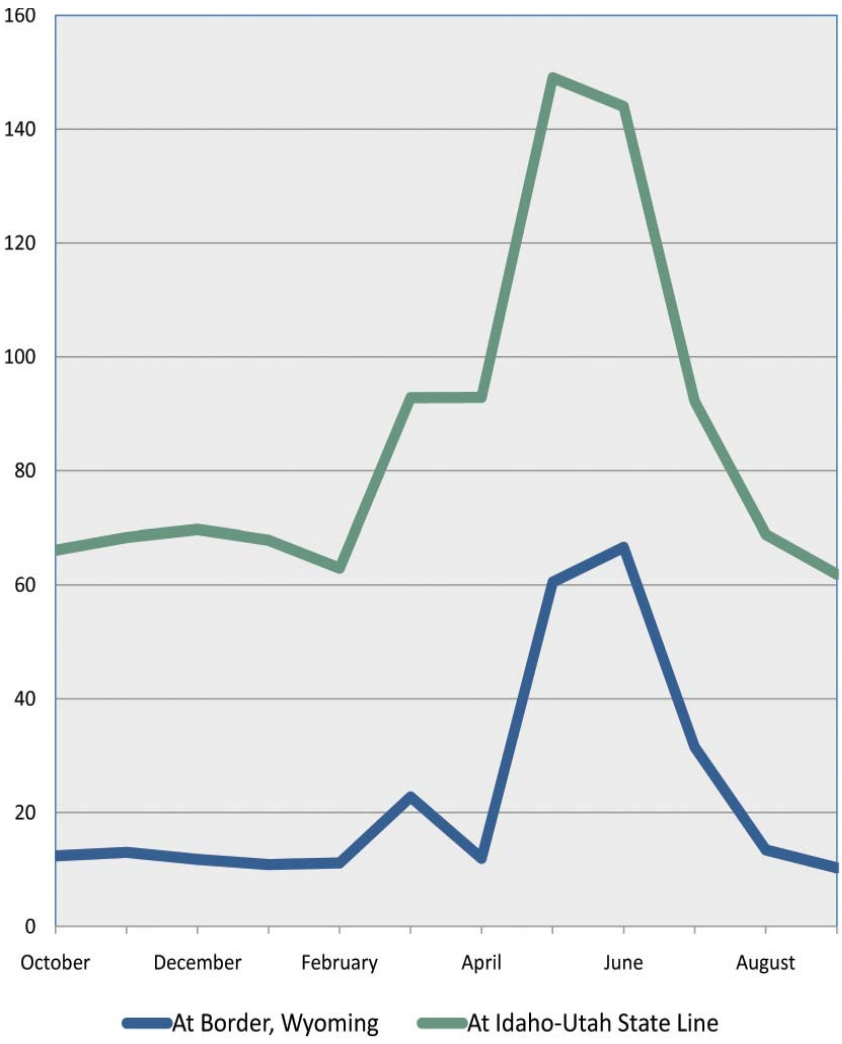


Figure 1.12 — Seasonal Distribution of Bear River Runoff

and is depleted by irrigation diversions in Wyoming and Utah. (**Figure 1.12.**) Downstream from Preston, the monthly flows are controlled by reservoir releases for power generation, tributary inflow and irrigation diversions. There are five hydroelectric plants operating on the main stem of the Bear River in Idaho. On average, close to a million acre-feet of water flows into the Great Salt Lake from the Bear River annually (2006, Bear River Commission).

Bear River Compact

The Bear River makes five state line crossings through three states. Because of this shared resource, Idaho, Utah and Wyoming cooperate for the benefit of all three states. Approximately 500 irrigation organizations own and operate irrigation systems that supply water for half a million acres of land (Bear River Commission, 2006).

The Bear River Compact established a framework for dividing the water of the Bear River among the States of Wyoming, Idaho and Utah. The Compact was signed into law in 1958 and amended in 1978. The amendments became law in February 1980. The Compact determines the rights and obligations of each of the three states (Bear River Commission, 2004). The purpose of the compact is to remove the causes of controversy over the distribution and use of Bear River water by providing for efficient use, allowing development, promoting interstate goodwill and to accomplish an equitable apportionment.

The Compact is administered by the Bear River Commission which is composed of ten members, three from each state and one representing the United States. Provisions of the Compact are administered and enforced under the direction of the Bear River Commission. However, water rights within each state are adjudicated and administered in accordance with state law, subject to limitations provided in the Compact (Bear River Commission, 2004).

The Compact divided the Bear into three main divisions and specifically identifies which river flows and canal diversions are to be assigned to each division. The Upper Division includes the basin above Pixley Dam in Wyoming; the Central Division covers the reach between Pixley Dam and Stewart Dam; and the Lower Division includes the basin between Stewart Dam and the Great Salt Lake.

In the Central Division the Compact granted Idaho 2,000 acre-feet. In the Lower Division, Idaho is granted the first right to develop and deplete (consume) 125,000 acre-feet. Utah is granted the second right to develop and deplete 275,000 acre-feet. The next 150,000 acre-feet of water depletion will be divided equally between Utah and Idaho. All water in excess of the above allocations will be divided between Utah and Idaho, with Idaho receiving 30 percent and Utah 70 percent.

Groundwater

Groundwater is water that fills the open spaces in the soil and rock beneath the earth's surface. The water table is the top of the saturated zone. An aquifer is a natural area underground that contains large quantities of water between the spaces in rock and sediment. According to Idaho code, the saturated material below the earth's surface must be capable of yielding economically significant quantities of water to wells and springs to be considered an aquifer.

There is often a hydrologic connection between surface and groundwater. Water may migrate between an aquifer and a stream several times as it moves through the system. Influences that affect the water supply in one environment will likely affect supply in the other. Aquifer discharge supplies a component of flow to most streams in Idaho, and although it varies seasonally, it is generally more stable than runoff from surface water. This aquifer discharge is generally referred to as baseflow.

Aquifer recharge generally occurs by infiltration of surface water. In many predominantly agricultural areas of the state, seepage from irrigation is the largest source of aquifer recharge. This has been demonstrated by historic rises in ground water levels as recorded in most surface water irrigated areas.

The state's principal aquifer systems are shown in **Figure 1.13** (Graham and Campbell, 1981). This map shows that most of the groundwater in the state exists in intermountain regions like the Snake River Plain, the area around Lewiston, and in the valleys of the Panhandle. Smaller aquifers are located in the depressions and river valleys around the state. While groundwater exists throughout the state, the most prolific aquifers are found in the intermountain regions of the Snake River Plain, the areas around Lewiston and in the valleys of the Panhandle.

Groundwater is a major water supplier in Idaho. It supplies 95% of the state's drinking water (DEQ, 2009) and provides irrigation water for an estimated 809,000 acres in the state. Groundwater availability is variable due to geologic and hydrogeologic characteristics. **Figure 1.14** shows the relative withdrawal of surface and groundwater for the state.

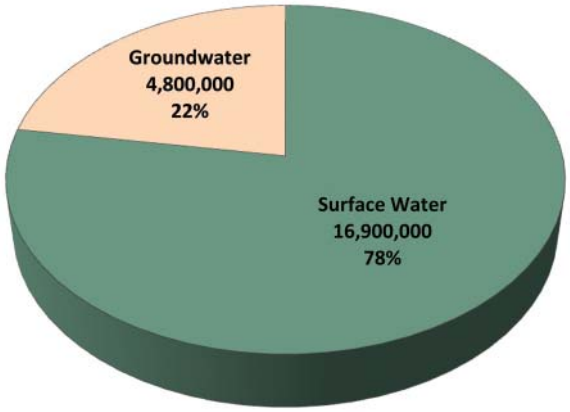


Figure 1.14 — Withdrawal of Surface and Groundwater

BEAR RIVER

The geologic setting across southeastern Idaho is composed of complex block-folded mountain ranges separated by open valleys. The mountain range aquifers consist primarily of sedimentary rocks, and wells in these materials generally have low yields (State of Utah, 1992). The river between Alexander and Grace flows in fractured basalt and is perched above the regional water table.

The principal water bearing materials are the sediments located in the open valleys. Aquifers generally exist in deep river

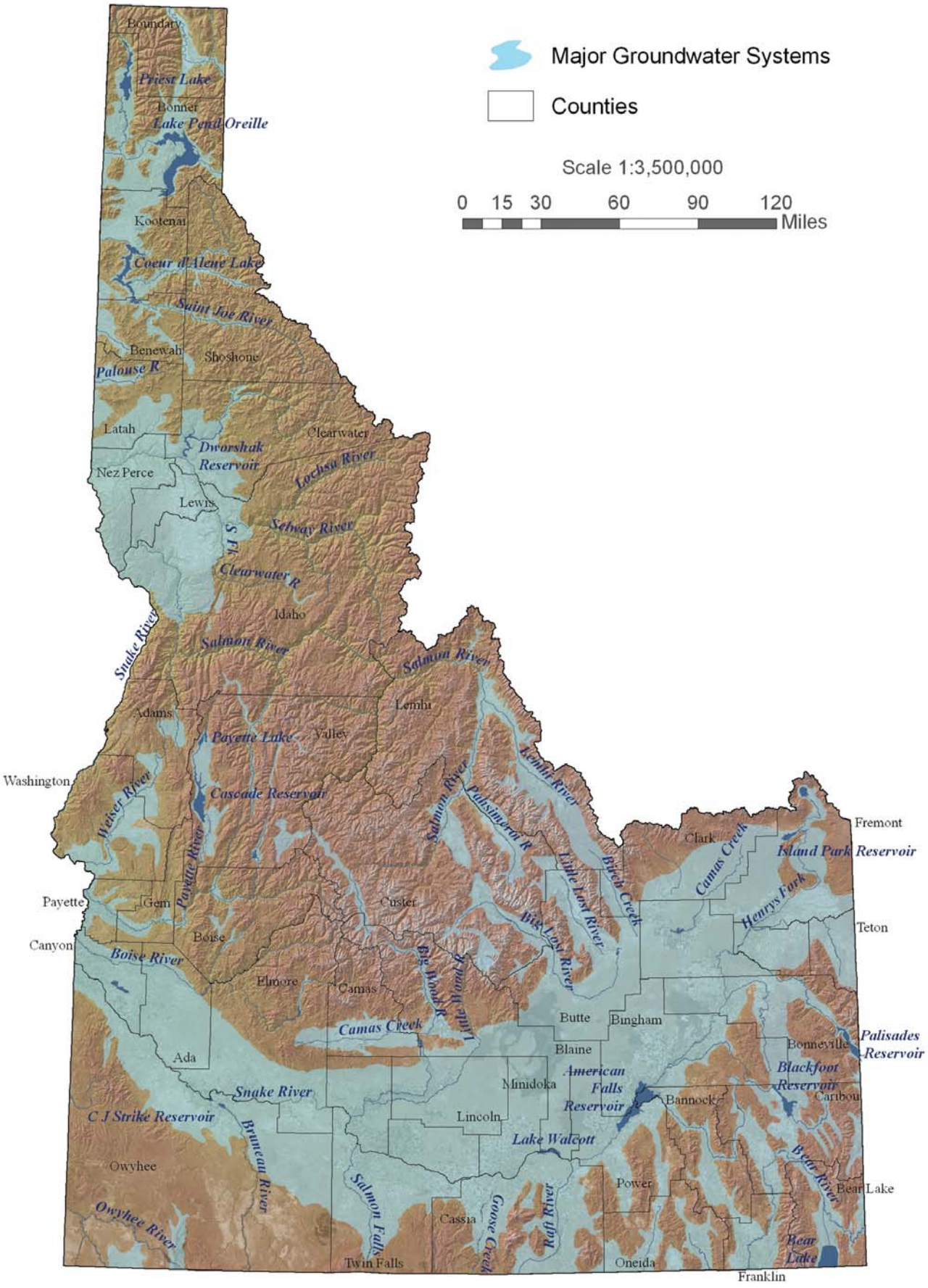


Figure 1.13 — Major Ground Water Systems

deposited sediments that consist of alternating layers of gravel, silt and clay (State of Utah, 1992). Runoff from the surrounding mountains, infiltration of rain and melted snow, and percolation of streams are the primary sources of recharge, and water levels are generally shallow (State of Idaho, 1996). **Figure 1.15** shows the locations of wells selected wells in the Deep Creek and Bear River basins. **Figure 1.16** displays the associated hydrographs.

SALMON-CLEARWATER

The Idaho Batholith, composed primarily of granitic rock, is the major geologic feature of this region. However, the aquifers that host the ground water resources in this area represent a wide range of geologic materials.

The southeast part of the Salmon-Clearwater region contains igneous, metamorphic and sedimentary rocks separated by relatively flat, alluvium filled valleys. The bedrock highlands do not yield substantial quantities of water.

Groundwater development occurs primarily in the valleys, within aquifers that consist of alluvial fan and flood plain sediments. Runoff from the surrounding mountains, percolation of streams, and infiltration of rain and melted snow provide

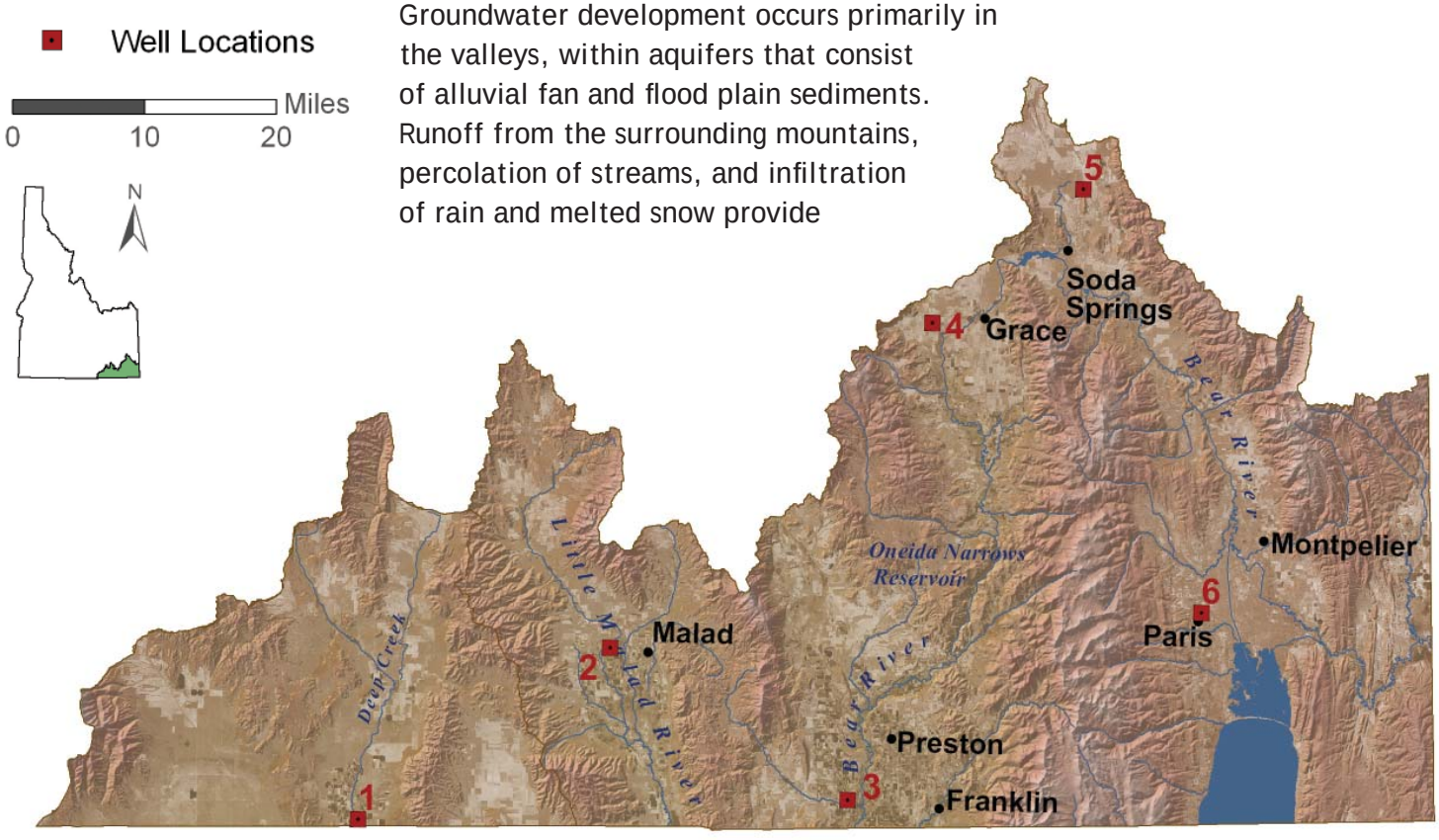


Figure 1.15 — Bear River and Deep Creek Well Locations

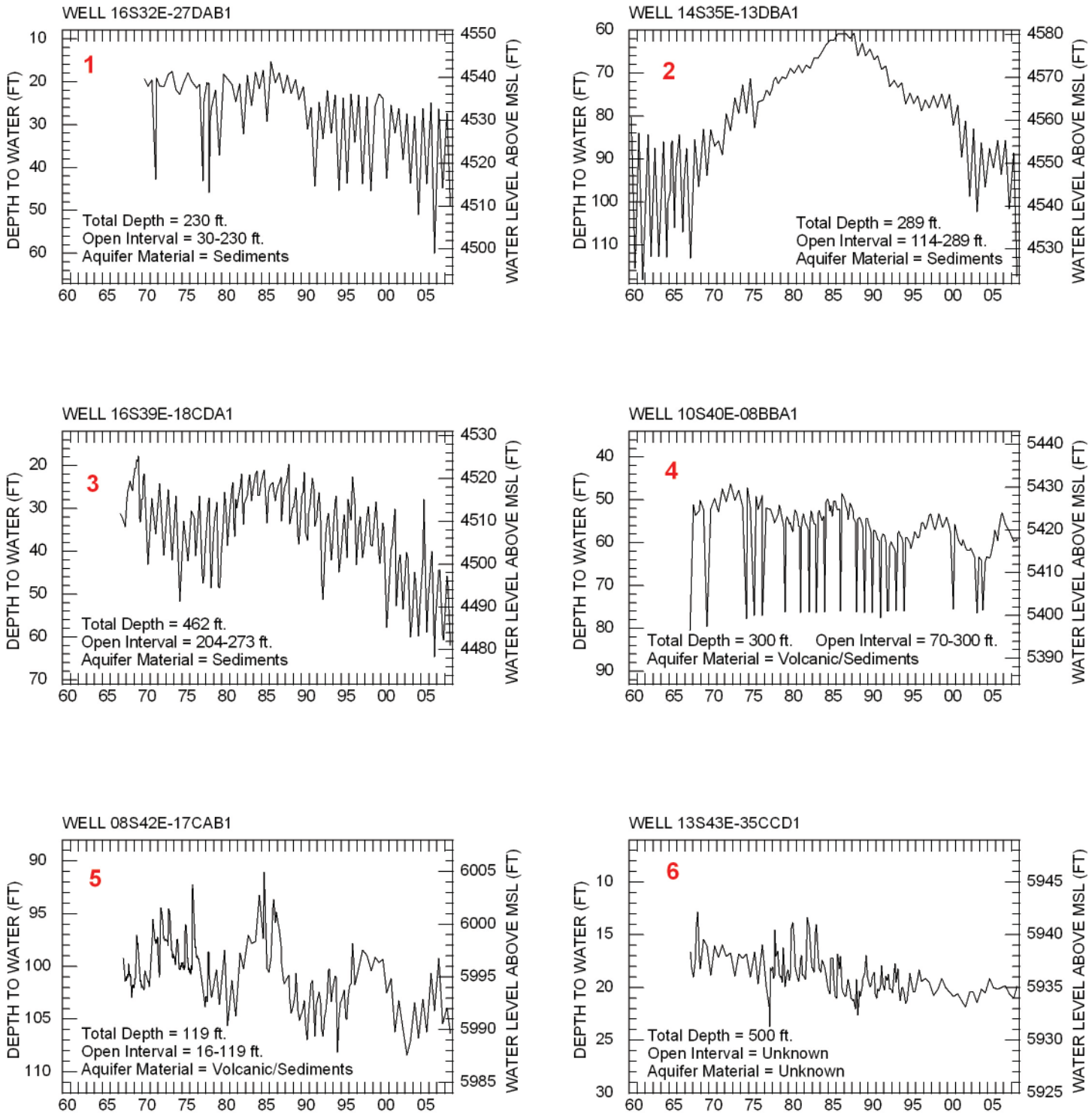


Figure 1.16 — Bear River and Deep Creek Hydrographs

aquifer recharge (Kinnison, 1955). **Figure 1.17** shows the locations of selected wells. **Figure 1.18** displays hydrographs associated with the wells.

The northwestern part of this region is dominated by the basalt of the Columbia River Plateau, which overlies the older Idaho Batholith and metamorphic bedrock. The basalt is the most important water bearing formation in this area. Aquifers are found in the basalt flows and in the layers of sediments found between these flows. The ability to store and convey water varies greatly in these aquifers due to the differences in the physical characteristics of the water bearing materials (Kinnison, 1955). Recharge has been assumed to occur along the margins where the basalt meets the older bedrock. It is thought that water flows down these margins and feeds the basalt and interbedded sediment aquifers. Deep wells in the area have experienced continual water-level declines, and recharge to the deeper systems appears to be limited.

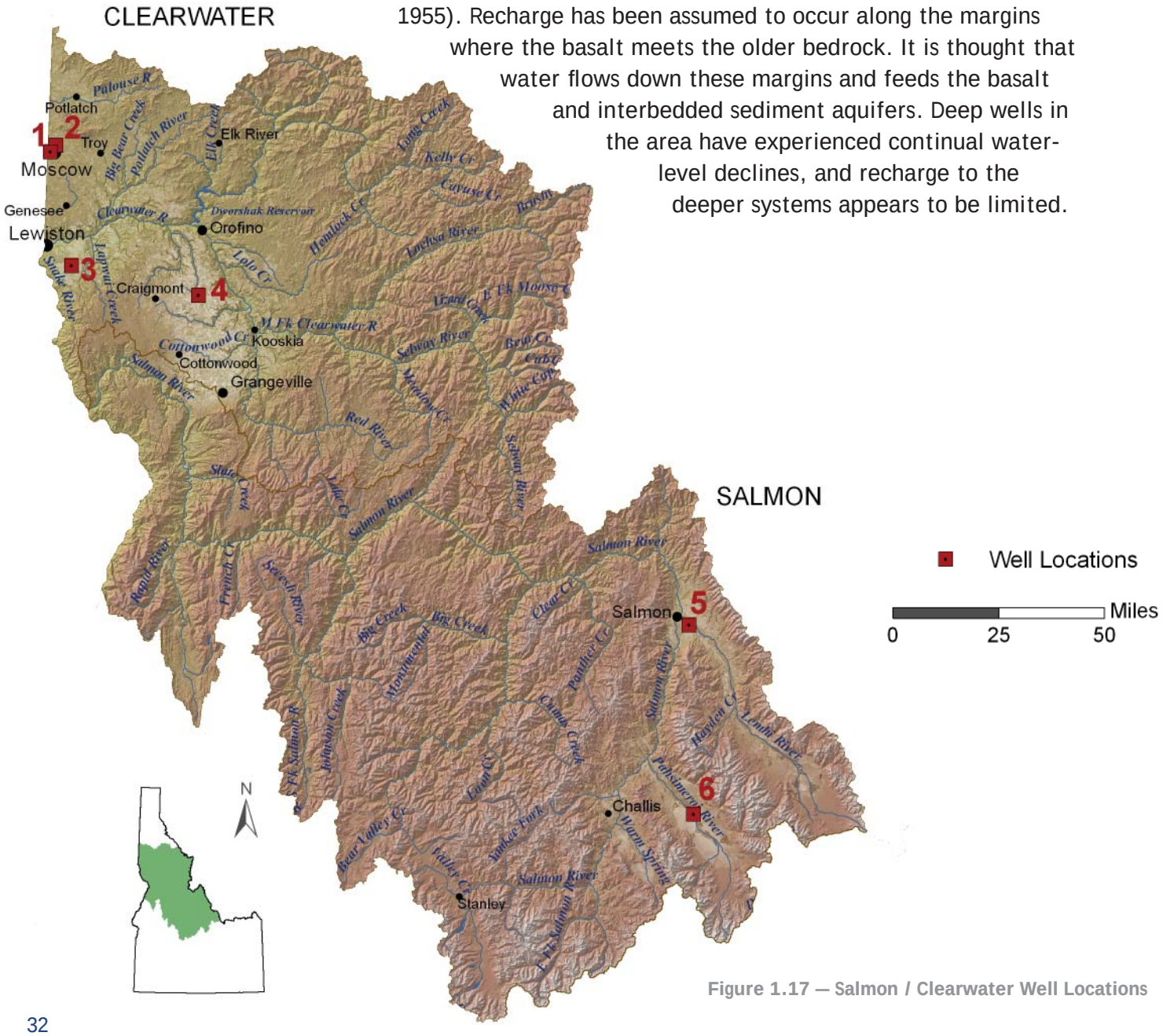


Figure 1.17 — Salmon / Clearwater Well Locations

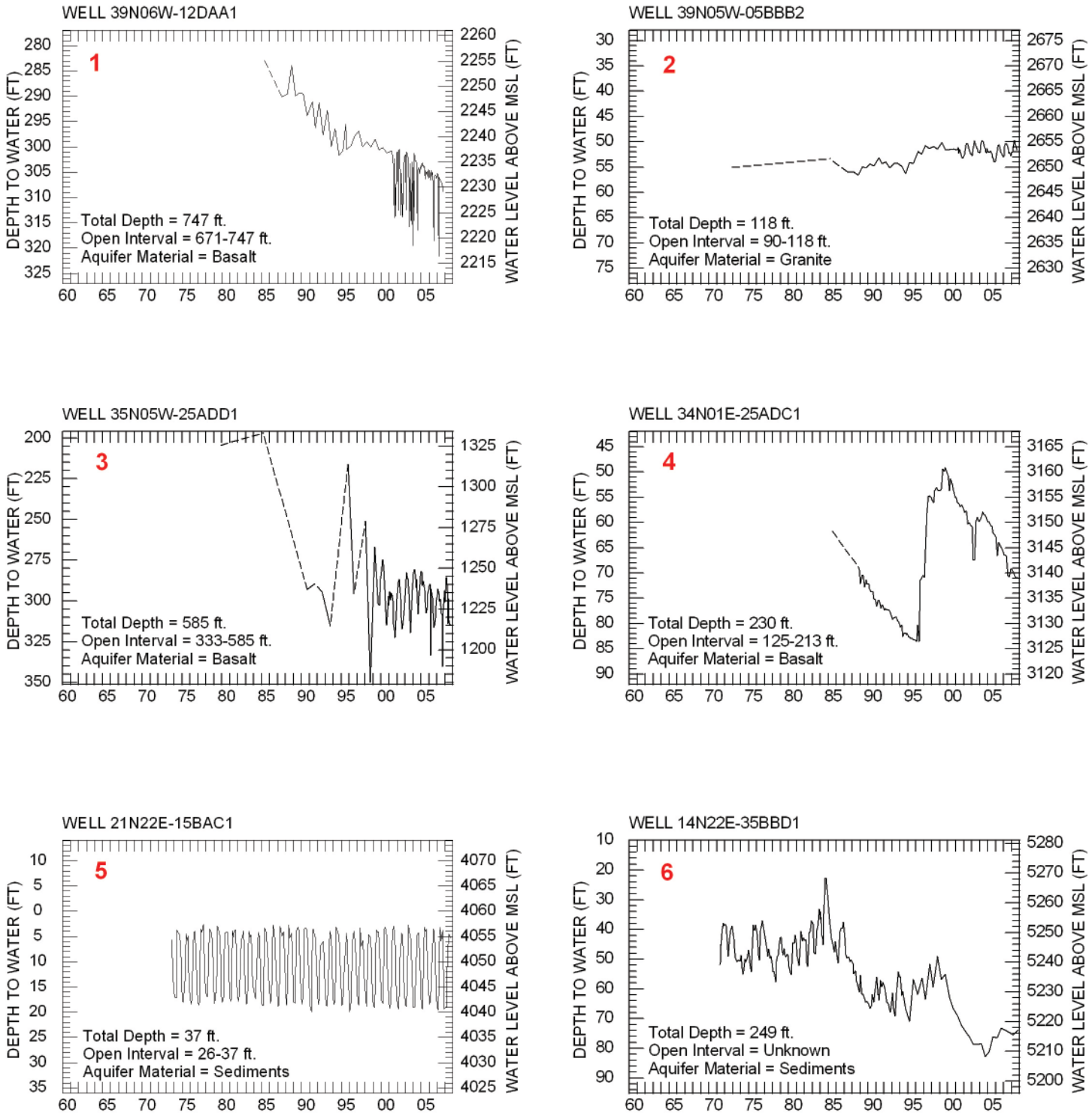


Figure 1.18 — Salmon / Clearwater Hydrographs

EASTERN SNAKE RIVER PLAIN

The highly productive aquifer that exists beneath the eastern Snake River Plain exists within layered basalts and occasional deposits of sediments between rocks. Fractured rubble zones between the numerous layers create highly permeable zones that provide the primary conduit for groundwater flow. **Figure 1.19** shows the location of wells in the Eastern Snake River Plain. **Figure 1.20** displays the hydrographs for the selected wells.

Aquifer recharge occurs primarily via irrigation percolation, canal and stream losses, and subsurface flow from surrounding areas (Cosgrove, et al., 2006). The Aquifer elevation is highest in the northeast portion of the Plain, and groundwater tends to flow from the northeast to the southwest. Natural discharge from the aquifer occurs primarily near American Falls Reservoir, and in the Kimberly to King Hill reach (Thousand Springs reach). During the summer, flows from Snake River canyon springs provide the majority of the flow in the Snake

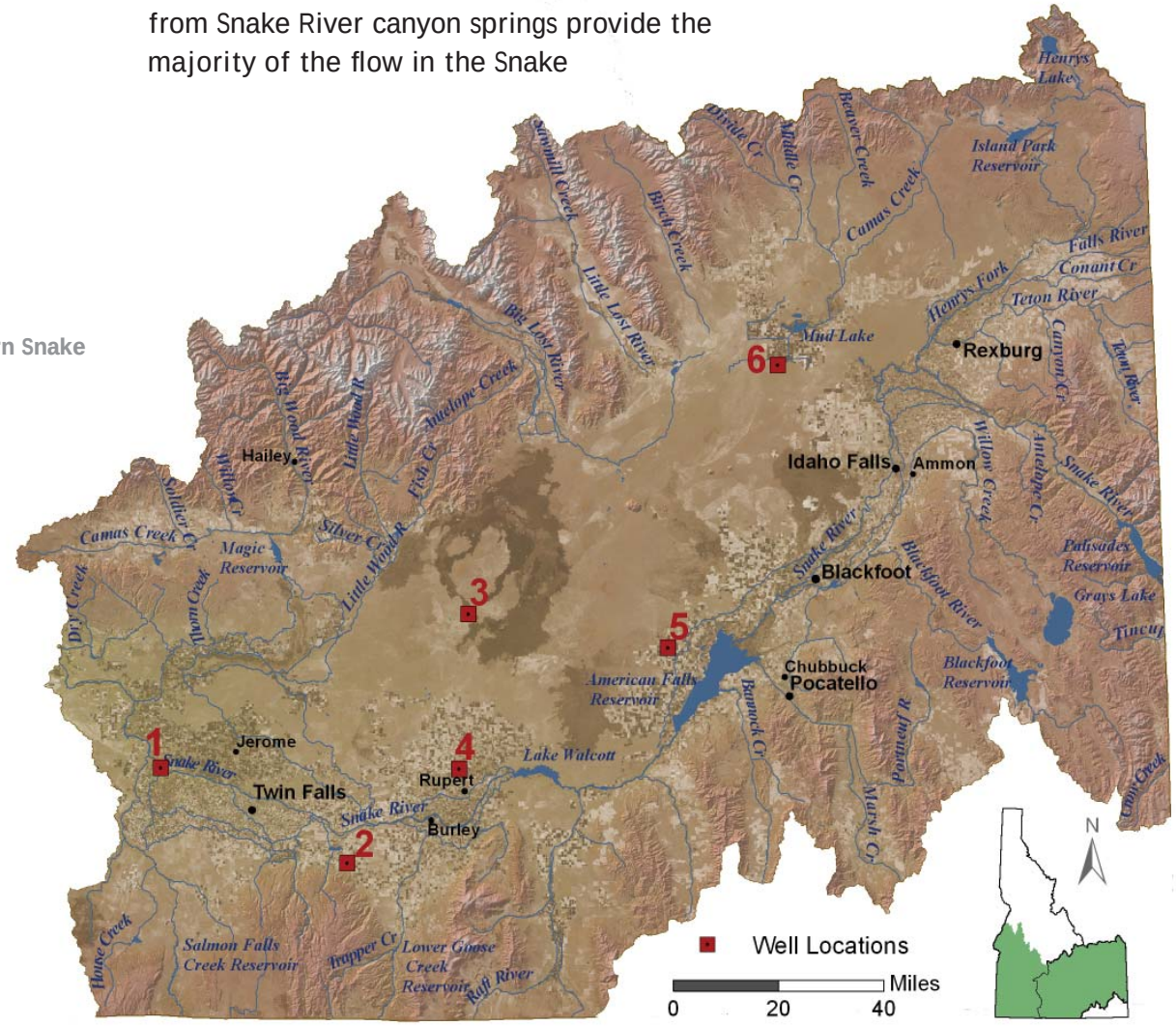


Figure 1.19 — Eastern Snake Plain Well Locations

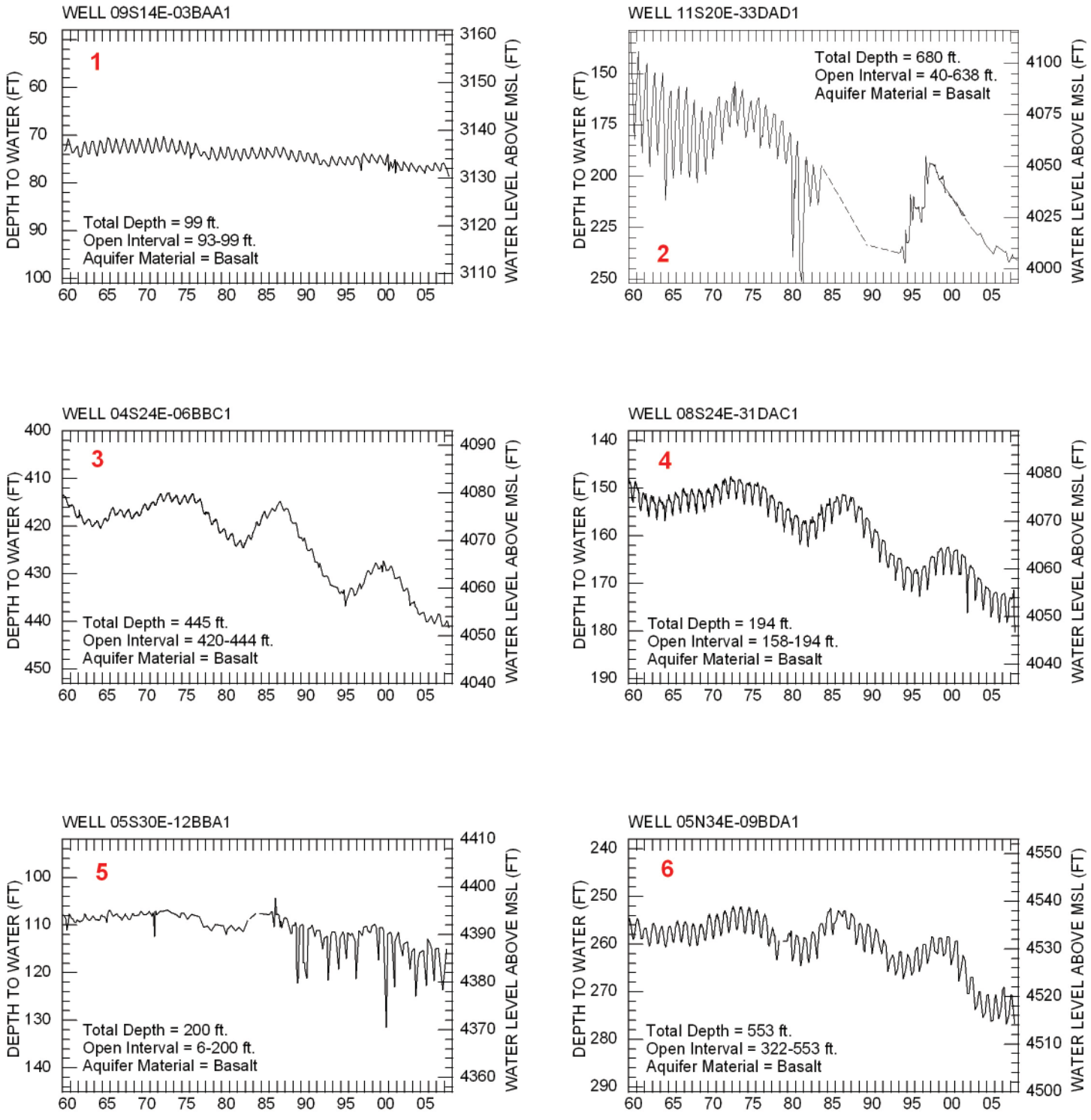
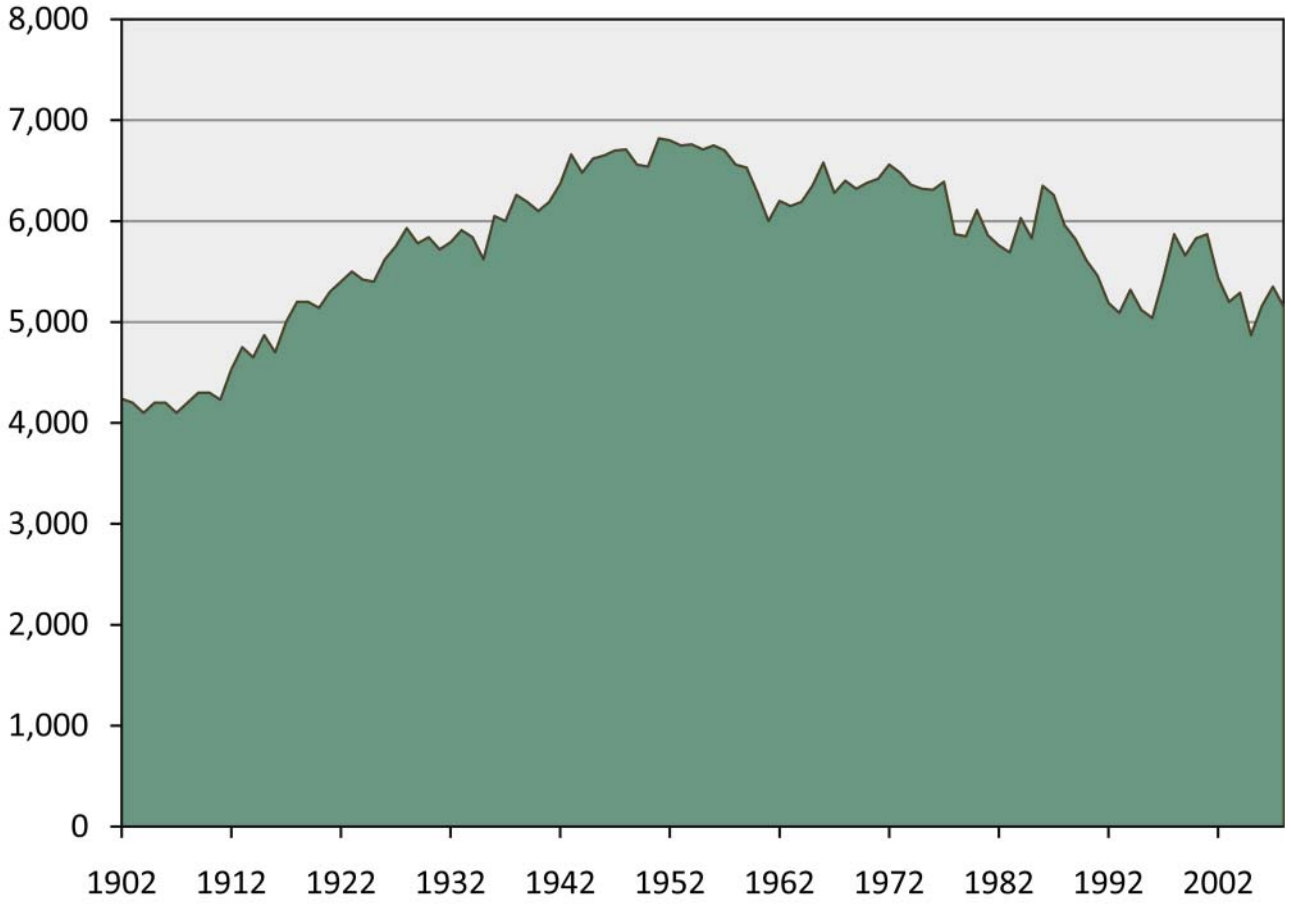


Figure 1.20 — Eastern Snake Plain Hydrographs

River below the irrigation diversions of Milner Dam. **Figure 1.21** shows the average annual groundwater discharge from the north side of the Snake River between Milner Dam and King Hill from 1902 to 2005, in cubic feet per second.

