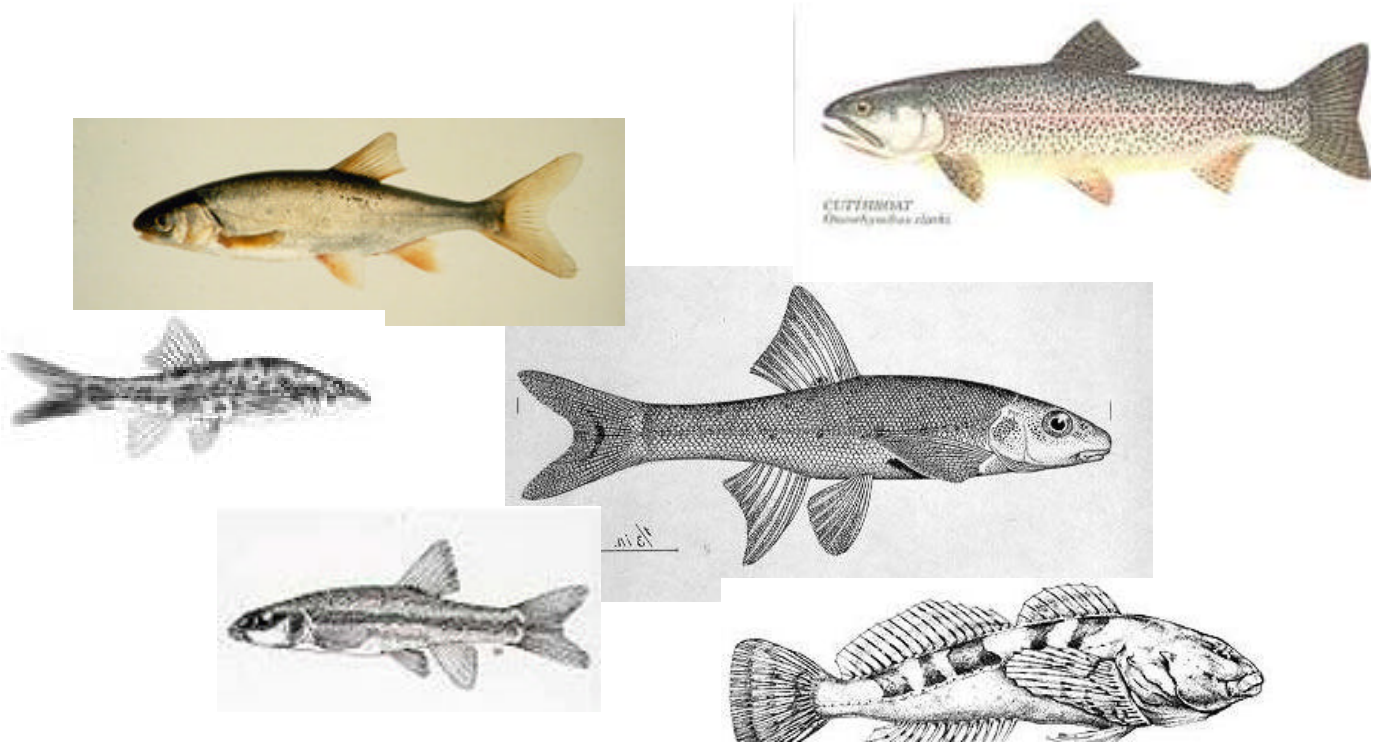
Okanagan Region
Fish Species at Risk Status Report



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EXECUTIVE SUMMARY

By querying both the Conservation Data Centre (CDC) and the Federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) the following list of species was identified as being at risk in the Okanagan Region.

- Chiselmouth, *Acrocheilus alutaceus*
- (northern) mountain sucker, *Catostomus platyrhynchus*
- (Columbia) mottled sculpin, *Cottus bairdi* subspecies *hubbsi*
- shorthead sculpin*, Cottus confuses*
- westslope cutthroat trout, *Oncorhynchus clarki lewisi*
- Interior Fraser coho salmon, *Oncorhynchus kisutch*
- Bull trout, *Salvelinus confluentus*
- Speckled dace, *Rhinichthys osculus*
- Umatilla dace, *Rhinichthys Umatilla*
- White sturgeon, *Acipenser transmontanus.*

The population status of chiselmouth and both sculpin species are stable, while mountain suckers and speckled dace populations are low with the remainder experiencing declining populations. White sturgeon if present historically have possibly been extirpated from the basin. All the species on the list are either highly or moderately sensitive to habitat alterations. Habitat loss is critical to the future of these fish species. Table 2 summarizes the fish species at risk and their related status in the Okanagan Region. Using relevant literature and expert opinion status reports have been completed for each species; these species accounts are detailed in sections 4.2.1 through 4.2.10.

There are gaps in the knowledge of biology and ecology of several of these Okanagan populations as well as assessing in the field the distribution or extent of range of several of the species. Concerning the mottled sculpin, speckled dace and Umatilla dace, the taxonomic relationships of the various populations need to be clarified.

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1.0 INTRODUCTION

The geography of British Columbia offers a great diversity of aquatic habitats. In the Okanagan Region, water flows at times from glaciers to small headwater lakes, through streams, wetlands, large lake systems and rivers. Each of these habitats plays a critical role in the survival of the many species that depend upon the aquatic environment during their complex life cycles (WLAP, 2003).

Animals that depend on freshwater ecosystems are about twice as likely to be at risk of extinction as other ecosystem species. In fact, 35.5% of animals that depend on freshwater ecosystems are at risk (Natureserve, 2003). Canada contains one quarter of the worlds freshwater and thus has a considerable responsibility for the protection of freshwater fish habitat (CESCC, 2001).

Even though the majority of freshwater fishes are ranked as secure (53%) a large proportion are undetermined (17%). It is these lesser known species which form part of the ecosystems that support other wildlife (CESCC, 2001).

Since the mid-19th century major changes have occurred in the Okanagan Basin. Areas that were once forests, grasslands and northern deserts are now cultivated. Irrigation projects have altered natural flow regimes. Cities and towns have changed nutrient levels and water quality in hundreds of streams and rivers. Long stretches of once turbulent waters have been tamed with low head dams and changed to lake-like reservoirs. Impacts of these environmental changes on the native fish fauna are probably immense (McPhail and Lindsey, 1986).

The following report reviews the current status of those fish species in the Okanagan Region that are listed Provincially by the Conservation Data Centre (CDC) and by the Federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Provincially, fish species at risk are listed under the CDC as Red or Blue. The Red and Blue lists serve two purposes:

1) to provide a list of species for consideration for more formal designation as Endangered or Threatened, either provincially under the British Columbia Wildlife Act, or nationally by COSEWIC, and
2) as a method of assigning conservation priorities for species considered at risk in British Columbia.

These lists serve as a practical method to assist in making conservation and land-use decisions and prioritize research, inventory, management, and protection activities. The rankings highlight species that have particular threats, declining population trends, or restricted distributions that indicate that they require special attention. There are additional species of concern present in the

region (e.g. kokanee, sockeye, rainbow trout and others) which may become listed in the future and should not be overlooked during the decision making processes.

2.0 STUDY AREA

The Provincial jurisdiction of the Okanagan Region is made up of the Shuswap (upper and middle), Kettle, Okanagan and Similkameen systems. The latter three drain the southern parts of the Interior Plateau and the Monashee Mountains (Fig. 2). They are sub-regions of the Columbia system and are smaller, less turbulent and warmer in summer than the Columbia. The Shuswap River (upper and middle) drains north into the Fraser system.

There are falls, dams and rapids on these rivers that act as barriers to fish migration/ dispersal. On the Okanagan River there are currently several man-made barriers blocking upstream fish migration, the first of which is McIntyre Dam located 24 km upstream of Osoyoos Lake. Until the construction of McIntyre Dam in 1921 the only barrier to fish migrating Okanagan River was a natural falls located at OK Falls which seemed to be a selective barrier to many fish. This falls was modified in 1928 with a raised concrete sill, which appears to still have been passable to some fish (anecdotal evidence) and rendered completely impassable to fish between 1950 and 1958 with the construction of the Skaha Lake Outlet Dam (Ernst, 1999a).

The final barrier to migrating fish is located at the outlet of Okanagan Lake, referred to as the Okanagan Lake Outlet Dam which was first constructed in 1920, modified in 1922 and 1928 reducing or eliminating fish passage at each installation but was most likely not completely impassable to fish until between 1950 and 1958 when the current concrete structure was constructed (Summit, 2003).

On the Similkameen River, Enloe Dam is located 8.8 miles from its mouth in the US and forms a barrier to all upstream fish migration. It was constructed immediately upstream of a natural falls that may have been a barrier to fish passage (Smith, 2003). Oral legends of the indigenous peoples indicate that fish did not pass above this natural falls (Ernst, 2000). The dam was constructed as a hydroelectric facility between 1916 and 1923 (Smith, 2003) and was not provided with fish passage facilities.

There is a natural falls on the Kettle River at Cascade located 2km south of Christina Lake. The canyon at Cascade is known as the mythological site *k'lhsaxem* meaning the end of fish going up (Ernst, 1999b). Historically several species of Pacific salmon were known to migrate upstream from the Columbia River into the Kettle River as far as Cascade Canyon; however upstream access was blocked in 1939 by the construction of Grand Coulee Dam (CHPP, 1999).

From 1897 to 1919 a small hydroelectric plant was in operation at the site. In 1990, the area was purchased for development of a modern power plant called the Cascade Heritage Power Park (CHPP, 1999).

