Idaho Department of
Environmental Quality

Blacks Creek Subbasin Assessment

December 2001

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Executive Summary

Blacks Creek is a small stream in Southwestern Idaho originating in the Danskin Mountains, flowing out into the Boise valley and ending in Blacks Creek Reservoir. All creeks in the watershed, including Blacks Creek, are intermittent or ephemeral. The watershed drains 25,000 acres of rangeland. The 303(d) listed segment is 13.22 miles in length and extends from the headwaters of Blacks Creek to the reservoir. Blacks Creek is 303(d) listed for sediment, dissolved oxygen and nutrients. No beneficial uses are designated for the water body. Sources of sediment are from both natural conditions and anthropogenic sources, including roads, grazing, borrow pits and off road recreation use. Nutrients primarily enter the stream through natural sources and grazing.

Blacks Creek was listed on the 303(d) list using anecdotal observations: no habitat or water quality data were provided in support of the listing. Data gathered since the listing shows that while sources of sediment and nutrients exist, the stream is able to naturally attenuate these inputs during the times when there is water in the creek. No beneficial uses are designated in the water quality standards for Blacks Creek. However, the presumed uses are secondary contact recreation and cold water biota.

The water quality data show that while the temperature and dissolved oxygen levels are adequate to support cold water biota, the seasonality or lack of water prevents a cold water community from becoming fully established. There are no coldwater indicators in the macroinvertebrate data and no evidence of cold water fish. The aquatic life community in Blacks Creek is limited by the stream's intermittent nature and lack of perennial pools. This limitation is not the result of excess pollutants introduced through human caused activities but rather, the lack of water due to natural conditions. The cold water organisms cannot re-establish their community structure in the short period of time that water is available to them.

The receiving water, Blacks Creek Reservoir, is a warm water fishery and is stocked accordingly. The majority of the year, there is no direct drainage of Blacks Creek into the reservoir. The stream is either dry or submerged in the gravel substrate south of Interstate 84. It is presumed that the reservoir fills primarily by ground water infiltration. While this report addresses the reservoir, the reservoir itself is not part of the 303(d) listed water body and is not subject to a TMDL.

Coldwater aquatic life in Blacks Creek is limited by natural conditions and not by pollutant loading, hence, the DEQ finds that a TMDL is not necessary for Blacks Creek. Instead, DEQ will propose changing the aquatic life use designation to modified aquatic life use to better describe the limitations on the biotic community due to the seasonality of water. The modified aquatic life use describes streams, such as Blacks Creek, that are limited in aquatic life diversity due to factors such as ephemeral or intermittent flow, naturally occurring pollutant levels or long-standing hydrologic modification. The modified use criteria and subsequent rule change will be completed during the next rule making cycle.

Subbasin Watershed Characterization

Blacks Creek is located in the Northeast portion of Hydrologic Unit Code (HUC) 17050114, which is the lower Boise River watershed (Figure 1). Blacks Creek is a 13.22 mile system that flows through Elmore and Ada counties, Idaho (Figure 2), draining 25,000 acres of rangeland. As early as 1887 (Foote, 1887), Blacks Creek was determined to be intermittent in the lower reaches, flowing mainly in the spring. In 2001, DEQ found the entire stream dry by mid-July. The creek flows in a Southwesterly direction from its origin in the Danskin Mountains to Blacks Creek reservoir. In addition to Blacks Creek, Bryans Run, an ephemeral stream, drains Slaters Flat and drains into the SE corner of the reservoir.

Elevation in the subwatershed ranges from 3212 feet at the reservoir to approximately 4800 feet at the headwaters (Figure 3 shows watershed slope). Blacks Creek originates from springs near Three Point Mountain and flows out of the foothills onto the valley floor.

Geology

Blacks Creek lies within the western Snake River Plain and above the Mountain Home Aquifer. Blacks Creek is underlain by Idaho batholith granodyrite broken through by rhyolite tertiary dikes. In the southern part of the subwatershed, the basalt of Slaters Flat is in contact with gravels in Blacks Creek. In the northern part of the watershed there is a NE trending fault along Blacks Creek, which provides contact between gravels and granite. Beneath the basalt flows and terrace gravel are 100-150 feet of sandy gravel which overlie another 800 to 1000 feet of alluvial fan/fan-delta sediments (Squires 1992). Figure 4 shows a general overview of the watershed geology.

At the base of the foothills, the plains area consists of quaternary basalt with alluvial sediments. Around the Bonneville Point area are alluvial fan gravels and some periglacial features of granite. These mounded features are formed from weathered, decomposed granite that has been affected by freeze thaw cycles

Soils are derived predominantly from river and wind born materials. The soils generally have weakly developed profiles, are unleached, alkaline, and have high natural fertility. Soil textures found in the subwatershed are silty and sandy loams in the lower portion and terraces and loamy sands and sandy loams in the upper portion as shown in Figure 4 (Collett, 1972).

Climate

Climate within the subwatershed is arid to semi-arid. The summer months are hot and dry while the winters are cold and wet, though generally not severe. The average summer temperature during the period of 1975-1995 was 70.4 F in Boise, with an average daily maximum temperature of 86.1 F. In winter, the average temperature in Boise from 1975-1995 was 30.9 F and the average daily maximum temperature was 39.0 F (Western Regional Climate Center, 2001). Average annual precipitation is about 18.9 inches at the Arrowrock Dam, North of Blacks Creek. Average annual precipitation during the period of 1975 -1996 in Boise was 12.31 inches (Western Regional Climate Center, 2001). Most precipitation falls during the colder months. Snow accumulation is typically light and usually melts shortly after it falls in the valley. Accumulation in the watershed occurs in the foothills of the Danskin range where Blacks Creek originates.

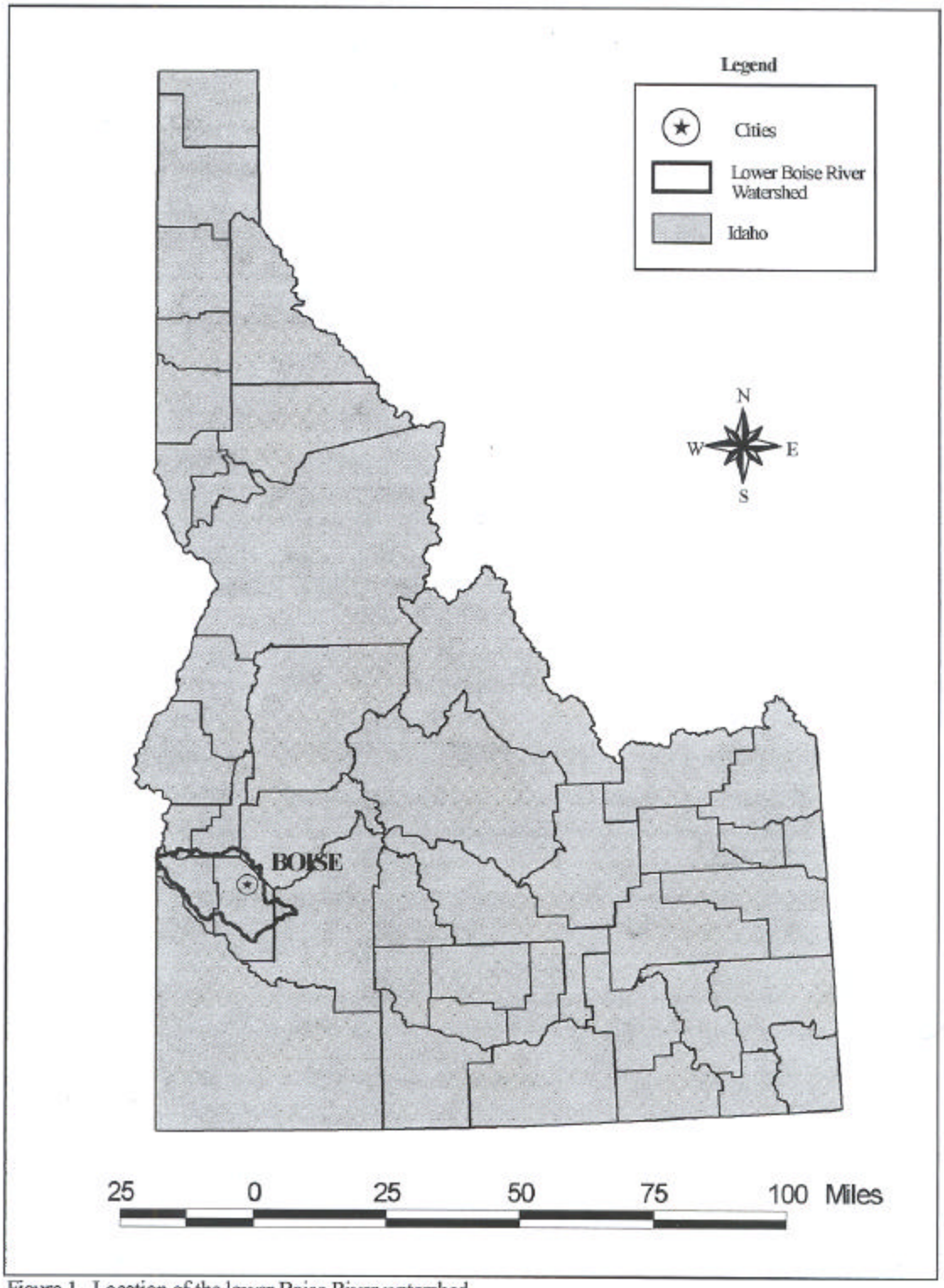

Figure 1. Location of the lower Boise River watershed.

