

Eyes on the Tsolum River Year 2

Summary of July 2023 Observations



Eyes on the Tsolum River (ETR) is a group of individuals and families that walk the Tsolum River and report their observations to myself Allan Chamberlain, a Tsolum River Restoration Society (TRRS) outreach volunteer and retired Fish and Wildlife Professor.

The information gathered includes fish and other wildlife sightings, water quality data, and general observations about the status of the river and watershed. The findings are summarized periodically and circulated to all of the ETR observers, and other persons and agencies interested in the Tsolum River watershed.

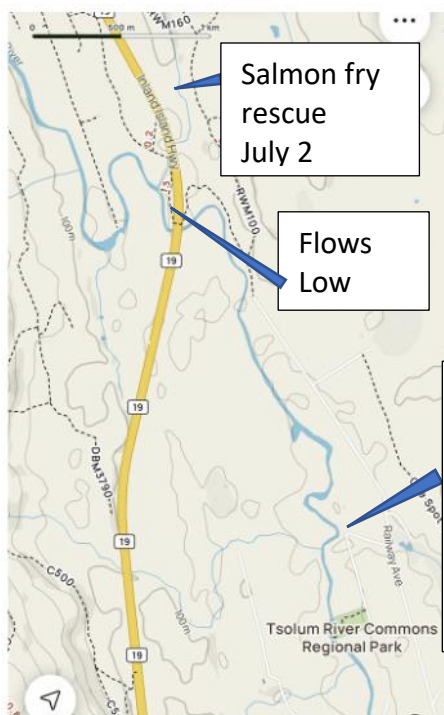
Sharing information creates a better understanding of the Tsolum watershed and the status of its native fish. **Using this information, we can identify focus areas for restoration and advocate for best practices for fisheries management, with the goal of improving the well-being of the native fish.**

The following pages are a summary of the July observations and water quality sampling made by Eyes on the Tsolum River Volunteers. For more detailed information on May, June and July observations, see Appendix 1. In the back of this report.

Summary of the Eyes on the Tsolum River Observations in July, 2023

Mid to upper reaches of the Tsolum River.

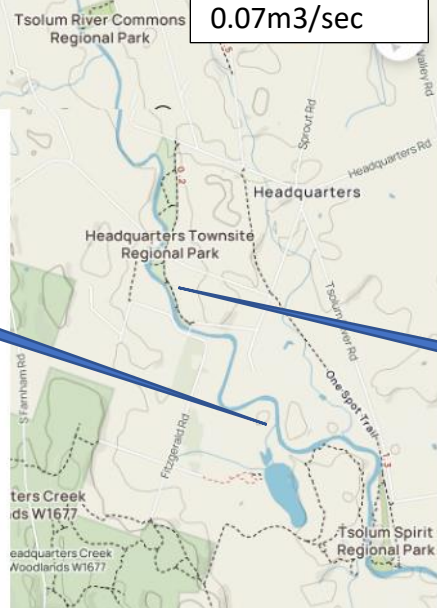
Lower to mid reaches of the Tsolum River.



W.temps
Upstream
of here
averaged
~21-24C

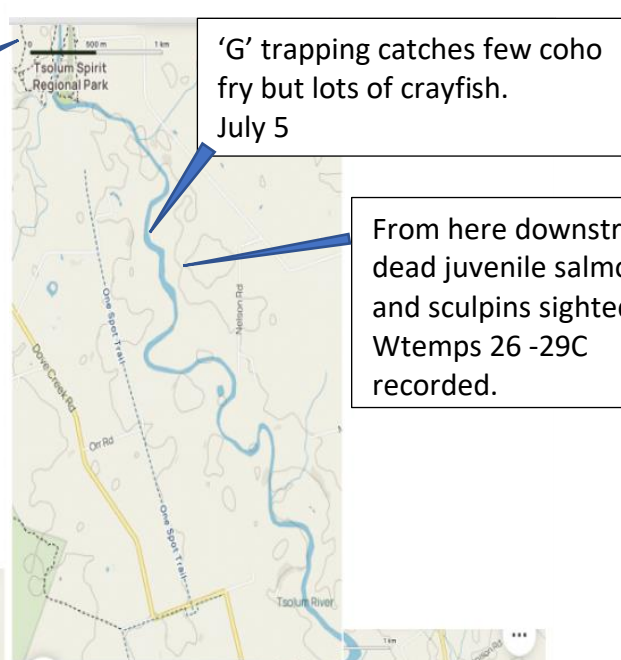
Flows July 9:
1.HQ.Cr =
0.03m³/sec
2.Mainstem
Upstream of
HQ Cr =
0.07m³/sec

Large(60cm)
Salmonids
spotted in
this stretch

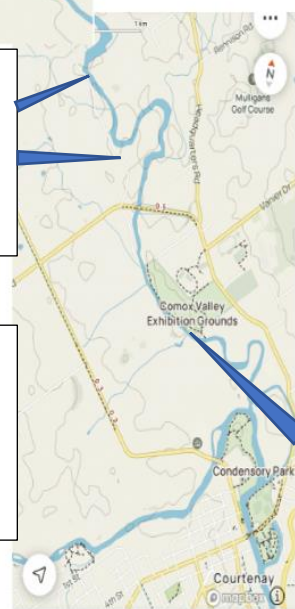


Lots coho fry
start of July.
Very few at end
of July Resident
Mink evident.

