SECTION 6 – Table of Contents

6 Coeur d’ Alene Subbasin Assessment – Aquatic

6.1 Species Characterization and Status[1]

Twelve native fish species and 16 introduced, exotic fish species inhabit the Coeur d’ Alene Subbasin (Table 6.1). More detailed descriptions on the status of focal species (bull trout, westslope cutthroat trout, kokanee salmon) and other important species (brook trout, Chinook salmon, mountain whitefish, northern pike, northern pikeminnow, rainbow trout) are given in the sections that follow.

Table 6.1. Fishes of the Coeur d’ Alene Subbasin

Common Name	Scientific Name	Location*	Native
Longnose sucker	*Catostomus catostomus*	B	Yes
Bridgelip sucker	*Catostomus columbianus*	L	Yes
Largescale sucker	*Catostomus macrocheilus*	L	Yes
Shorthead sculpin	*Cottus confusus*	Ri	Yes
Torrent sculpin	*Cottus rhotheus*	Ri	Yes
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	B	Yes
Mountain whitefish	*Prosopium williamsoni*	B	Yes
Northern pikeminnow	*Ptychocheilus oregonensis*	B	Yes
Longnose dace	*Rhinichthys cataractae*	Ri	Yes
Speckled dace	*Rhinichthys osculus*	Ri	Yes
Redside shiner	*Richardsonius balteatus*	Ri	Yes
Bull trout	*Salvelinus confluentus*	B	Yes
Lake superior whitefish**	*Coregonis clupeaformis*	L	No
Northern pike	*Esox lucius*	B	No
Tiger muskie	*Esox masquinongy x E. lucius*	B	No
Black bullhead	*Ictalurus melas*	L	No
Brown bullhead	*Ictalurus nebulosus*	L	No
Channel catfish	*Ictalurus punctata*	B	No
Pumpkinseed	*Lepomis gibbosus*	L	No
Smallmouth bass	*Micropterus dolomieui*	L	No
Largemouth bass	*Micropterus salmoides*	L	No
Rainbow trout	*Oncorhynchus mykiss*	Ri	No
Kokanee salmon	*Oncorhynchus nerka*	L	No
Chinook salmon	*Oncorhynchus tshawytscha*	B	No
Yellow perch	*Perca flavescens*	L	No
Black crappie	*Pomoxis nigromaculatus*	L	No
Brook trout	*Salvelinus fontinalis*	Ri	No
Tench	*Tinca tinca*	L	No

*L -Lake, Ri - River, B - Both
**Field observation by Ronald Peters, Coeur d’ Alene Tribe Fisheries Manager

Past and present land and fisheries management practices throughout the Coeur d’ Alene Subbasin have changed the fish assemblages in many of the watersheds in the Coeur d’ Alene Subbasin. Habitat degradation from a multitude of factors has resulted in lower

[1] Large portions of the following section were taken from the Coeur d’ Alene Subbasin Summary (2001), pp. 14-19.

quality habitats for native fishes, while in some instances increasing the aquatic habitats for nonnative species. Below is a short description of some of the species found in the Coeur d' Alene Subbasin.

6.1.1 Bull Trout

The Coeur d' Alene Subbasin lies within the native range of bull trout, although historic abundance and trend data are scarce. Historically adfluvial, fluvial, and most likely resident life histories were expressed within the Subbasin. Large migratory bull trout were historically abundant in the Coeur d' Alene Subbasin. Currently, adfluvial and fluvial life histories are present in bull trout populations, however bull trout are absent from much of the Coeur d' Alene Subbasin. Habitat degradation, migration barriers, and nonnative species interactions have all contributed to the species decline in not only the Coeur d' Alene Subbasin, but in most of their historical range. Bull trout were listed as threatened under the Federal Endangered Species Act in 1998.

6.1.2 Westslope Cutthroat Trout

Historically westslope cutthroat were the dominant salmonid in streams of the Coeur d' Alene Subbasin (Behnke and Wallace 1986). Few data describe the historic abundance of westslope cutthroat trout in the Coeur d' Alene Subbasin, but many historic accounts suggest that densities were high throughout the Subbasin. Resident, fluvial, and adfluvial forms of westslope cutthroat trout were all present within the Subbasin historically. Although all three forms still exist today, a combination of habitat degradation, migration barriers, and exotic species interactions have substantially reduced the diversity of the current populations.

Densities of westslope cutthroat trout are thought to have declined throughout much of the Subbasin. Adfluvial populations have declined the most and have been extirpated from many parts of the Subbasin, while resident and fluvial populations in headwater reaches of the St. Joe River remain at near historic levels of abundance. Rainbow trout hybridize with cutthroat trout and some hybrids are found in the lower Coeur d' Alene and St. Joe rivers. The extent of hybridization is unknown at this time, but many pure strain populations with resident or fluvial life histories still exist, especially in headwater reaches.

6.1.3 Kokanee Salmon

Kokanee salmon were introduced from Lake Pend Oreille into Coeur d' Alene Lake in the 1940s (Horner, IDFG, Regional Fisheries Manager, personal communication, July 2003) and have become the most important game fish in the lake. The kokanee salmon population in Coeur d' Alene Lake has been naturally reproducing and self-sustaining since the 1960s when road reconstruction along I-90 enhanced shoreline spawning habitat (Horner, IDFG, Regional Fisheries Manager, personal communication, July 2003). In 1979, the lake provided a harvest of nearly 600,000 kokanee salmon and supported over 250,000 angler hours. However, the kokanee population continued to expand and with no predator to control their abundance, became too numerous and stunted. Fall Chinook salmon were introduced in 1982 to help control kokanee abundance. Chinook are managed with both wild production from spawning in the Coeur d' Alene and St. Joe rivers and some hatchery supplementation to regulate the kokanee population. Today, kokanee salmon not only provide an important recreational fishery, but they provide a major source of prey for landlocked Chinook salmon and adfluvial bull trout rearing in Coeur d' Alene Lake. Kokanee salmon also provide an important subsistence fishery for the Tribal people of the Coeur d' Alene Tribe, who once relied on anadromous salmon in the Lower Spokane River.

6.1.4 Mountain Whitefish

Mountain whitefish were one of the most abundant and widely distributed game fish in the Coeur d' Alene Subbasin. Historically, mountain whitefish were a significant species in Coeur d' Alene Lake, but their abundance has declined dramatically. Strong populations are still found in riverine habitats of the Coeur d' Alene, St. Joe, and St. Maries rivers. Recent surveys indicated mountain whitefish were the dominant game fish captured in electrofishing samples from the Coeur d' Alene, St. Joe, and St. Maries rivers (Apperson et al. 1987; Fredericks et. al. 2002). Although mountain whitefish were found primarily in mainstem reaches of large rivers, their presence was also noted in several smaller tributaries to the St. Joe and St. Maries rivers. Strong populations remain of mountain whitefish in parts of the Coeur d' Alene Subbasin, but it is unclear whether these populations are currently stable, decreasing, or increasing. Future surveys may provide valuable insight into the current status of this species in the Subbasin.

6.1.5 Northern Pikeminnow

Northern pikeminnow are a native species and have likely increased from historic levels due to the increase in slackwater habitat resulting from the impoundment by Post Falls Dam. Northern pikeminnow populations in the St. Joe and St. Maries rivers have been intensively researched in past years. The dominant prey of 449 northern pikeminnow collected from the lower St. Joe River (Falter 1969) consisted of sculpins, dace, crayfish, redside shiners, insects, tench, yellow perch, and pumpkinseeds; no trout were found. Falter (1969) attributed the lack of predation on trout by pikeminnow to habitat segregation of the two groups. Despite these findings, social influence and concerns with interspecific competition and predation prompted numerous eradication programs. These programs were discontinued following treatments in the St. Maries and St. Joe rivers in 1973 and 1975, respectively. In surveys conducted in 1986 and 1987, Apperson et al. (1987) found northern pikeminnow numbers were at or near population levels prior to treatment. Gillnetting and electrofishing samples indicated northern pikeminnow were among the dominant species present in slackwater areas of the St. Joe and St. Maries rivers.

6.1.6 Northern Pike

Northern pike were illegally introduced into Coeur d' Alene Lake during the 1970s (PBTTAT 1998). Northern pike inhabit the weedy bays of Coeur d' Alene Lake as well as the Lateral Lakes. In 1989 and 1990, Rich (1992) studied northern pike population dynamics, food habits, movements and habitat use in the Coeur d' Alene Lake system and documented predation on adult and juvenile native westslope cutthroat trout. This study found relatively low densities of northern pike, compared to other areas in their current range, which was attributed to angler exploitation. The current management direction for northern pike is to maintain a year-round season and liberal limit of six northern pike daily to reduce predation on native westslope cutthroat and bull trout as well as other popular sport fish species.

6.1.7 Brook Trout

Eastern brook trout were stocked into many of the waters in the Coeur d' Alene Subbasin as early as the 1900s (PBTTAT 1998). Currently brook trout are distributed in some of the tributaries, several mountain lakes, and the upper most reaches of the South Fork Coeur d' Alene River. They are present, although to a lesser degree, in some tributaries to the North Fork Coeur d' Alene and St. Joe rivers.

It is still unclear to the extent that brook trout affect bull and westslope cutthroat trout, but it has been shown that eastern brook trout can out-compete and hybridize with bull trout (Gunckel et al.2001; Kanda et al. 2002). Griffith (1988) wrote that westslope cutthroat trout populations are less likely to coexist with brook trout than with other nonnative salmonid. Varley and Gresswell (1988) noted nonnative brook trout are capable of replacing native cutthroat trout populations.

6.1.8 Rainbow Trout

Rainbow trout were widely stocked into waters throughout the Coeur d' Alene Subbasin and can hybridize with westslope cutthroat trout. Today, rainbow/cutthroat hybrids are present in the lower reaches of the mainstem Coeur d' Alene River, and to a lesser extent in the lower St. Joe River, but there is little evidence of past rainbow stocking having resulted in widespread hybridization of native westslope cutthroat trout populations. The Idaho Department of Fish and Game (IDFG) shifted to stocking only sterile triploid rainbow trout statewide in 1998 and in 2003, while all river stocking of rainbow trout ended in the Coeur d' Alene Subbasin (Horner, Regional Fisheries Manager, IDFG, personal communication, December 2003). Put-and-take rainbow trout fisheries are still provided by stocking ponds located along popular river sections.

6.1.8 Chinook Salmon

In 1982, Chinook salmon were first introduced into Coeur d' Alene Lake as a biological control to manage an increasing kokanee population. Chinook salmon abundance is managed through wild escapement in the Coeur d' Alene and St. Joe rivers as well as some supplementation with hatchery fish in the north end of the lake. The management plan for Chinook salmon calls for a total annual stocking level of 70,000 Chinook smolts with wild (approximately 40,000) and hatchery (approximately 30,000) combined. Chinook abundance is controlled to maintain kokanee at a level that maintains a yield fishery for 10-11 inch kokanee and a limited trophy fishery for Chinook salmon in the 3-18 pound range (IDFG Fisheries Management Plan 2001-2006). Chinook salmon provide an important component of the sport fishery of Coeur d' Alene Lake, but may have some detrimental effects on the native sport fishes through direct predation on juvenile westslope cutthroat or bull trout.

6.1.9 Artificial Production

The IDFG historically stocked rainbow trout over much of the watershed to enhance sport-fishing opportunity. Since 1998, all of these fish were sterile triploid rainbow trout produced by heat shocking the eggs. Stocking of rainbow trout has been greatly reduced and is now limited to stocking sterile triploid rainbow trout in a few ponds located adjacent to tributaries, near the river, or in drive to mountain lakes. All stocking of rainbow trout in rivers within the Coeur d' Alene Subbasin was discontinued in 2003 (Horner, IDFG, personal communication, December 2003).

In 1889, the U.S. Fish Commission placed 1.9 million Lake Superior Whitefish fry in Coeur d' Alene Lake (Simpson and Wallace 1982). No evidence was found that any fish from this plant survived. However, the Coeur d' Alene Tribe captured a single specimen off Conkling Point in Coeur d' Alene Lake in 1996 during a deep-water gill net survey. Since the specimen was released, a second confirming identification was not made. This was the only specimen captured in five years of sampling from 1996-2000.

Coeur d' Alene Lake has at least 12 introduced species. Chinook salmon are currently the only species where artificial propagation is used as part of the management program. Chinook salmon abundance is managed through wild escapement in the Coeur d' Alene and St. Joe rivers as well as some supplementation with hatchery fish in the north end of the lake. The management plan for Chinook salmon calls for a total annual stocking level of 70,000 Chinook smolts (wild and hatchery combined). Wild production is managed by allowing up to 100 Chinook redds that produce an estimated 40,000 Chinook smolts. If redd numbers exceed 100, redds are physically removed by blasting them with a fire pump (this has only been done once). Hatchery Chinook are used to bring stocking levels up to 70,000 total. Chinook stocking has ranged from zero to 60,100 smolts annually, with an average of 30,200 stocked annually during the 22-year history of this management program (total of 663,900 hatchery Chinook stocked over the past 22 years) (Horner, IDFG, personal communication, December 2003).

The Coeur d' Alene Tribe fisheries program calls for the construction of a trout production facility to supplement wild stocks of westslope cutthroat trout in four Reservation streams. To date, this facility has not received the support of the Northwest Power and Conservation Council (Council).

6.2 Focal Species Selection

Three fish species were chosen for the aquatic focal species for the Coeur d' Alene Subbasin, bull trout, westslope cutthroat trout, and kokanee salmon. The rationale for choosing these species is described below.

Bull trout are important ecologically since they exhibit two life history strategies within the Coeur d' Alene Subbasin, adfluvial and fluvial. Compared to westslope cutthroat trout, bull trout were most likely not as abundant or widely distributed historically. However, bull trout did provide an important sport and subsistence fisheries historically, and were and are capable of reaching trophy sizes in the unproductive water of the Subbasin. Bull trout have been listed as threatened under the federal Endangered Species

Act since 1998. Since no harvest of bull trout is currently allowed, if recovered, bull trout could contribute to the recreational fisheries of the Subbasin.

Westslope cutthroat trout were chosen as a focal species based on their recreational, cultural, and ecological significance to the Coeur d' Alene Subbasin. Westslope cutthroat trout were once very abundant throughout the Subbasin, and are still present throughout much of their historic range, although many factors are currently threatening their populations. Westslope cutthroat trout exhibit three life history strategies, adfluvial, fluvial, and resident within the Coeur d' Alene Subbasin. In addition, westslope cutthroat trout are recognized as a major sport fish in the Subbasin, thus restoring all three forms of westslope cutthroat trout in the Subbasin would increase angling opportunities.

Kokanee salmon are not native to the Coeur d' Alene Subbasin, but have provided important sport fisheries since the 1940s and an important source of forage for native bull trout and landlocked Chinook salmon. The majority of kokanee spend their entire life in Coeur d' Alene Lake and spawn along the shoreline in the north end of the lake (Horner, IDFG, personal communication, December 2003). Few kokanee utilize tributaries for spawning.

Although kokanee salmon have been introduced to the Subbasin, this species meets the criteria for selecting a focal species, as discussed in Section 3, and was selected in the Coeur d' Alene Subbasin. Kokanee salmon are important to the Subbasin from an ecological perspective. They are known to be one of the primary food resources for threatened adfluvial bull trout in Coeur d' Alene Lake. In addition, kokanee salmon are one of the most sought after species in Coeur d' Alene Lake by recreational anglers. Kokanee have also helped mitigate for the loss of anadromous salmon runs for the people of the Coeur d' Alene Tribe of Indians. Since historical runs of anadromous salmon have ceased to exist after the construction of Chief Joseph and Grand Coulee dams, Tribal members have shifted, at least in part, from traditional subsistence uses to the harvesting of kokanee salmon.

All three focal species chosen in the Coeur d' Alene Subbasin are indicators of ecological health. Bull trout and westslope cutthroat trout overlap in many of their habitat requirements, but are separated temporally in spawning and migration. Bull trout spawn in the fall and westslope cutthroat trout in the spring, thus spawning and rearing habitats need to be evaluated throughout the entire year. Both species use small tributaries, mainstem rivers, and lakes for the various life histories they exhibit. Thus, habitat degradation or restoration in any one of these habitat types could influence populations. Using kokanee salmon as a focal species helps managers evaluate the lentic habitat and the productivity of lentic systems throughout the Subbasin. Changes in kokanee salmon populations can result from a multitude of factors; some possibilities are changes to the productivity or the trophic dynamics of a lake, changes in predation rates, and degradation or restoration of spawning habitat. Kokanee also provide a critical food source for migrating bald eagles in the fall and early winter. Over 100 bald eagles have been counted in the north end of the lake feeding on kokanee during December. However, since most kokanee are beach spawners, spawning along the northern shoreline of the lake, the majority of carcasses decompose in the lake and benefits from these nutrients are not realized in tributary systems or by terrestrial species associated with those systems.

6.3 Focal Species – Bull Trout

6.3.1 Historic Status

Bull trout were historically found in Coeur d' Alene Lake and its major tributaries, the St. Joe, St. Maries, and North and South Fork of the Coeur d' Alene rivers. Although historic bull trout distribution is not well-known, it is thought bull trout occurred throughout the Subbasin (USFWS 2002). Bull trout likely expressed three life histories within the Coeur d' Alene Subbasin: adfluvial, fluvial, and resident. Currently only fluvial and adfluvial life strategies are known to be present.

Historical data on bull trout distribution is limited and insufficient to provide abundance estimates in the Subbasin as a whole or within any sub-watershed. The very specific habitat requirements for bull trout and the apex predator role they fill in the fish community likely meant bull trout were not as numerous or widely distributed as westslope cutthroat trout. During the 1930s, Maclay (1940) observed bull trout in eight creeks including Grizzly, Brown, Beaver, Lost, Big, Downey, Yellow Dog, and West Fork Eagle creeks, in addition to the North Fork Coeur d' Alene River. During the same time, Fields (1935) and Maclay (1940) also observed bull trout in Santa Creek, a tributary to the St. Maries River. During the 1960s and 1970s, incidental observations of bull trout were made during several studies on westslope cutthroat trout within the Subbasin (Averett 1963; Rankel 1971; Thurow and Bjornn 1978).

Although dolly varden (*Salvelinus malma*), a close relative of bull trout, were stocked in the 1970s in Idaho, there has been no stocking of bull trout or dolly varden in any water that would influence existing bull trout populations. In 1993, two mountain lakes in the Coeur d' Alene Subbasin were stocked once with surplus bull trout. The bull trout were derived from an experimental program to evaluate hatchery spawning, hatching and rearing of bull trout in the Lake Pend Oreille system. Bull trout from two sources from Lake Pend Oreille (Gold Creek and the Clark Fork River) were spawned and the progeny of those fish were stocked into Revett Lake (309) and Upper Gildden Lake (180) to evaluate the potential for stunted brook trout control. Upper Gildden Lake is the upper most headwater of Canyon Creek, one of the most heavily polluted tributaries from mining waste of the South Fork Coeur d' Alene River. Revett Lake is in the headwater of Prichard Creek, a tributary of the North Fork Coeur d' Alene River that has the most extensive dredge mining of any system in the Coeur d' Alene Subbasin (Horner, IDFG, personal communication, December 2003). Limited sampling in Revett and Upper Gildden lakes by the IDFG has indicated these hatchery bull trout did not survive.

6.3.2 Current Status

In general, the current distribution of bull trout in the Subbasin is considered to be "substantially less" than the historical distribution (USFWS 2002). Today, bull trout are found primarily in the small concentrated areas of upper portions of the St. Joe River drainage (PBTTAT 1998). Bull trout use the St. Joe River and Coeur d' Alene Lake for adult rearing, migration, and over-wintering habitat (USFWS 2002). Over 70 percent of bull trout present in the St. Joe River drainage are found upstream of Heller Creek, with over 50 percent occurring in a 3 km reach in Medicine Creek (PBTTAT 1998). Bull trout populations throughout the rest of the Couer d' Alene Subbasin are either at undetectable levels or have gone locally extinct. Few verified sightings of bull trout have been recorded in recent years.

The following streams (tributaries to either Coeur d' Alene Lake, Lower St. Joe River, St. Maries River, or the lateral lakes) were surveyed by the Coeur d' Alene Tribe for native trout from the mouth to the headwaters: Fighting Creek, Lake Creek, Plummer Creek, Benewah Creek, Cherry Creek, Hells Gulch Creek, Alder Creek, Evans Creek, Pedee Creek, Cottonwood Creek, Squaw Creek (West Side), and all tributaries of these creeks. Additional primary tributaries include Wolf Lodge Creek, Beauty Creek, Carlin Creek, Mica Creek, and Cougar Creek. No bull trout were found in any of the streams except one sub-adult found in Lake Creek in 1993 and one sub-adult found in Fighting Creek in 1998. Adfluvial populations of bull trout, although considered seriously imperiled (USFWS 2002), do reside in Coeur d' Alene Lake, and are believed to spawn above Heller Creek in the upper St. Joe River.

Although there are data showing bull trout present in the Couer d' Alene Subbasin, there is inadequate data to provide a current bull trout abundance estimate in the Subbasin or within any individual watershed. Redd counts conducted in the upper St. Joe River and tributaries provide a minimum estimate ranging from 190 to 264 spawning adults (USFWS 2002). However, annual surveys are not conducted in all tributary or river reaches where spawning activity occurs and some bull trout exhibit alternate year spawning behavior, thus these population estimates may be low (USFWS 2002). During the 12-year survey period from 1992 to 2003, bull trout redd counts in three index streams (Medicine Creek, Wisdom Creek, upper St. Joe River between Heller Creek and St. Joe Lake) have ranged from 15-69 with an average of 42 redds (USFWS 2002, Horner, Regional Fisheries Manager, IDFG, personal communication, December 2003).