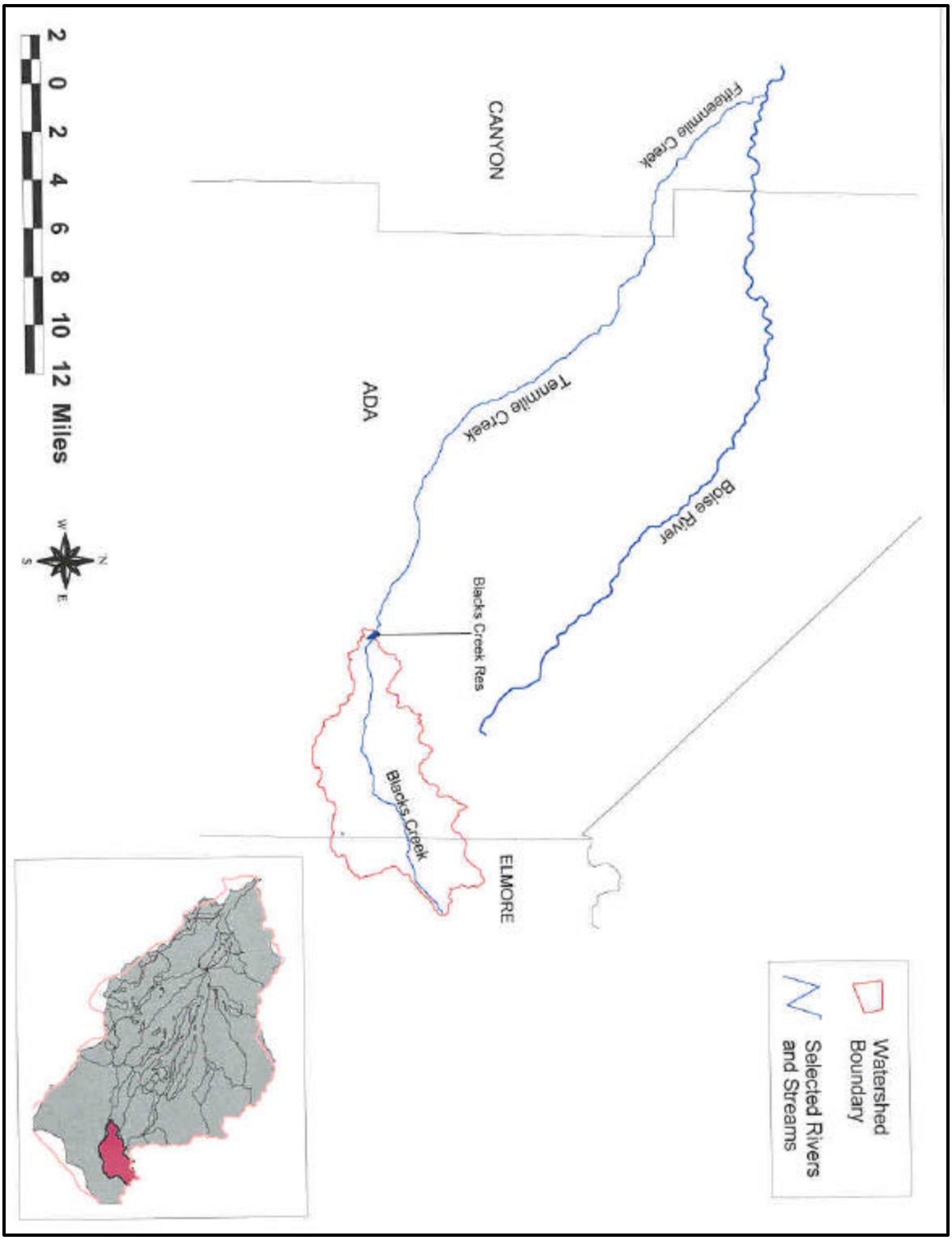

Figure 2. Blacks Creek Watershed

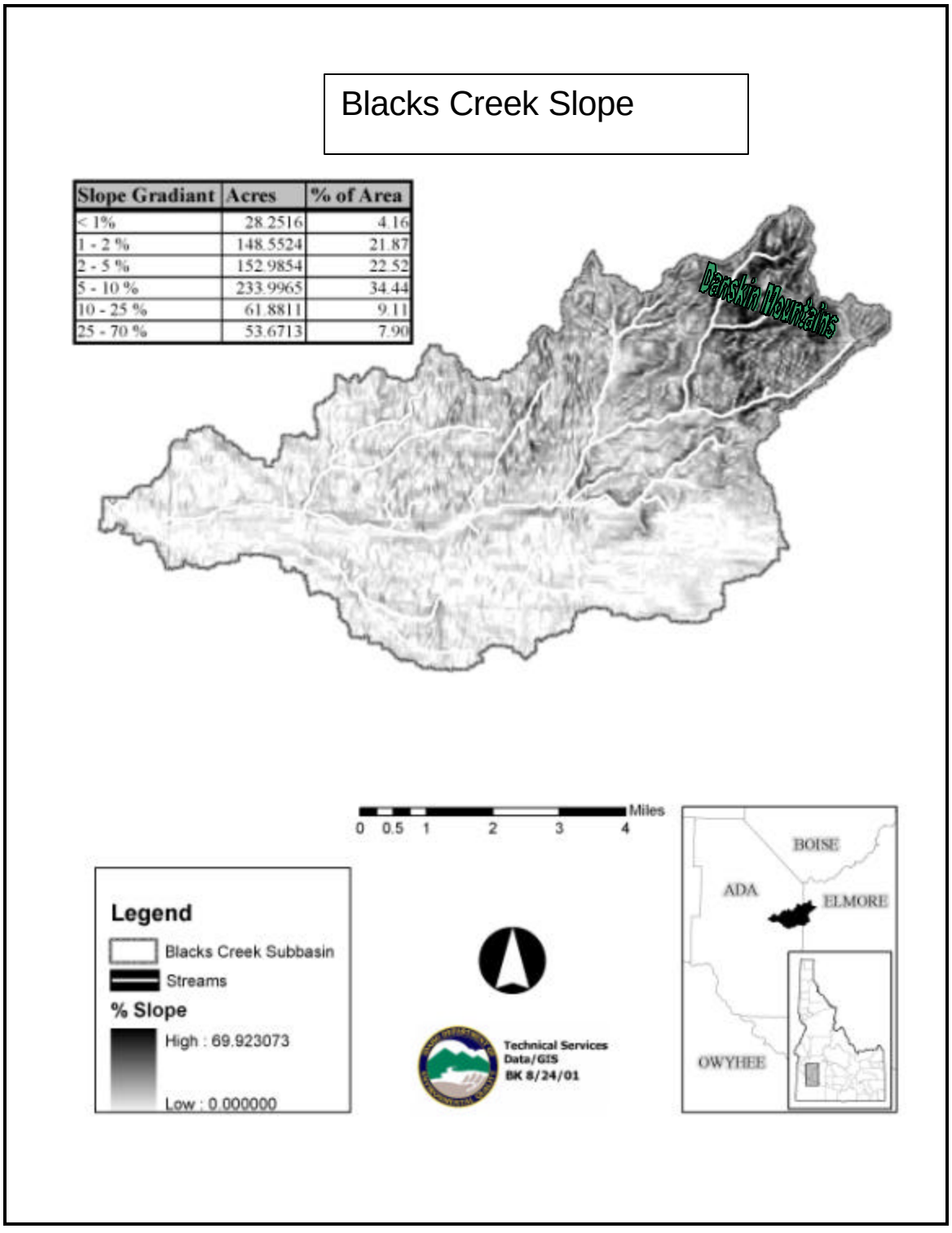

Figure 3. Blacks Creek Slope

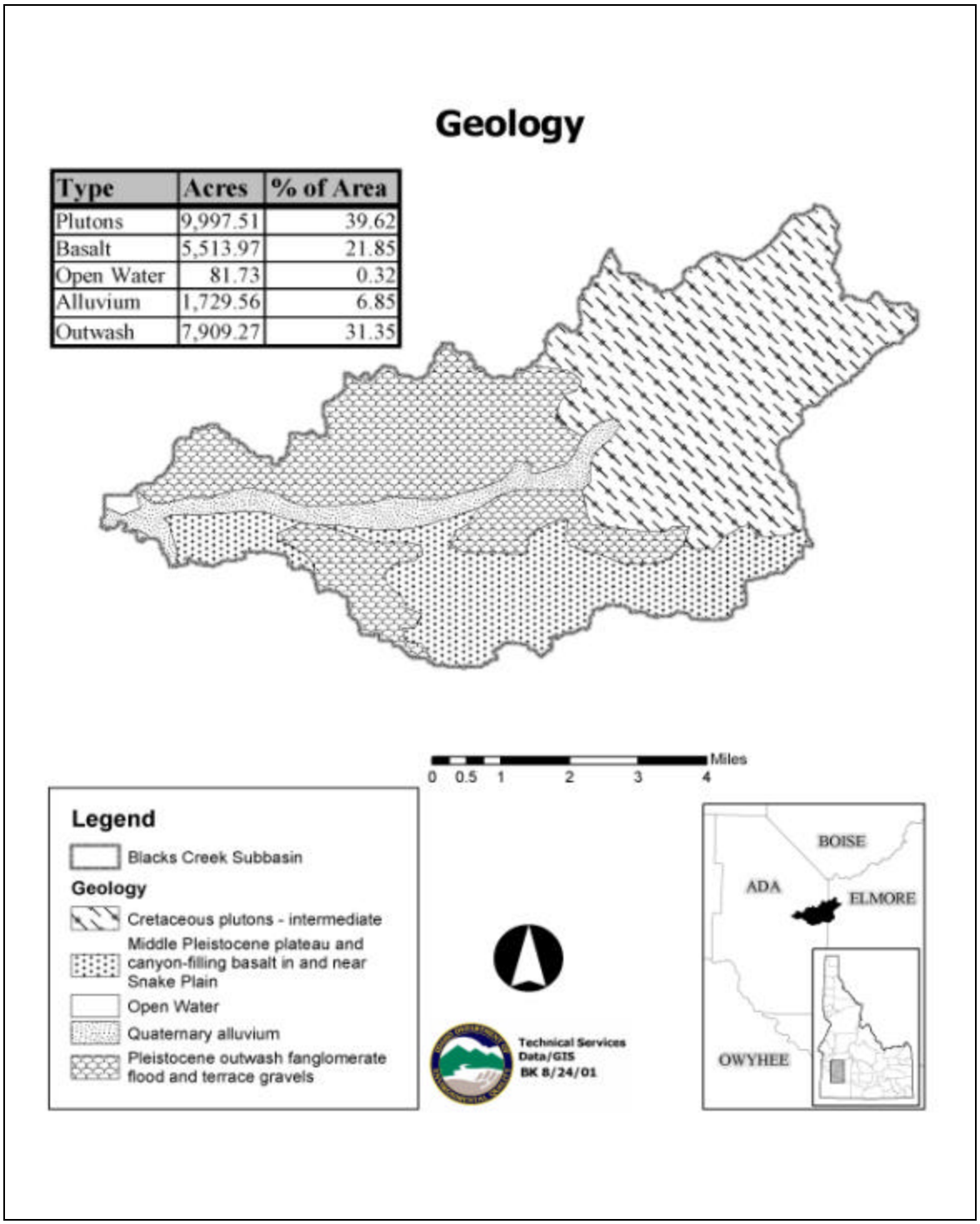

Figure 4. Blacks Creek Geology

Surface Water Hydrology

Blacks Creek originates from several springs in the Danskin Mountains. The 1898 and 1903 United States Geologic Survey (USGS) maps showed Blacks Creek to be perennial to 3600' and then intermittent to the town of Blacks. The current USGS 1:24,000 map shows Blacks Creek headwaters to be perennial and then the rest of the creek to be intermittent to Blacks Creek Reservoir.