Multiple Refugia mapped in this stretch. July 14 to end of July.



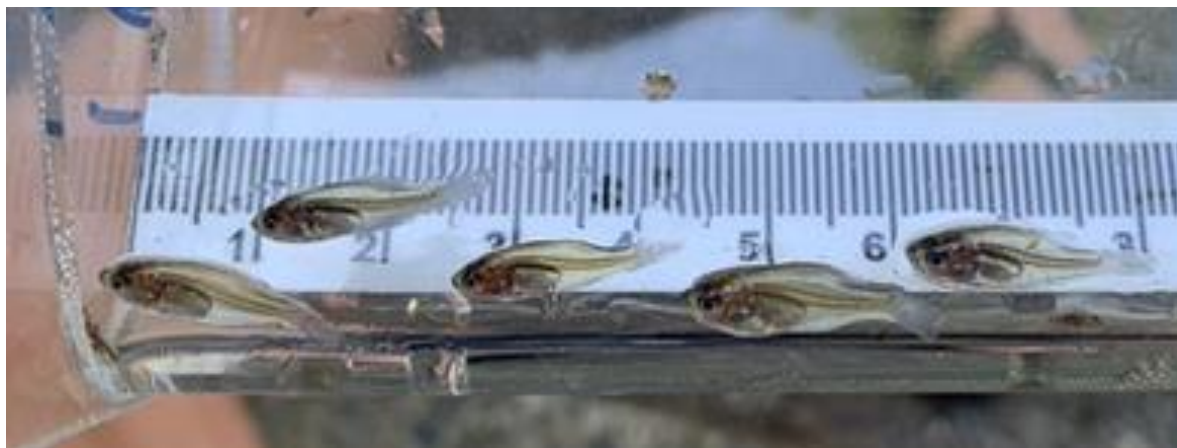
From here downstream
dead juvenile salmonids
and sculpins sighted and
Wtemps 26 -29C
recorded.



Sightings of Invasive Pumpkinseed Sunfish (*Lepomis gibbosus*) in the Tsolum Watershed.

This invasive species was first discovered by Graham Hilliar, a TRRS volunteer, in June, 2022 via minnow traps set in Wildwood Marsh and its outflow, Smit Creek, that eventually runs into lower Tsolum River. On June 26 this year, Graham observed schools of larval and juvenile Pumpkinseed Sunfish (PS) and sample netted some. Cloverleaf trapping in May, and now in June, show that they are now residing in the main stem of the lower Tsolum River.

To date, no larval size young of the year (YOY) Pumpkinseed Sunfish, (like the fish in the picture following), have been reported captured in nets in the main stem of Tsolum River. This indicates that they are possibly still only spawning in the Wildwood Marsh and other connected ponds connected to Smit Creek.



According to Gido et al. (2023), 5 year drought conditions in the American Southwest promoted the spread of the invasive Green Sunfish (*Lepomis cynallus*) in a California Stream. **So, we should always keep an eye out throughout the Tsolum watershed for these tiny flat roundish fish, especially in our nets while conducting salmon rescues and salvages.**

Juvenile Salmon and Trout Losses due Low Flows and Extreme Water Temperatures

A number reports of fish mortalities came in from the mid to lower reaches of the Tsolum in early July as flows diminished to a trickle (**0.05 to 0.1 cubic meter per second**) and water temperatures peaked above lethal levels (**26.9 to 28.8 Celsius**), see ETR observations in July, Appendix 1.

As in the previous two years, dead and diseased juvenile salmon and trout were observed, especially in areas in stretches that had little no tree canopy or riparian zone, where water temperatures were lethal. As a result, by the mid July in the barren open stretches of the mid to lower Tsolum, only the occasional small schools of young of the year (YOY) ThreeSpine Sticklebacks were observed.



Due to the very low flows, the “wetted width” of the main stem Tsolum to only a few meters wide in many areas and, consequently many fish were stranded in isolated, drying pools and side channels.

In these areas the salmon fry often die of heat stressed in late afternoon. Many of these fresh mortalities are quickly eaten overnight by crayfish raccoons or mink. Sculpins and larger juvenile trout however, being more bony, take longer to consume and their partially eaten carcasses are often seen the following day. Therefore, because these fish are quickly eaten, it is virtually impossible to make an accurate count the total fish loss from heat shock and/or hypoxia.

Examples Of Salmonid Mortalities Collected in July 2023 Mid to Lower Tsolum River 2023

Recently dead Coho succumbed to heat stress



Coho with Salprolegnia fungus



Rainbow trout likely died of heat stress the previous evening





Carcasses of sculpins that were, most likely, partially eaten by crayfish.



