APPENDIX A: GLOSSARY

AF or acre-foot, means the volume of water required to cover 1 acre of land (43,560 sq. ft.) to a depth of 1 foot; this is equivalent to 325,851 gallons.

BLM means Bureau of Land Management.

BNF means Boise National Forest.

BOR means Bureau of Reclamation.

cfs or cubic foot per second, means a unit of discharge for measurement of a flowing liquid equal to a flow of 1 cubic foot per second, 449 gallons per minute, or 1.98 AF per day.

DCMI means domestic, commercial, municipal and industrial uses.

DEQ means Division of Environmental Quality.

FERC means Federal Energy Regulatory Commission.

IDC means Idaho Department of Commerce.

IDFG means Idaho Department of Fish and Game.

IDHW means Idaho Department of Health and Welfare.

IDL means Idaho Department of Lands.

IDPR means Idaho Department of Parks and Recreation.

IDT means Idaho Department of Transportation.

IDWR means Idaho Department of Water Resources.

IWRB or Board means Idaho Water Resource Board.

RVD means recreational visitor days. One RVD is equivalent to one person spending 12 hours at a particular activity.

SCORP means State Comprehensive Outdoor Recreation Plan.

USACE means United States Army Corps of Engineers.

USFS means United States Forest Service.

USFWS means United States Fish and Wildlife Service.

Adjudicated means ownership or management that has been legally established in a court of law.

Alteration means any activity using mechanized equipment that moves or overturns gravel or earth.

Anion means a negatively charged ion in a chemical compound.

Annual sustained yield means that the yield of timber harvested in a given year is equivalent to the tree replacement during that same time period.

Anadromous means fish species that spend most of their adult life in the ocean and migrate to fresh water to spawn.

Benthic invertebrates means small spineless animals such as aquatic insects and worms, that typically live on the bottoms of streams and lakes.

Candidate species means species for which there is sufficient information available to propose their listing as threatened or endangered.

Cation means a positively charged ion in a chemical compound.

Chernozem means the black earth soils of prairies through which percolation is incomplete.

Cogeneration means production of two useful forms of energy such as thermal and electricity from the same process.

Comprehensive State Water Plan means the plan adopted by the board pursuant to section 43-1734A, Idaho Code, or a component of such plan developed for a particular water resource, waterway or waterways and approved by the legislature.

Consumptive use means the difference between the total quantity of water withdrawn from a source for use and the quantity of water returned to the source. It includes mainly water transpired by plants and evaporated from the soil.

Confluence means the flowing together of two or more bodies of water.

Director means the director of the Idaho Department of Water Resources.

Dredge mining means to recover minerals with the use of a dredge boat or sluice washing plant whether fed by bucket line or separate dragline or any other method including suction dredges.

Endangered species means a species in danger of extinction throughout all or a significant portion of its range.

Evapotranspiration means the loss of moisture by evaporation from soil and transpiration from plants.

Hydropower project means any development which uses a flow of water as a source of electrical or mechanical power, or which regulates the flow of water for the purpose of generating electrical or mechanical power. A hydropower project includes all powerhouses, dams, water conduits, transmission lines, water impoundments, roads, and other appurtenant works and structures.

Idaho batholith means the massive body of intrusive granitic rock. It covers an area about 250 miles long and a maximum of 100 miles wide throughout much of central Idaho. It is approximately 100 million years old, which would place its origin in the Cretaceous Period.

Interim protected river means a waterway designated pursuant to section 42-1734D or 42-1734-H, Idaho Code, as protected for up to two (2) years while a component of the comprehensive state water plan is prepared for that waterway.

Low-head dam means a dam with less than 20 meters (66 ft) of head.

Mean high water mark means a water level corresponding to the natural or ordinary high water mark as defined in Section 58-104(9), Idaho Code, and is the line which the water impresses on the soil by covering it for sufficient periods of time to deprive the soil of its terrestrial vegetation and limit its value for agricultural purposes.

Minimum stream flow means a minimum flow or lake level necessary to protect fish and wildlife habitat, aquatic life, water quality, navigation, transportation, recreation, and/or aesthetic beauty. Under Idaho Law (Chapter 15, Title 42, Idaho Code), minimum stream flows are valid water rights, held by the Idaho Water Resource Board in trust for the people of the state.

Natural river means a waterway which possesses outstanding fish and wildlife, recreation, geologic or aesthetic values, which is free of substantial existing man-made impoundments, dams or other structures, and of which the riparian areas are largely undeveloped, although accessible in places by trails and roads.

Outstanding resources means unique, highly-valued, and/or extremely sensitive resources. This may be indicated by 1) legal protection excluding or limiting development; 2) special agency management designations protecting the resource; 3) significant public concern voiced for its protection; and 4) resources susceptible to adverse impacts with little possibility of mitigating these impacts.

Podzol means soil with a bleached topsoil horizon, typical of boreal forests.

Recreational dredge mining means dredge mining using a suction dredge with a nozzle of 5 inches or less, and that moves less than 2 cubic yards per hour.

Recreational river means a waterway which possesses outstanding fish and wildlife, recreation, geologic or aesthetic values, and which might include some man-made development within the waterway or within the riparian area of the waterway.

Riparian area means that area within 100 feet of the mean highwater mark of a waterway.

River basin is the total drainage or catchment area of a river and its tributaries.

Stream means a natural water course of perceptible extent with definite bed and banks, which confines and conducts continuously or intermittently flowing water. Definite beds are defined as having a sandy or rocky bottom which results from the scouring action of water flow.

Stream channel means a natural water course of perceptible extent with definite beds and bands which confines and conducts water. The channel referred to is that which exists at the present time, regardless of where the channel may have been located at any time in the past. The beds of lakes and reservoir pool areas are not considered to be stream channels.

Threatened species means a species likely to be classified as endangered within the foreseeable future throughout all or a significant portion of its range.

Vested rights means those rights that are fixed and not contingent upon any future actions.

Waterway means a river, stream, creek, lake or spring, or a portion thereof.

APPENDIX B: PUBLIC INVOLVEMENT

Local Advisory Group and Affiliation or Occupation

Mrs. Rosemary Ardinger
Idaho City, Idaho
(teacher)

Mr. Greg Arndt
Boise, ID 83702
(mining consultant)

Mrs. Kristen Cheyney
Boise, ID 83712
(Idaho Rivers United)

Mr. Ron Davison
Mountain Home, ID 83647
(rancher)

Mr. Stephen Garman
Wilder, ID 83676
(farmer)

Mr. Alfred Larson
Boise, ID 83703
(retired forester)

Ms. Sue Anne Mason
Boise, ID 83704
(Account executive)

Mr. Ralph J. McAdams
Boise, ID 83702
(retired, U.S. West)

Mr. Ken E. Meierotto
Boise, ID 83704
(Boise Cascade supervisor)

Mr. Sam Roeber
Atlanta, ID 83601
(retired, IDT)

Mr. Ronald L. Sherer
Eagle, ID 83616
(Middle Fork landowner)

Mrs. Marcella Stewart
Nampa, ID 83686
(farmer)

Mr. James E. White
Idaho City, ID 83631
(retired)

Mr. Jerry M. Whitehead
Boise, ID 83706
(Middle Fork landowner)

Mr. J.A. Bob Williams*
Meridian, ID 83642
(farmer)

Ms. Raedean Inama**
Cascade, ID
(U.S. Postal Service)

* Deceased, (June 1, 1992). Mr. Williams was an active member through the final advisory group meeting.
** Ms. Inama moved from Atlanta after the first meeting of the Advisory Group.

Summary of Public and Advisory Group Meetings

Public Information Meeting (February 13, 1991)--This meeting initiated the public input facet of the planning process for the upper Boise River basin. The meeting was held in the IDT auditorium and attended by 31 individuals. Department staff discussed the planning process and schedule, public participation role of the Advisory Group, and a summary of the resources of the basin. A biographical sketch and application form was available for those interested in serving on the Advisory Group.

During the interim between the Public Information Meeting and the first meeting of the advisory group IDWR had received 27 applications from individuals interested in serving, of which 16 were selected. The first Advisory Group meeting, and most subsequent meetings, were held in the IDWR conference room.

Boise River Advisory Group Meeting (May 23, 1991)

Members Present: Ardinger, Arndt, Cheyney, Davison, Garman, Inama, Larson, Mason, McAdams, Meierotto, Roeber, Stewart, White, Whitehead, and Williams

The Rules and Regulations of the Comprehensive State Water Plan and the role of the Advisory Group in the planning process were discussed. Additional presentations included the planning process and schedule, and an overview of the basin's resources. The members asked a number of questions and had some specific concerns about the process and how IDWR interacts with the Forest Service in their wild & scenic river study process. The Advisory Group also discussed some of the important local issues that it felt needed to be addressed in the plan.

Boise River Advisory Group Meeting and Upper Boise River Basin Public Issues Meeting (July 30, 1991)

Members Present: Cheyney, White, Garman, Mason, Whitehead, McAdams, Meierotto, Williams, Roeber, Arndt, and Larson

This meeting, which was open to the general public and held in the Hall of Mirrors, was attended by 55 individuals. The meeting opened with a discussion of the purpose of the issues meeting and the sections of the Idaho Code that were relevant to river basin planning. Small groups of about 5-8 individuals each were formed to discuss the basin issues. The discussion for each group was facilitated by a member of the Advisory Group. Participants were asked to respond to several written questions: 1) best case scenario--what they would like to see the basin look like in 20 -50

years; 2) worst case scenario--what they would not like to see; and 3) what they considered the main attributes of the rivers and the threats to those attributes. The response was very positive; most participants felt they had provided input.

Boise River Advisory Group Meeting and Basin Field Trip (September 21, 1991)

Members Present: Ardinger, Arndt, Larson, Mason, McAdams, Meierotto, Roeber, Stewart, White, Whitehead, Williams, and Robbins (proxy for Cheyney)

The second Advisory Group meeting was combined with a field trip of the basin. The Advisory Group visited Mores Creek, North Fork Boise River, and Middle Fork Boise River, stopping at Kirby Dam. The meeting was held at Jerry Whitehead's summer home on the Middle Fork Boise River, where lunch was served.

One of the intentions of the meeting was to discuss cooperative river planning efforts with the Forest Service (i.e., the MOU between the State, the USFS and BLM) but this was postponed because the Boise National Forest staff, was unable to attend. The planning schedule and direction were presented (i.e., presentation of the options available). Possible objectives of the plan were discussed, based in large part on identified issues.

Boise River Advisory Group Meeting (October 17, 1991)

Members Present: Garman, Robbins (proxy for Cheyney), McAdams, Williams, Meierotto, Stewart, and Platts (IWRB)

The Advisory Group met at IDWR to discuss planning options and to hear from the Forest Service about the wild & scenic river study process. Vicki Lawson, from Boise National Forest staff, discussed how the two agencies' river planning efforts might be integrated.

The Advisory Group responded to a preliminary draft of possible reach delineations and protection potential for those reaches, based on the best available information to date. An adjusted planning process and schedule was presented to the Advisory Group, that included the screening process for identifying reaches eligible for protection.

Boise River Advisory Group Meeting (February 20, 1992)

Members Present: Arndt, Roeber, Williams, Garman, McAdams, Whitehead, Larson, Cheyney, Meierotto, White, Ardinger, and Platts (IWRB)

This meeting, held at IDWR, included a status report of the upper Boise River basin planning process. The screening process was presented along with the evaluation criteria for the three screening categories: biological (fish and wildlife), aesthetic (scenic and geologic features), and recreational. The Advisory Group studied the resource inventory and evaluation maps and provided input regarding changes and possible errors. Additional time was provided for examination of the inventory and evaluation maps at a subsequent open house.

Boise River Advisory Group Open House (March 3, 1992)

Members Present: Whitehead, McAdams, Arndt, Larson, Williams, Stewart, Davison, Garman, and Meierotto

An informal open house provided to members of the group with additional time to continue their examination of the inventory and evaluation maps and to provide input.

Boise River Advisory Group Meeting (April 30, 1992)

Members Present: Cheyney, Davison, Garman, McAdams, White, Larson, Whitehead, Meierotto, Arndt, Stewart, Ardinger, Williams, and Platts (IWRB)

Modified screening, inventory and evaluation maps were reviewed by the Advisory Group. This was followed by a discussion of river protection alternatives for the basin. These alternatives included a no protection alternative (A), an alternative that focused on those reaches with outstanding water quality, biological and recreational combinations (B), an alternative that exempted reaches with high development potential from possible protection (C), and a total protection alternative (D). Alternatives B and C included some proposed minimum stream flows. Advisory Group comments were recorded and each member received a copy of the comments.

Boise River Advisory Group Meeting (May 13, 1992)

Members Present: Meierotto, Davison, Whitehead, Roeber, Larson, McAdams, Williams, White, Arndt, Mason, Ardinger, Robbins (for Cheyney), and Stewart

Subsequent to the April 30 meeting, the planning staff developed a draft recommended alternative that reflected the comments received from the Advisory Group at the previous meeting. As a result of the discussion of that draft alternative, the Advisory Group:

- Supported the draft recommended alternative.

- Requested that the language in the State Water Plan identifying the Twin Springs site as a potential irrigation storage site be retained.

- Recommended the following be taken into consideration if Twin Springs were ever needed: 1) a scaled-down version of the most recent proposal thus reducing the reservoir size; 2) establishing a minimum pool level; and 3) establishing a minimum stream flow below the dam.

- Supported state protection over federal protection, and requested that the federal wild & scenic river designation not be supported in the plan.

- Recommended all tributaries to be protected be listed by name, if possible.

- Recommended that recreational river designations be conditioned to allow for road construction activities on or near recreational rivers.

APPENDIX C: TECHNICAL REPORT

Water Supply: Water Quantity

The area covered by this plan includes the upper Boise River basin which is the majority of the watershed for the intensely agricultural lower Boise River basin. Even though the majority of this report pertains only to the planning area, some references are made to the lower Boise River basin because of its interdependence with the upper basin.

The North and Middle Forks of the Boise represent a hydrologic unit which drains approximately 830 square miles, while the Mores Creek watershed drains 400 square miles. These three main streams from the upper Boise River basin feed into the Lucky Peak-Arrowrock reservoir complex. The total stream mileage in this basin, excluding the reservoirs, is approximately 1130 miles. The two reservoirs, Lucky Peak and Arrowrock, account for an additional 26 miles.

Precipitation and Snow Surveys

Data compiled by the Army Corps of Engineers (1988b), show the annual mean precipitation throughout the basin ranges from about less than 20 to over 50 inches per annum (USACE, 1988b; Table 15). This does not include recent snow study data which may increase those values up to 15% when completed (Molnau, 1991). Generally, a precipitation gradient occurs from west to east across the basin, with the lowest precipitation occurring in the west at the lower elevations and the highest values in the Sawtooth Mountains to the east. Mean values from the seven stations in the basin are included in Table 15.

Table 15. Mean Annual Precipitation in Upper Boise River Basin, 1961-1985 (USACE, 1988b; USDA, 1987b).

Station	Elevation (ft)	Mean Annual PPT. (in)	Monthly Min-Max Ppt. (in)
Arrowrock Dam	3275	18.71	0.0 - 9.09
Idaho City	3965	22.96	0.0 - 10.74
Centerville	4440	27.91	0.0 - 12.25
Graham G.S.	5690	32.70	
Mores Cr. Summit	6100	43.30	
Atlanta Summit	7600	46.50	
Trinity Mt.	7770	52.40	

At the higher elevations, snowfall contributes the bulk of the precipitation. There are four Snotel (snow telemetry) stations in the basin that provide snow precipitation data. The Snow Water Equivalents (SWE) that have accumulated by April at the Trinity Mt. Snotel station (elev. 7770) is 44.1 inches (total precipitation = 52.4 in.), while at the Graham G.S. Snotel station (elev. 5690), the SWE is 16.7 inches (total precipitation = 32.7 in.). The mean SWE accumulation at Atlanta Summit (elev. 7600) is 35.3 inches and at More's Cr. Summit (elev. 6100) it is 34.2 inches (USDA, 1987b).

Stream Discharge Data

Recording Stations and Flow Data: Stream discharge data is collected at three stream gages (a-c listed below), one of which is located just outside of the basin below Lucky Peak dam (Table 16). These are:

(a) Boise River - near Twin Springs (#13185000). This station is located 3.2 miles downstream from Twin Springs, 13 miles upstream from Arrowrock Dam, (mile 88.5) within the Boise National Forest (elev. 6350 ft.). There is no significant diversion or regulation above this gage. Seasonal variation of the flows at the Twin Springs gage is shown in Figure 5, and the historic annual discharges in Figure 7.

(b) Mores Creek above Robie Creek - near Arrowrock Dam (#13200000). This station is located on the left bank, 1.7 miles upstream from Robie Creek, 5.0 miles northwest of Arrowrock Dam (mile 5.8; elev. 3120 ft.). There is no significant diversion or regulation above this gage. Seasonal variation of the flows at the Twin Springs gage is shown in Figure 6, and the historic annual discharges in Figure 8.

(c) Boise River near Boise (#13202000). This station is located at the Lucky Peak Dam, 1.8 miles upstream from New York Canal diversion dam and 7.5 miles downstream from Mores Creek (mile 63.6). Records were kept from 1895 through 1916 and ceased until 1950 when they were restarted. Flows at this location are regulated by Anderson Ranch, Arrowrock and Lucky Peak reservoirs. There are no significant diversions upstream of the reservoirs.

In addition, water surface elevations are recorded for both Arrowrock and Lucky Peak reservoirs (Table 16).

Table 16. Recording Stations - North and Middle Forks Boise River and Mores Creek (USDI, 1990).

Station	Gage Type	Period of Record	Drainage Area (sq. mi.)	Average Runoff Volume (AF/annum)	Flow for the Period (cfs)		
					ave.	max.	min.
13185000 Boise R. near Twin Springs	River	1911 - pres.	830	864,300	1193	18,800	105
13200000 Mores Cr. above Robie Cr.	River	1950 - pres.	399	210,000	298	5,440	7.4*
13202000 Boise R. near Boise	River	1895 - 1916; 1950 - pres.	2680***	2,100,000***	2899	35,500	0.0**
13194000 Arrowrock Res. at Arrowrock Dam	Reservoir	1917 - pres.	2210				
13201500 Lucky Pk. Lake	Reservoir	1954 - pres.	2680				

* 1992 flows will be lower but official flows have not been published.

** This is not natural flow but a flow regulated at Lucky Peak Dam.

*** Figure includes South Fork Boise River contribution.

Normal Stream-Flow Behavior: Each year high flows occur in the spring as temperatures rise and snow melts. Stream flow rises in March, peaks between April 15 and June 15 and gradually recedes to base flow in July. Low flows generally prevail from August through February. From 1895 to 1980, the natural annual discharge volume of Boise River below Lucky Peak Dam averaged 2,040,00 AF annually. Approximately 78% of this volume comes off during the March through July snowmelt period. Occasionally, winter rainstorms will expedite snowmelt discharge, and this can severely intensify the peak flows during the winter. However, most of these winter discharges are of short duration and limited volume (USACE, 1988b).

The majority of the stream flow from the Middle and North Fork Boise River sub-basin is recorded at the Twin Springs gage (Fig. 5). Measurements at this station show more than 75% of the flow of the Boise River below Lucky Peak is contributed by approximately 60% of the total drainage area (Table 17). The discharge recorded at the Twin Springs gage gradually increases from March until it reaches a peak flow in May-June when it begins to decline to a low lasting from September through February (Fig. 5).

The contribution to the Boise River stream flow from the Mores Creek drainage is 20% (Fig. 6). The Mores Creek watershed represents less than 30% of the total basin (Plate 2). Mores Creek discharge begins increasing in February and peaks in April (Fig. 6).

Table 17. Stream Flow and Drainage Area Composition of North and Middle Forks Boise River and Mores Creek Drainages, Exclusive of the South Fork Boise (USDI, 1990b).*

Gage	Drainage Area (sq. miles)	Mean Discharge (cfs)	Volume/annum (1000 AF)	% of Total Basin Flow	% of Total Basin Area
Mores Cr.	399	298	216	19	29
Twin Spr.	830	1204	872	77	60

*Information is based on the two river gages within the basin. Mores Creek and Twin Springs values are exclusive of the Boise South Fork's contribution and what occurs below the two gages.

Extreme Stream-Flow Behavior: Significant rainstorm-snowmelt flood events occurred numerous times in the basin, but most notably in November 1909, December 1955, and December 1964. A December 1964 flood event in Boise with a computed instantaneous peak discharge of approximately 44,000 cfs was estimated to have been in excess of a 100-yr. event (IDWR, 1974). High annual flow volumes recorded at the Twin Springs gage occurred in 1943, 1965, and 1974 (Fig. 7). At the Mores Creek gage, high annual flows occurred in 1965, 1971, and 1983 (Fig. 8).

Droughts: The single lowest runoff year of record was 1977 at the Twin Springs gage and 1992 at the Mores Creek gage, both well under half the normal averages (Figs. 7, 8). The current drought, which began in 1987, is the most severe in recorded history. Prior to that, the period from 1931-1935 was the driest period.

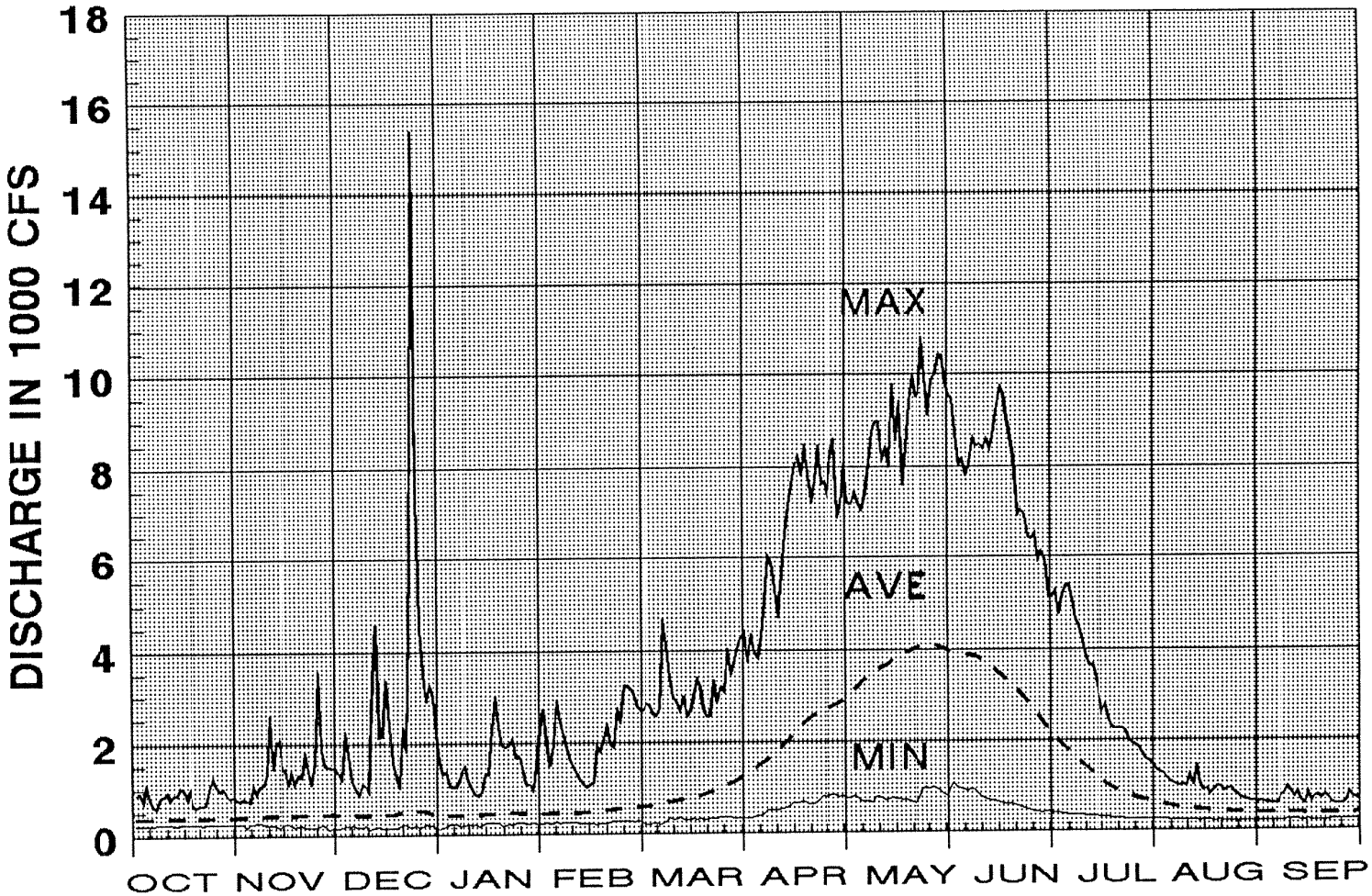
Storage and Flood Control Facilities

Within the entire Boise River basin, there are four separate federal reservoirs which are operated as one coordinated system. These are Anderson Ranch, Arrowrock, Lucky Peak and the Lake Lowell complex (Diversion Dam and New York Canal) (USACE, 1988b). Anderson Ranch is on the South Fork Boise but regulates flows into Arrowrock. Lake Lowell, an offstream storage facility in the lower valley, is below Lucky Peak Dam. Anderson Ranch and Lake Lowell are discussed here because of their significance to the Arrowrock and Lucky Peak operations and release schedules. Flood control and irrigation are the primary uses for Anderson Ranch, Arrowrock, and Lucky Peak. Additional uses of Lucky Peak water are for stream flow maintenance (50,000 AF) and non-contracted space (102,300 AF) that is for additional stream flow maintenance. At the end of the irrigation season (April through October), reservoir operation manuals recommend that Arrowrock

Figure 5.

MINIMUM, MAXIMUM, AND AVERAGE DAILY DISCHARGE, BOISE RIVER

NEAR TWIN SPRINGS, IDAHO

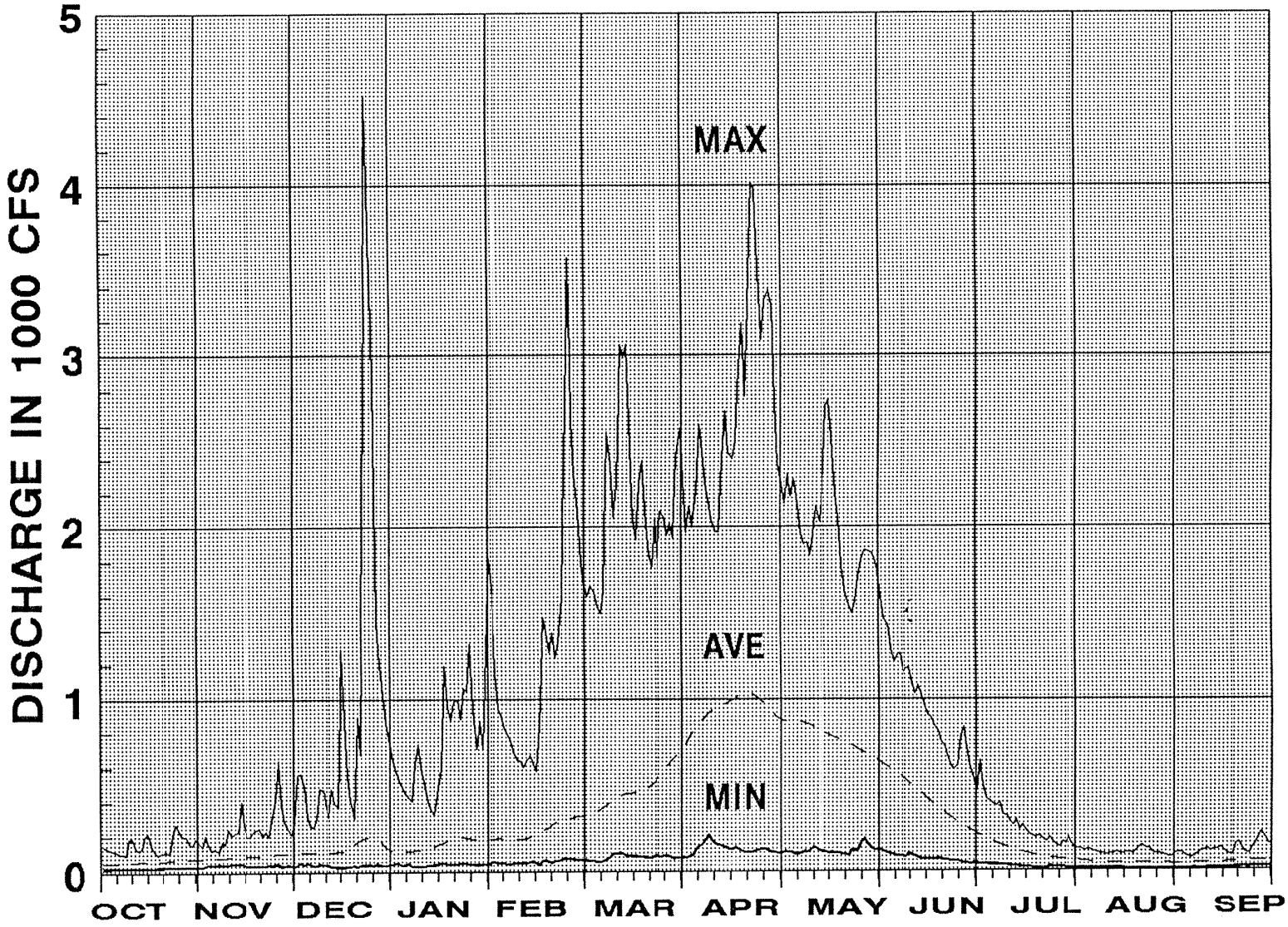


Source: IDWR, 1992.

