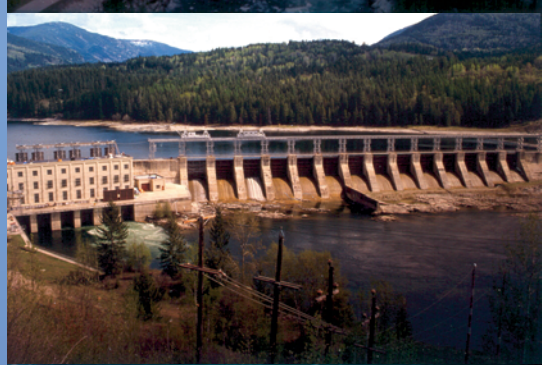

~ FINAL REPORT ~

FISHERIES RESOURCE INFORMATION AND TGP RISK ASSESSMENT FOR THE CANADIAN PORTION OF THE LOWER COLUMBIA RIVER BASIN

Prepared for

Columbia River
Integrated Environmental
Monitoring Program

RL&L ENVIRONMENTAL SERVICES
A Member of the Golder Group of Companies

rivers, lakes, & land

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- FINAL REPORT -

Prepared for

Columbia River Integrated Environmental Monitoring Program

by

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- Bob Chapman RL&L Environmental Services Ltd.
- Dana Schmidt RL&L Environmental Services Ltd.
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- Larry Hildebrand Contributor and Reviewer
- Charlene Williamson Data Entry
- Scott Millar Contributing Author, Tables and Figures Presentation
- Bob Chapman Information Review

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1.0 INTRODUCTION

1.1 BACKGROUND

Over the past decade, there have been increased concerns regarding the possible effects of high dissolved gas levels (referred to as total gas pressure or TGP in this report) on fisheries resources in rivers within British Columbia. The Columbia River below Hugh L. Keenleyside Dam (HLK) has been identified as having some of the highest TGP levels in the province (Clark 1977; RL&L 1995a), with levels of up to 144% saturation having been documented.

In response to concerns about the potential effects of high TGP levels on the fish resources, BC Environment, Environment Canada, and the federal Department of Fisheries and Oceans published water quality guidelines for the protection of aquatic biota from dissolved gas supersaturation in 1997 (Fidler and Miller 1997a, 1997b; BC Ministry of Environment, Lands and Parks 1997). These recommended guidelines stated that where local water depth at a given location exceeds one metre, the maximum delta P (ΔP) should not exceed 76 mmHG, which corresponds to a TGP of about 110% at sea level. As the TGP levels in the lower Columbia River, the Kootenay River, and the Pend d'Oreille River exceed these guidelines for at least part of the year, it was recognized that additional information was needed to identify the periods of the year within specific river reaches when elevated TGP levels were most likely to occur, and to identify species and life stages of fish at risk.

1.2 PURPOSE

The purpose of this study was to provide an overview of the fisheries resources present during periods of elevated TGP in order to identify key fisheries resources at risk due to high TGP levels in the lower Columbia River basin. The assessment, therefore, also required the identification of the periods of the year and the duration of elevated TGP levels in the Kootenay, Pend d'Oreille, and lower Columbia rivers in Canada. Due to the limited funding, the identification of species at risk was to be based on professional assessment at a workshop of individuals knowledgeable of the fish species and conditions in the Columbia River.

2.0 METHODS

2.1 STUDY AREA

The geographic location for the assessment was the Canadian portion of the transboundary reach of the Columbia River, including the Columbia River below HLK to the Canada-USA border, the Kootenay River below Kootenay Lake, and the Canadian portion of the Pend d'Oreille River (Figure 2.1 and 2.2).

Within the Kootenay River, TGP levels were modeled for the reaches from Cora Linn Dam to Upper Bonnington Dam, Upper Bonnington Dam to Lower Bonnington Dam, Lower Bonnington Dam to South Slocan Dam, Kootenay Canal powerplant tailrace, Brilliant Dam forebay, and Brilliant Dam to the confluence of the Columbia River.

Within the Pend d'Oreille River, TGP projections were completed for the Boundary Dam forebay, Boundary Dam to Seven Mile Dam, Seven Mile Dam to Waneta Dam, and the Waneta Dam spillway.

The mainstem Columbia River TGP projections include the reaches from Keenleyside Dam to the Kootenay River confluence, the Kootenay River Confluence to the Pend d'Oreille River confluence, and the Pend d'Oreille confluence to the U.S. border. The latter reach reflects the TGP load that will be contributed to Roosevelt Lake from Canada and the U.S. portion of the Pend d'Oreille River.

2.2 TGP ANALYSES AND DATA SUMMARY

The acronym TGP (total gas pressure) is equivalent to TDG (total dissolved gas) and DGS (dissolved gas supersaturation), which are commonly used in the literature. In this report, TGP is used as a generic descriptive term encompassing all expressions of supersaturated total dissolved gas. TGP is reported as percent saturation corrected to Sea Level. The TGP designation equates a ΔP of 76 mm Hg to 110% TGP and a ΔP of 152 mm Hg to 120%. This TGP designation was used to avoid the difficulties of varying elevation and barometric pressure on TGP% in the modeling projections and provides an approximate comparison between the units commonly used in U.S. water quality standards (TGP%) and Canadian water quality guidelines (ΔP or DP).

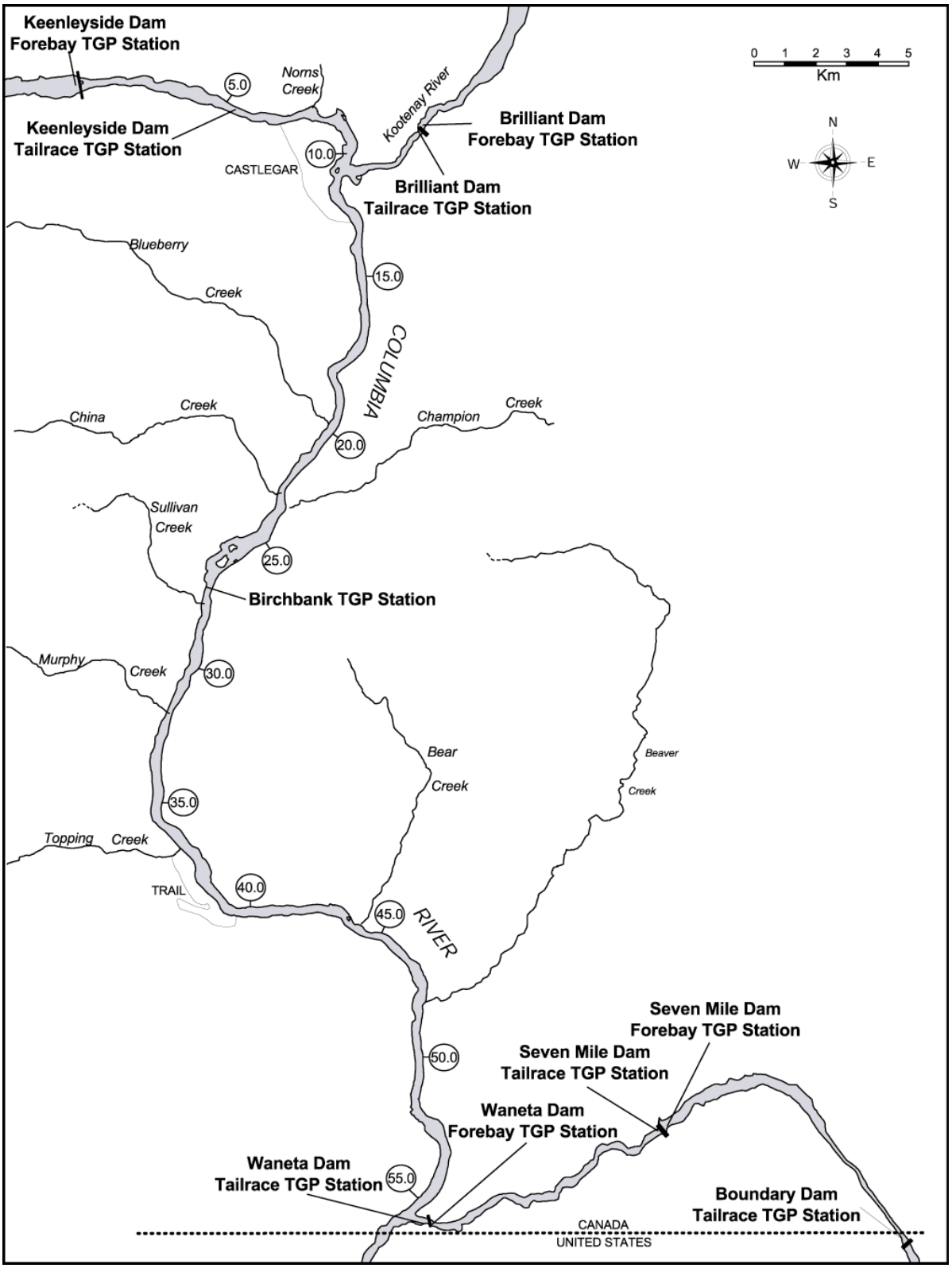

Figure 2.1 Lower Columbia, Kootenay, and Pend d'Oreille river TGP station locations.

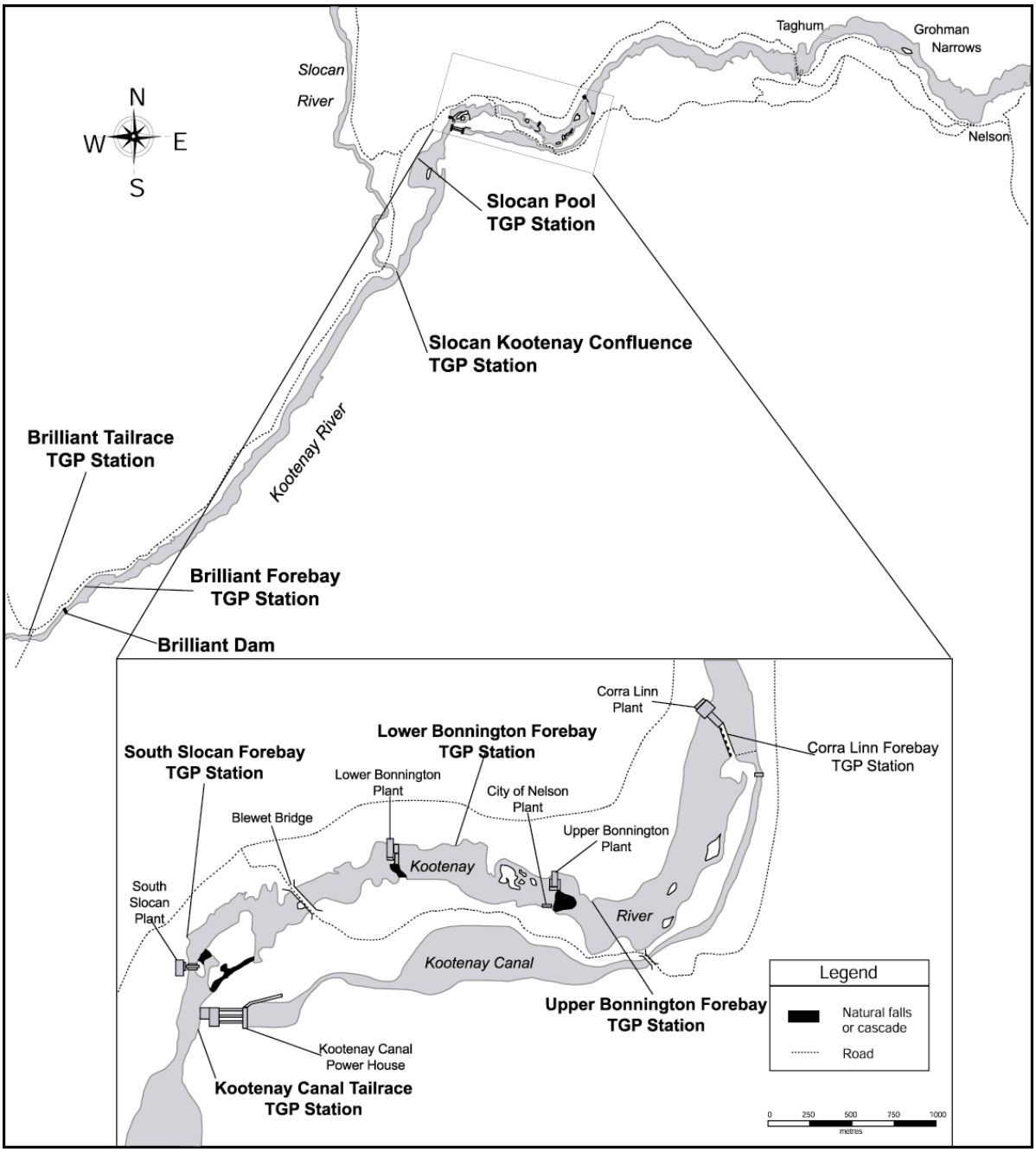

Figure 2.2 Upper Kootenay River TGP station locations.

TGP below hydroelectric facilities and below confluences of major tributaries was estimated using linear and non-linear regression techniques applied to the discharge and TGP measurements obtained during 1999 monitoring studies (RL&L 2000a; RL&L 2000b; RL&L 2000c). An exception was the Seven Mile project analysis, which was based on earlier investigations using the 1995-1998 monitoring data (RL&L 1997; RL&L 1998). These analyses were supplemented with additional studies completed in conjunction with the ongoing Brilliant Expansion Project (Aspen Applied Sciences 2000), which included analysis of multiple years of

monitoring data for Keenleyside and Brilliant dams related to the powerplant installations. Additional 1999 monitoring data from Boundary Dam were provided by Seattle City and Light. The equations and coefficients used for each facility, as well as the hydraulic capacity of the various facilities, are listed in Appendix A, Table A1.

The 1991-1999 hydrographic data from the Kootenay River (measured at Brilliant Dam), the Pend d'Oreille River (measured at Seven Mile Dam), and the Columbia River (measured at Keenleyside Dam and Birchbank) were used in a simulation to provide relative comparisons of TGP hazards associated with the various reaches of rivers throughout the lower Columbia River Basin. The simulations used the following assumptions:

- all facilities were operated maximizing the use of the hydraulic capacity of the powerplants (i.e., no volitional spills);
- no dissipation occurred between facilities except Brilliant Dam Reservoir;
- daily average discharge was used in the simulations (i.e., hourly load shaping was not considered);
- dilution from minor tributaries was not considered;
- operations of facilities were considered to be represented empirically within the monitoring periods and were not explicitly considered except for Brilliant and Keenleyside dams;
- Keenleyside Dam and Brilliant Dam operations were simulated using an explicit set of operational criteria that were designed to reduce TGP (See Aspen Applied Sciences 2000);
- transport times were not considered. Daily flow averages were applied to all facilities simultaneously; and
- powerplants were assumed not to entrain TGP (i.e., forebay TGP = tailrace TGP during non-spill periods), with the exception of Kootenay Canal, which was modeled empirically from the 1999 data.

The use of monitoring data to directly estimate impacts would not allow comparisons among facilities or reaches of rivers because monitoring did not occur concurrently over all facilities. The models varied in their ability to accurately reflect downstream TGP. The models for Brilliant Dam and Keenleyside Dam are the best developed but are highly dependent upon operational assumptions. Changes in operation of Keenleyside Dam over the past few years, resulting in water releases that reduce the incidence of spill, are an example of effects that are not included in the modeling.

Empirical relationships of TGP to discharge for Waneta spillways (RL&L 2000c), Lower Bonnington tailrace, and Brilliant forebay were relatively weak and most likely require more monitoring data and/or more complex modeling efforts to provide improved predictions of TGP. Brilliant forebay TGP was based on the observed

relationship of TGP to total discharge. Comparisons of the observed data to upstream mass balance estimates suggested major dissipation and/or dilution from the Slocan River occurred. The very high TGP values observed in South Slocan Dam forebay were likely significantly dissipated as the water passed through cascades and spillways prior to mixing with outflow from the Kootenay Canal powerplant. The combination of these two factors resulted in TGP levels in Brilliant Dam forebay substantially lower than what would be estimated by mass balance calculations from the upstream sources. The overall trends and relative ranking of hazards due to TGP are reasonably represented by the modeling results presented, and provide an initial perspective on TGP hazards in the lower Columbia Basin.

2.2.1 COLUMBIA RIVER

Exceedance probabilities are based on 1991-1999 hydraulic data using simulations based on TGP to discharge relationships estimated from the 1999 CRIEMP monitoring project, the Pend d'Oreille projections (see Figure 3.4), and projections provided by models from Aspen Applied Sciences (2000).

2.2.2 KOOTENAY RIVER

Kootenay River exceedance probabilities of TGP levels of 110%, 115%, 120%, and 130% are based on 1991-1999 hydraulic data using simulations based on TGP to discharge relationships estimated from the 1999 CRIEMP monitoring project.

2.2.3 PEND D'OREILLE RIVER

Exceedance probabilities are based on 1991-1999 hydraulic data using simulations based on TGP to discharge relationships estimated from 1999 monitoring data provided by Cominco, Seattle City and Light, and the 1995 - 1998 monitoring data for Seven Mile Dam provided by BC Hydro.

The lack of a complete mixing zone in the tailrace of Waneta Dam reduces utility of the prediction of downstream gas concentrations using the mass balance methods employed is this study. The use of spillway concentrations provides a conservative estimate of TGP in this region.

2.3 POTENTIAL EFFECTS OF KEENLEYSIDE POWERPLANT AND BRILLIANT EXPANSION PROJECTS

The effects of the Arrow Lakes Generating Station and the Brilliant Expansion Project (proposed) on TGP exceedance probabilities are based on 1991-1999 hydraulic data using simulations based on TGP to discharge relationships estimated from the 1999 CRIEMP monitoring project, the Pend d'Oreille projections, and projections provided by models from Aspen Applied Sciences (2000).