Very little flow data exists for Blacks Creek since it is not gauged. Based on the data that has been located (see Table 1), the creek is largely influenced by spring runoff. Low/no flow conditions generally begin in July and last through early winter. In this subbasin assessment, the upper reach refers to the portion of Blacks Creek that lies in the Danskin Mountain foothills. The lower reach is the section that flows out onto Slaters Flat as shown in Map A. A Department of Environmental Quality (DEQ) Beneficial Use Reconnaissance Project (BURP) survey in June 1997 found a flow of .04 cfs in the upper reach and on July 24, 1996 found that site to be dry. The upper reach flows continuously for a longer period than the lower reach.

Near Blacks Creek Reservoir, where the creek exits the hills into the flats, Blacks Creek typically goes underground into the alluvial sand and gravel that make up Slaters Flat unless there is significant runoff or precipitation.

Blacks Creek Reservoir is a 220-acre impoundment at full pool. In low water years, the reservoir is less than 50 acres.

Blacks Creek, June 2001

Table 1. Flow Data for Blacks Creek

Date	Location	SITE ID	Flow (CFS)
07/7/96	Upper Reach	96SWIROA55	Dry
06/11/97	Upper Reach	97LOWBOI01	.04
6/11/98	Upper Reach	1998SBOI006	3.73
6/11/98	Lower Reach	1998SBOI005	2.59
3/15/00	Upper Reach	1998SBOI006	1.95
3/15/00	Lower Reach	1998SBOI005	4.62
03/8/01	Upper Reach	1998SBOIB006	.41

Ground Water Hydrology

Blacks Creek lies above the Mountain Home Plateau aquifer. The Mountain Home Plateau aquifer is fractured basalt in the Blacks Creek area, and there are no perched water zones in the subwatershed. Recharge of this system occurs as downward percolation of precipitation in the Danskin Mountains and losses from Blacks Creek (Norton et al. 1982). Because of the generally low amounts of precipitation and the high potential for evaporation, direct precipitation on the lowlands of the plateau contributes little to recharge (Young, 1977). Groundwater flows in a southerly to southwesterly direction. Generally, the water table is deep, 500-700 feet below the surface. In the area around the reservoir the aquifer is unconfined. (Squires & Derricot 1992)

Channel and Substrate Characteristics

Blacks Creek originates as a series of springs which combine to form a small, moderate - low sinuosity meandering stream. The stream flows through a narrow valley which widens in the downstream direction. In the uppermost reaches the stream is not entrenched. Downstream, where the road more closely parallels and constrains the stream as the valley narrows, moderate entrenchment is seen. Blacks Creek becomes braided in the lower reach as it exits the valley and flows onto Slaters Flat and into Blacks Creek Reservoir.

In 1997, IDEQ BURP crews conducted Wolman pebble counts in both the upper and lower reaches of Blacks Creek. The substrate of the upper section is primarily made up of coarse and very coarse pebbles but ranges from silt/clay (0-1 mm) to small cobble (64.1-128 mm). During spring flows the smaller particles are flushed downstream leaving behind the heavier material. Subsequently, the dominant strata in the lower reach is sand. The lower section has a lower gradient and the streambed ranges from sand (1.1-2.5 mm) to large cobble (128.1-256 mm) (DEQ 1998). The streambed in the lower section ranged from silt/clay to small boulder (256.1-512 mm).

The stream channel has Rosgen classification scheme type G and C characteristics in the upper reach where the valley is narrow, Type C characteristics where Pole Creek enters and then Type C and G again to Blacks Creek Reservoir (Rosgen, 1994). In the lower reach where Blacks Creek exits the foothills, it is a C type channel characterized by low gradient, high width/depth ratio, with banks susceptible to accelerated erosion, moderate to high sediment supply and there is a broad, well-defined floodplain. The upper reaches do not show embeddedness, whereas downstream areas show moderate embeddedness of cobble and gravel. The banks are typically steeply sloped, but stable with vegetation.

Terrestrial and Aquatic Wildlife Characteristics

Blacks Creek and the lands adjacent to it are home to numerous species of wildlife. The watershed is an important over-wintering area for deer. In addition, several other species live on or near Blacks Creek. These species include fox, rabbit, weasel, deer, antelope, coyote, chukar, huns, frogs and other mammal and waterfowl species. Bear, mountain lion and elk have all been spotted in the Blacks Creek area at one time.

While Idaho Fish and Game stocks Blacks Creek Reservoir with large mouth bass, it is not done on a regular basis. (Dale Allen, IDFG, personal communication). Crappie are also present in the reservoir.

The dam at Blacks Creek Reservoir prevents cold water species migration from Ten-Mile creek into the watershed nor is there a documented cold water fishery in upper Ten-Mile Creek. The warm water fishery of Blacks Creek Reservoir, and the intermittent flows of Blacks Creek combine to prevent Blacks Creek itself from supporting a cold water fishery.

Cultural Characteristics

The Boise River valley and subsequently Blacks Creek was first explored in 1811 by overland explorers of John Jacob Astor's Pacific Fur company. The Boise valley was settled in 1863. Gold discoveries in 1862 in the nearby mountains prompted the founding of Boise City.

Mining and ranching took place in the Danskin mountains as evidenced by abandoned homesteads and old mining claims.

Demographics and Economics

Blacks Creek lies in relatively unpopulated areas of Ada and Elmore Counties, and there is little new development in the area. The deep groundwater has historically stymied development. Ada County itself, was one of the fastest growing counties in the United States from 1990 to 1999 with population increases of more than 37%.

Land Ownership and Land Use

Figure 5 illustrates the current land use pattern in the Blacks Creek subwatershed. The major land use is rangeland and there are a few residences/ranches in the area. Land ownership is primarily private although there are also federal and state owned landholdings as shown in Figure 6.

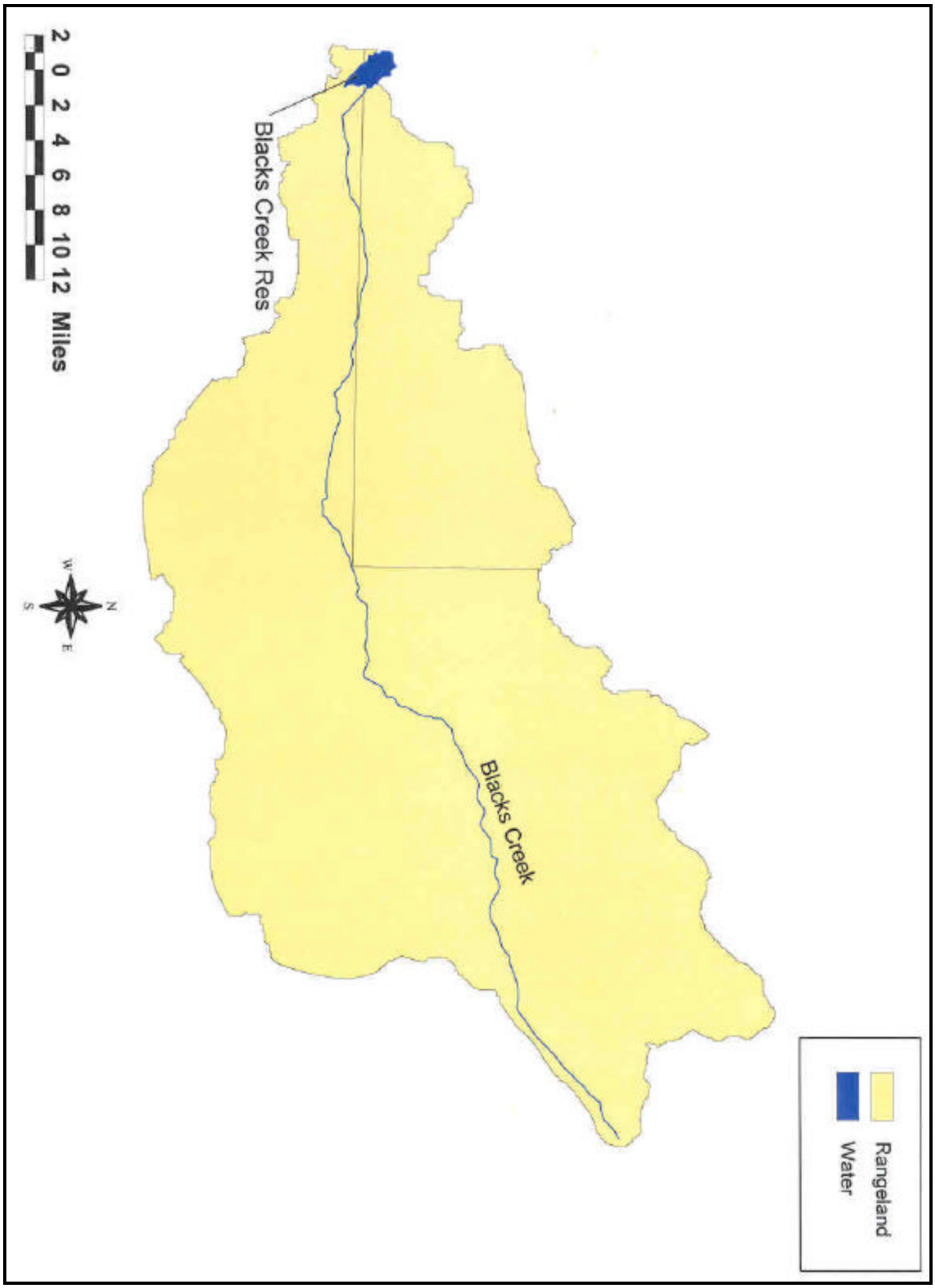

Figure 5. Blacks Creek Land Use (modified from IDWR 1994 data)