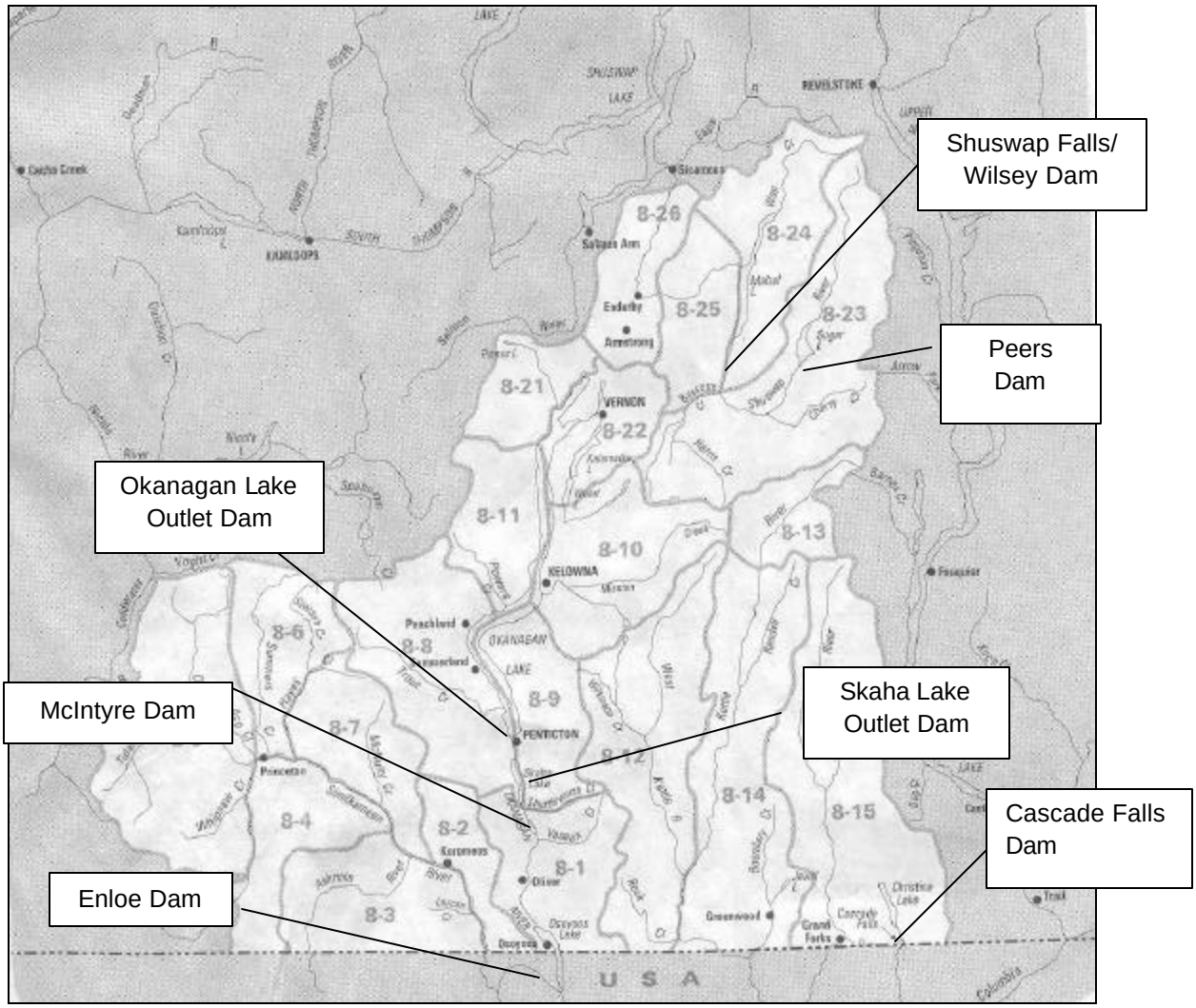


Figure 1. Map of the Okanagan Region

In the Middle Shuswap River drainage, there are two hydroelectric facilities, Wilsey Dam located 15km east of the Town of Lumby and Peers Dam at the outlet of Sugar Lake. Although the original Shuswap Falls made fish passage difficult, the placement of Wilsey Dam at the falls blocked upstream migration by chinook salmon and possibly other species (Ferguson, 2002). In 1929, Wilsey Dam was constructed with a concrete sill built at the sites of the falls. Both dams are operated by BCHydro (BCHydro, 2003). The Middle Shuswap River flows for approximately 29km between Peers Dam at Sugar Lake and Wilsey Dam which then flows 55km before entering Mable Lake (Ferguson, 2002).

3.0 METHODS

In the production of this report the following literature and data bases relating to fish species at risk indigenous to the Okanagan Region was consulted:

- ✓ Data bases of: CDC, COSEWIC, Fish wizard, FishBASE, and FISS,
- ✓ Okanagan Nation Fisheries Commission reports and files,
- ✓ Ministry of Water, Land and Air Protection reports and files.

Information was also solicited pertaining to listed fish species indigenous to the Okanagan Region for fisheries experts with potential knowledge relating to stock status including:

- ✓ Alex Peden, Fish Biologist, formerly of the BC Provincial Museum,
- ✓ Tom Northcote, Limnologist, Fish Biologist,
- ✓ Chris Bull, Fish Biologist formerly of the Ministry of Environment,
- ✓ Richard Bailey, Kamloops Fisheries and Oceans Canada.
- ✓ Julie Desy, Biologist, Integrated Resources.

The sensitivity of fish species to disturbance (found in Table 3) was categorized using Porter et al. (2000) report on the sensitivity of BC's freshwater fish. The sensitivity ratings are based on forestry impacts on stream habitats where the primary effects include:

1. Increased sedimentation,
2. Increased stream temperatures,
3. modified streamflow patterns,
4. drastic simplification of in-stream habitat through loss of large woody debris and associated pool-riffle structure,
5. modification of riparian zones,
6. changes in productivity (increasing or decreasing dependent o time scale),
7. restricted passage for adult or juvenile fish.

These effects could occur with other types of human disturbance. However, both species rarity and land use represent two components that were not included in the analysis by Porter el al. (2000). Small populations with limited distribution are by their nature, more vulnerable to natural accidents and human-caused alterations of habitat. Consequently, rare species will generally have greater attendant risk of genetic impoverishment or extinctions regardless of inherent sensitivity (Sheldon, 1987), particularly if rare populations coincide with areas of intensive development. According to Porter et al. (2000), the scoring of traits provides only a relative metric sensitivity where validation of the categorizations is dependent on existing and continuing field assessments.

4.0 FISH SPECIES AT RISK IN THE OKANAGAN BASIN

By querying both the CDC and COSEWIC data bases, the following list of species was identified as being at risk in the Okanagan Region (Table 1). The boundary of the Okanagan Region is based upon the Ministry of Water, Land and Air Protection's Management Unit 8 (Figure 1). Definitions of the terms used in ranking are found in Appendix A.

Table 1. Fish species at risk and distribution within the Okanagan Region

Common name	Scientific name	CDC	COSEWIC	Global rank	Sub-national	Okanagan system	Shuswap system (upper & middle)	Kettle system	Similkameen system
Chiselmouth	*Acrocheilus alutaceus*	Blue	Data deficient	G5	S3	X	X	X	X
(northern) mountain sucker	*Catostomus platyrhynchus*	Blue	Not at risk	G5	S3				X
(Columbia) mottled sculpin	*Cottus bairdi* subspecies *hubbsi*	Blue	Special concern	G5T4Q	S3	X –below OK Falls		X-below Cascade	x
Shorthead sculpin	*Cottus confuses*	Blue	Threatened	G5	S2S3			X-below Cascade	
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	Blue	-	G4T3	S3SE	X- hatchery	X – Hatchery	X	X-hatchery
Interior Fraser coho salmon	*Oncorhynchus kisutch* Interior Fraser population	-	Endangered	-	-		X		
bull trout	*Salvelinus confluentus*	Blue	-	G3	S3	X	X	X	
speckled dace	*Rhinichthys osculus*	Red	Endangered	G5	S2S3			X	
Umatilla dace	*Rhinichthys Umatilla*	Red	Special concern	G4T3	S2S3	X		X	X
White sturgeon	*Acipenser transmontanus*	-	Special concern	-	-	X			

Table 2 summarizes the fish species at risk and their related status in the Okanagan Region. Detailed species accounts are found in sections 4.2.1 through 4.2.10. The sensitivity rating is based upon the sensitivity of fish to timber harvesting using species traits as predictors as categorized in Porter et al. 2000.

Table 2 Summary of fish species at risk status

Common name	Population Status	Sensitivity Rating	Critical Habitat / Limiting Factor	Management Implications
chiselmouth	***STABLE***: narrow range and a spotty distribution with many populations are quite small, but the species does not appear to be in decline.	Medium	No known threats to the species but there is insufficient information regarding ecology and limiting factors	There are no obvious threats to the species but they are not commonly known from BC reservoirs and perhaps are threatened by habitat loss in relations to impoundments for hydroelectric development.
(northern) mountain sucker	***LOW NUMBERS***: They are neither abundant nor well distributed making them vulnerable to disturbance.	High	Maintenance of riparian areas is a priority as they appear to require some kind of cover (deep water, aquatic vegetation or bank cover).	Threatened by impoundments, agricultural diversions and habitat alterations.
(Columbia) mottled sculpin	***STABLE***: This species is restricted to portions of rivers with suitable habitat with limited extent in Canada. Not abundant but near historic levels in the Okanagan.	Medium	Habitat loss is critical since the population is already restricted. They disperse to no more than a few hundred metres.	The Columbia mottled sculpin is impacted by habitat loss. Possibly threatened by hydroelectric development.

Table 2 continued

Common name	Population Status	Sensitivity Rating	Critical Habitat / Limiting Factor	Management implications
shorthead sculpin	***ASSUME STABLE***: This species has a very small and restricted population in BC. Occupying 68km of river with an estimated population of 10,000 in 2000.	High	The shorthead sculpin is vulnerable to changes in water quality and increases in summer temperatures.	This population has only recently been recognized as a distinct species and critical habitat needs have not been identified. The Cascade Power Project will increase summer temperatures adding significant stress on the population.
Westslope cutthroat trout	***DECLINING***: Typically found along the west slope of the Rocky Mountains. A few isolated populations also exist in the Okanagan.	High	Cutthroat trout are very susceptible to overfishing and vulnerable to human activities which alter stream flow, increase sedimentation and reduce cover or raise water temperature.	Stocking sites of known Westslope cutthroat with brook trout (competitive) or rainbow trout (hybridization) negatively affects the population. Minimize changes in stream flow, sedimentation and riparian vegetation.
Interior Fraser coho salmon	***DECLINING***: A nationally significant population which has declined in excess of 60% therefore there is a serious risk of extinction.	High	Needs clean undisturbed gravelly river tributaries to spawn. Fry later need deep pools to rear and the ability to connect among habitats	Reductions in marine fishing pressure may be insufficient. Freshwater habitat loss or deterioration of spawning and rearing areas threatens recovery. Particularly in the case of water abstraction.
bull trout	***DECLINING:*** Major declines have occurred in the Columbia systems. In spite of their relative overall abundance. Populations in the Middle Shuswap are at very low levels.	High	Need deep pools with instream and overstream cover, clean gravel and tolerable water temperatures; overwintering habitat may be critical in colder streams	Bull trout are extremely sensitive to habitat degradation but declines are also noted as a result of over-exploitation and competition.

