



Summary of Freshwater Mussel Sightings within the Yakama Nation Ceded Lands during Larval Lamprey Habitat Surveys (2014-2018)



[Cover Photo: Two live Western Ridge Mussels (*Gonidea angulata*) discovered near the mouth of Ahtanum Creek (river km 1.1), a tributary of the Lower Yakima River]

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Highlights

- Since 2014, the YNPLP has documented the presence of freshwater mussels (live or dead) during larval lamprey electrofishing surveys.
- Freshwater mussels were documented in the Yakima and Wenatchee subbasins.
- In the Yakima Subbasin, both Western Pearlshell Mussels (*Margaritifera falcate*) and Western Ridged Mussels (*Gonidea angulata*) were documented.
- In the Wenatchee Subbasin, mussels were observed in the Upper Wenatchee River. These mussels were identified by the YNPLP, and may not be accurate due to limited knowledge of mussel identification (and no photos of mussels exist). However, to our best knowledge, the species in *M. falcate*.

Abstract

Freshwater mussels are an underappreciated species that play an irreplaceable ecological role in the rivers and streams of the Columbia River Basin. The Yakama Nation Pacific Lamprey Project (YNPLP) has documented the presence of freshwater mussels (live or dead) encountered during larval lamprey electrofishing surveys since 2014. During this time, freshwater mussels were documented within the Yakima and Wenatchee subbasins. In the Yakima Subbasin, both Western Pearlshell Mussels (*Margaritifera falcate*) and Western Ridged Mussels (*Gonidea angulata*) were documented. In the Yakima Subbasin, *M. falcate* was confirmed in the following locations: Lower Yakima River mainstem (Sunnyside and Wapato irrigation diversions, river km 171.4 and 176.3, respectively), Toppenish Creek (river km 59.9), Simcoe Creek (river km 9.0), and Wenas Creek (river km 0.5). In Ahtanum Creek, *G. angulata* was confirmed to be present at river km 1.2. In the Wenatchee Subbasin, *M. falcate* was potentially documented in the Upper Wenatchee River, 3.3 river km downstream of Lake Wenatchee. However, identification of these mussels was performed by the YNPLP and may not be accurate due to limited knowledge of mussel identification (and no photos exist). Although we provide species documentation from a variety of surveyed sites, it is quite possible other mussel species may have also be collected. In order to improve future documentation efforts, we will add a designated space to our lamprey datasheet to collect the following information; best guess of species, photo of the specimen, general description of the type of habitat where the mussel was found, and the mussels condition (live, freshly dead, or shell only). The data we collect will be submitted yearly to the Xerces Society, which documents freshwater mussel findings throughout the Northwestern United States.

Introduction

Freshwater mussels are an underappreciated species that play an irreplaceable ecological role in the rivers and streams of the Columbia River Basin. Since 2014, the Yakama Nation Pacific Lamprey Project (YNPLP) has documented the presence of freshwater mussels encountered during larval lamprey electrofishing surveys. These electrofishing surveys have extensively covered many rivers and streams within the Yakama Nation Ceded Lands, focusing on the White Salmon, Klickitat, Yakima, Entiat and Wenatchee subbasins. Although freshwater mussels do not actively respond during electrofishing, mussels do inhabit similar stream habitats as lampreys (fine and coarse sediment depositional areas). In an effort to supplement the current (and limited) knowledge of freshwater mussel distribution in the Columbia River Basin, these observations have been submitted to the Xerces Society of Freshwater Mussels (<https://Xerces.org>). In this report, we summarize all freshwater mussel sightings from 2014 through 2018 as a way to increase the general knowledge of freshwater mussel distribution in our region.