The complete absence of bull trout from tributaries to the North Fork Coeur d' Alene River in recently conducted fish population inventories, compared with reported distribution in the watershed historically, suggest bull trout may be now extirpated from the Coeur d' Alene River system. Comparison of historic and current distribution data of bull trout in the St. Joe River system indicate bull trout may have been more widespread, but that hypothesis is only partially supported due to the lack of specificity of the historic data.

It is also important to note that infrequent fish surveys do not demonstrate the absence of bull trout in tributary streams. Many survey methods are not rigorous enough to observe bull trout populations in low densities (USFWS 2002). Although fish surveys may not detect the presence of bull trout, the presence of suitable habitat parameters may be suffice to consider such areas for restoration/protection (USFWS 2002).

There are no data sets of sufficient length to assess current bull trout population trends in the Coeur d' Alene Subbasin. Even where declines in bull trout populations could be large, detection of trends often require long-term sampling, even longer than ten years of sampling. The only information available to give an indication of long-term trends is a comparison of known current distribution with reported historic distribution. The value of these comparisons is limited due to data limitations, and in particular the historic information. Recovery strategies and objectives for bull trout in the Subbasin are outlined in the management plan presented in Section 10.

6.3.3 Limiting Factors Bull Trout

Based on the QHA analysis, bull trout were recognized as being historically present in 27 of 36 watersheds in the Coeur d' Alene Subbasin. Since historical data is limited, the historical distribution of bull trout remains in dispute for five creeks among local biologists. For example, IDFG biologists do not agree bull trout were historically present in Plummer, Pedee, Fighting, Benewah, or Lake creeks as listed in Table 6.2 or analyzed for Table 6.3. If the historical distribution estimate used in the QHA is accurate, then current distributions have dropped 44 percent to only include 15 watersheds. The reaches no longer supporting bull trout populations (based on QHA results) are listed in Table 6.2.

Table 6.2. List of 12 reaches where bull trout are not currently present, but were historically present. Reach rank refers to the degree of habitat change from reference to present conditions (1 = greatest habitat alteration)

Reach Name	Reach Rank
East Fork Pine Creek	4
Prichard/Beaver Creek	6
Placer/Big Creek	7
Upper St Maries River	9
Latour Creek	12
Mica Creek (Joe)	13
West Fork Pine Creek	15
North Fork St. Joe	18
Marble Creek	18
Tepee	23
Upper North Fork Coeur d' Alene	25
Independence	26

The top five ranked watersheds having experienced the greatest degree of habitat deviation from reference conditions within the Subbasin are Benewah, Plummer/Pedee Creek, mainstem of the South Fork Coeur d' Alene River, Lake Creek, and East Fork Pine Creek (Table 6.3). Among the top five watersheds, almost all habitat attributes were identified as being altered and there does not appear to be one specific limiting habitat attribute common to all watersheds. Riparian condition, channel stability, habitat diversity, and fine sediments were more commonly impacted in the remaining watersheds listed in Table 6.3. IDFG contend that of the top five creeks, Benewah, Plummer/Pedee, and Lake creeks did not historically host bull trout.

Some of the watersheds included in the QHA identifying habitat attributes most similar to reference conditions where bull trout are currently distributed (Table 6.4 and 6.5) also remain in dispute. At present IDFG biologists contend there is no evidence of bull trout currently present in Fighting Creek, any west side tributaries to Coeur d' Alene Lake, main South Fork Coeur d' Alene River, Lake Creek, Plummer Creek, Pedee Creek, or Benewah Creek. IDFG's position is supported by discussions in Section 6.6.1 Environmental Conditions, under the subheading Coeur d' Alene River Drainage. In addition, water quality data show temperatures are unfavorable for bull trout in the streams previously mentioned located within the Coeur d' Alene Reservation. Furthermore, the physical, biological, and chemical impacts from historical mining and pollutants on the South Fork Coeur d' Alene River still prevent the presence of sensitive aquatic biota including species such as bull trout.

Table 6.4 lists the watersheds currently supporting bull trout populations and ranks them according to how similar current conditions are to reference conditions. Geographically, habitat quality in the St. Joe and Shoshone (North Fork Coeur d' Alene River drainage) watersheds is most representative of reference conditions. As described earlier in section 6.3.2 Current Status, the upper St. Joe River drainage is considered the critical bull trout recovery area within the Coeur d' Alene Subbasin.

Table 6.3. Ranking of reaches with the largest deviation from the reference habitat conditions for bull trout in the Coeur d' Alene Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
1	Benewah	1	0.5	4	2	4	6	7	1	9	11	2	10	8
2	Plummer/Pedee Creek	2	0.5	4	4	4	8	10	2	4	11	1	2	9
17.2	Main South Fork Coeur d' Alene River	3	0.5	2	2	2	7	8	8	10	10	5	1	6
3	Lake Creek	4	0.4	7	4	5	1	7	1	9	10	1	5	10
18.1	East Fork Pine Creek	4	0.4	1	1	1	7	7	7	10	10	5	1	6
22.1	Prichard/Beaver Creek	6	0.3	3	4	1	6	8	4	10	10	8	1	7
17.1	Placer/Big Creek	7	0.3	3	4	2	5	9	9	11	5	5	5	1
11	West Shore Coeur d' Alene Lake	8	0.3	3	6	3	2	8	1	10	10	6	3	9
16.1	Upper St Maries River	9	0.3	1	1	4	3	8	5	10	10	5	8	7
14.3	North side Joe	10	0.3	1	1	1	4	9	5	10	5	5	10	8
9	Fighting Creek	11	0.2	2	8	2	1	8	5	10	10	2	5	7
19.1	Latour Creek	12	0.2	1	1	3	4	4	4	9	9	8	9	4
14.6	Mica Creek (Joe)	13	0.2	2	2	2	1	5	7	10	7	7	10	6
15.1	St. Joe Lower	14	0.2	1	4	1	1	6	5	8	8	8	6	8

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
18.2	West Fork Pine Creek	15	0.2	4	1	2	4	4	4	9	9	8	9	3
14.4	Southside Joe	16	0.2	1	3	1	4	6	6	10	6	6	10	5
20.1	Evans Creek & Lateral Lake Tribs	17	0.2	4	1	2	4	7	2	9	9	4	9	7
14.2	North Fork St. Joe	18	0.2	1	1	1	4	6	9	9	6	6	9	5
14.5	Marble Creek	18	0.2	1	3	3	5	9	5	9	5	5	9	2
14.1	Slate/Big Creek	20	0.2	1	3	1	6	8	8	8	3	3	8	7
21.1	Middle North Fork Coeur d' Alene	20	0.2	1	1	1	5	5	8	8	8	4	8	7
21.2	Shoshone	20	0.2	1	1	1	5	5	8	8	8	4	8	7
21.5	Tepee	23	0.1	1	4	1	4	7	7	7	7	1	7	6
12	Upper St Joe inc. Heller Creek	24	0.0	2	2	1	4	4	4	4	4	4	4	4
21.3	Upper North Fork Coeur d' Alene	25	0.0	1	1	4	4	4	4	4	4	4	4	3
13	St. Joe Above Copper Creek	26	0.0	1	1	1	1	1	1	1	1	1	1	1
21.4	Independence	26	0.0	1	1	1	1	1	1	1	1	1	1	1

Table 6.4. Ranking of streams whose habitat is most similar to the reference condition for bull trout in the Coeur d' Alene Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
13	St. Joe Above Copper Creek	1	-0.97	1	1	1	1	1	1	1	1	1	1	11
12	Upper St Joe inc. Heller Creek	2	-0.92	8	8	10	1	1	1	1	1	1	1	11
21.2	Shoshone	3	-0.80	8	8	8	5	6	1	1	1	6	1	11
14.4	Southside Joe	4	-0.76	9	8	9	7	3	3	1	3	3	1	9
14.3	North side Joe	5	-0.69	8	8	8	7	3	3	1	3	3	1	8
21.1	Middle North Fork Coeur d' Alene	6	-0.68	6	6	6	4	10	1	1	11	5	1	9
20.1	Evans Creek & Lateral Lake Tribs	7	-0.60	3	8	5	3	9	5	1	11	5	1	9
9	Fighting Creek	8	-0.59	5	2	5	8	9	3	1	11	5	3	10
15.1	St. Joe Lower	9	-0.58	6	5	6	6	10	3	1	11	3	2	6
11	West Shore Coeur d' Alene Lake	10	-0.49	4	2	4	9	7	10	1	11	2	4	8
17.2	Main South Fork Coeur d' Alene River	11	-0.38	6	6	6	3	4	2	1	11	4	10	9
14.1	Slate/Big Creek	12	-0.37	9	5	9	7	7	1	1	11	5	1	4
3	Lake Creek	13	-0.35	2	6	3	8	8	7	1	11	8	3	3

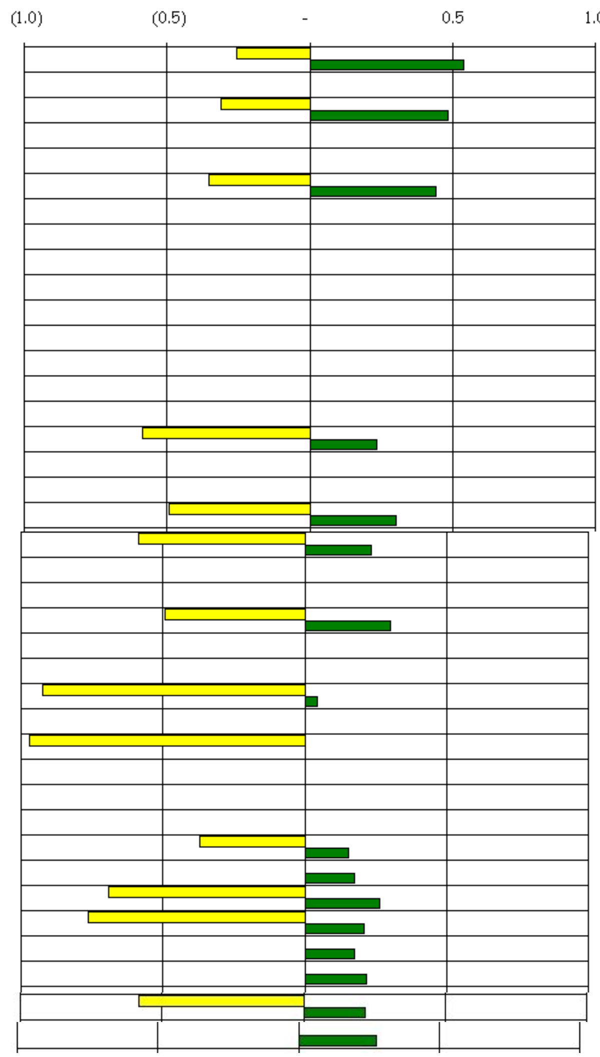
Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
2	Plummer/Pedee Creek	**14**	-0.31	1	1	1	1	6	6	1	10	10	6	9
1	Benewah	**15**	-0.26	3	7	3	3	7	9	2	9	9	1	6

The tornado diagram (Table 6.5) and maps (Map CdA-1, Map CdA-2, located at the end of Section 6) presents the reach scores for both current habitat condition (ranging from zero to positive one, Map CdA-1) and protection (ranging from zero to negative one, Map CdA-2). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

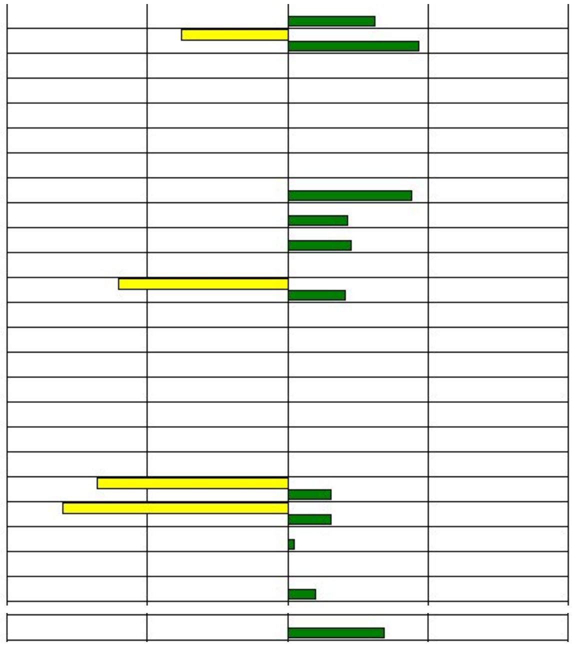
Table 6.5. Tornado diagram for bull trout in the Coeur d' Alene Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

NP = Not present

Sequence	Reach Name	Protection Confidence	Current Habitat Condition Confidence
1.1	Benewah	0.50	0.42
1.2	0	NP	
2.1	Plummer/Pedee Creek	0.42	0.38
2.2	0	NP	
2.3	0	NP	
3.1	Lake Creek	0.50	0.42
4.1	Wolf Lodge/Alder	NP	
4.2	0	NP	
4.3	0	NP	
5.1	Fernan	NP	
6.1	Blue Creek	NP	
7.1	Beauty Creek	NP	
8.1	E. Side Coeur d' Alene Lake	NP	
8.2	0	NP	
8.3	0	NP	
9.1	Fighting Creek	0.33	0.33
10.1	Cougar/Mica Creek	NP	
10.2	0	NP	
11.1	West Shore Coeur d' Alene Lake	0.33	0.33
9.1	Fighting Creek	0.33	0.33
10.1	Cougar/Mica Creek	NP	
10.2	0	NP	
11.1	West Shore Coeur d' Alene Lake	0.33	0.33
11.2	0	NP	
11.3	0	NP	
12.1	Upper St Joe inc. Heller Creek	0.50	0.42
12.2	0	NP	
13.1	St. Joe Above Copper Creek	0.50	0.42
13.2	0	NP	
13.3	0	NP	
13.4	0	NP	
14.1	Slate/Big Creek	0.50	0.42
14.2	North Fork St. Joe	0.50	0.42
14.3	Northside Joe	0.50	0.42
14.4	Southside Joe	0.50	0.42
14.5	Marble Creek	0.50	0.42
14.6	Mica Creek (Joe)	0.50	0.42
15.1	St. Joe Lower	0.17	0.25
16.1	Upper St Maries River	0.50	0.42



17.1	Placer/Big Creek	0.50	0.42
17.2	Main South Fork Coeur d'Alene River	0.50	0.42
17.3	0	NP	
17.4	0	NP	
17.5	0	NP	
17.6	0	NP	
17.7	0	NP	
18.1	Eastfork Pine Creek	0.50	0.42
18.2	Westfork Pine Creek	0.50	0.42
19.1	Latour Creek	0.50	0.42
19.2	0	NP	
20.1	Evans Creek & Lateral Lake Tribs	0.50	0.42
20.2	0	NP	
20.3	0	NP	
20.4	0	NP	
20.5	0	NP	
20.6	0	NP	
20.7	0	NP	
20.8	0	NP	
21.1	Middle North Fork Coeur d'Alene	0.50	0.42
21.2	Shoshone	0.50	0.42
21.3	Upper North Fork Coeur d'Alene	0.50	0.42
21.4	Independence	0.50	0.42
21.5	Tepee	0.50	0.42
22.1	Prichard/Beaver Creek	0.50	0.42



Although Table 6.4 provides a ranked list for protection of relatively unaltered watersheds currently supporting bull trout, experts of the region are not confident bull trout are present in all of these areas. However, biologists do agree that these watersheds with relatively high-quality habitat are important and critical to bull trout recovery in the Subbasin.

St. Joe watershed is biologically the most important area for bull trout within the Subbasin. Bull trout populations are most abundant in this region, especially in the headwater reaches. The ecological significance of the St. Joe watershed is supported by results from the QHA model, thus biologists agree this area of high habitat quality should be one of the primary areas protected from any disturbance or degradation.

The Middle North Fork of the Coeur d' Alene River provides an important migratory corridor for bull trout and was ranked 6th for protection (Table 6.4). This watershed may be important for the connectivity with the Shoshone Creek watershed. As mentioned earlier, habitat conditions in the Shoshone Creek watershed are also relatively good, however the presence of bull trout is not certain. Local biologists support prioritizing the protection of Shoshone Creek watershed due to its potential to support bull trout.

Fighting Creek watershed is ranked 8th for protection (see Table 6.4) based on similarity of habitat attributes to the reference and 11th for greatest degree of habitat deviation from the reference (see Table 6.3). According to Tribal biologists, this is an example of a drainage that would benefit most from restoration rather than protection. IDFG biologists, however, do not agree that Fighting Creek ever supported, or currently supports bull trout. Evans Creek (ranked 17th for habitat alteration, see Table 6.3) is another area that may benefit from restoration since water temperatures are within the appropriate range to support bull trout.

Graves et al. (1992) surveyed and evaluated current habitat conditions and suitability for salmonids in streams (Fighting Creek, Lake Creek, Plummer Creek, Pedee Creek) within the boundaries of the Coeur d' Alene Reservation (Benewah, Pedee, Plummer, Fighting, and Lake creeks). IDFG biologists contest and believe some of the streams did not historically and do not currently host bull trout. In general, the results of the study show most of these creeks are impacted by land use practices, have man-made barriers, have poor water quality, or are naturally not suitable for salmonids (Graves et al. 1992). Fighting Creek is surrounded by land uses including recreation, residential, agriculture, grazing, and timber harvest. There are manmade barriers (for example concrete embuttment) and water quality issues from a landfill site adjacent to the stream. The upper reaches are steep and "not conducive to a bull or cutthroat trout fishery" (Graves et al. 1992). The land use influencing Lake Creek watershed includes agriculture, grazing, and timber harvest. There are no barriers, however the stream channel is relatively unstable and water quality is moderate to poor as a result of sediment/silt loading (Graves et al. 1992). Land use practices around Plummer Creek include timber harvest and residential development along with in-stream impacts including culverts creating passage barriers and effluent from a sewage treatment facility (Graves et al. 1992). Pedee Creek was in general "not suitable for fish habitat" since it is covered in ice during the winter, has a steep gradient in the headwaters, and possibly some improperly graded culverts (Graves et al. 1992).

6.3.4 Current Management

The IDFG along with the Coeur d' Alene Indian Tribe are managers of the fish resources in the Subbasin. The U.S. Fish and Wildlife Service (USFWS) also manage bull trout populations in the Subbasin, since they are listed as threatened under the Endangered Species Act. The recovery criteria for bull trout in the Coeur d' Alene Recovery Unit (specifically St. Joe River and North Fork Coeur d' Alene River drainages) is available in the Draft Recovery Plan (USFWS 2002) and is also incorporated in the strategies and objectives in Section 10 Coeur d' Alene Subbasin Management Plan.

The legal harvest of bull trout has not been allowed in the Subbasin since 1988. IDFG developed and has updated a fisheries management plan for the basin on a five-year review cycle beginning in 1981. The fisheries management policies of the agency emphasize providing diverse sport fishing opportunities while also conserving wild, native stocks.

Many regulations limit the amount of mortality associated with catching bull trout on hook and line. Portions of the St. Joe River drainage and the North Fork Coeur d' Alene River drainage are managed as catch-and-release fisheries. In these areas, artificial flies and lures with a single barbless hook are allowed. Bait fishing with limited harvest is allowed in much of the Couer d' Alene Subbasin for other species, and three areas, Wolf Lodge Creek, Lake Creek, and Benewah Creek, are closed to all fishing.

Harvest of bull trout occurs through both misidentification and deliberate illegal catch. Spawning bull trout are particularly vulnerable to illegal harvest since the fish are easily observed during fall low flow conditions. Even in cases where an angler releases the fish, incidental mortality of four percent has been documented (Schill and Scarpella 1997).

Harvest and reduced fishing mortality can be further addressed through stricter enforcement of existing fishing regulations, angler education, and road closures where roads readily access native bull trout spawning areas. Fishing in the core bull trout area in the upper St. Joe River system, which encompasses the area upstream of the North Fork St. Joe River where all of the known spawning and early rearing occurs, is regulated with catch-and-release fishing regulations, with no bait allowed. Implementation of long-term angling and harvest regulation most likely will limit the effect they have on the population.

As mentioned in earlier sections, bull trout have had a limited stocking history and the restoration plans do not include artificial propagation. Instead USFWS emphasizes removal of limiting factors affecting bull trout and bull trout habitats (USFWS 2002). Artificial propagation as a restoration strategy is generally regarded as an option of last resort for bull trout recovery due to the genetic concerns and the difficulty with bull trout artificial propagation (Montana Bull Trout Scientific Group 1996). A thorough analysis on the streams that are capable of harboring bull trout and a determination of the factors limiting bull trout will need to be done prior to considering artificial propagation as a recovery tool. Transplanting listed species must be authorized by the USFWS through a 10(a)(1)(A) recovery permit and must meet applicable State fish-handling and disease policies.

Efforts to recover bull trout in the wild may be difficult in the Coeur d' Alene Recovery Unit since some local populations of bull trout within the North Fork Coeur d' Alene River drainage and portions of the St. Joe River Subbasin are thought to be extirpated. In addition, numbers of bull trout in the upper portion of the St. Joe River drainage are limited. While bull trout exhibit a high degree of fidelity to natal streams (Spruell et al. 2000; Hvenegaard and Thera 2001), there are no studies showing any instances of natural refounding occurring for a local population of bull trout after a complete life cycle has been extirpated.

The findings of the Montana Bull Trout Scientific Group (MBTSG) explore the possible use of artificial propagation and transplantation. The MBTSG (1996) identified seven potential strategies for using artificially propagated fish, evaluated the strategies relative to recovery criteria and objectives, and provided recommendations. The group also concluded that transplantation into areas where bull trout have been extirpated should be considered only after the causes of extirpation have been identified and corrected.