Table 2 continued

Common name	Population Status	Sensitivity Rating	Critical Habitat / Limiting Factor	Management implications
speckled dace	***LOW BUT STABLE NUMBERS***: Widespread in the western states, speckled dace has a restricted range in Canada. The upper Kettle River populations may be a unique entity.	Medium	Not immediately threatened, but its restricted distribution make it vulnerable to any catastrophic event affecting a singe drainage system. Sensitive to sedimentation.	Any dam construction would eliminate habitat. Recommend a portion of the Kettle River be protected to ensure survival of this unique species
Umatilla dace	***DECLINING***: Known in several scattered localities throughout the Columbia drainage, but has an extremely limited Canadian distribution.	Medium	Preference for cobble and stone habitat suggests that these dace are vulnerable to habitat changes which increase siltation. Probably in decline due to loss of habitat due to hydroelectric reservoirs.	Otter Creek may need managing with this species as a major concern, as well as protecting exemplary habitat such as sections of the Similkameen.
white sturgeon	***EXTIRPATED?:*** No recent records of sturgeon in the Okanagan Region. Sturgeons are known to live to 100 years and the dam cutting off access to spawning habitat was first constructed in 1920.	Medium	The limiting factor in the Okanagan would be the inability of the fish to access spawning habitat due to lake outlet dams. Also sensitive to climate change.	Removal of dams to allow access to large rivers for spawning.

4.1 Periodicity Chart to Identify Windows of Least Risk for Instream works

It is important when managing for fish species, particularly those at risk to identify the lowest risk periods for instream works to minimize further risks due to development applications. The following table outlines critical times when the fish at risk would be either spawning or incubating in streams and therefore vulnerable if instream work were to occur. There is little information on life history other than spawning and incubation where these fish would be at risk to instream developments. It is important to note that species such as the sculpins occur within restricted reaches of streams and do not disperse far, where as the chiselmouth would disperse further afield (Peden, 2003). As well there are stream and river "resident" populations, some showing only small scale movements between feeding and refuge (over-wintering) habitats, (Northcote, 2003).

Table 3 Periodicity Chart for Okanagan Region Species at Risk to Identify Windows of Least Risk for Instream works.

Common name	Jan.	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Spawning Comments
chiselmouth						spn	spn	*	*				Time to hatch unknown; assume two months incubation. Eggs are laid along the bottom and buried among boulders.
(northern) mountain sucker						spn	spn	spn	inc				Mountain suckers spawn in riffles adjacent to pools. Eggs are demersal and probably adhesive
(Columbia) mottled sculpin			spn	spn	spn	inc							All eggs (over 100) are laid in a single nest on or under rocks where there is a steady flow of water.
Shorthead sculpin				spn	spn	Inc	inc						Eggs are laid under rocks. Very little information on incubation available.
Westslope cutthroat trout					spn	spn	spn	inc	inc	inc			Eggs are incubated within the substrate until late summer, early fall
Interior Fraser Coho salmon	inc	inc	inc	inc	inc	rear	rear	rear	rear	spn	spn	spn	Remain in the stream for one year after emerging from gravel. Interior coho are at significant risk from water abstraction for the late summer and early fall.
bull trout	Inc	inc	inc	inc	inc			spn	spn	spn	inc	inc	Clean gravel and cobble substrate are required for spawning
speckled dace							spn	inc					Assumed, in streams or riffles of lake inlets streams. Time to hatch 6 days at 18^{o}C.
Umatilla dace						spn	spn	spn	Spn	*	*		Time to hatch unknown.
white sturgeon					spn	spn	spn	*	*				Okanagan lake populations would need river access for spawning takes place over rocky bottom in swift currents, near rapids or waterfalls. Nothing is known of time to hatch.

In Table 4, "spn" represents the month during which spawning occurs and "inc" represents time early life stages remain within the gravel. The * represent assumed time needed to emerge from substrate, however in each case this is unknown. The term "rear" refers to species at risk while they rear in streams.

4.2 Summary of Data Gaps and Recommendations for Future Work

There are gaps in the knowledge of biology, ecology and distribution of several of Okanagan fish populations at risk. For example, very little is known about chiselmouth regarding population sizes and trends, ecology, or limiting factors.

Information on the range of the (northern) mountain sucker is limited to presence absence data and the true extent of range may not be known. General biology and habitat requirements of this species are also poorly known and no population estimates exist (Cannings & Ptolemy 1998; Scott & Crossman 1973).

The taxonomic relationships between the Columbia mottled sculpin, shorthead sculpin and the various BC sculpins populations have yet to be clarified (Cannings & Ptolemy 1998). Critical habitat needs of the shorthead sculpin have not been identified (Cannings & Ptolemy 1998) as this species has only recently been recognized as distinct and therefore little is know of its life history or habits (Scott & Crossman 1973).

There exists conflicting information regarding the distribution of bull trout and cutthroat trout that need clarification by field studies as well as determining the stock source of the few introduced Westslope cutthroat populations. Juvenile recruitment, knowledge of migratory patterns and habitat use is limited for bull trout. Also the range of conditions that bull trout can tolerate and stock status is unknown or inadequate in most areas of the province (Canning & Ptolemy 1998).

Little is known about the Interior coho life histories. Of particular concern is that we know little about the requirements for inter-connectivity among habitats so fish can move in response to changing flows and temperatures. Most of the knowledge is derived from research on coastal populations (Bailey, 2003).

The biology and taxonomic position of the Kettle River speckled dace population needs to be investigated (Cannings & Ptolemy 1998). And although the population seems to be adequately abundant in the Kettle River, more observations over a longer period are needed to determine the population trend (Peden 1980).

The impact of habitat changes due to hydro-electric projects on Umatilla Dace populations needs to be assessed (Hughes & Peden 1988). The breeding biology and impacts of competition from other benthic fish and predation are not known (Hughes & Peden 1988). A survey of Otter Creek should be completed to determine the status of this population. Genetic and taxonomic relationships among isolated populations need to be elucidated (Cannings & Ptolemy 1998).

Information on the presence/absence and life history of white sturgeon in the Okanagan lakes is lacking.

4.3 Fish Species Accounts

4.3.1 Chiselmouth

Scientific Name: *Acrocheilus alutaceus (*Agassiz & Pickering 1855)
Family *Cyprinidae*
CDC listing: Blue
COSEWIC listing: Data Deficient 1997

	Chiselmouth	***Reference***
Description	Lower jaw chisel-like, nearly straight in adults; flanks a uniform silvery colour	McPhail & Carveth 1993
	The chiselmouth has a short blunt head with large eyes.	FishFacts, 2003
	Body elongate, average length 150-180mm. Mouth inferior overhung by snout, fleshy upper lip covers small cartilaginous plate in upper jaw. Lateral line incomplete. Overall colouration drab, dark brown above, sides lighter.	Scott & Crossman 1973
	 *Photo/image: Wydoski and Whitney*	Wydowski & Whitney 1979
Habitat preference	The chiselmouth is found in a variety of water body types.	Coffie 1997
	In BC, chiselmouth occurs more often in lakes than in rivers.	Scott & Crossman 1973
	Appears to prefer warmer sections of streams with moderately fast water. In BC, it is found in a variety of relatively warm water bodies small creeks to backwaters of larger rivers and small kettle lakes to large lakes. Spawns in streams.	Cannings & Ptolemy 1998
Reproduction	There appears to be little information on reproduction of chiselmouth. Spawning of lake populations occurred in tributary streams, usually in late June and early July. Eggs are laid along the bottom and buried among boulders.	Scott & Crossman 1973
	In BC, they usually spawn in late June to early July	Cannings & Ptolemy 1998
Feeding	Feeding by adults is very specialized and consists of scraping the chisel-like lower jaw along rocks or other bottom substrate.	Scott & Crossman 1973; Coffie 1997
	Chiselmouth feed mainly on surface insects as young and adults feed on diatoms while scraping their lower jaw along rocks or substrate.	Cannings & Ptolemy 1998

	Chiselmouth	***Reference***
General range	Confined to Columbia River and Fraser River in BC and Washington; Harney Basin in Oregon.	Cannings & Ptolemy 1998; Scott & Crossman 1973
	This fish has a fairly limited distribution in BC	FishFacts, 2003
Past and current distribution in Okanagan Region	Osoyoos Lake, Tugulnuit, Gallagher Lakes; Okanagan River South of McIntyre Dam, Skaha Lake. Wolfe Creek and lake of the Similkameen as well as Missezula Lake. Mara Lake in the Shuswap and the Kettle River.	Cannings & Ptolemy 1998
	Gallagher Lake, Hester Creek, Kettle River, Missezula Lake, Okanagan Lake, Okanagan River, Skaha Lake, Vaseux Lake, Wolfe Creek	FISS, 2003
	Okanagan, Shuswap, Kettle & Similkameen; sporadic in these systems	Johnson, 1994; McPhail & Carveth 1993
	Found throughout the Okanagan Valley lakes during 1971 surveys.	Pinsent 1974
	In the Okanagan-Columbia system, they are found in Missezula, Wolfe Creek, Skaha, Gallagher and Tugulnuit Lakes and the Okanagan River.	Scott & Crossman 1973
Population status	Although it has a narrow range and scattered distribution in Canada, it is found in several localities. There is no information on population sizes and trends, but the species does not appear to be in decline.	Coffie 1997
	It is considered vulnerable because it has a spotty distribution, and many populations are quite small. It is known from fewer than 20 localities and appears to have disappeared from some of these in recent years.	FishFacts, 2003
	There are 18 known occurrences, with probably more than 30. Spotty distribution makes it difficult to calculate the true range extent. Although its range is somewhat confined and spotty, this species is found in numerous localities and a variety of water body types. No obvious threats.	Cannings & Ptolemy 1998
Known causes of risk	Low population numbers at some sites; limited distribution in BC; taxonomic misidentification	Haas, 1998
Gap analysis	Very little is known about the species regarding population sizes and trends, ecology, or limiting factors. There is insufficient information to make a designation	Coffie 1997; Cannings & Ptolemy 1998
Management implications	The species may be threatened by habitat loss or degradation in relation to impoundments for hydro-electric development. Not known from BC reservoirs, perhaps threatened by hydroelectric developments (except the Nicola Lake reservoir)	Coffie 1997; Cannings & Ptolemy 1998; Northcote, 2003
	Preserve at least one system and adjacent land, limit contaminated runoff, riparian removal and habitat destruction; maintain natural stream flow.	Haas, 1998