Methods

YNPLP larval lamprey electrofishing surveys have extensively covered the White Salmon, Klickitat, Yakima, Entiat and Wenatchee subbasins since 2012, with observation records of freshwater mussels dating back to 2014. Although we did not actively search for mussels during these surveys, live (or dead) mussels were generally observed in the stream while searching for larval lampreys (usually in a mix of fine and coarse substrates), or shells were found along the bank. When a mussel was encountered, the following information was recorded; a photo of the animal (live or dead), the GPS coordinates of the discovery, and the mussel's condition [alive, recently dead (with tissues still intact), or shell only]. In general, mussels were not identified to species due to lack of identification knowledge. However in many cases, photos of captured mussels (or shells) were sent to local experts for identification. Collected mussels were photographed and immediately released back to the stream at the same spot they were found. In some cases mussels were found in irrigation diversions during lamprey rescue operations. During rescue operations within the diversion, we did set aside some time to capture mussels that were easily visible and return them to the river downstream of the diversion headgate (so they wouldn't wash back in). In the results section, we summarize all sites where freshwater mussels have been documented by the YNPLP using, photos, field notes, and Google Earth aerial maps.

Results

From 2014 through 2018, freshwater mussels were documented within the Yakima and Wenatchee subbasins (Table 1). In the Yakima Subbasin, the most commonly encountered mussel species during our surveys was Western Pearlshell (*Margaritifera falcate*). Western Ridged Mussel (*Gonidea angulata*) was encountered at one location on Ahtanum Creek (river km 1.2), a tributary of the Lower Yakima River. A Western Floater species (*Anodonta sp.*) was encountered on Wenas Creek (tributary of the Upper Yakima River), although the shell was difficult to identify due to poor condition (expert opinion suggested it could be *G. angulata*). In the Wenatchee Subbasin, *M. falcate* was identified at one site in the Upper Wenatchee River, 3.3 river km downstream of Lake Wenatchee. However, the mussels at this site were identified by the YNPLP with limited knowledge of mussel identification.

Table 1. Freshwater mussel observations by the YNPLP in the Yakima and Wenatchee subbasins. Under “Confirmed Species Present” a dash (-) indicates a location where mussel species was not recorded. An asterisk (*) next to a stream indicates that the mussel species listed has not been expertly confirmed, or the sample was too decomposed to get a definitive answer.

Subbasin	HUC4	Stream	RKM	Observing Agency	GPS Coordinate	Site Location Description	Date of Most Recent FW Mussel Sighting	Years FW Mussels Were Sighted	Species Present
Yakima	Lower Yakima	Yakima	171.1	YNPLP	46.518724 -120.478940	Sunnyside Diversion; Canal Downstream of Fish Screens	11/14/2018	2015, 2016, 2017, 2018	Western Pearlshell (<i>Margaritifera falcate</i>)
			175.7	YNPLP	46.496552 -120.438836	Wapato Diversion; Canal Upstream of Fish Screens	11/16/2018	2015, 2016, 2017, 2018	Western Pearlshell (<i>Margaritifera falcate</i>)
	Upper Yakima	Toppenish	59.9	YNPLP	46.365937 -120.671330	Upstream of Shaker Church Road, White Swan, WA	7/19/2017	2017	-
		Simcoe (Tributary of Toppenish)	9.0	YNPLP	46.400997 -120.691819	Upstream of Stephenson Road, White Swan, WA	8/24/2018	2015, 2016, 2017, 2018	Western Pearlshell (<i>Margaritifera falcate</i>)
		Ahtanum	1.2	YNPLP	46.53685 -120.47417	Downstream of Highway 97 Bridge Union Gap, WA	6/21/2018	2018	Western Ridged (<i>Gonidea angulata</i>)
		Naches	Cowichee	1.1	YNPLP	46.627178 -120.581045	Bridge on Powerhouse Road Yakima, WA	2014	2014
Upper Yakima	Wenas*	0.5	YNPLP	46.69724 -120.49537	BOR Land Access off Buchanan Road, Selah, WA	8/8/2018	2018	(<i>Anodonta sp.</i>)	
Wenatchee	Upper Wenatchee	Wenatchee*	84.0	YNPLP	47.815610 -120.687880	3.3 RKM downstream of Lake Wenatchee	8/29/2018	2016, 2017, 2018	Western Pearlshell (<i>Margaritifera falcate</i>)