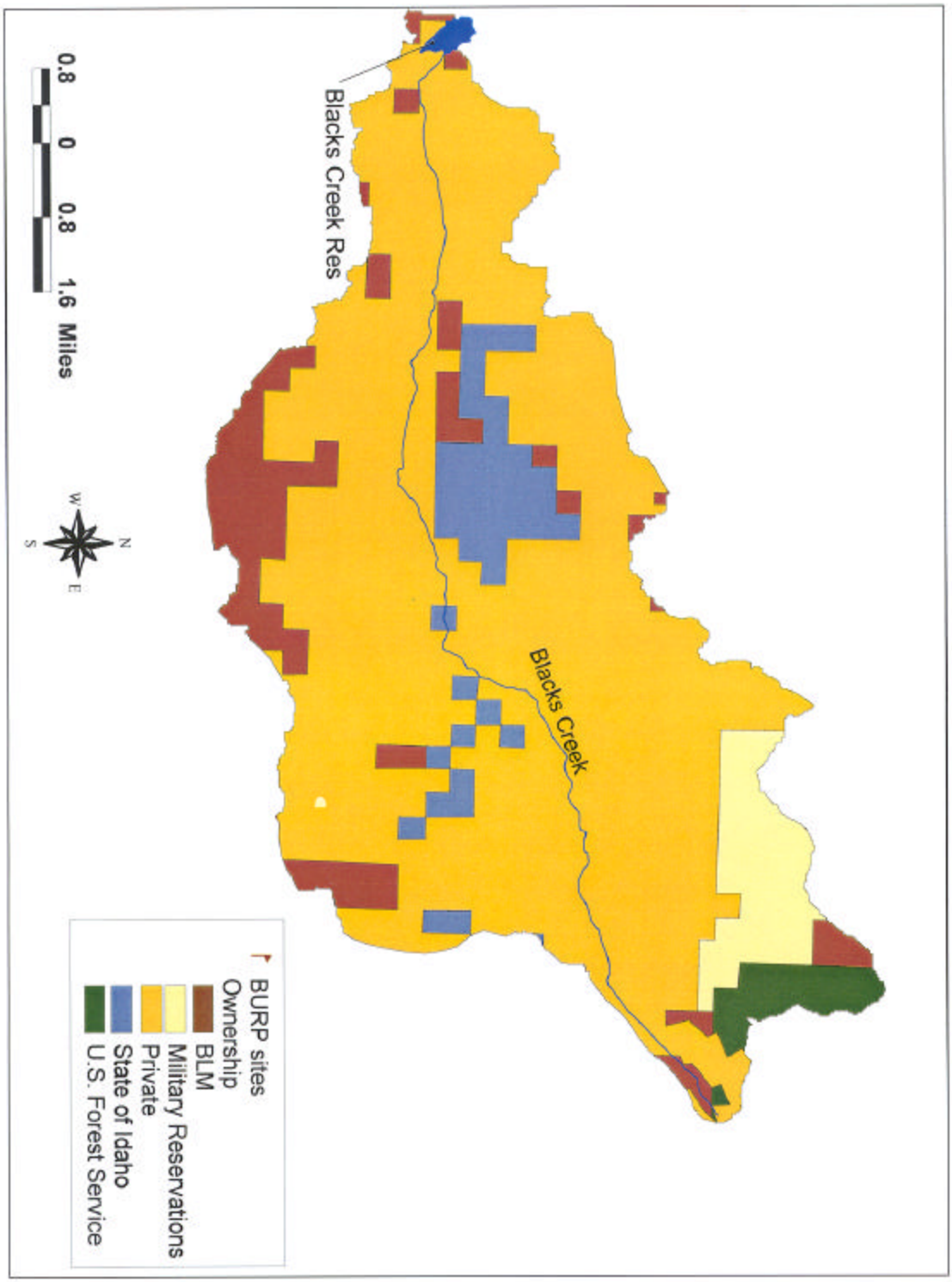

Figure 6. Blacks Creek Land Ownership

Public Involvement

Idaho Code section 39-3611 states that TMDLs shall be developed in accordance with section 39-3614 (duties of the basin advisory groups), section 39-3616 (duties of each watershed advisory group) and the federal Clean Water Act. Two groups within the lower Boise Valley are actively working to enhance the health and environment of the lower Boise River. The Lower Boise River Water Quality Plan (LBRWQP) was initiated in 1992 by stakeholders interested in water quality in the river, and was designated as the Watershed Advisory Group (WAG) for the lower Boise River watershed in July 1996. As the WAG, the group is responsible for advising the DEQ on the development of TMDLs in the watershed. Additionally, WAGs are to develop and recommend actions needed to effectively control sources of pollution in the watershed. Boise River 2000 focuses on issues related to the management of water quantity and flood control, but focuses primarily on the Boise River proper. Both groups are comprised of representatives from local and state government, environmental and recreation groups, agriculture, industry, flood control and drainage districts and concerned citizens. The primary goal of each group is to help improve and maintain the overall quality of the Boise River system, taking into account the member's individual and collective interests.

Subbasin Water Quality Concerns and Status

Blacks Creek (water quality limited segment 2737) is listed as water quality limited on the 1998 303(d) list for the state of Idaho. The 303(d) listed boundaries are the headwaters to Black's Creek Reservoir. The creek was originally proposed for the list in 1994 and officially listed in 1996 by EPA. The pollutants for which the stream is listed are shown in Table 2.

Table 2. Summary of Section 303(d) listed segments

Name	**Boundaries**	**Pollutants 1998 303(d) list**
Blacks Creek	Headwaters to Blacks Creek Reservoir	Dissolved Oxygen, Nutrients, Sediment

Surface Water Beneficial Use Classifications

The Federal Clean Water Act sets up a mechanism that the states use to protect their surface water from pollution and degradation. That mechanism is the establishment of water quality standards which are made up of beneficial uses of water and criteria designed to protect those uses. Surface water beneficial use classifications are intended to protect the various uses of the state's surface water. Idaho waterbodies that have designated beneficial uses are listed in *Idaho's Water Quality Standards and Wastewater Treatment Requirements*. They are comprised of five categories: aquatic life, recreation, water supply, wildlife habitat and aesthetics.

Aquatic life classifications are for waterbodies that are suitable or intended to be made suitable for protection and maintenance of viable aquatic life communities of aquatic organisms and populations of significant aquatic species. Aquatic life beneficial uses include cold water biota, warm water biota, seasonal cold water biota, modified communities and salmonid spawning.

Each aquatic life use has water quality criteria associated with them. These criteria are levels of chemical, physical and in some cases biological parameters that are necessary for the health of aquatic life. Aquatic life needs healthy levels of dissolved oxygen temperature and pH. Aquatic life must also not be exposed to lethal concentrations of chemicals, oxygen, sediment and nutrients.

Recreation classifications are for waterbodies that are suitable or intended to be made suitable for primary and secondary contact recreation. Primary contact recreation is defined as prolonged and intimate human contact with water where ingestion is likely to occur, such as swimming, water skiing and skin diving.

Water supply classifications are for waterbodies that are suitable or intended to be made suitable for agriculture, domestic and industrial uses. Industrial water supply applies to all waters of the state. Wildlife habitat waters are those which are suitable or intended to be made suitable for wildlife habitat. Aesthetics is a use that applies to all waters of the state.

IDAPA 58.01.02.140 designates beneficial uses for selected waterbodies in the Southwest Idaho Basin. Undesignated waterbodies are presumed to support cold water biota and primary or secondary contact recreation unless the Department of Environmental Quality determines that other uses are appropriate.

Beneficial Uses in Blacks Creek

No beneficial uses are designated in IDAPA 58.01.02.140 for Blacks Creek from its headwaters to Blacks Creek Reservoir. The Clean Water Act presumes that coldwater aquatic life, and primary or secondary contact recreation can be supported.

Applicable Water Quality Criteria

The Idaho Water Quality Standards and Wastewater Treatment Requirements contain numeric criteria necessary to protect beneficial uses. Currently, the following criteria are applicable to the pollutants of concern in Blacks Creek.

Sediment

Sediment shall not exceed quantities specified in IDAPA Sections 250 and 252, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in section 350 (IDAPA 58.01.02.200.08).

Excess Nutrients

Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses (IDAPA 16.01.02.200.06).

Turbidity

For cold water biota, turbidity below any applicable mixing zone set by the Department of Health and Welfare, Idaho Division of Environmental Quality, shall not exceed background turbidity by more than 50 Nephelometric Turbidity Units (NTU) instantaneously or more than 25 NTU more than 10 consecutive days (IDAPA 58.01.02.250.02.d).

Dissolved Oxygen

For cold water biota, waters are to exhibit the following characteristics:

Dissolved oxygen concentrations exceeding six (6) mg/l at all times (IDAPA 58.01.02.250.02.a).

Summary of Existing Water Quality Data

Blacks Creek subwatershed data is used to describe the physical and chemical water quality and the biological communities of the stream. In 2001, DEQ staff were unable to sample a lower reach location close to the reservoir due to a lack of flowing water in the creek. Instead, they sampled a site near the headwaters and a site below Pole Gulch where one of the major springtime tributaries enters the creek (Table 3). Figures 7 and 8 show the sampling locations.

