Montana Fish, Wildlife & Parks

Trout and Whitefish Life History Study
April 2016 Update

Status Report for PPL-Montana
FERC Project 2188

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Introduction

The timing of young rainbow trout outmigration from natal streams can have great influence on the survival and year class strength (Daugherty et al. 2003, Rosenau 1991, Biette et al. 1981). In Montana's Holter Dam tailwater fishery a large portion of rainbow trout spend their first year in their natal streams then migrate into the Missouri River at age 1 (Munro 2004, Leathe et al. 2002, Leathe et al. 2014). In 1996, *Myxobolus cerebralis*, the parasite that causes whirling disease in rainbow trout, was discovered in the two most important spawning tributaries in this area. Despite a high prevalence of the parasite in these tributaries, no population impacts have been documented. In fact, the highest population densities have occurred after the discovery of *M. cerebralis* (Grisak and Tribby 2013). Recent studies have shown the lack of spawning site fidelity in adult rainbow trout as the likely mechanism that reduces the risk of impacts from this parasite by spreading the risk over spawning areas with a broad range of infection severity (Grisak et al. 2012).

PPL Montana (now Northwestern Energy) awarded Montana Fish, Wildlife and Parks (MFWP) $84,600 following the December 2013 Missouri River Technical Advisory Committee meeting to investigate trout and mountain whitefish life history characteristics and to bridge the information gap between previous studies.

The specific objectives of this study are to;

1. Compare outmigration timing with past studies (Leathe 2001),
2. Evaluate homing/straying with natal stream (Grisak et al. 2012),
3. Document level of straying over multiple years (Grisak et al. 2012),
4. Identify summer and winter locations of tagged fish in the Missouri River,
5. Use known age fish to evaluate historic ageing results and growth patterns over the past 31 years.
6. Identify connectivity with Sun River and Smith River trout populations.

To meet these objectives, Passive Integrated Transponder (PIT) technology is being used to monitor fish movement in the Missouri, Smith, and Sun River systems. Full duplex PIT tags were used with primarily 23 and 35mm long tags to increase read range and tag detection efficiency. The majority of the fish were tagged by making a small incision in the abdomen and placing the tag into the abdominal cavity. Fish movements are being monitored using a network of remote PIT tag monitoring stations and tracking with mobile antennae.

This project coincides with a corresponding trout and mountain whitefish life history study using PIT technology on the Smith River, which is being conducted by a master's student at Montana State University. Given the ability of fish to utilize the entire Missouri, Smith, and Sun River system a great deal of coordination has been and will continue to be conducted between MSU and MFWP to maximize data collection and analysis efficiency. While the money awarded by Northwestern Energy was not utilized to conduct Smith River investigations, some Smith River results are reported here because of the interconnected nature of these studies. This report provides an update of the status of the study to date.

Results

Fish Tagging

A total of 10,619 fish have been tagged in the Missouri, Sun, and Smith River drainages since 2010 (Table 1, 2, and 3). Of these tags, 777 fish were tagged from 2010 through 2012 as part of the Tenderfoot Creek graduate study. A substantial number of these fish are likely no longer active in the system due to mortality. In 2014, 7,801 fish were tagged, which comprised 73% of the total fish tagged. All of the fish tagged in the Sun River drainage and 273 of the 572 (47%) fish tagged in the Missouri River were tagged in 2015. In spring 2016, 182 fish were tagged in the Smith River from the confluence with Sheep Creek downstream approximately 2 miles, and 23 fish (including 17 burbot) were tagged in the Missouri River downstream of Ulm.

Table 1. Number of tagged fish by species and waterbody in the Missouri River drainage.

	Mountain whitefish	Rainbow trout	Brown trout	White sucker	Longnose sucker	Ling	Misc*	Total Fish
Missouri River	230	128	138	51	4	19	2	572
Lyons Creek	--	263	113	1	--	--	--	377
Little Prickly Pear	1	521	86	9	2	--	--	619
Wolf Creek	--	760	93	--	--	--	--	853
Sheep Creek	--	424	72	2	--	--	--	498
Dearborn River	46	390	131	40	46	--	2	655
Total Fish	**277**	**2,486**	**633**	**103**	**52**	**19**	**4**	**3,574**

* Misc. = mountain sucker, yellow perch, and walleye.

Table 2. Number of tagged fish by species and waterbody in the Sun River drainage.

	Mountain whitefish	Rainbow trout	Brown trout	Brook trout	White sucker	Total Fish
Sun River – Hwy 287	75	48	100	--	--	223
Sun River – Simms	64	55	54	--	--	173
Sun River – Sun River	81	41	74	--	5	201
Elk Creek – Scherrer	--	4	99	3	--	106
Elk Creek – at Smith Creek	3	5	26	--	2	36
Total Fish	**223**	**153**	**353**	**3**	**7**	**739**

The size distribution of fish tagged in the Missouri River drainage is shown in Figure 1. The majority of rainbow trout and brown trout tagged were less than 7 inches, whereas mountain whitefish were larger with most tagged fish between 14 and 19 inches. Proportionally, more large fish were tagged in the Sun River (Figure 2) than the Missouri River.