4.3.2 (Northern) mountain sucker

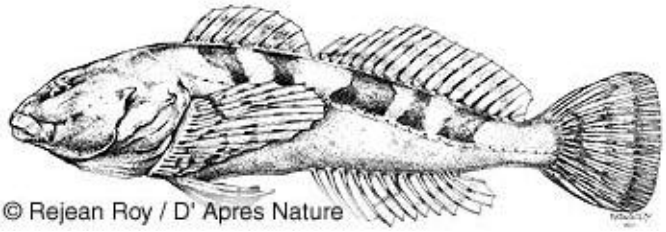
Scientific Name: *Catostomus platyrhynchus (*Cope 1874)
Family *Catostomidae*
CDC listing: Blue
COSEWIC listing: Not at risk in COSEWIC as of 1991

	Northern mountain sucker	***Reference***
Description	Deep notch between upper and lower lips at outer corners of mouth; lower jaw almost straight when viewed from below; viewed from the side the mouth is slightly cupped; a small species (usually less than 200mm)	McPhail & Carveth 1993
	A small shallow cylindrical sucker, body torpedo shaped, length usually (150-200mm); mouth ventral, large lips often exceed width of head, overhung by snout, lower lip the shape of paired wings, cleft shallow, incomplete; no teeth in mouth. The back and sides to the lateral line green, grey or brown, speckled with black, lateral line not prominent, ventral surface yellow to white, a dark green to black lateral band and/or five dorsal blotches of fine black pigment.	Scott & Crossman 1973
		web source
Habitat preference	Small mountain suckers are usually found in cover in shallow water of moderate current. Larger young were associated with weedy intermittent side channels or deep pools. After spawning, the habitat was associated with bank cover in deep pools, often in small isolated schools. They occur rarely in lakes.	Scott & Crossman 1973
	Typically associated with cool waters of small mountain streams in areas of moderate current. Substrates range from mud to boulder usually rubble.	Campbell 1992
Reproduction	Mountain suckers spawn in riffles adjacent to pools of swift mountain streams, for a short period in late spring to early summer. Eggs are demersal and probably adhesive.	Scott & Crossman 1973; Cannings & Ptolemy 1993
Feeding Habits	Diatoms were found to be most abundant in the digestive tracts of mountain suckers and larval diptera were the most common invertebrate.	Scott & Crossman 1973; Cannings & Ptolemy 1994

	Northern mountain sucker	***Reference***
General range	The mountain sucker is restricted to the freshwaters of the mountainous regions of western North America from Saskatchewan south and west growing less abundant to southern British Columbia. In BC, it occurs in the Similkameen River and North Thompson but nowhere is it abundant or widely distributed.	Scott & Crossman 1973; Cannings & Ptolemy 1998
Past and current distribution in the Okanagan Region	Known from a few sites on the Tulameen, Wolfe Creek and the mainstem Similkameen River	Cannings & Ptolemy 1998
	Similkameen River, Tulameen River	CDC, 2003
	Ashnola River	FISS, 2003
Population status	Viable populations of this species are known in numerous mountain streams in western Canada. It does not appear to be under any threat. Widespread but spotty distribution.	COSEWIC, 2003; Cannings & Ptolemy 1998
	Rare in most of the BC parts of the Columbia system but modestly abundant at some sites in the Similkameen River	McPhail & Carveth 1993
	They are neither abundant nor well distributed in BC. They have been placed on the provincial Blue list as their limited distribution makes them vulnerable to disturbance. The State of Washington has listed the mountain sucker as a species of special concern.	FishFacts, 2003
Known causes of risk	Low population numbers at some sties; limited known distribution in BC; taxonomic misidentification	Haas, 1998
Gap analysis	Information limited to presence absence data. May not know true extent of range. General biology and habitat requirements of the species are poorly known. No population estimates exist.	Cannings & Ptolemy 1998; Scott & Crossman 1973
Management implications	Threatened by impoundments, agricultural diversions and habitat alterations.	Cannings & Ptolemy 1998
	They are sensitive to habitat degradation from both agricultural and industrial development and to the introduction of exotic species.	FishFacts, 2003
	Maintenance of adjacent riparian areas and existing hydraulic conditions and riparian habitat is a priority. They appear to require some kind of cover (deep water, aquatic vegetation or bank cover) probably as protection from predators	Cannings & Ptolemy 1998; FishFacts, 2003

4.3.3 (Columbia) mottled sculpin

Scientific Name: *Cottus bairdi* subspeices *hubbsi (*Girard 1850*)*
Family *Cottidae*
CDC listing: Blue
COSEWIC listing: Special concern (2000)

	Columbia mottled sculpin	***Reference***
Description	Mottled and shorthead sculpin are difficult to key out as these species can coexist in the BC-Columbia system. Keying is made more difficult by the fact that these species hybridize commonly.	McPhail & Carveth 1993
	The Columbia Mottled Sculpin is a small fish that reaches a maximum 10 to 11 cm in length. It is a typically shaped sculpin with dark mottling on the fins, tail and body.	COSEWIC, 2003
	Head flattened dorsoventrally, eyes on top of head, maxillary extends posteriorly to below eye. Small prickles present on patch behind pectoral fins. Lateral line incomplete. mottling on back and sides.	Scott & Crossman 1973
		CDC, 2003
Habitat preference	Mottled sculpin occurs in cool streams and lakes. It has been noted that they are caught most often over sandy bottom in lakes and streams.	Scott & Crossman 1973; Peden 1994
	Columbia Mottled Sculpins disperse to no more than a few hundred metres .	COSEWIC, 2003
	In BC, the species is found in flowing waters ranging in size from small creeks to large rivers and in montane lakes.	Peden 1989
Reproduction	Mottled sculpin spawn in spring, but the exact date varies with geographic location. Hatching is suggested to occur a month after deposition, temperature depending.	Scott & Crossman 1973
	Each female spawns once a year and lays all her eggs (over 100) in a single nest on or under rocks where there is a steady flow of water.	COSEWIC, 2003
Feeding	Like other members of the genus, mottled sculpin are benthic feeders subsisting mainly on aquatic insect larvae. A few cases have been reported of sculpins eating trout eggs but are not considered to be destructive.	Scott & Crossman 1973

	Columbia mottled sculpin	***Reference***
General range	In BC, this species occurs in the Columbia, Flathead, Similkameen and Kettle rivers as well as some of their tributary streams.	COSEWIC, 2003; Cannings & Ptolemy 1998; Scott & Crossman 1973
Past and current distribution in Okanagan Region	Common below barriers in the Kettle River (below Cascade Falls) and Similkameen systems; absent from the Okanagan system above Okanagan Falls.	McPhail & Carveth 1993; Cannings & Ptolemy 1993; Northcote, 2003
	Recently found in the Kettle River downstream of Cascade Falls	Desy, 2003
	Ashnola, Copper, Granite, Hayes, Hedley, Keremeos, Lawless, Otter, and Summers Creeks	Johnson, 1994
	Ashnola River, Granite Creek, Hayes Creek, Hedley Creek, Keremeos Creek, Kettle River, Lawless creek, Okanagan River, Otter Creek, Summers Creek, Wolfe Creek	FISS, 2003
	Tulameen River at Otter Creek, Otter Creek, Lawless Creek, Similkameen River, Missezula Lake, Liard Lake, Hayes Creek, Dry Lake, Borgeson lake, Wolfe Creek, Kettle River	Cannings & Ptolemy 1998
Population status	This subspecies of the mottled sculpin is impacted by habitat loss. The risk of extirpation is reduced by the possibility of rescue from nearby populations in the US.	COSEWIC, 2003
	This species is restricted to portions of rivers that have suitable habitat, and such portions are relatively limited in extent in Canada. In addition, competition with other sculpin species limits the Columbia mottled sculpin to certain portions of rivers; other species are more effective competitors.	COSEWIC, 2003
	Populations are not overly abundant but seem to be near natural historical levels in the Similkameen River. Only a small portion of the Kettle River in Canada is suitable and populations there are stable but are probably supported by populations in the adjacent portion of the river in the United States. In the Columbia River, populations are low and are very threatened because of hydroelectric dams and reservoirs.	COSEWIC, 2003; Cannings & Ptolemy 1998; Scott & Crossman 1973
	31 known occurrences; there are probably a number more but certainly fewer than 100. Can be abundant.	Cannings & Ptolemy 1998
Known causes of risk	Restricted distribution in BC; small populations sizes; taxonomic misidentification.	Haas, 1998
Gap analysis	The taxonomic relationships of the various BC populations have yet to be clarified.	Cannings & Ptolemy 1998
Management implications	Sculpin populations have been impacted by hydroelectric and storage reservoirs. Controlled water flow has created conditions more suitable to other species. Possibly threatened by hydroelectric development or operations in the Similkameen and Columbia Rivers.	COSEWIC, 2003; Cannings & Ptolemy 1998
	Preservation in one system including available adjacent land; limit contaminated runoff, riparian removal and habitat destruction; proper taxonomic identification.	Haas, 1998

4.3.4 Shorthead sculpin

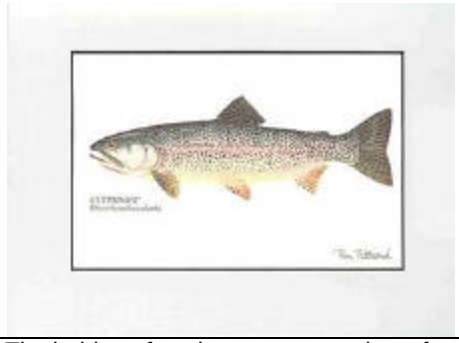
Scientific Name: *Cottus confusus* (Bailey & Bond 1963)
Family *Cottidae*
CDC listing: Blue
COSEWIC listing: Threatened 2001

