

1.B.9. Water Resources

Profile

Many factors affect the quality of water resources within the planning area. Potential sources of pollutants affecting water quality can be referred to as point sources or non-point sources. Point-source pollutants originate from a direct source such as permitted industrial discharges, sewage plant discharges, and direct runoff from feed-lot operations. Non-point source pollution comes from many diffuse sources such as rainfall, snowmelt, or surface water moving over and through the soil. As surface runoff moves, it picks up and carries away natural and human-made pollutants and may deposit them into streams, lakes, reservoirs, wetlands, and aquifers. Designated beneficial uses and general water quality can be negatively affected by these point and non-point pollutants. An excess of these pollutants can result in non-compliance with State surface and groundwater quality standards.

Runoff containing sediment and associated pollutants generally occurs as a result of two environmental factors. One is winter/spring snow melt and heavy rainfall periods occurring on saturated or frozen soils and in areas with rangeland soil surfaces lacking adequate vegetative ground cover to prevent excess erosion and sediment delivery off site. The other can occur after wildfire events on exposed rangelands during the summer months where intense summer cloudbursts impact large areas of unprotected soil resources due to a lack of plant and litter cover. Activities including, but not limited to, livestock grazing, OHV use, and fire suppression can affect sediment and other pollutants in the water.

Indicators

The water quality standards for the State of Idaho are the benchmark standards DEQ uses in order to protect, maintain, or improve surface water resources in Idaho. These standards support other Federal laws such as the Clean Water Act of 1977, the Water Resources Planning Act of 1962, the Pollution Prevention Act on 1990, and the Safe Drinking Water Act of 1977. The Idaho water quality standards are used to ensure the protection of the beneficial uses of water including cold water fisheries, recreation, and agriculture. Idaho BLM adopted these water quality standards to protect public health and welfare and enhance the quality of the water on public lands within the State of Idaho.

If water resources are in good condition, Standards 2 (Riparian Areas and Wetlands), 3 (Stream Channel/Floodplain), and 7 (Water Quality) of the S&Gs should be met as documented by S&G assessments conducted by an ID team (BLM, 1997). See Appendix 2 for more information on S&G assessments.

S&G assessments were conducted by BLM from 1998 through 2003 on 44 allotments on a total of 840,000 acres within the planning area. Standards for riparian areas and wetlands (Standard 2), stream channel/floodplain (Standard 3), and water quality (Standard 7) did not apply to nearly half of the acres assessed. The majority of the acres where Standards 2,3, and 7 did apply did not meet those standards (Table 1).

Table 1. S&G Determinations for Standards 2, 3, and 7, 1998-2003

Standard	Determination*				Standard Does Not Apply
	Standard is Being Met	Progress is Being Made Towards Meeting Standard	Standard is Not Being Met		
			Cattle Not a Significant Factor	Cattle a Significant Factor	
2 – Riparian Areas and Wetlands	3%	4%	8%	44%	41%
3 – Stream Channel/ Floodplain	3%	3%	8%	46%	42%
7 – Water Quality	2%	0%	14%	29%	43%

Percentages were rounded to the nearest whole number and Standards may not total 100%.
 *Determination displayed as percent of 840,000 acres assessed.

DEQ indicators for water quality include sediment, water temperature, dissolved oxygen (DO), *E. coli* (*Escherichia coli*), streamflow alterations/diversions, nutrients, and mercury. The DEQ criteria for each of these indicators are displayed in Table 2.

Table 2. Indicators and Standards for Monitoring Watershed Water Quality

Indicator	Measurement	DEQ Standards
Sediment	Total suspended solids	50-52 mg/L (average monthly)
		80 mg/L (weekly max)
Temperature	Maximum instantaneous temperature	72°F
	Maximum daily average temperature	66°F
Dissolved Oxygen	DO (mg/l)	> 6.0 mg/l
<i>E. coli</i>	<i>E. coli</i> (cfu/100ml) ^A	less than 126 cfu/100ml
Streamflow Alteration/Diversions	Presence/absence of dewatering	no dewatering
Nutrients	Ammonia	The 30 day average of total ammonia nitrogen is not to exceed the Criterion Continuous Concentration ^B more than once every 3 years.
	Total Phosphorous	0.100 mg/L free-flowing streams, 0.050 mg/L mouth of streams into lake/reservoir, 0.025mg/L lake/reservoir
Mercury	Methyl Mercury	0.3mg/kg of fresh weight fish tissue

^A The concentration of *E. coli*, based on a minimum of 5 samples during any 30-day period, must not exceed a geometric mean of 126 per 100 mL, nor may more than 10% of total samples during any 30-day period exceed 410 per 100 mL.
^B See IDAPA 58.01.02 for formula to calculate Criterion Continuous Concentration.
 Source: IDAPA 58.01.02

Sediment

Fine sediments in the water can increase the amount of turbidity and suspended solids and factor into raising water temperatures, decreasing DO, and detrimental impacts to fish and other aquatic organisms. As the suspended solids settle on the streambed, fine particles can accumulate and cover gravel and cobble on the streambed. This decreases

the amount of available spawning habitat for a variety of fish such as bull trout, redband trout, and white sturgeon. Increases in fine particles reduce the amount of habitat available for aquatic insects and other macroinvertebrates.

Sediment is a major limiting factor for water quality in the planning area. Increased instream fine sediments are linked to the unstable streambanks and a lack of upland and riparian vegetation that filters surface-water runoff from the uplands. Potential sources of upland surface water include spring snowmelt, summer cloudbursts, roads and drainage ditches, areas burned by wildfire, and areas with concentrated livestock use.

Water Temperature

Water temperature is a limiting factor for distribution and abundance of aquatic organisms. Many aquatic species can only inhabit and reproduce successfully within a specific range of water temperature. Elevated water temperatures can be harmful or lethal, isolate species by creating a thermal migration barrier, and decrease the amount of DO in the water.

High water temperatures and increased nutrient levels can create large algal blooms in popular recreation areas such as the Snake River and Salmon Falls Creek Reservoir. The increase of water temperature may be attributed to lack of overhead vegetation, decreased streamflows from irrigation diversions, warm irrigation return water, decreased amounts of spring and groundwater water discharge, and human-caused or natural low flows in the summer.

Water temperatures are highly variable during the day and throughout the year. Temperatures are generally low from the fall through the spring and increase in the summer. Water temperature is usually warmer in summers due to lower flows from drought. Daily changes in water temperature between highs and lows are greatest in the summer.

Dissolved Oxygen

Aquatic species require a certain amount of DO in surface water to perform biological functions such as respiration, and successful reproduction. Low amounts of DO can limit the distribution of aquatic species or can be lethal at substantially reduced levels. Potential sources of low DO levels include high water temperatures, decreased surface water flows, elevated nutrient levels, high suspended solids, and large colonies of bacteria within the sediments of a streambed.