Variations in weather patterns and irrigation practices on the Snake River Plain have caused changes in aquifer water levels. During the past several decades, ground water storage has been depleted, causing water levels to drop. Some areas of the aquifer have experienced significant drops in water levels and other areas have experienced only slight decreases in water levels (Johnson et. Al., 1999).

Figure 1.21 — Groundwater Discharge North of the Snake River between Milner Dam and King Hill



WESTERN SNAKE RIVER PLAIN

The ground water resources of southwestern Idaho are found in of a wide range of geologic materials, structures, and rock types. The most dominant geologic feature is a deep structural depression known as the western Snake River Plain. High mountains surround the plain on the northeast and southwest, and the basin is filled with sedimentary and volcanic rocks.

The highlands are generally composed of rhyolitic and granitic basement rocks that do not produce substantial quantities of water. Valley fill sediments serve as the major aquifers in the mountainous areas surrounding the plain (Newton, 1991). Recharge to these aquifers is typically due to leakage from overlying streams and percolation of runoff from surrounding highlands.

The aquifers underlying the Western Snake River Plain consist of complex arrangements of sediments and inter-fingered basalt. Groundwater resources are generally developed within two flow systems. The shallow system (approximately 500 feet deep) consists primarily of sand and gravel with locally confining lenses of clay. **Figure 1.22** shows the locations of selected wells and **Figure 1.23** shows the associated hydrographs.

This system is primarily recharged by percolation of canal and irrigation water, and runoff from the highlands. The deeper system consists of a series of confined aquifers within fine grained sediments and volcanic rocks. Recharge to the lower system is thought to occur where these units crop out along the basin margins (Newton, 1991).

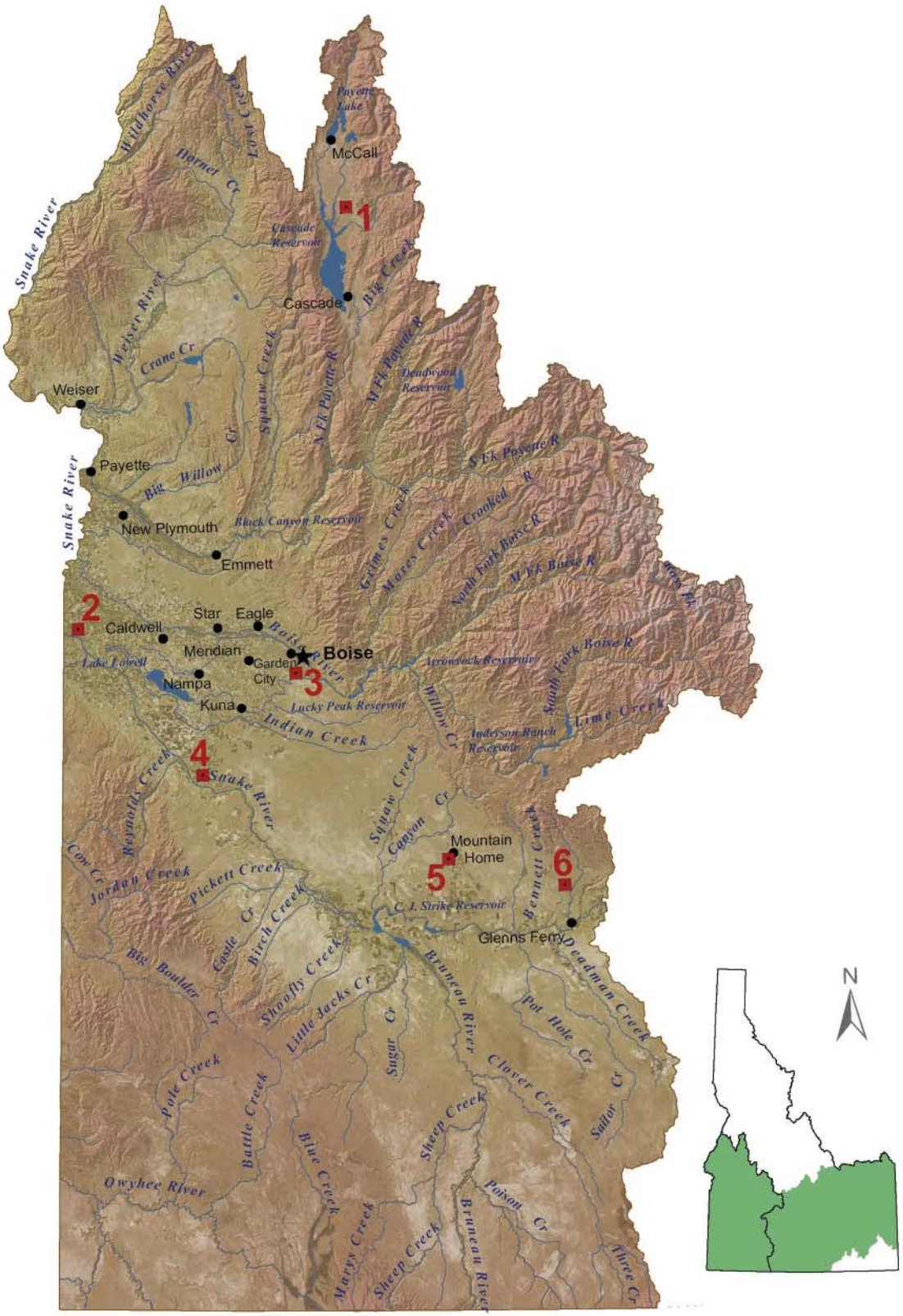


Figure 1.22 — Western Snake Plain Well Locations

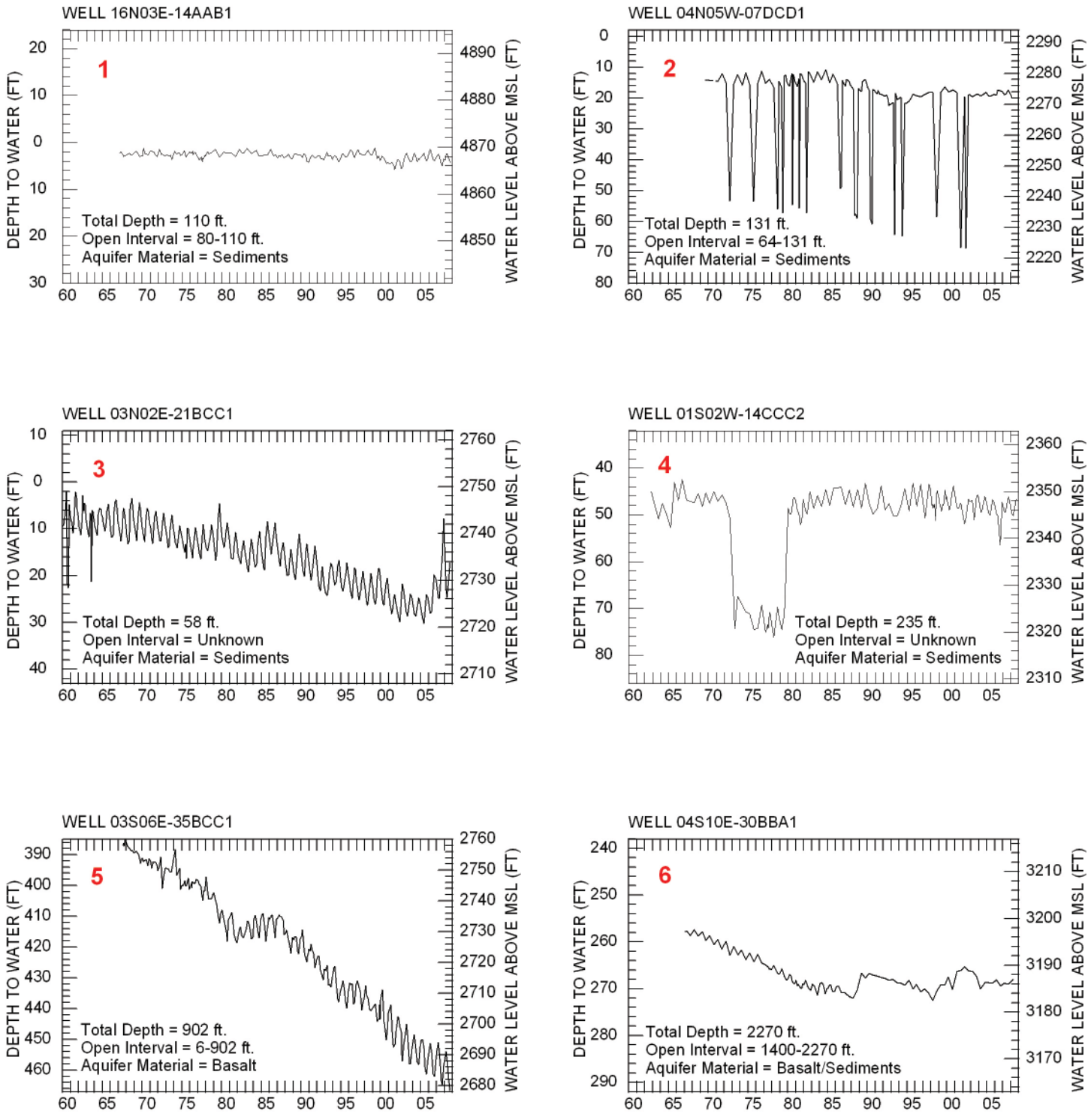


Figure 1.23 — Western Snake Plain Hydrographs

IDAHO PANHANDLE

Precambrian metamorphosed sediments dominate the geology of the Panhandle Region. These rock formations do not yield substantial quantities of water. Groundwater development in this region occurs primarily in the valleys that consist of sediments from lakes and rivers. These valley aquifers are recharged by the infiltration of rain and melted snow.

The most productive aquifer in the region is the Rathdrum Prairie-Spokane Valley Aquifer located in Kootenai County. This aquifer consists of coarse grained sediments which deposited by a series of catastrophic glacial floods from ancient Lake Missoula. The depth to water ranges from 125 feet to 500 feet, and well yields range from 1,000 to 3,000 gallons per minute. **Figure 1.24** shows selected well locations. **Figure 1.25** shows hydrographs for the wells. Fine-grained deposits in the Kootenai and Priest River valleys and the Sandpoint area limit ground water development. This is the case for most of the region (State of Idaho, 1996).

Although variable, water levels show generally stable trends. Where available, ground water supplies in the Panhandle are generally reliable due to abundant recharge, and water levels respond to wet/dry climate cycles.

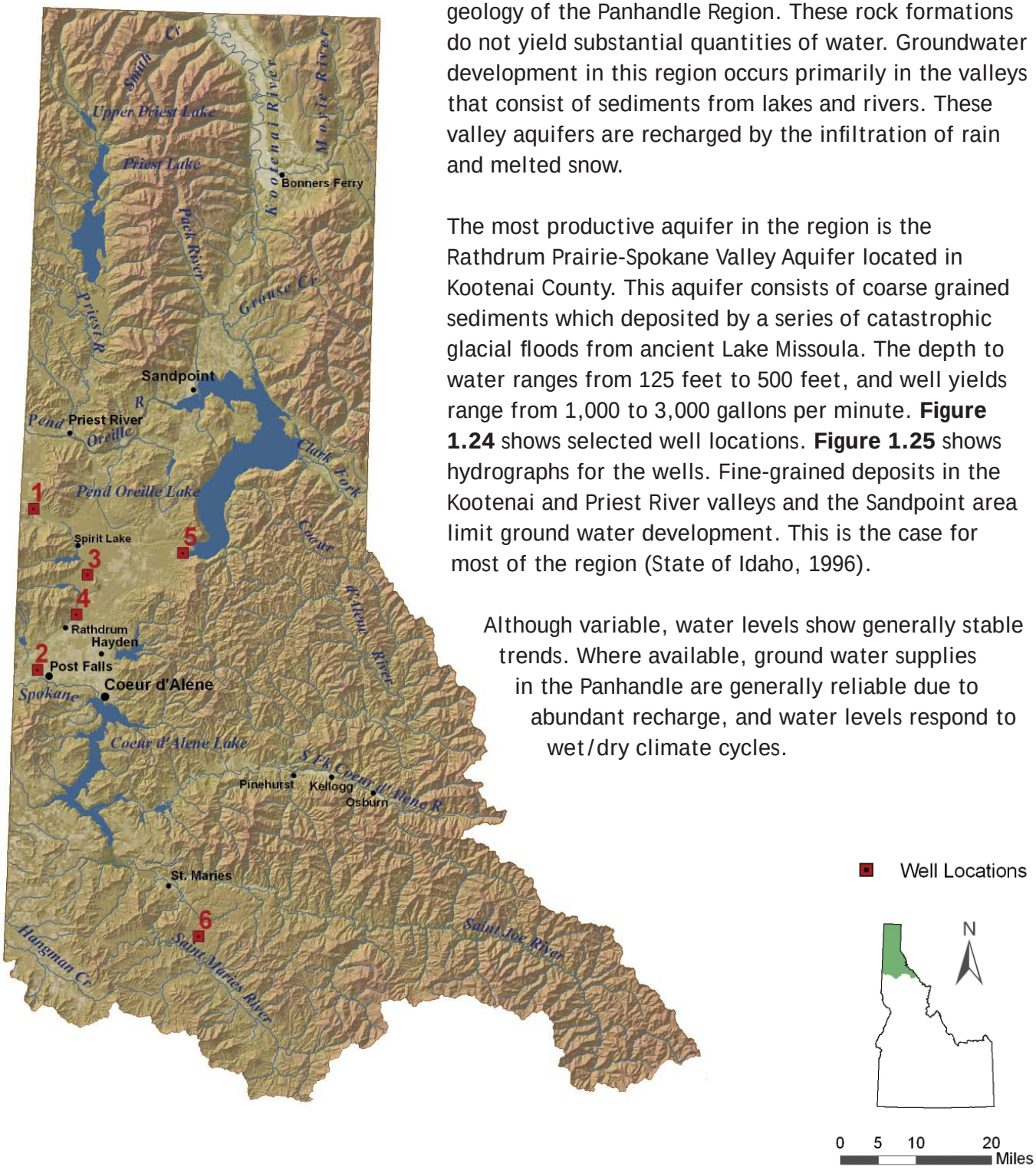


Figure 1.24 — Idaho Panhandle Well Locations

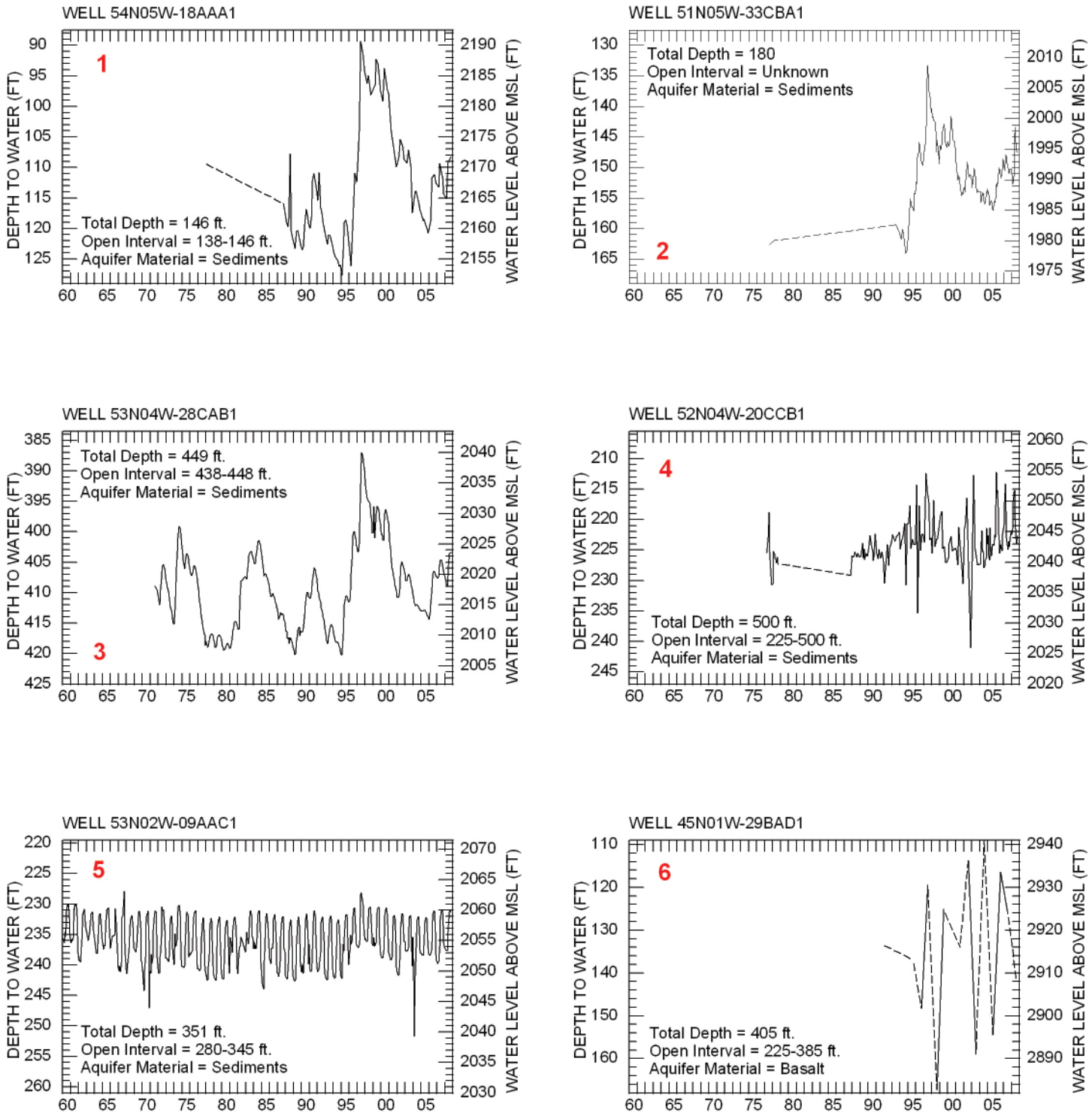


Figure 1.25 — Idaho Panhandle Hydrographs

Floods and Drought

Of the natural disasters experienced in the state, floods cause the most damage and loss of life, and have been the most costly. Many Idaho residents live near rivers that are subject to periodic flooding. Flooding occurs almost annually somewhere in the state. Flood waters, ice, and debris damage roadways and bridges, wipe out farmland and threaten structures. Water also erodes soils from hillsides and transports sediments to river channels. This siltation decreases the carrying capacity of stream channels and the storage capacity of reservoirs, changes the course of a river and degrades fish habitat. Flood water often carries contaminants from agriculture and urban runoff. These chemicals and waste may harm fisheries and riparian habitat.

In Idaho, the major cause of severe flooding is spring snow melt brought on by warm temperatures. These events are most common in April through June and occur throughout the state. Flash floods due to localized thunderstorms, and ice or debris flooding occur less frequently. The upper Salmon River Basin and the Snake River above Idaho Falls have both experienced ice jams from December to February. The Weiser River basin in southwestern Idaho has a history of flash floods (National Weather Service, 2008). Intense flood damage has occurred as a result of heavy rainfall on snowpack in mountainous areas of the state such as along Panhandle rivers and in the Big Wood River drainage. The Kootenai, Spokane and Pend Oreille rivers basins have long histories of major flooding. Bonners Ferry in the Kootenai River Valley faces flooding threats even in average precipitation years. The failure of the Teton Dam on June 5, 1976, released 300,000 acre feet of water which flooded towns and farmland downstream and killed 11 people. This was the worst flood in Idaho history.

FLOOD CONTROL STRUCTURES

Few of Idaho's major reservoirs were constructed solely for flood control. Irrigation diversions and storage reservoirs have greatly reduced flooding in the state and these structures provide the U.S. Bureau of

Reclamation (USBR) and the U.S. Army Corps of Engineers (USACE) with the ability to regulate flow providing some flood protection to local communities. Within the Snake River basin these include Jackson Lake in Wyoming, Palisades and American Falls dams. Several dams in the Boise River system that manage water for flood control include Lucky Peak, Arrowrock, and Anderson Ranch. There are also dams on Boise River tributaries Stewart Gulch, Cottonwood and Crane Creeks. Two dams in the Rathdrum Prairie region, Albeni Falls on the Pend Oreille, and Dworshak on the North Fork of the Clearwater River regulate flows in northern Idaho. PacifiCorps operates dams in the Bear River basin that have helped to reduce the flood threat in southeast Idaho. (Hornbaker, 2008).

Levees are another common flood control structure in Idaho. As of 2008 there is no comprehensive inventory of existing levees for the state. The failure of these structures has occasionally resulted in flooding in the Coeur d'Alene basin. Many of these structures remain undocumented. A levee district in south eastern Idaho serves Jefferson County and maintains the levees near Mud Lake. Other local levee districts exist but they are not monitored at the state level.

FLOOD PREVENTION AND MANAGEMENT

Flood control districts are local entities established to address flooding in Idaho. When landowners recognize a need within their county, or a portion of a county, they may petition the director of IDWR to form a flood control district. These independent political subdivisions have taxing authority to raise money to help control flooding. The first flood control district was formed in 1946 and originally included Jefferson and Madison counties. District goals include constructing projects to reduce flooding, maintaining existing flood works and discouraging development in the flood plain. **Table 1.9** list the 14 current districts.

Flood hazard conditions are dynamic. Idaho is one of the fastest growing states in the country and every metropolitan areas lies next to a river or lake. As population continues to grow, communities will experience an

TABLE 1.9 — FLOOD CONTROL DISTRICTS

DISTRICT	COUNTY	MAJOR STREAMS
1	Bingham, Bonneville, Jefferson and Madison	Snake River, Birch Creek, Lyons Creek, Spring Creek, Lower Willow Creek
2	Blaine	Little Wood River, Dry Creek
3	Adams, Washington	Weiser River, Middle and West Forks, Little Weiser, Grays Creek, lower reaches of Cottonwood, Crane, Rush, Spring, Pine, Goodrich and Mann Creek
5	Jefferson	Camas Creek, Mud Lake
6	Idaho	White Bird Creek
7	Bingham	Blackfoot River
8	Caribou	Portneuf River, Pebble, Toponce and Twenty-four Mile Creeks
9	Blaine	Big Wood River
10	Ada and Canyon	Boise River, lower reaches of Dry and Willow Creeks
11	Canyon	Lower Boise River and Sand Hollow Creek
12	Bear Lake	Thomas Fork Bear River, lower reaches Dry and Preuss Creeks
15	Cassia	Raft River, Calder, Shirley, Heglar Canyon and Tributaries, Cassia, Grape, Edwards, Almo, One Mile, Cottonwood and Clear, Parks, Clyde, Conner Creeks
16	Cassia	Goose Creek, Birch, Big Cottonwood, Dry, Trout, Trapper, Rock, Summit, Spring, Piney, Mill, Junction and Fall Creeks
17	Kootenai	Twin Lakes / Rathdurm

increase in impervious surfaces and more artificial stream channels. The pressures of development may result in increased flood intensity, higher flood velocities and, increased erosion and sedimentation. Increasing growth often encroaches on flood plains leading to significantly greater costs when flooding occurs. **Table 1.10** lists the years of major flooding and the areas impacted.

Canals and ditches pose yet another flood threat to residents. In 1973 a 30-foot breech in the Ridenbaugh canal flooded 15 houses in southeast Boise (Ada County, 2009). In June of 2006, the Kuna Mora Canal, south of Kuna was breeched and caused minor flood damage. As the existing irrigation infrastructure ages and neighborhoods encroach upon land formerly used for agriculture, canals may pose unanticipated hazards.

TABLE 1.10 — MAJOR FLOOD HISTORY

YEAR	AREA AFFECTED
1894	Statewide
1927	Upper Snake River Basin
1933	Spokane River Basin
1943	Boise and Payette River Basins
1948	Southwest Idaho
1955	Southwest Idaho
1959	Boise River Basin (August and September)
1962	Southern and Eastern Idaho
1963	Portneuf and Clearwater Basins
1964	Statewide at low elevations
1974	Northern and Central Idaho (January)
1974	Statewide (June)
1976	Eastern Idaho
1984	Eastern and central Idaho
1986	Bear River Basin
1996	Northern Idaho
1997	Southeastern and Northern counties

USGS and Source: Idaho Bureau of Homeland Security

DROUGHT

Extended periods of drought are historically part of the climatic cycle in Idaho, where the consequences of too little water are often far broader than the damages associated with flooding. Droughts decrease stream flow and the amount of water available for reservoir and aquifer storage. Farmers rely on natural precipitation and stream flow for irrigation. Low stream flows result in higher water temperatures that can harm fish. Much of Idaho's electrical energy is generated from hydro power and decreased stream flows and reservoir storage can drive up power costs. Idaho usually has an adequate supply of water because of winter snow pack and storage reservoirs along major rivers. However,

Palmer Drought Severity Index Values greater than 4 indicate extremely wet conditions and those -4 or less represent extreme drought.

because of variations in weather patterns, decreased snowpack may cause water shortages in all or part of the state.

The Palmer Drought Severity Index (PDSI) measures intensity, duration and the spatial extent of a drought. The Index varies roughly between -6.0 and +6.0 (NOAA 2005). Values greater than 4 indicate extremely wet conditions and those -4 or less represent extreme drought.

According to the (PDSI) mild to extreme drought has occurred in the state approximately 32 percent of the years on record. Severe to extreme conditions have occurred seven percent of the years from 1896 through 2007. **Figure 1.26** represents the time period of record and displays the wet and dry years as classified by the PDSI.

Some areas of the state are more susceptible to drought than others. There is a much greater potential for persistent and severe stream low flows in southwestern Idaho and the Snake River plain. However,

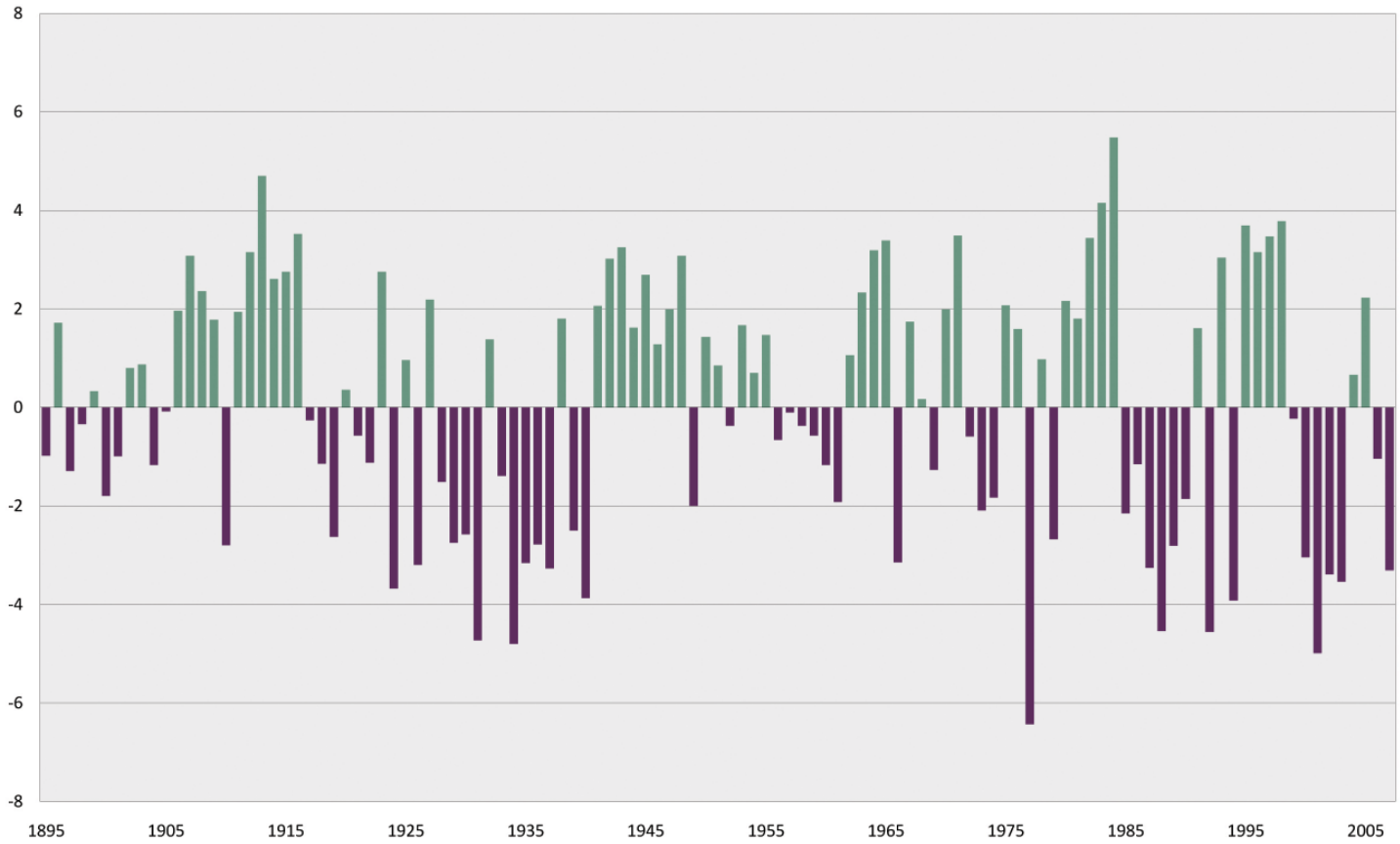


Figure 1.26 — History of Wet and Dry Years, using Palmer Drought Severity Index

regional droughts occur across the state with the general exception of the mountains along the Idaho and Montana border.

The earliest prolonged drought on record occurred during the Dust Bowl days in the 1920's and 1930's. Stream flow records indicate that other periods of low flow occurred in 1944-1945, mildly in 1959-1961, 1977, 1987-1992 and 2000-2004. Isolated years with drought characteristics have also occurred. The western part of the United States experienced the driest year on record in 1977. Low snow pack resulted in record low runoff at most gage stations in the state. The Snake River flow at Weiser, on July 1 of that year, was 4,570 cfs. The July first average from 1910 through 2007 is 11,800 cfs (USGS, 2008). Domestic wells in the Wood River Basins dried up as early as April and many shallow wells in western Idaho became dry in early summer.

Between 1987-1992 western Idaho experienced low snow pack and higher than normal temperatures that set records in the Boise Basin and the Salmon gage at Whitebird. The period of November 2000 through March 2001 was the second driest year following 1977. Spring snow pack in April was 50 to 61 percent of average. Precipitation remained below normal over much of the northwestern United States through the rest of the water year, which ends in September. Annual runoff for many gages was well below long term averages. **Figure 1.27** illustrates the impact the sequence of wet and dry years has had on stream flows in the Snake River basin.

The Idaho Drought Plan provides current and historic information and guidance for managing water shortages in Idaho. First published in 1990 and revised in 2001, the Plan outlines conditions for the formation of a Water Supply Committee by the Governor's office, to coordinate drought-related activities in Idaho. This Committee is tasked with compiling data, coordinating with various agencies, providing information to the public and encouraging water conservation. State and federal agencies and utilities are included on the committee. The plan outlines steps for local governments to encourage public involvement in creating phased demand reduction programs during conditions of severe drought.

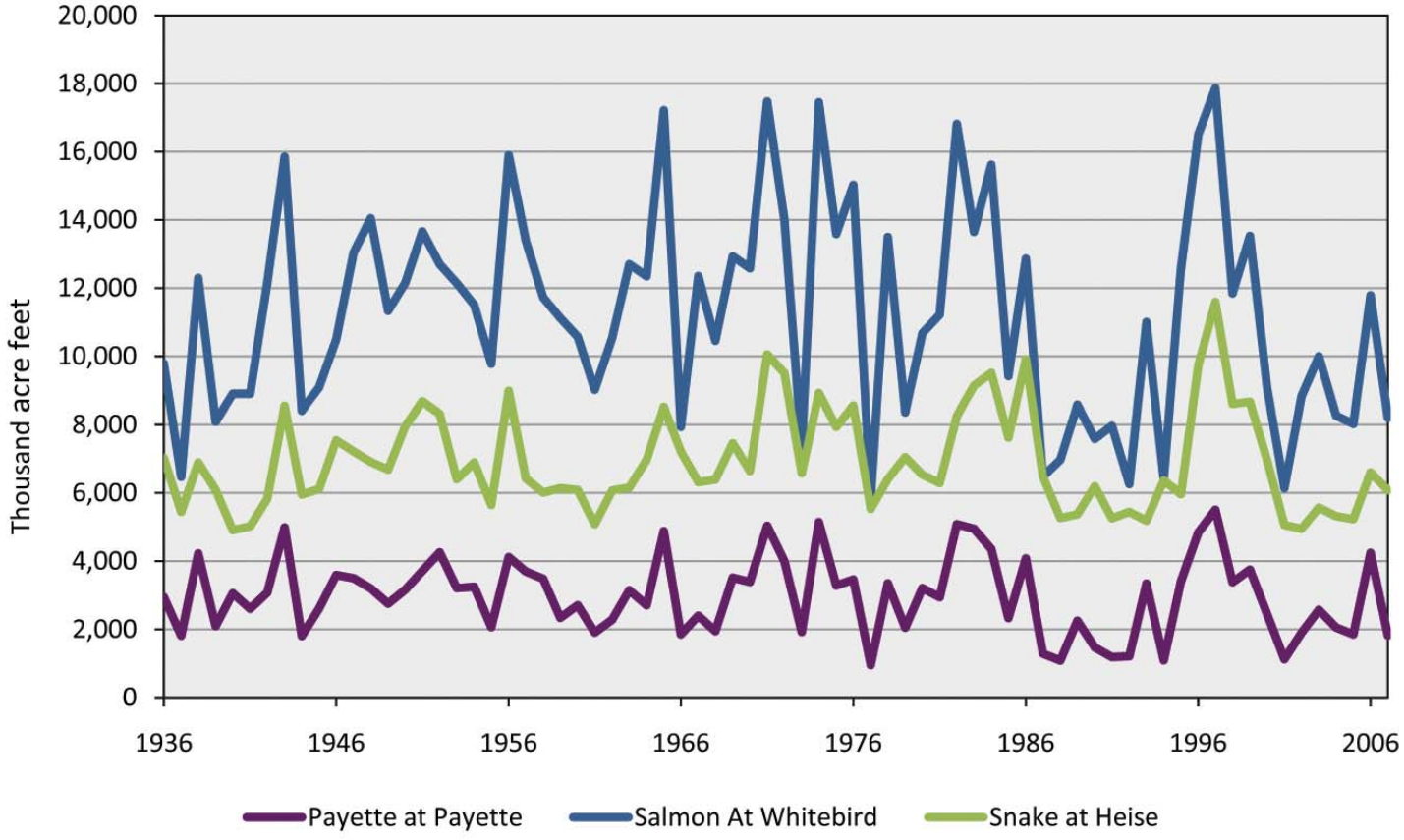


Figure 1.27 — Snake River Basin Annual Runoff

Geothermal Resources

Idaho has vast geothermal resources. Over 1,100 wells and springs have water temperatures warmer than 85º Fahrenheit (F), and 25 wells produce geothermal water hotter than 212º F. In general, any surface or groundwater that is over 85º F is commonly referred to as geothermal. For regulatory purposes, Idaho has three temperature classifications for water: 1) equal to or less than 85º Fahrenheit (F) is non-geothermal or cold water, 2) greater than 85º F and up to 212º F is low temperature geothermal, and 3) greater than 212º F is geothermal.

Idaho's geothermal resources occur in the central and southern parts of the state. The surface occurrences of the approximately 200 geothermal springs in Idaho are closely associated with geological structural features such as faults and fractures. The locations of the 900 plus geothermal wells are sometimes associated with known geologic surface or subsurface features. However, in some cases, the controlling geological structures are still unknown. **Figure 1.28** shows the locations geothermal resources.

Water Quality

The quality of water is related to the physical and chemical composition of the natural environment and the impact of human activity. Atmospheric water is mildly acidic due to airborne contact with carbon dioxide. As precipitation forms runoff or percolates into the soil it dissolves minerals and creates the natural or ambient chemical composition of water. Groundwater typically contains higher concentrations of the soluble chemicals because of increased soil contact and travel time.

The overall ambient quality of Idaho's natural water resources is excellent due to the high quantity of precipitation in the mountains, the short amount of travel and exposure times, and rock types that are either carbonate-based or only slightly soluble. 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 general, the surface water in the state is of high quality, primarily because of low population density and relatively little industry. Pollution problems that do exist tend to be localized and related to human activity. Sediments are a major source of stream degradation throughout the state. Agricultural practices often result in increased sediments and nutrients from irrigation returns (EPA, 2002). Grazing on public lands is

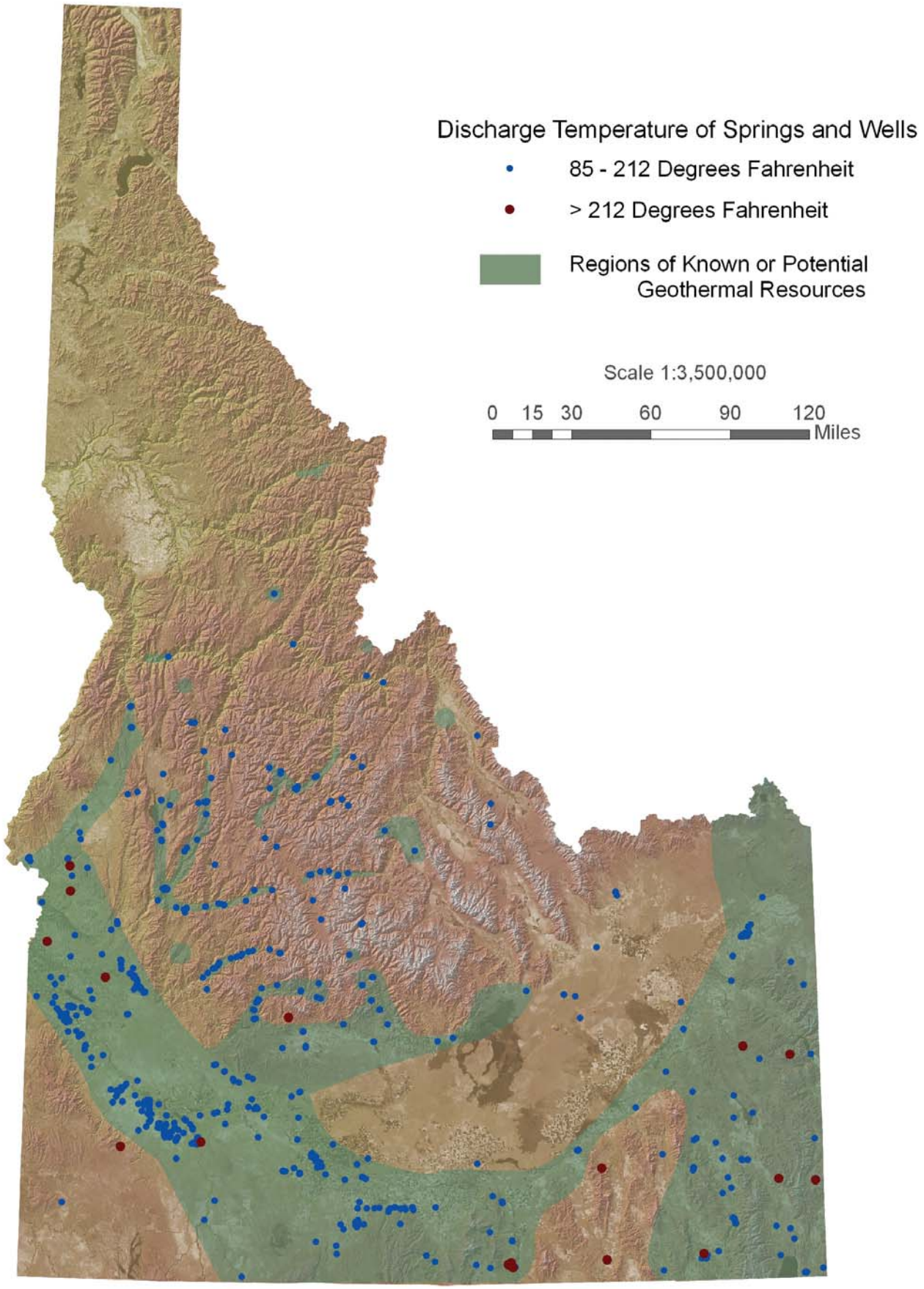


Figure 1.28 — Geothermal Resource Locations

common and riparian zone impacts often result in high sediment loads in streams, especially during spring runoff. Logging, road building and wildfires also tend to increase sediment in streams.