Currently, only one known local population in the St. Joe River may meet the level of 100 annual adult spawners suggested by Rieman and Allendorf (2001) to minimize the risk of inbreeding depression. The Coeur d' Alene Recovery Unit Team recommends the following: 1) identify and correct threats in the St. Joe River drainage to increase bull trout densities and allow for natural recolonization to occur within streams that have evidence of recruitment and consider an artificial propagation program only if a feasibility study indicates that such a program is the best option for recovery or to establish a genetic reserve, and 2) recognize that, even if threats are identified and corrected in the North Fork Coeur d' Alene River watershed, the probability of recolonization in the near future is low. A more thorough assessment of potential bull trout habitat is the watershed is warranted. Researchers at the U.S. Forest Service Intermountain Research Station, Boise, Idaho, and others (Watson and

Hillman 1997) have identified factors affecting bull trout distribution and abundance that will likely be applicable in assessing suitable bull trout habitat.

6.4 Focal Species – Westslope Cutthroat Trout

6.4.1 Historic Status

Historically, westslope cutthroat trout were the dominant salmonid in streams of the Coeur d' Alene Subbasin (Behnke and Wallace 1986). There is little data documenting historic abundance of westslope cutthroat trout, but densities were probably high throughout the basin. From 1901 to 1905, the St. Maries Courier reported catches of 7 to 9 pound trout and fishing trips where anglers caught 50 to 100 "speckled trout" averaging 3 to 5 pounds. In 1892, trout were a major source of protein to settlers and were commonly sold in the city of Wallace butcher shops (IDFG, Region 1 Files). Recent efforts to document changes in distribution of westslope cutthroat trout show significant reductions within some watersheds compared with the known historic range (Table 6.6). The pattern of changing distribution found within tributaries located on the Coeur d' Alene Reservation (Figure 6.1) is probably indicative of many other lower elevation tributaries in the Coeur d' Alene Subbasin (C. Corsi, IDFG, personal communication).

Table 6.6. Historical and occupied range for westslope cutthroat trout

Historical Range Occupied	Occupied Range Classed as Strong	Assessment Area	Source
Percentage	Percentage		
65	0	CDA Reservation	Coeur d' Alene Tribe (Unpublished)
82	11	Idaho	Rieman/Apperson (1989)
85	25	Interior Columbia Basin	ICBEMP (USFS/BLM)
96	50	Idaho	Shepard et al. 2003

Although westslope cutthroat trout still occupy a substantial portion of their historic distribution in Idaho and within the Coeur d' Alene Subbasin, the historic habitat quality is not well understood. Land use practices, along with fisheries management (introduction of exotics, take regulations, etc.) along with degraded habitats may have dramatically lowered the carrying capacity for westslope cutthroat trout.

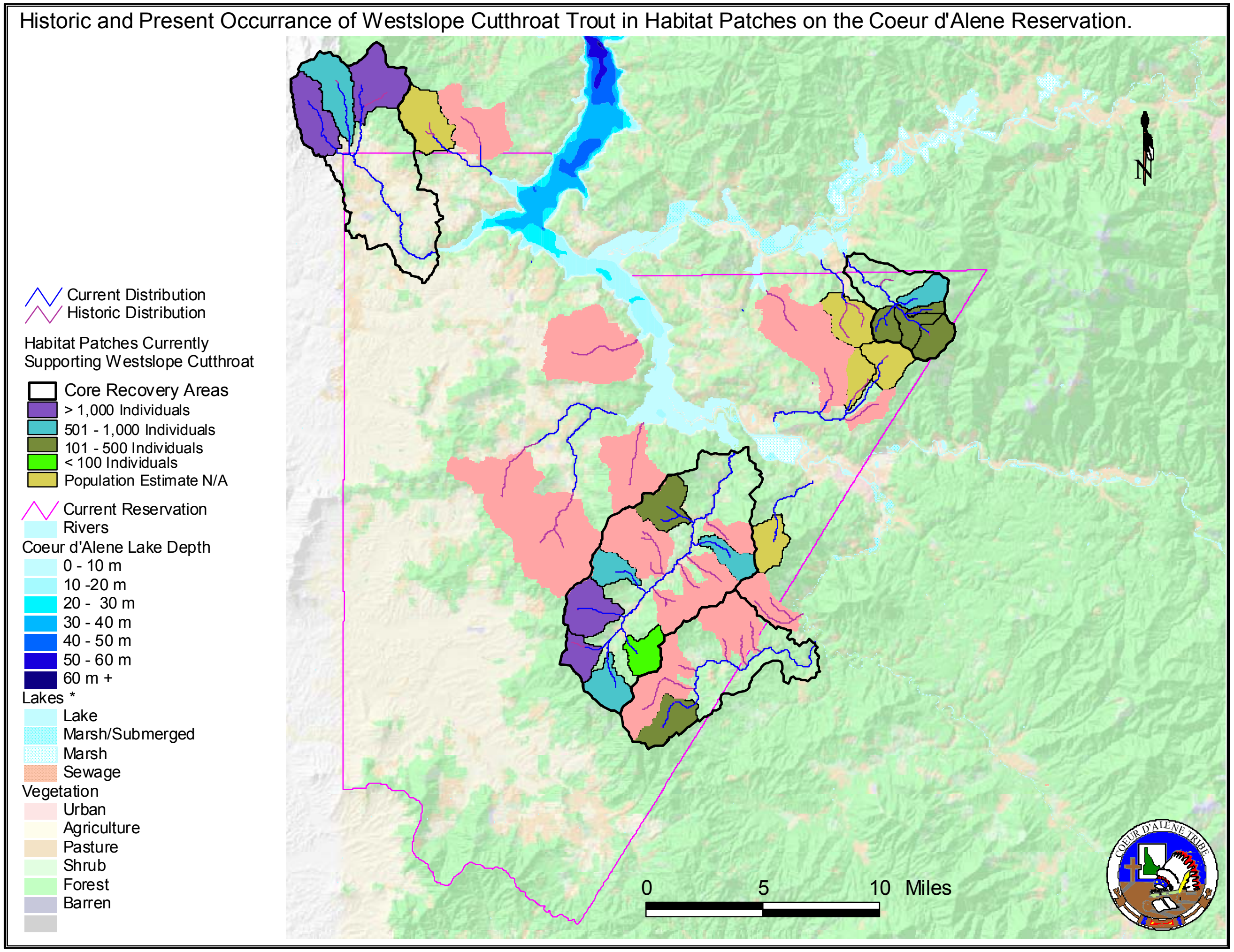


Figure 6.1. Historic versus present occurrence of westslope cutthroat trout in habitat patches on the Coeur d' Alene Reservation. This pattern of habitat loss and fragmentation is characteristic for many lower elevation watersheds in the Subbasin.

6.4.2 Current Status

Westslope cutthroat trout are currently distributed throughout the Coeur d' Alene Subbasin and three life histories are represented: adfluvial, fluvial, and resident. Populations of adfluvial westslope cutthroat trout reside in Coeur d' Alene Lake as adults and sub-adults, and disperse to tributaries lower in the Subbasin to spawn and rear through the juvenile life stage. Populations of fluvial fish reside in the St. Joe, St. Maries, and North Fork Coeur d' Alene rivers with spawning and rearing occurring in smaller tributaries. Strongholds for both adfluvial and fluvial life forms are concentrated in the St. Joe River and its tributaries and the Coeur d' Alene River and its tributaries upstream of Enaville (Bennett and Dunnigan 1997; Apperson et al. 1987; Hunt and Bjornn 1995). Smaller, more isolated adfluvial populations are distributed in many of the lower elevation tributaries to Coeur d' Alene Lake (Lillengreen et al. 1998). In addition, resident populations of westslope cutthroat are widely dispersed throughout many of the same watersheds, typically in headwater reaches or smaller tributaries.

The current patterns of westlsope cutthroat trout abundance and distribution vary among watersheds and among years, but seem to be highly correlated to seasonal changes in water quality and quantity (Peters and Vitale 1998). Downstream displacement has been recognized as a common occurrence and seems to be an adaptation to habitat availability (Chapman and Bjornn 1969; Bjornn 1971). Bennett and Dunnigan (1997) observed that most successful reproduction in the Coeur d' Alene River system occurs in third order and smaller tributaries that generally have watershed areas less than or equal to 60 square kilometers. Population surveys completed on the Coeur d' Alene Reservation also demonstrated that abundance of juvenile cutthroat is greatest in first and second order tributaries, suggesting a close link to the most heavily utilized spawning areas (Lillengreen et al. 1998).

More recent biological evaluations indicate that populations occupying lower elevation watersheds are at risk based on both low population numbers and habitat losses (Lillengreen et al. 1996). In Idaho, habitat loss was identified as the primary cause of decline in streams supporting depressed populations (Rieman and Apperson 1989). Other reasons for the range wide causes of decline include competition and predation by nonnative species, genetic introgression, overfishing, habitat loss and fragmentation, and habitat degradation (Liknes 1984; Liknes and Graham 1988; Rieman and Apperson 1989; McIntyre and Rieman 1995).

The upper St. Joe River (upstream of the North Fork) is currently regarded as one of the strongest westslope cutthroat trout populations in Idaho (Rieman and Apperson 1989) and has been lauded as a successful example of wild westlsope cutthroat trout management (Apperson et al 1987). Following the implementation of special regulations (3 trout, 13-inch minimum size limit), cutthroat trout catch rates increased from 0.2 fish/hour to 2.5 fish/hour, and the percentage of fish in the catch longer than 250 mm increased from 2.5 percent to 18 percent (Thurow and Bjornn 1978). Catch-and-release regulations were implemented in the upper St. Joe River above Prospector Creek in 1988 and the number and size of cutthroat continued to increase. The percentage of fish over 330 mm increased to over 50 percent of the population and densities of cutthroat increased to 500-750 fish/km. The catch-and-release area on the St. Joe River was expanded down to the North Fork St. Joe River in 2000 and a basin-wide cutthroat slot limit was implemented to provide additional protection for native cutthroat trout (Ned Horner, IDFG Regional Fisheries Manager, personal communication, December 2003).

Westslope cutthroat trout in the lower St. Joe River (downstream of the North Fork) are fairly abundant and widely distributed, although some hybridization with introduced rainbow trout is occasionally seen (Apperson et. al. 1987). The St. Maries River population appears to be somewhat depressed, but westslope cutthroat trout are still widely distributed. Westslope cutthroat trout were present in all tributaries to the Coeur d' Alene River as documented in surveys completed by the IDFG (Apperson et al. 1987). These same surveys reported that rainbow trout and cutthroat-rainbow hybrids comprised less than 25 percent of the salmonids in any given tributary. Understanding why there are differences may be important to future management decisions.

Westslope cutthroat trout populations are believed to be at least moderately damaged resulting from the persistence of adverse conditions in lower elevation tributaries to Coeur d' Alene Lake. Moderately damaged is defined by the Coeur d' Alene Tribe as the average spawning escapements fall between the minimum viable population and the number of adults needed to produce 50 percent of the carrying capacity of the stream environment. Rieman and Apperson (1989) estimated that populations considered as "strong" (greater than or equal to 50 percent of historic potential) by IDFG remained in only 11 percent of the historic range within the state of Idaho. The probability of persistence was calculated for several populations occupying lower elevation watersheds in the Coeur d' Alene Subbasin, using methods described by Rieman and McIntyre (1993) (Table 6.7). All populations in Table 6.7 had a positive but nearly zero rate of population growth, suggesting that each population is maintaining but not robustly growing. The limited time series data used for Table 6.7 (three years) creates a large degree of variance around the population growth rate, leading to uncertainty in the persistence of these populations. Longer time series data is needed to better understand the probability of persistence for these populations.

Table 6.7. Mean annual population estimates, the estimated mean annual variance (95 percent confidence interval is shown in parentheses) in the infinitesimal rate of population growth, and probability of persistence over 100 years for westslope cutthroat trout populations monitored on the Coeur d' Alene Reservation.

Stream	Years	Mean Annual Population Estimate	Population Growth Rate & Variance	Probability of Persistence
Alder Creek	3	808	0.03 (0.02-0.04)	0.58
Benewah Creek	3	5,553	0.16 (0.04-0.36)	0.67
Evans Creek	3	2,675	0.33 (0.05-0.71)	0.45
Lake Creek	3	4,946	0.14 (0.02-0.26)	0.7

(*Source:* Coeur d' Alene Tribe. Methods from Rieman and McIntyre [1993])

Despite the apparent instability of westslope cutthroat trout populations in lower elevation tributaries to Coeur d' Alene Lake, preliminary genetic analyses of 16 populations show that relatively pure stocks exist in Coeur d' Alene Tribal Reservation waters (Spruell et al. 1999). Only minimal amounts of hybridization with rainbow trout have occurred and some populations show no hybridization at all (Spruell et al. 1999). The risk of hybridization may be greater for populations in the Coeur d' Alene and St. Joe rivers, where stocking of rainbow trout has occurred, but only if nonnative rainbow trout survived and reproduced with native cutthroat trout. Stocking of rainbow trout shifted to sterile triploid fish in 1996 and was totally discontinued in 2003 (Ned Horner, IDFG, Regional Fisheries Manager, personal communication, December 2003).

Although westslope cutthroat trout are still widely distributed throughout the Coeur d' Alene Subbasin, it is not well understood to what extent their genetic integrity has been compromised in most of their historic range in the state of Idaho including the Coeur d' Alene Subbasin. Shepard et al. (2003) estimated that westslope cutthroat trout occupy almost 96 percent of their historic range in Idaho, and that stream segments that support westslope cutthroat trout "slightly below" or "near" habitat capacity occupy about 50 percent of the historic range. Although westslope cutthroat trout are still widespread, Shepard et al. (2003) estimated between 8 to 20 percent of all westslope cutthroat trout historic habitat is occupied by genetically unaltered westslope cutthroat trout. It is not known what percent of westslope cutthroat trout in the Coeur d' Alene Subbasin are genetically unaltered, thus it is not well understood what proportion of the historic habitat is occupied by pure westslope cutthroat trout.

The carrying capacity of westslope cutthroat trout in the Coeur d' Alene Subbasin has been lowered from the historical conditions, especially in direct tributaries to Coeur d' Alene Lake and tributaries lower in the Subbasin. Many of the streams throughout the Coeur d' Alene Subbasin have unnatural rates of sedimentation (refer to IDEQ 1998 303(d) list), which has lead to a reduction in the quality of salmonid habitat currently available. Studies on the Coeur d' Alene Indian Reservation have shown that many streams are well below their potential of supporting natural populations of salmonids due to habitat destruction (Graves et al. 1992). Managers of the Coeur d' Alene Indian Reservation attribute timber and agricultural practices to the loss in salmonid habitat on the reservation. Peters and Vitale (1998) used a modified habitat quality index model to model the potential increase in the numbers of juvenile westslope cutthroat trout in some of the streams of the Coeur d' Alene Indian Reservation. Their modeling effort predicted an increase in juvenile cutthroat trout of 117 percent with improved in-stream cover, decreased summer water temperatures, and the reduction of streambank erosion attributes.

6.4.2 Limiting Factors Westslope Cutthroat Trout

According to the QHA results, westslope cutthroat trout were historically present throughout the Subbasin (36 watersheds) and are currently only absent from the Little North Fork drainage, a headwater tributary that drains into the South Fork Coeur d' Alene River (refer to Sequence ID 21.6 in Map CdA-5, refer to protection habitat scores in Map CdA-4, located at the end of Section 6). In addition, a barrier at the mouth of the

Little North Fork prevents trout from entering the stream (Harvey, Waste and Remediation Manager, IDEQ, personal communication, 2004).

All 36 watersheds were included in assessing the degree of habitat deviation from reference to present conditions (Table 6.8). Different habitat attributes appear to have been impacted from reference to present conditions for the first four ranked watersheds (Benewah, Plummer/Pedee Creek, Lake Creek, and the main South Fork Coeur d' Alene River) (Table 6.8). These attributes include low flow, high flow, fine sediment, high temperatures, and pollutants. Mining has historically heavily impacted the main South Fork Coeur d' Alene River, thus pollutants may still persist in the system. The other three watersheds (Benewah, Plummer/Pedee, Lake Creek) are in close proximity to Coeur d' Alene Lake and are heavily impacted by land use practices (agriculture, timber harvest, logging, and/or residential development) (Graves et al. 1992).

According to results from the QHA, the streams in the St. Joe River drainage (western peninsula of the Subbasin) and North Fork Coeur d' Alene River drainage (northern region of the Subbasin) are most representative of reference conditions relative to the other watersheds analyzed within the Subbasin (Table 6.9). These results do not conclude that the creeks within these drainages (St Joe and North Fork Coeur d' Alene rivers) remain uninfluenced or untouched by land use activities. For example, stream habitat conditions do vary among the smaller watersheds such as Independence Creek, Tepee Creek, and Shoshone Creek in the North Fork Coeur d' Alene River. In general, the upper North Fork Coeur d' Alene River (upstream of the confluence with Tepee Creek) is more representative of reference conditions than other tributaries such as Tepee and Shoshone creeks in the North Fork Coeur d' Alene River drainage. Tepee and Shoshone creeks have experienced more alterations to in-stream habitat features through erosion and sedimentation resulting in pool-filling and channel widening (G. Harvey, IDEQ, personal communication, 2004).

The tornado diagram (Table 6.10) and maps (Map CdA-3, Map CdA-4 located at the end of Section 6) presents the reach scores for both current habitat condition (ranging from zero to positive one, Map CdA-3) and protection (ranging from zero to negative one, Map CdA-4). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

Table 6.8. Ranking of reaches with the largest deviation from the reference habitat conditions for westslope cutthroat trout in the Coeur d' Alene Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
1	Benewah	1	0.6	4	2	4	7	4	1	9	9	2	11	8
2	Plummer/Pedee Creek	2	0.5	4	4	4	10	4	2	4	11	1	2	9
3	Lake Creek	3	0.5	8	5	6	1	1	1	9	9	1	6	11
17.2	Main South Fork Coeur d' Alene River	4	0.5	2	2	2	7	8	8	10	10	5	1	6
5	Fernan	5	0.5	1	1	1	5	10	1	8	10	5	8	7
18.1	East Fork Pine Creek	6	0.4	1	1	1	7	7	7	10	10	5	1	6
6	Blue Creek	7	0.4	1	3	1	4	9	4	11	9	8	6	7
16.3	Emerald/Carpenter Creek	8	0.4	3	1	3	1	7	7	11	10	3	6	9
22.1	Prichard/Beaver Creek	9	0.3	3	4	1	6	8	4	10	10	8	1	7
11	West Shore Coeur d' Alene Lake	10	0.3	3	6	3	2	6	1	11	9	6	3	10
17.1	Placer/Big Creek	11	0.3	3	4	2	5	8	8	11	8	5	5	1
8	E. Side Coeur d' Alene Lake	12	0.3	3	1	1	3	7	3	11	10	7	7	6
10	Cougar/Mica Creek	13	0.3	4	4	4	1	4	4	11	10	4	3	2
16.1	Upper St Maries River	14	0.3	1	1	4	3	8	5	10	10	5	8	7
7	Beauty Creek	15	0.3	4	1	1	7	7	1	11	10	7	4	6

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
9	Fighting Creek	16	0.3	3	1	3	8	8	5	10	10	5	2	5
4	Wolf Lodge/Alder	16	0.3	2	9	2	1	5	5	11	9	2	5	5
14.3	North side Joe	18	0.3	1	1	1	4	8	5	10	8	5	10	7
15.1	St. Joe Lower	19	0.2	1	4	1	1	5	5	9	8	9	7	9
19.1	Latour Creek	20	0.2	1	1	3	4	4	4	9	9	8	9	4
20.1	Evans Creek & Lateral Lake Tribs	21	0.2	4	1	2	4	4	2	10	9	4	10	8
16.2	Lower St Maries River	22	0.2	1	3	3	7	7	3	11	7	1	7	6
14.6	Mica Creek (Joe)	23	0.2	2	2	2	1	5	7	10	9	7	10	6
18.2	West Fork Pine Creek	24	0.2	4	1	2	4	4	4	9	9	8	9	3
14.4	Southside Joe	25	0.2	1	3	1	4	6	6	10	9	6	10	5
21.6	Little North Fork	26	0.2	2	1	2	5	7	7	7	7	5	7	4
14.2	North Fork St. Joe	27	0.2	1	1	1	4	6	9	9	8	6	9	5
14.5	Marble Creek	27	0.2	1	3	3	5	9	5	9	8	5	9	2
21.1	Middle North Fork Coeur d’ Alene	29	0.2	1	1	1	5	5	8	8	8	4	8	7
21.2	Shoshone	29	0.2	1	1	1	5	5	8	8	8	4	8	7
14.1	Slate/Big Creek	31	0.1	1	3	1	5	8	8	8	5	3	8	7
21.5	Tepee	32	0.1	1	4	1	4	7	7	7	7	1	7	6
12.1	Upper St Joe inc. Heller Creek	33	0.0	2	2	1	4	4	4	4	4	4	4	4
21.3	Upper North Fork Coeur d’ Alene	34	0.0	1	1	4	4	4	4	4	4	4	4	3
13.1	St. Joe Above Copper Creek	35	0.0	1	1	1	1	1	1	1	1	1	1	1

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
21.4	Independence	35	0.0	1	1	1	1	1	1	1	1	1	1	1

