2017 Mountain Whitefish Kill on the Yellowstone River

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Background

On August 21, 2017, Montana Fish, Wildlife & Parks (FWP) received two separate reports from anglers of approximately a dozen dead Mountain Whitefish (MWF) between the Highway 89 Bridge Fishing Access Site (FAS) and the Springdale Bridge FAS. The dead fish were observed on August 19, 2017. On August 22, surveys were initiated between the Highway 89 Bridge FAS and Springdale FAS to determine the cause and evaluate the level and extent of mortality occurring.

Mortality Monitoring

Monitoring of fish mortality on the Yellowstone River was conducted on five sections starting August 22, 2017 and continued through September 6, 2017. Monitoring was generally done weekly, but not all sections were sampled for the same duration depending on mortality levels observed. The five sections were: Highway 89 Bridge FAS to Springdale Bridge FAS, Mayor's Landing FAS to Highway 89 Bridge FAS, Grey Owl to Pine Creek, Grey Owl to Mallard's Rest, and Springdale Bridge to Grey Bear (Figure 1). The HWY 89 Bridge to Springdale Bridge Section was 15.3-miles long. The Mayor's Landing to Highway 89 Bridge Section was 6.0-miles long. The Grey Owl to Pine Creek reach was 14.7-miles long. The Grey Owl to Mallard's Rest reach was 11.3-miles long. The Springdale Bridge to Grey Bear section was 9.4-miles long. Monitoring efforts focused on slow and backwater areas of each reach, not just one bank as was done in 2016 (Opitz and Rhoten 2017).

Observed fish were identified to species, counted, and assigned to a temporal mortality category (i.e., moribund, fish that were in process of dying; recent, fish that had died within the last 12 hours; and old, fish that had been dead longer than 12 hours). These categories were used to determine if mortality was increasing, decreasing, or remaining stable among weekly sampling events.