In 2008, Idaho Department of Environmental Quality (DEQ) reported that thirty-six percent, or over 18,000 miles, of Idaho's streams and 340 square miles of lakes were 'water quality limited', either not supporting or only partially supporting at least one designated beneficial use (DEQ, 2008). Thirty-seven percent of Idaho's streams were not assessed. **Figure 1.29** illustrates the water quality limited streams in Idaho. Beneficial uses include warm and cold water biota habitat, primary contact recreation such as swimming and secondary recreation including boating, domestic or drinking water, agriculture, industrial, wildlife habitat, aesthetics and salmonid spawning (IDAPA, 2008).

TMDL

Section 303(d) of the Clean Water Act mandates states to create a priority list of waters that fail to meet water quality standards. Each year, DEQ submits a list of impaired waters, those that do not meet water quality standards set by the state, to the Environmental Protection Agency (EPA). Once a stream is identified as water quality limited, DEQ creates a Total Maximum Daily Load (TMDL) report to identify pollutants and set allowable limits for each. The goal of the TMDL is to restore each stream to it designated beneficial use. These uses generally include fisheries, recreation and drinking water supplies. The primary causes of impairment statewide include temperature, sediment, nutrients such as phosphorus and nitrogen, and pathogens such as Escherichia coli. The TMDL reports identify the sources of the pollutants and develop implementation strategies for restoring the health of the waterbody.

In Idaho, the Department of Environmental Quality is the primary agency tasked with managing water quality. The director of DEQ appoints Basin Advisory Groups or BAMs for each of six major basins in Idaho: Panhandle, Clearwater, Salmon, Southwest, Upper Snake

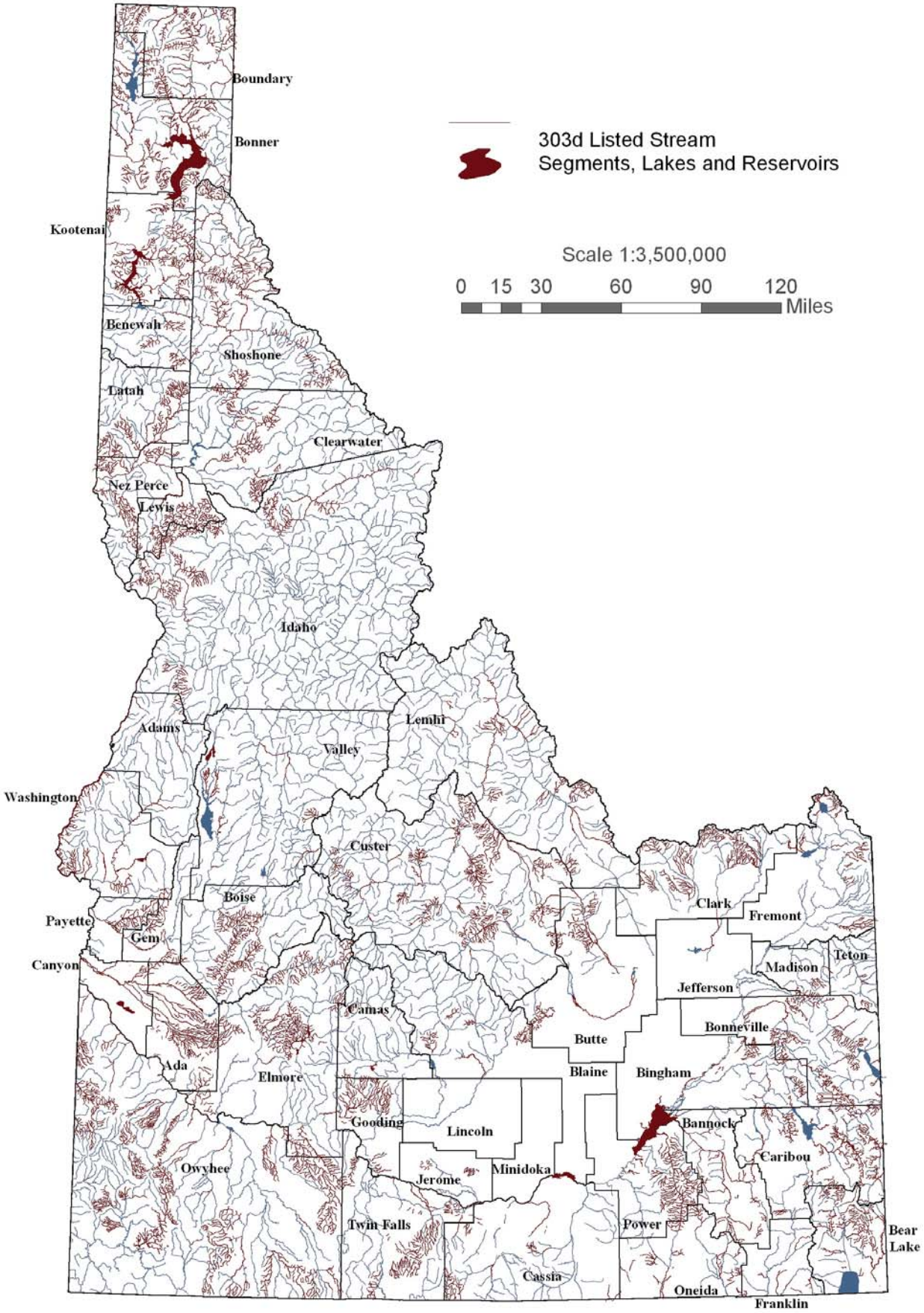


Figure 1.29 — Water Quality Limited Streams

and Bear River. Every two years DEQ develops an integrated report to highlight degraded water bodies. Subbasin assessments describe the status of the physical, biological and cultural setting, water quality and recent pollution control actions. Assessments also address water bodies previously impaired that fully support beneficial uses.

GROUNDWATER QUALITY

Since 1990, the Statewide Groundwater Quality Monitoring Program, which is administered by the Idaho Department of Water Resources http://www.idwr.idaho.gov/WaterInformation/GWQuality/default.htm has collected hundreds of thousands of water quality measurements at almost 2,000 wells and springs across Idaho. Based on information primarily from the Statewide Program, and from other programs administered by the Idaho Department of Environmental Quality (DEQ) and the Idaho State Department of Agriculture, it has been determined that the quality of groundwater in Idaho is generally suitable for human consumption and other beneficial uses such as irrigation, aquaculture and industry. However, natural and anthropogenic (human-related) groundwater quality concerns have been identified in several areas, most of them in the southern part of the state.

Natural constituents in groundwater that can cause health concerns include arsenic, fluoride, uranium and selenium. Elevated arsenic concentrations occur in the northern Owyhee County, Twin Falls County, Weiser and Payette counties, and the Treasure Valley Shallow and Deep aquifers (Neely, 2002). Elevated concentrations of fluoride are found in the Payette, Mountain Home, Northern Owyhee County, Salmon, Bear River and Boise Mountain areas. Elevated levels of gross alpha uranium, and gross beta radioactivity occur in the Treasure Valley Shallow and Deep aquifers, northern Owyhee County and the Twin Falls area.

Anthropogenic impacts to groundwater quality often occur in valley lowlands because of several factors: 1) the population density is high, 2) the use of land is extensive, and 3) the groundwater is usually shallow and vulnerable to infiltration of contaminants. In Idaho, anthropogenic

constituents that can cause health concerns include nitrate, volatile organic compounds, pesticides, selenium, cadmium and bacteria.

Nitrate is the most widespread human caused groundwater contaminant in Idaho. Although not all nitrates are man caused, the presence of nitrate is a good indicator of other potential water quality problems. About five percent of the 2,000 plus Statewide Program sites had nitrate levels that exceeded 10 milligrams per Liter (mg/L) which is the Maximum Contaminant Level (MCL) established by the Environmental Protection Agency and Idaho's Groundwater Rules. An additional 33 percent of the statewide sites had impacted concentrations of nitrate that ranged from 2 to 10 mg/L (Neely, 2005). Several sources discharge nitrate into the environment including septic systems, waste from animal feedlots and nitrogen based fertilizers. Nitrate is an essential nutrient for plant growth; however, since it is not used quickly by plants, nitrate can move through the soil and into the underlying groundwater. Elevated nitrate levels in drinking water are a definite health concern for infants less than six months old since this level can cause an oxygen deficiency known as Blue Baby Syndrome. High nitrate levels may also be a concern for pregnant women and may have links to certain types of cancer (DEQ website, and Neely, 2005).

Nitrate trend analyses have been conducted on Idaho's groundwater over the past 10 plus years. The results of these studies indicate that nitrate concentrations are increasing in several areas of the state. Using the Statewide Program's delineation of 20 Hydrogeologic Subareas in Idaho, results show that six of these 20 subareas (30 percent) had a significant increase in median nitrate values from the early years of the program (1991-1994) to the later years (1999- 2003) (Neely, 2005). In 2002, the USGS published the first nitrate trend analyses related to the Nitrate Priority Areas (NPAs) established by DEQ.

In the summer of 2006, the Idaho Groundwater Monitoring Technical Committee (GWMTC), working with DEQ, began the process of revising the NPAs. They assembled groundwater quality data from about 9,950 wells encompassing over 2 million acres. This data lead to the update of previous boundaries and the creation of new areas (DEQ, 2008).

Figure 1.30 displays the 2008 nitrate priority areas in Idaho. These areas show varying degrees of degradation and have a priority based upon population, existing groundwater quality and water quality trends. Approximately 300,000 people, or 20 percent of the population, lives within a NPA. The five areas of highest nitrate concentration are Twin Falls, Ada/Canyon, Weiser, Fort Hall and Northeast Star.

Elevated concentrations of selenium, associated with phosphate mining, occur in localized areas especially near Pocatello, Soda Springs and Blackfoot. In 1996, livestock deaths due to selenium consumption prompted local authorities and mining industry representatives to investigate possible human health and environmental effects (DEQ website). Selenium in drinking water is a concern because high levels can cause neurological effects, brittle hair and deformed nails (ATSDR, 2003). High levels of selenium in water can problems for waterfowl that include mortality, birth defects and reproductive problems (Rowland, et al., 2005). The DEQ found that "regional human health and population-level ecological risks were unlikely due to the limited amount of area impacted by previous releases", but they did find some environmental risk from selenium contamination (ISU, 2008).

The Treasure Valley shallow aquifer, Portneuf, Eastern Snake River Plain Alluvium, Payette and Twin Falls areas are the areas most affected by volatile organic compounds (VOC) and pesticides. VOC detections are usually very limited in areal extent and pesticide detections rarely exceed MCLs or Health Advisories. Fecal coliform bacteria, an indicator of contamination from warm-blooded fecal material, have been detected throughout the state with the most frequent occurrences being in the Boise mountains, Weiser, Treasure Valley Shallow, Cassia/Power and Payette subareas.

The U.S. Environmental Protection Agency has designated three aquifers in Idaho as Sole Source Aquifers (DEQ, 2008). A Sole Source Aquifer (SSA) is defined as an aquifer which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer and occurs where no alternative drinking water sources are available.

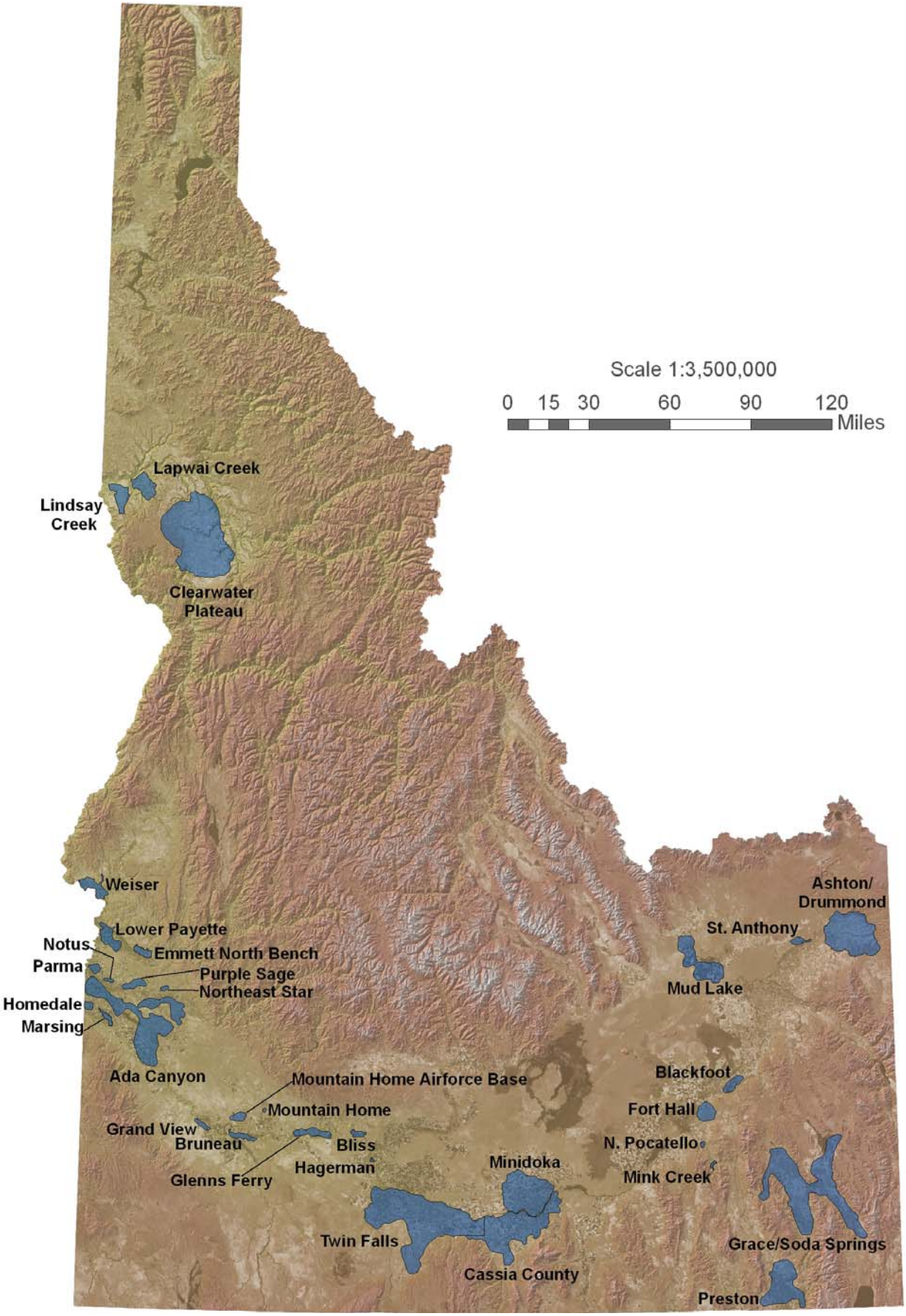


Figure 1.30 — Nitrate Priority Areas

The designated systems in Idaho are the Rathdrum Prairie (1978), Lewiston (1988) and the Eastern Snake Plain Aquifers (1991) shown in **Figure 1.31**. A SSA designation restricts federal activities within the area overlying the aquifer and its tributary sources. Because the Spokane/Rathdrum Prairie Valley serves over 400,000 people, Idaho also categorizes it as a sensitive resource aquifer, which means that stricter standards are enforced and it may not be degraded without demonstration that it is necessary for social or economic development (DEQ).

Idaho's current water infrastructure maybe to be inadequate for the increasing demands on water supply. Urbanization, Endangered Species, climate change and the competing interests of ground and surface water users all indicate a need for increasing supply. Conservation and management modification may not be sufficient to meet the future demands of Idaho's residents for water and the state must identify additional sources or create them. The increased pressure to find water supplies has led to the identification of potential storage projects. An abundant supply of water leaves the state and the ability to capture some of this resource may alleviate future water shortages.

Potential Water Storage

The combined storage capacity for the Snake River Basin is eight million acre feet. The Boise River system has a capacity of one million acre feet. The Payette River has storage for over 800,000 acre feet. The Snake River carries roughly 34 million acre feet out of the state each year and existing infrastructure allows Idaho to store one fifth of the water that leaves the state which provides opportunity to increase the storage capacity to capture this runoff. Another option involves increasing the storage capacity of existing reservoirs. **Table 1.11** lists all of the potential reservoir sites in Idaho and their capacity. **Figure 1.32** displays potential reservoir locations.

Figure 1.31 — Sole Source Aquifers

TABLE 1.11 — POTENTIAL RESERVOIR LOCATIONS

POTENTIAL DAMS & RESERVOIR NAME/SITE	STREAM	COUNTY	POTENTIAL USES (PRIM/SEC)[2]	TOTAL RESERVOIR CAPACITY (ACRE-FEET)
American Falls (enlargement-USBR owned)	Snake River	Power	FIP/RWQ	790,000
Bear Lake Pumps	Bear River (Bear Lake source)	Bear Lake	I/R	100,000
Birch Creek	Birch Creek (Snake River source)	Lemhi	I/R	24,000
Bissel Creek	Bissel Creek, trib to Payette (Snake River source)	Gem	Not Identified	170,600
Blackfoot (enlargement-USBIA owned)	Blackfoot River	Caribou	FI/RW	38,000
Bliss	Big Wood River	Blaine	Not Identified	16,000
Boulder Flats	Big Wood River	Blaine	F/R	61,500
C Ben Ross (enlargement)	Little Weiser River	Adams	I/R	12,450
Caribou Dam	Bear River	Clark	I/R/P	48,000
Challis Creek	Challis Creek	Custer	FI/RWQ	10,600
Clear Lakes	Snake River	Gooding/ Twin Falls	I/RW	1,070,000
Conant Creek - Lower	Conant Creek (Falls River source)	Fremont	I/R	8,700
Conant Creek - Upper	Conant Creek (Falls River source)	Fremont	I/R	22,300
Crevice	Salmon River	Not referenced	F/R	1,480,000
Driggs (Upper Teton)	Teton River	Teton	FI/R	50,000
Enaville	Coeur d'Alene River		Not referenced	700,000
Galloway	Weiser River	Washington	FI/RQ	900,000
Garden Valley	South Fork, Payette River	Boise	FIP/RWQ	1,700,000
Gold Fork	Gold Fork, Payette River	Valley	I/R	80,000
Goodrich	Weiser River	Washington	FI/R	350,000
Grindstone Butte	Deadmans Creek, Snake River source	Elmore	I	115,000
Guffey (High Alternative)	Snake River	Canyon/ Owyhee	IP/RF	333,000
Lost Valley (enlargement-LVRC owned)	Lost Valley Creek (West Fk Weiser River source)	Adams	I/R	20,000
Low Katka	Kootenai River			Not estimated
Lucky Peak (enlargement-USCE owned)	Boise River	Ada	FI	35,000

Lynn Crandall	Snake River	Bonneville	FI/R	1,460,000
Mapleton	Cub River (source from Maple Ck, High Ck, Summit Ck in Utah)	Franklin	I	34,000
Medicine Lodge	Medicine Lodge Creek	Clark	IQ/R	12,120
Minidoka (enlargement-USBR owned)	Snake River	Minidoka/ Cassia	IP/R	50,000
Monday Gulch	Intermittent stream (Little Weiser River source)	Adams	I/R/A	35,000
Nez Perce	Lower Snake River	Not referenced	P	6,600,000
Oneida Narrows	Bear River	Oneida	I/R	435,000
Pahsimeroi	Salmon River	Not referenced	FIP/R	1,500,000
Palouse	Palouse River	Not referenced	Not referenced	15,000
Plymouth	Malad River (Bear River source)	Utah	I/R	100,000
Rocky Point Irrigation	Bear River	Bear Lake	I/R	300,000
Rosevear Lower (small)	Rosevear Gulch (Snake River source)	Owyhee/ Elmore	I/R	51,700
Rosevear Upper (large)	Rosevear Gulch (Snake River source)	Owyhee/ Elmore	I/R	675,300
Sailor Creek	Sailor Creek (Snake River source)	Owyhee	I	113,000
Saylor Creek	Saylor Creek, trib Snake River	Owyhee	I/R	347,000
Shoestring	Snake River	Elmore	Not Referenced	1,100,000
Smithfield	Bear River (in Utah)	Utah	I	70,000
Squaw Hump	Hangman Creek		Not referenced	15,000
Succor Creek	Succor Creek (ID/OR) (Snake River source)	Malheur, OR	FI/R	103,800
Tamarack	Weiser River	Adams	IR/FW	30,000
Teton	Teton River	Madison	FIP/R	315,000 (200,000 active)
Texas Creek	Lemhi River	Not referenced	F	19,000
Thomas Fork	Thomas Fork River (Bear River source)	Bear Lake	I/R	12,000
Thousand Springs	Snake River	Gooding/ Twin Falls	FIP/R	595,000
Twin Springs	Boise River	Elmore	FP/RQ	400,000
Warm River	Henrys Fork	Fremont	PF/R	140,000

[1]Project data and costs were referenced from study(s) identified in the Project and Cost Data Study Reference Column. Potential uses are defined as follows (Primary/Secondary): F - Flood Control, I - Irrigation, P - Power, Q - Water Quality, R - Recreation, W - Fish and Wildlife, A - Flow Augmentation.

[2]Not Investigated = hydropower potential was not investigated in identified study; Yes = potential exists but was not quantified through the identified study; Not referenced = not referenced in identified study.

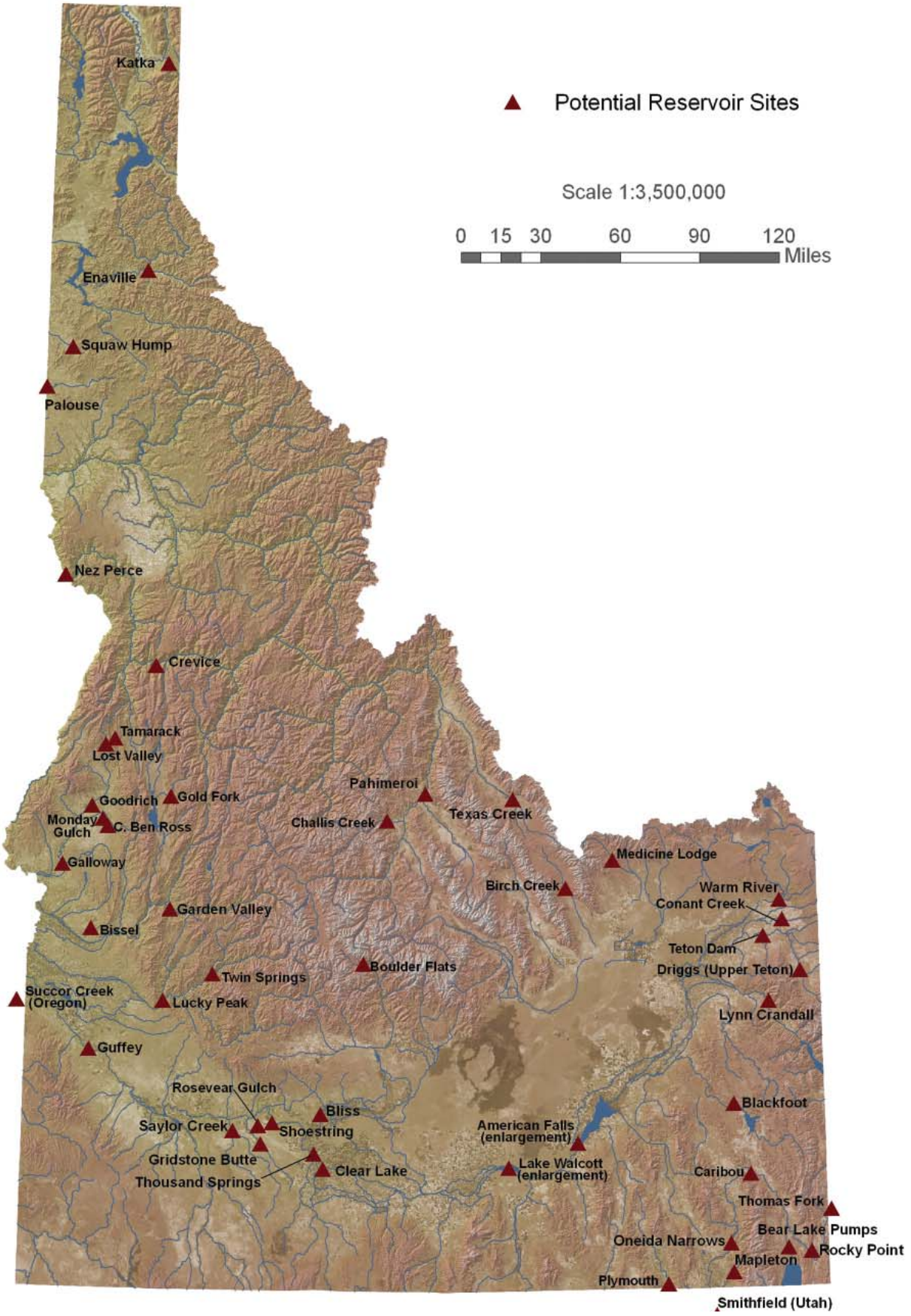


Figure 1.32 — Potential reservoir locations

REFERENCES

Ada City-County Emergency Management, 2009

ATSDR (Agency for Toxic Substances and Disease Registry), 2003, Selenium. Available at URL: http://www.atsdr.cdc.gov/tfacts92.pdf

Avista Utilities, 2008, Spokane River Project Hydro Relicensing. Available at URL: http://www.avistautilities.com/resources/relicensing/spokane/project/proj_pf.asp

Bear River Commission, 2004. Bear River Commission, Thirteenth Biennial Report, 2003-2004 Available at URL: http://www.bearrivercommission.org/Docs/Biennial Reports/Thirteenth Biennial Report.pdf

Bear River Commission, 2006, Amended Compact and Commission Bylaws. Available at URL: http://www.bearrivercommission.org/Docs/Compact & Bylaws/Bear River Compact.pdf

Blew, David and Jon Bowling, 2009, Spring Discharge Calculation for the Snake River Milner to King Hill Reaches Review of Kjelstrom Methodologies. Available at URL: http://www.idwr.idaho.gov/WaterBoard/PDFs/Kjelstrom_White_Paper.pdf

Corps of Engineers, 1989. Reconnaissance Report Bear River Investigation Idaho-Utah-Wyoming, February 1989. Department of the Army, Sacramento District, Corps of Engineers, Sacramento, California

Department of Environmental Quality, 2008, Groundwater in Idaho: Degraded Groundwater: Nitrate. Available at URL: http://www.deq.idaho.gov/water/prog_issues/ground_water/nitrate.cfm

Department of Environmental Quality, 2008, Mine Waste Management in Idaho: Selenium Investigations in Southeast Idaho. Available at URL: http://www.deq.idaho.gov/waste/prog_issues/mining/selenium.cfm

Department of Environmental Quality, 2002. Streams of Idaho (2002 305(b) & 303(d) Integrated Report - Water Quality), Data. Available at URL: http://data.insideidaho.org/data/IDEQ/archive/strm305b2002_id_ideq.zip

Department of Environmental Quality, 2008. Principles and Policies for the 2008 Integrated (303[d]/305[b]) Report. Available at URL: http://www.deq.state.id.us /water/data_reports /surface_water/monitoring/integrated_report_2008_final_entire.pdf

Department of Environmental Quality, 2008. Groundwater in Idaho: Degraded Groundwater: Nitrate. Available at URL: http://www.deq.state.id.us/water/prog_issues/ground_water/nitrate.cfm

Department of Environmental Quality, 2008. Surface Water: Water Quality Improvement Plans (TMDLs). Available at URL: http://www.deq.state.id.us/water/data_reports/surface_water/tmdls/overview.cfm

Department of Environmental Quality, 2008. Groundwater in Idaho: Idaho's Sole Source Aquifers, Available at URL: http://www.deq.idaho.gov/water/prog_issues/ground_water/aquifers_sole_source.cfm

Department of Environmental Quality, 2006. WAG News: An Update on Actions Impacting Watershed Advisory Groups in Idaho. Available at URL: http://www.deq.state.id.us/water/data_reports/surface_water/tmdls/wag_newsletter_0606.pdf

Environmental Protection Agency, 2002. Section 319 Success Stories, Vol. III.

Available at URL: http://www.epa.gov/nps/Section319III/ID.htm

Graham, William G. and Campbell, Linford J., 1981. "Ground Water Resources of Idaho, Idaho Department of Water Resources

Hornbaker, Sonny, 2008, Idaho Department of Water Resources Dam Safety database of Active Dams.

IDAPA (Idaho Administrative Procedures Act), 2008. Water Quality Standards. Available at URL: http://adm.idaho.gov/adminrules/rules/idapa58/0102.pdf

Idaho Bureau of Homeland Security, 2007. State of Idaho Hazard Mitigation Plan Available at URL: http://www.bhs.idaho.gov/Resources/PDF/SHMPFinalw-signatures.pdf

Idaho Department of Environmental Quality (DEQ), 2000-2009, "Ground Water in Idaho: Overview". Available at URL: http://www.deq.state.id.us/WATER/prog_issues/ground_water/overview.cfm

Idaho Department of Water Resources Geothermal Webpage: http://www.idwr.idaho.gov/WaterInformation/GeothermalResources/geo_default.htm

Idaho Department of Water Resources 1972 Interim State Water Plan

Idaho Department of Water Resources, Idaho Drought Plan, 2001

Idaho Office of Energy Resources Geothermal Webpage: http://www.energy.idaho.gov/renewableenergy/geothermal.htm

Idaho's Geothermal Interactive Map: http://www.idwr.idaho.gov/GeographicInfo/MapServer/mapserver.htm

Idaho State University, 2008, Southeast Idaho Selenium Information System. Available at: http://giscenter-ims.isu.edu/sisp/

Johnson, G.S., A. Wylie, D. Cosgrove, R. Jensen, L. Janczak, D. Eldredge, 2002, Spring Discharge along the Milner to King Hill Reach of the Snake River. Available at URL: http://www.if.uidaho.edu/~johnson/ifiwrri/pub_docs/ThousSprs_datarept.pdf

Montana Watershed Coordination Council, 2008. Available at URL: http://mwcc.montana.edu/groups/details.asp?groupID=14

National Oceanic and Atmospheric Administration. 2008. Available at URL: http://www.crh.noaa.gov/glossary.php?letter=a

National Weather Service, 2008. Review Of April 2006 Weiser River Flood Event. Available at URL: http://www.nwrfc.noaa.gov/floods/apr_2006/WSRI1_report_filtered.htm

Natural Resource Conservation Service, 2008. Idaho Water Supply Outlook Report April 1, 2008 Available at URL: ftp://ftp-fc.sc.egov.usda.gov/ID/snow/watersupply/bor/2008/borid408.pdf

Neely, K.W., 2002, Arsenic results from the Statewide Program 1991-2001. Idaho Department of Water Resources, Water Information Bulletin No. 50, part 5, 42 p. Available at URL: http://www.idwr.idaho.gov/WaterInformation/Publications/default.htm

Neely, K.W., 2005, Nitrate overview for the Statewide Ambient Groundwater Quality Monitoring Program, 1990-2003. Idaho Department of Water Resources, Groundwater Quality Technical Brief, 12 p. Available at URL: http://www.idwr.idaho.gov/WaterInformation/Publications/default.htm

Neely, K.W., 2008, Trend analyses for Idaho's Nitrate Priority Areas, 1994-2007. Idaho Department of Water Resources, Water Information Bulletin No 5, part 7, 38 p. Available at URL: http://www.idwr.idaho.gov/WaterInformation/Publications/default.htm

Neely, K.W., and Galinato, G., 2007, Geothermal power generation in Idaho: an overview of current developments and future potential. Idaho Department of Water Resources and Idaho Office of Energy Resources, 12 p. Available at URL: http://energy.idaho.gov/informationresources/d/geo_power_generation_in_idaho.pdf

Rowland, R.C., Stephens, D.W., Waddell, B., and Naftz, D.L., 2005, Selenium Contamination and Remediation at Stewart Lake Waterfowl Management Area and Ashley Creek, Middle Green River Basin, Utah. Available at URL: http://pubs.usgs.gov/fs/fs-031-03/

U.S. Army Corps of Engineer, 2007. Albeni Falls Dam, Water Management. Available at URL: http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=albeni&pagename=Water_Management

U.S. Geological Survey, 1990. National Water Summary 1987. United States Geological Survey Water Supply Paper 2350.

NOAA National Oceanic Atmospheric Association Satellite and Information Center 2008, National Climate Data Center US Department of Commerce. Available at URL: http://www1.ncdc.noaa.gov/pub/data/cirs/

NOAA 2005 National Weather Service Climate Predication Center. Available at URL: http://www.cpc.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/wpdanote.shtml

US Geological Survey, 2008. National Water Information System. Available at URL: http://waterdata.usgs.gov/id/nwis/rt

CHAPTER 2: DEMOGRAPHICS AND ECONOMY

The economics and culture of Idaho are as diverse as the physical landscape. In northern and central Idaho, mountains covered with forests, lakes and rivers have historically supported an economy based on logging and mining. In southern Idaho, the open valleys, abundant sunshine, and availability of water for irrigation have contributed to a strong economy based on agricultural production.

In the 1970's, Idaho began a shift away from economies based on resource extraction, and began to grow in sectors including resource conservation, technology and tourism.

For the last two decades, Idaho has been one of the nation's fastest growing states in terms population, employment, and income. Idaho will face numerous challenges in the coming years with new and diverse requirements being placed on its water resources. A continued and sustained movement of people from rural to urban areas will add to the water demand in Idaho.

Population Growth

From 2000 to 2007 Idaho's population grew from about 1.29 million people, to about 1.5 million people. This represents a population gain of 15.9 percent, making Idaho the 5th fastest growing state, behind Nevada, Arizona, Utah and Georgia. The national average was 6.7 percent during the same time period. **Figure 2.1** displays the 2006 population by county, the number of people per square mile and the estimated change in population from 2000 to 2035.

Even with the relatively high rate of growth, Idaho's population density remains the one of the lowest in the United States (39th out of 50), at less than 16 persons per square mile. Nationally, the average population density is 80 persons per square mile. Over the last 50 years, Idaho

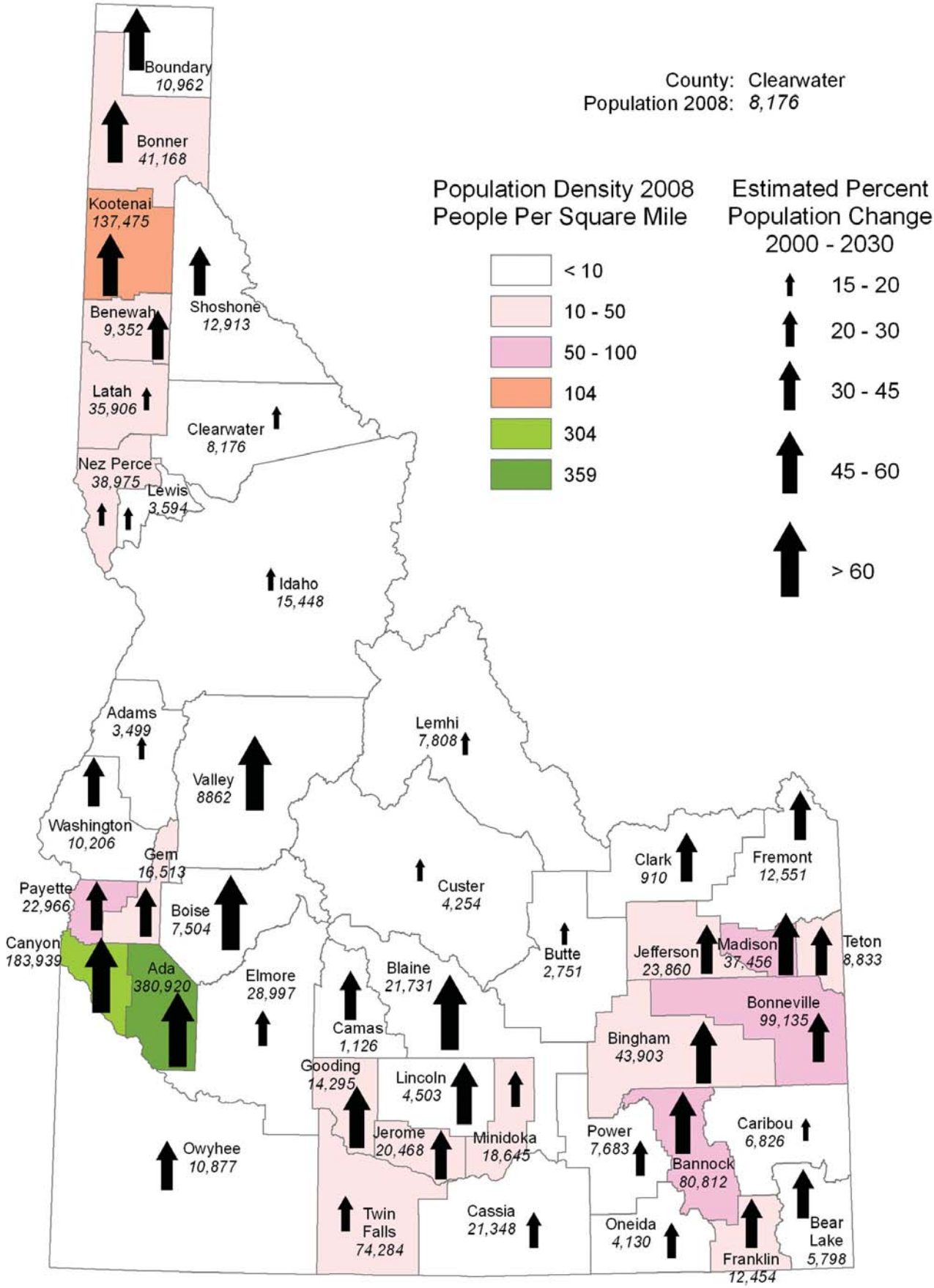


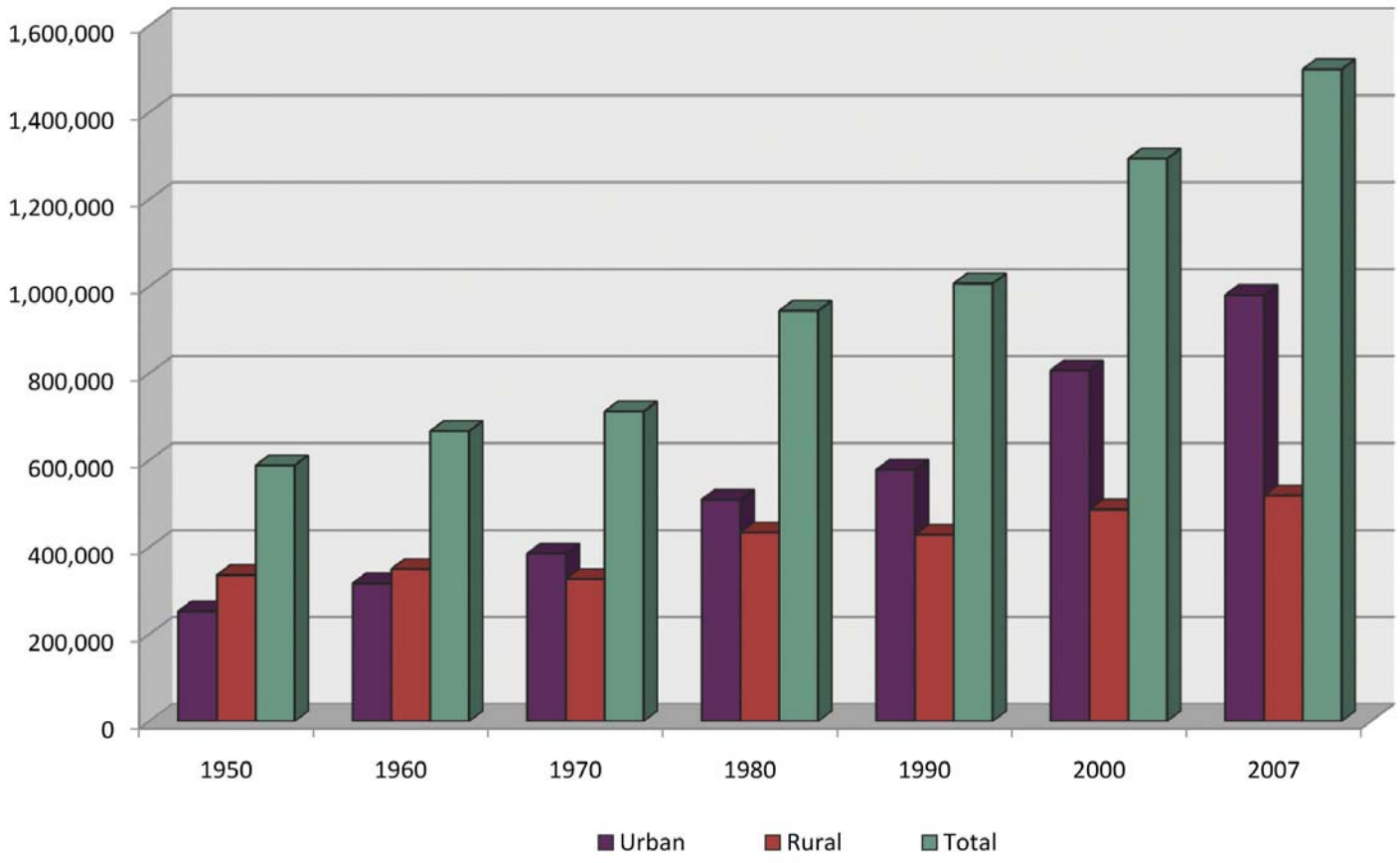
Figure 2.1 — The 2006 population by county, the number of people per square mile and the estimated change in population from 2000 to 2035

has changed from a state where most of its citizens lived in a rural setting, to a state of primarily urban dwellers. **Figure 2.2** highlights this shift from rural to urban growth from 1970 to the last census in 2000. It should be noted that the US Census Bureau restructured its urban classification groups for the 2000 census. While some areas that once were considered rural are now urban, the overall pattern remains the same for the demographic shifts.