Yakima Subbasin

Lower Yakima River, RKM 171.4 (Sunnyside Diversion)

On November 14, 2018, freshwater mussels were rescued from Sunnyside Diversion; a large scale irrigation diversion of the Lower Yakima River (river km 171.4). All collected mussels were identified as *M. falcate* (confirmed through photo verification of several mussels), although other mussel species may have been present. Mussels were collected from the canal area, both upstream and downstream of the fish screens (Map 1, Photo 1 and 2). From the upstream canal, 24 live mussel were collected. From the downstream canal, 32 live mussels and 93 dead mussels were collected. Mussels were returned to the mainstem Yakima River near the rescue site. Mussels were found in substrate composed of sand and gravel/cobble. A similar number of live and dead mussels were collected from Sunnyside Diversion in 2015, 2016, 2017 and 2018.



Map 1. Overview map of Sunnyside Diversion where Western Pearlshell Mussels (indicated by the green balloons) have been collected since 2015. The green balloons also show the general location upstream, and downstream, of the fish screens where mussel collection has occurred. Water is flowing from east to west (downstream is on the west side of the fish screens).



Photo 1A. Overview of the upstream canal (left photo) and the downstream canal (right photo) at Sunnyside Diversion where Western Pearlshell mussels have been found (and recovered) since 2015.



Photo 1B. Various size classes of Western Pearlshell mussels collected from the downstream canal of Sunnyside Diversion, Yakima River, on November 14, 2018 (left photo), and an underwater view of a Western Pearlshell mussel found in the same location (right photo). The underwater photo also displays the type of habitat where mussels were collected (mix of fine and coarse substrates).

Lower Yakima River, RKM 176.3 (Wapato Diversion)

At Wapato Diversion (headgate at river km 176.3), mussel shells have been found in the canal upstream of the fish screens (Map 2 and Photo 3). Documentation of mussels in the canal upstream of the fish screens dates back to 2015 (observations in 2015, 2016, 2017 and 2018). In October of 2017 and 2018, a total of four dead *M. falcate* shells were found (three in 2017 and one in 2018). The condition of the mussels observed in Wapato Diversion prior to 2017 is unknown.



Map 2. Overview map of Wapato Diversion where Western Pearlshell Mussels (indicated by the green balloon) have been collected since 2015. The green balloon also shows the general location upstream of the fish screens where mussel collection has occurred. Water is flowing from north to south (north side of the fish screens is “upstream”).



Photo 2. Overview photo of the upstream canal at Wapato Diversion (left photo) and a close-up of the habitat (silt and cobble substrates) where freshwater mussels have been found (right photo).

Toppenish Creek, RKM 59.9 (tributary of the Lower Yakima River)

On July 19, 2017, one dead freshwater mussel was found along the bank of Toppenish Creek at river km 59.9 (Map 3 and Photo 4). No photos of the observed mussel are available.