Salmonid Migrations to Coolwater Refuge Areas

Many of the Tsolum tributaries and some spawning channels were completely dried by the beginning of July and the main stem of the Tsolum flows dropped dramatically throughout the watershed. Also, by the second week in July, much of the lower Tsolum had reached lethal water temperatures for salmonids. Consequently, it became very challenging to find water suitable to transfer fish that were stranded in drying pools (see July Observations, Appendix 1).

There have been some discussions on transferring these stranded salmon to coolwater refugia sites along the main stem of the Tsolum. **I would advise against this practice because of the potential of stressing the salmon already in these refugia.**

Recently, Railsback and Harvey (2023), researched the value potential of coolwater refuges to salmonid populations. They concluded that

“Growth and survival in refugia are not determined just by temperature and area but also the availability of food and habitat for feeding and predator avoidance”.

ETR observations, in 2022 of one large refugia devoid of good habitat, an estimate 2500 juvenile salmon on July 30 declined to only 300 by August 8. (Chamberlain 2023).

Due to the prolonged low flows last fall Coho Salmon Prespawning mortality was high and spawning was many restricted to the lower Tsolum. Subsequently, spring coho fry hatch was low in the spring 2023. As a result, only ~500 juvenile salmonids were observed seeking refuge there this year.

This same refugia in the Lower Tsolum is being monitored again this year In an attempt to increase salmon survival at this refugia, small woody debris (SWD) tree cover and signs warning to notify walkers of this sensitive area, were installed.



ETR observers this year have increased their monitoring of refugia sites in one stretch of the Lower Tsolum and noted the coordinates and estimated fish densities (see Appendix 1. July observations).



Cool water Refuge Sites Mapped in 2023:

3 upstream sites: A total ~ 800 juvenile salmonids, see July 14, SC

1 middle site: ~ 500 juvenile salmonids, see July AC

Multiple isolated pools along off spawning channel spawning sites, ~ 500-1000 juvenile salmonids see July AC

Salmon Loss through Entrainment in the Intakes of Pumps

As flows and water levels dropped, some water users moved their intakes closer to deeper channels (Thalweg), possibly making the intake screens are more prone to mechanical damage.



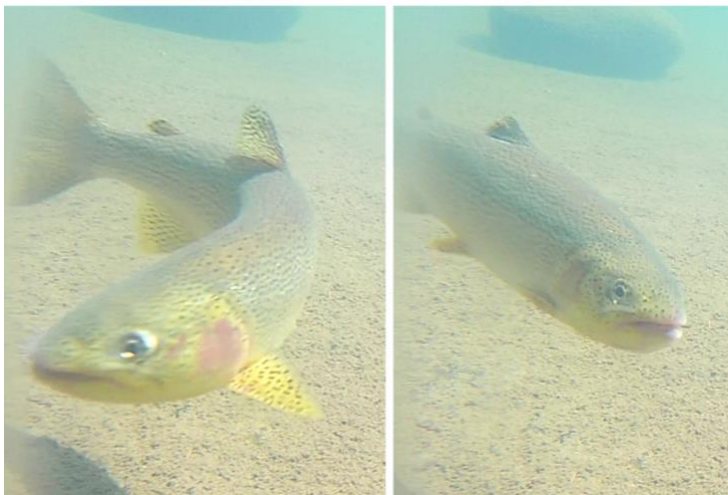
To safe guard against salmon smolts and fry getting suck in the pump, especially when pumping at night, water users please inspect intake screens regularly.

Searching for the Elusive Steelheads

Recently, there has been a number of sightings of large ~ 2ft (60cm) salmonids in the mid stretches of the Tsolum. This prompted a few ETR persons to keep an eye out for these fish. In July, after two or three large fish were regularly seen in one location, a GroPro camera was set up at the sight for couple days, and we were fortunate to a 2 second glimpse of one fish (see pictures following).

After sending the mini video clip and stills of this fish around to a few persons, the consensus was that it is possibly a sea-run cutthroat trout or Cut/Bow, a hybrid between a cutthroat trout and rainbow trout.

There are a number of ETRs on look out for these large fish. It will be interesting to video other fish in the future to determine if and how many of the iconic Steelhead have returned to the Tsolum.



Lessons Learned and Recommendations

The following are my suggestions and do not necessarily reflect those of the TRRS.

1. Invasive Pumpkinseed Sunfish (PSs)

ETR observations in June determined that 0+ and 1+ PSs had migrated in high numbers into the lower Tsolum. It was therefore concluded that, with this invasive species, we are now gone from an eradication to a containment strategy.

Just recently an interdisciplinary team met to discuss how to contain these fish. It was decided at this meeting to install a containment fence in Smit Creek closer to the confluence of the Tsolum River, before the fall rains arrive. This is necessary because, so far, the PS spawning nest sites have not been located.

If drought conditions continue each year, it is likely PS will increase their range in the Tsolum watershed (Godi et al. 2023)

2. Improving Survival of Salmon and Trout in Coolwater Refuges (Refugia)

From the ETR observations the past 2 years, it is evident that some salmonids survive in refugia in the in the Tsolum watershed during the summer.