E. coli

The presence of *E. coli* in the water indicates it has been in contact with or contaminated by fecal matter. High amounts of *E. coli* bacteria pose a risk to recreational users and may be stressful to aquatic organisms sensitive to bacterial outbreaks. Ingestion of this bacterium by humans and livestock can lead to severe illness. *E. coli* contaminations of water are caused by improper disposal of human waste and the presence of livestock waste in the riparian area. In addition to *E. coli*, a number of other bacteria may be present including *Salmonella*, fecal coliform, and fecal streptococcus (Tiedemann et al.

1987). *Giardia*, a protozoan, can cause illness when ingested. *E. coli* may not be a suitable indicator to detect the presence of *Giardia* (Tiedemann et al., 1987).

Streamflow Alteration/Diversions

DEQ criteria for streamflow are based upon the presence or absence of the dewatering of streams. Streamflow affects many critical factors associated with aquatic organisms. Reduced streamflows can increase temperature, decrease DO levels, cause fine sediments to accumulate in the streambed, concentrate bacteria and nutrients in the streambed, and alter the composition of the riparian vegetation. Riparian plant species, which stabilize streambanks and provide cover and forage for fish and wildlife, demonstrate low vigor and cannot persist when streamflows are substantially reduced or absent. The diversion of surface water for agriculture and livestock use can deplete, and in many cases completely dewater, entire reaches of a stream. This destabilizes stream habitats and alters migration corridors, limiting the distribution of aquatic species.

The annual amount of precipitation directly influences streamflows and can lead to severely reduced surface flows or drought-like conditions. As streamflows are reduced, aquatic species are concentrated into areas with remaining water, making them more susceptible to disease and predation. Diversions can substantially alter the recharge of groundwater sources and the seasonal streamflow regime. Over time, native fish species evolved under natural flow regimes and may not be able to adapt to rapid fluctuations in streamflow. In addition, fish and other aquatic species may be displaced into irrigation diversions and canals where the environment is not suitable for long-term survival.

Nutrients

Nutrients can increase the productivity of surface water in rivers and streams. This increase in productivity can lead to large algal blooms that rapidly reduce DO levels and decrease the visual value of a body of water. Some non-native species, such as small mouth bass, thrive in nutrient rich waters, enabling them to out-compete native fish that evolved in a low nutrient aquatic environment.

Increased nutrients may be derived from agricultural runoff into the water system. DEQ identified nutrients as a factor in the Snake River, Bruneau River, Cedar Creek, Roseworth Reservoir, and Salmon Falls Creek and Reservoir. BLM does not have data on aquatic nutrient levels within the planning area.

Mercury

Mercury occurs naturally in the environment. Presence of mercury in a water system can lead to bioaccumulation within the fatty tissue of fish and other aquatic species. Some of these species are game fish harvested by recreationists for consumption. Large amounts of mercury consumption is harmful to humans, especially pregnant women and unborn children. The organic form of mercury, methyl mercury, is more toxic to humans than the inorganic form.

Potential sources of mercury include atmospheric fallout from volcanic activity, active or abandoned mine lands, and a variety of industrial pollutants. Within the planning area,

DEQ identified mercury as a factor in the Snake River and Salmon Falls Creek Reservoir. DEQ is responsible for monitoring mercury levels throughout Idaho.

Current Condition

There are three primary drainage basins or “watersheds” within the Jarbidge planning area: the Bruneau River Watershed, the Salmon Falls Creek Watershed, and the Snake River Watershed. The current condition of water quality in these watersheds is affected by land uses on BLM managed lands and lands not managed by BLM. Many of the water courses within the planning area flow through private, State, and other managed lands. Practices increasing sedimentation, water temperature, *E. coli*, nutrients, and mercury levels, and decreasing DO levels on lands not under BLM management affect water quality on BLM-managed land. In many cases, BLM can only address water quality related issues that arise from activities on BLM-managed land.

Streams listed by DEQ as water quality limited (impaired) for one or more of the indicators (also known as Clean Water Act (303)d-listed streams) are listed in Table 3 and displayed in Figure 6.

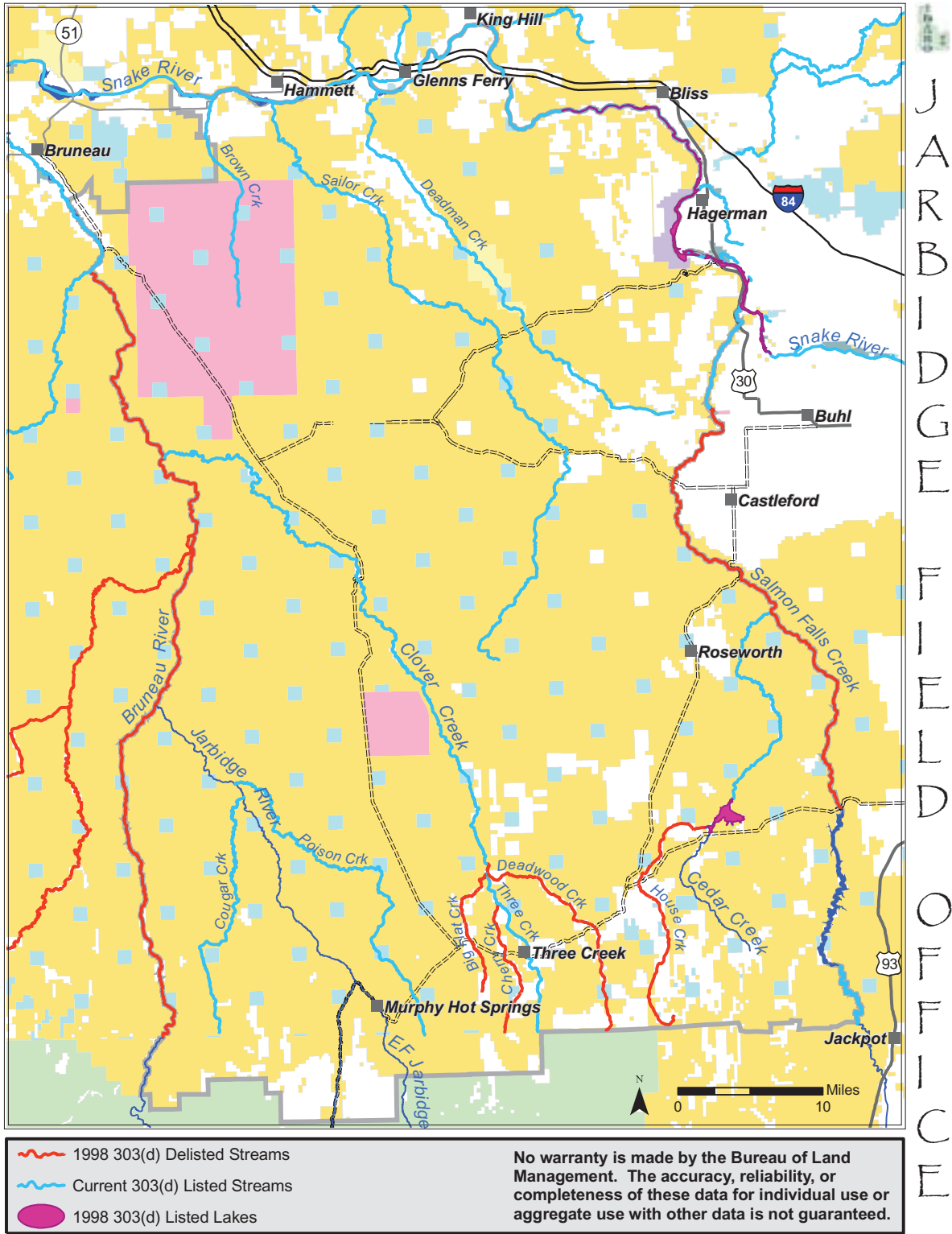
Table 3. 303d Water Quality Limited Streams