Table 6.9. Ranking of streams whose habitat is most similar to the reference condition for westslope cutthroat trout in the Coeur d' Alene Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
13.1	St. Joe Above Copper Creek	1	-0.92	1	1	1	1	1	1	1	11	1	1	10
21.4	Independence	2	-0.91	1	1	1	1	9	1	1	11	1	1	10
21.3	Upper North Fork Coeur d' Alene	3	-0.89	7	7	1	1	7	1	1	11	1	1	10
12.1	Upper St Joe inc. Heller Creek	4	-0.88	7	7	9	1	1	1	1	11	1	1	10
21.5	Tepee	5	-0.81	7	4	7	4	4	1	1	11	7	1	10
14.1	Slate/Big Creek	6	-0.77	8	6	8	4	4	1	1	11	6	1	10
21.1	Middle North Fork Coeur d' Alene	7	-0.76	7	7	7	4	5	1	1	11	5	1	10
21.2	Shoshone	7	-0.76	7	7	7	4	5	1	1	11	5	1	10
14.2	North Fork St. Joe	9	-0.74	7	7	7	5	5	1	1	11	4	1	10
14.5	Marble Creek	9	-0.74	9	7	7	3	3	3	1	10	3	1	11
14.4	Southside Joe	11	-0.72	8	7	8	6	3	3	1	11	3	1	8
18.2	West Fork Pine Creek	12	-0.71	4	9	8	4	4	4	1	9	3	1	11
1.6	Mica Creek (Joe)	13	-0.71	6	6	6	9	5	3	1	11	3	1	9
19.1	Latour Creek	14	-0.70	8	8	7	4	4	4	1	8	3	1	11
20.1	Evans Creek & Lateral Lake Tribs	15	-0.69	3	9	6	3	3	6	1	11	6	1	9

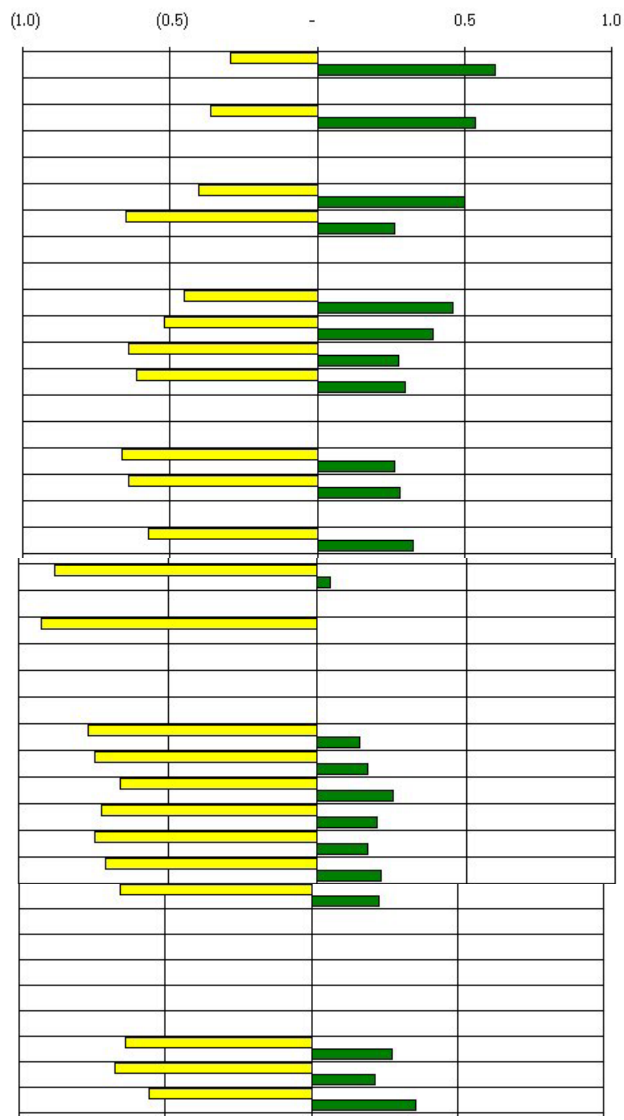
Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
16.2	Lower St Maries River	**16**	-0.67	8	4	4	4	2	4	1	10	11	2	8
9	Fighting Creek	**17**	-0.66	6	2	6	9	3	3	1	11	6	3	10
14.3	North side Joe	**18**	-0.66	7	7	7	6	3	3	1	11	3	1	7
15.1	St. Joe Lower	**19**	-0.65	7	6	7	7	3	3	1	11	3	2	7
4	Wolf Lodge/Alder	**20**	-0.65	6	11	6	2	3	3	1	8	3	8	10
10	Cougar/Mica Creek	**21**	-0.64	2	2	2	10	2	2	1	9	2	8	10
7	Beauty Creek	**22**	-0.64	5	7	7	2	4	7	1	10	2	5	11
16.1	Upper St Maries River	**23**	-0.64	9	9	6	9	2	4	1	7	4	2	7
17.1	Placer/Big Creek	**24**	-0.63	8	7	9	4	2	2	1	9	4	4	11
8	E. Side Coeur d' Alene Lake	**25**	-0.62	4	8	8	4	4	4	1	10	2	2	11
11	West Shore Coeur d' Alene Lake	**26**	-0.57	5	2	5	10	2	11	1	9	2	5	8
22.1	Prichard/Beaver Creek	**27**	-0.57	9	5	10	3	3	5	1	5	2	10	5
16.3	Emerald/Carpenter Creek	**28**	-0.56	5	9	5	11	2	2	1	9	5	4	5
6	Blue Creek	**29**	-0.52	10	7	10	5	2	5	1	7	2	4	9
18.1	East Fork Pine Creek	**30**	-0.48	7	7	7	2	2	2	1	5	6	7	11
17.2	Main South Fork Coeur d’ Alene River	**31**	-0.46	7	7	7	4	2	2	1	5	6	11	10
5	Fernan	**32**	-0.45	8	8	8	4	1	8	1	6	4	1	7
3	Lake Creek	**33**	-0.40	3	6	4	10	7	7	1	7	10	4	2
2	Plummer/Pedee Creek	**34**	-0.36	1	1	1	1	1	7	1	7	11	7	7

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
1	Benewah	**35**	-0.30	3	9	3	3	3	10	2	3	10	1	3

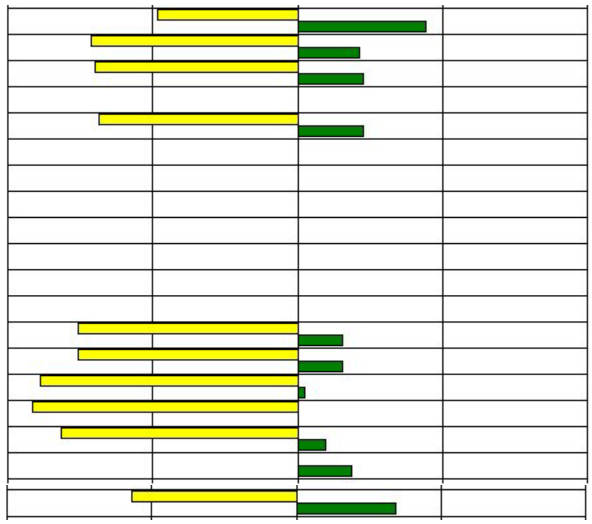
Table 6.10. Tornado diagram for westslope cutthroat trout in the Coeur d' Alene Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

NP = Not present

Sequence	Reach Name	Protection Confidence	Current Habitat Condition Confidence
1.1	Benewah	0.50	0.42
1.2	0	NP	
2.1	Plummer/Pedee Creek	0.42	0.38
2.2	0	NP	
2.3	0	NP	
3.1	Lake Creek	0.50	0.42
4.1	Wolf Lodge/Alder	0.50	0.42
4.2	0	NP	
4.3	0	NP	
5.1	Fernan	0.50	0.42
6.1	Blue Creek	0.33	0.33
7.1	Beauty Creek	0.50	0.42
8.1	E. Side Coeur d' Alene Lake	0.33	0.33
8.2	0	NP	
8.3	0	NP	
9.1	Fighting Creek	0.33	0.33
10.1	Cougar/Mica Creek	0.50	0.42
10.2	0	NP	
11.1	West Shore Coeur d' Alene Lake	0.33	0.33
12.1	Upper St Joe inc. Heller Creek	0.50	0.42
12.2	0	NP	
13.1	St. Joe Above Copper Creek	0.50	0.42
13.2	0	NP	
13.3	0	NP	
13.4	0	NP	
14.1	Slate/Big Creek	0.50	0.42
14.2	North Fork St. Joe	0.50	0.42
14.3	Northside Joe	0.50	0.42
14.4	Southside Joe	0.50	0.42
14.5	Marble Creek	0.50	0.42
14.6	Mica Creek (Joe)	0.50	0.42
15.1	St. Joe Lower	0.17	0.25
15.2	0	NP	
15.3	0	NP	
15.4	0	NP	
15.5	0	NP	
15.6	0	NP	
16.1	Upper St Maries River	0.50	0.42
16.2	Lower St Maries River	0.50	0.42
16.3	Emerald/Carpenter Creek	0.50	0.42



18.1	Eastfork Pine Creek	0.50	0.42
18.2	Westfork Pine Creek	0.50	0.42
19.1	Latour Creek	0.50	0.42
19.2	0	NP	
20.1	Evans Creek & Lateral Lake Tribs	0.50	0.42
20.2	0	NP	
20.3	0	NP	
20.4	0	NP	
20.5	0	NP	
20.6	0	NP	
20.7	0	NP	
20.8	0	NP	
21.1	Middle North Fork Coeur d'Alene	0.50	0.42
21.2	Shoshone	0.50	0.42
21.3	Upper North Fork Coeur d'Alene	0.50	0.42
21.4	Independence	0.50	0.42
21.5	Tepee	0.50	0.42
21.6	Little North Fork	0.50	0.42
22.1	Prichard/Beaver Creek	0.50	0.42



Coeur d' Alene Tribe is currently rehabilitating Lake Creek, which is ranked 3rd for greatest deviation in habitat conditions (see Table 6.8, Coeur d' Alene Tribe, personal communication, September 2003). Biologists conclude Lake Creek has more biological potential out of the top three ranked watersheds (Benewah, Plummer, Lake) identified in Table 6.8 that have experience significant habitat alterations based on watershed land use activities (Graves et al. 1992). Lake Creek has shown to provide critical passageway for adfluvial cutthroat trout.

Wolf Lodge Creek drains into Coeur d' Alene Lake and is an important westslope cutthroat trout stream for the lake. In the late 1970s, Wolf Lodge Creek had a spawning run of over 5,000 fish (N. Horner, IDFG, personal communication, September 2003). Currently the spawning run is likely less than 1,000 fish. Biologists feel Wolf Lodge Creek (ranked 16th for habitat alteration, Table 6.8) is more important biologically for protecting and restoring compared to Blue Creek (ranked 7th for habitat alteration, Table 6.8), although cutthroat trout may still have a strong presence in Blue.

If fish passage could be established around an old splash dam, local biologists feel Marble Creek (ranked 27th for habitat alteration) has great potential biologically (Table 6.8). An inspection of the splash dam during December 2003 indicated major flooding in 1996 and 1997 might have breached the dam (Joe DuPont, IDFG, Fisheries Biologist, personal communication, December 2003). A follow-up inspection is intended during the summer of 2004. The riparian condition in the lower reaches of Marble Creek has been degraded by road construction and would need some restoration, but upstream (approximately 20 km in length) of the fish barrier would provide higher quality habitat.

Fernan Creek (ranked 5th in habitat alteration) has been heavily degraded, which may limit feasibility of restoring cutthroat trout. East Fork Pine (ranked 6th) has also been severely degraded in the lower reaches (Table 6.8).

Mica Creek (St. Joe) was ranked 13th for representing conditions most similar to the reference (Table 6.9). Historically, this area had been closed to fishing with the goal to protect adfluvial westslope cutthroat trout.

As for the St. Maries River drainage, the IDEQ contracted the Kootenai-Shoshone Soil and Water Conservation District (KSSWCD) to survey the agricultural portions of the St. Maries River drainage for streambank erosion in order to complete the Total Maximum Daily Load (TMDL). In doing so, the KSSWCD have identified key stream reaches in need of restoration. Bank stabilization via restoring native riparian vegetation is considered a critical component to obtain TMDLs and improve aquatic habitat quality in these reaches. Reducing habitat fragmentation in the St. Maries River drainage would also contribute to increasing biological productivity and habitat function in the watershed.

The St. Joe River (above the North Fork St. Joe River) and especially the roadless portion in the headwaters provide the best opportunity to protect core habitat for westslope cutthroat trout. Habitat conditions above the North Fork St. Joe are close to reference conditions in many reaches and the cutthroat trout population is classified as strong, which is indicated by both numbers and size of fish. This area is managed with catch-and-release fishing regulations, so cutthroat populations receive maximum harvest protection.

6.4.4 Current Management

Fishing regulations for the Coeur d' Alene Subbasin have been modified over the years to enhance populations of native westslope cutthroat trout, while providing a diversity of fishing opportunity. In 1988, with modifications in 2000, the entire Spokane River drainage including Coeur d' Alene Lake and the Spokane River down to Post Falls Dam was placed under a set of regulations that provided harvest protection. A slot limit for cutthroat trout (2 fish, none between 8 and 16 inches) was adopted in 2000 to provide limited harvest opportunity for cutthroat trout while providing harvest protection to 95 percent of the population. In addition, headwater portions of both the Coeur d' Alene and St. Joe rivers have been managed with catch-and-release regulations since 1985 and 1988, respectively (Ned Horner, IDFG, personal communication, December 2003). The general fishing season is open from the Saturday of Memorial Day weekend through 30 November, with a winter stream season running from 1 December through 31 March that allows catch-and-release fishing for trout. Three water bodies, Wolf Lodge, Benewah, and Lake Creek are all closed to fishing year around to provide maximum recruitment of adfluvial cutthroat trout for Coeur d' Alene Lake.

Cutthroat trout fry were stocked into many tributaries in the Coeur d' Alene Subbasin in the late 1960s and early 1970s. Currently there are no westslope cutthroat trout stocking programs in place in the Coeur d' Alene Subbasin.

6.5 Focal Species – Kokanee Salmon

6.5.1 Historic Status

Kokanee salmon are not native to the Coeur d' Alene Subbasin. Historical stocking of kokanee salmon in Coeur d' Alene Lake started in 1937 with fish from Lake Pend Oreille. Periodic stocking continued until the early 1970s. Kokanee salmon have been naturally reproducing and self-sustaining in Coeur d' Alene Lake since the late 1960s when reconstruction of Interstate 90 created shoreline spawning areas in the north end of the lake between Higgins Point and Beauty Bay. Kokanee spawning habitat was further enhanced along this same shoreline (approximately 3.2 km) in 1990 with the addition of shoreline spawning gravel as mitigation for addition road construction impacts. In 1979, the lake provided a harvest of nearly 600,000 kokanee salmon and supported over 250,000 hours of angler effort.

6.5.2 Current Status

There is a large self-sustaining kokanee salmon population found in the Coeur d' Alene Lake. These kokanee are supported primarily by shoreline spawning beds located in the northeast end of the lake along the 3.2 kilometers (2 miles) of shoreline between Higgins Point and Beauty Bay. A small run of kokanee is found in Mica and Wolf Lodge creeks.

Kokanee salmon remain the dominant species in Coeur d' Alene Lake and are still the most sought after game fish in the region. By 1981, kokanee salmon numbers exceeded their estimated carrying capacity in Coeur d' Alene Lake and the average size declined as densities increased. There were no fish predators capable of maintaining kokanee at the appropriate density and anglers lost interest in harvesting the small fish despite an increase in the limit. Subsequently, fall Chinook salmon were introduced in 1982 to control kokanee salmon abundance. Chinook salmon are managed to maintain kokanee densities at a level that provide a yield fishery (50 age 3 fish per hectare) and to provide a limited trophy fishery for Chinook salmon in the 1.5 to 8 kg size range (Ned Horner, IDFG Regional Fisheries Manager, personal communication, December 2003). A high percentage of Coeur d' Alene Lake's kokanee population was flushed out of the lake during the flood years of 1996 and 1997. Fortunately, kokanee numbers have now rebounded and IDFG is now rebuilding the Chinook salmon fishery in Coeur d' Alene Lake. Chinook salmon abundance is maintained by allowing wild fish to spawn in the mainstem reaches of the lower Coeur d' Alene and St. Joe rivers and limited hatchery supplementation to bring the total annual smolt production to approximately 70,000 fish (Ned Horner, IDFG, personal communication, December 2003).

6.5.3 Limiting Factors Kokanee Salmon

Kokanee are a lake species that often utilize riverine habitat for spawning and rearing, thus were included in the QHA approach to identify potential limiting factors to the life stage, spawning and incubation. Details of the QHA process are provided in Section 3.

Historically, kokanee were not present in the Coeur d' Alene Subbasin. However, for the purposes of analyzing the species with the QHA, it was necessary to rank the "historic" habitat for the species in the reaches where they presently exist. (QHA will not produce output for reaches where the species is rated as not being present historically.)

Kokanee are primarily a lake species using shoreline gravels for spawning. Tributary spawning and rearing is very limited in the Subbasin and there are only two watersheds known with in the Subbasin to support kokanee (Cougar/Mica Creek and Wolf Lodge/Alder). Fine sediment appears to have increased in Cougar/Mica Creek watershed, which may impact spawning grounds. Channel stability appears to have changed the most in Wolf Lodge/Alder watershed. Of these two watersheds, Wolf Lodge/Alder is considered most similar to reference conditions (Tables 6.11 and 6.12).

The tornado diagram (Table 6.13) presents the reach scores for both protection (ranging from zero to negative one) and current habitat condition (ranging from zero to positive one). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

Conditions in Coeur d' Alene Lake are discussed in Section 6.6 Environmental Conditions under the subheading Coeur d' Alene Lake Drainage.

Efforts to restore westslope cutthroat trout spawning and rearing habitat in the Wolf Lodge/Alder and Cougar/Mica Creek drainages will likely benefit kokanee. However, since the vast majority of kokanee spawning occurs in shoreline gravels of Coeur d' Alene Lake, benefits to these two tributary spawning stocks of kokanee from habitat improvement efforts are not likely to produce a measurable biological benefit to the kokanee population.

Table 6.11. Ranking of reaches with the largest deviation from the reference habitat conditions for kokanee in the Coeur d' Alene Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
10	Cougar/Mica Creek	1	0.2	10	4	7	1	4	4	10	7	9	3	2
4	Wolf Lodge/Alder	2	0.2	9	1	5	6	6	3	9	9	8	2	3

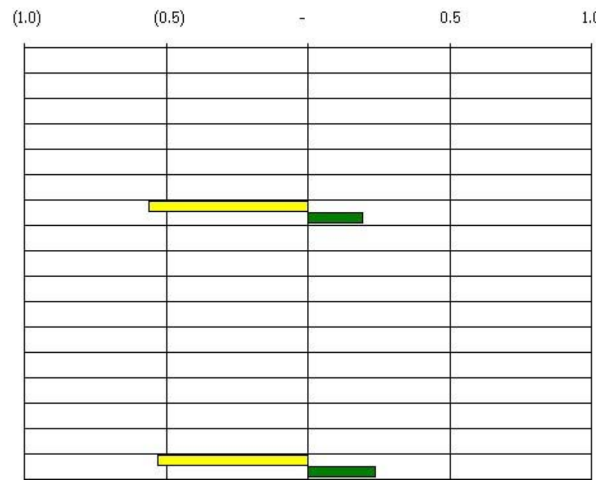
Table 6.12. Ranking of streams whose habitat is most similar to the reference condition for kokanee in the Coeur d' Alene Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

Sequence	Reach Name	Reach Rank	Reach Score	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
4	Wolf Lodge/Alder	1	-0.56	11	8	9	3	4	4	1	1	10	6	7
10	Cougar/Mica Creek	2	-0.53	11	3	7	8	3	3	1	2	10	6	8

Table 6.13. Tornado diagram for kokanee salmon in the Coeur d' Alene Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

NP = Not present

Sequence	Reach Name	Protection Confidence	Current Habitat Condition Confidence
1.1	Benewah	NP	
1.2	0	NP	
2.1	Plummer/Pedee Creek	NP	
2.2	0	NP	
2.3	0	NP	
3.1	Lake Creek	NP	
4.1	Wolf Lodge/Alder	0.50	0.42
4.2	0	NP	
4.3	0	NP	
5.1	Fernan	NP	
6.1	Blue Creek	NP	
7.1	Beauty Creek	NP	
8.1	E. Side Coeur d' Alene Lake	NP	
8.2	0	NP	
8.3	0	NP	
9.1	Fighting Creek	NP	
10.1	Cougar/Mica Creek	0.50	0.42



6.5.4 Current Management

Current regulations for kokanee salmon in Coeur d' Alene Lake allow anglers to harvest up to 25 fish a day with no minimum size requirements.

6.6 Environmental Conditions[2]

The discussion on environmental conditions within the Coeur d' Alene Subbasin is delineated into four distinct drainages: St. Joe River drainage, St. Maries River drainage, Coeur d' Alene River, and Coeur d' Alene Lake. Figure 6.3 displays all impaired water bodies identified on Idaho's 1998 303(d) list within the entire Coeur d' Alene Subbasin. Water quality issues are identified and discussed for each drainage. The water quality impairments identified in Idaho's 303(d) list and Figure 6.3 often reflect the impacts of land use activities in the watershed and assist in recognizing the physical/chemical limiting factors for aquatic biota in the stream systems. From this assessment of environmental condition and limiting conditions (see section 6.6.2), objectives and strategies were developed to address the limiting conditions for aquatic resources and are presented in the Section 10: Coeur d' Alene Subbasin Management Plan Section.

[2] Large portions of Section 6.6 were contributed to by the Coeur d' Alene Subbasin Summary Report (2001), pp. 29-38.

