APPENDIX C

APPENDIX C - TABLE OF CONTENTS

I. FISH AND WILDLIFE 1
- Biological Communities 1
- Sensitive Species 3
- Segment Descriptions 5
- Evaluation 19
- References 24

II. SCENIC VALUES AND NATURAL FEATURES 27
- Segment Descriptions 27
- Geologic Features 28
- Scenic Evaluation 32
- Geologic Features Evaluation 36
- Bibliography 40

III. CULTURAL VALUES 42
- Evaluation 43
- References 51

IV. RECREATION 53
- Summary 53
- Developed Recreation Facilities 59
- Boating/Floating 61
- Fishing, Hunting, and Wildlife Observation 66
- Sightseeing and Trail Use 70
- Other Recreation Opportunities 73
- Evaluation 74
- Bibliography 79

LIST OF TABLES

Table 1. Fish and Wildlife, Biological Communities Evaluation for the Middle Snake Reach . 22
Table 2. Scenic Distinction Evaluation for Middle Snake Reach 34
Table 3. Geologic Features Evaluation for Middle Snake Reach 38
Table 4. Cultural Resource Evaluation for Middle Snake Reach 45
Table 5. Estimated Recreation Activity 54
Table 6. Developed Recreational Facilities Within the Middle Snake Study Area 60
Table 7. Developed Campgrounds 60
Table 8. Middle Snake Whitewater Sections 62
Table 9. Estimated Boating Activity 65
Table 10. Reported Boating Activity by Outfitters and Economic Values 65
Table 11. IDFG Sportman's Access and Wildlife Management Areas 66

LIST OF TABLES, Cont.

Table 12. Angler Hours and Catch Rates for Areas Within the Middle Snake Planning Area . . . 68
Table 13. Estimated Hunter Days for Gooding, Jerome and Twin Falls Counties 69
Table 14. Estimated Deer Hunter User Days 70
Table 15. Recreation Units for the Middle Snake Reach 75
Table 16. Recreation Evaluation Criteria and Results for the Middle Snake Reach 77

LIST OF FIGURES

Figure 1. Fish and Wildlife Evaluation Map 23
Figure 2. Hagerman Fossil Beds National Monument 31
Figure 3. Scenic Evaluation Map 35
Figure 4. Geologic Features Evaluation Map 39
Figure 5. Cultural Features Evaluation Map 46
Figure 6. Recreation Evaluation Map 78

I. FISH AND WILDLIFE

The Middle Snake reach has an unusual and varied fish population. Game fish include the white sturgeon, rainbow trout, cutthroat trout, the rainbow-cutthroat hybrid, channel catfish, smallmouth bass, largemouth bass, yellow perch, and mountain whitefish. Spawning of game fish in the main river is limited to the white sturgeon, channel catfish, and possibly smallmouth bass.

The Idaho Department of Fish and Game reports that with the exception of spawning areas, trout habitat in the main Snake River is good throughout most of the free-flowing reaches where large amounts of spring flow are discharged into the river (IDFG, 1991). However, natural reproduction in the main river is limited by fluctuating water levels, lack of spawning gravels, heavy siltation and plant growth, and localized areas of poor water quality (Hill, 1991; FERC, 1990).

Thousands of ducks, geese, herons, and raptors utilize the canyon for winter habitat and nesting. Game and non-game birds in the vicinity of the river include the pheasant, chukar, Hungarian partridge, sage grouse, California or valley quail, and mourning doves. A variety of warblers, wrens, and sparrows are also present. Some bluegrouse, bobwhite, and mountain quail are also found. The birds of prey include hawks, falcons, golden eagles, occasionally bald eagles, great horned owls, barn owls, kingfishers, and possibly the osprey.

Resident deer are found within the canyon. Predators that converse the area are coyotes and bobcats; furbearing animals are primarily the muskrat, mink, weasel, otter, and raccoon. Non-game or small mammals are the jackrabbit, marmot, pygmy rabbit, cottontail rabbit, badger, and other small rodents.

Biological Communities

The biological communities of most desert canyons, such as the Middle Snake reach, frequently harbor tremendous biological diversity due to a heterogeneous and less stressful environment. The river usually remains open and ice free throughout the winter, and the canyon provides shelter from extreme temperatures and winds.

Aquatic and River Channel Communities

The river channel is characterized by communities of free-floating and attached algae, which provide food and cover for invertebrates and fish (Murphey et al., 1991). These algal communities respond to nutrient loading and increased light and temperature in the summer, and have become a

problem in the Middle Snake, particularly in the slower flowing stretches and reservoirs. On the other hand, the eutrophication has provided increased food supply for dabbling ducks, particularly around the Niagara and Hagerman Wildlife Management Areas.

The benthic invertebrate diversity and abundance can be quite rich and varies with the type and degree of pollution and flow characteristics. As a general rule, the slower moving waters support crustaceans, mollusks, and midges, while the fast moving waters support caddisflies and mayflies. While native fish, such as the salmonids, sturgeon, and sculpin still exist in the Middle Snake, and in some reaches do well, non-game species such as the carp, largescale sucker, and squawfish have thrived largely because of eutrophication and reduced dissolved oxygen levels throughout most of the reach. The aquatic communities of the Middle Snake frequently have established populations of river otter, mink, and muskrat.

Currently, what exists on the Middle Snake are two different ecosystems: the reservoir or lake (lacustrine) ecosystem, and the free-flowing or riverine ecosystem. There are physical differences between the two ecosystems, and consequently, the biota are also distinct. Studies done by Idaho Power Company compared benthic invertebrate fauna of a riverine reach with a reservoir and found a significant difference in abundance and diversity (IPC, 1981). In the riverine reach, samples contained 576 individuals representing 19 taxonomic families compared to 82 individuals representing 13 families in the reservoir. In contrast, planktonic (free-swimming) invertebrates should have a higher diversity and standing crop in the still waters of the reservoirs than in the free-flowing reaches.

Riparian Communities

The floodplain and surrounding springs, where plants can access surface water or ground water, support healthy vegetative communities. The riparian communities vary from emergent wetlands, typically associated with the numerous springs and seeps along the Middle Snake, to deciduous woodlands. Some studies in this section of the Snake identify as many as 11 distinct riparian communities (IPC, 1991b). The wetlands are dominated by sedges, horsetails, cattails, and rushes. Springs and seeps frequently contain watercress. The dominant tree canopy may include several species of willow, cottonwood, juniper, water birch, netleaf hackberry, Russian olive (introduced), chokecherry, and black locust (Bowler and Bowler, 1991). The canopy understory shrubs are frequently squawbush, golden current, dogwood, wood's rose, nettle, and Solomon's seal.

Riparian communities provide an array of habitats for a wide range of birds: waterfowl, wading, shore, and diving birds (herons, commorant, ducks, white pelican), songbirds (robin, flicker, sparrows), and raptors (red-tailed hawk, kestrel). These groups are well represented in both abundance and diversity throughout most of the Middle Snake reach.

The most common small mammals in the riparian commonties include the cottontail rabbit, shrew, deer mouse, coyote, and an occasional bobcat (Cogeneration, Inc., 1983; Murphey et al., 1991). Mule deer are found throughout the canyon and on the rim, and are known to utilize channel islands for fawning, feeding, and resting (IPC, 1991b). Lizards, including the side-blotched lizard, western whiptail, and western fence lizard, and snakes such as the gopher snake, rubber boa, and western rattlesnake are the more common reptiles in the riparian and slope communities (IPC, 1990).

Upland and Slope Communities

Above the riparian communities, on slopes and benches in the canyon, the sagebrush-grassland community prevails. Big sagebrush is usually the dominant shrub, but both green and gray rabbitbrush, shadscale, and greasewood are frequently associated with it (Murphey et al., 1991). The Rocky Mountain juniper is the dominant tree species. The cliff and talus slopes are sparsely vegetated.

The Middle Snake's canyon walls and larger trees provide excellent nesting sites for a diversity of raptors. The nesting raptor list would include the red-tailed hawk, golden eagle, prairie falcon, northern harrier, American kestrel, and great-horned owl (Murphey et al., 1991). Bald eagles and rough-legged hawks have become relatively common winter visitors. Upland game birds, such as quail and chukar, inhabit the sagebrush-grassland slopes. Mule deer and pronghorn move along the rim, particularly during the winter, feed in the pastures on the rim and grasses on slopes, and may move down into the riparian communities to rest.

Sensitive Species

White sturgeon - Until fairly recently, little was known about the white sturgeon *Acipenser transmontanus* in Idaho (Lukens, 1981). In the Middle Snake segment, the healthiest population of sturgeon exists downstream of Bliss Dam. That population is considered viable and stable. A second population, in the Hagerman reach, is not as successful, and their status is probably declining (Reid, 1992; Partridge, 1992). Sturgeon have been caught throughout the Middle Snake reach, from Shoshone Falls to Lower Salmon Falls, but the Department of Fish and Game does not consider the numbers sufficient to represent a population, but rather isolated individuals. The white sturgeon is listed by the U.S. Fish and Wildlife Service (USFWS) as an Endangered Species Act candidate (C1) species, which means there is sufficient information to list them as threatened or endangered (Moseley and Groves, 1992). The Conservation Data Center considers their state status as being imperiled, but throughout their range, they are not considered to be currently in threat of extinction.

Shoshone sculpin - The Shoshone sculpin *Cottus greenei* is a species of fish endemic to Idaho waters and currently distributed in the Hagerman Valley. The fish is distributed in a number of springs and streams associated with the Thousand Springs formation, with an estimated total population size of 150,000 to 200,000 individuals (Wallace et al., 1982). Several of the springs, particularly Bickel Springs and Box Canyon, have concentrations of 20,000 individuals. The U.S. Fish and Wildlife Service lists the Shoshone sculpin as a Endangered Species Act candidate (C1) species (Beck-Haas, 1992), and the Conservation Data Center considers their global and local population status to be imperiled (Moseley and Groves, 1992).

Snails - Populations of five mollusc species designated as endangered or threatened by the U.S. Fish and Wildlife Service are found in the Middle Snake reach and its tributaries. The Snake River Physa *Physa natricina*, Idaho springsnail *Fontelicella idahoensis*, Utah Valvata *Valvata utahensis*, and the Banbury Springs limpet *Lanx sp.* are listed endangered. The Bliss Rapids snail, an undescribed monotypic genus in the family Hydrobiidae is listed as threatened.

The Utah Valvata existed continuously along the Snake until the Bonneville Flood 15,000 years ago caused their isolation (Taylor, 1985). The Bliss Rapids snail was historically found on boulder bars from King Hill to Lower Salmon Falls and in Box Canyon Spring (Federal Register, 1990). The Snake River Physa snail, a relict from Pleistocene lakes in the area, historically has ranged from Indian Cove (River Mile 524) to Salmon Falls Dam (Taylor, 1988; Federal Register, 1990). The Idaho springsnail, has been reduced to 80 percent of its original range (Federal Register, 1990). The Banbury Springs limpet was discovered in 1988 at Banbury Springs and a second population was discovered the next year in nearby Box Canyon Springs (Federal Register, 1990).

Established snail populations are dependent on clean, well-oxygenated, rapidly flowing rivers or large spring habitats (USFWS, 1991). Only eleven known sites in the Middle Snake reach support remnant populations. The factors limiting the snail populations today include fluctuating flows associated with hydropower generation, water quality, and competition from the introduced New Zealand mudsnail *Potamopyrgus antipodarium* (Frest and Johannes, 1992).

Birds - The Conservation Data Center (CDC) has identified two bird species that are federally listed by the USFWS. This includes the bald eagle *Haliaeetus leucocephalus* and long-billed curlew *Numenius americanus*. The bald eagle, listed endangered, is a migrant winter visitor throughout the entire reach. Data collected in the winter of 1991 and 1992 suggests a few bald eagles use the Hagerman to King Hill reach consistently and may be winter residents. Loggerhead shrikes and ferruginous hawks are present between Salmon Falls Creek and King Hill. Both bird species have a federal C2 classification, indicating endangered or threatened listing may be appropriate but further research and study is needed. Nesting loggerhead shrikes were observed in the same segment

(Carson, 1993). The long-billed curlew, with a 3c status (taxon is more abundant than previously thought), has a known population of 15-20 nesting pairs in the Hagerman segment. In addition to the federally listed species, the blue grosbeak *Guiraca caerulea*, and American white pelican *Pelecanus erythrorhynchos* are all species of concern in the state, but not throughout their distribution. The blue grosbeak has been found along Deep Creek in the Kanaka Rapids segment and the white pelican is found in large numbers throughout the Middle Snake but is not known to nest here (Trost, 1985).

Plants - Of the eight sensitive plant species listed by CDC, only one, the Snake River Milkvetch *Astragalus purshii var. ophiogenes* has USFWS status as a category C3, which is the weakest ESA candidate listing it can receive. This milkvetch is recorded as occurring from Kanaka Rapids to King Hill. The seven other plants are species of concern either locally and/or globally, according to the CDC appraisal, and occur in the Snake River canyon:

- Owyhee mourning milkvetch *Astragalus atratus var. owyheensis*
- Malheur cryptantha *Cryptantha propria*
- giant helleborine *Epipactis gigantea*
- large-flowered gymnosteris *Gymnosteris nudicaulis*
- Torrey's blazing star *Mentzelia torreyi var. acerosa*
- Janish's penstemon *Penstemon janishiae*
- tall dropseed *Sporobolus asper*

The study area contains seven areas that are on the list of Idaho Priorities for Wetland Acquisition prepared by the Idaho Department of Parks and Recreation.

Segment Descriptions

Milner Segment - The Milner segment extends from Milner Dam to Murtaugh Bridge. It is dewatered for much of its length during the irrigation season but regains some water as it approaches Murtaugh Bridge because of spring recharge and irrigation return flows. It is designated as water-quantity limited by DEQ. The segment has large rapids alternating with long pools, and passes through a narrow canyon with steep cliffs on both sides (B&C Energy Inc, 1992). The shoreline consists of rock shelves with boulders on sand. There are limited gravel areas and stands of riparian vegetation occur where the slope of the shore is more gradual.

The Milner segment is described as a cold-water fishery with modest hatchery rainbow and wild cutthroat trout populations in watered sections, and spawning potential in tributary springs (IDFG, 1991a; Partridge, 1992). IDFG believes that bypass flows at the Milner Dam powerhouse will allow further development of a trout fishery in this segment (Partridge, 1992).

B & C Energy, Inc., in their impact assessment for the proposed Star Falls hydropower project (1992), found limited spawning and rearing in the affected stretch of the river, and concluded that the segment does not seem to support coldwater gamefish species, except mountain whitefish. A few nongame species (dace, sculpin) were found in this segment. Benthic sampling revealed a low density and diversity of invertebrates (only Tubifex worms and Chironomid larvae). They also found most of the river bottom covered with a thick layer of silt, and riparian cover was lacking.

Wildlife habitat in the Milner segment is considered good, except for the lack of water in the river. Wintering migrant bald eagles utilize the Milner segment as they do the entire Middle Snake reach (Steenhof, 1992).

In the 1970s, shells of ESA listed mollusks, Utah valvata and Snake River Physa, were collected in the Milner segment (IPC, 1983). Utah Valvata may be expected to occur here as it prefers a silt bottom substrate (FERC, 1990). Other sensitive species that are expected to occur in the segment but have not been documented, include the Swainson's hawk, Ferruginous hawk, long-billed curlew and bobcat (IPC, 1983).

The Milner segment seems to have a high diversity of birds, but any comparison to the other segments may be misleading because of data inequities. In a 1983 study of breeding songbirds cited by B&C Energy Inc., the investigators found 288 birds/10 acres in the brushy riparian and wetland habitats. In their 1992 study, they found 61.6 birds/10 acres in the riparian/wetland habitat type compared to 82 birds/10 acres in sagebrush habitat. The most common birds encountered in winter in the project area were the robin, song sparrow, and Townsend's solitaire.

In the cited 1983 study, the investigators found 6 occupied raptor nests in the cliffs in the project area. This included 2 kestrel, 2 prairie falcon, 1 red-tailed hawk, and 1 golden eagle. Again in 1992, 4 raptor nests were found, which included 2 kestrel, 1 red-tailed hawk, and 1 great horned owl. Other raptors observed in 1992 in the area included bald eagle, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, Swainson's hawk, golden eagle, prairie falcon, and rough-legged hawk. B & C Energy found 700 pairs of cliff and rough-winged swallow nests in the canyon walls and 600 breeding pairs of barn swallows. In the riparian system along the river, the same study identified 50 roosting pheasants. The FERC (1990) listed prairie falcon, raven, red-tailed hawk, northern harrier, great horned owl, rough-legged hawk, grey partridge, chukar partridge, California quail, and mountain quail, robin, Hudson warbler, Oregon junco, flicker, and black-billed magpie in an inventory encompassing the segment.

In the area of impact of the proposed Star Falls hydropower project, B&C Energy, Inc. found 0.24 pairs of Canada geese per river mile and only 5 pairs of dabbling ducks. In a waterfowl survey

done in 1984, they counted 250-300 Canada geese, 300-400 mallards, 100-125 common mergansers, 5-10 lesser scaup, 5-10 white-winged scoters. IDFG found 12 waterfowl/mi. during the winter in the project area. In a 1991 IDFG winter waterfowl count, no Canada geese were found in the Milner segment and 45 total waterfowl of other species (IDFG, 1991c). These figures may be compared to 147 Canada geese and 7027 waterfowl counted in the Murtaugh to Thousand Springs stretch.

Other vertebrate species identified in the 1992 B&C Energy inventory included cottontail rabbit, mule deer, river otter, mink, western fence lizard, sagebrush fence lizard, and western garter snake.

A population of tall dropseed grass *Sporobolus asper* has been identified in an area approximately 100 ft. by 200 ft. below Milner Dam (Popovich, 1992). This species of grass, common to the midwestern grasslands, had not previously been documented for Idaho. This is the only plant species documented for the segment (Moseley and Groves, 1992).

Four distinct plant communities have been identified in the segment. The communities include willow/forb wetland, cattail/rush emergent wetland, riparian shrub, and mixed upland shrub/rock. The willow and forb wetland occurs along the river's edge below a basalt ledge on the south side of the canyon; the cattail and rush wetland is above the willow wetland and perched behind the basalt ledge; the riparian shrub occurs above the basalt ledges and extends up the canyon walls; and the upland shrub exists on the steep slopes anywhere from the river's edge to the canyon rim (B&C Energy, 1992).

The benches and moderate slopes are dominated by sagebrush and rabbitbrush, cheatgrass, and a mix of other grasses and forbs (IPC, 1983). In the basalt rock areas shaggy fleabane, a cactus, is common. The most common community in the segment is the mixed upland shrub/rock community, which is dominated by sagebrush, rabbitbrush, grasses (mainly cheatgrass), and scattered junipers (FERC, 1990). The wetland areas are dominated by rose, golden currant, willows, Russian olive, chokecherry, black hawthorne, and water birch. Eighty percent of the Milner segment is designated as Idaho Priority Wetland (IDPR, 1989). The SCORP describes this wetland as scrub-shrub and emergent wetland types with spring systems.

Murtaugh Segment - The Murtaugh segment is a free-flowing stretch that extends from Murtaugh Bridge to the backwaters of Twin Falls Reservoir. This section is dewatered at times during the irrigation season. The stretch is characterized by long, deep pools and rubble riffles. The segment is considered to closely approximate prehistoric habitat conditions (Partridge, 1992). Cutthroat, rainbow, and cutthroat/rainbow hybrids delineate this segment as a cold-water fishery (IDFG, 1991a). No hatchery stockings are made in the reach in an effort to protect the existing wild fish population.

The river habitat is described by IDFG personnel as outstanding to the backwaters of Twin Falls Reservoir (Partridge, 1992).

In all probability, bald eagles use this stretch of the Snake extensively in the winter. In the 1970s, blue heron and snowy egret colonies were known to exist in the Murtaugh segment, but their current status is not known (Trost, 1985). Birds listed for this segment include prairie falcon, raven, red-tailed hawk, northern harrier, great horned owl, rough-legged hawk, grey partridge, chukar partridge, California quail, mountain quail, robin, Hudson warbler, Oregon junco, flicker, and black-billed magpie (FERC, 1990).

Habitat similarities with the Milner segment would suggest that this reach contains populations of ESA listed mollusc species. However, supporting investigations have not been undertaken.

The vegetation communities of this segment are not chronicled, probably due to its inaccessibility. The only sensitive plant documented for the segment, the giant helleborine, *Epipactis gigantea*, was collected near Hansen Bridge (Moseley and Groves, 1992; FERC, 1990).

Twin Falls Reservoir --This short (1.0 mi.) reservoir is described as a mixed fishery containing rainbow trout, largemouth bass, channel catfish, black crappie, and bluegill (IDFG, 1991a). The reservoir is also known to contain smallmouth bass and an occasional walleye pike (Partridge, 1992). Walleye are not stocked because of the possible competition with other species in the Snake River system (Partridge, 1992). Vineyard Creek, an outstanding spawning tributary for wild cutthroat and rainbow trout, enters the reservoir less than a mile upstream of the dam (Reid, 1992).

The Twin Falls relicensing study (IPC, 1983) listed the bald eagle, long-billed curlew, and white-faced ibis, as sensitive species documented for the county, but no records sight these species around the reservoir (Moseley and Groves, 1992). None of the ESA listed mollusks have been confirmed for this segment of the river, but the Utah Valvata is expected to occur here because it prefers a silt bottom substrate (FERC, 1990).

Birds listed for this segment include prairie falcon, raven, red-tailed hawk, northern harrier, great horned owl, rough-legged hawk, grey partridge, chukar partridge, California quail, and mountain quail, robin, Hudson warbler, Oregon junco, flicker, and black-billed magpie (FERC, 1990).

The yellow belly marmot, beaver, porcupine, raccoon, and skunk roam the shores of the reservoir, and the bobcat is considered a potential inhabitant (IPC, 1983).

The giant helleborine, *Epipactis gigantea*, is reported in the Vineyard Creek area (Moseley and Groves, 1992). The vegetation around the reservoir is predominantly a shrub/grassland type, dominated by sagebrush, greasewood, shadscale, four-wing saltbush, and annual grasses (IPC, 1983).

Twin Falls relicensing study documented the palustrine scrub-shrub wetlands containing cottonwood, hackberry, willow, and skunkbush in the study area. Vinyard Creek, a tributary of the reservoir, is both an Area of Critical Environmental Concern (BLM) and an Idaho Priority Wetland (IDPR, 1989).

Devil's Corral Segment --This is a short (approximately 1.0 mi.) free-flowing stretch that extends from the Twin Falls Dam to the backwaters of Shoshone Falls Reservoir. This segment of the river contains one important tributary, Devil's Corral, which enters about a mile below Twin Falls Dam.

The fishery is described as mixed, containing rainbow and cutthroat trout and smallmouth bass (IDFG, 1991a). An IDFG Stream Habitat Condition evaluation (1986-1987) rated the habitat excellent for spawning (value of 21, highest possible). The habitat is described as superior, with no single limiting factor. Devil's Corral represents one of the few remaining undeveloped spring systems in south central Idaho (Grunder et al., 1987).

Wildlife habitat is ranked high by the Idaho Department of Fish and Game (IRIS). Birds listed for this entire stretch of the river include prairie falcon, raven, red-tailed hawk, northern harrier, great horned owl, rough-legged hawk, grey partridge, chukar partridge, California quail, and mountain quail, robin, Hudson warbler, Oregon junco, flicker, and black-billed magpie (FERC, 1990). A golden eagle nest was identified about 0.5 miles below the Twin Falls Dam (FERC, 1990).

Habitat similarities with the Milner segment indicate that this reach may contain populations of ESA listed mollusc species.

The Devil's Corral segment is short but contains a good population of giant helleborine *Epipactis gigantea*, below the dam and on the north side of the river (Moseley and Groves, 1992). Devil's Corral is designated as an Idaho Priority Wetland, although the vegetation has suffered from grazing and recreation (IDPR, 1989).

Shoshone Falls Reservoir --Like Twin Falls, this is a short reservoir (approximately 1.0 mi.), with a mixed fishery sporting rainbow and cutthroat trout, and smallmouth bass (IDFG, 1991a).

The relicensing study for the Shoshone Falls project identified the ferruginous hawk, long-billed curlew, white-faced ibis, Townsend's big-eared bat, and spotted bat as sensitive species that

may occur in the project area (IPC, 1991b). None are recorded in the CDC database as occurring in the segment (Moseley and Groves, 1992). The terrestrial habitat surrounding the reservoir is primarily desert. Three big-game species, mule deer, elk, and pronghorn, have been reported in the area (IPC, 1991b). The reptile diversity is relatively high: 8 lizard species, 8 snake species and even 7 amphibian species (IPC, 1991b).