So, until a long-term restoration strategy is implemented and completed to rectify the lethally high-water temperatures in the main stem, **it is paramount that the wild salmon and trout who migrate to refugia are protected.**

This requires a concerted effort of resources and labour to locate as many refugia as possible, to install escape cover from predators, maintain adequate dissolved oxygen, fence off refugia epicentres from dogs and stream walkers, and where necessary, post warning signs.

Some ETR folks have suggested installing **portable aeration systems** temporarily during heat periods in refugia with high salmonid densities. They suggest that these could be powered by solar, wind or, for short emergency situations, gas power. Naturally, funding would be required to research their efficacy of survival in aerated (test) and un-aerated (control) refugia sites.

3. Prevention of Potential Massive Prespawning Pink Salmon Kills in 2023

In the fall of 2021, the TRRS volunteers counted an estimate of 150,000 Pink Salmon spawning in the main stem Tsolum and Headquarters Creek. Being an odd year, it is anticipated that this year will be another significant Pink salmon spawning run.

Low flows and low water levels in late August and early September caused migrating Pink Salmon to stack up downstream of barriers such logjams and isolated pools. Because of the very high fish density behind these barriers, the dissolved oxygen dropped to lethal levels, asphyxiating 1000s of adult Pink Salmon and some juvenile salmonids (Chamberlain 2022).

Example of Pink Salmon Kills in a Bottleneck in 2021 (Chamberlain 2022).



Fortunately, ETR folks reported these bottlenecks early, and a tunnel was made in the logjam and channels were dug between isolated pools, freeing to fish to move further upstream. This averted subsequent massive fish kills as 1000s more Pinks that were downstream, immediately behind these fish. Fortunately shortly after these fish kill events, the rains came, enabling this fish to spawning throughout the watershed in October 2021.

To be more proactive this year the DFO water management team has asked ETR to locate potential logjams that could prevent fish passage and possibly tunnel them before significant number of Pink Salmon move upstream in late August. Personally, I do not the equipment or expertise to do this work but would gladly assist anyone who has?

The digging channels between isolated pools however, is best to done once fish are stacking up in the lower pools, to prevent the possible of premature de-watering of upstream pools before the rains come.

Of course, this proactive management work is being recommended on the assumption that rains will begin early enough in the fall to promote fish passage for the Pink Salmon run. **If the rains do not arrive until December like in 2022, more innovative decisions will be needed to help at least some of these salmon complete their life cycle successfully.**

Literature Cited

Beamish R, 2022. The need to see a bigger picture to understand the ups and downs of Pacific salmon abundances. *Journal of Marine Science*, 2022, 0,1-10 Emeritus Scientist, Pacific Biological Station, Fisheries and Oceans Canada, Nanaimo, V9T6N7 British Columbia, Canada *Corresponding author: tel: +250 758 2574; e-mail: rabeamish@shaw.ca.

Chamberlain A, 2022. Fish Health in the Tsolum River. Our Choices will make a difference. For the Tsolum River Restoration Society Outreach program, January 2022. 53 pages.

Chamberlain A, 2023. Eyes of the Tsolum River 2022 Year 1. For the Tsolum River Restoration Society Outreach program, February 2023. 42pages.

Gido K. B, M. J. Osborne, D. L. Propst, T. F. Turner, and J. D. 2023. Megadroughts Pose Mega-Risk to Native Fishes of the American Southwest. *Fisheries* Vol. 48, No. 5 May 2023. American Fisheries Society.

Railsback S. T., and B. C. Harvey 2023 Can thermal refuges save salmonids? Simulation of cold-pool benefits to salmonid populations. *Transactions of the American Fisheries Society*, March 2023.

Appendix 1. Eyes on the Tsolum River Daily Reports from Observers in 2023.

(S= Surface B=Bottom, and D.O. = Dissolved Oxygen in milligrams per litre)