Idaho's population is expected to increase to about two million people over the next 20 years. Projections displayed in **Figure 2.3** illustrates the two different scenarios. The first estimate is from the 2006 Idaho Power Integrated Resource Plan while the lower projection is from the US Census Bureau.

In-migration, which has accounted for about 57 percent of Idaho's population growth so far this decade (2000-2007), will continue to be a large contributor to population growth. Two factors contribute to this

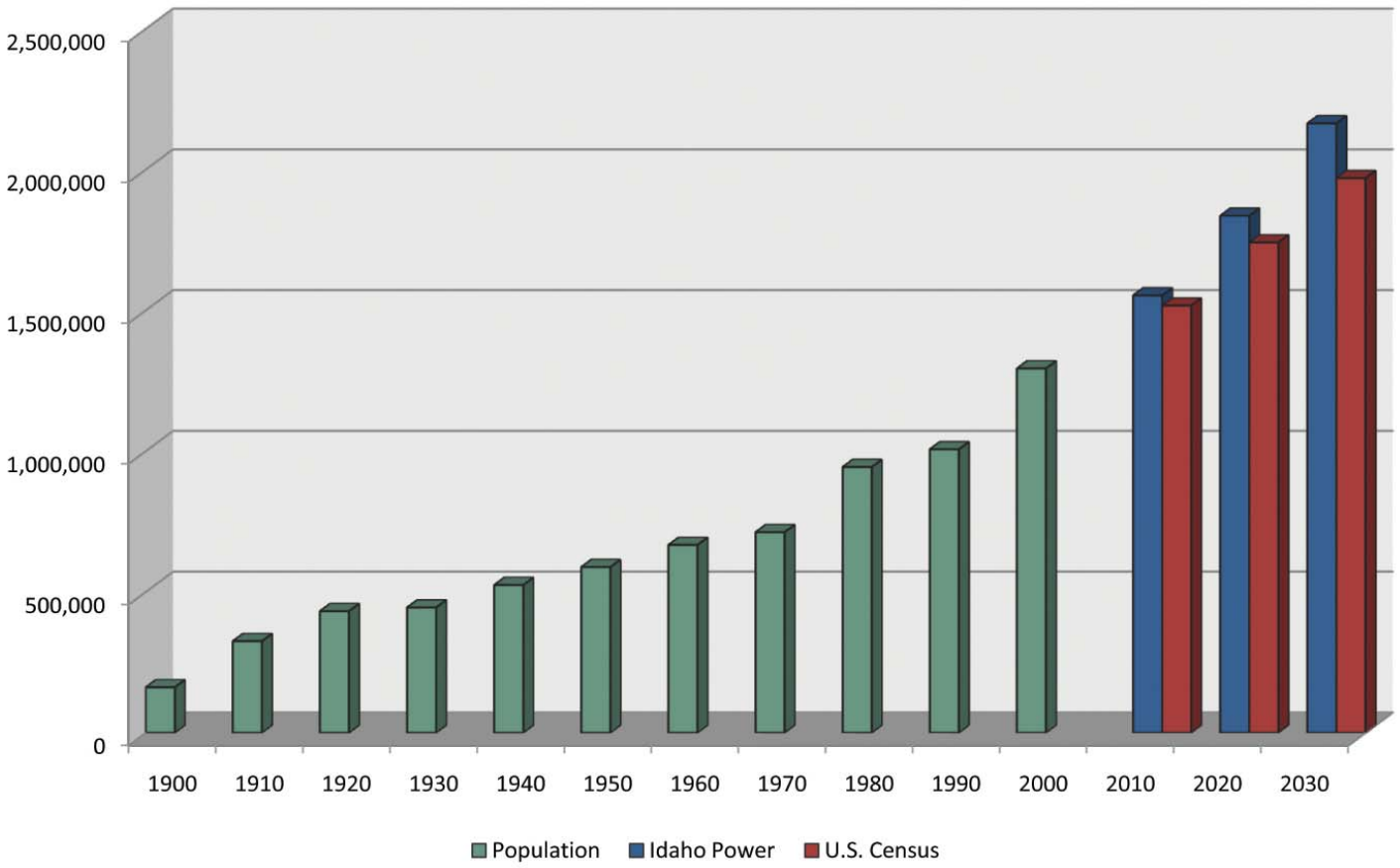
Figure 2.2 — Highlights this shift from rural to urban growth from 1970 to the last census in 2000



trend. First, a relatively low cost of living and an above average job growth create favorable economic climate. In the third quarter of 2008, Idaho's cost-of living was the 13th lowest in the nation, and the lowest of any western state.

The second factor contributing to migration into the state is that Idaho is an attractive place to live in because of ample outdoor recreation opportunities, a comfortable four season climate, and clean air and water. These are often referred to as "amenity" values. These values extend to the communities throughout the state, and include good schools, cultural opportunities, and much more.

Figure 2.3 — Projections for Idaho's population increase



Employment and Income

Employment in Idaho has grown at about the same rate as the population. Between 2000 and 2007, total employment has grown 16.3 percent, to a record high of 733,652. Also, job growth in the state continues to be among the fastest in the county. For example, the growth rate of Idaho's non-agricultural employment from 2000 to 2005 was 15.2 percent. In comparison, the national rate over the same time period was only two percent (US Census Bureau 2008).

Wages in Idaho tend to be slightly lower than the national average. Median household income was $48,354 in 2007, compared to a national average of $49,901 (US Census Bureau 2008). Per capita income according to Idaho Department of Labor as of 2006 was $29,948 (Idaho Department of Labor 2008).

Unemployment rates have continued to fluctuate, in the fall of 2008 rates were running about two points lower than the national average. 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.

Over the last ten years, the industries that have experienced the strongest growth in terms of covered employment include professional and business services, construction, and education. In terms of wages, the highest growth has been in financial activities, mining, and trade, utilities & transportation. In terms of total 2007 wages, the strongest sectors are professional & business services, government, and trade, utilities & transportation, and manufacturing.

TABLE 2.1 — WAGES & EMPLOYMENT

INDUSTRY	1997 EMPLOYMENT	1997 WAGES	2007 EMPLOYMENT	2007 WAGES	% CHANGE — EMPLOYMENT*	% CHANGE — WAGES*	TOTAL 2007 WAGES BY INDUSTRY
Agriculture	19,809	$18,563	21,762	$25,114	9.86%	35.29%	$546,530,868
Mining	2,993	$35,936	2,374	$51,692	-20.68%	43.84%	$122,716,808
Construction	32,309	$26,700	52,201	$33,560	61.57%	25.69%	$1,751,568,560
Manufacturing	67,481	$32,887	65,886	$45,278	-2.36%	37.68%	$2,983,186,308
Trade, Utilities & Transportation	107,573	$21,438	126,436	$30,240	17.54%	41.06%	$3,823,424,640
Information	7,587	$27,562	10,595	$38,227	39.65%	38.69%	$405,015,065
Financial Activities	21,647	$26,703	29,848	$40,036	37.89%	49.93%	$1,194,994,528
Professional & Business Services	47,348	$28,957	81,392	$39,320	71.90%	35.79%	$3,200,333,440
Educational & Health Services	44,663	$24,564	67,072	$32,047	50.17%	30.46%	$2,149,456,384
Leisure & Hospitality	48,854	$8,988	59,599	$12,571	21.99%	39.89%	$749,219,029
Other Services	13,396	$16,761	15,684	$22,634	17.08%	35.04%	$354,991,656
Government	93,039	$25,430	111,504	$33,213	19.85%	30.61%	$3,703,382,352

Agriculture

Although the numbers in **Table 2.1** indicate that only about three percent of the total income in Idaho is directly attributable to agriculture that may not be an accurate reflection of the value and importance of agriculture in the state. According to the 2007 USDA Census of Agriculture, the total value of all agricultural products sold in 2007 (including all crops, poultry and livestock) was over 5.6 billion dollars.* This ranks Idaho among the top 20 states in the nation.

* This number represents total sales, before taxes and production expenses are removed.

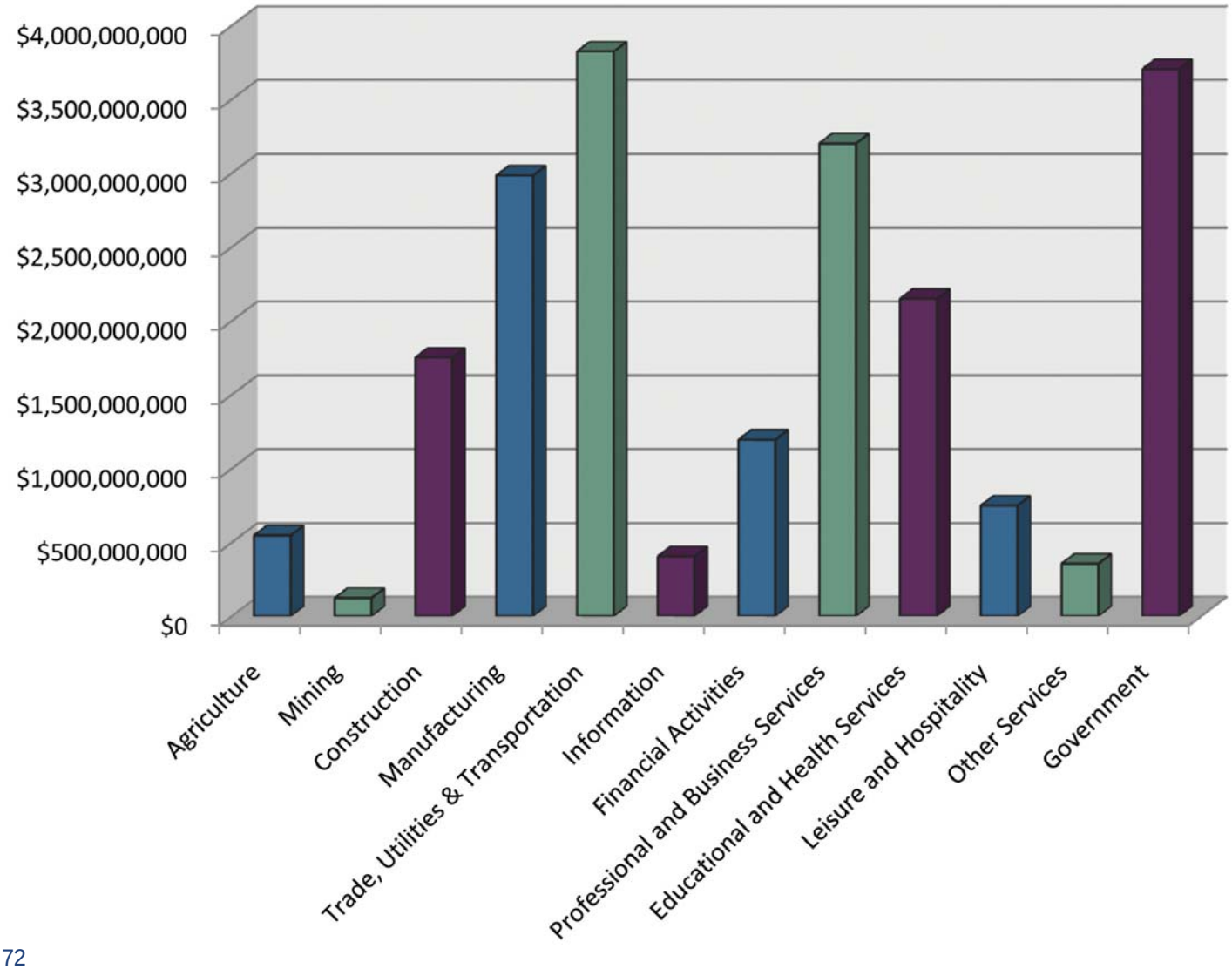
According to the 2007 Idaho Agricultural Statistics report, the state ranks first in potato production with around 121 million hundred-pound sacks annually or 28 percent of total U.S. volume. The state also ranks second in barley production, third among the states in the production of sugar beets, hops, and mint. Idaho is recognized for many livestock products. The state ranks number one in food trout production with 46,500 thousand pounds produced in 2006. Idaho is third in cheese production, tenth in honey, and eighth in sheep, lambs, and wool. Cattle, potatoes, milk, wheat, barley, sugar beets, and hay are the dominant agricultural drivers in Idaho. Cash receipts in 2006 for Idaho amounted to nearly $2 billion in revenue. This was up over 7 percent from 2005. As of the end of September 2006, the agricultural commodities exported during the fiscal year totaled $911 million. This was an increase of 4 percent over 2005.

The majority of Idaho's 25,000 farms are small and family-operated. Overall, people who listed their occupation as "farmer" rose by 8.4 percent between 1997 and 2002. 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. Hired farm labor declined 22 percent in Idaho over the period 1997-2002, posting a loss of 14,000 jobs. Most of this decline came in the form of part-time labor and was a result of the use of more efficient machinery. Labor costs and an overall shortage of labor encourage agricultural producers to automate as much as possible.

Non-Agricultural Employment

Idaho's non-agricultural employment shown in **Figure 2.4** by sector has shown impressive growth over the last 17 years. Roughly 281,000 jobs have been added over that time period. There have been several economic slowdowns over the last 17 years with the most recent emerging in late 2007. The employment outlook for the near future looks to be in line with the last decade. Industries tied to natural resource extraction such as logging, farming and mining will see increased efficiency gains as well as variable commodity prices. This culminates in fewer overall jobs in these sectors. Retail trade, services, healthcare, technology and education will continue to grow. These industries are urban focused and the coming demand on water resources could be predominantly focused in those areas.

Figure 2.4 — Idaho's non-agricultural employment



Mining

Idaho's mining employment peaked in the mid-1990s then declined but has recently picked back up to early 1990's level. 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 US producer of newly mined silver, accounting for almost half of national production. Mining employment stood at 2,900 jobs as of 2008. The mining sector employment is heavily tied to commodity prices

Construction

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. Idaho construction employment increased in 15 of the last 16 years. Since 1991, construction has been the most consistent sector among the state's goods-producing sectors. From 1991 to the present, the number of construction jobs expanded from 20,350 to 52,634, which is a 6.1 percent average annual growth rate. This rate is twice as fast when compared to the total non-farm job growth which is was only 3.2 percent. This sector has taken some large hits over the last couple of years as a result of the slowdown in the overall US economy. This slowdown has lead to fewer housing starts and thus fewer jobs. This sector will take some time to recover but should still be a large player in non-farm employment.

Forestry and Wood Products

A combination of less-than-favorable supply and demand factors slowed employment in Idaho's lumber and wood products sector coming out of the 1980s. During the mid-1990s, an expanding housing market reversed the declining employment trend in Idaho's logging and wood sectors.

After that time however, employment began to sag again. Employment went from a peak of about 12,000 jobs in 1996 to a low of just under 9,100 jobs in 2003. Idaho's lumber and wood products sector faced dwindling timber supply from public forests. This decline in publicly available timber resulted in the closure of several older mills around the state.

Retail and Service

Employment has boomed in the retail trade and service sector over the last 15 years, with 130,500 new jobs added. More than 32,000 jobs have been added in the retail industry while the remaining jobs were picked up in the other service sectors. The strongest area of growth was leisure and hospitality establishments. Educational and health services had also been a large player in the new economy with 44,500 jobs being added to the Idaho economy.

Government

Government employment will probably show growth but primarily in the education sector as Federal and state budgets are tightened. The federal government employs roughly 15,000 people in Idaho. Expenditures by the Department of Defense and the Department of Energy support Gowen Field, a National Guard training facility, as well as Mountain Home Air Force base and the Idaho National Laboratory. State and local governments employ approximately 110,000 people in Idaho. State government employment trends have been trending positive since 1991 when the combined level of employment stood at around 70,500 employees. This is roughly a 36 percent increase in the number of state and local government employees.

Travel and Tourism

Travel and tourism have been and will continue to be 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, tourism and travel. Special events, such as music and film festivals as well as other outdoor activities such as camping, boating, fishing, backpacking, and hunting bring large numbers of visitors to Idaho each year. Since 1991, this sector has acquired roughly 32,800 jobs. This represents a 49 percent increase in the number of workers in this industry. In 1991 there were 34,500 workers and by mid-2008, that number had grown to 67,400. On top of adding jobs, visitors to Idaho spent $2.97 billion in 2005.

REFERENCES

Arrington, L.J. 1994. History of Idaho, Vol. 2. Moscow, ID: University of Idaho Press.

Idaho Department of Commerce. 2008. Economic Indicators. Available at URL: commerce.idaho.gov/business/economic-indicators.aspx

Idaho Division of Financial Management. July 2008. Idaho Economic Forecast, Vol. XXX, No. 3.

Idaho Department of Labor. 2008. Labor Market Information. Available at URL: lmi.idaho.gov/

Idaho Power Company. 2006. 2006 Integrated Resource Plan – Appendix C Economic Forecast.

Salant, P. and Porter, A. 2005. Profile of Rural Idaho: A look at economic and social trends affecting rural Idaho. Idaho Commerce and Labor. pp. 1-37.

U.S. Bureau of the Census. 2008. State and County QuickFacts. Available at URL: quickfacts.census.gov/qfd/states/16000.html

U.S. Bureau of the Census. 2008. Population Division. Available at URL: www.census.gov/popest/estimates.php

U.S. Department of Commerce - Bureau of Economic Analysis. 2008. State Personal Income for 2007. Available at URL: www.bea.gov/newsreleases/regional/spi/2008/pdf/spi0308.pdf

CHAPTER 3: PROTECTION PROGRAMS

Minimum Stream Flows and Minimum Lake Levels

Minimum stream flow and minimum lake level water rights are held by the Idaho Water Resource Board in trust for Idaho's citizens (Chapter 15, Title 42, Idaho Code). These rights are established through the same state process for establishing other water rights in Idaho. These water rights, however, protect the flow in the river or creek or a lake level elevation to protect fish and wildlife habitat, aquatic life, water quality, or preserve navigation, transportation, recreation and aesthetic values without diverting it. These rights establish a priority date for the minimum and do not harm or supersede existing water rights.

Idaho's Minimum Stream Flow Program was approved by the Legislature in 1978 to preserve stream flows and lake elevations for public health, safety, and welfare. The minimum stream flow is the amount of flow necessary to preserve desired stream values and is expressed in cubic feet per second. Any person or entity can make a request to the Idaho Water Resource Board to file an application for stream flow on any water body within the state. To be approved, a minimum stream flow water right must:

- Be in the public interest
- Not adversely affect senior water rights
- Represent the minimum flow, not the desirable flow
- Be capable of being maintained

As of the fall of 2008, Idaho had 296 licensed or permitted water rights for minimum stream flows, and three for minimum lake levels. These licenses cover 724 miles of Idaho streams, which is less than one percent of the total stream miles in the state. **Figure 3.1** displays the distribution of minimum stream flow appropriation in Idaho. Minimum stream flow appropriations are also listed in **Table 3.1**.

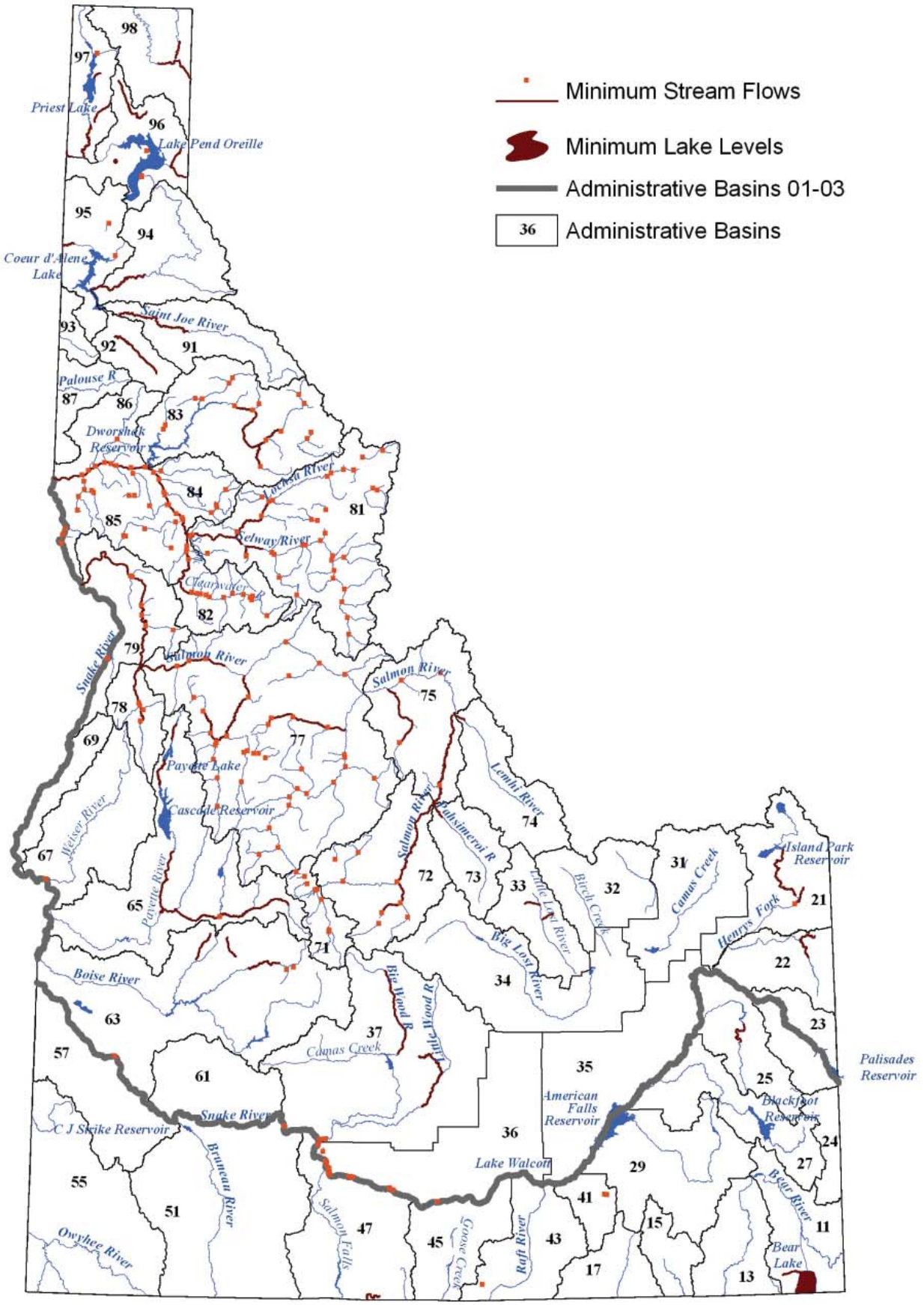


Figure 3.1 — The distribution of minimum stream flow appropriation in Idaho

STREAM OR SPRING	BASIN	WATER RIGHT NO.	PRIORITY DATE	MILES	FLOW CFS	REQUESTOR
Alturas Lake Creek	Salmon River / Sawtooth Valley	71-10890	4/1/2005	0	21-313	Nez Perce Tribe
American River	South Fork Clearwater River	82-12227	4/1/2005	0	19-447	Nez Perce Tribe
Badger Creek	Little Lost River	33-7206	10/3/1991	5	3.0-5.5	Idaho Department of Fish and Game / BLM
Banbury Springs	Snake River / Hagerman	36-7822	9/13/1978	0	97	Magic Valley Fly Fisherman
Bancroft Springs	Big Wood River	37-7734	9/13/1978	0	17	Idaho Department of Fish and Game
Bargamin Creek	Central Idaho / Middle Salmon River	77-14167	4/1/2005	0	27-741	Nez Perce Tribe
Bear Creek	Upper Clearwater River	81-11962	4/1/2005	0	97-2708	Nez Perce Tribe
Bear Valley Creek	Central Idaho / Middle Salmon River	77-14209	4/1/2005	0	105-1434	Nez Perce Tribe
Bedrock Creek	Potlatch Creek	86-11959	4/1/2005	0	2-48	Nez Perce Tribe
Big Canyon Creek	Lower Clearwater River	85-15600	4/1/2005	0	8-148	Nez Perce Tribe
Big Creek	Central Idaho / Middle Salmon River	77-14178	4/1/2005	0	289-3496	Nez Perce Tribe
Big Creek	Central Idaho / Middle Salmon River	77-14182	4/1/2005	0	11-212	Nez Perce Tribe
Big Elk Creek	South Fork Clearwater River	82-12225	4/1/2005	0	4-98	Nez Perce Tribe
Big Flat Creek	Upper Clearwater River	81-11945	4/1/2005	0	14-200	Nez Perce Tribe
Big Sand Creek	Upper Clearwater River	81-11944	4/1/2005	0	70-1052	Nez Perce Tribe
Big Wood River	Big Wood River	37-7919	6/19/1981	18	70	Idaho Department of Fish and Game
Big Wood River	Big Wood River	37-8258	1/16/1986	9	150-200	Blaine County
Big Wood River	Big Wood River	37-8307	10/26/1987	0	119	Idaho Water Resource Board
Billy Creek	Lower Clearwater River	85-15626	4/1/2005	0	0.2-2.4	Nez Perce Tribe
Bitch Creek	Teton River	22-7370	6/19/1981	8	28	Idaho Department of Fish and Game
Blackmare Creek	Central Idaho / Middle Salmon River	77-14202	4/1/2005	0	8-140	Nez Perce Tribe
Blind Canyon Springs	Snake River / Hagerman	36-7820	3/20/1979	1	8	Idaho Department of Fish and Game
Boulder Creek	Little Salmon River	78-12235	4/1/2005	0	7-127	Nez Perce Tribe
Boulder Creek	Upper Clearwater River	81-11947	4/1/2005	0	16-389	Nez Perce Tribe
Box Canyon Creek	Snake River / Hagerman	36-8337	10/16/1987	0	75 - 162	Bureau of Land Management
Breakfast Creek	North Fork Clearwater River	83-11951	4/1/2005	0	67-946	Nez Perce Tribe
Briggs Springs	Snake River / Hagerman	36-7819	9/13/1978	0	30	Idaho Department of Fish and Game
Brush Creek	Central Idaho / Middle Salmon River	77-14191	4/1/2005	0	13-187	Nez Perce Tribe
Brushy Fork	Upper Clearwater River	81-11934	4/1/2005	0	79-1189	Nez Perce Tribe
Buck Lake Creek	Upper Clearwater River	81-11968	4/1/2005	0	17-250	Nez Perce Tribe
Buckhorn Creek	Central Idaho / Middle Salmon River	77-14195	4/1/2005	0	20-367	Nez Perce Tribe
Burntlog Creek	Central Idaho / Middle Salmon River	77-14204	4/1/2005	0	15-270	Nez Perce Tribe
Camas Creek	Central Idaho / Middle Salmon River	77-14198	4/1/2005	0	203-2497	Nez Perce Tribe
Canyon Creek	North Fork Clearwater River	83-11945	4/1/2005	0	36-293	Nez Perce Tribe
Captain John Creek	Lower Clearwater River	85-15625	4/1/2005	0	0.9-12.9	Nez Perce Tribe
Cayuse Creek	North Fork Clearwater River	83-11957	4/1/2005	0	78-1767	Nez Perce Tribe
Cedar Creek	Potlatch Creek	86-11957	4/1/2005	0	2.9-76.6	Nez Perce Tribe
Chamberlain Creek	Central Idaho / Middle Salmon River	77-14171	4/1/2005	0	107-1374	Nez Perce Tribe

Circle Creek	Raft River	43-7295	7/1/1988	7	0.5 - 1.5	Idaho Department of Parks and Recreation
Clear Creek	Upper Clearwater River	81-11957	4/1/2005	0	16-377	Nez Perce Tribe
Coeur D'Alene River	Upper Coeur D'Alene River	94-7341	6/15/1992	35	413-1018	Idaho Water Resource Board
Collins Creek	North Fork Clearwater River	83-11947	4/1/2005	0	11-260	Nez Perce Tribe
Cottonwood creek	Lower Clearwater River	85-15598	4/1/2005	0	1.8-30.7	Nez Perce Tribe
Cottonwood Creek	Lower Clearwater River	85-15622	4/1/2005	0	4-289	Nez Perce Tribe
Cougar Creek	South Fork Clearwater River	82-12228	4/1/2005	0	1-31	Nez Perce Tribe
Crooked Fork	Upper Clearwater River	81-11938	4/1/2005	0	108-3062	Nez Perce Tribe
Crooked River	Boise River	63-12031	5/24/1993	10	34-150	Idaho Water Resource Board
Crooked River	South Fork Clearwater River	82-12232	4/1/2005	0	13-291	Nez Perce Tribe
Crystal Springs	Snake River / Hagerman	36-8330	7/27/1987	0	50	Idaho Department of Fish and Game
Crystal Springs	Snake River / Hagerman	36-8374	7/1/1988	0	25	Idaho Department of Parks and Recreation
Crystal Springs	Snake River / Hagerman	36-8600	3/22/1991	0	59	Idaho Department of Parks and Recreation
Cub Creek	Upper Clearwater River	81-11967	4/1/2005	0	76-1139	Nez Perce Tribe
Deep Creek	Upper Clearwater River	81-11974	4/1/2005	0	28-426	Nez Perce Tribe
Devils Corral Springs	Snake River / Hagerman	36-7872	9/21/1979	1	48	Idaho Department of Fish and Game
Dynamite Creek	Central Idaho / Middle Salmon River	77-14199	4/1/2005	0	8-109	Nez Perce Tribe
E Fork - Montezuma Creek	Boise River	63-12030	5/24/1993	2	0.11	Idaho Water Resource Board
E. Fork Moose Cr.	Upper Clearwater River	81-11949	4/1/2005	0	168-2629	Nez Perce Tribe
E. Fork S. Fork Salmon	Central Idaho / Middle Salmon River	77-14190	4/1/2005	0	173-2269	Nez Perce Tribe
E. Fork Sweetwater	Lower Clearwater River	85-15614	4/1/2005	0	0.3-6.5	Nez Perce Tribe
East Fork of Rock Creek	Rock Creek	41-7046	1/16/1980	3	11	Power County Commissioners
East Fork of Rock Creek	Rock Creek	41-7074	9/12/1984	1	11	Idaho Water Resource Board
East Fork Salmon River	Challis	72-16669	4/1/2005	0	91-1014	Nez Perce Tribe
East Fork Salmon River	Challis	72-16671	4/1/2005	0	35-528	Nez Perce Tribe
East Pass Creek	Challis	72-16672	4/1/2005	0	8-91	Nez Perce Tribe
Effie Creek	Lower Clearwater River	85-15613	4/1/2005	0	0.3-4	Nez Perce Tribe
Eightmile Creek	Challis	72-16665	4/1/2005	0	3.7-56.2	Nez Perce Tribe
Eldorado Creek	Middle Fork Clearwater River	84-12220	4/1/2005	0	10-147	Nez Perce Tribe
Elk Creek	Boise River	63-12034	5/24/1993	15	5	Idaho Water Resource Board
Elk Creek	Salmon River / Sawtooth Valley	71-10891	4/1/2005	0	11-119	Nez Perce Tribe
Elk Creek	Central Idaho / Middle Salmon River	77-14211	4/1/2005	0	43-562	Nez Perce Tribe
Elk Creek	Little Salmon River	78-12233	4/1/2005	0	2-29.4	Nez Perce Tribe
Elk Creek	North Fork Clearwater River	83-11955	4/1/2005	0	19-482	Nez Perce Tribe
Elk Creek	North Fork Clearwater River	83-7099	2/10/1989	2	40 - 120	Idaho Department of Parks and Recreation
Fish Creek	Upper Clearwater River	81-11943	4/1/2005	0	47-1119	Nez Perce Tribe
Fitzum Creek	Central Idaho / Middle Salmon River	77-14188	4/1/2005	0	10-162	Nez Perce Tribe
Fivemile Creek	Lower Clearwater River	85-15607	4/1/2005	0	0.7-7.4	Nez Perce Tribe
Foehl Creek	North Fork Clearwater River	83-11946	4/1/2005	0	20-157	Nez Perce Tribe
Fourth of July Creek	North Fork Clearwater River	83-11958	4/1/2005	0	13-301	Nez Perce Tribe
French Creek	Central Idaho / Middle Salmon River	77-14173	4/1/2005	0	24-421	Nez Perce Tribe
Gedney Creek	Upper Clearwater River	81-11958	4/1/2005	0	15-365	Nez Perce Tribe
Germania Creek	Challis	72-16673	4/1/2005	0	15-238	Nez Perce Tribe
Goat Creek	Salmon River / Sawtooth Valley	71-10895	4/1/2005	0	2.1-10.5	Nez Perce Tribe
Goat Creek	Upper Clearwater River	81-11969	4/1/2005	0	15-225	Nez Perce Tribe
Granite Creek	Pend Oreille Lake	96-7771	4/17/1979	1	10	Idaho Department of Fish and Game

Grouse Creek	Pend Oreille Lake	96-7980	6/19/1981	5	14 - 85	Idaho Department of Fish and Game
Hamby Fork of O'Hara Creek	Upper Clearwater River	81-11964	4/1/2005	0	3-80	Nez Perce Tribe
Hat Creek	Middle Salmon River	75-14189	4/1/2005	0	9-108	Nez Perce Tribe
Hayden Creek	Lower Coeur D'Alene River	95-8560	10/16/1987	3	4 - 20	Idaho Department of Fish and Game
Hazard Creek	Little Salmon River	78-12234	4/1/2005	0	8-116	Nez Perce Tribe
Hazard Creek	Little Salmon River	78-12236	4/1/2005	0	15-201	Nez Perce Tribe
Henrys Fork	Henrys Fork	21-7282	6/19/1981	24	300 - 100	Idaho Department of Parks and Recreation
Herd Creek	Challis	72-16670	4/1/2005	0	19-217	Nez Perce Tribe
Holes Creek	Lower Clearwater River	85-15612	4/1/2005	0	0.6-11.2	Nez Perce Tribe
Horse Creek	Central Idaho / Middle Salmon River	77-14172	4/1/2005	0	80-801	Nez Perce Tribe
Hungery Creek	Upper Clearwater River	81-11942	4/1/2005	0	17-412	Nez Perce Tribe
Indian Creek	Central Idaho / Middle Salmon River	77-14200	4/1/2005	0	42-550	Nez Perce Tribe
Indian Creek	Upper Clearwater River	81-11972	4/1/2005	0	29-438	Nez Perce Tribe
Indian Creek	Priest River	97-7274	4/26/1985	3	26	Idaho Department of Parks and Recreation
Iron Creek	Salmon River / Sawtooth Valley	71-10896	4/1/2005	0	3.8-22.5	Nez Perce Tribe
Isabella Creek	North Fork Clearwater River	83-11949	4/1/2005	0	15-126	Nez Perce Tribe
Jacks Creek	Lower Clearwater River	85-15599	4/1/2005	0	0.5-9.4	Nez Perce Tribe
Jim Ford Creek	Middle Fork Clearwater River	84-12217	4/1/2005	0	13-176	Nez Perce Tribe
Johns Creek	South Fork Clearwater River	82-12231	4/1/2005	0	19-459	Nez Perce Tribe
Johnson Creek	Central Idaho / Middle Salmon River	77-14194	4/1/2005	0	87-1513	Nez Perce Tribe
Kelly Creek	North Fork Clearwater River	83-11956	4/1/2005	0	204-4782	Nez Perce Tribe
Lake Creek	Central Idaho / Middle Salmon River	77-14212	4/1/2005	0	10-164	Nez Perce Tribe
Lake Creek	North Fork Clearwater River	83-11953	4/1/2005	0	16-385	Nez Perce Tribe
Lapwai Creek	Lower Clearwater River	85-15603	4/1/2005	0	18-209	Nez Perce Tribe
Lawyer Creek	Lower Clearwater River	85-15616	4/1/2005	0	5-260	Nez Perce Tribe
Lemhi River	Lemhi River	74-14993	4/12/2001	8	35	Legislature
Lick Creek	Central Idaho / Middle Salmon River	77-14183	4/1/2005	0	12-195	Nez Perce Tribe
Lightning Creek	Challis	72-16666	4/1/2005	0	4-59.4	Nez Perce Tribe
Lightning Creek	Pend Oreille Lake	96-7979	6/19/1981	8	49-84	Idaho Department of Fish and Game
Lion Creek	Priest River	97-7275	4/26/1985	2	22	Idaho Department of Parks and Recreation
Little Canyon Creek	Lower Clearwater River	85-15602	4/1/2005	0	3-56	Nez Perce Tribe
Little N.F. Clearwater	North Fork Clearwater River	83-11950	4/1/2005	0	232-1780	Nez Perce Tribe
Little Salmon River	Little Salmon River	78-12237	4/1/2005	0	28-832	Nez Perce Tribe
Little Salmon River	Lower Salmon River	79-14124	4/1/2005	0	211-2679	Nez Perce Tribe
Little Slate Creek	Lower Salmon River	79-14123	4/1/2005	0	11-371	Nez Perce Tribe
Little Wood River	Big Wood River	37-7739	9/29/1978	14	39	Idaho Department of Fish and Game
Lochsa River	Upper Clearwater River	81-7161	7/30/1992	24	563-1140	Idaho Water Resource Board
Logan Creek	Central Idaho / Middle Salmon River	77-14180	4/1/2005	0	9-175	Nez Perce Tribe
Lolo Creek	Middle Fork Clearwater River	84-12219	4/1/2005	0	57-869	Nez Perce Tribe
Long Hollow Creek	Lower Clearwater River	85-15611	4/1/2005	0	0.9-17.1	Nez Perce Tribe
Loon Creek	Central Idaho / Middle Salmon River	77-14203	4/1/2005	0	182-2248	Nez Perce Tribe
M Fork - Boise River	Boise River	63-12033	5/24/1993	16	200-1000	Idaho Water Resource Board
Maggie Creek	Upper Clearwater River	81-11954	4/1/2005	0	3-55	Nez Perce Tribe