2.4 IDENTIFICATION OF SPECIES AND LIFE STAGES AT RISK

As the budget available for the project did not allow for a detailed literature review of the distribution and life history of fishes in the study area that could affect their vulnerability to elevated TGP levels, information was compiled during a one-and-a-half day workshop held in Castlegar on 6-7 September 2000. The workshop was attended by biological staff of RL&L Environmental Services Ltd., BC Hydro, and the Department of Fisheries and Oceans who were familiar with the habitat, biology, behaviour, and life history requirements of most of the fish species within the Columbia River basin. The assessment, based primarily on professional judgments of the biologists at the workshop, identified the main fish species of concern (Table 2.1) and life history phases present in each reach on a seasonal basis. Fish species were selected based upon their abundance in the system and the background information/knowledge available for that species. In addition, species that were listed in either the provincial or federal species at risk listings and known to occur in the watershed were included because of their status as a sensitive species.

Table 2.1 Fish species selected for TGP Risk assessment.

Species	Code	Scientific Name	Comments
Rainbow trout	RB	*Oncorhynchus mykiss* (Walbaum)	Major sportfish species
White sturgeon	WSG	*Acipenser transmontanus* Richardson	Red Listed species[1] Species of Special Concern[2]
Kokanee	KO	*Oncorhynchus nerka* (Walbaum)	Major sportfish species
Burbot	BB	*Lota lota* (Linnaeus)	Red Listed species[1]
Mountain whitefish	MW	*Prosopium williamsoni* (Girard)	Abundant sportfish species
Bull trout	BT	*Salvelinus confluentus* (Suckley)	Blue Listed species[1]
Walleye	WP	*Stizostedion vitreum vitreum* (Mitchill)	Major sportfish species introduced into Lake Roosevelt
Shorthead sculpin	CCN	*Cottus confusus* Bailey and Bond	Blue Listed species[1] Threatened Species[2]
Mottled sculpin	CBA	*Cottus bairdi* Girard	Blue Listed species[1] Species of Special Concern[2]
Umatilla dace	UDC	*Rhinichthys umatilla* (Gilbert and Evermann)	Red Listed species[1] Species of Special Concern[2]
Redside shiner	RSC	*Richardsonius balteatus* (Richardson)	Forage species
Largescale sucker	CSU	*Catostomus macrocheilus* Girard	Abundant sucker species

[1] BC CDC 2000 [2] COSEWIC 2000

The habitat use requirements for different life stages for each species, based on available information and knowledge of the workshop participants, were compiled for each reach within the study area. These variables included the species use of the river section (low, medium, high), depth (<1 m, 0-3 m, and >3 m) and velocity preferences, and the diel use and duration of use for the preferred habitat. In addition, the TGP levels for each season were categorized as low (<110%), moderate (110 to 120%), or high (>120%) in each river section. Two variables, depth and TGP level, were used to determine the TGP Risk Rating for each species (Table 2.2), based on the compensatory factor of depth (i.e., each metre of depth compensates for approximately 10% saturation).

Table 2.2 Depth and TGP Level matrix to determine species TGP Risk Rating.

	TGP Level		
	<110%	**110 to 120%**	**>120%**
Shallow (<1 m)	LOW	MODERATE	HIGH
Intermediate (1 to 3 m)	LOW	LOW	MODERATE
Deep (>3 m)	LOW	LOW	LOW

3.0 TGP MODELLING RESULTS

The equations and hydraulic assumptions used for the modeling are described in Appendix A, Table A1. The projections approximate a steady state and reflect daily averages. Dissipation was not considered to be a factor in significantly reducing gas concentrations across the reaches of rivers investigated, based on empirical data obtained during monitoring efforts. Exceptions include the gas stripping that occurs as supersaturated water is spilled from Seven Mile forebay and dissipation that occurs from spill over natural cascades at the South Slocan Dam and as water passes through Brilliant Dam headpond. Both of these conditions were approximated in the models. In the case of Brilliant Dam, forebay, TGP was estimated from empirical data as a function of total discharge and is independent of upstream TGP levels. In the case of the Seven Mile project, the dissipation of gas was modeled as a function of Seven Mile spill discharge rate and Seven Mile TGP concentrations. The models selected were generally log linear functions, with one exception where a logistic function was used to approximate TGP formed at lower Bonnington Dam. The pattern observed in the monitoring data suggested a logistic curve would provide a better approximation and is likely caused by the combination of spills from the spillways and the natural cascade.

3.1 COLUMBIA RIVER

The TGP levels and exceedence projections for the mainstem Columbia River below Keenleyside Dam to the U.S. Boundary are presented in Appendix B, Table B1 and are summarized in Figure 3.1. The TGP levels below Keenleyside Dam are frequently high because all flow volume during the period of the assessment was being released through spillways or low-level ports that produce elevated TGP. When spillways are operating alone, TGP levels frequently exceed 140%, whereas operation of the low-level ports alone produce TGP levels less than 120%. Below the confluence of the Kootenay River, represented by the modeling at the Birchbank site, TGP peak levels are typically lower than peak levels below the Keenleyside or Brilliant dams because of seasonal dilution of the TGP levels from either the Kootenay or upstream Columbia Rivers; however, the exceedance of the water quality guideline of 110% occurs over 45% of the time because of the combined effects of TGP formation from Brilliant and Keenleyside Dams. At the U.S. Border, reflecting the small reach of the Columbia River below the Pend d'Oreille confluence, generally both the magnitude and duration of TGP levels are reduced although the longer consecutive day periods are slightly increased when compared with the upstream Columbia Birchbank site, reflecting seasonal dilution as well as amplification of TGP levels from the Pend d'Oreille River.

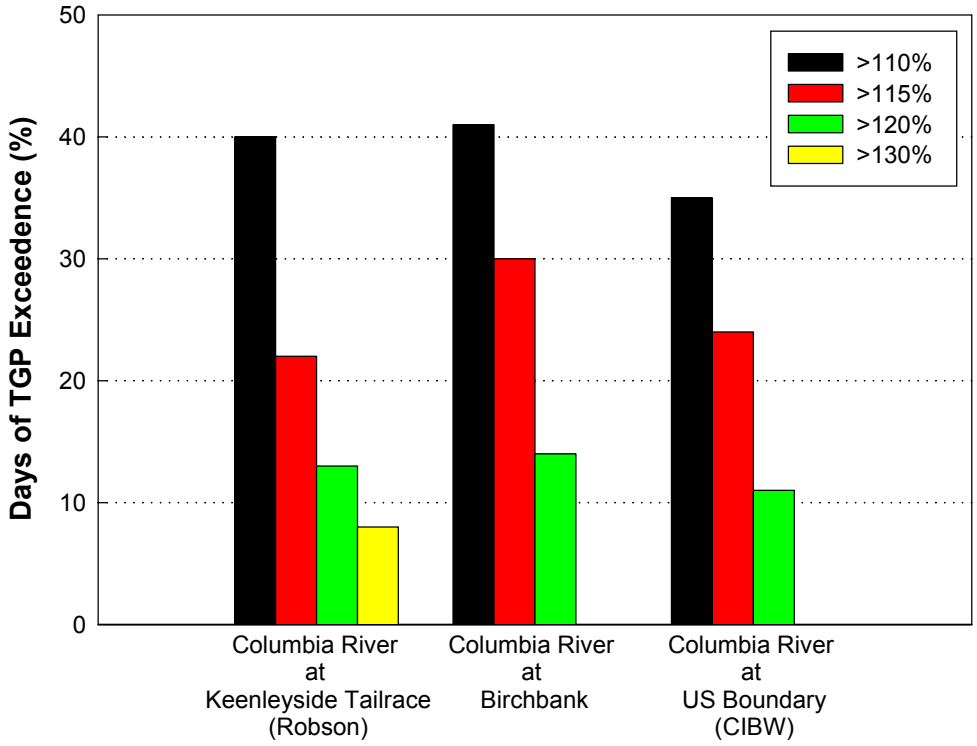

Figure 3.1 Percentage of time where river segment TGP exceeded target TGP levels for the Columbia River.

3.2 KOOTENAY RIVER

Model simulations were generated for six segments of the Kootenay River between Kootenay Lake and the confluence with the Columbia River (Appendix B, Table B2) based on nine years of hydrographic data (1991 – 1999). The probability of exceeding a target TGP level (Brilliant Dam Tailrace only) is illustrated in Figure 3.2. For this modeling effort, the data were summarized to reflect the percentage of time the river TGP saturation exceeded a target TGP level (e.g., 110, 115, 120, and 130%) for between 1 and 100 consecutive days (i.e., 33% of the time over the nine year period, the TGP level exceeded 110% for 10 consecutive days at Brilliant Dam Tailrace). The bold lines on the graph in Figure 3.2 are a preliminary estimate of the region where the gas levels are unlikely to produce gas bubble trauma (GBT) symptoms in salmonids because of the short duration of exposure (Bonnie Antcliffe, DFO, Vancouver, pers. comm., 2001)

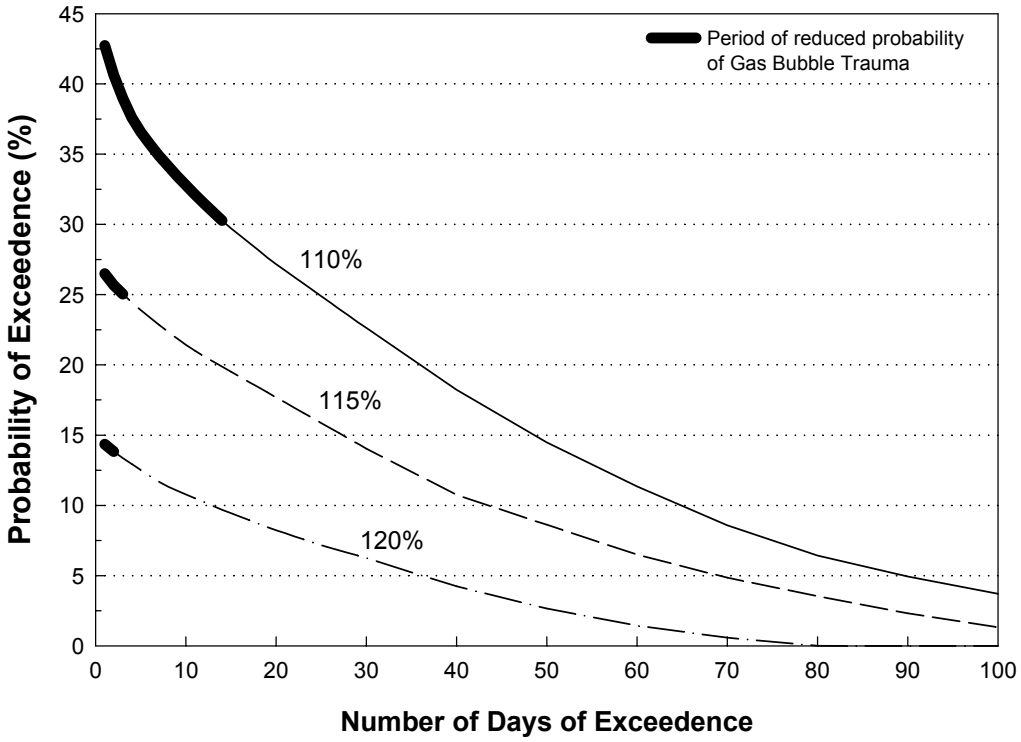

Figure 3.2 Probability of exceedance of TGP over consecutive numbers of days, Brilliant Dam tailrace.

The TGP values projected for each of the Kootenay River facilities (Appendix B, Table B2) are illustrated in Figure 3.3. Of interest is the relatively low entrainment of gas that occurs at the Kootenay Canal Plant generation station. Although TGP levels of 110% are frequently exceeded, levels in excess of 115% rarely occur. Spill from Cora Linn Dam also produced low levels of TGP. The Upper Bonnington project produced moderate levels of TGP, with 120% being exceeded three or more consecutive days less than 1% of the time. Brilliant forebay had TGP levels similar to Upper Bonnington. These levels were substantially reduced from levels measured below Lower Bonnington Dam, the highest TGP producer in the lower Kootenay system. The reductions were primarily caused by dilution with low TGP laden waters from the Kootenay Canal powerplant, dissipation from transport through the cascades adjacent to the South Slocan Dam, dilution from the Slocan River, and dissipation as water was transported through Brilliant headpond. The TGP levels at lower Bonnington tailrace were the highest from all of the locations included in this study, although they affected a reach length of only about 3 km (primarily the headpond of South Slocan Dam). Very high levels exceeding 150% have been observed during major spills, and the model projection reflected TGP exceeding 130% over 7% of the time. Brilliant Dam tailrace has the next highest TGP levels, which affects the 3 km reach of the Lower Kootenay River immediately above the confluence with the Columbia River. The TGP effects from Brilliant Dam spills are attenuated below the confluence because of dilution with the Columbia River. Because of seasonal differences in the timing of spills between Brilliant and Keenleyside dams, the mixture of flows usually

reduces the hazard below the confluence (i.e., typically one has low TGP). Although Brilliant does not produce very high levels of TGP, because of its current limited hydraulic capacity, spills frequently occur, resulting in exceedance of the TGP guideline of 110% over 42% of the time during the nine year simulation period used in this study.

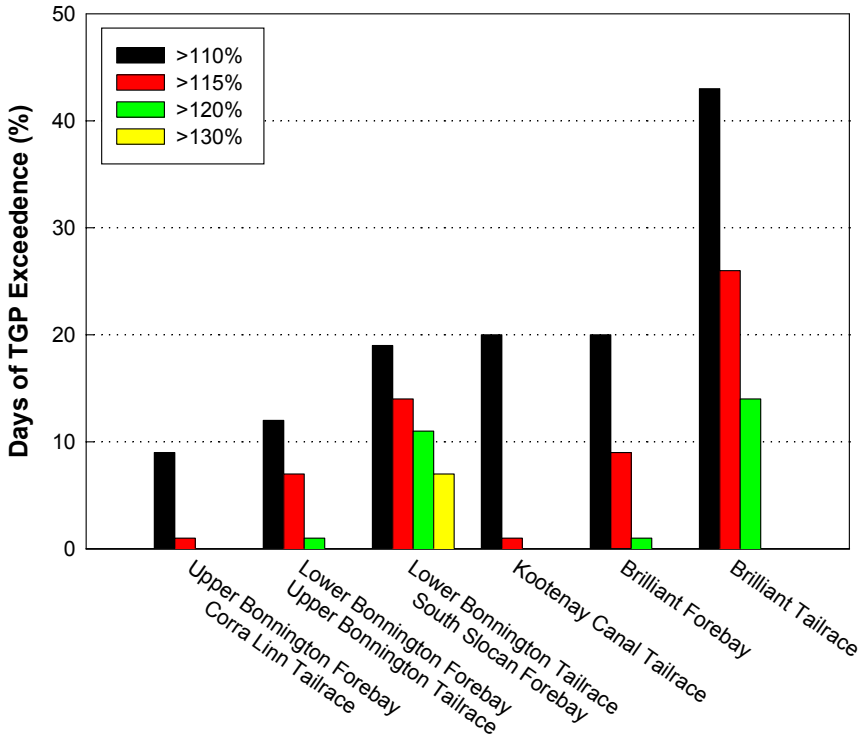

Figure 3.3 Percentage of time where river segment TGP exceeded target TGP levels for the Kootenay River.

3.3 PEND D'OREILLE RIVER

The Pend d'Oreille River TGP projections (Appendix B, Table B3) are illustrated for all facilities in Figure 3.4. The reach of river above Boundary Dam is influenced primarily by Box Canyon Dam and is totally within the U.S. Both Box Canyon and Boundary dams do not produce frequent elevated TGP levels because of relatively large hydraulic capacities compared with the typical flow of the Pend d'Oreille River. When spill does occur, both facilities produce very high TGP levels. During spill events, TGP values often exceed 130%, and field measurements below Boundary Dam have documented TGP values of above 150%. Seven Mile Dam is unique in the system in that water spilled that has TGP levels in excess of 110% will be stripped of gas as it passes through the "flip lip" spillways. Because forebay elevations are usually in excess of 110% when Seven Mile Dam is spilling, TGP levels are usually reduced in Seven Mile tailrace when compared with Seven Mile forebay. However, forebay water with elevated TGP levels passes through the Seven Mile powerplant

unchanged and contributes to high TGP levels in Waneta headpond. Although there are temporal shifts in daily patterns of downstream TGP in Seven Mile and Waneta headponds, monitoring data indicate little dissipation occurs as the travel time of water through these reservoirs is relatively short. The stripping effect of Seven Mile spillways reduces the frequency of TGP in excess of 130% in Seven Mile forebay (occurring over 10% of the time) to less than 2% of the time in Waneta headpond.

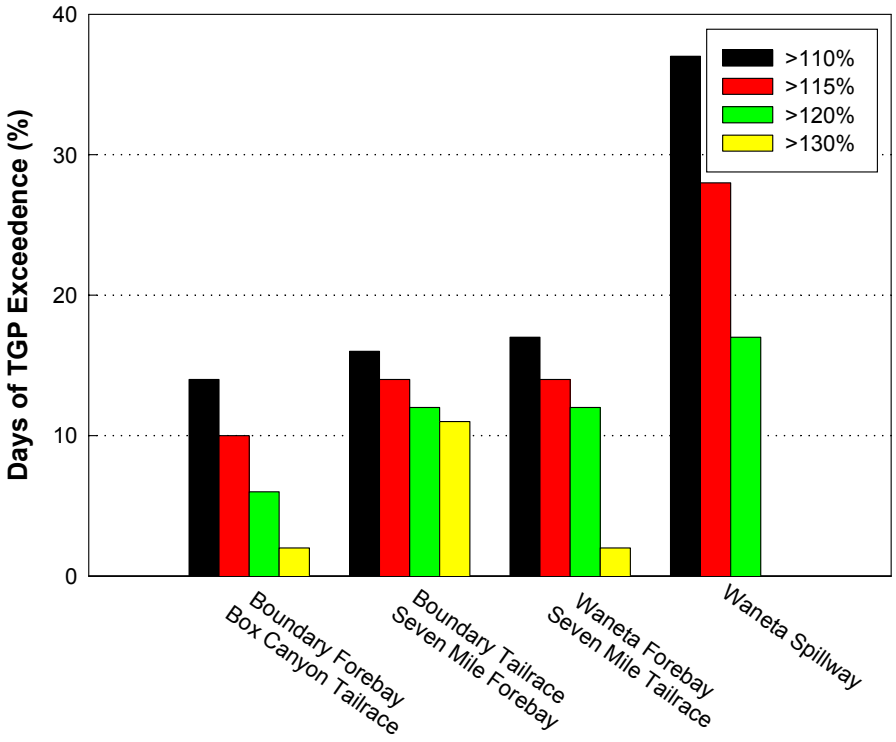

Figure 3.4 Percentage of time where river segment TGP exceeded target TGP levels for the Pend d'Oreille River.

