3.14 Trepanier Creek

Trepanier Creek flows from the west side of the Okanagan Basin into Okanagan Lake at Peachland, B.C. The Trepanier Creek watershed is approximately 260 km^2 with two main tributaries. MacDonald and Lacoma Creeks (Associated 2016). The total stream length is 28 km (Lukey & Louie 2015). The creek drains a gently sloping plateau and enters a steep canyon section below Highway 97 before flowing through the community of Peachland (Associated 2016). In the upper reaches the main land use is forestry, with agriculture and urban development within the lower portions of the watershed. Brenda Mine, located in the headwaters, has not been operational since 1990 (Associated 2016). A summary of creek characteristics is found in Table 3-42 and additional stream-specific data is provided in Appendix B14.

A waterfall and a series of cascades are located 1 km from the mouth and are considered a barrier to fish passage (Grainger & Streamworks 2010). The accessible reach is impaired by riparian vegetation removal and encroachment of residential land-use (Lukey & Louie 2015). There is also evidence of past channelization, which has reduced the availability of holding pools and habitat diversity, and has reduced available gravel for Rainbow and Kokanee spawning (Wightman & Taylor 1978).

The stream is known to currently support populations of Kokanee (spawning) and Rainbow spawning and rearing. Juvenile Burbot were also captured upstream of Highway 97 (Wightman & Taylor 1978). Kokanee habitat is considered marginal due to large substrate size, short accessible length and high gradient (Tredger 1989b; Shepherd & Ptolemy 1999). In the 1970s, Kokanee spawning was prevented during dry years by lack of flow in the lower reaches resulting from water abstraction (Pearson 1977). More recently, Kokanee enumeration reports indicate that crowding in the limited spawning gravels is an issue during years with higher escapement (Webster 2017).

At present, there are 160 points of diversion and 11 pending water licence applications within the Trepanier Creek watershed (Associated 2019); however, the actual volume extracted is unknown. The District of Peachland is the main water supplier in the watershed with developed water storage at Wilson Lake and Silver Lake reservoirs (Associated 2016). Inter-basin water transfers do occur from Trepanier Creek into Peachland Creek (Associated 2016). As of 1976, Trepanier Creek is considered fully recorded (except for domestic purposes) unless storage is provided (MELP 2000). Further, MOE requested a Water Act Reserve on Trepanier Creek on June 15, 1989 (Shepherd & Ptolemy 1999), but the status is unknown. Trepanier Creek is 'flow sensitive' during the winter but not the summer season as flows are at 20% LTMAD (Table 3-43). The Trepanier Creek Operating Strategy was drafted in 2006 following close to zero flows in Lower Trepanier Creek in August of 2003 and 2005. The strategy is not a formal operating agreement but is intended to guide the District of Peachland to maintain close to natural flow levels during periods of flow (Epp 2010b). Estimated naturalized flows (Associated 2019) are generally quite high in comparison to other Okanagan streams; however, historical reports indicate low flows resulting from water use may limit Kokanee spawning (Pearson 1977, Tredger 1989b). Streamflow losses and gains across the alluvial fan near the mouth are unknown but the stream was assumed to be losing water to groundwater for the flow naturalization exercise (Associated 2019).

Okanagan Tennant EFNs for Trepanier Creek were developed in accordance with the methods outlined in Section 2.2. No WUW data was collected in Trepanier Creek. Naturalized flow data were provided by Associated (2019) with an estimated data quality rating of B (data error between 10% and 25%); residual and maximum licensed flows were not available at the time of reporting. Fish periodicity and flow standards described in Table 2-2 to Table 2-6 were used. Weekly Okanagan Tennant EFNs were set to the lower of the naturalized flow or flow standard. A summary of EFNs for Trepanier Creek is provided in Table

3-44 including the median EFN and the range of weekly EFNs, with weekly details in Figure 3-30, Figure 3-31 and Appendix B14, and flow sensitivities in Table 3-43. Further information on EFN setting in Trepanier Creek is provided at the end of this section.