Birds listed for this stretch include prairie falcon, raven, red-tailed hawk, northern harrier, great horned owl, rough-legged hawk, grey partridge, chukar partridge, California quail, and mountain quail, robin, Hudson warbler, Oregon junco, flicker, and black-billed magpie, common loon, white pelican, trumpeter swan, upland sandpiper, Swainson's hawk, merlin, burrowing owl, osprey, short-eared owl, screech owl, and double-crested commorant (FERC, 1990; IPC, 1991b).

Auger Falls Segment --This segment runs from Shoshone Falls Dam to the mouth of Rock Creek. One significant tributary, Perrine Coulee, drains the community of Twin Falls. This segment has water year-round. Water-quality is considered fair for fishery development; habitat limitations are related to low summer flows (Partridge, 1992).

This stretch is a mixed fishery consisting of yellow perch, large and smallmouth bass, channel catfish, whitefish, rainbow and brown trout, and some sturgeon (IDFG, 1991a). The IDFG stocks this segment with hatchery rainbow trout, and there are two white sturgeon planting sites in this segment. Spawning is limited, but IDFG considers the habitat potential outstanding due to ample cover and pools (Partridge, 1992).

Tiedemann (1989) observed winter migrating bald eagles in the Auger Falls area, but also concluded that because the cottonwoods were declining, eagle perch sites were disappearing in the segment. There were no wintering bald eagles counted from 1980 to 1986 (FERC, 1990). The ESA candidate mollusks have not been found in this segment, but the Utah Valvata is expected to occur here as it prefers a silt bottom substrate (FERC, 1990).

In the early 1980s, Sather-Blair and Howard (1982; 1983) did a nesting raptor study from Shoshone Falls to Kanaka Rapids, focusing on three species: the prairie falcon, golden eagle, and red-tailed hawk. They compared their results to the known nesting densities in the Snake River Birds of Prey Natural Area (SRBPNA). The nest density of the three species in the Auger Falls segment was 0.6 nests/river mile compared to 2.0 nests/river mile in the SRBPNA. The authors concluded that the canyon habitat in the Auger Falls segment is similar to the SRBPNA, but a deficient prey base cannot support a higher density of raptors. Harriers, kestrels, and turkey vulture nests were also found (Sather-Blair and Howard, 1982; Howard and Sather-Blair, 1983).

Other birds listed for this stretch include raven, great horned owl, rough-legged hawk, grey partridge, chukar partridge, California quail, and mountain quail, robin, Hudson warbler, Oregon junco, flicker, and black-billed magpie (FERC, 1990). IDFG waterfowl surveys between 1977 to 1986 found 33.4% mallard, 3.5% goldeneye, 3.8% mergansers, and 0.9% Canada geese (FERC, 1990).

Scattered, resident mule deer populations are reported to exist from Star Falls to Auger Falls (FERC, 1990; USACE, 1983). Otters are regularly seen in this segment.

Habitat similarities with the Milner segment indicate that this reach may contain populations of ESA listed mollusc species.

One sensitive plant is documented for the Auger Falls segment. A population of large-flowered gymnosteris, *Gymnosteris nudicaulis*, is located in the canyon at the point where Highway 93 crosses it above Twin Falls (Moseley and Groves, 1992).

Vegetation is a mixture of upland and riparian communities (Cogeneration Inc, 1983). Willow, cattail, hackberry, alder, and cottonwood dominate the riparian areas, while sagebrush, rabbitbrush, cheatgrass, foxtail and wild rye dominate the upland. Sather-Blair and Howard (1982) identified five habitat types in the segment: hydric deciduous, mesic woodland, mesic shrubland, xeric shrubland, and herbaceous wetland. An Idaho Priority Wetland has recently been designated between Auger Falls and the mouth of Rock Creek (IDPR, 1989).

Kanaka Rapids Segment --This segment extends from the mouth of Rock Creek to the backwaters of Upper Salmon Falls Reservoir. Springs and tributaries, important for spawning, are tributary to the stretch, but the water quality of the river is poor below Rock Creek (Partridge, 1992).

Yellow perch, large and smallmouth bass, channel catfish, whitefish, rainbow and brown trout, and some sturgeon delineate a mixed fishery (IDFG, 1991a). There are both hatchery and wild rainbow trout in this section (Reid, 1992). Trout escapement from several fish hatcheries add to the fishery in this section. Fishing for trout is generally limited to the areas near spring inflows. IDFG has a Put-and-Take fishery established for hatchery rainbow at Crystal Lake with a 1.0 fish/hour catch rate goal (IDFG, 1991a). The habitat potential is considered outstanding, particularly for rainbow trout production, despite water quality limitations (Reid, 1992).

A remnant sturgeon population exists in this segment, and IDFG has stocked the stretch; however, the population is declining (Partridge, 1992). Northside springs create unique sturgeon habitat for food and temperature (54°F.) (Lukens, 1981). Briggs Springs, which enters the Snake

upstream of Kanaka Rapids, has a moderate population of shoshone sculpin (*C. greenei*) (Wallace, et al., 1982).

The Kanaka Rapids segment possesses wildlife habitat for a wide diversity of species. This is due in large part to the diversity of land uses in the segment, which include the Niagara Springs Wildlife Management Area (WMA), Kanaka Rapids, Clear Lakes, and Crystal Springs. Sensitive species that utilize the segment are the bald eagle and blue grosbeak (Moseley and Groves, 1992). The blue grosbeak *Guiraqca caerulea*, a species of concern in Idaho but not threatened globally, is recorded in only one location near the Middle Snake, about a mile up Deep Creek (Moseley and Groves, 1992).

Raptor nesting density is 0.6 nests/river mile (Sather-Blair and Howard, 1982; Howard and Sather-Blair, 1983). The U.S. Army Corps of Engineers (1983) identified seven golden eagle nests, Cooper's hawk, northern harrier, long-eared owl, osprey and several bald eagles wintering in the large cottonwoods. Between Niagara Springs and Crystal Springs, a distance of 0.25 mile, 100 great blue herons were counted in a survey done in the early 1980s on the north bank talus slopes, in addition to large flocks of Lazuli buntings (USACE, 1983). Species richness is highest, as expected, in the riparian habitats, and lowest on the talus slopes (USACE, 1983).

Waterfowl densities are high, particularly around Niagara Springs WMA and Boulder and Kanaka Rapids (Musil, 1992). A waterfowl census at the Niagara WMA in 1983 estimated 14,500 individuals, most of which were mallards. The segment supports a density of waterfowl 200-300 percent higher than the Auger Falls segment attributed to the abundance of islands (USACE, 1983). Waterfowl harvested during the 1991 hunting season at Niagara Springs WMA include mallard, widgeon, gadwall, Canada goose, green-winged teal, common and goldeneye (Musil, 1992). The U.S. Army Corps of Engineers (1983) study also found common loons, double-crested cormorants, and whistling swans in the area.

Habitat similarities with the Milner segment would suggest that this reach contains populations of the ESA listed mollusc species. However, supporting investigations have not been undertaken.

Four sensitive plant species are recorded for the Kanaka Rapids segment: Torrey's blazing star *Mentzelia torreyi var. acerosa*, Malheur cryptantha *Cryptantha propria*, giant helleborine *Epipactis gigantea*, and Snake River milkvetch *Astragalus purshii var. ophiogenes* (Moseley and Groves, 1992). Torrey's blazing star is the only species of the four with more than a single occurrence. A population of blazing star is documented on the south side of the canyon below Deep Creek.

Thousand Springs Segment --This five mile, flat water segment runs from Banbury Springs to the Upper Salmon Falls Dam. Channel catfish, large and smallmouth bass, and rainbow trout comprise a mixed fishery in this segment (IDFG, 1991a). Tributary springs provide excellent spawning (e.g., Box Canyon, Blind Canyon, Banbury Springs, and Sand Creek, etc.). Electrofishing in Blind Canyon Creek in 1990 yielded 27 wild rainbow, 3 hatchery rainbow, 2 chiselmouth chub, 6 dace, and 15 sculpin (Partridge and Corsi, 1991).

The greatest concentrations of Shoshone sculpin exist in the Thousand Springs area (Wallace, et al., 1982). This sculpin is sympatric with the mottled sculpin, *Cottus bairdi*, in a number of springs, but where that situation exists, Shoshone sculpin is found in the headwaters and mottled sculpin is found in the lower segments. According to Wallace significant populations of shoshone sculpin may be found in Bickel Springs, Sand Springs, Blue Heart Springs, Box Canyon Springs, Blind Canyon Springs, and Banbury Springs. Wallace assessed sculpin populations as moderate at Tucker Spring and Thousand Springs. The highest sculpin densities were observed at Bickel Springs and the lower section of Box Canyon.

Data collection on snails is extensive for the Thousand Springs segment. The Thousand Springs Nature Preserve is considered a refuge for all ESA listed taxa and has the largest known occurrence of Bliss Rapids snail (Frest and Johannes, 1992). Taylor (1985) found the greatest mix of mollusks in Box Canyon: the Bliss Rapids snail, giant Columbia River limpet, Banbury Springs limpet, and the Utah Valvata (Federal Register, 1990; U.S. BLM, 1985). The Banbury Springs limpet is known only from two locations, Box Canyon and Banbury Springs (Federal Register, 1990).

Alcove ecosystems and the presence of the Hagerman Wildlife Refuge provide numerous and diverse wildlife habitat adjacent to the Snake River. Songbird densities in the willow and mixed riparian habitat ranged from 98 to 234 birds per 10 acres, compared to 118 per 10 acres in the vicinity of Twin Falls (B&C Energy, 1992). Nesting raptors include the prairie falcon, golden eagle, red-tailed hawk, great gray owl, and barn owl (Boccard, 1980). Two established large heron rookeries occur in this segment, one at the mouth of Salmon Falls Creek, the other on an island near Banbury Springs (Smith, 1992). Both rookeries contain blue and black-crowned night herons.

The Hagerman Wildlife Management Area has one of the higher waterfowl concentrations on the Snake River. The IDFG 1991 winter waterfowl count from Upper Salmon Falls through the Murtaugh segment was 7027 ducks and 147 geese.

There are four sensitive plants recorded for the Thousand Springs segment. The Malheur cryptantha and the large flowered gymnosteris nudicaulis occur in the Hagerman WMA. Giant helleborine and Torrey's blazing star are documented at several locations in the canyon, with a well-

established population of giant helleborine in Box Canyon (Moseley and Groves, 1992). Three Idaho Priority Wetlands are in the Thousand Springs segment: 1) Box Canyon/Blueheart Springs, 2) Sand Springs, and 3) Salmon Falls Creek (IDPR, 1989).

Dolman Rapids Segment --This short (1-2 mile), multi-channeled section of the river below Upper Salmon Falls Dam, is dewatered in portions of the channel during the irrigation season (Partridge, 1992). Flow through this segment is controlled by releases from Upper Salmon Falls Dam.

The Dolman Rapids stretch is a mixed fishery, with abundant hatchery rainbow trout (Partridge, 1992). There is no known spawning of wild rainbow, and if sturgeon are found in this stretch it is because they have moved down from upper segments (Partridge, 1992). IDFG considers the Dolman Rapids stretch to have excellent fishery potential. Current limiting factors are water level fluctuations for power generation, and water quality.

Dolman Island and the rapids area has well-developed woodland riparian vegetation, that supports upland game birds, mule deer and probably wintering bald eagles. Waterfowl densities from Lower Salmon Falls Reservoir to Dolman Rapids are high, but less than densities found between Thousand Springs and Murtaugh (IDFG, 1991c).

Lower Salmon Falls Reservoir --This reservoir extends approximately 7 miles from Upper Salmon Falls to the Lower Salmon Falls Dam. Billingsley Creek is the major tributary. During the summer, there is a considerable build-up of aquatic macrophytes in both Lower and Upper Salmon Falls Reservoirs (Bowler and Bowler, 1991).

The reservoir provides a mixed fishery with rainbow trout, largemouth bass, channel catfish, black crappie and bluegill. The reservoir is stocked annually with hatchery rainbow trout (Partridge, 1992; IDFG, 1991a). Over eighty percent of the fish in the reservoir are nongame species: chiselmouth, carp, dace, largescale sucker, mottled sculpin, northern squawfish, peamouth chub, Utah chub and redside shiner (Partridge and Corsi, 1991).

Sensitive species documented for the area are the peregrine falcon and bald eagle (IPC, 1990). The only ESA candidate snail species collected to date in the mainstem or tributaries is the Utah Valvata (Duke, 1992). Vegetation around the reservoir is predominantly sagebrush. Because of the dominance of desert scrub habitat, there is a fairly good diversity of reptiles: the western whiptail and western fence lizards, gopher snake, rubber boa, and western rattlesnake (IPC, 1990). Upland game birds are abundant and including chukar, pheasant, partridge, quail and mourning dove (IPC, 1990).

The golden eagle population is greater downstream of Lower Salmon Falls Dam, than upstream (Smith, 1992). Raptors that are likely to occur around the reservoir are: Coopers hawk, northern harrier, long-eared owl, western screech owl, short-eared owl, great-horned owl, and the barn owl. The winter waterfowl count in 1991 was 3466 ducks and 9 geese (IDFG, 1991c).

Three sensitive plant species have been collected about one mile west of the reservoir: Owyhee mourning milkvetch, Torrey's blazing star, and Malheur cryptantha (Moseley and Groves, 1992).

Hagerman/Wiley Segment --The Hagerman segment is an eight mile stretch that extends from Lower Salmon Falls Dam to the backwaters of Bliss Reservoir. The Malad River is tributary to this segment. The segment is a mixed fishery containing white sturgeon, rainbow and brown trout, whitefish, channel catfish, smallmouth and largemouth bass and yellow perch (IDFG, 1991a). IDFG considers this stretch the best segment of the Middle Snake reach for trout. The IDFG has documented natural reproduction, good growth rates, and good recruitment from the Malad River (Partridge 1992; Reid, 1992).

The number of hatchery rainbow captured in the Snake River above the mouth of the Malad exceeds wild rainbow better than 3:1, but below the Malad, wild rainbow populations exceed hatchery populations (IDFG, 1991). The segment is managed as a trophy trout fishery. Cochnauer, (1980), found 0.2 percent of the non-game fish species sampled in the Hagerman segment were Shoshone sculpin. Wallace, et al. (1982) found sculpin population densities moderate to very low in springs between Lower Salmon Falls Dam and Bliss Bridge.

Historically, the Hagerman segment contained large white sturgeon (1500 lb. sturgeon caught near Hagerman; Bowler and Bowler, 1991). The white sturgeon population in this segment is declining, due in part to severe over fishing before catch and release regulations were put into effect in 1970. There are three sturgeon planting locations in this segment, but the IDFG is not planting sturgeon in the stretch because the hatchery sturgeon have had problems with disease. There is also controversy regarding whether this segment is long enough to support a viable population.

Fish habitat in this segment is considered good by IDFG; dissolved oxygen is high and oxygen exchange rates are good. However, flow fluctuations below Lower Salmon Falls Dam limit spawning (Partridge 1992; Reid, 1992).

The Hagerman segment is used by winter migrating bald eagles, and the long-billed curlew, an ESA candidate, is known to nest on both sides of the river almost directly south of Bliss (Moseley and Groves, 1992). Two of the ESA listed snails, the Bliss Rapids snail and the Snake River physa

have been collected in the segment (Duke, 1992). Water level fluctuation for power generation and competition from the New Zealand mudsnail limit both species (Bowler and Bowler, 1991). Two additional species, the Idaho springsnail and the Banbury Springs limpet, may exist in the segment (IPC, 1991). In the Malad Gorge, about 3 miles north of Hagerman, two bat species, the western pipistrelle bat (*Pipistrellus hesperus*) and the pallid bat (*Antrozous pallidus*) have been found. Neither have federal status but both are considered species of concern in Idaho (Moseley and Groves, 1992).

Raptors, including golden eagles and prairie falcons, nest in the segment (Boccard, 1980). The peregrine falcon is considered to be a casual visitor during migration (IPC, 1991a). Habitat for mule deer and upland game birds is abundant in the canyon (Smith, 1992). Chukar, partridge, California quail, pheasant and mourning dove are fairly common (IPC, 1991a). The woody riparian habitat supports high densities of small mammals and the channel islands are considered important for mule deer fawning, feeding, and resting (IPC, 1991a). Occasional or seasonal visitors include the common loon, merlin falcon, double-crested commorant, white pelican, and snowy egret. Winter waterfowl counts are not particularly high for the Hagerman segment (IDFG, 1991c).

Six of the eight sensitive plant species documented for the Middle Snake reach are found in the Hagerman segment: the Owyhee mourning milkvetch, Snake River milkvetch, Malheur cryptantha, giant helleborine, large-flowered gymnosteris, and Torrey's blazing star (Moseley and Groves, 1992). Torrey's blazing star and Owyhee mourning milkvetch are represented by small populations, but the others are only documented at single collection points.

There are 11 riparian communities delineated along the segment (IPC, 1991a). Bocard (1980) states that the Hagerman segment contains one of the few remaining undisturbed riparian communities in the state. The Hagerman stretch contains many plant communities that are no longer present around reservoirs downstream of Thousand Springs (IPC, 1991). Bowler and Bowler (1991) state that the segment has some of the largest stands of river birch *Betula occidentalis* and hackberry *Celtis reticulata* in the state. River birch and hackberry communities may be considered rare (IPC, 1991a). The largest Idaho Priority Wetland along the Middle Snake reach runs from the Bliss Bridge to the point where the freeway crosses Malad Gorge (IDPR, 1989).

Bliss Reservoir --Bliss Dam impounds water approximately five miles upstream. Bliss Reservoir is a warmwater fishery containing largemouth and smallmouth bass, channel catfish, and black crappie (IDFG, 1991a).

The reservoir may provide some habitat for migrant wintering bald eagles. Raptor surveys done by BLM show fairly high densities of prairie falcons and red-tailed hawks on the north side of the canyon. Mule deer and pronghorns utilize Tuana Gulch regularly to access the main canyon

(Klott, 1992). Habitat in this portion of the canyon is considered good for upland game birds such as pheasant, Hungarian partridge and quail (Smith, 1992).

Two sensitive plants are recorded for the Bliss Reservoir segment, Torrey's blazing star and Snake River milkvetch (Moseley and Groves, 1992). All along the south side of Bliss Reservoir and into Tuana Gulch are numerous disjunct populations of Torrey's blazing star. A good population of Snake River milkvetch occurs just above Bliss Dam on the north side of the reservoir.

King Hill Segment --The King Hill segment extends slightly over 12.0 miles from Bliss Dam to Clover Creek. The Snake runs relatively fast and clear in the upper two-thirds of the section, and is described by Cochnauer (1981) as deep (10 m.), with intermittent holes and riffles, and numerous large boulders. Bancroft Springs, occurs about midway along the segment.

The fishery is mixed, and similar to the Hagerman segment in species composition: whitefish, channel catfish, largemouth and smallmouth bass, yellow perch, rainbow and brown trout, and white sturgeon (IDFG, 1991a). Cochnauer (1981) found 99 percent of the fish were nongame species.

Idaho Fish and Game believes this segment holds potential for an excellent sturgeon and hatchery rainbow trout fishery. Limited spawning on the mainstem may be possible because of the boulder and sand substrate (Partridge, 1992). Currently, the rainbow trout fishery is not considered exceptional. The spawning potential of tributary streams is not known.

The population of white sturgeon in this segment is second only to the Hell's Canyon population in reproduction within the state (Partridge, 1992). Wintering bald eagles occur in the segment. Other sensitive species that are thought to occur in the King Hill segment are: ferruginous hawk, long-billed curlew, blue grosbeak, Townsend's big-eared bat, and American white pelican. Three of the ESA listed snails are documented for this segment, the Banbury Springs limpet, the Bliss Rapids snail, and the Snake River physa (Moseley and Groves, 1992).

Upland game birds inhabiting the corridor include pheasant, quail, and chukar. A herd of 40-50 mule deer, and small numbers of pronghorn have been observed in the canyon and frequently utilize tributary canyons such as Tuana, and Big and Little Pilgrim Gulch (Klott, 1992). The Double crested commorant, marsh hawk, golden eagle, blue heron, black-crowned night heron, white pelican, and great horned owl have been observed along the segment. Additional vertebrates documented for the area include bobcat, river otter, spotted bat, prairie falcon, and osprey. Seasonal or occasional visitors include common loon, peregrine falcon and snowy egret (Boccard, 1980).

Winter waterfowl counts by IDFG in 1991 indicate that the segment supports a low density of waterfowl relative to other segments of the Middle Snake reach (IDFG, 1991c). Ninety-nine ducks and two geese were counted in the King Hill segment.

Snake River milkvetch and Torrey's blazing star have been collected from several locations along the King Hill segment, with several notable populations of Torrey's blazing star, particularly near the mouth of Big Pilgrim Gulch (Moseley and Groves, 1992). Janish's penstemonn, considered a species of concern statewide, occurs in Big Pilgrim Gulch. The dominant trees of the riparian zone are Russian olive, hackberry and willow. Much of the shoreline vegetation on public land has been severely overgrazed, but there are still some excellent stands of water birch (Boccard, 1980; Bowler and Bowler, 1991).

SPECIAL MANAGEMENT AREAS

There are several special management areas adjacent to the Middle Snake reach that are devoted to protecting fish and wildlife. These include:

Areas of Critical Environmental Concern (ACECs)--ACECs are designated and managed for protection by the BLM, because they possess unique biological features that are threatened or have the potential of being threatened. They may include unique biological communities or rare species or both. There are two ACECs adjacent to the Snake River in the planning reach: Box Canyon and Vineyard Creek. The values identified for these two include fish (Shoshone sculpin), scenic and geological features (BLM 1990 Annual Report).

Idaho Priority Wetlands--Along the Middle Snake reach are eleven (11) established Idaho Priority Wetlands. The list includes: the Wiley segment, Malad Gorge, Box Canyon/Blueheart Springs, Vinyard Creek, Devil's Corral, Star Falls, Salmon Falls Creek, the Milner segment, Thousand Springs, Sand Springs, and Auger Falls. Most of these are identified in the 1990 IDPR State Comprehensive Outdoor Recreation Plan (SCORP), but four have been added since 1990. Priority wetlands are in response to the Emergency Wetlands Resources Act of 1986 and the subsequent Idaho Wetlands Conservation Priority Plan (IWCPP). The IWCPP is to assist decision makers in focusing their protection efforts on the most vulnerable and important wetlands in Idaho (IDPR, 1989). Within these priority wetlands exist most of the sensitive species found in the Middle Snake.

Thousand Springs Preserve--The Nature Conservancy currently manages a 200 acre tract of land adjacent to the Idaho Power Thousand Springs facility. The preserve has one of the best remaining populations of Shoshone sculpin, habitat for the Utah Valvata snail and Giant Columbia River limpet, and nesting for golden eagles.

Wildlife Management Areas and River Channel Islands--There are three IDFG Wildlife Management Areas adjacent to the Middle Snake reach: Hagerman, Niagara Springs, and Billingsley Creek. Many of the stream channel islands are managed for wildlife, also by IDFG. The WMAs and the islands provide habitat for waterfowl and mule deer. Very likely, the highest concentrations of waterfowl are in these units.

Isolated wildlife tracts--These are parcels of land that exist on BLM property, but are cooperatively managed by both the BLM and IDFG. The main objective is to manage habitat for all wildlife, but particularly upland game birds. The tracts exist in the uplands south of the river between Salmon Falls Creek and Big Pilgrim Gulch. From Milner Dam to Kanaka Rapids these tracts are in the canyon and adjacent to the river.

Evaluation

DELINEATION OF ECOSYSTEMS

The IDFG 1991 Five Year Management Plan identified 11 segments in the Middle Snake reach. The management units that are identified are distinguished by whether they are reservoir or free-flowing. This delineation was modified, primarily based on fishery habitat.
The delineated segments are:

- Milner (from Milner Dam to Murtaugh Bridge, 8.5 miles)
- Murtaugh (Murtaugh Bridge to Twin Falls Reservoir backwaters, 9.5 miles)
- Twin Falls Reservoir (1.5 mile)
- Devil's Corral (Twin Falls Dam to Shoshone Falls Reservoir backwaters, 1 mile)
- Shoshone Falls Reservoir (1.5 mile)
- Auger Falls (Shoshone Falls Dam to Rock Creek, 8.5 miles)
- Kanaka Rapids (Rock Creek to Banbury Springs, 17 miles)
- Thousand Springs (Banbury Springs to Upper Salmon Falls Dam, 9 miles)
- Dolman Rapids (Upper Salmon Falls Dam to Lower Salmon Falls Reservoir backwaters, 1.5 miles)
- Lower Salmon Falls Reservoir (7 miles)
- Hagerman (Lower Salmon Falls Dam to Bliss Reservoir backwaters, 8 miles)
- Bliss Reservoir (5 miles)
- King Hill (Bliss Dam to Clover Creek, 12 miles)

METHODOLOGY

The fish and wildlife evaluation involved two steps: (1) delineation of biological ecosystems, and (2) evaluating the distinction of each unit. Segment boundaries define an area with similar characteristics, and for the most part are distinguished by whether they are a reservoir (lacustrine) or a free-flowing segment (riverine).