Watershed/River	Sediment Limited	Temperature Limited	Nutrient Limited
Bruneau River Watershed			
Bruneau River	X	X	X
Clover Creek	X		
Three Creek	X		
Poison Creek	X		
Cougar Creek	X		
Jarbidge River		X	
East Fork Jarbidge River		X	
Salmon Falls Creek Watershed			
Salmon Falls Creek	X	X	X
Cedar Creek	X		X
Salmon Falls Reservoir			X
Cedar Creek Reservoir			X
Snake River Watershed			
Snake River	X	X	X
Sailor Creek	X		
Browns Creek	X		
Deadman Creek	X		

Bruneau River Watershed

The primary tributaries of the Bruneau River Watershed are the Jarbidge River and the East Fork of the Bruneau River (Clover Creek). The tributaries of the Jarbidge River are Dave Creek, Jack Creek, Deer Creek, Buck Creek, Columbet Creek, Dorsey Creek, Poison Creek, Cougar Creek, and the East and West Forks of the Jarbidge River. The tributaries of Clover Creek are Big Flat Creek, Cherry Creek, Three Creek, Deadwood Creek, Deer Creek, and Pole Creek.

Figure 6. Water Quality Limited Streams



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Currently, this watershed includes a recently completed Bruneau Subbasin Assessment and Total Maximum Daily Load Plan, which is in the implementation stage. This plan was approved by EPA in March 2001 and assessed nine water bodies, four of which are in the Boise District, and 19 pollutants listed on the 1998 303(d) list. The five streams involved in the Jarbidge planning area include Cougar Creek, Poison Creek, Three Creek, Clover Creek, and the Bruneau River; however, since Cougar Creek and Poison Creek were classified as intermittent, no Total Maximum Daily Loads (TMDLs) were developed for them. Pollutants of concern for which TMDLs have been developed include nutrients, sediment, and bacteria for the Bruneau River, Three Creek, and Clover Creek, respectively. Sediment was determined to be the most common listed pollutant in the watershed (Lay, 2000).

Sediment

DEQ identified the Bruneau River, Clover Creek, Three Creek, Poison Creek, and Cougar Creek as water quality limited due to sediment. BLM has limited data on the amount of Total Suspended Solids (TSS) in streams in the Bruneau River Watershed. Data collected on TSS determines the amount of very fine sediments suspended in the water column. The creeks surveyed by DEQ for TSS include Buck Creek, Cherry Creek, Deer Creek, Deadwood Creek, Dave Creek, Flat Creek, Jack Creek, the Jarbidge River, and Three Creek (Table 4). All creeks sampled by BLM passed according to the State water quality standard for TSS; however these data largely reflect one-point-in-time samples for individual streams.

In 2006, BLM measured the number of pools dominated by fine sediments in the tributaries of Clover Creek containing redband trout (Table 5). Three Creek, Deadwood Creek, Deer Creek, and Pole Creek had less than 20% of their pools dominated by fine sediment. Big Flat Creek was the only tributary surveyed to exceed this amount, with 21% of its pools dominated by fine sediment.

Table 4. Results of Monitoring in Bruneau River Watershed

Stream Name	Year	DO (mg/l)	TSS (mg/l)	<i>E. coli</i> (cfu/100ml)
Big Flat Creek (Lower)	1998	N/A	-	46.00
Big Flat Creek (Upper)	2002	7.90	-	N/A
Buck Creek	1997	6.75	8	N/A
Buck Creek (Lower)	2002	8.80	8	130.00
Cherry Creek	2000	8.70	9	N/A
Clover Creek (Lower)	1997	N/A	-	N/A
Clover Creek (Middle)	2003	N/A	-	N/A
Clover Creek (Upper)	1998	N/A	-	N/A
Columbet Creek	1998	N/A	-	145.00
Dave Creek	2002	8.70	9	5.50
Deadwood Creek	2002	9.20	9	397.00
Deer Creek (by Three Creek Highway)	2002	8.60	2	N/A
Dorsey Creek (Middle)	1997	7.23	-	N/A
Dorsey Creek (Upper)	1997	6.51	-	N/A
Flat Creek	2004	N/A	8	N/A
Jack Creek	2002	9.40	1	0.09
East Fork Jarbidge River (at campground)	2004	N/A	2	N/A
Jarbidge River (at East and West Forks)	2001	9.10	2	N/A
Jarbidge River (Upper)	1997	6.58	2	N/A
Pole Creek by Nevada/Idaho border (Tributary to Flat Cr.)	1998	12.05	-	N/A
Pole Creek (Tributary to Deer Creek)	1998	N/A	-	N/A
Three Creek (Lower)	1996	11.20	5	N/A
Three Creek (Middle)	2001	8.10	5	220.00
Three Creek (Upper)	1999	9.60	11	N/A
-: These streams are in the process of being reevaluated as the majority of them are intermittent, ephemeral, or dewatered by diversions.				
N/A: Data not available				
These measurements were taken from the most recent survey done by the BLM or the Idaho DEQ Beneficial Use Reconnaissance Project (BURP). Standards for these indicators are outlined in Table 2.				

Table 5. Data from Redband Trout Surveys in the Bruneau Watershed, 2006

Stream Name	Stable stream banks	Covered stream banks	Fine sediment
Deadwood Creek	64%	71%	0%
Deadwood Creek Upper East	85%	85%	0%
Deadwood Creek Upper West	92%	92%	0%
Deer Creek	64%	68%	5%
Flat Creek	80%	80%	15%
Pole Creek	61%	61%	14%
Shack Creek	95%	95%	5%
Three Creek Lower	79%	82%	19%
Three Creek Middle	53%	67%	0%
Three Creek Upper	50%	50%	0%

Temperature

DEQ identified the Bruneau River, Jarbidge River, and the East Fork of the Jarbidge River to be limited by water temperature. All creeks surveyed passed the maximum temperature standard except for the lower reach of the Jarbidge River, Clover Creek, Three Creek, Deer Creek, and Big Flat Creek. All creeks measured for the maximum average daily temperature passed except the lower Jarbidge River. Measurements were also taken on Clover Creek, Three Creek, Deer Creek, Deadwood Creek and Big Flat Creek; however, maximum daily average temperature was not calculated (Table 6).