Table 3. Blacks Creek Water Quality Data

Agency	Date	Location	Data Type
DEQ	07/7/96	Upper Blacks Creek	Biological (BURP)—DRY—no data collected
DEQ	06/11/97	97LOWBOI01	Biological (BURP)
DEQ	06/11/98	1998SBOIB005 1998SBOIB006	Biological (BURP)
DEQ	03/15/00	1998SBOIB005 1998SBOIB006	Bacteria, DO, Temp, Flow
DEQ	03/15/01	1998SBOIB006	Bacteria, DO, Temp, Flow
DEQ	03/23/01	Upper reach, IDFG gate	DO, Temp, Riparian
DEQ	02/08/01	Upper reach near headwaters	Morphology, nutrient
DEQ	06/05/01	1998SBOIB006	DO, Temp

Data Analysis

The DEQ used chemical water quality, biological, and physical habitat data to assess the support status of beneficial uses in Blacks Creek. The concentrations of listed pollutants in relation to applicable criteria (both numeric and narrative) are used to assess the status of beneficial uses and pollutants contributing to impairment. Evaluation of benthic macroinvertebrates and physical habitat give additional direct and indirect information about the status of aquatic life uses. In any location where criteria listed pollutants are exceeded on a chronic basis, a beneficial use is likely to be impaired. If beneficial uses are impaired by a Section 303(d) listed pollutant, a TMDL for that pollutant is required.

If beneficial uses appear to be impaired by a non-303(d) listed pollutant the DEQ has the option of preparing a TMDL at the current time or postponing the TMDL until a later date when additional data can be collected to validate the suspected impairment.

Water quality standards apply to intermittent waters during optimum flow periods, which are defined as $\geq$ 5 cfs for recreation and water supply uses and $\geq$ 1 cfs for aquatic life. BURP data from 1997 was not used to evaluate aquatic life communities because the flow was < 1 cfs.

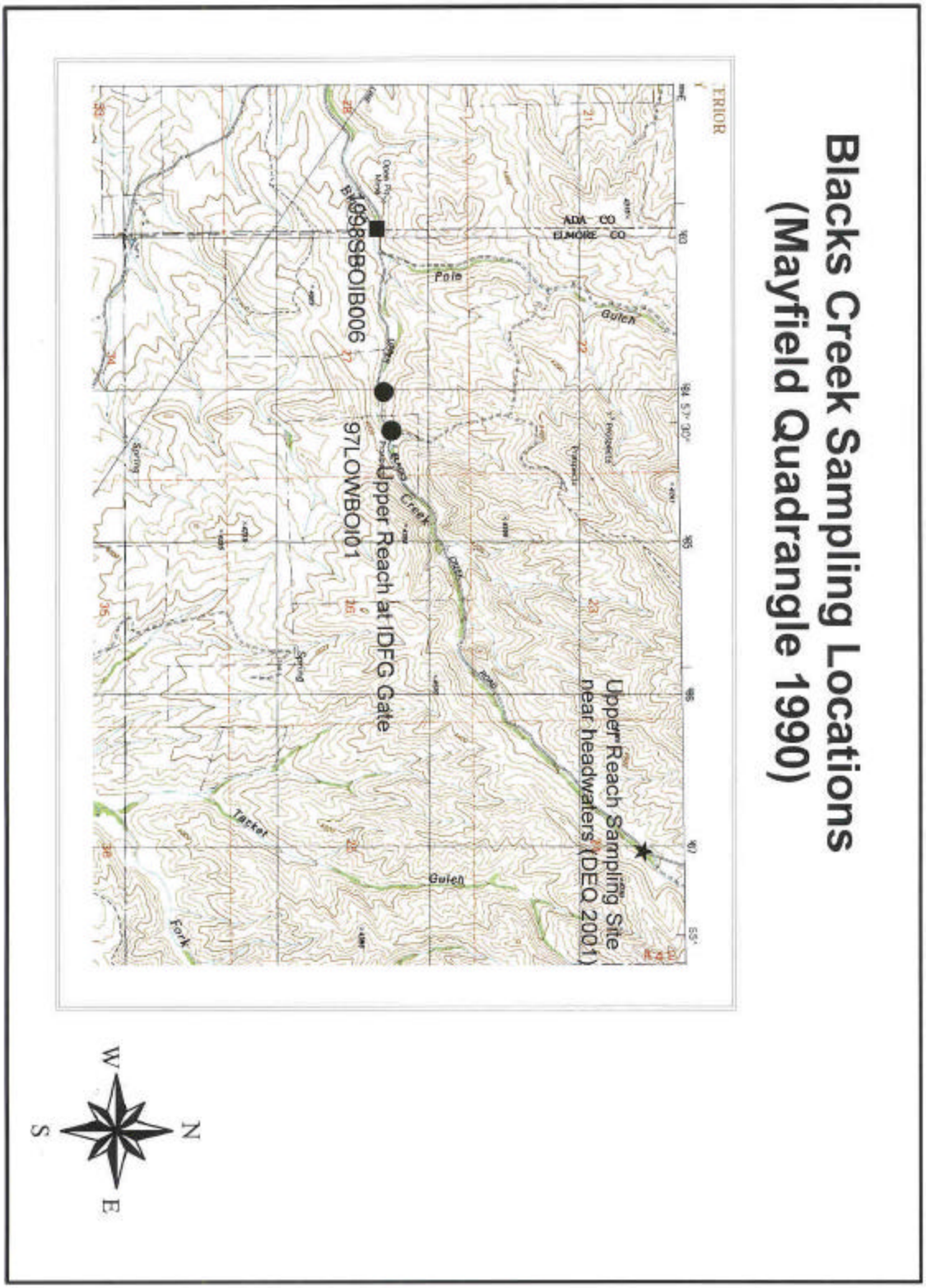

Figure 7. Upper Reach Sampling Locations

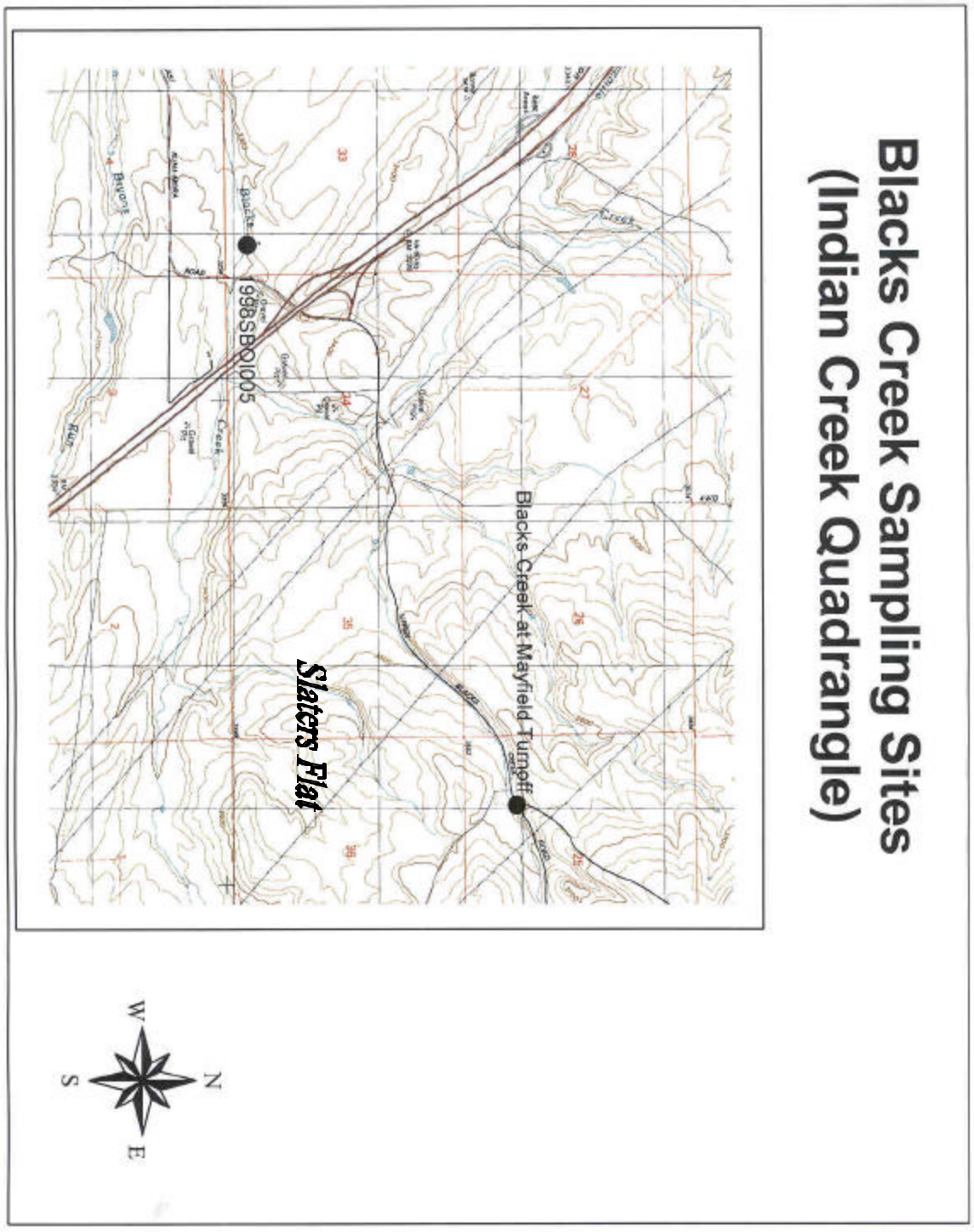

Figure 8. Lower Reach Sampling Locations

Dissolved Oxygen

As shown in Table 4, dissolved oxygen concentrations are above 6.0 mg/L throughout the stream. No data exists for the period of July 15-October 15 when diurnal sags typically occur because Blacks Creek does not flow during that time period.