Physical and biological variables were identified to evaluate each segment as an ecosystem. The physical variables considered for each segment were:

1. Water Quantity
2. Water Quality
3. Springs or perennial tributaries with high spawning potential
4. Fish habitat
   (a) in a lacustrine environment--depth, shoreline, rocky substrate, and vegetation are evaluated
   (b) in a riverine environment--pool:riffle ratio, and cover are evaluated
   (c) water quantity
   (d) water quality

   If all other physical parameters for fish habitat are good, but current water quantity/quality problems limit populations and species, habitat was rated Intermediate.
5. Wildlife habitat; heterogeneity would provide more niche opportunities and therefore greater or potentially greater species diversity (riparian woodland, springs, cliffs, etc.).

The biological variables taken into consideration were:

1. Sensitive species presence - aquatic (sturgeon, sculpin, snails)
2. Sensitive species presence - terrestrial (raptors, bats, plants, etc.)
3. Spawning
4. Special management areas (WMA, ACEC, wetlands)
5. High species diversity represented by several trophic levels.

In order for a segment to be considered Outstanding, four of the five physical criteria must be met, and four of the five biological criteria must be met. The justification for this assumes that in order for an ecosystem to warrant an Outstanding evaluation, it must be relatively whole and relatively healthy, and consequently, meet the majority of the criteria.

Physical Habitat					
Segment Name	1) Water quantity currently sufficient	2) Water quality currently good	3) Perennial tributaries **or** springs	4) Fish habitat: good*	5) Wildlife habitat: good**
Milner	No	Yes	No	No	No
Murtaugh	No	Yes	Yes	Yes	Yes
Twin Falls Res.	Yes	Yes	Yes	Yes	No
Devil's Corral	Yes	Yes	Yes	Yes	No
Shoshone Falls Res.	Yes	Yes	No	No	No
Auger Falls	No	No	Yes	Yes	No
Kanaka Rapids	No	No	Yes	No	Yes
Thousand Springs	Yes	No	Yes	Yes	Yes
Dolman Rapids	No	Yes	No	Yes	No
Lower Salmon Falls Res.	Yes	Yes	Yes	No	No
Hagerman	Yes	Yes	Yes	Yes	Yes
Bliss Res.	Yes	Yes	No	No	No
King Hill	Yes	Yes	Yes	Yes	Yes

***Lacustrine fish habitat**: 1) Good--if it currently possesses following characteristics: good depth column, heterogeneous shoreline, rocky substrate, and vegetation cover.
***Riverine fish habitat**: Good--if it currently possesses following characteristics: good pool:riffle ratio, cover, etc.
****Wildlife Habitat**: 1) Good terrestrial habitat is of high quality and provides numerous wildlife niches.

Species					
Segment Name	1) Sensitive aquatic species present (sturgeon, sculpin, snails)	2) Important spawning occurs	3) Sensitive terrestrial species present (raptors, bats, plants, etc.)	4) Special management areas: WMA, ACEC, isolated wildlife tracts (IWT), Idaho Priority Wetlands (IPW)	5) Unique species richness (high diversity, several trophic levels represented)
Milner	Unknown	No	Yes-plants	IWT, IPW	Yes
Murtaugh	Unknown	No	Yes-plants	IWT	No
Twin Falls Reservoir	No	Yes-salmonids	Yes-plants	IWT, ACEC, IPW	No
Devil's Corral	No	Yes-salmonids	Yes-plants	IPW	No
Shoshone Falls Res.	No	No	No	None	No
Auger Falls	Yes-sturgeon	No	Yes-plants	IPW	Yes
Kanaka Rapids	Yes-sturgeon, sculpin, snails	No	Yes-plants, blue grosbeak	IWT, WMA	Yes
Thousand Springs	Yes-sturgeon, sculpin, snails	Yes-salmonids	Yes-plants	WMA, IPW, ACEC	Yes
Dolman Rapids	No	No	No	None	Yes
Lower S.F. Reservoir	No	No	No	WMA	No
Hagerman	Yes-sturgeon, sculpin, snails	Yes-sturgeon, salmonids	Yes-plants, bats, long-billed curlew	IPW	Yes
Bliss Reservoir	No	No	Yes-plants	None	Yes
King Hill	Yes-sturgeon, snails	Yes-sturgeon	Yes-plants	None	Yes

Fish and Wildlife, Biological Communities Evaluation for the Middle Snake Reach

EVALUATION CLASS	CRITERIA	SEGMENTS
Outstanding	Four out of five physical parameters must be met and four of the five biological parameters must be met: **Physical Parameters** 1) Water quantity good **OR** reversible 2) Water quality good **OR** reversible 3) Perennial tributaries **OR** springs present 4) Fish habitat good 5) Wildlife habitat good **Biological Parameters** 1) Sensitive aquatic species present (sturgeon, sculpin, snails) 2) Important spawning occurs 3) Sensitive terrestrial species present (raptors, bats, plants, etc.) 4) Special management areas (WMA, ACEC, wetlands, etc.) 5) Unique species richness; several trophic levels represented	***Banbury Springs to Upper Salmon Falls Dam*** - water quantity good; water quality reversible; perennial tributaries and springs; wildlife habitat has good heterogeneity; sturgeon and sculpin present; salmonid spawning; sensitive plants; isolated wildlife tracts; Idaho Priority Wetland; Wildlife Management Area, Area of Critical Environmental Concern (BLM) ***Lower Salmon Falls Dam to Bliss Bridge*** - water quantity good; water quality good; perennial tributaries and springs; fish habitat = Good; wildlife habitat has good heterogeneity; sturgeon, sculpin present; spawning for sturgeon and salmonids; sensitive plants; Idaho Priority Wetland; several tropic levels are represented ***Bliss Dam to Clover Creek*** - water quantity good; water quality good; perennial tributaries and springs; fish habitat = Good; wildlife habitat has good heterogeneity; sturgeon present; spawning for sturgeon; sensitive plants; several tropic levels are represented

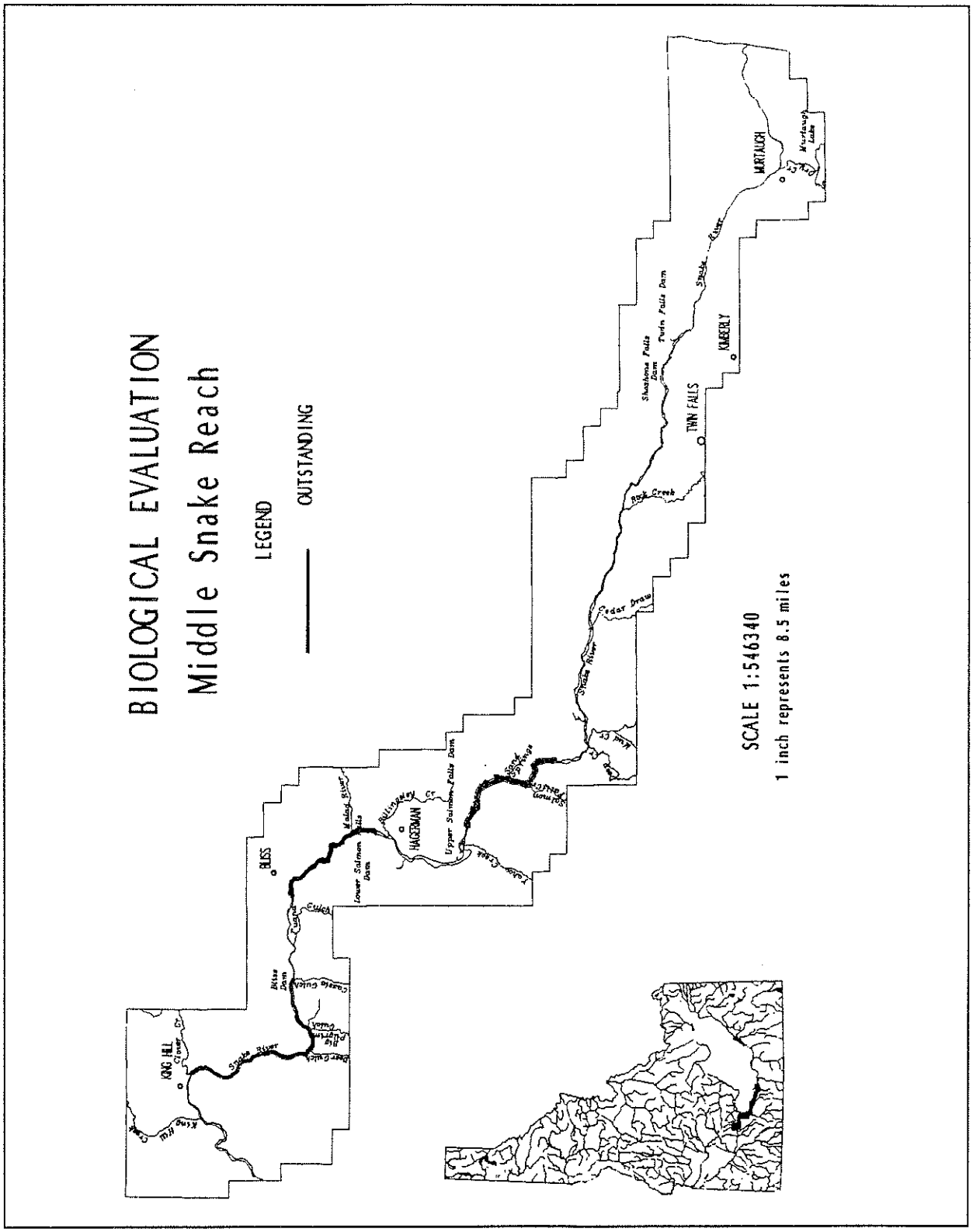

Figure 1. Fish and Wildlife Evaluation Map.

References

B&C Energy, 1992. Revised Application for License - Star Falls Hydroelectric Project. FERC No. 5797. Volumes XVII-XVIII.

Beck-Haas, Allison, 1992. Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Boise. Personal communication.

Boccard, Bruce, 1980. "Important Fish and Wildlife Habitats of Idaho." Boise, ID: U.S. Fish and Wildlife Service.

Bowler, A. and P. Bowler, 1991. *The History and Heritage of the Hagerman Reach of the Snake River*. Unpublished manuscript.

Carson, Gary, 1993. Area Manager, Jarbidge Resource Area, Bureau of Land Management, Twin Falls, ID. Personal communication.

Cochnauer, Tim, 1980. Snake River Fisheries Investigation, Study VII. Boise, ID: Idaho Department of Fish and Game.

Cochnauer, Tim, 1981. Snake River Fisheries Investigations, Study VII. Boise, ID: Idaho Department of Fish and Game.

Cogeneration, Inc., 1983. Application for License for the Auger Falls Hydroelectric project. FERC Project #4797.

Duke, Steve, 1992. Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Boise. Personal communication.

Federal Register, 1990. "Proposal Rules." Vol. 55 No. 243, Tues, Dec. 18, 1990.

FERC [Federal Energy Regulatory Commission], 1990. Final Environmental Impact Statement - Milner, Twin Falls, Auger Falls and Star Falls Hydroelectric Projects. FERC/EIS-0048F.

Frest, T.J. and E.J. Johannes, 1992. *Distribution and Ecology of the Endemic and Relict Mollusc fauna of Idaho The Nature Conservancy's Thousand Springs Preserve*. Final Report prepared for The Nature Conservancy of Idaho.

Grunder, S.A., L. Barrett, and R.J. Bell, 1987. Region 4 River and Stream Investigations, July 1 1986-June 30, 1987. Idaho Department of Fish and Game Project No. F-71-R-11.

Hill, Mark, 1991. Don Chapman Consultants, Inc. Presentation for the Middle Snake Study Group, November 26, 1991, at Twin Falls, ID.

Howard, R. and S. Sather-Blair, 1983. "An Ecological Comparison of Two Raptor Populations of the Snake River in Southern Idaho." *Proceedings 7th Annual Wildlife Conference*. Eds. N. Venizeles and C. Grijalva.

IDFG [Idaho Department of Fish and Game], 1991a. Fisheries Management Plan 1991-1995. Boise, ID.

_____, 1991b. *Population Estimates for Gamefish in Snake River from Lower Salmon Falls Dam to Bliss Bridge, June 1991*. Unpublished report.

_____, 1991c. Region 4 Winter Waterfowl Survey 1991. Jerome, ID.

IPC [Idaho Power Company], 1981. Application for License, A.J. Wiley Hydroelectric Project, No. 2845.

_____, 1983. Twin Falls Hydroelectric Project. FERC Application For New License: Project No. 18.

_____, 1990. Formal Consultation Package, Bliss, Lower Salmon Falls, Upper Salmon Falls. October, 1990.

_____, 1991a. Formal Consultation Package, A.J. Wiley Project.

_____, 1991b. Formal Consultation Package, Shoshone Falls. October, 1991.

IDPR [Idaho Department of Parks & Recreation], 1989. 1990 Centennial Edition: Idaho Outdoor Recreation Plan. Boise, ID.

Klott, Jim, 1992. Bureau of Land Management, Jarbidge Resource Area. Personal communication.

Lukens, J.R., 1981. Snake River Sturgeon Investigation (Bliss Dam upstream to Shoshone Falls). Idaho Department of Fish and Game Report.

Lukens, James R., 1982. Study VII: Snake River Fisheries Investigations, Project F-73-R-4. Boise, ID: Idaho Department of Fish and Game.

Moseley, R. and C. Groves, 1992. *Rare, Threatened and Endangered Plants and Animals of Idaho* Boise, ID: Conservation Data Center.

Murphey, Kelly A., M.J. Freeman, and Peter Bowler, 1991. *Valley of the Mighty Snake: An Overview of the Cultural and Natural History of Hagerman Valley, Southwestern Idaho*. Draft manuscript.

Musil, Dave, 1992. Wildlife Biologist, Niagara Springs Wildlife Management Area, Idaho Department of Fish and Game. Personal communication.

Popovich, Steve, 1992. Botanist, Shoshone District, Bureau of Land Management. Memorandum to Bob Cordell. Personal communication.

Partridge, Fred, 1992. Regional Fisheries Manager, Idaho Department of Fish and Game. Personal communications.

Partridge, F. and C. Corsi, 1991. Region 4 Lowland Lakes and Reservoirs Investigations: July 1, 1990-June 30, 1991. Idaho Department of Fish and Game Project No. F-71-R-15.

Reid, Will, 1992. Fisheries Program Coordinator, Idaho Department of Fish and Game. Personal communication.

Sather-Blair, S. and R. Howard, 1982. Wildlife Inventory Clear Lakes Project - Snake River, Buhl, Idaho. Walla Walla, WA: Army Corps of Engineers.

Smith, Randy, 1992. Idaho Department of Fish and Game. Personal communication.

Steenhof, Karen, 1992. Raptor biologist, Bureau of Land Management, Boise, Idaho. Personal communication.

Taylor, D.W., 1985. Candidate Threatened or Endangered Mollusks in Box Canyon ACEC, Gooding County, Idaho. Report to Bureau of Land Management, Shoshone, Idaho.

Taylor, D.W., 1988. "New Species of Physa (Gastropoda: Hygrophilia) from the western United States," *Malacological Review* 21:43-79.

Tiedemann, Rob, 1989. A Wetland Identification and Delineation for the Auger Falls Hydroelectric Project and Recommendations for Mitigating Potential Impacts. Project No. 4797-001-Idaho.

Trost, C.H., 1985. *Status and Distribution of Colonial Nesting Water Birds in Idaho*. Report submitted to Nongame Wildlife Program, Idaho Department of Fish and Game.

USACE [U.S. Army Corps of Engineers], 1983. Interim Feasibility Report: Clear Lakes Hydropower Snake River, Idaho -- Upper Snake River and Tributaries.

U.S. BLM [Bureau of Land Management], 1985. Box Canyon Area of Critical Environmental Concern (ACEC) Management Plan. Bureau of Land Management, Shoshone District Office.

USFWS [U.S. Fish and Wildlife Service], 1991. "Listing Proposals," *Endangered Species Technical Bulletin*. Vol XVI (1). p. 6.

Wallace, R.L., J.S. Griffith, P.J. Connolly, D.M. Daley and G.B. Beckhan, 1982. Distribution, Relative Abundance, Life History and Habitat Preferences of Shoshone Sculpin. Report to U.S. Fish and Wildlife Service.

II. SCENIC VALUES AND NATURAL FEATURES

Spectacular vistas and unique geologic features are practically commonplace throughout the Middle Snake reach. U.S. Highway 30 and State Highway 50 between Bliss and I-84 east of Twin Falls, with a spur on U.S. Highway 93 to I-84 north of Twin Falls, have been designated the Thousand Springs Scenic Route. Steep canyon walls, scabland features, springs issuing from the walls, the river itself, and at certain times of the year spectacular waterfalls at Twin Falls and Shoshone Falls are the principal natural attractions

The present aspect of the Snake River canyon below Milner is largely a relic of the Bonneville Flood (Malde, 1968). The Pleistocene flood widened the canyon and contoured the canyon floor throughout the Middle Snake reach. Abandoned channels, spillways, and scabland mark the flood path downstream to Twin Falls, and massive bars of boulders and sand that indicate a former stream of extraordinary size, litter the canyon further west.

Segment Descriptions

Milner Dam to Twin Falls Reservoir - Between Milner Dam and the Twin Falls Reservoir the Snake River follows a narrow basalt canyon with reactively smooth, straight walls. From Milner Dam to Dry Creek the canyon is about 600 feet wide and comparatively shallow (200 feet or less). River gradient in this segment is about 35 feet per mile, and the river environment below the rim remains in a relatively natural condition. Idaho Power Company is currently constructing a hydropower flume from the rim to the river 1.5 miles below Milner Dam. This site is a definite intrusion on the surrounding environment but is being built to minimize the amount of permanent visual impact. Star Falls, a 40 foot drop about a mile above Dry Creek, is the remaining undeveloped waterfall on the Snake River within the Middle Snake reach.

Downstream from the Murtaugh Bridge the canyon is remarkably uniform in width and depth, about 1,100 by 325 feet, with smooth vertical walls and a box-like cross section. The canyon floor descends steadily at a gradient of about 24 feet per mile. The Murtaugh segment is a deeper canyon than the Milner segment, and is largely undeveloped and in a primitive condition. The canyon is crossed by Highway 50 at Hansen Bridge, a major view point for tourists. The land above the rim has many private homes and roads paralleling the canyon.

Twin Falls to Upper Salmon Falls - Nearly 600 feet deep and 1,300 feet to a mile in width, this segment of the canyon exceeds the size of the canyon immediately above. Below Twin Falls the Snake River descends over outcrops of silicic volcanic rocks which make up the lower story of the

canyon. These outcrops form cataracts at Pillar and Shoshone Falls and represent impediments to canyon entrenchment.

Downstream of the Perrine Bridge, the Snake River canyon consists of a series of wide segments, that include relatively flat bottom lands not far above the river, connected by constricted canyon segments of variable length. In many areas the river flows in a trough below a bench. At Melon Valley, Deep Creek and Mud Creek have dissected the south rim into a rough and gullied terrain. This segment is characterized by a persistent line of springs about 150 feet below the north rim, and intermittent rapids.

Hagerman Valley to Bliss Reservoir - Hagerman Valley is a broad canyon segment about four miles wide, bounded on the west by barren cliffs of the Glenns Ferry Formation. There is a high degree of development between Hagerman and Bliss along the Snake River. Many private homes are situated on the rim or on bottomlands along the river, and there are many access roads.

Downstream from Hagerman Valley, the Snake River enters another long constriction. For the most part, this constricted segment is a two-story canyon in which the Snake River follows a narrow inner gorge, 400-800 feet wide and 200 feet deep, cut mainly into Banbury Basalt. Above the inner gorge is a bench about a mile wide from which canyon walls rise abruptly to a height 575 feet above the river.

Bliss Dam to King Hill - A unique visual and geologic feature of the Bliss Dam-King Hill section is the presence of several large sand dunes which rise up the rock cliffs from the river benches. Several roads, a railroad line, an old irrigation canal and an Interstate 84 crossing may impose on the segment, however, the level of development of visible structures along this section is low.

Geologic Features

SCABLAND

The term "scabland" was first used in 1923 to describe the eroded surface of basalt flows scoured by glacial flood-water in Washington (Malde, 1968). Scabland erosional features include coulees, dry falls (alcoves), and scoured channels distributed in such a manner as to cause a bizarre landscape. Minor features on the basalt bedrock include polished and fluted surfaces that indicate the direction of the flow. Features of this kind are found at places along the path of the Bonneville Flood through the Snake River Plain, particularly at Twin Falls.

The Milner segment is bordered by continuous scabland, indicating that the capacity of the canyon was exceeded by the Bonneville Flood. The canyon walls between Murtaugh Bridge and Hansen Bridge are nearly devoid of talus, and practically no detritus occurs along the floor. The

absence of scabland in this segment indicates the canyon below Murtaugh was capable of carrying that portion of the Bonneville flood-water that continued down the river channel.

Malde (1968) believes the most impressive erosion features produced by the Bonneville Flood are along the Snake River canyon near Twin Falls, where the Rupert channel joins the canyon at Devil's Corral (Geologic Features Map). The north rim, where floodwater entered from the Rupert channel, is embayed by several large alcoves (dry falls) at Devil's Washbowl, Devil's Corral, and Blue Lakes. Scouring of the river bed left crags of scabland that reach 200 feet above the river at Pillar and Shoshone Falls. The Blue Lakes Golf Course is constructed on a jagged mass of scabland that rises 200 feet above the canyon floor.

MELON GRAVELS

Rounded boulders of basalt form gigantic bars and large heaps of bouldery detritus along the Middle Snake reach. H.A. Powers recognized that these boulders were of catastrophic origin, and with Malde applied the name of Melon Gravel to the boulder deposits (Malde and Powers, 1962). They were inspired to use this term after observing a road sign in 1955 that called the boulders "petrified watermelons" (Maley, 1987).

Melon Gravels were deposited at places along the river canyon where the flood velocity was retarded, especially at the upper ends of local basins. The Melon Gravels deposited by the flood average three feet in diameter, but some range up to 10 feet. These boulders are composed almost entirely of basalt broken from nearby cliffs. They are strewn in deposits up to 300 feet thick, as much as one mile wide by 1.5 miles long.

The path of the Bonneville Flood downstream of Melon Valley is marked by numerous abandoned channels near the canyon walls. Most channels are bounded by bars of Melon Gravel on one side and by canyon walls on the other. The channels, which measure several miles long and 150 feet deep, were abandoned when the flood subsided.

Hagerman Valley was a major sediment trap for flood debris. The segment has a fair amount of talus and landslides younger than the Bonneville flood line. This section has some of the largest boulders found anywhere along the Snake River canyon. Boulders on a bench near the town of Bliss are about eight feet in diameter. These boulders match the lithology of rimrock along the north canyon wall and are probably pieces of talus that were rolled by the flood-water.

One mile downstream of Bancroft Springs chunks of basalt, 10-15 feet in the long dimension, plucked from the lava and tumbled a few hundred feet downstream, rest on the overtopped basalt 240 feet above the Snake River. The King Hill basin is situated where the Bonneville Flood first entered

relatively slack water. It holds more than half the Melon Gravel that was flushed down the canyon (Malde, 1968). Enormous bars of Melon Gravel fill the center of the valley around King Hill and form broad benches several hundred feet above the Snake River.

SPRINGS

A succession of springs, some of the world's largest, cascade down the talus-covered slopes of the canyon or well up in sparkling pools in reentrant alcoves along the Middle Snake reach. Springs occur singly, in clusters, and in continuous zones. The larger springs or groups of springs are named, but innumerable small springs and seeps are either unnamed or known only to local residents. Outflows from many of the springs fall almost directly into the river. Others form tributary streams, like Billingsley Creek, before entering the river. One of the largest spring groups occurs in the Malad River canyon.

Ten of the 65 largest springs (> 100 cfs) in the United States are located along the Snake River between Twin Falls and King Hill. Box Canyon is the 11th largest natural spring in the United States (Kjelstrom, 1992). The springs provide water with exceptional clarity and only a slight annual variation in temperature or volume. The water from the main group of springs is collected in flumes and used for power generation, agriculture, and aquaculture.

HAGERMAN FOSSIL BEDS NATIONAL MONUMENT

The Hagerman Fossil Beds National Monument possesses the greatest diversity and abundance of Pliocene Blancan vertebrate fossils in the world (IPC, 1990). Over 300 species of flora and fauna have been identified at the fossil beds. This is the site of the Hagerman horse excavation by the Smithsonian Institute. In November, 1988 the Hagerman Fossil Beds were added to the National Park System as a National Monument.