The outflow from the powerplant and spillways at Waneta Dam is not mixed prior to entering the Columbia River so projections were limited to the spillway waters only. These data are the least reliable as the model has substantial error because of a limited period where monitoring of TGP formation was conducted. Monitoring of TGP from the mainstem Columbia River above the confluence and below the confluence at the U.S. border along with the Waneta forebay monitor were required to be operating concurrently to obtain the required data. All three data sets are necessary to estimate spillway TGP formation at Waneta Dam. As with Brilliant Dam, Waneta Dam has a limited hydraulic capacity, and frequent spills occur contributing to TGP levels that exceed the guidelines over 38% of the time. The mixture of these waters with the elevated TGP from the upstream Columbia River mainstem contributed to the long duration of TGP exceedance levels observed at the U.S. border (see Section 3.4).

3.4 LOWER COLUMBIA RIVER BASIN

Due to the additive effects of TGP from the upstream dams, TGP concentrations recorded at the confluence of the tributaries (i.e., Kootenay and Pend d'Oreille rivers) and at the U.S. border are within the 110% Provincial TGP guideline approximately 60% of the time (Table 3.1). In addition, the Arrow Lakes Generating Station (ALGS) and the proposed Brilliant Expansion Project (BEP) were both projected to further reduce the river TGP concentrations (Table 3.1; Figure 3.5).

Table 3.1 Summary of Lower Columbia River Basin TGP.

Location	Time (%)[1]				
	Within TGP Guidelines	>110%	>115%	>120%	>130%
Kootenay River					
Upper Bonnington Forebay/Corra Linn Tailrace	91	9	1	0	0
Lower Bonnington Forebay/Upper Bonnington Tailrace	88	12	7	1	0
Lower Bonnington Tailrace/South Slocan Forebay	81	19	14	11	7
Kootenay Canal Tailrace	80	20	1	0	0
Brilliant Forebay	80	20	9	1	0
Brilliant Tailrace	57	43	26	14	0
Pend d'Oreille River					
Boundary Forebay/Box Canyon Tailrace	86	14	10	6	2
Boundary Tailrace/Seven Mile Forebay	84	16	14	12	11
Waneta Forebay/Seven Mile Tailrace	83	17	14	12	2
Waneta Spillway	63	37	28	17	0
Columbia River					
Columbia River at Keenleyside Tailrace (Robson)	60	40	22	13	8
Columbia River at Birchbank	59	41	30	14	0
Columbia River at U.S. Boundary (CIBW)	65	35	24	11	0
Summary of Project Impacts[2]					
Brilliant Tailrace Pre BEP	57	43	26	14	0
Brilliant Tailrace Post BEP	78	22	13	5	0
Brilliant Forebay	80	20	9	1	0
Birchbank Pre BEP without KPP	59	41	30	14	0
Birchbank Pre BEP with KPP	72	28	18	4	0
Birchbank Post BEP with KPP	76	24	11	1	0
U.S. Border Pre BEP without KPP	65	35	24	11	0
U.S. Border Pre BEP with KPP	72	28	16	8	0
U.S. Border Post BEP with KPP	77	23	12	6	0

[1] Values reported are based on model TGP projections for each hydroelectric facility using 1991-1999 hydrographic data for the Columbia, Kootenay and Pend d'Oreille Rivers. Models are based on 1999 TGP monitoring data (RL&L 2000a;RL&L 2000b; RL&L 2000c) with the exception of Seven Mile Dam, which was based on 1995-1998 monitoring data (RL&L 1997;RL&L 1998). TGP% values equate to DP at sea level (i.e. 110%=76 mm Hg ΔP)

[2] BEP = Brilliant 100 MW Proposed Expansion Project; KPP = Keenleyside Power Plant (under construction)

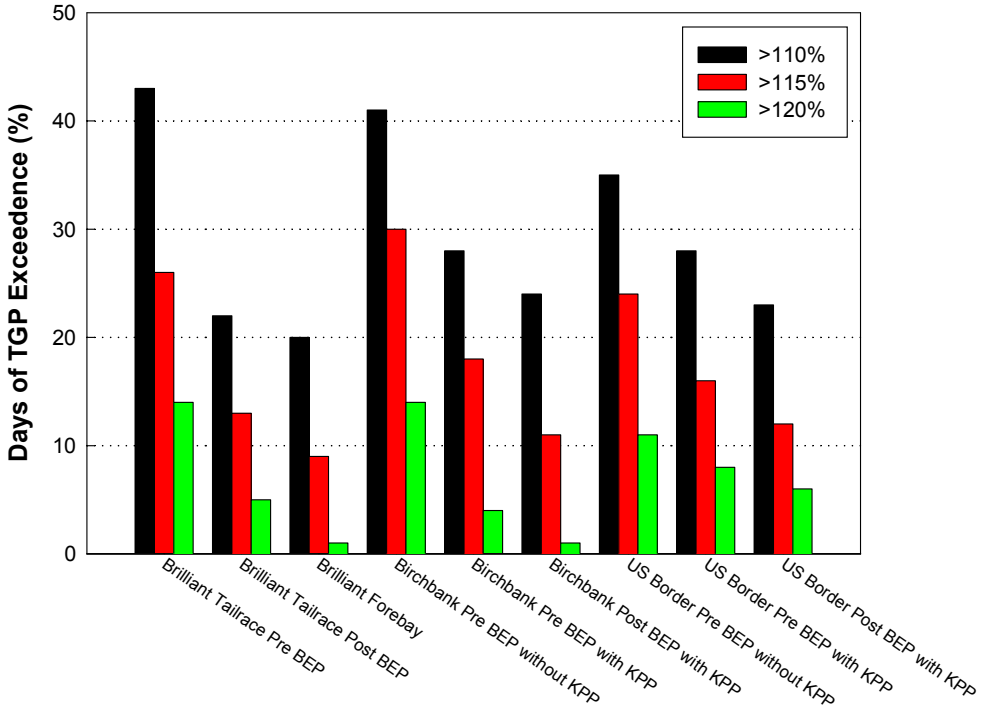

Figure 3.5 TGP exceedance probabilities for target TGP concentrations for the Kootenay River below Brilliant Dam, the Columbia River at Birchbank and at the U.S. Border.

4.0 TGP RISK RATINGS

The TGP risk ratings assigned by workshop participants are presented in Table 4.1 and Appendix C.

Table 4.1 TGP Risk ratings assigned to selected species life stages in each reach of the Columbia, Kootenay, and Pend d'Oreille rivers.

Season	Life Stage[1]	Species Code[2]											
		RB	WSG	KO	BB	MW	BT	WP	CCN	CBA	UDC	RSC	CSU
Columbia-Kootenay Confluence to Keenleyside Dam													
Spring	SP	L	-	-	L (pelagic)	-	-	-	-	L	L	L	L
	EI	L	-	-	L	-	-	-	-	L	L	L	L
	FR	L	-	L	L	L	-	-	-	L	L	L	L
	JR	L	-	L	L	L	L	L	-	L	L	L	L
	AH&F	L	L	L	L	L	L	L	L	L	L	L	L
Summer	SP	-[3]	-	-	-	-	-	-	-	-	-	H	-
	EI	M	-	-	-	-	-	-	-	-	-	H	-
	FR	H	-	-	-	M-H	-	-	-	-	-	H	H
	JR	H	-	L-M	M	M	M	M	L	H	H	H	M
	AH&F	L-M	L	-	L	L-M	M	L-M	H	H	M	M	M
Fall	SP	-	-	-	-	L	-	-	-	-	-	-	-
	EI	-	-	-	-	L	-	-	-	-	-	-	-
	FR	-	-	-	-	-	-	-	-	-	-	-	-
	JR	H	-	L-M	M	M	M	M	L	H	H	H	M
	AH&F	L-M	L	M	L	L-M	M	L-M	H	H	M	M	M
Winter	SP	-	-	-	L	L	-	-	-	-	-	-	-
	EI	-	-	L	L	L	-	-	-	-	-	-	-
	FR	-	-	-	-	-	-	-	-	-	-	-	-
	JR	L	-	L	L	L	L	L	L	L	L	L	L
	AH&F	L	L	-	L	L	L	L	L	L	L	L	L
Columbia-Pend d'Oreille Confluence to Columbia-Kootenay Confluence													
Spring	SP	L	-	-	M (Pelagic)	-	-	-	-		-	M	L
	EI	L	-	-	L	-	-	-	-		-	M	L
	FR	L	-	-	M	M	-	-	-	M	-	M	M
	JR	L	-	L	L	L	M	L	-	M	M	M	L
	AH&F	L	L	-	L	L	L	L	M	M	L	L	L
Summer	SP	-	-	-	-	-	-	-	-	-	-	H	-
	EI	M	-	-	-	-	-	-	-	-	-	H	-
	FR	M	-	-	-	M-H	-	-	-	-	-		-
	JR	M	-	M	M	M	M	M	-	H	H	H	M
	AH&F	L-M	L	L (Migrate)	L	L-M	M	L-M	H	H	M	M	M

Season	Life Stage[1]	Species Code[2]											
		RB	WSG	KO	BB	MW	BT	WP	CCN	CBA	UDC	RSC	CSU
Fall	SP	-	-	-	-	L	-	-	-	-	-	-	-
	EI	-	-	-	-	L	-	-	-	-	-	-	-
	FR	-	-	-	-	-	-	-	-	-	-	-	-
	JR	M	-	M	M	M	M	M	-	H	M-H	H	M
	AH&F	L-M	L	M	L	L-M	M	L-M	H	H	M	M	M
Winter	SP	-	-	-	L	L	-	-	-	-	-	-	-
	EI	-	-	-	L	L	-	-	-	-	-	-	-
	FR	-	-	-	-	-	-	-	-	-	-	-	-
	JR	L	-	L	L	L	M	L	-	M	L-M	M	L
	AH&F	L	L	-	L	L	L	L	M	M	L	L	L
Columbia-Pend d'Oreille Confluence downstream													
Spring	SP	L	L	-	M (pelagic)	-	Species not present[4]	-	Species not present[4]	Species not present[4]	Species not present[4]	M	L
	EI	L	L	-	L	-		-				M	L
	FR	L	H	-	M	M		-				M	M
	JR	L	L	L	L	L		L				M	L
	AH&F	L	L	-	L	L		L				L	L
Summer	SP	-	L	-	-	-		-				H	-
	EI	-	L	-	-	-		-				H	-
	FR	-	H	-	-	H		-				-	-
	JR	M	L	-	M	M		M				H	M
	AH&F	L-M	L	L (Migrate)	L	L-M		L-M				M	M
Fall	SP	-	-	-	-	M		-				-	-
	EI	-	-	-	-	M		-				-	-
	FR	-	-	-	-	-		-				-	-
	JR	L	L	-	M	L		L				M	L
	AH&F	L	L	M	L	L		L				L	L
Winter	SP	-	-	-	L	L		-				-	-
	EI	-	-	-	L	L		-				-	-
	FR	-	-	-	-	-		-				-	-
	JR	L	L	-	L	L		L				L	L
	AH&F	L	L	L	L	L		L				L	L
Brilliant Dam Head Pond													
Spring	SP	M	-	-	M (Pelagic)	-	Species not present[4]	Species not present[4]	-	-	-	H	M
	EI	M	-	-	L	-			-	-	-	H	M
	FR	M	-	-	M	H			-	-	-	H	H
	JR	M	-	-	L	M			H	H	H	H	M
	AH&F	L-M	L	L	L	L-M			H	H	H	M	M
Summer	SP	-	-	-	-	-			-	-	-	H	-
	EI	-	-	-	-	-			-	-	-	H	-
	FR	-	-	-	-	H			-	-	-	-	-
	JR	M	-	-	M	M			H	H	H	H	M
	AH&F	L-M	L	L	L	L-M			H	H	H	M	M

Season	Life Stage[1]	Species Code[2]											
		RB	WSG	KO	BB	MW	BT	WP	CCN	CBA	UDC	RSC	CSU
Fall	SP	-	-	-	-	L			-	-	-	-	-
	EI	-	-	-	-	L			-	-	-	-	-
	FR	-	-	-	-	-			-	-	-	-	-
	JR	L	-	-	L	L			L	L	L	L	L
	AH&F	L	L	L	L	L			L	L	L	L	L
Winter	SP	-	-	-	L	M			-	-	-	-	-
	EI	-	-	-	L	M			-	-	-	-	-
	FR	-	-	-	-	-			-	-	-	-	-
	JR	M	-	-	L	M			H	H	H	H	M
	AH&F	L-M	L	L	L	L				H	H	M	L-M
Kootenay-Columbia Confluence to Brilliant Dam													
Spring	SP	M	-	-	H (pelagic)	-	Species not present[4]	-	-	-	-	H	M
	EI	M	-	-	L	-		-	-	-	-	H	M
	FR	M	-	H	H	H		-	-	-	-	H	H
	JR	M	-	L	M	M		M	H	H	H	H	M
	AH&F	L-M	L	L	L	L-M		L-M	H	H	H	M	M
Summer	SP	-	-	-	-	-		-	-	-	-	H	-
	EI	M	-	-	-	-		-	-	-	-	H	-
	FR	M	-	-	-	H		-	-	-	-		-
	JR	M	-	L	M	M		M	H	H	H	H	M
	AH&F	L-M	L	M (Subadult)	L	L-M		L-M	H	H	H	M	M
Fall	SP	-	-	L	-	L		-	-	-	-	-	-
	EI	-	-	L	-	L		-	-	-	-	-	-
	FR	-	-	-	-	-		-	-	-	-	-	-
	JR	L	-	L	L	L		L	L	L	L	L	L
	AH&F	L	L	L	L	L		L	L	L	L	L	L
Winter	SP	-	-	-	L	H		-	-	-	-	-	-
	EI	-	-	M	L	H		-	-	-	-	-	-
	FR	-	-	-	-	-		-	-	-	-	-	-
	JR	M	-	L	M	M		M	H	H	H	H	M
	AH&F	L-M	L	L	L	L		L-M	H	H	H	M	L-M
Boundary Dam to Waneta Dam													
Spring	SP	L	Species not present[4]	Species not present[4]	M (Pelagic)	-	Species not present[4]	Species not present[4]	Species not present[4]	Species not present[4]	Species not present[4]	M	L
	EI	L			L	-						M	L
	FR	L			M	M						M	M
	JR	L			L	L						M	L
	AH&F	L			L	L						L	L
Summer	SP	-			-	-						H	-
	EI	M			-	-						H	-
	FR	M			-	H						-	-
	JR	M			M	M						H	M
	AH&F	L			L	L-M						M	M

Season	Life Stage[1]	Species Code[2]											
		RB	WSG	KO	BB	MW	BT	WP	CCN	CBA	UDC	RSC	CSU
Fall	SP	-			-	L						-	-
	EI	-			-	L						-	-
	FR	-			-	-						-	-
	JR	L			L	L						M	L
	AH&F	L			L	L						L	L
Winter	SP	-			L	L						-	-
	EI	-			L	L						-	-
	FR	-			-	-						-	-
	JR	L			L	L						L	L
	AH&F	L			L	L						L	L
Pend d'Oreille-Columbia Confluence to Waneta Dam													
Spring	SP	L	L	-	M (Pelagic)	-	Species not present[4]	-	Species not present[4]	Species not present[4]	-	M	L
	EI	L	L	-	L	-		-			-	M	L
	FR	L	H	-	M	M		-			-	M	M
	JR	L	L	-	L	L		L			L-M	M	L
	AH&F	L	L	-	L	L		L			L	L	L
Summer	SP	-	L	-	-	-		-			-	H	-
	EI	M	L	-	-	-		-			-	H	-
	FR	-	H	-	-	H		-			-	H	-
	JR	M	L	-	M	M		M			H	H	M
	AH&F	L-M	L	L (Migrate)	L	L-M		L-M			M	M	M
Fall	SP	-	-	-	-	L		-			-		-
	EI	-	-	-	-	L		-			-		-
	FR	-	-	-	-	-		-			-		-
	JR	L	L	-	M	L		L			M-H	M	L
	AH&F	L	L	M	L	L		L			M	L	L
Winter	SP	-	-	-	L	L		-			-		-
	EI	-	-	-	L	L		-			-		-
	FR	-	-	-	-	-		-			-		-
	JR	L	L	L	L	L		L			L-M	L	L
	AH&F	L	L	-	L	L		L			L	L	L

[1] Life Stage: SP = Spawning, EI = Egg Incubation, FR = Fry Rearing, JR = Juvenile Rearing, and AH&F = Adult Holding and Feeding.
[2] Species Code = See Table 2.1
[3] ' – ' indicates that no TGP Risk Rating was assigned because life stage does not occur during season, lack of information, species migrates out of area, etc.
[4] Species not present in river reach or present in very low numbers.

Rainbow trout: Rainbow trout utilize a variety of water depths throughout their life history, typically using intermediate water areas during spawning and juvenile rearing, shallow water during the fry stage and using deeper water areas during late juvenile and adult life stages. Rainbow trout occur in moderate to high abundance in all reaches of the Columbia and Kootenay rivers, and in the lower section of the Pend d'Oreille River; river use for early life stages (e.g., spawning and rearing) is concentrated in the upper reaches of the Columbia River and downstream of Brilliant Dam on the Kootenay River. Eighty-six risk ratings were assigned to rainbow trout

for the study area, only 3% of these were rated *High* and 43% rated *Moderate* overall TGP risk. The majority of the ratings (53%) were *Low*. *High* risk ratings were limited to early life stages use of shallow water in areas and time periods of elevated TGP (e.g., downstream of Keenleyside Dam during the summer period).

White sturgeon: White sturgeon use deep water throughout the majority of their life stages; however, larvae undergo a pelagic phase and utilize variable water depths over a period of several days and have been identified as being vulnerable to TGP (Counihan et al. 1998). Portions of the Columbia River, the Kootenay River downstream of Brilliant Dam, and the Pend d'Oreille River downstream of Waneta Dam have been identified as high use areas for adult white sturgeon, and spawning has been documented at the confluence of the Pend d'Oreille and Columbia rivers. White sturgeon are Red-listed in BC (BC CDC 2000) and are a federally listed as a 'Species of Special Concern' (COSEWIC 2000).