	Shorthead sculpin	***Reference***
Description	Body typical cottoid, heaviest forward, decreasing in size posteriorly to a medium caudal peduncle. Maxillary extends posteriorly to below pupil of eye. Body light brown-yellow with dark mottlings. Slides usually pale, without bars.	Scott & Crossman 1973
	Keying between mottled, slimy and shorthead sculpin very difficult as these species coexist in various combinations in the BC-Columbia system. Keying is made more difficult by the fact that these species hybridize commonly and that there are differences within species.	McPhail & Carveth 1993
	This fish is distinguished by its large mouth and fan shaped pectoral fins.	Peden & Hughes 1984b
	 *Photo/image: Wydoski and Whitney*	Wydoski & Whitney 1979
Habitat preference	It inhabits the riffles of small cold streams, usually farther upstream than other cottids, but may also inhabit large rivers, such as the Columbia.	Scott & Crossman 1973
	The Shorthead Sculpin usually inhabits small rivers draining mountainous regions, which have a moderate to swift current and moderately cool water. It occurs in riffle habitats with stones or gravel, used for shelter and breeding.	Peden & Hughes 1984b; Cannings and Ptolemy 1998
Reproduction	Spawning occurs in the early spring. Lay eggs in rubble-boulder areas on the undersurface of rocks.	Cannings & Ptolemy 1998
	Incubation needs are most likely late winter or early summer but little information is available	Peden, 2003
	Spawning occurs in mid April; the eggs are laid under rocks. Very little information on incubation need (late spring?)	Peden & Hughes 1984b; Peden 2003
Feeding habits	The species feeds primarily on aquatic insect larvae.	Peden & Hughes 1984b

	Shorthead sculpin	***Reference***
General range	Found in the Puget Sound and Columbia River basins (Columbia River, Kettle River and Lower Kootenay River).	Cannings & Ptolemy 1998
	In Canada, the shorthead sculpin has an exceedingly restricted range, the fish are found in southeast British Columbia.	Scott & Crossman 1973; COSEWIC, 2003
	Common in low gradient sections of stream tributary to the Columbia River below Keenleyside Dam; in the Kootenay River and tributaries below Bonnington Falls,	McPhail & Carveth 1993
Past and current distribution in the Okanagan Region	Restricted to the Kettle River below Cascade Falls. Earlier reports include the Flathead River as part of the distribution; these populations have now been assigned to *C. Bairdi.*	Cannings & Ptolemy 1998; Desy, 2003; McPhail & Carveth 1993; Northcote, 2003
	Kettle River below Cascade Falls	FISS, 2003
Population status	This species has a very small and restricted population in BC. Its habitat is impacted by urban and rural development and by changes in water levels.	Peden & Hughes 1984b
	In Canada, the species occupies approximately 68 km of river and streams, with an estimated population in 2000 of 10,000 individuals.	COSEWIC, 2003
	A regional endemic with healthy populations in many creeks. Nine sites known; perhaps in a few more.	Cannings & Ptolemy 1998
Known causes of risk	Taxonomic misidentification, limited distribution; small population sizes	Haas, 1998; Hughes & Peden 1984; Peden & Hughes 1984b.
Gap analysis	Critical habitat needs have not been identified.	Cannings & Ptolemy 1998
	The shorthead sculpin has only recently been recognized as a distinct species and hence little is know of its life history or habits.	Scott & Crossman 1973
Management implications	The shorthead sculpin is vulnerable to potential changes in water quality resulting from human activity such as mining, logging, agriculture, roadside maintenance and effluents from local communities. The Cascade Power Project will increase summer temperatures in Kettle River by 1.5^{o}C, adding significant stress on the population.	Peden & Hughes 1984b
	Preservation in one system including available adjacent land (Cannings, 1993 suggests Norns Creek be secured); limit contaminated runoff, riparian removal and habitat destruction	Cannings 1993; Haas, 1998

4.3.5 Westslope cutthroat trout

Scientific Name: *Oncorhynchus clarkia* subspecies *lewisi (*Girard 1856)
Family *Salmonidae*
CDC listing: Blue
COSEWIC listing: not listed

	Westslope cutthroat trout	***Reference***
Description	Red or orange slash under lower jaw; upper jaw extends back past hind margin of eye; tail usually yellowish with black spots	McPhail & Carveth 1993
	Most of the black spots are found towards the tail with is usually heavily spotted and yellowish in colour.	FishFacts, 2003
	Body typically trout like, average length 300-380mm. Maxillary long, at least to posterior margin of eye, often far beyond; teeth well developed on upper and lower jaws. This species shows colour and pigment patterns different from basin to basin.	Scott & Crossman 1973
		web sources
Habitat preference	The habitat of cutthroat trout consists of gravelly streams, lakes and small rivers. The young spend their early life in the gravelly spawning streams.	Scott & Crossman 1973
Reproduction	Spawning of westslope cutthroat takes place in spring and early summer about 3-5 weeks after ice breakup. Eggs are incubated within the substrate until late summer, early fall	Scott & Crossman 1973
Feeding Habits	Food consists of mainly insects, both aquatic and terrestrial, but small fishes form an important part at times.	Scott & Crossman 1973

	Westslope cutthroat trout	***Reference***
General range	Typically found along the west slope of the Rocky Mountains. A few isolated populations also exist in the Okanagan.	FishFacts, 2003
	Westslope cutthroat occurs in western drainages but not the Kootenays where Yellowstone cutthroat occur. Introductions by humans could disrupt the pattern.	Peden, 2003
	The inland form (westslope) occurs west as far as the Arrow Lakes (Columbia River) and Shuswap Lake (Fraser River).	Scott & Crossman 1973
Past and current distribution in Okanagan Region	Ashnola River, Bitter Creek. Blue Lake, Boundary, Dungate, Finlayson Lake, Lake of the Woods, Lost lake, Morrissey Creek, O'Farrell Creek, Philippa Creek, Placer Lake, Rankin Lake, Reith Lake, Sutherland Creek.	FISS, 2003; Haas, 1998
	Present in the Kettle, but natural populations absent in the Okanagan and Similkameen systems.	McPhail & Carveth 1993; Haas, 1998
	Shuswap and Kettle Rivers	CDC, 2003
	Okanagan and Similkameen Rivers	Ford et al. 1995
	Introduced as early as 1930's in the Cathedrals brought in by horse back. Also in the upper elevations of the Shuswap River. Okanagan Region cutthroat populations are primarily associated with high elevation lakes.	Bull, 2003; Ford et al. 1995; Northcote, 2003
Population status	Westslope cutthroat is a vulnerable species in BC. The range of this fish has been greatly reduced. Competition with non-native fish species is one factor in the shrinkage of its distribution. It has been eliminated in some areas where brook trout have been introduced and it also hybridizes readily with introduced rainbow trout. Over-harvesting and habitat damage are other factors that affect the health of some populations.	FishFacts, 2003
	Fifteen BC stocks extinctions noted in Slaney et al. 1996 with the vast majority of other BC stocks having "unknown" status; many populations in severe decline likely due to habitat destruction and overfishing	Haas, 1998; Slaney et al. 1996; Nehlsen et al. 1991
Known causes of risk	Forest harvesting effects and subsequent improved angler and recreational access; overfishing; habitat alterations/loss; urbanization; agricultural and industrial pollution (Woodward et al. 1997); trout (hybridization/gene pool mixing) and exotic competitive fish introductions; hydroelectric reservoirs/ water fluctuation/ sedimentation effects (Ford et al. 1995)	Woodward et al. 1997; ford et al. 1995
Gap analysis	Stock source of the few introduced populations need to be determined. The distribution of this species should be determined.	Northcote, 2003
Management implications	Cutthroat trout are very susceptible to over-fishing. They are also highly vulnerable to human activities which alter stream flow, increase sedimentation, reduce cover or raise water temperature. Hybridization with trout should be reduced	FishFacts, 2003

4.3.6 Interior Fraser Coho salmon

Scientific Name: *Oncorhynchus kisutch (*Walbaum in Artedi 1792)
Interior Fraser population
Family *Salmonidae*
CDC listing: not listed
COSEWIC listing: Endangered (2002)

	Interior Fraser coho salmon	***Reference***
Description	Coho differs from other salmonids by the upper half of the tail being spotted; gums at base of teeth in lower jaw white.	McPhail & Carveth 1993
	Body streamlined, laterally compressed, maxillary extending well beyond eye. Adults in ocean are steel-blue to slightly green on dorsal surface, sides brilliant silver, ventral surface white, small black spots on back, sides above lateral line, base of dorsal fin and upper lobe of caudal fin.	Scott & Crossman 1973
		web source
Habitat preference	Spawning takes place in swifter water of shallow, gravelly areas of river tributaries. In late summer fry move to deeper pools and become aggressive and territorial. Usually in late March of the following year the fry migrate to the ocean.	Scott & Crossman 1973
	There is only a modest knowledge of habitat preferences, unlike coastal populations where the fry are typically territorial through the summer, Interior populations take advantage of the large amounts of available flooded habitats through the summer. As waters recede toward the fall, fry likely move toward on-channel areas and overwinter in larger mainstems or areas of significant influent ground water influence. Lake rearing is also important for many interior populations. Significant portions of the fry may rear in lakes throughout the year.	Bailey, 2003
Reproduction	Spawning takes place usually October to November, with hatching occurring in early spring. Spawner distribution is usually clumped within the drainage basin.	Scott & Crossman 1973; Irving 2002
	Emergence is usually in May. Spawning is typically in tail-outs.	Bailey, 2003
Feeding habits	Fry take up residence in shallow, gravel areas near the stream bank, feed voraciously and grow quickly.	Scott & Crossman 1973

	Interior Fraser coho salmon	***Reference***
General range	This species occurs naturally only in the Pacific Ocean and its tributary drainages. Adults regularly ascend the Thompson (north and south).	Scott & Crossman 1973; McPhail & Carveth 1993
Past and current distribution in Okanagan Region	Ashton Creek, Bessette Creek, Bluesprings Creek, Blurton Creek, Cooke Creek, Creighton Creek, Danforth Creek, Duteau Creek, Fortune Creek, Gardom Creek, Ireland Creek, Johnson Creek, Kingfisher creek, Lambert Creek, Nicklen Ck, Noisy Ck, Smyth Ck, Trinity Ck, Tsuius Ck., Wap Ck.	COSEWIC, 2003 FISS, 2003
Population status	A nationally significant population that has experienced declines in excess of 60% in number of individuals COSEWIC concluded that there is a serious risk of extinction of Interior Fraser Coho.	COSEWIC, 2003
Known causes of risk	Due to changes in freshwater and marine habitats , and to overexploitation. Coho declines are often related to the intensity of human disturbance in freshwater.	COSEWIC, 2003; Irvine 2002
	Water abstraction is probably the largest single threat. However decline was driven by overfishing in a time of declining marine survival. Habitats are negatively impacted by agricultural activity, water abstraction, forestry, urban and linear development.	Bailey, 2003
Gap analysis	Little is known about the Interior coho life histories. Of particular concern is that we know little about the requirements for inter-connectivity among habitats so fish can move in response to changing flows and temperatures. Most of the knowledge is derived from research on coastal populations.	Bailey, 2003
	There are gaps in the knowledge of biology and ecology of Okanagan Region populations	Northcote, 2003
Management implications	COSEWIC was concerned that reductions in fishing pressure may be insufficient or not maintained, that marine survivorship may not improve, that habitat loss or deterioration in the watershed continues, and that use of hatcheries threatens recovery.	COSEWIC, 2003