Table 4. Dissolved Oxygen (DO) Results

Date	Site	DO (mg/L)
3/15/00	1998SBOIB006	11.27
3/15/00	1998SBOIB005	11.6
2/8/01	Upper Reach near Headwaters	9.55
3/23/01	1998SBOIB006	8.5
3/23/01	Lower Reach (Mayfield Turnoff)	8.64
6/5/01	1998SBOIB006	6.05*

*Dry in parts of upper and lower reaches, < 1cfs at sampling location

Suspended Sediment

Suspended sediment (TSS) and surface sediment characteristics can be used as direct indicators of sediment conditions in water bodies. Suspended sediment is defined as the sediment fraction that is suspended in the water column (typically < 0.1mm). Suspended sediment affects aquatic beneficial uses by covering macroinvertebrate living space and smothering fish spawning and rearing ground habitat when it occurs. Excess sediment can also reduce the value of contact recreation by reducing visibility, or creating an undesirable mucky substrate.

Suspended sediment samples were collected during runoff to determine peak flow concentrations. Suggested limits for TSS were developed by the European Inland Fisheries Advisory Commission and the National Academy of Sciences and adopted by the state of Idaho in previous TMDLs. The Lower Boise River TMDL adopted a target of less than or equal to 80 mg/L TSS for acute events lasting less than 14 days and 50 mg/L TSS for acute events lasting less than 60 days. While this target was established to be protective of salmonid spawning (which does not occur in Blacks Creek), it is being used as a threshold in this SBA to illustrate that TSS concentrations are not high enough to impact the existing aquatic life. The results show that aquatic organisms are protected during the periods of highest suspended sediment concentrations (Table 5). These levels are also well below the 50 mg/L target set for the Lower Boise River TMDL.

Table 5. Total Suspended Sediment Results for Blacks Creek

Date	Site	Total Suspended Sediment (mg/L)
3/8/01	1998SBOIB006	31
3/8/01	Upper Reach – headwaters	22

Surface Sediment

Surface sediment is defined as the sediment fraction that resides on the bottom of the stream but is not buried to a great extent. Surface sediment levels are commonly associated with bedload conditions.

There is little information that directly relates quantitative levels of surface sediment to deleterious effects on aquatic beneficial uses. While several authors have shown how different ranges of sedimentation affect macroinvertebrate community composition and distribution, (Waters 1995), Richards and Bacon (1994)), few have correlated specific values to aquatic life beneficial use support status. Excessive surface sediment impacts the macroinvertebrate communities by reducing dissolved oxygen concentrations in the substrate. Information does exist on the relationship between percent fine sediment (< 6.5mm) and salmonid spawning. Rhodes et al. (1994) concluded that survival to emergence for Chinook salmon in the Snake River Basin is substantially reduced when fine sediment concentrations exceed 20%. However, salmonid spawning does not occur in Blacks Creek and according to Rosgen (1994) percent fines of 30% are expected in type G4 streams. Where the stream is steeper and more deeply incised, percent fines of 60% are expected.

Wolman Pebble Count information from the most recent BURP surveys were used to determine substrate conditions (Table 6). Weathered unconsolidated granite outcroppings line the stream as it exits the Danskin Mountains which facilitates seasonal influxes of coarse granite sand and fine gravel from the adjacent land. Thus, a large percentage of sediment is attributable to natural background. Rosgen (1994) data indicate that percent fines of 30% are expected due to natural conditions. Other creeks in the Danskin Mountain area such as upper Indian Creek also show high background levels of fine material.

Table 6. Wolman Pebble Count Results for Blacks Creek

Date	Site	% Fines
6/11/98	1998SBOIB006	37%
6/11/98	1998SBOIB005	36%

Contact Recreation Beneficial Uses

Historical data indicate that from July through December the stream channel is dry, thus making contact recreation impossible. During the remainder of the year, a lack of data prevents a concrete assessment as to whether bacteria levels are exceeding the criterion. Because of the intermittent nature of Blacks Creek and its shallow depths, primary contact recreation is not likely. Secondary contact recreation consists of recreational uses where raw water ingestion is not probable, such as wading and boating. Low flows prevent the use of personal watercraft on Blacks Creek but other activities like wading are probable.

Overall, the contact recreational use of the creek is minimal. In the upper reach, fencing is prevalent and the riparian vegetation is thick enough to discourage stream access. In the lower reach access is more difficult since the road no longer follows the creek and the creek flows through fenced, private property. Also, the data collected by DEQ indicates that flow is often not at the optimal level (5 cfs) at which the water quality standards then apply.

Both primary and secondary contact recreation beneficial uses have associated numeric criteria in *Idaho's Water Quality Standards and Wastewater Treatment Requirements*.

Waters designated for primary contact recreation (May 1 - September 30) are not to contain E. coli bacteria significant to public health in concentrations exceeding:

- A single sample of four hundred six (406) E. coli per one hundred (100) ml; or
- A geometric mean of one hundred twenty six (126) E. coli organisms per one hundred ml based on a minimum of five (5) samples taken every three (3) to five (5) days over a thirty (30) day period.

Waters designated for secondary contact recreation (all year) are not to contain E. coli bacteria significant to public health in concentrations exceeding:

- A single sample of four hundred six (576) E. coli per one hundred (100) ml; or
- A geometric mean of one hundred twenty six (126) E. coli organisms per one hundred ml based on a minimum of five (5) samples taken every three (3) to five (5) days over a thirty (30) day period.

Bacteria samples collected by DEQ, shown in Table 7, on lower and upper Blacks Creek resulted in instantaneous E coli. counts well below the instantaneous criteria for both primary and secondary contact recreation.

Table 7. Bacteria Results for Blacks Creek

Date	Site	E. coli (cts/100 mL)
3/15/00	1998SBOIB006	6
3/15/00	1998SBOIB005	3
4/18/01	Upper Reach near headwaters	<1
4/18/01	Lower Reach at Mayfield *	93

* cattle present above sampling site

Nutrients

Under natural conditions, algae appear where sufficient nutrients, flow, temperature and sunlight combine to create suitable growing conditions. Naturally speaking, there are few ambient conditions that preclude algal growth of some kind. Excessive algal growth in the forms of periphyton, phytoplankon, macrophytes and other species can occur when nutrient levels become excessive, at some point becoming a significant deterrent to contact recreation. Algae blooms and excessive rooted aquatic macrophytes can physically interfere with boating, swimming and wading. Decomposing algae can create objectionable odors and under the right conditions, some species may produce toxins that could impair agricultural water supply and contact recreation. Nitrogen and phosphorus are the primary macro-nutrients that enrich streams and rivers and cause nuisance algae growth (EPA, 2000).

The exact nutrient levels at which algae growth becomes qualified as “nuisance” are not well defined. In addition, the very definition of nuisance algae levels are in question. The nutrient level and the mass of algae itself is different in nearly every water body. Thus, by itself, high levels of nutrients do not necessarily constitute impairment. Nuisance algae growth is often dictated by other limiting factors such as water velocity, substrate composition, ground water nutrient concentration and substrate nutrient concentration (in the case of attached macrophytes).

Without quantitative nutrient criteria in place, the determination of nuisance algal growth is commonly based on surrogate measures such as suspended and benthic algal biomass levels, dissolved oxygen levels, pH levels and the implied recreational value. All of these factors in turn give direct and indirect information about the status of beneficial uses.

EPA’s gold book criterion for total phosphate phosphorous is 0.10 mg/L. EPA has recognized the potential for eutrophication exists at this level. No state standards exist for the numeric value of excess nutrients. However, EPA has suggested guidelines to determine when phosphorus is in excess. To prevent the development of biological nuisance growth and to control accelerated cultural eutrophication, total phosphorus (as P) should not exceed 0.05 mg/l in streams where it enters a lake or reservoir. As a guideline, EPA has suggested that total phosphorus (as P) not exceed 0.1 mg/L in any stream or other flowing waters (USEPA 1986).

There is no chlorophyll-a data for Blacks Creek, and only spring-time phosphorus levels are available. During the runoff period, phosphorus levels were below 0.10 mg/L.

Samples were taken close to the headwaters to ascertain natural background concentrations of phosphorus. Although only two samples were taken, those samples show concentrations of 0.05 mg/L TP near the source, which illustrates naturally high background levels. The first sample was taken in the winter to minimize the possibility that runoff could potentially influence the sample, since the stream originates partway up a hill and near the road.

Monitoring staff were unable to sample Blacks Creek where it enters the reservoir because the flow was too low or nonexistent. Because the creek usually has subsurface flow before it enters the reservoir, the 0.1 mg/L criterion was utilized. During the peak months of the growing season, Blacks Creek is dry and BURP data indicate no visual nuisance algae growth.

Ammonia levels were below water quality standards of 2.0 mg/L and also below the recommended EPA criterion of 0.3 mg/L as shown in Table 8.

Table 8. Nutrient Data for Blacks Creek

Date	Reach	TP (mg/L)	NH3 (mg/L)
2/8/01	Upper, near headwaters	.054	.006
3/8/01	Upper, near headwaters	.059	.013
3/8/01	1998SBOIB006	.068	.008

Periphyton Results

Benthic algae occur naturally in streams, although under certain conditions, algal populations may reach nuisance levels and adversely affect other instream biological communities. Because of their rapid response to increases and decreases in nutrients and sediment, algal assemblages are a useful biological indicator. Algal assemblages are also:

1. easy to sample
2. ubiquitous over large geographical regions
3. can be used to quantify the rate of degradation or recovery of water quality
4. can be used to furnish reference conditions

Samples collected 6/11/98 at the upper site, showed a large percentage of *Achnanthes minutissima* which may indicate significant disturbance at this site by either physical (scour), chemical (toxicity) or biological (grazing by macroinvertebrates) mechanisms. A large number of *Cymbella sinuata* may indicate moderate siltation and/or a sandy substrate.

The Algal Biotic Index (ABI) data indicate that both reaches are not impaired for all metrics (Horsburgh and Steed, 1998). The %NIT/%NAV (genus *Nitzschia* and genus *Navicula*) is a siltation index where a ratio of 30.86 or above indicates recent sedimentation. As shown in Table 9, the scores for both reaches were both below 11 percent.

Table 9. Periphyton Data

Date	Site	%NIT/NAV
6/11/98	1998SBOIB006	8.39
6/11/98	1998SBOIB005	10.5

Aquatic Life Beneficial Uses

Aquatic insects and worms, as a group called benthic macroinvertebrates are good indicators of localized water quality and habitat conditions. Macroinvertebrates have a complex life cycle, often spanning a year or more. The life stages such as pupae and larvae are more sensitive than the adult stage, making them excellent surrogates for detecting short term and long term environmental variation. In addition, macroinvertebrates as a community are composed of species spanning a broad range of trophic levels. Thus, they are good indicators of the cumulative effects of water quality pollution.