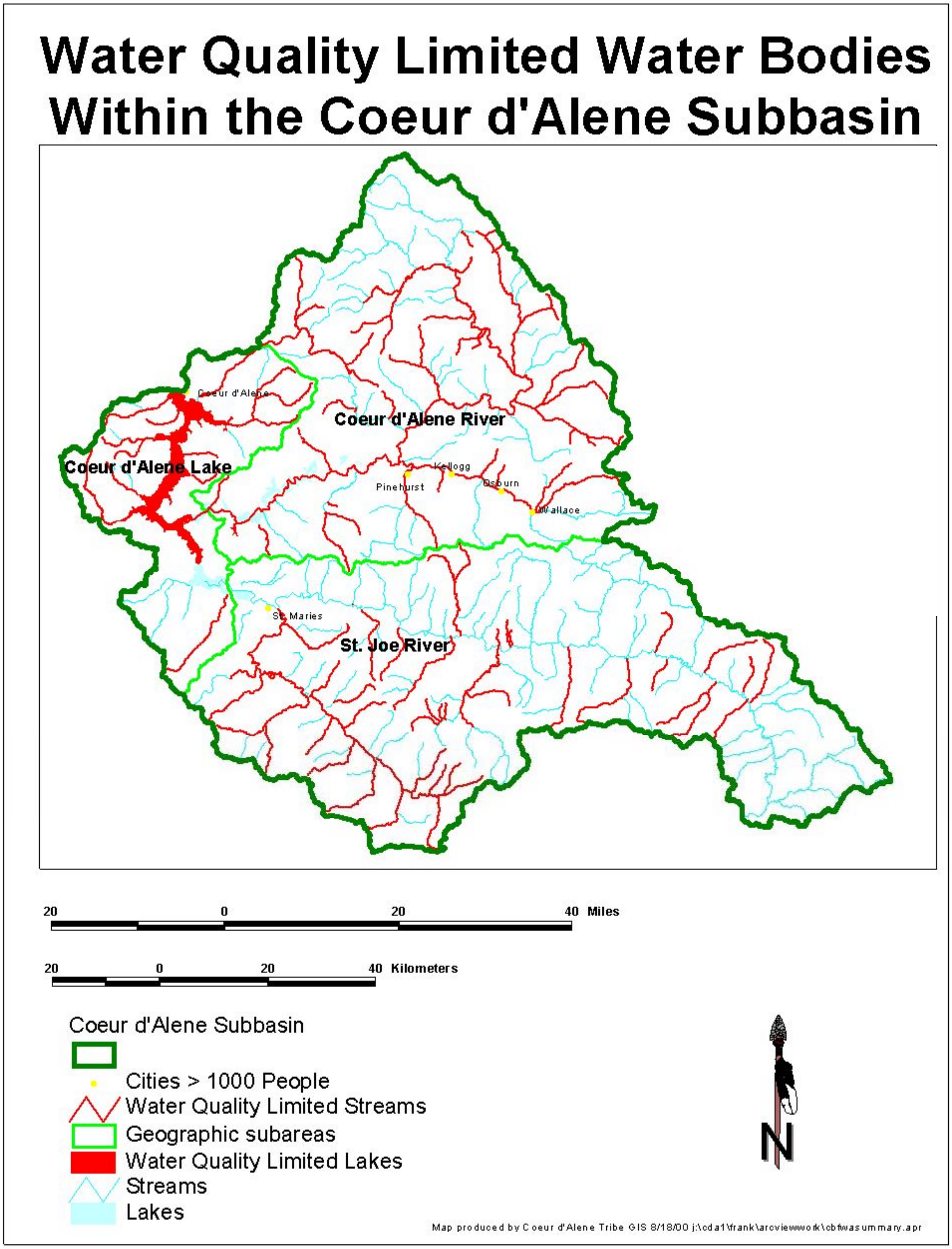


Figure 6.2. Water quality limited water bodies included in the Coeur d' Alene Subbasin (*Source*: IDEQ 1998 303(d) list)

6.6.1 Environmental Conditions within the Subbasin

6.6.1.1 St. Joe River Drainage

The St. Joe River, excluding the St. Maries River, contains an estimated 949 kilometers (590 miles) of streams with over 63 tributaries. The St. Joe River and its tributaries include the core refugia watersheds for native riverine fish and herptofauna. Since the early twentieth century, the St. Joe drainage has been impacted by mining, logging, and agricultural practices, however these activities have impacted the drainage to a lesser degree compared to other areas of the Coeur d' Alene Subbasin (for example South Fork Coeur d' Alene River drainage). The watershed has a history of timber harvest and some grazing, which, in recent years has been restricted to the floodplain area of the lower reaches of the St. Joe River. The U.S. Forest Service (USFS), Idaho Panhandle National Forest owns most of the land (47 percent) within the drainage with some smaller areas designated as BLM, Idaho State, and private lands (refer Section 5, Figure 5.5 for land ownership for the Coeur d' Alene Subbasin).

Currently, there are 27 streams (28 stream segments), 10 streams within the St. Joe drainage (Table 6.14) and 17 streams within the St. Maries drainage (Table 6.15), identified on the Idaho Department of Environmental Quality (IDEQ) 303(d) list of water bodies that are water quality impaired (Available 2004: http://www.deq.state.id.us/water/1998_303d/303dlist.pdf). The mainstem St. Joe River was not included on the 303(d) list, nor was it found to be impaired. The most common water quality impairment within the St. Joe River drainage (excluding St. Maries drainage) is sediment, followed by other impairments such as temperature, bacteria, dissolved oxygen, habitat alteration, and nutrients (Table 6.14).

Table 6.14. Impaired water bodies within the St. Joe River drainage according to Idaho's 303(d) list (1998). Abbreviations for water quality impairment are: BA = bacteria, DO = dissolved oxygen, HAB = habitat alteration, NUT = nutrients, SED = sediment, TEMP = temperature

	Water body	Drainage	# Segments	Impairment
1	Bear Cr	St. Joe	1	BA, SED, TEMP
2	Bird Cr	St. Joe	1	SED
3	Blackjack Cr	St. Joe	1	BA, DO, SED
4	East Fork Bluff Cr	St. Joe	1	SED
5	Fishhook Cr	St. Joe	1	SED
6	Gold Cr	St. Joe	1	HAB, NUT, SED, TEMP
7	Harvey Cr	St. Joe	1	BA, DO, SED, TEMP
8	Little Bear Cr	St. Joe	1	BA, SED, TEMP
9	Loop Cr	St. Joe	1	SED
10	Mica Cr	St. Joe	1	SED

(*Source*: Available 2004: http://www.deq.state.id.us/water/1998_303d/303dlist.pdf)

The Upper St. Joe River Watersheds: Upstream from Heller Creek

This 5,776-hectare (14,272-acre) portion of the St. Joe River drainage includes the uppermost reaches of the St. Joe River and several tributaries. Major river tributaries include (beginning upstream in the headwaters) Wisdom, Medicine, California, and Yankee Bar creeks. The high elevation and cold-water temperatures inherent to this area result in natural conditions favoring the persistence of native species, especially bull trout and westslope cutthroat trout. The upper St. Joe River watershed has been relatively undisturbed compared to other drainages in the Coeur d' Alene Subbasin. Historic mining and naturally occurring events such as fires and floods are the most noteworthy disturbances associated with this portion of the Subbasin. Majority of the upper St. Joe River watershed consists exclusively of National Forest System lands managed by the USFS (refer to Section 5, Figure 5.5). Road density in the upper St. Joe River watershed is classified as high (1.7-4.7 mi/mi^2, refer to Section 5, Figure 5.6).

Aquatic habitat surveys were completed by the USFS for most streams in this portion of the watershed most recently in 1991 and 1992. Snorkel surveys were conducted by the USFS in Medicine Creek in 1993. IDFG has been counting bull trout redds in index streams in upper St. Joe River tributaries since 1992 and has conducted miscellaneous snorkel and electrofishing surveys for juvenile fish. In addition, other tributaries have been surveyed for bull trout redds since 1992 in a cooperative effort among the USFS and other agencies and organizations (data from these surveys are on file at the St. Joe Ranger District office). Plum Creek Timber Company (PCTC) conducted electrofishing surveys during 1994 and IDEQ has also conducted electrofishing (data available in the IDEQ BURP data).

These surveys confirmed that native species, including bull trout and westslope cutthroat trout, currently spawn, rear, and over-winter within this portion of the St. Joe River drainage. Fish populations exhibiting adfluvial, fluvial and resident life history forms utilize this area. Collectively, this watershed area is one of the core native trout refugia watersheds and is, in fact, the most important known source of bull trout within the St. Joe River drainage. More than 70 percent of the bull trout redds located within the entire St. Joe River drainage have been found in this area and over 50 percent of the redds have been found in Medicine Creek alone.

The Middle St. Joe River Watersheds: Copper Creek to Bean Creek

The Middle St. Joe River watersheds consists of approximately 12,100 hectares (29,900 acres) of tributary watersheds in the St. Joe River drainage. Major river tributaries include Bean Creek (3,254 hectares), Bacon Creek (2,303 hectares), Ruby Creek (2,409 hectares), Timber Creek (2,230 hectares), and Copper Creek (1,905 hectares). The high elevation and cold-water temperatures inherent to this area result in natural conditions that favor persistence of native species. As in the upper St. Joe watershed, land use impacts have been primarily associated with historic mining and naturally occurring events such as fires and floods. The majority of the watershed is managed by the USFS.

Aquatic habitat surveys were completed by the USFS in these watersheds most recently in 1992. Bull trout redd surveys have been conducted annually in some tributaries since

1992 in a cooperative effort between numerous agencies and organizations. Snorkel surveys were also conducted in Timber Creek in 1993 and in Bacon Creek in 1997. (Data from these surveys are on file at the St. Joe Ranger District office.) As a result of these surveys, native trout spawning and rearing has been documented in each stream. Fish populations exhibiting adfluvial, fluvial, and resident life history forms likely occur.

The Lower St. Joe River downstream to Mica Creek including all tributaries
The high elevation and cold water temperatures inherent to this area favor the persistence of native trout. However, land management activities have significantly altered many natural processes. Historic activities include road construction, timber harvest as well as some development. Naturally occurring events such as fires and floods also influence natural processes. The USFS, BLM, and private citizens represent the various entities that own and manage the lower reaches of the St. Joe River watershed (refer to Section 5, Figure 5.5). Road densities within the lower reaches range from moderate (0.7-1.7 mi/square mi) to very high (4.7-16.6 mi/square mi) (refer to Section 5, Figure 5.6).

Aquatic habitat surveys were completed by the USFS in the watersheds most recently in 1997. In addition, bull trout redd surveys have occurred nearly annually since 1992 in a cooperative effort between numerous agencies and organizations. Electro-fishing surveys and snorkel surveys were also conducted in 1993. (Data from these surveys are on file at the St. Joe Ranger District office). IDEQ has also conducted electroshocking fish surveys since 1994 (data available in IDEQ BURP data). As a result of these surveys, native trout are currently known to spawn, rear, and over-winter within most of these watersheds. Fish populations that exhibit adfluvial, fluvial and resident life history forms most likely utilize this area.

The Lower Most Reaches of St. Joe River: downstream to the St. Maries River
The lower reach of the St. Joe River downstream of the confluence with the St. Maries River is an obligate migratory corridor for adfluvial fish (bull and westslope cutthroat trout). Westslope cutthroat trout utilize the St. Joe and St. Maries rivers and some of the tributary habitat within these watersheds for spawning and rearing. Spawning and rearing populations of bull trout have not been found in recent surveys, however, individual fish occur in these lower watersheds at various times of the year.

The lower reach of the St. Joe River, downstream of St. Maries River has been heavily impacted by wide-spread land use changes and mixed land ownership (refer to Section 5, Figure 5.5), which impact aquatic habitat and create challenges for coordinated restoration efforts. Water quality issues identified on the 1998 303(d) list (Table 6.14) are associated with elevated temperature and increased sedimentation, which can limit productivity of native fish species. In addition, operations at Post Falls Dam controlling storage and raising Coeur d' Alene Lake summer lake levels has increased the slack water habitat in the lower portions of the St. Joe River. The transition from swift water to slack water occurs at Falls Creek on the St. Joe River. Water quality issues (sediment and temperature) identified in the lower reach of the St. Joe River may be a direct result of land use activities and indirect result of operations at Post Falls Dam.

6.6.1.2 St. Maries River Drainage

The St. Maries River drainage has been impacted by anthropogenic activities since the early 1900s when loggers, ranchers and gold and garnet miners settled the area. Historic and current mining activities are described in more detail in Section 5.2.7 Major Land Ownership and Land Uses under the subheading Mining.

Seventeen water bodies (18 stream segments) in the St. Maries River drainage are listed as impaired on the IDEQ 1998 303(d) list (Table 6.15). Sediment is a common water quality issue in all the streams listed in Table 6.15 except for Thorn Creek. Habitat alteration and temperature were the other two most common water quality issues. Nutrients, dissolved oxygen, and bacteria were also listed as water quality issues but were less frequent.

Table 6.15. Impaired water bodies within the St. Maries River drainage according to Idaho's 303(d) list (1998). Abbreviations for water quality impairment are: BA = bacteria, DO = dissolved oxygen, HAB = habitat alteration, NUT = nutrients, SED = sediment, TEMP = temperature

	Water body	Drainage	# Segments	Impairment
1	Alder Cr	St. Maries	1	NUT, SED
2	Carpenter Cr	St. Maries	1	HAB, SED
3	Charlie Cr	St. Maries	1	HAB, SED
4	Crystal Cr	St. Maries	1	SED
5	Emerald Cr	St. Maries	1	HAB, SED, TEMP
6	Flewsie Cr	St. Maries	1	SED, TEMP
7	Gold Center Cr	St. Maries	1	HAB, SED, TEMP
8	Gramp Cr	St. Maries	1	BA, SED, TEMP
9	John Cr	St. Maries	1	SED
10	Middle Fork St. Maries River	St. Maries	1	HAB, SED
11	Renfro Cr	St. Maries	1	SED
12	Santa Cr	St. Maries	1	DO, HAB, NUT, SED
13	St. Maries River	St. Maries	2	HAB, NUT, SED
14	Tank Cr	St. Maries	1	BA, DO, SED, TEMP
15	Thorn Cr	St. Maries	1	NUT, TEMP
16	Tyson Cr	St. Maries	1	HAB, SED
17	West Fork St. Maries River	St. Maries	1	SED, TEMP

(*Source*: Available 2004: http://www.deq.state.id.us/water/1998_303d/303dlist.pdf)

The St. Maries River contains more than 240 kilometers (150^{+} miles) of streams with over 15 tributaries. In the St. Maries River drainage, there have been only occasional sightings of bull trout in the watershed; westslope cutthroat trout populations are severely depressed. Alder Creek is considered an important resident cutthroat trout fishery and has been prioritized by the Coeur d' Alene Tribe for habitat restoration. Santa and Renfro creeks may also be important as a resident cutthroat trout fishery since cutthroat trout were identified during streambank erosion surveys (Kootenai-Shoshone Soil and Water Conservation District 1991). In addition, Coeur d' Alene Conservation District suggests all of the streams identified on Idaho's 1998 303(d) list (Table 6.15) are equally deserving of priority status for stream restoration relative to their importance to sustaining a cutthroat fishery in the St. Maries River drainage (R. Flagor, Coeur d' Alene Conservation District, personal communication, 2004). Refer to section 6.3, Focal

Species-Bull Trout, for additional information on the historic and current distribution of bull trout in the St. Maries River drainage.

6.6.1.3 Coeur d' Alene River Drainage

The Coeur d' Alene River drainage is approximately 3,858 square kilometers, and contains an estimated 1,052 kilometers of stream (654 miles) with over 78 tributaries. The drainage consists of two watersheds: the South Fork, which drains the Coeur d' Alene mining district, and the North Fork, which is located entirely within the Panhandle National Forest (Funk et al. 1975). The confluence of the North Fork and South Fork at the town of Enaville form the mainstem of the Coeur d' Alene River.

Development of the Silver Valley mining district in the South Fork Coeur d' Alene River Valley since 1883 has brought significant and essentially permanent changes to the South Fork watershed. Silver mining is still active in the valley, but at much reduced levels due to low silver prices and reduce supplies. Early gold placer mining operations in tributaries to the North Fork of the Coeur d' Alene River, Beaver and Prichard creeks, resulted in destruction of stream channels and floodplains, and continue to negatively impact fish habitat. Bull trout spawning and rearing is not currently known to occur in this basin, and westslope cutthroat trout are severely depressed in many reaches.

Refer to Section 5.2.7 under subheading Forest Management for historical description of logging and timber harvest practices with the Coeur d' Alene Subbasin.

North Fork of the Coeur d' Alene River Watershed

The North Fork Coeur d' Alene River (North Fork) watershed has a long history of forest management, with logging, grazing, water resource, and recreation all occurring in the watershed. Grazing is limited mainly to the lower portions of the river valleys. Mining has occurred in a few areas, with intense activities occurring in Prichard and Beaver creeks in the 1880s. The watershed has had a long history of extensive logging. Splash dams were erected for transporting timber, and clear cutting was common practice.

There are over 100 fish-bearing tributary streams present in the North Fork watershed (PBTTAT 1998). Major tributaries included the Little North Fork Coeur d' Alene River, Independence Creek, Tepee Creek, and Shoshone Creek. Additionally, Cougar Gulch and Graham Creek are key streams currently supporting migratory cutthroat trout populations (Apperson et al. 1988). Between 1984 and 1987 bull trout were observed in Brown and Graham creeks by IDFG (Apperson et al. 1988). However, additional surveys in these streams and in 73 other streams in the drainage between 1994 and 1995 did not confirm or document the presence of bull trout (Dunnigan and Bennett 1997, cited in IDEQ 2001). Refer to section 6.3, Focal Species-Bull Trout, for additional information on the historic and current distribution of bull trout in the North Fork Coeur d' Alene River watershed.

Sixteen water bodies (17 stream segments) are currently listed as impaired on the IDEQ 303(d) list (Table 6.16). Prichard Creek appeared to have the greatest degree of quantifiable water quality impairment within the Coeur d' Alene River drainage. All water bodies except for Lost Creek identified sediment as a common water quality issue. Other water quality issues identified include habitat alteration, flow alterations, bacteria, pH, metals, dissolved oxygen, nutrients, and oil pollution. Flow alteration is sometimes described as the change in the flood magnitude as a result of reduction in vegetation and increase in road densities. Road densities in the Coeur d' Alene Subbasin are classified as high to very high (1.7 to 16.6 miles/square mile, Figure 5.6) (CDA Tribe 2000; IDEQ 2001). Habitat alteration can occur from several actions, including road construction, removal of riparian vegetation, channelization, or excess sedimentation. Sediment input to the mainstem and tributaries from the watershed is a natural process. The estimated natural background sedimentation rate for the entire North Fork watershed is 13,089 tons per year (IDEQ 2001). However, excess sedimentation, both suspended and bedload gravel, in a forested watershed like the North Fork most often has its origin in roads developed for logging or access to a watershed or improper forest harvest practices. Roads may yield sediment directly from their surfaces or beds through mass wasting, location in relation to the stream resulting in cutting of the streambank, or improper harvest practices including skidding logs on steep slopes or in stream corridors. The Beaver and Prichard sub-watersheds have added sedimentation resulting from dredge, hydraulic, and underground mining with its associated development (IDEQ 2001).

Table 6.16. Impaired water bodies within the North Fork Coeur d' Alene River drainage according to Idaho's 303(d) list (1998). Abbreviations for water quality impairment are: BA = bacteria, DO = dissolved oxygen, HAB = habitat alteration, FLOW = flow alteration, NUT = nutrients, OIL = oil pollution, MET = metals, pH = [H^+ ions], SED = sediment, TEMP = temperature

	Water Body	# Segments	Impairments
1	Beaver Cr	1	SED
2	Big Elk Cr	1	SED
3	Burnt Cabin Cr	1	SED
4	Copper Cr	1	SED
5	Cougar Gulch	1	HAB, SED
6	Cub Cr	1	SED
7	Falls Cr	1	SED
8	Little North Fork Coeur d' Alene River	1	FLOW, HAB, SED
9	Lost Cr	1	unknown
10	North Fork Coeur d' Alene River	2	FLOW, HAB, SED
11	Prichard Cr	1	BA, DO, HAB, NUT, OIL, SED, TEMP
12	Shoshone Cr	1	unknown
13	Steamboat Cr	1	FLOW, HAB, SED
14	Tepee Cr	1	HAB, SED
15	West Fork Eagle Cr	1	HAB, MET, pH, SED
16	Yellow Dog Cr	1	SED

(*Source*: Available 2004: http://www.deq.state.id.us/water/1998_303d/303dlist.pdf)

As in many areas of the Coeur 'd Alene Subbasin, mining and logging activities have also impacted the North Fork watershed. The proportions of pool and run habitat types in the reach of the North Fork between Tepee and Cow creeks and in Trail Creek were lower than in watersheds without roads and extensively logged areas (Hunt and Bjornn 1991). Land use practices and current water quality issues impacting and degrading critical trout habitat along with relatively low compliance with harvest regulations may have attributed to the relatively low trout densities present within the North Fork watershed (IDEQ 2001). Salmonid density for impaired streams within the North Fork drainage range between 0.0015 to 0.2847 fish per square meter per hour of effort electrofishing (fish/m^2/hr) with the range of trout density present in the reference sites between 0.0021 and 0.3314 fish/m^2/hr (IDEQ 2001).

