

Bowman Creek (Klickitat River Subbasin, Washington) Rapid Aquatic Habitat Assessment Stream Report



Confederated Tribes and Bands of the Yakama Nation
Yakama Nation Fisheries Program, Yakima/Klickitat Fisheries Project
Klickitat Research, Monitoring, and Evaluation Project
Klickitat Field Office
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Assessment Stream Report**

Prepared by:
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Stream: Bowman Creek

LLID: 1210387458548

Basin: Klickitat River

HUC Number: 17070106

Ecoregion: Columbia River Gorge

Watershed Area: 153 km²

Survey Dates: Reach 1 –June 25, 2019

Reach 2 –June 25-26, 2019

Reach 3-June 26 & 28, 2019

Reach 4-June 28, 2019

Survey Crew: Reach 1 – Nicolas Romero and Kory Kuhn

Reach 2 – Nicolas Romero and Kory Kuhn

Reach 3- Nicolas Romero and Kory Kuhn

Reach 4- Nicolas Romero and Kory Kuhn

Report Prepared By: Kory G. Kuhn and Nicolas Romero

Introduction:

The Rapid Aquatic Habitat Assessment Protocol (RAHAP) is designed to provide quantitative information on stream habitat and fish distribution at the watershed scale. Data collected from the stream inventory surveys are used to provide baseline information for fisheries biologists, hydrologists, and foresters to guide natural resources management and land use practices on Yakama Nation Southern Ceded lands. This protocol establishes hierarchical spatial context and fish habitat relationships at habitat unit, reach, and basin scales. The spatially continuous method is useful when the scale(s) necessary to detect pattern are unknown. This level of pattern detection is useful to managers for refining study designs; locating, identifying, and prioritizing projects; and establishing reference or control sites for project design. Existing stream inventory protocols were reviewed during the development of the RAHAP methodology. Upon review, two widely used Pacific Northwest stream classification systems, Washington Timber, Fish, and Wildlife (TFW) Monitoring Program and the Aquatic Inventory Project (AIP), were incorporated into the RAHAP methodology (Moore et al. 2010, Pleus et al. 1999, and Schuett-Hames et al. 1999).

RAHAP quantifies both the abiotic and biotic state of aquatic habitat. The abiotic components are: geomorphic reach segments, habitat units, bedrock features, wood pieces, wood jams, and streamflow. These physical parameters are coupled with a separate one-pass fish survey that ties fish abundance to

habitat. The geomorphic reach and habitat unit level delineation methodology was derived primarily from AIP (Moore et al. 2010). The wood piece and wood jam inventories follow protocols established by Schuett-Hames et al. 1999. Yakama Nation Fisheries personnel identified bedrock features as habitat of interest and subsequently developed survey methodologies. Refer to Romero and Lindley 2012 for the complete RAHAP protocol.

Stream Level Description:

The Bowman Creek habitat survey began at the confluence with the Little Klickitat River (rkm 1.9) and extended upstream approximately 2 kilometers. The habitat survey ended at a waterfall barrier that delineated the upstream extent to salmonid anadromy. Four reaches were delineated over the length of the habitat survey. A valley transition from wide to narrow delineated Reach 1 from Reach 2. Reach 2 was delineated from Reach 3 by a change of valley type from narrow to wide. A 2.3 meter waterfall delineated Reach 3 from Reach 4. A narrow v-shaped valley was the dominant valley form encountered. The stream channel was generally constrained by alternating terrace and hillslope.

Three side channels and an alcove were encountered on the survey. The stream gradient was 4.4%. The total wetted area quantified was 11,498.7 m². The average wetted and bankfull widths were 5.2 and 8.6 meters, respectively. Boulders and cobble were the dominant substrate accounting for approximately 82% of the substrate area. Riffle was the most common geomorphic unit delineated, comprising 53% of the wetted area and 53% of the survey length. A total of 38 pools were quantified. The average residual pool depth was 0.62 meters. Approximately 21% of pools throughout all survey reaches had a maximum depth ≥1 meter. The number of pools/kilometer and pools ≥1 meter/kilometer was estimated at 17.7 and 3.7, respectively. Pool frequency was measured at 6.6 (bankfull widths/pool).

Ponderosa Pine and Oregon White Oak were the most common upslope trees. Red Alder and Big Leaf Maple were the dominant and sub-dominant riparian vegetation, respectively. The canopy covered approximately 75% of the wetted area. A total of 71 large wood pieces were counted resulting in a frequency of 3.3pieces/100 meters and a volume of 2.1 m³/100 meters. Deciduous wood pieces accounted for 68 of the 71 pieces and 91% of the wood volume. Logs accounted for 65 of the 71 pieces and 85% of the wood volume. Of the 71 large wood pieces, 24, 61, 53, and 28 were located completely or partially in the wetted channel, within bankfull but outside of the wetted channel, above the bankfull channel, and flood plain/terrace, respectively. The majority of the large wood pieces were pinned (59%) followed by pieces that were buried (23%). Approximately one-third of pieces were unstable. There were no pieces that functioned as a pool forming agent. Large wood pieces were most commonly oriented parallel (37%) followed by perpendicular (32%), downstream (28%), and upstream (3%).

A total of 33 distinct bedrock features were quantified. The cumulative measured length was 632.5 meters. The dominant cross-sectional shape was cliff which accounted for 24 of 33 identified bedrock rock features. Bedrock ledge and slope accounted for the remaining five and four bedrock features respectively. All ledge and slope bedrock features projected into the wetted channel.

Reach Level Descriptions:

Reach 1 began at the confluence with the Little Klickitat River (rkm 1.9) and extended upstream 295.6 meters. A valley transition from a wide valley to narrow valley delineated the end of Reach 1. The reach was characterized by a wide alluvial fan valley. The stream channel was constrained by a road along the northwest bank. One side channel was encountered on the survey.

The primary channel reach gradient was high at 5%. The total wetted area quantified for the primary channel was 1,533.2 m². The average wetted and bankfull widths for the primary channel were 5.0 and 7.8 meters, respectively. Boulder was the dominant reach substrate accounting for two-thirds of the wetted area. Cobble and gravel comprised an additional 27% and 5% of the quantified substrate, respectively. Riffles were the most common geomorphic unit delineated comprising 69% of the reach wetted area and 68% of the reach length. A total of 4 pools were quantified in the primary channel. The average primary channel residual pool depth was 0.61 meters. One of the pools had a maximum depth ≥1 meter. The number of primary channel pools/kilometer and pools >1 meter/kilometer was estimated at 13.5 and 3.4, respectively. Pool frequency for the primary channel was measured at 9.5 (bankfull widths/pool).

Oregon White Oak and Ponderosa Pine were the most common upslope trees. Red Alder and Big Leaf Maple were the dominant and sub-dominant riparian vegetation, respectively. The canopy covered approximately 85% of the wetted area. A total of 16 large wood pieces were counted resulting in a frequency of 5.4 pieces/100 meters and a volume of 2.9 m³/100 meters. Of the 16 large wood pieces, 5, 11, 8, and 8 were located completely or partially in the wetted channel, within bankfull but outside of the wetted channel, above the bankfull channel, and flood plain/terrace, respectively. Deciduous accounted for all 16 pieces and 100% of the wood volume. Logs accounted for 14 of the 16 pieces and 81% of the wood volume. Approximately half of the quantified large wood pieces were unstable (50%). Of the pieces exhibiting a level of stability, pinned and buried stability forms were observed in 37.5% and 12.5% of the pieces, respectively. Large wood pieces were most commonly oriented downstream (50%) followed by parallel (31%), perpendicular (19%), and upstream (0%).

One distinct bedrock feature was quantified. The cumulative measured length was 44.8 meters. The bedrock feature was located along the left bank. The encountered bedrock feature was a cliff and did not project in to the wetted channel.

In addition to the primary channel, a side channel was encountered on the survey. The total wetted area quantified for the secondary channel was 55 m². The side channel consisted of 3 habitat units and extended upstream 18.8 meters. There was one pool quantified for the secondary channel and had an average residual pool depth of 0.57. There were no pools ≥1 meter in depth within the secondary channel.

Reach 2 began 295.6 meters upstream from the confluence with the Little Klickitat River (rkm 1.9) and extended upstream 706.4 meters. Reach 1 was delineated from Reach 2 by a valley transition from wide to narrow. A narrow v-shaped valley was the dominant valley form encountered. The stream channel was constrained by a road along the northwest and northeast bank. No side channels were encountered in Reach 2. An alcove measuring 8.2 meter long and 17.63 m² was present.

The primary channel reach gradient was moderate at 3.6%. The total wetted area quantified was 4,036.7 m². The average wetted and bankfull widths were 5.5 and 9.4 meters, respectively. Boulder and cobble were the dominant substrate accounting for almost 90% of the substrate area. Gravel comprised an additional 8% of the quantified substrate. Riffle was the most common geomorphic unit delineated comprising 72% of the reach wetted area and 71% of the reach length. A total of 7 pools were quantified. The average residual pool depth was 0.4 meters. None of the pools had a maximum depth ≥1 meter. The number of pools/kilometer was estimated at 9.8. Pool frequency was measured at 10.9 (bankfull widths/pool).

Ponderosa Pine and Oregon White Oak were the most common upslope trees. Red Alder and Big Leaf Maple were the dominant and sub-dominant riparian vegetation, respectively. The canopy covered approximately 87% of the wetted area. A total of 20 large wood pieces were counted resulting in a frequency of 2.8 pieces/100 meters and a volume of 2.1 m³/100 meters. Of the 20 large wood pieces, 5, 18, 19, and 11 were located completely or partially in the wetted channel, within but outside of the bankfull channel, above the bankfull channel, and flood plain/terrace, respectively. Deciduous trees accounted for all 20 pieces and 100% of the wood volume. Logs accounted for 19 of the 20 pieces and 81% of the wood volume. Of the pieces exhibiting a level of stability, pinned and buried stability forms were observed in 55% and 20% of the pieces, respectively. Approximately 40% of the quantified large wood pieces were unstable. There were no pieces that functioned as a pool forming agent. Large wood pieces were most commonly oriented parallel (50%) followed by perpendicular (30%), upstream (10%), and downstream (10%).

A total of 1 distinct bedrock feature located on the left bank was quantified. The cumulative measured length was 8.5 meters on the left bank. The bedrock feature was a cliff and did not project into the wetted area.

Reach 3 began 1002 meters upstream from the confluence with the Little Klickitat River (rkm 1.9) and extended upstream 802.9 meters. A 2.3 meter waterfall delineated the end of Reach 3. A narrow v-shaped valley was the dominant valley form encountered. The stream channel was constrained by an alternating terrace and hillslope. One side channel was encountered on the survey.

The primary channel reach gradient was high at 4.2%. The total quantified wetted area was 4,304 m². The average wetted and bankfull widths for the primary channel were 5.3 and 8.6 meters, respectively. Boulder was the dominant reach substrate and compromised 45% of the wetted area. Cobble and gravel comprised an additional 34% and 7% of the quantified substrate respectively. Riffles were the most common geomorphic unit delineated comprising 37.3% of the reach wetted area and 37.5% of the reach length. Pools were the second most common geomorphic unit delineated comprising 30.3% of the reach wetted area and 30.5% of the reach length. A total of 18 pools were quantified in the primary channel. The average primary channel residual pool depth was 0.68 meters. Five of the primary channel pools had a maximum depth ≥1 meter. The number of primary channel pools/kilometer and pools ≥1 meter/kilometer was estimated at 22.4 and 6.2, respectively. Pool frequency for the primary channel was measured at 5.2 (bankfull widths/pool).

Oregon White Oaks and Ponderosa Pine were the most common upslope trees. Red Alder and Big Leaf Maple were the dominant and sub-dominant riparian vegetation, respectively. The canopy covered approximately 67% of the wetted area. A total of 20 large wood pieces were counted resulting in a frequency of 2.5 pieces/100 meters and a volume of $1.0 \text{ m}^3/100 \text{ meters}$. Of the 20 larger wood pieces, 6, 17, 16, and 4 were located completely or partially in the wetted channel, within bankfull but outside of the wetted channel, above the bankfull channel, and flood plain/terrace, respectively. Deciduous accounted for 19 of the 20 primary channel pieces and 95% of the wood volume. Logs accounted for 18 of the 20 pieces and approximately 76% of the wood volume. Of the pieces exhibiting a level of stability, pinned and buried stability forms were observed in 75% and 20% of the pieces, respectively. One-quarter of the quantified large wood pieces were unstable. Large wood pieces were most commonly oriented downstream (40%) followed by parallel (30%), perpendicular (30%), and upstream (0%).

A total of 18 primary channel distinct bedrock features were quantified. The cumulative measured length was 457.2 meters. Fourteen encountered bedrock features were cliffs and 4 bedrock features were a slope. The four slope features projected in to the wetted channel and functioned as a hydraulic surface control.

In addition to the primary channel, a side channel was encountered on the survey. The total wetted area quantified for the secondary channel was 121 m^2 . The side channel consisted of 4 habitat units and extended upstream 39.5 meters. There was one pool quantified for the secondary channel and had an average residual pool depth of 0.34. There were no pools >1 meter in depth encountered on the secondary channel.

Reach 4 began 1,804.9 meters upstream from the confluence with the Little Klickitat River (rkm 1.9) and extended upstream 248.3 meters. A 12.2 meter high waterfall delineated the end of Reach 4 and end of the habitat survey. A narrow v-shaped valley was the dominant valley form encountered. The stream channel was constrained by an alternating terrace and hillslope. One side channel was encountered on the survey.