Figure 6.

MINIMUM, MAXIMUM, AND AVERAGE DISCHARGE, MORES CREEK

ABOVE ROBIE CREEK NEAR ARROWROCK

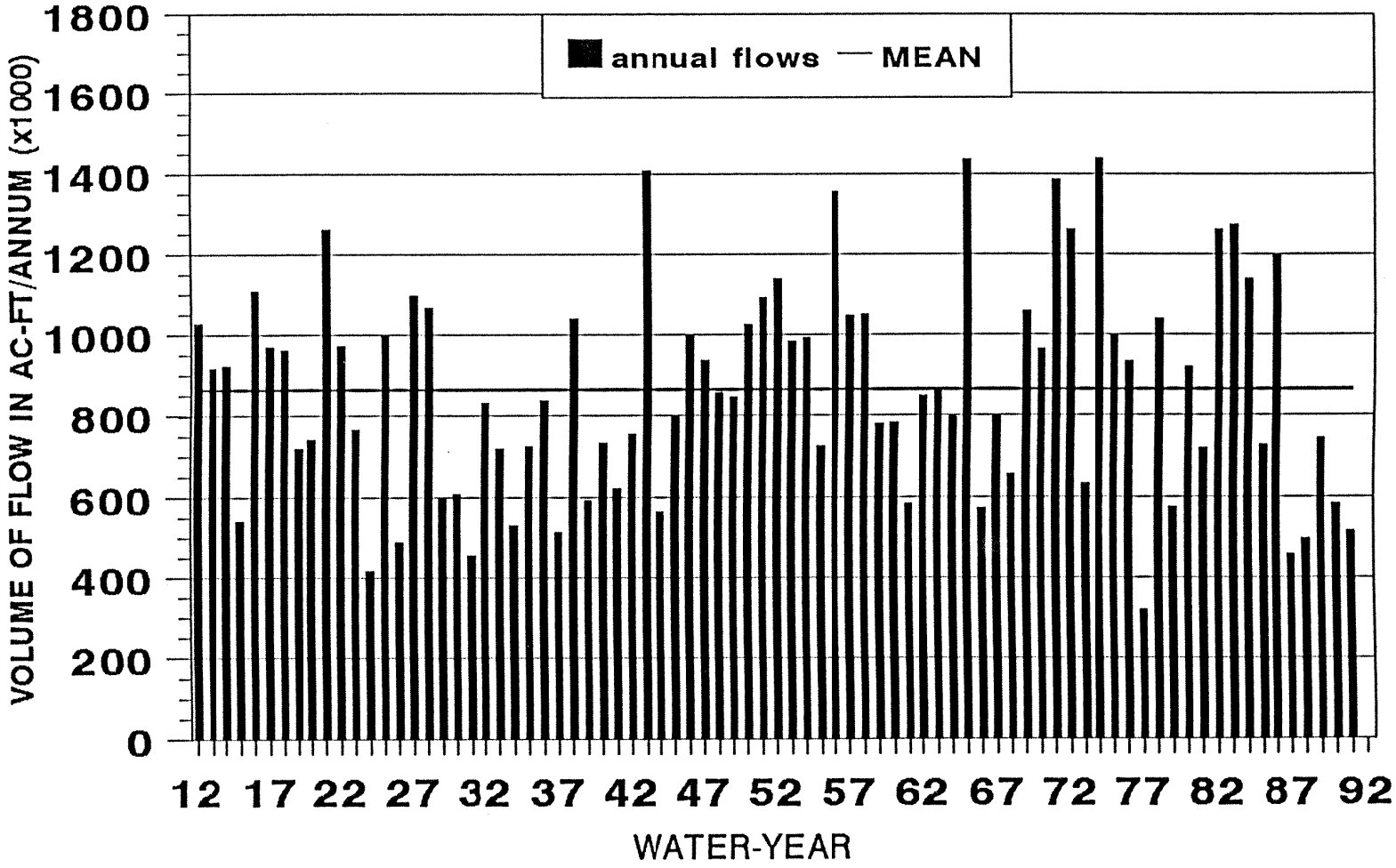


Source: IDWR, 1992.

Figure 7.

HISTORIC FLOW, BOISE RIVER

NEAR TWIN SPRINGS, IDAHO



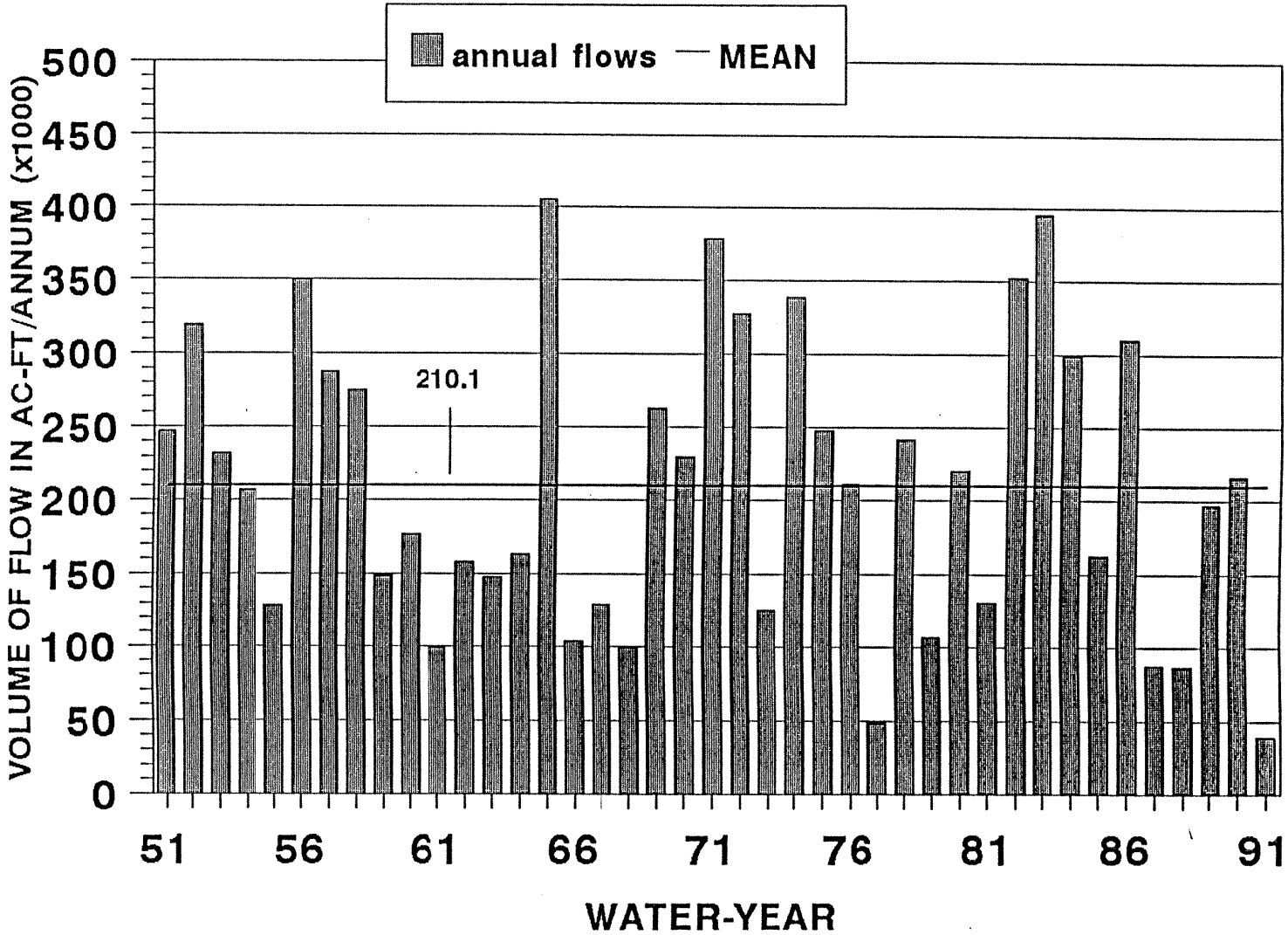
MEAN = 864.8 KAF

Source: IDWR, 1992.

Figure 8.

HISTORIC FLOW, MORES CREEK

ABOVE ROBIE CREEK NEAR ARROWROCK



MEAN = 210.1 KAF

Source: IDWR, 1992.

and Lucky Peak not be drawn down below minimum fish conservation pools of 28,700 AF and 28,767 AF respectively (USACE, 1988b). The operation of the Boise reservoirs is coordinated jointly by the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the Boise River Watermaster.

The Arrowrock project was completed in 1915 by the U.S. Bureau of Reclamation and has a maximum capacity of 298,230 AF of water which includes 11,630 AF of surcharge space. It is located 12 miles above Lucky Peak Dam (USACE, 1988). During high pool periods, water within Lucky Peak Reservoir is backed up to the downstream face of Arrowrock Dam. The total watershed area above Arrowrock Dam, but below Anderson Ranch Dam, is 1230 sq. mi. The major use of storage in Arrowrock is for irrigation. Other purposes are: 1) flood control, 2) recreation, and 3) regulation of releases from Anderson Ranch.

Presently, Arrowrock has no power generating facilities, but the dam was designed so three units could be installed. Recently the local irrigation districts received a FERC license (#4646-002) to construct and operate a 60 MW powerplant at Arrowrock Dam. Releases are coordinated with releases from Anderson Ranch, Lucky Peak, and Lake Lowell to maximize all uses (irrigation, recreation, flood control, hydropower, and stream flow maintenance) within the Boise River system. In years when it is not possible to fill the entire system, the Bureau releases water first from Arrowrock (instead of Anderson Ranch) to Lucky Peak to keep the pool up for recreation and to maintain the power head and the fishery at Anderson Ranch and for stream flow maintenance below Anderson Ranch.

Lucky Peak Reservoir began filling in October, 1954 (dam construction was not completed until February, 1955 by the Army Corps of Engineers) (USACE, 1988b). It holds 307,043 AF which includes 13,905 AF of surcharge space. The dam is located 64 river miles above the mouth of the Boise River, several miles east of the City of Boise. The watershed between the two dams is 470 square miles. The reservoir pool level at the dam normally fluctuates between elevations of 2905 ft. (top of active conservation pool) and 3055 ft. (normal full pool), a draft of 150 ft. (USACE, 1988b).

In 1988, a hydropower project was completed at the Lucky Peak dam. Three generating units were installed to provide a total capacity of 106.5 MW of power. The power project is owned and operated by local irrigation districts, but power generation is supervised by Seattle City Light under a 50 year (1988-2038) purchase contract (Morgan, 1991).

Irrigation releases from Anderson Ranch and Arrowrock pass through Lucky Peak reservoir. Because of high recreation demands on Lucky Peak, it is normally the last of the reservoirs in the system to be drawn down. Power head at Lucky Peak is not a consideration in water movement

within the system because Anderson Ranch has priority to maintain head for power and irrigation (and secondarily, by an informal agreement between BOR and IDFG, to maintain fish flows in the South Fork Boise River).

Anderson Ranch Reservoir, while not in the study basin, is being included because its operation is coordinated with the other reservoirs in the system. It holds 503,682 AF which includes 10,504 AF of surcharge space at maximum capacity and is located on the South Fork Boise River 25 miles above the confluence with the mainstem Boise River. The watershed area covers 980 square miles and extends eastward to the Smoky Mountains. The reservoir provides storage for irrigation, flood control, power generation, and recreation. It also maintains a permanent dead storage pool for fishery maintenance and silt control, and an inactive storage pool for power head. Irrigation releases from Anderson Ranch flow down through Arrowrock and Lucky Peak reservoirs and are coordinated with releases from Arrowrock and Lucky Peak to meet diversion requirements in the lower Boise valley.

Water is diverted from the river into the New York Canal at Diversion Dam, located 1.8 miles downstream of Lucky Peak Dam. The New York canal follows a southwesterly route for 40 miles to Lake Lowell, an off-stream storage reservoir located 27 miles southwest of Boise. Its storage capacity is 177,000 AF, supplying water for about 50,000 irrigated acres. During the winter and spring runoff seasons, excess flows from the Boise River are delivered to Lake Lowell for storage. During the irrigation season, water from the river and from storage release is diverted through the New York Canal and delivered to users both along the canal's route and through Lake Lowell to users in the lower Boise Valley. Like Anderson Ranch, Lake Lowell is located out of the immediate basin of study but is operated as part of the Boise River system.

Groundwater and Associated Geology

This upper Boise River basin is mountainous and roughly 90 percent of it is covered with granitic soils overlying the parent granite of the Idaho Batholith. Canyon-filling basalts occur in the lower Boise River and Mores Creek. The streams of much of the upper Boise River basin typically occupy narrow canyons and are still downcutting with little deposition. Some groundwater exists along the river corridors, as it does in the Mores Creek and Grimes Creek drainage associated with alluvial deposits and fissures in the bedrock. There are no reported instances of ground water contamination.

Water Conservation

Since 1987, southwestern Idaho has been in the midst of a drought. Based on the historic precipitation records since 1900, the statewide mean annual precipitation has gone from 23 per year to 26 per year. There has been a seasonal shift of precipitation, and the trend has been toward drier winters and wetter summers (Molnau, 1991). This means less recharge and spring runoff and greater evaporation in the summer, which may mean less water available for storage and irrigation. This is exactly what has happened in regard to the Boise River reservoir system. The reservoir system has not filled for several years and by the end of July, 1991, storage in the Boise basin was 34% of capacity and 45% of normal which resulted in a reduction of the winter flow in the Boise River through town from a normal 150 cfs to 80 cfs (USBR, 1991).

The 1976 State Water Plan recommended that the state should establish a water supply bank for water reallocation by sale or lease. This was formalized by the Idaho Legislature in 1979 and Idaho now has three banks, one of which was started in the Boise basin in 1988. One of the original purposes of the banks is to provide water for irrigation companies during drought years. For example, the Upper Snake Water Bank was utilized to provide drought relief in 1988.

Although little water is removed from the upper Boise River basin for any use, since 1980, the IDWR has a moratorium on issuing water right permits for consumptive uses during the irrigation season, June 15 to November 1. Good watershed and riparian management practices are therefore needed to prevent unnecessary water loss from the system. If indeed the climate pattern is shifting toward drier winters and wetter summers, then increasing pressure from users can be anticipated to maximize storage in the Boise reservoir system.

Water Supply: Water Quality

Physical and Chemical Quality of the Water

Based on samples collected by the USGS over the past two decades (1973-1990) at three stream gages in the basin, the overall water quality in the basin is good (Table 18). The temperature range for the Middle and North Fork Boise River, as indicated by data from the Twin Springs gage, stays below the 22.0 degrees C° required to maintain cold-water biota (salmonid fish, aquatic insects). However, Mores Creek experiences summer water temperatures that exceed cold-water biota maximum. Even though no domestic water supplies are taken from Mores Creek or the Middle Fork Boise River, concentrations of dissolved solids have been well within secondary drinking water standards at all three sample locations. The pH of the water tends to be slightly basic (greater than 7), which is normal for cold-water streams of the Northwest that flow through granitics.

Anions, cations, and nutrients generally remain within established standards for domestic water supplies and water quality criteria supporting aquatic life (Table 18).

Data reported for Mores Creek near Lucky Peak Reservoir exceeded water quality criteria for total phosphorus (Table 19).

Table 18. Physical and Chemical Water Quality in the Upper Boise River Basin (USDI, 1990a).

USGS Gage Stations	Boise River near Twin Spr.			Mores Creek			Boise R., below Lucky Pk.			DEQ Water Quality Standards or EPA Water Quality Criteria for Aquatic Life
Constituents	Sample Size	Mean	Range	Sample Size	Mean	Range	Sample Size	Mean	Range	
Temp. (deg. C)	29	8.76	<.01-20.5	149	8.34	<.01-28.5	95	8.71	<.01-35.0	
Specific Conductance (umhos/cm)	164	75.26	29-380	147	96.9	8-166	106	85.2	43-263	
dissolved solids (mg/l)	2	52.58	32-69	13	71.77	44-97	22	54.23	35-70	15,000 (EPA)
pH (range)	36		6.4-8.7	13		6.5-8.5	41		6.0-8.5	6.5-9.0 (EPA)
ANIONS										
HCO3 (bicarbonate, mg/l)	34	38.85	18-50	8	55.38	28-78	37	43.43	24-66	
CO3 (carbonate, mg/l)	33	.03	<.01-1.0				38	.08	<.01-3.0	
Cl (chloride, mg/l)	38	.35	<.01-2.0	13	.90	0.1-2.0	41	.46	<.01-2	
SO4 (sulfate, mg/l)	38	2.96	0.4-8.0	13	4.69	0.6-12.0	41	3.3	<.01-9	
F (fluoride, mg/l)	38	.52	0.1-0.9	13	.28	0.1-0.6	41	.31	.2-.4	
CATIONS										
Ca (calcium, mg/l)	38	9.91	5-14	13	12.52	6.7-18	41	10.15	6.6-14.0	
Mg (magnesium, mg/l)	38	.61	.1-1.9	13	1.89	1.1-2.4	41	1.4	.6-2.8	
Na (sodium, mg/l)	38	4.15	1.5-7.4	13	5.62	3.3-8.3	41	4.03	2-5.8	
K (potassium, mg/l)	38	.62	.3-1.6	13	.85	.4-1.1	41	.79	.5-1.4	
NUTRIENTS										
NO2 + NO3 (mg/l as N)	12	.08	.01-.40	13	.21	<.01-2.1	14	.13	<.01-.3	
NO3 total (mg/l N)	26	.27	<.01-0.6				26	.58	.1-1.3	
Phosphorus total (mg/l as P)	12	.01	<.01-.05	13	.03	.01-.06	14	.04	.01-.11	.05 (EPA)
Phosphate total (mg/l as P)	4	.02	<.01-.06	6	.10	<.01-.18	5	.07	<.01-.12	

Measurements were made from 1973 to 1990 at three USGS stream gages within the basin. Measurements compared against IDHW/DEQ Water Quality Criteria Standards and EPA Water Quality Criteria for Aquatic Life.

Table 19. Total Phosphorus Concentrations on Mores Creek (USDI, 1990a).

Sampling location	Sampling period	# Samples	mean (mg/l)	range (mg/l)	EPA Water Quality Criteria for Aquatic Life (mg/l)
Robie Cr., near mouth	11/78 - 9/79	6	.11	.04-.25	.05
Mores Cr., near mouth	11/78-9/79	6	.06	.03-.11	.05
Mores Cr., below Grimes Cr.	11/78-9/79	6	.07	.01-.10	.05
Grimes Cr., near mouth	11/78-9/79	6	.23	.01-1.07	.05

Impacts to Specific Waterways

In 1988, the Idaho Department of Health and Welfare, DEQ completed their survey and assessment of Idaho stream water quality in regard to nonpoint sources of pollution. Nonpoint pollution is diffuse and intermittent and usually related to surface activities such as agriculture, logging, and mining. The concern of the DEQ was whether or not beneficial uses, such as domestic and agriculture water supplies, salmonid spawning, cold water biota, and primary and secondary contact recreation, are being adversely affected by these activities. Assessment of the major streams within the upper Boise River basin follow:

North Fork Boise River: The only nonpoint source pollution listed for the entire North Fork Boise River, from the headwaters to the Middle Fork Boise River, is grazing and its impact is considered low (DEQ, 1988). There is some timber harvest activity in the watershed and its impact is also considered low at this time. The North Fork Boise River supports all beneficial uses.

The North Fork Boise River has also been placed on the EPA's priority wetlands list as part of an effort to identify wetlands that may require special attention. As of 1988, there were 149 such identified wetlands in Idaho. The EPA listed habitat alterations from forest practices, placer mining, and hydrologic modification (dam construction, removal of riparian vegetation, etc.) as threats to the North Fork wetlands.

The North Fork Boise River, from the Sawtooth Wilderness boundary, to its confluence with the Middle Fork Boise River, along with Crooked River, a major tributary to the North Fork Boise River, have both been designated Stream Segments of Concern (SSOC) because of timber harvest

activities (Dunn, 1990). When the designation is due to timber harvest activities, Rules and Regulations pertaining to the Idaho Forest Practices Act provides for the development of site-specific best management practices (BMP). Sediment may impact Beaver Creek, a tributary of Crooked River, by the Idaho Department of Transportation (IDT) when work is done on State Route 21.

Middle Fork Boise River: The Middle Fork Boise River was defined as including everything from the Sawtooth Wilderness boundary to the upper end of Arrowrock Reservoir. The Middle Fork Boise River does not presently support salmonid spawning as a beneficial use due to sedimentation of habitat. The sediment is believed to be from a combination of sources including the failure of Kirby Dam, the Middle Fork road, historic mining practices and some limited timber harvesting and grazing in the area. In addition, non-specified metals have been identified as a pollutant of concern.

Mores Creek and Grimes Creek: Mores Creek and its tributary Grimes Creek also do not presently support salmonid spawning due to sedimentation of habitat. The sediment here is also believed to come from a combination of sources including historic mining practices, timber harvesting, road construction and maintenance and limited grazing (IDHW, 1988).

Kirby Dam Failure and Impact on Water Quality

Currently, there are no toxic impacted segments listed by DEQ in the basin. However, when the Kirby Dam failed on May 26, 1991, sediments containing toxic chemicals from Atlanta's historic mining days were released into the Middle Fork Boise River. In a DEQ study, McIntyre (1991) reported that 90,000 cubic yards washed down when the dam failed, leaving behind 160-210,000 cubic yards. During the follow-up study, water samples taken 0.5 mile below the dam, two days after the failure, contained levels above EPA Drinking Water Standards for arsenic (Table 20). The dam has been stabilized by the State of Idaho and the U.S. Forest Service (completed April, 1992) and the sediments remaining will be prevented from further contaminating the Middle Fork Boise River. It is still to early to determine the full impact on the river and its fishery. Currently, arsenic and mercury concentrations in the water column and sediments are within an acceptable range. Mercury concentrations found in fish tissue have prompted health officials to recommend a limit of one meal of fish from the Middle Fork Boise River per week.

Table 20. Levels of Arsenic (As) and Mercury (Hg) in Samples Collected from the Middle Fork Boise River, After the Kirby Dam Failure (McIntyre, 1991).

Location	Sample Date	As (μg/l)*	Hg (μg/l)*
1/2 mile below Kirby Dam	5-26-91 5-27-91	0.260 - 5250 0.140 - 0.410	0.013 0.006
Swanholm Creek	5-27-91	0.060	less than .0005
Slide Gulch	5-27-91	0.058	less than .0005

*EPA Water Quality Criteria: Arsenic = .050 μg/l; Mercury = 0.050 μg/l.

Fish, Wildlife, and Biological Communities

The high biological diversity of the basin is in large part due to the fact that there is a wide array of communities represented, which include the following dominant vegetation types:

Sagebrush--around the two reservoirs and along the north side of the Middle Fork Boise River (elev. 2500-8500').

Ponderosa pine--open woodlands, sometimes mixed with Douglas fir on north-facing slopes (elev. 2500-7000').

Douglas fir--closed and open canopied forests mixed with quaking aspen and patches of sagebrush on north-facing slopes and at higher elevations (elev. 5000-9500').

Lodgepole pine--dense canopied forests with sparse understory in upper reaches of both North and Middle Forks Boise River and Crooked River (elev. 6000-8000').

Subalpine fir--closed and open canopied forests at higher elevations, primarily in Sawtooth Wilderness Area (elev. 5000-9500').

Riparian types--along the rivers and creeks above the reservoirs exist floodplain vegetation dominated by cottonwoods, willows, alder and even lodgepole pine at certain specific locations (elev.3280-6562' Sawtooth Wilderness Area boundary).

Special Species and Habitats

Even though the biological diversity of the basin is relatively high, the population status of several species is of concern (Moseley and Groves, 1992; Table 22). These are listed with the U.S. Fish & Wildlife Service and Idaho Department of Fish & Game.

The USFWS provides protection for those species of plants and animals that are listed as threatened or endangered (T&E species). Species can also be classed as candidate species, and can fall into one of several candidate categories, depending on their status. The species of plants and animals that are found within the upper Boise River basin identified by USFWS as endangered candidates are listed in Table 21.

Table 21. Threatened and Endangered Wildlife and Plants Found Within Upper Boise River Basin (Moseley and Groves, 1992).

Candidates	Listed Endangered
Bull trout (Dolly Varden) Wolverine Goshawk Silvery whitlow-grass Idaho goldenweed Wilcox's primrose	Bald eagle Gray wolf

The Natural Heritage Programs and Conservation Data Centers (CDC) around the county, have developed their own ranking system which represents their assessment of the global and state status of each species. The CDC in Idaho is affiliated with the IDFG. The ranking is on a 1 to 5 scale for plants, animals, and natural communities and is applied separately at global rangewide and state levels (Table 22). The rank is primarily based on the number of known occurrences, but other factors such as habitat quality, narrowness of range, and population trends are taken into consideration (Moseley and Groves, 1992). The USFWS and CDC ranking systems are used in the screening process for fish, wildlife, and plants. In addition, the USFS, Region 4, lists five plant species, the native rainbow trout, bull trout, westslope cutthroat trout, wolverine, flammulated owl, goshawk and fisher as sensitive species. Goshawks are known to nest in the basin; one has already been located in the Logging Gulch area.

The IDFG recognizes that recent gray wolf (1979-88 in the North Fork Boise River vicinity and Pete Creek) are probable sightings, and are not confirmed. Wolverine sitings have been confirmed in the Atlanta area (Stephens, 1991). A few of the wolf and wolverine occurrences are within six miles of the river. A fisher was trapped in 1978 in upper Devil's Creek, and bald eagles commonly winter along the Middle Fork (Stephens, 1991).