As part of the Beneficial Use Reconnaissance project (BURP), macroinvertebrate samples were collected. The BURP data were collected in June of 1997 and 1998 in both the upper and lower reaches. BURP data from 1997 were not used to evaluate aquatic life communities because the flow was < 1 cfs. Water quality standards apply to intermittent waters during optimum flow periods, which are defined as $\geq$ 5 cfs for recreation and water supply uses and $\geq$ 1 cfs for aquatic life. Macroinvertebrate data were not collected during low/stable flow period (July 1-Oct. 15).

Interpretation of the BURP macroinvertebrate data is based on the DEQ macroinvertebrate biotic index (IDEQ 1996). The macroinvertebrate biotic index (MBI) scores were calculated using IDEQ (1996b) water body assessment guidance process. The MBI uses seven metrics: (taxa richness, EPT index, percent Ephemeroptera, Plecoptera, and Trichoptera (EPT), percent scrapers, percent dominant taxa, the Hilsenhoff Biotic Index, and Shannon's diversity index).

An MBI score of 2.5 or less renders a status call of 'impaired' for aquatic life (coldwater biota in most cases). An MBI score of 3.5 or greater is determined to be 'not impaired'. If a score falls between 2.5 and 3.5, the site was considered too close to determine and given a rating of 'needs verification' (IDEQ 1999). Table 10 shows the MBI scores for Blacks Creek.

Table 10. Macroinvertebrate Data for Blacks Creek

Date	Site	MBI Score
06/11/98	1998SBOIB006	MBI=2.75 (NV); no cold water indicators
06/11/98	1998SBOIB005	MBI=2.62 (NV); no cold water indicators

Macroinvertebrate communities adapt to various instream conditions. While dissolved oxygen and temperature conditions exist to support macroinvertebrate communities, the intermittent nature of the stream inhibits development of a diverse community, which is reflected in the lower MBI scores. Few taxa are obligate inhabitants of intermittent streams and generally, these taxa are found in pools since pools provide refuge longer than riffles in intermittent streams (Boulton & Lake 1992). Blacks Creek has few pools and the time necessary for reestablishment of aquatic communities in the stream prevent this water body from attaining higher MBI scores.

At this time, DEQ does not have guidance specific to intermittent streams. The state of Arizona does not include macroinvertebrate scores in their determinations of impairment for intermittent streams because they do not consider them comparable to perennial streams due to the lack of water. Considering these factors, the MBI scores were not used in determining impairment, but were used in determining whether coldwater biota are able to establish themselves in this stream.

No coldwater indicators have been found in the stream, although all measured in-stream temperatures were less than 16º Celsius. Further, all sites were sampled close to the end of the flow regime, which would be expected to result in a lower score due to stress on the aquatic community as the flows decrease.

Data Gaps

Monitoring of Blacks Creek is difficult due to the intermittent flow regime. Access is a problem in winter and spring because the roads are not plowed. Table 11 outlines the data gaps that have been identified during this assessment.

Table 11. Data Gaps

Pollutant or other Factor	Data Gap
Dissolved Oxygen	No diurnal measurements, no measurements at the end of the flow regime.
Nutrients	Only instantaneous data available, no data from summer or all flow regimes.
Biological	Chlorophyll-a data; no macroinvertebrate data throughout the system for the entire year.
Sediment	Stream bank erosion rates, sediment data for all flow regimes, only instantaneous suspended sediment data available: cannot evaluate duration of concentrations.

Pollutant Sources

Sediment

Roads may be a source of sediment input in the watershed. Unpaved roads parallel the creek for approximately 51% of Blacks Creek in the upper reach (Figure 9). There are roads within a ¼ mile of the creek for 90% of its length. In addition, there are several old borrow pits that contribute an unknown amount of sediment.

Off road recreation and grazing, to a lesser extent, cause sediment inputs in the upper and lower sections of the stream, although contributions from these sources have not been quantified due to a lack of data. Grazing takes place in the early season (before mid summer). This early grazing strategy results in minimal degradation of the riparian and stream condition. This is because Blacks Creek, like other C type streams is characterized by deep rooted, woody species such as dogwood and willow. In early season, the palatability of forage material in the upland adjacent to the riparian corridor is very high, reducing the pressure on the riparian corridor. Plant moisture is higher in the early season providing greater water availability in the upland areas, causing lower concentration of livestock along the riparian corridor. Low air temperatures also result in livestock using high energy or exposed slopes adjacent to the streamside zone. Nuisance insects are less problematic, reducing yarding up and wallowing in or next to the creek. The palatability of woody species is higher later in the season so excessive browsing does not occur early in the season. (This is true given the assumption that stocking rates, livestock distribution and carrying capacity is balanced in the riparian pasture). Rest following early grazing allows the riparian plants to regenerate during the rest of the growing season. (Rosgen, 1994)

Nutrients

Grazing occurs in the upper section, the season of use is generally in the springtime (late March through early June) and is influenced by water availability for livestock. The nutrient input from grazing has not been quantified. Natural sources of nutrient loading also include background levels in the water coming from the springs.

Pollution Control Efforts

In the lower reach at the DeMeyer Ranch, reseeding has occurred in the 150-acre area burned in the fire of 2000 and there are plans to re-seed the area burned in summer 2001. Grazing has been reduced 40% and no winter or early spring grazing occurs at any location. Finally, the feedlot on the ranch, which was originally sited alongside the creek, is no longer in operation.

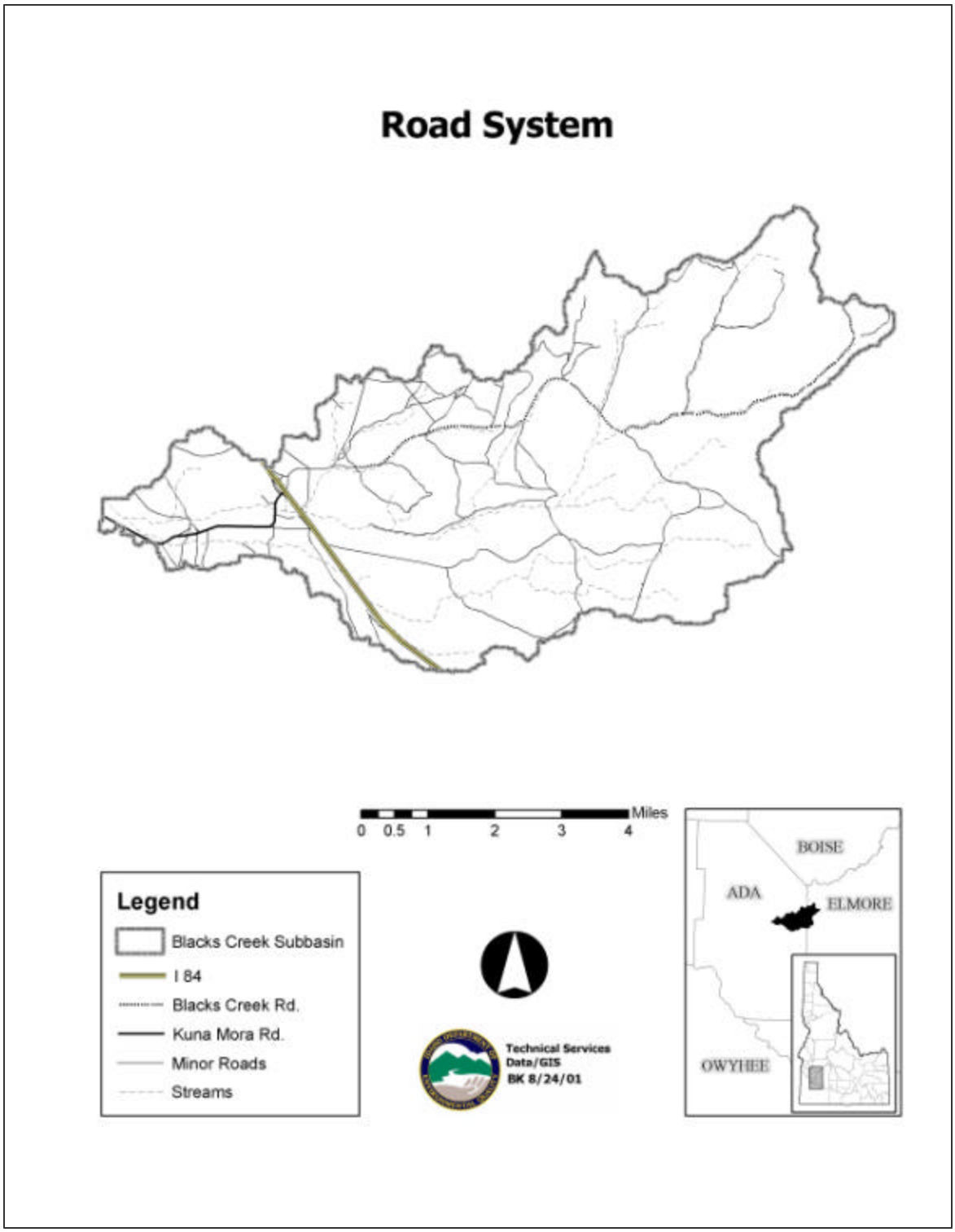

Figure 9. Roads in the Black Creek Watershed

TMDL Recommendations

The natural self-stabilization tendencies of Blacks Creek appear to be functioning such that the watershed attenuates inputs of nutrients and sediment well. While anthropogenic sources of sediment and nutrient are in existence in the watershed, they are not significant and are not impairing beneficial uses. DEQ has determined that because the intermittent hydrological nature of Blacks Creek predominantly affects its beneficial uses, a TMDL is not necessary for Blacks Creek.