Table 3-42: Trepanier Creek description

Drainage Area	260 km^2
Median Elevation	1228 m
WSC station	08NM041 (historic) Trepanier Creek near Peachland (1919-2014) 08NM013 (historic) Jack Creek at the Mouth (1919-1919) 08NM155 (historic) Trepanier Creek at the Mouth (1969-1981)
MOE station	08NM572 Trepanier Creek at Highway 97 (2006-2009) 08NM573 Trepanier Creek downstream Highway 97 (2006-2007) 08NM574 Trepanier Creek upstream of Highway 98 (2006-2008)
LTMAD	1.283 m^3/s (Associated 2019)
Fish species expected	Rainbow, Kokanee, Burbot, Largescale Sucker, Sucker spp., Prickly Sculpin, Sculpin spp. (ESSA & Solander 2009)
Land use	Forestry in the upper watershed, agriculture and urban development in lower watershed. Brenda Mine (no longer in operation) is located in the headwaters (Associated 2016)

Table 3-43: Flow sensitivities in Trepanier Creek

Species & life stage	**1-in-2 yr 30-day summer low flow**		**1-in-2 yr 30-day winter low flow**	
	Flow (m^3/s)	% LTMAD	Flow (m^3/s)	% LTMAD
Rainbow rearing	0.263	20%		
Insect production				
Kokanee spawning				
Rainbow overwintering			0.213	17%
Kokanee egg incubation				

Source: Associated (2019)

Table 3-44: EFN summary table for Trepanier Creek

Species & life stage	**Time period**	**Okanagan Tennant Recommended EFN**				**Critical flow**	
		Median (m^3/s)	% LTMAD	Min (m^3/s)	Max (m^3/s)	Flow (m^3/s)	% LTMAD
Rainbow rearing & insect production [a]	April 1 – Oct 31	0.257	20%	0.257	0.968	0.064	5%
Rainbow spawning	May 20 – Jul 10	1.73	135%	1.15	7.66	0.642	50%
Kokanee spawning	Sep 4 – Oct 4	0.257	20%	0.257	0.257	0.128	10%
Rainbow overwintering	Nov 1 – Mar 31	0.257	20%	0.229	0.257	0.064	5%

a while EFNs apply to the entire period, median values are presented for the summer low flow period from Jul 15-Sept 30.