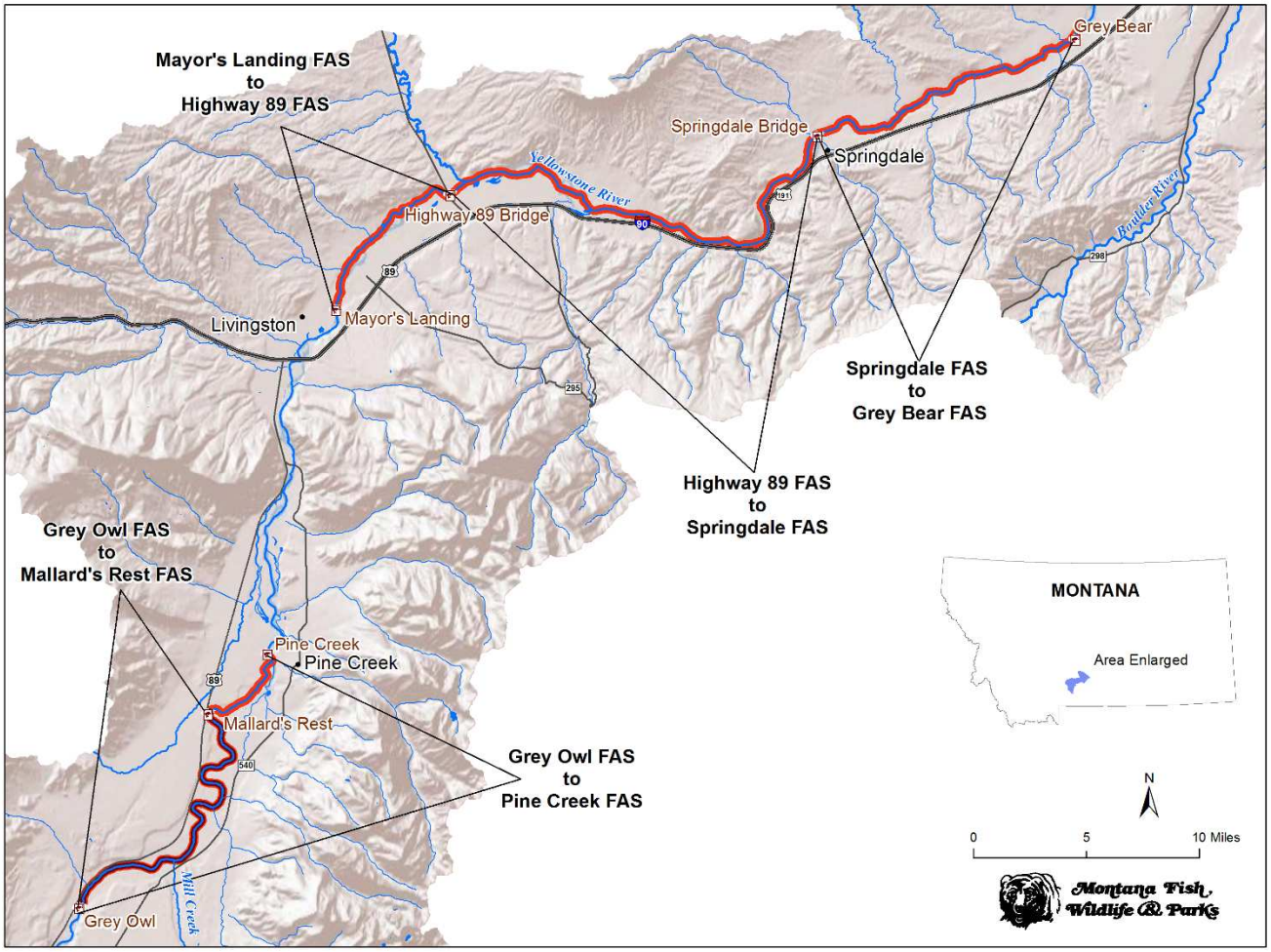

Figure 1: Map of PKD mortality monitoring sections in the Yellowstone River.

Springdale to Grey Bear

The Springdale to Grey bear section was monitored to determine the lower boundary of the fish kill on August 23, 2017 (Figure 1). A total of six dead MWF and one White Sucker were found in this section (Table 1). This section was the furthest down river that mortality was observed or reported.

Table 1: Grey Owl to Pine Creek

Date	Total MWF	Total WHSU	Moribund MWF	Recent MWF	Old MWF	Moribund WHSU	Recent WHSU	Old WHSU
8/24/17	6	1	0	1	5	0	0	1

Highway 89 to Springdale

The Highway 89 to Springdale Section was monitored on August 22, 25, and 29, 2017 (Figure 1). This section was where mortality was first reported and had the highest mortality level of all five sections (Table 2). Some of the variability of mortality among dates is likely a result of not sampling just one bank, but focusing on prime areas on both sides of the river and the use of two boats on August 29.

Table 2: Pig Farm to Springdale mortality survey data

Date	Total MWF	Total LNSU	Total YCT	Moribund MWF	Recent MWF	Old MWF	Moribund LNSU	Recent LNSU	Old LNSU	Moribund YCT	Recent YCT	Old YCT
8/22/17	53	1	0	0	52	1	0	1	0	0	0	0
8/25/17	10	1	0	1	9	0	1	0	0	0	0	0
8/29/17	21	2	1	0	14	7	0	0	2	0	0	1

In this section of the river, mortality was observed in two Longnose Suckers (LNSU) and one Yellowstone Cutthroat Trout.

Mayor's Landing to 89 Bridge

The Mayor's Landing to 89 Bridge Section was monitored on August 23, 2017 (Figure 1) to determine how far upstream mortality was occurring. This section had MWF and LNSU mortality at a lower level than the Highway 89 to Springdale Section (Table 3).

Table 3: Mayor's Landing to 89 Bridge mortality survey data

Date	Total MWF	Total LNSU	Total LL	Moribund MWF	Moribund LNSU	Recent MWF	Recent LNSU	Old MWF	Old LNSU	Moribund LL	Recent LL	Old LL
8/23/17	23	4	1	1	1	19	3	3	0	0	0	1

Grey Owl to Pine Creek

The Grey Owl to Pine Creek section was monitored for mortality and to determine the upper boundary of the fish kill on August 24, 2017 (Figure 1). A total of 19 dead MWF were found in this section (Table 4). In addition to the MWF, one old LNSU mortality was observed in this section. The length of this section was reduced due to low mortality and became the Grey Owl to Mallard's Rest section.