In total, 44 ratings were assigned to white sturgeon life stages, of which 91% (n=40) were classified as low risk as related to the adult holding and feeding life stage. The remaining 9% (n=4) ratings were classified as high risk as related to pelagic larvae life stages that are known to be present in the lower reaches of the Pend d'Oreille River and in the Columbia River downstream of the Columbia-Pend d'Oreille confluence. The high risk rating at these locations was based on evidence that at high TGP levels, bubbles can form within the buccal cavity and nares of larval white sturgeon and this may result in increased mortality as a result of 1)asphyxiation and/or 2) increased risk of predation associated with increased positive buoyancy (Counihan et al. 1998).

Kokanee: Kokanee, like rainbow trout, make use of shallow areas during the spawning period and egg incubation life stage. Egg incubation and initial fry rearing life stages occur primarily over the winter, when TGP levels are typically lower, although depending on the timing of spawning, the initial incubation period could be during periods of higher TGP. The upper reach of the Columbia River and the Kootenay River downstream of Brilliant Dam were considered high use areas. Spawning has been documented in the upper reach of the Columbia River (i.e. at Norn's Creek Fan). This reach is also utilized by early fry stages. Fry have also been documented in the Kootenay River below Brilliant Dam. These could represent a small spawning population in the lower Kootenay River or entrainment through Brilliant Dam. Other reaches in the study area were low use areas, except upstream of Waneta Dam where kokanee have not been documented. *High* TGP risk rankings comprised 3% of the total (n=37), *Moderate* and *Low* rankings comprised 35% and 62%, respectively.

Burbot: Burbot occur in very low numbers throughout the study area; this species is Red-listed in BC (BC CDC 2000). Early life stages of this species (i.e., pelagic larvae and fry rearing) typically make use of shallow water areas, whereas other life stages (i.e., egg incubation, larger juvenile, and adult) likely use moderate to deep

water depths (i.e., 0 m to greater than 3 m). Shallow water life stages may be exposed to elevated TGP levels during their use of limited depth. Ninety-one TGP risk ratings were assigned to burbot, 2% were rated *High*, 26% were rated *Moderate* and the remainder were *Low* (71%). All of the life stages associated with *Moderate* and *High* TGP risk ratings were early life stages identified to make use of shallow water or adults spawning in shallows in early spring. Most spawning is likely completed prior to the onset of elevated TGP in most areas and has not been documented in these areas.

Mountain whitefish: Mountain whitefish make use of shallow water areas during spawning and rearing, using deeper water areas during late juvenile and adult life stages. Mountain whitefish occur in moderate to high abundance in the Columbia River, although river use for early life stages (e.g., spawning and rearing) diminishes downstream of the Pend d'Oreille River confluence. This species makes moderate use of Brilliant Headpond, and low use of the Pend d'Oreille River upstream and downstream of Waneta Dam. One hundred and three risk ratings were assigned to mountain whitefish life stages in the study area, 11% of these were rated *High* and 33% rated *Moderate* overall TGP risk. The majority of these *High* and *Moderate* ratings were assigned to early life stages when shallow water use was more prevalent. In particular, juvenile whitefish in larval stage were often assigned a *High* overall TGP risk. The majority of risk ratings (53%) were *Low*.

Bull trout: Late juvenile and adult life stages of bull trout primarily occur in low numbers in the mainstem Columbia River downstream of Keenleyside Dam. Bull trout are Blue-listed in BC (BC CDC 2000). Early life stages of this species (e.g., spawning, incubation, early rearing) occur in tributaries (e.g., Norn's Creek). Adult and older juvenile life stages of bull trout use moderate water depths (i.e., 0 to 3 m) for feeding and deeper water for holding. As a result, they can be exposed to elevated TGP levels during their use of shallow water. Sixteen TGP risk ratings were assigned to bull trout, 63% were rated *Moderate* and 0% were rated *High*.

Walleye: Walleye were introduced into the Lake Roosevelt system in the USA in the 1960s (Peone et al. 1990 in RL&L 1995b) and have since become an important sportfish species in the Canadian portion of the Columbia River. Walleye in the Columbia River typically migrate downstream to Lake Roosevelt and its large tributaries for spawning, with the fry rearing in the Lake Roosevelt system. A portion of the walleye appear to move upstream into the Canadian section of the Columbia River as late juveniles and adults primarily for feeding. Walleye occur in moderate abundance throughout the Columbia River mainstem and in the lower Kootenay and lower Pend d'Oreille rivers. In total, 40 risk ratings were assigned, of which the majority (55%) were rated *Low* due to the preference for deeper water habitats. The remainder of the ratings (45%) were *Moderate*.

Shorthead sculpin: This species often utilizes shallow nearshore habitat throughout its life history, although spawning, incubation, and rearing likely occur in tributaries to the Columbia and Kootenay rivers. This species was considered to occur in low abundance in the upper two reaches of the Columbia River and in both reaches of the Kootenay River. Shorthead sculpin are Blue-listed in BC (BC CDC 2000) and are a federally listed as a 'Threatened' (COSEWIC 2000). In total, 27 ratings were assigned to shorthead sculpin, 59% of these ratings were classified as *High*. *High* risk ratings were assigned to adult life stages in the upper reaches of the Columbia River and to juvenile rearing and adult life stages occurring in the Kootenay River reaches.

Mottled sculpin: As with shorthead sculpin, mottled sculpin typically inhabit shallow nearshore areas, although little is known about the spawning, egg incubation, and rearing life stages in the Columbia drainage. Overall, the abundance of this species in these two river reaches was considered to be low. Mottled sculpin are Blue-listed provincially (BC CDC 2000) and are a federally listed as a 'Species of Special Concern' (COSEWIC 2000). In total, 34 ratings were assigned to mottled sculpin, 59% of these were rated *High* and 15% rated *Moderate* overall TGP risk. All of these ratings pertain to juvenile rearing and adult life stages. Due to the lack of information on early life stages (e.g., spawning and egg incubation) in the mainstem Columbia river, risk ratings were not assigned.

Umatilla dace: Umatilla dace also inhabit shallow-water areas throughout their life history. Little information is available regarding the occurrence of and conditions for spawning, egg incubation, and rearing life stages in the Columbia drainage. TGP risk was rated for Umatilla dace in the upper two reaches of the Columbia River, the Kootenay River downstream of Brilliant Dam and the Pend d'Oreille River downstream of Waneta Dam. This species has not been recorded upstream of Waneta Dam and little information is available for Umatilla dace in the Columbia River mainstem downstream of the Pend d'Oreille River confluence. Overall, the abundance of this species was considered to be low; Umatilla dace are Red-listed by BC CDC (2000) and are a 'Species of Special Concern' under COSEWIC (2000). Forty-three risk ratings were assigned to Umatilla dace, 42% of these were rated *High* and 23% rated *Moderate* overall TGP risk. All of these ratings pertain to juvenile rearing and adult life stages. Risk ratings were not assigned to early life stages (e.g., spawning and egg incubation) due to the lack of information on these life stages in the study area.

Redside shiners: Redside shiners utilize shallow areas for the majority of early life stages (e.g., spawning, incubation, fry and juvenile rearing) and shallow to moderate depths during adult life stages. This species occurs in high abundance in the Columbia River immediately downstream of Keenleyside Dam and in the reservoirs upstream of Brilliant and Waneta dams. Elsewhere in the study area, redside shiners were low in abundance. In

total, 93 ratings were assigned to redside shiner, 38% of these were rated *High* and 35% were rated *Moderate*. *High* and *Moderate* risk ratings were assigned to all life stages in all reaches of the study area.

Largescale sucker: Largescale suckers predominantly make use of moderate water depths throughout their life history, although shallow water areas are used during early rearing life stages (e.g., fry rearing). This species was considered to be abundant in all reaches of the study area. Seventy-eight risk ratings were assigned to largescale sucker, 4% of these were rated *High*, 44% rated *Moderate,* and 53% were rated *Low* overall TGP risk. *High* risk ratings pertain to early juvenile life stages (fry rearing) during the summer period within the Columbia River below HLK and in the Kootenay River.

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APPENDIX A

Table A1. Summary of equations used to model TGP throughout the lower Columbia River basin.

Site	Location	Equation[1]	Coefficients			Hydraulic Capacity (m^3/s)	Discharge Range Applicable (m^3/s)	Data Used for Model[2]	Comments
			B0	B1	B2				
KRQ	**Kootenay River (measured at Brilliant Dam)**								
CLF	Corra Linn Forebay	*CLF=B0+B1*(KRQ)*	1	0.023			All	1999 Hourly	
CLP	Corra Linn Powerplant	*See CLT*				363			
CLS	Corra Linn Spillway	*See CLT*						1999 Hourly	
CLT	Corra Linn Tailrace	*CLS=B0+B1*Log(KRQ-KCPQ-CLPQ)*	-343.971	60.441			KRQ-KCPQ>363		Estimate based on combined spill and powerplant discharge
UBF	Upper Bonnington Forebay	*UBF=CLT*					All		
UBP	Upper Bonnington & City of Nelson Powerplant					463	All		Upper Bonnington Powerplant Q=425 m^3/s; City of Nelson Powerplant Q= 48 m^3/s
UBS	Upper Bonnington Spillway and falls		-234.704	55.916			KRQ-KCPQ>463	1999 Hourly	Use UBP below 463
UBT	Upper Bonnington Tailrace						All		
LBF	Lower Bonnington Forebay	*LBF=UBT*					All		
LBP	Lower Bonnington Powerplant	*See LBT*				278			
LBS	Lower Bonnington Spillway and falls	*See LBT*							
LBT	Lower Bonnington Tailrace (LBT)	*LBT=B0/(1-EXP(-B1*((KRQ-KCPQ)-B2)))*	450	0.00242	1143		>278	1999 Hourly	450 mm Hg ΔP considered upper limit; Model assumes powerplant discharge is entrained by spill.
SSF	South Slocan Forebay (SSF)	*SSF=LBT*					All		
SSS	South Slocan Spillway and Falls	*Not Estimated*							
SSP	South Slocan Powerplant	*SSP=SSF*				298	All		
SP	Slocan Pool	*SP=B0+B1*KCP*KCPQ+B2*SSF*(SSSQ+SSPQ)/KRQ*	1	1.453	0.568		>298	1999 Hourly	Not used; see Brilliant forebay
		*SP=B0+B1*KCP*KCPQ+B2*SSF*(SSSQ+SSPQ)/KRQ*	1	1	1		≤298		Not used; see Brilliant forebay
KCP	Kootenay Canal Powerplant	*KCP=B0+B1*CLF*	61.038	0.782		830	>650	1999 Hourly	Used 650 m^3/s to indicate use of fourth powerplant
		*KCP=B0+B1*CLF*	8.87	1.054			≤650	1999 Hourly	Model used 140 m^3/s for minimum flow into Corra Linn Powerplant
BF	Brilliant Forebay	*BF=B0+B1*Log(KRQ*B2)*	-1056	106	35.34		>623	1999 Hourly	Brilliant forebay is set to 0; Equation converts Q to CFS
BP	Brilliant Powerplant	See Aspen Applied Sciences (2000)							
BS	Brilliant Spillway	See Aspen Applied Sciences (2000)							
BT	Brilliant Tailrace	See Aspen Applied Sciences (2000)							

Site	Location	Equation[1]	Coefficients			Hydraulic Capacity (m^3/s)	Discharge Range Applicable (m^3/s)	Data Used for Model[2]	Comments
			B0	B1	B2				
PRQ	**Pend d'Oreille River (measured at Seven Mile Dam)**								
BOF	Boundary Forebay/Box Canyon Tailrace	*BOF=B0+B1*Log(PRQ*B2)*	-2157	209	35.34	870	>870	1999 Hourly	Upstream bound on beginning spill derived empirically. Assumes upstream TGP= 0 when PRQ<870 m^3/s
BOP	Boundary Powerplant	*BOP=BOF*				1472	>870		Powerplant TGP was assumed only during non spill periods
BOS	Boundary Spillway	*BOS=B0+B1*Log(PRQ*B2)*	-252	46.1	35.34	3454	>1472	1999 Hourly	Sluiceways used above 3454 m^3/s; Assumes powerplant flow is entrained when spill occurs
BOSL	Boundary Sluiceway	*BOSL=B0+B1*Log(PRQ*B2)*	-178.1	44.57	35.34		>3454	1999 Hourly	Boundary calculations convert Q to CFS
BOT	Boundary Tailrace	*BOT=BOS*					>1472		BOT=BOP <=870 m^3/s
		BOT=BOSL					>3454		
SMF	Seven Mile Forebay	*SMF=BOT*					All		
SMP	Seven Mile Powerplant	*SMP=SMF*				1020	All		
SMS	Seven Mile Spillway	*SMS=SMF-(B0+B1*Log(SMF)+B2*Log((PRQ-SMPQ)))*	-542	-82	224		>1020	1995-1998 Hourly	
SMT	Seven Mile Tailrace	*SMT=((SMPQ*SMF)+(SMSQ*SMS))/(PRQ)*					All	1995-1998 Hourly	Tailrace equates to forebay at PRQ<=1020 m^3/s
WF	Waneta Forebay	*WF=SMT*					All		
WP	Waneta Powerplant	*WP=WF*				680	All		
WS	Waneta Spillway	*WS=B0+B1*LOG(PRQ-WSQ)*	6.435	24.235			>680	1999 Hourly	Likely an underestimate of spillway entrainment at higher flows.
CRQ	**Columbia River (Sum of Birchbank discharge and Pend d'Oreille discharge measured at Seven Mile)**								
CIBW	U.S. Boundary (CIBW)	*CIBW=((BBQ*BB)+(WSQ*WS)+(WPQ*WP))/CRQ*							
BB	Birchbank (BB)	See Aspen Applied Sciences (2000)							
KT	Keenleyside Tailrace - Robson (KT)	See Aspen Applied Sciences (2000)							
KF	Keenleyside Forebay (KF)	*KF=B0+B1*Log(KRQ*B@)*	-1055.82	105.642	35.34		>623		Equation converts Q to CFS; TGP set to "0" if KRQ<623 m^3/s

[1] Equations use abbreviations to represent TGP expressed as □P at location indicated. The abbreviation followed with the letter "Q" indicates discharge at location indicated by the abbreviation.

[2] Data were provided by Seattle City and Light (Boundary Dam tailrace and forebay), BC Hydro (Seven Mile tailrace and forebay), Cominco (Waneta forebay), U.S. Bureau of Reclamation (CIBW U.S. Boundary), and CRIEMP (Keenleyside tailrace and forebay and all Kootenay River sites). Projections for Keenleyside tailrace and forebay, Birchbank, and Brilliant tailrace were provided by Aspen Applied Sciences (2000).

Note: Equations were based on 1999 monitoring data except for Seven Mile Dam, which was based on 1995-1998 monitoring data.

APPENDIX B

Table B1. Summary of TGP Exceedence Data for the Columbia River. Values listed are the proportion of the time when the TGP values given were consecutively exceeded by equal to or more than the number of days listed.

Consecutive Days of Exceedence	Proportion[1]											
	Columbia River U.S. Boundary				Columbia River at Birchbank				Columbia River /Keenleyside Tailrace			
	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%
1	0.39	0.24	0.11	0.00	0.46	0.31	0.14	0.00	0.40	0.22	0.13	0.08
2	0.37	0.22	0.10	0.00	0.44	0.29	0.12	0.00	0.39	0.20	0.11	0.07
3	0.36	0.21	0.10	0.00	0.42	0.28	0.10	0.00	0.37	0.19	0.10	0.06
4	0.35	0.20	0.09	0.00	0.41	0.26	0.09	0.00	0.36	0.17	0.08	0.05
5	0.34	0.19	0.08	0.00	0.40	0.25	0.08	0.00	0.35	0.16	0.07	0.05
6	0.33	0.18	0.08	0.00	0.39	0.25	0.07	0.00	0.34	0.15	0.06	0.04
7	0.33	0.18	0.07	0.00	0.38	0.24	0.07	0.00	0.33	0.15	0.05	0.03
8	0.32	0.17	0.07	0.00	0.37	0.23	0.06	0.00	0.33	0.14	0.05	0.03
9	0.32	0.16	0.07	0.00	0.37	0.23	0.06	0.00	0.32	0.14	0.04	0.03
10	0.31	0.16	0.07	0.00	0.36	0.22	0.05	0.00	0.31	0.13	0.04	0.02
11	0.31	0.15	0.06	0.00	0.35	0.21	0.05	0.00	0.30	0.13	0.03	0.02
12	0.30	0.15	0.06	0.00	0.35	0.21	0.04	0.00	0.30	0.12	0.03	0.02
13	0.30	0.15	0.06	0.00	0.35	0.20	0.04	0.00	0.29	0.12	0.03	0.02
14	0.29	0.14	0.06	0.00	0.34	0.20	0.04	0.00	0.29	0.12	0.02	0.01
15	0.29	0.14	0.05	0.00	0.34	0.19	0.03	0.00	0.28	0.11	0.02	0.01
16	0.28	0.13	0.05	0.00	0.33	0.19	0.03	0.00	0.27	0.11	0.02	0.01
17	0.28	0.13	0.05	0.00	0.33	0.18	0.03	0.00	0.27	0.10	0.02	0.01
18	0.28	0.13	0.05	0.00	0.32	0.18	0.03	0.00	0.26	0.10	0.02	0.01
19	0.27	0.12	0.05	0.00	0.32	0.17	0.02	0.00	0.26	0.10	0.01	0.01
20	0.27	0.12	0.05	0.00	0.32	0.17	0.02	0.00	0.25	0.09	0.01	0.01
21	0.26	0.12	0.04	0.00	0.31	0.17	0.02	0.00	0.24	0.09	0.01	0.01
22	0.26	0.11	0.04	0.00	0.31	0.16	0.02	0.00	0.24	0.09	0.01	0.00
23	0.26	0.11	0.04	0.00	0.30	0.16	0.02	0.00	0.23	0.09	0.01	0.00
24	0.25	0.11	0.04	0.00	0.30	0.15	0.02	0.00	0.23	0.08	0.01	0.00
25	0.25	0.11	0.04	0.00	0.29	0.15	0.01	0.00	0.22	0.08	0.01	0.00
26	0.25	0.10	0.04	0.00	0.29	0.15	0.01	0.00	0.22	0.08	0.01	0.00
27	0.24	0.10	0.04	0.00	0.29	0.15	0.01	0.00	0.22	0.08	0.01	0.00
28	0.24	0.10	0.03	0.00	0.28	0.14	0.01	0.00	0.21	0.07	0.00	0.00
29	0.24	0.09	0.03	0.00	0.28	0.14	0.01	0.00	0.21	0.07	0.00	0.00
30	0.23	0.09	0.03	0.00	0.28	0.14	0.01	0.00	0.21	0.07	0.00	0.00
40	0.20	0.07	0.02	0.00	0.24	0.11	0.00	0.00	0.17	0.05	0.00	0.00
50	0.18	0.05	0.01	0.00	0.20	0.09	0.00	0.00	0.15	0.03	0.00	0.00
60	0.15	0.03	0.00	0.00	0.17	0.07	0.00	0.00	0.12	0.02	0.00	0.00
70	0.13	0.02	0.00	0.00	0.14	0.05	0.00	0.00	0.10	0.01	0.00	0.00

Consecutive Days of Exceedence	Proportion[1]											
	Columbia River U.S. Boundary				Columbia River at Birchbank				Columbia River /Keenleyside Tailrace			
	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%
80	0.11	0.01	0.00	0.00	0.12	0.04	0.00	0.00	0.08	0.01	0.00	0.00
90	0.09	0.00	0.00	0.00	0.10	0.02	0.00	0.00	0.06	0.00	0.00	0.00
100	0.06	0.00	0.00	0.00	0.08	0.02	0.00	0.00	0.04	0.00	0.00	0.00

[1] Values listed are model projections from the Aspen Applied Science Keenleyside Model except for the U.S. Boundary, which is a mass balance projection using the Birchbank projection and the Waneta Dam tailrace projection (Appendix A, Table A3), applied to the hydrographic data for the years 1991-1999. Shaded areas indicate conditions with reduced probability of developing acute GBT (Bonnie Antcliffe, DFO, Vancouver, pers. comm., 2001), Department. Methods for the projections other than the U.S. Boundary are described by Aspen Applied Sciences (2000).