The area is located along the western slope of the Snake River canyon about two miles west of Hagerman, and covers 4,500 acres in Twin Falls County (Fig. 10). The fossil beds are distributed vertically through a 500-ft section of the Glenns Ferry formation; this stratigraphic distribution is of great value in tracing evolutionary trends. In November, 1988 the Hagerman Fossil Beds was added to the National Park System as a National Monument.

NATIONAL NATURAL LANDMARKS

The National Natural Landmarks (NNL) Program was established by the Secretary of the Interior in 1962, to identify and encourage the preservation of the full range of geological and botanical features that are determined to represent nationally significant examples of the Nation's natural heritage. Potential natural landmarks are identified through studies conducted by the National

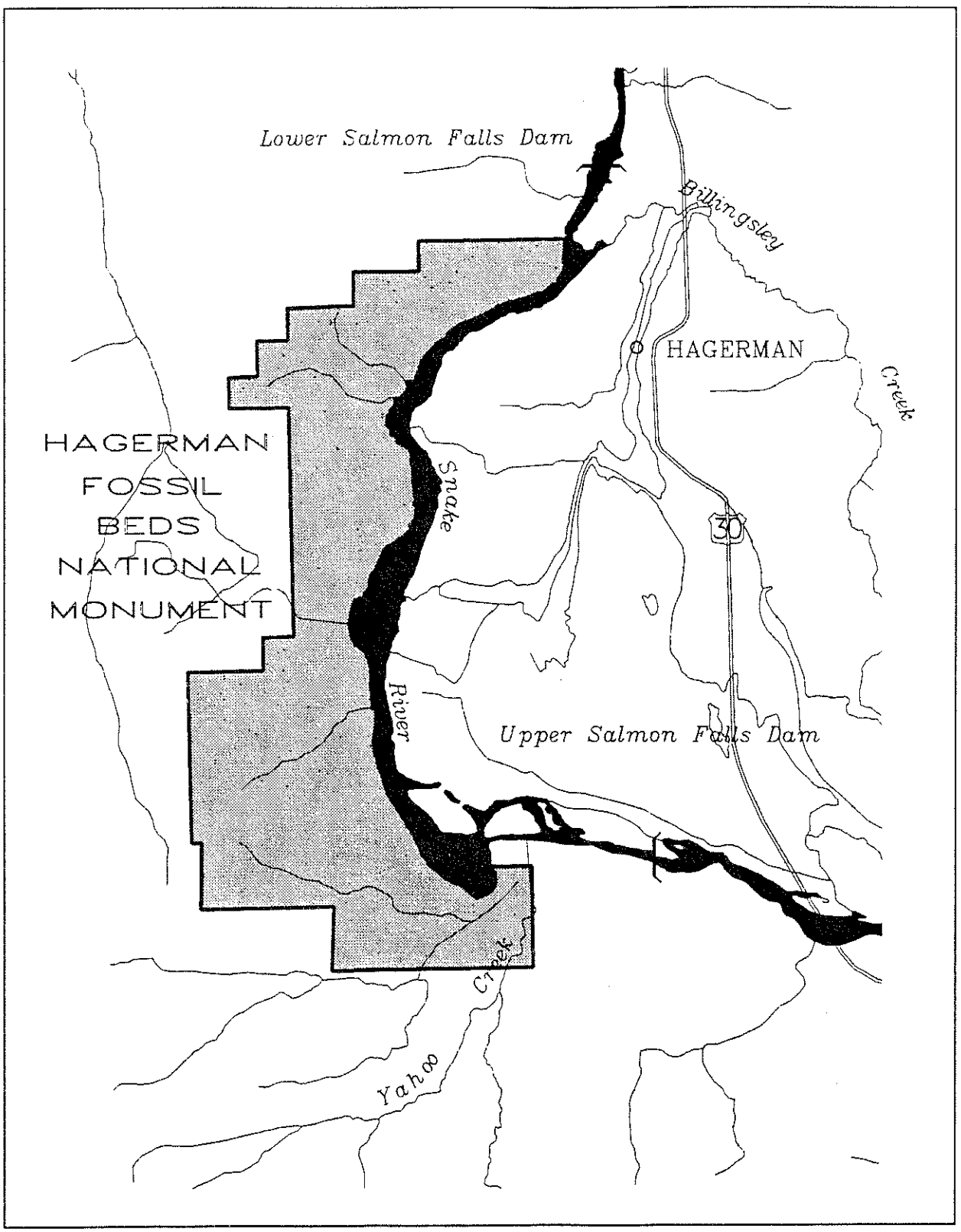

Figure 2. Hagerman Fossil Beds National Monument.

Park Service and other sources, evaluated by expert natural scientists, and, if determined nationally significant, designated as landmarks by the Secretary of the Interior.

Niagara Springs is a National Natural Landmark, designated as representative of the spring complexes; it is one of the largest spring complexes with only moderate development. The spring complex has an average flow of about 250 cfs. Several sites are under consideration as National Natural Landmarks: (1) Dry Cataracts, in the vicinity of Twin and Shoshone Falls, encompasses representative Bonneville Flood features such as blind canyons, terraces, plunge pools, and scabland, (2) Box Canyon, (3) Malad Canyon, and (4) Thousand Springs.

Scenic Evaluation

The objective of the scenic evaluation was to determine the distinctiveness or scenic quality of landscape settings. Data collection for the scenic value study involved review of visual resource inventory information available from other agencies, and photographic documentation of visual landscapes in the Middle Snake reach.

The planning area was previously inventoried for visual resource values by three Bureau of Land Management (BLM) Districts (Boise, Burley and Shoshone) as part of their resource management plans. 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), originally published in 1980 with revisions in 1984 and 1986 (U.S. BLM, 1986). Review of the visual inventory data available from the three BLM districts located in the planning area revealed differences in inventory dates, quantity of available data, and study scales. All districts had VRM class data mapped, but scenic quality classes were only available from one district. Given the varying inventory periods and differences in types of available data, it was determined that IDWR needed to conduct an independent evaluation.

Planning staff conducted a scenic distinction evaluation at a scale consistent with the planning area. The evaluation was conducted from November 1991 to September 1992. The scenic distinction evaluation involved two steps: (1) defining visual unit boundaries, and (2) evaluating the scenic distinction or scenic quality of each visual unit. Visual sensitivity levels and distance zones were not evaluated or delineated in this study. Visual unit boundaries define a landscape with similar spatial characteristics such as landform, vegetation, water form, or land use patterns (Tetlow and Sheppard, 1980). Significant or noticeable changes in any of these or other visual characteristics denote the boundary between visual units.

Visual unit boundaries were determined through extensive field reconnaissance and photographic documentation. The outermost boundary is defined by the edge of the canyon walls. Generally, visual unit boundaries mark the change from free flowing water to reservoirs, differences in canyon wall scale and enclosure, unique landforms, and/or changes in the degree or type of land use patterns. A total of 28 visual units were identified from Milner Dam to Clover Creek.

Boundaries were mapped on U.S. Geological Survey 7.5 minute quadrangles and then field checked to verify accuracy. Forms were completed in the field and through review of photographic documentation recording landform, vegetation, water character, cultural modifications and other characteristics for each unit.

Scenic distinction ratings were determined using the BLM's scenic quality model described in the agency's VRM manual. The model assesses the degree of variety a landscape possesses. All landscapes are considered to have some scenic worth, but landscapes with greater variety are rated higher (U.S. BLM, 1986). A numeric rating system is used to evaluate the degree of visual variety and harmonious composition of seven factors: landform, vegetation, water, color, adjacent scenery, scarcity and cultural modifications (U.S. BLM, 1986). Each factor was rated using a value of one to five (with the exception of cultural modifications which is rated -4 to 2) based on the amount of variety, contrast, harmony, or distinctiveness within the unit -- the higher the rating, the greater variety or more distinctive the feature.

A scenic distinction evaluation using the BLM model was completed for each of the 28 visual units identified in the Middle Snake reach. The numerical ranking system for determining scenic distinction has a maximum of 32 points. Landscapes with "Outstanding" or distinctive scenic values received scores of 32 to 19. Landscapes considered above average, but not outstanding, received scores of 18 to 12 and were rated "High" for scenic distinction. Landscapes with little visual variety received a score of 11 or less and were rated "Moderate to Low" for scenic distinction. Table 2 summarizes the results of the scenic evaluation for the Middle Snake reach. Evaluation forms describing landscape features and documenting the scoring for each visual unit are available at the Idaho Department of Water Resources.

Table 2. Scenic Distinction Evaluation for Middle Snake Reach.

SCENIC DISTINCTION CATEGORY	CRITERIA	MIDDLE SNAKE REACH
Outstanding	Landscapes with significant variety in landscape features; and/or possessing distinctive or unique, rare features (score of 32 to 19). Landscapes with vertical or steep canyon walls, strong enclosure and immense scale; variety in water forms characterized by whitewater, falls, and numerous springs; variety in vegetation pattern, texture and color with contrasts introduced by wetlands, riparian and spring-associated vegetation; cultural modifications adding visual variety and are generally harmonious to the visual unit as a whole.	***Downstream from Milner Bridge to Bickel Springs (near Gridley Island - Highway 30 Bridge)*** ***Bliss Dam to Little Pilgrim Gulch*** ***Bancroft Springs area***
High	Landscapes which provide above average variety in landscape features (score of 12 to 18). Areas where canyon is defined by dissected hills or canyon walls which are less vertical, enclosure and scale are not as distinct; whitewater is lacking or minimal; some variety in vegetation patterns and types; cultural modifications add little or no visual variety to landscape.	***Bickel Springs (near Gridley - Highway 30 Bridge) to backwaters of Bliss Reservoir*** ***Little Pilgrim Gulch to Bancroft Springs*** ***I-84 Bridge to Clover Creek***
Moderate to Low	Landscapes where characteristic features possess little variety (score of 11 or less). Areas where canyon walls are characterized by moderate to low hills; minimal variety in vegetation, usually one type.	***Milner Dam to below Milner Bridge*** ***Backwaters of Bliss Reservoir to Bliss Dam (Bliss Reservoir)*** ***I-84 Bridge vicinity***

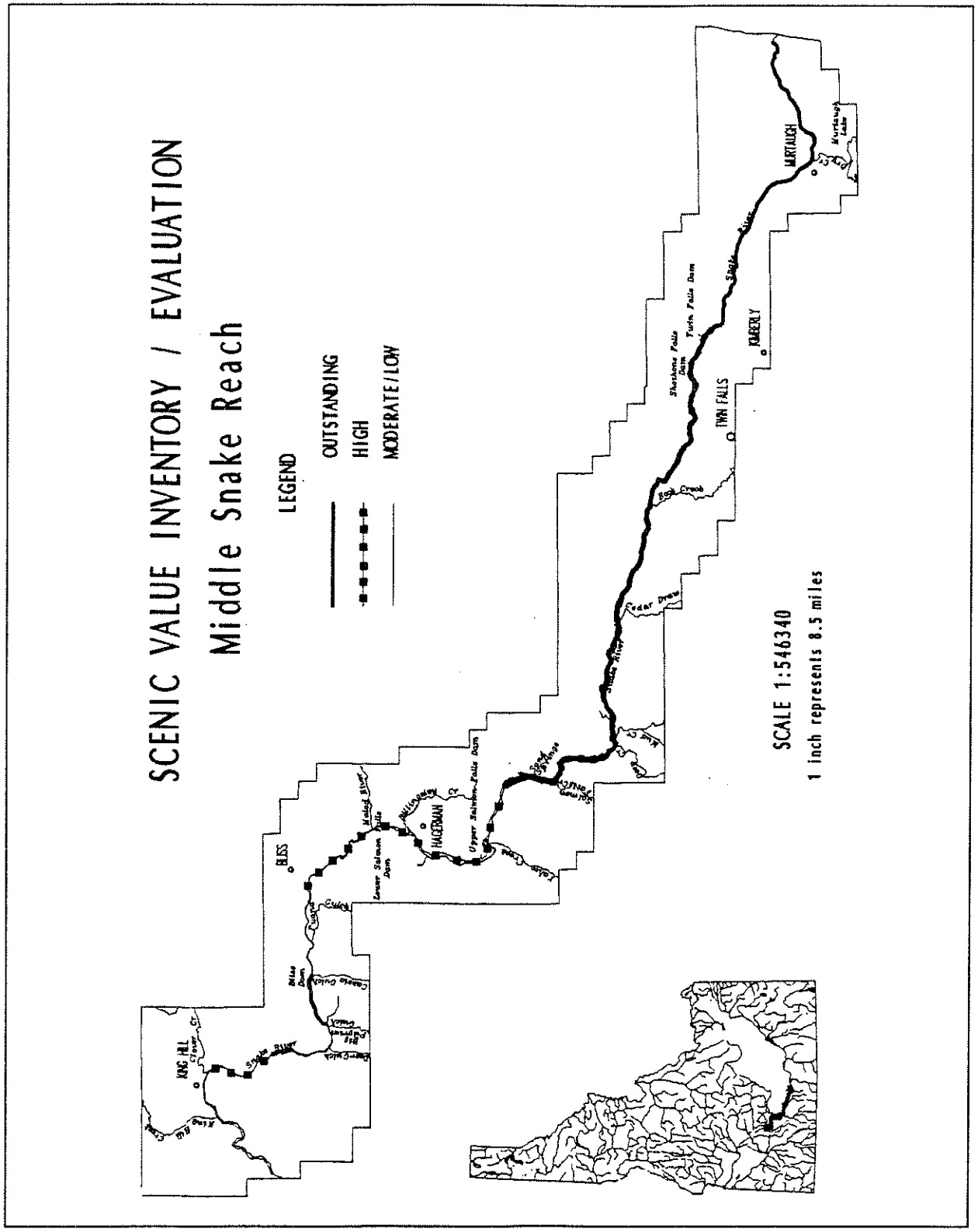

Figure 3. Scenic Evaluation Map.

Geologic Features Evaluation

The geologic features evaluation considered the uniqueness or significance of geologic features from a national or regional perspective, and the degree of protection accorded the resource through statute, regulation, or agency management policy. Geologic data came from the National Park Services National Natural Landmark studies, the Bureau of Land Management, and unpublished and published sources. An inventory of the Middle Snake reach identified landforms, water features (i.e., waterfalls, springs), cultural modifications to the site or along the segment, and distinctive features of the site or segment.

A numeric measure is used to evaluate the degree of geologic distinction of a feature under four factors: scarcity, quality, scientific value, and cultural modifications. The size and degree of disturbance related to historic land-use practices of the specific site were considered in the ranking (Fig. 3).

Scarcity refers to the distribution of the feature both within the state and nationally. Quality refers to the relative physical condition of the geological feature in comparison to other known occurrences of the same feature. A site which is among the best known examples of its kind received a higher evaluation mark than a marginal or low quality occurrence. The scientific value of a feature or a given site refers to its usefulness and importance as an educational resource. The historical, current use, potential use, and accessibility of the given feature or site was considered under the cultural modifications category.

Each factor was rated using a value of 0-5, with the exception of cultural modifications, which is rated from -2 to 2. The ranking system has a maximum of 15 points. Those segments with Outstanding or distinctive geologic features received scores of 11 to 15. Segments considered above average, but not outstanding, received scores of 6 to 10 and were rated High for geologic distinction. Segments with little distinction received a score of 5 or less and were rated Moderate to Low for geologic features (Table 3).

Management	Site designation indicates national significance; National Park, National Monument or National Natural Landmark	State designation or management indicates regional significance	No designation
Scarcity	Few occurrences nationally or within the state 5	Limited in occurrences regionally 3	Fairly common within the region 1
Quality	Site is one of best known examples of geologic feature; size of feature is distinctive 5	Distinctive, though somewhat similar to other comparable geologic features within the state 3	Site does not clearly display feature 0
Scientific Value	Recognized as a high quality study location 5	Accessibility or land ownership may limit study of feature 3	Not recognized in literature or locally as a study location 0
Cultural Modifications	Modifications add to public accessibility or education 2	Modifications have no effect on feature 0	Modifications have eroded distinctiveness or quality of feature -2

Values for each criteria are maximum and minimum only. It is possible to assign scores within the three ranges.

Figure 3. Geologic features evaluation chart.

Table 3. Geologic Features Evaluation for Middle Snake Reach

CATEGORY	CRITERIA	MIDDLE SNAKE REACH
Outstanding	Segments possessing distinctive or unique geologic features defined by scarcity, quality or scientific value (score of 11 to 15); limited in occurrences nationally or within the State; site is one of best known examples of geologic feature; size of features is distinctive; recognized as high quality study location; agency designation indicates national significance (National Monument, National Natural Landmarks)	***Twin Falls Reservoir to Blue Lakes Golf Course*** - distinctive scabland topography remnant of Bonneville Flood has well-defined dry falls and displays flood scouring of canyon floor and sides; largest water falls in the state (height and width); site under consideration as a National Natural Landmark ***Crystal Springs to Thousand Springs*** - discharge volume of Snake River Plain Aquifer from the canyon walls is unique on a national scale; 10 of 65 largest springs in the U.S. (discharge > 100 cfs) are along this segment; Box Canyon is 11th largest spring in the U.S.; Niagara Springs is National Natural Landmark. Box Canyon is under consideration as a National Natural Landmark ***Upper Salmon Falls to Malad River*** - Hagerman Fossil Beds is a National Monument; average discharge of Malad spring complex is > 1,000 cfs; Malad Canyon displays distinctive features of the Bonneville Flood; Malad Canyon is under consideration as a National Natural Landmark
High	Segments with above average geologic features (score of 6-10); limited in occurrences regionally; distinctive, though somewhat similar to other comparable geologic features within the State; accessibility or land ownership may limit study of feature	***Bliss Dam to Clover Creek*** - sand dunes; melon gravels of large diameter deposited by Bonneville Flood in significant quantity ***Milner Dam to Dry Creek*** - scabland topography along the top of the canyon remnant of Bonneville Flood; falls at Caldron Linn are the only undeveloped falls of the Middle Snake reach.
Moderate to Low	Segments with little distinction (score of 0-5); fairly common regionally; site does not clearly display feature; not recognized in literature or locally as a study location	***Dry Creek to Twin Falls Reservoir*** ***Blue Lakes to Crystal Springs*** ***Thousand Springs to Upper Salmon Falls*** ***Malad River to Bliss Dam***

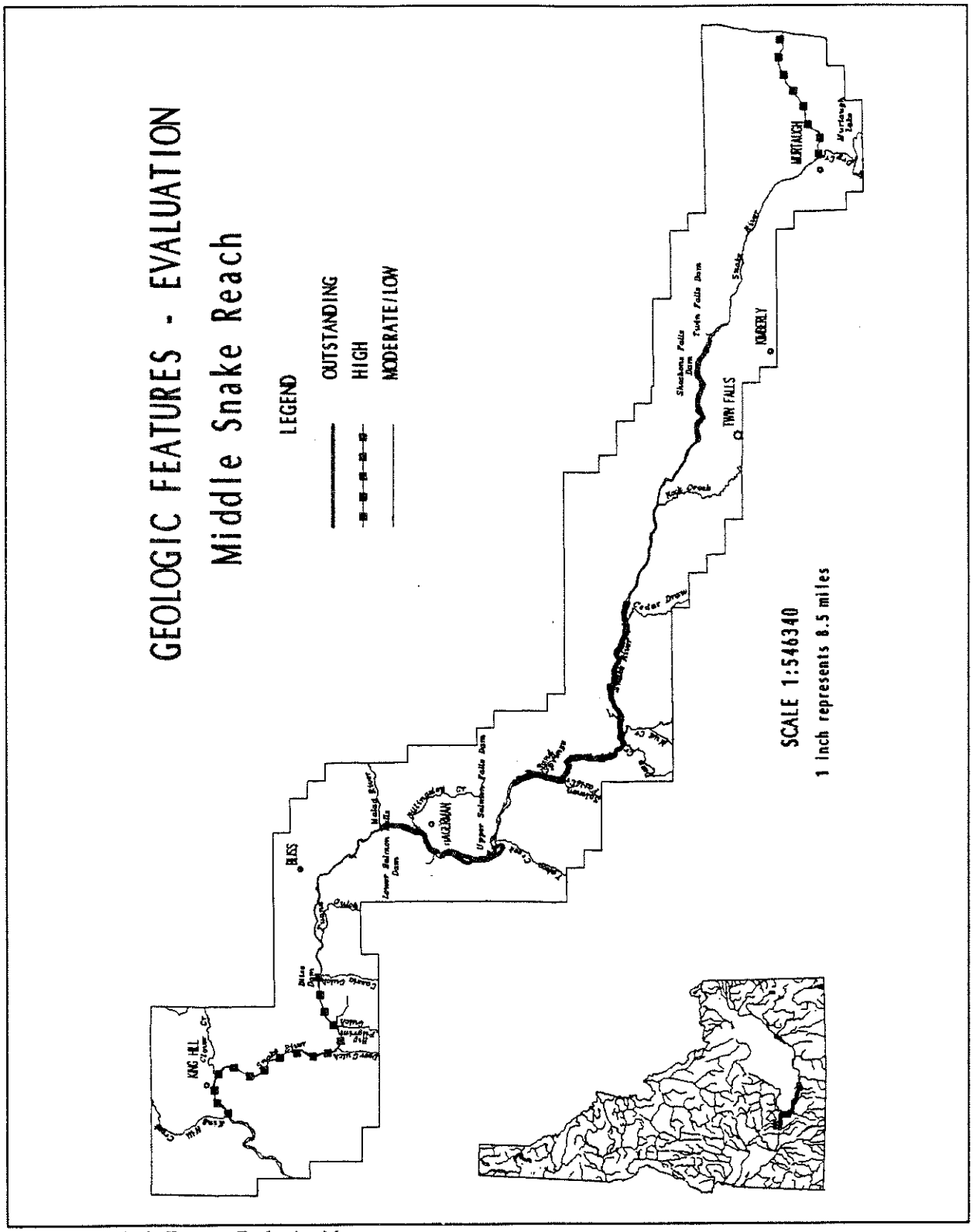

Figure 4. Geologic Features Evaluation Map.

Bibliography

Boggs, Bill, 1991. Outdoor Recreation Planner, Burley District, Bureau of Land Management. Personal communication.

Brown, Thomas C. and Terry C. Daniel, 1991. "Landscape Aesthetics of Riparian Environments: Relationship of Flow Quantity to Scenic Quality Along A Wild and Scenic River," *Water Resources Research* 27(8):1787-1799.

Brown, T.C., M.T. Richards, T.C. Daniel and D.A. King, 1990. "Scenic Beauty and Recreation Value: Assessing the Relationship" in Vining, J. [ed.] *Social Science and Natural Resource Recreation Management*. Boulder, CO: Westview Press.

Hagdorn, Bill, 1992. Outdoor Recreation Planner, Boise District, Bureau of Land Management. Personal communication.

Idaho Power Company, 1990. Formal Consultation Package, Bliss, Lower Salmon Falls, Upper Salmon Falls - Volume 1.

Jerome County, 1990. *A Comprehensive Plan for Jerome County, Idaho.*

Kjelstrom, L., 1992. *Assessment of Spring Discharge to the Snake River, Milner Dam to King Hill, Idaho.* Open-File Report 92-147.

Litton, R. Burton, 1984. "Visual Fluctuations in River Landscape Quality," in Popadic, J.S., D.I. Butterfield, D. H. Anderson and M. R. Popadic [eds.] *National River Recreation Symposium Proceedings*. Baton Rouge, LA: Louisiana State University.

Litton, R. Burton, Robert J. Tetlow, Jens Sorensen and Russel A. Beatty, 1974. *Water and Landscape - An Aesthetic Overview of the Role of Water in the Landscape.* Port Washington, N.Y: Water Information Center, Inc.

Long, Robert J., 1991. *North Fork, Middle Fork and Main Boise River Recreation Use Survey.* Survey conducted for Idaho Department of Parks and Recreation, in cooperation with Idaho Department of Water Resources, Idaho Department of Fish and Game, Boise National Forest, and the National Park Service.

Malde, H.E., 1968. The Catastrophic Late Pleistocene Bonneville Flood in the Snake River Plain, Idaho. Geological Survey Professional Paper 596.

Malde, H.E. and H.A. Powers, 1962. Upper Cenozoic stratigraphy of Western Snake River Plain, Idaho. Geological Society of America Bulletin, 73:1197-1220.

Maley, Terry, 1987. *Exploring Idaho Geology.* Boise, ID: Mineral Land Publications.

Perletti, Paula, 1992. Outdoor Recreation Planner, Shoshone District, Bureau of Land Management. Personal communication.

Reid, Will, 1989. *A Survey of 1987 Idaho Anglers Opinions and Preferences.* Idaho Department of Fish and Game. Boise, ID.

Ross, Jeff, 1991. Outdoor Recreation Planner, Boise District, Bureau of Land Management. Personal communication.

Sharp, Marty, 1991. Outdoor Recreation Planner, Shoshone District, Bureau of Land Management. Personal communication.