Malad (Big Wood) River	Big Wood River	37-7920	6/19/1981	1	39	Idaho Department of Fish and Game
Marble Creek	Central Idaho / Middle Salmon River	77-14201	4/1/2005	0	62-825	Nez Perce Tribe
Marsh Creek	Central Idaho / Middle Salmon River	77-14210	4/1/2005	0	82-1249	Nez Perce Tribe
Marten Creek	Upper Clearwater River	81-11959	4/1/2005	0	16-238	Nez Perce Tribe
Meadow Creek	Salmon River / Sawtooth Valley	71-10892	4/1/2005	0	4.1-59.5	Nez Perce Tribe
Meadow Creek	Salmon River / Sawtooth Valley	71-10894	4/1/2005	0	4.2-24.5	Nez Perce Tribe
Meadow Creek	Upper Clearwater River	81-11966	4/1/2005	0	126-2003	Nez Perce Tribe
Meadow Creek	South Fork Clearwater River	82-12223	4/1/2005	0	5-114	Nez Perce Tribe
Meadow Creek	Lower Clearwater River	85-15618	4/1/2005	0	0.3-13	Nez Perce Tribe
Middle Fork - Clearwater	Upper Clearwater River	81-7162	7/30/1992	23	1323-2640	Idaho Water Resource Board
Mill Creek	South Fork Clearwater River	82-12230	4/1/2005	0	5-104	Nez Perce Tribe
Mink Creek	Upper Clearwater River	81-11960	4/1/2005	0	7-99	Nez Perce Tribe
Minnie Miller Springs	Snake River / Hagerman	36-8307	3/19/1986	1	180 - 360	Idaho Department of Parks and Recreation
Mission Creek	Lower Clearwater River	85-15605	4/1/2005	0	1.8-38.9	Nez Perce Tribe
Monumental Creek	Central Idaho / Middle Salmon River	77-14179	4/1/2005	0	47-924	Nez Perce Tribe
Moose Creek	Upper Clearwater River	81-11956	4/1/2005	0	184-5181	Nez Perce Tribe
Moyie River	Kootenai River	98-7704	6/15/1992	7	149-354	Idaho Water Resource Board
Musselshell Creek	Middle Fork Clearwater River	84-12218	4/1/2005	0	10-141	Nez Perce Tribe
N. Fork Moose Cr.	Upper Clearwater River	81-11952	4/1/2005	0	79-2237	Nez Perce Tribe
Newsome Creek	South Fork Clearwater River	82-12222	4/1/2005	0	12-281	Nez Perce Tribe
North Fork Clearwater	North Fork Clearwater River	83-11952	4/1/2005	0	107-2495	Nez Perce Tribe
North Fork East River	Priest River	97-7308	11/9/1990	9	18 - 70	Idaho Water Resource Board
North Fork Payette River	Payette River	65-12822	12/17/1987	10	106 - 140	Parks and Recreation / Fish and Game
North Fork Payette River	Payette River	65-12839	4/5/1988	0	100 - 294	Idaho Water Resource Board
North Fork Payette River	Payette River	65-12840	4/5/1988	17	1300 - 18	Idaho Department of Parks and Recreation
North Fork Payette River	Payette River	65-13059	5/16/1989	0	400	Idaho Department of Fish and Game
North Fork Salmon River	Middle Salmon River	75-14184	4/1/2005	0	41-366	Nez Perce Tribe
O'Hara Creek	Upper Clearwater River	81-11961	4/1/2005	0	13-306	Nez Perce Tribe
O'Hara Creek	Upper Clearwater River	81-11965	4/1/2005	0	6-141	Nez Perce Tribe
Old Man Creek	Upper Clearwater River	81-11950	4/1/2005	0	15-342	Nez Perce Tribe
Orofino Creek	Middle Fork Clearwater River	84-12216	4/1/2005	0	28-387	Nez Perce Tribe
Pack River	Pend Oreille Lake	96-8717	6/15/1992	22	54-129	Idaho Water Resource Board
Pahsimeroi River	Pahsimeroi River	73-7045	12/19/1979	7	45-74	Idaho Department of Fish and Game
Panther Creek	Middle Salmon River	75-14186	4/1/2005	0	111-1297	Nez Perce Tribe
Panther Creek	Middle Salmon River	75-14188	4/1/2005	0	22-193	Nez Perce Tribe
Papoose Creek	Upper Clearwater River	81-11936	4/1/2005	0	14-213	Nez Perce Tribe
Peasley Creek	South Fork Clearwater River	82-12226	4/1/2005	0	2-46.8	Nez Perce Tribe
Pend Oreille River	Pend Oreille Lake	96-8730	6/15/1992	2	10655	Idaho Water Resource Board
Pete King Creek	Upper Clearwater River	81-11953	4/1/2005	0	5-130	Nez Perce Tribe
Pettibone Creek	Upper Clearwater River	81-11955	4/1/2005	0	22-338	Nez Perce Tribe
Pine Creek	Middle Salmon River	75-14185	4/1/2005	0	6-54	Nez Perce Tribe
Pine Creek	Potlatch Creek	86-11958	4/1/2005	0	0.6-17.4	Nez Perce Tribe
Pistol Creek	Central Idaho / Middle Salmon River	77-14205	4/1/2005	0	58-765	Nez Perce Tribe
Porphyry Creek	Central Idaho / Middle Salmon River	77-14176	4/1/2005	0	12-216	Nez Perce Tribe
Post Hole Creek	Lower Clearwater River	85-15608	4/1/2005	0	0.2-3.7	Nez Perce Tribe
Potlatch River	Potlatch Creek	86-11960	4/1/2005	0	43-1305	Nez Perce Tribe

Profile Creek	Central Idaho / Middle Salmon River	77-14187	4/1/2005	0	7-140	Nez Perce Tribe
Quartz Creek	Central Idaho / Middle Salmon River	77-14186	4/1/2005	0	7-130	Nez Perce Tribe
Rabbit Creek	South Fork Clearwater River	82-12221	4/1/2005	0	0.2-14.5	Nez Perce Tribe
Rapid River	Central Idaho / Middle Salmon River	77-14207	4/1/2005	0	57-874	Nez Perce Tribe
Red River	South Fork Clearwater River	82-12233	4/1/2005	0	37-842	Nez Perce Tribe
Red Rock Creek	Lower Clearwater River	85-15620	4/1/2005	0	0.6-43.4	Nez Perce Tribe
Redfish Lake Creek	Salmon River / Sawtooth Valley	71-10888	4/1/2005	0	17-287	Nez Perce Tribe
Rhoda Creek	Upper Clearwater River	81-11951	4/1/2005	0	42-626	Nez Perce Tribe
Rice Creek	Lower Salmon River	79-14118	4/1/2005	0	2.7-195.8	Nez Perce Tribe
Rock Creek	Lower Salmon River	79-14117	4/1/2005	0	5-356	Nez Perce Tribe
Rock Creek	Lower Clearwater River	85-15606	4/1/2005	0	0.4-7.1	Nez Perce Tribe
Running Creek	Upper Clearwater River	81-11970	4/1/2005	0	58-864	Nez Perce Tribe
Rush Creek	Central Idaho / Middle Salmon River	77-14184	4/1/2005	0	34-687	Nez Perce Tribe
S. Fork Clear Creek	Upper Clearwater River	81-11963	4/1/2005	0	3-82	Nez Perce Tribe
S. Fork Red River	South Fork Clearwater River	82-12235	4/1/2005	0	7-166	Nez Perce Tribe
S. Thousand Springs Estuary	Snake River / Hagerman	36-8556	8/3/1990	1	500	Idaho Department of Parks and Recreation
Sally Ann Creek	Lower Clearwater River	85-15624	4/1/2005	0	1.1-52.2	Nez Perce Tribe
Salmon River	Challis	72-16664	4/1/2005	0	566-4910	Nez Perce Tribe
Salmon River	Challis	72-16668	4/1/2005	0	364-3310	Nez Perce Tribe
Salmon River	Middle Salmon River	75-14187	4/1/2005	0	87-5700	Nez Perce Tribe
Salmon River	Lower Salmon River	79-14119	4/1/2005	0	4000-3100	Nez Perce Tribe
Sand Springs Creek	Snake River / Hagerman	36-8558	8/3/1990	0	34	Idaho Department of Parks and Recreation
Sculpin Springs Creek	Snake River / Hagerman	36-8557	8/3/1990	1	33	Idaho Department of Parks and Recreation
Secesh River	Central Idaho / Middle Salmon River	77-14175	4/1/2005	0	50-843	Nez Perce Tribe
Secesh River	Central Idaho / Middle Salmon River	77-14181	4/1/2005	0	86-1513	Nez Perce Tribe
Selway River	Upper Clearwater River	81-7160	7/30/1992	19	760-1500	Idaho Water Resource Board
Sevenmile Creek	Lower Clearwater River	85-15617	4/1/2005	0	0.3-14.2	Nez Perce Tribe
SF & Main Stem Payette R.	Payette River	65-12733	4/26/1985	54	212 - 135	Idaho Department of Parks and Recreation
Sheep Creek	Central Idaho / Middle Salmon River	77-14168	4/1/2005	0	18-350	Nez Perce Tribe
Sheep Creek	Central Idaho / Middle Salmon River	77-14185	4/1/2005	0	9-138	Nez Perce Tribe
Sheep Creek	Central Idaho / Middle Salmon River	77-14197	4/1/2005	0	12-187	Nez Perce Tribe
Shoshone Creek	Salmon Falls	47-8073	10/16/1987	10	5 - 7	Idaho Department of Fish and Game
Silver Creek	Big Wood River	37-7727	9/13/1978	11	99	Idaho Department of Fish and Game
Silver Creek	Big Wood River	37-7728	9/13/1978	10	74	Idaho Department of Fish and Game
Silver Creek	Big Wood River	37-7849	8/26/1980	13	74	Idaho Department of Fish and Game
Silver Creek	Central Idaho / Middle Salmon River	77-14196	4/1/2005	0	25-375	Nez Perce Tribe
Silver Creek	South Fork Clearwater River	82-12224	4/1/2005	0	4-99	Nez Perce Tribe
Sixmile Creek	Middle Fork Clearwater River	84-12222	4/1/2005	0	1.3-14.1	Nez Perce Tribe
Skookumchuck Creek	Lower Salmon River	79-14121	4/1/2005	0	5-159	Nez Perce Tribe
Skull Creek	North Fork Clearwater River	83-11954	4/1/2005	0	31-717	Nez Perce Tribe

Slate Creek	Lower Salmon River	79-14122	4/1/2005	0	22-689	Nez Perce Tribe
Smith Creek	Central Idaho / Middle Salmon River	77-14177	4/1/2005	0	9-175	Nez Perce Tribe
Snake River at Johnsons Bar	Snake River	03-007	7/1/1978	0	5,000	Idaho Water Resource Board
Snake River at Lime Point	Snake River	03-008	7/1/1985	0	13,000	Idaho Water Resource Board
Snake River at Milner	Snake River	02-200	12/29/1976	0	0	Idaho Water Resource Board
Snake River at Murphy	Snake River	02-201	12/29/1976	0	3,300	Idaho Water Resource Board
Snake River at Murphy	Snake River	02-223	7/1/1985	0	600	Idaho Water Resource Board
Snake River at Murphy	Snake River	20-224	7/1/1985	0	1,700	Idaho Water Resource Board
Snake River at Weiser	Snake River	03-006	12/29/1976	0	4,750	Idaho Water Resource Board
South Fork Clearwater	South Fork Clearwater River	82-12220	4/1/2005	0	259-3639	Nez Perce Tribe
South Fork Clearwater	South Fork Clearwater River	82-12229	4/1/2005	0	136-2391	Nez Perce Tribe
South Fork Payette River	Payette River	65-13060	5/16/1989	0	700 - 763	Idaho Water Resource Board
South Fork Salmon River	Central Idaho / Middle Salmon River	77-14174	4/1/2005	0	443-5691	Nez Perce Tribe
South Fork Salmon River	Central Idaho / Middle Salmon River	77-14192	4/1/2005	0	163-2161	Nez Perce Tribe
Spokane River	Lower Coeur D'Alene River	95-8780	6/15/1992	5	951-2495	Idaho Water Resource Board
Spruce Creek	Upper Clearwater River	81-11935	4/1/2005	0	26-388	Nez Perce Tribe
Squaw Creek	Upper Clearwater River	81-11937	4/1/2005	0	18-263	Nez Perce Tribe
St. Charles Creek	Bear Lake	11-7152	9/13/1978	7	9 - 17	Idaho Department of Fish and Game
St. Joe River	Saint Joe River	91-7122	6/15/1992	36	460-941	Idaho Water Resource Board
St. Maries River	Saint Maries River	92-7200	6/15/1992	26	65-141	Idaho Water Resource Board
Stanley Lake Creek	Salmon River / Sawtooth Valley	71-10887	4/1/2005	0	6-88	Nez Perce Tribe
Sugar Creek	Central Idaho / Middle Salmon River	77-14193	4/1/2005	0	7-130	Nez Perce Tribe
Sullivan Springs	Pend Oreille Lake	96-7772	4/17/1979	0	45	Idaho Department of Fish and Game
Sulphur Creek	Central Idaho / Middle Salmon River	77-14208	4/1/2005	0	27-347	Nez Perce Tribe
Sweetwater Creek	Lower Clearwater River	85-15604	4/1/2005	0	4.7-39.5	Nez Perce Tribe
Tamarack Creek	Central Idaho / Middle Salmon River	77-14189	4/1/2005	0	7-130	Nez Perce Tribe
Tenmile Creek	South Fork Clearwater River	82-12234	4/1/2005	0	11-247	Nez Perce Tribe
Three Prong Creek	Upper Clearwater River	81-11973	4/1/2005	0	7-105	Nez Perce Tribe
Threemile Creek	Lower Clearwater River	85-15623	4/1/2005	0	0.7-47.6	Nez Perce Tribe
Toboggan Creek	North Fork Clearwater River	83-11959	4/1/2005	0	7-156	Nez Perce Tribe
Tom Beall Creek	Lower Clearwater River	85-15601	4/1/2005	0	0.3-5.7	Nez Perce Tribe
Tom Taha Creek	Middle Fork Clearwater River	84-12223	4/1/2005	0	1.7-23.8	Nez Perce Tribe
Trap Creek	Salmon River / Sawtooth Valley	71-10893	4/1/2005	0	2.2-32.5	Nez Perce Tribe
Unnamed	Lower Clearwater River	85-15609	4/1/2005	0	0.3-4.3	Nez Perce Tribe
Unnamed	Lower Clearwater River	85-15621	4/1/2005	0	0.3-11	Nez Perce Tribe
Unnamed Stream	Middle Fork Clearwater River	84-12221	4/1/2005	0	0.9-13.2	Nez Perce Tribe
Valley Creek	Salmon River / Sawtooth Valley	71-10886	4/1/2005	0	48-787	Nez Perce Tribe
Vanderbilt Gulch Creek	North Fork Clearwater River	83-11948	4/1/2005	0	7-166	Nez Perce Tribe
Vinyard Creek	Snake River / Hagerman	36-7818	9/13/1978	0	17	Idaho Department of Fish and Game
W. Fork Chamberlain	Central Idaho / Middle Salmon River	77-14170	4/1/2005	0	6-167	Nez Perce Tribe
W. Fork Sweetwater	Lower Clearwater River	85-15615	4/1/2005	0	0.3-5.8	Nez Perce Tribe
Walton Creek	Upper Clearwater River	81-11940	4/1/2005	0	7-111	Nez Perce Tribe
Warm Lake Creek	Central Idaho / Middle Salmon	77-14206	4/1/2005	0	10-173	Nez Perce Tribe

Protected Rivers

The Idaho Legislature authorized the Idaho Water Resource Board to preserve highly-valued waterways as state protected rivers in 1988. 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. **Figure 3.2** shows areas of the state that have Comprehensive Basin Plans.

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 the waterway either a Natural or Recreational River to protect existing resources and use. Natural rivers are free of substantial man-made development in the waterway, and the riparian area is largely undeveloped. Recreational rivers may include manmade development in the waterway or riparian area. Designation may prohibit:

- Construction or expansion of dams or impoundments
- Construction of hydropower projects
- Construction of water diversion works
- Dredge or placer mining
- Alterations of the stream bed
- Mineral or sand and gravel extraction within the stream bed

Through this program, 2,268 miles of Idaho's rivers are protected. This includes 790 miles of Natural and 1,478 miles of Recreational rivers. **Figure 3.3** shows designated stream segments in Idaho. **Table 3.2** lists the stream, designation, river miles and date.

National Wild and Scenic Rivers

Congress passed the Wild and Scenic Rivers Act in 1968 to protect free flowing rivers with "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values." No

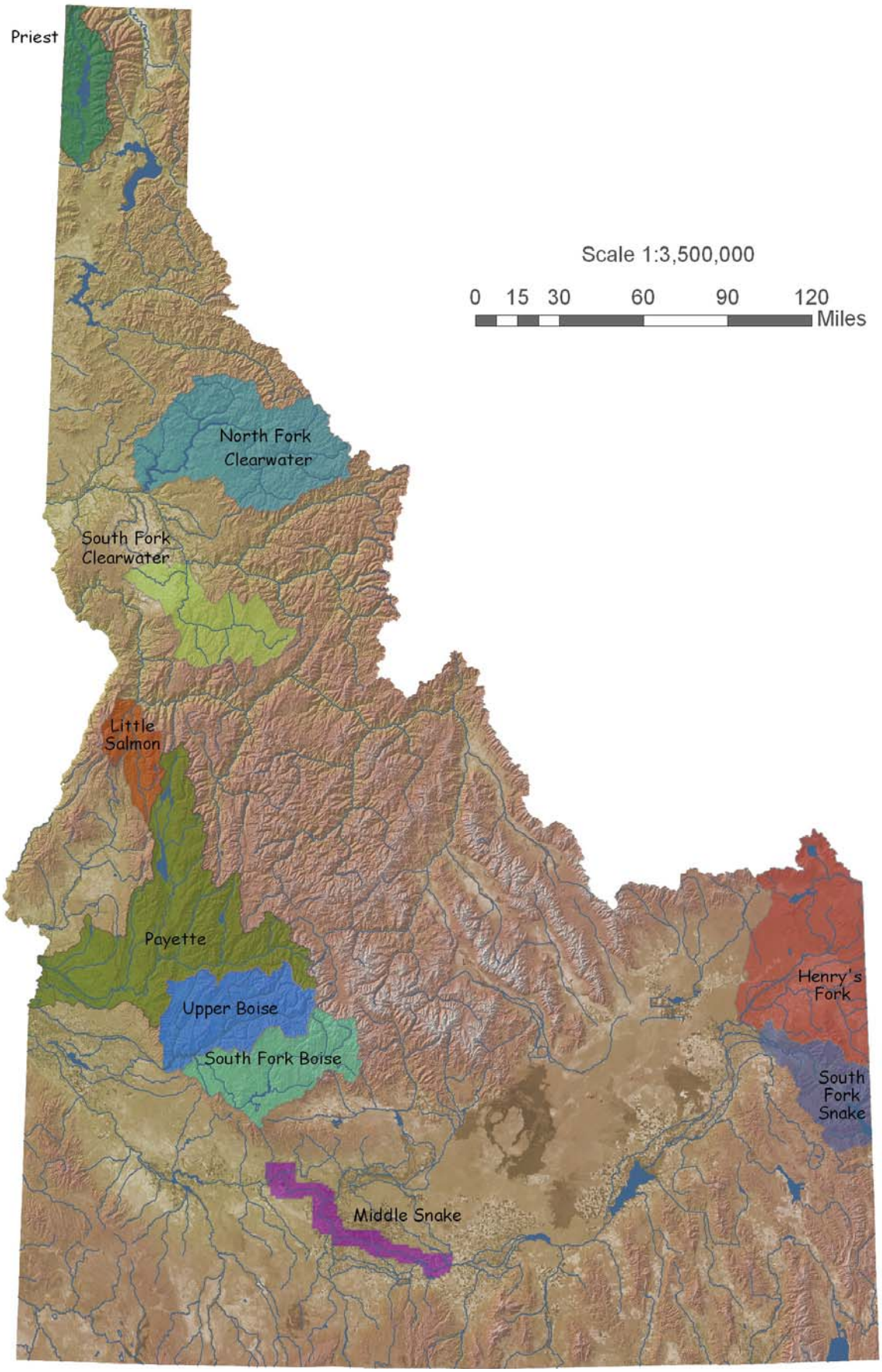


Figure 3.2 — Areas of the state that have Comprehensive Basin Plans

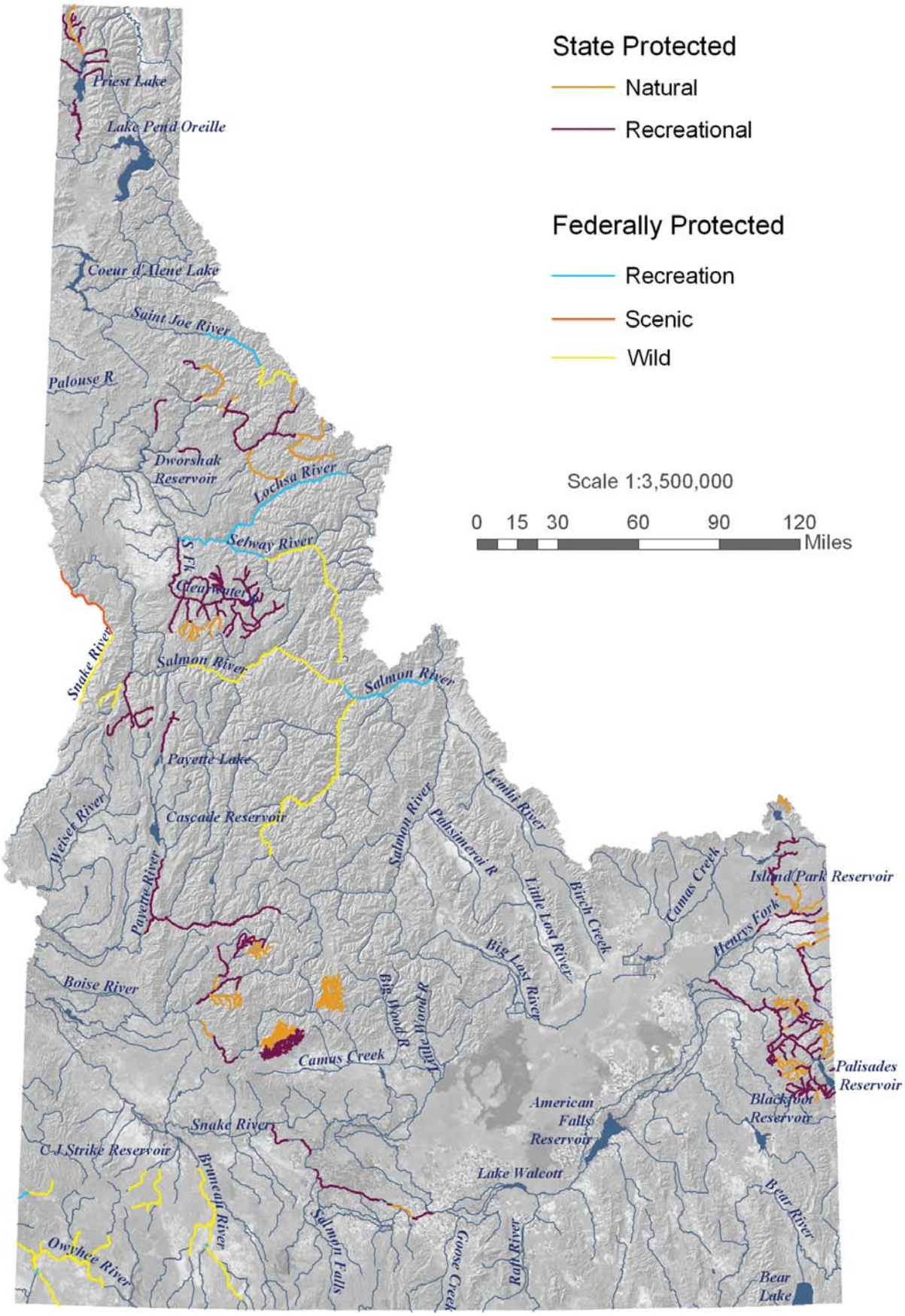


Figure 3.3 — Designated stream segments in Idaho

TABLE 3.2 — PROTECTED RIVERS

BASIN PLAN	STREAM NAME	STATUS	MILES
Henrys Fork 1992	Badger Creek	Recreational	3.53
	Big Springs Creek	Recreational	1.31
	Bitch Creek	Natural	16.55
	Boone Creek	Natural	4.93
	Buffalo River	Recreational	8.48
	Conant Creek	Natural	9.23
	East Fork Targhee Creek	Natural	1.61
	Elk Creek	Recreational	1.31
	Falls River	Natural	18.42
	Fox Creek	Recreational	3.66
	Golden Lake	Recreational	0.45
	Henrys Fork	Natural	58.64
	Island Park Reservoir	Recreational	3.66
	Robinson Creek	Recreational	14.96
	Rock Creek	Recreational	10.55
	Silver Lake	Recreational	1.14
	Targhee Creek	Natural	8.06
	Teton Creek	Recreational	5.18
	Teton River	Recreational	29.68
	Thirsty Creek	Recreational	0.43
	Thurmon Creek	Recreational	1.94
	Warm River	Natural	16.77
	West Targhee Creek	Natural	2.85
		TOTAL MILES	**223.5**
Little Salmon 2001	Boulder Creek	Recreational	18.65
	Hard Creek	Recreational	12.05
	Hazard Creek	Recreational	10.86
	Little Salmon River	Recreational	24.36
		TOTAL MILES	**65.91**
Middle Snake 1993	Shoshone Falls Reservoir	Recreational	0.67
	Snake River	Natural	63.25
	Upper Salmon Falls Reservoir	Recreational	9.05
		TOTAL MILES	**72.97**

BASIN PLAN	STREAM NAME	STATUS	MILES
Payette 1999	North Fork Payette River	Recreational	48.78
	North Fork Payette River, Trial Creek	Recreational	2.78
	Payette River	Recreational	17.02
	South Fork Payette River	Recreational	59.65
		TOTAL MILES	**128.23**
Priest 1995	Cedar Creek	Recreational	4.21
	Granite Creek	Recreational	11.07
	Hughes Fork	Recreational	14.13
	Indian Creek	Recreational	3.24
	Lime Creek	Recreational	3.95
	Lion Creek	Recreational	11.30
	North Fork Indian Creek	Recreational	7.30
	Priest River	Recreational	32.38
	Rock Creek	Recreational	3.80
	South Fork Granite Creek	Recreational	0.38
	The Thorofare	Natural	2.75
	Trapper Creek	Recreational	7.89
	Two Mouth Creek	Recreational	10.14
	Upper Priest Lake	Natural	3.40
	Upper Priest River	Natural	19.61
		TOTAL MILES	**135.56**
North Fork Clearwater 1996	Beaver Crek	Recreational	**3.32**
	Cayuse Creek	Natural	34.57
	Dworshak Reservoir	Natural	1.27
	Elk Creek	Recreational	17.52
	Frog Creek	Natural	2.03
	Isabella Creek	Natural	8.52
	Kelly Creek	Natural	31.08
	Little North Fork Clearwater River	Natural	40.75
	Middle North Fork Kelly Creek	Natural	3.46
	North Fork Clearwater River	Natural	77.90
	Reeds Creek	Recreational	9.55
	South Fork Kelly Creek	Natural	5.93
	Weitas Creek	Natural	27.70
		TOTAL MILES	**263.60**

BASIN PLAN	STREAM NAME	STATUS	MILES
South Fork Boise 1996	Barlow Creek	Natural	2.43
	Bear Gulch	Natural	2.39
	Big Peak Creek	Natural	4.57
	Big Smokey Unnamed	Natural	57.45
	Big Smoky Creek	Natural	17.28
	Big Springs Creek	Recreational	3.97
	Blind Canyon	Natural	3.80
	Bluff Creek	Natural	4.37
	Buckhorn Creek	Natural	2.10
	Calf Creek	Natural	1.93
	Cold Spring Creek	Natural	2.08
	Ear Creek	Recreational	3.69
	East Fork Big Peak Creek	Natural	4.84
	Fox Gulch	Natural	1.67
	Gem Gulch	Natural	1.98
	Hearn Creek	Recreational	2.50
	Helen Creek	Natural	0.85
	Honey Creek	Natural	4.12
	Hunter Creek	Recreational	4.99
	Lime Creek	Natural	11.19
	Lime Creek Unnamed	Natural	134.25
	Loggy Creek	Natural	2.77
	Long Tom Creek	Natural	2.46
	Lotah Gulch	Natural	1.26
	Maxfield Creek	Recreational	5.02
	Middle Fork Lime Creek	Natural	8.24
	Monroe Creek	Natural	1.96
	Moores Creek	Recreational	7.57
	Mule Creek	Natural	2.34
	Narrow Creek	Natural	2.59
	North Fork Big Smoky Creek	Natural	4.91
	North Fork Lime Creek	Natural	7.98
	Poison Creek	Natural	3.36
	Royal Gorge	Natural	3.52
	Salix Creek	Recreational	2.72
	Salt Log Creek	Recreational	4.15
	Sedum Gulch	Natural	1.10
	Skillem Creek	Natural	4.51
	Slickear Creek	Natural	4.36

BASIN PLAN	STREAM NAME	STATUS	MILES
	Snowslide Creek	Natural	2.60
	South Fork Boise River	Natural	28.84
	South Fork Lime Creek	Recreational	13.05
	Spring Creek	Natural	1.09
	Sprout Creek	Natural	3.18
	Stewart Creek	Natural	4.89
	Taylor Creek	Natural	1.73
	Thompson Creek	Recreational	4.87
	Trail Creek	Natural	3.13
	West Fork Big Peak Creek	Natural	4.28
	West Fork Big Smoky Creek	Natural	6.67
		TOTAL MILES	**417.48**
South Fork Clearwater 2004	American River	Recreational	64.80
	Baldy Creek	Recreational	18.40
	Crooked RIver	Recreational	34.88
	East Fork American River	Recreational	13.05
	East Fork Crooked River	Recreational	6.48
	Gospel Creek	Natural	6.61
	Hagen Creek	Recreational	4.35
	Haysfork Creek	Recreational	9.89
	Johns Creek	Natural	30.01
	Kirks Fork American River	Recreational	13.56
	Limber Luke Creek	Recreational	8.43
	Meadow Creek	Recreational	45.55
	Mill Creek	Recreational	54.42
	Moores Creek	Natural	6.41
	Newsome Creek	Recreational	47.09
	Otterson Creek	Recreational	10.49
	Pilot Creek	Recreational	11.89
	Red Horse Creek	Recreational	24.67
	Red River	Recreational	83.59
	Relief Creek	Recreational	12.58
	Sawmill Creek	Recreational	7.17
	South Fork Clearwater River	Recreational	176.30
	South Fork Red River	Recreational	23.31
	Square Mountain Creek	Natural	5.04
	Tenmile Creek	Natural	16.09

BASIN PLAN	STREAM NAME	STATUS	MILES
	Twentymile Creek	Natural	18.51
	West Fork American River	Recreational	9.94
	West Fork Crooked River	Recreational	5.29
	West Fork Gospel Creek	Natural	5.15
	West Fork Newsome Creek	Recreational	17.98
	West Fork Red River	Recreational	12.85
	Williams Creek	Natural	5.41
	Wing Creek	Recreational	10.22
		TOTAL MILES	**846.31**
South Fork Snake 1996	Bear Creek	Natural	17.35
	Beartrap Canyon	Natural	1.74
	Beaver Creek	Recreational	3.36
	Big Elk Creek	Natural	10.49
	Bitters Creek	Recreational	3.50
	Black Canyon	Recreational	5.15
	Blacktail Canyon	Recreational	2.30
	Box Canyon Creek	Recreational	4.24
	Burns Canyon	Natural	7.27
	Burns Creek	Recreational	4.72
	Camp Creek	Recreational	6.98
	Chaparral Hollow	Natural	3.96
	Clear Creek	Recreational	7.09
	Corral Canyon	Natural	3.25
	Corral Creek	Natural	3.04
	Currant Creek	Natural	2.60
	Currant Hollow	Recreational	1.78
	Dead Man Canyon	Natural	1.98
	Deadman Creek	Natural	3.97
	Dry Canyon	Natural	4.02
	East Fork	Natural	4.99
	East Fork Palisades Creek	Natural	3.37
	Elbow Fork	Natural	2.40
	Elk Flat Fork	Natural	2.93
	Fall Creek	Natural	17.98
	Fish Creek	Natural	5.17
	Gibson Creek	Recreational	3.80
	Haskin Creek	Recreational	3.39
	Hell Creek	Recreational	2.41

BASIN PLAN	STREAM NAME	STATUS	MILES
	Hell Hole Canyon	Natural	2.38
	Holler Creek	Natural	2.32
	Indian Creek	Recreational	6.59
	Iowa Creek	Recreational	3.13
	Jensen Creek	Natural	7.99
	Kirk Creek	Recreational	4.17
	Little Burns Canyon	Natural	3.66
	Little Dry Canyon	Natural	1.37
	Little Elk Creek	Natural	4.53
	Lookingglass Creek	Recreational	1.89
	Lost Spring Canyon	Natural	1.48
	Lower Palisades Lakes	Recreational	0.26
	McCoy Creek	Recreational	18.24
	Mike Spencer Canyon	Recreational	4.34
	Miners Delight Creek	Recreational	2.94
	Muddy Creek	Natural	2.75
	North Fork Bear Creek	Natural	6.81
	North Fork Indian Creek	Recreational	1.08
	North Fork Palisades Creek	Natural	3.06
	North Fork Pine Creek	Natural	8.62
	North Fork Rainy Creek	Recreational	7.52
	Palisades Creek	Natural	11.64
	Pine Creek	Natural	17.21
	Poison Creek	Natural	3.04
	Pritchard Creek	Recreational	6.65
	Rainey Creek	Recreational	12.57
	Red Creek	Natural	4.31
	Sheep Creek	Recreational	5.38
	Small Creek	Natural	1.66
	South Fork Bear Creek	Natural	5.02
	South Fork Fall Creek	Recreational	6.28
	South Fork Rainy Creek	Recreational	5.31
	South Fork Snake River	Recreational	63.12
	Spring Creek	Recreational	3.94
	Trap Creek	Recreational	2.03
	Trout Creek	Recreational	4.57
	Upper Palisades Lake	Natural	1.13
	Warm Springs	Recreational	0.14

BASIN PLAN	STREAM NAME	STATUS	MILES
	Waterfall Canyon	Natural	3.96
	West Pine Creek	Natural	6.00
	Willow Springs Creek	Natural	1.88
	Wolverine Creek	Recreational	9.11
		TOTAL MILES	**417.2**
Upper Boise 1992	Bear Creek	Recreational	8.19
	Bear River	Recreational	13.69
	Big Silver Creek	Recreational	**4.33**
	Boise River	Recreational	10.94
	Bow Creek	Natural	1.69
	Crooked River	Recreational	9.97
	Cub Creek	Recreational	2.96
	Devils Creek	Natural	3.65
	East Fork Roaring River	Natural	6.05
	East Fork Sheep Creek	Natural	3.58
	Grouse Creek	Natural	0.84
	Horsefly Creek	Natural	1.81
	Johnson Creek	Natural	4.01
	Lodgepole Creek	Natural	3.48
	Louise Creek	Recreational	2.11
	McDonald Creek	Natural	2.11
	McNutt Creek	Natural	2.09
	Middle Fork Boise River	Recreational	14.86
	Middle Fork Roaring River	Natural	5.36
	North Fork Boise River	Natural	31.01
	North Fork Boise Unnamed	Natural	4.03
	Roaring River	Natural	10.81
	Robin Creek	Natural	2.45
	Rockey Creek	Recreational	3.61
	Sheep Creek	Natural	10.46
	South Fork Club Creek	Recreational	2.19
	South Fork Sheep Creek	Natural	4.16
	Steamboat Creek	Recreational	1.50
	Taylor Creek	Natural	4.87
		TOTAL MILES	**176.82**

dams or water projects can be built on designated river segments and 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 rivers.

The Act directed all federal agencies to give consideration to potential national wild, scenic or recreational rivers areas in planning for the use and development of water related resources.

On March 30, 2009 President Obama signed into law, the second largest Wild and Scenic river designation in history. Included in that act are 316 miles of streams in Idaho (American Rivers, 2009).

As of 2010 there are 905 miles of federally protected rivers in Idaho including 201 Recreational, 36 Scenic and 668 Wild, shown in **Table 3.3**.

Critical Ground Water Areas and Ground Water Management Areas

In 1953 Idaho's Ground Water Act gave the Idaho Department of Water Resources the authority to designate critical ground water areas and ground water management areas. These areas are established when the ground water resources are insufficient or approaching insufficiency to meet current or future water needs. The Director of IDWR can deny an application for a proposed use if the point of diversion is within the designated area. The Director may also require water users to report withdrawals and may seek a ground water management plan for the area to decrease ground water withdrawals.

There are eight Critical Ground Water Areas (CGWA) including all or part of ground water basins that do not have a sufficient supply of ground water for irrigation or other uses, at the then current or projected rate of withdrawal. **Table 3.4** lists the CGWA's. The eleven Ground Water Management Areas (GWMA) are those ground water supply basins that are approaching critical ground water area conditions. **Figure 3.4** displays the locations of the CGWAs and the GWMAs in Idaho. **Table 3.5** lists the GWMAs and **Table 3.6** lists the geothermal GWMA's.