Table B2. Summary of TGP Exceedence Data for the Kootenay River. Values listed are the proportion of the time when the TGP values given were consecutively exceeded by equal to or more than the number of days listed.

Consecutive Days of Exceedence	Proportion [1]																							
	Brilliant Tailrace				Brilliant Forebay				Kootenay Canal Tailrace				Lower Bonnington Tailrace/ South Slocan Forebay				Upper Bonnington Tailrace/ Lower Bonnington Forebay				Corra Linn Tailrace/ Upper Bonnington Forebay			
	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%
1	0.43	0.26	0.14	0.00	0.20	0.09	0.01	0.00	0.20	0.01	0.00	0.00	0.19	0.14	0.11	0.07	0.12	0.07	0.01	0.00	0.09	0.01	0.00	0.00
2	0.41	0.26	0.14	0.00	0.19	0.09	0.01	0.00	0.19	0.01	0.00	0.00	0.18	0.13	0.11	0.07	0.11	0.07	0.01	0.00	0.08	0.01	0.00	0.00
3	0.39	0.25	0.13	0.00	0.19	0.09	0.01	0.00	0.18	0.00	0.00	0.00	0.18	0.13	0.10	0.06	0.11	0.06	0.01	0.00	0.08	0.01	0.00	0.00
4	0.38	0.24	0.13	0.00	0.18	0.08	0.01	0.00	0.17	0.00	0.00	0.00	0.17	0.12	0.10	0.06	0.11	0.06	0.01	0.00	0.08	0.01	0.00	0.00
5	0.37	0.24	0.13	0.00	0.18	0.08	0.01	0.00	0.17	0.00	0.00	0.00	0.17	0.12	0.10	0.06	0.10	0.06	0.01	0.00	0.07	0.01	0.00	0.00
6	0.36	0.23	0.12	0.00	0.17	0.08	0.01	0.00	0.16	0.00	0.00	0.00	0.17	0.11	0.10	0.06	0.10	0.06	0.01	0.00	0.07	0.00	0.00	0.00
7	0.35	0.23	0.12	0.00	0.17	0.08	0.01	0.00	0.16	0.00	0.00	0.00	0.16	0.11	0.09	0.06	0.10	0.05	0.01	0.00	0.07	0.00	0.00	0.00
8	0.34	0.22	0.11	0.00	0.17	0.07	0.01	0.00	0.15	0.00	0.00	0.00	0.16	0.11	0.09	0.05	0.10	0.05	0.01	0.00	0.06	0.00	0.00	0.00
9	0.33	0.22	0.11	0.00	0.16	0.07	0.01	0.00	0.15	0.00	0.00	0.00	0.16	0.11	0.09	0.05	0.09	0.05	0.01	0.00	0.06	0.00	0.00	0.00
10	0.33	0.21	0.11	0.00	0.16	0.07	0.01	0.00	0.15	0.00	0.00	0.00	0.15	0.10	0.09	0.05	0.09	0.05	0.01	0.00	0.06	0.00	0.00	0.00
11	0.32	0.21	0.10	0.00	0.16	0.07	0.00	0.00	0.14	0.00	0.00	0.00	0.15	0.10	0.08	0.05	0.09	0.05	0.00	0.00	0.06	0.00	0.00	0.00
12	0.31	0.21	0.10	0.00	0.15	0.07	0.00	0.00	0.14	0.00	0.00	0.00	0.15	0.10	0.08	0.05	0.09	0.05	0.00	0.00	0.05	0.00	0.00	0.00
13	0.31	0.20	0.10	0.00	0.15	0.06	0.00	0.00	0.14	0.00	0.00	0.00	0.14	0.10	0.08	0.04	0.08	0.04	0.00	0.00	0.05	0.00	0.00	0.00
14	0.30	0.20	0.10	0.00	0.15	0.06	0.00	0.00	0.13	0.00	0.00	0.00	0.14	0.09	0.08	0.04	0.08	0.04	0.00	0.00	0.05	0.00	0.00	0.00
15	0.30	0.20	0.09	0.00	0.14	0.06	0.00	0.00	0.13	0.00	0.00	0.00	0.14	0.09	0.08	0.04	0.08	0.04	0.00	0.00	0.05	0.00	0.00	0.00
16	0.29	0.19	0.09	0.00	0.14	0.06	0.00	0.00	0.13	0.00	0.00	0.00	0.13	0.09	0.07	0.04	0.08	0.04	0.00	0.00	0.05	0.00	0.00	0.00
17	0.29	0.19	0.09	0.00	0.14	0.06	0.00	0.00	0.12	0.00	0.00	0.00	0.13	0.09	0.07	0.04	0.08	0.04	0.00	0.00	0.04	0.00	0.00	0.00
18	0.28	0.18	0.09	0.00	0.14	0.05	0.00	0.00	0.12	0.00	0.00	0.00	0.13	0.08	0.07	0.04	0.07	0.04	0.00	0.00	0.04	0.00	0.00	0.00
19	0.28	0.18	0.08	0.00	0.13	0.05	0.00	0.00	0.12	0.00	0.00	0.00	0.13	0.08	0.07	0.04	0.07	0.03	0.00	0.00	0.04	0.00	0.00	0.00
20	0.27	0.18	0.08	0.00	0.13	0.05	0.00	0.00	0.11	0.00	0.00	0.00	0.12	0.08	0.07	0.03	0.07	0.03	0.00	0.00	0.04	0.00	0.00	0.00
21	0.27	0.17	0.08	0.00	0.13	0.05	0.00	0.00	0.11	0.00	0.00	0.00	0.12	0.08	0.06	0.03	0.07	0.03	0.00	0.00	0.04	0.00	0.00	0.00
22	0.26	0.17	0.08	0.00	0.12	0.05	0.00	0.00	0.11	0.00	0.00	0.00	0.12	0.08	0.06	0.03	0.06	0.03	0.00	0.00	0.03	0.00	0.00	0.00
23	0.26	0.17	0.08	0.00	0.12	0.05	0.00	0.00	0.11	0.00	0.00	0.00	0.11	0.07	0.06	0.03	0.06	0.03	0.00	0.00	0.03	0.00	0.00	0.00
24	0.25	0.16	0.07	0.00	0.12	0.04	0.00	0.00	0.10	0.00	0.00	0.00	0.11	0.07	0.06	0.03	0.06	0.03	0.00	0.00	0.03	0.00	0.00	0.00
25	0.25	0.16	0.07	0.00	0.11	0.04	0.00	0.00	0.10	0.00	0.00	0.00	0.11	0.07	0.06	0.03	0.06	0.03	0.00	0.00	0.03	0.00	0.00	0.00
26	0.24	0.15	0.07	0.00	0.11	0.04	0.00	0.00	0.10	0.00	0.00	0.00	0.11	0.07	0.05	0.02	0.06	0.02	0.00	0.00	0.03	0.00	0.00	0.00
27	0.24	0.15	0.07	0.00	0.11	0.04	0.00	0.00	0.09	0.00	0.00	0.00	0.10	0.07	0.05	0.02	0.06	0.02	0.00	0.00	0.03	0.00	0.00	0.00
28	0.24	0.15	0.07	0.00	0.11	0.04	0.00	0.00	0.09	0.00	0.00	0.00	0.10	0.06	0.05	0.02	0.05	0.02	0.00	0.00	0.02	0.00	0.00	0.00
29	0.23	0.14	0.06	0.00	0.10	0.04	0.00	0.00	0.09	0.00	0.00	0.00	0.10	0.06	0.05	0.02	0.05	0.02	0.00	0.00	0.02	0.00	0.00	0.00
30	0.23	0.14	0.06	0.00	0.10	0.03	0.00	0.00	0.09	0.00	0.00	0.00	0.10	0.06	0.05	0.02	0.05	0.02	0.00	0.00	0.02	0.00	0.00	0.00
40	0.18	0.11	0.04	0.00	0.08	0.02	0.00	0.00	0.06	0.00	0.00	0.00	0.07	0.04	0.03	0.01	0.03	0.01	0.00	0.00	0.01	0.00	0.00	0.00
50	0.14	0.09	0.03	0.00	0.06	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.05	0.03	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Consecutive Days of Exceedence	Proportion [1]																							
	Brilliant Tailrace				Brilliant Forebay				Kootenay Canal Tailrace				Lower Bonnington Tailrace/ South Slocan Forebay				Upper Bonnington Tailrace/ Lower Bonnington Forebay				Corra Linn Tailrace/ Upper Bonnington Forebay			
	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%
60	0.11	0.06	0.01	0.00	0.04	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70	0.09	0.05	0.01	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80	0.06	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[1] For example, Brilliant forebay TGP of 115% was exceeded by three or more consecutive days 8.7% of the time. Values listed are model projections from the 1999 monitoring data and applied to the hydrographic data for the years 1991-1999. Shaded areas indicate conditions with reduced probability of developing acute GBT (Bonnie Antcliffe, DFO, Vancouver, pers. comm., 2001). Equations used for projections are listed in Appendix A. Kootenay Lake outflow did not exceed 110%.

Table B3. Summary of TGP Exceedence Data for the Pend d'Oreille River. Values listed are the Proportion of the time when the TGP values given were consecutively exceeded by equal to or more than the number of days listed.

Consecutive Days of Exceedance	Proportion[1]															
	Waneta Spillway				Seven-Mile Tailrace/ Waneta Forebay				Boundary Tailrace/ Seven Mile Forebay				Boundary Forebay/ Box Canyon Tailrace			
	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%
1	38.82%	30.24%	16.55%	0.00%	17.10%	14.18%	12.14%	1.83%	16.46%	14.21%	12.38%	10.68%	13.72%	9.89%	6.42%	1.79%
2	35.17%	26.99%	15.70%	0.00%	16.12%	13.33%	11.38%	1.73%	15.52%	13.36%	11.65%	10.04%	13.02%	9.19%	6.05%	1.61%
3	32.92%	25.22%	15.12%	0.00%	15.33%	12.53%	10.71%	1.64%	14.66%	12.56%	10.98%	9.43%	12.50%	8.52%	5.81%	1.52%
4	31.15%	23.91%	14.66%	0.00%	14.60%	11.83%	10.10%	1.55%	13.87%	11.86%	10.40%	8.88%	11.99%	7.94%	5.60%	1.43%
5	29.60%	22.97%	14.24%	0.00%	13.90%	11.32%	9.64%	1.46%	13.23%	11.35%	9.95%	8.46%	11.53%	7.48%	5.38%	1.34%
6	28.32%	22.27%	13.81%	0.00%	13.23%	10.80%	9.22%	1.37%	12.60%	10.83%	9.52%	8.06%	11.07%	7.09%	5.20%	1.25%
7	27.29%	21.66%	13.42%	0.00%	12.60%	10.31%	8.82%	1.28%	12.05%	10.34%	9.13%	7.70%	10.68%	6.69%	5.02%	1.22%
8	26.29%	21.11%	13.05%	0.00%	12.08%	9.89%	8.52%	1.19%	11.59%	9.95%	8.82%	7.42%	10.31%	6.39%	4.84%	1.19%
9	25.40%	20.60%	12.69%	0.00%	11.62%	9.55%	8.24%	1.10%	11.17%	9.61%	8.55%	7.18%	9.95%	6.11%	4.65%	1.16%
10	24.61%	20.08%	12.35%	0.00%	11.20%	9.22%	7.97%	1.03%	10.77%	9.28%	8.28%	6.94%	9.61%	5.84%	4.47%	1.13%
11	23.91%	19.59%	12.02%	0.00%	10.77%	8.88%	7.70%	0.97%	10.37%	8.94%	8.00%	6.69%	9.28%	5.57%	4.32%	1.10%
12	23.24%	19.14%	11.68%	0.00%	10.34%	8.55%	7.42%	0.91%	9.98%	8.61%	7.73%	6.45%	8.94%	5.29%	4.17%	1.06%
13	22.60%	18.71%	11.35%	0.00%	9.95%	8.21%	7.15%	0.85%	9.61%	8.28%	7.45%	6.21%	8.64%	5.02%	4.02%	1.03%
14	21.97%	18.31%	11.01%	0.00%	9.55%	7.88%	6.88%	0.79%	9.25%	7.94%	7.18%	5.96%	8.34%	4.81%	3.86%	1.00%
15	21.36%	17.95%	10.71%	0.00%	9.16%	7.54%	6.60%	0.76%	8.88%	7.61%	6.91%	5.72%	8.03%	4.59%	3.71%	0.97%
16	20.81%	17.61%	10.40%	0.00%	8.79%	7.21%	6.33%	0.73%	8.52%	7.27%	6.63%	5.48%	7.76%	4.38%	3.56%	0.94%
17	20.26%	17.31%	10.10%	0.00%	8.49%	6.94%	6.08%	0.70%	8.21%	7.00%	6.39%	5.26%	7.51%	4.20%	3.41%	0.91%
18	19.74%	17.04%	9.80%	0.00%	8.21%	6.72%	5.87%	0.67%	7.94%	6.78%	6.18%	5.08%	7.27%	4.05%	3.26%	0.88%
19	19.26%	16.76%	9.49%	0.00%	7.94%	6.51%	5.66%	0.64%	7.67%	6.57%	5.96%	4.90%	7.03%	3.89%	3.10%	0.85%
20	18.83%	16.52%	9.22%	0.00%	7.70%	6.30%	5.45%	0.61%	7.42%	6.36%	5.75%	4.72%	6.81%	3.74%	2.95%	0.82%
21	18.47%	16.28%	9.01%	0.00%	7.45%	6.08%	5.23%	0.58%	7.18%	6.15%	5.54%	4.53%	6.60%	3.59%	2.80%	0.79%
22	18.13%	16.03%	8.79%	0.00%	7.21%	5.87%	5.02%	0.55%	6.94%	5.93%	5.32%	4.35%	6.39%	3.44%	2.65%	0.76%
23	17.80%	15.79%	8.58%	0.00%	6.97%	5.66%	4.81%	0.52%	6.69%	5.72%	5.11%	4.17%	6.18%	3.29%	2.49%	0.73%
24	17.49%	15.55%	8.37%	0.00%	6.72%	5.45%	4.59%	0.49%	6.45%	5.51%	4.90%	3.99%	5.96%	3.13%	2.34%	0.70%
25	17.19%	15.30%	8.15%	0.00%	6.48%	5.23%	4.38%	0.46%	6.21%	5.29%	4.69%	3.80%	5.78%	2.98%	2.22%	0.67%
26	16.92%	15.06%	7.94%	0.00%	6.24%	5.02%	4.17%	0.43%	5.96%	5.08%	4.47%	3.62%	5.60%	2.83%	2.10%	0.64%
27	16.64%	14.82%	7.73%	0.00%	5.99%	4.81%	3.95%	0.40%	5.72%	4.87%	4.26%	3.44%	5.42%	2.68%	1.98%	0.61%
28	16.37%	14.57%	7.51%	0.00%	5.75%	4.59%	3.77%	0.37%	5.48%	4.65%	4.08%	3.26%	5.23%	2.53%	1.89%	0.58%
29	16.09%	14.33%	7.30%	0.00%	5.51%	4.38%	3.59%	0.33%	5.23%	4.44%	3.89%	3.07%	5.05%	2.37%	1.79%	0.55%
30	15.82%	14.09%	7.09%	0.00%	5.26%	4.17%	3.41%	0.30%	4.99%	4.23%	3.71%	2.89%	4.87%	2.22%	1.70%	0.52%
40	13.17%	11.80%	4.84%	0.00%	3.50%	2.74%	2.01%	0.00%	3.22%	2.80%	2.31%	1.49%	3.13%	1.16%	0.85%	0.18%
50	11.04%	9.98%	3.10%	0.00%	2.37%	1.76%	1.03%	0.00%	2.19%	1.83%	1.34%	0.61%	2.19%	0.61%	0.55%	0.00%

Consecutive Days of Exceedance	Proportion[1]															
	Waneta Spillway				Seven-Mile Tailrace/ Waneta Forebay				Boundary Tailrace/ Seven Mile Forebay				Boundary Forebay/ Box Canyon Tailrace			
	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%	110%	115%	120%	130%
60	9.19%	8.18%	2.19%	0.00%	1.58%	1.16%	0.43%	0.00%	1.58%	1.22%	0.73%	0.30%	1.58%	0.30%	0.24%	0.00%
70	7.64%	6.66%	1.58%	0.00%	0.97%	0.55%	0.00%	0.00%	0.97%	0.61%	0.18%	0.00%	0.97%	0.00%	0.00%	0.00%
80	6.11%	5.14%	0.97%	0.00%	0.37%	0.00%	0.00%	0.00%	0.37%	0.03%	0.00%	0.00%	0.37%	0.00%	0.00%	0.00%
90	4.59%	3.80%	0.37%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
100	3.35%	2.74%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[1] Values listed are model projections from the 1995-1998 (Seven Mile) and 1999 (all others) monitoring data and applied to the hydrographic data for the years 1991-1999. Shaded areas indicate conditions with reduced probability of developing acute GBT (Bonnie Antcliffe, DFO, Vancouver, pers. comm., 2001). Equations used for projections are listed in Appendix A.