Taylor, Lee, 1992. Administrator and Building Official, Twin Falls County Planning and Zoning. Personal communication.

Tetlow, R.J. and S.R.J. Sheppard, 1980. "Visual Unit Analysis: A Descriptive Approach to Landscape Assessment" in *Our National Landscape: Proceedings of a Conference on Applied Techniques for Analysis and Management of the Visual Resource.* Berkeley, CA: Pacific Southwest Forest and Range Experiment Station.

Twin Falls County, 1978. *Comprehensive Plan - Twin Falls County.*

U.S. BLM [Bureau of Land Management], 1986. *Visual Resource Management Inventory and Contrast Rating Manuals - 8400 Series.*

U.S. Bureau of Land Management, Boise District, 1983-83. Visual Resource Management Inventory Maps for the Jarbidge Resource Area.

U.S. Bureau of Land Management, Burley District, 1981. Visual Resource Management Inventory Maps for the Snake River Resource Area.

U.S. Bureau of Land Management, Shoshone District, 1991. Visual Resource Management Inventory Maps for the Bennett Hills Resource Area.

U.S. Bureau of Land Management, Shoshone District, 1992. Shoshone District Involvement in the Evaluation of the Middle Snake River for Inclusion in the Wild and Scenic Rivers System.

U.S. National Park Service, 1992. Unpublished reports on National Natural Landmarks.

III. CULTURAL FEATURES

The Snake River canyon has played a major role in Idaho's history. The canyon is believed to have been intensively occupied for the last 10,000 years (Butler, 1986; Swanson, 1965; Swanson et al., 1959). Game, fish, firewood, salmon runs, gold, warmer winter temperatures, springs, and bottomlands for farming were draws to the canyon of the Middle Snake reach. Cultural features along the Middle Snake reach may be generalized as prehistoric sites downstream of Shoshone Falls, and mining sites upstream (Green, 1992).

The archeological record of the Upper Snake extends back 14,500 years by radiocarbon dating of artifacts from the Wilson Butte Cave in the Shoshone-Dietrich area. Prehistorians believe this represents the earliest period of human occupation in North America, discerned by cave deposits and Clovis points. Small, highly mobile bands hunted big game, including now extinct megafauna. Native societies shifted from specialized big game hunting to a more generalized hunting and gathering way of life as the climate became more arid (7,500 - 2,000 years before present). In search of food, early inhabitants gradually developed seasonal migratory routes to camas grounds, fishing waters, and other food gathering areas, utilizing natural routes along rivers and through mountain passes. Trails to and from the Snake River traversed the region. Small Shoshone groups from northern Utah may have extended their food-collecting activities into southern Idaho as early as the middle of the fifteenth century. However, the main surge of Shoshone occupation came in the late eighteenth century, after their displacement from the High Plains by the Blackfoot (Butler, 1986).

The Snake and other river canyons are believed to have been favored locations for winter camps. This is particularly true of the Middle Snake reach west of Shoshone Falls which historically marked the upper limit of salmon migrations. In the 1980s, fish hatchery construction along the river below Twin Falls, resulted in an extensive disturbance of deposits containing well-made Clovis points. Housepits at Clover Creek and Kanaka Rapids relinquished ceramic shards, a mano, pestile, several large, thick ovoid bifaces, and a stone ball (Butler, 1986). Prehistoric sites are particularly abundant in the vicinity of Hagerman. Eighty-six sites have been recorded along the Middle Snake reach from the Thousand Springs downstream to Bliss Reservoir. This inventory includes 22 camp sites, ten village sites, nine rock shelters and two burial sites (IPC, 1990). Mild winters, hot springs, and cold spring fisheries made the Hagerman Valley a favorite wintering area. Upper and Lower Salmon Falls and Kanaka Rapids were major fishing sites. Fishing areas focused on falls and rapids which provided easy access to fish.

Historic sites affiliated with the Snake River corridor are associated with gold mining (predominately above Shoshone Falls), the establishment of homesteads, and the development of the

water resources of the Snake River, its tributaries and springs. An abundance of fur bearing animals along the Snake and Malad rivers attracted trappers, the first white men in the region, in the early 1800's. The Wilson Price Hunt expedition of 1810-12 opened Idaho to American fur trapping, and successive European settlement. Beaver hunting expeditions were common in the 1820's, but a decade later the beaver population was devastated. The 1840's saw the migration of homesteaders enroute to Oregon and California by means of the Oregon Trail. The trail paralleled the canyon, approaching the river in more easily accessible places such as Upper Salmon Falls.

In Idaho physical remnants of historic wagon trails have been destroyed in many areas by farming, roads, and urban development. This is especially true on the irrigable lands adjacent to the Snake River. Of the over 1700 miles of emigrant trails that traversed southern Idaho, about 580 miles of trail remnants still exist. Trail remnants are found mostly on public lands, with the longest sections located on large blocks of BLM-administered land in southwestern Idaho.

By the mid-1860's, books describing natural wonders, such as the great Shoshone Falls, began to attract tourists from the east. Tourist traffic to Shoshone Falls and other "wonders" in the area, including Blue Lakes and the Thousand Springs, was heavy by the 1890's. In 1898 a movement began to create a natural preserve, and possibly a national park, for a section of the Middle Snake reach to include Twin and Shoshone Falls and Blue Lakes (Rhodes-Jones, 1979). Simultaneously others saw the potential to utilize the waters of the Snake for irrigation and power. The preserve, or national park proposal died in the courts with a ruling that favored the Twin Falls Water and Land Company's reclamation project. Permanent settlement of the region accompanied irrigation development. In the summer of 1903 the Twin Falls Southside Land and Water Company tract was opened to entry. A townsite was selected near the center of the project, and delineated land was quickly appropriated. Intensive settlement on the north side of the canyon began in 1907 when the Twin Falls North Side Land and Water Company was granted permission to construct canal systems under the provisions of the federal Carey Act.

Evaluation

Evaluation of cultural resources in the Middle Snake area focused on identifying the significance and density of known prehistoric and historic sites through consultation with the Idaho State Historic Preservation Office (SHPO). Additionally, archaeologists from the three Bureau of Land Management (BLM) Districts (Boise, Burley and Shoshone) located within the planning area were consulted. Documentation of archaeological investigations conducted within the area over the past 30 years were also reviewed.

The State Historic Preservation Office conducted the evaluation of cultural resources found along the Middle Snake reach. Site density, historical significance, and National Register of Historic Places (NRHP) status were considered in rating a river segment as Very High, High, or Moderate to Low for cultural resource values. (The National Register is an official list maintained by the National Park Service of archaeological, historic, and architectural properties of national, state and local significance worthy of preservation. Compilation of this list was established by the Historic Preservation Act of 1966.)

River segments with "Very High" cultural values have sites or properties with significant historic value, and/or an exceptionally high density of prehistoric and historic sites and properties listed or eligible for listing on the NRHP. A "High" rating indicates a high site density of prehistoric and historic sites listed or eligible for listing on the NRHP. "Moderate to Low" ratings indicate reach segments with low site densities. Segments classified as "Unknown" have not been inventoried (King, 1992).

The SHPO considers the entire Snake River canyon a significant cultural resource (Green, 1991). "Unknown" segments are predicted to possess very high or high values if surveys are conducted (King, 1992). Only one surveyed section was evaluated as moderate to low for cultural resource values (Fig. 5). Table 4 lists the classification criteria and provides an evaluation summary for the Middle Snake reach. Figure 5 illustrates these evaluation classifications for the reach. A narrative describing values for each river segment follows.

RIVER SEGMENTS WITH VERY HIGH CULTURAL RESOURCE VALUES

Milner Dam to Murtaugh Bridge - Caldron Linn, synonymous with this stretch of the Snake River canyon, is considered one of the most significant historical locales in the state (Green, 1992; FERC, 1990; Thorson, 1993). The National Register of Historic Places (NRHP) associates Caldron Linn with an accident befalling the Hunt party in 1811 during an expedition to find "easy" boat access to the Columbia River. The events affiliated with the Hunt expedition have led the National Park Service to recommend investigation of this reach as a National Register District (Corbyn, 1992). The Idaho State Historic Preservation Office supports this proposal (Neitzel, 1992). The Hunt expedition was significant for three key reasons: 1) the expedition verified that the Snake River was not navigable to the Pacific Ocean; 2) the overland route used by the expedition later became the Oregon Trail; and 3) the trip secured claim to the Northwest Territory for the United States (Corbyn, 1992). Several sites associated with this expedition are found within the segment.

Table 4. Cultural Resource Evaluation for Middle Snake Reach

EVALUATION CLASS	CRITERIA	MIDDLE SNAKE REACH
Outstanding/Very High	Reaches with sites possessing significant historic values; and/or exceptionally high site densities eligible or listed on the National Register of Historic Places	***Milner Dam to Murtaugh Bridge*** - Caldron Linn and other sites associated with the John Wilson Hunt expedition; potentially eligible for National Historic District designation; prehistoric sites and historic mining sites ***Twin Falls Reservoir to Shoshone Falls*** - prehistoric rock shelters, caves and other sites; historic mining sites ***River Mile 602 (3 miles east of Cedar Draw) to backwaters of Bliss Reservoir*** - major prehistoric villages, caves, rock shelters, camp sites and other sites, Kanaka, Lower and Upper Salmon falls site of fishing activity and villages; Hagerman Fossil Beds National Monument; historic sites associated with the Oregon Trail and the settlement of the Buhl area ***Bliss Dam to Bancroft Springs*** - significant prehistoric site density including Shoshonean fishing areas and villages; significant Oregon Trail site at Big Pilgrim's Gulch
High	High site densities eligible or listed on the National Register of Historic Places	***Murtaugh Bridge to Twin Falls Reservoir*** - historic placer mining sites including town sites and Chinese mining sites; some prehistoric sites ***Perrine Bridge to Blue Lakes (River Mile 610.5)*** - prehistoric rock shelters and lithic scatter ***Bancroft Springs to King Hill*** - prehistoric sites including a pithouse
Moderate to Low	Low site densities of eligible or listed National Register of Historic Places Properties	***Auger Falls Area*** - low site density and determined not to provide significant prehistory information
Unknown	River reaches with unknown site densities	***Shoshone Falls to Perrine Bridge*** ***Blue Lakes (River Mile 610.5) to Auger Falls*** ***Rock Creek to River Mile 602 (3 miles east of Cedar Draw)*** ***Bliss Reservoir***

Sources: SHPO, 1992; Henrikson, 1992.

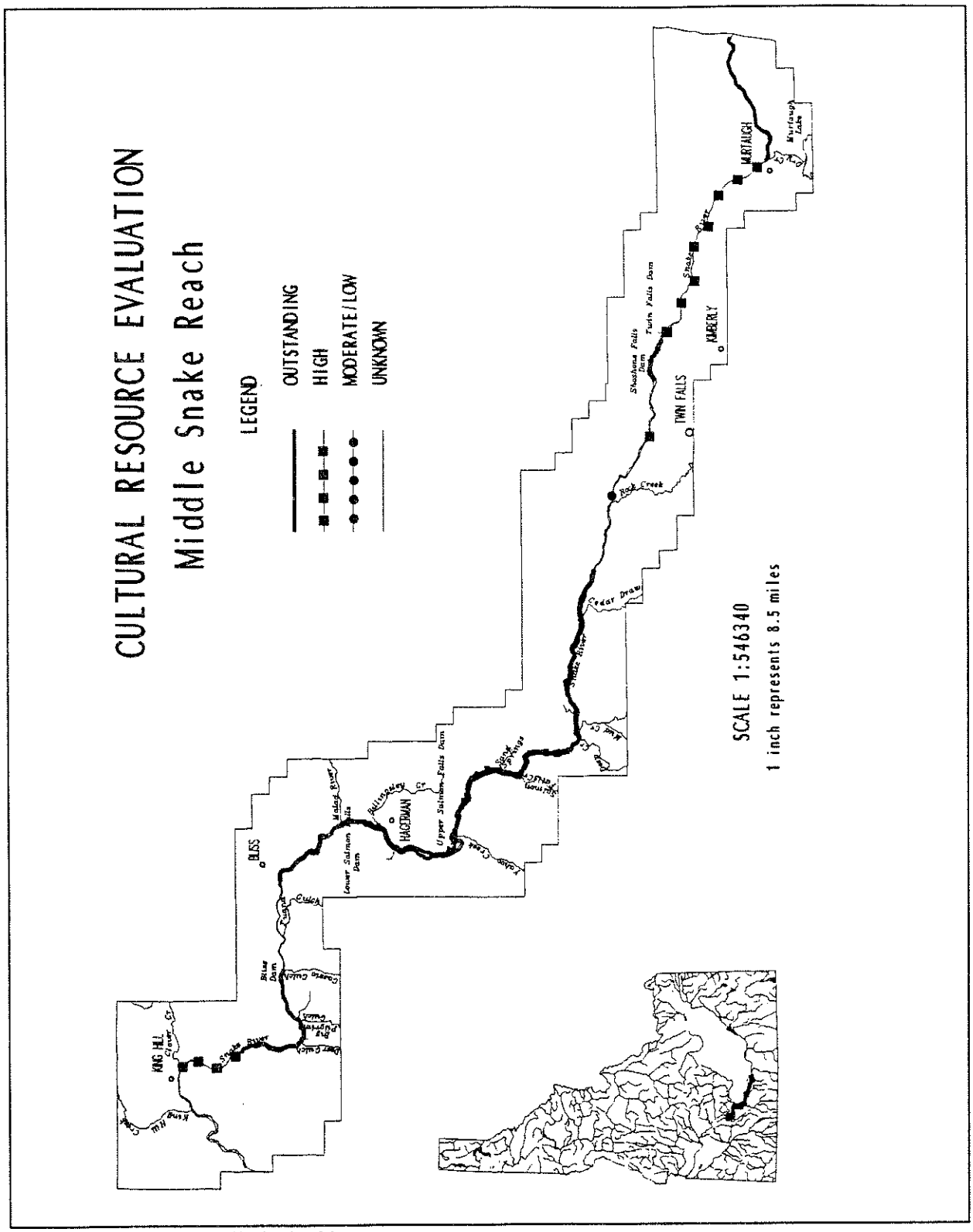

Figure 5. Cultural Features Evaluation Map.

Other historic resources located in this stretch are related to early mining operations. Additionally, Milner Dam and Twin Falls Main Canal are listed in the NRHP (IPC, 1991). The historic townsite of Milner was located in this reach, although little physical evidence remains today. Several Chinese mining structures are also located in the section (Henrikson, 1992).

Prehistoric sites include a stone hunting blind and lithic scatter (Twin Falls Canal Company and North Side Canal Company, 1984). The Star Falls area also is characterized by several prehistoric sites eligible for listing on the NRHP. These include a rock shelter which may have functioned as a base camp for hunting and gathering activities as well as possibly being a winter occupation site. The site could provide significant prehistoric information dating from 7000 to 150 years ago. Another occupation site possesses a lithic workshop, and animal and plant processing areas. Three other rock shelters are in the vicinity, one eligible for NRHP listing, one undetermined, and one ineligible (FERC, 1990).

Murtaugh Bridge to Twin Falls Reservoir - Several sites associated with historic placer mining in the Snake River canyon are located along this segment, many of them related to Chinese mining activity. Specific sites include the townsites of Drytown and Springtown, placer mine tailings, and a rock shelter. Drytown was the first placer mining community inhabited along the Snake River in the study reach (FERC, 1990). These sites are eligible for NRHP listing.

Other important sites include the Twin Falls Dam, powerhouse and associated facilities eligible for listing on the NRHP (FERC, 1990).

Twin Falls Reservoir to Shoshone Falls - Prehistoric sites are located in the vicinity of the Shoshone Falls Reservoir and include a number of rock shelters and a burial site (IPC, 1991). One of the sites is the Pence-Duerig cave which contained artifacts originally interpreted as Shoshonean (Gruhn, 1961). Butler (1979), argues that the cave artifacts have strong associations with the earlier Fremont cultural tradition centered in Utah.

Historic sites are primarily associated with mining, and include the mining town of Shoshone located near the present Twin Falls Dam, a number of rock walls, mining camps and cabins, and Chinese mining sites (IPC, 1991). Among the sites is the Mon-Tung Chinese site providing historic artifacts from the 1870s and 1880s. The Shoshone Falls Hydroelectric Project at Shoshone Falls may be eligible for listing on the NRHP. A former caretaker's house at the hydro project site is listed on the NRHP representing an unusual form of lava architecture (IPC, 1991).

Although located five miles from the Oregon Trail, some emigrants made the trip to see Shoshone Falls whose roar could be heard for miles. The Northside Alternate Trail is only a few hundred feet

from the falls. A trail there gave access to water for travelers on this route. Shoshone Falls became a popular tourist attraction in the late 1800's. Tours out of the town of Shoshone transported people to the falls where a hotel was located. In 1898 the Snake River canyon from Shoshone Falls to Blue Lakes was proposed as a national preserve (Rhodes-Jones, 1979).

Perrine Bridge to Blue Lakes Country Club (River Mile 610.5) - Surveys conducted on private lands in the area have discovered approximately ten prehistoric sites. These consist of small lithic scatters and rock shelters. The eligibility for NRHP listing has not been determined (Henrikson, 1992).

Auger Falls Area - The section of the river containing Auger Falls was surveyed in conjunction with the proposed Auger Falls Hydro Power Project. A ranking of moderate to low was given because of the minor significance of cultural sites in the area. The four sites identified were determined to have little potential to contribute significant information about local prehistory (FERC, 1990).

River Mile 602 (Gooding-Jerome County Line) to Backwaters of Bliss Reservoir - Numerous prehistoric sites have been identified in this stretch of the river including camp sites, villages, rock shelters and burial sites (IPC, 1990; Carley and Sappington, 1982). Major villages were occupied at least 5000 years ago.

Thirteen historic sites are documented between River Mile 602 (Gooding-Jerome County line) and the Clear Lakes Bridge. These sites consist of six homesteads, a stage stop, four roads or bridges, and two mining locations. Many of these sites are associated with the early settlement of the Buhl area in the late nineteenth and early twentieth centuries (Carley and Sappington, 1982). Clark's Ferry began operation near Niagara Springs in 1869. The ferry served wagon and stage travel on the Kelton Road and Oregon Trail (Jones, 1992).

Twelve prehistoric sites were recorded in a survey from Clear Lakes Bridge to Cedar Draw (Carley and Sappington, 1982). Many of these sites were associated with rapids. These sites consisted of lithic scatters, pottery shards, tool fragments and flakes, an overhang shelter, and possible occupation sites. The area has received considerable disturbance from agricultural, road and home building activities. Many of these sites suggest possible prehistoric occupation and additional information may be retrievable with further investigation (Carley and Sappington, 1982).

Kanaka Rapids is a significant prehistoric site. Winter villages were located at the falls and it was the fishing falls mentioned by many who travelled the Oregon Trail (Myers Engineering, 1992). A house pit was excavated at the foot of the rapids (Butler, 1986).

The Snake River reach in the Hagerman Valley possesses abundant prehistoric material (IPC, 1990). Upper and Lower Salmon Falls were major Indian camps. Upper Salmon Falls served as an Indian village with as many as 100 lodges. Use was seasonally related to the presence of salmon (IPC, 1990). Surveys currently being conducted below Upper Salmon Falls Dam indicate a high density of prehistoric sites (Green, 1992).

In the proposed Wiley project reach, six prehistoric sites are documented. The sites include a campsite, lithic scatters, and a rock arrangement dating from the Archaic cultural tradition (4000 B.C. to 1700 A.D.) (FERC, 1982). Two of the identified sites are eligible for NRHP listing.

Historic sites documented from Thousand Springs to downstream of Bliss Dam include homesteads, mining sites, canal/siphons, power plants, bridges, and the Oregon Trail (IPC, 1990). Significant sites associated with the Oregon Trail along this section include:

- Kanaka Rapids marks where the trail returns to the Snake River canyon. Emigrants traded with Indians at this point which was an important salmon fishery.

- Thousand Springs was a landmark mentioned in the diaries of many travelers on the Oregon Trail. The springs, which were clearly visible from the Oregon Trail, gush from beneath the rimrock on the north side of the Snake River. Today, nearly 100 cascades are clearly visible. Here, in 1869 or 1879, the North Alternate Oregon Trail and the early route of the Kelton Road crossed to the north side of the Snake River on M. E. Payne's Ferry. In August 1865, Lt. J.W. Cullen established an Army Camp near the mouth of Salmon Falls Creek to protect the emigrants. A stage station was later established near Cullen's camp.

- Upper Salmon Falls was a favorite Indian fishing spot and trading place for the Indians and emigrants. It was also a popular camping and rest area for the travelers (Planmakers, 1991).

Other significant historic resources include the Teater Studio and Frank Lloyd Wright house, both listed in the NRHP. The Upper and Lower Salmon Falls, Malad, and Bliss hydroelectric projects may be eligible for NRHP listing (IPC, 1990).

In the Wiley project reach, thirteen historic sites are documented, three of them possibly eligible for NRHP listing. Historic sites include homesteads, trash dumps, rock shelters, irrigation facilities, and placer tailings (FERC, 1982).

Bliss Dam to Bancroft Springs - Very high densities of prehistoric sites have been identified in this section. Unpublished State Historic Preservation Office (SHPO) records document 90 sites. These sites include late prehistoric Shoshonean fishing activity areas and villages.

A significant site associated with the Oregon Trail is located at Pilgrim's Gulch. Pilgrim's Gulch constituted a major campground and point of access to the Snake River to obtain water. Nearby, Pilgrim Stage Station served freight and stage traffic along the Kelton Road (Planmakers, 1991). The area has changed little over the years, and the remains of the stage station can still be found.

Bliss Hydroelectric Project may be eligible for listing on the NRHP.

Bancroft Springs to King Hill - Numerous prehistoric sites have been found in this area, although site density is lower than other river stretches. A total of seven sites are recorded in unpublished SHPO's records. Among prehistoric resources are a stratified pithouse with deposits dating from A.D. 500 to 1350 and a circular semi-subterranean house (Butler, 1986).

RIVER SEGMENTS WITH HIGH CULTURAL RESOURCE VALUES

Murtaugh Bridge to Twin Falls Reservoir - Lower density and smaller sites resulted in a high versus a very high ranking (Green, 1992). Several sites associated with historic placer mining in the Snake River canyon are located along this segment, many of them related to Chinese mining activity. Specific sites include the townsites of Drytown and Springtown, placer mine tailings, and a rock shelter. Drytown was the first placer mining community inhabited along the Snake River in the study reach (FERC, 1990). These sites are eligible for NRHP listing.

Other important sites include the Twin Falls dam, powerhouse and associated facilities operating since 1935 and eligible for listing on the NRHP (FERC, 1990). Prehistoric rock shelters may also be located in the area (Henrikson, 1992).

Perrine Bridge to Blue Lakes Country Club (River Mile 610.5) - Surveys conducted on private lands in the area have discovered approximately ten prehistoric sites. These consist of small lithic scatters and rock shelters. The eligibility for NRHP listing has not been determined (Henrikson, 1992).

Bancroft Springs to King Hill - Numerous prehistoric sites have been found in this area, although site density is lower than other river stretches. A total of seven sites are recorded in unpublished SHPO's records. Among prehistoric resources are a stratified pithouse with deposits dating from A.D. 500 to 1350 and a circular semi-subterranean house (Butler, 1986).

RIVER SEGMENTS WITH MODERATE TO LOW CULTURAL RESOURCE VALUES

Auger Falls Area - The section of the river containing Auger Falls was surveyed in conjunction with the proposed Auger Falls Hydro Power Project. A ranking of moderate to low was given because of the minor significance of cultural sites in the area. The four sites identified were determined to have little potential to contribute significant information about local prehistory (FERC, 1990).

RIVER SEGMENTS WITH UNKNOWN VALUES

Archaeological investigations have not occurred for several river segments in the Middle Snake Reach, and therefore, were categorized as unknown for cultural resource sensitivity. These areas tend to occur at impounded sections or private lands. Although rated as unknown, the SHPO predicts the area upstream of Bliss Dam would receive a high and the remaining areas would be rated as very high if cultural surveys were conducted (King, 1992).

References

Butler, B.R., 1979. "A Fremont Culture Frontier in the Upper Snake and Salmon River Country?" *Tebiwa*, (Miscellaneous Papers of the Idaho State University Museum of Natural History) 18:1-10.

Butler, B.R., 1986. "Prehistory of the Snake and Salmon River Area" in Sturtevant, W.C. and Warren L. D'Azevedo [eds.] *Handbook of North American Indians*. Washington, D.C.: Smithsonian Institution.

Carley, C.D. and Robert L. Sappington, 1982. "Archaeological Survey of the Clear Lakes Project on the Snake River, South Central, Idaho, 1981," in *Interim Feasibility Report Clear Lakes Hydropower Snake River, Idaho, Upper Snake River and Tributaries*. Walla Walla, WA: U.S. Army Corp of Engineers.