Table 6. Bruneau River Watershed Temperatures.

Tributary	Year Measured	Maximum Temperature (°F)	Maximum Daily Average Temperature (°F)	Maximum Monthly Average Temperature (°F)
Jarbidge River	2006	78	73	
West Fork Jarbidge River	2006	70	62	
Buck Creek	2006	68	64	
Jack Creek	2006	63	58	
Dave Creek	2006	66	63	
Clover Creek	2001	80		
Three Creek	2002	77		66
Deer Creek	2002	74		58
Deadwood Creek	2002	69		57
Big Flat Creek	2002	78		66
These are the most current measurements documented. Maximum monthly average temperature is not an Idaho water quality standard.				

Dissolved Oxygen

DEQ and BLM collected and measured DO levels in a number of creeks in the Bruneau River Watershed (Table 4). According to these data, all creeks sampled are in compliance with the criteria set by DEQ for DO; however, the majority of DO sampling occurred in the spring and fall when thermographs were being placed and retrieved.

E. coli

E. coli measurements were taken by DEQ in the Beneficial Use Reconnaissance Project (BURP). This information and *E. coli* data collected by BLM are summarized in Table 4. Flat Creek, Buck Creek, Cherry Creek, Clover Creek, Columbet Creek, Dave Creek, Deadwood Creek, Deer Creek, Dorsey Creek, Jack Creek, the Jarbidge River, the East Fork of the Jarbidge River, and Three Creek were sampled. Lower Buck Creek, Columbet Creek, Deadwood Creek, and the middle reach of Three Creek did not meet *E. coli* state water quality standards.

Streamflow Alteration/Diversions

Known sources of surface water dewatering the Bruneau River Watershed occur on Buck, Cougar, Dorsey, Columbet, Sanovia, Flat, Three, Cherry, Deer, Clover, and Deadwood Creeks. Due largely to historic water right permits, these diversions often take a majority of the water in these streams for agriculture and livestock use, frequently leaving the lower reaches of these streams completely dewatered.

Nutrients and Mercury

Neither nutrients nor mercury are considered to be limiting factors of water quality for any of the tributaries in the Bruneau River Watershed; however, the Bruneau River is listed by DEQ as water quality limited due to nutrients. BLM does not have information pertaining to the nutrient or mercury levels in the Bruneau Watershed.

Salmon Falls Creek Watershed

The primary tributaries of the Salmon Falls Creek Watershed include Bear Creek, Shack Creek, China Creek, Corral Creek, Browns Creek, Cedar Creek, and the North Fork Salmon Falls Creek (Timber Canyon Creek). Tributaries of Cedar Creek include House Creek and Little House Creek. Player Creek is a tributary to China Creek. Rocky Canyon Creek and Chimney Creek are tributaries to the North Fork of Salmon Falls Creek.

Currently, the Salmon Falls Creek Subbasin Assessment and Total Maximum Daily Load Plan is being developed for this watershed and may include some or all the above creeks and tributaries depending on the assessment determinations and public review process.

Sediment

DEQ identified Salmon Falls Creek and Cedar Creek as water quality limited streams due to sediment. BLM has limited data on the amount of TSS in streams in the Salmon Falls Creek Watershed. The creeks analyzed for TSS in this watershed include Cedar Creek, China Creek and House Creek (Table 7). All creeks sampled by BLM met the State water quality standard for TSS; however these data reflect one-point-in-time samples.

In 2006, BLM measured the number of pools dominated by fine sediments in the tributaries of Clover Creek containing redband trout (Table 8).

Table 7. Monitoring Results for Salmon Falls Creek Watershed Streams

Stream Name	Year	DO (mg/l)	TSS (mg/l)	<i>E. coli</i> (cfu/100ml)
Bear Creek	1997	8.02	-	N/A
Cedar Creek	2002	8.70	17	360
China Creek (Middle) by Road crossing	1999	8.36	-	170
China Creek (Lower) by Reservoir	1999	7.57	14.5	9
China Creek (Upper) on State Land	2002	N/A	14	6
Corral Creek	1998	10.24	-	-
House Creek	2002	7.30	5	65
House Creek (Upper)	2000	N/A	5	555
Little House Creek	1998	N/A	-	N/A
North Fork Salmon Falls Creek (below Confluence of Rocky/Timber Canyon)	1998	9.91	-	N/A
Player Creek	1998	9.03	-	N/A
Rocky Canyon Creek	2002	N/A	-	2,932
Salmon Falls Creek (Lower) near Hagerman	1994	11.40	-	130
Salmon Falls Creek (Middle) South End of Reservoir	1996	7.65	-	N/A
Salmon Falls Creek (Upper) in Nevada	2002	N/A	-	170
Shack Creek	2004	N/A	-	N/A
Timber Canyon Creek	2002	N/A	-	310
-: Streams being reevaluated as they are intermittent, ephemeral, or dewatered by diversions.				
N/A: Data not available				
These measurements were taken from the most recent survey done by the BLM or the Idaho DEQ BURP (Beneficial Use Reconnaissance Project). Standards for these indicators are outlined in Table 2.				

Table 8. Data from Redband Trout Surveys in the Salmon Falls Creek Watershed, 2006

Stream Name	Stable stream banks	Covered stream banks	Fine sediment
Bear Creek	78%	80%	0%
Cedar Creek	82%	86%	1%
Chimney Creek	81%	83%	0%
China Creek Lower	59%	71%	68%
China Creek Upper	78%	78%	0%
House Creek Upper	77%	87%	6%
House Creek Lower	86%	87%	0%
Little House Creek	89%	89%	0%
Rocky Canyon Creek	90%	90%	43%
Timber Canyon Creek	50%	79%	5%

Temperature

DEQ identified Salmon Falls Creek to be water quality limited due to elevated water temperature. Water temperature was only measured on Cedar Creek, China Creek and House Creek (Table 9). Of these creeks, only House Creek did not meet the maximum water temperature standard. Water temperature data has not been collected on these streams since 2002.

Table 9. Salmon Falls Creek Watershed Temperatures

Tributary	Year Measured	Maximum Temperature (°F)	Maximum Monthly Average Temperature (°F)
Cedar Creek	2002	70	59
China Creek	2002	72	61
House Creek	2002	79	67
These are the most current measurements documented. Maximum monthly average temperature is not an Idaho water quality standard.			

BLM planted cottonwood as part of fire rehabilitation along a portion of Salmon Falls Creek and along portions of Clover Creek to increase stream shading and provide a long-term source of large woody debris.

Dissolved Oxygen

DEQ and BLM collected and measured DO levels in a number of creeks in the Salmon Falls Creek Watershed, primarily in the early summer and fall (Table 7). DEQ identified Salmon Falls Creek, Cedar Creek below the reservoir, and Cedar Creek Reservoir to be water quality limited due to low levels of DO. All other creeks in the Salmon Falls Watershed are in accordance with the criteria set by the State of Idaho for DO.