	W.Temp.	D.O.	Initials
March			
28. 11.30am			
Walked along the bank from the Confluence of Towhee Creek upstream for 200m. Water clear and flow good. Did not see any fish, salmon fry or other species.			AC
April			
30. Coho Salmon fry and Chum fry Gropro videoed in the main stem Lower Tsolum at the confluence of Towhee Creek that was flowing in to the mainstem.			AC
May:			
1. 170 Coho Salmon fry counted along the lower Tsolum River between the confluence of Towhee Creek and Meadow Farm Creek (~200m stretch) Size range of fish 32-41mmFL.			AC
2. Upper Tsolum under HWY 19 bridge (12.00 hr):	6.9		
Upper Tsolum 200yds upstream of HWY 19 bridge:	7.3		
Upper Tsolum 600yds upstream of HWY 19 bridge:	7.4.		W&J
4. Chilli Creek at the confluence of the Lower Tsolum River. Flowing with ~50 smolt size Coho Salmon and ~100 Coho Salmon fry observed in Gropro video at 13.25hr:			
	18	10.4	
At 12.30 to 13,00 hr.			
Chilli Creek at Culvert, Dove Creek Rd, surface reading:	14.9	6.9	
Chilli Creek at Culvert, Dove Creek Rd, bottom reading:	13.4	6.8	
Chilli Creek, midway down channel, surface reading:	14.5	6.7	
Chilli Creek, midway down channel, bottom reading:	14.1	7.5	
At 14.00hr at approximately 300m downstream of the Bottleneck Pool, ~60 Coho fry, average size 35mm FL and ~10 Chum fry (see pics).			
At 15.00hr at approximately 50m downstream of the Bottleneck Pool, 100s of estimated 1-3 day old swim-up coho fry, 30-35mm FL (see pics).			
Immediately upstream of Bottleneck Pool, no fry observed.	12.0.	10.2	AC
10. Spirit Park Pool 12.03hr. saw 3 Coho Fry in shallows. Walked 200m downstream counted 7 Coho fry – took Gropro video.	9.5.	10.7.	AC
11. Pumpkinseed Sunfish Trap (PST) in Smit Creek caught 4 Pumpkinseed Sunfish.			HM
13. Morewood Site Lower/Mid Tsolum River.	13.4.	10.0.	DM
14. Diane's Pool (location?), 20 Coho Salmon fry			SG
14. ~300m downstream of the Bottleneck Pool 200 salmon fry.			SC
15. Upper Tsolum under HWY 19 bridge: no fish.	10.4		
200yds upstream of HWY 19 bridge: 5 Coho fry	11.0		
600yds upstream of HWY 19 bridge: 12 Coho Salmon fry (measured 1fish = 35mm FL)	11.0.		W&J
15. At 19.21hr at approximately 200m downstream of the Bottleneck Pool, ~5 Coho fry, average size 39mm FL and ~5 Chinook fry? 29-32mm FL (see pics).			AC

S= Surface B=Bottom, and D.O. = Dissolved Oxygen in milligrams per litre)

	W.Temp.	D.O.	Initials
15. ~1km downstream of Spirit Park. Flows High, Air Temp. 28.	10.0.		LM
18. River Ave Pond, channel drying up fast catching 1+ smolts in Gee Traps.			LO
20. Headquarters Park Deep Hole 50+ Coho fry			SG
21. Lutkin Site, Mid Tsolum, 11.00hr.	10.5	11.0.	
Spirit Park – lots of Coho Salmon fry.			DM
21. Morewood Site Lower/Mid Tsolum River.	10.5	10.1.	DM
23. Exhibition Grounds, Lower Tsolum:			
Set 10 Gee traps un-baited from 11.30am-12.45pm (1.5hrs):			
(Catch= (5) Coho fry 51,52,48,41,38mmFL. (6) Pumpkinseeds 41,38,39,36,39,35mmFL. (2) Prickly Sculpins. (45) ThreeSpine Sticklebacks.			
Set Cloverleaf Trap un-baited 12.30pm-2.45pm (2.25hrs set):			
(2) Coho smolts 95,100mmFL (2) Coho fry 38,37mmFL (11) Pumpkinseed 43,42,39,39,34,38,38,36,31,32 29mmFL. (see pictures in text)			MV
23. Towhee Creek Ponds drying up.			KG
23. ~1km downstream of Spirit Park. Flows High, Air Temp. 15.	12.0.		LM
24. Godin Pool Area. Continue to see Coho fry (43mm FL) in Spawning Channel			K&D
26. Towhee Creek Upper Deer Gate Pond.			
Set, aerated, un-baited Cloverleaf Trap 11.45am- 1.15pm (May27) -25.5hrs set:			
Catch (2) Coho smolts 96,116mmFL.	14.3.	1.06.	MV
27. Towhee Creek Pond 2.			
Set, aerated, un-baited Cloverleaf Trap 3.00pm- 8.30am (May27) -17.5hrs set:			
(1) Pumpkinseed (90mmFL -see pic), (16) Coho fry 42,47,45,49,48,43mmFL (71) TS.Stbacks.			AC
28. Towhee Creek Pond 2.			
Set, aerated, un-baited Cloverleaf Trap 9.30am- 12.00pm (May28) -26.5hrs set:			
(33) Coho fry 46,45,51,42,39,39,48,49,38,61mmFL (4) TS.Stbacks.	15.4	4.06	MV
29. Towhee Creek Pond 2.			
Set, aerated, un-baited Cloverleaf Trap 9.30am- 12.00pm (May28) -26.5hrs set:			
(22) Coho fry 38,48, 59,54,49,47,39mmFL (7) ThreeSpine Sticklebacks.			
Aerator not operating at time of lifting trap.	16.9	3.3.	MV
30. Headquarters Pk. Deep Hole upstream ~ 150 Coho fry 100m in a stretch.			
	12.0	8.4.	CT
30. Towhee Creek Pond 3.			
Set, aerated, un-baited Cloverleaf Trap 1.30pm- 3.30pm (May29) -26hrs set:			
(1) Coho fry (80) ThreeSpine Sticklebacks	15.7.	2.92	MV
Note: People camping around Pond 1. Towhee Creek Did not set traps in this location.			AC
31. Godin Pool Area. Spawning Channel pools beginning to dry up.			
Water Temperatures taken each day at 9.00am, respectively from May 16 to 31:			
10.2,10.5,10.7,10.8,11.4,11.8,10.2,10.9,11.5,12.4,12.9,13.4,13.2,13.5,13.3, 12.4 C.			K&D

