Bellevue Salmon Spawner Surveys 2023

Coal Creek

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March 2024

Introduction

The Coal Creek watershed, like many tributaries to the Greater Lake Washington Watershed, provides spawning and rearing habitat for Chinook, Sockeye, and Coho salmon. The City of Bellevue has monitored salmon spawning in select Bellevue streams since 1999. Current survey efforts prioritize Coal Creek. This monitoring provides a strong foundation for assessing trends in salmon use within Bellevue's priority streams and allows for comparison to overall salmon returns throughout the Greater Lake Washington Watershed.

This technical memo summarizes adult salmonid spawning activity observed in Coal Creek during the 2023 salmon spawning season (Sept.-Dec. 2023).

Greater Lake Washington Salmon Returns

Salmon returning to the Greater Lake Washington Watershed pass through the Hiram M. Chittenden Locks in Ballard and the Lake Washington Ship Canal during late summer/early fall before migrating to spawning areas or hatchery facilities within the basin between September-December. Most of the Chinook and Coho salmon passing through the Ballard Locks are hatchery-origin fish returning to the Issaquah Salmon Hatchery, but some are natural-origin fish that spawn naturally in the Cedar River or tributaries to the Sammamish River (Bear Creek, Cottage Lake Creek, and Issaquah Creek). Most Sockeye Salmon passing through the Ballard Locks return to the Cedar River or the Cedar Hatchery at Landsburg, while some spawn in tributaries to the Sammamish River. Chinook, Coho, and Sockeye salmon that use Bellevue streams for spawning follow the pathway outlined in Figure 1.

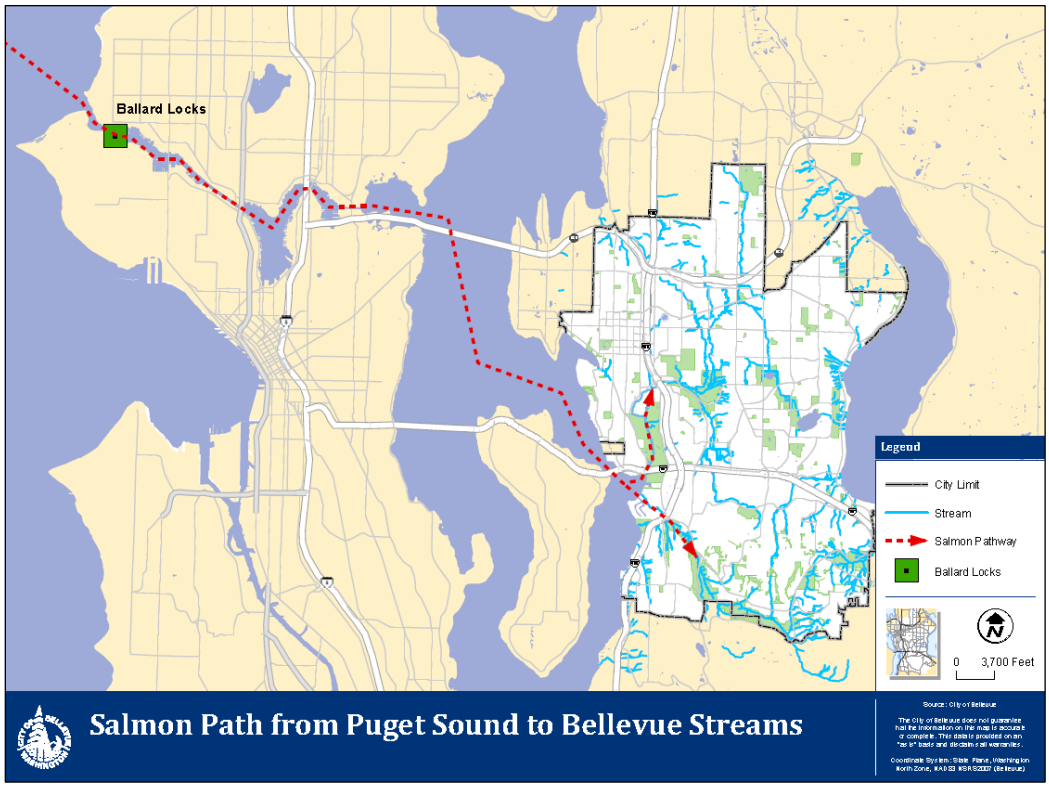

Figure 1. Salmon path from Puget Sound to Bellevue streams.

Survey Methodology

Salmon spawning surveys in Bellevue streams begin in early-September and are conducted weekly until mid to late December. All survey reaches are found in Figure 2. Surveys in 2023 were conducted by City of Bellevue staff who are trained in ecology and biological sciences. The survey methodology employed throughout Bellevue streams is consistent with methods used in other major salmon spawning streams within the Greater Lake Washington Watershed.