The primary channel reach gradient was high at 4.2%. The total wetted area quantified for the primary channel was $1,385.6 \text{ m}^2$. The average wetted and bankfull widths for the primary channel were 5.4 and 8.6 meters, respectively. Boulder was the dominant reach substrate and comprised 39% of the wetted area. Bedrock and cobble comprised an additional 24% and 21% of the quantified substrate, respectively. Cascades were the most common geomorphic unit delineated comprising 36.1% of the reach wetted area and 38.6% of the reach length. A total of 6 pools were quantified for the primary channel. The average primary channel residual pool depth was 0.85 meters. Two of the primary channel pools had a maximum depth ≥ 1 meter. The number of primary channel pools/kilometer and pools ≥ 1 meter/kilometer was estimated at 24.2 and 8.1, respectively. Pool frequency for the primary channel was measured at 4.8 (bankfull widths/pool).

Oregon White Oak and Ponderosa Pine were the most common upslope trees. Red Alder and Dogwood were the dominant and sub-dominant riparian vegetation, respectively. The canopy covered approximately 53% of the primary channel wetted area. A total of 12 large wood pieces were counted

resulting in a frequency of 4.8 pieces/100 meters and a volume of 4.8 m³/100 meters. Of the 12 large wood pieces, 8, 12, 9, and 4 were located completely or partially in the wetted channel, within bankfull but outside of the wetted channel, above the bankfull channel, and flood plain/terrace, respectively. Deciduous accounted for 10 of the 12 primary channel pieces and 69% of the wood volume. Logs accounted for 11 of the 12 pieces and approximately 98% of the wood volume. Of the pieces exhibiting a level of stability, pinned and buried stability forms were observed in 58% and 33% of the pieces, respectively. One-quarter of the quantified large wood pieces were unstable. There were no pieces that functioned as a pool forming agent. Large wood pieces were most commonly oriented perpendicular (58%) followed by parallel (33%), downstream (8%), and upstream (0%).

A total of 9 primary channel distinct bedrock features were quantified. The cumulative measured length was 111.9 meters. Five encountered bedrock features were cliffs and five bedrock features were a ledge. The five ledge features projected in to the wetted channel and each functioned as a hydraulic surface control.

In addition to the primary channel, a single side channel was encountered on the survey. The total wetted area quantified for the secondary channel was 63 m². The side channel consisted of 3 habitat units and extended upstream 22.8 meters. There was one pool quantified for the secondary channel and had an average residual pool depth of 0.37 meters. There were no pools ≥1 meter in depth encountered on the secondary channel.

References:

Moore, K. K. Jones, J. Dambacher, and C. Stein. 2010. Aquatic Inventories Project: Methods for Stream Habitat Surveys. Oregon Department of Fish and Wildlife, Aquatic Inventories Project, Conservation and Recovery Program, Corvallis, OR 97333.

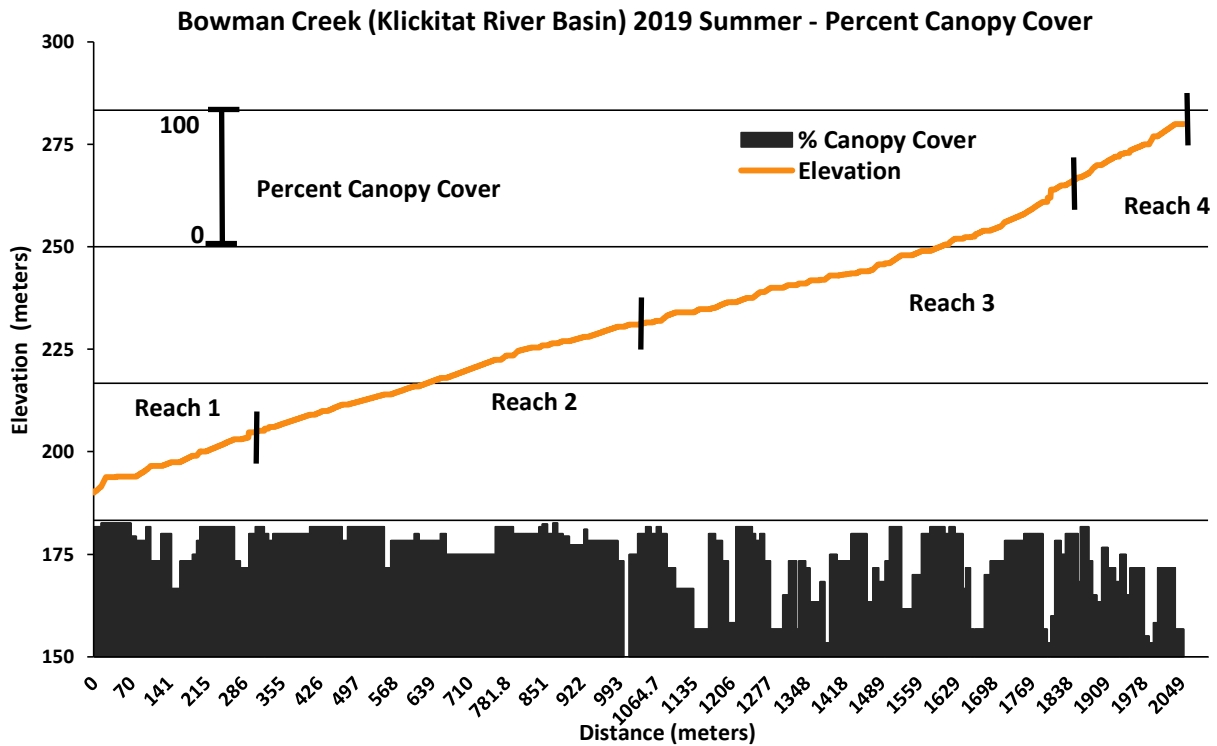
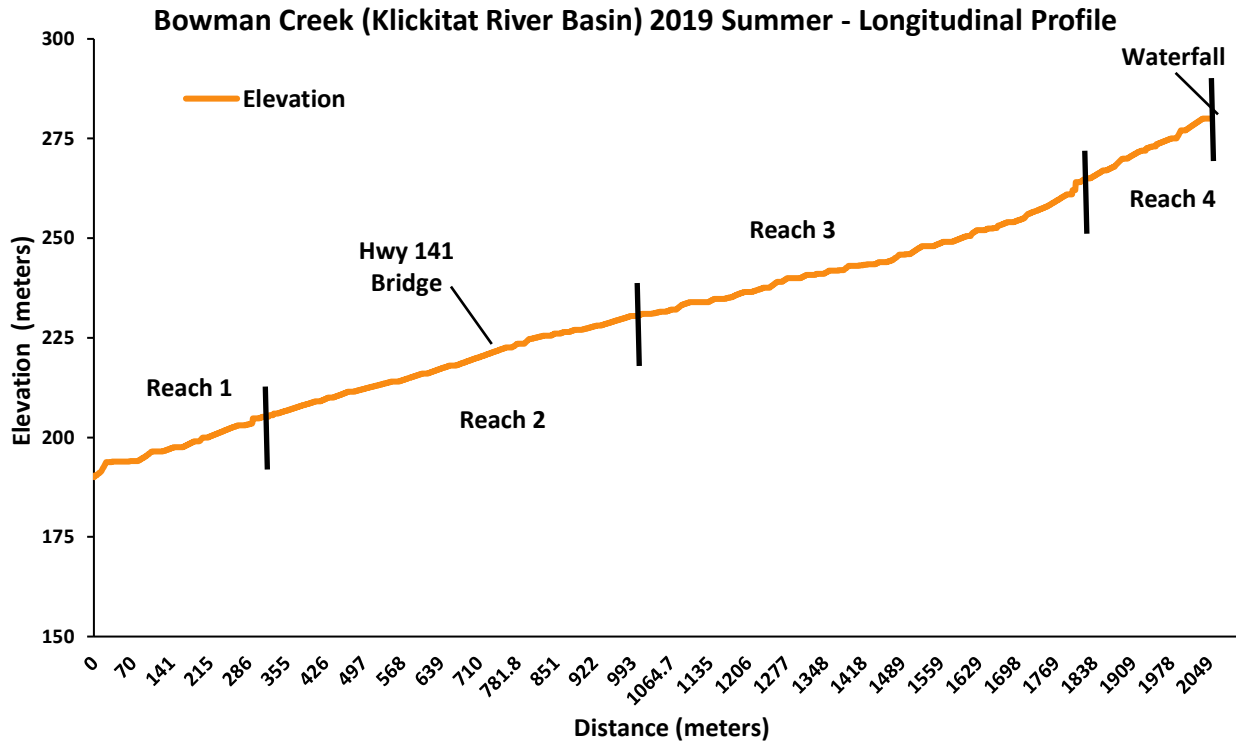
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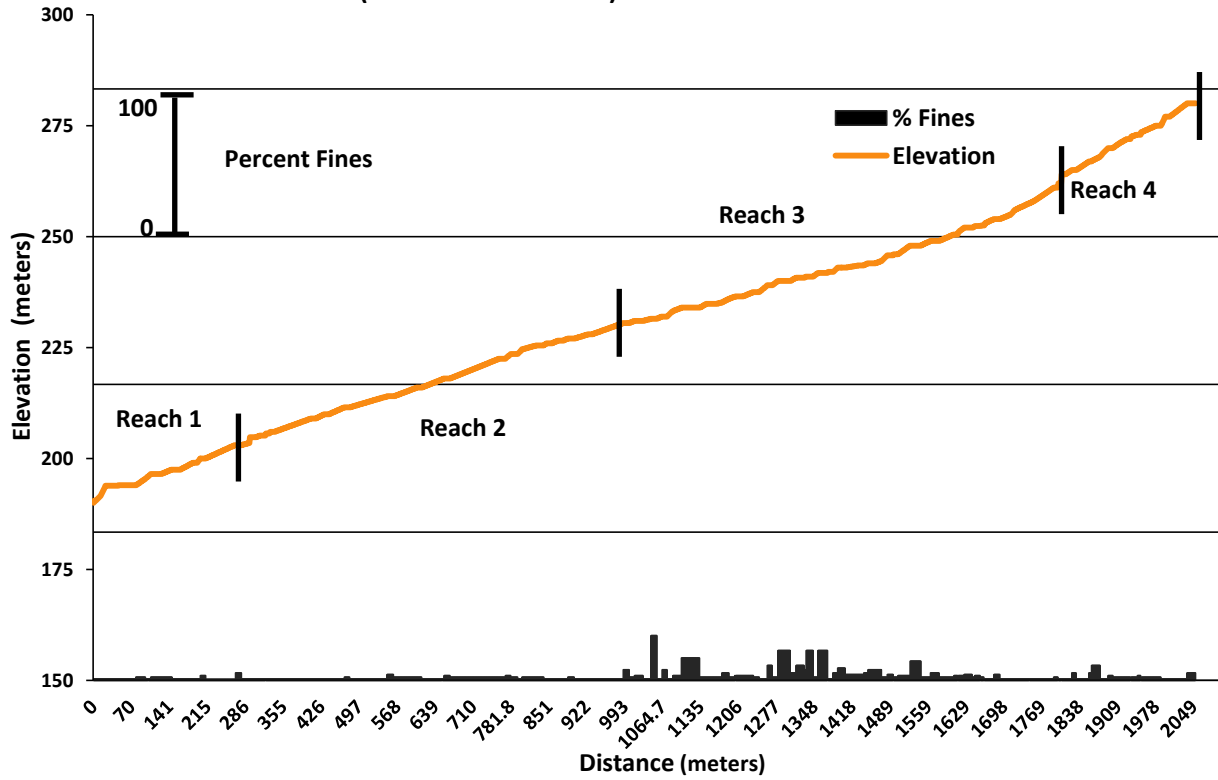
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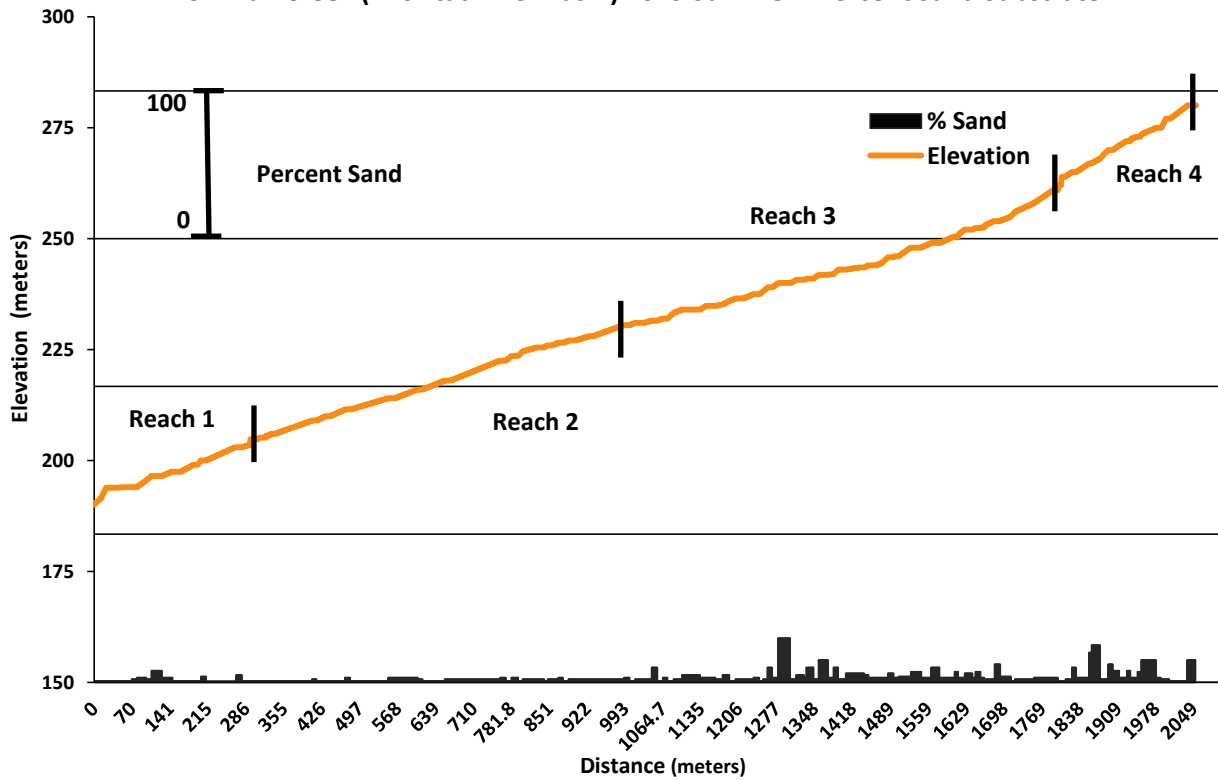
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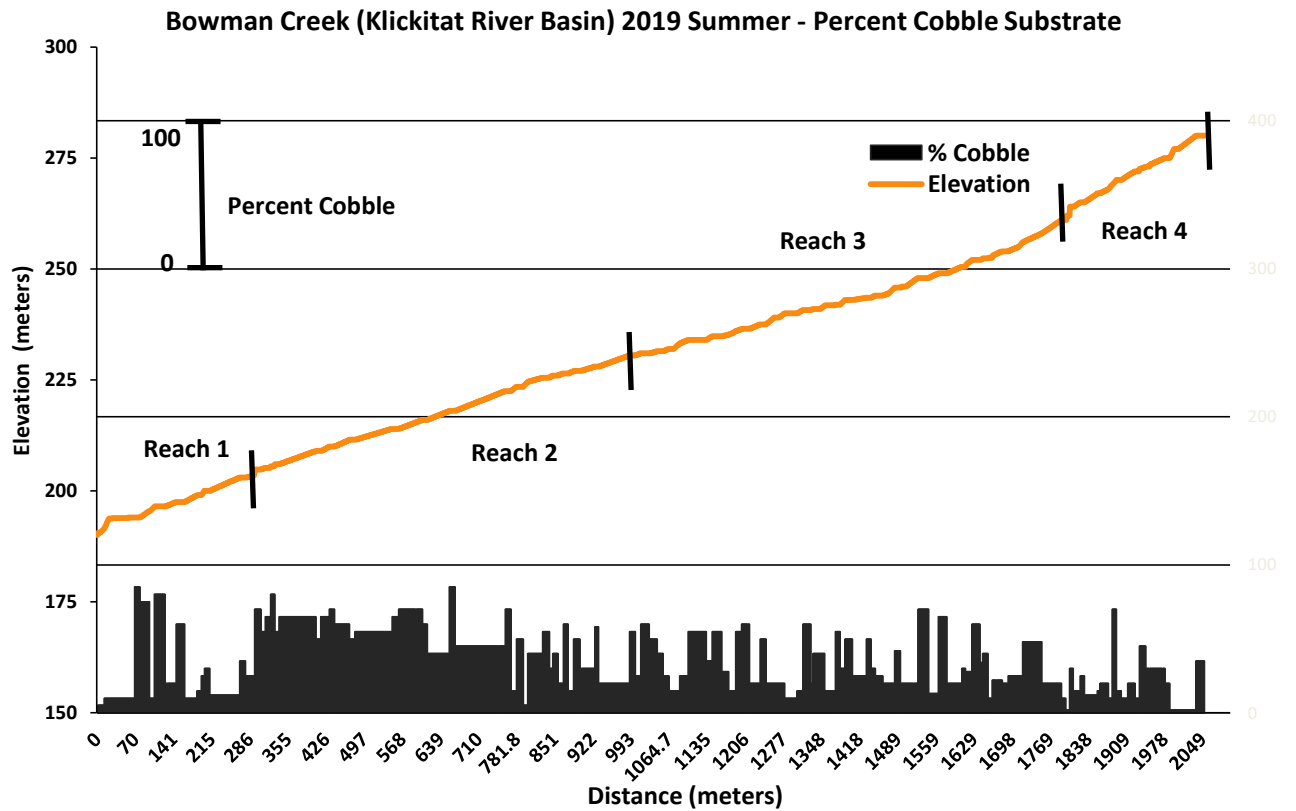
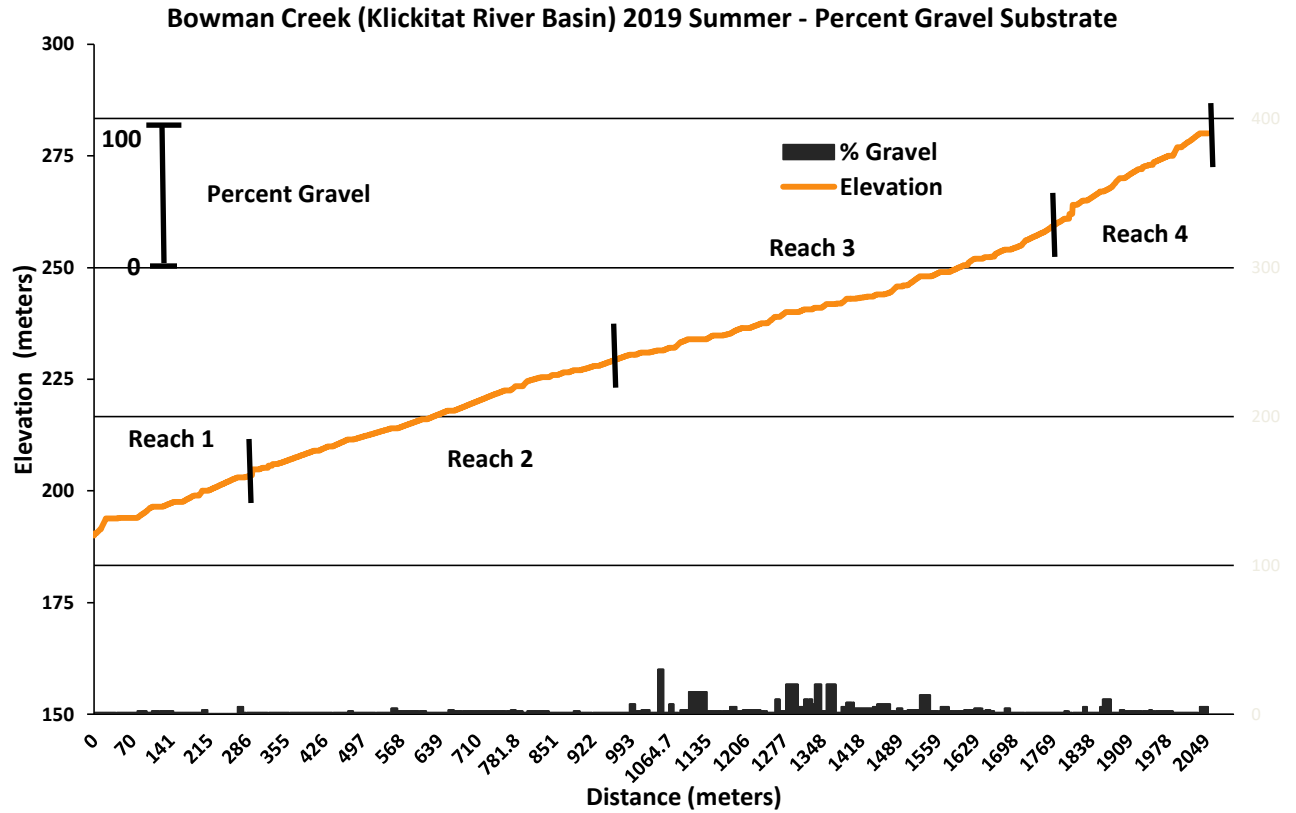