Because of the relative pristineness and species diversity of the basin, the Boise National Forest has proposed two Research Natural Areas (RNA) in addition to the already established Bannock Creek RNA, for protection (USDA, 1990a; Plate 8). One is on the North Fork Boise River (874 acres), 5-6 miles above the confluence with the Middle Fork Boise River, and the other on the Roaring River 4-6 miles above the Middle Fork Boise River (423 acres). The proposed North Fork Boise River RNA contains a relatively uncommon species of false yarrow and the Roaring River RNA contains the

Idaho goldenweed, a candidate for federal listing (USDA, 1990a). The existing 445-acre Bannock Creek RNA, east of Idaho City, which contains a high diversity of biological communities from sagebrush to Douglas fir. The BLM officially established the Boise Front Area of Critical Environmental Concern (ACEC) which covers 12,000 acres of the Boise Mountains to protect the winter range for approximately 4000 mule deer (USDI, 1987; Plate 8). Although not indicated on Plate 8, the headwaters of Grimes Creek are considered an important elk calving and deer fawning area (Minter, 1992).

Table 22. Global and State Ranks for Sensitive Species in Upper Boise River Basin (Moseley and Groves, 1992).

Species	Global Rank	State Rank
Fisher (Martes pennanti)	5	1
Wolverine (Gulo gulo)	4	2
Fringed myotis bat (Myotis thysanodes)	5	1
River otter (Lutra canadensis)	5	4
Gray wolf (Canis lupus)	4	1
Bald eagle (Haliaeetus leucocephalus)	3	3
White-headed woodpecker (Picoides albolarvatus)	5	1
Goshawk (Accipiter gentilis)	4	4
Flammulated owl (Otus flammeolus)	4	3
Westslope Cutthroat trout (Oncorhynchus clarki lewisi)	5	2
Bull trout (Salvelinus confluentus)	4	2
Tiehm's rush (Juneus tiehmii)	5	2
Tall swamp onion (Alium validum)	4	1
Wilcox's primrose (Primula wilcoxiana)	2	2
Silvery whitlow grass (Draba argyraea)	3	3
Idaho goldenweed (Haplopappus aberrans)	3	3
Giant helleborine (Epipactis gigantea)	4	3
Idaho douglasia (Douglasia idahoensis)	2	2

1 = critically imperiled because of extreme rarity or because of some factor of its biology making it especially vulnerable to extinction
2 = imperiled because of rarity or because of other factors demonstrably making it very vulnerable to extinction
3 = either very rare and local throughout its range or found locally in a restricted range or because of other factors making it vulnerable to extinction
4 = apparently secure, though it may be quite rare in parts of its range, especially at the periphery
5 = demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery

The North and Middle Forks Boise River are listed as Protected Areas by the Northwest Power Planning Council because of the wild rainbow trout and deer and elk wintering range (NWPPC, 1990). The forks and adjacent plateaus serve as major mule deer migratory routes from the high elevations to lower elevations, south-facing slopes and the Boise Front Wildlife Management Area (WMA), just outside Boise (Harris, 1991). The canyon of the North Fork Boise River above the Middle Fork Boise River confluence is roadless and contains rugged terrain, is reputed to be an important refuge for elk during hunting season. During winter, the elk migrate from the Trinity Mountains to the north side (south-facing slope) of the Middle Fork Boise River (Harris, 1991).

Fisheries

Lucky Peak and Arrowrock Reservoirs: Fisheries in the two reservoirs on the Main Boise River, Lucky Peak and Arrowrock, are classified by IDFG as mixed (contain cold and warm water species) fisheries and contain populations of smallmouth bass, perch, rainbow trout, kokanee, bull trout, and whitefish (IDFG, 1990a). The fisheries in both reservoirs vary in quality and quantity because of fluctuating water levels (Rohrer, 1989). A fish kill occurred at Arrowrock in 1966 due to drawdown, and in 1988 it was completely drained for irrigation purposes (Rohrer, 1989). The 1988 Army Corps of Engineers Operations Manual for the Boise River System recommends that both Lucky Peak and Arrowrock each have a minimum conservation pool of about 28,700 AF. But in the recent dry years, the minimum pool has dropped below the recommended level (Reid, 1991).

The IDFG plan for Arrowrock is to stock annually with fingerling rainbow. The intention for Lucky Peak is to improve the kokanee (landlocked sockeye) fishery. Kokanee probably need to be stocked annually in the reservoir to maintain a population. In the early 1970s, kokanee spawned in Mores Creek, but didn't establish (Rohrer, 1989). IDFG also plans to study the feasibility of stocking fingerling rainbow and continue to stock catchable rainbow in Lucky Peak.

Main Boise, North and Middle Forks Boise River: Upstream from the reservoirs, the Main, North, and Middle Forks Boise River contain excellent populations of wild rainbow trout, mountain whitefish and bull trout (IDFG, 1990a). The highest densities in the basin of both the bull and wild trout are in the roadless portion of the North Fork, the reach between the confluence at Troutdale and Rabbit Creek.

Because of heavy fishing pressure, hatchery-reared rainbow trout are released by IDFG to supplement the wild populations. Currently, 75% of the Middle Fork and 64% of the North Fork are managed as native trout fisheries, while the remaining 25%/36% are managed for hatchery-reared trout (Allen, 1991). The management direction proposed by IDFG for the early 90s varies for different reaches of the river (IDFG, 1990a). Prior to the Kirby Dam failure in the spring of 1991, the IDFG had planned to stock the Middle Fork from Arrowrock to the North Fork confluence with catchable rainbow trout following the high water period (usually mid-July) until Labor Day. Their intention had been to manage for high catch rates of wild fish from the North Fork confluence to Kirby Dam. The IDFG also planned to stock with rainbows above Kirby Dam to Sawtooth Wilderness prior to the failure of Kirby Dam. However, the IDFG Middle Fork management plan has been put on hold until the impact from the Kirby failure can be assessed (Reid, 1991). According to the IDFG, the North Fork currently does not receive the angling pressure that the Middle Fork gets and will be managed for high catch rates (3 fish/hour) and low angler density.

Boise River Tributaries: While the main rivers of the basin serve for both spawning and rearing, the tributaries serve mainly for spawning. Natural populations of brook trout, wild rainbow trout, and westslope cutthroat trout occur in some tributary streams. Sheep Creek, a tributary of the Middle Fork, has the highest density of juvenile wild trout and is an important spawning stream (Rohrer, 1989). Table 23 provides wild rainbow trout densities for sections of the North and Middle Forks and several of their important tributaries (Rohrer, 1989 and 1990). In addition to Sheep Creek, other important spawning tributaries in the basin include Roaring River, Yuba River, Rabbit Creek, and Johnson Creek.

Table 23. Boise River Wild Rainbow Trout Densities (Rohrer, 1989, 1990).

Stream Sections Studied	Density (fish/100 m^2)
Mainstem and Middle Fork Boise	
Section 1 (Willow Cr. C.G. to confluence)	.39
Section 2 (confluence to Alexander Cr.)	.69
Section 3 (Alexander Cr. to Dutch Cr.)	.57
Section 4 Dutch Cr. to Kirby Dam)	.89
Section average	.65
Middle Fork Tributaries:	
Sheep Creek	12.01
Roaring River	8.59
Queens River	2.90
Yuba River	4.43
North Fork Boise	
Section 1 (confluence to Rabbit Cr.)	.98
Section 2 (Rabbit Cr. to Crooked R.)	.21
Section 3 (Crooked R. to Deer Park)	1.00
Section 4 (Deer Park to Graham C.G.)	1.20
North Fork Tributaries:	
Rabbit Creek	4.50
Crooked River	2.90
Bear River	1.60
Johnson Creek	8.60

Aesthetic Values

The objective of data collection for the upper Boise River basin aesthetic study was to identify landscape scenic values, viewer characteristics and special management designations. Most of the upper Boise River basin is under the jurisdiction of the Boise National Forest with a few scattered parcels managed by the Cascade and Bruneau resource areas within the Boise District Bureau of Land Management (BLM). The Forest Service and BLM inventory and manage their lands for aesthetic

resources during land management planning as required in organic statutes and other federal regulations. Consequently, the majority of aesthetic data necessary for the Upper Boise Plan were available from these two agencies.

Visual Management Systems

Guidance for conducting visual inventories on Forest Service lands is contained in *National Forest Landscape Management, Volume 2 - Chapter 1, The Visual Management System* (USDA, 1974). This process, known as the Visual Management System (VMS), provides a framework for inventory and management of the visual resource (USDA, 1974). Guidance for inventorying BLM lands for visual resource values is found in the *Visual Resource Management Inventory and Contrast Rating Manual - 8400 Series* (VRM manual) (USDI, 1986), originally published in 1980 with revisions in 1984 and 1986.

Visual inventory data collected during evaluation of Forest Service and BLM lands provide information on landscape scenic values and viewer characteristics. The Boise National Forest inventoried and mapped visual resource data at a scale of 1:24,000 from 1979 to 1981. The Cascade and Bruneau resource areas within the Boise BLM District conducted visual resource inventories in 1984. Inventory data were mapped at a scale of 1/2 inch = 1 mile.

Landscape Scenic Values

Landscape scenic values are a measure of the aesthetic quality of a landscape from a regional perspective. This value is based on the degree of variety a landscape possesses. All landscapes are considered to have some scenic worth, but landscapes with greater variety are rated higher (USDA, 1974; USDI, 1986). The Forest Service system terms these values variety classes which are determined by evaluation of variety found in characteristic landform, rock form, vegetation, and water forms (USDA, 1974). The BLM relies on a numeric rating system to derive scenic quality classes. This system assesses the degree of visual variety and harmonious composition of seven criteria: landform, vegetation, water, color, adjacent scenery, scarcity and cultural modifications (USDI, 1986). Both agencies categorize landscape scenic values using one of three classes: class A - outstanding; class B - common; or class C - minimal.

Landscape scenic values for the basin were identified in Forest Service and BLM visual resource inventories as class A, B or C and reviewed for use in the Upper Boise aesthetic analysis. The most outstanding or scenic landscapes in the basin were those landscapes rated as variety class A by the Forest Service or scenic quality class A by the BLM. Class B landscapes, although aesthetically appealing locally, possess characteristics common to the region. Class C landscapes have minimal

variety in landscape features. Plate 10 depicts the scenic values assessed for landscapes in the basin. The most outstanding scenic landscapes are described in Table 24.

Table 24. Outstanding Scenic Landscapes in the Upper Boise River Basin* (USDA, 1979-81; USDI, 1984a; and USDI, 1984b).

Grays Creek drainage	Browns Creek drainage
Middle Fork Boise	Portion of Black Warrior Creek drainage
Slopes adjacent to Sawtooth Wilderness	Johnson Creek drainage
Right Creek drainage	Headwaters of Phifer Creek
Browns Creek drainage	Headwaters of Hot Creek
Little Queens River drainage	Headwaters of Lake Creek
Cub Creek drainage	Steel Mountain Summit area
Ridge along Cayuse Point to Bald Mountain Summit	Elk Creek drainage
Headwaters of Yuba River	Boiler Creek drainage
East Fork Yuba River drainage	Grade Creek drainage
Corbus Lake	Grouse Creek drainage
Jennie Lake	Grouse Lakes
Wolf Mountain	Decker Creek Drainage
Headwaters of Bear Creek	Upper end of Devils Creek
Little Trinity Lakes area	Upper end of Sheep Creek drainage
Upper Roaring River area	Upper end of Rattlesnake Creek
Middle Fork of the Roaring River	Warrior Lakes area
East Warrior Peak and northern slope	Blue Jay Lake area
East Bank of North Fork of Boise River	Swanholm Peak area
Easy Slope of Graham Peak area	Lodgepole Creek drainage
Cub, Taylor and McNutt Creek drainages	Lodgepole Lake area
Tyee Mountain	Goat Mountain
Northside of Little Silver Creek	Shephard Peak
Bear River	Graham Peak
	Silver Mountain
	South side of Lucky Peak

* Landscapes inventoried as variety class A or scenic quality class A by the Boise National Forest or Boise District BLM

Viewer Characteristics

Viewer characteristics include the sensitivity of viewers to changes in the visual landscape and the visible landscape as seen by the viewer. Sensitivity levels are a measure of public concern for the scenic values of the landscape. This is accomplished by first identifying key viewpoints (roads, use areas and water bodies) which provide an opportunity for a person to view the landscape. Several criteria are then considered to determine the sensitivity of the viewer located at this viewing area. Criteria evaluated include viewer activity, use volume, use duration, and national or local importance. Three levels of viewer sensitivity are used to describe viewer concern for the visual landscape: level 1 or high, level 2 or moderate, and level 3 or low.

Viewpoint inventory data for the basin were available for Boise National Forest lands, but not for BLM lands. Sensitive viewpoints identified in the Forest Service visual inventory were reviewed for accuracy and currency. It was discovered that levels of use, types of users, and other indicators of

visual sensitivity had changed for some key viewpoints subsequent to the original sensitivity analysis conducted ten years ago by the Forest Service. Accordingly, sensitivity levels were updated through review with Forest Service staff familiar with the VMS system and use patterns on the forest. Final sensitivity levels for high and moderate viewpoints used in the Upper Boise aesthetic analysis are summarized in Table 25.

Distance zones define the viewshed or the visible landscape as seen from a sensitive viewpoint. The viewshed is differentiated into the following categories defining specific distances from the viewpoint: foreground (0 to 1/4-1/2 mile), middleground (1/4-1/2 to 3-5 miles), background (3-5 miles to 15 miles), and seldom seen (unseen or beyond 5 miles). Visibility and clarity of detail are dependent on distance; consequently, these delineations define different levels of viewer perception. The foreground describes the area where detail is readily perceived. The middleground defines the distance where texture is perceived. Background describes the distance where texture becomes difficult to discern but forms or masses are perceived (USDA, 1974). Distance from a viewer is an important determinant in mitigating visual impacts.

The sensitivity of the viewshed is determined by the sensitivity of the viewpoint. Viewshed data were available for Forest Service lands only. Viewsheds for high and moderate sensitivity viewpoints listed in Table 25 were calculated by the Boise National Forest through use of a computer mapping program called VIEWIT using terrain data at a scale of 1:250,000. Viewsheds were divided into foreground, middleground, background or unseen distance zones. Maps depicting these viewsheds are located in IDWR files.

Agency Visual Resource Management

The Forest Service and BLM overlay landscape scenic value classes, viewer sensitivity and viewshed mapping to arrive at agency management objectives. These define the management direction for the visual resource, or degree of acceptable visual change allowed in a particular landscape. The Forest Service derives visual quality objectives (VQOs). The BLM derives visual resource management classes (VRM classes). Table 26 summarizes management direction for VQOS and VRMs.

Table 25. Key Viewpoints and Sensitivity Levels for the Upper Boise River Basin.

Roads	Trails	Water Bodies/Streams	Use Areas
Sensitivity Level 1 or High			
Middle Fork Boise 268	Pogue National Recreation Trail 122	North Fork Boise	Black Rock Campground
North Fork Boise 327	Crooked River 158	Sheep Creek	Nunamker homesite
State Highway 21	Little Queens River 054	Middle Fork Boise River	Ninemeyer Hot Springs
Fall Creek - Rocky Bar 129	Johnson Creek 059	Little Queens River	Trinity Look Out
Queens River 206	Black Warrior 053	Little Trinity Lake	Edna Creek Campground
Grayback 374A	Trinity Mountain Rd. 129	Rainbow Lake Area	Power Site
Roaring River 255	Middle Fork Boise River 060	Big Roaring River Lake	Queens River Trailhead
	Roaring River 45	Queens River	Little Roaring River Campground
	Cottonwood 189	Little Roaring River Lake	Big Roaring River Campground
		Big Trinity Lake	Power Plant Campground
		Cottonwood Creek	Grayback Gulch Campground
		Jennie Lake	Hayfork Campground
		Roaring River	Bad Bear Campground
		Yuba River	Ten Mile Campground
Sensitivity Level 2 or Moderate			
Middle Fork Boise 268	Devils Creek 128	Arrowrock Reservoir	Willow Creek Campground
Thorn Creek to Cottonwood 377	Snowslide 123	Lucky Peak Reservoir	Ninemeyer campground
North Fork Boise 327	Rattlesnake 127	Grimes Creek	Willow Creek campground
Little Owl 384	Clear Creek 145	Clear Creek	Irish Point dispersed site
Grimes Creek 364	Link 148	Pescado Lake	Badger Creek Campground
Robie Creek 261	Warm Springs 147	Grouse Lakes	Troutdale Guard Station
South Fork Robie Creek 260	Kirkham Ridge 144	James Creek	Arrowrock boat ramp
Roaring River 255 (paralleling Lost Man Creek)	Grouse Creek 066	Mores Creek	Graham Bridge Campground
Fall Creek to Rocky Bar 129			Johnson Creek Campground
James Creek 126			Clear Creek subdivision
Flint Creek to Decker Creek 289			Robie Creek subdivision
China Basin 205			Karney subdivision
Private Road in Atlanta area			Macks Creek Picnic Area & Boat Ramp
Idaho City to Horseshoe Bend 307			Arrowrock Dam
Alder Creek 615			Spring Shores Marina
			Dutch Creek Administrative Site
			Weatherby Landing Field
			Riverside Campground
			Atlanta Townsite
			Rocky Bar Historical Area
			Atlanta Airstrip
			Atlanta Guard Station

The Basin includes lands managed for all five VQO's, i.e, preservation, retention, partial retention, modification and maximum modification. A detailed map is available in the Department's files or the Boise National Forest Supervisor's office. VRM class delineations for BLM parcels are presented in Table 27. These lands are managed under VRM classes II and III within the basin. Specific geographic delineations of VRM class boundaries are available in BLM and Department files.

Table 26. Visual Management Direction for Forest Service and BLM Lands (USDA, 1974; USDI, 1986).

VQO (Forest Service)	VRM Class (BLM)	Management Direction
Preservation	VRM Class I	Ecological changes only.
Retention	VRM Class II	Retain existing visual character of the landscape. Allows activities which are not visually evident. Visual change should be low.
Partial Retention	VRM Class III	Partially retain visual character of the landscape. Visual change should be moderate.
Modification	VRM Class IV	Allows major modifications to the existing landscape character. Management activities may visually dominate the landscape. Level of change can be high.
Maximum Modification		

Table 27. VRM Classes for BLM Lands in the Upper Boise River Basin (USDI, 1984a and USDI, 1984b).

VRM Class	Land Area
II	Boise Front Lucky Peak area
III	Idaho City area Quartzburg area Placerville area Centerville area

Additional Visual Resource Data Collected

In addition to evaluating the Forest Service and BLM visual inventory data, the aesthetic study involved a review of other agency programs to identify resources and/or viewpoints managed to preserve or promote aesthetic qualities. Public input was also considered to identify resources which are highly valued for scenic or aesthetic attributes. Many of the resources identified through these procedures were already considered in the Forest Service's and BLM's visual resource inventories. Recreational facilities operated by the USACE, Bureau of Reclamation, and IDPR, were considered in the sensitivity analysis conducted by the Forest Service. Other agency designations which recognize aesthetic resource values include wilderness, national trail, and federal Wild and Scenic River designations. The federal agencies considered wilderness and national trail designations during its visual inventory processes. The BLM designates areas of critical environmental concern (ACECs) and special recreation management areas (SRMAs) which were also considered during its visual inventory.

Four additional agency management designations with the purpose of protecting aesthetic values apply in the basin. Three of these programs identify scenic values viewed from travel routes. They include Idaho's State Scenic Route program, the U.S. Department of Transportation's National Scenic Byway program and the Forest Service's Scenic Byway program. A fourth recognizes outstanding aesthetic values of river corridors -- federal wild and scenic river designations.

Scenic Routes and Byways Program

The Idaho Transportation Department (ITD) has a program which identifies certain state highways as state scenic routes. This designation characterizes highways with unquestionable scenic quality (ITD, 1977). Additionally, many of these are eligible for national scenic byway status (USDT, 1988).

The Forest Service has a program similar to the state's in identifying national forest scenic byways. The objectives of the scenic byway program in Idaho include: 1) highlighting outstanding Forest Service scenery; 2) increasing public comprehension of Forest Service management activities including its provision of recreational opportunities; 3) meeting demand for the recreational pursuit of pleasure driving; 4) promoting use of the national forest by non-traditional users; and 5) contributing to the national scenic byways effort (Cook, 1989). In Idaho, the Forest Service scenic byway program complements the ITD program (Cook, 1991). Those highways which are designated state scenic routes and traverse national forest lands are proposed as national forest scenic byways.

In the upper Boise River basin, State Highway 21 is designated as the Ponderosa State Scenic Route from Boise to Stanley by the ITD (ITD, 1977). It is also eligible for national scenic byway designation (USDT, 1988). Additionally, the Boise National Forest has nominated State Highway 21 from Idaho City to Lowman as a national forest scenic byway in its Land and Resource Management Plan (USDA, 1990a).

National Wild and Scenic Rivers

The objective of the Wild and Scenic Rivers Act is to keep river corridors which possess outstandingly remarkable scenery, recreational, geologic, fish & wildlife, historic, cultural, or other similar values . . . free-flowing (Section 1[b]). One of three designations may occur reflecting the type of access and intensity of development in the river corridor -- wild, scenic or recreational (USDA, 1990a).

No wild and scenic rivers are designated within the basin. However, the Forest Service has conducted eligibility studies to identify free-flowing rivers possessing at least one outstandingly remarkable values. These river segments were found eligible for detailed suitability analysis for possible inclusion in the National Wild and Scenic River system (USDA, 1990a).

Wild

- North Fork Boise - Johnson Creek to Hunter Creek
- North Fork Boise - Rabbit Creek to Middle Fork Boise
- Yuba River - Headwaters to Trails Creek
- Bear River - Headwaters to North Fork Boise
- Roaring River - Headwaters to crossing of Forest Service Road 255
- Crooked River - Whoop Um Up Creek to North Fork Boise

Recreational

- North Fork Boise - Wilderness boundary to Johnson Creek - recreational
- North Fork Boise - Hunter Creek to Rabbit Creek
- Middle Fork Boise - Forest boundary to Willow Creek
- Yuba River - Trail Creek to Middle Fork Boise
- Roaring River - Crossing of Forest Service Road 255 to Middle Fork Boise

Other Scenic Designations

Additional special management designations by the Forest Service which are related to aesthetic resource management or protection include the Sawtooth Wilderness and the adjacent recommended Ten Mile Wilderness located in the northeast corner of the basin. Additionally, the BLM manages the Boise Front as an ACEC and SRMA, noting its function as a scenic backdrop for the City of Boise (USDI, 1987).

Cultural Features

The National Register is an official list compiled by the National Park Service since 1966 of archaeological, historic, and architectural properties of national, state and local significance worthy of preservation. Register sites located on private lands include Idaho City and the Atlanta Historic District (USDA, 1990b). Register sites on BLM lands include the Placerville Historical District. The BLM proposes nominating three other sites including Quartzburg, Centerville, and Pioneerville (USDI, 1987). National Register sites on the Boise National Forest include Alturas City, Yuba City, some mill sites, several cabins, historic graves, and Arrowrock Dam (USDA, 1991d; USDA, 1990b). Kirby Dam was formerly listed, but is no longer eligible because of its rehabilitation in 1990 and subsequent collapse in the spring of 1991.

Numerous sites are eligible for listing, and others may be eligible although an evaluation has not been completed (USDA, 1990b). Eligible sites include a number of Forest Service administrative sites, historic mining and logging sites, particularly Chinese mining sites. Administrative sites eligible for nomination include the Atlanta and Cottonwood ranger stations; Barber Flat, Deer Park, Graham and Troutdale guard stations; Beaver Creek and Dutch Creek work stations; and the Idaho City work compound (USDA, 1991d).

The discovery of gold around Idaho City launched gold fever in the Boise basin in 1862 (Alt and Hyndman, 1989). By 1869, the rush was over, but limited mining continued until about 1952. Prospectors found gold near Atlanta, on the Middle Fork Boise River, in 1863, but the glory was short-lived (Alt and Hyndman, 1989). In 1932, however, a mill was erected that utilized a new process extracting both gold and silver which made Atlanta the top gold producer in the state until 1936. The Monarch Mine, the most renowned of Atlanta district mines, produced over $2 million between 1865 and 1936 (Anderson, 1939). In 1908, Kirby Dam was completed just below Atlanta, to supply 600 hp of power to Monarch (Bell, 1906).

Throughout the basin is the evidence of the mining activity. After the independents hand-worked the gravels, mining companies hydraulically worked the hillsides, to be followed in 1898 by the dredges, which turned the floodplains upside down and resulted in the gravel piles that litter the valley floors. The Boise basin was the most productive gold mining district in Idaho. The Idaho City area is important for understanding the local mining history and Chinese populations.

During the gold rush, prospectors followed the 50 mile Goodrich Trail that ran between Idaho City and Rocky Bar (Idaho Historical Society, 1972). The trail was named after the Goodrich Brothers who owned a ranch at Alexander Flats on the Middle Fork Boise River, where they established a hotel for miners called the 24 Mile House or Middle Boise Hotel. The hotel and trail were maintained by the brothers for several years until miners began to use other routes to Idaho City and Boise, such as by way of Banner or directly down the Middle Fork Boise River.

Recreation

Methods

The objectives of the recreation study for the Upper Boise Plan were to identify (a) the types and diversity of recreational opportunities within the basin; (b) agency recreational management direction and designations; and (c) current use and future capacity of these recreational activities. This information was obtained from a number of sources. Predominately, data were acquired from contacts with various agencies and review of their land management plans including the Boise National Forest Land and Resource Management Plan (USDA, 1990a), the Idaho Outdoor Recreation Plan (SCORP) (IDPR, 1989), the Bureau of Land Management (BLM) Cascade Resource Area Management Plan (USDI, 1987), and the Lucky Peak Master Plan (USACE, 1988a).

In addition to the agency contacts described above, data were obtained from literature review and contacts with private organizations regarding trail and boating use. Specific information with respect to trail use were lacking for the basin. Consequently, the Department contacted specific trail

users to identify the type of trail use, location of trails used, and issues and concerns with respect to the river planning process. Numerous publications were also examined which summarize trails located within the basin. Individual boaters were contacted and boating guides reviewed to obtain information on put-in and take-outs, whitewater classifications, and boating activity in the river corridors.

The IDPR and IDWR contracted a recreation study through Boise State University which provided information regarding types of river recreation activity and degree of use in certain geographic areas along the mainstem, North and Middle Forks of the Boise river. This survey was conducted from May to September 1991, and focused on recreational use in roaded areas for the early spring and summer seasons.

Overview

According to the 1987 Idaho Leisure Travel and Recreation Study, Region 3 ranked second in the state as a major recreation destination, receiving 16% of all leisure travelers in the state. (Region 3 encompasses Adams, Canyon, Gem, Owyhee, Payette, Valley and Washington counties, in addition to Ada, Boise and Elmore counties). Destination travellers consisted of 52.4% Idaho residents, with most non-resident visitors coming from California, Oregon, Washington, Utah and Montana (Tynon et al., 1988). A 1991 study concluded Region 3 received 28.5% of all tourists, ranking it first along with Region 1 located in the Panhandle (IDC, 1991). Regionally, at least 35% of residents and non-residents engage in hunting, pleasure driving, nature study, hiking, walking, picnicking or sightseeing. Recreation patterns within the planning area generally reflect regional trends (Table 28).

Secondary suppliers of recreational opportunities include BLM in the vicinity of Lucky Peak and the area surrounding Placerville, Quartzburg, Centerville, Pioneerville and Idaho City. These opportunities accounted for approximately 2370 recreation visits in 1991. Recreation primarily consisted of motorized and non-motorized trail uses, and winter sports in the Idaho City area (Farrow, 1991). The IDFG Boise River Wildlife Management Area (WMA) accounted for another 8275 recreation visits, the most popular uses being wildlife observation, nature study and hunting (Table 28).

Table 28. Estimated Recreation Activity Participation for Region 3 and the Upper Boise River Basin (IDPR, 1989; USDA, 1991a; Schiepan, 1992; USDI, 1992; Farrow, 1992; Scholten, 1992; Budolfson, 1992; USACE, 1992 and Carter, 1992).