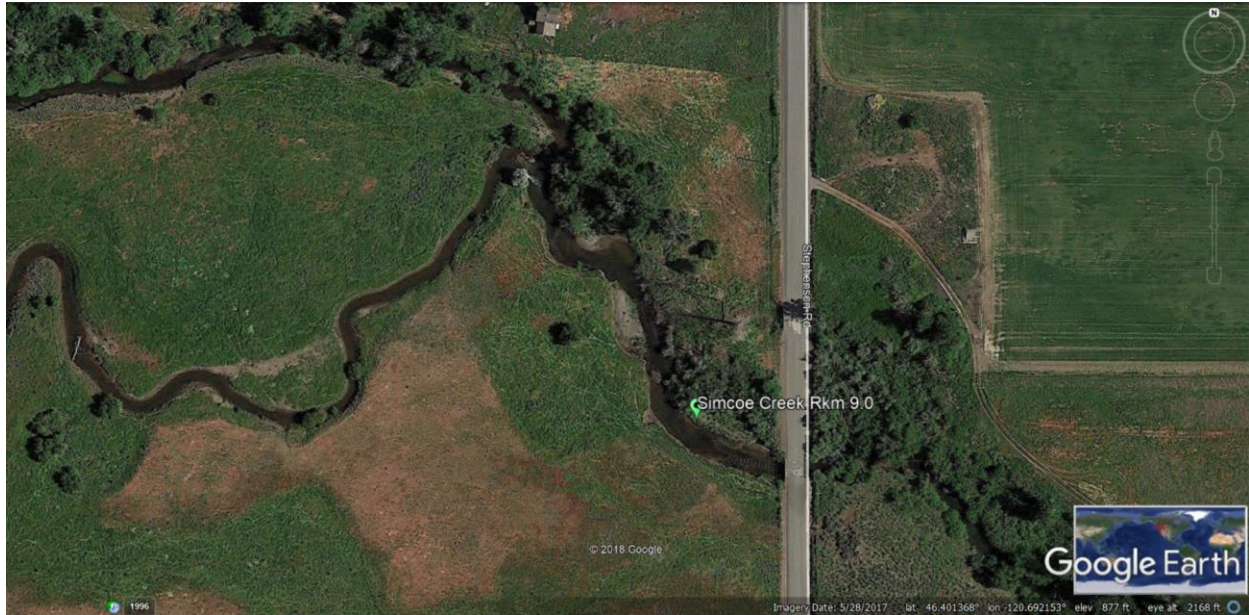
Map 3. Overview map of a Toppenish Creek survey site (river km 59.9) where a freshwater mussel shell was found in 2017. The mussel was not identified to species (indicated by the white balloon). On the map, water is flowing from west to east.



Photo 3. Overview of Toppenish Creek (river km 59.9) where a dead mussel (shell only) was found along the stream bank in 2017. The photo on the left is an upstream view, and the photo on the right is a downstream view.

Simcoe Creek, RKM 9.0 (tributary of Toppenish Creek)

Observations of freshwater mussels at Simcoe Creek (river km 9.0, upstream of Stephenson Road in White Swan, WA) have been documented since 2015, and as recent as August 24, 2018 (Map 4 and Photo 5). In 2018, two live specimens were observed at this site. Past explorations of this site have shown the densities of mussels to be high at this location. The mussels reside in a mixture of fine and coarse substrates. No photos of the observed mussels are available, although several experts did join us for one survey in 2017, and confirmed the species (at that time) to be *M. falcate*.



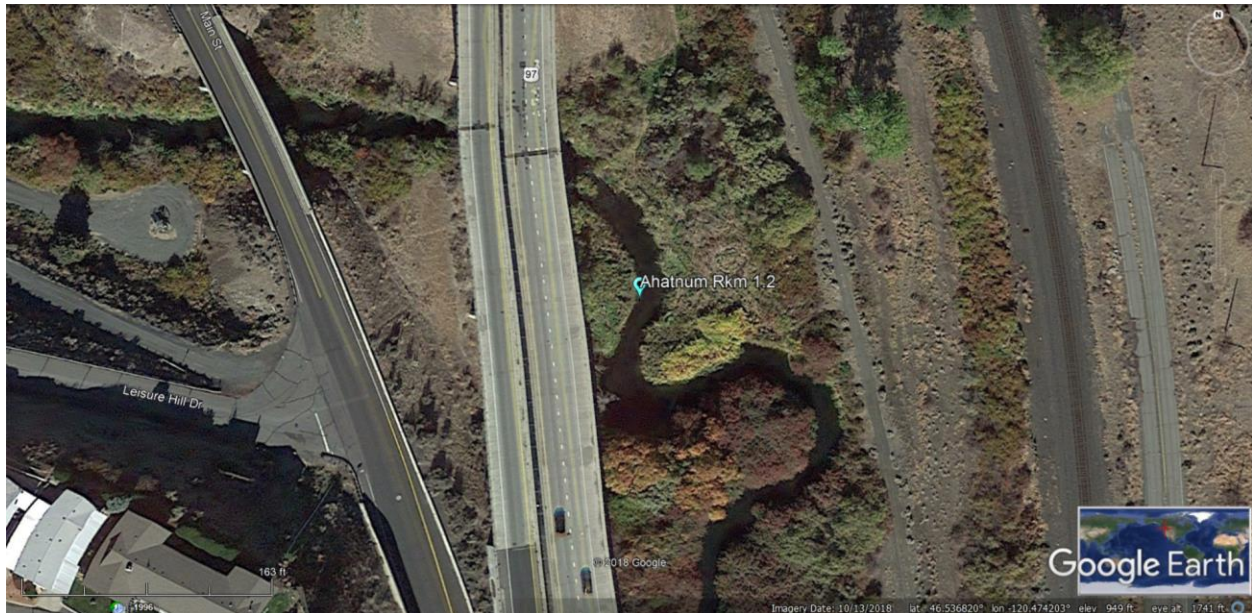
Map 4. Overview map of a Simcoe Creek survey site (river km 59.9) where Western Pearlshell mussels (indicated by the green balloon) have been observed since 2015, with the most recent observation in 2018. Water is flowing from west to east.