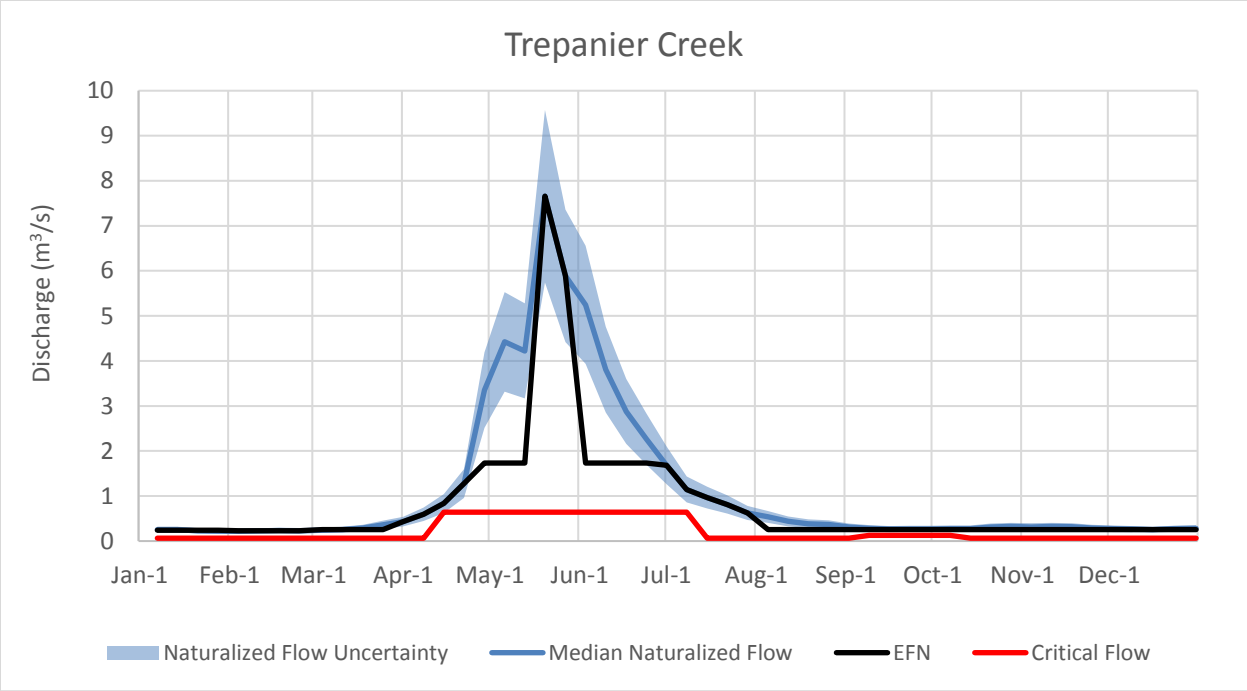

Figure 3-30: Weekly EFNs, critical flow and streamflows in Trepanier Creek

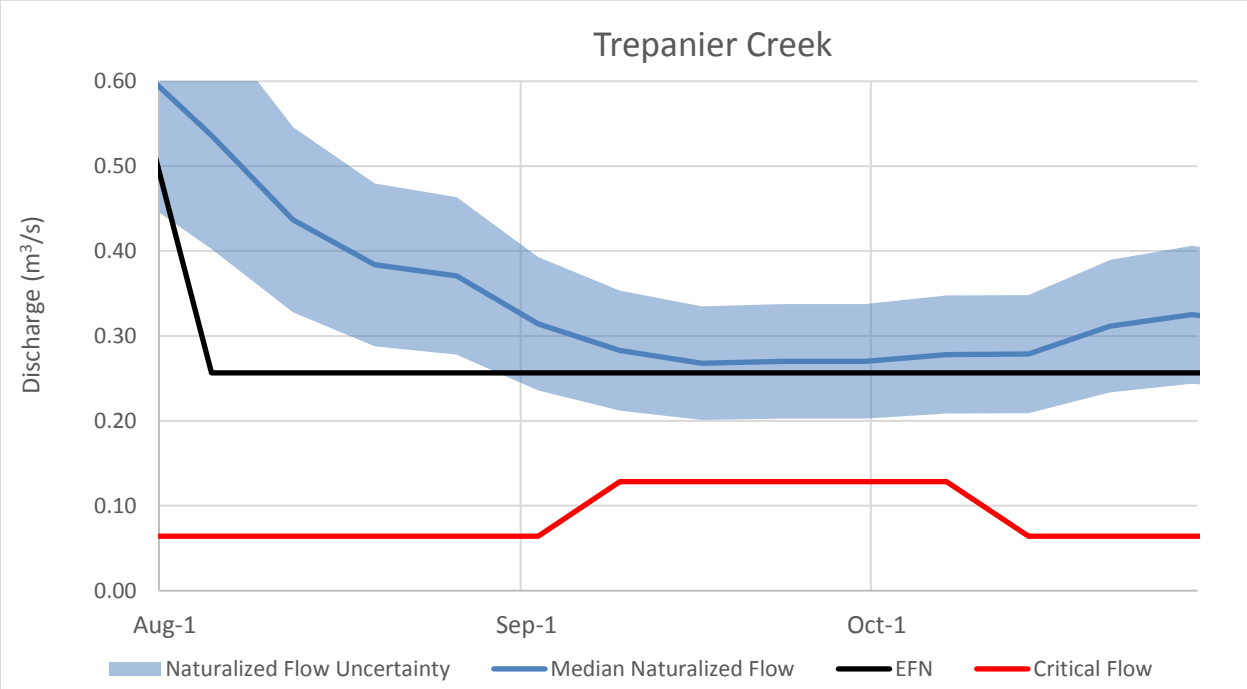

Figure 3-31: Weekly EFNs, critical flow and streamflows during the summer and fall period in Trepanier Creek

Rainbow parr rearing

The median recommended Okanagan Tennant EFN for Rainbow rearing is 0.257 m^3/s (Table 3-44) which is equal to the flow standard of 20% LTMAD. No WUW data was collected in Trepanier Creek for this project. Previous EFN recommendations have ranged from a low of 0.057 m^3/s (Hunter 1978) to 0.328 m^3/s (Dobson 1990), with intermediate values of 0.14 m^3/s (Cairns 1992) and 0.165 m^3/s (Shepherd & Ptolemy 1999). The Trepanier Creek Operating Strategy recommends that flows in the lower reaches should be maintained at close to natural levels as possible during lower flow periods (<0.30 m^3/s) as useable fish habitat is directly proportional to flow at lower levels, and states that there is very little useable habitat when flows in lower Trepanier Creek are below 0.10 m^3/s (Epp 2010b). The recommended critical flow for Rainbow parr rearing is 0.064 m^3/s (5% LTMAD) based on the LTMAD criterion (Table 2-7).