TABLE 3.3 — IDAHO RIVERS PROTECTED BY THE NATIONAL WILD & SCENIC RIVERS ACT

RIVER	LENGTH (MILES)	DESIGNATION	DATE
Middle Fork 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
Battle Creek	23.4	Wild	2009
Big Jacks Creek	35	Wild	2009
Bruneau River	39.3	Wild	2009
	0.6	Recreational	2009
Cottonwood Creek	2.6	Wild	2009
Deep Creek	13.1	Wild	2009
Dickshooter Creek	9.25	Wild	2009
Duncan Creek	0.9	Wild	2009
Jarbridge River	28.8	Wild	2009
Little Jacks Creek	12.4	Wild	2009
North Fork Owyhee River	15.1	Wild	2009
	5.7	Recreational	2009
Owyhee River	67.3	Wild	2009
Red Canyon	4.6	Wild	2009
Sheep Creek	25.6	Wild	2009
South Fork Owyhee River	31.4	Wild	2009
	1.2	Recreational	2009
West Fork Bruneau River	0.35	Wild	2009
Wickahoney Creek	1.5	Wild	2009

TABLE 3.4 — CRITICAL GROUNDWATER AREAS

	DESIGNATED	COUNTIES
Artesian City	January 1962	Cassia, Twin Falls
Blue Gulch	December 1970	Twin Falls, Owyhee
Cinder Cone Butte	May 1981	Elmore
Cottonwood	January 1962	Cassia
Curlew Valley	March 1976	Oneida, Power
Oakley-Kenyon	January 1962	Cassia
Raft River	July 1963	Cassia, Power, Oneida
Oakley Fan	January 1982	Cassia

TABLE 3.5 — GROUNDWATER MANAGEMENT AREAS

	DESIGNATED	COUNTIES
American Falls	August 2001 Modified 2003	Bingham, Power, Bannock
Banbury Hot Springs	April 1983	Twin Falls
Bear River	August 2001	Bannock, Caribou, Bear Lake, Oneida, Franklin
Big Wood River	June 1991	Camas, Blaine, Elmore, Gooding
Boise Front	June 1987	Ada
Bruneau-Grandview	June 1982	Owyhee
Lindsay Creek	March 1992	Nez Perce
Mountain Home	November 1982	Elmore, Ada
Southeast Boise	October 1994	Ada
Rathdrum Prairie	September 2005	Bonner & Kootenai
Twin Falls	January 1984	Twin Falls, Gooding, Jerome

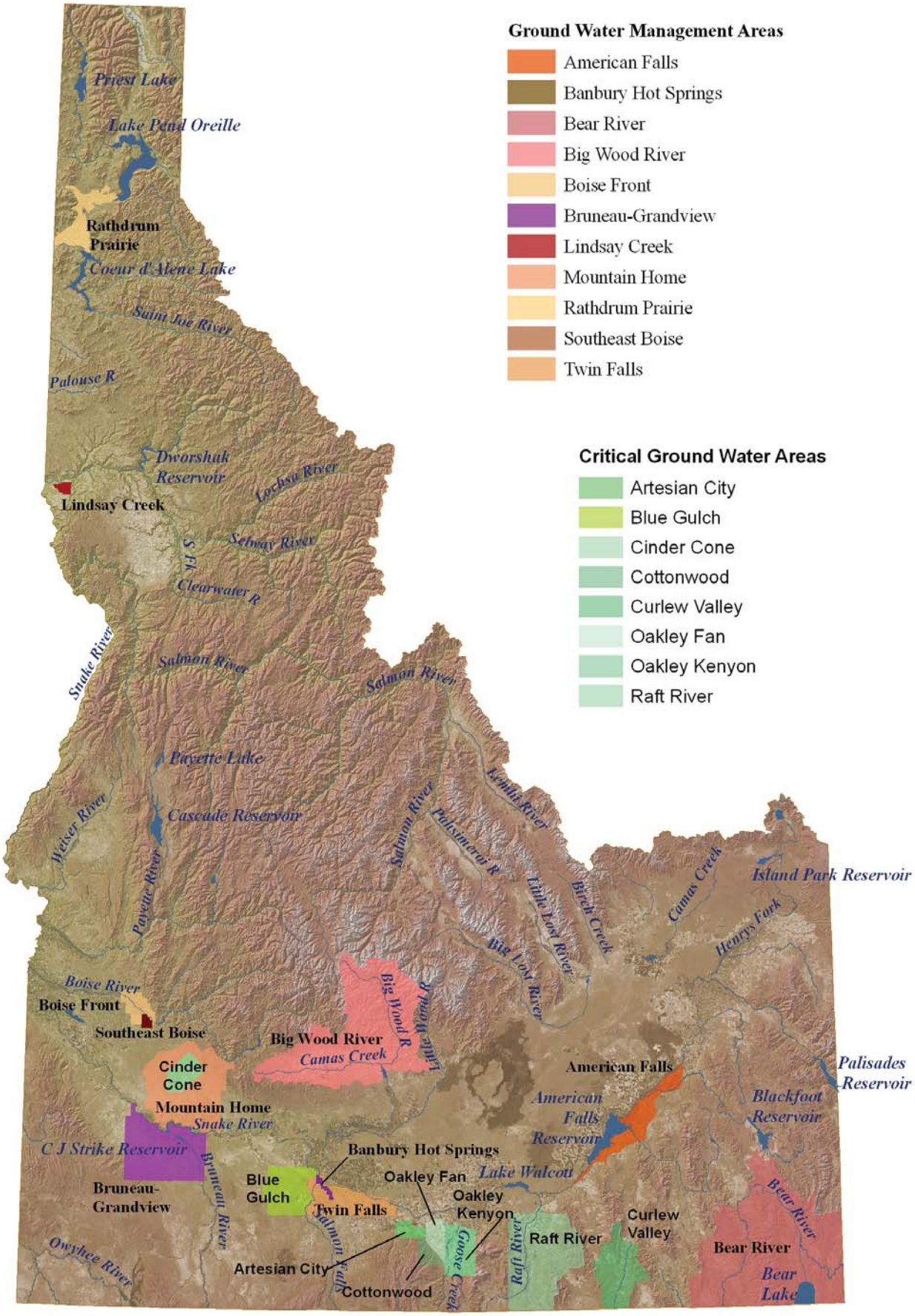


Figure 3.4 — The locations of the CGWAs and the GWMAs in Idaho

Water Districts

One of the most critical needs for making water management decisions is reliable water diversion data. The availability of this data varies throughout the state. Idaho Code Section 42-604 authorizes the director of the Department of Water Resources to divide the state into water districts with the purpose of distributing water among adjudicated water right holders. There are over 100 water districts in Idaho and more than 70 of these are active.

The largest water district in the state is District 01. The district covers most of the Upper Snake River basin above Milner Dam. It includes numerous streams and tributaries and thousands of individual users. Many of the smaller districts may encompass only one tributary steam and have no more than a half-dozen water users. Each active district has an elected water master who oversees the distribution of water within the district. These officials account for the daily distribution and diversion of natural flow and storage water, and regulate diversions according to available supplies and water right priority dates.

The Department has created new water districts over the last several years to administer both ground water and surface water rights in the Eastern Snake Plain Aquifer and portions of the Upper Salmon River Basin. The Department anticipates the gradual creation of additional water districts and/or modification of existing water districts throughout the Snake River Basin upon further completion of the Snake River Basin Adjudication (SRBA). Many of the new or modified water districts will include administration of ground water rights in addition to the traditional administration and regulation of surface water rights. A description of individual water districts is available at: www.idwr.idaho.gov/WaterManagement/WaterDistricts/default.htm

GROUNDWATER DISTRICTS

The Idaho Legislature adopted the Ground Water District Act in 1995 that enables ground water users to organize their own Ground Water Districts. Ground Water Districts can perform the measurement and reporting functions required by law and levy assessments like Water Measurement Districts. Additionally, Ground Water Districts may represent their members in various water use issues and related legal matters, develop and operate mitigation and recharge plans, and perform other duties as described under Section 42-5224.
Since 1995, nine separate Ground Water Districts have been organized. These districts are listed in **Table 3.7** and shown in **Figure 3.5**.

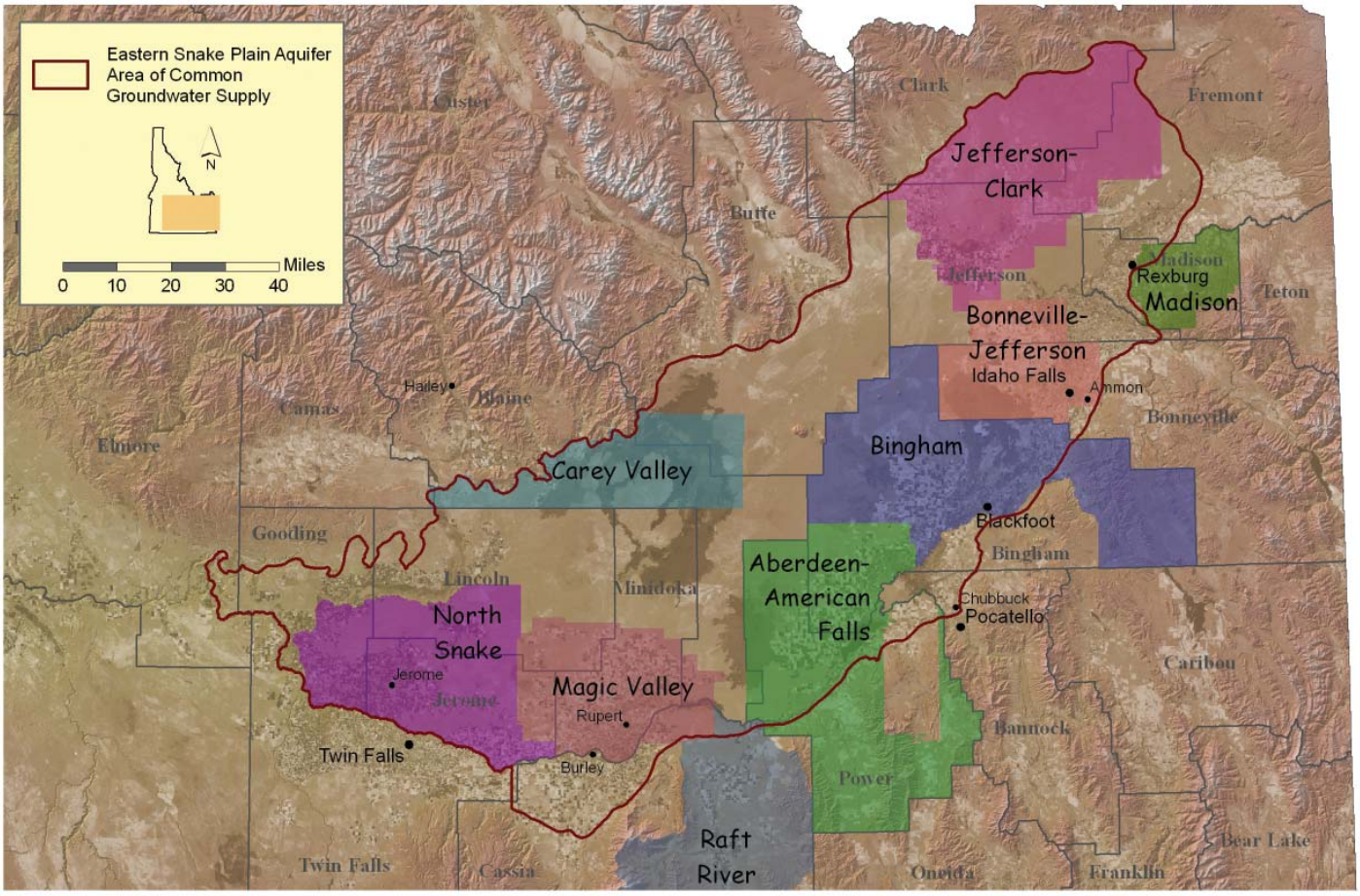


Figure 3.5 — Groundwater Districts

TABLE 3.7 — GROUNDWATER DISTRICTS

GROUNDWATER DISTRICT	COUNTIES
Aberdeen-American Falls	Bingham, Power, Bannock, Cassia, Oneida, Blaine
Bingham	Jefferson, Bingham, Bonneville, Caribou, Butte, Blaine
Bonneville-Jefferson	Jefferson, Bingham, Bonneville
Magic Valley	Lincoln, Minidoka, Jerome, Cassia, Blaine
North Snake	Gooding, Lincoln, Twin Falls, Jerome, Cassia
Madison	Fremont, Jefferson, Madison
Jefferson Clark	Fremont, Clark, Jefferson
Carey Valley	Camas, Minidoka, Butte, Blaine
Raft River	Power, Cassia, Blaine

Managed Recharge

Ground water pumping from the Eastern Snake Plain Aquifer (ESPA) began in the 1950's. Over time this withdrawal has led to reduced spring flows in the Thousand Springs and American Falls areas where the aquifer discharges. The Idaho Department of Water Resources is required to conjunctively manage surface and groundwater and has issued several Administrative Orders requiring mitigation or curtailment of junior groundwater rights.

Managed recharge is one possible solution to the declining aquifer levels. Incidental recharge is accomplished when water is diverted from the Snake River, or tributaries, during times of high water flows. Canals carry the water either infiltrate into the underlying aquifer as it leaks out of canals Recharge can also occur in constructed facilities or natural depressions where water either percolates into the ground or is injected into wells

There are both institutional and physical constraints to aquifer recharge projects. Water rights have the potential to constrain diversions for recharge opportunities. The Idaho Water Resource Board water right for recharge on the Sanke and Wood Rivers has a relatively junior

priority of 1980. Any diversion, whether for irrigation or recharge will require water right permits from IDWR. Diversions may also impact fish and wildlife during November to March low flow periods. Recharge has the potential to alter ground water quality by introducing surface contaminants to the aquifer. Finally, economic constraints are a major factor affecting potential recharge, particularly for constructed facilities.

There are several possible recharge sites within the ESPA. **Figure 3.6** displays the locations of existing and potential recharge sites.

Water Transactions Program

The Idaho Water Resource Board joined the Columbia Basin Water Transactions Program in 2003 with the intent to support innovative, voluntary, grassroots strategies that improve flows to streams and rivers in the Columbia Basin. The National Fish and Wildlife Foundation, a not-

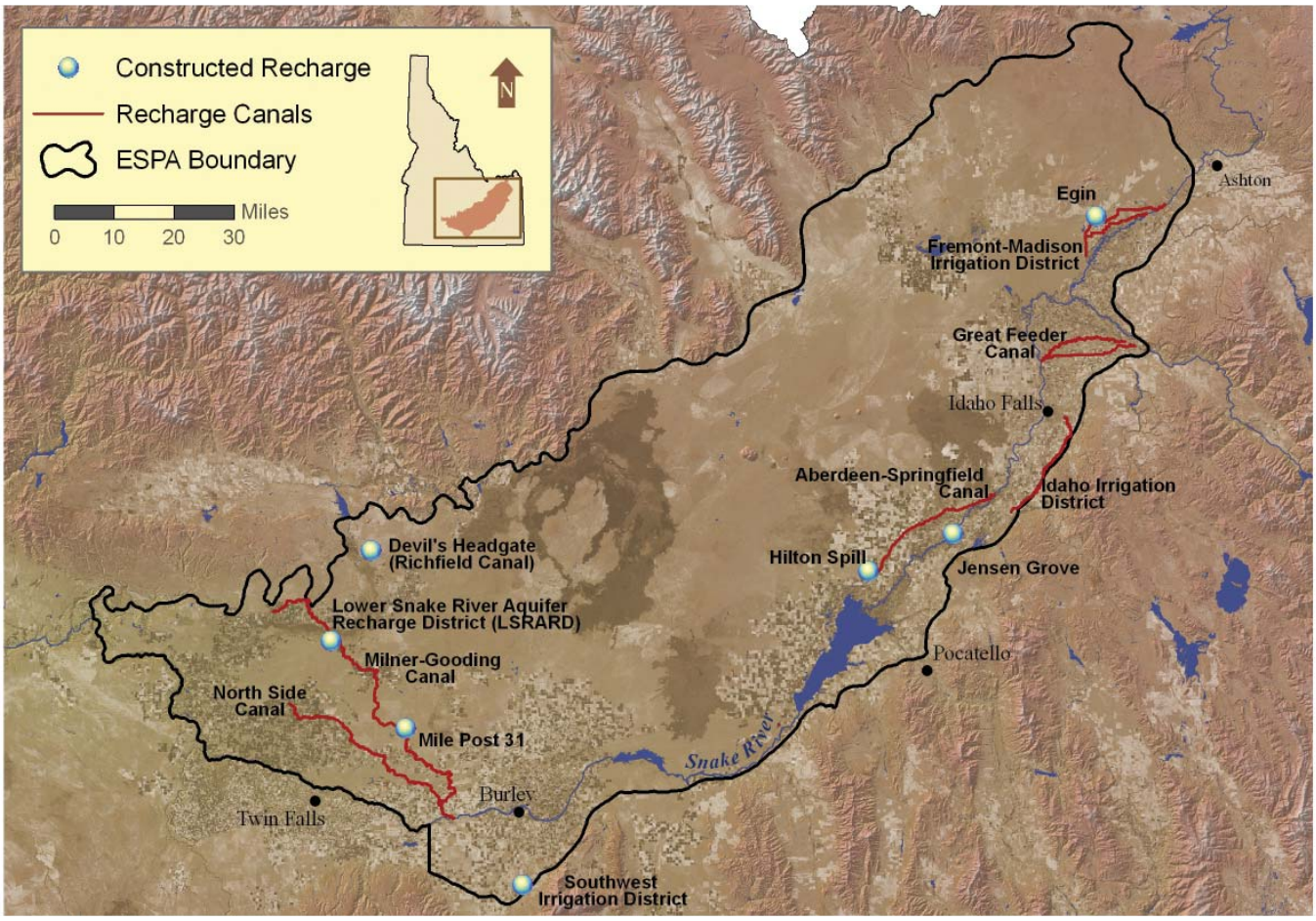


Figure 3.6 — The locations of existing and potential recharge sites

for-profit organization dedicated to the conservation of fish and wildlife, working in partnership with the Bonneville Power Administration (BPA), manages the program. Funding for the program is provided by BPA in cooperation with the Northwest Power and Conservation Council. The Board has leveraged the BPA funds through grants from the Pacific Coast Salmon Recovery Fund and the Aquatic Species Conservation Fund. Water transactions are also funded through the 2008 Idaho Fish Accord a Memorandum of Agreement signed by the state of Idaho and Federal Action Agencies. This agreement funds projects in Idaho which are consistent with the Northwest Power and Conservation Council's Fish and Wildlife Program.

The Water Transaction Program philosophy is simple: Improve fish and wildlife habitat, respect private property rights, respect the values of irrigated agriculture, work locally using market-based strategies, and take a balanced approach. The primary objective of Water Transactions Programs projects is "acquisition" (through leases, donations etc.) of water to enhance flows at critical times. Since the inception of the Idaho program in 2003, the Board has completed 40 transactions on 14 streams in the Upper Salmon River Basin. The transactions range from partial season annual leases to 20-year agreements not to divert. The program protected 8.7 cubic feet per second (cfs) in 2003 and has grown to protect 117 cfs in 2008.

Water Supply Bank and Rental Pools

The Idaho Water Resource Board manages the Idaho's Water Supply Bank (Bank). The purposes of the Bank are to encourage the highest beneficial use of water, provide a source of adequate water supplies to benefit new and supplemental water uses, and to provide a source of funding for improving water user facilities and efficiencies. The history of the Idaho water bank system began in the 1930s. In 1979, the legislature made Idaho the first state to officially operate a water supply bank and associated rental pools.

The Water Supply Bank is a water exchange market operated by the Board to assist marketing of water rights to natural flow water or water

stored in Idaho reservoirs. Water users who use the bank in any given year have rights to more water than they require can put the excess stored water or natural flow rights in the Bank.

Once the water rights are put in the Bank, the water can be sold or leased to people who do not have enough to meet their needs. This system helps make excess water available to other users for irrigation or other authorized uses. Water Bank water also may provide stored water for downstream salmon recovery efforts. This approach helps put the maximum amount of water to beneficial use.

CATEGORIES OF WATER

Water in the Bank involves two distinct categories. The first is natural flow water. This generally involves rights to surface water diverted from a river, stream or groundwater. The Board directly controls the sale or rental of water covered under natural flow water rights.

The second category is stored water that is water stored in "rental pools" in reservoirs. There are currently four rental pools operated by local committees, appointed by the Board. They involve water from the Snake River upstream from Milner Dam near Burley (including a separate bank operated by the Shoshone-Bannock Tribes), the Boise River and the Payette River. Figure 3.7 shows the locations of the Bank and associated rental pools.

Created in 1976, and encompassing Water District 01, the Upper Snake River Basin rental pool includes water between the Wyoming border and Milner Dam. Created in 1988, the Boise River rental pool allows for storage space in Lucky Peak, Anderson Ranch and Arrowrock/Lake Lowell. The Payette rental pool, created in 1990, allows storage in Cascade and Deadwood Reservoirs, and Payette Lake. The Lemhi River water bank is unique in that it provides for a natural flow rental pool. Created in 2001, it allows water rights to be left in the river to maintain in-stream flows. A similar bank now also exists in the upper Big Wood River basin. It also allows water right holders to leave all or part of a

water right in the river to enhance flows. The Shoshone-Bannock Tribes store water in Palisades and American Falls Reservoirs, and makes this water available for use outside of the reservation boundaries. Water from Palisades may be rented above Milner Dam and water from American Falls maybe used within the Snake River Basin in Idaho.

PRICING

Rental pool committees set the price, subject to Board approval, for which water can be rented or sold from their rental pool. This price is different for each rental pool and can be determined by where the water is to be used.

The Board receives a fee of 10 percent of the gross price of rental pool water. IDWR receives 10 percent for natural flow rentals. This fee pays the costs of administering the Water Bank. Any remaining funds go to the Board's financial loans and grants program where it is used to help finance water projects around the state. Formal rules govern the Board's operation of the Water Supply Bank. **Table 3.8** shows a summary of water bank transactions in the state.

TABLE 3.8 — WATER SUPPLY BANK SUMMARY

BANK	TOTAL DEPOSITS IN ACRE-FEET	YEARS	MAXIMUM	YEAR	AVERAGE
Idaho Water Supply Bank	11,728	1995-2002	5,453	1999	1,954
Snake River Rental Pool	2,745,505	1990-2002	432,170	1994	211,192
Boise River Rental Pool	321,629	1990-2002	44,159	1999	24,740
Payette River Rental Pool	1,373,428	1990-2002	166,000	2002	105,648
Lemhi River Water Bank	3,338	2001-2003	1,283	2003	1,112

Analysis of Water Banks in the Western States, 2004. Washington State Department of Ecology, West Water Research. Publication No. 04-11-011. Available at URL: http://www.ecy.wa.gov/pubs/0411011.pdf Accessed October 31, 2008.

Climate Change

Scientific studies have shown that changes in climate are likely to have significant impacts on Idaho's water supply. Climate history studies of the western United States show cycles of floods and droughts recorded in lake sediments, tree rings and glaciers. The changes anticipated in Idaho may cause longer periods of drought, larger floods and less recharge to ground water. Regardless of the source of this change, there are likely to be long term impacts on the availability of water, especially in the southern part of the state. This shift is likely to occur during a time of growth when demand for water is increasing.

Climate models indicate that there may only be a minimal change in total amount of precipitation over the next several decades. The form of precipitation, however, may have the largest impact on when and where water is available. If temperatures increase, there may be less snow and more rain. Mountain snowpacks act like reservoirs. Water, in the form of snow, is deposited in the higher elevations and slowly melts into streams over time. This extended release keeps water in rivers longer, reduces the threat of flooding and stores water until needed later in the season. Earlier springs could mean higher stream flows in March and much lower flows in May, and reduced flows in late summer. There may also be more occurrences of rain on snow leading to a higher incidence of spring flooding. (Walden)

Idaho's water management infrastructure of canals and dams is designed to take advantage of existing climate conditions (USGS, 2007). While there may be only minimal change to the average annual flow of streams (Walden), the faster release of water stored at higher elevations may have a negative impact on storage. Reservoirs may reach capacity earlier, causing operators to release water earlier in the season. Many existing dams serve as flood control structures making increased flooding a concern. Existing storage may not be adequate for capturing earlier runoff (Mote, 2004). Reservoir draw down may result in less water available for diversion in the late summer months. With river flows higher for short periods of time, and the potential for extreme

low flows late in the water season, hydropower generation may face reductions during the late summer and early fall.

Higher temperatures mean the atmosphere will be able to absorb more water. This can lead to increased evapotranspiration and also heavier, if less frequent, rain storms (Udall, 2008). Warmer climates and less soil moisture due to increased evaporation may increase the need for irrigation during the summer months when flows are at their lowest.

Much of Idaho's water occurs in underground aquifers. Some precipitation percolates into the soil and recharges ground water. Many streams gain water from the surrounding soils helping maintain flows much later in the season than might be expected from snowmelt or precipitation. One possible result of climate change is longer periods between precipitations with increased volumes of precipitation. When soils become saturated the excess water becomes runoff, leading to less water, over time, to recharge ground water. Increasing evapotranspiration and lower summer flows may also result in less aquifer recharge (Mote, 2004). This could lead to less spring discharge from the Eastern Snake Plain Aquifer and lower aquifer levels.

REFERENCES

American Rivers, 2009. Available at URL:
www.americanrivers.org/newsroom/press-releases/2009/president-obama-signs.html

IDWR, May 15, 2004, Fact Sheet on Snake River Water Agreement. Available at URL:
www.idwr.idaho.gov/waterboard/WaterPlanning/NezPerce/pdf_files/fact-sheet.pdf

McGown, Mary. "The Snake River Basin Adjudication — Nez Perce Tribe Water Rights Settlement" Powerpoint presentation. Moscow, Idaho. September 14-16, 2005.

Mote, Philip, 2004. Expanded Natural Resources Interim Committee Meeting — June 3, 2004 Minutes. Available at URL:
www.legislature.idaho.gov/sessioninfo/2004/interim/expnatres0603min.pdf

Udall, Brad 2008. Western Governors' Association Plenary II — Managing Water in the West. Available at URL: www.westgov.org/wga/meetings/am2008/Udall.pdf

U.S. Geological Survey (USGS), 2007. Global Change Research, The Arid and Semi-Arid Western United States. Available at URL: esp.cr.usgs.gov/info/assessment/southwest.html

Walden, Boll. Humes Preliminary steps toward understanding the effects of global climate change on long-term trends in water resources in Idaho.

CHAPTER 4: WATER USE AND ALLOCATION

Overview

Idaho's water resources have been developed extensively for irrigation, power generation, aquaculture, and municipal and industrial supply. Although irrigation is by far the largest use of available water in the state, other off stream and in stream uses are important to the economy. Idaho industries depend on an ample supply of good quality water. Hydroelectric power generation, aquaculture, and the recreation and 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 (DCMI) water use continues to grow.

Within Idaho, water withdrawals are an estimated 21.8 million acre feet (Maupin, 2008). Surface water diversions are approximately 16.9 million acre feet and groundwater withdrawals total an estimated 4.9 million acre feet. Figure 4.1 relative surface and groundwater withdrawals by county. Approximately 85 percent of the total withdrawals for the state are used for agriculture.

Water Rights, Allocation and Adjudication

Water allocations in Idaho follow the Prior Appropriation Doctrine which is best described as "first in time, first in right." Water rights are administered by the IDWR. The IDWR also acts as an independent expert and technical assistant to the court in the water right adjudication process. Under state law, water rights can only be established by appropriation and once established, cannot be lost provided the water is used. The purpose of adjudication is to create a complete and accurate record of all existing water rights. This information allows IDWR to deliver water to those who are entitled to it. When the supply of water is less than the demand for water the most recent (junior) water rights

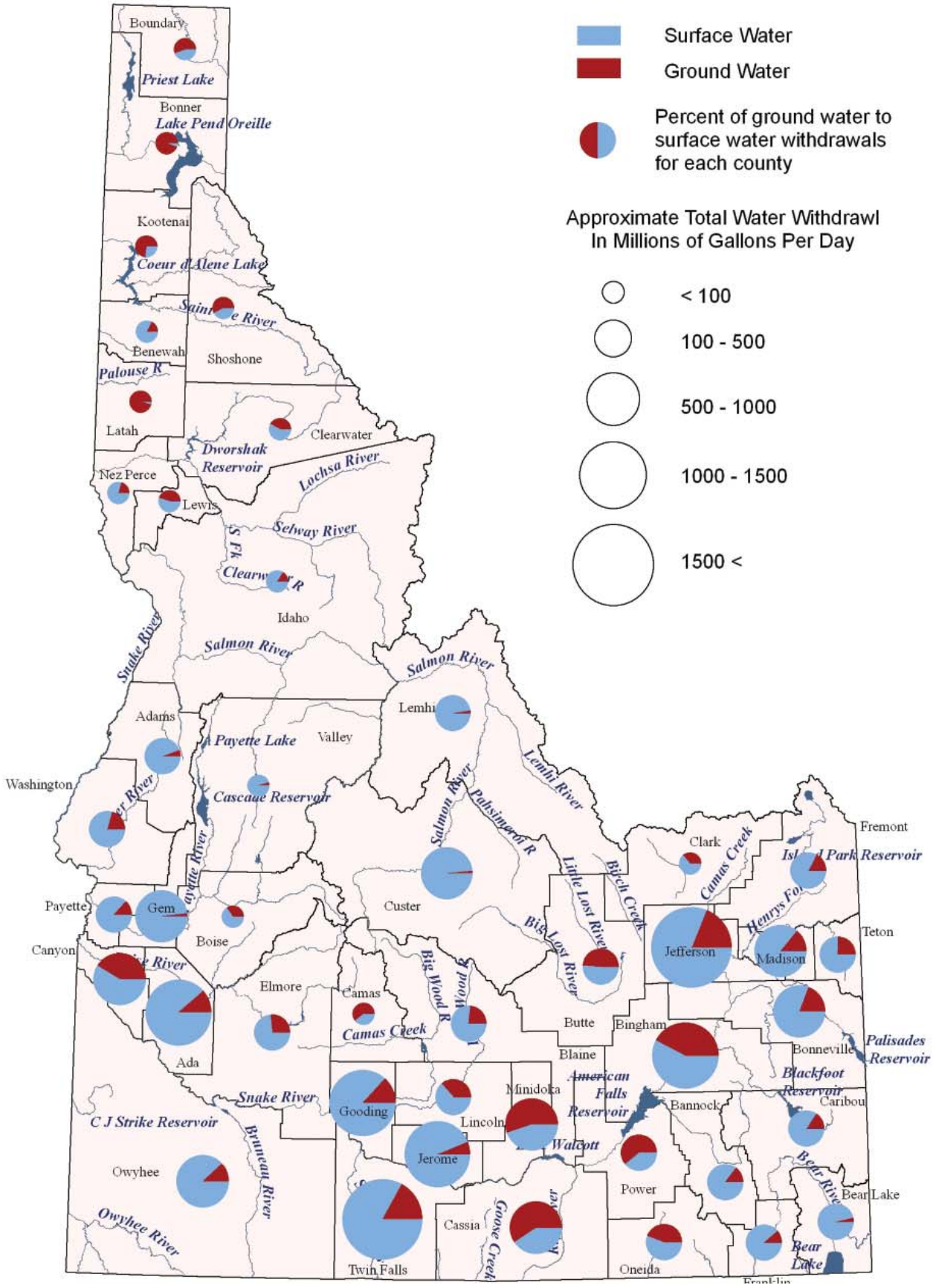


Figure 4.1 — Relative surface and groundwater withdrawals by county

are curtailed. The list also enables the Department to estimate how much water is available for future development. Water rights are issued by date of appropriation, for specific quantities, diversion points, places of use and purposes.

MORATORIUM AREAS

There are five areas in the state where a moratorium on further appropriation is in place. The largest moratorium area covers surface and groundwater tributaries to the Snake River upstream from the USGS gaging station on the Snake River at King Hill. This area includes the Trust Water Area shown in **Figure 4.2**. IDWR will generally not process applications for ground or surface water which propose a consumptive use of water in the Snake River basin. Development of a new consumptive use of water can be authorized if the applicant provides mitigation to offset injury to other rights. Small domestic and stockwater appropriations are exempted from the moratorium.

The Twin Falls moratorium, first created on July 24, 1987 has been extended to April 1, 2013. It precludes new uses of low-temperature geothermal groundwater. The Twin Falls Groundwater Management Area (GWMA) was created because artesian pressure in the thermal (low temperature) groundwater aquifer underlying the area was declining.

The Director of IDWR designated the Boise Front Low Temperature Geothermal Resource GWMA because of declining aquifer levels and declining artesian pressure. The order prevents further development and additional use of the low temperature geothermal resources. The Boise Front moratorium order was signed in 1988, has been extended four times, and currently has an expiration date of May 5, 2014.

Banbury Hot Springs GWMA was created in 1983. As of 1985, pending applications for permit to appropriate groundwater within this GWMA have been stayed until further order by the Director.

The boundaries of Water District 13-T are identical to the boundaries of the Bancroft-Lund GWMA, which was dissolved in 2004. The order

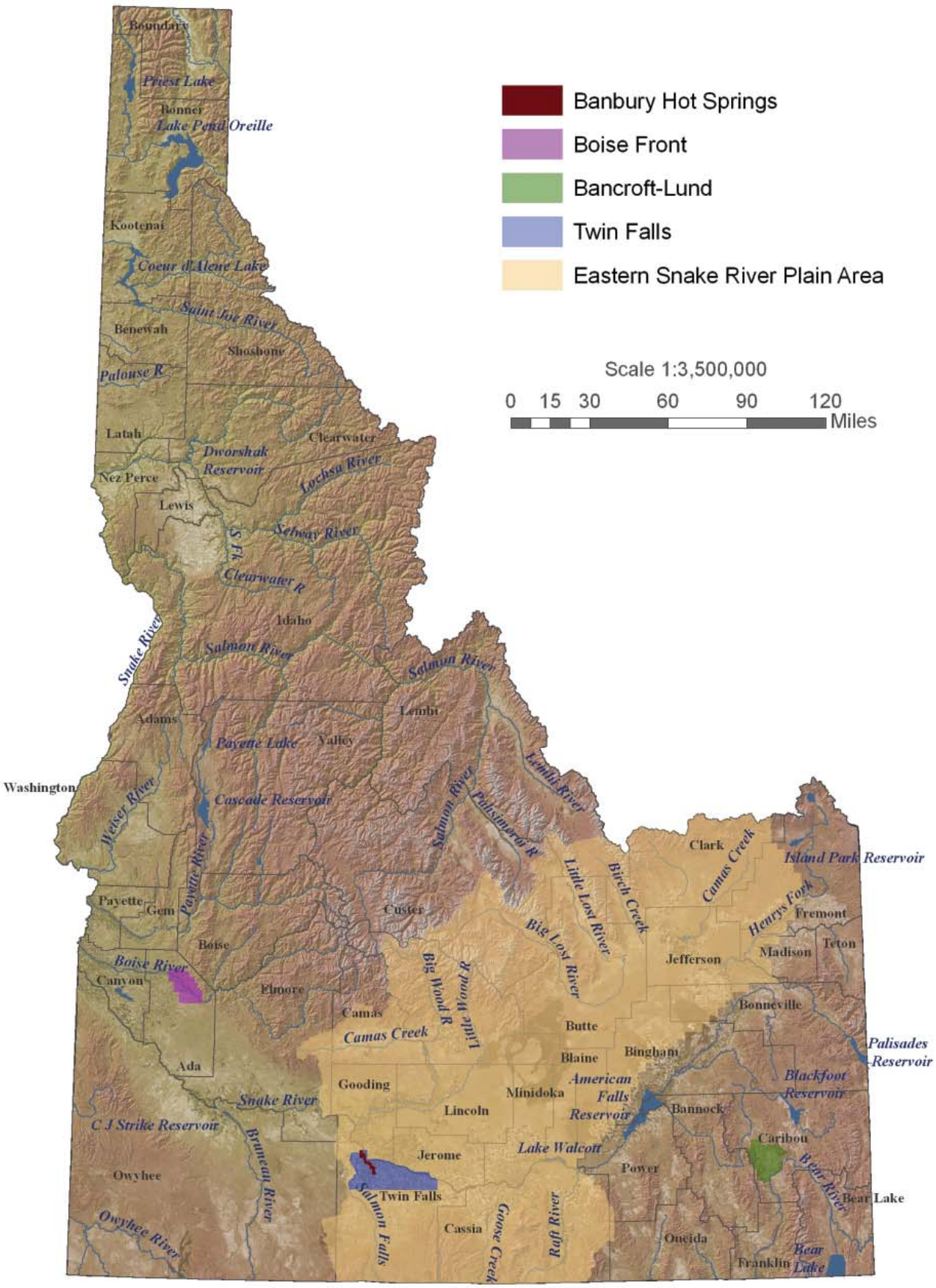


Figure 4.2 — Trust Water Area

dissolving the Bancroft-Lund GWMA also established a moratorium on new appropriations of groundwater within Water District 13-T. Approval of applications to appropriate groundwater is prohibited except in specific circumstances, including non-consumptive, municipal, stockwater and domestic uses. The Department will also process an application if the applicant can provide technical information demonstrating that the proposed application will not injure other rights and that there is sufficient water supply for the proposed use.

SNAKE RIVER BASIN ADJUDICATION AND SWAN FALLS AGREEMENT

The 1984 Swan Falls Agreement between the State of Idaho and the Idaho Power Company, established certain rights and policies concerning water use in the Snake River Basin. This encompasses the area above the Swan Falls Dam upstream of Murphy, Idaho. The State agreed that the Snake River was 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. As of July 2008, there were over 150,000 recommendations including federal reserved right claims making claims on over one million cubic feet per second in the Snake River Basin. **Figure 4.3** shows Idaho Department of Water Resources administrative basins.

The 1984 Swan Falls Agreement was reaffirmed in March 2009 in a legal settlement between the State of Idaho and Idaho Power Company. The agreement entitled Idaho Power to 3,900 cfs of water during the irrigation season and 5,600 the rest of the year. It also placed Idaho Power water rights exceeding those flows in a trust established by the Idaho Legislature. This Trust allows the State to allocate the Trust water to future beneficial uses. Idaho Power retains the right to use water

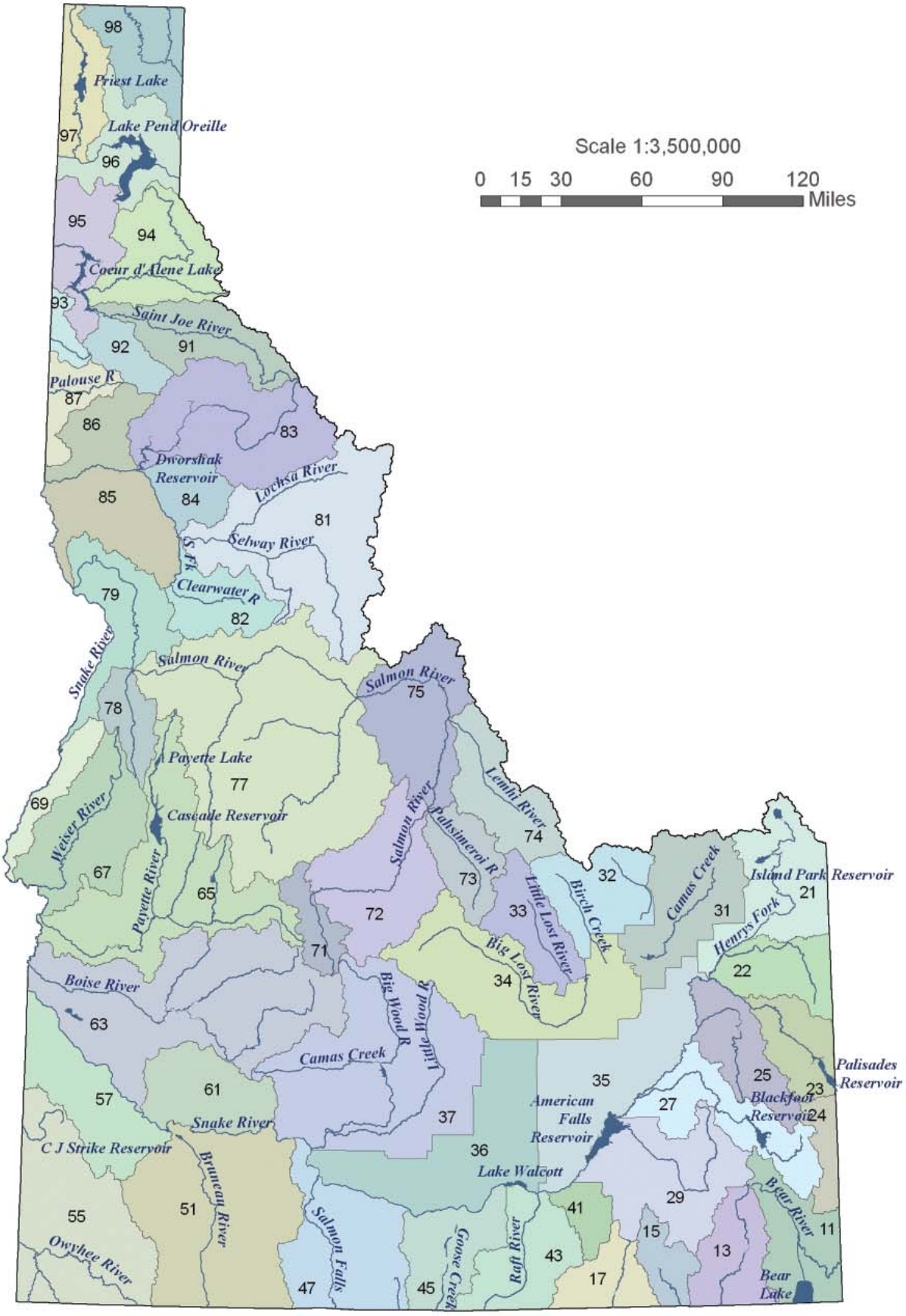


Figure 4.3 — The Idaho Department of Water Resources administrative basins

that is in excess of those minimum flows for power generation until it is allocated to other uses. The 2009 agreement recognizes that water management measures such as aquifer recharge benefit both agriculture and hydropower generation.

2004 SNAKE RIVER WATER RIGHTS SETTLEMENT

The Nez Perce Tribe in north central Idaho is party to treaties and other agreements with the United States that protect its rights to land, water and fisheries resources. The Tribe is interested in protecting its historic water use and restoring salmon to a level allowing members to harvest fish for commercial, subsistence and ceremonial purposes. Tribal water right claims in the Snake River Basin Adjudication (SRBA) posed a major obstacle to the adjudication because they could have affected the rights of Idaho water users to divert water.

In 1993 the Tribe filed claims on water rights, based on treaties from 1855 and 1863. These claims included in-stream flows in about 11,000 streams and about 1,800 springs on federal, state and private land. The Tribe also filed claims on all on reservation surface and ground water resources. The 2004 Snake River Water Rights Settlement, a result of the SRBA Court-ordered mediation, resolved all claims by the Nez Perce Tribe in the Snake River Basin

There are three components to the Agreement. The first, known as the Nez Perce Tribal Component, quantified the Tribe's on-reservation, consumptive water rights to 50,000 acre feet a year, primarily from the Clearwater River, with a priority date of 1855. It also established a multiple-use water and fisheries trust fund, and provided money for the design and construction of a water supply and sewer system on the reservation.