During the walking surveys, City of Bellevue staff walk full survey reaches and enumerate live and dead fish for all salmonid species, and the location of individual redds constructed by Chinook Salmon, Coho Salmon and Cutthroat Trout are recorded with ArcGIS Field Maps on a GPS-enabled tablet. Sockeye Salmon redds are not recorded, as this species often spawns close together with numerous overlapping redds that are difficult to accurately count. All recovered salmon carcasses, with the exception of those out-planted to the stream (more information to follow), are sampled for length, sex, origin (natural versus hatchery), age, and egg retention (to determine if the female was able to spawn naturally or if it should be counted as a pre-spawn mortality). Photo 1 shows a recovered Chinook Salmon carcass that was partially eaten by a predator and sampled in early October 2023 in Coal Creek Reach 1.

Photo 1. Recovered and partial eaten Chinook Salmon carcass was measured for post-orbital to hypural-plate (POH) length in the field by Bellevue staff in October 2023.

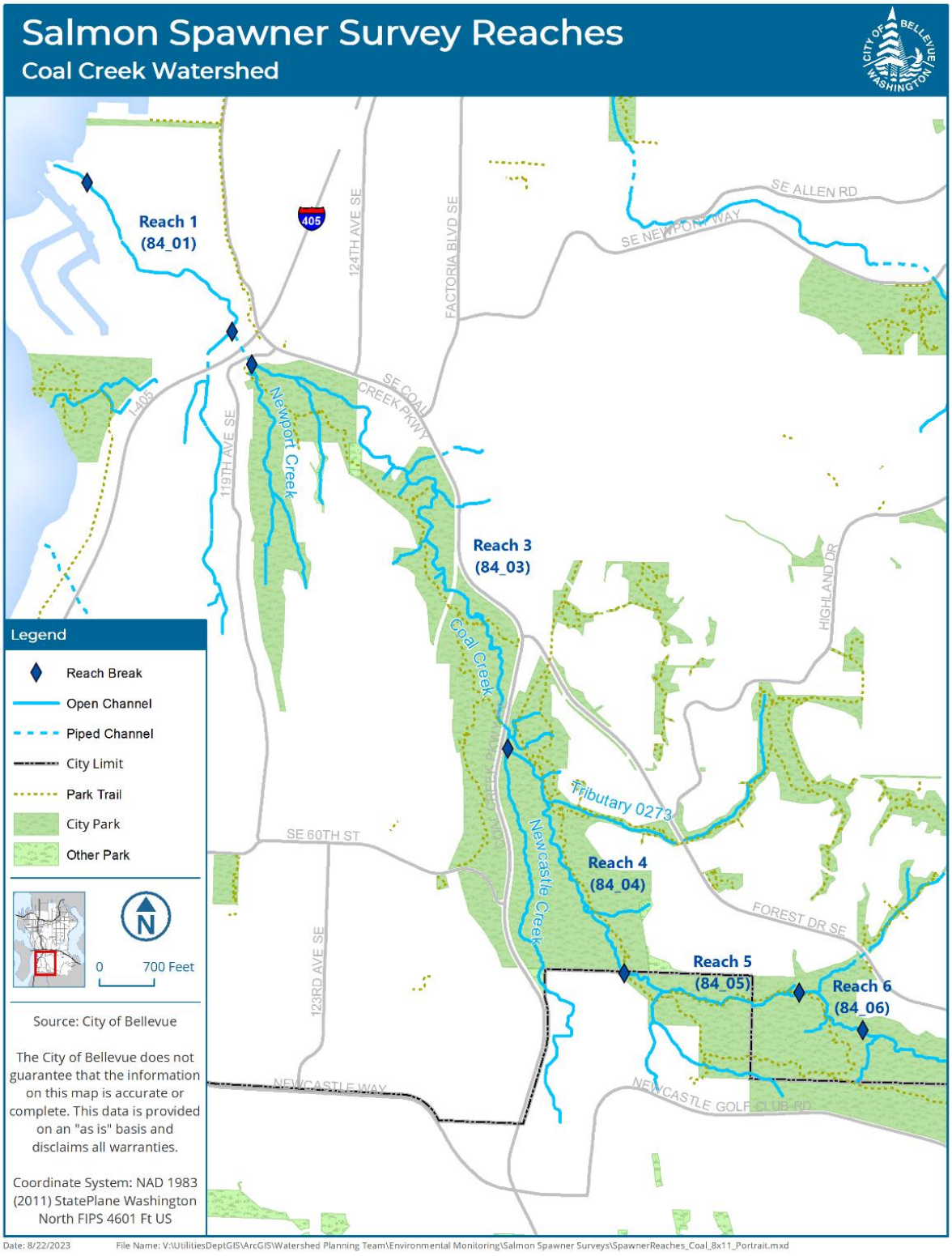

Figure 2. Map of survey reaches in the Coal Creek Watershed. (Note: Reaches 1 and 3-5 are surveyed annually. Reach 2 contains the culvert under I-405 and is therefore not surveyable. Reach 6 contains a natural barrier to salmon migration, therefore only the lower portion of this reach is surveyed.)