APPENDIX C

FISH HABITAT USE AND TGP RISK

River: *Columbia River* **River Section:** *Columbia-Kootenay Confluence to Keenleyside Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT *(Status: Abundant)*									
Spring	Low	Spawning	High	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Low	40-50% of mainstem Columbia/Kooteney spawning population present; ~500 redds.
	Low	Egg Incubation	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	Egg incubation occurs sub-gravel. Late spawn incubation may be subject to high TGP
	Low	Fry Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Low	
	Low	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	
Summer	High	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	Buffered due to depth; late spawn incubation may be subject to high TGP.
	High	Fry Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	High	Rated as high, should be moderate accoring to matrix
	High	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	High	Rated as high, should be moderate accoring to matrix
	High	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Moderate	Moderate to high TGP risk rating
	High	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	
Fall	High	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Medium	0 - 3 m	All	Night	<12 h	Moderate	Varying depth from 0 to 3 m. Moderate to high TGP risk rating
	High	Adult Holding & Feeding	Medium	>3 m	All	Day	>12 h	Low	
Winter	Low	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Medium	0 - 3 m	All	Night	>12 h	Low	
	Low	Adult Holding & Feeding	Medium	>3 m	All	Day	<12 h	Low	
WHITE STURGEON *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)*									
Spring	Low	Adult Holding & Feeding	High	>3 m	All	Both	24 h	Low	
Summer	High	Adult Holding & Feeding	High	>3 m	All	Both	24 h	Low	
Fall	High	Adult Holding & Feeding	High	>3 m	All	Both	24 h	Low	
Winter	Low	Adult Holding & Feeding	High	>3 m	Low (<25 cm/s)	Both	24 h	Low	
KOKANEE *(Status: Abundant)*									
Spring	Low	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Juvenile/Subadult Rearing	Medium	>3 m	Low (<25 cm/s)	Day	>12 h	Low	
	Low	Juvenile/Subadult Rearing	Medium	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	Some feeding in shallows
Summer	High	Juvenile/Subadult Rearing	High	>3 m	Low (<25 cm/s)	Day	>12 h	Low	
	High	Juvenile/Subadult Rearing	High	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Moderate	May be at risk of high TGP if long duration in shallows
Fall	High	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	Not rated	Sporadic with questionable success within and between years
	High	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	Not rated	Poor quality of eggs and fish
	High	Juvenile Rearing	High	>3 m	Low (<25 cm/s)	Day	>12 h	Low	
	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	Large numbers below Keenleyside Dam (>1000 fish); will die within a few weeks

FISH HABITAT USE AND TGP RISK

River: *Columbia River* **River Section:** *Columbia-Kootenay Confluence to Keenleyside Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Winter	Low	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Juvenile/Subadult Rearing	High	0 - 3 m	Low (<25 cm/s)	Day	<12 h	Low	Juvenile and subadult rearing.
	Low	Juvenile/Subadult Rearing	High	>3 m	Low (<25 cm/s)	Night	>12 h	Low	More susceptible if long duration in shallow water
BURBOT *(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)*									
Spring	Low	Pelagic	Low	<1 m	High (>75 cm/s)	Both	24 h	Low	All information from literature (McPhail 1997)
	Low	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Hatch in early spring
	Low	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	May move into shallows at night to feed
Summer	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*	24 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Fall	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Winter	Low	Spawning	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Spawning locations unknown
	Low	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Egg incubation areas unknown
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
MOUNTAIN WHITEFISH *(Status: Abundant)*									
Spring	Low	Fry Rearing	Medium	<1 m	Low (<25 cm/s)	Both	24 h	Low	Tincup Rapids, embayments, etc.
	Low	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both		Low	
	Low	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Both		Low	
Summer	High	YOY	Medium	0 - 3 m	Medium (25 -75 cm/s)	Day	>12 h	Moderate	Young-of-the-year (life stage)
	High	YOY	Medium	<1 m	Low (<25 cm/s)	Night	<12 h	High	
	High	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	1+ age classes
	High	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	May be succeptable in shallow water at night
Fall	Low	Spawning	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Low	Spill ends before spawning starts
	Low	Egg Incubation	High	0 - 3 m	High (>75 cm/s)	Both	24 h	Low	Spill ends before spawning starts
	High	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	More rearing in fall; possibly u/s migration
	High	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	Nighttime use of shallow water may make susceptible
Winter	Low	Spawning	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Low	
	Low	Egg Incubation	High	0 - 3 m	High (>75 cm/s)	Both	24 h	Low	
	Low	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day	<12 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	>12 h	Low	
BULL TROUT *(Status: BLUE listed by BC)*									
Spring	Low	Egg Incubation	Nil					Not rated	Incubation and rearing in tributaries
	Low	Fry Rearing	Nil					Not rated	Spawn and rear in tributaries

FISH HABITAT USE AND TGP RISK

River: *Columbia River* **River Section:** *Columbia-Kootenay Confluence to Keenleyside Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Low	Juvenile Rearing	Low	nd*				Low	Larger juveniles may be present in river
	Low	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Nil					Not rated	Spawning in late summer/fall in tributaries (e.g., Norns Creek)
	High	Fry Rearing	Nil					Not rated	
	High	Juvenile Rearing	Low	nd*				Moderate	Larger juveniles may be present in river
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	Very low numbers of bull trout present
Fall	High	Spawning	Nil					Not rated	Spawning and rearing occurs in tributaries
	High	Juvenile Rearing	Low	nd*				Moderate	Larger juveniles may be present in river
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	Very low numbers of bull trout present
Winter	Low	Juvenile Rearing	Low	nd*				Low	Larger juveniles may be present in river
	Low	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
WALLEYE ***(Status: Common)***									
Spring	Low	Spawning	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Low	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Low	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Low	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Summer	High	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Fall	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Winter	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Low	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
SHORTHEAD SCULPIN ***(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)***									
Spring	Low	Spawning	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Likely spawn in tributaries
	Low	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Incubation likely occurs in tributaries
	Low	Fry Rearing	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Likely rear in tributaries
	Low	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Likely rear in tributaries
	Low	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			Low	
Summer	High	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Likely rear in tributaries
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
Fall	High	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Likely rear in tributaries
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	

FISH HABITAT USE AND TGP RISK

River: *Columbia River* **River Section:** *Columbia-Kootenay Confluence to Keenleyside Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Winter	Low	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)			Not rated	Likely rear in tributaries
	Low	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			Low	
MOTTLED SCULPIN ***(Status: Blue listed in BC; listed as 'Species of Special Concern" by COSEWIC)***									
Spring	Low	Spawning	Low	nd*	nd*			Not rated	*nd= no data
	Low	Egg Incubation	Low	nd*	nd*			Not rated	*nd= no data
	Low	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Low	nd*	nd*			Not rated	*nd= no data
	High	Egg Incubation	Low	nd*	nd*	Both	24 h	Not rated	*nd= no data
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
Fall	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
Winter	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
UMATILLA DACE ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)***									
Spring	Low	Spawning	Low	nd*	nd*			Low	*nd= no data
	Low	Egg Incubation	Low	nd*	nd*	Both	24 h	Low	*nd= no data
	Low	Fry Rearing	Low	nd*	Low (<25 cm/s)			Low	
	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Day	>12 h	Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Low	nd*	nd*				*nd= no data
	High	Egg Incubation	Low	nd*	nd*				*nd= no data
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Fall	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Day	>12 h	High	
	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Day	<12 h	Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	>12 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
REDSIDE SHINER ***(Status: Abundant)***									
Spring	Low	Spawning	High	<1 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Egg Incubation	High	<1 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Fry Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Juvenile Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	High	<1 m	Medium (25 -75 cm/s)	Both	24 h	High	

FISH HABITAT USE AND TGP RISK

River: *Columbia River* **River Section:** *Columbia-Kootenay Confluence to Keenleyside Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	High	Egg Incubation	High	<1 m	Medium (25 -75 cm/s)	Both	24 h	High	
	High	Fry Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Juvenile Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Fall	High	Juvenile Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Low	Juvenile Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
LARGESCALE SUCKER ***(Status: Abundant)***									
Spring	Low	Spawning	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	*nd= no data
	Low	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	*nd= no data
	Low	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		Low	*nd= no data
	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	*nd= no data
	Low	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Low	*nd= no data
Summer	High	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		High	*nd= no data
	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	*nd= no data
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	*nd= no data
Fall	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	*nd= no data
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	*nd= no data
Winter	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	*nd= no data
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	>12 h	Low	Feeding on Mountain whitefish eggs

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia River* **River Section:** *Columbia-Pend d'Oreille Confluence to Columbia-Kootenay Confluence*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT *(Status: Abundant)*									
Spring	Moderate	Spawning	High	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Low	40-50% of spawning took place at Gennelle and Champion Fan
	Moderate	Egg Incubation	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Fry Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	Mitigated by depth of use
	Moderate	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	Mitigated by depth of use
Summer	High	Egg Incubation	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Fry Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Moderate	Risk dependant on duration in shallows
	High	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	
Fall	High	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	
Winter	Moderate	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	42% of the time there is a spill at Brilliant Reservoir. Low TGP risk rating due to diel cycles.
	Moderate	Adult Holding & Feeding	High	0 - 3 m	All	Night	>12 h	Low	Mitigated by depth of use
	Moderate	Adult Holding & Feeding	High	>3 m	All	Day	<12 h	Low	
WHITE STURGEON *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)*									
Spring	Moderate	Adult Holding & Feeding	Medium	>3 m	All	Both	24 h	Low	
Summer	High	Adult Holding & Feeding	Medium	>3 m	All	Both	24 h	Low	
Fall	High	Adult Holding & Feeding	Medium	>3 m	All	Both	24 h	Low	
Winter	Moderate	Adult Holding & Feeding	Medium	>3 m	Low (<25 cm/s)	Both	24 h	Low	
KOKANEE *(Status: Occasional)*									
Spring	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Juvenile/subadult rearing	Low	>3 m	Low (<25 cm/s)	Day	12 - 24 h	Low	
	Moderate	Juvenile/subadult rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	
Summer	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Migration	Moderate	>3 m	All	Both	24 h	Low	Assumed portion of Norns Creek run from Roosevelt.
Fall	High	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	No documented spawning areas identified in recent years.
	High	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	NIL to low spawning
	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Moderate	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	NIL to low spawning

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia River* **River Section:** *Columbia-Pend d'Oreille Confluence to Columbia-Kootenay Confluence*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Moderate	Juvenile/subadult rearing	Low	0 - 3 m	Low (<25 cm/s)	Day	<12 h	Low	
	Moderate	Juvenile/subadult rearing	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	
BURBOT *(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)*									
Spring	Moderate	Pelagic	Low	<1 m	High (>75 cm/s)	Both	24 h	Moderate	All information from literature (McPhail 1997)
	Moderate	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Hatch in early spring
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	May move into shallows at night to feed
Summer	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	May be Moderate, depending on time spent in shallows
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Fall	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	May be High, depending on time spent in shallows
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Winter	Moderate	Spawning	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Spawning locations unknown
	Moderate	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Egg incubation areas unknown
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
MOUNTAIN WHITEFISH *(Status: Abundant)*									
Spring	Moderate	Fry Rearing	High	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Both	24 h	Low	
Summer	High	YOY(Parr)	High	0 - 3 m	Medium (25 -75 cm/s)	Day	>12 h	Moderate	
	High	YOY(Parr)	High	<1 m	Low (<25 cm/s)	Night	<12 h	High	
	High	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	
Fall	Moderate	Spawning	Medium	0 - 3 m	High (>75 cm/s)	Both	24 h	Low	Spill ends before spawning starts.
	Moderate	Egg Incubation	Medium	0 - 3 m	High (>75 cm/s)	Both	24 h	Low	
	High	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Night	24 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	Day	24 h	Moderate	
Winter	Moderate	Spawning	Medium	0 - 3 m	High (>75 cm/s)	Both	24 h	Low	
	Moderate	Egg Incubation	Medium	0 - 3 m	High (>75 cm/s)	Both	24 h	Low	
	Moderate	Juvenile Rearing	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	>12 h	Low	
	Moderate	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day	<12 h	Low	
BULL TROUT *(Status: BLUE listed by BC)*									
Spring	Moderate	Egg Incubation	Nil						Incubation and rearing in tributaries
	Moderate	Fry Rearing	Nil						Spawn and rear in tributaries

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia River* **River Section:** *Columbia-Pend d'Oreille Confluence to Columbia-Kootenay Confluence*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Moderate	Juvenile Rearing	Low	nd*				Moderate	Larger juveniles may be present in river
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Nil						Spawning in late summer/fall in tributaries (e.g., Norns Creek)
	High	Egg Incubation	Nil						
	High	Juvenile Rearing	Low	nd*				Moderate	Larger juveniles may be present in river
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
Fall	High	Spawning	Nil						Spawning and rearing occurs in tributaries
	High	Juvenile Rearing	Low	nd*				Moderate	Larger juveniles may be present in river
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
Winter	Moderate	Juvenile Rearing	Low	nd*				Moderate	Larger juveniles may be present in river
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
WALLEYE ***(Status: Common)***									
Spring	Moderate	Spawning	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Moderate	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Moderate	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Moderate	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Summer	High	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Fall	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Winter	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Moderate	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
SHORTHEAD SCULPIN ***(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)***									
Spring	Moderate	Spawning	Nil	<1 m	Medium (25 -75 cm/s)				Likely spawn in tributaries
	Moderate	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)				Incubation likely occurs in tributaries
	Moderate	Fry Rearing	Nil	<1 m	Medium (25 -75 cm/s)				Likely rear in tributaries
	Moderate	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)				Likely rear in tributaries
	Moderate	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			Moderate	
Summer	High	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)				Likely rear in tributaries
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia River* **River Section:** *Columbia-Pend d'Oreille Confluence to Columbia-Kootenay Confluence*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Fall	High	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)				Likely rear in tributaries
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
Winter	Moderate	Juvenile Rearing	Nil	<1 m	Medium (25 -75 cm/s)				Likely rear in tributaries
	Moderate	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			Moderate	
MOTTLED SCULPIN *(Status: Blue listed in BC; listed as 'Species of Special Concern" by COSEWIC)*									
Spring	Moderate	Spawning	Low	nd*	nd*			Not Rated	*nd= no data
	Moderate	Egg Incubation	Low	nd*	nd*			Not Rated	*nd= no data
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
Summer	High	Spawning	Low	nd*	nd*			Not Rated	*nd= no data
	High	Egg Incubation	Low	nd*	nd*			Not Rated	*nd= no data
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
Fall	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
Winter	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Adult Holding & Feeding	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
UMATILLA DACE *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)*									
Spring	Moderate	Spawning	Medium*	nd*	nd*			Not Rated	*use of section is localized (ie. In eddies)
	Moderate	Egg Incubation	Medium*	nd*	nd*			Not Rated	
	Moderate	Fry Rearing	Medium*	nd*	Low (<25 cm/s)			Not Rated	
	Moderate	Juvenile Rearing	Medium*	<1 m	Low (<25 cm/s)	Day	>12 h	Moderate	
	Moderate	Juvenile Rearing	Medium*	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Medium*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Medium*	nd*	nd*			Not Rated	
	High	Egg Incubation	Medium*	nd*	nd*			Not Rated	
	High	Juvenile Rearing	Medium*	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Medium*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Fall	High	Juvenile Rearing	Medium*	<1 m	Low (<25 cm/s)	Day	>12 h	High	
	High	Juvenile Rearing	Medium*	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Medium*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Moderate	Juvenile Rearing	Medium*	<1 m	Low (<25 cm/s)	Day	<12 h	Moderate	
	Moderate	Juvenile Rearing	Medium*	0 - 3 m	Low (<25 cm/s)	Night	>12 h	Low	
	Moderate	Adult Holding & Feeding	Medium*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
REDSIDE SHINER *(Status: Common)*									
Spring	Moderate	Spawning	Low*	<1 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	*Note= use of section is very localized (ie. In eddies)
	Moderate	Egg Incubation	Low*	<1 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia River* **River Section:** *Columbia-Pend d'Oreille Confluence to Columbia-Kootenay Confluence*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Moderate	Fry Rearing	Low*	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low*	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Adult Holding & Feeding	Low*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Low*	<1 m	Medium (25 -75 cm/s)	Both	24 h	High	
	High	Egg Incubation	Low*	<1 m	Medium (25 -75 cm/s)	Both	24 h	High	
	High	Juvenile Rearing	Low*	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Fall	High	Juvenile Rearing	Low*	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Moderate	Juvenile Rearing	Low*	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Adult Holding & Feeding	Low*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
LARGESCALE SUCKER ***(Status: Abundant)***									
Spring	Moderate	Spawning	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	nd*= no data
	Moderate	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		Moderate	
	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Low	
Summer	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	
Fall	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	
Winter	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	>12 h	Low	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia* **River Section:** *Columbia-Pend d'Oreille Confluence downstream*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT ***(Status: Common)***									
Spring	Moderate	Spawning	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Low	
	Moderate	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Fry Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Juvenile Rearing	Moderate	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Moderate	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Moderate	>3 m	All	Day	>12 h	Low	
Summer	High	Juvenile Rearing	Moderate	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Moderate	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Moderate	>3 m	All	Day	>12 h	Low	
Fall	Moderate	Juvenile Rearing	Moderate	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Moderate	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Moderate	>3 m	All	Day	>12 h	Low	
Winter	Low	Juvenile Rearing	Moderate	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Moderate	0 - 3 m	All	Night	>12 h	Low	
	Low	Adult Holding & Feeding	Moderate	>3 m	All	Day	<12 h	Low	
WHITE STURGEON ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)***									
Spring	Moderate	Spawning	High	>3 m	High (>75 cm/s)	Both		Low	
	Moderate	Egg Incubation	High	>3 m	High (>75 cm/s)	Both		Low	
	Moderate	Swim Up Fry	High	All	High (>75 cm/s)	Both	<12 h	High	Pelagic. Bubbles may form in buccal cavity and result in asphyxiation.
	Moderate	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	All	Both		Low	
Summer	High	Spawning	High	>3 m	High (>75 cm/s)	Both		Low	
	High	Egg Incubation	High	>3 m	High (>75 cm/s)	Both		Low	
	High	Swim Up Fry	High	All	High (>75 cm/s)	Both	<12 h	High	Pelagic. Bubbles may form in buccal cavity and result in asphyxiation.
	High	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	High	Adult Holding & Feeding	High	>3 m	All	Both		Low	
Fall	Moderate	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	Low (<25 cm/s)	Both		Low	
Winter	Low	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	Low	Adult Holding & Feeding	High	>3 m	Low (<25 cm/s)	Both		Low	
KOKANEE ***(Status: Occasional)***									
Spring	Moderate	Fry Rearing	Nil	<1 m	Low (<25 cm/s)	Both	24 h		
	Moderate	Juvenile Rearing	Nil	>3 m	Low (<25 cm/s)	Day	12 - 24 h		
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	
Summer	High	Juvenile Rearing	Nil	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h		