	1987 REGION 3 PARTICIPATION		BOISE NATIONAL FOREST (including Arrowrock)	BLM	BOISE WMA	LUCKY PEAK (excludes Spring Shores State Park)	IDPR (Spring Shores State Park)	ARROWROCK FACILITIES
Activity	**Resident Travelers**	**Non-resident Travelers**	**1991 RVDs[1] (% of total)**	**1991 RVs[2] (% of total)**	**1991 RVs (% of total)**	**1991 RVs (% of total)**	**1991 RVs (% of total)**	**1990 RVs**
Fishing	15.7%	13.3%	7500 (2.3)			47,768 (7.6)	10,704 (6.1)	
Boating						157,184 (25.2)	66,789 (37.8)	
Power boat	2.4%	0.2	5000 (1.5)					
Jet boat	3.5%	1.8%	-					
Canoe	6.3%	0	500 (0.15)					
Sail	0	1.1%	1000 (0.3)					
Kayak	0	0.8%	1900 (0.6)					
Raft	0.4%	2.3%	-					
Swimming								
Pools	23.4%	3.2%	-					
Reservoir/lake	1.5%	0.3%	-			48,181 (7.8)	21,853 (2.3)	
River/streams	1.8%	0.4%	3300 (1.0)					
Diving	0	0	500 (0.15)					
Water ski	0.3%	0	3000 (0.9)			43,249 (7.0)	18,966 (10.7)	
Beach	15.4%	2.4%	-					
Non-motorized				250 (10.5)				
Hiking/walking	37.1%	24.5%	3900 (1.2)					
Horseback	2.1%	1.9%	18,000 (5.4)					
Biking	0	5.4%	6500 (2.0)		450 (5.4)			
Off road vehicle	3.0%	5.7%	19,900 (6.0)	240 (10.1)	300 (3.6)			
Camping								
Developed	18.8%	9.9%	49,800 (15.0)	-				
Dispersed	2.5%	2.0%	63,300 (19.0)	150 (6.3)		3265 (0.5)	4678 (2.6)	
Recreational cabin	-	-	3500 (1.1)	-				
Hunting				300 (12.6)		2367 (0.3)		
Big game	1.0%	2.6%	25,200 (7.6)		1150 (9.0)			
Upland game/birds	0.6%	0.6%	4700 (1.4)		700 (8.5)			
Nature study/wildlife observation	42.0%	56.2%	3350 (1.0)		5000 (60.4)			
Winter recreation				800 (33.8)	400 (4.8)			
Snowplay/sled	0.6%	0	4000 (1.2)					
Snowmobiling	4.5%	0	9000 (2.7)					
Cross country ski	5.8%	0	10,500 (3.1)					
Other land-based								
Picnicking	36.7%	19.6%	12,500 (3.7)	180 (7.6)		151,623 (24.3)	11,704 (6.6)	
Pleasure driving	46.1%	31.3%	37,450 (11.3)	450 (18.9)				
Sightseeing	34.5%	70.1%	2000 (0.6)			77,395 (12.4)	5323 (3.0)	
Gathering forest products	-	-	8700 (2.6)					
Guided tours	0.5%	1.9%	13,400 (4.0)					
Sports	30.7%	19.9%	1400 (0.4)					
Miscellaneous			12,400(3.7)		275 (3.3)	90,579 (14.6)	36,882 (20.8)	
TOTALS			**332,100 RVDs**	**2370 RVs**	**8275 RVs**	**305,748 RVs**	**88,863 RVs**	**15,000 RVs**

[1] Recreation visitor day (RVD) equals one person for twelve hours.

[2] Recreation visit (RV) equals one person for one visit regardless of length of visit. RVs for activities do not necessarily add up to the total RVs for an area as a person may participate in more than one activity on a visit.

Table 29. Number and Percent of Recreation Activities and Number of Visitors Observed on Segments of the Main, North and Middle Forks Boise River (Long, 1991*).

	MAIN STEM BOISE	NORTH FORK BOISE				MIDDLE FORK BOISE		
	Confluence to Arrowrock	Deer Park	Deer Park to Little Owl Creek	Little Owl Creek to Barber Flat	Barber Flat to Rabbit Creek	Jackalyn Creek to Swanholm Creek	Swanholm Creek to Alexander Flats	Alexander Flats to Confluence
Activity								
Fishing	482 (25.7%)	82 (33.4%)	153 (37.2%)	459 (27.8%)	658 (22.0%)	43 (22.9%)	63 (18.5%)	80 (14.8%)
Nap/Relax	478 (25.6%)	78 (31.8%)	111 (27.0%)	332 (20.1%)	462 (15.4%)	52 (27.7%)	88 (25.8%)	132 (24.4%)
Swim	351 (18.7%)	11 (4.4%)	34 (8.3%)	406 (24.5%)	450 (15.0%)	11 (5.9%)	59 (17.3%)	54 (10.0%)
Camp	252 (13.4%)	39 (15.9%)	77 (18.7%)	260 (15.7%)	566 (18.9%)	35 (18.6%)	23 (6.7%)	115 (21.3%)
Motor bike	52 (2.7%)	11 (4.4%)	6 (1.5%)	47 (2.8%)	260 (8.7%)	11 (5.9%)	13 (3.8%)	4 (0.7%)
Floating	72 (3.8%)	0	0	46 (2.7%)	61 (2.0%)	0	0	48 (8.8%)
Picnicking	44 (2.4%)	0	11 (2.7%)	26 (1.6%)	63 (2.1%)	19 (10.1%)	6 (1.8%)	22 (4.1%)
Sightseeing	44 (2.4%)	3 (1.2%)	8 (1.9%)	10 (0.6%)	95 (3.2%)	9 (4.7%)	14 (4.1%)	6 (1.1%)
Hiking	37 (2.0%)	2 (0.8%)	3 (0.7%)	2 (0.1%)	80 (2.7%)	0	0	5 (0.9%)
Mountain biking	45 (2.4%)	8 (3.3%)	2 (0.4%)	24 (1.5%)	25 (0.8%)	0	7 (2.1%)	6 (1.1%)
Hot Springs	6 (0.3%)	0	0	0	0	0	49 (14.3%)	58 (10.7%)
Horseback Riding	2 (0.1%)	6 (2.4%)	0	28 (1.7%)	41 (1.4%)	0	2 (0.5%)	0
Gathering Firewood	0	3 (1.2%)	4 (1.0%)	8 (0.4%)	18 (0.6%)	0	0	4 (0.7%)
Hunting	2 (0.1%)	1 (0.4%)	0	2 (0.1%)	7 (0.2%)	6 (3.2%)	1 (0.3%)	2 (0.4%)
Reading	0	1 (0.4%)	1 (0.2%)	4 (0.2%)	4 (0.1%)	1 (0.5%)	0	4 (0.7%)
Other	2 (0.1%)	0	1 (0.2%)	0	198 (6.6%)	12 (6.3%)	16 (4.7%)	0
Total Activities by Segment	1869	245	411	1654	2988	199	341	540
TOTAL ACTIVITIES BY RIVER CORRIDOR	1869	5298				1080		
Total Visitors by Segment	1279	195	327	1117	2180	150	259	417
TOTAL VISITORS BY RIVER CORRIDOR	1279	3819				826		

Note: Some visitors engaged in multiple activities.
* Bob Long's survey ran for a total period of 41 days from May 18, 1991 to September 1, 1991.

Recreation Opportunity Spectrum

The Boise National Forest inventoried lands for recreational opportunities using the recreation opportunity spectrum (ROS) classifications. This inventory provides general information regarding the range or spectrum of recreational opportunities available on the inventoried lands. Five ROS classes are used which indicate outdoor recreation settings, activities and experience opportunities (USDA, 1986). Since the majority of recreational use in the basin occurs on Forest Service lands and much of this use constitutes dispersed recreation, ROS classes provide a good overview of the range of recreation activities possible within the basin.

Most of the river corridors are classified as roaded natural indicating the landscape is natural appearing with areas of substantial modification. Motorized use is possible. Exceptions include portions of the North Fork downstream from Rabbit Creek and between Johnson and Hunter Creeks; Cottonwood Creek; and the upstream portions of the Yuba River, Bear River and Crooked River which are categorized as semi-primitive motorized. This indicates a landscape which is predominately unmodified and natural appearing where motorized use may occur. River corridors within the Sawtooth Wilderness are classified as primitive, representing natural landscapes, where motorized use is prohibited.

Developed Recreation Facilities

Numerous developed recreational facilities are located in the basin providing opportunities to engage in camping, picnicking, fishing, hunting, swimming, boating and winter recreational endeavors. These facilities are summarized in Table 30 and located in Plate 11.

Developed recreation facilities within the basin are mainly associated with the USACE's Lucky Peak Reservoir or Boise National Forest campgrounds and concentrated adjacent to water bodies. Facilities at Lucky Peak attract 62% of all attendance at lakes and reservoirs within a 50 mile radius of Boise (USACE, 1988a). Recreational use at Lucky Peak is predicted to increase 45% in the next 20 years to an estimated 612,318 visitors annually (USACE, 1988a). Increased use is predicted to be the result of an increased population rather than increased activity participation rates per individual (USACE, 1988a). Currently, use has decreased since 1987. This may be related to the drought which has resulted in lower water levels and/or shortened boating season on the reservoir (USACE, 1992). Developed recreational facilities located on the Boise National Forest are primarily campgrounds, but include trailheads, parking areas and a visitor center.

Camping

A study conducted by the Idaho Department of Commerce in 1991 concluded 28.5% of all tourists camped while traveling in Idaho (IDC, 1991). Regionally, recreation participation surveys conducted in 1987 estimated 55.5% of resident and 25.9% of non-resident destination travellers camped. The regions's public campgrounds were cited as one of its most positive assets (Tynon et al., 1988). The Boise National Forest estimates 19% of the total RVDs on the Boise and Idaho City ranger districts engaged in dispersed camping compared to 15% of the RVD total using developed facilities (Table 28).

According to a 1991 recreation study conducted in the basin, 75% of recreationists camped (Long, 1991). Camping activity was concentrated on the North Fork Boise River from Little Owl Creek to Rabbit Creek, and on the mainstem from the confluence of the North and Middle Forks to Arrowrock backwaters. These segments received 78% of camping use occurring in surveyed areas (Long, 1991).

A total of 163 developed public camping sites exist within the upper Boise River basin (Table 31 and Plate 11). The majority of developed and dispersed camping opportunities are available on the Boise National Forest. Developed camping facilities are limited at Lucky Peak, with ten sites at Spring Shores State Park. Primitive camping occurs at Barclay Bay, Charcoal Creek and Deer Flat, the latter two are accessible by boat only (USACE, 1988a and 1992). There are no developed camping facilities at Arrowrock Reservoir, although dispersed use does occur.

Table 30. Developed Recreational Sites Within the Upper Boise River Basin (USDA, 1987; USACE, 1988a; and USACE, 1992).

Recreation Facility	Activities	Estimated Use*
Forest Service		
Arrowrock	boat ramp, water skiing	15,000 (1990)
Atlanta	trailhead, stock loading facilities, recreational cabin	
Bad Bear	camping	
Badger Creek	camping	
Bald Mountain	camping	
Banner Ridge	trailhead, cross country skiing	
Barber Flats	recreational cabin, camping	
Big Roaring	camping	
Black Rock	camping	
Cottonwood	camping, recreational cabin	
Deer Park	recreational cabin	
Dutch Creek	recreational cabin	
Edna Creek	camping	
Gold Fork	trailhead, cross country ski trails	
Graham Bridge	camping	
Granite Creek	trailhead	
Grayback Gulch	camping	
Hayfork	camping	
Idaho City Visitor Center	information	
Johnson Creek	camping	
Little Roaring	camping	
Mores Creek Summit	trailhead	
Ninemeyer	camping	
Power Plant	camping	
Riverside	camping	
Ten Mile	camping	
Troutdale	camping	
Willow Creek (north)	camping	
Willow Creek (south)	camping	
Whoop Um Up	trailhead, cross country ski trails	
LUCKY PEAK FACILITIES		
Army Corp of Engineers		
Barclay Bay	picnicking, boat ramp, swimming, fishing	109,166
Birch Creek	picnicking, boat docks	
Browns Gulch	picnicking, boat docks	
Charcoal Creek	picnicking, swimming, fishing	8,015 (1987)
Chimney Rock	picnicking, swimming, fishing	7,875 (1987)
Dead Dog Creek	picnicking, boat dock	
Deer Flat	picnicking, swimming, fishing	7,975 (1987)
Lucky Peak Overlook	picnicking, fishing	102,571 (1987)
Goose Neck Bay	picnicking, boat docks	
Mack's Creek Landing	boat ramp, picnicking, swimming, fishing	11,203
More's Creek	picnicking, fishing, swimming	14,040 (1987)
Pipeline Gulch	picnicking, boat docks	
Placer Point	picnicking, swimming, fishing	5,760 (1987)
Robie Creek Park	picnicking, boat launch,swimming, fishing	42,310
Sheep Creek	picnicking, boat docks	11,889 (1987)
South Robie Creek	picnicking, boat docks	
Turnaround Point	picnicking, boat docks	
Turner Gulch	picnicking, boat launch, swimming, fishing	
IDPR		
Spring Shores State Park	picnicking, food service, marina, boat launch, swimming, fishing, RV camping	88,863

* Based on 1991 fiscal year attendance tabulation at Lucky Peak, unless noted otherwise.
U.S. Forest Service estimated use in RVDs; Lucky Peak estimated use in RVs.

Table 31. Upper Boise River Basin Developed Public Campgrounds, and Number of Sites (USDA, 1987b; and USACE, 1988a).

	No. of Developed Sites
Boise National Forest	
Bad Bear	8
Badger Creek	5
Bald Mountain	4
Big Roaring River	10
Black Rock	11
Cottonwood	3
Edna Creek	9
Graham Bridge	4
Grayback Gulch	14
Hayfork	6
Johnson Creek	3
Little Roaring River	4
Ninemeyer	8
Power Plant	25
Riverside	7
Ten Mile	14
Troutdale	4
Willow Creek (north)	4
Willow Creek (south)	10
IDPR	
Spring Shores State Park	10
TOTAL	163

Although nineteen developed campgrounds are managed by the Forest within the Upper Boise basin, the Forest Service estimates most camping occurs in dispersed areas (USDA, 1991b). Most developed campgrounds are located adjacent to rivers or streams providing easy access to the water. Dispersed camping is also concentrated in river corridors. Three campgrounds located along the North Fork Boise were closed because of threats to the water quality from the restroom facilities. However, camping near streams and rivers is popular, and despite closure, these and other areas located along the mainstem, North Fork and Middle Fork, and tributaries receive heavy dispersed use. The Forest Service plans to provide developed facilities at some of these dispersed use areas in the future (Herrity, 1992). Estimated use at the developed USFS campgrounds in the basin was 49,800 RVD's (USDA, 1991a).

Swimming and Water Skiing

Recreation participation surveys indicate most swimming occurring within Region 3 is concentrated at pools (Table 28, p. C-29). An estimated 15.4% of residents and 2.4% of non-residents visit beaches. An estimated 1.5% and 1.8% of residents and non-residents respectively swim in reservoirs or rivers (Table 28).

Most of the swimming activity on the Boise River occurs at Sandy Point located below Lucky Peak Dam and outside of the basin. In 1991, 37% of all swimming activity at Lucky Peak occurred at Sandy Point. Barclay Bay, Spring Shores and Robie Creek were also major providers of

swimming opportunities (USACE, 1992). Remaining use occurs at boat and vehicle access sites around the reservoir. Swimming capacity at Lucky Peak's facilities, based on density of swimmers per water surface area, currently exceeds use at both Spring Shores and Robie Creek developed areas. This is largely a function of parking facility limitations (USACE, 1988a).

Swimming activity was observed throughout the Boise River corridors during a recreational survey in 1991. Use was concentrated on the mainstem and North Fork from Little Owl Creek to Rabbit Creek (Table 29). Several hot springs on the mainstem, Middle Fork and Queens River also attracted visitors. Additional swimming opportunities are provided at the Warm Springs Resort's natural warm water pool near Idaho City.

Water-skiing occurs on Lucky Peak and participation levels are projected to nearly double over the next 20 years (USACE, 1988a). Areas of the reservoir receiving concentrated use are the Mores Creek arm, Barclay Bay, Spring Shores State Park and Turnaround Point. This has resulted in congestion and complaints of near misses (Hoedt, 1992). Future zoning may be required to resolve these conflicts (USACE, 1988a).

Picnicking

Developed picnic areas are concentrated in the Lucky Peak area. Additional opportunities are available at Forest Service campgrounds. Dispersed use is possible throughout the upper Boise River basin with use concentrated along river corridors with easier access.

Picnicking was engaged in by 3.2% of visitors observed in Boise River segments in a 1991 survey (Long, 1991). The most popular picnicking spots were on the North Fork from Barber Flat to Rabbit Creek and on the mainstem Boise (Table 29). Facilities at Lucky Peak are most heavily used by virtue of its close proximity to Boise and provision of developed sites. Most picnicking use occurs at Spring Shores, Barclay Bay and Robie Creek (USACE, 1992).

Boating/Floating

A diversity of boating opportunities are available in the study basin including canoeing, kayaking, rafting, power boating and sailing. Recreation on Lucky Peak and Arrowrock reservoirs is limited by water level fluctuations. Water from Arrowrock and Anderson Reservoirs is released into Lucky Peak to maintain recreation levels. Lucky Peak Reservoir receives heavier boating use than Arrowrock because of maintained water levels, accessibility, and the number and variety of facilities including boat launches, ramps and a marina. The boating experience is enhanced by picnicking, fishing and primitive camping facilities accessible only by boat at several sites around the reservoir.

In normal water years, water levels in Lucky Peak are maintained at a level useable for recreation from mid-June through Labor Day weekend. However, in low water years Lucky Peak is drawn down sooner to meet irrigation demands, shortening the recreation season. This situation is evidenced in the recreation estimates for Lucky Peak over the last years which show a decrease in use coinciding with the drought.

In addition to the low-water constraints, boating capacity on the reservoir is limited by a shortage of parking, launching and moorage facilities. Estimated capacity is 463 boats at one time, or 980 boats a day (USACE, 1988a). Current boating use is at 60% of estimated capacity (280 boats at one time) comprised of 60% high power (jet boats, power boats pulling water skiers) and 40% low power boats (sail boats, canoes) (USACE, 1988a). The Lucky Peak Master Plan proposes expanding parking and boating facilities in several key areas to accommodate increased boating access to the reservoir. However, development is not proposed to accommodate the full estimated capacity of the reservoir (USACE, 1988a).

Use is concentrated in areas on the reservoir resulting in boating densities which exceed safety considerations. Low water years result in less available water surface area to accommodate the estimated carrying capacity. The IDPR had eight reported accidents and numerous reports of near misses in 1991 (Beale, 1992). Past experience indicates only 3-5% of accidents are reported. In 1991, 10,887 registered boaters designated Ada and Boise counties as one of their primary use areas. This is a 32% increase from 1989 (Hoedt, 1992).

The mainstem, North and Middle Forks of the Boise, Mores Creek and Grimes Creek provide a variety of whitewater boating experiences for different skill levels and water craft. The Boise River system has been canoed, pole-canoed, kayaked, tubed, and rafted since at least the 1960s, but use has increased in recent years (Lucachick, 1992). No commercial outfitters are licensed by the Idaho State Board of Outfitters and Guides on these stretches (Sangrey, 1991).

The Middle Fork is considered an excellent river for beginning and intermediate canoeists and kayakers (Rosentreter, 1991). This area is often used for instructing boaters through Boise State University's Outdoor Education Program. A roadless stretch of the North Fork canyon, above the confluence with the Middle Fork, provides continuous class IV whitewater for advanced boaters (Amaral, 1990; Moore and McClaran, 1989). The whitewater season on these stretches generally occurs from April through June when spring run-off provides sufficient water for boating.

Whitewater boating opportunities are also available on Mores and Grimes creeks in the early spring during the peak run-off. These are intermediate runs which may require portaging around bridges and fences (Amaral, 1990). Table 32 provides information regarding the more popular runs

in the basin. Plate 11 locates put-ins and take-outs. Boating is also reported to occur above Barber Flats on the North Fork and on the Crooked River (Rosentreter, 1991; Herrity, 1992).

Table 32. Upper Boise Whitewater Segments (Amaral, 1990; Moore and McClaran, 1989; and Rosentreter, 1991).

Segment	Put-in/Take-out	Flow Range (cfs)	Skill Level	Craft
Main Boise	Troutdale/Willow Creek	500-1500 > 1500	Beginner - Class II Intermediate - Class II-III	Kayak, canoe, raft
North Fork Boise	Barber Flat/Black Rock	600-2000	Beginner to Intermediate - Class II-III	Kayak, canoe, raft
North Fork Boise	Black Rock/Troutdale	600-1000 1000-2000	Intermediate - Class III-IV Advanced - Class IV	Kayak, raft
Middle Fork Boise	Ninemeyer/Troutdale		Beginner - Class II+	Kayak, canoe, raft
Mores Creek	Big Gulch/Grimes Creek confluence	600-1300	Intermediate - Class II-III	Kayak, canoe
Mores Creek	Grimes Creek confluence/Robie Creek confluence	600-1300	Intermediate - Class II-III	Kayak, canoe
Grimes Creek	Pine Creek/Mores Creek confluence	400-1000	Intermediate - Class II-III	Kayak, canoe

A recreation survey conducted on the mainstem, North and Middle Forks from May to September, 1991, documented the boating activity occurring on these rivers (Table 33). Boating accounted for 2.7% of all recreation activity on the Boise River system engaged in by 3.8% of visitors (Table 29, p. C-30). Use was concentrated on the mainstem and North Fork from Barber Flat to Rabbit Creek. Additional boating use occurred on the Middle Fork from Alexander Flats to the confluence, and on the North Fork from Little Owl Creek to Barber Flat (Table 29). Rafting comprised 35% of total boating use, tubing 42%, kayaking 13%, and canoeing 10% (Table 33).

Table 33. Boating Activity Observed on the Boise River System (Long, 1991).

	Rafts	Float Tubes	Kayak	Canoe	Total
North Fork Deer Park to Rabbit Creek	19	53	22	13	98
Main & Middle Fork Jackalyn Cr. to Arrowrock backwaters	51	34	6	7	107
TOTALS	70	87	28	20	205

Differences in boating craft were observed on the Middle and North Forks. Rafting and tubing were sighted more frequently on the mainstem and Middle Fork. About half of all boating craft observed were rafts. By comparison, tubing comprised half of all boating observed on the North Fork with all the tubing occurring along the roaded reach. The remaining half was equally distributed between rafts, canoes and kayaks (Table 33).

Wildlife Observation

The upper Boise River basin has numerous opportunities for wildlife observation. Extensive areas of mule deer and elk winter and summer range occur in the basin and along river corridors. Bald eagles forage along the Middle Fork Boise in the winter. An area noted in the *Idaho Wildlife Viewing Guide* is the Boise River WMA which includes the area surrounding Lucky Peak Reservoir (Carpenter, 1990). The area provides winter range for more than 6000 mule deer and opportunities to observe bald and golden eagles. The optimum period to make wildlife observations is from December through March.

Additional wildlife opportunities are afforded by sportsman's access areas managed by the IDFG. Acquired to provide access for hunters and fishermen, they also provide wildlife observation opportunities.

Fishing

Fishing license sales have been relatively stable over the years increasing by 4% from 1977 to 1987. For this same period a 14% increase in angler use has occurred (Reid, 1989). In 1990, 20% of fishing licenses were purchased in Ada, Boise, Canyon and Elmore counties (IDFG, 1991). The majority of people recreating in the basin reside in these counties (USACE, 1988a; Long, 1991). Although all purchasers may not reside or fish in the vicinity of license purchase, there likely is some relationship.

Two of the ten most frequently fished waters cited by anglers in a 1987 angler survey were located in the basin -- the Boise River and Lucky Peak Reservoir (Reid, 1989). A total of 77.4% of Idaho anglers preferred cold-water fishing for trout on rivers and streams (Reid, 1989). The Upper Boise Basin provides ample opportunity to engage in this preferred fishing activity.

Management by IDFG varies on the mainstem, North and Middle Forks Boise River. Sport fish species occurring widely throughout the Boise drainage are rainbow and bull trout, and whitefish. Cutthroat and brook trout are found on the Middle Fork (IDFG, 1990a). The mainstem, Middle Fork from the Sawtooth Wilderness boundary to Kirby Dam, and North Fork from Deer Park to Rabbit

Creek are managed as put-and-take rainbow trout fisheries (IDFG, 1990a). Management emphasis is on wild rainbow trout for the North Fork from Rabbit Creek to the confluence and above Deer Park, and for the Middle Fork within the Sawtooth Wilderness. The Middle Fork from Kirby Dam to the confluence is managed as a quality wild trout fishery for bull and rainbow trout. This management involves size and catch number restrictions to increase catch rates for larger fish (IDFG, 1990a). Arrowrock and Lucky Peak are managed as mixed fisheries with smallmouth bass, yellow perch, bull trout, whitefish and rainbow trout. The IDFG is also attempting to establish a kokanee fishery in Lucky Peak (IDFG, 1990a).

Table 34 summarizes creel surveys conducted on reservoirs, rivers and streams located in the upper Boise River basin since 1986. The data mainly represent angler hours and catch rates for a specific day derived from spot creel checks. Underlined data for 1988 and 1989 estimate angler hours for the time period indicated. It is difficult to make comparisons between river segments as survey periods do not coincide.

A 1991 recreation survey provides the best information for comparing fishing activity between river segments (Long, 1991). This survey found that fishing was the most popular recreational activity in the river corridors. Fishing comprised 24% of all observed recreational activities and was engaged in by at least one-third of visitors to the basin (Long, 1991). Fishing occurred throughout the basin, but was concentrated most heavily on the North Fork downstream from Barber Flat to Rabbit Creek. According to the Forest Service, fishing has increased on the North Fork since implementation of fishing restrictions by the IDFG on the Middle Fork in 1990 (Herrity, 1992). This increase may also be partly attributable to the Kirby Dam failure in May 1991. Substantial use also occurred upstream of Barber Flats to the confluence of Little Owl Creek and on the mainstem Boise (Long, 1991) (Table 29, p. C-30).

Hunting

The Upper Boise planning area encompasses all of IDFG management unit 39. The area supports predominately deer and elk hunting, but is also open for black bear, mountain lion, upland game and birds. In 1990, Unit 39 ranked first in the state for numbers of hunters, fourth for hunter days and second for harvest numbers for deer hunting. Elk hunting ranked first in hunter numbers, third in hunter days, and second for harvest (Nelson, 1986-1990). Popularity is attributed to proximity to Boise, excellent deer and elk populations, good success rates, and ease of access, combined with an opportunity to hunt in remote areas (Nelson, 1992).

Table 35 summarizes the estimated hunter days for deer, elk, black bear, mountain lion, upland birds, and upland game hunting from 1986 to 1990. Deer hunting has increased by 1% and

elk by 42% during the 5-year period. Black bear and mountain lion hunting has increased substantially, by 99.6% and 319% respectively, but overall hunter days remain low.

Table 34. Estimated Angler Hours and Catch Rates (fish/hour) in the Upper Boise River Basin* (Reid and Mabbott, 1987; Mabbott and Holubetz, 1989, 1990a, and 1990b; Rohrer, 1989 and 1990).