4.3.7 Bull trout

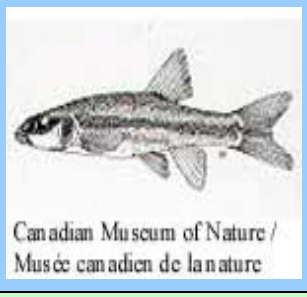
Scientific Name: *Salvelinus confluentus (*Suckley 1858)
Family *Salmonidae*
CDC listing: Blue
COSEWIC listing: not listed
US Fish and Wildlife: designated threatened in Washington state (ESA, 2003)
American Fisheries Society: designated as special concern (Williams et al. 1989)

	Bull trout	***Reference***
Description	dorsal fin dusky and without bold black marks; spots on sides not surrounded by light haloes	McPhail & Carveth 1993
	The differences between Dolly Varden and bull trout are consistent throughout their range. Bull trout have a larger broader and flatter head and a more ventrally flattened body.	Ford et al, 1995
		Web sources
Habitat preference	Riverine habitat; requires deep pools associated with an array of instream and overstream cover. The presence of large woody debris is important. Clean gravel and cobble substrate are required for spawning and juvenile cover. Bull trout can be found in high gradient areas (up to 30%). Overwintering habitat can be critical, especially for stream resident populations in colder regions	Canning & Ptolemy 1998
	Most common in high mountain areas. Lacustrine form matures in lakes and spawns in tributaries where young reside for 1 - 3 years.	fishBASE, 2003
Reproduction	Spawning occurs during September and October in streams. Emergence occurs in the spring.	Canning & Ptolemy 1998
Feeding Habits	The adult diet of small fish. Juveniles are mostly made up of aquatic insects taken either form the bottom or as drift. Bull trout become piscivorous wherever other fish species are available.	Canning & Ptolemy 1998

	Bull trout	***Reference***
General range	In BC, the bull trout is an interior species. They are widely distributed, but are absent from the western tributaries of the Columbia. In the middle Columbia and lower Shuswap Rivers.	Canning & Ptolemy 1998; McPhail & Lindsey, 1986; Haas 1998; Haas & McPhail 1991
Past and current distribution in Okanagan Region	Christie Lake, Cooke Creek, Gates Creek, Goose Lake, Headwater Lake, Kettle River, Kingfisher Creek, Latewhos Creek, Lindmark Creek, McCall Lakes, Monashee Creek, Rottacker Lake, Sandberg Lake, Trinity Creek, Vawyk Creek, Wap Creek, Yeowark Creek	FISS, 2003
	Absent from the mainstem Kettle, Okanagan and Similkameen rivers.	McPhail & Carveth 1993
	Bull trout populations in the Middle Shuswap River between the two dams are at very low levels. Isolation of this small population by the dams creates a risk of extirpation.	Chamberlain et al 2001
	Okanagan and Similkameen systems	CDC, 2003
	Kettle River possibly below the Cascade Falls as they are distributed throughout the Columbia River.	Ford et al, 1995; CHPP, 1999
Population status	Threatened by competition and genetic swamping from introduced trout and char; In BC, major declines have occurred in the Columbia system.	Canning & Ptolemy 1998
	In spite of their relative overall abundance, their gradual disappearance in the south indicates that they are environmentally sensitive.	Haas & McPhail 1991
	Although the range is relatively large, occurrence is dependent on critical habitat characteristics such as water temperature. Declines noted as a result of habitat alteration.	Canning & Ptolemy 1998
Known causes of risk	Forest harvesting and oil/gas exploration and subsequent improved angler and recreational use access; overfishing; exotic fish introductions, particularly brook trout with which they hybridize; hydroelectric impoundments and migration restrictions, temperature increases.	Haas, 1998; Ford et al. 1995; Parkinson & Haas 1996
	Threatened by habitat loss or degradation, over-exploitation and competition from other salmonids.	Cannings & Ptolemy 1998
	Changes in pool volume and depth as a result of channel destabilization have been shown to be detrimental.	Cross & Everest 1994
Gap analysis	Factors limiting juvenile recruitment are poorly understood. Knowledge of migratory patterns and habitat use is limited. The range of conditions that can be tolerated is unknown. Knowledge of species distribution and stock status are inadequate in most areas of the province.	Canning & Ptolemy 1998
Management implications	Bull trout are extremely sensitive to habitat degradation and are considered to be an indicator species of ecosystem health. They seem to have a narrower range of habitat preference.	Canning & Ptolemy 1998; FPC, 2003

4.3.8 Speckled dace

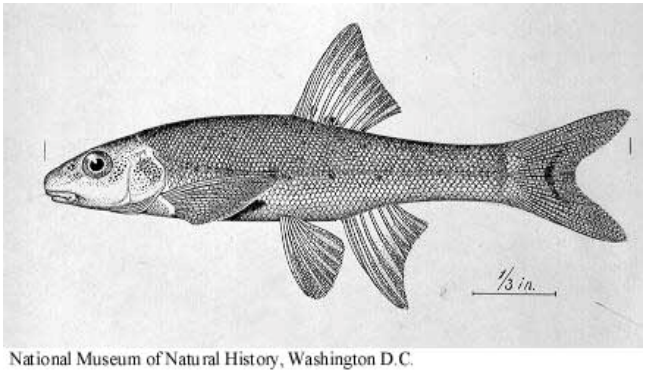
Scientific Name: *Rhinichthys osculus (*Girard 1856)
Family *Cyprinidae*
CDC listing: Red
COSEWIC listing: Endangered (2002)

	Speckled dace	***Reference***
Description 	No barbels at the corner of mouth; origin of anal fin almost directly below the hind end of dorsal fin base	McPhail & Carveth 1993
	Body elongate, 50-75mm total length. Head bluntly triangular, a small but distinct hump behind the head; snout long and overhanging mouth, mouth inferior sucker-like, lower jaw overhung by snout, extending back to mid nostril. A faint lateral band along the side.	Scott & Crossman 1973
	Speckled dace exhibit great differences in the morphological and meristic characters used to distinguish species.	Scott & Crossman 1973
	The upper parts are grey to grey-brown or olive, with dark speckles. The lips, snout and lower fin bases may be orange-red.	Peden 1980
Habitat preference	Throughout the United States, the speckled dace inhabits greatly diverse habitats.	Scott & Crossman 1973
	Speckled dace are primarily found in cool streams and rivers with rocky substrate, but also in large and small lakes, warm permanent and intermittent streams and outflows of desert springs. Usually in shallow water.	Moyle 1976
	In BC, adults have been found in reaches with rock habitat and slow to moderately strong current where siltation and scouring was not excessive and the water is shallow.	Peden & Hughes 1984a; CHPP, 1999
	The few adults taken from BC were found under larger stones or overhanging banks, where the current was moderate. The young of the year were generally found amongst stones along the river's edge, where the current was slow and shallow. No migration of dace is known but they seen able to quickly reinvade areas as flooding occurs.	Peden 1980
Feeding habits	A bottom feeder. Young fish sampled in the Kettle River had eaten filamentous algae and bottom -dwelling aquatic insects.	Peden & Hughes 1980; Wydoski & Whitney 1979
Reproduction	In the Kettle River, speckled dace probably spawn in summer (July), and the juveniles hatch in the summer.	Peden & Hughes 1980; Northcote 1963; CHPP, 1999
	Reproductive behaviour is not known.	Peden 1980
	Lake populations spawn in shallow waters with gravel substrate or on gravel edge of riffles in inlet streams. Eggs hatch in 6 days at water temperatures of 18 to 19^{o}C.	Moyle 1976

	Speckled dace	***Reference***
General range	Native to all major western drainages from the Columbia River to Colorado River and south to Sonora, Mexico.	Lee et al. 1980
	In Canada the species has been reported from only three localities along the Kettle River, representing the northwestern extent of this species which is widely distributed throughout most of the USA..	Scott & Crossman 1973; CHPP, 1999
Past and current distribution in Okanagan Region	In Canada, the fish is restricted to the Kettle and Granby Rivers. Population levels may fluctuate widely in response to fluctuations in the river flow.	Peden 1980; McPhail & Carveth 1993
	Kettle and Similkameen Rivers	CDC, 2003
	Speckled dace occur in the Kettle River mainly above Cascade Falls. Those below the falls are strays that have been washed downstream. This is the only known population in Canada.	Peden, 2003; Northcote, 2003
	Kettle river upstream of Cascade Falls	Desy, 2003; Haas 1998
	Granby River, Ingram Creek, Kettle River, West Kettle River	FISS, 2003
	Kettle River, West Kettle River, Granby River	Cannings & Ptolemy 1998
	Kettle River (as far upstream as Wilkinson Creek) and a tributary, the Granby River in south-central BC).	Peden & Huges 1984a
Population status	Speckled dace has a very restricted Canadian range where it is subject to deteriorating water quality, as well as to loss of preferred habitat and fragmentation due to construction of a proposed dam.	COSEWIC, 2003
	Most widespread freshwater fish of the western states. Although it is restricted to two moderate-sized drainages in BC it is found at a number of locations within those streams. No particular threat.	Cannings & Ptolemy 1998
	Kettle River population recently sampled for was found to be in high densities throughout the reaches upstream of Cascade Falls.	Desy, 2003
	The upper Kettle River population may be a unique entity, isolated from the rest of the species by the Cascade Falls.	Peden & Huges 1984a
	The population in BC may be limited by the seasonal flooding and scouring of the river bed which lowers productivity and a lack of appropriate shelter for adults.	Peden 1980
Known causes of risk	Limited distribution in BC; small population sizes.	Haas, 1998
Gap analysis	The taxonomic position of the Kettle River population needs to be further investigated.	Cannings & Ptolemy 1998
	Although the population seems to be adequately abundant in the Kettle River, more observations over a longer period are needed to determine the population trend.	Peden 1980
	No detailed information on the biology of the BC population.	Scott & Crossman 1973
Management implications	Not immediately threatened, but its restricted distribution makes it vulnerable to any catastrophic event affecting a single drainage system. Any dam construction would eliminate habitat.	Cannings & Ptolemy 1998
	A portion of the Kettle River system should be protected to ensure the survival of these and other unique fish populations above the falls at Cascade.	Cannings & Ptolemy 1998