Photo 4. Overview of Simcoe Creek (river km 59.9) where *M. falcate* has been observed since 2015, with the most recent documentation in 2018. The photo on the left shows an overview of the site, and the photo on the right shows the habitat where mussels have been found (a mix of mostly fine sediment with some gravel/cobble).

Ahtanum Creek, RKM 1.2 (tributary of the Lower Yakima River)

In 2018, *G. angulata* was found at one survey site in Ahtanum Creek on June 21 and October 1, 2018 (Map 5, Photo 6 and Photo 7). A total of 6 live and 2 dead (shell only) *G. angulata* were found. The mussels at this site were found buried in the fine sediment (mix of silt and clay). This observation is different than other sites, where mussels were observed to inhabit habitat composed of fine and rocky substrates. This is the first known sighting of *G. angulata* by the YNPLP.



Map 5. Overview map of an Ahtanum Creek survey site (river km 1.2) where Western Ridged Mussels (indicated by the blue balloon) were first observed in 2018.



Photo 5. Overview of an Ahtanum Creek survey site (river km 1.2) where Western Ridged Mussels have been found in 2018. The photo on the left shows an overview of the site, and the photo on the right shows the fine sediment habitat where mussels were been found (primarily fine silt/clay).



Photo 5. Overview of Western Ridge Mussels collected from an Ahtanum Creek survey site (river km 1.2) in 2018. The photo on the left shows two different sized live mussels, and the photo on the right shows a mussel shell collected from the same site.

Cowichee Creek, RKM 1.1 (tributary of the Naches River)

The most recent sighting of freshwater mussels in Cowichee Creek (tributary of the Naches River) was in 2014 (Map 5). Freshwater mussels were observed at the Powerhouse Road Bridge in Yakima, WA. Memory suggests that this site was a hot spot for freshwater mussels. No photos of the mussels found at this site are available.



Map 6. Overview of Cowichee Creek (river km 1.1) where freshwater mussels were documented in 2014. The white balloon indicates the species at this location is unknown. Water is flowing from west to east.

Wenas Creek, RKM 0.5 (tributary of the Upper Yakima River)

In Wenas Creek, one freshwater mussel shell was found at a surveyed site near the mouth (river km 0.5) on August 8, 2018 (Map 7, Photo 8 and Photo 9). The mussel shell appeared old, with several holes in the shell. It was found in a pool, sitting on cobble substrate. This is the first YNPLP documentation of freshwater mussels in Wenas Creek. The mussel is hard to identify based on its condition, but expert opinion suggests it most likely to be of the floater genus (*Anodonta. spp.*), but some features suggest *G. angulata*.



Map 7. Overview map of a Wenas Creek survey site (river km 0.5) where the shell of an *Anodonta sp.* was found in 2018 (indicated by the yellow balloon). Water is flowing from north to south.



Photo 7A. Upstream (left photo) and downstream (right photo) overview of a Wenas Creek survey site (river km 0.5) where a Western Pearlshell Mussel shell was found.