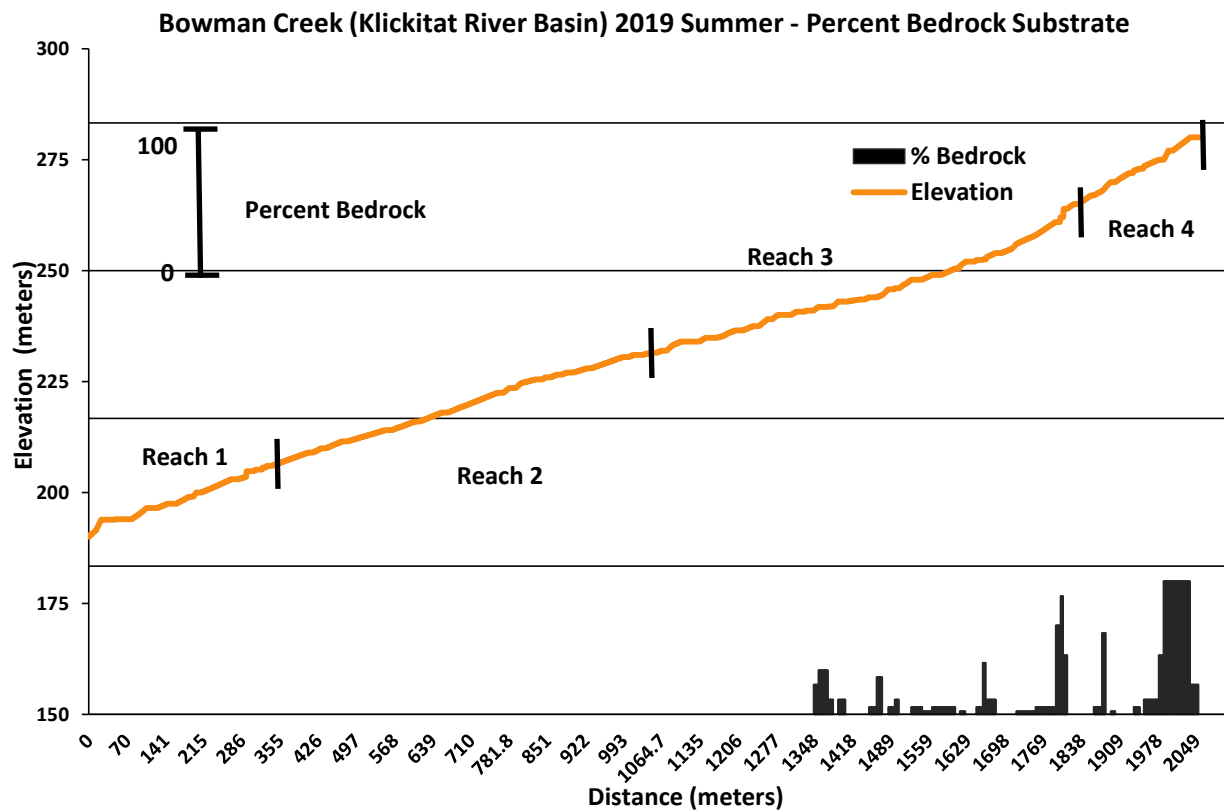
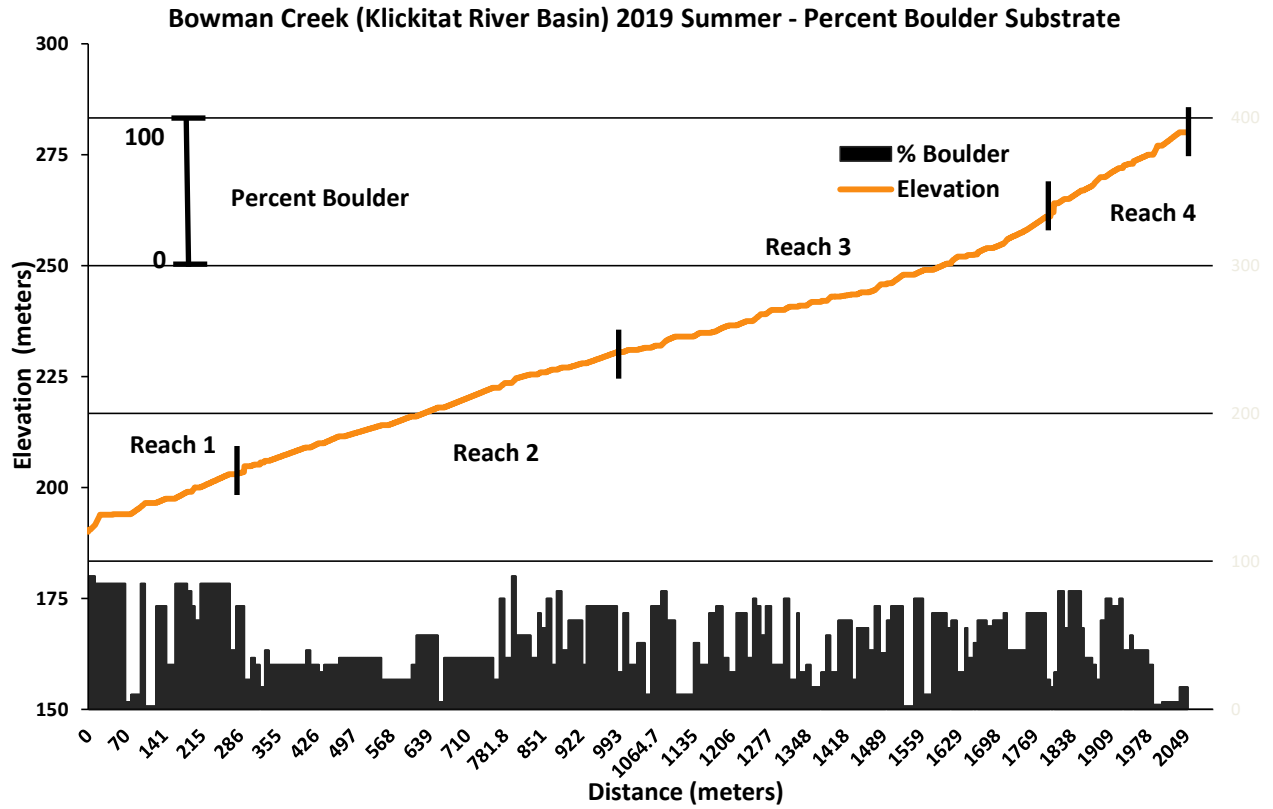
Bowman Creek (Klickitat River Basin) 2019 Summer - Percent Fines Substrate