(S= Surface B=Bottom, and D.O. = Dissolved Oxygen in milligrams per litre)

	W.Temp.	D.O.	Initials
June			
2. Mid Tsolum between HQ, townsite and Spirit Park. Large trout or salmon about 2ft (60 cm) long observed in pool.			A&B, L
3. Morewood Site Lower/Mid Tsolum River.	17.0		DM
4. Rotating Screw Trap in Lower Tsolum just upstream of Piercy Rd Bridge Coho Salmon Smolts (22) and fry (2) and Chinook Salmon fry (19) Rainbow trout juvenile/smolts (10).			DT
5. River Ave Pond Gee traps set and lifted daily for the past 7days caught 56 Coho smolts of an average range of 90 to100mm FL. 3 Coho Salmon mortalities were also found in the traps.			LO
6. Mid Tsolum between HQ, townsite and Spirit Park at 1.32pm	17.5.	7.6.	
Low density salmon fry observed in pool and upstream (~5fry'50m).			AC
6. and 7. Godin Pool Spawning Channel. Fry Rescue of 15 Coho Salmon fry Gee trapped and transferred from drying pools to the main stem.			K&D
8. ~1km downstream of Spirit Park. Flows Mod., Air Temp. 15C.	17.0.		LM
11. In the Blind Channel of Chilli Creek in the lower Tsolum at 6.45pm, a fish kill of Coho Salmon smolts was observed and reported. Water temperature and Dissolved oxygen were measure and the total mortality was estimated. See page 5 in this summary.			
Water temperature and Dissolved Oxygen:			
At culvert on Dove Creek Rd, videod-Groproed 100s of salmon smolt gilling rapidly on surface.			
	Surface =	17.5.	4.14
	Near bottom =	15.8.	0.60
50 to 200m downstream of culvert on Dove Creek Rd salmon smolt mortalities observed. In one 10m sample stretch, collected 8 dead Coho Salmon smolts.	14.4.	0.54	AC
11. Upper Tsolum under HWY 19 bridge: no fish.	17.1 at 5pm		
200yds upstream of HWY 19 bridge: 5 Coho fry	16.8 at		
5.30pm			
600yds upstream of HWY 19 bridge: 12 Coho Salmom fry (measured 1fish = 35mm FL)			
	16.8. at 6.00pm		
Additional site 4 at Oxbow, no fish sighted. Water level dropping (~ 2.5 ft) at all site			W&J
11. Lower Tsolum ~300m upstream of the confluence of Chilli Creek.			
	At 4.46pm. 20.8.	6.4.	
	At 7.20pm. 19.6	6.2.	AC
12. Lower Tsolum at Exhibition Gr ~ 300m upstream of Confluence of Towhee Creek.			
	At 5.30pm. 22.3.	8.3.	AC
12. Lower Tsolum, at Towhee Creek Ponds, no predator track observed in any of the ponds.			
Pond 1, no fish observed at 6.14 pm.	13.4.	0.39	
Pond 2, no fish observed at 6.34pm.	15.3.	1.20	
Pond 3, one dead Coho Salmon smolt, 6.50pm.	16.1.	1.26	AC
13. Mid Tsolum in mainstem above RiverAve, lots of Coho Samon fry observed.			LO
13. Morewood Site Lower/Mid Tsolum River.	18.0		DM
13. Tributary, Mid Tsolum, approximately 400m above the north end of Railway Ave. 20 Coho Salmon fry rescued by seining and transferred to mainstem.			G&J&F

13. Upper Tsolum under HWY 19 bridge at 12,56pm.
Coho salmon fry ~ 2 fish/m2 videoGoproed and seine netted to samples 3 fish, Fork Lengths 43mm, 38mm and 38mm. 15.7. 9.27 AC

14. ~1km downstream of Spirit Park. Flows Mod., Air Temp. 24.6C. 16.0. LM

14. Portuguese Creek tributary, Sackville Rd.10.55pm.
Siene netted shallow pools, caught 1 juvenile ThreeSpine Stickleback. 13.7. 4.86 GA

14. Lower to start of Mid Tsolum, Bagely Rd. 1.35pm.
Video Goproed low density of Coho Salmon fry. Also saw salmon fry swimming upstream via spillway of constructed rock dam. 18.7 8.45 BM

19. Lower Tsolum ~300m upstream of the confluence of Chilli Creek 1.25pm.
Very low flow in the main stem. Salmon 16.1 8.0

A dead sculpin observed at site of last year's refugia at this site where titbit is installed in the opposite bank. Readings in the Refugia = 15.0. 8.0 AC