	1986 Angler Hours	Catch Rate	1987 Angler Hours	Catch Rate	1988 Angler Hours	Catch Rate	1989 Angler Hours	Catch Rate
Boise River								
Confluence - Willow Creek	-	-	-	-	5450[1]	0.70[1]	5749[2]	0.95[2]
North Fork Boise	28	1.24	228	0.77	209	0.82	183	0.57
Deer Park - Crooked River	-	-	-	-	-	-	1143[3]	1.31[3]
Crooked River - Rabbit Creek	-	-	-	-	-	-	2013[4]	1.38[4]
Middle Fork Boise	764	0.63	658	0.52	482	0.82	315	0.59
Alexander Creek - Confluence	-	-	-	-	3299[1]	1.48[1]	1863[2]	0.73[2]
Mores Creek	90	0.51	137	0.50	61	0.85	94.5	0.69
Grimes Creek	103	0.76	129	0.81	108	0.47	14	0.29
Crooked River	-	-	80	0.39	47	0.74	16	0.5
Roaring River					24	0.83	-	-
Queens River	-	-	17	0.41	13	1.15	20	0.95
Rabbit Creek	33	0.67	29	1.07	-	-	-	-
Arrowrock Reservoir	772	0.39	1019	0.62	121	0.68	1720	1.47
Lucky Peak Reservoir	1964	0.42	10,618	0.78	2050	0.82	5029.5	0.64

* All data represent spot creel checks except for underlined data which represent season statistics for the period noted.
[1]May 28 - Oct. 28, 1988 [2]May 27 - Sept. 29, 1989 [3]Sept. 26 - Oct. 13, 1989 [4]Aug. 26 - Oct. 13, 1989

Table 35. **Hunter Days for Mule Deer, Elk, Black Bear, Mountain Lion, Upland Game and Upland Birds (Nelson, 1986-90; IDFG, 1986-1990).**

	1986	1987	1988	1989	1990
Deer Unit 39	44,828	50,060	47,386	41,772	45,032
Elk Unit 39	13,935	16,918	17,697	18,679	24,134
Black Bear Unit 39	2396	1796	3944	3731	4784
Mountain Lion Unit 39	48	436	206	265	201
**Upland Game*		5539	3447	5229	8,772
**Upland Birds*			39,460		40,601

* Hunter days for Ada, Boise, and Elmore counties.

Trails

The upper Boise River basin contains an extensive trail network providing opportunities for motorized and non-motorized use (Plate 11). The large number of trails in the basin makes it difficult to map them. Consequently, effort was focused on designated trails identified in the Boise National Forest Travel Plan and trail inventory; priority trails identified by organizations representing trail bike, equestrian and mountain bike users; and trails cited in hiking guides. IDPR provided additional information with respect to winter trail use, i.e., snowmobile and cross country ski trails. A detailed table listing the Forest Service or other identification number, motorized or non-motorized use, and special designations is located in the Department's files.

The Boise National Forest as a whole manages 969 miles of trails (USDA, 1990a). Through this planning process, 358 miles of trails were inventoried with 115 miles of these being non-motorized. Motorized use includes trail bikes, all terrain vehicles and snowmobiles. Non-motorized use is limited to trails in the Sawtooth Wilderness, and trails parallelling Cottonwood Creek, North Fork Rabbit Creek, Bear Creek, Bear River, and Johnson Creek. The William Pogue trail, parallelling Sheep Creek, is a designated national recreation trail providing for motorized and non-motorized use.

Access to the lesser used western portion of the Sawtooth Wilderness occurs from trails located in the eastern portion of the basin. Developed trailhead facilities accessible by vehicle are located on the Middle Fork east of Atlanta and the Queens River.

Substantial snowmobile use occurs in the Idaho City area which provides designated parking areas for trailers and groomed trails. A number of marked and groomed cross country ski trails are also found in the upper Boise River basin (see Winter Recreation section below).

Although the basin provides extensive trails for all users, many of these are poorly signed or require maintenance. All user groups interviewed during the trail inventory cited this as a major concern. Additionally, terrain constraints often restrict trail location to river and stream canyons, resulting in potential water resource impacts.

Winter Recreation

The upper Boise River basin receives winter recreation use particularly in the vicinity of Idaho City. Snowmobilers use a number of Forest Service roads in the area and along the North Fork, Granite, Rabbit, Swanholm, Phifer, Willow, Little Owl, and Bannock creeks (Wells, 1991). Several popular snowmobile areas are Granite Creek Snow Park, Pilot Peak, Summit Flats and Rabbit Creek. A notable trail is the Highway to Heaven, a 150 mile snowmobile trail from Boise to Stanley via Idaho City and Lowman.

Cross country skiing is also popular. Almost thirty five miles of marked trails affiliated with the IDPR Park N' Ski program are provided fifteen to twenty miles above Idaho City adjacent to State Highway 21. These include Whoop Um Up, a national recreation trail; Banner Ridge; and Gold Fork with parking areas, restrooms and groomed trails. Skiing also occurs in the Idaho City area and at Mores Creek Summit.

Additional winter recreation activities include snowplay, sledding and ice skating in the vicinity of Idaho City and to the north.

Recreational Dredge Mining

Recreational dredging is restricted to intake nozzle diameters of five inches or less, and to a season extending from July 1 to October 31. The North Fork and its tributaries from the confluence with the Middle Fork to Bay Horse Creek is a one-stop permit area, which means that applications do not have to specify their location. The Middle Fork Boise River from Roaring River to the Sawtooth Wilderness boundary is also a one-stop permit segment [6-8 permits issued for the reach in 1990 (Ballou, 1991)]. The Middle Fork and main Boise River from Lucky Peak to Roaring River is closed all year to mining. However, the Idaho Gold Prospectors have requested opening this segment to recreational mining. In 1989, there were two applications to mine outside the one-stop areas in the basin (Ballou, 1991).

Sightseeing

Sightseeing and pleasure driving were cited as one of the more popular recreation activities in the region (IDPR, 1989) (Table 29, p. C-30). Access in the study basin is amenable to pleasure driving in the river corridors as numerous improved and unimproved roads are adjacent to the Middle and North Forks, Grimes Creek, Mores Creek, and other tributaries.

Sightseeing opportunities include travel on State Highway 21, designated the Ponderosa State Scenic Route and eligible as a national scenic byway (ITD, 1977; USDT, 1988). The route parallels Mores Creek for most of its length, accessing Forest Service recreation sites, trailheads and winter play areas. Travellers pass through Idaho City, an historic mining town with museums, lodging, food and other tourist services.

In the northwestern corner of the basin are additional historic mining towns including the townsites of Placerville, Quartzburg, Centerville and Pioneerville. Atlanta, another historic townsite, is located at the edge of the Sawtooth Wilderness on the Middle Fork. Some recreational visitation occurs to these mining areas. Opportunities exist to enhance recreational experiences through provision of interpretative facilities. The Boise District BLM proposes future development of historic interpretation, cross country ski trails and snowmobile trails in the Pioneerville, Placerville, and Quartzburg areas (USDI, 1989). The Forest Service also plans to provide historic interpretation of sites on its lands (USDA, 1990a).

Additional Recreation Opportunities

Several special management designations are found in the basin which have recreational implications. These include the southern portion of the Boise Front situated on the northern edge of Lucky Peak Reservoir designated by the BLM as an area of critical environmental concern (ACEC) and special recreation management area (SRMA) (USDI, 1987; Plate 11). The Boise Front is the site of substantial dispersed recreation use including off road vehicle use, hiking, mountain biking, hunting, horseback riding and nature study. The area is designated an ACEC because of potential impacts to fragile soils and watersheds from heavy recreational demands (USDI, 1989). The area has mixed ownership resulting in access conflicts (Farrow, 1991). Trail use is significant, but lack of signs and maintenance result in erosion impacts.

The basin contains the western edge of the Sawtooth Wilderness. In addition, the Forest Service has recommended the Ten Mile area, 78,785 acres along the North Fork and adjacent to the Sawtooth Wilderness, for wilderness designation (USDA, 1990a). Non-motorized trails and other

forms of non-motorized recreation are available in these areas. Numerous alpine lakes are found in the Sawtooth Wilderness.

Very few private cabins or homes are found along the Middle and North Forks, with the exception of Atlanta, because very little patented land exists. A few private cabins or homes are located at Twin Springs, Alexander Flats, Deer Park and Dutch Creek. Tributaries, such as Mores, Robie, Daggett, and Grimes creeks, are parallelled by large areas of private land and homes. In addition, rental cabins are available at Idaho City, Atlanta and Twin Springs. Several Forest Service guard stations and lookouts are available to the public on a rental basis (USDA, 1991a).

Agriculture: Irrigation/Livestock Watering

The occurrence of irrigation and livestock watering in the upper Boise River basin from either ground or surface water is limited. Most of the surface water from the watershed goes into the two storage reservoirs within the lower end of the basin, Lucky Peak and Arrowrock. Arrowrock was constructed specifically to provide storage for the irrigation of the Boise Valley, while Lucky Peak's primary role was for flood control. Secondarily, Lucky Peak has stored water for irrigation and recreation purposes. In all, about 327,000 acres of land are irrigated in the Boise Valley by Boise River water, with an additional 82,500 acres irrigated by water transported from the lower Payette River.

Implementation of this plan will have no effect on existing water rights for irrigation and other beneficial uses.

Current Agriculture Water Use Within the Basin

The Stewart Decree of 1906 and the Bryan Decree of 1929 have governed how most Boise River water is managed. Court decrees typically finalize the water right process. Early decrees commonly address natural flow rights rather than storage rights. In the Boise basin, all irrigation storage rights and permits are held by the BOR, who then contracts with the various irrigation districts and canal companies for the use of the stored water. The Snake River Basin Adjudication is the current effort to update the water right records for the basin.

Currently, above Lucky Peak dam, the IDWR Water Allocation Bureau indicates that there have been 172 water rights issued for irrigation or irrigation storage and 85 for stock watering, accounting for a total of 304,915 AF/annum. Of this total 303,601 AF are allocated for irrigation storage in the two reservoirs. The total Boise River reservoir system irrigates about 327,000 acres in the Boise Valley between Lucky Peak Dam and the mouth of the Boise River. There are several

isolated irrigated pastures in the Mores Creek drainage but they account for a very small percentage of the total lands irrigated in the Boise River basin.

Future Irrigation Development Within the Basin

Within the upper Boise River basin, no Class 1, 2, or 3 potentially irrigable lands have been identified (Pacific NW River Basin Comm., 1971; IWRB, 1970). Land ownership is an additional barrier to future irrigation development since the vast majority of the land is managed either by the Forest Service or the State of Idaho.

The upper Boise River basin has limited irrigation potential, but the lower Boise River basin (below Lucky Peak) still has potentially arable lands that could be irrigated by Boise River water. However, several studies have suggested a trend toward declining irrigated acreage in the lower basin over the last thirty years (Table 36). IWRB data indicated the irrigated acreage in Ada and Canyon counties exceeded 425,000 acres (in 1967) (IWRB, 1968). By 1989, IDWR studies showed that the irrigated acreage in the two counties was over 289,000 (IDWR, 1991). Because of high urban growth explosion in the basin, farm land has been converted into subdivisions. Since a peak during the 1950's into the 1960's, the total water diverted from the Boise River for agricultural use has steadily declined.

Livestock Watering

Within the basin there are currently 23 active cattle and sheep grazing allotments on Forest Service property and two in BLM Cascade Resource Area (Ririe, 1991; Boltz, 1991) (Plate 4). Of those 23 USFS allotments, four are on the periphery of the basin and extend into adjacent basins (Grouse Cr., Rock Cr., Rattlesnake Cr., and Jerusalem Assn. allotments); the remainder are contained within the basin. The total allotment acreage, animal-unit-months (AUM), and grazing density (AUMs/acre) are provided in Table 37. AUM is the amount of forage it takes to feed one adult cow plus unweaned calf for one month; five sheep units equal one cow unit. The grazing density in the basin ranges widely because it is dependent on several factors including, soil, vegetation cover, and slope, all of which vary considerably. An additional 200 AUMs need to be included to the basin total to account for animals trailed through inactive allotments (Ririe, 1992).

Allotments that exist on the main streams may impact the riparian communities and water quality (Plate 4). Because of the sheep grazing threat to the water quality of Elk Creek, Idaho City's municipal water source, Boise National Forest temporarily removed the sheep (827 AUMs) from the Elk Creek allotment after the 1988 season pending a NEPA Environmental Assessment (Swearinger,

1991). Other areas that BNF is concerned about the potential grazing impact on water quality are around Thorn Creek Butte and upper Roaring River (Ririe, 1992).

Table 36. Total Irrigated Acreages for the Lower Boise River Basin (Morse, 1991; IWRB, 1968; Boltz, 1991).

Year	Ada County		Canyon County	
	Dept. Commerce	IDWR/IWRB	Dept. Commerce	IDWR/IWRB
1967		109,440		315,790
1969	84,428		217,240	
1970		109,500		315,800
1974	80,297		219,653	
1978	97,801		235,589	
1982	91,736		229,066	
1987	85,928	104,200	213,013	248,000
1988		67,612		214,209
1989		85,343		203,790

Table 37. Active Cattle and Sheep Allotments in Upper Boise River Basin.

Active Allotments	Total Suitable Acres[1]	Partial Suitable Acres (% within basin)	Total AUMs	Partial AUMs (in basin)	Grazing Density (AUMs/S. acre)
Boise N.F.					
Bald Mt.	4881		540		11.1
Black A	7627		2086		27.4
Circle Bar	9321		1490		16.0
Cold Springs	4620		90		1.9
Dead Horse	3727		248		6.7
Deer Cr.	3562		600		5.9
Granite Cr. *	4773	3723 (78%)	165	129	3.5
Grimes Cr.	7454		786		10.5
Grouse Cr.*	13,262	6498 (49%)	1783	874	13.5
Jerusalem *	24,485	2448 (10%)	3484	35	1.4
Lazy H *	30,819	27,737 (90%)	76	68	0.2
Little Beaver *	10,036	7025 (70%)	600	420	6.0
Lostman	12,453		1380		11.1
Mores Cr.	2639		824		31.2
Ophir Cr.	9388		1100		8.5
Porter Cr. *	1579	173 (11%)	198	22	12.7
Rattlesnake Cr.*	8000	2720 (34%)	1639	557	20.5
Rock Cr.*	12,758	5358 (42%)	540	227	4.2
Smith Cr.	6708		784		11.7
Summit Flats *	4969	4770 (96%)	932	895	18.8
Sunset	9865		540		5.5
Two Bar	15,736		1393		8.8
Yuba R.	4000		1200		30.0
BLM					
Quartzburg	2179		200		10.9
Pioneerville	5		5		1.0

*Partial acreages are given only for those allotments that are not totally within the basin.
[1]Suitable acres are those acres within an allotment that are suitable for grazing.

Domestic, Commercial, Municipal and Industrial Uses

Mores Creek Drainage

Within the Mores Creek watershed, several small communities utilize both ground and surface water. Idaho City, from 1980 to 1986 grew by 70 people. In addition, several new subdivisions have been developed along Mores Creek (DuQuette Pines, Wilderness Ranch, and Mores Creek Rim Ranches) that have groundwater rights. Most domestic wells pump small volumes from fractures or decomposed granites. A few wells produce from shallow alluvial systems that overlay the granites in small mountain valleys (Neely, 1992).

The Idaho City water supply comes from gravity flow, collecting the water from sandy alluvium beneath Elk Creek (Reed, 1992). The water is run through a treatment facility in Idaho City at an average rate of 175,000 gal./day (100,000 to 300,000 gal./day). Idaho City has a water right to divert up to 5.9 cfs (Reed, M., 1992). The water is treated with ozone gas to prevent the occurrence of giardiasis.

Boise North and Middle Forks Drainage

Atlanta is the only community along the Middle Fork that utilizes basin water for municipal use. The community of 30-50 permanent residents, maintains a gravity collection system on the East Fork Montezuma Creek. The community has a domestic water right to divert 0.11 cfs and 60 AF/annum. There are only four well driller's logs available for the Middle Fork from Arrowrock Reservoir to Atlanta (Neeley, 1992). Two of these wells produce domestic water from fractured granite and two from alluvium.

Geothermal Resources

Numerous geothermal springs exist in the basin with temperatures ranging from 41°C to 76°C. Some have been developed for commercial and recreational uses. An example is a fish farm at Twin Springs, on the Middle Fork, that used hot spring water to raise Tilapia (type of sunfish). The farm operated for several years but is no longer active (Parrish, 1991).

Summary of Water Rights Within the Basin

In early 1992, the total quantity of water appropriated within the upper Boise River basin both ground and surface water was 16,023 cfs and an annual volume of 303,008 AF per year (Table 38).

These numbers include the storage in Lucky Peak Reservoir and reflect the totals found in the water rights files of IDWR. Water right applications for an additional 5,479 cfs and 1,200 AF/annum have been submitted to the Department for approval.

Uses by stream reach are shown in Table 38. Water rights in the basin are summarized above 10 cfs flow rate or 25 AF volume. Appropriated water includes licenses, decrees, claims and permits, but does not include applications. Irrigation and storage irrigation, mining and power are the largest uses by flow and volume. Most of the irrigation water is appropriated for storage in Lucky Peak and Arrowrock reservoirs and subsequent use in the Boise Valley below the planning area. The communities of Idaho City, Atlanta, and Placerville have appropriated surface water for municipal and domestic use. Only a small percentage of the appropriated water is from groundwater and springs.

Table 38. Water Rights by Use (decrees, licenses, permits, and claims--not including applications) and by Stream Reach for the Upper Boise River Basin.*

Water Use	Number of Rights	Flow Rate (CFS)	Volume (AF/annum)
Irrigation	168	144.065	1289.70
Irrigation Storage	4	15000.000	303601.80
Stockwater	84	2.720	23.80
Stockwater Storage	1	0.000	0.10
Industrial	7	45.500	0.00
Commercial	2	0.180	5.40
Mining	83	595.750	903.64
Fish Propogation	1	2.000	0.00
Heating	3	0.420	173.70
Cooling	1	2.000	0.00
Power	4	271.520	1100.40
Municipal	1	4.000	0.00
Domestic	198	12.162	502.64
Recreation	5	1.780	0.00
Fire Protection	13	3.180	5.60
Fire Protection Storage	3	0.040	11.24
TOTAL	578	16085.317	307618.02
Reach Name			
Birch Creek	1	10.000	0.00
Boise River	3	15001.000	303600.00
Boise River, Middle Fork	10	474.520	72.40
Browns Creek	4	16.560	0.00
Canyon Creek	2	20.600	0.00
Charcoal Creek	2	12.000	0.00
Clear Creek	9	23.820	1.20
Elk Creek	20	86.880	8.20
Granite Creek	11	9.200	336.40
Grimes Creek	9	47.510	0.00
Hot Creek	1	25.000	0.00
Macks Creek	8	3.820	1109.20
Mores Creek	20	43.760	545.60
Phifer Creek	1	25.000	0.00
Robie Creek	12	6.700	0.24
Sawmill Creek	4	28.020	0.73
Thorn Creek	5	16.630	10.40
West Fork Creek	2	37.000	0.00
Other Tributaries	151	163.979	1183.40
Springs	213	24.475	347.48
Groundwater	90	8.843	402.77
TOTAL	578	16085.317	307618.02

*The water rights that are included are only those that were for a minimum of 10 cfs or 25 AF. If a water right was for more than one use, only the dominant use is listed.

Minerals and Mining[1]

The upper Boise River basin contains 20 mining districts. Most important are the placer and lode gold mines in the Mores Creek, Idaho City, Pioneerville, Grimes Pass, Banner, Summit Flat, Gambrinus, Quartzburg, and Centerville districts and gold/silver mines in the Yuba district (Plate 5). Much of the area has a high mineral potential, especially for precious metals and molybdenum.

History of Mining in the Basin

The Mores Creek and Middle and North Forks of the Boise River basins include some of the most mineralized land in the state of Idaho (Gillerman, 1991). According to Smith (1983) gold was discovered on Grimes Creek in the Boise Basin on August 2, 1862. Hundreds of mines have operated at various times in the basin and at one point, Idaho City was Idaho's most populous city. Gold mining continued in the basin (particularly at Atlanta) into the 1950's. Initially, gold was recovered from placer deposits (free gold in stream gravels that eroded from the source veins) and later lode mines were developed (usually underground mines in the original vein deposits). Mines in the Boise basin collectively produced about 3 million ounces of gold, making it historically the largest gold-producing area in the state.

The majority of mineral production from the basin has been precious metals. Gold has been the primary metal of interest, but silver, lead, zinc, and occasionally copper are often mixed in the gold-bearing ore. Other minerals mined or known to exist in quantity in the district include antimony (Swanholm Creek), molybdenum (upper Grimes Creek), and bismuth (upper Grimes Creek). Non-economic mineral occurrences include: beryllium, niobium, arsenic, zirconium, thorium, uranium, rare earths, garnet (industrial grade), and iron. The lack of development of mining properties containing some of these minerals like molybdenum or antimony, is often dictated by a ready supply of these materials from other sources. However, these occurrences may become marketable with changes in world supply and demand.

Recent Mining Activity in the Basins

There are thousands of mining claims throughout the North and Middle Fork basins. Although the majority of the mines on Plate 5 are no longer in production, the mineral wealth of the Boise basin and other mining districts is clearly indicated by the large number of mines and prospects (Mitchell et al., 1991).

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[1] We would like to thank Earl Bennett of the Idaho Geological Survey for writing the majority of this section.

Many of the mines ceased production due to fluctuations in the metal markets rather than a lack of minable resources. Another reason was federal government action. All gold mines in the United States were closed in 1942 under War Production Board Act L-208 and many never reopened after the war. The recent introduction of low-cost heap-leach and open-pit mine technology has made some of the old mine sites attractive exploration targets. Idaho experienced a modern gold rush in the 1980's, comparable to the boom of the 1930's (brought on by the depression). By 1990, 10,300 mining claims had been registered on federal land in the Boise National Forest (USDA, 1990a).

Currently, there are two mining districts in the Basin that are getting considerable attention from exploration companies. In December 1990, Atlanta Gold signed an agreement with Newmont Exploration to explore its 3,100 acre property in the Yuba district (Bennett and Gillerman, 1991). Atlanta Gold estimates near-surface minable reserves at 974,000 ounces of gold and 558,000 ounces of silver (compared to the estimated 400,000 ounces of gold mined from the district between 1865 and 1952; (Kiilsgaard, 1989). Several companies, including Freeport, Goldpost Resources, Westmin Resources Cominco, and Pegasus Gold, have been exploring between Grimes Creek and Quartzburg and around Elk Creek (Bennett et al., 1990; Gillerman, 1992).

Additional metals of interest in the basin include molybdenum, beryllium, and uranium. The Cumo molybdenum prospect located above Grimes Creek was extensively explored by AMAX in the early 1980's. This is a significant deposit that was not developed because of the current oversupply of molybdenum in North America. The Sheep Creek pluton (formerly called the Twin Springs pluton) also contains molybdenum mineralization (prospects in the Roaring River district) and is anomalous in beryllium and uranium (Bennett and Knowles, 1983; Bennett, 1980). Almost the entire Sheep Creek pluton was staked by Inspiration Resources in 1981 based on geochemical anomalies. However, the current oversupply of molybdenum will preclude serious exploration in this area for some time.

Mines in the Neal district, located south of Lucky Peak Reservoir, have produced about 30,000 ounces of gold (Plate 5). Recently, Centennial Mining Company completed a 200-drill hole exploration program in this area. A gold resource of about 27,000 ounces was identified but this is not large enough to warrant mining at current gold prices.

Geochemical anomalies were reported by the U.S. Geological Survey near the Cottonwood Ranger Station, Dutch Creek Ranger Station, and Sheep Creek (Smith, 1989). These anomalies are in areas with no known mines and prospects, and may contain deposits of low grade precious metals and rare earth minerals.

Current Laws That Regulate Mining

As two thirds of Idaho is federal land, mining has been historically controlled by federal laws and regulations. These laws are enforced by the USFS and the BLM. The General Mining Law of 1872 gives U.S. citizens the right to enter public lands, locate (stake) claims, and remove valuable minerals. The law also allows for patenting claims (i.e., buying the land) from the federal government if a minable mineral deposit exists on the claim(s). Currently, a number of changes in the 1872 law are being considered by Congress. The Organic Act of 1897 specifies that mining laws and regulations apply to all federal lands. The 1955 Surface Resource Act attempts to minimize adverse environmental impacts to surface resources from mining.

Several state laws apply to all mines in Idaho, including those on federal lands. The Idaho Dredge and Placer Mining Protection Act of 1955 requires reclamation of disturbed areas and adherence to water quality standards for placer mines. The Idaho Surface Mining Act of 1971 provides measures to reclaim the lands disturbed by surface mining operations. The IDL administers these two laws under direction from the State Land Board. IDL has signed an MOU with the USFS that coordinates state/federal requirements for mine operating plans and bonding on federal lands. The DEQ administers water quality laws on state and federal lands (USDA, 1990a). All minerals on state lands are leasable in contrast to locatable minerals on federal lands.

Mineral Potential

Non-metallic commodities that may be of economic interest in the basins include sand and gravel deposits. There is no potential for oil and gas in the basin.

There are a number of sand and gravel pits in the Boise basin, mostly in the lower basin, which are a source of local construction materials. There is no market for transporting this high-bulk, low-value commodity over long distances. State, County, and private sand and gravel operations are located on Mores Creek, below Idaho City and along Grimes Creek. None of these operate in active stream channels but crush old dredge and placer piles to make aggregate (Murray, 1991).

Given the right economic climate, most of the Middle and North Fork basins of the Boise River have significant mineral potential. As noted, the basins have recently been the site of a number of exploration projects. A study by the USGS to determine the mineral potential of the Hailey 2° quadrangle, which includes the North and Middle Forks of the Boise River, classified most of the area basins having a high mineral potential.

There are areas with mineral resource potential in the Basin (Table 39) that have recently been considered for inclusion in the federal wilderness system (Plate 5). The mineral potential of these areas has been studied by the Bureau of Mines as required by the 1964 Wilderness Act and RARE II program. The U.S. Geological Survey has also looked at the Ten Mile and Black Warrior areas (Johnson and Worl, 1991). The report notes that both areas have the potential for several types of ore deposits.

Any state designation, such as a natural or recreational waterway, would not preclude mining activity and exploration unless it directly impacted the stream channel, such as a sand and gravel operation or an access road. Currently, there is a moratorium on granting any further water rights above Lucky Peak Dam.

Placer and Dredge Mining

Today, placer mines typically are not located in the active stream itself, but on the shore, in older river gravel deposits. Historically, placer gold has been mined in the Boise basin and on the Middle Fork of the Boise River downstream from Atlanta and at Twin Springs. One of the larger placer gold operations is the ABC mining operation on Buckskin Creek near Idaho City, though there are several other producing placers in the basin. An active placer mine is currently operating on bench gravels at Twin Springs (Fink, 1992).

In the 1980's, recreational dredging or using suction dredges to mine small amounts of placer gold became a popular pastime. The use of these small dredges (5 in. or less diameter nozzle), which requires a one-stop permit from the Department of Water Resources, is allowed on many waterways in Idaho, unless specifically closed. No site-specific records of recreational dredging activity are kept. Various state and federal officials who happen to be in remote areas check for possible permit violations.

A number of stream segments in the Boise River system are closed to dredge mining, or have seasonal limitations (Table 40). The Boise River from Lucky Peak Dam to the confluence of Roaring River, the North Fork Boise River, the Queens River, and Grimes Creek are closed the entire year.

Table 39. Mineral Resource Investigation Studies Conducted in the Upper Boise River Basin, Their Minerals, and Potential Yield Summaries (Plate 5).

Mineral Study and Reference	Minerals With Potential	Summary of Mineral Potential
Atlanta Gold (Atlanta Gold Corporation 1990 Annual Report)	gold, silver	*Annual report: 1,024,000 oz. gold; 2,516,000 ozs. silver estimated to be profitable at $400/oz. for gold
Black Warrior Basin (Gabby, 1992. Bureau of Mines Report MLA 3-92)	gold, silver, copper, lead, and zinc	*No identified resources *Seven properties show strong evidence of disseminated gold with silver, copper, lead, zinc byproducts *Confluence of Queens-Little Queens rivers may have significant gold-bearing gravels
Trinities Basin (Benjamin and Federspeil, 1991. Bureau of Mines Report MLA 10-91)	gold, silver, bismuth, molybdenum, and beryllium	*5 localities and 28 individual sites may warrant additional exploration *28 sites contain anomalous concentrations of one or more of gold, silver, bismuth, molybdenum, and beryllium
Ten Mile West RARE II Area (Benham and Avery, 1983. Bureau of Mines Report MLA 63-83)	gold, silver, lead, and zinc	*Potential for placer and lode gold in basin (assays indicated that 4 groups of lode workings and 4 gravel sites showed potential for gold, silver, lead and zinc) *low lode potential at one group for silver-zinc and moderate gold-silver resources at the other three *Samples of gravel indicated that no site could be mined at profit but lower alluvial deposits may yield better gold, particularly near Johnson Cr. C.G.