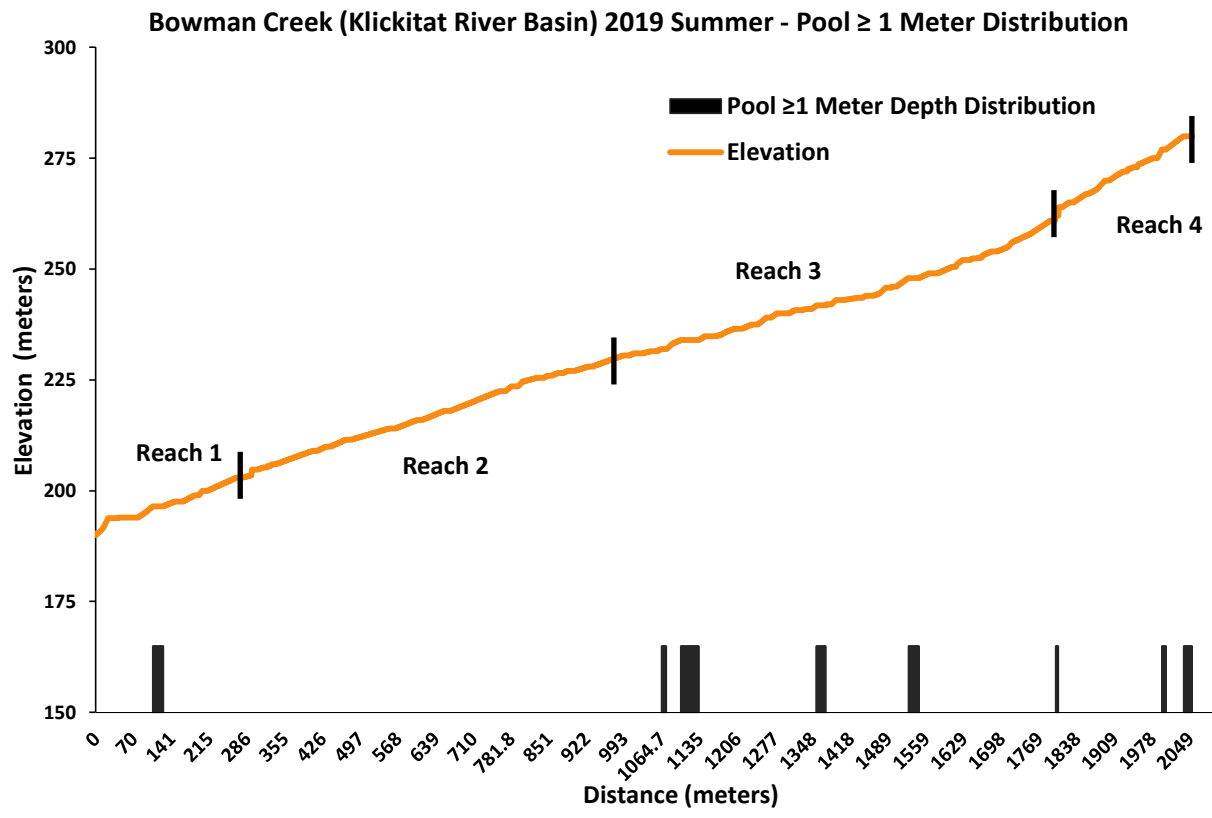
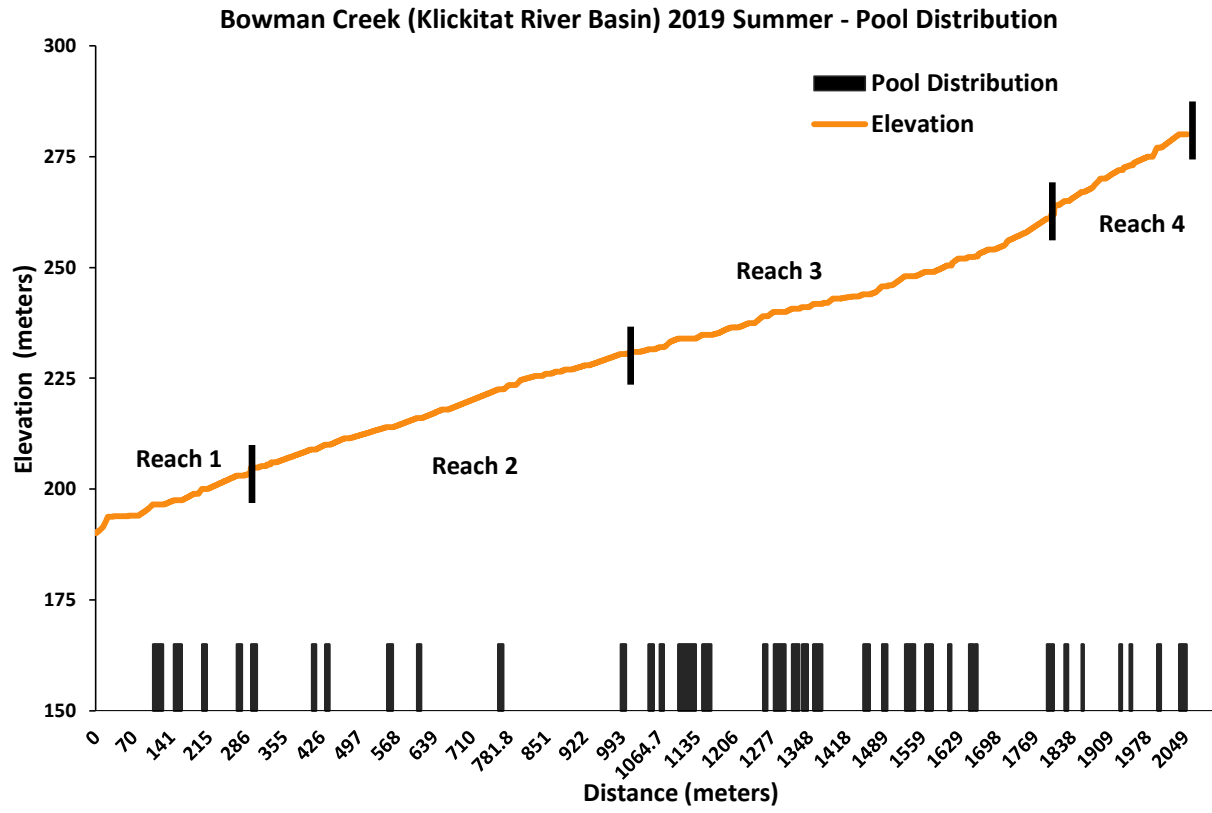