Table 4: Grey Owl to Pine Creek

Date	Total MWF	Total LNSU	Moribund MWF	Recent MWF	Old MWF	Moribund LNSU	Recent LNSU	Old LNSU
8/24/17	19	1	1	17	1	0	0	1

Grey Owl to Mallard's Rest

The Grey Owl to Mallard's Rest section was a shortened length of the Grey Owl to Pine Creek section (Figure 1). The section was monitored on August 30 and September 06, 2017. Mortality in this reach was low and decreased to 1 by September 6, 2017 (Table 5).

Table 5: Grey Owl to Mallard's Rest mortality count results.

Date	Total MWF	Total LNSU	Moribund MWF	Recent MWF	Old MWF	Moribund LNSU	Recent LNSU	Old LNSU
8/30/17	13	2	0	8	5	0	2	0
9/06/17	1	0	0	0	1	0	0	0

In this section of the river two recent LNSU mortalities were observed.

River Closure

In contrast to 2016, no closure of the river was implemented in 2017. This decision was based on low mortality, limited extent of mortality, above average flows, and reasonable water temperatures unlike the conditions noted in 2016.

Proliferative Kidney Disease (PKD) Testing

MWF, Longnose Sucker (LNSU), and Brown Trout were collected from the Yellowstone River on August 23, 24, and 25, 2017 for histological and Polymerase Chain Reaction (PCR) testing to determine the cause of mortality.

Histology

Samples of one preserved MWF and kidney imprints from five additional MWF collected in the Grey Owl to Pine Creek reach (Figure 1) of the Yellowstone River were examined at the U.S. Fish and Wildlife Service Bozeman Fish Health Center (BFHC). Samples of one preserved MWF, one preserved LNSU, three MWF kidney imprints, one LNSU kidney imprint, and one Brown Trout kidney imprint from the Highway 89 Bridge to Springdale Bridge reach (Figure 1)of the Yellowstone River were also examined.

Preserved Fish

The BFHC reported that both preserved whole MWF were infected with *Tetracapsuloides bryosalmonea* (PKX) and had severe PKD. PKX organisms were present in many tissues including kidneys, spleens, gastrointestinal tracts, and gills. PKX organisms were noted in blood vessels and sinusoid of other tissues (Figure 2 and Figure 3).

Histological examination of the preserved whole LNSU did not reveal the presence of any PKX organisms.

Kidney Imprints

Histology indicated that all eight of the kidney imprints from MWF were infected with PKX. PKX was not detected in the kidney imprints from the LNSU or the Brown Trout collected in the Highway 89 to Springdale reach.

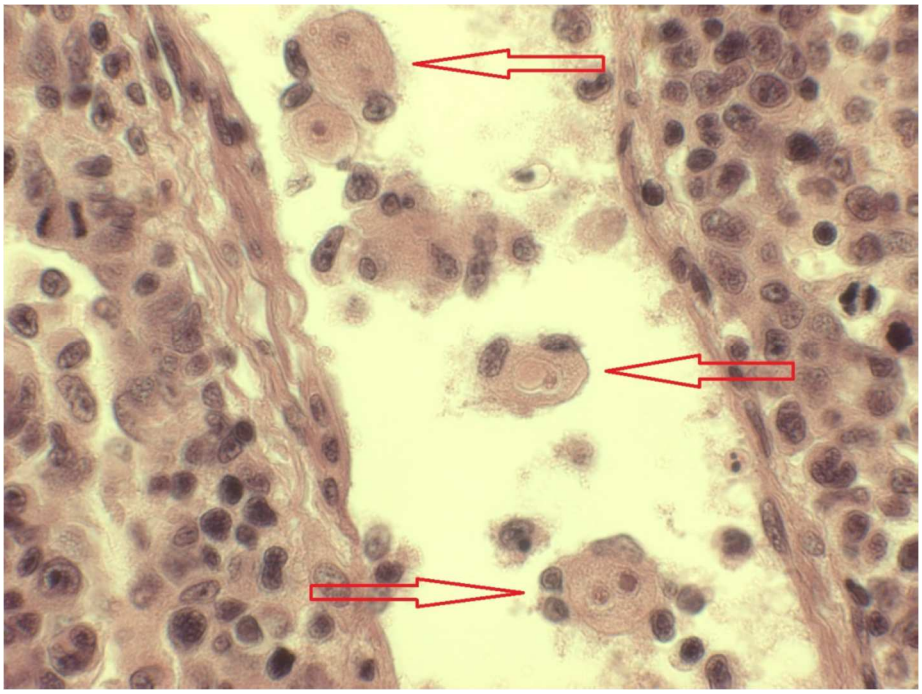

Figure 2: PKX organisms in blood vessel of kidney. Photo Credit: Bozeman Fish Health Center