Timber Resources

Forests cover approximately 90% of the upper Boise River basin; the remaining 10% is a mixture of sagebrush, grasslands, and open water. The dominant timber species of the forest are Ponderosa pine and Douglas fir, with Lodgepole pine Subalpine fir, and Whitebark pine being of lesser abundance. The vast majority of the forested land in the basin is administered by the Boise National Forest (BNF). Approximately 85% of the BNF is forested and of that about 65% is suited for timber management (USDA, 1990a). Other agencies that manage commercial timber stands in the basin are the Bureau of Land Management (BLM) and Idaho Department of Lands (IDL). Some additional harvesting is done on private lands in the basin.

Table 40. Recreational Dredge Mining Status in the Upper Boise River Basin (IDWR, 1991).

Boise River Basin Reach	Open	Closed
-Boise River Star Bridge to Arrowrock Dam		Entire Year
-North Fork Boise River and tributaries		Entire Year
-Boise River and Middle Fork Boise River from Arrowrock Dam to Roaring River		Entire Year
-Middle Fork Boise River from the confluence with Roaring River to Sawtooth Wilderness Area boundary below Leggitt Creek	July 1-Oct. 31	
-Middle Fork Boise River and all tributaries from Sawtooth Wilderness Area boundary upstream		Entire Year
-Queens River and all tributaries		Entire Year
-Middle Fork Boise River tributaries (mouth to Sawtooth Wilderness Area boundary below Leggitt Creek)	July 1-Oct. 31	
-Mores Creek From Lucky Peak Reservoir to Idaho City & tributaries	July 1-Sep. 30	
EXCEPT Grimes Creek & tributaries	Entire Year	
EXCEPT Elk Creek drainage upstream from Eldorado Gulch	Entire Year	
EXCEPT Elk Creek and tributaries downstream from Eldorado Gulch		Entire Year
-Mores Creek & tributaries above Idaho City	Entire Year	

Timber Harvests

During fiscal year 1989, the BNF offered 86.5 million board feet (MMBF) for sale and sold a total of 85.4 MMBF valued at $2,650,000 (USDA, 1990a). Over the past decade, an average of 74.5 MMBF has been sold annually on the BNF. A forest-wide harvest of 127 MMBF would occur if timber harvest were maximized (USDA, 1990a). The allowable sale quantity (ASQ) is 850 MMBF for the decade (85 MMBF average annual ASQ).

The BNF has 30 timber sales scheduled through 1999 (Table 41; USDA, 1990c). The total board footage cut in the next five year period is 92.3 MMBF (ave. per year = 18.46 MMBF), with an additional 24.0 MMBF sold in 1994 and 1995. All harvesting will directly impact streams in varying degrees, depending on the harvesting technique use.

Table 41. BNF Timber Sale Program in the Upper Boise River Basin through 1999 (Idaho City and Boise Ranger Districts Timber Sale Programs; USDA, 1990c).

Sale Name	Volume (MMBF)	Area (Acres)	Drainage	Cut Year
Roaring R.	2.5	463	Roaring R.	1991
Hermada	7.1	1466	Swanholm	1991
Corral	3.9	1620	Meadow Cr.	1991
Alex-Brown	5.8	558	Alexander	1991
Big Tree	11.4	1600	Big Owl	1991,92,93
Mineral Mt.	13.2	1303	Ophir Cr.	1991,92,93
Hungarian	6.7	1435	Hungarian	1991
Ski Cr.	5.7	617	Crooked R.	1992
Hoodoo	5.0	800	Hoodoo	1991,92
California Gulch	3.0	284	Cal Gulch	1991
Mack-Pine	8.0	1600	Macks Cr.	1993,94
Fourth Cr.	10.0	1345	Fourth Cr.	1993,94,95
Jackson-Smith	5.0	630	Smith Cr.	1994,95
Hot Cr.	5.0	580	Hot Cr.	1994,95
Horse Heaven	4.0	440	Trail Cr.	--
Logging Gulch	7.0	1000	French Cr.	--
South Rabbit	8.0	1770	Rabbit Cr.	--
Warm Springs	5.0	900	Warm Sprs.	--
Bear Run	1.2	200	Mores Cr.	1992
Jack-Wil	8.0	1000	Grimes Cr.	1992
Sunset	4.0	500	Mores Cr.	1998
Granite	2.0	300	Mores Cr.	1993
Black Rock	9.0	1,500	Boise N.F.	1997
Crooked-Pike	6.0	800	Crooked R.	1992
Bears	2.0	300	Bear R.	1993
Brown-Wren	6.0	800	Boise N.F.	1993
Hot Horse	6.0	800	N.F./M.F. Boise	1992
Atlanta	4.0	900	M.F. Boise	1998
Lostman	4.5	1800	M.F. Boise	1993
Buck Creek			M.F. Boise	1994

State lands that are managed for timber harvest in the basin are found exclusively in the Mores Creek drainage (Horn, 1991). Over the past seven years (1983-1990), 39.2 MMBF were cut and sold on state lands in the Boise basin (Table 42; Hill, 1991). The Boise basin occupies approximately 40% of the IDL's Southwestern Area (Area 6). The normal annual harvest in this area is 10 MMBF, but it was increased to 20 MMBF in 1989 in order to salvage insect killed timber. It is scheduled to drop back to 10 MMBF in 1993.

BLM lands are found in the Mores Creek watershed and around Lucky Peak Reservoir, where there is little or no timber (Plate 1). Historically, limited logging has occurred since the early 1960s on BLM property in the Mores Creek watershed. Currently logging activity is limited to selective cutting to control pine bark beetle infestations. The BLM has an active timber salvage sale west of Idaho City that involves less than 0.2 MMBF. Its expansion will depend on beetle activity. The extent of future logging on BLM lands around Quartzburg, Placerville, Centerville, and Pioneerville will also depend on the level of insect activity. Small salvage sales are planned for 1991-1993 around Placerville (Jones, 1991).

Table 42. Timber Harvested On State Lands in the Upper Boise River Basin in the Past Seven Years (1983-90) (Hill, 1991).

Year	Amount Cut (MMBF)
1984	7.57
1985	6.04
1986	0
1987	1.71
1988	15.87
1989	1.10
1990	6.91
TOTAL	39.2

MMBF=Million board feet

Timber harvested in the North and Middle Fork and Mores Creek watersheds in recent years has gone to mills primarily in western Idaho or occasionally eastern Oregon (Table 43). Several other mills from eastern Oregon that have been successful bidding in the Payette basin and Boise South Fork, have also bid on sales in this basin.

Table 43. Mills Relying on Harvested Timber From Upper Boise River Basin (Morelan, 1991).

Mill	Location
Croman Corporation	Boise
Producer's Lumber Co.	Boise
Boise Cascade	Horseshoe Bend
Emmett Plywood Mill	Emmett
Ellingson	Baker, Oregon

It is not the intent of the Idaho Water Resource Board that this plan affect harvest of timber or log hauling in the upper Boise River basin. The Idaho Forest Practices Act and Water Quality regulations afford protection regarding these activities.

Riparian Forests

Riparian forests exists along virtually all major streams and their tributaries in the basin. The BNF estimates that 7% of the forest consists of riparian vegetation typically dominated by cottonwoods, willows and alders. All vegetation is critical in slope stability, minimizing erosion and maintenance of water quality, but riparian vegetation is critical because it serves to stabilize stream channels and to provide wildlife and fish habitat. While riparian communities represent less than 1% of the area in the Western U.S. they typically provide critical habitat for the majority of terrestrial

species (Chaney et al., 1990). Overgrazing and detrimental logging practices impair both the biological integrity and aesthetic quality of a river canyon riparian community.

Power Development and Energy Conservation

According to the Northwest Power Planning Council's 1991 Conservation and Power Plan, the Pacific Northwest region gets 62 percent (12,500 megawatts) of its energy from the region's network of hydropower dams (the percent that hydropower contributes can vary up to 75 percent of the total production, depending on annual precipitation conditions). The remaining power is generated by coal (16%), nuclear (7%), imports (11%), oil/gas (2%), and miscellaneous (2%).

Existing Hydropower Facilities

Hydropower generation on the North and Middle Forks of the Boise River is currently secondary in importance behind flood control, irrigation water supply and maintenance of minimum stream flows. Power is generated as releases are made for these primary purposes and to balance storage distribution within the Boise basin reservoir system.

Within the upper Boise River basin, there are three active hydropower generating plants in operation (Table 44). Anderson Ranch Dam, while not in the basin per se, is operated as part of the Boise River system and is included in the discussion.

Table 44. Power Generating Facilities Within the Upper Boise River Basin.

Dam	Installed Capacity
Lucky Peak Dam	101.500 MW
Kirby Dam *	0.158 MW
Macks Creek Dam	0.010 MW
TOTAL CAPACITY	106.510 MW

* Kirby Dam, below Atlanta, collapsed May 26, 1991, but has been reconstructed in 1992.

Lucky Peak Dam (at the downstream boundary of the basin): The 101.5 MW powerplant at Lucky Peak Dam which began operating on October 1, 1988, is owned by the Boise-Kuna, Nampa-Meridian, Wilder, New York, and Big Bend irrigation districts (the districts). It has contracted with Seattle City Light to purchase the power generated and to operate the Lucky Peak power facility. The energy from the plant ties into the Idaho Power company grid and is wheeled through the IPC intertie into the Northwest power grid. Seattle City Light then draws equivalent power from the Northwest power grid as needed, or markets it to other utilities in the system. The Idaho Power Company occasionally purchases power from Lucky Peak.

Kirby Dam: Kirby Dam was an isolated facility serving the community of Atlanta until May 26, 1991 when the dam collapsed. The original Kirby Dam was a log crib built on the Middle Fork Boise River and completed in 1908 to provide electricity for the Monarch gold mine. In 1984 a lightening fire destroyed the powerhouse which was later rebuilt. In 1990, the log crib construction was judged unstable by IDWR and reinforced using large boulders on the face of the dam. The reinforcement failed during spring runoff. Recently, the dam was rebuilt/stabilized and upstream diversion constructed to provide water to the Kirby Hydropower plant.

The Kirby power system is owned by the Atlanta Power Company Inc. The owners have speculated that the system could be expanded from its current .16 MW capacity to 1.09 MW, almost a 7-fold increase to accommodate a river flow rate of 350 cfs. The mean annual flow below Atlanta is estimated at 190 cfs (Warnick, 1981).

Macks Creek: Macks Creek is a tiny (.01 MW) facility (FERC No. 06631-03) located on a small tributary to Grimes Creek that serves private homes.

Anderson Ranch: This project was completed in 1945 by the Bureau of Reclamation. It is located on the South Fork Boise River and consequently not in the study basin, but it is operated cooperatively with the other dams in the Boise system. Anderson Ranch was designed for a total of three generating units, but presently only two units are installed, each with a 20 MW capacity, providing a total of 40 MW of power. Future plans are to install a third unit.

Existing Facilities Without Power

Arrowrock Dam is the only facility in the basin that currently does not have power. It is owned by U.S. Bureau of Reclamation, built in 1915, and has an active storage capacity of 286,600 AF. It is located about 12 river miles above Lucky Peak Dam on the main Boise River. Currently, Arrowrock has no power generation, but it's design allows for the installation of 3 units. Recently, the districts applied for and received a FERC license (License No. 4646-002) to construct and operate a 60 MW powerplant at Arrowrock.

Hydropower Potential

The attributes that are used to assess the hydropower potential include stream gradients/discharge data, access to transmission system, drainage (sq. mi.), head, acre-foot storage capacity, installed kW capacity, and estimated MW annual generation. With the exception of Twin Springs Project (Boise-Kuna Irrigation Dist. et. al, 1990) and the Alva Green Project (FERC Docket

No. EL90-50-0000), most of these data have not been determined or are not available for other sites in the basin.

In 1980, a report done by the Idaho Water Resources Research Institute, evaluated eleven stream sites in the basin in regards to their theoretical hydroelectric potential (Heitz et al., 1980). Three sites were identified on Mores and Grimes creeks, one site on the Boise River, three on the North Fork Boise River, three on the Middle Fork Boise River, and one on the Queens River. The report did not actually rate the sites nor did it provide information on their economic feasibility.

FERC Filings: In addition to the Arrowrock FERC license, there is currently only one other active FERC application for hydropower/storage facilities within the upper Boise River basin (USACE, 1991). A Declaration of Intention (DI) was filed for the Alva Green project on September 11, 1990 (FERC Docket No. EL90-50-0000). The facility would be located above Atlanta on Boise National Forest land (T5N, R11E, Sect. 35) on the Middle Fork Boise River and would consist of a three foot high diversion dam, 1300 ft. diversion canal, an offstream reservoir with an 8 acre-foot capacity, a 12 ft. high dam, a 1500 foot penstock, and a powerhouse with a projected capacity of 60 kW (storage structure and portion of diversion canal would be on private property; the remainder on public land).

Inactive FERC Filings/Identified Sites: Since the inception of FERC, there have been 37 separate filings in the basin. This list includes, everything from operational sites, such as Lucky Peak, to inactive license applications. Of those 37 most have received only study permits to evaluate feasibility for hydropower potential. Table 45 lists filings that have inactive status. Some of these filings may be for almost the same site, as is the case with the Twin Springs site.

The Twin Springs reservoir and damsite (T4N, R7E, Sect.18), 3.3 miles downstream confluence of North and Middle Forks Boise River, has been studied since the early 20th century by Bureau of Reclamation, USGS, and Army Corps of Engineers. Most recently, the irrigation districts producing power at Lucky Peak were issued a preliminary permit by FERC to study the feasibility of the project. The districts preliminary permit application was initially based on a 1968 Corps study which recommended a 470-foot high rockfill dam, 600,000 acre-foot reservoir and 103.5 MW powerhouse. Further study by MK resulted in a modified design that included a 420-foot high roller compacted concrete (RCC) dam that would impound 400,00 acre-foot of water. The damsite and powerplant would be 3.3 miles downstream from the confluence of the Middle and North Forks of the Boise. At full pool, the reservoir would inundate 3700 acres, flooding 11.6 miles of Boise River and Middle Fork and 6.7 miles of North Fork. Recently, Morrison-Knudsen Engineering concluded that Twin Springs was not currently economically feasible, and on July 30, 1990 the districts voluntarily surrendered their preliminary permit to FERC (Olowinski, 1991).

Table 45. Inactive Filings on Study Sites and FERC Applications in the Upper Boise River Basin.

Ferc No.	Project Name	Stream Name	Power Potential (MW)
Study Sites			
V63	Graham	N. F. Boise R.	
T73	Trail Creek	N. F. Boise R.	
T74	Big Owl	N. F. Boise R.	
V62	Lost Creek	N. F. Boise R.	
V65	Yuba Dam/Reservoir	M. F. Boise R.	
V24	Atlanta	M. F. Boise R.	
T62	Barber Flats	N. F. Boise R.	
T72	King	M. F. Boise R.	
V64	Alexander Flats	M. F. Boise R.	
T60	Slide Gulch	Boise River	
T71	Bald Mountain	M. F. Boise R.	
FERC Applications			
7950-00	Boise R. North Fork	Boise River, N. Fk.	10.00
9819-01	N. Fork Boise R.	Boise River, N. Fk.	6.35
9675-00	N. Fork Boise R.	Boise River, N. Fk.	10.00
	Twin Springs	Boise River	75-87.5

Energy Supply and Conservation

Current Energy Supply: Being almost exclusively a rural basin, virtually all the energy demands in the basin go toward residential and municipal uses. Electric power is supplied to Idaho City by Idaho Power, but Atlanta has it's own power supply in Kirby Dam. In the basin, heat is the greater consumer of energy followed by hot water needs (Hoebelheinrich, 1992). Major sources of heat are wood, electric, oil, and possibly propane. Hot water energy is almost totally electric.

Energy Conservation: The Northwest Power Planning Council 1991 Conservation and Electric Power Plan has projected that 75% of the energy needed for the region over the next 20 years can be provided by conservation resources. The remaining 25% will come from low-cost hydropower and cogeneration.

In this basin, energy efficiencies would be most effectively improved by weatherization and adding insulation to existing residential and municipal structures and meeting national standards for new buildings. Given the probability that wood stoves are prevalent in the basin, energy could be saved and air quality improved if residents were encouraged to buy catalytic converted and wood pellet stoves.

Over the past few years, there have been a number of federal and state programs to encourage conservation. The Good Cents and Design In Excellence programs, funded by Idaho Power, are promoted for new commercial and residential construction. Existing facilities are eligible for conservation upgrading through grants and loans sponsored by state and federal agencies and the

public utilities. These programs promote conservation upgrades by providing low-interest loans or funding a percentage of the installation costs.

Navigation

The basis of Idaho's title to the streambeds of navigable waters is stated specifically in the Idaho Admission Bill of 1890 and the Idaho Constitution. State title applies to the entire Boise mainstem, Boise North Fork through T5N, R7E (above Black Rock C.G.), and the Boise Middle Fork through T5N, R8E (confluence with Roaring River) (IDL, 1986). State title does not apply to Mores Creek and its tributaries.

No commercial navigation occurs in the basin. Recreational boating occurs on the Middle and North Forks of the Boise, particularly during the spring runoff period (May, June), but currently there are no outfitters licensed to guide on any stretch of the Boise River (Sangrey, 1991).

APPENDIX D: MANAGEMENT ALTERNATIVES

Draft Alternative A

The No Action alternative would continue present management policies and practices and serves as a baseline for analyzing all other alternatives. Resource use levels for this alternative were established by examining current use levels. The present level of management on public and private lands would not be affected. No river segments are proposed for state protection or minimum stream flows. The only recommendation is to continue present management practices.

Boise National Forest manages 81% of the planning area, with 12% of that being managed as wilderness. Recreation within the area, largely takes place on Forest Service property or on the two reservoirs. The recreation facilities on Lucky Peak are managed by the Army Corps of Engineers, while those on Arrowrock (Bureau of Reclamation facility) are managed by the Forest Service. Without state river protection in the basin, there would probably be little impact on short-term recreation patterns, but long-term recreation patterns may be impacted. Demand for river-related recreation, such as whitewater rafting, is increasing rapidly in Idaho. Without additional protection of the rivers in the basin, development such as diversions and mining activities could impair the primitive and scenic character of several of the river reaches in the basin.

Given the fact that the majority of the land in the basin is in the public domain, the likelihood of major developments is not great. But any development or significant increase in recreation that directly impacts the waterways in the basin could have harmful consequences on the river fishery, the riparian wildlife, and the water quality. Without state protection of river segments, the Federal Energy Regulatory Commission would be less likely to constrain hydropower development.

The absence of state river protection would have little if any impact on current and future water uses and water development because for the critical summer season the basin is considered to be fully appropriated. Even though several hydropower sites have been identified in the basin, only two could possibly go ahead in the next few years--Alva Green Project near Atlanta and the Arrowrock retrofit. Twin Springs Hydropower Project is not considered feasible at this time.

Draft Alternative B

The objective of this alternative is to provide state protection for reaches in the basin which possess a combination of the following: a) outstanding fish and wildlife resources; b) current excellent water quality conditions in which those conditions need to be protected, such as the water supply for

Idaho City and Atlanta; and c) reaches which have current and projected high recreational use and diversity, such as the Middle and North Forks Boise River. Minimum stream flows are recommended as actions for specific streams where water supply is critical. These would be determined in cooperation with IDFG and IDPR.

The waterways in the basin that would be protected with this alternative include:

- Boise River (from Arrowrock Reservoir backwaters to confluence of North and Middle Forks Boise River)
- Sheep Creek (mouth to headwaters and tributaries)
- Middle Fork Boise (from confluence North Fork Boise to Roaring River)
- Montezuma Creek (mouth to headwaters and tributaries)
- North Fork Boise (from confluence Middle Fork Boise to Rabbit Creek)
- Elk Creek (from Deer Creek to headwaters and tributaries).

Under this alternative the IWRB would make applications for minimum stream flows on:

- Sheep Creek (mouth)
- Middle Fork Boise (at Roaring River)
- Roaring River (at mouth)
- Yuba River (at mouth)
- Montezuma Creek (at Atlanta well site)
- North Fork Boise River (at Rabbit Creek)
- Rabbit Creek (at mouth)
- Johnson Creek (at mouth)
- Elk Creek (at Idaho City well site)

This alternative addresses several of the basin objectives and issues. The fishery and wildlife habitat, particularly along the Boise River and the Middle and North Forks would be protected from any further degradation. Sheep Creek, which would be provided both protection and minimum stream flow, has been one of the most important spawning tributaries in the basin. This alternative also provides for establishing minimum stream flows on tributaries that wouldn't be protected, such as Roaring River, Yuba River, Rabbit Creek, and Johnson Creek that are highly regarded as native trout spawning streams.

This alternative addresses the basin objective of maintaining high quality recreation associated with free-flowing rivers. One of the main issues raised by the public was recreational over-use. This alternative would prohibit development on those reaches that currently receive high recreational use,

such as the Boise River, Middle and North Forks, thereby maintaining much of the existing recreational opportunity. Development opportunities are not addressed by this alternative, but are not precluded on those reaches left unprotected.

Draft Alternative C

The Idaho Code states that pre-existing activities, such as mineral leases, grazing, and timber harvesting would not be affected by a state protection designation, but it is still possible that protection serves as an impediment to future development. Consequently, the development alternative provides for state protection for only those outstanding reaches that do not conflict with any of the following: a) Twin Springs hydropower damsite and storage reservoir; b) current and future mineral exploration in the area where Atlanta Gold Corporation has demonstrated mineral potential; c) current grazing practices; and d) suitable timber land and planned salvage and green sales. The minimum stream flows necessary to maintain biological communities, aesthetics, and recreational activities would be determined in cooperation with the IDFG and IDPR.

Actions

The waterways in the basin that would be protected with this alternative include:

- Boise River (from Arrowrock Reservoir backwaters to Twin Springs damsite)
- Sheep Creek (above Devils Creek to headwaters and tributaries)
- Middle Fork Boise River (Alexandar Flats to Roaring River; above Atlanta to Sawtooth Wilderness boundary)
- Roaring River (East and Middle Fork confluence to headwaters and tributaries)
- Hot Creek (upper portion)
- Black Warrior (mouth to Sawtooth Wilderness boundary)
- Queens River (mouth to Sawtooth Wilderness boundary)
- North Fork Boise River (Crooked River to Bear River; Hunter Creek to Sawtooth Wilderness boundary)
- Crooked River (from FS road 348 to headwaters and tributaries)
- Bear River (upper portion and tributaries)
- Johnson Creek (mouth to headwaters and tributaries)

Under this alternative the IWRB would make applications for minimum stream flows on:

- Boise River (below Twin Springs damsite)
- Sheep Creek (at Devils Creek)
- Middle Fork Boise River (at Alexander Flats)

- North Fork Boise River (at Rabbit Creek)

This alternative addresses the development opportunities in the basin. One of the stated basin objectives is that potential hydropower sites, such as Twin Springs, be protected from uses and threats that may compromise that potential. This alternative would prevent possible upstream diversions on the North and Middle Forks that may divert water from the stream by establishing minimum stream flows on the North Fork at Rabbit Creek, on the Middle Fork at Alexander Flats, and on Sheep Creek at Devils Creek. One of the major issues raised by the public is the threat of dams and diversions. A minimum stream flow established below the Twin Springs damsite would mitigate that to some degree by insuring sufficient water for instream uses below the project.

This alternative also addresses the possible need for road-building and stream channel alteration for mineral exploration and development by the Atlanta Gold Corporation in Yuba River-Decker Creek watershed. It also allows for the possibility of road building along reaches that have a high probability of timber harvest in the future. Those outstanding reaches that are not directly affected by Twin Springs Hydropower, Atlanta Gold mining, or extensive grazing and logging practices were provided protection.

Draft Alternative D

This draft alternative is at the opposite end of the continuum from the "no action" alternative in providing protection for all reaches in the basin that were outstanding in at least one of the screening areas (biological, aesthetics, and recreation). In this alternative, no consideration is given for current land use practices, such as grazing and logging, or potential hydropower or mineral development.

The waterways in the basin that would be protected with this alternative include:

- Boise River (Lucky Peak Dam to confluence of North and Middle Forks)
- Sheep Creek (mouth to headwaters and tributaries)
- Middle Fork Boise River (from confluence with North Fork to Roaring River; Gray's Creek to Sawtooth Wilderness boundary)
- Roaring River (from confluence of East and Middle Forks to headwaters and tributaries)
- Hot Creek (upper portion and tributaries)
- Phifer Creek (upper portion and tributaries)
- Black Warrior Creek (mouth to headwaters and tributaries)
- Queens River (mouth to Sawtooth Wilderness boundary and tributaries)

- Yuba River (mouth to headwaters and tributaries)
- Decker Creek (mouth to headwaters and tributaries)
- North Fork Boise River (from confluence with Middle Fork to Little Owl Creek; from Hunter Creek to Sawtooth Wilderness Area)
- Crooked River (lower segment: mouth to FS road 384; upper segment: from FS road 348 to headwaters and tributaries)
- Beaver Creek (east fork and tributaries)
- Edna Creek (upper portion)
- Bear River (mouth to headwaters and tributaries)
- Bear Creek (mouth to headwaters and tributaries)
- Johnson Creek (mouth to Sawtooth Wilderness boundary and tributaries)
- Elk Creek (from Deer Creek to headwaters and tributaries)

This alternative addresses several basin objectives that deal with protecting the *status quo* and attempting to preserve for posterity the free-flowing and unpolluted rivers, and the primitive character of the basin. The major threats to the basin, as perceived by the public, are habitat deterioration from development, recreational abuse, dams, and poor land stewardship practices. This alternative would go the farthest of the four alternatives to preserve the outstanding waterways in the basin. This alternative would not address any potential for development on the protected reaches but would not preclude development on those unprotected reaches.