Beneficial Use Recommendations

As mentioned above, the presumed used for Blacks Creek are cold water biota and secondary contact recreation. However, this assessment has determined that the full attainment of a cold water aquatic life community is limited by the intermittent flow regime of the stream. During years of unusually high snow pack, when the flow period is extended, a fully established aquatic life community may develop, but this does not represent normal stream conditions. The aquatic life community in Blacks Creek can be described using the modified aquatic life use designation. Modified aquatic life communities are those that are limited due to one or more conditions set forth in 40 CFR 131.10(g), which includes a condition for ephemeral and intermittent streams. Given the fact that aquatic life in Blacks Creek is not impaired by pollutants, but rather, is limited by intermittent flow, DEQ proposes a use change to modified during the next legislative session. During this time site specific criteria will be developed for Blacks Creek.

References

Allen, D. 2001. Personal communication with Dale Allen, Idaho Fish and Game, Nampa, Idaho.

Boulton, A.J., E.H. Stanley, S.G. Fisher, and P.S. Lake. 1992. Over-summering strategies of macroinvertebrates in intermittent streams in Australia and Arizona. Pp. 227-237 in R.D. Robarts and M.L. Bothwell (eds.), Aquatic ecosystems in semi-arid regions: Implications for resource management. NHRI Symposium Series 7, Environment Canada, Saskatoon, Saskatchewan.

Collett, R.A. 1972. Soil Survey of Ada County Area Idaho. United States Department of Agriculture, Soil Conservation Service, 327 p., maps.

Foote, A.D. 1887. Report on the Irrigating and Reclaiming of Certain Desert Lands in Idaho Projects Connected Therewith. 54p.

Horsburgh B. and R. Steed. 1998. Reconnaissance Monitoring of Algae Assemblages and Stream Conditions in Southwest Idaho. Idaho Department of Environmental Quality. 13 p.

IDEQ 1998, Lower Boise River TMDL Subbasin Assessment, Total Maxiumum Daily Loads. Idaho Department of Environmental Quality, Boise Idaho. 83 p.

IDEQ 1996. Water Body Assessment Guidance: A Stream to Standards Process. Idaho Department of Environmental Quality, Boise, Idaho.

Norton, MA, Ondrechen W. and J.L. Baggs. 1982. Ground Water Investigation of the Mountain Home Plateau, Idaho, Idaho Department of Water Resources, 62 p.

Richards, C., and K.L. Bacon. 1994. Influence of fine sediment on macroinvertebrate colonization of surface and hyporheic stream substrates. Great Basin Naturalist 54:106-113.

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena, Vol. 22, pp. 169-199.

Rosgen, D. L. Applied river morphology. Pagosa Springs, Colo.:Wildland Hydrology, c1996; 1 v.; ISBN 0965328902. R 84 N6-7

Schuld, Bruce. Water Quality Science Officer. 2000. Personal Communication, Idaho Department of Environmental Quality.

Squires, E., S.H. Wood, and J.L. Osiensky. 1992. Hydrogeologic framework of the Boise aquifer system, Ada County, Idaho. Idaho Water Resources Institute, University of Idaho, Moscow, Idaho, Research Technical Completion Report 14-08-0001-G1559-06, 114 p.

Squires, E., and S.L. Derricott, 1992. Hydrogeologic Investigation for the Proposed State of Idaho, Department of Transportation Blacks Creek Rest Area, Ada County Idaho, Idaho State Department of Transportation, 36 p.

USEPA United States Environmental Protection Agency. 1986. Quality Criteria for Water. EPA, Report 440/5-86-001, Washington D.C.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects and Control. American Fisheries Society 2, 251p.

Western Regional Climate Center, 2001, www.wrcc,dri.edu

Wisseman, B. 1996. Benthic invertebrate biomonitoring and bioassessment in western montane streams. Aquatic Biology Associates Inc. Corvallis, Oregon

Young, H.W. 1977. Reconnaissance of Ground-water Resources in the Mountain Home Plateau Area, Southwest Idaho. USGS Report 77-108 40 p.

Acronyms

(BAG)	Basin Advisory Group
(BMP)	Best Management Practices
(BURP)	Beneficial Use Reconnaissance Project
(CAFO)	Confined Animal Feeding Operation
(CFA)	Confined Feeding Areas
(CFR)	Code of Federal Regulation
(CWB)	Cold Water Biota
(DEQ)	Idaho Division of Environmental Quality
(DO)	Dissolved Oxygen
(EPA)	Environmental Protection Agency
(EQIP)	Environmental Quality Incentive Program
(HUC)	Hydrologic Unit Code
(IDA)	Idaho Department of Agriculture
(IDAPA)	Idaho Administrative Procedures Act
(IDFG)	Idaho Fish and Game
(IDHW)	Idaho Department of Health and Welfare
(IDWR)	Idaho Department of Water Resources
(LA)	Load Allocation
(LBRWQP)	Lower Boise River Water Quality Plan
(MOD)	Modified Aquatic Life (beneficial use)
(MOU)	Memorandum of Understanding
(NRCS)	Natural Resource Conservation Service
(NPDES)	National Pollutant Discharge Elimination System
(NTU)	Nephelometric Turbidity Units
(SCC)	Soil Conservation Commission
(SCD)	Soil Conservation District
(SCR)	Secondary Contact Recreation
(SBA)	Subbasin Assessment
(TP)	Total Phosphorus
(TSS)	Total Suspended Sediment
(TMDL)	Total Maximum Daily Load
(USBR)	United States Bureau of Reclamation
(USGS)	United States Geological Survey
(WAG)	Watershed Advisory Group
(WLA)	Wasteland Allocation
(WQPA)	Water Quality Programs for Agriculture
(WWTP)	Wastewater Treatment Plants

Glossary of Terms

Algal bloom - Rapid growth of algae on the surface of lakes, streams, or ponds; stimulated by nutrient enrichment.

Average flow - The average of annual volumes converted to a rate of flow for a single year; (measured in cubic feet per second cfs).

Base flow - Streamflow derived primarily from groundwater contributions to the stream.

Basin - A physiographic region bounded by a drainage divide; consists of a drainage system comprised of streams and often natural or man-made lakes. Also called drainage basin or watershed.)

Bed load - The larger or heavier particles of the stream load moved along the bottom of a stream by the moving water and not continuously in suspension or solution.

Beneficial use - Any water use that enables the user to derive economic or other benefit from such use.

Benthic fauna - Organisms attached to or resting on the bottom or living in the bottom sediments of a water body.

Biological community - All of the living things in a given environment.

Biota - The plant and animal life of a region.

Channelization - The artificial enlargement or realignment of a stream channel.

Climate - Meteorological elements that characterize the average and extreme conditions of the atmosphere over a long period of time at any one place or region of the earth's surface.

Confluence - The place where streams meet.

Dissolved oxygen (DO) – The amount of oxygen freely available in water and necessary for aquatic life and the oxidation of organic materials.

Diversion - The transfer of water from a stream, lake, aquifer, or other source of water by a canal, pipe, well, or other conduit to another watercourse or to the land, as in the case of an irrigation system.

Diversity - The distribution and abundance of different kinds of plant and animal species and communities in a specified area.

Ecology - The study of the interrelationships of living things to one another and to the environment.

Effluent - The sewage or industrial liquid waste that is released into natural waters by sewage treatment plants, industry, or septic tanks.

Growing season - The number of consecutive days having a minimum temperature above 32^{o}F.

Habitat – The native environment where a plant or animal naturally grows or lives.

Headwaters - The source and upper reaches of a stream; also the upper reaches of a reservoir.

Hydrograph - A graph showing the changes in discharge of a stream or river with the passage of time.

Hydrology - The science of waters of the earth; water's properties, circulation, principles, and distribution.

Impairment - A detrimental effect on the biological integrity of a water body caused by impact that prevents attainment of the designated or existing use.

Irrigation - The controlled application of water to cropland, hayland, and/or pasture to supplement that supplied through nature.

Irrigation return flow - Nonconsumptive irrigation water returned to a surface or ground water supply.

National Pollutant Discharge Elimination System (NPDES) - A permit program under Section 402 of the Clean Water Act that imposes discharge limitations on point sources by basing them on the effluent limitation capabilities of a control technology or on local water-quality standards.

Nonpoint source pollution - Pollution discharged over a wide land area, not from one specific location or discrete source.

Nutrients - Elements or compounds essential to life, including carbon, oxygen, nitrogen, phosphorus, and many others.

Organic matter - Plant and animal residues, or substances made by living organisms.

Perennial stream - A stream that flows from source to mouth throughout the year.

pH - An expression of both acidity and alkalinity on a scale of 0-14, with 7 representing neutrality; numbers less than 7 indicate increasing acidity and numbers greater than 7 indicate increasing alkalinity.

Point-source pollution - Pollution discharged through a pipe or some other discrete source from municipal water-treatment plants, factories, confined animal feedlots, or combined sewers.

Riparian area - Land areas directly influenced by a body of water. Usually have visible vegetation or physical characteristics showing this water influence. Stream sides, lake borders, and marshes are typical riparian areas.

Sediment - Fragmented organic or inorganic material derived from the weathering of soil, alluvial, and rock materials; removed by erosion and transported by water, wind, ice, and gravity.

Sedimentation - The deposition of sediment from a state of suspension of water or air.

Silt - Sedimentary particles smaller than sand particles, but larger than clay particles.

Subbasin - Subdivision of a major river basin, drained by tributaries or groups of tributaries, including associated closed basins.

Total maximum daily load (TMDL) - The total allowable pollutant load to a receiving water such that any additional loading will produce a violation of water-quality standards.

Tributary - A stream that contributes its water to another stream or body of water.

Turbidity - Cloudiness caused by the presence of suspended solids in water; an indicator of water quality.

Waste water treatment - Any of the mechanical, chemical or biological processes used to modify the quality of waste water in order to make it more compatible or acceptable to man and his environment.

Water quality - A term used to describe the chemical, physical, and biological characteristics of water with respect to its suitability for a particular use.

Water quality standard - Recommended or enforceable maximum contaminant levels of chemical parameters (e.g., BOD, TDS, iron, arsenic, and others) of water. These parameters are established for water used by municipalities, industries, agriculture, and recreation.

Watershed - Area of land that contributes surface runoff to a given point in a drainage system.