Corbyn, Robert, 1992. Archaeologist, National Park Service. Personal communication.

FERC [Federal Energy Regulatory Commission], 1982. *A.J. Wiley Hydroelectric Project Final Environmental Impact Statement*. FERC/EIS-0031.

FERC [Federal Energy Regulatory Commission], 1990. *Final Environmental Impact Statement - Milner, Twin Falls, Auger Falls and Star Falls Hydroelectric Projects*. FERC/EIS-0048F.

Green, Tom, 1992. State Archaeologist, Idaho State Historical Society. Personal communications.

Gruhn, Ruth, 1961. "A Collection of Artifacts from Pence-Duerig Cave in South-Central Idaho," *Tebiwa* 4(1):1-24.

Henrikson, Suzann, 1992. Archaeologist, Shoshone District Bureau of Land Management. Personal communication.

IPC [Idaho Power Company], 1990. Formal Consultation Package, Bliss, Lower Salmon Falls, Upper Salmon Falls - Volume 1.

IPC [Idaho Power Company], 1991. Informal Consultation Package, Shoshone Falls - FERC No. 2778.

Jones, Larry, 1992. State Historical Library. Personal Communication, September 24, 1992.

King, Glenda, 1992. Curator of Archaeology, Idaho State Historical Society. Personal communications.

Laudeman, Pete, 1992. Archaeologist, Burley District BLM. Personal communication.

Myers Engineering Company, P.A., 1992. Application for License for Boulder Rapids, Empire, and Kanaka Rapids Hydroelectric Projects. Boise, ID.

Murphey, Kelly A., M.J. Freeman and Peter Bowler, 1991. "Valley of the Mighty Snake: An Overview of the Cultural and Natural History of Hagerman Valley, Southwestern Idaho." Draft Manuscript.

Neitzel, Suzy, 1992. Idaho State Historic Preservation Office. Personal communication.

Planmakers, 1991. *A Study and Action Plan for Idaho's Commemoration of the Oregon Trail Sesquicentennial: 1993 and Beyond.*

Rhodes-Jones, Carolyn, 1979. "An Evolving View of the Landscape: Trappers, Tourists, and the Great Shoshone Falls," *Idaho Yesterdays* 23(2):19-27.

Swanson, Earl H., 1965. "Archeological Explorations in Southwestern Idaho," *American Antiquity* 31(1):24-37.

Swanson, E.H., D.R. Tuchy and A.L. Bryan, 1959. "Archaeological Explorations in Central and South Idaho--1958; I--Types and Distributions of Site Features and Tools," *Occasional Papers of the Idaho State College Museum,* No. 2, Pocatello.

Thorson, Steven L., 1993. "Caldron Linn - National Register of Historical Places -- Site Relocation Place." Unpublished report.

Twin Falls Canal Company and North Side Canal Company, 1984. Application for License for the Milner Hydroelectric Project - Exhibit E.

U.S. BLM [Bureau of Land Management], Boise District, Jarbidge Resource Area, 1987. *Hagerman Fauna Sites National Natural Landmark, Natural History Resource Management Plan.*

IV. RECREATION

The recreation evaluation for the Middle Snake plan identified the recreational opportunities within the planning area; agency recreational management direction and designations; and the use, and future growth or capacity of recreational activities. The study was conducted from November 1991 to September 1992. Data were acquired from literature review, contacts with various agencies, businesses and private organizations, and review of resource management plans, including the National Park Service (NPS); Boise, Burley, and Shoshone districts of the Bureau of Land Management (BLM); Idaho Department of Parks & Recreation (IDPR); Idaho Department of Fish and Game (IDFG); and Twin Falls County. FERC applications for current and past proposals over the last fifteen years were examined for relevant recreational information.

Summary

Several federal, state and local entities provide recreation services and facilities in the planning area. Recreation use in the planning corridor by agency and regional participation patterns for various recreation activities are summarized in Table 5. Regionally, the most popular recreational pursuits are sightseeing, nature study, camping, picnicking, fishing, and organized sports. Recreation patterns within the planning area reflect some, but not all, of these regional trends. For example, picnicking, nature study, and fishing are also common activities along the Middle Snake, but boating and off-road vehicle (ORV) recreation are popular as well.

Table 5 does not provide complete quantification of recreation use in the planning area, because dispersed use and use of private facilities has not been enumerated or estimated. However, a general description of recreational activities and a comparison of use estimates is presented. The Snake River canyon in the planning area provides a diversity of recreation backdrops ranging from natural, undeveloped settings to areas with facilities. Recreational opportunities vary along the reach.

Milner Dam to Backwaters of Twin Falls Reservoir - Milner and Murtaugh canyons provide an undeveloped recreation setting. This segment is free-flowing, but subject to extreme flow modifications due to the manipulation of releases at Milner Dam for irrigation and flood control. The canyon walls are steep making vehicular access difficult. The setting is relatively natural with rural development on the rim. The Main Milner Powerhouse is currently being constructed near the beginning of Milner Canyon; although a major alteration, the project is designed to minimize visual intrusion. Some powerline crossings, two bridge crossings, and trash dumped over the rim in places are the only other major alterations in this section. The canyon possesses outstanding scenery with numerous springs, rapids, waterfalls, basalt outcroppings, and lush vegetation concentrated at springs

Table 5. Estimated Recreation Activity Participation for Region 4 and the Middle Snake Reach.

	1987 REGION 4 PARTICIPATION[1]		BLM	NPS	IDFG	IDPR	Idaho Power Co.
Activity	Resident Travelers	Non-resident Travelers	1991 RVs[2] (% of total)	1991 RVs	1991 RVs[3] (% of total)	1991 RVs[4] (% of total)	1990 RVs
Fishing			6520 (16.9%)		15,750 (39.3%)	12,274 (8.9%)	
Reservoirs	10.6%	2.9%					
Rivers	12.8%	12.2%					
Boating			8945 (23.2%)			818 (0.59%)	
Motor	3.1%	0.4%					
Non-motorized	2.0%	1.4%					
Tour	0.9%	0.2%					
Other Water-based			222 (0.05%)				
Swimming					1800 (4.5%)		
Lakes	1.2%	0.5%					
Rivers	3.0%	0.6%					
Pools	9.4%	1.8%					
Beach	6.4%	1.3%					
Camping	15.6%	12.7%	328 (0.09%)			4,910 (3.5%)	
Hunting			2986 (7.8%)		2880 (7.2%)		
Big Game	2.1%	0.3%					
Upland game	0	0.9%					
Waterfowl	0.7%	3.3%					
ORV Travel	3.8%	1.7%	11,264 (29.2%)				
Other Motorized	44.6%	27.5%	2240 (5.8%)				
Non-motorized			1409 (3.7%)				
Hiking	24.1%	14.5%			720 (1.8%)	1,132 (2.0%)	
Biking	0	3.7%					
Horseback	0.7%	5.8%			528 (1.3%)		
Other Land-based			3216 (8.4%)		2135 (5.3%)		
Picnicking	13.7%	23.7%			1000 (2.5%)	58,292 (42.0%)	
Nature study	36.7%	49.3%			1400 (3.5%)	2,768 (2.0%)	
Sightseeing	55.5%	56.5%			13,880 (34.6%)	54,748 (39.5%)	
Historic sites	2.8%	12.2%				567 (0.4%)	
Tours	8.1%	1.5%				2,204 (1.6%)	
Sports	19.8%	22.1%					
Winter Sports	11.4%	13.9%	1327 (3.5%)				
TOTAL			**38,457**	**approx. 700**	**40,093**	**138,531**	**71,029[5]**

[1] Region 4 includes Blaine, Camas, Cassia, Gooding, Jerome, Lincoln, Minidoka, and Twin Falls counties.
[2] RV - Recreation visit equals one person for one visit regardless of length of visit.
[3] Average estimated yearly use 1986-1991.
[4] Includes recreation use at Pugmire Memorial, Crystal Springs, and Malad Gorge State Park.
[5] Does not include recreational visitation at Niagara Springs Hatchery which is included in the recreation figures for IDPR Niagara Springs Complex.

Sources: US BLM, 1992; Boggs, 1992; Ross, 1992; Sharp, 1992; IDPR, 1989; Lynott, 1992; Wood, 1992; IPC, 1991d, Wilhite, 1992; Perletti, 1992; Musil, 1992.

and falls throughout its length. The Star Falls/Caldron Linn area affords a view of one of the few remaining undeveloped waterfalls on the Snake River and access is relatively easy. This area also possesses significant historical values through association with the tragedy befalling the Hunt party during their journey to Astoria.

This segment may be best known for unique whitewater boating opportunities. River flow above 10,000 cfs creates 1.6 miles of Class V whitewater from Milner Bridge to the Main Milner Powerhouse, and Class IV whitewater through the Murtaugh section, Star Falls to the backwaters of Twin Falls Reservoir (based on the international scale of difficulty with Class I being the easiest and Class VI being extremely difficult). The Murtaugh section is considered a premiere day trip providing river experiences likened to the Grand Canyon. In contrast, the section from the Main Milner Powerhouse to Star Falls is amenable to beginning boaters' skills (Class II rapids). Boating is typically confined to spring and the fall when releases occur at Milner Dam. Hunting, hiking, fishing, picnicking, camping, and sightseeing in a natural setting are other recreational pursuits in the reach.

Twin Falls Reservoir to Rock Creek - The Twin Falls to Rock Creek section provides more developed recreation areas and receives high use. Within this reach are two reservoirs and a free-flowing section downstream of Shoshone Falls. Access to this segment is generally site-specific since landownership and terrain constraints limit continuous access. Twin Falls and Shoshone Falls reservoirs are intensely used for flat water recreation. Popular activities include motorized boating, water skiing, and swimming. Day use parks located at the hydro project sites provide picnicking, boat ramps, and sightseeing opportunities. Views of Twin and Shoshone falls are possible from these parks, which at high river flows still provide an outstanding display of water, rock, and space.

Dierkes Lake Park, adjacent to Shoshone Falls Park, provides picnicking, a swimming beach, boating, and fishing. Hiking opportunities among small "hidden" lakes and unusual geologic formations created 30,000 years ago by the Bonneville Flood are possible. The city has plans to further develop the park by improving hiking trails; developing an interpretive program for the geology, hydrology, and ecology of the area; creating an arboretum of native and non-native trees and shrubs; and renovating a series of rock-lined walkways among cascading brooks.

Devil's Corral and Vineyard Creek, two tributaries in side canyons on the north of the river, supply a natural setting for recreation endeavors. These tributaries support green oases in contrast to the surrounding sagebrush/grassland communities. The areas are attractive for swimming, fishing, picnicking, camping, hiking, and hunting. These lands are part of the Snake River Rim Special Recreation Management Area (SRMA), a BLM management designation emphasizing recreation use. The Snake River Rim SRMA encompasses all public lands adjacent to the Snake River on the north

side of the river, continuing to King Hill Creek. The portion of the SRMA downstream of Shoshone Falls and north of Twin Falls receives significant dispersed use including ORV use, mountain biking, hiking, jogging, equestrian, shooting, photography, bird watching, and driving for pleasure (U.S. BLM, 1989).

Downstream from the reservoirs, Pillar Falls, marked by distinctive basalt outcrops in the river channel, is a popular swimming and picnicking site. Access is possible by foot along a road down to the falls. Motorized and non-motorized boating is popular below Pillar Falls. There is a put-in at Centennial Park located below Perrine Bridge. Fishing is also prevalent below the falls. Non-motorized boating occurs upstream of Pillar Falls.

Downstream of the Perrine Bridge the canyon broadens permitting development in the canyon. The segment is a more urban setting with two golf courses, aquaculture facilities, homes, a sewage treatment plant, Centennial Park, the proposed Auger Falls hydro project, and a proposed trail system. Use in this section includes fishing, motorized and non-motorized boating, and some hunting. Public land on the north and south accommodates dispersed recreation and provides additional access points.

Rock Creek to Crystal Springs - The stretch from Rock Creek to Crystal Springs is isolated and difficult to access. Construction does not disturb the setting except for a pumping station on the south side, and a few dirt roads on the north side of the river. No developed recreation facilities are provided in this segment and recreation use is minor. Access is possible on the north from an IDFG sportsman's access area. Recreation use consists predominately of hunting and fishing.

Crystal Springs to Thousand Springs - This segment offers the greatest diversity in recreational opportunities and settings along the Middle Snake reach. Developed facilities and natural settings are interspersed. Numerous natural features attract sightseers and provide nature study opportunities. The most pronounced feature in the area is the springs cascading from the canyon walls. Some of the more significant springs are: Crystal Springs located adjacent to a state park; Niagara Springs, a National Natural Landmark; Blueheart Springs, the destination of boat tours and scuba divers; and Minnie Miller Spring, one of the last unaltered springs in the Thousand Springs complex. Additionally, several major rapids -- Boulder, Empire, and Kanaka rapids -- provide visual interest.

Wildlife observation opportunities are abundant due to the occurrence of important waterfowl wintering areas, heron rookeries, and nesting raptors. The Box Canyon Area of Critical Environmental Concern (ACEC), managed by the BLM, contains a relatively undisturbed alcove ecosystem which provides scenic and nature study opportunities. The Nature Conservancy's

Thousand Springs Preserve provides wildlife habitat in springs, riparian bottomlands, marshes and sloughs. Wildlife observation and nature study are possible year round.

Numerous points of access are available along the segment. Between Cedar Draw and Banbury Springs there are two state parks (Crystal Lake and Pugmire Memorial Park), Niagara Springs Wildlife Management Area (WMA), Bordewick and Cedar Draw sportsman's access areas, and Catfish Outlet. Fishing, picnicking, camping and hunting occur at these recreation areas. Idaho Power Company has a day use park at Clear Lakes. Clear Lakes Country Club, open to the public, also allows river access in addition to camping, fishing, and golfing.

From Cedar Draw to below Kanaka Rapids fishing is the most popular recreation activity observed with most use concentrated at Crystal Springs (Don Chapman Consultants, Inc., 1992; Wood, 1992; Partridge, 1992). Recreational surveys in this section in 1991 and 1984 indicate fishing, picnicking and sightseeing as recreational activities participated in most (Don Chapman Consultants, Inc., 1992; Wood, 1992).

Several commercial recreation facilities, located on the south side of the river, (Banbury Hot Springs Natatorium, Sligar's Thousand Springs Resort, and Sportsman's River Resort), provide swimming and boating access to the river. Two of them offer pools supplied from geothermal wells. Other activities include camping, picnicking, fishing and duck hunting. A 1991 recreation survey of this section suggests that the most popular activities are motorized boating, water skiing, swimming/sunbathing, and fishing (Reingold, 1992). Many of these activities originate at the commercial facilities.

On the north side of the river is Idaho Power's Thousand Springs day-use park. Sightseeing opportunities are afforded by two fish hatcheries which are open to the public (Clear Lakes and Niagara Springs), and boat tours of the Thousand Springs area.

Upper and Lower Salmon Falls Reservoirs - The impoundments created by Upper and Lower Salmon Falls dams create approximately 12.4 miles of "flat" water. Both reservoirs saw about a 30 percent increase in recreational use from 1990 to 1991 (Reingold, 1992). Steep basalt cliffs are found on the north and east sides of the reservoirs. The Hagerman Valley is the dominate foreground view. The south and west sides of the canyon are defined by the large, light-colored, dissected hills of the Hagerman Fossil Beds National Monument.

At the upper end of Upper Salmon Falls Reservoir, springs cascade from the basalt cliffs on the north side. Views of the springs are possible from State Highway 30, but views also include powerlines, flumes, a powerhouse, commercial businesses, houses, and agricultural development.

The most observed recreation activities on the reservoir are picnicking, water skiing, swimming/sunbathing, and motorized boating (Reingold, 1992).

The Hagerman Wildlife Management Area (WMA), located on the north side of the river adjacent to the Upper Salmon Falls Reservoir, also receives significant fishing use. Several ponds provide bass and trout fishing. An estimated 80 percent of harvested waterfowl in the region use the Hagerman WMA.

Lower Salmon Falls Reservoir is bordered by the Hagerman Fossil Beds National Monument on the west and the Hagerman Valley on the east. The most popular recreational endeavor is fishing, particularly in the Bell Rapids pool. Other popular recreational activities include picnicking, water skiing, motorized boating, and swimming (Reingold, 1992). The Monument saw a significant increase in visitation, from 700 to 1630 visitors between 1991 and 1992 (Wilhite, 1992). Continued increase in site visitation is expected. Future plans for the Monument include a research and visitor's center for interpretation and display of fossils, and establishment of an ongoing paleontological research service.

Lower Salmon Falls Reservoir to Bliss Reservoir - Lower Salmon Falls Dam to Bliss Reservoir is an 7.3 mile free-flowing stretch. The canyon walls narrow and provide more enclosure, while the setting varies from developed to natural. Land ownership is primarily private, and there are few developed recreation facilities. River access is available at Lower Salmon Falls Dam, the Malad River confluence, a day-use park at the Malad project, and Bliss Bridge. Some public lands on the south provide additional access opportunities. Recreational use on this segment increased 32.5 percent between 1990 and 1991 (Reingold, 1992).

River floating is the most popular recreational activity, increasing 143 percent over the last ten years (Wood, 1992). The Idaho Outfitters and Guides Licensing Board has licensed five outfitters for this segment of the Middle Snake reach. Inflows from the Snake Plain Aquifer provide sufficient flows for boating year round. Fishing for trout and sturgeon, and pleasure driving are also popular endeavors in this segment.

Bliss Dam Reservoir to Clover Creek - The reservoir formed by Bliss Dam is approximately four miles long and receives limited recreation use. In fact, while use in upstream sections of the planning area were increasing, recreation use on Bliss Reservoir decreased by 3.4 percent from 1990 to 1991 (Reingold, 1992). The most popular recreation activities were picnicking, fishing, and water skiing.

Bliss Dam to the community of King Hill is a 13.5 mile free-flowing reach. The river is enclosed by sloping, dissected hills on the south and west side of the river, and basalt cliffs on the

north and east. Sand dunes are located on a north-side bench below Bliss Dam. The canyon is undeveloped, except for some disturbance immediately below Bliss Dam, a pumping station near Big Pilgrim Gulch, the Interstate 84 bridge crossing, and skyline views of powerlines. Agriculture is the principal land use on the benches above the river and on the canyon rim.

Recreation use is dispersed. Access to the river is possible from public lands on the north and east managed as the Snake River Rim SRMA. Additional public lands are located on the south and west. Fishing for trout and white sturgeon are probably the most popular recreation activities in the reach. White sturgeon fishing is considered a unique fishing experience, and this segment of the Middle Snake supports the most abundant and important white sturgeon fishery above Hells Canyon.

Whitewater boating from Bliss Dam to King Hill provides an experience suitable for novices (Moore and McClaran, 1989). Currently, there are no developed access points for whitewater boating, which may account for the low boating use. However, a commercial outfitter was recently licensed for this section. Other recreational endeavors include waterfowl and upland game hunting. Minor camping, ORV use, and equestrian use also occurs.

Developed Recreation Facilities

Developed recreational facilities provide access to the Snake River for fishing, hunting, swimming, and boating. The majority of recreational facilities are privately operated, and also provide camping, picnicking, and hiking (Table 6). Many are associated with hydropower development and consist of reservoir-related recreation activities. Of the developed recreational facilities with visitation tallies, the Crystal Springs/Pugmire Memorial Recreation Area complex, operated by the IDPR receives the largest number of visits. Perrine viewpoint, the golf courses, and the City of Twin Falls' Shoshone Falls and Dierkes Lake parks also receive substantial use.

CAMPING

The 1990 State Comprehensive Outdoor Recreation Plan cited camping facilities as a high priority for the Region (IDPR, 1989b). Several privately operated facilities are located adjacent to the river south of Hagerman including Sligar's Thousand Springs Resort, Sportsman's River Resort, and Banbury Hot Springs (Table 7). These establishments provide boating and fishing access to the river as well. Other private campgrounds in the canyon, but away from the river, include Miracle Hot Springs near Banbury on the west side of State Highway 30, and Rock Lodge and Creekside RV Park north of Hagerman on Billingsley Creek. No developed campgrounds are located on public lands.

Dispersed camping opportunities are available on Bureau of Land Management, Department of Fish and Game, and some state park lands in the planning area. Camping on BLM lands occurs at

Table 6. Developed Recreational Facilities Within the Middle Snake Study Area.

State of Idaho		1991 Estimated Attendance
Pugmire Memorial Recreation Area and Crystal Springs Park	picnicking, fishing, dispersed camping, bird watching	81,825[1]
Twin Falls County		
Picnic Access	picnicking	
Centennial Park	boating, fishing (future phases: picnicking, trails)	
City of Twin Falls		
Shoshone Falls Park	picnicking, viewpoint, fishing, water sports, boat dock and ramp	
Dierkes Lake Park	picnicking, swimming, fishing	37,000[2]
Perrine Bridge Viewpoint	scenic vista, tourist information	55,000[3]
Private		
Banbury Hot Springs	swimming, boat docks, picnicking	---
Sligar's Thousand Springs Resort	picnicking, camping, boat ramp and dock, water sports, fishing	---
Sportman's River Resort	picnicking, fishing, boating, camping, water sports	---
Twin Falls Park	picnicking, fishing, boat ramp and dock, water sports, overlook	23,500 recreation days
Upper Salmon Falls Park	picnicking, fishing, water sports, boat ramp and dock	8,920 recreation days
Lower Salmon Falls Park	picnicking, fishing, water sports, boat ramp and dock	14,700 recreation days
Upper Malad Park	picnicking	1,900 recreation days
Lower Malad Park	picnicking, fishing, water sports	5,000 recreation days
Niagara Springs Hatchery	viewpoint, picnicking, hatchery tours	81,825[1]
Clear Lakes Park	picnicking, fishing, water sports	5676 visitors
Thousand Springs Park	picnicking, fishing, boat ramp (small boats), water sports	8133 visitors
Bliss Park	picnicking, fishing, swimming, water skiing, boat ramp and dock	3,200 recreation days
Blue Lakes Country Club	golfing, fishing, swimming	21,000 rounds golf
Jerome Country Club	golfing	38,000 rounds golf
Canyon Springs Golf Course	golfing	41,000 rounds golf
Clear Lakes Country Club	golfing, fishing, picnicking, camping	32,000 rounds golf

[1] Represents attendance for Pugmire and Crystal Springs parks, and Niagara Springs Hatchery.
[2] Attendance for Shoshone Falls and Dierkes Parks combined.
[3] People signing attendance book. Actual attendance is likely greater.

Sources: IPC, 1991; Heider, 1992; Lynott, 1992; Wood, 1992; Zuck, 1992; Twin Falls City Parks and Recreation, 1992; Thorne, 1992; Ericson, 1992; Peterson, 1992.

Table 7. Developed Campgrounds

	Number of Sites
Banbury Hot Springs	30
Miracle Hot Springs	14
Rock Lodge and Creekside RV Park	11
Sligar's Thousand Springs	50
Sportsman's River Resort	9
TOTAL	**114**

Source: Idaho Department of Parks and Recreation, 1991.

Star Falls, Murtaugh Bridge, Devils Corral, and other lands in the Snake River Rim SRMA. Pugmire Memorial Park allows camping although no facilities are provided; to date camping activities at Pugmire have been associated with group reservations of the picnic shelter (Lynott, 1992). Dispersed camping is allowed at IDFG sportsman's access areas.

SWIMMING, WATER SKIING AND SCUBA DIVING

Swimming occurs at the reservoirs and at sites along free flowing segments of the river where access is available. A number of swimming pools are also available in the area, some taking advantage of hot spring sources. Developed hot spring pools are open at Banbury, Sligars and Miracle Hot Springs. Dierkes Lake Park has a swimming beach. Recreational surveys in the lower portion of the planning area indicate swimming is one of the more popular activities observed in the Thousand Springs area and Upper and Lower Salmon Falls reservoirs (Reingold, 1992). Water quality problems in the last few years has resulted in a curtailment of swimming in the river, especially from Crystal Springs downstream to Thousand Springs. Some resort owners have reported increased use of their pool facilities because of the low water and water quality problems in the river (Sligar, 1992).

Water skiing occurs on all five reservoirs and on the river in the Thousand Springs area. In recent years water skiing has been impeded because of algal blooms. On a normal summer weekend from 100 to 200 water skiers may be observed in the Thousand Springs area (Bolduc, 1992; Sligar, 1992).

Scuba diving occurs in the vicinity of Thousand Springs and Blueheart Springs. Classes conducted at Boise State University, the College of Southern Idaho, and Northwest Nazarene College bring students to the area for approximately six months in the winter (Bolduc, 1992).

PICNICKING

Picnicking opportunities are possible at the many developed facilities located in the study area. These include state, county and city parks, as well as facilities provided by private entities most notably Idaho Power Company's many parks at its hydropower facilities.