E. coli

Bear Creek, Cedar Creek, China Creek, Corral Creek, House Creek, Little House Creek, North Fork of Salmon Falls Creek, Player Creek, Rocky Canyon Creek, Salmon Falls Creek and Shack Creek were surveyed for *E. coli* (Table 7). Cedar Creek, China Creek, upper House Creek, Rocky Canyon Creek, Salmon Falls Creek, and Timber Canyon did not meet *E. coli* standards.

Streamflow Alteration/Diversions

Known sources of dewatering in the Salmon Falls Creek Watershed include Cedar, China, Devil, Player, Antelope Springs, and House Creeks. Due largely to historic water right permits, these diversions often take a majority of the water in the streams for agriculture and livestock use, leaving lower reaches essentially dry.

Nutrients and Mercury

Nutrients are considered a water quality limiting factor in Salmon Falls Creek, Salmon Falls Creek Reservoir, Cedar Creek, and Cedar Creek Reservoir. BLM does not have information pertaining to the nutrient levels in these tributaries. DEQ considers both reservoirs as water quality limited for mercury.

In 2005, DEQ added the criteria to test methyl mercury levels in the fatty tissues of fish; however, this information has not yet been published. Although DEQ has yet to release any specific data concerning mercury levels in Salmon Falls Creek Reservoir, general warnings about possible high level mercury counts in fish taken from the reservoir have been identified in recent news media articles (Christensen, 2006).

Snake River Watershed

The primary tributaries of the Snake River include Salmon Falls Creek, the Bruneau

River, Sailor Creek, Yahoo Creek, Browns Creek, Deadman Creek, Ring Springs, Toana Gulch, Rosevear Gulch, Cassia Gulch, Big Pilgrim Gulch, and Deer Gulch.

There are very few other live surface waters in the northern region of the planning area except a few prominent springs including Coyote Springs, the primary source of water for Yahoo Creek. This major spring is centrally located within the Yahoo Allotment and normally discharges a volume of about 1 to 2 cubic feet per second (cfs) of water and flows for about four miles in a northeasterly direction to where it confluences with the Snake River near Dolman Rapids. This spring and creek water provides a water source for wildlife and livestock in the allotment.

Other important springs associated with the above-listed creeks or gulches include Ring, Toana, and Pilgrim Springs. Ring Springs discharges a lower flow of water into Salmon Falls Creek a little over a mile upstream of the Salmon Falls/Snake River confluence. It is the sole source of water for livestock in the Lower Salmon Falls Allotment. Toana Springs in Toana Gulch is a low volume spring in the Hagerman Allotment. Several water troughs supply water to livestock in the majority of pastures in the allotment. Pilgrim Spring lies in the lower end of Pilgrim Gulch. A fence generally keeps livestock from accessing this spring.

Browns Creek, Deadman Creek, Sailor Creek, Cassia Gulch, Deer Gulch, Pilgrim Gulch, and Rosevear Gulch are ephemeral drainages. Water runs sporadically in the spring when there is sufficient snow for run-off. These drainages carry sediment when they contain surface water.

Currently, this watershed includes a completed King Hill – C.J. Strike Reservoir Subbasin Assessment and Total Maximum Daily Load Plan 2006, which is now in the implementation stage. This plan was approved by EPA in April 1997 and originally assessed ten water bodies, five of which are in the Boise District, and 19 pollutants listed on the 1996 303(d) list. The five water bodies involved in the Jarbidge planning area include Browns, Deadman, and Sailor Creeks, the Snake River, and the C.J. Strike Reservoir; however, since all the creeks were classified as intermittent, no TMDLs were developed for them. Pollutants of concern for which TMDLs have been developed include nutrients, sediment, and DO for the Snake River and C.J. Strike Reservoir. Sediment was determined to be the most common listed pollutant in the watershed, though most loading comes primarily from upstream segments (DEQ, 2006).

Sediment

DEQ identified the Snake River, Sailor Creek, Browns Creek, and Deadman Creek as water quality limited due to sediment. BLM has no data on the amount of TSS in streams in the Snake River Watershed.

Increased concentrated OHV use on BLM lands in Yahoo Creek and Rosevear Gulch resulted in areas with highly erosive soils stripped of vegetation. Rills and gullies from these high use areas increases the amount of sediment delivered to the Snake River.

Temperature

DEQ identified the Snake River as water quality limited due to temperature. Water temperature regimes in the Snake River are directly influenced by the operation of hydroelectric power plants managed by Idaho Power and the Bureau of Reclamation. BLM does not have water temperature data for the Snake River or any of the above mentioned tributaries.

Dissolved Oxygen

DEQ and BLM collected and measured DO levels in Browns Creek, a tributary to the Snake River (Table 10). DO levels in Browns Creek were 11.6 mg/l and passed the state water quality standards for DO.

Table 10. Monitoring Results for Snake River Watershed Streams

Stream Name	Year	DO (mg/l)	TSS (mg/l)	<i>E. coli</i> (cfu/100ml)
Browns Creek	1998	11.6	N/A	N/A
-: Streams being reevaluated as they are intermittent, ephemeral, or dewatered by diversions. N/A: Data not available				
Source: These measurements were taken from the most recent survey done by the BLM or the Idaho DEQ BURP (Beneficial Use Reconnaissance Project). Standards for these indicators are outlined in Table 2.				

E. coli

BLM has no data on the amount of *E. coli* in the Snake River Watershed.

Streamflow Alteration/Diversions

Due to the limited amount and sporadic nature of the flows in the major drainages, none of the flows are diverted from the above drainages. BLM has no data on the amount of diversions in the Snake River Watershed within the planning area.

Nutrients and Mercury

DEQ identified the Snake River as water quality limited due to nutrients. BLM currently has no data on the amount of nutrients and mercury in the Snake River Watershed.

Playas

Playas are naturally occurring depressions in the land that contain pools of water seasonally. Playas collect water from small basins and have no external drainage. The playas provide a water source for livestock and wildlife when water is present. Typically, the playas lack water from late June into December. BLM has no water quality data for any of the playas scattered across the area.

Groundwater

Groundwater sources in the planning area consist of a few government wells and include the following: AEC, Blue Butte, Browns Gulch, Buck Flat, Cheatgrass, Grindstone, Hammett, Notch Butte, Signal Butte, Three Creek, and Twin Butte Wells. All wells have or currently provide sufficient and important supplies of water throughout much of the planning area by means of intricate and elaborate storage, pipeline, and watering trough distribution systems. Although a few of these sources are rarely used because they have

been replaced with more dependable perennial creek water, they are still viable water sources. The other wells are dependable and used on a daily basis.

No water quality sampling or monitoring has been done by BLM on any of these groundwater wells. Information on well water resources within the planning area are summarized in Table 11.