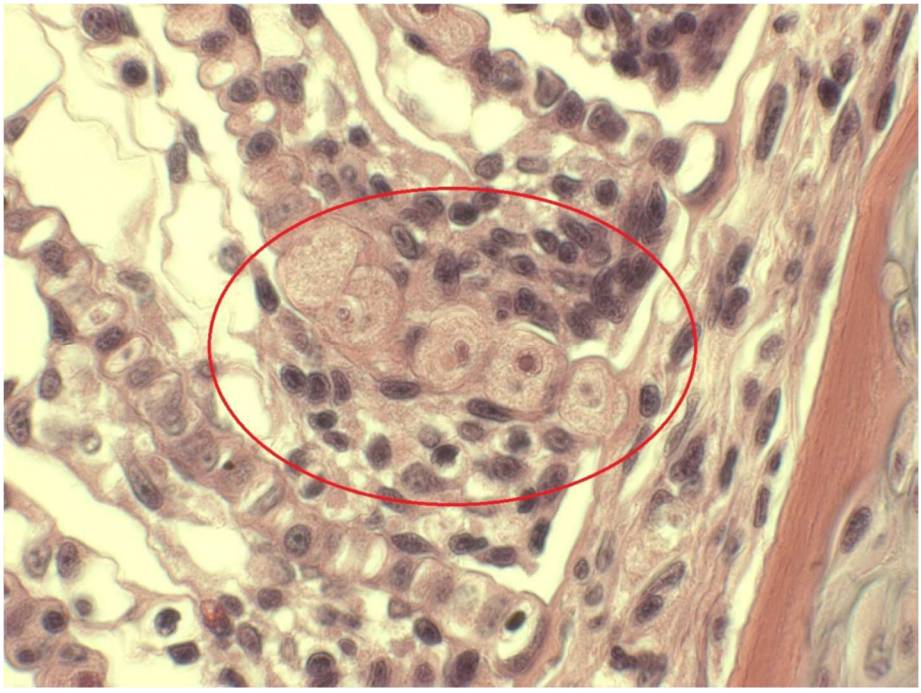

Figure 3: PKX organisms in gill lamellae. Photo Credit: Bozeman Fish Health Center

Polymerase Chain Reaction (PCR)

BFHC ran PCR on five MWF collected in the Grey Owl FAS to Pine Creek FAS reach of the Yellowstone River and results indicated all five were positive for PKX.

PCR was also done on three MFW, one LNSU, and one Brown trout from the Highway 89 Bridge FAS to Springdale Bridge FAS reach of the Yellowstone River. All three MWF samples were positive for PKX and both the LNSU and Brown Trout were negative.

Bryozoan Sampling

Bryozoan sampling was competed at the Dan Bailey FAS and the Pig Farm FAS on September 8, 2017 (Figure 4). This was an effort to verify the presence and location of bryozoans in the Yellowstone River system. The effort consisted of turning over several types of substrate both near shore and in the main channel. Bryozoans that were located were collected and preserved in water for identification at the FWP lab.