Bowman Creek (Klickitat River Basin) 2019 Summer - Percent Sand Substrate

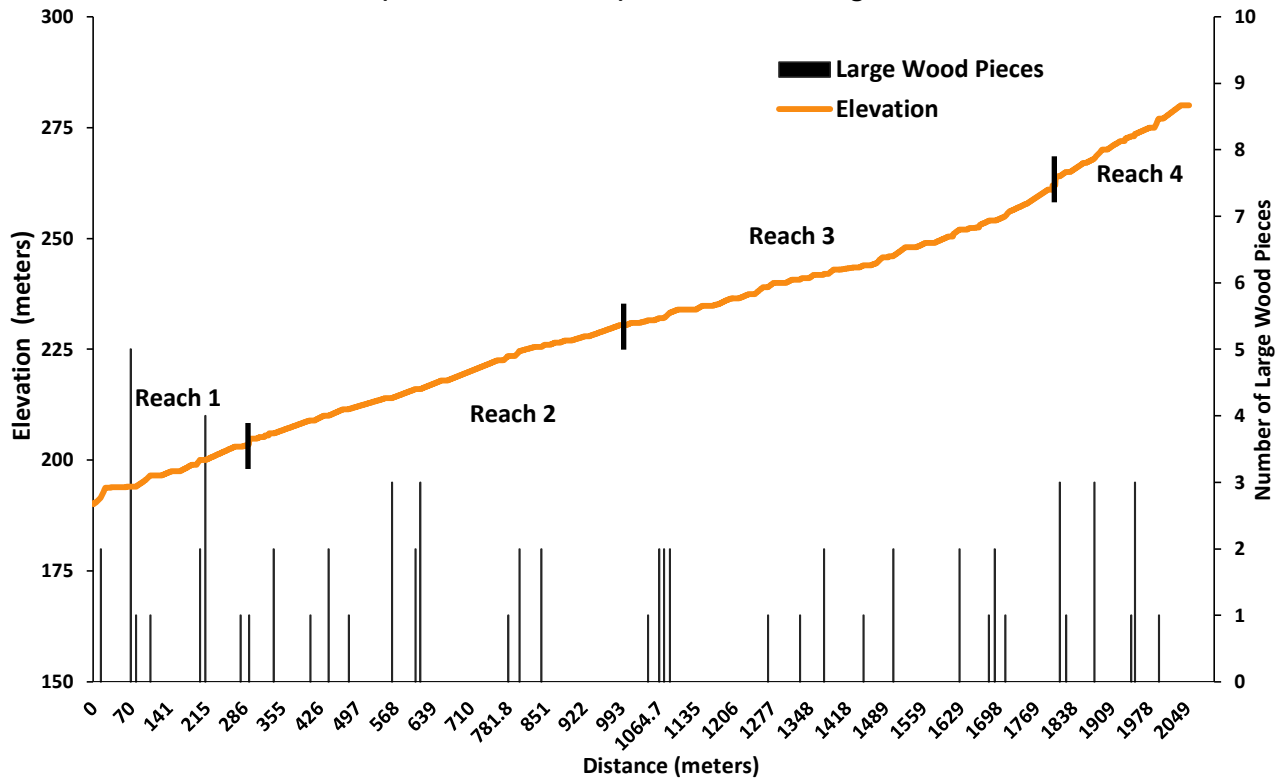




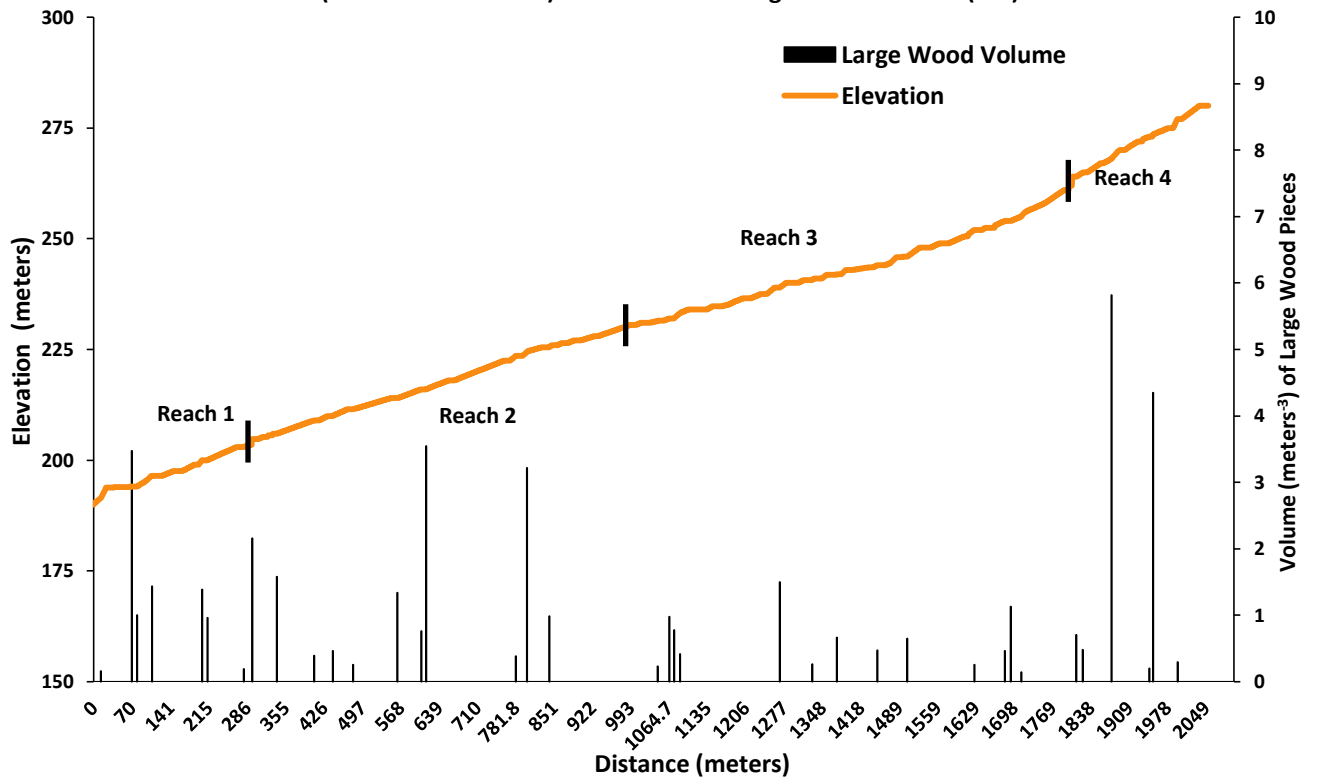


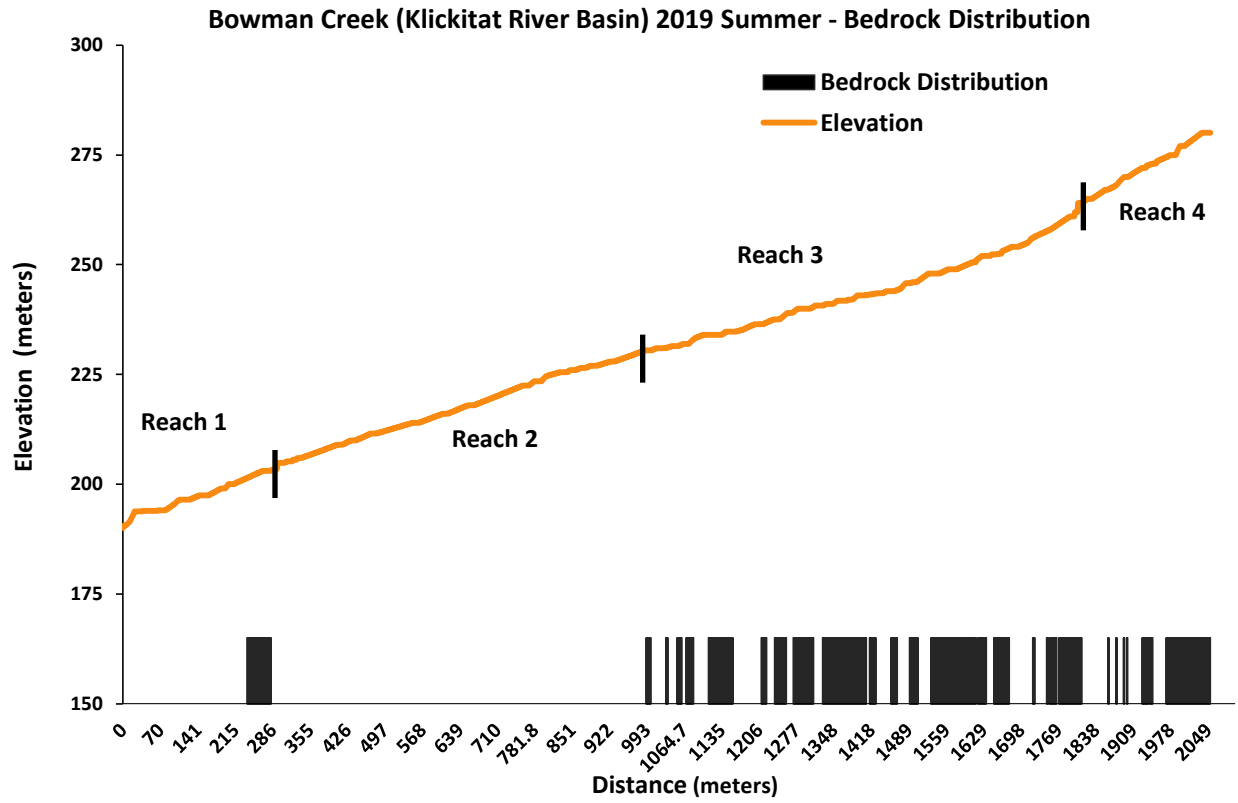


Bowman Creek (Klickitat River Basin) 2019 Summer - Large Wood Pieces Distribution



Bowman Creek (Klickitat River Basin) 2019 Summer - Large Wood Volume (m³) Distribution





Summary Tables:

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 1
Report Date: 05/08/2020	Survey Date: 06/25/2019
Start Location: 45.842473, -121.044	End Location: 45.84448, -121.042282
Start Elevation: 190.5 m	End Elevation: 204.8 m
Reach Forming Agent: Tributary Junction	Reach Ending Agent: Valley Transition

CHANNEL SUMMARY

Channel Characteristics (m)					
<u>Type</u>	<u>No. Units</u>	<u>Length (m)</u>	<u>Area (m²)</u>	<u>Gradient (%)</u>	<u>Dry Units</u>
Primary	15	295.6	1,533.2	5.0	0
Secondary	3	18.8	55.0	-	0

Channel Dimensions (m)					
<u>Type</u>	<u>Unit</u> <u>Avg. Length</u>	<u>Avg. Wetted</u> <u>Width</u>	<u>Avg. Bankfull</u> <u>Width</u>	<u>LB Undercut</u> <u>Bank Length</u>	<u>RB Undercut</u> <u>Bank Length</u>
Primary	19.7	5.0	7.8	6.6	0.0
Secondary	6.3	2.9	6.4	0.0	0.0

Substrate Summary

<u>Hab Type</u>	<u>Substrate Percent Wetted Area</u>						<u>Substrate Wetted Area</u>					
	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>
Pools	2.7	4.9	8.3	59.3	24.7	0.0	8.2	14.8	25.3	179.7	74.9	0.0
Glides	1.0	1.6	5.2	53.7	38.5	0.0	0.9	1.3	4.4	45.7	32.8	0.0
Runs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riffles	1.1	1.4	3.7	18.6	75.3	0.0	12.2	15.0	40.0	203.1	822.6	0.0
Rapids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cascades	1.0	1.5	3.0	7.5	87.0	0.0	1.1	1.6	3.2	8.2	94.1	0.0
Steps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alcoves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iso Pools	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obscured	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Culverts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1.4	2.1	4.6	27.5	64.5	0.0	22.4	32.7	72.9	436.5	1,024.3	0.0

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 2
Report Date: 05/08/2020	Survey Date: 06/25-6/26/19
Start Location: 45.84448, -121.042282	End Location: 45.85039, -121.041255
Start Elevation: 204.8 m	End Elevation: 230.5 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Valley Transition

CHANNEL SUMMARY

Channel Characteristics (m)					
<u>Type</u>	<u>No. Units</u>	<u>Length (m)</u>	<u>Area (m²)</u>	<u>Gradient (%)</u>	<u>Dry Units</u>
Primary	36	706.4	4,019.1	3.6	0
Secondary	1	8.2	17.6	-	0

Channel Dimensions (m)					
<u>Type</u>	<u>Unit</u> <u>Avg. Length</u>	<u>Avg. Wetted</u> <u>Width</u>	<u>Avg. Bankfull</u> <u>Width</u>	<u>LB Undercut</u> <u>Bank Length</u>	<u>RB Undercut</u> <u>Bank Length</u>
Primary	19.6	5.5	9.4	0.0	0.0
Secondary	8.2	2.2	-	0.0	0.0

Substrate Summary

<u>Hab Type</u>	<u>Substrate Percent Wetted Area</u>						<u>Substrate Wetted Area</u>					
	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>
Pools	2.8	2.2	7.0	62.7	25.3	0.0	12.5	9.8	31.0	277.2	111.7	0.0
Glides	1.7	2.1	6.0	58.4	31.8	0.0	9.3	11.5	32.6	318.1	173.6	0.0
Runs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riffles	1.3	1.6	8.1	47.5	41.5	0.0	38.5	46.2	232.6	1370.0	1197.3	0.0
Rapids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cascades	1.9	1.0	4.3	14.2	78.6	0.0	2.7	1.5	6.3	20.9	115.8	0.0
Steps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alcoves	80	10	10	0.0	0.0	0.0	14.1	1.8	1.8	0.0	0.0	0.0
Iso Pools	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obscured	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Culverts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1.9	1.8	7.5	49.2	39.6	0.0	77.1	70.7	304.2	1,986.3	1,598.3	0.0

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 3
Report Date: 05/08/2020	Survey Date: 6/26/19 & 6/28/19
Start Location: 45.85039, -121.041255	End Location: 45.854841, -121.039415
Start Elevation: 230.5 m	End Elevation: 264.0 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Waterfall Barrier

CHANNEL SUMMARY

Channel Characteristics (m)

<u>Type</u>	<u>No. Units</u>	<u>Length (m)</u>	<u>Area (m²)</u>	<u>Gradient (%)</u>	<u>Dry Units</u>
Primary	65	802.9	4,304.0	4.2	0
Secondary	4	39.5	121.1	-	0

Channel Dimensions (m)

<u>Type</u>	<u>Unit</u> <u>Avg. Length</u>	<u>Avg. Wetted</u> <u>Width</u>	<u>Avg. Bankfull</u> <u>Width</u>	<u>LB Undercut</u> <u>Bank Length</u>	<u>RB Undercut</u> <u>Bank Length</u>
Primary	12.4	5.3	8.6	0.0	0.0
Secondary	9.9	3.2	5.3	0.0	0.0

Substrate Summary

<u>Hab Type</u>	<u>Substrate Percent Wetted Area</u>						<u>Substrate Wetted Area</u>					
	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>
Pools	11.7	8.7	8.0	39.3	24.5	7.8	154.7	114.1	105.1	517.3	323.3	103.3
Glides	3.7	4.2	7.8	49.2	32.3	2.8	19.9	22.8	42.0	263.5	173.0	14.8
Runs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riffles	2.4	2.7	6.4	30.4	56.1	2.0	40.7	46.9	109.1	520.9	961.6	35.1
Rapids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cascades	2.3	3.6	5.2	21.6	64.8	2.5	20.1	30.6	44.3	185.4	55.4	21.2
Steps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alcoves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iso Pools	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obscured	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Culverts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	5.3	4.8	6.8	33.6	45.5	3.9	235.4	214.4	300.5	1,487.1	2,013.2	174.5

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 4
Report Date: 05/08/2020	Survey Date: 6/28/19
Start Location: 45.854841, -121.039415	End Location: 45.854105, -121.037076
Start Elevation: 264.0 m	End Elevation: 280.0 m
Reach Forming Agent: Waterfall Barrier	Reach Ending Agent: Waterfall Barrier

CHANNEL SUMMARY

Channel Characteristics (m)

<u>Type</u>	<u>No. Units</u>	<u>Length (m)</u>	<u>Area (m²)</u>	<u>Gradient (%)</u>	<u>Dry Units</u>
Primary	23	248.3	1,385.6	4.2	0
Secondary	3	22.8	63.0	-	0

Channel Dimensions (m)

<u>Type</u>	<u>Unit</u> <u>Avg. Length</u>	<u>Avg. Wetted</u> <u>Width</u>	<u>Avg. Bankfull</u> <u>Width</u>	<u>LB Undercut</u> <u>Bank Length</u>	<u>RB Undercut</u> <u>Bank Length</u>
Primary	10.8	5.4	8.6	0.0	0.0
Secondary	7.6	2.8	-	0.0	0.0

Substrate Summary

<u>Hab Type</u>	<u>Substrate Percent Wetted Area</u>						<u>Substrate Wetted Area</u>					
	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>	<u>Fin</u>	<u>Snd</u>	<u>Grv</u>	<u>Cbl</u>	<u>Bld</u>	<u>Bdrk</u>
Pools	4.2	12.1	7.8	26.3	30.4	19.2	16.0	46.5	30.1	101.3	116.9	73.7
Glides	2.0	5.4	5.4	21.2	38.4	27.5	2.6	6.7	6.8	26.5	47.9	34.4
Runs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riffles	3.6	12.5	4.3	31.1	41.2	7.3	14.8	51.2	17.7	127.2	168.3	29.6
Rapids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cascades	1.1	2.5	2.5	8.6	44.9	40.4	5.9	13.5	13.5	45.69	237.9	214.1
Steps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Backwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alcoves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iso Pools	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Obscured	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Culverts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2.7	8.1	4.7	20.8	39.4	24.3	39.3	117.9	68.0	300.6	571.0	351.8

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 1
Report Date: 05/08/2020	Survey Date: 06/25/2019
Start Location: 45.842473, -121.044	End Location: 45.84448, -121.042282
Start Elevation: 190.5 m	End Elevation: 204.8 m
Reach Forming Agent: Tributary Junction	Reach Ending Agent: Valley Transition

HABITAT SUMMARY

Geomorphic Habitat Type Summary

<u>Habitat Type</u>	Primary Channel (PC)					Secondary Channel (SC)				
	No. <u>Units</u>	Length <u>(m)</u>	Avg. Width <u>(m)</u>	Wetted Area <u>(m²)</u>	% Wetted <u>Area (m²)</u>	No. <u>Units</u>	Length <u>(m)</u>	Avg. Width <u>(m)</u>	Wetted Area <u>(m²)</u>	% Wetted <u>Area (m²)</u>
Pools	4	55.6	5.1	287.5	18.8	1	5.2	2.9	15.3	27.3
Glides	2	17.5	4.9	85.0	5.5	0	0.0	0.0	0.0	0.0
Runs	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Riffles	7	200.5	5.0	1,053.1	68.6	1	13.6	2.9	39.8	72.7
Rapids	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Cascades	2	22.0	5.1	107.6	7.1	0	0.0	0.0	0.0	0.0
Steps	0	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0
Backwater	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Alcoves	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Isolated Pools	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Obscured	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Dry Channel	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Culvert	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Total	15	295.6	5.0	1,533.2	100	3	18.8	2.9	55.0	100

Pool Summary

<u>Variable</u>	<u>Total Pool #</u>	<u>PC Pool #</u>	<u>SC Pool #</u>	<u># Pools/KM</u>	<u># PC Pools/KM</u>	<u># SC Pools/KM</u>
All Pools	5	4	1	15.9	13.5	53.2
Pools ≥1m	1	1	0	3.2	3.4	0.0
Pool frequency (channel widths/pool)	8.1	9.5	2.9			
Residual pool depth (avg)	0.60	0.61	0.57			

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 2
Report Date: 05/08/2020	Survey Date: 06/25-6/26/19
Start Location: 45.84448, -121.042282	End Location: 45.85039, -121.041255
Start Elevation: 204.8 m	End Elevation: 230.5 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Valley Transition