Draft survey data collected by Idaho Power Company suggest picnicking may be one of the most popular activities within the river canyon (Fuhrman, 1992). A telephone survey conducted in 1983 cited picnicking as the recreation activity engaged in most by recreationists using Twin Falls Hydro Project facilities (53.8 percent of respondents) (IPC, 1985). Picnicking was also the most frequent recreation activity observed at Lower Salmon Falls and Bliss reservoirs (Reingold, 1992).

Boating/Floating

The Middle Snake reach provides opportunities for motorized and non-motorized boating. Five reservoirs provide flat water boating: Twin Falls, Shoshone Falls, Upper and Lower Salmon Falls, and Bliss reservoirs. Boat ramps are provided at all of these facilities. When there is sufficient

water in the river, it is also possible to power and jet boat on several free-flowing sections of the Snake. Centennial Park, located in the canyon to the west of Perrine Bridge, provides boat access to the river below Pillar Falls. Other free-flowing stretches used by power boats include the Thousand Springs area, where developed boat ramps and launches are provided by several private enterprises, and below Lower Salmon Falls and Bliss dams.

Boater registration suggests motorized boating in the planning area has increased at a rate greater than the state-wide trend. In 1991, 3,747 registered boaters indicated Gooding, Jerome or Twin Falls as their primary use area, an increase of 8.5 percent from the previous year. Registered boaters in the State of Idaho as a whole increased by 3 percent in 1991 from 1990 (Brandt, 1992). Discussions with the Idaho Department of Parks and Recreation Boating Safety section and Idaho Power Company recreation planners indicate no capacity problems on existing reservoirs. Conflicts that do occur are generally related to access constraints rather than reservoir capacity (Brandt, 1992; Reingold, 1992).

The planning area provides whitewater runs for all experience levels (Table 8). When referring to whitewater boating within the Middle Snake reach, four sections are usually delineated: Milner, Murtaugh, Wiley, and Bliss (Amaral, 1990; Moore and McClaran, 1989). At flows of 10,000 cfs and above, the Milner and Murtaugh segments are cited for possessing national significance (U.S. BLM, 1989). With the construction of a developed boat access at the Milner Powerhouse, boating opportunities will be available from the powerhouse to Star Falls.

Table 8. Middle Snake Whitewater Sections

Segment	Put-in/Take-out	Ideal cfs	Skill Level*	Craft	Licensed Outfitters
Milner	Milner Bridge/ Main Milner Powerhouse	12,000 - 15,000	Expert - Class V	Kayak	0
Star Falls	Main Milner Powerhouse/Above Star Falls	-	Beginner - II/III (@ 1200 cfs) Beginner II (@ 3500-4000 cfs)	Kayak, rafts, canoes	0
Murtaugh	Below Star Falls or Murtaugh Bridge/ Twin Falls Reservoir	10,000 - 15,000	Advanced Intermediate - Class IV	Kayak, raft	4
Wiley	Below Salmon Falls/Bridge at Bliss	Above 10,000	Beginner - Class II (III)	Kayak, raft, canoe	5
Bliss	Below Bliss Dam/King Hill	Above 10,000	Beginner - Class II (III+)	Kayak, raft, canoe	1

* Based on the international scale of difficulty with Class I being the easiest and Class VI being extremely difficult.

Sources: Amaral, 1990; McClaran and Moore, 1989; Idaho Outfitters and Guides Licensing Board, 1992; Lesser, 1991; Lucachick, 1992; Ridenhour, 1992.

The Idaho Outfitters and Guides Licensing Board licenses outfitter use for most of the Middle Snake reach. Currently, there are four licensed for the Murtaugh, five for the Wiley, and one for the Bliss section. One outfitter was recently licensed for power and float boating from Centennial Park to Pillar Falls (Gardner, 1992). Information on commercial use of these sections of the Snake River are limited by the current drought which has made some sections unboatable. Additionally, the Outfitters and Guides Board only began requesting this information in 1986, which coincides with the current drought cycle.

Milner Section - The Milner canyon is a short stretch from Milner Dam to the Milner Powerhouse which provides a Class V experience for expert kayakers at flows above 10,000 cfs. Floating opportunities are controlled by releases over Milner Dam. In normal water years this section was floated in late spring. Sufficient flows for boating have not been available since 1986. With completion of the Milner hydropower complex opportunities to float will be further reduced, by diversion of flows to the main powerhouse. Currently, the FERC license for the project requires halting operation of the powerhouse up to 12 days a year for 8 hour periods between April 1 and May 31 when flows in excess of irrigation needs exceed 4,000 or 10,000 cfs (Milner License Article No. 415). Models based on historic discharges (1928-1989) and operations indicate the possibility of flows of 4000 cfs or above occurring in April is 52 percent, and 45 percent in May; flows of 10,000 cfs or more have a 33 percent chance of occurring in April and a 20 percent chance in May.

The Idaho Outfitters and Guides Licensing Board has made provision to license three outfitters in the section from Milner Dam to Star Falls. No outfitters are currently licensed for this stretch.

Star Falls Section - The Star Falls section (put-in at the Main Milner Powerhouse and take-out above Star Falls) provides an opportunity suitable for beginning boaters in a scenic and relatively natural section of the Snake River. Construction of the Milner Powerhouse has provided access to make floating this section feasible. Limited knowledge is available regarding whitewater characteristics at varying flows. At 1200 cfs, Class II and some Class III rapids develop. The confined nature of the canyon at this flow restricts use to small craft such as kayaks, small rafts, and canoes (Lucachick, 1992). Flows of 4000 cfs result in class II rapids (Reingold, 1992).

Murtaugh Section - The Murtaugh section, with put-ins at Star Falls or Murtaugh Bridge, extends to the backwaters of Twin Falls Reservoir. This stretch provides Class IV whitewater and outstanding scenery for boaters with advanced-intermediate skills. The boating experience is described by many as comparable to the "big water" of the Grand Canyon, but neatly packaged in a one day trip (Lesser, 1991; Gardner, 1991; and Bridges, 1992).

Four outfitters are licensed for this stretch. No commercial use has occurred since 1986, because of inadequate water flows (Idaho Outfitters and Guides Licensing Board, 1992). However, some private use has occurred as this section can be kayaked at flows as low as 600 cfs (Gardner, 1992). A minimum of 6000 cfs is required to float a raft down the river (Ater, 1992; McBride, 1992). Boating use on the Murtaugh section was reported to be increasing prior to the drought (U.S. BLM, 1989). Floating opportunities in the Murtaugh section are dependent on releases at Milner Dam or the main Milner powerhouse. In a normal water year, the boating season is typically from March to June.

A survey conducted of boaters using the section of the Snake from Star Falls to Twin Falls Reservoir (Murtaugh section) from April 23 to July 6, 1984 reported 68 percent of boating use was whitewater boating. The remaining were power and jet boats, canoes, and flatboats used on Twin Falls Reservoir. Most whitewater boaters kayaked (60%), but rafts (38.9%) were also common. Whitewater boating was by far the most popular boating activity in this section of the planning area when sufficient flows were available (Feldman and McLaughlin, 1986).

Wiley Section - The Wiley section with put-in below Lower Salmon Falls Dam and take-out at Bliss Bridge provides whitewater suitable for beginning boaters. An alternative put-in is at the Malad River confluence. The whitewater consists of Class II rapids and one Class III rapid (Amaral, 1990). Unlike the Milner and Murtaugh sections and other rivers in Idaho, this section is unique because boating flows are available year round. This section of the Middle Snake reach is the most heavily used for float boating.

Boating use on the Wiley segment has tripled since 1981 (Table 9; IPC, 1981; Wood, 1992). The majority of boating craft consisted of rafts (97.6%) while canoes, inner tubes, and kayaks made up minor portions in a 1981 study (IPC, 1981). A 1989 survey conducted by IDPR obtained similar results. Rafts comprised 92 percent of craft, the remaining 8 percent were made up of kayaks, inflatable kayaks, and inner tubes (IDPR, 1989a). Current studies indicate that rafts are still the major means of floating the Wiley section, although minor increases in kayak use are occurring (Reingold, 1992).

Recent surveys are showing a larger regional draw for this section. Surveys in 1981 and 1989 indicated the majority of Idaho boaters came from Gooding, Jerome and Twin Falls counties (IPC, 1981; IDPR, 1989a). Surveys conducted in 1990-1992 show an increase in boaters from the Boise area and Wood River Valley (Reingold, 1992). The broader regional draw may be the result of the drought which has reduced the season on other rivers while the Wiley reach has been boatable year round. However, the growing popularity of whitewater boating and growing knowledge of this area will likely result in continued use of this section from a greater regional area in the future.

Table 9. Estimated Boating Activity.

	MURTAUGH SECTION	WILEY SECTION
1981	-	1856[1]
1984	1042[2]	-
1989	-	3258[3]
1992	-	approx. 5500[4]

[1] Estimated use for May 15 to October 2, 1981.
[2] Derived from Feldman and McLaughlin, 1986. Estimated whitewater boating use for a season from March 28 to July 8, 1989.
[3] Derived from IDPR, 1989a. Does not depict total use for 1989, but only use estimated for June 1, to August 31, 1989.
[4] Based on statement made by Wood, 1992 at Wiley Hydro Project consultation meeting.

Sources IPC, 1981; Feldman and McLaughlin, 1986; IDPR, 1989a; Wood, 1992.

The Idaho Outfitters and Guide Licensing Board has licensed five outfitters to float this section (Idaho Outfitters and Guides Licensing Board, 1992). Commercial use in general is experiencing increases, with a significant increase in 1992 (Table 10). Recent increases can be attributed to more bookings by large groups. Outfitters on the Wiley stretch are floating more business groups, organized bus tours, senior citizens, college classes, and family reunions (Sager, 1992; Hess, 1992; Gardner, 1992) . Another trend is the increase in non-resident clientele. The majority of floaters using outfitters in 1991 were from out-of-state. Although figures for resident and non-resident boaters are not available for 1992, one outfitter estimates 80 percent of their business consists of non-residents with the majority from California (Sager, 1992).

Table 10. Reported Boating Activity by Outfitters and Economic Values.

	MURTAUGH		HAGERMAN		KING HILL	
Year	Total (Non-resident)	Economic Value	Total (Non-resident)	Economic Value	Total (Nonresident)	Economic Value
1986	111 (75)	$4780	227 (77)	$8635	-	-
1987	*	*	155 (55)	$4460	-	-
1988	*	*	141 (43)	$5820	-	-
1989	*	*	369 (136)	$13,340	-	-
1990	*	*	225 (73)	$8090	-	-
1991	*	*	335 (212)	$11,710	-	-
1992	*	*	1310 (Not available)	$59,250	-	-

* Insufficient flows for commercial floating.

Sources: Idaho Outfitters and Guides Licensing Board, 1992; U.S. BLM, Shoshone District, 1986-1991; Hess, 1992; Gardner, 1992; Sager, 1992; Edson, 1992.

Two of the five licensed outfitters are experiencing increases in commercial trips. One outfitter has not conducted trips in the last three years pending sale of the business, and two others focus efforts on other rivers in the state. The potential exists for increased commercial opportunities

if all five outfitters marketed to their potential. However, increased commercial use, along with concurrent expansion in private use, may lead to resource impacts.

Commercial outfitters currently report put-in and take-out facilities are at or exceed capacity on some weekends. Reported problems include crowded parking facilities, trash at the take-out and picnic spot known as Mustard Beach, potential river safety conflicts from overcrowded conditions, and conflicts with motorized craft using the section. Many inexperienced boaters and families float this section of the river. Crowded conditions could result in unsafe experiences. If use continues to increase, more formal management of the river may be necessary.

Bliss Section - The Bliss section, with put-in below Bliss Dam and take-out in the King Hill area, offers additional year round opportunities for beginning float boating. This section of the river provides a more natural setting offering an alternative to the Wiley stretch. Current use is low, because of lack of developed put-in and take-out facilities. However, an outfitter was recently licensed to offer commercial trips on this stretch.

Fishing, Hunting and Wildlife Observation

The Snake River Canyon possesses abundant opportunities for wildlife observation, fishing, and hunting. Several areas within the canyon are designated wildlife management areas (WMA), sportsman's access areas, and isolated wildlife tracts. Isolated wildlife tracts are cooperatively managed by the BLM and IDFG predominately for upland game. The IDFG and BLM also have jurisdiction over many of the river islands.

Wildlife Management Areas and sportsman's access areas are funded from fishing and hunting license fees to secure access for these uses. The areas also provide opportunities for wildlife observation and nature study. Table 11 lists IDFG sportsman's access areas and WMAs located in the Snake River canyon.

Table 11. IDFG Sportman's Access and Wildlife Management Areas

Hagerman WMA	fishing, hunting (upland birds)
Bell Rapids Access	fishing, hunting (waterfowl), boat ramp and dock
Bordewick Access	fishing, hunting (waterfowl)
Niagara Springs WMA	fishing, hunting (waterfowl, upland birds)
Niagara Springs Access	fishing, hunting (waterfowl)
Cedar Draw Access	fishing, hunting (waterfowl)
Banbury's Access	
Scott Access	fishing, hunting (waterfowl and upland birds), boat ramp

Source: IDFG, 1990.

FISHING

Warm and cold water fishing opportunities are available along the Middle Snake reach. Access to the river is provided at Idaho Power Company's hydro project facilities, IDFG sportsman's access and WMAs, and a number of county, city, and private operations. Public lands located along portions of Milner and Murtaugh canyons, below the Perrine Bridge, in the vicinity of Bliss Bridge, and below Bliss Dam also provide fishing access.

Statewide fishing license sales have been relatively stable over the years increasing by four percent from 1977 to 1987. For this same period a 14 percent increase in angler use occurred (Reid, 1989). In 1990, five percent of statewide fishing license sales were purchased in Gooding, Jerome and Twin Falls counties (IDFG, 1991a). Although all purchasers may not reside or fish in the vicinity of license purchase, there likely is some relationship.

Fishing is frequently one of the most observed recreational activities in surveys conducted on the Middle Snake. Within the planning area the Lower Salmon Falls to Bliss Dam section probably has the most angler effort expended because of the easy access (Partridge, 1992). A 1976 survey conducted from Loveridge Bridge to Lower Salmon Falls Dam by the IDFG observed the majority of angler effort occurred from Lower Salmon Falls Dam to Bliss Bridge (Gibson and Mate, 1976). In a 1981 recreation survey conducted from Lower Salmon Falls Dam to Bliss Bridge, fishing was the most observed activity comprising 40 percent of all recreational activity. Most fishing occurred below Lower Salmon Falls Dam and at the Malad Power Plant (IPC, 1981). Whitewater boating has currently surpassed fishing in popularity in this stretch (Wood, 1992). Another area with significant angler effort is the Clear Lakes area, particularly at Crystal Springs (Partridge, 1992). From Mud Creek to Cedar Draw, fishing was the most observed recreation activity in 1984 and 1991 surveys (Don Chapman Consultants, Inc., 1992; Wood, 1992). The surveys found fishing activity concentrated at Crystal Springs. Lower and Upper Salmon Falls reservoirs receive the most angler effort of the five reservoirs in the planning area (Partridge, 1992).

The IDFG *Fisheries Management Plan* classifies trout habitat, with the exception of spawning habitat, as good in free-flowing sections between King Hill and Milner (IDFG, 1991b). Trout species present include rainbow, brown, cutthroat, and a rainbow-cutthroat hybrid. The hybrid is found predominately between Milner and Twin Falls dams. The reservoirs are also suitable for trout. Trophy size trout have been caught in Lower Salmon Falls Reservoir. Recent public meetings conducted by IDFG have resulted in harvest restrictions for Lower Salmon Falls Reservoir in order to build a trophy fishery (Turnipseed, 1992). Warmwater species include largemouth and smallmouth bass, bluegill, brown, bullhead, channel catfish and yellow perch (IDFG, 1991b).

For the last 20 years the Snake River could not be considered a "quality" fishery (Table 12; Partridge, 1992). Fishing opportunities are greatly reduced because of current water quality problems, low flows, and spawning habitat losses. Additional potential threats to the trout and sturgeon fisheries include hydropower development on the mainstem and tributaries, and dewatering in the summer which impairs spawning habitat access. However, the IDFG believes the Snake River has the "greatest potential for increasing angler opportunity" in Southern Idaho (IDFG, 1991b).

Unique fishing opportunities are afforded by the white sturgeon fishery occurring in free flowing sections from Auger Falls to King Hill. Angler interest is described as high for this species (IDFG, 1991a). The IDFG manages this population for catch and release only. Studies conducted in the early 1980's concluded the best sturgeon habitat and populations occur in the free-flowing sections below Bliss Dam to C.J. Strike Reservoir. Based on catch rates, this section was also determined to have the most abundant populations between Shoshone Falls to Givens Hot Springs (Lukens, 1982). The IDFG plans to augment sturgeon populations in the free-flowing sections between Auger Falls and Bliss Dam with hatchery stock (IDFG, 1991b).

Table 12. Angler Hours and Catch Rates for Areas Within the Middle Snake Planning Area.

Segment	1971	1975	1981	1984	1987	1991
Shoshone Falls to Upper Salmon Falls	2988 hrs.[1] 0.55 fish/hr.					
Lower Salmon Falls to Bliss Dam		5137 hrs.[2] 0.29 fish/hr	4581.8 hrs.[3] 0.58 fish/hr.			
Bliss Dam to King Hill		1665 hrs.[2] 0.08 fish/hr				
Upper Salmon Falls Reservoir	6023 hrs.[1] 0.6 fish/hr.					
Lower Salmon Falls Reservoir					22,000 hrs.[5] 0.48 fish/hr.	40,078 hrs.[6] 0.30 fish/hr.
Hagerman Wildlife Management Area				23,958 hrs.[4] 0.99 fish/hr.		

[1] March 29 to December 19, 1971 [2] April 7, 1975 to January 11, 1976 [3] May 15 to October 2, 1981
[4] June 30 to November 2, 1984 [5] June 1 to December, 1978 [6] December 1, 1990 to November 30, 1992

Sources: Reid, 1972; Gibson and Mate, 1976; Grunder, 1986; Grunder, Elam and Bell, 1989; IPC, 1981; Partridge, 1992.

HUNTING

Hunting activities in the Middle Snake reach focus on waterfowl, upland birds and game, and deer. Restrictions apply in many sections. Deer harvest is restricted to archery from Milner Dam to Perrine Bridge, shotguns from Rock Creek to the Malad River and on the islands downstream of the Highway 30 Bridge near Hagerman. The Hagerman Wildlife Management Area is closed to waterfowl hunting, and geese are protected from Clear Lakes Bridge to the Malad River (Musil, 1992).

Hunting for upland bird and game occurs throughout the planning area. In the Hagerman area quail and pheasant are the main species harvested. Table 13 summarizes hunter days expended over the last five years for waterfowl, and upland birds and game in Gooding, Jerome, and Twin Falls counties. A hunter day is equivalent to one hunter hunting any portion of a day.

Table 13. Estimated Hunter Days for Gooding, Jerome and Twin Falls Counties.

Year	Waterfowl	Upland Birds	Upland Game
1987	29,198	38,305	3076
1988	20,504	26,126	1434
1989	35,670	29,867	2854
1990	19,199	40,552	5091

* Waterfowl includes Canada geese, snow geese, coots and ducks; Upland birds include chukars, huns, quail and pheasant; Upland game includes doves, cottontail rabbits, snipe and snowshoe hare.

Source: IDFG, 1987-91.

Waterfowl are by far the most popular species hunted in the planning area. The reach from Cedar Draw to Bliss Bridge receives the most use (Kvale, 1992). The IDFG estimates that 80 percent of the ducks harvested in Region 4 inhabit the Hagerman Wildlife Management Area (Turnipseed, 1992). A decrease in waterfowl hunter days in 1990 is attributed to increased costs for ammunition, and state and federal waterfowl stamps (Kvale, 1992).

Private hunting clubs in the Hagerman area capitalize on the waterfowl populations in the vicinity. Water development and farming operations are managed on these lands to promote waterfowl habitat. For a fee members may hunt. One such hunting club is Buckeye Ranch located across the river from the Hagerman Fossil Beds National Monument. Another is located downstream from Buckeye Ranch.

Deer harvest within the planning area is mainly managed to control depredation of orchards in the Niagara Springs area (Turnipseed, 1992). Deer hunting occurs in Milner and Murtaugh canyons and the vicinities of Devil's Corral, Vineyard Creek, and Crystal Springs. Success rates are low compared to the rest of the state. Table 14 summarizes the estimated deer hunter days for the past five years by IDFG hunting unit. The Middle Snake Reach is located within three IDFG hunting units; the reach is primarily encompassed by Unit 53, with very small portions within Units 45 (located on the north side of the Snake River west of Bliss) and 46 (located on the south side of the Snake River west of State Highway 30).

Table 14. Estimated Deer Hunter User Days.

Year	Unit 45	Unit 46	Unit 53*
1987	-	3512	-
1988	-	2523	3175
1989	-	1953	110
1990	-	5953	2244
1991	-	2806	1249

* The study area is located predominately in Unit 53.

Source: Nelson, 1986-91.

WILDLIFE OBSERVATION

The Snake River canyon in the Middle Snake reach possess abundant opportunities for wildlife observation including waterfowl, raptors, heron rookeries, and pelicans. Refer to Section I, Fish and Wildlife, for more detailed information regarding species located within the canyon.

Two areas specifically noted for wildlife viewing opportunities in the *Idaho Wildlife Viewing Guide* include Hagerman and Niagara Springs Wildlife Management Areas (Carpenter, 1990). Management of these land areas emphasize protection of wildlife habitat and provide ample opportunities for wildlife observation. These areas are noted for year round opportunities to view waterfowl, wading birds, and raptors. In addition, the Hagerman WMA is noted for upland birds and fish; the Niagara Springs area for songbirds and as a major wintering waterfowl area.

The Thousand's Springs Nature Preserve was acquired by The Nature Conservancy in 1986. Important wildlife habitat include a remaining unaltered spring system in the Thousand Springs complex, riparian bottomland, steep basalt cliffs, several spring creeks, marshes and sloughs. Opportunities exist to view Shoshone sculpin, several snails listed as endangered, waterfowl, wading birds, and nesting raptors. The Preserve has probably the best population of Shoshone sculpin in its spring creeks. Tours are conducted every weekend from June through September in cooperation with Malad Gorge State Park.

Sightseeing and Trail Use

SIGHTSEEING

The planning area provides the opportunity to visit many interpretive centers and museums. In the Hagerman area, there is Rose Creek Winery, Snake River Pottery, Hagerman Historical Society Museum, and a Frank Lloyd Wright House, the only house designed by the architect in

Idaho. Other attractions include the Evil Knievel jump site near the city of Twin Falls; the many hydroelectric projects; and numerous federal, state, and privately owned aquaculture facilities.

Thousand Springs Tours is a two year old business operating out of Hagerman which provides boat tours on the Snake River from April through October. The tours begin at Sligar's Thousand Springs Resort and go upstream to Blueheart Springs, past the Thousand Springs complex. An estimated 1000 people took the tour this year (Bolduc, 1992).

Numerous natural features offer sightseeing opportunities in the planning area, most notably the canyon spring complex and major waterfalls and rapids. Springs issue from the canyon walls in many places. Most notable are Niagara Springs, a National Natural Landmark, and Minnie Miller Springs, one of the last undeveloped springs along the reach. Waterfalls and major rapids also attract people. Most notable are Star Falls/Caldron Linn, Shoshone Falls, Twin Falls, Pillar Falls, Auger Falls, and Kanaka, Boulder, and Empire rapids.

Numerous viewpoints on the canyon rim provide extensive views of the Snake River Canyon. Hansen Bridge viewpoint, Perrine Bridge viewpoint north of Twin Falls, and a viewpoint located on Highway 30 providing a panoramic view of the Hagerman Valley are developed. There are also many areas where public lands along the rim provide opportunities to observe the canyon. The Thousand Springs Scenic Byway, U.S. Highway 30, traverses the Snake River canyon from Bliss, south through the Thousand Springs area. Perrine Bridge and Hansen Bridge are also a part of the scenic byway. Shoestring Road follows sections of the Oregon Trail in the western portion of the study area. Views of the Snake Canyon upstream of King Hill to Bliss Bridge are possible from this road.

TRAIL USE

Developed trails within the canyon are limited although public input indicates the demand is great. Limitations to extensive trails along the canyon is due to the diversity in land ownership. Although public and state parcels are located along the canyon, extensive sections of private land limits the opportunity to provide extensive trail systems. Additionally, several points of interest (rapids, waterfalls, and springs) are difficult to access because of private ownership of lands surrounding the feature.

Some trail systems are proposed and attempts are currently being made to coordinate with various entities to achieve more trail opportunities. Hiking, equestrian and mountain biking activities are possible on public lands located throughout the planning area. Extensive areas of public land occur on the north side of the river from Bliss to Clover Creek, and in the Twin Falls area. Other trail opportunities provided by the BLM include a proposed trail located near Twin Falls on the south

side of the canyon. Some trail activity occurs on BLM land at the Hansen Bridge Scenic Overlook on both the north and south sides of the rim. The Owsley Bridge ORV SRMA provides motorized and non-motorized opportunities adjacent to the Hagerman Fossil Beds National Monument.