Table 11. Groundwater Well Information

Name of Groundwater Well	Water Right Number	Number of Miles of Pipelines	Number of Troughs
AEC	51-07264	8.0	7
Blick	51-12714	0.0	1
Blue Butte	51-07276	29.0	21
Browns Gulch	51-07202	3.0	2
Buck Flat	51-12710	60.0	41
Cheatgrass	51-04059	7.0	6
Grindstone	51-12984	16.0	8
Hammett	51-02349	0.0	1
Notch Butte	51-04072B	22.0	12
Row	51-12344	0.0	1
Signal Butte	47-17179	21.0	18
Three Creek	51-02356	38.0	62
Three Island	51-04033	3.5	5
Deadman	51-04072A	9.9	8

Trends

Interpreting trends from water quality data can be difficult and sometimes misleading. Often, water quality measurements are taken at one point in time and do not encompass the annual, seasonal, and daily fluctuations in the water quality within a stream system. Specific run-off events, such as summer cloudbursts, can cause uncharacteristic changes in water quality for short or long periods of time depending on the location and magnitude of the run-off event. Single point data will not reveal the average or range of the indicators.

Indicators such as *E. coli* have a wide range of variability and spikes in *E. coli* levels can occur for a short period of time. Over a longer period of time such as one month, the average levels may be much lower and within an acceptable range. For this reason, an accurate *E. coli* trend cannot be calculated based on the data BLM has collected.

In 2006, BLM collected data on instream fine sediments for approximately 15 streams within the southern portion of the planning area (Table 4). This data indicates there is a wide range of instream fines for the streams sampled. In general, streams with reduced streambank stability ratings tended to have higher instream fines. This instream sediment data can provide a starting point for identifying sources and sinks for fine sediment within a watershed. The photopoints associated with this data can also be used to establish the current baseline sediment levels and for trend comparisons in the long-term.

Over the past ten years, the BLM implemented numerous habitat improvement projects designed

to improve water quality within the planning area. Fencing projects restricting or excluding livestock access to streams have a beneficial effect on water temperature, sedimentation, DO, and nutrients because riparian vegetation can grow without being browsed and streambank alterations from hoof shearing, trampling, and compaction are reduced. These projects can also reduce the amount of *E. coli* levels in the protected stream reach by decreasing the amount of livestock waste entering the water.

Livestock trailing down steep slopes to water in streams is one source of sedimentation. Exclosures, fences preventing livestock from accessing portions of streams, were constructed by BLM on Cedar Creek and Columbet Creek in 2002. Gap fences, short sections of fence that tie into existing topography to prevent livestock from accessing a stream, were constructed by BLM on lengthy portions of Salmon Falls (1989), Clover (1987-1992), and Cedar (1998) Creeks. These fences are expected to improve riparian conditions and water quality in the long-term and may be used as reference areas for determining trends in the future.

Forecast

The BLM is working on an interagency bull trout recovery plan for the Jarbidge River Watershed. As part of this recovery plan, road improvements were implemented by the USFS along the Jarbidge River to decrease the amount of sediment, nutrients, and other contaminants entering the river. These improvements were started in the summer of 2006 and are expected to improve long-term water quality in the Jarbidge River.

Sediment

Human activities on public land are expected to increase. This will lead to creation of more roadways, increased OHV use, and increased risk of wildfires. An increase in development on private land and facilities and other structures on BLM-managed land is also expected. These factors may directly impact the amount of ground disturbance and sediment input into water resources throughout the planning area. Riparian exclosures and gap fences will stabilize the riparian vegetation and streambanks and are likely to reduce amount of point and non-point sediment delivery to streams to some extent. Sediment from areas with OHV use is expected to increase due to compacted soils. Sediment created at these sites will be transported to the Snake River in periodic pulses.

Water Temperature and Dissolved Oxygen

Water temperature and DO are expected to remain fairly constant due to the climate of the area. Areas expected to improve in water temperature and DO include Dave Creek, Salmon Falls Creek, Cedar Creek, and Clover Creek. Restoration projects, exclosures, and gap fences in these areas are expected to allow riparian vegetation to increase and provide more shading to these streams, which in turn restores more natural water temperature regimes and DO concentrations.

E. coli

E. coli levels are expected to remain the same or potentially decrease due to the development of more effective monitoring strategies. With increased knowledge of *E. coli* levels, BLM can concentrate monitoring efforts on improving areas with water quality concerns.

Streamflow Alteration/Diversions

Surface water availability and streamflow levels are expected to remain constant due to the continuation of current diversions in the planning area. Low flows and dry streambeds will continue to be a limiting factor of water quality in the future. The availability of surface water will also be influenced by annual precipitation amounts in the coming years.

Nutrients and Mercury

Nutrient levels in the water are expected to increase as a result of more human-related use on the public and private lands. The development of private land, new roads, increased off road vehicle use, and increased recreation creates more sources of nutrients for the watersheds within the planning areas.

Mercury levels in the environment are expected to remain constant. There are no new potential sources of mercury anticipated in the future.

Key Features

Streams containing special status species are a high priority for monitoring and managing water quality standards. Bull trout streams in the planning area include Jack Creek, Deer Creek, Buck Creek, Dave Creek, the Jarbidge River, and the East Fork of the Jarbidge River. Redband trout streams are located in the southern end of the planning area (see Aquatic Resources). White sturgeon inhabit the Snake River at the northern boundary of the planning area. Shoshone sculpin inhabit the springs and seeps entering the Snake River. Five Federally listed species of mollusks also inhabit the Bruneau and Snake Rivers (see Aquatic Resources).

Maintaining water quality is a concern for special status amphibians such as the Columbia spotted frog and western toad (see Special Status Wildlife). All areas with surface waters are important to maintaining populations of these amphibians; however, riparian systems are particularly important for the Columbia spotted frog.

Cold water springs and seeps, fed by underground aquifers, are important for moderating water temperatures and streamflow regimes in the three watersheds within the planning area. In arid ecosystems of the west, springs and seeps are a primary source of surface water during summer months and drought years. They also contribute an important source of minerals and nutrients to the system benefiting wildlife, riparian plant species, and aquatic organisms. Maintaining or improving these water sources is important for maintaining water quality in the planning area.

Wet meadows and beaver ponds are important features that capture, filter, and store surface water. Snow accumulation in the foothills of the Jarbidge Mountains is the major source of the water supply for the perennial streams and springs in the planning area and contributes to both groundwater recharge and surface flows. This stored water is gradually released into the ground and surface water limiting erosion potential. Maintaining water quality in these water storage areas is important for both fish and wildlife species.

Riparian areas with minimal livestock access are important for improving the water quality of the

watersheds within the planning area. Maintaining the fences in these key areas should continue to improve water quality in and downstream of these protected reaches.

Current Management

Although there were no goals, objectives, or management actions for water quality in the 1987 Jarbidge RMP, more recently developed water quality guidance directs BLM to implement actions that improve water quality and the condition of other water resources within the planning area. These management practices, including restoration projects along perennial streams and riparian areas with various methods and techniques, mitigating range improvement projects, and managing proper grazing use, have been relatively successful at maintaining and/or improving water resources in the planning area. General field observations found these recent management practices reduced the effects of upland erosion and sediment contribution in many streams.