HABITAT SUMMARY

Geomorphic Habitat Type Summary

<u>Habitat Type</u>	Primary Channel (PC)					Secondary Channel (SC)				
	No. <u>Units</u>	Length <u>(m)</u>	Avg. Width <u>(m)</u>	Wetted Area <u>(m²)</u>	% Wetted Area (m ²)	No. <u>Units</u>	Length <u>(m)</u>	Avg. Width <u>(m)</u>	Wetted Area <u>(m²)</u>	% Wetted Area (m ²)
Pools	7	72.9	6.1	442.2	11.0	0	0.0	0.0	0.0	0.0
Glides	11	107.7	5.0	545.1	13.5	0	0.0	0.0	0.0	0.0
Runs	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Riffles	13	501.6	5.6	2,884.6	71.8	0	0.0	0.0	0.0	0.0
Rapids	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Cascades	3	24.2	6.0	147.2	3.7	0	0.0	0.0	0.0	0.0
Steps	2	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Backwater	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Alcoves	0	0.0	0.0	0.0	0.0	1	8.2	2.2	17.6	100
Isolated Pools	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Obscured	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Dry Channel	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Culvert	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Total	36	706.4	5.5	4,019.1	100	1	8.2	2.2	17.6	100

Pool Summary

<u>Variable</u>	Total <u>Pool #</u>	PC <u>Pool #</u>	SC <u>Pool #</u>	# <u>Pools/KM</u>	# PC <u>Pools/KM</u>	# SC <u>Pools/KM</u>
All Pools	7	7	0	9.8	9.9	0
Pools ≥1m	0	0	0	0	0	0
Pool frequency (channel widths/pool)	10.9	10.7	0			
Residual pool depth (avg)	0.40	0.40	0			

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 3
Report Date: 05/08/2020	Survey Date: 6/26/19 & 6/28/19
Start Location: 45.85039, -121.041255	End Location: 45.854841, -121.039415
Start Elevation: 230.5 m	End Elevation: 264.0 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Waterfall Barrier

HABITAT SUMMARY

Geomorphic Habitat Type Summary

<u>Habitat Type</u>	Primary Channel (PC)					Secondary Channel (SC)				
	No. <u>Units</u>	Length <u>(m)</u>	Avg. Width <u>(m)</u>	Wetted Area <u>(m²)</u>	% Wetted <u>Area (m²)</u>	No. <u>Units</u>	Length <u>(m)</u>	Avg. Width <u>(m)</u>	Wetted Area <u>(m²)</u>	% Wetted <u>Area (m²)</u>
Pools	18	244.9	5.2	1,304.8	30.3	1	3.7	3.5	13.1	10.8
Glides	9	108.4	4.9	535.9	12.5	0	0.0	0.0	0.0	0.0
Runs	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Riffles	20	301.3	5.3	1,606.3	37.3	2	35.8	3.0	108.0	89.2
Rapids	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Cascades	11	148.3	5.6	857.0	19.9	0	0.0	0.0	0.0	0.0
Steps	7	0.0	0.0	0.0	0.0	1	0.0	0.0	0.0	0.0
Backwater	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Alcoves	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Isolated Pools	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Obscured	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Dry Channel	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Culvert	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Total	65	802.9	5.3	4,304.0	100	4	39.5	3.2	121.1	100

Pool Summary

<u>Variable</u>	<u>Total</u>	<u>PC</u>	<u>SC</u>	<u>#</u>	<u># PC</u>	<u># SC</u>
	<u>Pool #</u>	<u>Pool #</u>	<u>Pool #</u>	<u>Pools/KM</u>	<u>Pools/KM</u>	<u>Pools/KM</u>
All Pools	19	18	1	22.6	22.4	25.3
Pools ≥1m	5	5	0	5.9	6.2	0
Pool frequency (channel widths/pool)	5.2	5.2	7.5			
Residual pool depth (avg)	0.66	0.68	0.34			

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 4
Report Date: 05/08/2020	Survey Date: 6/28/19
Start Location: 45.854841, -121.039415	End Location: 45.854105, -121.037076
Start Elevation: 264.0 m	End Elevation: 280.0 m
Reach Forming Agent: Waterfall Barrier	Reach Ending Agent: Waterfall Barrier

HABITAT SUMMARY

Geomorphic Habitat Type Summary

<u>Habitat Type</u>	Primary Channel (PC)					Secondary Channel (SC)				
	<u>No.</u>	<u>Length</u>	<u>Avg.</u>	<u>Wetted</u>	<u>% Wetted</u>	<u>No.</u>	<u>Length</u>	<u>Avg.</u>	<u>Wetted</u>	<u>% Wetted</u>
	<u>Units</u>	<u>(m)</u>	<u>(m)</u>	<u>(m²)</u>	<u>Area (m²)</u>	<u>Units</u>	<u>(m)</u>	<u>(m)</u>	<u>(m²)</u>	<u>Area (m²)</u>
Pools	6	50.8	6.0	369.1	26.6	1	5.4	2.9	15.5	23.8
Glides	3	24.8	5.0	124.8	9.0	0	0.0	0.0	0.0	0.0
Runs	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Riffles	5	76.8	4.9	391.2	28.2	1	5.8	3.1	17.7	28.6
Rapids	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Cascades	6	95.9	5.2	500.6	36.2	1	11.6	2.6	29.9	47.6
Steps	3	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Backwater	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Alcoves	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Isolated Pools	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Obscured	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Dry Channel	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Culvert	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Total	23	248.3	5.4	1,385.6	100	3	22.8	2.8	63	100

Pool Summary

<u>Variable</u>	<u>Total</u>	<u>PC</u>	<u>SC</u>	<u>#</u>	<u># PC</u>	<u># SC</u>
	<u>Pool #</u>	<u>Pool #</u>	<u>Pool #</u>	<u>Pools/KM</u>	<u>Pools/KM</u>	<u>Pools/KM</u>
All Pools	7	6	1	25.8	24.2	43.9
Pools ≥1m	2	2	0	7.4	8.1	0
Pool frequency (channel widths/pool)	4.5	4.8	-			
Residual pool depth (avg)	0.77	0.85	0.37			

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek
Report Date: 05/08/2020
Start Location: 45.842473, -121.044

Reach: 1-4
Survey Date: 6/25/19, 6/26/19, 6/28/19
End Location: 45.854105, -121.037076

Start Elevation: 190.5 m

End Elevation: 280.0 m

Reach Forming Agent: Tributary Junction

Reach Ending Agent: Waterfall Barrier

STREAM CHANNEL AND HABITAT SUMMARY

Channel Summary

Channel Type	No. Units	Total Length (m)	Wetted Area (m ²)	Avg Width (m)	Avg Bankfull		% Gradient	% Fin	% Snd	% Grv	% Cbl	% Bldr	% Bdrk
					Width (m)	Width (m)							
PC	139	2,053.2	11,241.9	5.3	8.7		4.4	3.1	3.8	6.5	36.6	45.5	4.5
SC	11	89.3	256.8	2.9	5.7		-	8.9	5.6	5.2	36.4	34.8	9.1

Geomorphic Habitat Type Summary

Habitat Type	Primary Channel (PC)					Secondary Channel (SC)				
	No. Units	Length (m)	Avg. Width (m)	Wetted Area (m ²)	% Wetted Area (m ²)	No. Units	Length (m)	Avg. Width (m)	Wetted Area (m ²)	% Wetted Area (m ²)
Pools	35	424.2	5.5	2,403.6	21.4	3	14.3	3.1	43.8	17.1
Glides	25	258.4	4.9	1,290.7	11.5	0	0.0	0.0	0.0	0.0
Runs	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Riffles	45	1,080.2	5.3	5,935.1	52.8	4	55.2	3.0	165.5	64.4
Rapids	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Cascades	22	290.4	5.5	1,612.4	14.3	1	11.6	2.6	29.9	11.6
Steps	12	0.0	0.0	0.0	0.0	2	0.0	0.0	0.0	0.0
Backwater	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Alcoves	0	0.0	0.0	0.0	0.0	1	8.2	2.2	17.6	6.9
Isolated Pools	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Obscured	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Dry Channel	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Culvert	0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
Total	139	2,053.2	5.3	11,241.8	100	11	89.3	2.9	256.8	100

Pool Summary

Variable	Total	PC	SC	#	# PC	# SC
	Pool #	Pool #	Pool #	Pools/KM	Pools/KM	Pools/KM
All Pools	38	35	3	17.7	17.0	33.6
Pools ≥1m	8	8	0	3.7	3.9	0.0
Pool frequency (channel widths/pool)	6.6	6.7	5.2			
Residual pool depth (avg)	0.62	0.64	0.43			

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 1
Report Date: 05/08/2020	Survey Date: 06/25/2019
Start Location: 45.842473, -121.044	End Location: 45.84448, -121.042282
Start Elevation: 190.5 m	End Elevation: 204.8 m
Reach Forming Agent: Tributary Junction	Reach Ending Agent: Valley Transition

RIPARIAN AND LARGE WOOD PIECES SUMMARY

Riparian Characteristics

<u>Type</u>	<u>Total Canopy Cover Area (m²)</u>	<u>Total % Canopy Cover</u>	<u>Unit Avg. % Canopy Cover</u>	<u>Dom Canopy Species</u>	<u>Sub-dom Canopy Species</u>
Primary	1,306.0	85.2	81.7	Red Alder	Big Leaf Maple
Secondary	47.5	86.4	87.5	Red Alder	Big Leaf Maple

Large Wood Piece Inventory Summary

<u>Channel Type</u>	<u>Primary Channel</u>	<u>#Pieces</u>	<u>Volume (m³)</u>	<u>Pieces/100 m</u>	<u>Volume (m³)/100 m</u>
Primary	All Pieces ¹	16	8.6	5.4	2.9
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	14	7.0	4.7	2.4
	Rootwads	2	1.6	0.7	0.5
	Conifer	0	0.0	0.0	0.0
Secondary	Deciduous	16	8.6	5.4	2.9
	All Pieces ¹	0	0.0	0.0	0.0
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	0	0.0	0.0	0.0
	Rootwads	0	0.0	0.0	0.0
	Conifer	0	0.0	0.0	0.0
	Deciduous	0	0.0	0.0	0.0

¹Minimum Qualifying Large Wood Piece (≥2 m x ≥0.10 m dia.); ² Minimum Qualifying Key Piece (≥2.5 m³)

Large Wood Piece Zone Location Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Zone 1 (%)</u>	<u># Zone 2 (%)</u>	<u># Zone 3 (%)</u>	<u># Zone 4 (%)</u>
Primary	16	5 (31.3)	11 (68.8)	8 (50.0)	8 (50.0)
Secondary	0	-	-	-	-

*Pieces may span multiple zones

*Zone 1 (wetted channel); Zone 2 (within bankfull); Zone 3 (above bankfull); Zone 4 (flood plain/terrace/hillslope)

Large Wood Piece Stability and Pool Forming Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Rooted (%)</u>	<u># Buried (%)</u>	<u># Pinned (%)</u>	<u># Unstable (%)</u>	<u># Pool Forming (%)</u>
Primary	16	0 (0.0)	2 (12.5)	6 (37.5)	8 (50.0)	0 (0.0)
Secondary	0	-	-	-	-	-

Large Wood Piece Orientation Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Parallel (%)</u>	<u># Perpendicular (%)</u>	<u># Downstream (%)</u>	<u># Upstream (%)</u>
Primary	16	5 (31.3)	3 (18.8)	8 (50.0)	0 (0.0)
Secondary	0	-	-	-	-

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 2
Report Date: 05/08/2020	Survey Date: 06/25-6/26/19
Start Location: 45.84448, -121.042282	End Location: 45.85039, -121.041255
Start Elevation: 204.8 m	End Elevation: 230.5 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Valley Transition

RIPARIAN AND LARGE WOOD PIECES SUMMARY

Riparian Characteristics

<u>Type</u>	<u>Total Canopy Cover Area (m²)</u>	<u>Total % Canopy Cover</u>	<u>Unit Avg. % Canopy Cover</u>	<u>Dom Canopy Species</u>	<u>Sub-dom Canopy Species</u>
Primary	3509.3	87.3	89.4	Red Alder	Big Leaf Maple
Secondary	3.5	20.0	20.0	Oregon White Oak	Oregon White Oak

Large Wood Piece Inventory Summary

<u>Channel Type</u>	<u>Primary Channel</u>	<u>#Pieces</u>	<u>Volume (m³)</u>	<u>Pieces/100 m</u>	<u>Volume (m³)/100 m</u>
Primary	All Pieces ¹	20	15.1	2.8	2.1
	Key Pieces ²	1	3.0	0.1	0.4
	Logs	19	12.1	2.7	1.7
	Rootwads	1	3.0	0.1	0.4
	Conifer	0	0.0	0.0	0.0
Secondary	Deciduous	20	15.1	2.8	2.1
	All Pieces ¹	0	0.0	0.0	0.0
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	0	0.0	0.0	0.0
	Rootwads	0	0.0	0.0	0.0
	Conifer	0	0.0	0.0	0.0
	Deciduous	0	0.0	0.0	0.0

¹Minimum Qualifying Large Wood Piece (≥2 m x ≥0.10 m dia.); ² Minimum Qualifying Key Piece (≥2.5 m³)

Large Wood Piece Zone Location Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Zone 1 (%)</u>	<u># Zone 2 (%)</u>	<u># Zone 3 (%)</u>	<u># Zone 4 (%)</u>
Primary	20	5 (25.0)	18 (90.0)	19 (95.0)	11 (55.0)
Secondary	0	-	-	-	-

*Pieces may span multiple zones

*Zone 1 (wetted channel); Zone 2 (within bankfull); Zone 3 (above bankfull); Zone 4 (flood plain/terrace/hillslope)

Large Wood Piece Stability and Pool Forming Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Rooted (%)</u>	<u># Buried (%)</u>	<u># Pinned (%)</u>	<u># Unstable (%)</u>	<u># Pool Forming (%)</u>
Primary	20	0 (0)	4 (20.0)	11 (55.0)	8 (40.0)	0 (0.0)
Secondary	0	-	-	-	-	-