Photo 7B. Overview photos of the single freshwater mussel shell found near the mouth of Wenas Creek (river km 0.5), tentatively identified as *Anodonata sp.*, although due to the decomposed nature of the shell, it could potentially be *G. angulata* (river km 0.5).

Wenatchee Subbasin

Wenatchee River (River km 84.0)

In the Wenatchee River, freshwater mussels were observed 3.3 river kilometers downstream of Lake Wenatchee in the mainstem Wenatchee River (Map 8 and Photo 10). Only dead mussels (shells only) have been observed at this site (along the bank trapped in woody debris). In 2018, approximately 20 mussel shells were observed within a 100 m reach, with a similar number of shells observed in 2016, 2017 and 2018. There appears to be large areas of mussel habitat (mixture of coarse and fine substrates) at this location, although the stream habitat has not yet been searched for live mussels (by the YNPLP). No photos have been taken of the mussel shells found at this location, although appear to be *M. falcate* (although this has not been confirmed).



Map 8. Overview of a survey site on the Wenatchee River (river km 84.0), where freshwater mussels were observed. The white balloon indicates that the species at this location has not been confirmed. This site is approximately 3.3 river km downstream of Lake Wenatchee. Water is flowing from west to east.



Photo 8. Overview of Wenatchee River (river km 84.0) in 2017, where dead mussels (shells only) have been found trapped in debris along the bank. Both left and right photos are facing downstream.

Discussion

Sightings of freshwater mussels have been documented by the Yakama Nation Pacific Lamprey Project (YNPLP) in both the Yakima Subbasin and the Wenatchee Subbasin. Although larval lampreys prefer the deeper fine sediments, as opposed to areas with gravel and cobble, larval lamprey often utilize these gravel/cobble/fine sediment areas (potentially seeking a mutual benefit from the presence of the freshwater mussels, when the mussels are present). In the Yakima Subbasin, freshwater mussels were found to reside in the canals of both Sunnyside and Wapato

diversions. The mussels collected downstream of the fish screens at Sunnyside Diversion (1.5 inches to 5 inches in longest length) are too large to have drifted downstream through the fish screens, suggesting that they most likely entered the diversion as larvae, and reared in this location for many years. The variance of size classes suggest larval mussels have entered the diversion over a multitude of years. There is an unknown number of mussels that remain in these canal areas, and although our surveys in these diversions are geared towards lamprey recovery, a yearly effort will be given to remove as many mussels as possible (with priority given to salvaging mussels downstream of the fish screens) and document our findings (including sizes, live or dead, and species).

Through various photo identification and confirmation by experts, the vast majority of the mussels we have encountered appear to be *M. falcate*. For the first time, *G. angulata* was encountered (at one site in Ahtanum Creek, river km 1.2). A potential *Anodonta sp.* shell was found in Wenas Creek, which would be document the first time this genus was discovered by the YNPLP. In general, all observed mussels were often found in a mix of sandy and gravel/cobble substrates. However, *G. angulata* in Ahtanum Creek was observed to reside in primarily fine sediment (fine silt and clay). The mussels were discovered ~ 1" below the surface of the fine sediment. In the Wenatchee Subbasin, mussels were observed in the Upper Wenatchee River. These mussels were identified by the YNPLP, and may not be accurate due to limited knowledge of mussel identification (and no photos of mussels exist). However, to our best knowledge, the species in *M. falcate*.

Although we provide species documentation from a variety of surveyed sites, it is quite possible other mussel species may have also been collected. In order to improve future documentation efforts, we will add a designated space to our lamprey datasheet to collect the following information; best guess of species, photo of the specimen (for live ones the papillae underwater and the shell, and for dead ones the pseudocardinal teeth on the inside), general description of the type of habitat where the mussel was found, and the mussels condition (live, freshly dead, or shell only). The data we collect will be submitted yearly to the Xerces Society, which documents freshwater mussel findings throughout the Northwestern United States.