Management Opportunities

In order for BLM-managed public lands to be in compliance with current regulations as administered by the EPA, DEQ, *Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management*, and ICBEMP, there are several areas where BLM could focus management efforts including: issuing new grazing permits that include best management practices (BMPs) to improve and restore water quality, monitoring livestock use on riparian vegetation along 303(d) streams (Table 3), conducting effectiveness monitoring on implemented BMPs, preparing water quality restoration plans for 303(d)-listed streams, and evaluating compliance with State of Idaho water quality criteria. These actions promote improvements in the quality of surface and groundwater resources within the planning area.

The following BMPs could be used to improve water quality within the planning area:

- Designating the location for livestock trailing corridors, seeding and/or planting burned areas;
- Resting burned areas with critical resource concerns (upland and riparian areas);
- Maintaining existing gap and enclosure fences and constructing new fences where water quality concerns are identified; and
- Careful planning of surface water uses (i.e. pipeline installations, water trough placement, spring developments).

1.B.10. Aquatic Resources

Profile

Aquatic resources within the Jarbidge planning area can be described in three broad categories:

- Aquatic species Federally listed under the ESA
- Aquatic species identified on the BLM Sensitive Species List for Idaho and Nevada
- All other native and non-native aquatic species present in the planning area.

Aquatic species included in the first two categories are discussed and broken down as either ‘Fish’ or ‘Aquatic Snails/Mollusks’ and discussed in the Special Status Aquatic Resources section. Aquatic species included in the third category are discussed below under ‘Game and Non-Game Fish Species’. Aquatic species found in the planning area are listed in (Appendix 10).

Indicators

The Jarbidge planning area contains a variety of fish not identified as special status species. These fish species are generally referred to as ‘game fish’ or ‘non-game fish’ and are broadly distributed throughout the streams and reservoirs in the planning area. Game fish populations are managed by IDFG and NDOW through angler harvest regulations and fish stocking programs. Non-game fish include the native fish not managed by angler harvest regulations due to their small size. They are protected through regulation and are important as forage fish for other fish and wildlife species.

Game fish including walleye (*Sander vitreus*), large mouth bass (*Micropterus salmoides*), small mouth bass (*Micropterus dolomieu*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), yellow perch (*Perca flavescens*), brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss gairdeneri*), redband trout (*O. mykiss gibsii*), and mountain whitefish (*Prosopium williamsoni*) are commonly pursued by anglers. Except for mountain whitefish and redband trout, these fish are not native to the planning area, but are present in water impoundments such as Salmon Falls Reservoir and in the Snake River.

Non-game fish, such as the redband shiner (*Richardsonicus balticus*), Utah chub (*Gilia atraria*) and speckled dace (*Rhinichthys osculus*), are not actively managed by IDFG or NDOW through regulation, but are recognized by Federal and State agencies as an important food source for a variety of fish and wildlife species and necessary for a healthy aquatic ecosystem. These smaller non-game fish are native to the planning area and are rather limited in their distribution.

For aquatic wildlife, Standards 2 (Riparian Areas and Wetlands), 3 (Stream Channel/Floodplain), and 7 (Water Quality) of the S&Gs should be met as documented by S&G assessments conducted by an ID team (BLM, 1997). See Appendix 2 for more information on S&G assessments.

S&G assessments were conducted by BLM from 1998 through 2003 in 44 allotments on a total of 840,000 acres within the planning area. Standards for riparian areas and wetlands (Standard 2), stream channel/floodplain (Standard 3), and water quality (Standard 7) did not apply to nearly half of the acres assessed. The majority of the acres where Standards 2, 3, and 7 did apply did not meet the standards (Table 12).

Table 12. S&G Determinations for Standards 2, 3, and 7, 1998-2003

Standard	Determination*				Standard Does Not Apply
	Standard is Being Met	Progress is Being Made Towards Meeting Standard	Standard is Not Being Met		
			Cattle Not a Significant Factor	Cattle a Significant Factor	
2 – Riparian Areas and Wetlands	3%	4%	8%	44%	41%
3 – Stream Channel/ Floodplain	3%	3%	8%	46%	42%
7 – Water Quality	2%	0%	14%	29%	43%

Percentages were rounded to the nearest whole number and Standards may not total 100%.
 *Determination displayed as percent of 840,000 acres assessed.

The 1987 RMP did not identify indicators for managing game and native non-game fish species within the planning area. Habitat indicators developed to benefit stream habitats for special status species will also benefit native non-game fish species.

Current Condition

The current distribution of game fish in the planning area is identified in Appendix 3. Many of these fish are not native to the planning area and have been stocked into reservoirs by IDFG to provide a recreational sport fishery for the public. On occasion, game fish have migrated to tributary streams where they compete with native fish for food and cover. Historically, hatchery rainbow trout were stocked in redband and bull trout streams by IDFG and NDOW.

Game fish within the planning area primarily occur in reservoirs, which have warmer water temperatures than stream habitats. Salmon Falls Creek Reservoir is managed as a multi-resource fishery for game fish species that tolerate both warm and cool water conditions. Rainbow trout and walleye are the primary game fish sought by fisherman in the reservoir. This reservoir is known as one of the best walleye fisheries in the State of Idaho, and the current state record for walleye was caught in the reservoir in the summer of 2006. Cedar Creek Reservoir is managed by IDFG as primarily a fishery for rainbow trout.

The Snake River and Salmon Falls Reservoir are the primary locations of the other game fish in the planning area. Largemouth bass, smallmouth bass, white crappie, black crappie, yellow perch, and other species inhabit the Snake River. Smallmouth bass, yellow perch, and black crappie are present in Salmon Falls Creek Reservoir.

Sixteen native non-game fish species are present in the Jarbidge planning area, and they represent members of the Cottidae (sculpin), Catostomidae (sucker), and Cyprinidae (Carp and Minnows) families (Appendix 3).

Four species of sculpin (Shoshone Sculpin, Mottled Sculpin, Paiute Sculpin, and Shorthead Sculpin) are present within the planning area. Members of the sculpin family are relatively short lived, requiring well-oxygenated water with good water quality. They are found in streams with fast to moderate flow, gravelly substrates, and relatively cool water temperatures (<70°F) during

summer months (Sigler & Sigler, 1987). These fish require stream substrates with low amounts of fine sediment for successful spawning and egg survival.

Three species of sucker are found within the Jarbidge planning area. One species, the large-scale sucker, can tolerate the warmer water temperatures commonly found in larger river systems like the Snake River. The other two species of sucker, mountain sucker and bridgelip sucker, are found in cool, fast-moving streams. They are broadcast spawners, but require gravelly to sandy substrates for spawning (Sigler & Sigler, 1987). Suckers primarily feed on algae and zooplankton, are relatively long lived (four to eight years), and provide no parental care for their off-spring.