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Plate 1

LAND OWNERSHIP

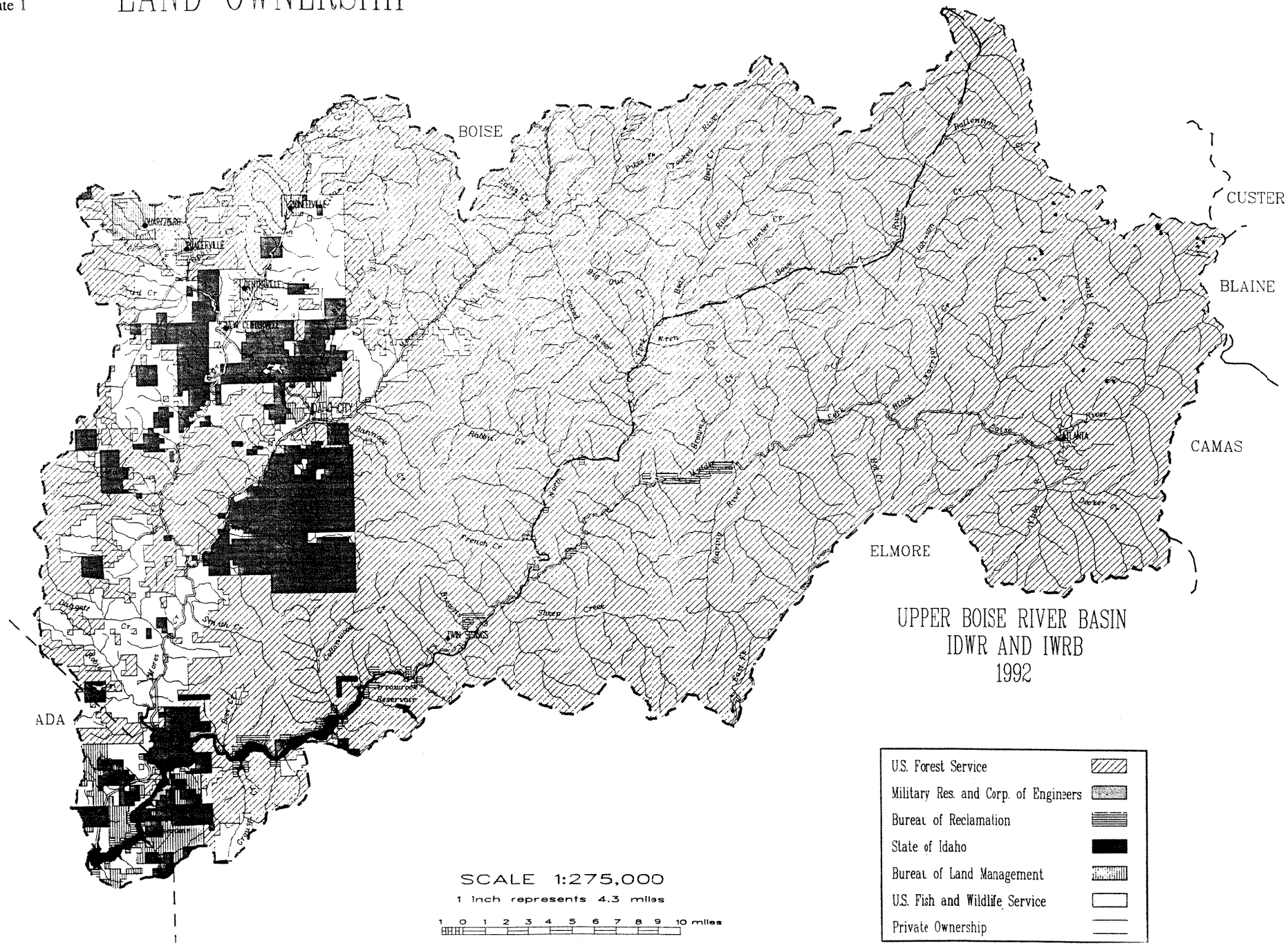


Plate 2

PRECIPITATION

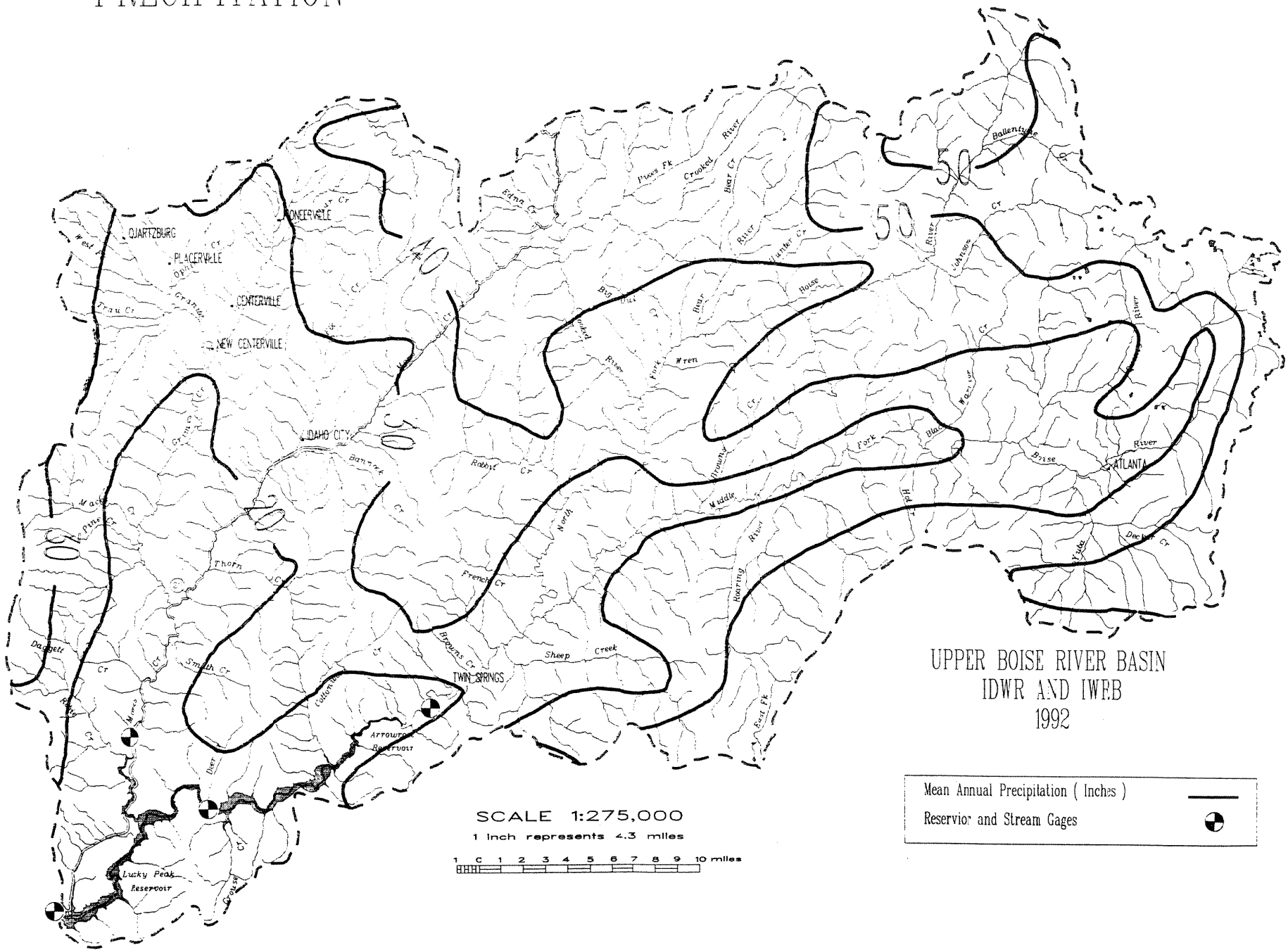


Plate 3

WATER QUALITY

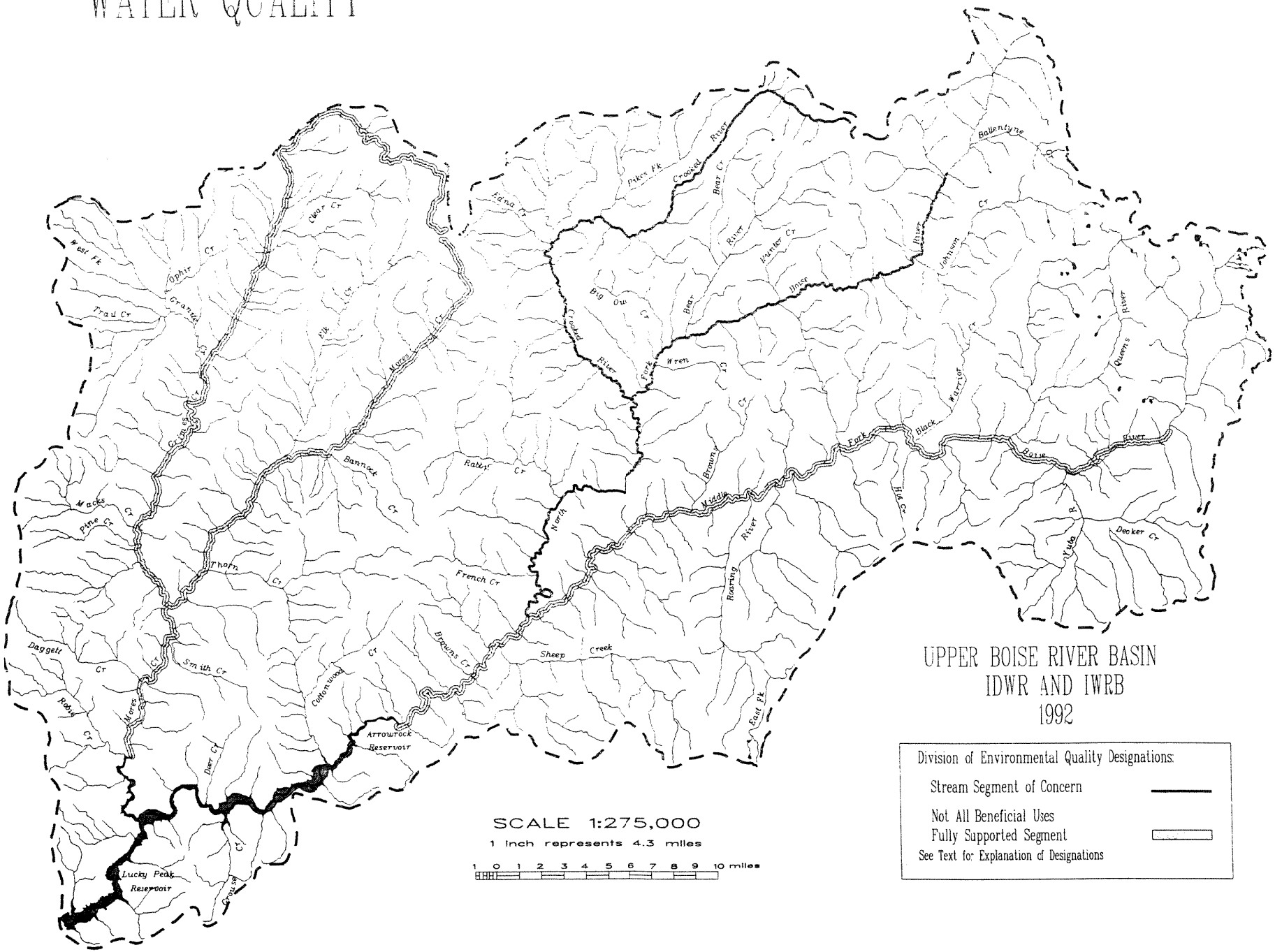


Plate 4

PUBLIC GRAZING UNITS

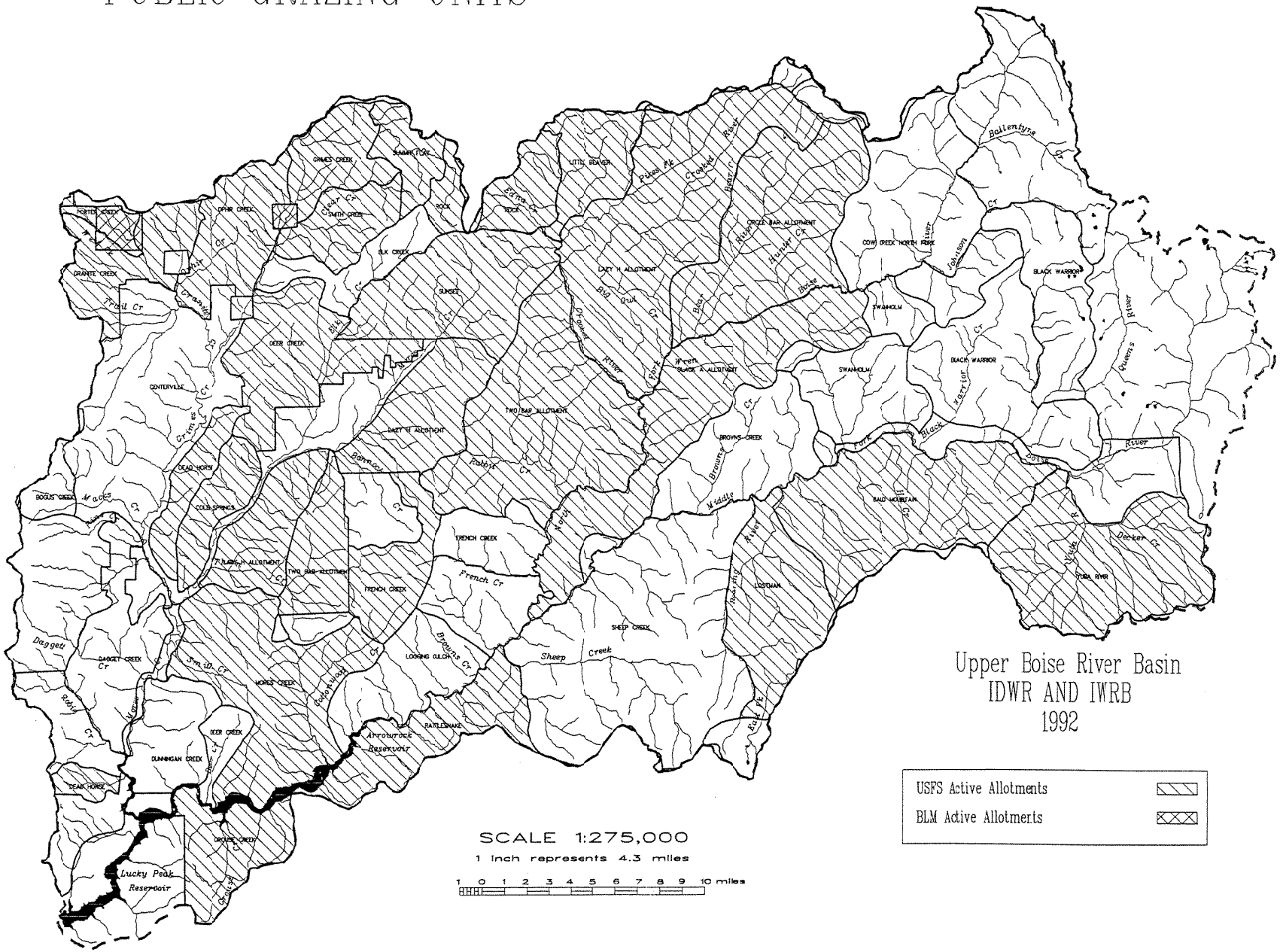


Plate 5

MINING

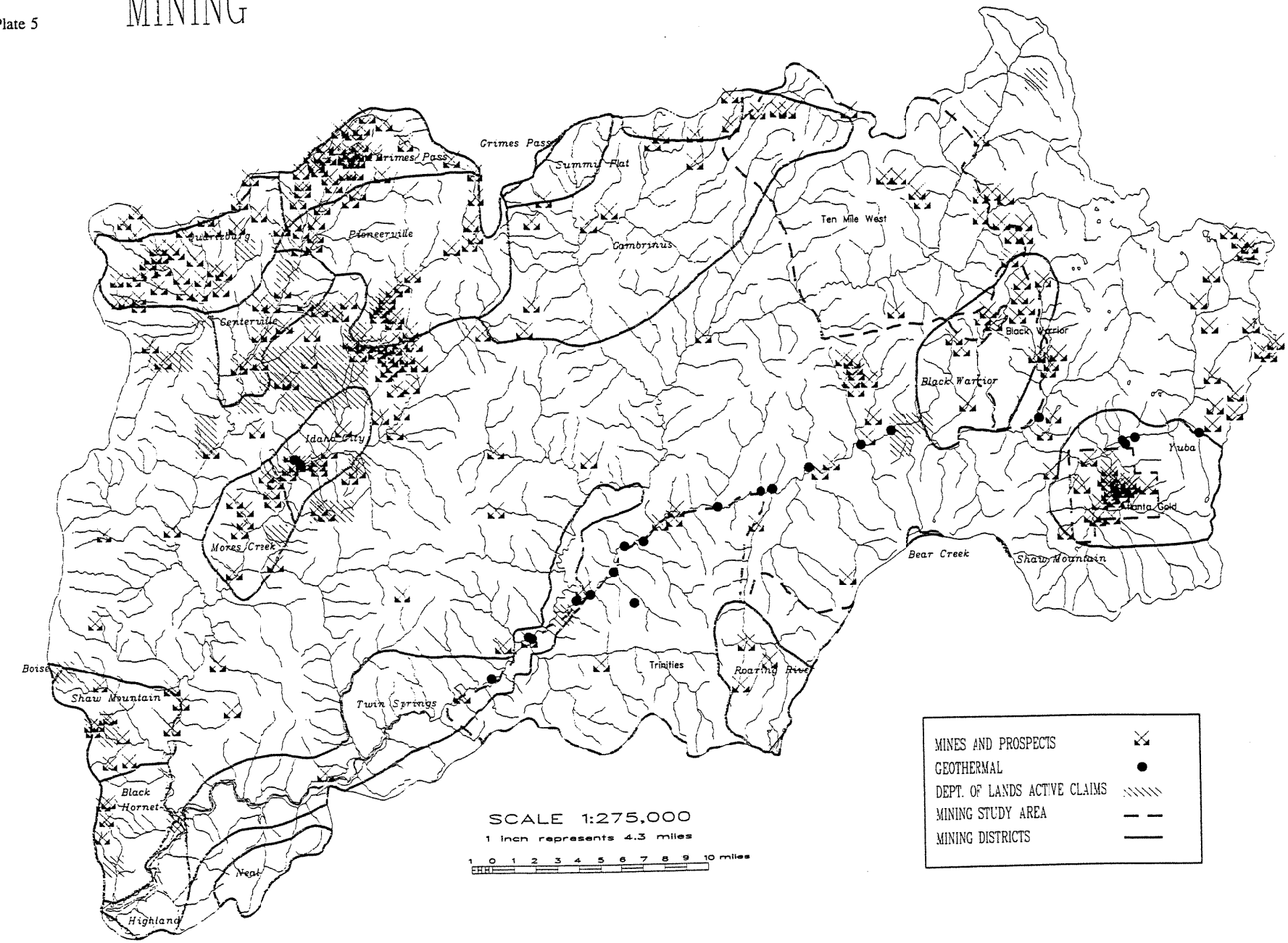


Plate 6

TIMBER

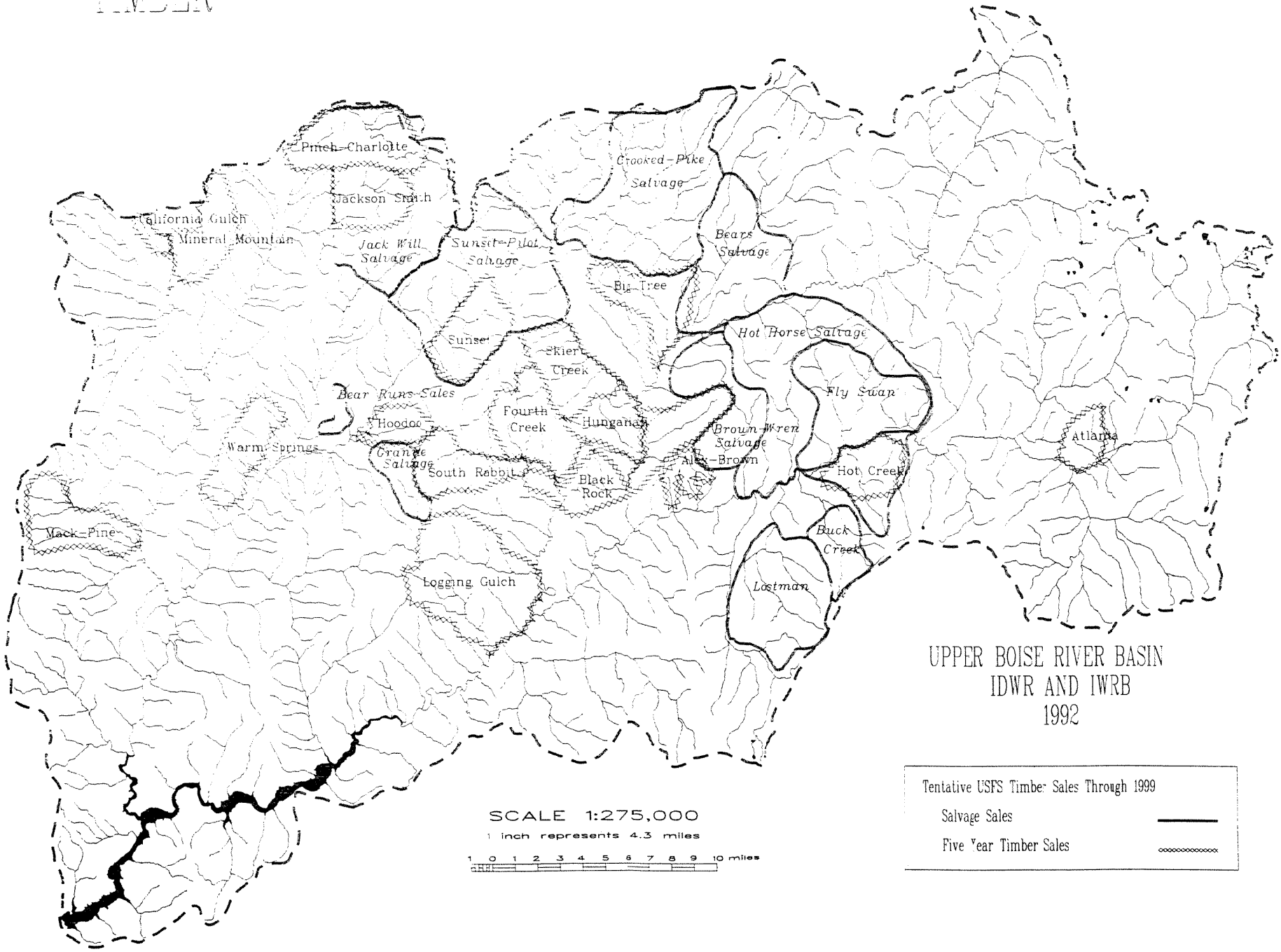


Plate 7

POWER DEVELOPMENT

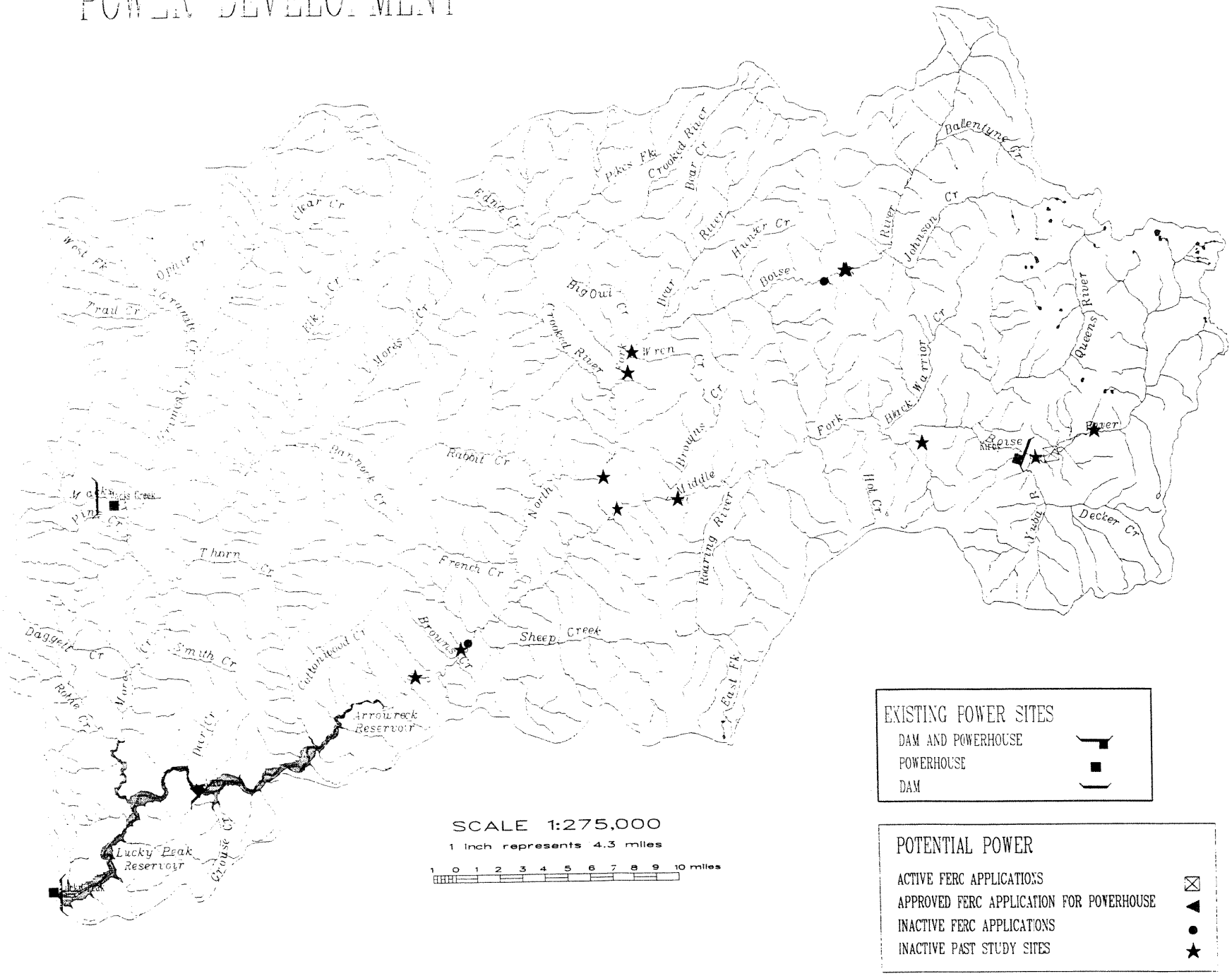


Plate 8

WILDLIFE INVENTORY