4.3.9 Umatilla dace

Scientific Name: *Rhinichthys umatilla (*Gilbert & Evermann 1894)
Family *Cyprinidae*
CDC listing: Red
COSEWIC listing: Special Concern (1988)

	Umatilla dace	***Reference***
Description	Barbel inconspicuous, does not protrude beyond corner of mouth; fleshy membranes (stays) not well developed; caudal peduncle depth conspicuously wider than interorbital width.	McPhail & Carveth 1993
	Dark upper head and back, and mostly creamy flanks with some irregular dark spotting. The average lengths is about 12 cm. The mouth is inferior, with the snout projecting beyond the upper lip, and the upper lip separated from the snout by a groove. The species is distinguished by a short, rounded barbel at each corner of the mouth.	Hughes 1988
	 National Museum of Natural History, Washington D.C.	CDC, 2003
Habitat preference	The fish are usually found along the river banks, at depths of less than 1 m. The spaces between the rocks provide shelter for large fish, and the dense covering of green algae on the rocks during the summer and fall provides a source of food.	Hughes 1988
	Umatilla dace is a riverine species that seems to prefer the cover provided by cobbles and larger rocks where the current is fast enough to prevent siltation. Occurs in rivers that are relatively warm and productive; the species is absent from cold tributaries in the mountains.	Cannings & Ptolemy 1998
	Has also been found in reservoirs where there is a rocky bottom and a noticeable current.	Hughes & Peden 1988
Reproduction	Breeding probably occurs in late spring and in summer, if it is similar to closely related species.	Hughes & Peden 1988
	Little direct information on incubation needs, but by implication late spring or early summer. Breeding seems to be near spring flood.	Peden, 2003
	Reproductive biology has not been investigated. Breeding probably occurs in late spring and summer.	Cannings & Ptolemy 1998
Feeding habits	Food preferences are unknown, but the closely-related speckled dace is a bottom feeder.	Cannings & Ptolemy 1998

	Umatilla dace	***Reference***
General range	This species is known from the type locality of the Columbia River at Umatilla, Oregon and from scattered localities throughout the Columbia drainage.	Cannings & Ptolemy 1998
	Populations of the Umatilla dace in the Similkameen, Kettle, Columbia, Slocan and Kootenay river drainages represent the only known occurrences of the species in Canada.	Hughes & Peden 1988
Past and current distribution in Okanagan Region	The Kettle River population is isolated from lower Columbia River populations and may represent different species.	Hughes & Peden 1988
	Okanagan, Kettle and Similkameen Rivers (Keremeos Creek & Otter Creek)	CDC, 2003; Cannings & Ptolemy 1998; McPhail & Carveth 1993
	Keremeos Creek, Kettle River	FISS, 2003
	Umatilla dace occur below Cascade Falls of the Kettle as well as the Columbia and Similkameen	Peden, 2003
	Found in Mission Creek	Bull, 2003
	Not currently found during sampling in the Kettle River	Desy, 2003
Population status	This species has an extremely limited Canadian distribution and is impacted by habitat degradation resulting from impoundments.	Hughes & Peden 1988
	The Similkameen populations appear to be the same as those in Oregon. The Otter Creek population, however is isolated and morphologically distinct from other populations (McPhail, Peden, pers. comm.). Those in the Kettle River may also be isolated and divergent (Peden & Hughes 1988; McPhail, pers. comm.).	in Cannings & Ptolemy 1998
	Probably declined because of loss of habitat to hydroelectric reservoirs.	Cannings & Ptolemy 1998
	18 known sites in BC; probably a few more exist. Otter Creek populations has declined in recent years. Except for the Otter Creek populations the species does not appear to be threatened.	Cannings & Ptolemy 1998; Peden & Orchard 1993
Gap analysis	The impact of habitat changes due to hydro-electric projects on Umatilla Dace populations needs to be assessed.	Hughes & Peden 1988
	Breeding biology has not been determined. The impacts of competition from other benthic fish and predation are not known.	Hughes & Peden 1988
	A survey of Otter Creek should be completed to determine the status of this populations. Genetic and taxonomic relationships among isolated populations needs to be elucidated	Cannings & Ptolemy 1998
Management implications	The presumed preference of this species for cobble and stone habitat with sufficient current to remove silt, suggests that the fish are vulnerable to habitat changes which increase siltation.	Hughes & Peden 1988
	Otter Creek should be managed with the exis tence of this species as a major concern. Exemplary habitat such as that in the Similkameen River at Keremeos should be protected.	Cannings & Ptolemy 1998

4.3.10 White sturgeon

Scientific Name: *Acipenser transmontanus (*Richardson, 1836)
Family *Acipenseridae*
CDC listing: not listed
COSEWIC listing: Special Concern (1990)
US Fish and Wildlife: designated endangered in the Kootenai system (ESA, 2003)

	White sturgeon	***Reference***
Description	Maximum length 6m; probably the largest freshwater fish in Canada. Eyes small, snout short, depressed, bluntly rounded; mouth toothless; 4 barbels anterior to mouth, slightly closer to tip of snout than to mouth. Caudal fin markedly heterocercal, lower lobe more pointed than other sturgeons.	Scott & Crossman 1973
	There are no scales; the body is covered with patches of minute dermal denticles and five rows of bony plates. There is no lateral line. The White Sturgeon can be distinguished from the similar Green Sturgeon (A. *medirostris*), by the posterior position of its anus with respect to the insertion of the pelvic fins.	Lane 1990
	  *Photo/image: Wydoshi and Whitney*	Wydowski, and Whitney, 1979 web sources
Habitat preference	Sturgeons are found in lakes and large rivers. Anadromous in most systems but landlocked in the upper Columbia and Okanagan systems. Mature adults of this sturgeon move into large rives in the early spring.	Scott & Crossman 1973
	Likes turbid or murky waters, especially for spawning and during early juvenile stages. Predominantly inhabit large rivers preferring deep, low velocity areas with fine substrate.	Ford et al 1995
	In rivers, the species occurs in turbid water. It is possible that the largest fish have lived for more than 100 years.	Lane 1990
Reproduction	If White Sturgeon behave like related species, fertilization is broadcast, with the adhesive fertilized eggs adhering to crevices in the substrate.	Lane 1990
	Spawning takes place over rocky bottom in swift currents, near rapids or waterfalls. The spawning period is usually May and June. Adults multiple spawn.	Scott & Crossman 1973
Feeding Habits	Like other sturgeons, this species is mainly a bottom feeder using its ventral barbels and ventral sucker mouth.	Scott & Crossman 1973
	The fish is an opportunistic carnivorous feeder, that preys on bottom invertebrates and small fish.	Lane 1990

	White sturgeon	***Reference***
Range	Restricted to the Pacific shores of North America. In Canada, it is known to occur in the Fraser River system; the Columbia River and possibly Okanagan Lake.	Scott & Crossman 1973
Past and current distribution in Okanagan Region	There has been only anecdotal evidence of sturgeon sunning themselves on Skaha and Okanagan Lakes however there is no fishery accounts or has there ever been a wash-up of a carcass.	Bull, 2003 (pers. comm.)
	Reports of the sturgeon persist from Okanagan Lake but these have not been verified.	Lane 1990; CDC, 2003; McPhail and Carveth 1993
	No records recent in the Okanagan Region	FISS, 2003
Population status	The most serious limitation to this species may be the physical and ecological barriers created by dams and their impoundments.	Scott & Crossman 1973
	Columbia River populations have apparently not been successfully spawning since the construction of dams in the drainage basin; in decline almost everywhere else in BC	Haas, 1998
	This species has a restricted Canadian range and is impacted by exploitation.	Lane 1990
Known causes of risk	Impoundments and flow alterations; urbanization; agricultural and industrial pollution; habitat loss and alterations especially for juvenile rearing (Lane, 1991); limited distribution in BC; small population; cumulative long-term pollution effects.	Lane, 1991; Haas, 1998
Gap analysis	Information on incubation biology and presence/absence in the Okanagan lakes is needed.	
Management implications	In Canada, the limiting factors for this species appear to be climate (water temperature) and the availability of suitable large rivers. It is possible that water temperatures of 14-15 °C are necessary for spawning and fry survival. The construction of dams and vertical drop structures may have a limiting effect on the sturgeon populations in the upper Columbia River system and Okanagan Rivers.	Lane 1990

5.0 REFERENCES

Bailey, Richard. Biologist. Fisheries and Oceans Canada, Kamloops. 20 April 2003. Personal Communication.

BCHydro. 2003. www.bchydro.com/recreation/southern.

Bull, Chris. Biologist. Glenfir Resources. 16 February 2003. Personal Communication.

Campbell, R.R. 1988. Rare and endangered fishes and marine mammals of Canada. COSEWIC fish and marine mammals subcommittee status reports: IV. Can. Field. Nat. 102:81-86.

Cannings, S.G. 1993. Rare freshwater fish of British Columbia. BC. Ministry of Environment, Lands and Parks. Fisheries Branch. Conservation Data Centre. Victoria, BC. Canada.

Cannings, S.G. and J. Ptolemy. 1998. Rare fish of British Columbia. BC Environment.

Cascade Heritage Power Park (CHPP). 1999. Project Approval Certificate Application for CHPP project. Powerhouse Energy Corp. Vancouver, BC. Submitted to Environmental Assessment Office, Victoria, BC.

Canadian Endangered Species Conservation Council (CESCC). 2001. Wild species 2000: General Status of Species in Canada. Ottawa: Minister of Public Works and Government Services Canada.

Chamberlain, M.W., A.R. Morris and a. Caverly. 2001. Middle Shuswap river and Sugar Lake: bull trout and kokanee assessment 2000/2001. Prepared for the BC Ministry of Water, Land and Air Protection, Fisheries Branch, Southern Interior Region: Kamloops, BC.36pp.

Clemens, W.A., D.S. Rawson, J.L. McHugh. 1939. A Biological Survey of Okanagan Lake, British Columbia. Bulletin of the Fisheries Research Board of Canada. No. LVI. BC Ministry of Environment, Lands and Parks, Penticton Report 2507

Coffie, P. A. 1997. COSEWIC Status Report on the CHISELMOUTH, Acrocheilus alutaceus. Committee on the Status of Endangered Wildlife in Canada. 13 pp.

Conservation Data Center (CDC). 2003. Provincial Ministry of Sustainable Resource Management. //srmwww.gov.bc.ca/cdc

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2003. www.cosewic.ca

Cross, D. and L. Everest. 1994. Fish habitat attributes of entered and un-entered watersheds and the distribution of bull char spawning sites in the Upper Spokane River Ecosystem, Northern Idaho. From the abstracts of the Friends of the Bull trout Conf. Calgary, Alberta, AB. May 1994.