Summary of 2023 Salmon Returns

Coal Creek Watershed: In 2023, nearly all salmon returning to Bellevue were in Coal Creek. This is consistent with reports from Bellevue's Stream Team volunteers and trends of the past decade. Salmon redds (or egg nests), and live and dead fish observations were counted during weekly walking surveys and are summarized with previous years' observations in Table 1.

Table 1. Summary of salmon observations in the Coal Creek Watershed.

Coal Creek								
Year	Chinook			Sockeye		Coho		
	Redds	Live Fish	Carcasses	Live Fish	Carcasses	Redds	Live Fish	Carcasses
2008	0	0	0	0	0	6	0	3
2009	0	0	0	0	0	0	5	1
2010	1	1	0	0	0	0	1	0
2011	0	0	0	1	0	1	2	1
2012	1	19	1	66	8	2	17	2
2013	3	8	2	1	1	152*	921*	340*
2014	2	1	0	2	0	174*	1032*	210*
2015	2	10	3	0	0	2	8	1
2016	7	13	4	17	8	13	43	15
2017	3	9	8	6	4	21	48	12
2018	0	0	2	0	0	34	39	11
2019	7	21	11	2	0	114*	521*	259*
2020	3	11	9	0	0	7	1	2
2021	3	41	15	0	0	108*	191*	96*
2022	0	0	0	0	0	118*	421*	107*
2023	8	15	5	0	0	84*	244*	300*

(* indicates years when returned Coho Salmon adults were out-planted from the Issaquah Hatchery)

Similar to previous years, small numbers of Chinook and Coho salmon continue to spawn naturally in Coal Creek. Live adult Chinook Salmon were observed in lower Coal Creek from Sept. 20 until Oct. 6, whereas live adult Coho Salmon were observed from Oct. 2 until Nov. 21. One unknown adult salmonid was observed on Oct. 12 and one adfluvial Cutthroat Trout (trout that live in a lake and spawn in small streams) was observed on Nov. 21. No Sockeye Salmon or kokanee were observed in Coal Creek in 2023.

In November of 2023, 1,582 surplus adult hatchery-origin Coho Salmon from the Issaquah Hatchery were transported and released into Coal Creek at two locations (Anna's Pond in Reach 3 and the Coal Creek Parkway Sediment Pond found in Reach 4) to increase natural spawning and smolt production (Table 2 and Photo 2). This Coho Salmon out-planting effort is responsible for the majority of Coho Salmon, including redds, and live and dead fish observations, recorded in Coal Creek in 2023. The exact timeframe of naturally returning Coho Salmon to Coal Creek is uncertain due to the out-planting effort in early November. Eight live Coho Salmon (and two carcasses) that would likely have naturally returned to Coal Creek, therefore, not associated with the 2023 out-planting effort, were observed in lower Coal Creek from Oct. 2 to at least early November and produced four redds. After the out-planting, an additional 80 Coho Salmon redds

were recorded and an additional 236 live Coho Salmon and 298 carcasses were observed in Coal Creek. In total, 300 Coho Salmon carcasses were recovered, eight that were of natural origin (adipose fin present) and 11 that were pre-spawn mortalities (likely caused by degraded water quality (Photo 3)).

High stream flows from several large rain events resulted in significantly fewer Coho Salmon redds in 2023 than were anticipated from the out-planting effort. Additionally, high stream flows just after the out-planting events prevented surveyors from documenting live fish and redds produced within the first week, which may be responsible for the lower numbers of live and dead fish observed. Several smaller storm events resulted in only 10% spawning success from out-planted females before a large storm event on December 5, 2023, caused substantial streambed scour from streamflow recorded at 218 cfs. This likely washed away the majority of the 2023 salmon redds. Any surviving progeny, or offspring, from this out-planting effort are expected to return in the fall of 2026. Progeny from the 2021 effort are anticipated to return next fall, in the fall of 2024.

Table 2. Location and dates of adult Coho Salmon out-planted from Issaquah Hatchery to the Coal Creek and Greater Kelsey Creek watersheds.

Year	Stream	Dates planted	Planting location*	Number of Coho planted
2013	Kelsey Creek	11/13-11/20	Reach 1 and 3	1,150
	Coal Creek	11/21	Reach 3	742
	West Tributary	11/13	Reach 4	100
2014	Kelsey Creek	10/23-10/24	Reach 1 and 3	643
	Coal Creek	10/30-11/7	Reach 3	1,573
2019	Coal Creek	11/4-11/14	Reach 3 and 4	1,049
2021	Coal Creek	11/3	Reach 4	598
2022	Coal Creek	11/16	Reach 4	636
2023	Coal Creek	11/1-11/2	Reach 3 and 4	1,582

*Planting locations correspond to Reaches established during the 2018 Open Streams Condition Assessment.

Photo 2. Adult hatchery-origin Coho Salmon from the Issaquah Hatchery rest in the shallows after being transported and released into the Coal Creek Parkway Sediment Pond found in Reach 4 (November 1, 2023).

Photo 3. Naturally returning adult Coho Salmon pre-spawn mortality (female that died prior to spawning) sampled in Coal Creek Reach 1 (October 25, 2023).