The second component, the Salmon/Clearwater Habitat Management and Restoration Initiative, established 205 minimum stream flow water rights in the Salmon and Clearwater basins held by the Idaho Water Resource Board. The State of Idaho also agreed to develop cooperative

agreements under the Endangered Species Act to enhance riparian habitat and protect existing and future State-approved water use, and for riparian and stream bank protection measures on forest land. A Habitat Trust Fund was established to implement these flow and forestry habitat improvement projects.

The third and final component is known as the Snake River Flow Component. It provided that minimum flows defined by the Swan Falls Agreement be decreed to the Idaho Water Resource Board. It also allows the Bureau of Reclamation to lease up to 427,000 acre-feet of water from Idaho water banks for flow augmentation. And, it allows Reclamation to acquire up to 60,000 acre feet of consumptive natural flow water rights from the Snake River. For more information see www.idwr.idaho.gov/waterboard/WaterPlanning/NezPerce/default.htm

NORTHERN IDAHO ADJUDICATION

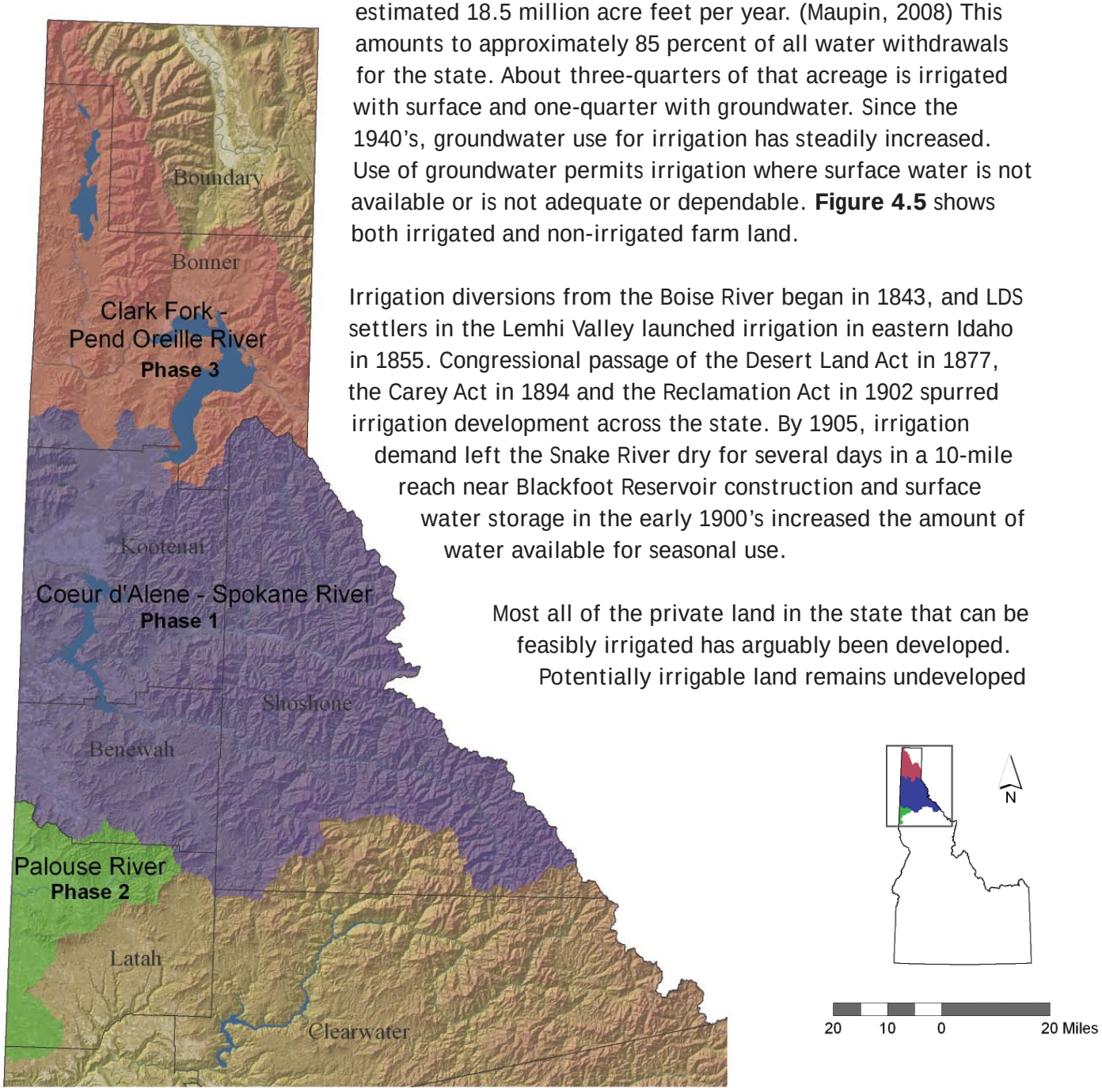
The 2006 Legislature authorized IDWR to begin planning and designing the administrative mechanisms for adjudication water rights in Northern Idaho. The region has been divided into three subbasins: the Coeur d' Alene and Spokane River drainages; the Palouse River basin; and the Clark Fork-Pend Oreille River basin. The IDWR was authorized in 2008 to proceed with a petition for an adjudication of the Spokane -Coeur d'Alene Rivers system. This area encompasses the watershed of the Spokane River upstream including groundwater beginning in Basin 95 and Kootenai County. **Figure 4.4** shows the basins included in the Northern Idaho Adjudication. There will be separate petitions for the other subbasins in the future, contingent upon future legislative funding.

IRRIGATION

As of 2007, Idaho had an estimated 11.5 million acres in agricultural land. Roughly one-third, or 4.3 million acres, of that land was planted in crops. Precipitation in northern Idaho is generally adequate for

agriculture without the need for irrigation. However, cooler growing season temperatures generally limit crop production to 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 land wheat and barley. The amount of land in farms has decreased by 21 percent since 1978 (USDA, 2007).

Figure 4.4 — Basins included in the Northern Idaho Adjudication



At present 3.5 million acres in Idaho are irrigated with an estimated 18.5 million acre feet per year. (Maupin, 2008) This amounts to approximately 85 percent of all water withdrawals for the state. About three-quarters of that acreage is irrigated with surface and one-quarter with groundwater. Since the 1940's, groundwater use for irrigation has steadily increased. Use of groundwater permits irrigation where surface water is not available or is not adequate or dependable. **Figure 4.5** shows both irrigated and non-irrigated farm land.

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 Reservoir construction and surface water storage in the early 1900's increased the amount of water available for seasonal use.

Most all of the private land in the state that can be feasibly irrigated has arguably been developed. Potentially irrigable land remains undeveloped

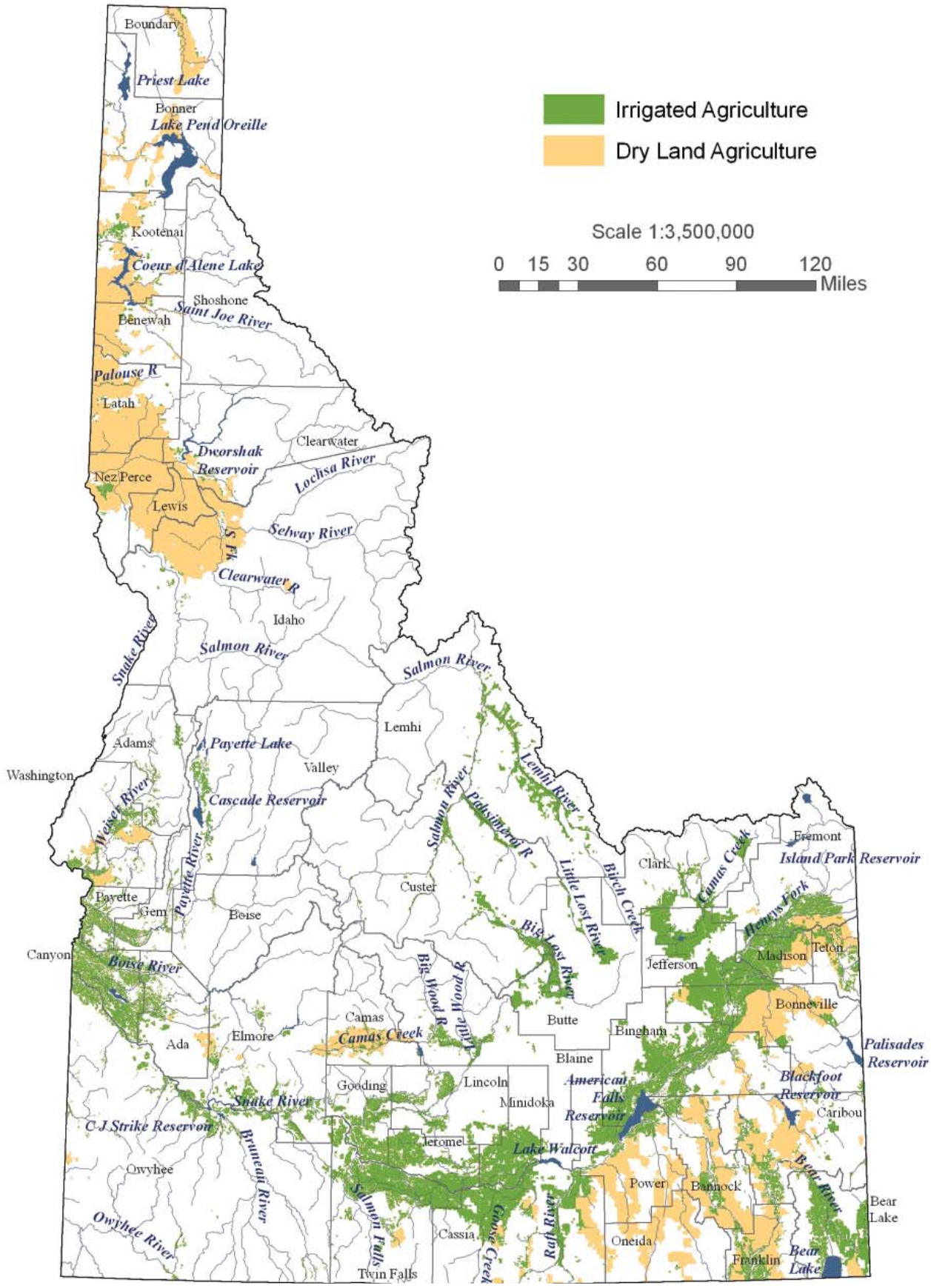


Figure 4.5 — Irrigated and non-irrigated farm land

because plausible financial returns are not great enough to attract necessary capital, the land is managed for multiple and/or competing uses, or water available for new irrigation is limited. In many areas of the state, new irrigation is dependent upon groundwater pumping, new storage construction or the purchase of existing upstream water rights.

The use of sprinkler irrigation has steadily increased. Today, 65 percent of the state's irrigated acreage uses sprinklers. Table 4.1 shows the type of irrigation used and the number of acres by county. Increased water application efficiency has aided Idaho irrigators in maintaining crop production levels even in extremely short water years.

TABLE 4.1 — IRRIGATED ACRES BY COUNTY & METHOD

COUNTY	ACRES IN SPRINKLER IRRIGATION	ACRES IN GRAVITY IRRIGATION	TOTAL ACRES IN COUNTY
Ada	26,710	46,900	678,282
Adams	8,060	19,150	876,296
Bannock	32,750	13,410	736,940
Bear Lake	29,900	22,330	675,837
Benewah	330	430	502,975
Bingham	285,850	31,740	1,360,430
Blaine	29,420	17,820	1,700,328
Boise	1,210	1,190	1,219,825
Bonner	960	850	1,227,903
Bonneville	134,850	23,710	1,221,058
Boundary	420	670	817,093
Butte	46,410	18,770	1,434,516
Camas	9,840	6,540	689,127
Canyon	79,800	150,440	386,057
Caribou	55,180	24,340	1,155,606
Cassia	209,070	67,360	1,653,012
Clark	19,860	10,200	1,131,970
Clearwater	220	140	1,591,508
Custer	28,510	34,160	3,162,193
Elmore	81,250	9,000	1,985,327
Franklin	49,970	12,480	428,094
Fremont	91,420	21,990	1,217,713
Gem	4,080	36,410	361,128

COUNTY	ACRES IN SPRINKLER IRRIGATION	ACRES IN GRAVITY IRRIGATION	TOTAL ACRES IN COUNTY
Gooding	67,550	45,010	469,848
Idaho	1,620	1,640	5,439,930
Jefferson	136,390	90,830	709,660
Jerome	122,430	30,580	385,771
Kootenai	11,070	2,550	842,356
Latah	260	200	688,662
Lemhi	34,460	49,160	2,926,165
Lewis	430	310	306,810
Lincoln	45,250	30,170	772,215
Madison	100,200	18,600	304,049
Minidoka	159,470	33,310	488,425
Nez Perce	920	620	547,700
Oneida	26,550	12,390	770,846
Owyhee	74,420	58,010	4,922,949
Payette	8,840	52,970	262,208
Power	117,090	4,880	924,869
Shoshone	70	0	1,682,327
Teton	44,830	15,280	289,463
Twin Falls	106,090	158,310	1,234,531
Valley	5,380	15,380	2,388,293
Washington	17,600	27,030	941,694
TOTAL	**2,306,990**	**1,217,260**	

Source: USGS 2005 Molly Maupin

Panhandle Basins

Although agriculture encompasses 13 percent land in the Panhandle Basins irrigation is not a major water use because precipitation is adequate for most crops. Crop selection is limited by elevation and growing season. Wheat, peas, lentils are the primary cultivated crops. Grass seed is grown on the Rathdrum Prairie in Kootenai County and the western part of Benewah County. Wild rice is grown along the St. Joe and Coeur d'Alene rivers.

There are approximately 17,000 acres of irrigated land in the five Panhandle counties of Benewah, Bonner, Boundary, Shoshone and Kootenai (Maupin, 2008). Over 10,000 acres are on the Rathdrum Prairie in Kootenai (DEQ, 2008) and over 80 percent of the irrigation is applied using sprinklers. 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.

Bear River Basin

Approximately 233,000 acres in Bear Lake, Caribou, Franklin and Oneida counties are irrigated, with over 80 percent of the water supply coming from surface water diverted from the Bear River and its tributaries (Maupin, 2008). The irrigated lands in the Bear River Basin are devoted mainly to pasture, small grains, alfalfa and other hay crops. Other significant irrigated crops include sugar beets and potatoes.

The average annual acre-feet of surface water withdrawals for the Idaho portion of the Bear River in Idaho is 199,000 based on years 1989 to 2007 (Tuttle, 2008). Since irrigation diversions occur along almost the whole length of the Bear River return flows are an important component in the availability of water in the basin. Withdrawals upstream from Idaho, in Wyoming and Utah, amount to an additional 100,000 acre feet annually.

Snake River Basin

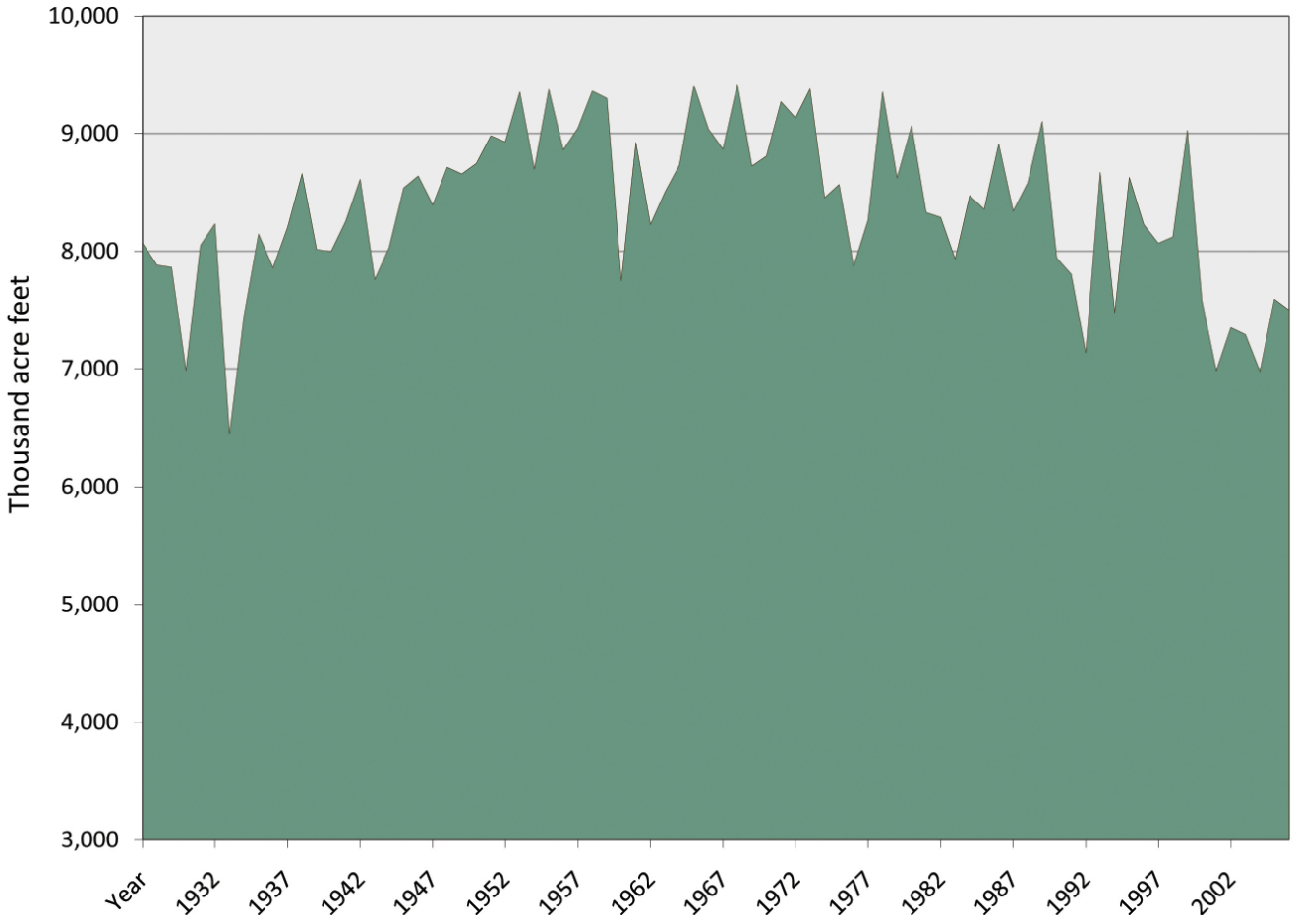
Irrigation demands account for 85 percent of the total water used in the Snake River Basin. Surface water provides 75 percent of the water needs on 3.4 million acres irrigated land in the basin. About 6.1 million acre feet are diverted from the Snake River and another 1.2 million acre feet comes from tributaries in the Upper Snake River above Milner Dam (Olenichak, 2008). An estimated 13.8 million acre feet (Lutz, 2008) is conveyed by over

7,300 miles of canals and laterals Snake River Basin, excluding the Clearwater and Salmon basin (IDWR, 1996).

Groundwater supplies the remaining 25 percent on 1.13 million acres. Groundwater diversions supply approximately 4.2 million acre feet to agricultural lands in the Snake River Basin. About 85 percent of the Snake River basin groundwater withdrawals take place above King Hill.

In the last several decades, there has been a trend toward decreased surface water diversions above Milner Dam. **Figure 4.6** shows the amount of water diverted in thousand acre feet from 1932 through 2007. However, there has been an increase in the conversion of irrigation to sprinklers from gravity.

Figure 4.6 — Amount of water diverted in thousand acre feet from 1932 through 2007



AQUACULTURE

Aquaculture is the farming of fish and other aquatic species under controlled conditions. It is an important part of Idaho's animal industry especially in the Magic Valley region of Southern Idaho. As of the summer of 2008, there were 115 facilities permitted by the Department of Environmental Quality. Most of these facilities are located in two areas: between Twin Falls and Hagerman, and between American Falls and Pocatello. Aquaculture in Idaho is non-consumptive and uses roughly 2.75 million acre feet of water per year (Maupin, 2008). It is estimated that 50 percent of the spring flow along the Snake River between Milner Dam and Bliss Reservoir is used for fish production.

The first modern raceway farm began in 1928 at Snake River Trout Farm at Clear Lakes near Twin Falls. By 1935 four trout farms were in production and that number climbed to eight by 1950. Aquaculture in Idaho expanded greatly in the early 1970's. Most fish hatcheries consist of a series of flow-through raceways that requires a continual flow of water. There are 23 federal, state and tribal hatcheries and over 2,700 ponds and raceways (Lawrence, 2008). The Idaho Department of Fish and Game is responsible for operating 19 hatcheries in the state. Twelve hatcheries produce resident fish; the others grow salmon and steelhead (IDFG, 2008).

In 2008, Idaho was the number one producer of rainbow trout, growing an average of 41 million pounds and supplying 70% of domestic production (University of Idaho, 2008). Rainbow trout are the dominant commercial fish, but the availability of both cooler water and warmer geothermal water allow for the production of other aquatic species. Geothermal springs provide favorable conditions for raising fish such as tilapia. The presence of these springs has contributed greatly to the growth of this species production over the last few years (USDA, 2007). Idaho aquaculture also produces carp, catfish and sturgeon for human consumption. Other fish species raised in Idaho aquaculture facilities include sport fish largemouth bass, crappie, goldfish and koi for ornamental purposes. Other species raised include crawfish, freshwater clams, alligators, caviar, frogs and tadpoles.

LIVESTOCK

A 2007 inventory of all cattle, sheep and hogs totals 2.41 million head. Over two million are cattle, with 23 percent of those being dairy cows. Livestock enterprises are important in most of the state and cattle are raised in every county. Grazing is the single largest land use in Idaho with most cattle concentrated in the eight south-central counties from Gooding to Minidoka, where 43 percent of all calves and cattle are raised (ISCC, 2003). In the high valley areas of the state, cattle and sheep grazing play an important role in the local economy. In these rural areas pratically all agricultural activities are associated with livestock production. Hay and pasture lands are extensive and grazing on public land vital to cattle producers.

Total livestock water use in Idaho is estimated to be roughly 50,000 acre feet per year(Maupin, 2008). Dairy industry withdrawals are estimated at 30,000 acre feet total per year (VanGreuningen, 2007). Water use includes stock watering and other non-farm needs aside from irrgation. Free-range cattle usually drink freely at streams or springs. Within the confined animal feeding operations (CAFOs), water is important not only for watering, but for sanitation needs that include cow and equipment washing.

Over the past ten years, the value of livestock and their products sold have exceeded the value of crops sold, making milk and cattle the top farm commodities (USDA, 2007). Idaho is the 4th largest milk producing state with a 7.2 percent increase between 2005 and 2006 alone (Idaho Department of Agriculture, 2007). From 1991 to 2006 the number of mature dairy cows rose 167 percent (USDA, 2007, MOU). In the past decade, the state has experienced a nine percent decrease in sheep and lambs and a 16 percent decrease in pig and hog production During this same time period, the number of dairy cows in the state increased 79 percent.

DOMESTIC, COMMERCIAL, MUNICIPAL AND INDUSTRIAL WATER USE

In general, water demand for domestic, commercial, municipal, and industrial (DCMI) depends on the size and characteristics of the population including housing density, water related activities, the price of water, weather conditions and the characteristics of the commercial and industrial sectors of the local economy.
DCMI use in Idaho is relatively small, but a clean and consistent supply of water is essential to human life and economic development. Domestic and commercial use applies to homes, restaurants, and office buildings and comprises only one percent of Idaho's total water use (Maupin, 2008). The category includes drinking water, food preparation, sometimes referred to as culinary, washing and lawn and garden watering. Municipalities supply water not only to residents and commercial enterprises but also to schools, fire departments and irrigation for municipal parks. Industrial water use incorporates manufacturing processes, cooling and employee sanitation.

DCMI water use is difficult to quantify because many 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. In 2005, withdrawals for domestic, commercial, municipal and industrial water use in Idaho total an estimated 445,000 acre feet per year (Maupin, 2008).

Statewide, 87 percent of the DCMI demand is supplied from groundwater. In the five Panhandle counties, however, surface water provides about 89 percent of DCMI demand. Industrial water requirement in Idaho amounts to 16 percent of the DCMI use and less than one percent of the total withdrawals for the state.

Over 1,900 regulated public drinking water systems serve 1.2 million people. Public water supply systems are those that serve at least 25 people or have at least 15 service connections. Of these, 752 are community water systems. Community water systems regularly serve

year round residents and include homes, towns or subdivisions (DEQ, 2006). Ninety-five percent of the public systems withdraw their water from groundwater. Municipal water systems provide over 70 percent of the domestic and commercial water Idaho. Idaho public water supplies an average of 180 gallons per person per day (Maupin, 2008).

DCMI demand is increasing due to population growth. Idaho's population has increased over 45 percent between 1990 to 2006 to 1,466,465 people (Census, 2008). The cities, which are the fastest growing areas, may require new water supplies to provide for additional people. As the industrial potential for the area is developed, water requirements for industrial use will also increase.

Commercial and industrial water use includes food processing, manufacturing, and a wide range of miscellaneous needs. Many of these uses have distinct seasonal patterns. For example, water demands for sugar refining and potato processing is highest from September through March. Water use for industrial canning and freezing of fruits and vegetables peaks from July through October. Water use for the processing of milk and meat, including fish is relatively constant throughout the year.

Other water uses include mining which uses less than one percent of the total withdrawals for the state. There are over 7,900 acres in golf courses in Idaho which use an estimated 42,000 acre feet per year for irrigation.

Power Generation

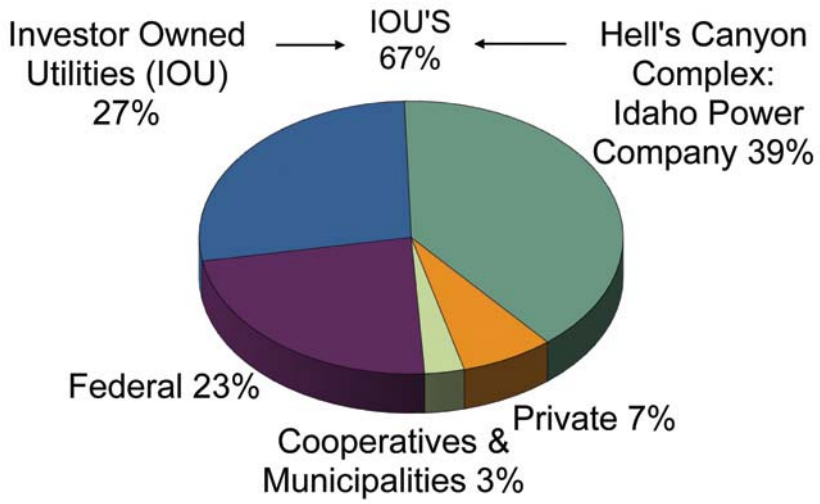
Inexpensive electricity is vital to all sectors of Idaho's economy. Hydroelectric power generation has given Idaho the lowest electricity rates in the nation. Hydropower is renewable, emits no pollutants or greenhouse gases and is an integral part of Idaho's rich history.

The first electricity in Idaho was produced by hydropower in 1882 in Ketchum. By 1901 Swan Falls Dam began providing electricity to Silver

City and its surrounding mining operations. Today, there are about 114 grid-connected hydropower facilities on Idaho rivers and canals, including the Hells Canyon Complex on the Idaho-Oregon border. Many additional small hydropower systems provide electricity "off-the-grid" (off of the electric power grid) to backcountry homes and operations in Idaho. Grid-connected hydropower plants in Idaho have an installed capacity of 3,113 megawatts (MW) and produce about 13 million megawatt-hours (MWH) during a normal water year. An Idaho map showing the location of Federal Energy Regulatory Commission (FERC) licensed and exempted plants is shown in **Figure 4.7**.

Idaho hydropower plants are owned by Investor Owned Utilities (IOU's), the federal government, municipal utilities, electric cooperatives, and private entities that sell power to utilities. A breakdown of the ownership of Idaho hydropower facilities, by the average power production, is provided in **Figure 4.8**. **Table 4.2** lists power producing facilities, their capacity, owners and stream location. About 70 percent of both the hydropower capacity and generation is provided by the three IOU's: Idaho Power Company, Avista Utilities, and Rocky Mountain Power. About 40 percent of Idaho's hydropower generation is from Idaho Power Company's three plants that make up the Hells Canyon Complex and straddle the Idaho-Oregon border: Brownlee, Oxbow, and Hells Canyon. The Idaho Power Company also owns and operates 13 additional plants for a total installed capacity of 1,695 MW.

Figure 4.8 — A breakdown of the ownership of Idaho hydropower facilities, by the average power production



Avista Utilities has two hydropower plants in Idaho on the Spokane and Clark Fork Rivers that have a total installed capacity of 278 MW. Avista also owns and operates hydropower plants up and down stream of these rivers outside of Idaho. Rocky Mountain Power has seven plants in eastern Idaho. Three are located in the Ashton area and four are in the Bear Lake area.

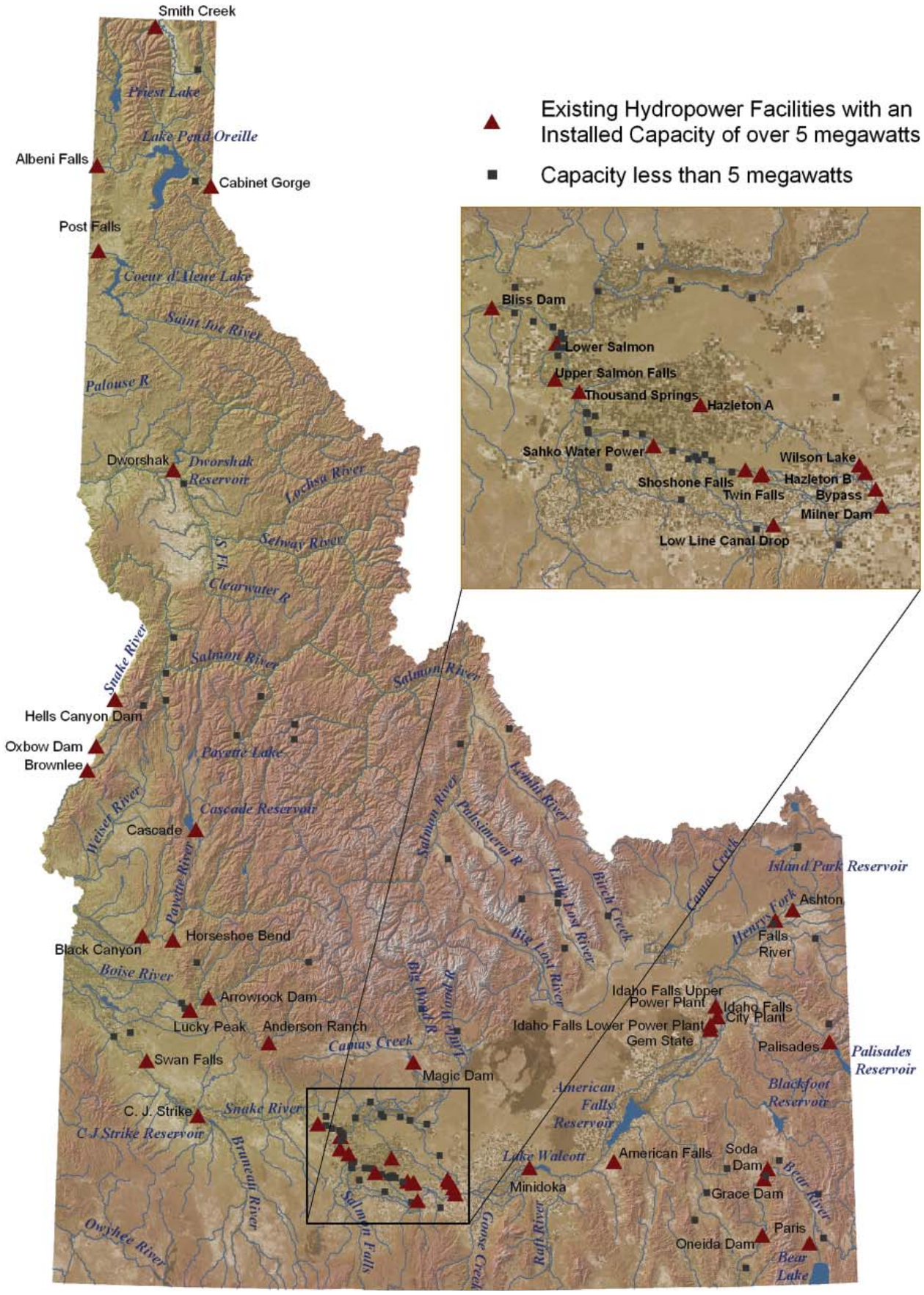


Figure 4.7 — A map showing the location of (FERC) licensed and exempted plants

PROJECT NAME	STREAM	OWNER	CAPACITY (MW)	2005 MWH/YR	POWER MARKETER
Albeni Falls	Pend Oreille River	Corps Of Engineers	49	20,484,300	BPA
American Falls	Snake River	Idaho Power Company	92.4	224,948,000	IPCO
Amy Ranch	Black & Deep Creek	New Energy Inc	0.65	Unknown	RMP-PP
Anderson Ranch	S.F. Boise River	Bureau Of Reclamation	40	161,206,140	BPA
Ashton	Henrys Fork River	Pacificorp	6.85	31,673,000	RMP
Atlanta Power Station	Mf Boise River	Atlanta Power Co. Inc.	0.187	Unknown	AP
Barber Dam	Boise River	Ada County	3.7	9,841,000	IPCO-PP
Bear River	Bear River	Pacificorp		See Projects	RMP
Big Elk Creek Ymca Camp	Tributary	Idaho Falls Family Ymca	0.008		ON SITE
Billingsley Creek	Billingsley Creek	Mike & K. Branchflower	0.28	845,032	IPCO-PP
Birch Creek	Birch Creek	Ted Sorenson	2.7	14,059,000	RMP-PP
Birch Creek Trout Co.	Birch Creek	Everand Jensen	0.086	276,821	IPCO-PP
Black Canyon	Payette River	Bureau Of Reclamation	10	66,145,800	BPA
Black Canyon No. 3	N. Gooding Canal	Chi-Black Canyon Inc.	0.99	337,000	IPCO-PP
Blind Canyon	S. Coulee	Blind Canyon Aquaranch	1.3	3,493,000	IPCO-PP
Bliss Dam	Snake River	Idaho Power Company	73.763	287,702,000	IPCO
Boise Diversion	Boise River	Bureau Of Reclamation	3	14,893,000	BPA
Box Canyon Hydro	Box Canyon Creek	Clear Springs Trout Co.	0.564	1,736,000	IPCO-PP
Briggs Creek	Briggs Creek	Richard Kaster	0.75	3,628,000	IPCO-PP
Brownlee	Snake River	Idaho Power Company	585.4	1,958,064,000	IPCO
Buffalo	Buffalo River	Fall River Rea	0.25	1,119,422	RMP-PP
Bypass	Main/Bypass Canal	Bypass Ltd (Ny)	9.9	23,232,000	IPCO-PP
C.J. Strike	Snake River	Idaho Power Company	82.8	383,049,000	IPCO
Cabinet Gorge	Clark Fork	Avista	263.2	1,003,826,000	AVISTA
Canyon Springs	Artesian Well	Mccollum	0.13	731,835	IPCO-PP
Cascade	N.F. Payette	Idaho Power Company	12.42	37,584,000	IPCO
Cedar Draw	Cedar Draw Creek	Crystal Springs Trout Co.	2.878	7,468,573	IPCO-PP
Clear Lakes	Clear Lakes	Idaho Power Company	2.5	13,238,000	IPCO
Curry Cattle	Lateral 28 Canal	Doug Hull	0.254	328,073	IPCO-PP
Dietrich Drop	Milner-Gooding Canl	Bp Hydro Associates	4.77	12,310,000	IPCO-PP
Dry Creek	Dry Creek	Dry Creek, Llc	3.56	9,499,000	UP&L-PP
Dworshak	N.F. Clearwater	Corps Of Engineers	400	195,477,700	BPA
Dworshak	Nf Clearwater River	Idaho Water Board	3	21,000,000	BPA-PP
Elk Creek	Elk Creek	El Dorado Hydro (Ny)	2.003	4,048,000	IPCO-PP
Falls River	Marysville Canal	Marysville Hydro Prtnrs.	9.1	43,957,833	IPCO-PP
Faulkner Hydro	Northside Y Canal	Faulkner L&L	0.87	2,797,000	IPCO-PP
Felt Dam	Teton River	Fall River Rea	7.45	27,296,690	RMP-PP
Fisheries Development	Billlingsly Creek	Nyal Hoffman	0.249	1,046,939	IPCO-PP
Flying W	Lick Creek	Ronald Vaughn	0.008		ON SITE

Ford Power Project	Jim Ford Creek	Ford Hydro Ltd Prtnrship	1.497	3,781,000	AVISTA -PP
Forgy	Un-Named Spring	John Forgy	0.001		ON SITE
Gem State	Snake River	City Of Idaho Falls	23.5	See Idaho Falls	MUNC
Geo-Bon Ii	Little Wood River	George Arkoosh	1.15	2,659,157	IPCO-PP
Georgetown Irrigation	Georgetown Creek	Georgetown Irrigation Dist.	0.48	1,756,000	RMP-PP
Gillihan	No Name Creek	Catherine Gillihan			ON SITE
Grace	Bear River	Pacificorp	33	61,852,000	RMP
Hailey Hydro	Indian Creek Spring	City Of Hailey	0.046	24	IPCO-PP
Hazelton A	Northside Canal	Northside Canal Co.	8.94	19,839,489	IPCO-PP
Hazelton B	Northside Canal	Northside Canal Co.	7.5	19,653,906	IPCO-PP
Hells Canyon	Snake River	Idaho Power Company	391.5	1,589,522,000	IPCO
Horseshoe Bend	Payette River	L.B. Industries	7.85	33,298,675	IPCO-PP
Idaho Falls	Snake River	City Of Idaho Falls	27	222,365,404	MUNC
City Plant (Rm 800) - 8,300 Kw	Snake River	City Of Idaho Falls		See Idaho Falls	MUNC
Lower Plant (Rm 798) – 11,300 Kw	Snake River	City Of Idaho Falls		See Idaho Falls	MUNC
Island Park	Henry's Fork	Fall River Rea	4.8	17,048,620	BPA-M
James White Hydro	Deer Creek	James White	0.25	1,362,000	AVISTA -PP
Jim Knight Hdyro	S. Gooding Canal	Mutual Energy Company	0.289	1,111,281	IPCO-PP
John Day Creek	John Day Creek	David Cereghino	1.01	2,199,000	AVISTA -PP
Kasel & Witherspoon Co.	Canal	Kw Co Idaho Gen.Partners	1	3,608,400	IPCO-PP
Koyle Ranch	Big Wood River	John Koyle	1.405	2,971,231	IPCO-PP
L&M Angus Ranch (Ingram)	Warm Springs Creek	Lois Von Morganroth	0.86	1,887,000	RMP-PP
Last Chance Canal	Irrigation Canal	Pacificorp Last Chance Canal Co	1.734	2,062,000	RMP
Lateral No. 10	Canal	Lateral 10 Ventures	2.869	8,016,924	IPCO-PP
Lemoyne	Riley Creek	John Lemoyne	0.075	646,643	IPCO-PP
Little Mac (Cedar Draw)	Cedar Draw	T.L. & R.R. Mccauley	1.619	5,201,721	IPCO-PP
Little Wood Ranch	Little Wood River	William Arkoosh	0.662	2,984,634	IPCO-PP
Little Wood Reservoir	Little Wood River	Little Wood Rvr Irr. Dist.	3	6,275,907	IPCO-PP
Low Line Midway	Low Line Canal	Twin Falls Canal Co.	2.3	0	IPCO-PP
Lower Low Line	Lowline Canal	Chi-Idaho Inc	2.8	8,348,525	IPCO-PP
Lower Salmon	Snake River	Idaho Power Company	60	196,441,000	IPCO
Lowline Canal Drop	Lowline Canal	Twin Falls Canal Co.	8.0	22,856,324	IPCO-PP
Lq & Ls Hydro	Lq & Ls Drains	Pigeon Cove Power Co	1.75	7,381,683	IPCO-PP
Lucky Peak	Boise River	Big Bend Irrigation Dist. (Or)	101.25	226,238,000	SCL
Magic Dam	Big Wood River	J. R. Simplot Co.	9	12,180,015	IPCO-PP
Marsh Valley Hydro	Portneuf-M.V. Canal	March Valley Hydro Co	1.65	4,741,000	RMP-PP
Mile 28	Milner/Gooding Canal	John Straubhar	1.5	3,920,704	IPCO-PP
Milner Dam	Snake River	Idaho Power Company	59.448	35,641,000	IPCO

Minidoka (Lake Walcott)	Snake River	Bureau Of Reclamation	28	112,112,550	BPA
Mink Creek	Mink Creek	Robert Fackrell	3.075	10,631,000	RMP-PP
Mora Canal Drop	Boise River	Boise Prjct Board Of Cntrl	1.9	*	IPCO-PP
Moyie River	Moyie River	City Of Bonners Ferry	3.938	30,091,296	BPA
Mud Creek	Mud Creek	Hk Hydro	0.624	1,281,952	IPCO-PP
N-32 (Marco Ranches)	N-32 Canal	Marco Ranches	1.28	2,018,442	IPCO-PP
Nicholson	Uncle Ike Creek	Orville Nicholson	0.45	1,422,000	RMP-PP
O.J. Power Co	Mill Creek	O.J. Power Co	0.26	890,000	RMP-PP
Oneida Hydroelectric Project	Bear River	Pacificorp	30	38,801,000	RMP
Oxbow	Snake River	Idaho Power Company	190	825,345,000	IPCO
Palisades	S.F. Snake River	Bureau Of Reclamation	176	643,661,769	BPA
Pancheri (Telford Pipeline)	Telford Pipeline	Pancheri Inc	0.16	1,279,000	RMP-PP
Paris	Paris Creek	Pacificorp (Or)	715.0	2,756,000	RMP
Portneuf	Portneuf River	Commercial Energy Mngmnt	0.9	1,320,000	RMP-PP
Post Falls	Spokane River	Avista	14.75	86,653,000	AVISTA
Powercat Production Facility	Supply Pipeline Fish Facility	Donald & Diane Campbell			ON SITE
Preston	City's Water Line	City Of Preston	0.41	2,673,000	RMP-PP
Pristine Hydro #1	Warm Creek	Idwr Board		891,438	IPCO-PP
Pristine Springs Hydro #3	Warm Creek	Idwr Board	0.5	1,412,376	IPCO-PP
Ravencroft Ranch	Malad River	Vern Ravenscroft	1.063	1,518,481	IPCO-PP
Reynolds Irrigation	Canal	Reynolds Irrigation Dist.	0.35	1,203,164	IPCO-PP
Rim View	Niagra Springs	Rim View Trout Co	0.525	1,228,061	IPCO-PP
Rock Creek	Rock Creek	Cogeneration Inc (Ut)	2.542	8,771,631	IPCO-PP
Rock Creek #2	Rock Creek	Bonneville Pacific Corp.	1.9	6,314,625	IPCO-PP
Sagebrush Hydro	S. Gooding Canal	Mutual Energy (O'keefe)	0.35	944,141	IPCO-PP
Sahko Water Power	Snake River	J M Miller Enterprises Inc	500	0	IPCO-PP
Schaffner	W.F. Sandy Creek	Lehi Hydro Power Inc	0.45	1,254,677	IPCO-PP
Shingle Creek	Shingle Creek	Willis & Betty Deveny	0.224	794,320	IPCO-PP
Shoshone	Little Wood River	Shorock Hydro, Inc.	0.945	3,676,242	IPCO-PP
Shoshone Falls	Snake River	Idaho Power Company	11.875	82,726,000	IPCO
Smith Creek	Smith Creek	City Of Eugene	37.792	81,053,000	EWEB
Snake River Pottery	Thousand Springs	Aldrich Bowler	0.086	385,049	IPCO-PP
Snedigar Ranch	Coulee Creek	Ls-Lq Hydro. Partners (Ut)	0.54	1,151,114	IPCO-PP
Soda	Bear River	Pacificorp	14	12,799,000	RMP
Soda Creek Hydro	Soda Creek	City Of Soda Springs	0.35	1,254,000	MUN.COOP.
Soda Creek Project No. 4	Soda Creek	City Of Soda Springs	0.5	**	MUN.COOP.
Sunshine Power	Lake Creek	Lee Mcmillian	0.11	117,815	IPCO-PP
Swan Falls	Snake River	Idaho Power Company	25	119,857,000	IPCO
Thousand Springs	Thousand Springs	Idaho Power Company	8.8	52,050,000	IPCO
Twin Falls	Snake River	Idaho Power Company	42.217	54,446,000	IPCO

Upper & Lower Malad	Malad River	Idaho Power Company	21.77	158,637,000	IPCO
Upper Plant (Rm804) - 8,300 Kw	Snake River	City Of Idaho Falls		See Idaho Falls	MUNC
Upper Salmon Falls	Snake River	Idaho Power Company	34.5	190,867,000	IPCO
White Ranch	Mud Creek	Mud Creek Hydro (Ut)	0.284	328,073	IPCO-PP
White Water Ranch	Stoddard Creek	Stan Standal	0.17	561,386	IPCO-PP
Wilson Lake	Wilson Lake	North Side Canal Co.	6.3	22,224,034	IPCO-PP
Zena Creek Ranch	Zena Creek	James Adkins			ON SITE

Federal hydropower plants, operated by either the U.S. Bureau of Reclamation (USBR) or the U.S. Army Corps of Engineers (USACE), located within the state have a combined installed capacity of 706 MW. The USBR operates the five federal plants in southern Idaho; Anderson Ranch, Black Canyon, Boise Diversion, Minidoka, and Palisades. The USACE operates the two federal facilities in northern Idaho: Dworshak Dam and Abeni Falls. At some federal facilities the first obligation is to provide electricity to irrigators. Once that obligation is met, the Bonneville Power Administration (BPA) then markets the electricity.