Naturalized weekly flows during the mid-July to late September period are greater than the recommended EFN (0.268 - 0.968 m^3/s, Figure 3-31). Median daily residual flows recorded at the WSC hydrometric station 08NM041 (Trepanier Creek near Peachland, 1919-2014; Figure B14-1, Appendix B14), which is located above the District of Peachland water intake, were generally at or above the recommended EFN. However, median daily residual flows at the WSC hydrometric station near the mouth (08NM155 Trepanier Creek at the Mouth, 1969-1981, Figure B14-1, Appendix B14), were well below the recommended EFN from late July through the winter, reaching as low as 0.045 m^3/s (4% LTMAD). Achieving EFNs for Rainbow parr rearing near the mouth may thus be problematic. WUW information collected by Tredger (1989b) up to a discharge of 0.165 m^3/s demonstrated increasing capacity for parr rearing beyond the flows measured. WUW information collected by Epp (2008) indicates that parr rearing WUW increases rapidly up to approximately 100% LTMAD in the channelized sections near the mouth. In a natural channel reach further upstream near Highway 97C, WUW increased rapidly between approximately 0.25 to 0.5 m^3/s and then levelled off.

Rainbow spawning

The median recommended Okanagan Tennant EFN for Rainbow spawning is 1.73 m^3/s (Table 3-44), which is equal to the flow standard of 135% LTMAD. The recommended critical flow for Rainbow spawning is 0.642 m^3/s (50% LTMAD) based on the LTMAD criterion (Table 2-7).

Estimated naturalized flows (Figure 3-30) are greater than the EFN from mid-April to late June, whereas residual flows (particularly at the mouth) drop below the recommended EFN in early June (WSC 08NM155 Trepanier Creek at the Mouth, 1969-1981, Figure B14-1, Appendix B14). Achieving Rainbow spawning EFNs is considered feasible with improved flow management. A previous EFN recommendation by ESSA & Solander (2009) was approximately 2 m^3/s.

Kokanee spawning

The recommended Okanagan Tennant EFN for Kokanee spawning is 0.257 m^3/s (Table 3-44), which is equal to the flow standard of 20% LTMAD. WUW information collected by Tredger (1989b) up to a discharge of 0.165 m^3/s demonstrated increasing capacity for Kokanee spawning beyond the flows measured. Their estimated capacity of 4,000 spawners at 0.165 m^3/s was below the maximum escapement on record (9,300 in 1971; MELP 2000). WUW information collected by Epp (2008) indicates that Kokanee spawning WUW increases rapidly up to approximately 0.8 m^3/s (62% LTMAD) in the accessible reaches near the mouth. The Trepanier Creek Operating Strategy recommends that flows in the lower reaches should be maintained at close to natural levels as possible during lower flow periods (<0.30 m^3/s) as useable fish habitat is directly proportional to flow at lower levels (50% of maximum spawning WUW at <0.30 m^3/s), and states that there is very little useable habitat when flows in lower

Trepanier Creek are below 0.10 m^3/s (Epp 2010b). Historical EFN recommendations for Kokanee spawning range from 0.14-0.28 m^3/s (Koshinsky 1972b; Dobson 1990; Cairns 1992; Shepherd & Ptolemy 1999). The recommended critical flow for Kokanee spawning is 0.064 m^3/s (10% LTMAD) based on the LTMAD criterion (Table 2-7).

Naturalized weekly flows during the Kokanee spawning period are just above the recommended EFN (Figure 3-31). Median daily residual flows recorded at the WSC hydrometric station 08NM041 (Trepanier Creek near Peachland, 1919-2014; Figure B14-1, Appendix B14), which is located above the District of Peachland water intake, are generally very close to the recommended EFN. However, flows near the mouth (WSC 08NM155, Trepanier Creek at the Mouth, 1969-1981, Figure B14-1, Appendix B14), were on average 0.086 m^3/s which is well below the recommended EFN, reaching as low as 0.045 m^3/s (4% LTMAD), indicating that low flows near the mouth are likely severely reducing the Kokanee spawning capacity of Trepanier Creek. Achieving the Kokanee spawning EFN near the mouth is thus considered problematic.