Bennett and Dunnigan (1997) conducted surveys in second and third order tributaries to measure cutthroat trout densities and estimate which physical habitat and watershed characteristics can be used to predict trout density and biomass. Hunt and Bjornn (1991) completed aquatic habitat surveys throughout the North Fork watershed including Little North Fork and its tributaries and Tepee Creek and its tributaries. In 1986-1987 the IDFG studied the North Fork from the confluence of the South Fork up to the Little North Fork by performing creel surveys, electroshocking, installing migration traps and snorkeling. Each of these studies confirmed spawning and rearing activity by westslope cutthroat trout. Cutthroat population trends in the Coeur d' Alene River drainage have been monitored annually by IDFG with snorkeling transects since 1983. Cutthroat trout densities in the Coeur d'Alene River basin have been described as depressed (Lewynsky 1986; Hunt and Bjornn 1993). Recent surveys indicate the population of cutthroat trout is increasing, although it is believed this population is still below its potential (DuPont and Horner, in press). Reasons for this depressed fishery have been attributed to toxic mining wastes (IDEQ 1996), poor habitat (Abbott 2000), over fishing and poaching (Lewynsky 1986), and sediment delivery (IDEQ 1996).

South Fork Coeur d' Alene River Watershed

Large scale and adverse changes have occurred to the South Fork and its tributaries as a result of mining, urbanization, agriculture, logging, and road building (Woods and Beckwith 1997). This most significant impact to aquatic habitat originates from mining. The South Fork Coeur d' Alene River (South Fork) watershed is at the heart of Idaho's Coeur d' Alene Mining District. Major tributaries to the South Fork include Canyon Creek, Nine Mile Creek, Pine Creek, Big Creek and Bear Creek. Lead, zinc, silver, and other metals have been commercially mined since 1883 within what is now referred to as the 21 square mile Bunker Hill Superfund Site (EPA 2000). However, much of the mining and/or milling capacity of the Silver Valley Mining District has declined since the early 1980s. Mills and the smelter facility at Bunker Hill have been cleaned up under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) or are slated for clean up. After removal of the hazardous materials, some of these sites are finding industrial or recreational uses.

Cleanup of heavy metals and other toxic waste related to mining activity began in earnest in the 1990s. Water quality has improved in many reaches of the South Fork and its tributaries, but heavy metals continue to preclude establishment of a fishery in a portion of the South Fork and in several tributaries (Reiser 1999). There are nine water bodies (total of 15 stream segments) recognized on Idaho State's 303(d) list with metals and/or sediment identified as the principle impairment to water quality (Table 6.17). The unnatural rate of sedimentation originates from mine waste piles, urban land use, road erosion, encroachment on stream channels and floodplains, and the encroachment of towns and mining facilities. Water quality data indicate chronic metal exposure exceeds federal metals criteria for the protection of aquatic life (Ridolfi 1996). Three major pollutants existing throughout the watershed are cadmium, lead, and zinc. The metals that exist in the water column provide a pathway to injury for biota including, macroinvertebrates, plants, phytoplankton, and fish. Hazardous substances have contaminated floodplain and riverine sediments throughout the Coeur d' Alene River drainage (Horowitz et al. 1993; NRDA Report of Injury Determination 2000). Lead concentrations range between 500 to 80,000 parts per million (ppm). Concentrations of this magnitude have been documented to act as a pathway to injury for aquatic and terrestrial biota. Substrate lead concentrations of 80,000 ppm were found in "jig" tailings in Nine Mile and Canyon Creeks, which lead the Silver Valley Natural Resources Trustees to remove 85,000 cubic yards of tailings and mining waste in 1994 and 1995. Approximately 1,500 tons of lead and 100 tons of zinc were removed during the cleanup.

Table 6.17. Impaired water bodies within the South Fork Coeur d' Alene River drainage according to Idaho's 303(d) list (1998). Abbreviations for water quality impairment are: MET = metals, and SED = sediment

	Water Body	# Segments	Impairments
1	Canyon Cr	1	MET, SED
2	East Fork Nine Mile Cr	1	unknown
3	East Fork Pine Cr	2	MET, SED
4	Government Gulch	1	MET, SED
5	Milo Cr	1	MET
6	Moon Cr	1	MET, SED
7	Nine Mile Cr	1	MET, SED
8	Pine Cr	1	MET, SED
9	South Fork Coeur d' Alene River	6	MET, SED

(*Source*: Available 2004: http://www.deq.state.id.us/water/1998_303d/303dlist.pdf)

Tributaries to the South Fork Coeur d' Alene River generally have V-shaped valleys as a result of the deeply dissected nature of the topography. These valleys accommodate primarily Rosgen A and high gradient B channels. There are exceptions at Woodland Park Flats in lower Canyon Creek, a short section of Placer Creek, lower East Fork Pine Creek, and in the valley of Pine Creek below Langlois Creek. These broader valleys accommodate low gradient Rosgen B channels. The tributaries generally have boulder-bedrock control. Their channel morphology is typically Rosgen A and high gradient B channels. The Belt Supergroup bedrock of the Subbasin weathers to soils rich in coarse fragments (60-75 percent) and rather poor in fine materials (25-40 percent). Silts dominate the fine soil materials. As a consequence of the soil composition and the steep tributary gradients, boulders and cobble comprise the majority of the stream sediment particles. Width-to-depth ratios are lower in these streams. The low gradient B channels of tributaries have cobble as the primary stream sediment particles. The width-to-depth ratio is higher. Floodplains are narrow in most tributary channels. Broader floodplains are found in the wider valleys noted above. Riparian communities correspondingly are narrow in the narrow valleys and broader where valleys and floodplains widen.

The South Fork above the town of Wallace is similar to the other tributary channels in valley shape, stream gradient, channel sediment, floodplain width and riparian communities. At Wallace, Canyon, Nine Mile, and Placer creeks join the South Fork within the distance of a mile reach. The valley slopes remain steep, but the valley floor widens. The channel is a moderate to low gradient Rosgen B channel below Wallace. The channel passes through the "flats" at Osburn, Big Creek, and Smelterville. The channel is at its lowest gradient through these reaches. The "flats" are isolated by narrow reaches, which are characterized by a higher gradient. Width-to-depth ratio is lower in the narrow reaches as compared to the "flats." Cobble particle sizes dominate the stream sediments, but a higher percentage of sand and finer materials are present. The "flats" have correspondingly wider floodplains and would naturally have more extensive riparian communities. The narrow reaches have a narrower floodplain and would naturally have less extensive riparian communities.

Mainstem of Coeur d' Alene River Watershed

The mainstem Coeur d' Alene River extends from the confluence of the North Fork and South Fork downstream to Coeur d' Alene Lake, near the town of Harrison, a distance of approximately 67 kilometers (42 miles). With the exception of the upper 12 kilometers (8 miles), the mainstem is influenced by the operation of Post Falls Dam (operations began in 1906), and is essentially slackwater during much of the year. Nine small lakes, referred to as the Lateral or Chain Lakes, are present in the floodplain between Coeur d' Alene Lake and Cataldo. Important streams that support migratory cutthroat trout populations in the lower Coeur d' Alene River are French Gulch, Skeel Gulch, and Latour Creek. Evans Creek historically had among the highest densities of resident cutthroat trout in the Coeur d' Alene River drainage, as reported by Apperson, et al. (1987) and has been targeted for restoration activities by the Coeur d' Alene Tribe, NRCS, and local soil conservation district offices.

In 1986-1987, IDFG surveyed the mainstem Coeur d' Alene River reach inundated by Post Falls Dam. Results indicate this section serves primarily as a migratory corridor for westslope cutthroat trout (Apperson et al. 1987). More recent surveys of the 12 km stretch of free flowing river show high densities of cutthroat trout, similar in abundance to upper St. Joe River that is managed under catch-and-release regulations (Fredericks et al. 2002).

6.6.1.4 Coeur d' Alene Lake Drainage

Coeur d' Alene Lake drainage contains over 321 kilometers (200^+ miles) of streams with over 27 tributaries excluding the St. Joe and Coeur d' Alene rivers. The lake is 42 kilometers (26 miles) long and anywhere from 1.6 to 9.6 kilometers (1 to 6 miles) wide. The lake's mean depth is 22 meters (72 feet) with a maximum depth of 63.7 meters (209 feet).

Overall, the water quality of Coeur d' Alene Lake is considered good for nutrients, clarity, and dissolved oxygen (Woods and Harvey 2002). However, there are regions of the lake and some tributaries identified in Table 6.18 according to Idaho State's 1998 303(d) list that do not meet water quality standards. Sediment and habitat alteration appear to be the most common water quality impairment. Other water quality issues include nutrients, dissolved oxygen, metals, bacteria, temperature, and pH (associated with metals).

Table 6.18. Impaired water bodies within the Coeur d' Alene Lake drainage according to Idaho's 303(d) list (1998). Abbreviations for water quality impairment are: BA = bacteria, DO = dissolved oxygen, HAB = habitat alteration, MET = metals, NUT = nutrients, SED = sediment, TEMP = temperature

	Water Body	# Segments	Impairments
1	Baldy Cr	1	BA, HAB, SED, TEMP
2	Black Lake	1	NUT
3	Coeur d' Alene Lake	1	MET
4	Coeur d' Alene River*	10	HAB, MET, pH, SED
5	Cougar Cr	1	HAB, NUT, SED
6	Fernan Cr	1	BA, DO, HAB, NUT, SED
7	Fernan Lake	1	DO, NUT, SED
8	Fourth of July Cr	1	HAB, SED
9	Kid Cr	1	HAB, NUT, SED
10	Lake Cr	1	SED
11	Larch Cr	1	BA, HAB, SED, TEMP
12	Latour Cr	1	BA, HAB, SED, TEMP
13	Marie Cr	1	HAB
14	North Fork Mica Cr	1	BA, HAB, NUT, SED
15	Thompson Cr	1	HAB, SED
16	Willow Cr	1	SED
17	Wolf Lodge Cr	1	HAB, NUT, SED

* one of 10 sediments also had DO, and/or TEMP listed as impairments

(*Source:* Available 2004: http://www.deq.state.id.us/water/1998_303d/303dlist.pdf)

In 1995, the Coeur d' Alene Lake Management Plan was approved and categorized the lake into four distinct areas: the deep northern pools, the shallow southern pool, backwater sections of the Coeur d' Alene River and the St. Joe rivers, and shallow near-shore zone of variable width that rings much of the lake (Woods and Harvey 2002). The following text describes water quality conditions in the northern pools, southern pool, and near-shore zones from monitoring efforts between 1995 and 2001.

The northern pools are characteristic of oligotrophic conditions having low level of nutrients, average clarity of 10 meters, and total phosphorus concentrations in the euphotic zone 5-7.5 µg/L (Woods and Harvey 2002). Dissolved oxygen has met both State and Tribal standards during the summer months in the northern pools. Average dissolved oxygen levels declined 52 percent of saturation during a low discharge year (2001), while during normal discharge years, average dissolved oxygen levels declined to 70 percent of saturation with depth (Woods and Harvey 2002).

In the southern pool, water quality conditions are classified as mesotrophic or eutrophic. The poorer conditions in the southern pool are potentially the result of Post Falls impoundment, agricultural sediment, and nutrient sources from adjacent tributaries and other pollution sources (Woods and Harvey 2002). Water clarity ranges 1-9 meters throughout the year, total phosphorus levels range from <5-88 µg/L, and dissolved oxygen concentrations do not meet Tribal water quality standards during the summer months (Woods and Harvey 2002). Dissolved oxygen declines during the summer and early fall to below 30 percent of saturation at depth (Woods and Harvey 2002).

Approximately half of the near-shore areas monitored had similar water quality conditions as areas in the mid-lake sections. Wolf Lodge, Blue Creek, and Squaw bays were the exceptions with total phosphorus levels greater than 8 µg/L and water clarity at about 6 meters (Woods and Harvey 2002).

Coeur d' Alene Lake level is controlled by Post Falls Dam. The operation of Post Falls Dam in maintaining an artificially high and stable summer pool level is one of several factors influencing aquatic habitat in Coeur d' Alene Lake. The lake is held approximately 2.15 meters higher than the "natural" low pool elevation, primarily to provide recreational benefits and some limited benefit to water management for hydropower. At full pool (lake elevation 648.7 meters) Coeur d' Alene Lake covers 12,900 hectares (31,876 acres); at minimum pool level (lake elevation of 646.2 meters) the lake covers 12,200 hectares (30,146 acres) (Peters et al. 1999).

As a result of elevated lake levels, areas that would historically be wet meadows have been transformed into shallow water bays benefiting warmwater fish species. The effects of Post Falls Dam are most prominent in the southern end of the lake. Large expanses of shallow inundated lands typically reach temperatures of over 26 ºC (79 ºF) during the summer (Peters et. al. 1999). Additionally, sediment is transported to the lake from agricultural areas where it is deposited and accumulates in the slackwater portions of the smaller tributaries in the interior bays of the lake. Sediment accumulation creates large mudflats that are quickly colonized by aquatic macrophytes resulting in habitat conditions more suitable for exotic species. A significant portion of the Coeur d' Alene Subbasin, especially in the Coeur d' Alene River drainage, has high forest road densities ranging from 1.7 to 4.7 miles per square mile (refer to Section 5, Figure 5.6). Roads are a significant source of sediment, in addition to other land management activities such as farming, grazing and home development.

Mining and ore processing operations in the South Fork Coeur d' Alene River since the early 1880s have produced extensive trace-element-contaminated sediments in the South Fork Coeur d' Alene River, mainstem Coeur d' Alene River, and the lake bottom of Coeur d' Alene Lake (Woods 2001). An estimated 72 million tons of heavy metal laden sediments have been deposited in the floodplain and bottom of Coeur d' Alene Lake over the past 100 years. As a result, the benthic invertebrate community has been altered, the riparian plant community has been suppressed or altered in some areas where pollutants (primarily lead) are especially high, and algae production has been suppressed masking the relative productivity of the lake as a result of high heavy metals (primarily zinc) in the water column (Woods and Beckwith 1997). In 2003, the EPA and the Idaho Department of Health and Welfare issued a fish consumption advisory for bass, bullheads, and kokanee for lead, mercury and arsenic.

Recently (1998, 2000, 2002), mobilization of metals from lakebed sediments have been investigated by the USGS and University of Idaho (Woods and Harvey 2002). In the northern pools, results found lake bottom sediments contribute some dissolved nutrients, zinc and arsenic, to the water column by diffusion of the sediment pore water (Woods Harvey 2002). Through a mass-balance calculation, it was demonstrated that Lake Coeur d' Alene may serve as an overall sink rather than source of metals, however the investigations were not able to determine the overall fate and transport of the metals and nutrients (Woods and Harvey 2002).

Lake Creek

The Lake Creek watershed covers 9.3 hectares (ha, 23,117 acres) and has 153 kilometers (95 miles) of stream channel. Unnaturally high fine sediment loads are a problem in Lake Creek due to agricultural activities and poor bank stability (Kootenai-Shoshone Soil Conservation District 1991, Bauer 1998). A sediment budget constructed for the watershed shows agricultural sheet and hill erosion to be the largest contributor to both the total budget and to the stream system. Forest roads are a minor contributor of sediment, but are still an important factor in generating runoff over impervious surface, and converting ground storage to surface flow. Watershed hydrology is strongly influenced by rain-on-snow precipitation events (refer to Figure 5.3), which occur in late winter and early spring. Runoff generation over agricultural land is a substantial proportion of generated runoff. Lake Creek exhibits flashy hydrology, with peak events greater than 1,000 cfs contrasted with low flows less than 1.0 cfs. The removal of the canopy and water budget transfers from the ground storage to the runoff component contributes to this flashy hydrology.

Sediment and temperature limit fisheries production in the watershed. Spawning and rearing areas for westslope cutthroat trout are primarily restricted to second and third order tributaries. Cutthroat trout densities exceed 5.0 fish/100 square meters throughout the upper watershed and densities as high as 42 fish/l00 square meters have also been documented (Vitale et al. 1999). Ongoing restoration efforts are focused on recovering key watershed processes and expanding the current distribution of westslope cutthroat trout.

Benewah Creek

The Benewah Creek watershed covers 15 ha (37,448 acres) and has 219 kilometers (136 miles) of stream channel. The watershed is primarily managed forest (84 percent) with much of the remaining area used for pasture or agriculture. Road density is 5.4 miles/square mile across the entire watershed (refer to Figure 5.6) (Lillengreen et al. 1998). Forest roads and streambank erosion are the primary contributors of sediment to the stream channel. Watershed hydrology is strongly influenced by rain-on-snow precipitation events, which occur in late winter and early spring.

Temperature is the primary limiting factor for fisheries production in the watershed. Spawning and rearing areas occur in seven principle tributaries. Cutthroat trout densities exceed 10 fish/100 square miles in most of these tributaries. Ongoing restoration efforts are focused on recovering key watershed processes and expanding the current distribution of westslope cutthroat trout by regulating summer water temperatures in the mainstem of Benewah Creek.

6.6.2 Out-of-Subbasin Effects

The complete blockage of anadromous salmon by Grand Coulee and Chief Joseph dams affected the Coeur d' Alene Indians. Although anadromous salmon never entered the Coeur d' Alene Subbasin, the people of the Coeur d' Alene Indian Tribe relied on salmon from the Spokane River for cultural and subsistence uses. After the demise of salmon, the Coeur d' Alene Tribal members placed more emphasis on harvesting westslope cutthroat and bull trout. Over-harvest of native salmonids within the Coeur d' Alene system may be one of many impacts contributing to the loss of resident salmonid populations.

The Coeur d' Alene Subbasin is a headwater Subbasin; no waters within the Subbasin originate outside of the Subbasin boundaries. Post Falls Dam on the Spokane River, located in the Spokane Subbasin, affects water level elevation of Coeur d' Alene Lake. From approximately mid-June through September, the lake is held at a higher and constant level (2128 ft above mean sea level) than would occur naturally (mean lake level in July before and after operations at Post Falls Dam in 1906 is shown in Figure 6.3). This unnatural water management situation has created more warmwater fish habitat by flooding shallow bays that would otherwise be wet meadows. Riverine portions of the Coeur d' Alene, St. Joe, and St. Maries rivers have also been inundated during part of the year. Outside the time frame when Post Falls Dam controls lake elevation, Coeur d' Alene Lake can and does fluctuate as much as 5 meters during winter rain-on-snow flood events (refer to Section 5, Figure 5.3 for rain-on-snow). A natural constriction at the outlet of the lake is the primary flow control affecting lake level fluctuation during most of the year.

Management of water levels in Coeur d' Alene Lake may be negatively impacting westslope cutthroat and bull trout through changes in lake habitat and loss of riverine habitat. Shallow, weedy, warm bays may not provide the same type of habitat adfluvial cutthroat and bull trout evolved in. The increase of shallow water bays has enhanced warmwater fish populations with potential negative impacts to cutthroat and bull trout through predation and competition. Additional warm water leaving the lake and the change from a flowing river to slack water reservoir likely altered the suitability of the upper Spokane River to support a year-round cutthroat and bull trout population. Loss of riverine habitat in tributaries to the lake, especially in the lower Coeur d' Alene River, has also reduced productive resident trout habitat. Changes in the water storage retention time, may also affect the trophic dynamics of Coeur d' Alene Lake. Impacts to the food chain may then indirectly affect westslope cutthroat trout that migrate to tributaries to spawn and rear as juveniles.

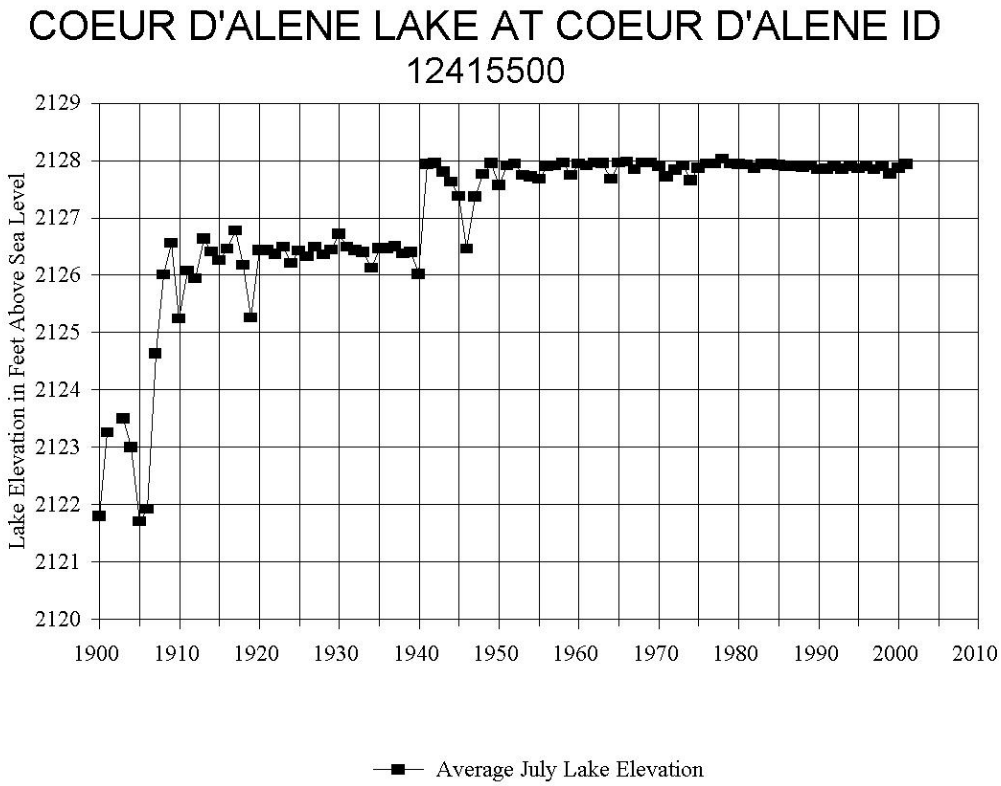


Figure 6.3. Average July Coeur d' Alene Lake elevation in feet above mean sea level from 1900 to 2003 (*Source*: WDOE 2004)

6.7 Limiting Factors and Conditions

It is widely accepted that the persistence of species is linked to the resilience of local populations as well as to the condition, structure, and interaction of populations and habitats at larger scales. There is a substantial amount of literature with examples of habitat disruption and its effects on specific fish and wildlife species (Meehan 1991). Recent research introduces important concepts about the scale, distribution, and connection of habitats and populations, and the associated risks of extinction (Soule 1987; Rieman and McIntyre 1993).