Members of the minnow family are one of the most diverse groups in North America and are the largest component of the native non-game fish resource in the planning area. These species include chiselmouth, redbside shiner, speckled dace, longnose dace, peamouth chub, leopard dace, northern pikeminnow, and Utah Chub. These species can occupy a variety of habitats and stream conditions and adapt well to different environments and temperature regimes.

Trends

The current status and trend for native non-game fish indicates a slow decline throughout their historic range as a result of increased human activity on the land. Human uses such as the diverting of surface flows, road construction, recreational uses, livestock grazing, and other soil-disturbing activities have cumulatively affected fish bearing habitats. The significance of this decline varies by species and geographic area. There are no known population losses for non-native fish in the planning area, but data describing their status or trend is limited.

Threats to the continued existence of native non-game fish are often related to the introduction of non-native fish that prey on native fish or directly compete with them for food and space and include activities that alter water quality, such as changes in water temperature; reductions in overhead cover; sedimentation of stream substrates; and channel widening as a result of streambank disturbance.

Forecast

Game fish populations, many of which are not native to the planning area, are not likely to experience declines as they are managed by IDFG and NDOW through regulations and hatchery stocking programs. The habitat used by these species could experience declines, such as reductions in water quality and introductions of sediment into spawning habitats, under the 1987 RMP. This could occur because the current plan does not include specific guidelines for protecting riparian areas and other aquatic habitats.

Declines in non-game fish species could be expected under the 1987 RMP as there are no management guidelines to protect the habitats they depend upon and their populations are not supplemented through State of Idaho or Nevada hatchery programs.

Key Features

Native non-game fish species such as dace, sculpin, shiners, and suckers occupy the lower

elevation stream reaches in the planning area. Inventory and assessments are needed to determine the location of key spawning areas for these species so disturbance to the streambed from BLM permitted or other public land uses can be minimized when eggs and hatchlings are in the gravel. The annual recruitment of juveniles, combined with the maintenance of natural streamflow regimes, are the most important factors in maintaining fish populations over time. A list of streams that are important to these fish species is provided under “Current Condition of Fish,” (Appendix 3).

Species of Conservation Concern

A number of aquatic species of conservation concern exist. Reasons for the concern could include broad changes in habitat, State or regional declining populations, or a general lack of information. Aquatic species appearing to have downward population trends in other regions may be categorized by BLM as Watch species. Aquatic species classified as Watch species do not receive any additional management emphasis by BLM general aquatic species. Currently, no aquatic species are classified as Watch species in Idaho. The Nevada BLM has identified the California floater as a Sensitive species. The California floater is suspected to be present throughout the Bruneau River, but surveys have not been conducted to confirm its presence (Coffin, 2007).

IDFG completed the Comprehensive Wildlife Conservation Strategy in 2005 (IDFG, 2005). The strategy identified 229 Species of Greatest Conservation Need (SGCN) in Idaho and established an ecological, habitat-based framework to aid in the conservation and management of these species. The strategy provides recommendations for actions to improve the population status and habitat conditions of SGCN, describes an approach for long-term monitoring, and complements other conservation strategies, funding sources, planning initiatives, and legally mandated activities. The SGCN includes all Federally listed and Candidate species, as well as the majority of the BLM Sensitive and Watch species. Species in the Comprehensive Wildlife Conservation Strategy are considered general aquatic species unless they are designated by BLM and IDFG as Sensitive species or are classified as Candidate or listed under ESA by FWS. No aquatic SGCN are found in the planning area.

Aquatic species experience a number of crucial seasonal periods when resources can limit production, recruitment, and survival. These periods are commonly associated with spawning and incubation (Table 13).

Table 13. Aquatic Species Crucial Seasonal Periods

Species	Crucial Season(s)	Approximate Dates
Dace and minnows	Spawning Incubation	Spring through Fall ^A Spring through Fall ^A
Suckers	Spawning Incubation	May through June June through July

^A Based on water temperature.

Current Management

Riparian and fisheries habitat were to be maintained in current condition or improved. Fences were constructed in 2001 and 2002 in Saylor Creek/North Three Island, and River Bridge

Allotment to restrict livestock access to 1.8 miles of Snake River. Four miles of riparian fence in Lower Saylor Creek Allotment created a riparian pasture which limits livestock grazing on 3.5 miles of Snake River. A closure of part of Hagerman Allotment protects about 8 miles of Snake River. Approximately 200 cottonwood poles were planted along Clover Creek to improve aquatic habitat. Recent development of inventory and monitoring protocols and restrictions on livestock grazing in riparian areas to protect special status species have likely resulted in some riparian and fish habitat improvement

Gap fences are short sections of fence tied to rock outcrops or other topographic features to restrict livestock movements. Approximately half a mile of gap fence prevents livestock from accessing 4 miles of the lower Bruneau River. Approximately 6 miles of gap fence protects about 15 miles of Clover Creek. These fences have been reasonably successful in protecting targeted reaches of riparian habitat, also benefiting fish habitat.

Springs and reservoirs and pipeline systems for off-site livestock watering were to be developed away from riparian areas. Off-site water developments and fences that protect riparian habitats have likely resulted in some improvement to fish habitat.

Ongoing livestock grazing where livestock have access to the Snake River has been determined to be Likely to Adversely Affect Snake River snails; a Biological Opinion has been issued by the US Fish and Wildlife Service (FWS) (FWS, 2005).

The 1987 Jarbidge RMP prohibited surface occupancy for mineral projects within 500 feet of streambanks on perennial or intermittent streams or edges of reservoirs. This guideline for riparian protection also protects fish habitat. The guideline has been consistently applied to minerals projects.

Management Opportunities

Future management of aquatic resources should apply current ESA Consultation Streamlining Guidelines and establish procedures for completing consultation with the FWS in Boise, Idaho, and Reno, Nevada.

Management objectives to maintain riparian habitats in properly functioning condition and improve habitat that are functional-at risk or nonfunctional could be set. The following could be assessed to determine their impact on aquatic resources:

- The need to reduce recreational and OHV impacts to Snake River and tributaries and the Jarbidge and Bruneau Rivers;
- The effects of livestock grazing, fire, and roads on Clover Creek;
- The effects from irrigation diversions on fish distribution;
- The effects of roads in adding sediment to streams; and
- The effects of culverts in creating a migration barrier for fish.

Mitigation measures could be developed based on the results of these assessments and inventories. Mitigation measures could include the following:

- Spring sources could be protected when developed for livestock water,
- Fences could be used to protect stream reaches with native non-game fish species,

- Developments of livestock watering systems could be evaluated to ensure they are not diminishing surface flows to levels that reduce available fish habitat.

The revised RMP could include guidelines that reduce effects from BLM land management activities on water quality in the Snake River and Lower Bruneau River. Mitigation that reduces upland erosion and protect streamflows and water quality would reduce BLM-related effects on these Threatened and Endangered species.