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia* **River Section:** *Columbia-Pend d'Oreille Confluence downstream*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	High	Adult Migration	Moderate	>3 m	All	Both		Low	Assumed portion of Norns Creek run from Roosevelt.
Fall	Moderate	Spawning	Nil	<1 m	Medium (25 -75 cm/s)	Both	24 h		No documented spawning areas identified in recent
	Moderate	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)	Both	24 h		NIL to low spawning
	Moderate	Juvenile Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Both	24 h		
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Low	Egg Incubation	Nil	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h		
	Low	Juvenile/Subadult Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Day	<12 h		
	Low	Juvenile/Subadult Rearing	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	
BURBOT *(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)*									
Spring	Moderate	Pelagic	Low	<1 m	High (>75 cm/s)	Both	24 h	Moderate	All information from literature (McPhail 1997)
	Moderate	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Hatch in early spring
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	May move into shallows at night to feed
Summer	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	May be Moderate, depending on time spent in
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	May be High, depending on time spent in shallows
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Winter	Low	Spawning	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Spawning locations unknown
	Low	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Egg incubation areas unknown
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
MOUNTAIN WHITEFISH *(Status: Abundant)*									
Spring	Moderate	Fry Rearing	Medium	<1 m	Low (<25 cm/s)	Both	>24 h	Moderate	
	Moderate	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day		Low	
	Moderate	Adult Holding & Feeding	Medium	0 - 3 m		Night		Low	
Summer	High	YOY	Medium	0 - 3 m	Medium (25 -75 cm/s)	Day	12	Moderate	Young-of-the-year life stage
	High	Parr	Medium	<1 m	Low (<25 cm/s)	Night	<12 h	High	Parr life stage
	High	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	
Fall	Moderate	Spawning	Low	0 - 3 m	High (>75 cm/s)			Moderate	No data
	Moderate	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Moderate	No data
	Moderate	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day		Low	
Winter	Low	Spawning	Low	0 - 3 m	High (>75 cm/s)			Low	No data

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia* **River Section:** *Columbia-Pend d'Oreille Confluence downstream*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Low	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Low	No data
	Low	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Low	
	Low	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day		Low	
BULL TROUT *(Status: BLUE listed by BC)*									
Spring	Low	Egg Incubation	Low					Not Rated	TGP risk rating= NIL
	Low	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Summer	High	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Fall	Moderate	Spawning	Low	<1 m				Not Rated	TGP risk rating= NIL, Primarily occurs in tributaries
	Moderate	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Winter	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
WALLEYE *(Status: Common)*									
Spring	Low	Spawning	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Low	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Low	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Low	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Summer	High	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	Moderate	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Winter	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Low	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
SHORTHEAD SCULPIN *(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)*									
Spring	Moderate	Egg Incubation	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	*nd= no data; no data available on section use.
	Moderate	Fry Rearing	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
	Moderate	Juvenile Rearing	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia* **River Section:** *Columbia-Pend d'Oreille Confluence downstream*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Moderate	Adult Holding & Feeding	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
Summer	High	Juvenile Rearing	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
	High	Adult Holding & Feeding	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
Fall	Moderate	Juvenile Rearing	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
	Moderate	Adult Holding & Feeding	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
Winter	Low	Juvenile Rearing	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
	Low	Adult Holding & Feeding	nd*	<1 m	Medium (25 -75 cm/s)			Not Rated	
UMATILLA DACE ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)***									
Spring	Moderate	Spawning	nd*	nd*	nd*			Not Rated	*No data on presence of UMD in Pend d'Oreille or Columbia R. d/s Pend d'Oreille (likely not in Pend d'Oreille system).
	Moderate	Egg Incubation	nd*	nd*	nd*			Not Rated	
	Moderate	Fry Rearing	nd*	nd*	Low (<25 cm/s)			Not Rated	
	Moderate	Juvenile Rearing	nd*	<1 m	Low (<25 cm/s)	Day		Not Rated	
	Moderate	Juvenile Rearing	nd*	>1 m	Low (<25 cm/s)	Night		Not Rated	
	Moderate	Adult Holding & Feeding	nd*	>1 m	Low (<25 cm/s)			Not Rated	
Summer	High	Spawning	nd*	nd*	nd*			Not Rated	
	High	Egg Incubation	nd*	nd*	nd*			Not Rated	
	High	Juvenile Rearing	nd*	<1 m	Low (<25 cm/s)	Both		Not Rated	
	High	Adult Holding & Feeding	nd*	>1 m	Low (<25 cm/s)	Both		Not Rated	
Fall	Moderate	Juvenile Rearing	nd*	<1 m	Low (<25 cm/s)	Day		Not Rated	
	Moderate	Juvenile Rearing	nd*	>1 m	Low (<25 cm/s)	Night		Not Rated	
	Moderate	Adult Holding & Feeding	nd*	>1 m	Low (<25 cm/s)	Both		Not Rated	
Winter	Low	Juvenile Rearing	nd*	<1 m	Low (<25 cm/s)	Day		Not Rated	
	Low	Juvenile Rearing	nd*	>1 m	Low (<25 cm/s)	Night		Not Rated	
	Low	Adult Holding & Feeding	nd*	>1 m	Low (<25 cm/s)	Both		Not Rated	
REDSIDE SHINER ***(Status: Common)***									
Spring	Moderate	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both		Moderate	
	Moderate	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)			Moderate	
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)			Moderate	
	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			Moderate	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Low	
Summer	High	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both		High	
	High	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)			High	
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Moderate	
Fall	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			Moderate	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Low	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Columbia* **River Section:** *Columbia-Pend d'Oreille Confluence downstream*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Winter	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Low	
LARGESCALE SUCKER ***(Status: Abundant)***									
Spring	Moderate	Spawning	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	*nd= no data
	Moderate	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		Moderate	
	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Low	
Summer	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	
Fall	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	nd*		Low	
Winter	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	>12 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Low	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Brilliant Dam Head Pond*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT *(Status: Occasional)*									
Spring	High	Spawning	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Moderate	
	High	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Fry Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Summer	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Fall	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Low	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Winter	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	All	Night	>12 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	All	Day	<12 h	Low	
WHITE STURGEON *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)*									
Spring	High	Adult Holding & Feeding	Low	>3 m	All	Both		Low	
Summer	High	Adult Holding & Feeding	Low	>3 m	All	Both		Low	
Fall	Low	Adult Holding & Feeding	Low	>3 m	All	Both		Low	
Winter	High	Adult Holding & Feeding	Low	>3 m	All	Both		Low	
KOKANEE *(Status: Occasional)*									
Spring	Moderate	Fry Rearing	Nil	<1 m	Low (<25 cm/s)	Both	24 h		
	Moderate	Juvenile Rearing	Nil	>3 m	Low (<25 cm/s)	Day	12 - 24 h		
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	
Summer	High	Juvenile Rearing	Nil	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h		
	High	Subadult	Nil	0 - 3 m	Low (<25 cm/s)	Day	<12 h		
	High	Adult Holding & Feeding	Low	>3 m	All	Both	24 h	Low	
Fall	Moderate	Spawning	Nil	<1 m	Medium (25 -75 cm/s)	Both	24 h		
	Moderate	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)	Both	24 h		
	Moderate	Juvenile Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Both	24 h		
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Winter	Low	Spawning	Nil	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h		
	Low	Egg Incubation	Nil						
	Low	Juvenile Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Day	<12 h		
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
BURBOT *(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)*									

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Brilliant Dam Head Pond*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Spring	Moderate	Pelagic	Low	<1 m	High (>75 cm/s)	Both	24 h	Moderate	
	Moderate	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	
Summer	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	
Winter	Low	Spawning	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	
MOUNTAIN WHITEFISH ***(Status: Common)***									
Spring	High	Fry Rearing	nd*	<1 m	Low (<25 cm/s)	Both	>24 h	High	No data, likely low
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both		Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day		Low	No data on day/night use
	High	Adult Holding & Feeding		0 - 3 m	High (>75 cm/s)	Night		Moderate	
Summer	High	YOY	nd*	0 - 3 m	Medium (25 -75 cm/s)	Day	12 h	Moderate	No data, likely low
	High	Parr	nd*	<1 m	Low (<25 cm/s)	Night	<12 h	High	No data, likely low
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	
Fall	Low	Spawning	Low	0 - 3 m	High (>75 cm/s)			Low	May spawn in Slocan River; no data
	Low	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day		Low	
Winter	High	Spawning	Low	0 - 3 m	High (>75 cm/s)			Moderate	No data
	High	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Moderate	
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	High (>75 cm/s)	Day		Low	
BULL TROUT ***(Status: BLUE listed by BC)***									
Spring	Low	Egg Incubation	Low					Not Rated	TGP risk rating= NIL
	Low	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Summer	High	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Brilliant Dam Head Pond*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	High	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Fall	Moderate	Spawning	Low	<1 m				Not Rated	TGP risk rating= NIL, Primarily occurs in tributaries
	Moderate	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Winter	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
WALLEYE ***(Status: Common)***									
Spring	Low	Spawning	Nil					Not Rated	Walleye spawn in tributaries to Lake Roosevelt
	Low	Egg Incubation	Nil					Not Rated	Walleye spawn in tributaries to Lake Roosevelt
	Low	Fry Rearing	Nil					Not Rated	Fry rearing in Lake Roosevelt
	Low	Juvenile Rearing	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
Summer	High	Egg Incubation	Nil					Not Rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil					Not Rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Nil					Not Rated	
	High	Adult Holding & Feeding	Nil					Not Rated	
	High	Adult Holding & Feeding	Nil					Not Rated	
Fall	Moderate	Juvenile Rearing	Nil					Not Rated	
	Moderate	Adult Holding & Feeding	Nil					Not Rated	
	Moderate	Adult Holding & Feeding	Nil					Not Rated	
Winter	Low	Juvenile Rearing	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
SHORTHEAD SCULPIN ***(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)***									
Spring	High	Spawning	Nil	<1 m	Medium (25 -75 cm/s)				NIL
	High	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)				NIL
	High	Fry Rearing	Nil	<1 m	Medium (25 -75 cm/s)				NIL
	High	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			High	*Juveniles may be displaced from Slocan River
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
Summer	High	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			High	*Juveniles may be displaced from Slocan River
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
Fall	Low	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			Low	*Juveniles may be displaced from Slocan River
	Low	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			Low	
Winter	High	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			High	*Juveniles may be displaced from Slocan River
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
UMATILLA DACE ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)***									

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Brilliant Dam Head Pond*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Spring	High	Spawning	Nil						
	High	Egg Incubation	Nil						
	High	Fry Rearing	Nil						
	High	Juvenile Rearing	Nil						
	High	Juvenile Rearing	Nil						
	High	Adult Holding & Feeding	Nil						
Summer	High	Spawning	Nil						
	High	Egg Incubation	Nil						
	High	Juvenile Rearing	Nil						
	High	Adult Holding & Feeding	Nil						
Fall	Low	Juvenile Rearing	Nil						
	Low	Juvenile Rearing	Nil						
	Low	Adult Holding & Feeding	Nil						
Winter	High	Juvenile Rearing	Nil						
	High	Juvenile Rearing	Nil						
	High	Adult Holding & Feeding	Nil						
REDSIDE SHINER ***(Status: Common)***									
Spring	High	Spawning	High	<1 m	Medium (25 -75 cm/s)	Both		High	
	High	Egg Incubation	High	<1 m	Medium (25 -75 cm/s)			High	
	High	Fry Rearing	High	<1 m	Low (<25 cm/s)			High	
	High	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Moderate	
Summer	High	Spawning	High	<1 m	Medium (25 -75 cm/s)	Both		High	
	High	Egg Incubation	High	<1 m	Medium (25 -75 cm/s)			High	
	High	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Moderate	
Fall	Low	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Low	
Winter	High	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Moderate	
LARGESCALE SUCKER ***(Status: Abundant)***									
Spring	High	Spawning	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	nd*= no data
	High	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		High	
	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	
Summer	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Brilliant Dam Head Pond*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Fall	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	nd*		Low	
Winter	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Kootenay-Columbia Confluence to Brilliant Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT *(Status: Common)*									
Spring	High	Spawning	High	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Moderate	Deeper than Gennelle (20% of spawning)
	High	Egg Incubation	High	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Fry Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	Similar to Gennelle
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Moderate	Mitigated due to depth
	High	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	Mitigated due to depth
Summer	High	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	Low to moderate TGP risk rating
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	
Fall	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	All	Night	<12 h	Low	
	Low	Adult Holding & Feeding	High	>3 m	All	Day	>12 h	Low	
Winter	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	All	Night	>12 h	Moderate	
	High	Adult Holding & Feeding	High	>3 m	All	Day	<12 h	Low	
WHITE STURGEON *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)*									
Spring	High	Adult Holding & Feeding	High	>3 m	All			Low	
Summer	High	Adult Holding & Feeding	High	>3 m	All			Low	
Fall	Low	Adult Holding & Feeding	High	>3 m	All			Low	
Winter	High	Adult Holding & Feeding	High	>3 m	Low (<25 cm/s)			Low	
KOKANEE *(Status: Common)*									
Spring	High	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both		High	
	High	Juvenile Rearing	nd*	>3 m	Low (<25 cm/s)	Day		Low	Juvenile/subadult rearing.
	High	Adult Holding & Feeding	nd*	>3 m	Low (<25 cm/s)	Night		Low	Feeding only
Summer	High	Juvenile Rearing	nd*	>3 m		Day		Low	
	High	Subadult	nd*	0 - 3 m		Night		Moderate	May be at risk of high TGP depending on duration in shallows
Fall	Low	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both		Low	
	Low	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)	Both		Low	Sporadic with questionable success within
	Low	Juvenile Rearing	High	>3 m	Low (<25 cm/s)	Both		Low	Poor quality of eggs and fish
	Low	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)	Both		Low	Will die anyway (>1000 fish)
Winter	High	Egg Incubation	Low	0 - 3 m	Low (<25 cm/s)			Moderate	
	High	Juvenile Rearing	High	>3 m	Low (<25 cm/s)	Day		Low	Juvenile and subadult rearing.
	High	Subadult	High	>3 m	Low (<25 cm/s)	Night		Low	More successful if hang around.
BURBOT *(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)*									