The distribution and abundance of native fish and wildlife species in the Coeur d' Alene Subbasin have been limited by landscape level activities and changes. Limiting factors can be generalized as aquatic and habitat alterations. Aquatic alterations refer to water quality (non-point and point source pollution, Figure 6.4), hydropower, fish barriers, and species interactions resulting from the introduction of nonnative species. Habitat alterations include wildfires, roads, forest management, agriculture, urbanization, and mining.

In many instances, habitat degradation and consequent reduction in native fish and wildlife populations have resulted from the cumulative effects of small changes to terrestrial and aquatic ecosystems. Over time, these cumulative effects may be the most harmful to native fish and wildlife populations because of their potential to alter ecosystem processes, which defined these species existence. Thus, anthropogenic disturbance can significantly alter the productivity of ecosystems by adversely impacting species composition and diversity.

The following sections include narratives describing limiting factors specific to stream habitats that were identified from the QHA results as well as anthropogenic and natural disturbances that have contributed to the degradation of aquatic and terrestrial habitats negatively impacting populations of focal species. Additionally, limiting factors are logically addressed within objectives and strategies as part of Section 10 Coeur d' Alene Subbasin Management Plan.

6.7.1 Physical Habitat Alterations/Limiting Habitat Attributes

QHA was utilized to compare historic versus current physical stream conditions with respect to 11 habitat attributes. Details of the analysis method are provided in Section 3. QHA model does not determine which habitat attributes are most biologically limiting, but does identify which physical attributes have undergone the greatest deviation from the reference stream/reach condition. These results, coupled with knowledge of local biologists and biological status and interactions of the focal species, can assist in identifying key limiting factors. This section provides QHA results on a subbasin level for the Coeur d' Alene Subbasin. Results specific to each focal species are discussed in each focal species section.

The Coeur d' Alene Subbasin was delineated into 36 watersheds (Map CdA-5, located at the end of Section 6). Using the QHA model, habitat conditions were analyzed where bull trout, westslope cutthroat trout, and kokanee were historically and are currently present. Table 6.19 provides a list of reaches with less than optimal (value = 4) reference conditions.

Table 6.19. Reaches that were ranked as containing less than optimal habitat conditions in the reference condition in the QHA

Sequence	Reach Name	Habitat Attributes < optimal
1	Benewah	Fine Sediment, High Temperature
2	Plummer/Pedee Creek	Fine Sediment, High Temperature
3	Lake Creek	Fine Sediment, High Temperature
4	Wolf Lodge/Alder	High Flow
5	Fernan	High Flow
6	Blue Creek	High Flow
7	Beauty Creek	High Flow

Sequence	Reach Name	Habitat Attributes < optimal
8	E. Side Coeur d' Alene Lake	High Flow
11	West Shore Coeur d' Alene Lake	Fine Sediment, Obstructions
14.1	Slate/Big Creek	High Flow
14.2	North Fork St. Joe	High Flow
14.3	North side Joe	High Flow
14.5	Marble Creek	High Flow
15.1	St. Joe Lower	High Temperature, Obstructions
16.1	Upper St Maries River	High Flow
16.2	Lower St Maries River	High Flow, High Temperature
16.3	Emerald/Carpenter Creek	High Flow
20.1	Evans Creek & Lateral Lake Tribs	High Temperature
21.1	Middle North Fork Coeur d' Alene	High Flow
21.2	Shoshone	High Flow
21.3	Upper North Fork Coeur d' Alene	High Flow
21.4	Independence	High Flow
21.5	Tepee	High Flow
21.6	Little North Fork	High Flow
22.1	Prichard/Beaver Creek	High Flow

The habitat parameters with the greatest deviation from reference conditions vary by species and are presented in Table 6.20. This table should be interpreted as an indication of the types of habitat parameters that are problematic for the focal species in the Subbasin as a whole. Some reaches had more than one habitat parameter that was ranked as being equally deviant from the reference, hence the number of reaches listed adds up to more than the total number of reaches ranked. Most reaches had more than one habitat parameter that is currently ranked less than the reference. Table 6.20 only lists those habitat parameters that had the greatest deviation from reference, not all the parameters that could be less than optimal. Kokanee salmon are primarily shoreline spawners and the current habitat conditions most likely only impact a fraction of the kokanee salmon population.

Table 6.20. Habitat conditions with the greatest deviation from reference conditions as presented in the QHA model output for each focal species in Coeur d' Alene Subbasin. In parentheses are the number of reaches or watersheds with the particular habitat attribute exhibiting the largest deviation within that area.

Bull Trout (27)	Cutthroat (36)	Kokanee (2)
Riparian Condition (12)	Riparian Condition (15)	Fine Sediment (1)
Habitat Diversity (10)	Channel Stability (15)	Channel Stability (1)
Channel Stability (9)	Habitat Diversity (15)	
Fine Sediment (4)	Fine Sediment (6)	
Low Flow (3)	Low Flow (5)	
Pollutants (3)	High Temperatures (4)	
High Temperature (3)	Pollutants (3)	
Obstructions (1)	Obstructions (1)	
	High Flow (1)	

The Coeur d' Alene Subbasin has experienced over a century of settlement and anthropogenic disturbances impacting aquatic systems throughout the Subbasin in various degrees. The South Fork of the Coeur d' Alene River watershed has been heavily influenced by past mining activities. In the Coeur d' Alene, lower St. Joe and St. Maries river drainages, high road densities and a long history of timber harvest have been the primary activities impacting fish habitat. Development has also impacted watersheds immediately surrounding Coeur d' Alene Lake. The watershed viewed as least impacted (or having the most potential for recovery from restoration efforts) and most ecologically significant for bull trout and westslope cutthroat trout include the upper St. Joe River watershed, the East Fork Eagle Creek, Shoshone Creek, and few remaining roadless areas in the North Fork of the Coeur d' Alene River.

Local biologists agree the QHA output accurately identified heavily degraded areas in the Subbasin. However, they emphasize that these areas may require laborious and costly restoration projects to restore habitat conditions adequate to support bull trout. In addition, the same effort provided to restore a larger area having somewhat intact habitat might reap greater biological benefits. The experts of the area also believe future projects for restoration and recovery of focal species (for example, bull trout) should work from the headwaters downstream. The focus should also be placed on areas having an abundance of fish and somewhat intact habitat resulting in greater biological benefits from any restoration endeavors. An exception to this would be for managing kokanee, where lake habitat is the first priority.

For a more detailed analysis of limiting habitat attributes identified for each focal species (bull trout, westslope cutthroat trout, and kokanee salmon), refer the sections on focal species where QHA results are discussed.

6.7.2 Description of Historic Factors Leading to Decline of Focal Species[3]

The overall cumulative effects of mining, logging, nonnative species, agriculture, roads, urbanization, over harvesting, and the operations of Post Falls Dam have all contributed to the decline in the salmonid production of the Coeur d' Alene Subbasin. The principle factors leading to the decline or collapse in the native fish population in the Subbasin are water temperature, excess sedimentation, degraded spawning and rearing habitat, and interactions with exotic species. The physical limiting factors have been identified in the QHA (see Table 6.20) and by stream studies conducted over the years by USGS, Coeur d' Alene Tribe, and IDEQ.

Since 1883, the South Fork Coeur d' Alene River drainage has undergone extensive mining pollution, which has decreased the potential for salmonid. During the 1880s mining and milling wastes were discharge directly into the South Fork Coeur d' Alene River, which prevented the existence of almost all aquatic life in the South Fork and the entire mainstem of the Coeur d' Alene River. Since 1981, when mining operations stopped, the conditions in the mainstem Coeur d' Alene River have continued to gradually improve, and westslope cutthroat trout now migrate through the area (Graves et al. 1992).

The southwest portion of Coeur d' Alene Lake, with its rich Palouse soils, has been intensively farmed for at least the past 100 years. Heavy sedimentation, high water temperatures, and increased runoff rates have attributed to a substantial decrease in water quality.

The operations of Post Falls Dam have seriously altered the available habitat for westslope cutthroat trout (Graves et al. 1992). Inundation of riverine portions of the Coeur d' Alene and possibly lower reaches of St. Joe and St. Maries rivers has eliminated productive trout habitat.

6.7.2.1 Aquatic Alterations

Limiting factors affecting native aquatic species include poor water quality (Figure 6.2), habitat degradation, loss of prey species, passage barriers (e.g., culverts, dams), hybridization and competition with exotic species, and over harvest. Any number or combination of these limiting factors present in the Coeur d' Alene Subbasin can be further divided into either legacy or ongoing impacts.

Legacy impacts are results of activities, management actions, or events that occurred in the past, but their effects are still present. In many cases legacy effects continue to pose a risk to native trout. Legacy degradation to native trout habitat has resulted from timber harvest and skidding in and along riparian areas, splash dams, stream crossing structures (passage barriers and/or potential flow blockages), roads, wildfire, mining, grazing, and removal of large organic debris. Legacy effects have diminished, and in many instances

[3] The majority of Section 6.7.2 was taken directly from the Coeur d' Alene Subbasin Summary (2001), pp. 49-57.

continue to diminish, habitats and require restoration efforts. Legacy impacts can influence ongoing or proposed activities.

Legacy impacts directly affecting native trout populations have occurred from fishery management actions such as Tribal subsistence fisheries on spawning cutthroat populations, liberal harvest limits for sport fisheries, and the stocking of exotic fish species.

Ongoing impacts may result from activities or management actions that are legal according to present laws and regulations. Examples include road construction and maintenance, timber harvest, National Pollutant Discharge Elimination System (NPDES) permits (Figure 6.4), clean up and management of CERCLA sites (Figure 6.4), mining, grazing, urbanization, recreation, etc.

Activities such as the management for nonnative species may threaten native trout through competition and/or predation of native fish, while other activities such as unintentional, incidental, or illegal harvest of bull trout or cutthroat trout within the protective slot limit threaten already depressed populations.

Watersheds encompassing both aquatic and terrestrial resources have been negatively impacted as human populations have grown overtime with the concurrent increase in land use activities such as roads, timber harvest, agriculture, and mining in the Subbasin. The effects of both legacy and ongoing problems from land use can be reduced through immediate actions and other actions identified by analysis and monitoring. Watershed analysis provides a comprehensive assessment of watershed and fish habitat conditions within a basin. The analysis includes assessments for roads (refer to Section 5, Figure 5.6), streams, riparian areas, erosion, and fish. The results are applied to improve land management and fishery management actions.

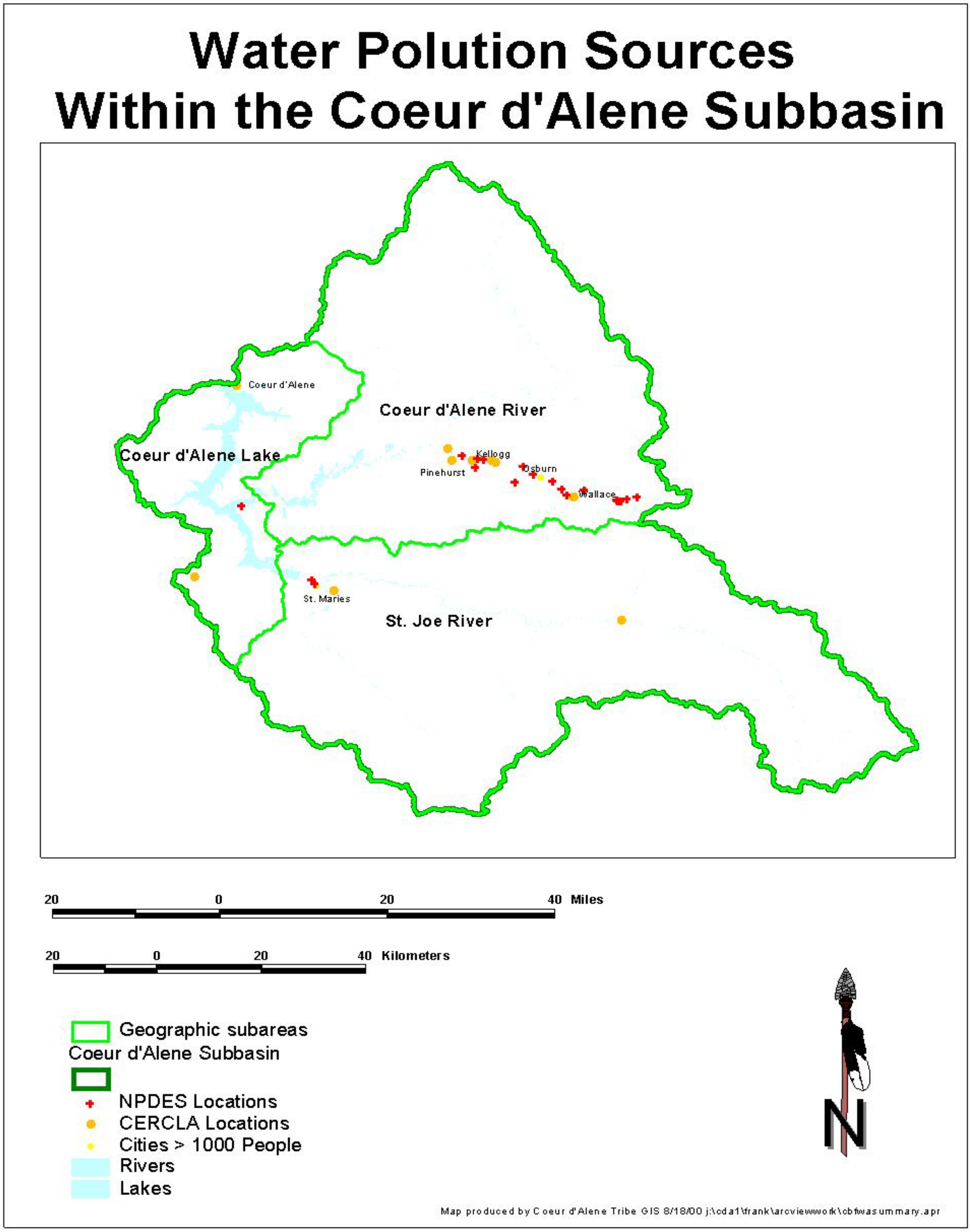


Figure 6.4 Water pollution point sources based on designated NPDES and CERCLA sites within the Coeur d' Alene Subbasin

Hydropower

A historical description of the Spokane River upstream of Spokane Falls and Post Falls prior to impoundment by Monroe Street Dam in 1890 and Post Falls Dam in 1906 is provided in Scholz et al. (1985). McDonald (1978 cited in Scholz et al. 1985) states "…salmon were able to get over the falls [Spokane Falls] at Spokane; at least up until the first dam was constructed [Monroe Street Dam in 1890], and to continue on to Coeur d' Alene Lake and all its tributaries." Scott (1968 cited in Scholz et al. 1985) reported "salmon would congregate by the thousands below Spokane Falls, awaiting an opportunity to push their way over the falls into the river above and from there into Coeur d' Alene Lake and its tributaries. … Some [salmon] got through the seething torrent [of Spokane Falls], others were destined for disappointment." None of these accounts indicate Post Falls was a natural barrier to fish migration. However, the lack of any historic or present data of anadromous fish presence (lack of any mention of anadromous fish by Mullan (1860), lack of other historic accounts of spawning concentrations of salmon in tributaries, presence of native rainbow trout populations any where in the drainage, in the Coeur d' Alene Subbasin above Spokane and Post Falls would suggest that these falls were natural barriers to anadromous fish.

Post Falls Dam was in operation in 1906 on the Spokane River, approximately 15 kilometers (10 miles) downstream from the outlet of Coeur d' Alene Lake and is currently operated by Avista. There is no fish passage facility and resident fish are unable to migrate upstream, however entrainment downstream does occur. Operation of the project has resulted in a modified hydrograph for the lake, with the lake level held artificially high from about mid-June through mid-September (648.6 meters, 2128 ft above sea level). The lake is drafted beginning in early to mid-September and ending six to eight weeks later to 646.2 meters (2120 ft) above sea level. Because of the constriction at the outlet of the lake, large midwinter storms, typically characterized by rain-on-snow events, can result in the lake reaching levels up to 5 meters (16.4 ft) above minimum winter pool elevation. Rain-on-snow events typically occur between November and April with none occurring some winters and multiple events occurring in other winters. Post Falls Dam is operated as a run-of-the river project with little or no influence on Coeur d' Alene Lake levels during the winter months due to the unpredictability and magnitude of winter storm events.

Prior to impoundment (1906), the lake typically filled during spring runoff events (normally occurring sometime between early April and late June) and then gradually drained to a post runoff elevation of two to three meters below the current level maintained during the summer. The lake level then remained low until the next large runoff event. The upper Spokane River above Post Falls, as well as some portion of the lower Coeur d' Alene, St. Joe and St. Maries rivers were characterized as a large flowing rivers rather than slack water reservoir type habitats that exist now during summer impoundment.

Post Falls Dam has also inundated the free flowing portion of the Spokane River below the outlet of Coeur d' Alene Lake. A description of the Spokane River upstream from Post Falls prior to impoundment was provided by Mullan (1860). He described a rocky, boulder strewn river channel with a swift current, suggesting the habitat conditions suitable for trout. The presence of native trout in the river system elsewhere during that time and high concentrations of cutthroat trout below the outlet of the lake in the spring prior to impoundment suggests the reach provided at least seasonal habitat for native coldwater fish (Horner, IDFG, personal communication, 2004).

By extending the period of time when the lake levels are maintained at higher than historical level through most of the growing season, a significant amount of historically vegetated lowlands and riparian areas have been converted to mudflats and raw exposed river and streambanks when the lake level is dropped during the winter. At the same time, previously dry upland areas have been converted to seasonal wetland habitats. Although many of the previously dry upland areas may have been seasonal wetlands under a natural hydrograph, and today are permanently inundated due to the operation of Post Falls Dam (Cameron Heusser, Wildlife Biologist, Coeur d' Alene Tribe, personal communication). The amount and function of wetland habitat lost and gained by artificially holding the lake up through the summer months has not been quantified, and an assessment of the losses and gains is needed.

Impacts to riverine habitat are somewhat more clearly defined. Approximately 40 km (25 miles) each of the lower St. Joe and Coeur d' Alene rivers are artificially impounded to some extent during the summer months, reducing their value to native species such as westslope cutthroat trout, bull trout, and mountain whitefish as well as important terrestrial wildlife species. Because of the loss of riverine habitat characteristics, and the low retention time in artificially created slackwater areas, these lower reaches appear to have neither the productivity or carrying capacity of adjacent, un-impounded up-river reaches, nor of the lake. Habitat impacts are compounded due to increased temperatures, and to the lack of vegetation in the drawdown zone, which has resulted in unstable banks and a loss of allochthonous inputs into the river system. Unstable banks are also attributed to wave action from watercraft (G. Harvey, IDEQ, personal communication, 2004).

During high flow events, which typically occur when the lake level is drawn down, exposed banks erode at a high rate. The problem is particularly acute in the lower Coeur d' Alene River, where bank sediments include high levels of toxic metals. Densities of trout in the lower Coeur d' Alene River immediately upstream of the artificial water level are high (Fredericks et. al. 2002), suggesting trout populations were historically high through free flowing reaches of the lower river. Anecdotal accounts suggest a good fishery for cutthroat trout and bull trout in the lower St. Joe River existed prior to impoundment by Post Falls Dam. An undetermined length of tributary habitat has been similarly impacted by artificially high water levels. For example, approximately three kilometers of lower Wolf Lodge Creek is described as slackwater habitat during the summer months.

The impacts of Post Falls Dam are most prominent in the southern end of the lake. Large expanses of shallow inundated lands typically reach temperatures of over 26 ºC (80 ºF) during the summer (Peters et. al. 1999). Additionally, sediment delivery to the lake from agricultural areas is collecting in the slackwater portions of the smaller tributaries in the interior bays of the lake creating large mudflats that are quickly colonized by aquatic macrophytes creating habitat more suitable for exotic species. Whether entrainment of downstream moving fish results in significant mortality is not currently known. However, this question may be addressed in the Avista re-licensing of the Spokane River hydropower projects in 2003-2004.

The effect of Post Falls Dam operations on downstream water temperatures is not currently understood. Given summer flooding of low lying areas and impoundment of free flowing river reaches, it is feasible that surface temperatures of the lake and rivers have been increased, potentially affecting downstream fisheries as well. Data should be available to ascertain the hypothesis from the Avista re-licensing of the Spokane River hydropower projects in 2003-2004.

Passage Barriers

Potential man-made barriers within the Coeur d' Alene Subbasin include Post Falls Dam, remnant splash dams, and culverts. Post Falls Dam is located on the Spokane River downstream from Coeur d' Alene Lake and presents a barrier to upstream migration of resident fishes and entrains some fish downstream. The remnants of a large splash dam on Marble Creek in the St. Joe River drainage that were originally complete barrier is currently only a partial barrier to fish passage due to modifications during the big floods of 1996 and 1997 (Joe DuPont, Fisheries Biologist, IDFG, personal communication, December 2003). Culverts can be barriers to fish movement when the jump into the culvert is too high, the jump pool below the culvert is not adequate, water velocity through the culvert exceed the fishes swimming ability, or inadequate water depths occur through the culvert (especially for spawning adult trout during August and September).