The Oregon Trail traverses the planning area. The trail, extending over 2000 miles from Independence, Missouri to Oregon City, Oregon, defines one of the major emigrant trails used in the settlement of the west. Ruts and other historic sites associated with the emigrants' journey across the Snake River Plain on the trail are found throughout the planning area. Known ruts located on public lands are marked by carsonite markers at 1/4 mile intervals. Approximately 580 miles of the original 1700 miles crossing Idaho remain (Planmakers, 1991). In 1989, an estimated 1500 people visited the marked trail in Idaho (Ross, 1992).

The Oregon Trail is defined by many routes. Segments of the primary route and associated historic sites were designated a National Historic Trail in 1978 (Dolonich, 1992). Many of the historic sites and trail segments located on public lands will be interpreted and promoted for recreational use as part of the 1993 sesquicentennial celebration of the trail. Historic sites associated with the trail and located in the Middle Snake reach are described in the cultural resources section. A backcountry byway is proposed as part of the interpretation of the Oregon Trail. The purpose is to promote the recreational opportunities of the trail and give individuals an opportunity to traverse sections of the original trail and view significant sites (Jenks, 1992).

Additional trail opportunities exist with proposed development in the canyon in the vicinity of Twin Falls. For example, the licensed Auger Falls hydro project proposes a trail system for hiking, equestrian, and biking uses as part of the recreation mitigation for the project. The trail system would consist of a loop located around the perimeter of the project site with side trails, including a trail paralleling the river providing view access to Auger Falls. Future phases of the Twin Falls County Centennial Park also include plans for a trail system. One proposal would link the park with the restaurant located at Canyon Springs Country Club, to the Auger Falls trail system, and eventually to Rock Creek Park. Additionally, a trail system from the park to Pillar Falls is desired (Heider, 1992). Currently, a private road allows access to Pillar Falls.

The Idaho Department of Parks and Recreation also would like to implement a trail system in its Niagara Springs Complex. This trail would connect Niagara Springs, Pugmire Park and Crystal Springs (Lynott, 1992). The Banbury Springs dispersed recreation area owned by Idaho Power Company has some trails which have been established by boy scouts who use the area (Wood, 1992).

Other Recreation Opportunities

RECREATIONAL DREDGE MINING

Although the planning area is closed to one stop permits, recreational dredge mining has occurred in the past through procurement of a Stream Channel Alteration Permit from the Department. Permits have been issued for such activity in the vicinity of Auger Falls and above Star Falls, but have expired. Occasionally interest is expressed to dredge mine in the canyon; however, serious activity has not been pursued (Blau, 1992)

HAGERMAN FOSSIL BEDS NATIONAL MONUMENT

The Hagerman Fossil Beds National Monument encompasses 4500 acres situated on the east side of the Snake River across from Hagerman. The Monument was only recently designated as such by Congress in 1988. This designation is to protect and preserve the paleontological sites, to provide a research center, and display and interpret the specimens discovered at the Monument (Public Law 100-696).

The National Park Service is currently preparing a management plan which is expected to be available for public review in early 1993. This plan will evaluate and recommend development and uses on the Monument. Erosion and slumping problems because of fragile soils will likely limit the degree of developed facilities within the Monument itself. A number of sites across the river from the Monument are currently being evaluated for possible location of a research/visitor center. Potential development on the Monument might include visitor contact stations, trails for guided and self-guided tours, and picnic areas (King, 1992). Plans will also include interpretation of the Oregon Trail which passes through the southern portion of the Monument and is currently marked (Wilhite, 1992). Hunting is and will continue to be allowed within the first fifty (50) feet in elevation from the river. Fishing access will also be provided.

The Monument received approximately 700 visitors in 1991 at its visitor center located in downtown Hagerman and on tours of the quarry site. These numbers reflect limited visitor hours at the temporary visitor center (Wilhite, 1992). A significant increase in visitation occurred in 1992 for a total of 1630 as of the end of September (Wilhite, 1992). Increased visitation may be attributed to tours of the monument which were conducted at least once a month from April through September (King, 1992). Future visitation is expected to continue to increase substantially. Similar sites have received between 20,000 to 30,000 visits annually (Wilhite, 1992).

BUREAU OF LAND MANAGEMENT LANDS

Lands under the jurisdiction of the BLM provide opportunities for dispersed recreation use in the study area. Lands managed by the Boise District - Jarbidge Resource Area, Burley District - Snake River Resource Area, and Shoshone District - Bennett Hills Resource Area are found in the Middle Snake planning area supporting camping, hunting, fishing, ORV travel, boating, and hiking opportunities. The most popular activities reported are ORV travel, fishing and boating.

BLM lands provide one of the few opportunities for camping on public lands, although no developed facilities are available. Additionally, these lands provide important access in areas where no other access is available, for example in Milner and Murtaugh canyons, and the reach from Bliss Bridge downstream.

The BLM has few developed recreation facilities in the study area, although considerable dispersed recreational use occurs. Two special recreation management areas (SRMAs) are located in the planning area. The Snake River Rim SRMA is located on public lands adjacent to the river on the north side for the entire length of the planning area. Recreational activities occurring on the site include off-road vehicle use, mountain biking, hiking, jogging, equestrian, shooting, photography, bird watching, fishing, swimming, and sightseeing (Perletti, 1992; Sharp, 1992; U.S. BLM, 1989). Another is the Owsley Bridge SRMA located adjacent to the south of the Hagerman Fossil Beds National Monument and managed primarily for ORV use.

Another management designation with recreation implications is the Box Canyon and Blueheart Springs area of critical environmental concern (ACEC). This designation was established to protect biologic, visual, geological, and hydrologic values (U.S. BLM, 1985). These values attract recreational use to the area. Sightseeing, wildlife observation, and scuba diving are some of the activities which occur.

Semi-developed facilities are available at whitewater boat put-ins and take-outs at Murtaugh Bridge and Bliss Bridge, and the canyon viewpoint at Hansen Bridge. Potential developed facilities may include a trail on the south rim down to Twin Falls, a picnic/ interpretative area at Hansen Bridge, and expanded facilities at Bliss Bridge take-out (U.S. BLM, 1989; Boggs, 1992; Ridenhour, 1992). Future recreational facilities on the Shoshone District, located on north side of the river, are currently being evaluated as part of the Bennett Hills Resource Management Plan.

Recreation Evaluation

The recreation evaluation focused on recreational opportunities occurring within specific river reaches. The evaluation entailed identification of recreation units; analysis of the recreational

diversity and importance of each unit; and categorization of a final evaluation value (Outstanding, High, or Moderate to Low) based on diversity and uniqueness of the recreational experiences available on the river segment.

The Middle Snake reach was grouped into segments or discrete recreation units delineated on the basis of landform, hydrology, land use patterns, visual character, and recreational use patterns (Table 15). Each recreation unit was individually evaluated for recreational diversity and the importance of recreational opportunities. Specific recreational features of these units are summarized in evaluation assessment forms filed with the Department of Water Resources.

Table 15. Recreation Units for the Middle Snake Reach

Recreation Unit No.	Segment
1	Milner Dam to Milner Bridge
2	Milner Bridge to Main Milner Powerhouse
3	Main Milner Powerhouse to above Star Falls
4	Above Star Falls to Twin Falls Reservoir backwaters
5	Twin Falls Reservoir backwaters to Shoshone Falls Dam
6	Shoshone Falls Dam to Centennial Park
7	Centennial Park to Rock Creek
8	Rock Creek to Crystal Springs
9	Crystal Springs to north end of Ritter Island
10	North end of Ritter Island to Lower Salmon Falls Dam
11	Lower Salmon Falls Dam to Bliss Bridge
12	Bliss Bridge to Bliss Dam
13	Bliss Dam to Clover Creek

Recreational diversity is a measure of the variety of recreational activities available in the recreation unit. Four criteria were assessed to arrive at a diversity value: (1) identification of land-based and (2) water-based recreation opportunities, (3) natural features and (4) level of access. Land-based activities include camping, hiking, or hunting. Water-based recreation includes fishing, swimming, and boating.

Four criteria were assessed to determine recreational importance: (1) unique or rare features which enhance the recreation experience, (i.e., unusual landforms, hot springs, water falls or rapids), or highly-valued fisheries; (2) public concern for the recreational values of the unit (determined from public and advisory committee input, and agency consultation); (3) use based on recreational survey data; and (4) special designations and/or management objectives.

Land-based and water-based recreation activities occurring within the river corridor were identified through review of agency documents and maps describing recreation facilities; communications with various agencies and user groups; and review of several recreational surveys conducted by the IDPR, IDFG, Idaho Power Company and Myers Engineering Company, for various segments within the reach over the last fifteen years.

Natural features were identified which enhance recreation opportunities or experiences. Evaluation included a description of water characteristics influencing boating activity; a summary of the aesthetic values of the unit; identification of special wildlife habitat characteristics providing increased opportunities for wildlife observation; and general viewing characteristics within the river corridor.

Level of access was described to provide information regarding the types of recreational activities possible, potential use volume, and opportunities for primitive or isolated recreation experiences versus a more developed recreation experience. Assessment of land- and water-based recreation activities, natural features and access levels resulted in a diversity rating for the recreation unit.

The final recreation evaluation class for each recreation unit was based on a combined assessment of diversity and importance. A recreation unit evaluated as Outstanding a) provides significant recreation opportunities encompassing a great diversity of activities; or b) provides a unique or rare experience within the region or planning area; or c) receives the highest use; or d) possesses an agency designation indicating national or regional significance.

A recreation unit evaluated as High is characterized by river segments a) receiving high use; or b) potentially providing an important recreation experience which is not rare but lacking in the region. Moderate to Low designations define those river segments with recreational opportunities typical in the region and receiving moderate to low use, and/or having low recreation diversity. Table 16 summarizes the results of the recreation evaluation for the Middle Snake reach. Information for specific recreation units is available from the Department of Water Resources.

Table 16. Recreation Evaluation Criteria and Results for the Middle Snake Reach

EVALUATION CLASS	CRITERIA	RECREATION UNITS
Outstanding	Significant recreational opportunities available as indicated by a great diversity of activities; a unique or rare experience; highest use areas; or agency designation indicating the national or regional significance of recreational opportunities	***Milner Bridge to Main Milner Powerhouse*** - unique expert whitewater boating run (Class V) at high flows ***Star Falls to Twin Falls Reservoir*** - Star Falls one of the last undeveloped waterfalls in the reach, unique expert whitewater boating run comparable to the Grand Canyon (Class IV-IV+) ***Twin Falls Reservoir to Shoshone Falls Dam*** - recreational use of reservoirs and parks is very high ***Crystal Springs to Thousand Springs (north end of Ritter Island)*** - significant diversity combined with unique recreational opportunities ***Thousand Springs to Lower Salmon Falls Dam*** - Hagerman National Monument and high diversity of recreational opportunities ***Lower Salmon Falls Dam to Bliss Bridge*** - unique year round whitewater boating opportunity receiving significant use ***Bliss Dam to Clover Creek*** - unique and highly-valued sturgeon fishing opportunities
High	River segments with a high use volume; and/or a recreation opportunity which is not rare but not typical in the region	***Main Milner Powerhouse to Star Falls*** - potential intermediate whitewater boating run offering easy access in an isolated setting ***Pillar Falls to Centennial Park*** - high use volume
Moderate and Low	River segments with moderate to low use volume; low diversity of opportunities; and/or providing recreational opportunities typical and abundant within the region	***Milner Dam to Milner Bridge*** - low use and diversity ***Shoshone Falls Dam to Pillar Falls*** - low use and recreation diversity ***Centennial Park to Rock Creek*** - moderate recreation diversity ***Rock Creek to Crystal Springs*** - low use and recreational diversity ***Bliss Bridge to Bliss Dam*** - low use and recreational diversity

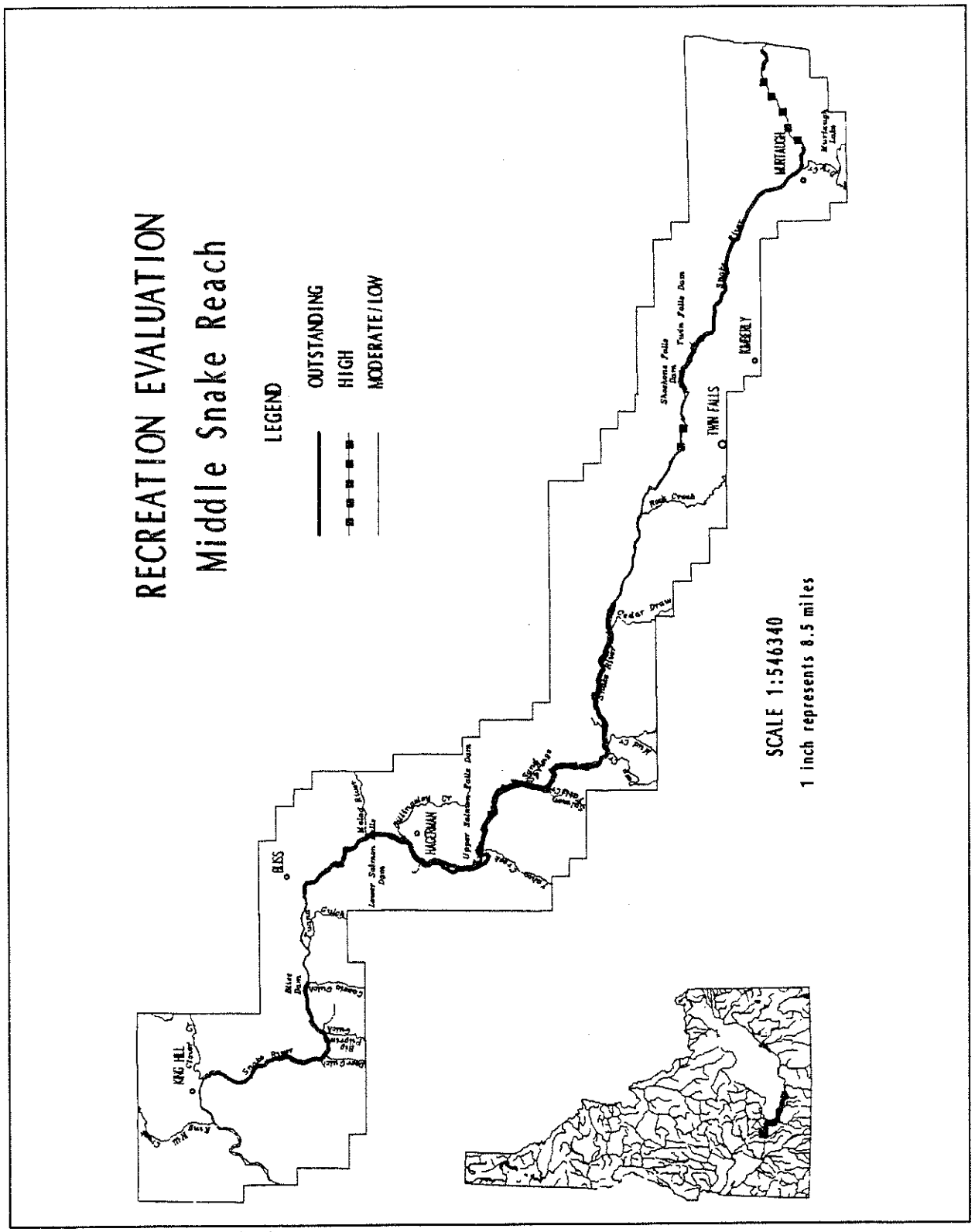

Figure 6. Recreation Evaluation Map.

Bibliography

Amaral, Grant, 1990. *Idaho - The Whitewater State: A Guidebook.* Chelsea, Michigan: Bookcrafters.

Ater, Gail, 1992. Idaho Rivers United. Personal communication.

B & C Energy, Inc., 1992. Revised Application for License - Star Falls Hydroelectric Project - FERC No. 5797, Volume XVIII - Response to FERC Request for Additional information Regarding Revised Application.

Blau, Terry, 1992. Idaho Department of Water Resources. Personal communication.

Bluestein, S.R., 1981. *Hiking Trails of Southern Idaho.* Caldwell, ID: The Caxton Printers, Ltd.

Boggs, Bill, 1992. Outdoor Recreation Planner, Burley District Bureau of Land Management. Personal communications.

Bolduc, Mark, 1992. Co-owner, Thousand Springs Tours. Personal communication.

Bond, Patty, 1992. Tourism Development Specialist, Idaho Department of Commerce. Personal communication.

Brandt, Mark, 1992. Boat Safety Training Specialist, Idaho Department of Parks and Recreation. Personal communication.

Bridges, Marti, 1992. Idaho Rivers United. Personal communication.

Carpenter, Leslie Benjamin, 1990. *Idaho Wildlife Viewing Guide.* Helena, MT:Falcon Press.

Cordell, H. Ken, John C. Bergstrom, Lawrence A. Hartmann, and Donald B. K. English, 1990. *An Analysis of the Outdoor Recreation and Wilderness Situation in the United States 1989-2040.* Fort Collins, CO: Rocky Mountains Forest and Range Experiment Station, General Technical Report RM-189.

Dolonich, Peggy, 1992. Trails Manager, National Park Service. Personal communications.

Don Chapman Consultants, Inc. 1992. Application for License for the Kanaka Rapids Hydroelectric Project (No. 10930), Empire Rapids Hydroelectric Project (No. 10849), and Boulder Rapids Hydroelectric Project (No. 10772).

Edson, Greg, 1992. Middle Fork Rapid Transit. Personal communications.

Ericson, Del, 1992. Lessee, Canyon Springs Golf Course. Personal communication.

Feldman, Murray D. and William J. McLaughlin, 1986. "Idaho River Study 1984: A Continued Look at Boater Use on Nine Non-Designated River Segments in Idaho - Volume 3, Snake River Murtaugh Bridge to Twin Falls Reservoir." Report for Idaho Department of Parks and Recreation.

Fuhrman, Roger, 1992. Idaho Power Company. Personal communications.

Gardner, Olin, 1992. Owner, Idaho Guide Service. Personal communications.

Gibson, Harry R. and Steven M. Mate, 1976. *Survey of Angler Use and Harvest in the Snake River From C. J. Strike Flowline Upstream to Bliss Dam, Project F-63-R-5.* Idaho Department of Fish and Game, Boise, ID.

Grunder, Scott A., 1986. *Regional Fishery Management Investigation, Region 4 Reservoir and Stream Investigations* - Job IV-c. Idaho Department of Fish and Game, Boise, ID.

Grunder, Scott A., Steve C. Elam, and Robert J. Bell, 1989. *Regional Fisheries Management Investigations, Region 4 Lowland Lake and Reservoir Investigations* - Job No. IV-b. Idaho Department of Fish and Game, Boise, ID.

Harris, Charles C., Joanne Tynon, Sharon E. Timko and William J. McLaughlin, 1989. "The 1987 Idaho Leisure Travel and Recreation Study: Analysis for Region IV - Final Report." Report for Idaho Debarment of Commerce, Boise, ID.

Heider, Darrell, 1992. Twin Falls County Solid Waste and Parks and Recreation. Personal communications.

Hess, Randy, 1992. Owner, White Otter Outdoor Adventures. Personal communication.

Holmes, Burt, 1988. *Hagerman Valley "1000 Springs Scenic Route."*

Idaho Department of Commerce, 1991. *Idaho Travel Council Conversion Research Study.*

Idaho Department of Fish & Game, N.D. *The Official Guide to Fishing in Idaho.*

_____, 1986-1990. Summary of 1986-1990 Bird Harvest Estimates.

_____, 1990. *Idaho Sportsman's Access Guide.*

_____, 1991a. License and Tag Transaction Summary for 1990.

_____, 1991b. *Fisheries Management Plan 1991-1995.*

Idaho Department of Parks and Recreation. N.D. "A Guide to Idaho Boating Facilities."

_____, 1989a. Boating Survey Data for Snake River From Lower Salmon Falls Dam to Bliss Bridge.

_____, 1989b. *1990 Centennial Edition: Idaho Outdoor Recreation Plan.*

_____, 1991. Idaho Campground Directory.

Idaho Outfitters and Guides Licensing Board, 1992. Outfitters Records.

Idaho Transportation Department and U.S. Department of Transportation, 1988. Environmental Assessment for Clear Lakes Grade, Gooding County, Idaho [Project RS-2709(6)].

IPC [Idaho Power Company], 1981. *A.J. Wiley Recreation Survey - Project No. 2845.*

_____, 1985. *Supplement to Twin Falls Relicensing Application - Project No. 18-000.*

_____, 1991. FERC Form 80 - Recreation Reports.

Jenks, Frank, 1992. Outdoor Recreation Planner, Bruneau Resource Area, Boise District Bureau of Land Management. Personal communication.

King, Neil, 1992. Manager, Hagerman Fossil Beds National Monument, National Park Service. Personal communication.

Kvale, Craig, 1992. Regional Wildlife Manager, Idaho Department of Fish and Game, Jerome, ID. Personal communication.

Lesser, Rob, 1992. Regional sales representative for Perception kayaks. Personal communication.

Loam, Jayson, Davis Bybee and Marjorie Gersh, 1990. *Hot Springs and Hot Pools of the U.S.* Santa Cruz, CA: Aqua Thermal Access.

Lucachick, Mary, 1992. Resource Specialist, Idaho Department of Parks and Recreation. Personal communications.

Lukens, James R., 1982. *Status of White Sturgeon Populations in the Snake River, Project F-73-R-4.* Idaho Department of Fish and Game, Boise, ID.

Lynott, Kevin, 1992. Malad Gorge State Park Manager, Idaho Department of Parks and Recreation. Personal communication.

McBride, Randy, 1992. Owner, High Adventure River Tours. Personal communication.

Moore, Greg and Don McClaran, 1989. *Idaho Whitewater: The Complete River Guide for Canoeists, Rafters and Kayakers.* McCall, ID: Class VI Whitewater.

Musil, Dave, 1992. Regional Wildlife Biologist, Idaho Department of Fish and Game. Personal communications.

Nelson, Louis J., 1986-1991. Summary of 1986-1991 Big Game Harvest Estimates. Idaho Department of Fish and Game, Boise, ID.

Partridge, Fred, 1992. Regional Fisheries Manager, Idaho Department of Fish and Game, Jerome, ID. Personal communication.

Perletti, Paula, 1992. Outdoor Recreation Planner, Shoshone District Bureau of Land Management. Personal communications.

Peterson, John, 1992. Golf Pro, Jerome Country Club. Personal communication.

Planmakers, 1991. *A Study and Action Plan for Idaho's Commemoration of the Oregon Trail Sesquicentennial: 1993 and Beyond.* Boise, ID.

Ramsey, Jack, 1992. Buhl Economic Development Council. Personal communication.

Reid, Will, 1972. *Survey of Angler Use and Fish Harvest in the Snake River* - Job No. II-a. Idaho Department of Fish and Game, Boise, ID.

Reid, Will, 1989. *Idaho Anglers, A Survey of Opinion and Preferences.* Idaho Department of Fish and Game, Boise, ID.

Reingold, Ben, 1992. Recreation Planner, Idaho Power Company. Personal communications.

Ridenhour, Larry, 1992. Outdoor Recreation Planner, Shoshone District Bureau of Land Management. Personal communications.

Ross, Jeff, 1992. Archaeologist and Outdoor Recreation Planner, Boise District Bureau of Land Management. Personal communications.

Sager, Brent, 1992. Managing Agent, High Adventure River Tours. Personal communications.

Sharp, Marty, 1992. Outdoor Recreation Planner, Shoshone District Bureau of Land Management. Personal communications.

Sligar, Marge, 1992. Co-owner, Sligar's Thousand Springs Resort. Personal Communication.

Thorne, Warren, 1992. Club Manager, Blue Lakes Country Club. Personal communication.

Turnipseed, Dale, 1992. Regional Land Manager, Idaho Department of Fish and Game, Jerome, ID. Personal communications.

U.S. BLM [Bureau of Land Management], 1989. *Recreation 2000 Implementation Plan - Idaho Unlimited Outdoor Adventure.*

_____, 1992. Recreation Management Information System (RMIS) Database for 1991.

U.S. Bureau of Land Management, Shoshone District, 1985. Box Canyon Area of Critical Environmental Concern Management Plan.

_____, 1986-1991. Commercial Special Recreation Permit - River Trip Logs.

Wilhite, Bill, 1991. Park Ranger, Hagerman Fossil Beds National Monument, National Park Service. Personal communication.

Wood, Dwayne, 1992. Recreation Planner, Idaho Power Company. Personal communications.

Zuck, Betty, 1992. Twin Falls Chamber of Commerce. Personal Communication.