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Kootenay-Columbia Confluence to Brilliant Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Spring	High	Pelagic	nd*	<1 m	High (>75 cm/s)	Both	24 h	High	nd*= no data
	High	Egg Incubation	nd*	>3 m	Low (<25 cm/s)	Both	24 h	Low	
	High	Fry Rearing	nd*	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Juvenile Rearing	nd*	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	nd*	>3 m	Low (<25 cm/s)	Both	>12 h	Low	
Summer	High	Juvenile Rearing	nd*	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	nd*	>3 m	Low (<25 cm/s)	nd*		Low	
Fall	Low	Juvenile Rearing	nd*	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	nd*	>3 m	Low (<25 cm/s)	nd*		Low	
Winter	High	Spawning	nd*	>3 m	Low (<25 cm/s)	Both	24 h	Low	
	High	Egg Incubation	nd*	>3 m	Low (<25 cm/s)	Both	24 h	Low	
	High	Juvenile Rearing	nd*	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	nd*	>3 m	Low (<25 cm/s)	nd*		Low	
MOUNTAIN WHITEFISH ***(Status: Abundant)***									
Spring	High	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	>24 h	High	
	High	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both		Moderate	
	High	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day		Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night		Moderate	
Summer	High	YOY	High	0 - 3 m	Medium (25 -75 cm/s)	Day	12 h	Moderate	
	High	Parr	High	<1 m	Low (<25 cm/s)	Night	<12 h	High	
	High	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	High	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	
Fall	Low	Spawning	High	0 - 3 m	High (>75 cm/s)			Low	
	Low	Egg Incubation	High	0 - 3 m	High (>75 cm/s)			Low	
	Low	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day		Low	
Winter	High	Spawning	High	0 - 3 m	High (>75 cm/s)			High	
	High	Egg Incubation	High	0 - 3 m	High (>75 cm/s)			High	
	High	Juvenile Rearing	Medium	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Day		Low	
BULL TROUT ***(Status: BLUE listed by BC)***									
Spring	High	Egg Incubation	Low					Not Rated	TGP risk rating= NIL
	High	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Summer	High	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Kootenay-Columbia Confluence to Brilliant Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	High	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Fall	Low	Spawning	Low	<1 m				Not Rated	TGP risk rating= NIL, Primarily occurs in tributaries
	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Winter	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
WALLEYE ***(Status: Common)***									
Spring	High	Spawning	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Low	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Summer	High	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Low	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Fall	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Low	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Winter	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Low	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
SHORTHEAD SCULPIN ***(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)***									
Spring	High	Spawning	Nil	<1 m	Medium (25 -75 cm/s)				NIL
	High	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)				NIL
	High	Fry Rearing	Nil	<1 m	Medium (25 -75 cm/s)				NIL
	High	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			High	*Juveniles may be displaced from Slocan River
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
Summer	High	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			High	*Juveniles may be displaced from Slocan River
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	
Fall	Low	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			Low	*Juveniles may be displaced from Slocan River
	Low	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			Low	
Winter	High	Juvenile Rearing	Low*	<1 m	Medium (25 -75 cm/s)			High	*Juveniles may be displaced from Slocan River
	High	Adult Holding & Feeding	Low	<1 m	Medium (25 -75 cm/s)			High	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Kootenay-Columbia Confluence to Brilliant Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
UMATILLA DACE *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)*									
Spring	High	Spawning	Medium	nd*	nd*			Not Rated	nd*= no data
	High	Egg Incubation	Medium	nd*	nd*			Not Rated	
	High	Fry Rearing	Medium	nd*	Low (<25 cm/s)			Not Rated	
	High	Juvenile Rearing	Medium	<1 m	Low (<25 cm/s)	Day		High	
	High	Juvenile Rearing	Medium	0 - 3 m	Low (<25 cm/s)	Night		Moderate	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Low (<25 cm/s)			Moderate	
Summer	High	Spawning	Medium	nd*	nd*			Not Rated	
	High	Egg Incubation	Medium	nd*	nd*			Not Rated	
	High	Juvenile Rearing	Medium	<1 m	Low (<25 cm/s)	Both		High	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Low (<25 cm/s)	Both		Moderate	
Fall	Low	Juvenile Rearing	Medium	<1 m	Low (<25 cm/s)	Day		Low	
	Low	Juvenile Rearing	Medium	0 - 3 m	Low (<25 cm/s)	Night		Low	
	Low	Adult Holding & Feeding	Medium	0 - 3 m	Low (<25 cm/s)			Low	
Winter	High	Juvenile Rearing	Medium	<1 m	Low (<25 cm/s)	Day		High	
	High	Juvenile Rearing	Medium	0 - 3 m	Low (<25 cm/s)	Night		Moderate	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Low (<25 cm/s)	Both		Moderate	
REDSIDE SHINER *(Status: Common)*									
Spring	High	Spawning	nd*	<1 m	Medium (25 -75 cm/s)	Both		High	*Note= Likely limited habitat for spawning
	High	Egg Incubation	nd*	<1 m	Medium (25 -75 cm/s)			High	
	High	Fry Rearing	Low	<1 m	Low (<25 cm/s)			High	
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Moderate	
Summer	High	Spawning	nd*	<1 m	Medium (25 -75 cm/s)	Both		High	*Note= Likely limited habitat for spawning
	High	Egg Incubation	nd*	<1 m	Medium (25 -75 cm/s)			High	
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Moderate	
Fall	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Low	
Winter	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)			Moderate	
LARGESCALE SUCKER *(Status: Abundant)*									
Spring	High	Spawning	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	nd*= no data
	High	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		High	
	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Kootenay* **River Section:** *Kootenay-Columbia Confluence to Brilliant Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Summer	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	
Fall	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	nd*		Low	
Winter	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Boundary Dam to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT *(Status: Occasional)*									
Spring	Moderate	Spawning	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Low	
	Moderate	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Fry Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Summer	High	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Winter	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Low	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
WHITE STURGEON *(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)*									
Spring	Moderate	Adult Holding & Feeding	Nil						
Summer	High	Adult Holding & Feeding	Nil						
Fall	Moderate	Adult Holding & Feeding	Nil						
Winter	Low	Adult Holding & Feeding	Nil						
KOKANEE *(Status: Not Present)*									
Spring	Moderate	Fry Rearing	Nil						
	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Summer	High	Juvenile Rearing	Nil						
	High	Subadult	Nil						
Fall	Moderate	Spawning	Nil						
	Moderate	Egg Incubation	Nil						
	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Winter	Low	Egg Incubation	Nil						
	Low	Juvenile Rearing	Nil						
	Low	Subadult	Nil						
BURBOT *(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)*									
Spring	Moderate	Pelagic	Low	<1 m	High (>75 cm/s)	Both	24 h	Moderate	nd*= no data

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Boundary Dam to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Moderate	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	nd*= no data
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	nd*= no data
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	nd*= no data
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	nd*= no data
Summer	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	nd*= no data
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	nd*= no data
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	nd*= no data
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	nd*= no data
Winter	Low	Spawning	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	nd*= no data
	Low	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	nd*= no data
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	nd*= no data
	Low	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	nd*= no data
MOUNTAIN WHITEFISH ***(Status: Occasional)***									
Spring	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	>24 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day		Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	High (>75 cm/s)	Night		Low	
Summer	High	YOY	Low	0 - 3 m	Medium (25 -75 cm/s)	Day	12 h	Moderate	
	High	Parr	Low	<1 m	Low (<25 cm/s)	Night	<12 h	High	
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	Low	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	
Fall	Moderate	Spawning	Low	0 - 3 m	High (>75 cm/s)			Low	
	Moderate	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Low	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day		Low	
Winter	Low	Spawning	Low	0 - 3 m	High (>75 cm/s)			Low	
	Low	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Low	
	Low	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day		Low	
BULL TROUT ***(Status: BLUE listed by BC)***									
Spring	Moderate	Egg Incubation	Low					Not Rated	TGP risk rating= NIL
	Moderate	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	TGP risk rating= NIL
Summer	High	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	TGP risk rating= NIL

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Boundary Dam to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Fall	Moderate	Spawning	Low	<1 m				Not Rated	TGP risk rating= NIL, Primarily occurs in
	Moderate	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	TGP risk rating= NIL
Winter	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Not Rated	TGP risk rating= NIL
WALLEYE ***(Status: Common)***									
Spring	Low	Spawning	Nil					Not rated	
	Low	Egg Incubation	Nil					Not rated	
	Low	Fry Rearing	Nil					Not rated	
	Low	Juvenile Rearing	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
Summer	High	Egg Incubation	Nil					Not rated	
	High	Fry Rearing	Nil					Not rated	
	High	Juvenile Rearing	Nil					Not Rated	
	High	Adult Holding & Feeding	Nil					Not Rated	
	High	Adult Holding & Feeding	Nil					Not Rated	
Fall	High	Juvenile Rearing	Nil					Not Rated	
	High	Adult Holding & Feeding	Nil					Not Rated	
	High	Adult Holding & Feeding	Nil					Not Rated	
Winter	Low	Juvenile Rearing	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
	Low	Adult Holding & Feeding	Nil					Not Rated	
SHORTHEAD SCULPIN ***(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)***									
Spring	Moderate	Spawning	Nil						
	Moderate	Egg Incubation	Nil						
	Moderate	Fry Rearing	Nil						
	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Summer	High	Juvenile Rearing	Nil						
	High	Adult Holding & Feeding	Nil						
Fall	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Winter	Low	Juvenile Rearing	Nil						
	Low	Adult Holding & Feeding	Nil						
UMATILLA DACE ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)***									
Spring	Moderate	Spawning	Nil						

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Boundary Dam to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Moderate	Egg Incubation	Nil						
	Moderate	Fry Rearing	Nil						
	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Summer	High	Spawning	Nil						
	High	Egg Incubation	Nil						
	High	Juvenile Rearing	Nil						
	High	Adult Holding & Feeding	Nil						
Fall	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Winter	Low	Juvenile Rearing	Nil						
	Low	Adult Holding & Feeding	Nil						
REDSIDE SHINER ***(Status: Common)***									
Spring	Moderate	Spawning	High	<1 m	Medium (25 -75 cm/s)	Both		Moderate	
	Moderate	Egg Incubation	High	<1 m	Medium (25 -75 cm/s)			Moderate	
	Moderate	Fry Rearing	High	<1 m	Low (<25 cm/s)			Moderate	
	Moderate	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			Moderate	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Low	
Summer	High	Spawning	High	<1 m	Medium (25 -75 cm/s)	Both		High	
	High	Egg Incubation	High	<1 m	Medium (25 -75 cm/s)			High	
	High	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			High	
	High	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Moderate	
Fall	Moderate	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			Moderate	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Low	
Winter	Low	Juvenile Rearing	High	<1 m	Low (<25 cm/s)			Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	Low (<25 cm/s)			Low	
LARGESCALE SUCKER ***(Status: Common)***									
Spring	Moderate	Spawning	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	*nd= no data
	Moderate	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Fry Rearing	High	<1 m	Low (<25 cm/s)	nd*		Moderate	
	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Low	
Summer	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	nd*		Moderate	
Fall	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	nd*		Low	
Winter	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	>12 h	Low	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Boundary Dam to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Low	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Low	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Pend d'Oreille-Columbia Confuence to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
RAINBOW TROUT ***(Status: Common)***									
Spring	Moderate	Spawning	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	12 h	Low	
	Moderate	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Fry Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Summer	High	Egg Incubation	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	High	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
Winter	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	All	Night	<12 h	Low	
	Low	Adult Holding & Feeding	Low	>3 m	All	Day	>12 h	Low	
WHITE STURGEON ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC 2000)***									
Spring	Moderate	Spawning	High	>3 m	High (>75 cm/s)	Both		Low	
	Moderate	Egg Incubation	High	>3 m	High (>75 cm/s)	Both		Low	
	Moderate	Swim Up Fry	High	All	High (>75 cm/s)	Both	<12 h	High	Pelagic. Bubbles may form in buccal cavity and result in asphyxiation.
	Moderate	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	All	Both		Low	
Summer	High	Spawning	High	>3 m	High (>75 cm/s)	Both		Low	
	High	Egg Incubation	High	>3 m	High (>75 cm/s)	Both		Low	
	High	Swim Up Fry	High	All	High (>75 cm/s)	Both	<12 h	High	Pelagic. Bubbles may form in buccal cavity and result in asphyxiation.
	High	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	High	Adult Holding & Feeding	High	>3 m	All	Both		Low	
Fall	Moderate	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	Low (<25 cm/s)	Both		Low	
Winter	Low	Juvenile Rearing	Low	>3 m	Low (<25 cm/s)	Both		Low	
	Low	Adult Holding & Feeding	High	>3 m	Low (<25 cm/s)	Both		Low	
KOKANEE ***(Status: Occasional)***									
Spring	Moderate	Fry Rearing	Nil	<1 m	Low (<25 cm/s)	Both	24 h		
	Moderate	Juvenile Rearing	Nil	>3 m	Low (<25 cm/s)	Day	12 - 24 h		
	Moderate	Juvenile Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Night	<12 h		

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Pend d'Oreille-Columbia Confuence to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Summer	High	Juvenile Rearing	Nil	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h		
	High	Adult Migration	Moderate	>3 m	All	Both		Low	Assumed portion of Norns Creek run from Roosevelt.
Fall	Moderate	Spawning	Nil	<1 m	Medium (25 -75 cm/s)	Both	24 h		No documented spawning areas identified in recent years
	Moderate	Egg Incubation	Nil	<1 m	Medium (25 -75 cm/s)	Both	24 h		NIL to low spawning
	Moderate	Juvenile Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Both	24 h		
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Low	Egg Incubation	Nil	0 - 3 m	Medium (25 -75 cm/s)	Both	24 h		
	Low	Juvenile/Subadult Rearing	Nil	0 - 3 m	Low (<25 cm/s)	Day	<12 h		
	Low	Juvenile/Subadult Rearing	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	
BURBOT ***(Status; RED listed below Keenleyside Dam in BC - CDC 2000; Very low abundance)***									
Spring	Moderate	Pelagic	Low	<1 m	High (>75 cm/s)	Both	24 h	Moderate	All information from literature (McPhail 1997)
	Moderate	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Hatch in early spring
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	Both	>12 h	Low	May move into shallows at night to feed
Summer	High	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	May be Moderate, depending on time spent in shallows
	High	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Moderate	May be High, depending on time spent in shallows
	Moderate	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
Winter	Low	Spawning	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Spawning locations unknown
	Low	Egg Incubation	Low	>3 m	Low (<25 cm/s)	Both	24 h	Low	Egg incubation areas unknown
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	nd*		Low	
	Low	Adult Holding & Feeding	Low	>3 m	Low (<25 cm/s)	nd*		Low	May move into shallows at night to feed
MOUNTAIN WHITEFISH ***(Status: Common)***									
Spring	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	>24 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both		Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day		Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	High (>75 cm/s)	Night		Low	
Summer	High	YOY	Low	0 - 3 m	Medium (25 -75 cm/s)	Day	12 h	Moderate	
	High	Parr	Low	<1 m	Low (<25 cm/s)	Night	<12 h	High	
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Moderate	
	High	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day	>12 h	Low	
	High	Adult Holding & Feeding	Low	0 - 3 m	High (>75 cm/s)	Night	<12 h	Moderate	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Pend d'Oreille-Columbia Confuence to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
Fall	Moderate	Spawning	Low	0 - 3 m	High (>75 cm/s)			Low	
	Moderate	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Low	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day		Low	
Winter	Low	Spawning	Low	0 - 3 m	High (>75 cm/s)			Low	
	Low	Egg Incubation	Low	0 - 3 m	High (>75 cm/s)			Low	
	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)	Both	>24 h	Low	
	Low	Adult Holding & Feeding	Low	>3 m	High (>75 cm/s)	Day		Low	
BULL TROUT ***(Status: BLUE listed by BC)***									
Spring	Moderate	Egg Incubation	Low					Not Rated	TGP risk rating= NIL
	Moderate	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Summer	High	Fry Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	High	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Fall	Moderate	Spawning	Low	<1 m				Not Rated	TGP risk rating= NIL, Primarily occurs in
	Moderate	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Moderate	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
Winter	Low	Juvenile Rearing	Low					Not Rated	TGP risk rating= NIL
	Low	Adult Holding & Feeding	Low					Not Rated	TGP risk rating= NIL
WALLEYE ***(Status: Common)***									
Spring	Moderate	Spawning	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Moderate	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	Moderate	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	Moderate	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Summer	High	Egg Incubation	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Walleye spawn in tributaries to Lake Roosevelt
	High	Fry Rearing	Nil	0 - 3 m	Low (<25 cm/s)			Not rated	Fry rearing in Lake Roosevelt
	High	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Moderate	
	High	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	
	High	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Moderate	
Fall	Moderate	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Moderate	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12 h	Low	
	Moderate	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
Winter	Low	Juvenile Rearing	Low	0 - 3 m	Medium (25 -75 cm/s)			Low	
	Low	Adult Holding & Feeding	Medium	>3 m	Medium (25 -75 cm/s)	Day	<12h	Low	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Pend d'Oreille-Columbia Confuence to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	Low	Adult Holding & Feeding	Medium	0 - 3 m	Medium (25 -75 cm/s)	Night		Low	
SHORTHEAD SCULPIN ***(Status: BLUE listed by BC; listed as 'Threatened' by COSEWIC)***									
Spring	Moderate	Spawning	Nil						
	Moderate	Egg Incubation	Nil						
	Moderate	Fry Rearing	Nil						
	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Summer	High	Juvenile Rearing	Nil						
	High	Adult Holding & Feeding	Nil						
Fall	Moderate	Juvenile Rearing	Nil						
	Moderate	Adult Holding & Feeding	Nil						
Winter	Low	Juvenile Rearing	Nil						
	Low	Adult Holding & Feeding	Nil						
UMATILLA DACE ***(Status: RED listed in BC; listed as 'Species of Special Concern' by COSEWIC)***									
Spring	Moderate	Spawning	Low	nd*	*				* = no data
	Moderate	Egg Incubation	Low	nd*	*				
	Moderate	Fry Rearing	Low	nd*	Low (<25 cm/s)				
	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Day	>12 h	Moderate	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Low	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Low	nd*	*				
	High	Egg Incubation	Low	nd*	*				
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Fall	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Day	>12 h	High	
	Moderate	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	<12 h	Moderate	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Winter	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Day	<12 h	Moderate	
	Low	Juvenile Rearing	Low	0 - 3 m	Low (<25 cm/s)	Night	>12 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
REDSIDE SHINER ***(Status: Common)***									
Spring	Moderate	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	Moderate	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	Moderate	
	Moderate	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Summer	High	Spawning	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	High	

FISHERIES RESOURCE INFORMATION AND TGP RISK RATING
FOR THE CANADIAN PORTION OF THE COLUMBIA RIVER BASIN

River: *Pend d'Oreille* **River Section:** *Pend d'Oreille-Columbia Confuence to Waneta Dam*

Season	TGP Duration Rating	Life Stage	River Section Use	Depth	Velocity	Diel Use	Daily Duration	TGP Risk Rating	Comments
	High	Egg Incubation	Low	<1 m	Medium (25 -75 cm/s)	Both	24 h	High	
	High	Fry Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	High	
	High	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Moderate	
Fall	Moderate	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Moderate	
	Moderate	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
Winter	Low	Juvenile Rearing	Low	<1 m	Low (<25 cm/s)	Both	24 h	Low	
	Low	Adult Holding & Feeding	Low	0 - 3 m	Low (<25 cm/s)	Both	24 h	Low	
LARGESCALE SUCKER ***(Status: Common)***									
Spring	Moderate	Spawning	High	0 - 3 m	Low (<25 cm/s)	*		Low	*nd= no data
	Moderate	Egg Incubation	High	0 - 3 m	Low (<25 cm/s)	*		Low	
	Moderate	Fry Rearing	High	<1 m	Low (<25 cm/s)	*		Moderate	
	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	*		Low	
	Moderate	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	*		Low	
Summer	High	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	*		Moderate	
	High	Adult Holding & Feeding	High	0 - 3 m	Medium (25 -75 cm/s)	*		Moderate	
Fall	Moderate	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	*		Low	
	Moderate	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	*		Low	
Winter	Low	Juvenile Rearing	High	0 - 3 m	Low (<25 cm/s)	*		Low	
	Low	Adult Holding & Feeding	High	>3 m	Medium (25 -75 cm/s)	Day	>12 h	Low	
	Low	Adult Holding & Feeding	High	0 - 3 m	High (>75 cm/s)	Night	<12 h	Low	