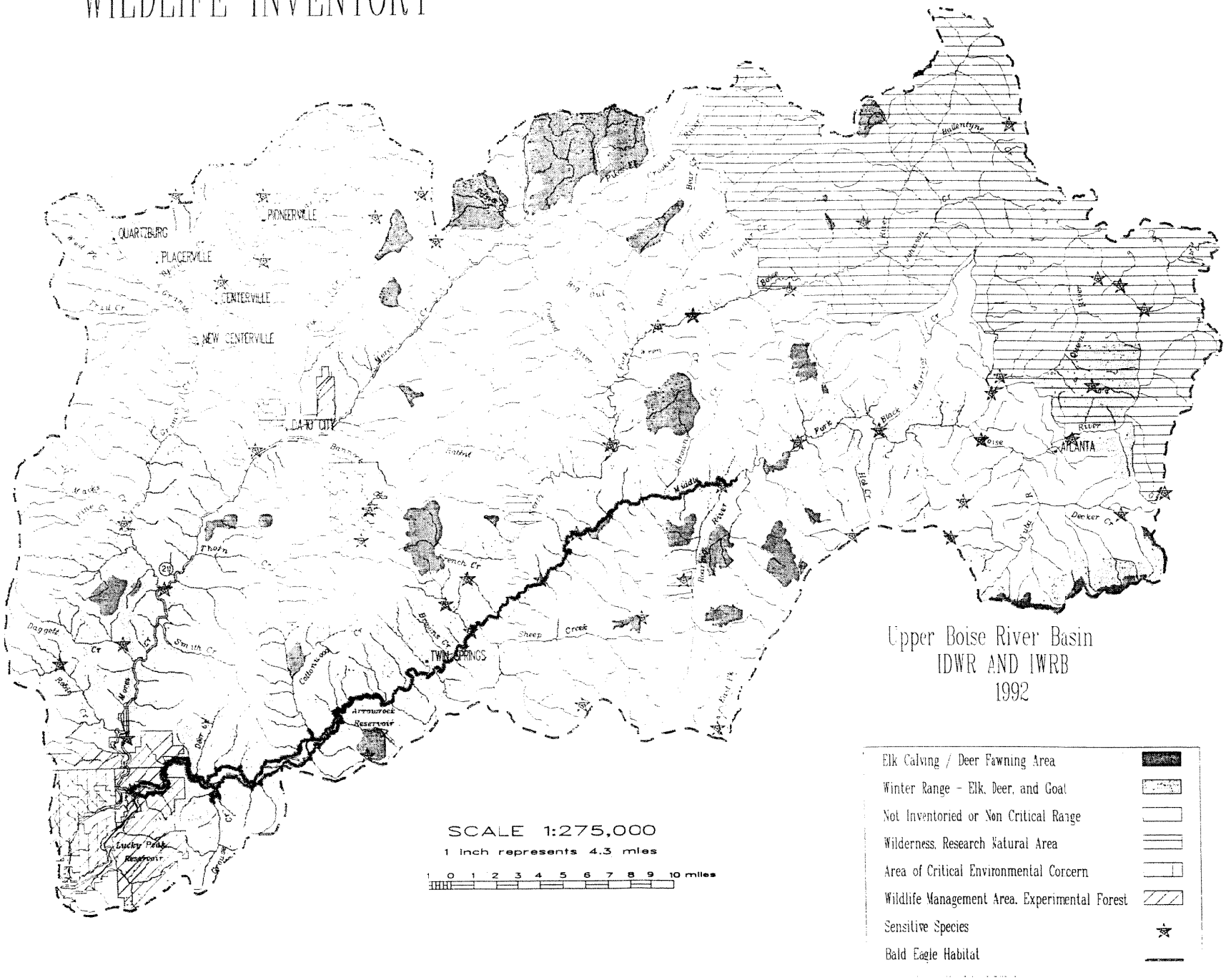


Plate 9

FISHERY INVENTORY

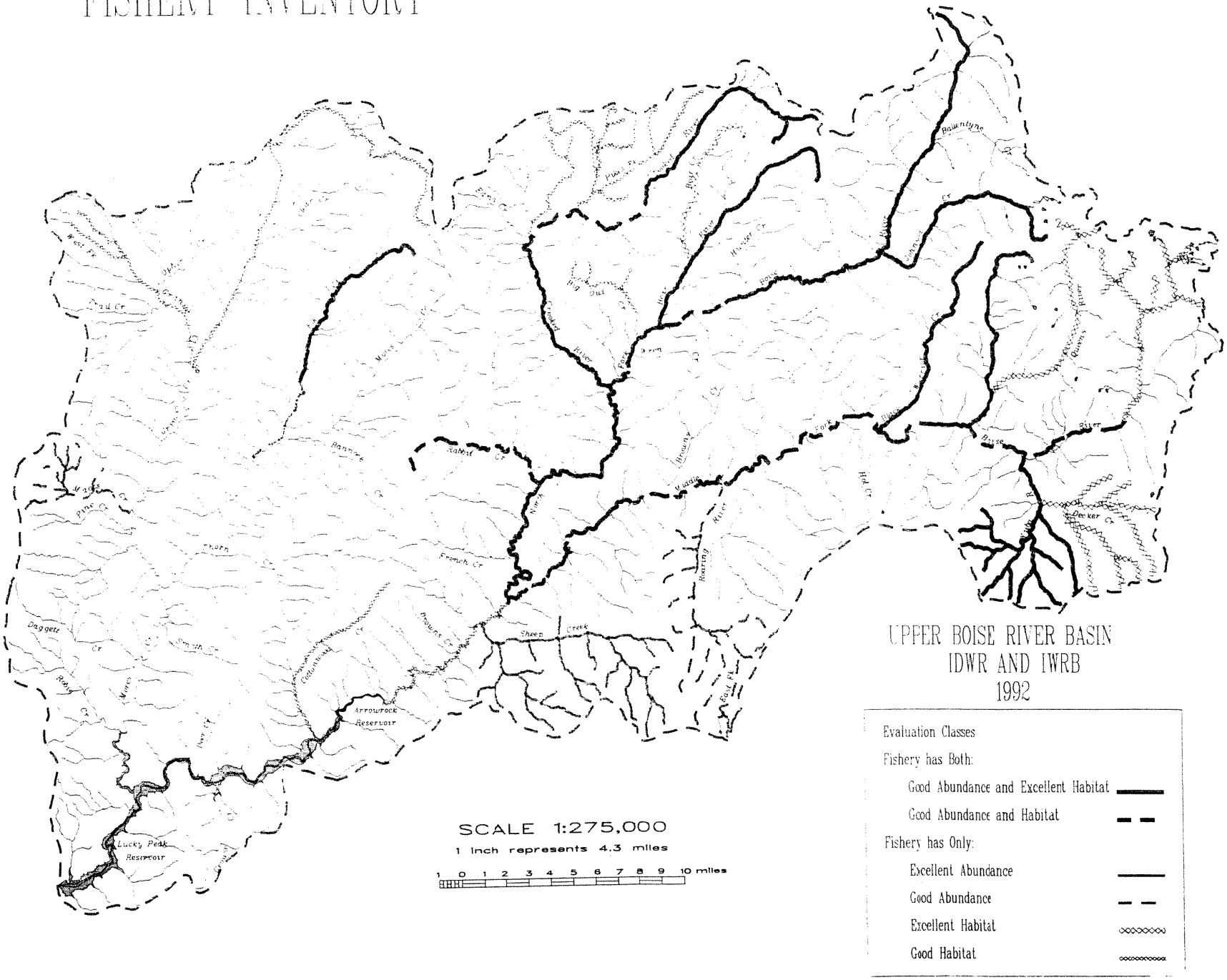


Plate 10

AESTHETIC INVENTORY

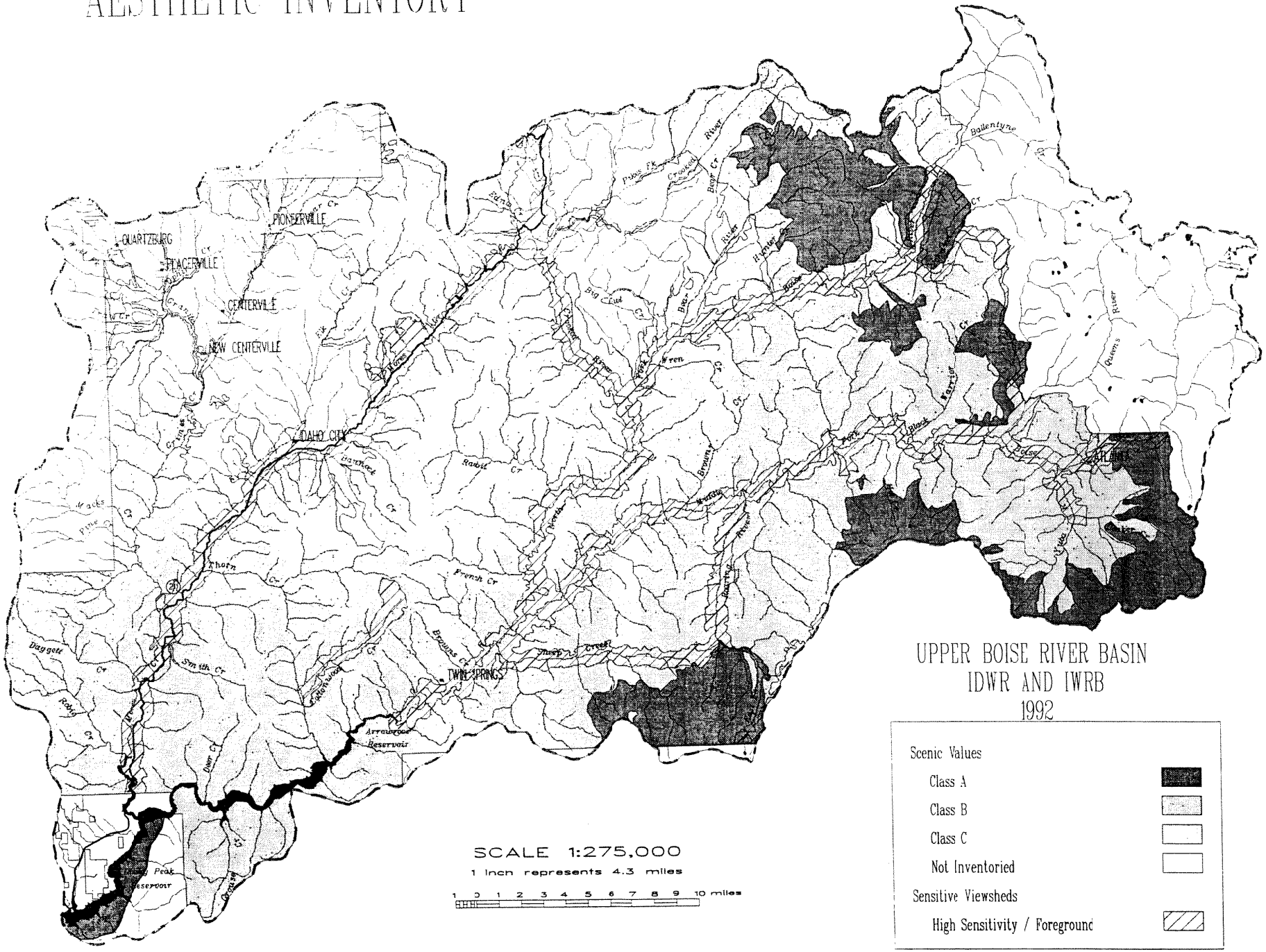


Plate 11

RECREATION INVENTORY

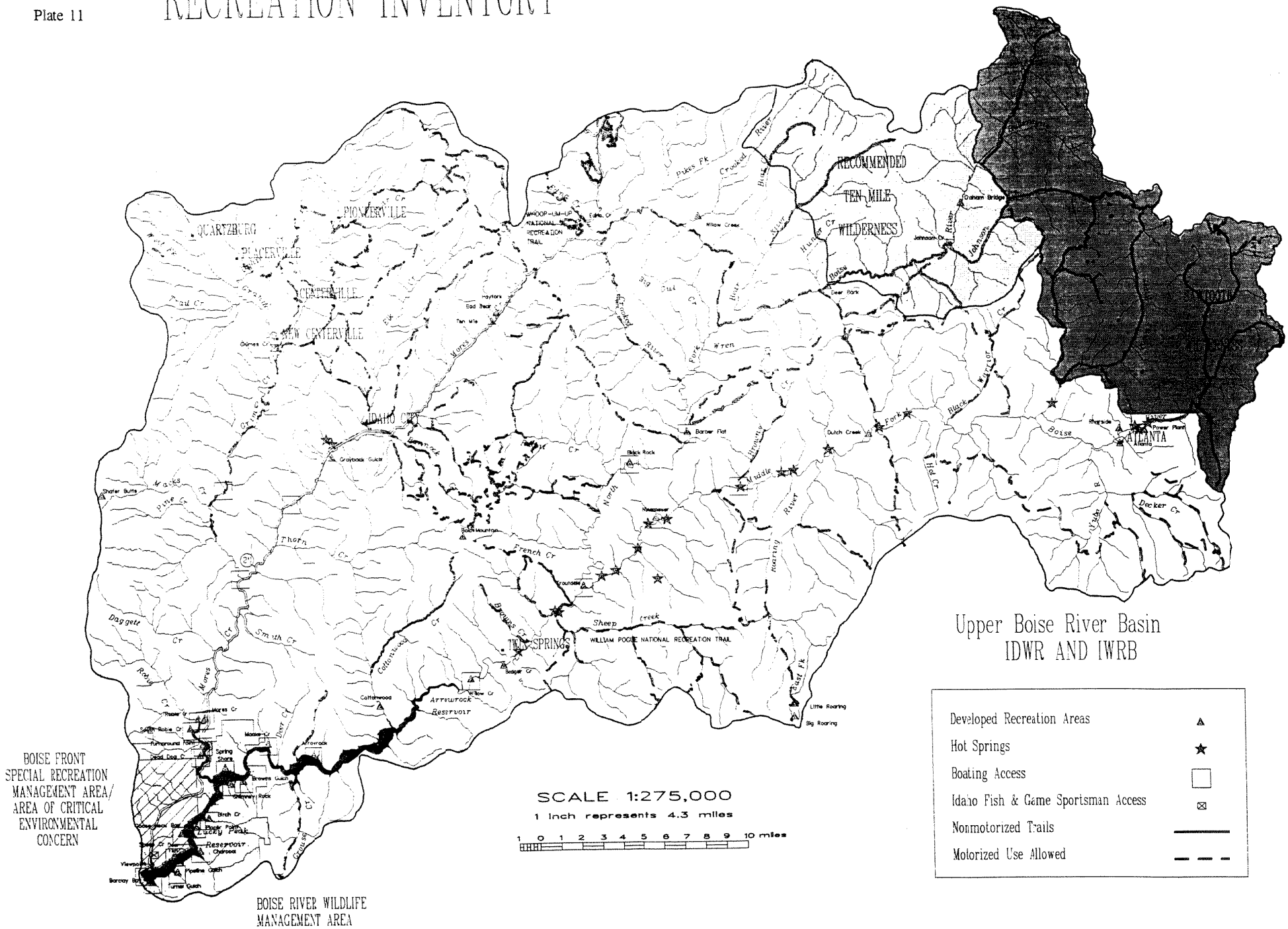


Plate 12

BIOLOGICAL EVALUATION

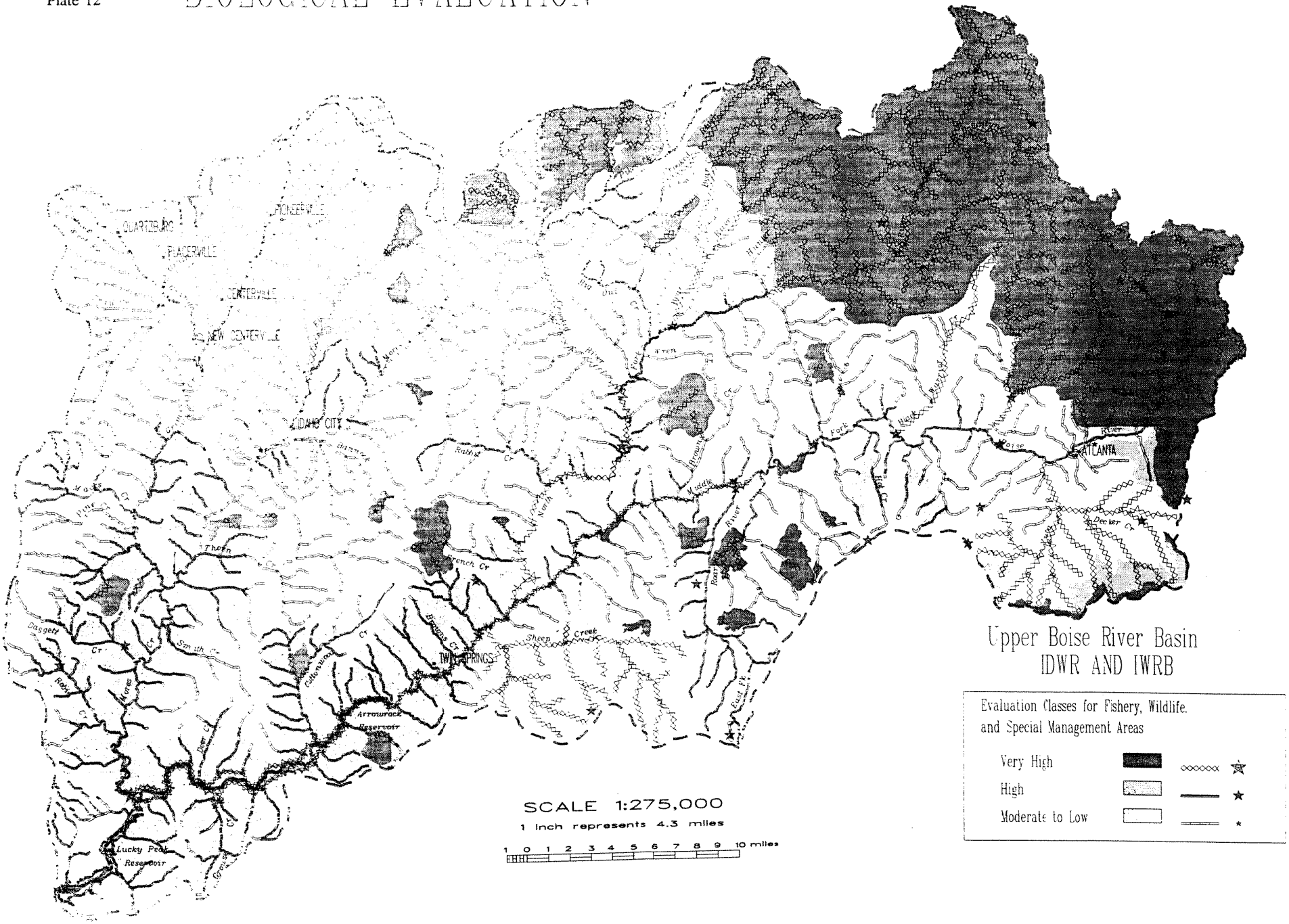


Plate 13

AESTHETIC EVALUATION

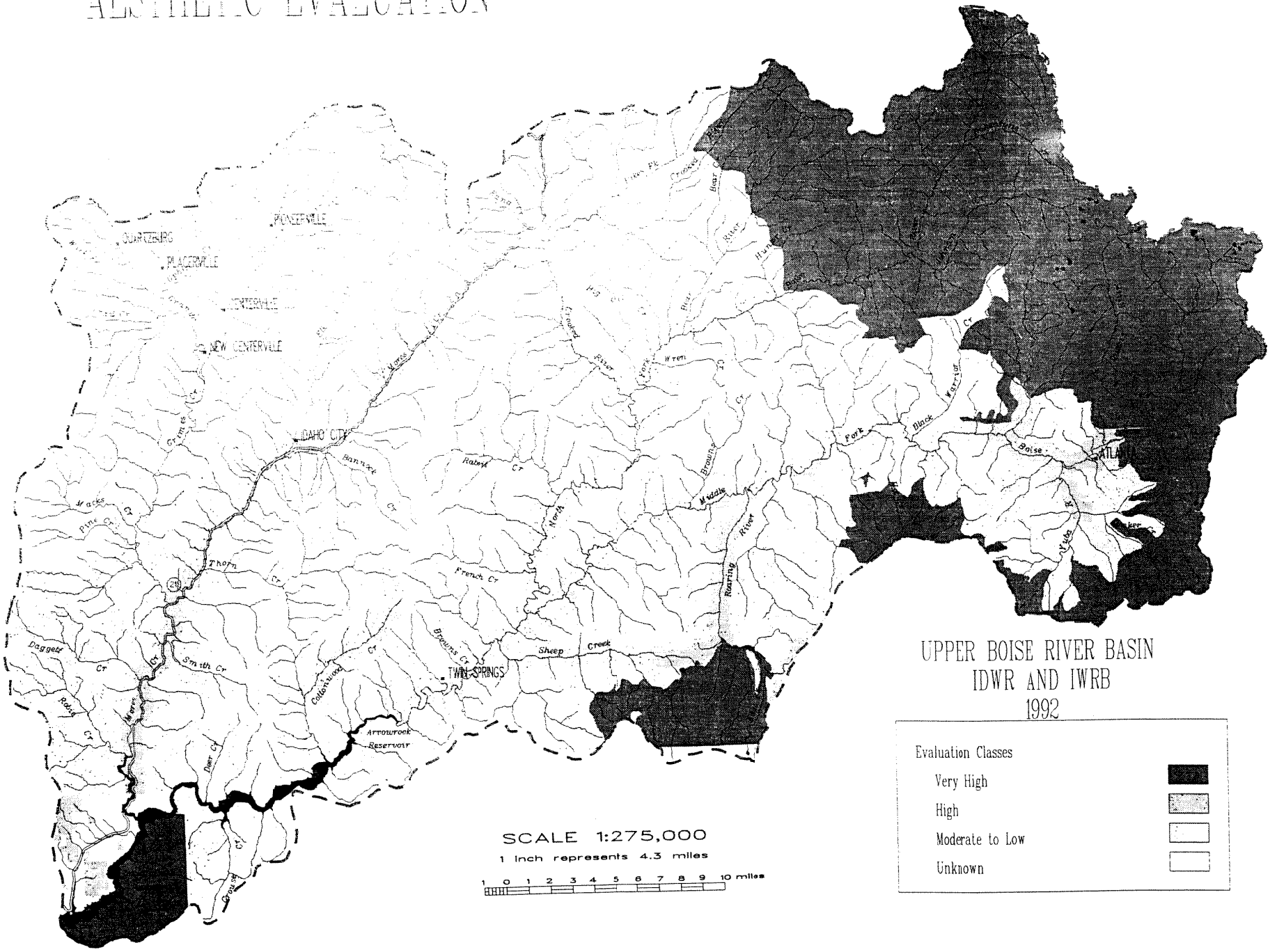


Plate 14

RECREATION EVALUATION

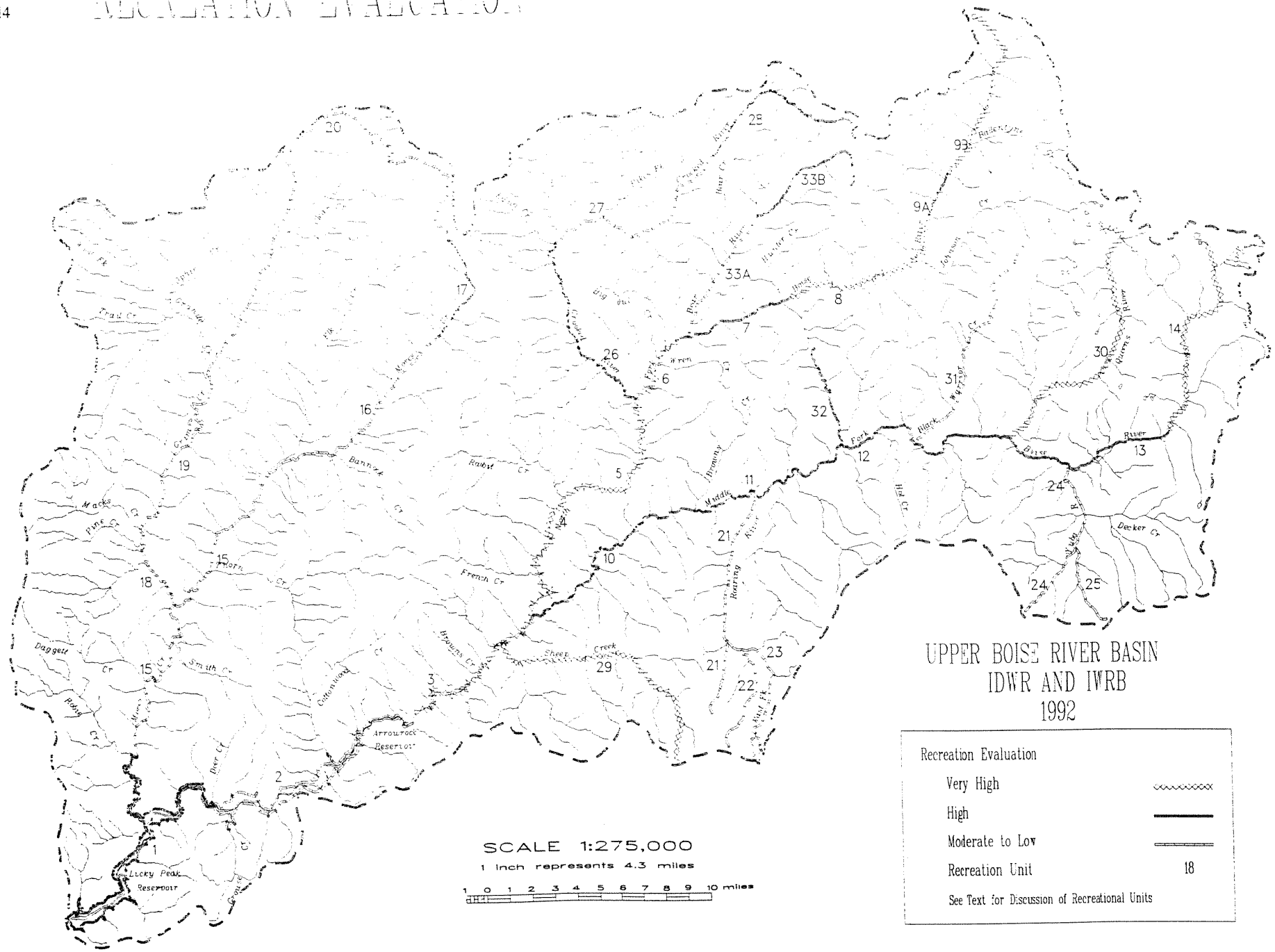
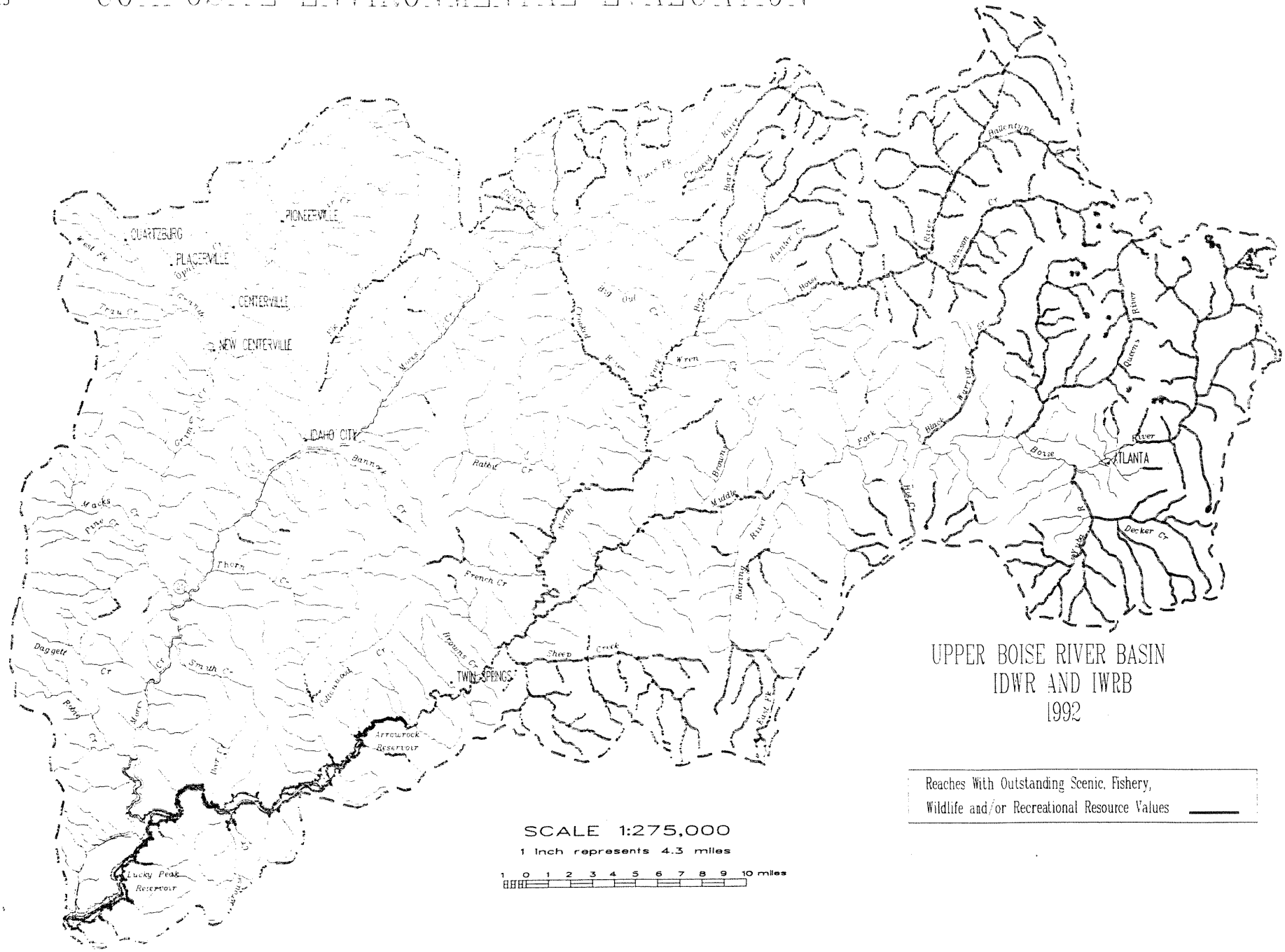


Plate 15

COMPOSITE ENVIRONMENTAL EVALUATION