Three of Idaho's 12 municipal electric utilities operate hydropower plants in the State. The City of Idaho Falls has four plants, the City of Soda Springs has two plants, and the City of Bonners Ferry has one. These plants have a total combined capacity of 55 MW. The City of Preston, City of Hailey and Ada County also each own a plant, but the power from these plants is sold to the local IOU.

The passage of the federal Public Utilities Regulatory Policies Act (PURPA) in 1978 requires utilities to purchase energy from "qualifying facilities" (QFs). Renewable generation facilities, including hydropower plants, are QFs. The Federal Energy Regulatory Commission (FERC) administers PURPA and permits the construction and operation of hydropower facilities. However, it leaves the determination of how much independent power producers will be paid for their power, or "avoided costs" to the states.
The policies established by the Idaho Public Utilities Commission (IPUC) in the 1980's were favorable toward QFs and led to the development of about 75 hydropower plants in the state. Within the 10-year period after the IPUC first implemented PURPA Idaho increased its power production from hydropower by over 10 percent.

Since about 1995, only a handful of new hydropower plants have been built. Today the combined capacity of privately owned hydropower facilities is nearly 780 MW. All but three of independently owned hydropower plants sell their electricity to one of Idaho's Investor Owned Utilities. Power produced from plants at Lucky Peak, Smith Creek and

Dworshak (Idaho Water Resource Board) are sold to the City of Seattle, Eugene Water and Electric Board and the BPA, respectively.

Since water used in hydropower generation is not consumptively used; the water is available for other uses after passing through a power generation facility. The hydropower generation that is available in a given year can vary widely due to variation in rainfall and mountain snowpack. In 2005, a low water year, hydropower provided about 51 percent of the electricity consumed in the state. In 2006, a high water year, hydropower provided about 67 percent of the electricity consumed. The energy output from Idaho hydropower facilities is highly seasonal, peaking during the spring runoff and declining in the late summer and fall.

While Idaho's most promising hydroelectric sites have already been developed the Idaho National Laboratory estimates that there are 2,100 MW of potentially developable new hydroelectric resources at 6,700 sites around the state.

Geothermal Water Use

Artifacts and petroglyphs at hot springs indicate that Native Americans made use of Idaho's vast resources of geothermal water. In the late 1890's, commercial use of Idaho's geothermal resources began with the development the Boise Warm Springs Water District heating system. Over the next 100 years, Idahoans put geothermal water to use for recreation (swimming and soaking pools), greenhouse heating, aquaculture, and space heating of residential and public buildings. Although Idaho is a national leader in direct use applications of geothermal water, only an estimated 17 percent of the low temperature geothermal springs and wells in the state are being used for thermal purposes.

Four industries in Idaho directly use geothermal resources: space heating for living and work spaces, aquaculture, heating for greenhouses, and recreation. Four direct heating systems in the Boise

area withdrawal approximately 775 million gallons per year to heat homes, government buildings and businesses; most of the water is re-injected after heating the buildings. Heating systems in the Twin Falls area supply low temperature geothermal water to homes, buildings on the College of Southern Idaho campus, a high school, and the Twin Falls swimming pool. Thirteen aquaculture sites use natural hot water to grow catfish, tilapia, ornamental fish, coral, aquatic plants, and alligators. There are ten greenhouses in southern Idaho using geothermal resources to produce flower and vegetable crops. There are 37 developed recreation sites making use of wells or spring water with temperatures over 85 degrees Fahrenheit (Neely, 2007). Undeveloped hot springs occur throughout numerous areas in southern and central Idaho.

In 2007, Idaho's first geothermal power plant began producing electricity. Located in south central Idaho (Cassia County), the Raft River plant was designed to produce 13 megawatts of electricity. Additional phases of the Raft River Project are in the planning stages, and other areas in the state are being investigated by at least three companies for their geothermal power potentials.

Fish and Wildlife

Idaho's fish and wildlife resources 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.

In Idaho there are 1191 known animal species including 619 vertebrate, 83 species of fish and 572 invertebrates (IDFG, 2007). Rivers, streams, wetlands, and riparian communities are the permanent or temporary home to the majority of the state's fish and wildlife. There are 83 species of fish in 100,000 miles of streams and 464,000 acres of lakes and reservoirs (IDFG, 2007).

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 habitat, and contributed to spring flow decline. Water diversion has contributed to disconnected streams and flow-limited reaches for aquatic species.

Concern over habitat degradation and population decline has led to the federal listing of endangered and threatened species under the federal Endangered Species Act. An Endangered species is in danger of extinction throughout all or a significant portion of its range, while a Threatened species is likely to be listed as Endangered in the foreseeable future. **Table 4.3** list the Federally designated Threatened or Endangered species in Idaho who rely upon aquatic, riparian or wetland habitats.

The Governor's Office of Species of Conservation (OSC, 2008), was created by the 2000 Legislature to coordinate policies and programs related to the conservation of threatened, endangered and candidate species in Idaho. OCS coordinates and implements decisions to preserve, protect, and restore species listed as Threatened or Endangered under the federal Endangered Species Act. The OSC coordinates with natural resource agencies, with input from Idaho citizens, and includes consideration of the state's economic vitality.

In addition to the conservation and restoration work being coordinated by the OSC, the Idaho Department of Fish and Game (IDFG) developed a comprehensive wildlife conservation strategy to address the issue of rare and declining species. The strategy was accepted by the US Fish and Wildlife Service in February 2006. This strategy identifies species of greatest conservation need (SGCN) and lays out the life history and habitat requirements for those species to best develop conservation actions. Coordination, cooperation, data collection, adaptive management, and public participation are all important elements of the strategy.

TABLE 4.3 — FEDERAL THREATENED & ENDANGERED SPECIES IN IDAHO ASSOCIATED WITH AQUATIC, RIPARIAN OR WETLAND HABITAT

Bald Eagle, *Haliaeetus leucocephalus*
Sockeye Salmon, *Oncorhynchus nerka* (Snake River runs)
White Sturgeon, *Acipenser transontanus* (Kootenai River)
Bull Trout, *Salvelinus confluentus*
Chinook Salmon, *Oncorhynchus tshawytscha* (Snake River runs)
Steelhead, *Oncorhynchus mykiss* (Snake River runs) gairdneri?
Banbury Springs Lanx, *Lanx* sp.
Bruneau Hot Springsnail, *Pyrgulopsis bruneauensis*
Utah Valvata, *Valvata utahensis*
Idaho Springsnail, *Pyrgulopsis idahoensis*
Snake River Physa, *Physa natricina*
Bliss Rapids Snail, *Taylorconcha serpenticola*
PLANTS:
Ute Ladies' Tresses, *Spiranthes diluvialis*
Water howellia, *Howellia aquatilis*
CANDIDATE FOR PROPOSAL:
Columbia Spotted Frog, *Rana luteiventris* (Great Basin population)

Source: Office of Species Conservation

Sixteen fish species have been identified as SGCN under the comprehensive wildlife conservation strategy. Other SGCN species associated with aquatic riparian or wetland habitats include twenty-five birds, four amphibians, seven insects, three bivalves, and several gastropods. **Table 4.4** lists the Idaho fish identified as having the Greatest Conservation Need. **Table 4.5** lists other SGCN Associated with aquatic, riparian or wetland habitats.

INVASIVE SPECIES

Invasive species are generally those plants and animals not native to an area, and specifically are those species that have the potential to spread uncontrollably and cause ecological or economic damage. Aquatic Nuisance Species (ANS) are those plants and animals that depend upon water or riparian areas.

TABLE 4.4 — FISH SPECIES OF GREATEST CONSERVATION NEED

Pacific Lamprey, *Lampetra tridentata*
White Sturgeon (Snake River System), *Acipenser transmontanus*
White Sturgeon (Kootenai River System), *Acipenser transmontanus*
Northern Leatherside Chub, *Lepidomeda copei*
Bonneville Cutthroat Trout, *Oncorhynchus clarki utah*
Yellowstone Cutthroat Trout, *Oncorhynchus larkia bouvieri*
Westslope Cutthroat Trout, *Oncorhynchus clarki lewisi*
Inland Redband Trout, *mykiss gairdneri*
Kokanee, *Oncorhynchus nerka*
Bear Lake Whitefish, *Prosopium abyssicola*
Bonneville Cisco, *Prosopium gemmifer*
Bonneville Whitefish *Prosopium spilonotus*
Burbot, *Lota lota*
Bear Lake Sculpin, *Cottus extensus*
Shoshone Sculpin, *Cottus greenei*
Wood Rive Sculpin, *Cottus leiopomus*

Several factors contribute to Idaho vulnerability to non-native species. Recreational opportunities lure boaters and fisherman from other regions. Also, Idaho's growing population increases the threat of accidental introduction. Historically many invasive species were introduced as ornamental plants or released animals. The impact of that introduction often remained unknown until the damage was too widespread to contain.

TABLE 4.5 — TERRESTRIAL SPECIES OF GREATEST CONSERVATION NEED ASSOCIATED WITH AQUATIC, RIPARIAN OR WETLAND HABITAT

BIRDS:
Trumpeter Swan, *Cygnus buccinator*
Northern Pintail, *Anas acuta*
Lesser Scaup, *Aythya affinis*
Harlequin Duck, *Histrionicus histrionicus*
Hooded Merganser, *Lophodytes cucullatus*
Common Loon, *Gavia immer*
Red-necked Grebe, *Podiceps grisegena*
Western Grebe, *Aechmophorus occidentalis*
Clark's Grebe, *Aechmophorus clarkii*
American White Pelican, *Pelecanus erythrorhynchos*
Great Egret, *Ardea alba*
Snowy Egret, *Egretta thula*
Black-crowned Night-Heron, *Nycticorax nycticorax*
White-faced Ibis, *Plegadis chihi*
Sandhill Crane, *Grus canadensis*
Black-necked Stilt, *Himantopus mexicanus*
American Avocet, *Recurvirostra americana*
Long-billed Curlew, *Numenius americanus*
Wilson's Phalarope, *Phalaropus tricolor*
Franklin's Gull, *Larus pipixcan*
California Gull, *Larus californicus*
Caspian Tern, *Sterna caspia*
Forster's Tern, *Sterna forsteri*
Black Tern, *Chlidonias niger*
Blue Grosbeak, *Passerina caerulea*
AMPHIBIANS:
Woodhouse's Toad, *Bufo woodhousii*
Columbia Spotted Frog (populations south of the Snake River), *Rana luteiventris*
Northern Leopard Frog, *Rana pipiens*
Idaho Giant Salamander, *Dicamptodon aterrimus*
Coeur d'Alene Salamander, *Plethodon idahoensis*

INSECTS:
A Mayfly, *Caurinella idahoensis*
A Mayfly, *Ametropus ammophilus*
A Mayfly, *Centroptilum selanderorum*
A Stonefly, *Capnia zukeli*
A Stonefly, *Soyedina potteri*
A Stonefly, *Pictetiella expansa*
An Agapetus Caddisfly, *Agapetus montanus*

The interagency Idaho Invasive Species Council works to coordinate early detection, provide education, seek funding and effect legal change to stop the spread of invasive species. In the spring of 2008, the Idaho State legislature passed the Idaho Invasive Species Act. This law tasks the Idaho Department of Agriculture with the primary authority to control this threat. The law allows for coordination between agencies, imposes penalties for violations and establishes a fund for prevention, detection and control. Violations include the transport, sale, propagation and distribution of species determined to be a threat.

The 100th Meridian Initiative (whose cooperators include state, federal and Canadian agencies) was formed specifically to arrest the westward expansion of zebra and quagga mussels. These ¾ inch mussels are natives of the Caspian and Black Seas, and were first discovered in Michigan in 1988. In January 2007 quagga mussels were discovered in Lake Mead in Nevada. These small mussels attach themselves to boats and may be transported from waterbody to waterbody. Once established they spread, covering everything from rope to boat bottoms. Steam cleaning boats that are traveling from one location to another, is one of the best ways to prevent the spread of this species.

The Idaho Aquatic Nuisance Species Plan identifies 88 aquatic and terrestrial wetland plants as non indigenous (IISC, 2007). The report also lists 45 species of fish, two amphibians and five invertebrates. Of these the New Zealand mudnsail, Asian clam and whirling disease are high priority aquatic nusiance species (ANS). The list of plants includes

Eurasian water milfoil, parrot feather milfoil, yellow flag iris, curly leaf pondweed, purple loosestrive and saltcedar.

The 2009 Idaho Legislature passed a law requiring boaters, both motorized and non-motorized, to purchase Idaho Invasive Species Stickers. Non-motorized inflatable vessels less than 10 feet long are exempt. The money will fund programs designed to prevent the introduction of invasive aquatic species to Idaho. Programs include vessel inspection at boat launch sites, washing stations and educational materials for the public.

Recreation

The Idaho Department of Commerce estimates that the recreation and tourism industry is the third largest industry in the state (IDFG, 2007). In 2004 the travelers in Idaho contributed 2.9 billion dollars to the economy supporting over 68,000 jobs (Global Insight, 2004). According to an economic impact study commissioned in 2004, Idaho's $2.97 billion tourism industry created jobs for Idahoans and generated $438 million in local, state and federal tax revenues (Department of Commerce, 2008). 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. Additionally, in a state covered with rugged mountains, river canyons are often a transportation corridor. In Idaho, roads, trails, campgrounds and other recreation areas are usually located along water courses.

Water recreation is an important source of revenue for the outfitting and guiding industry. In 2005, 68,552 fisherman participated in guided boating, including both float and power boat trips (Simmonds, 2008). According to the Idaho Outfitters and Guides Licensing Board, a self governing state agency, 68,552 guided fisherman and 148,959 people participated in guided float and power boating trips. The number of guided fisherman increased by 26.3 percent since 1995 and guided boating numbers increased 56.6 percent. Fishing revenue has increased from $3.0 million to $3.7 million. Boat revenue has more than doubled

since 1995 from $14 million to $29 million. **Figure 4.9** displays the percent of Idahoan's participating in outdoor recreation. **Table 4.6** lists the percent of Idahoan's engaged in boating activities.

BOATING

Boating opportunities are numerous in Idaho and nearly 400,000 people boat Idaho's waters each year. (IDPR, 2007). The state has more than 650,000 acres of boatable waters encompassing rivers lakes and reservoirs (**Table 4.7**). In 2006 over 86,000 motorized boats used Idaho's waters. This was a five percent increase since 2002 (IDPR, 2006). The number of motorized boats is growing by approximately three percent annually. Much of this increase is attributed to the rapid growth in the use of personal watercraft, the use of which is growing at a 15 percent annual rate in Idaho. Estimates indicate that there are over 100,000 non-motorized or manually propelled boats such as row boats, canoes, kayaks, and inflatable boats in Idaho (IDPR, 2007). Boater registration

Figure 4.9 — Percent of Idahoan's participating in outdoor recreation

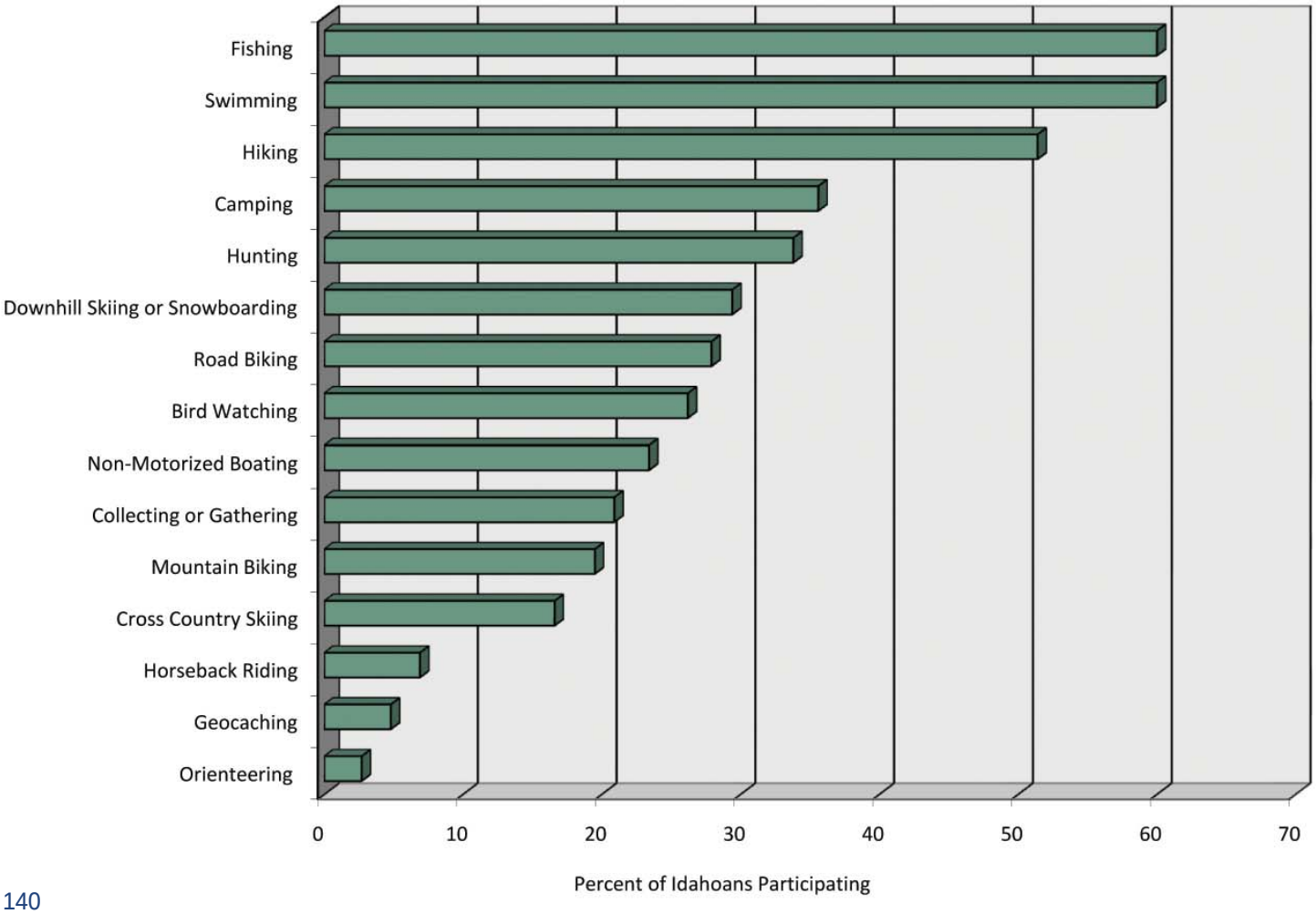


TABLE 4.6 — TOTAL SURFACE WATER DIVERSIONS ABOVE MILNER

ACTIVITY	PERCENT OF IDAHO RESIDENTS
Power Boating for Pleasure	28
Water Skiing or Towing	20
Canoeing	19
White Water Rafting	16
Jet Boating	12
Personal Watercraft	10
Lake Kayaking	8
Sailing	5
Whitewater Kayaking	3

Source: IDPR, 2005

TABLE 4.7 — BOATABLE SURFACE ACRES IN IDAHO BY REGION

REGION	SURFACE ACRES %	PERCENT OF STATE TOTAL
Panhandle	176,695	25.7%
Clearwater	33,530	9.4%
Southwest Idaho	127,003	20.8%
South Central	29,635	4.6%
Southeast Idaho	134,355	20.7%
Upper Snake	80,075	12.2%
Upper Salmon	42,812	6.6%
TOTAL	**651,257**	

TABLE 4.8 — IDAHO WHITE WATER TRAIL

RIVER	MILES
Clearwater	61
Boise	16.5
Jarbridge/Bruneau/Owyhee	104
Lochsa	57
Payette	127
Salmon	416
Selway	63
Snake	142.5
TOTAL	987

is highest in the five northern counties of the Panhandle that contain Idaho's largest lakes. The southwest region of the state has the second highest boater registration.

Within Idaho, there are more than 3,100 miles of whitewater on over 67 rivers and streams, more than any other of the lower 48 states. Opportunities for all skill levels are available. Many of these rivers attract people from around the country and world. Idaho's white water trail system includes 987 miles on eight river systems (**Table 4.8**). Four rivers within the state require would-be boaters to have a permit. These rivers include the Main Salmon, the Middle Fork of the Salmon, the Selway and the Snake-Hells Canyon. Permits are allocated by a computerized lottery system. In 2007, 1049 permits were issued out of 16,257 applications (USFS, 2008). The state Department of Parks and Recreation estimates that the popularity of boating will continue to increase in the years to come.

FISHING

Idaho has significant fishing resources that include over 26,000 miles of fishing streams and over 200 major lowland lakes and reservoirs. In 2008 over 436,000 individuals purchased fishing licenses* (Norrell, 2009). Residents constitute about two-thirds of the anglers who fish in Idaho. The greatest numbers of resident anglers live in the Southwest (40 percent) and Panhandle (15 percent) regions and about two percent live in the Salmon Region. Most non-resident anglers come from Utah and Washington (IDFG, 2007).

*This number includes combination hunting and fishing licenses and one day, non-resident licenses.

Fishing in Idaho generated $437,631,735 in statewide retail sales in 2003 with an additional $12,289,806 for fishing licenses and permits (IDFG, 2003). In 2003 one in four eligible people in the state purchased a fishing license (Columbia Basin Bulletin, 2008). Fish and Game estimates that over 424,000 anglers spent more than 3.9 million days (2.9 million trips) on Idaho waters in 2003. Fishing revenue is especially important to rural counties such as Fremont, Idaho and Custer which had the highest angler spending in 2003 (IDFG, 2008). The most preferred species sought in Idaho are trout, bass and steelhead. Fish and Game issued over 106,000 permits for Steelhead and Chinook salmon in 2003 (IDFG 2007).

REFERENCES

American Rivers, 2009. Available at URL:
www.americanrivers.org/newsroom/press-releases/2009/president-obama-signs.html

Columbia Basin Fish and Wildlife News Bulletin, 2008. Idaho Fish And Game Releases Releases Sport Fishing Economic Report. Available at URL:
www.cbbulletin.com/292561.aspx

Department of Environmental Quality, 2008. Groundwater in Idaho: Rathdrum Prairie Aquifer Available at URL:
www.deq.state.id.us/water/prog_issues/ground_water/rathdrum_prairie_aquifer/index.cfm

Falk, Dean E. 2008. Water Needs for Dairy Farms. Available at URL:
www.oneplan.org/Stock/DairyWater.shtml

Harvey, Jacqueline, 1999. Idaho Fish Hatcheries. Available at URL:
imnh.isu.edu/digitalatlas/geog/fishery/hatchery.htm

Global Insight, 2005 The Economic Impact of Travel and Tourism in Idaho: A Comprehensive Analysis. Available at URL:
labor.idaho.gov/publications/tourism_economic_impact_2005.pdf (page 5)

Idaho Department of Agriculture, 2007. Idaho State Department of Agriculture Dairy MOU Report, April 23, 2007. Available at URL:
www.agri.idaho.gov/Categories/Animals/Dairy/Documents/MouWeb2006.pdf

Idaho Department of Commerce, 2008. Tourism Information. Available at URL:
commerce.idaho.gov/travel/

Idaho Department of Environmental Quality, 2008. Aquaculture in Idaho. Available at URL:
www.deq.state.id.us/water/prog_issues/agriculture/aquaculture.cfm

Department of Environmental Quality, 2006. 2006 Idaho Public Water System Annual Compliance Report. Available at URL:
www.deq.state.id.us/water/data_reports/drinking_water/acr_06.pdf

Grunder, S.A., T.J. McArthur, S. Clark, V.K. Moore, 2008, Idaho Department of Fish And Game 2003 Economic Survey Report

Idaho Department of Fish and Game, 2008. Fish Hatcheries. Available at URL:
fishandgame.idaho.gov/cms/fish/hatcheries/

Idaho Department of Fish and Game. 2007. Fisheries Management Plan 2007 – 2012 Available at URL: fishandgame.idaho.gov/fish/programs/fish_plan.pdf

Idaho Department of Fish and Game, 2003. 2003 Idaho Sport Fishing Economic Report Available at URL: fishandgame.idaho.gov/cms/fish/misc/03econstudy/

Idaho Office of Energy Resources Geothermal Webpage
www.energy.idaho.gov/informationresources/d/geothermal_book_complete_2007.pdf

Idaho Department of Parks and Recreation, 2010, Invasive Species Prevention in Idaho. Available at URL: parksandrecreation.idaho.gov/idahoinvasivespeciesfund.aspx

Idaho Department of Parks and Recreation, 2006, Idaho Primary Boat Registration Designation Statistics 2002-2006. Available at URL: parksandrecreation.idaho.gov/assets/content/docs/Registration/2006 Boat Registrations.pdf

Idaho Invasive Species Council, 2005. Idaho's Action Plan for Invasive Species. Available at URL: www.idl.idaho.gov/invasivespecies/invasive_species_resources/idaho_invasive_species_plan.pdf

Idaho Invasive Species Council Technical Committee, 2007. Idaho Aquatic Nuisance Species Plan: A Supplement to Idaho's Strategic Action Plan For Invasive Species. Prepared for Governor C. L. "Butch" Otter and the Idaho Invasive Species Council. Available at URL: www.anstaskforce.gov/State Plans/Idaho_ANS_Plan_2007.pdf

Idaho Soil Conservation Commission, 2003, Idaho Agricultural Pollution Abatement Plan. Available at URL: www.scc.idaho.gov/PDF/AgPlan.pdf

Idaho Department of Water Resource, 1996, 1:100,000 Scale Hydrography data

Idaho Department of Water Resources, 2008. Water Use Information. Available at URL: www.idwr.idaho.gov/WaterManagement/WaterRights/wateruse.htm

IDWR, May 15, 2004, Fact Sheet on Snake River Water Agreement. Available at URL: www.idwr.idaho.gov/waterboard/WaterPlanning/NezPerce/pdf_files/fact-sheet.pdf

Lawrence, Debra. DVM, Division of Animal Industries, Idaho Department of Agriculture 2008. Personal Communication, August 4, 2008

Lutz, Dick, Idaho Department of Water Resources,2008 Personal Communication

Maupin, M. 2008, Water-Use Estimates for 2005. U.S. Geological Survey

McGown, Mary. "The Snake River Basin Adjudication – Nez Perce Tribe Water Rights Settlement" Powerpoint presentation. Moscow, Idaho. September 14-16, 2005

Neely, K.W., 2007, Geothermal Resources In Idaho, A Consumer's Guide. Originally published in 2003 by Harrington, H., Neely, K., and Weihung, W. Idaho Department of Water Resources Energy Division, 18 p. Available at URL: www.energy.idaho.gov/informationresources/d/geothermal_book_complete_2007.pdf

Norrell , Celeste, Idaho Department of Fish and Game, 2008, Personal Correspondence, February 12, 2009 0210

Olenichak, Tony, Idaho Department of Water Resources, 2008. Personal Communication

Tuttle, Bruce, Idaho Department of Water Resources, 2008. Personal Communication

U.S. Department of Agriculture, National Agricultural Statistics Service, Idaho Field Office, 2007. Idaho Agricultural Statistics

U.S. Census Bureau, 2008. State and County Quick Facts: Idaho. Available at URL: quickfacts.census.gov/qfd/states/16000.html

U.S. Geothermal website: www.usgeothermal.com/index.aspx

VanGreuningen, Stuart, et al., 2007, Review and Analysis of the WMC Mitigation Agreement, Idaho Department of Water Resources Memo. U.S. Department of Agriculture, National Agricultural Statistics Service, Idaho Field Office, 2007. Idaho Agricultural Statistics

GLOSSARY

Acre-foot
The volume of water required to cover one acre of land (43,560 square feet) to a depth of one foot; equivalent to 325,80 gallons.

Adjudicated water right
A water right for which the defining parameters required by law have been determined and decreed by a court of law.

Anadromous
Fish species, such as salmon, that are born in fresh water, spend most of their adult life in the ocean, and return to fresh water to reproduce.

Appropriate or appropriation
To obtain the right to divert and use the public waters of the state of Idaho.

Beneficial use
The uses of water that can legally be protected by water rights.

Board
Idaho Water Resource Board.

Comprehensive State Water Plan
A plan adopted by the Idaho Water Resource Board and approved by the legislature pursuant to Section 42-1734A of the Idaho Code.

Consumptive use
The portion of the volume of water diverted under a water right that is transpired by vegetation, evaporated from soils, converted to non-recoverable water vapor, incorporated into products, or otherwise does not return to the waters of the state. Consumptive use does not include any water that falls as precipitation directly on the place of use unless it is captured, controlled, and used under an appurtenant water right [Idaho Code 42-202B(1)].

Cubic feet per second (cfs)
One cubic foot per second is the rate of flow of one square foot of water that is flowing at mean velocity of one foot per second. It is equal to 448.8 gallons per minute, or 1.98 acre-foot per day.

Decree
A written decision by a court of law. Water right disputes are sometimes taken to court for resolution – the resultant description of the water rights in question are known as "decreed" water rights.

Domestic water use
The use of water as described in Idaho Code 42-111. Domestic use can be for home, livestock, and for any other purposes in connection with a home, including irrigation of up to one-half acre of land. The total use cannot exceed 13,000 gallons per day. Domestic use can also be for other small uses such as commercial or business establishments, if the total diversion rate does not exceed 0.04 cubic feet per second and a diversion volume of 2,500 gallons per day.

Endangered Species Act
A federal statute that invokes protection for the species listed under the law (16 U.S.C. §1536). Animals and plants are designated as "endangered" or "threatened" by either the U.S. Fish and Wildlife Service or the U.S. National Marine Fisheries Service. There are other designations for "experimental populations." Listed populations receive the highest protection possible, with penalties for taking, harming, or injuring an individual or its environment. Special procedures apply to government projects in areas where listed species may be present.

Evapotranspiration
The loss of moisture by evaporation from land and water surfaces and transpiration from plants.

Ground water
All water under the surface of the ground whatever may be the geological structure in which it is standing or moving (Idaho Code 42-230).

Idaho Code
Idaho laws, as written by the state legislature and approved by the governor.

Idaho Water Resource Board
A constitutional water agency within the Idaho Department of Water Resources consisting of eight appointed members pursuant to the provisions of Article 15, Section 7 of the Idaho Constitution (Idaho Code 42-1732).

Irrigation
The watering of cropland. Residential lawn and garden uses are not considered "irrigation" in the context of water rights issued by the state of Idaho.

Natural River
A designation made by the Idaho Water Resource Board. It defines a waterway which possesses outstanding fish and wildlife, recreation, geologic, or aesthetic values; which is free of substantial existing human-made impoundments, dams, or other structures; and of which the riparian areas are largely undeveloped although accessible in places by trails and roads [Idaho Code 42-1731(7)].

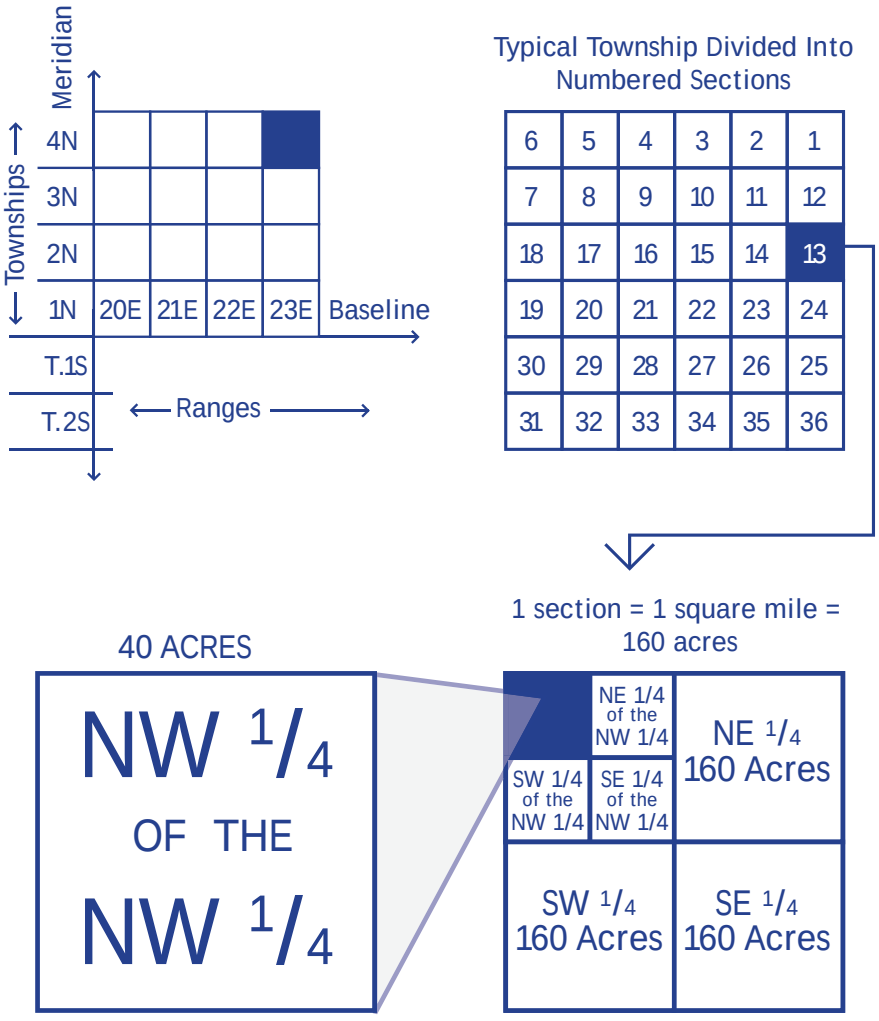
Recreational River
A designation made by the Idaho Water Resource Board. It defines a waterway which possesses outstanding fish and wildlife, recreation, geologic or aesthetic values, and which might include some human-made development within the waterway or within the riparian area of the waterway [Idaho Code 42-1731(9)].

Rental pool
A market for exchange of stored water operated by a local committee. The committee is appointed by the Idaho Water Resource Board.

Total Maximum Daily Load (TMDL)
The sum of all pollutants in a waterway. Pollutant levels established through TMDL standards must be at or below the level that the water body can assimilate without violating the state's water quality standards.

Water right
The legal right, however acquired, to the use of water for beneficial purposes [Idaho Code 42-230(e)].

PUBLIC LAND SURVEY DESIGNATIONS



ACRONYMS

AF	Acre feet
AFA	Acre feet per annum
BLM	Bureau of Land Management
cfs	Cubic feet per second
DCMI	Domestic, commercial, municipal, industrial
EPA	Environmental Protection Agency
ESPA	Eastern Snake Plain Aquifer
FERC	Federal Energy Regulatory Commission
GWMA	Ground Water Management Area
HUC	Hydrologic unit code
IDEQ	Idaho Department of Environmental Quality
IDAPA	Idaho Administrative Procedures Act
IDWR	Idaho Department of Water Resources
IWRB	Idaho Water Resources Board
Kaf	Thousand Acre Feet
NRCS	Natural Resource Conservation Service
SRBA	Snake River Basin Adjudication
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WAG	Watershed advisory group
WSA	Wilderness Study Area