Large Wood Piece Orientation Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Parallel (%)</u>	<u># Perpendicular (%)</u>	<u># Downstream (%)</u>	<u># Upstream (%)</u>
Primary	20	10 (50.0)	6 (30.0)	2 (10.0)	2 (10.0)
Secondary	0	-	-	-	-

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 3
Report Date: 05/08/2020	Survey Date: 6/26/19 & 6/28/19
Start Location: 45.85039, -121.041255	End Location: 45.854841, -121.039415
Start Elevation: 230.5 m	End Elevation: 264.0 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Waterfall Barrier

RIPARIAN AND LARGE WOOD PIECES SUMMARY

Riparian Characteristics

<u>Type</u>	<u>Total Canopy Cover Area (m²)</u>	<u>Total % Canopy Cover</u>	<u>Unit Avg. % Canopy Cover</u>	<u>Dom Canopy Species</u>	<u>Sub-dom Canopy Species</u>
Primary	2862.8	66.5	64.4	Red Alder	Big Leaf Maple
Secondary	114.4	94.5	93.3	Red Alder	Big Leaf Maple

Large Wood Piece Inventory Summary

<u>Channel Type</u>	<u>Primary Channel</u>	<u>#Pieces</u>	<u>Volume (m³)</u>	<u>Pieces/100 m</u>	<u>Volume (m³)/100 m</u>
Primary	All Pieces ¹	20	7.9	2.5	1.0
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	18	6.0	2.2	0.7
	Rootwads	2	2.0	0.2	0.2
	Conifer	1	0.5	0.1	0.1
	Deciduous	19	7.5	2.4	0.9
Secondary	All Pieces ¹	3	1.4	7.6	3.5
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	3	1.4	7.6	3.5
	Rootwads	0	0.0	0.0	0.0
	Conifer	0	0.0	0.0	0.0
	Deciduous	3	1.4	7.6	3.5

¹Minimum Qualifying Large Wood Piece (≥2 m x ≥0.10 m dia.); ² Minimum Qualifying Key Piece (≥2.5 m³)

Large Wood Piece Zone Location Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Zone 1 (%)</u>	<u># Zone 2 (%)</u>	<u># Zone 3 (%)</u>	<u># Zone 4 (%)</u>
Primary	20	6 (30.0)	17 (85.0)	16 (80.0)	4 (20.0)
Secondary	3	0 (0.0)	3 (100)	1 (33.3)	1 (33.3)

*Pieces may span multiple zones

*Zone 1 (wetted channel); Zone 2 (within bankfull); Zone 3 (above bankfull); Zone 4 (flood plain/terrace/hillslope)

Large Wood Piece Stability and Pool Forming Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Rooted (%)</u>	<u># Buried (%)</u>	<u># Pinned (%)</u>	<u># Unstable (%)</u>	<u># Pool Forming (%)</u>
Primary	20	0 (0.0)	4 (20.0)	15 (75.0)	5 (25.0)	0 (0.0)
Secondary	3	0 (0.0)	2 (66.7)	3 (100)	0 (0.0)	0 (0.0)

Large Wood Piece Orientation Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Parallel (%)</u>	<u># Perpendicular (%)</u>	<u># Downstream (%)</u>	<u># Upstream (%)</u>
Primary	20	6 (30.0)	6 (30.0)	8 (40.0)	0 (0.0)
Secondary	3	1 (33.3)	1 (33.3)	1 (33.3)	0 (0.0)

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 4
Report Date: 05/08/2020	Survey Date: 6/28/19
Start Location: 45.854841, -121.039415	End Location: 45.854105, -121.037076
Start Elevation: 264.0 m	End Elevation: 280.0 m
Reach Forming Agent: Waterfall Barrier	Reach Ending Agent: Waterfall Barrier

RIPARIAN AND LARGE WOOD PIECES SUMMARY

<u>Type</u>	Riparian Characteristics				
	<u>Total Canopy Cover Area (m²)</u>	<u>Total % Canopy Cover</u>	<u>Unit Avg. % Canopy Cover</u>	<u>Dom Canopy Species</u>	<u>Sub-dom Canopy Species</u>
Primary	734.7	53.0	55.3	Red Alder	Dogwood
Secondary	53.6	85.0	85.0	Big Leaf Maple	Dogwood

Large Wood Piece Inventory Summary

<u>Channel Type</u>	<u>Primary Channel</u>	<u>#Pieces</u>	<u>Volume (m³)</u>	<u>Pieces/100 m</u>	<u>Volume (m³)/100 m</u>
Primary	All Pieces ¹	12	11.8	4.8	4.8
	Key Pieces ²	1	4.4	0.4	1.8
	Logs	11	11.6	4.4	4.7
	Rootwads	1	0.2	0.4	0.1
	Conifer	2	3.7	0.8	1.5
Secondary	Deciduous	10	8.2	4.0	3.3
	All Pieces ¹	0	0.0	0.0	0.0
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	0	0.0	0.0	0.0
	Rootwads	0	0.0	0.0	0.0
	Conifer	0	0.0	0.0	0.0
	Deciduous	0	0.0	0.0	0.0

¹Minimum Qualifying Large Wood Piece (≥2 m x ≥0.10 m dia.); ² Minimum Qualifying Key Piece (≥2.5 m³)

Large Wood Piece Zone Location Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Zone 1 (%)</u>	<u># Zone 2 (%)</u>	<u># Zone 3 (%)</u>	<u># Zone 4 (%)</u>
Primary	12	8 (66.7)	12 (100)	9 (75.0)	4 (33.0)
Secondary	0	-	-	-	-

*Pieces may span multiple zones

*Zone 1 (wetted channel); Zone 2 (within bankfull); Zone 3 (above bankfull); Zone 4 (flood plain/terrace/hillslope)

Large Wood Piece Stability and Pool Forming Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Rooted (%)</u>	<u># Buried (%)</u>	<u># Pinned (%)</u>	<u># Unstable (%)</u>	<u># Pool Forming (%)</u>
Primary	12	0 (0.0)	4 (33.3)	7 (58.3)	3 (25.0)	0 (0.0)
Secondary	0	-	-	-	-	-

Large Wood Piece Orientation Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Parallel (%)</u>	<u># Perpendicular (%)</u>	<u># Downstream (%)</u>	<u># Upstream (%)</u>
Primary	12	4 (33.3)	7 (58.3)	1 (8.3)	0 (0.0)
Secondary	0	-	-	-	-

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 1-4
Report Date: 05/08/2020	Survey Date: 6/25/19, 6/26/19, 6/28/19
Start Location: 45.842473, -121.044	End Location: 45.854105, -121.037076
Start Elevation: 190.5 m	End Elevation: 280.0 m
Reach Forming Agent: Tributary Junction	Reach Ending Agent: Waterfall Barrier

STREAM RIPARIAN AND LARGE WOOD PIECES SUMMARY

Riparian Characteristics

<u>Type</u>	<u>Total Canopy Cover Area (m²)</u>	<u>Total % Canopy Cover</u>	<u>Unit Avg. % Canopy Cover</u>	<u>Dom Canopy Species</u>	<u>Sub-dom Canopy Species</u>
Primary	8412.9	74.8	71.7	Red Alder	Big Leaf Maple
Secondary	219.0	85.3	88.8	Red Alder	Big Leaf Maple

Large Wood Piece Inventory Summary

<u>Channel Type</u>	<u>Primary Channel</u>	<u>#Pieces</u>	<u>Volume (m³)</u>	<u>Pieces/100 m</u>	<u>Volume (m³)/100 m</u>
Primary	All Pieces ¹	68	43.5	3.3	2.1
	Key Pieces ²	1	4.4	0.1	0.2
	Logs	62	36.7	3.0	1.8
	Rootwads	6	6.7	0.3	0.3
	Conifer	3	4.2	0.1	0.2
Secondary	Deciduous	65	39.3	3.2	1.9
	All Pieces ¹	3	1.4	3.4	1.6
	Key Pieces ²	0	0.0	0.0	0.0
	Logs	3	1.4	3.4	1.6
	Rootwads	0	0.0	0.0	0.0
	Conifer	0	0.0	0.0	0.0
	Deciduous	3	1.4	3.4	1.6

¹Minimum Qualifying Large Wood Piece (≥2 m x ≥0.10 m dia.); ² Minimum Qualifying Key Piece (≥2.5 m³)

Large Wood Piece Zone Location Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Zone 1 (%)</u>	<u># Zone 2 (%)</u>	<u># Zone 3 (%)</u>	<u># Zone 4 (%)</u>
Primary	68	24 (35.3)	58 (85.3)	52 (76.5)	27 (39.7)
Secondary	3	0 (0.0)	3 (100)	1 (33.3)	1 (33.3)

*Pieces may span multiple zones

*Zone 1 (wetted channel); Zone 2 (within bankfull); Zone 3 (above bankfull); Zone 4 (flood plain/terrace/hillslope)

Large Wood Piece Stability and Pool Forming Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Rooted (%)</u>	<u># Buried (%)</u>	<u># Pinned (%)</u>	<u># Unstable (%)</u>	<u># Pool Forming (%)</u>
Primary	68	0 (0.0)	14 (20.6)	39 (57.4)	24 (35.3)	0 (0.0)
Secondary	3	0 (0.0)	2 (66.7)	3 (100)	0 (0.0)	0 (0.0)

Large Wood Piece Orientation Summary

<u>Channel Type</u>	<u>Total Pieces</u>	<u># Parallel (%)</u>	<u># Perpendicular (%)</u>	<u># Downstream (%)</u>	<u># Upstream (%)</u>
Primary	68	25 (36.8)	22 (32.4)	19 (27.9)	2 (2.9)
Secondary	3	1 (33.3)	1 (33.3)	1 (33.3)	0 (0)

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 1
Report Date: 05/08/2020	Survey Date: 06/25/2019
Start Location: 45.842473, -121.044	End Location: 45.84448, -121.042282
Start Elevation: 190.5 m	End Elevation: 204.8 m
Reach Forming Agent: Tributary Junction	Reach Ending Agent: Valley Transition

LARGE WOOD JAM SUMMARY

Large Wood Jam Inventory Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u># Pieces</u>	<u>Avg # Pieces</u>	<u>Jam Frequency¹</u>	<u># Jams/KM</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

¹Jam frequency (total bankfull channel widths/jam)

Large Wood Jam Composition Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Total Pieces</u>	<u>Large Wood Piece Size</u>				<u>#Rtwd Key Pieces</u>	<u>#Log Key Pieces</u>
			<u>#Rootwad (Dia≥20cm)</u>	<u>#Log (Dia≥10>20cm)</u>	<u>#Log (Dia20<50cm)</u>	<u>#Log (Dia≥50cm)</u>		
Primary	0	-	-	-	-	-	-	-
Secondary	0	-	-	-	-	-	-	-

Large Wood Piece Zone Location and Pool Forming Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Wetted Channel Area (%)</u>	<u>Bankfull Channel Area (%)</u>	<u>Flood plain/Terrace Area (%)</u>	<u>Pool Forming (%)</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

*A jam was assigned to wetted or bankfull zone if a LWD piece extended 0.1 meters into a zone

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 2
Report Date: 05/08/2020	Survey Date: 06/25-6/26/19
Start Location: 45.84448, -121.042282	End Location: 45.85039, -121.041255
Start Elevation: 204.8 m	End Elevation: 230.5 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Valley Transition

LARGE WOOD JAM SUMMARY

Large Wood Jam Inventory Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u># Pieces</u>	<u>Avg # Pieces</u>	<u>Jam Frequency¹</u>	<u># Jams/KM</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

¹Jam frequency (total bankfull channel widths/jam)

Large Wood Jam Composition Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Total Pieces</u>	<u>Large Wood Piece Size</u>				<u>#Rtwd Key Pieces</u>	<u>#Log Key Pieces</u>
			<u>#Rootwad (Dia≥20cm)</u>	<u>#Log (Dia≥10>20cm)</u>	<u>#Log (Dia20<50cm)</u>	<u>#Log (Dia≥50cm)</u>		
Primary	0	-	-	-	-	-	-	-
Secondary	0	-	-	-	-	-	-	-

Large Wood Piece Zone Location and Pool Forming Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Wetted Channel Area (%)</u>	<u>Bankfull Channel Area (%)</u>	<u>Flood plain/Terrace Area (%)</u>	<u>Pool Forming (%)</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

*A jam was assigned to wetted or bankfull zone if a LWD piece extended 0.1 meters into a zone

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 3
Report Date: 05/08/2020	Survey Date: 6/26/19 & 6/28/19
Start Location: 45.85039, -121.041255	End Location: 45.854841, -121.039415
Start Elevation: 230.5 m	End Elevation: 264.0 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Waterfall Barrier

LARGE WOOD JAM SUMMARY

Large Wood Jam Inventory Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u># Pieces</u>	<u>Avg # Pieces</u>	<u>Jam Frequency¹</u>	<u># Jams/KM</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

¹Jam frequency (total bankfull channel widths/jam)

Large Wood Jam Composition Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Total Pieces</u>	<u>Large Wood Piece Size</u>				<u>#Rtwd Key Pieces</u>	<u>#Log Key Pieces</u>
			<u>#Rootwad (Dia≥20cm)</u>	<u>#Log (Dia≥10>20cm)</u>	<u>#Log (Dia20<50cm)</u>	<u>#Log (Dia≥50cm)</u>		
Primary	0	-	-	-	-	-	-	
Secondary	0	-	-	-	-	-	-	

Large Wood Piece Zone Location and Pool Forming Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Wetted Channel Area (%)</u>	<u>Bankfull Channel Area (%)</u>	<u>Flood plain/Terrace Area (%)</u>	<u>Pool Forming (%)</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

*A jam was assigned to wetted or bankfull zone if a LWD piece extended 0.1 meters into a zone