19. In the Blind Channel of Chilli Creek in the lower Tsolum ~ 1-200 mainly Coho salmon fry were video Goproed in the pool at the culvert on Dove Greek Rd. All fish were breathing rapidly and some fry were observed feeding. Downstream 150m of the blind channel had dewatered further but a trickle of water was flowing down the channel and ~ 50 TSsticklebacks concentrated in the shallows at the upstream end. No salmon smolt or fry dead or alive were observed in the 150m of the blind channel at 1.01pm. 12.6. 1.8. AC

19. ~1km downstream of Spirit Park. Flows Mod., Air Temp. 24.0C. 16.5. LM

23. At 3.30pm Morewood Site Lower/Mid Tsolum River. 22.0 6.4 DM

23. At 3.30pm in Lower Tsolum approximately 1 km downstream of the Godin Pool. Observed in a riffle area: 1 Coho fry 80mm FL, 2 cutthroat trout 200mm FL and several schools tiny fish unknown species? 23.0. BM

23. Mid Tsolum between HQ, townsite and Spirit Park. A large trout or salmon observed in pool. A&B L

25. At 3.00pm Morewood Site Lower/Mid Tsolum River. 22.8 8.9 DM

25. Afternoon Headquarters Park Deep Hole 21.2 SG

26. 100s of Larval and juvenile Pumpkinseed Sunfish observed in Wildwood Marsh (see pic.). GH

26. ~1km downstream of Spirit Park. Flows Low/Mod., Air Temp. 16.0C. 18.0. LM

Water level dropping massively.

27. Pup Creek at end of Farnham Rd at bridge close to power line. Isolated pools connected by a trickle flow. 20-50 Coho fry feeding in each pool. 18.5. 5.4. AC

25 -29. Mid Tsolum between HQ, townsite and Spirit Park. A large salmonid observed in pool. Species yet to be identified? A&B L

30. Headquarters Park Deep Hole. Lots of coho salmon fry. Flow very slow. 23.3. SG

30. ~1km downstream of Spirit Park. Flows Low/Mod., Air Temp. 28.9 C. 25.0. LM

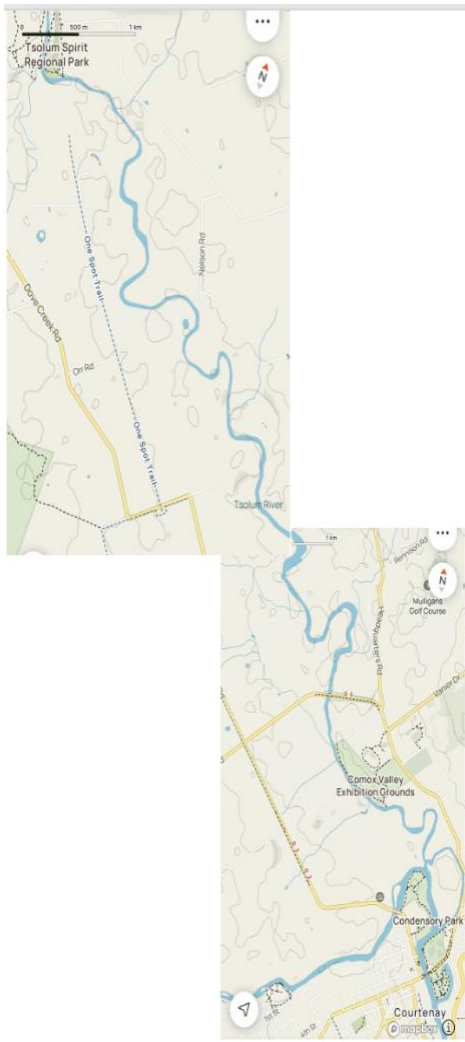
(S= Surface B=Bottom, and D.O. = Dissolved Oxygen in milligrams per litre)