Desy, Julie. Biologist. CPP, Integrated Resources. 19 February 2003. Personal Communication.

Ernst, A. 1999a. Okanagan Nation Fisheries Commission Dam Research. Prepared for the Okanagan Nation Fisheries Commission.

Ernst, A. 1999b. Cascade Heritage Power Park Project: Aboriginal Interests and Use Study. Powerhouse Energy Corporation.

Ernst, A. 2000. Aboriginal Fisheries Information within the Okanagan Basin. Prepared for the Okanagan Nation Fisheries Commission.

ESA (United States Endangered Species Act designations). 2003. http//endangered.fws.gov/

Ferguson, A. 2002. Strageic Plan for the Bridge-Coastal Fish and Wildlife Program. BC Hydro.

Fish Wizard. 2003. BC Provincial Ministry of Water, Land and Air protection. //pisces.env.gov.bc.ca/

FishBASE. 2003. www.fishbase.org/search.cfm

Fishes of Canada. 2003. www.aquatic.uoguelph.ca/fish/fish.htm

Fish Facts. 2003. www.bcfisheries.gov.bc.ca/fishhabitat

FISS. 2003. www.bcfisheries.gov.bc.ca/fishinv/fiss.html

Ford, B.S., P.S. Higgins, A.F. Lewis, K.L. Copper, T.A. Watson, C.M. Gee, G.L. Ennis and R.L. Sweeting. 1995. Literature reviews of the life history, habitat requirements and mitigation/compensation strategies for selected fish species in the Peace, Liard and Columbia River Drainages of British Columbia. Canadian Department of Fisheries and Oceans Report, Vancouver, BC.

Forest Practices code (FPC), 2003. www.for.gov.bc.ca/tasb/egsregs/fpc/fpcguide/otherspecies/species-01.htm

Haas, G.S. and J.D. McPhail. 1991. Systematics and distribution of Dolly Varden and bull trout in North America. Can. J. Fish. Aquat. Sci. 48:2191-2211.

Haas, G.S. 1998. Indigenous fish species potentially at risk in BC, with recommendations and prioritizations for conservation, forestry/resource use, inventory and research. Ministry of Fisheries. Fisheries Management Report No. 105. Vancouver, BC.

Hughes, G.W. and A.E. Peden. 1984. Life history and status of the shorthead sculpin (*Cottus confuses*: Pisces, Cottidae) in Canda and the sympatric relationship to the slimy sculpin (*Cottus cognatus*). Canadian Journal of Zoology. 62:306-311.

Hughes, G. M. and A.E. Peden. 1988. Status Report on the UMATILLA DACE, Rhinichthys umatilla, in Canada. Committee on the Status of Endangered Wildlife in Canada. 21 pp.

Integrated taxonomic information systems (IT IS). 2003. //sis.agr.ca/it is/

Irving, J.R. 2002. COSEWIC status report on the coho salmon *Oncorhynchus kisutch* Interior Fraser (Interior Fraser populations) in Canada, in COSEWIC assessment and status report on the coho salmon *Oncorhynchus kisutch* (Interior Fraser population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-40 pp.

Johnson, R. 1994. A general fish inventory of the streams in the south Okanagan and Similkameen watersheds. First Nations Okanagan-Similkameen Environmental Protection Society and Fisheries Branch, BC Ministry of Environment, Lands and Parks.

Lane, E.D. 1990. Status Report on the WHITE STURGEON, Acipenser transmontanus, in Canada. Committee on the Status of Endangered Wildlife in Canada. 29 pp.

Lane, E.D. 1991. Status of the white sturgeon, *Acipenser transmontanus*, in Canada. Canadian Field- Naturalist. 105:161-168.

Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. 1980. Atlas of North American freshwater fishes. N.C. State Museum of Natural History, Raleigh, NC. 854pp.

McPhail, J.D. and C.C. Lindsey. 1986. Zoogeography of the Freshwater Fishes of Cascadia (the Columbia System and Rivers North to the Stikine). The Zoogeography of North American Freshwater Fishers. C.H. Hocutt and E.O. Wiley. New York, Wiley: 615-635.

McPhail, J.D. and R. Carveth. 1993. Field key to the freshwater fishes of British Columbia. Resources Inventory Committee, Province of British Columbia.

Moyle, P.B. 1976. Inland fishes of California. University of California Press, Berkley, CA. 405pp.

NatureServe. 2003. www.natureserve.org

Nehlsen, W., J.E. Williams and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk form California, Oregon, Idaho, and Washington. Fisheries. 16:4-20.

Northcote, T.G. 2003. Limnologist and Fish Biologist. Email March 3, 2003 Personal Communication.

Parkinson, E.A. and G. Haas. 1996. The role of macrohabitat variables and temperature in defining the range of bull trout. Fisheries Project Report 51. BC Ministry of the Environment, Fisheries Research, Vancouver, BC.

Peden, A.E. and G.W. Hughes. 1980. Life history notes relevant to the Canadian status of the speckled dace (*Rhyinichthys osculus*). Syesis 14:21-31.

Peden, A.E. and G.W. Hughes. 1984a. Status of the speckled dace, *Rhyinichthys osculus*. In Canada. Can. Field-Nat. 98:98-103.

Peden, A.E. and G.W. Hughes. 1984b. Status Report on the SHORTHEAD SCULPIN, Cottus confusus, in Canada. Committee on the Status of Endangered Wildlife in Canada. 85 pp.

Peden, A.E. 1980. Status Report on the SPECKLED DACE, Rhinichthys osculus, in Canada. Committee on the Status of Endangered Wildlife in Canada. 13 pp.

Peden, A.E., G.W. Hughes and W.E. Roberts. 1989. Morphologically distinct populations of the shorthead sculpin and mottled sculpin near the eastern border of Canadian and the United States. Can. J. Zool. 67:2711-2720.

Peden, A.E. and S.A. Orchard. 1993. Vulnerable dace populations of the Similkameen Rover 1992-1993. BC Ministry of Environment, lands and Parks Habitat Conservation Fund Interim Report. March 31, 1993. Victoria, BC 38pp.

Peden, A.J. Sendall and S. Orchard. 2000. Rare and endangered fish of the Thompson Okanagan - A museum perspective. www.royal.okanagan.bc.ca/octoconf/1funk/funk.html

Peden, Alex. Biologist, retired from BC Museum. 26 February 2003. Personal Communication.

Pinsent, M.E. (Ed.) 1974. The Limnology of the Major Okanagan Basin lakes. Technical Supplement V. Canada-British Columbia. Okanagan Basin Agreement.

Porter, M.S., G.R. Haas and E.A. Parkinson. 2000. Sensitivity of British Columbia's freshwater Fish to Timer Harvest: Using Species Traits of Predictors of Species

Risk. BC Fisheries. BC Ministry of Food, Agriculture and Fish. Fisheries Management Report No. 114.
Species at Risk (SAR). 2003. www.speciesatrisk.gc.ca
Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bulletin 184. Fisheries Research Board of Canada.
Sheldon, A.L. 1987. Rarity: Patterns and consequences for stream fishes. *In*: Porter, M.S., G.R. Haas and E.A. Parkinson. 2000. Sensitivity of British Columbia's freshwater Fish to Timer Harvest: Using Species Traits of Predictors of Species Risk. BC Fisheries. BC Ministry of Food, Agriculture and Fish. Fisheries Management Report No. 114.
Slaney, T.L., K.D. Hyatt, T.G. Northcote and R.J. Fielden. 1996. Status of anadromous salmon and trout in British Columbia and Yukon. Fisheries 21:20-35.
Summit (Summit Environmental Consultants Ltd.). 2003. A review of geomorphic and hydraulic factors controlling the distribution, abundance and quality of sockeye salmon habitat in the Okanagan Basin from 1900 to present. Prepared for the Okanagan Nation Fisheries Commission: Westbank, BC.
Smith, S. 2003. An investigation of salmon and steelhead in the Similkameen River above the site of Enloe Dam. Prepared for the Colville Confederated Tribes. Omak, Washington.
Williams, J.E., J.E. Johnson, D.A. Henrickson, S. Contreras-Balderas, J.D. Williams. M. Navarro-Mendoza, D.E. McAllister and J.E. Deacon. 1989. Fishes of North America endangered, threatened or of special concern: 1989. Fisheries 14(6):2-20.
Woodward, D.F., J.N. Goldstein and W.G. Brumbaugh. 1997. Cutthroat trout avoidance of metal and conditions characteristic of a mining waste site: Coeur d'Alene River, Idaho. Transactions of the American fisheries Society 126: 699-706.
Wydowski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. Wash. Press, Seattle, WA.

APPENDIX A
Definitions of the terms used in ranking
(NatureServe, 2003)

Species: any indigenous species, subspecies, variety or geographically defined population of wild fauna and flora.

PROVINCIAL RANKING: Applies to CDC listed species

Red list species includes any indigenous species or subspecies that have or are candidates for Extirpation, Endangered or Threatened status in BC. Placing taxa on these lists flags them as being at risk and requiring investigation.

Blue list species includes indigenous species or subspecies considered vulnerable in BC.

Yellow list species: apparently secure and not at risk of extinction.

SUB-NATIONAL RANKING: Applies to a species conservation status in BC.

SE: exotic species
SH: historical
SX: extirpated
SA: accidental
S1: critically imperiled
S2: imperiled
S3: vulnerable to extirpation or extinction
S4: apparently secure
S5: demonstrably widespread, abundant and secure.

FEDERAL RANKING: Applies to COSEWIC listed species

Extinct (X): a species that no longer exists

Extirpated (XT) species are those taxa that no longer exist in the wild in Canada but occur elsewhere.

Endangered (E) taxa are facing imminent extirpation or extinction.

Threatened (T) taxa are likely to become endangered of limiting factors are not reversed. Not all red-listed taxa will necessarily become formally designated.

Special concern (SC) Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk but are not Extirpated, Endangered or Threatened.

Not at risk (NAR) a species that has been evaluated and found to be not at risk.

Data deficient (DD) a species for which there is insufficient scientific information to support status designation.

GLOBAL RANKING: Applies to a species across its entire range.

GE: exotic species
GX: presumed extinct
GH: historical
G1: critically imperiled
G2: imperiled
G3: vulnerable to extirpation or extinction
G4: apparently secure
G5: demonstrably widespread, abundant and secure.