Fish size, season and flows need to be considered for native trout access to habitat. Where culverts prevent invasion of exotic fishes, they may have a positive effect on native trout populations. Barriers should be evaluated for their effect on native fishes and amphibians in the drainage before they are removed. Culvert barriers with negative effects on native trout should be removed or modified to provide for fish passage. The Idaho Forest Practices Act (enforced by IDL), the stream channel Protection Act (enforced by IDWR) and Idaho Code 36-906 (enforced by IDFG) require stream crossing on fish-bearing streams to provide unrestricted fish passage. Migration barriers created by culverts are common in the Coeur d' Alene Subbasin. However, a complete inventory of existing fish passage barriers has not been completed in the Coeur d' Alene Subbasin.

Restoring and maintaining connectivity between remaining populations of native trout is believed to be important for the persistence of the species (Rieman and McIntyre 1993). Migration and spawning between populations increases genetic variability and strengthens population viability (Rieman and McIntyre 1993). Barriers caused by human activities limit population interactions and may eliminate life history forms of native trout. Where isolation has occurred, the risk of local extinction due to natural events such as flood and drought increase.

Native trout that migrate downstream of fish passage barriers are unable to contribute to the trout population upstream. In systems with dams, this loss can be quite significant. Research on Arrow Rock reservoir (Boise River) found that about 20 percent of the bull trout in the reservoir migrated past Arrow Rock Dam (Brian Flatter, IDFG, personal communication). Swanberg (1997) also found that a significant portion of bull trout in the Blackfoot River (Clark Fork River drainage, Montana) migrated downstream of Milltown Dam.

Hybridization, Competition, and Predation

Brook trout were widely stocked in the early 1900s, and there are currently established populations in the Coeur d' Alene Subbasin, although they are not widely distributed. Brook trout populations are present in several tributaries, lakes and reaches of the South Fork Coeur d' Alene River, the North Fork Coeur d' Alene River drainage, St. Maries River drainage, and the St. Joe River drainage. However, brook trout were more common in the tributaries in the lower St. Joe River versus the North Fork St. Joe River and its tributaries (Apperson et al. 1989).

Bull trout did not evolve with brook trout; therefore, mechanisms that promote coexistence and resource partitioning have likely not developed in the Coeur d' Alene Subbasin. One of the consequences of introducing brook trout is hybridization with native bull trout (Dambacher et al. 1992). Bull-brook trout hybrids have a low egg to adult survival and are sterile in most cases. In some cases, brook trout competition and hybridization have resulted in complete displacement of bull trout in some resident populations (Dambacher et al 1992; Leary and Allendorf 1989; Leary et al. 1991). Currently, brook trout and bull trout do not co-exist in the core bull trout spawning and rearing habitats in the upper St. Joe River drainage.

IDFG has a statewide brook trout limit that allows an angler to keep 25 brook trout (any size). The brook trout limit applies on all waters open to fishing, including catch-and-release waters, unless specifically excluded in the regulations. However, because brook trout often mature at sizes smaller than what anglers will normally catch or keep, angling is not likely to significantly reduce brook trout populations.

Westslope cutthroat trout can hybridize with rainbow trout and other cutthroat subspecies. Fortunately, evidence of hybridization of cutthroat trout with rainbow trout is low in the Coeur d' Alene Subbasin. After nearly 30 years of monitoring cutthroat populations via snorkeling and electrofishing in the St. Joe and Coeur d' Alene river drainages, only fish in the lower reaches of both rivers show phenotypic signs of hybridization (Ned Horner, IDFG, personal communication, December 2003). Genetic analyses of cutthroat trout further up in the drainage and in tributaries to Coeur d' Alene Lake indicate pure strain populations. Although the hybrid trout are viable, introgression results in the progressive loss of genetic variability in westslope cutthroat trout populations (Allendorf and Leary 1988). Lost variation may lead to poorer performance (growth, survival, fertility, development) of individual stocks and greater susceptibility to epizootics, environmental change, or catastrophic events (Allendorf and Leary 1988).

Westslope cutthroat trout are also negatively impacted by brook trout. Cutthroat trout did not evolve with brook trout; therefore, mechanisms that promote coexistence and resource partitioning have likely not developed in the Coeur d' Alene Subbasin. Griffith (1972) demonstrated that cutthroat trout fry emerge from the gravel later in the year than brook trout and, thus, age-0 cutthroat trout acquire a statistically significant length disadvantage that may continue throughout their lifetime. Such a size discrepancy may enhance resource partitioning, but in times of habitat shortage cutthroat trout may be at a disadvantage if they cannot hold territories against larger competitors. Competitive exclusion is a likely cause of decline for cutthroat trout in some subbasin watersheds. Replacement of this kind, at least in stream environments, may be an irreversible process (Moyle and Vondracek 1985). This was found to be the case in Yellowstone National Park where the introduction of brook trout has nearly always resulted in the disappearance of the cutthroat trout (Varley and Gresswell 1988). Implications are that cutthroat trout may have a difficult time recovering given continued water quality degradation and the persistence of brook trout.

Chinook salmon feed on kokanee salmon (both introduced species) in Coeur d' Alene Lake. Kokanee are likely an important forage item for adfluvial bull trout. Chinook salmon may occasionally feed on westslope cutthroat trout as well, but habitat preferences of both species limit their direct interaction.

Illegally introduced northern pike are found in bays, smaller lakes, and slow moving river reaches and may consume trout as they migrate to Coeur d' Alene Lake. Northern pike were documented to consume large numbers of migratory cutthroat trout in bays of Coeur d' Alene Lake (Rich 1992), thus it is logical to suspect them to also prey on bull trout that migrate into Coeur d' Alene Lake (USFWS 2002). However, it is unknown how much of a threat northern pike pose for other trout species migrating into the lake. Northern pike have been in the Coeur d' Alene system since at least the early 1970s. Native northern pikeminnow (formerly northern squawfish) may also occasionally prey on juvenile trout migrants in the lower St. Joe River and Coeur d' Alene Lake.

Harvest and Fishing Mortality

Current harvest regulations allow a limited harvest fishery on westslope cutthroat trout with a slot limit of two fish, none between 8 to 16 inches. This regulation applies to all waters above Post Falls Dam outside the catch-and-release waters in the headwaters of the St. Joe and Coeur d' Alene rivers. Bull trout harvest has been closed since 1988. A limited harvest of bull trout may occur through both misidentification and poaching. Spawning bull trout are particularly vulnerable to illegal harvest since the fish are easily observed during fall low flow conditions. Even in cases where an angler releases the fish, incidental mortality of four percent has been documented for other species of trout (Schill and Scarpella 1997). Harvest and reduced fishing mortality can be further addressed through fishing regulations, angler education, enforcement, and road closures where roads readily access native trout spawning areas. Fishing in the core bull trout area (the area upstream from the North Fork St. Joe River where all of the known spawning and early rearing occurs) of the upper St. Joe River system is regulated with catch-and-release fishing regulations, with single barbless hooks and no bait allowed.

Beaver Activity and Impacts to Fish[4]

There is no specific literature describing native trout use of beaver dams in the IMP. However, as in other watersheds native trout must have co-evolved with beaver. Beaver dams are known to have a variety of positive and negative impacts on salmonid production including reduced spawning habitat and barriers to migration (Churchill 1980, Call 1966), increased rearing and over-wintering habitat (Gard 1961, Bustard and Narver 1975), sediment trapping (Smith 1980) and increased bottom fauna (Gard 1961) via addition of large woody debris. Beaver ponds may positively or negatively influence stream temperatures. In stream systems where beaver ponds elevate water tables and saturate the adjacent floodplain, stored water released from the floodplain during the warm summer months may serve to cool stream temperatures. Large shallow ponds with significant exposure to the sun and a low turnover rate may warm stream temperatures. In exceptionally low flow years, beaver ponds have been observed to provide refuge areas for salmonids in otherwise intermittent reaches of stream (Corsi and Elle 1989).

A potential impact of beaver activity on native trout in the Coeur d' Alene Subbasin may be the value of ponds as brook trout habitat. MacPhee (1966), Platts (1974) and Griffith (1971) observed that brook trout in Idaho streams were more likely to occupy low gradient habitat. Call (1966) and Huey and Wolfrum (1956) observed that brook trout growth and biomass was favored by the presence of beaver ponds in Rocky Mountain streams.

Beavers and beaver activity are relatively common in the Coeur d' Alene Subbasin, with most of the activity occurring on lower gradient stream reaches where stream energy is less likely to remove dams. Brook trout distribution in the watershed is very limited and does not appear to be strongly correlated with the occurrence of beaver activity. Beaver dams are present in reaches of the upper St. Joe River drainage, which native trout are known to pass through on their way to spawning areas. In Wisconsin and Michigan, the removal of beaver dams led to reduction of native brook trout, an unintentional outcome that was designed to improve fish passage and enhance populations. The intended management action had the exact opposite effect intended by Michigan Department of Natural Resources.

6.7.2.2 Habitat Alterations

Habitat degradation may generally result from two sources: natural and human-caused disturbances. Wildfire is an example of a natural habitat disturbance to terrestrial and aquatic systems. Poor construction or design of roads is an example of a management-related disturbance that can degrade aquatic habitat and lead to surface or mass wasting erosion. Other anthropogenic activities such as timber harvest, mining, and agriculture are also included as having potential for negatively impacting aquatic systems through habitat disturbance and degradation.

[4] This Section was taken directly from the Coeur d' Alene Subbasin Summary (2001), p. 57.

Wildfire
Fire ignition may be either natural or man-caused. Man-caused fire ignition may be intentional (either legally for management purposes, or illegally in cases of arson) or accidental. Recent evidence suggests that successful fire suppression since the 1930s may be currently resulting in more intense, catastrophic fires. Catastrophic fire is associated with increased sediment delivery to streams, more rapid water delivery to stream channels, increased temperatures (due to burning of stream side vegetation), lack of large woody debris (in extreme cases the existing woody debris is consumed by the fire, in other cases the fire consumes trees that would contribute to woody debris in the future) and lack of habitat complexity (due to increased sediment and reduction in woody debris). Less intense fires can actually increase the complexity and diversity of the aquatic and terrestrial habitat mosaic. If the fire is not extremely hot, woody debris recruitment may increase. Woody debris acts in the stream channel to provide cover, pool habitat complexity, and sediment storage.

Past management activities and successful wildfire control have caused a shift in forest species composition and stocking levels, predisposing forests to large scale mortality. Drought conditions can further dispose these forests to increased wildfire incidence and intensity, with the potential for significant negative impacts on water quality and fish habitat. During 1910 and the 1930s, large wildfires and numerous smaller fires burned in the Coeur d' Alene Subbasin. Large fires have often left riparian vegetation intact along larger streams, but accounts of the 1910 fire from the St. Joe River drainage documented significant burning of riparian areas along some streams. Intense fires may increase natural sediment delivery to streams, when hydrophobic soils are created. At the same time, fires can significantly increase recruitment of large woody debris to stream channels. Where post-fire salvage operations have removed woody debris from stream-side areas, or created other disturbances such as roads and fire breaks, impacts to fish may be increased (Rieman and Clayton 1997). Although stream habitat in the most severely burned drainages is recovering from past fires, legacy effects from these fires may continue to lower overall productivity for native trout in some stream reaches.

Wildfire may result in short- or long-term loss of, or reductions in, bull trout use of specific streams or stream reaches. Rieman and McIntyre (1995) document a case where a catastrophic (using the definition above) fire extirpated bull trout from a small watershed, and within two years bull trout returned. The large stand replacing fires of 1910 burned through a considerable portion of the upper St. Joe watershed, including riparian areas, yet the upper St. Joe watershed is the remaining stronghold for bull trout in the Coeur d' Alene Subbasin.

Roads
Road and railroad construction has resulted in significant changes on the Coeur d' Alene Subbasin landscape since the 19th century. Roads may cause elevated sediment delivery to streams in two ways: land slides and/or road surface run-off (Edwards and Burns 1986, Weaver and Fraley 1991, Shepard et al. 1984). Roads can also reduce subsurface flow and contribute to increased rates of overland flow delivery to streams, changing the way

rain events impact stream channels (Jones and Grant 1996, Rothacher 1970, Peck and Williamson 1987, Troendle and King 1987).

During the nineteenth, twentieth, and twenty-first century, road and railroad construction has been developed for hauling goods to markets, extraction of timber and other natural resources, and for general transportation. Roads and railroads have had significant impacts on stream habitats through channelization of streams, encroachment on floodplains, destruction of riparian zones, creation of migration barriers for fish, sediment delivery associated with construction and failures, and altered runoff patterns. Those areas with the highest density of roads occur in areas managed primarily for timber production and center of urban development (refer to Section 5, Figure 5.6). Land management and access roads paralleling tributary streams are common and along with the problems cited above are typically more prone to failure and sediment delivery to streams.

Roads (and old railroad beds) paralleling streams typically constrain channel meanders, reduce floodplain capacity, and reduce or eliminate riparian areas and large woody debris recruitment. Streamside roads are vulnerable to failure during high flows and are significant sources of sediment to stream channels. Stream crossings may result in channel constrictions and impede water movement through floodplains, and can increase deposition on the upstream side and erosion on the downstream side of a crossing. Over 50 percent of the tributaries (second order and larger) to the St. Joe, St. Maries, and Coeur d' Alene rivers have reaches that are significantly affected by roads constructed in the floodplain or adjacent to the stream channel.

Although some areas remain roadless, overall road density in the Coeur d' Alene Subbasin is categorized as high (1.7 to 4.7 mile/square mile) or very high (4.7 to 16.6 mile/square mile) based on data gathered at a scale of 1:24,000 from the USFS, BLM, University of Idaho, IDL, and Coeur d' Alene Tribe (refer to Section 5, Figure 5.6, CDA Tribe 2000). The most significant problems are primarily associated with "legacy" roads and roads for which there are insufficient funds to conduct routine maintenance. Legacy roads are those roads that were constructed prior to the advent of best management practices (BMPs), or were constructed without using best management practices, and pose a significant threat to fish and fish habitat. Legacy roads impact, or pose risks to, fish habitat from failure and sediment delivery, actual loss of stream area and length, modified hydrology, loss of woody debris recruitment, and/or obstruction of fish habitat.

Legacy effects of past construction practices are evident and old, unmaintained road and railroad beds continue to pose serious risks to fish habitat in some portions of the basin. Construction of the Milwaukee rail line and Forest Highway 50 resulted in channelization of the mainstem St. Joe and numerous stream crossings became fish migration barriers. Rail grades and more recently Interstate 90 have also resulted in channelization of the South Fork Coeur d' Alene River. Fill failures associated with old and unmaintained rail beds and timber roads are relatively common, particularly during years with flood events. Forest Highways 9 and 208 up the North Fork Coeur d' Alene River have had similar impacts and in particular isolation of much of the floodplain from main channel of the river.

Newer timber roads constructed in the 1980s and 1990s (following the advent of the Forest Practices Act) are generally considered to be less likely to contribute sediment to streams than older roads. There are a large number of old roads in the Coeur d’ Alene Subbasin, many of which are no longer maintained and have essentially been abandoned. Some old roads have stabilized and may not pose a significant risk to stream habitat, but many are in an unstable condition, and/or have undersized and inadequately maintained culverts which may plug and fail, resulting in landslides and massive sediment inputs to streams. Regular inspection and maintenance of all roads in the road network can help reduce road-related landslides.

Timber Harvest

Timber harvesting activities in the Subbasin have included clear cutting, partial cutting, thinning, fertilization and prescribed burning. The yarding or skidding of trees varies from ground-based operations and cable systems to aerial approaches such as helicopters. The road building aspects of timber harvesting management are discussed above.

Legacy impacts of timber harvest include: changes in watershed hydrology through changes in canopy cover, which reduces infiltration leading to an increase in flood frequency and magnitude; decrease in channel stability resulting in an increase of bedload sediment movement and scouring of fish habitat; a decrease in available and potential for large woody debris recruitment in streams; and an increase in water temperatures as a consequence of degraded or elimination of riparian forests. Splash dams were used in several streams (most notably Marble Creek in the St. Joe River drainage) and created significant changes to stream channels and fish habitat by creating migration barriers and scouring channels with regular releases of large flows of water and logs.

Current impacts of timber harvest on native trout have been reduced with implementation of forest practice rules that require riparian trees are not removed, prohibiting equipment in or near streams, and controlling erosion from roads, trails and landings. However, the current practices to leave riparian forests untouched may not adequately protect temperature in all cases (Sullivan et al. 1990).

Zaroban et al. (1997) found forest practice rules were implemented 97 percent of the time, and when applied, they were 99 percent effective at preventing pollutants from reaching a stream. However, half of the timber sales reviewed had sediment being delivered to streams or streams channels and the impact of this sediment delivery was not assessed. These findings illustrate the need to adequately implement all applicable rules as the misapplication of one rule, out of many, can result in sediment delivery. Recently, federal lands have adopted PACFISH and INFISH management guidelines that exceed Idaho Forest Practice Act rules and were designed to protect native fish populations.

Other impacts of timber harvesting may include decreased slope stability and hydrologic alteration. Clear-cutting on steep, unstable slopes has been associated with decreased slope stability in other northern Idaho watersheds (McClelland 1998, Cacek 1989).

Hydrologic alteration, such as increased water yields, increased summer low flows, shifting of snowmelt timing, and increased peak flows have been associated with timber harvesting (Brooks et al 1991; Grant and Jones 1996). While increased summer low flows may be of benefit to native trout, the principal concern is on increases in peak flows during egg incubation and prior to emergence from the gravel. Increased peak flows may result in increased scour and deposition on redds. The combination of high road densities and large canopy openings from clear-cut logging has resulted in significant degradation of fish habitat in the Coeur d' Alene Subbasin. Increased frequency and intensity of floods, especially associated with winter rain-on-snow events, has destabilized many headwater streams. Erosion of bedload sediment from headwater reaches and deposition in fish bearing streams downstream has resulted in the loss of pool and pocket water habitat important for the rearing and over-wintering of native trout and char (Idaho Panhandle National Forests).

Mining

Placer mining in streams and valley bottoms can have serious negative effects on native trout. This type of mining is associated with increased sediment load, substrate disturbances, re-suspension of fine sediments, channelization, bank destabilization, and removal of large woody debris. Streams that have been mined usually lack habitat complexity, large woody debris, and suitable spawning and wintering habitat (Nelson et al. 1991). Revegetation of dredge piles may be slow and sparse, creating a long-term potential for sedimentation (Levell et al. 1987; Nelson et al. 1991). Griffith (1981) found that entrainment of salmonid eggs and sac fry by suction dredges resulted in 100 percent mortality of un-eyed eggs, 35 percent mortality of eyed eggs, and 42 percent mortality of sac fry. These particular developmental stages are considered to be more vulnerable due to sensitive soft tissues.

Placer mining has significantly impacted streams in the Beaver and Prichard Creek drainages in the North Fork Coeur d' Alene watershed, and the Emerald and Carpenter creeks in the St. Maries River drainage. Some placer mining has occurred in upper St. Joe River tributaries, including Heller and Sherlock creeks, but impacts appear to be less severe in those streams.

Tailings dams, waste dumps and diversions can provide barriers to bull trout migratory corridors and spawning sites. Toxic constituents (such as heavy metals) arising from historical activities can block migratory corridors or kill life stages of native trout. Prior to establishment of the Clean Water Act, the entire South Fork of the Coeur d' Alene River from Wallace downstream to the mainstem Coeur d' Alene River, and the mainstem downstream to Coeur d' Alene Lake, were so polluted from mining and other wastes that resident fish were unable to survive (Ellis 1932). Portions of the South Fork still do not support coldwater biota due to metals contamination, and the Bunker Hill Superfund Site centered at Kellogg is one of the largest in the nation. As discussed in environmental conditions, some tributaries to the South Fork remain impaired by heavy metals such that conditions do not support fish (Reiser 1999). Clean-up projects and the cessation of much of the mining and all of the smelting operations have allowed recovery of several stream reaches to the point where at least some fish and other coldwater biota are supported. Waste dumps and tailings placed in stream channels have also contributed to channel instability and intermittency problems in some stream reaches.

In Idaho, the Idaho Department of Lands (IDL) regulates all mining except underground mining and place mining covering less than half a surface acre. The Idaho Department of Water Resources (IDWR) also jointly regulates any mining that occurs within a stream's bed or banks. Recreational dredge mining has regulations establishing locations and seasons throughout the state. Recreational suction dredge operators must get a "One Stop" permit from the IDWR and comply with these regulations. If they choose to operate outside of the One Stop regulations, they are required to obtain a stream channel alteration permit. Commercial dredge mining requires special permits. Recreational suction dredging regulations and management is discussed in Section 5.2.7 Major Land Ownership and Land Uses under the subheading Minerals.

Agriculture

Grazing represents the majority of the agricultural practices within the Coeur d' Alene Subbasin along with some hay and grain production. Agriculture activities such as livestock grazing and crop production can result in increased nutrient levels from fertilizers and wastes, increased chemicals from pesticides, increased sediment from bank and channel alteration, and riparian damage. In the Coeur d' Alene Subbasin, livestock grazing is generally confined to the lower river valley bottoms, and is a significant factor affecting native trout distribution only in a few watersheds. Livestock grazing along the St. Maries River and some of its tributaries is likely reducing riparian vegetation resulting in a loss in riparian cover, shade, and streambank stability. Similarly, grazing in Benewah Creek and other lower elevation watersheds has contributed to degradation of the channel within the historic floodplain.

Establishment of drainage districts along the lower St. Joe and Coeur d' Alene rivers has resulted in reduced floodplain capacity, channel alterations, and migration barriers. Grazing can result in decreased water quality, increased temperatures, lack of habitat complexity, stream widening, decreased stream depth, and bank sloughing (Amour et al, 1991; Chaney et al, 1993; Platts 1991).