July	W.Temp.	D.O.	Initials
2. Tributary, Mid Tsolum, approximately 400m above the north end of Railway Ave. 35 Coho Salmon fry rescued by seining and transferred to mainstem. Puddle almost dry.			G&J&F
2. Mid Tsolum between HQ, townsite and Spirit Park.	17.4.		A&B L
3. Mid Tsolum between HQ, townsite and Spirit Park.	17.6.		A&B L
3. Note: Little River (LR) near mouth at salmon smolt fence water temp. = 15.7C and at LR Hatchery = 9.4C DH			
5. Morewood Site Lower/Mid Tsolum River. 16.30hrs	0.4m deep = 23.8		
	1.2m deep = 20.7		
G Trap(minnow trap) catches 24 hr sets: Trap 1 = 3- 45mmFL coho fry			
Trap 2 = 2- 45mmFL coho fry, 1 sculpin, 12 crayfish			
Trap 3 = 1- 45mmFL coho fry, 9 crayfish			
Trap 4 = zero fish, 1 crayfish.			DM
6. Headquarters Park Deep Hole. Large number of coho salmon fry in pool. Flows very low.			
	22.0.		SG
7. Headquarter Creek Flows immediately downstream of Wolf Lake water control gate = 3-4 CFS This cubic feet per second flow is leakage flowing under the spillway.			
Wolf Lake water level = 7.48 feet			JA
8. ~1km downstream of Spirit Park. Stressed cutthroat trout fry ans coho fry bunched together with sculpins and crayfish. It is a deperessing sight. Need flow to raise dissolved oxygen. Recommend aerating nursery ponds in intermittent streams systems along lower Tsolum.			
Water Temperatures along my stretch = 26 to 27.5C			LM
7. Godin Pool Spawning Channel. Seeing very few in pool. Also saw one large ~5inch Sculpin.			
At channel mouth = 28.3			
At mainstem 2-3feet deep = 23.5			K&D
8. Flows Calculatioins: 5pm .Headquarters (HQ) Creek ~40m upstream of the confluence and main stem Tsolum = 0.03 m3/sec.			
4.50pm.Tsolum River ~ 10m upstream of the confluence and main stem Tsolum = 0.07 m3/sec.			AC
9. In stream Flow Calculations at confluence of Headquaters creek and the Tsolum River:			
1. Headquarters Creek (HQ) ~10m upstream of the confluence of the Tsolum River = 0.3m3/sec			
2. Tsolum River ~ 15m upstream before HQ Creek join the main stem Tsolum = 0.7m3/sec			
At both sites water temperature and dissolved oxygen the same.	23.0	7.0.	AC
9. Lower Tsolum approximately 1 km downstream of the Godin Pool.			
In Gark's pool a school of coho salmon fry a a couple of fish ~170mm FL			
Water temperatuesin a riffle area =	26		BM
10. Headquarters Park Deep Hole. 30 coho salmon fry. Flow very low.	22.0		
Resident mink looking very fat.			SG

10. Mid Tsolum in mainstem above RiverAve. Main stem of river very warm, seeing lower numbers of coho fry. River Rd Pond "done" no live juvenile salmon, stopped trapping. LO
12. Godin Pool Spawning Channel. Transferred 41 Young of the Year (YOY) ThreeSpine Stickbacks (see pics in ETR July Summary) from isolated pool to the main stem. K&D
12. ~1km downstream of Spirit Park. Sinking water levels. Observed dead sculpin (see pics in July Summary). Juvenile Coho and Cutthroat trout moved to deeper part of channel. FW mussels very visible, gasping – prey for raccoons. "Disastrous dismantling of the ecosystem and no relief in sight". At 1pm W.Temp = 27.5. LM
12. Flows Calculations: 3.50pm. Lower Tsolum main stem ~100m upstream of the confluence of Towhee Creek = 0.1 m³/sec AC
14. Sightings on my walk today. SC
- 49.717327, -125.020966 water intake abandoned
- 49.718240, -125.022457 water intake operational (not operating today)
- 49.718693, -125.023294 water intake operational (not operating today)
- 49.722063, -125.022140 refugia approx 200-250 fry north side of river facing west
- 49.721899, -125.024785 water intake operational (not operating today)
- 49.722550, -125.025712 refugia approx 500+ fry.....THESE WILL BE TRAPPED SOON
- 49.723048, -125.025053 refugia approx 100+ fry
16. Headquarters Park Deep Hole. Middle of pool at 3ft deep =. 22.0 to 23C. SG
16. ~1km downstream of Spirit Park. Observed one coho fry stressed with saprolegnia and also possible ? one blob of rock snot, Didymo (*Didymosphenia geminata*) a microscopic algae (diatom) see pics in ETR July Summary. Air Temp 30.5C. 27.0. LM
18. Lower Tsolum Spawning Channels ~ 300-500m upstream of the Piercy Rd Bridge. Fish Savage: ~100 Coho salmon fry in one tiny very shallow drying pool, netted and transferred them to larger deeper pool. Note main stem too warm transfer fish to (24-26C). AC
20. At 9am DFO increased flow in HQ Creek to 6 cubic feet per second (CFS) by opening Wolf lake Gate Valve. JA
21. Mid Tsolum between HQ, townsite and Spirit Park. Family of mink frequenting pool daily. Good News! Flows must have been let out of Wolf Lake. 7am = 20.0C . Evening 22-23C. A&B L
22. Headquarters Park Deep Hole. 21.0 to 23C. SG
23. Lower Tsolum approximately 1 km downstream of the Godin Pool. In Gark's pool no fish observed
- Water temperatures in a riffle area = 26 BM
25. ~1km downstream of Spirit Park. Hydro obvious released water on the weekend. Water levels in river up 4 inches and cooler this morning. Air Temp.= 17.7 and Water temp =17.0C Observed two dead coho fry in main stem, not sure where they came from? LM
27. Tsolum main stem ~50 upstream of confluence of HQ Creek 50-100 coho fry/100m 21C. SG
27. Refuge Area ~ 300m upstream of confluence of HQ Creek ~ 200-300 coho fry 18C SG
- 27 Headquarters Park Deep Hole. Low No. of coho fry. Mink in pool. 21.C. SG
30. ~1km downstream of Spirit Park. 19.30 hr 22C. LM

Appendix 2. Sections of the Tsolum River being observed by TRRS Volunteers.

Lower to mid Tsolum



Mid to beginning of Upper Reaches of the Tsolum