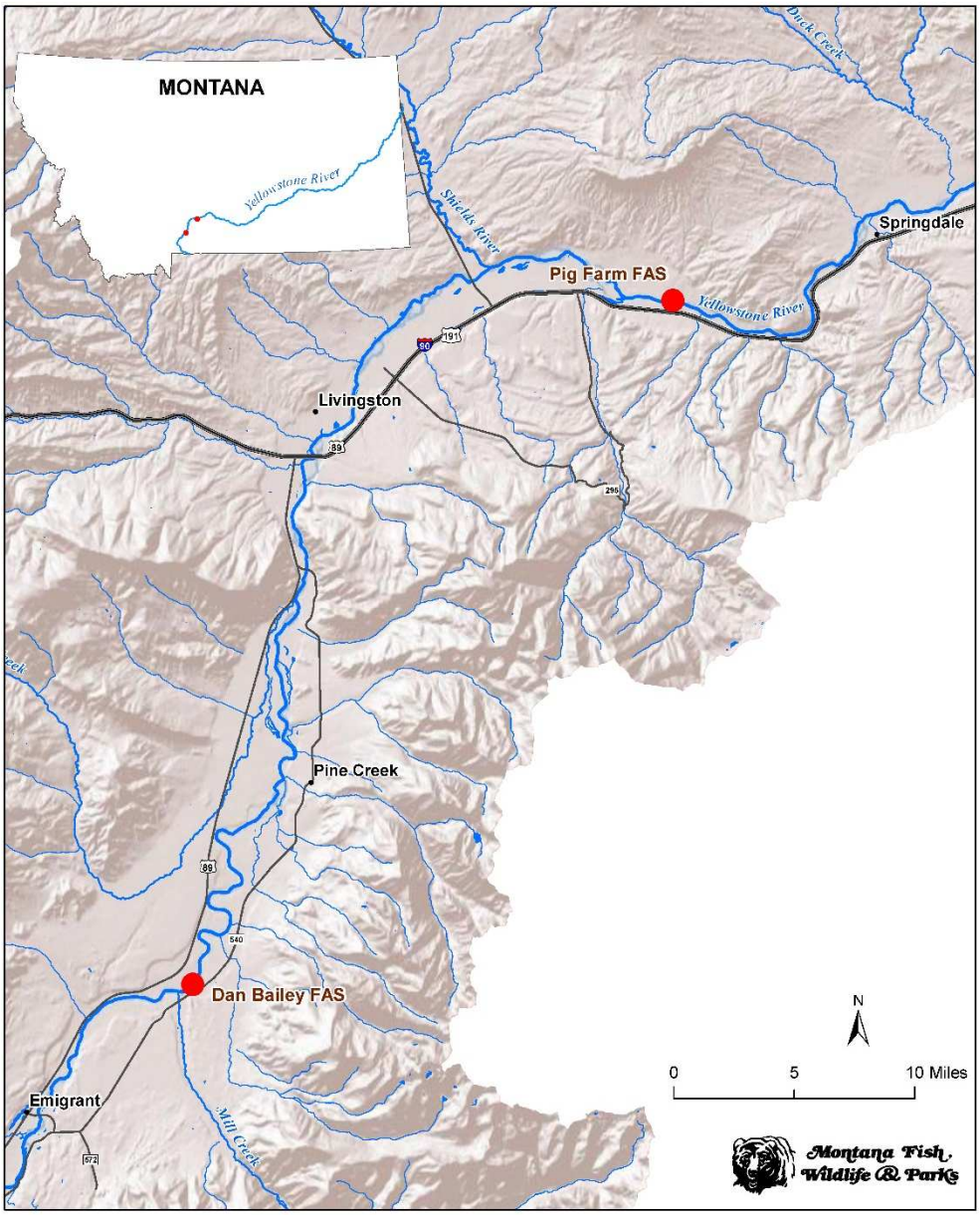

Figure 4: Bryozoan sampling locations on the Yellowstone River in 2017.

No bryozoans were located at the Dan Bailey FAS. This may have been due to sampling occurring too late in the year or that this was not an ideal sampling location.

Five separate colonies of bryozoans were found at the Pig Farm FAS (Figure 5). The bryozoans were collected and taken to the FWP lab for identification. The bryozoans were no longer alive and were not able to be identified to species. This was likely the result of byrozoans entering their dormant stage in colder water temperatures.

FWP plans to do further work to document distribution and abundance of bryozoans in the Yellowstone River.

Figure 5: Photos of bryozoans collected at the Pig Farm FAS.

Summary

In August of 2017, a MWF kill occurred in the Yellowstone River and subsequent testing confirmed PKD as the cause. MWF mortality was lower and distribution of mortality was smaller than 2016. Mortality was monitored in five sections of the river and no river closure was implemented. Mortality subsided by the second week of September 2017.

Sampling for bryozoans was conducted in two locations and five colonies were found at the Pig Farm FAS. The samples were not viable enough to be identified to species.

Population monitoring to asses potential MWF and trout population impacts and sampling to determine distribution and species of bryozoans is planned for 2018.

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Stacy Schmitz – bryozoan sampling

References

Opitz S. T., Rhoten J.C. (2017) 2016 Mountain Whitefish Kill on the Yellowstone River. Montana Department of Fish, Wildlife & Parks, Bozeman Montana