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 4
Report Date: 05/08/2020	Survey Date: 6/28/19
Start Location: 45.854841, -121.039415	End Location: 45.854105, -121.037076
Start Elevation: 264.0 m	End Elevation: 280.0 m
Reach Forming Agent: Waterfall Barrier	Reach Ending Agent: Waterfall Barrier

LARGE WOOD JAM SUMMARY

Large Wood Jam Inventory Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u># Pieces</u>	<u>Avg # Pieces</u>	<u>Jam Frequency¹</u>	<u># Jams/KM</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

¹Jam frequency (total bankfull channel widths/jam)

Large Wood Jam Composition Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Total Pieces</u>	<u>Large Wood Piece Size</u>				<u>#Rtwd Key Pieces</u>	<u>#Log Key Pieces</u>
			<u>#Rootwad (Dia≥20cm)</u>	<u>#Log (Dia≥10>20cm)</u>	<u>#Log (Dia20<50cm)</u>	<u>#Log (Dia≥50cm)</u>		
Primary	0	-	-	-	-	-	-	-
Secondary	0	-	-	-	-	-	-	-

Large Wood Piece Zone Location and Pool Forming Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Wetted Channel Area (%)</u>	<u>Bankfull Channel Area (%)</u>	<u>Flood plain/Terrace Area (%)</u>	<u>Pool Forming (%)</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

*A jam was assigned to wetted or bankfull zone if a LWD piece extended 0.1 meters into a zone

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek

Reach: 1-4

Report Date: 05/08/2020

Survey Date: 6/25/19, 6/26/19, 6/28/19

Start Location: 45.842473, -121.044

End Location: 45.854105, -121.037076

Start Elevation: 190.5 m

End Elevation: 280.0 m

Reach Forming Agent: Tributary Junction

Reach Ending Agent: Waterfall Barrier

STREAM LARGE WOOD JAM SUMMARY

Large Wood Jam Inventory Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u># Pieces</u>	<u>Avg # Pieces</u>	<u>Jam Frequency¹</u>	<u># Jams/KM</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

¹Jam frequency (total bankfull channel widths/jam)

Large Wood Jam Composition Summary

Large Wood Piece Size

<u>Channel Type</u>	<u>Total Jams</u>	<u>Total Pieces</u>	<u>#Rootwad (Dia≥20cm)</u>	<u>#Log (Dia≥10>20cm)</u>	<u>#Log (Dia20<50cm)</u>	<u>#Log (Dia≥50cm)</u>	<u>#Rtwd Key Pieces</u>	<u>#Log Key Pieces</u>
Primary	0	-	-	-	-	-	-	-
Secondary	0	-	-	-	-	-	-	-

Large Wood Piece Zone Location and Pool Forming Summary

<u>Channel Type</u>	<u>Total Jams</u>	<u>Wetted Channel Area (%)</u>	<u>Bankfull Channel Area (%)</u>	<u>Floop plain/Terrace Area (%)</u>	<u>Pool Forming (%)</u>
Primary	0	-	-	-	-
Secondary	0	-	-	-	-

*A jam was assigned to wetted or bankfull zone if a LWD piece extended 0.1 meters into a zone

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 1
Report Date: 05/08/2020	Survey Date: 06/25/2019
Start Location: 45.842473, -121.044	End Location: 45.84448, -121.042282
Start Elevation: 190.5 m	End Elevation: 204.8 m
Reach Forming Agent: Tributary Junction	Reach Ending Agent: Valley Transition

BEDROCK FEATURE SUMMARY

Bedrock Feature Inventory Summary

<u>Channel Type</u>	<u>Total #</u>	<u># Left Bank Loc</u>	<u># Right Bank Loc</u>	<u># Channel Bottom Loc</u>	<u># Channel Span Loc</u>	<u>Total Length (m)</u>
Primary	1	1	0	0	0	44.8
Secondary	0	-	-	-	-	-

Bedrock Feature Characteristic Summary

<u>Channel Type</u>	<u># Ledge</u>	<u># Slope</u>	<u># Cliff</u>	<u># Projecting</u>	<u># Non- projecting</u>	<u># Surface Control</u>
Primary	0	0	1	0	1	0
Secondary	-	-	-	-	-	-

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 2
Report Date: 05/08/2020	Survey Date: 06/25-6/26/19
Start Location: 45.84448, -121.042282	End Location: 45.85039, -121.041255
Start Elevation: 204.8 m	End Elevation: 230.5 m
Reach Forming Agent: Valley Transition	Reach Ending Agent: Valley Transition

BEDROCK FEATURE SUMMARY

Bedrock Feature Inventory Summary

<u>Channel Type</u>	<u>Total #</u>	<u># Left Bank Loc</u>	<u># Right Bank Loc</u>	<u># Channel Bottom Loc</u>	<u># Channel Span Loc</u>	<u>Total Length (m)</u>
Primary	1	1	0	0	0	8.5
Secondary	0	-	-	-	-	-

Bedrock Feature Characteristic Summary

<u>Channel Type</u>	<u># Ledge</u>	<u># Slope</u>	<u># Cliff</u>	<u># Projecting</u>	<u># Non- projecting</u>	<u># Surface Control</u>
Primary	0	0	1	0	1	0
Secondary	-	-	-	-	-	-

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek

Reach: 3

Report Date: 05/08/2020

Survey Date: 6/26/19 & 6/28/19

Start Location: 45.85039, -121.041255

End Location: 45.854841, -121.039415

Start Elevation: 230.5 m

End Elevation: 264.0 m

Reach Forming Agent: Valley Transition

Reach Ending Agent: Waterfall Barrier

BEDROCK FEATURE SUMMARY

Bedrock Feature Inventory Summary

<u>Channel Type</u>	<u>Total #</u>	<u># Left Bank Loc</u>	<u># Right Bank Loc</u>	<u># Channel Bottom Loc</u>	<u># Channel Span Loc</u>	<u>Total Length (m)</u>
Primary	18	7	11	0	0	457.2
Secondary	2	1	1	0	0	4.0

Bedrock Feature Characteristic Summary

<u>Channel Type</u>	<u># Ledge</u>	<u># Slope</u>	<u># Cliff</u>	<u># Projecting</u>	<u># Non- projecting</u>	<u># Surface Control</u>
Primary	0	4	14	4	14	4
Secondary	0	0	2	0	2	0

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek	Reach: 4
Report Date: 05/08/2020	Survey Date: 6/28/19
Start Location: 45.854841, -121.039415	End Location: 45.854105, -121.037076
Start Elevation: 264.0 m	End Elevation: 280.0 m
Reach Forming Agent: Waterfall Barrier	Reach Ending Agent: Waterfall

BEDROCK FEATURE SUMMARY

Bedrock Feature Inventory Summary

<u>Channel Type</u>	<u>Total #</u>	<u># Left Bank Loc</u>	<u># Right Bank Loc</u>	<u># Channel Bottom Loc</u>	<u># Channel Span Loc</u>	<u>Total Length (m)</u>
Primary	10	5	3	2	0	119.4
Secondary	1	1	0	0	0	6.1

Bedrock Feature Characteristic Summary

<u>Channel Type</u>	<u># Ledge</u>	<u># Slope</u>	<u># Cliff</u>	<u># Projecting</u>	<u># Non- projecting</u>	<u># Surface Control</u>
Primary	5	0	5	5	5	5
Secondary	0	0	1	0	1	0

Klickitat Monitoring and Evaluation Project Rapid Aquatic Habitat Inventory

Survey Stream: Bowman Creek
Report Date: 05/08/2020
Start Location: 45.842473, -121.044
Start Elevation: 190.5 m
Reach Forming Agent: Confluence

Reach: 1-4
Survey Date: 6/25/19, 6/26/19, 6/28/19
End Location: 45.854105, -121.037076
End Elevation: 280.0 m
Reach Ending Agent: Waterfall Barrier

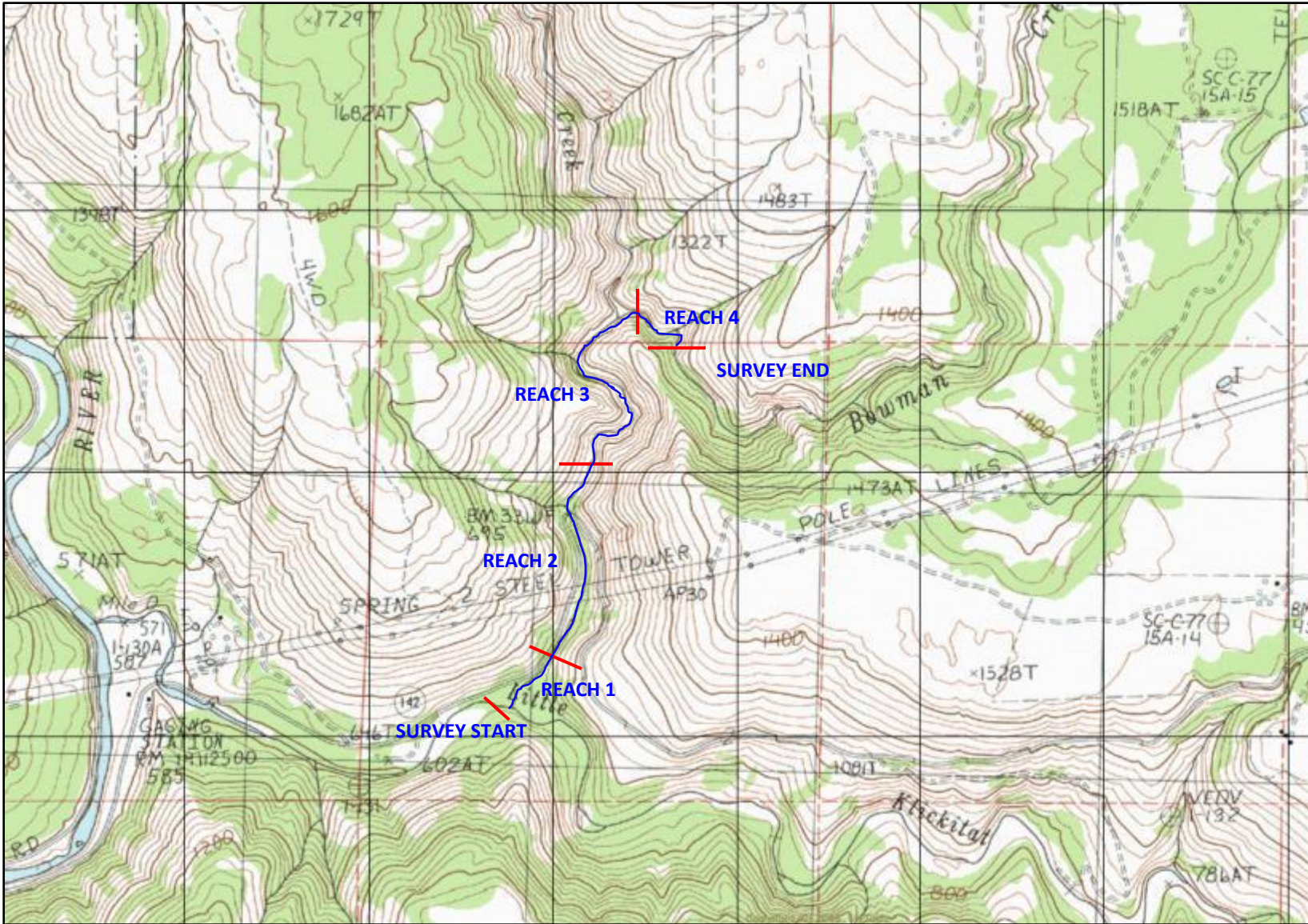
BEDROCK FEATURE SUMMARY

Bedrock Feature Inventory Summary

<u>Channel Type</u>	<u>Total #</u>	<u># Left Bank Loc</u>	<u># Right Bank Loc</u>	<u># Channel Bottom Loc</u>	<u># Channel Span Loc</u>	<u>Total Length (m)</u>
Primary	30	14	14	2	0	622.4
Secondary	3	2	1	0	0	10.1

Bedrock Feature Characteristic Summary

<u>Channel Type</u>	<u># Ledge</u>	<u># Slope</u>	<u># Cliff</u>	<u># Projecting</u>	<u># Non- projecting</u>	<u># Surface Control</u>
Primary	5	4	21	9	21	9
Secondary	0	0	3	0	3	0



Quad Map: WAHKIACUS
 Date: 6/25-6/28/2019
 Survey Length: 2.054 kilometers

Location: 45.85039, -121.041255
 Survey: Bowman Creek Habitat Survey
 Klickitat River Sub-basin

Bowman Creek 2019 Habitat Survey – Reach 1 Photos



Unit 1 – Downstream view of cascade to confluence



Unit 1.1 – Upstream view of side channel riffle



Unit 8 – Upstream view of boulder scour pool



Unit 12 – Upstream view of boulder scour pool



Unit 14 – Downstream view of bedrock scour pool

Bowman Creek 2019 Habitat Survey – Reach 2 Photos



Unit 3 – Upstream view of glide



Unit 15 – Upstream view of boulder scour pool



Unit 33 – Upstream view of riffle



Unit 36.1 – View of left bank alcove



Unit 36 – Downstream view of bedrock scour pool

Bowman Creek 2019 Habitat Survey – Reach 3 Photos



Units 3.1-3.4 – Upstream view of left bank side channel



Unit 9 – Upstream view of bedrock scour pool



Unit 26 – Upstream view of bedrock scour pool



Unit 30 – View of freshwater mussel shells



Units 62 and 63 – Upstream view of bedrock plunge pool



Units 64 and 65 – Upstream view of reach ending pool and falls

Bowman Creek 2019 Habitat Survey – Reach 4 Photos



Unit 11 – Upstream view of riffle



Unit 14.3 – Upstream view of side-channel cascade



Units 22 and 23 – Upstream view of upstream most pool and anadromous waterfall barrier