Table 3. Number of tagged fish by species and waterbody in the Smith River drainage.

	Mountain whitefish	Rainbow trout	Brown trout	Brook trout	White sucker	Longnose sucker	Burbot	Total Fish
Smith River	695	601	436	3	31	17	10	1,794*
Sheep Creek	183	955	134	2	13	1	--	1,288
Moose Creek	271	906	6	21	--	--	--	1,204
Tenderfoot	577	522	106	94	--	--	--	1,299**
Hound Creek	11	24	367	--	48	19	--	469
Newlan Creek	5	1	21	13	43	--	2	85
Rock Creek	17	13	68	--	--	--	--	98
Birch Creek	--	6	50	11	2	--	--	69
Total Fish	**1,759**	**3,028**	**1,188**	**144**	**137**	**37**	**12**	**6,306***

* Totals include one mountain sucker tagged in the Smith River.
** 777 of the Tenderfoot tags are from David Ritter's graduate work and are likely no longer active.

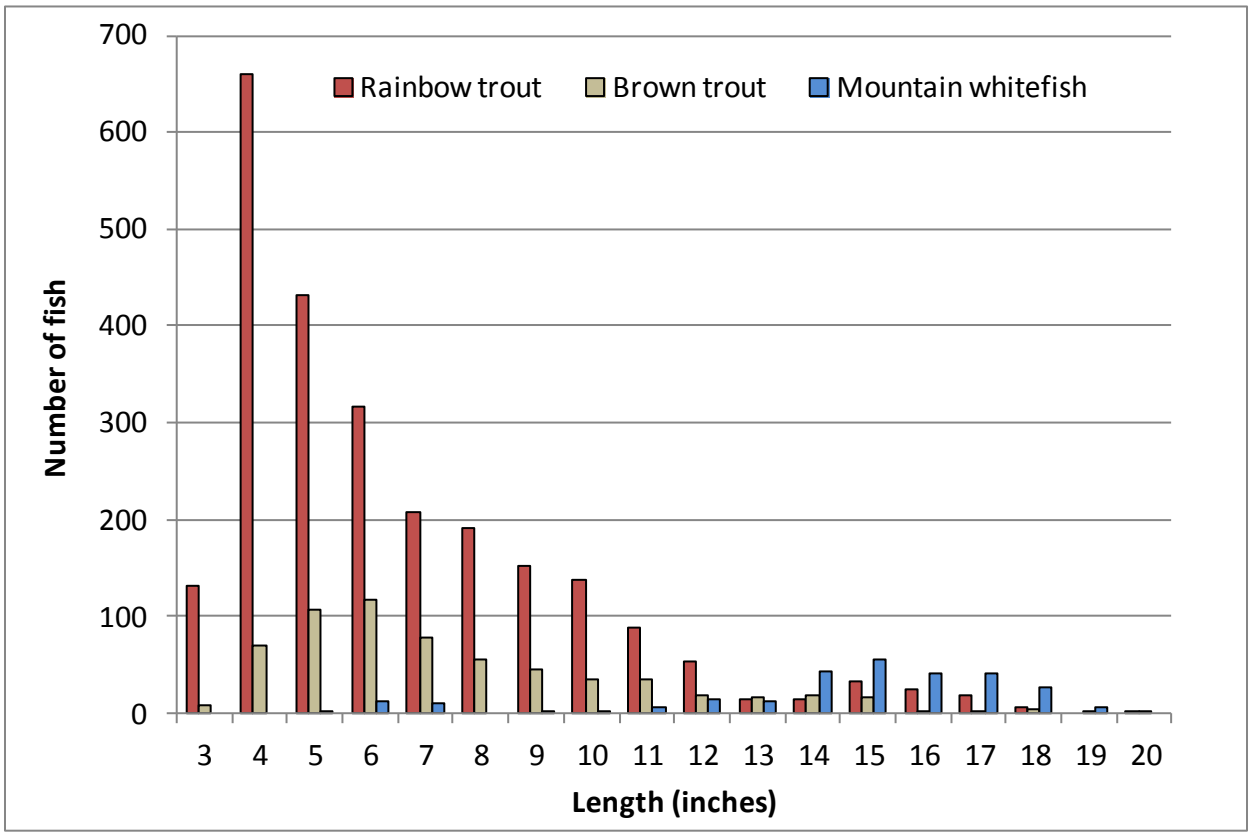


Figure 1. Size distribution of tagged fish from the Missouri River drainage.

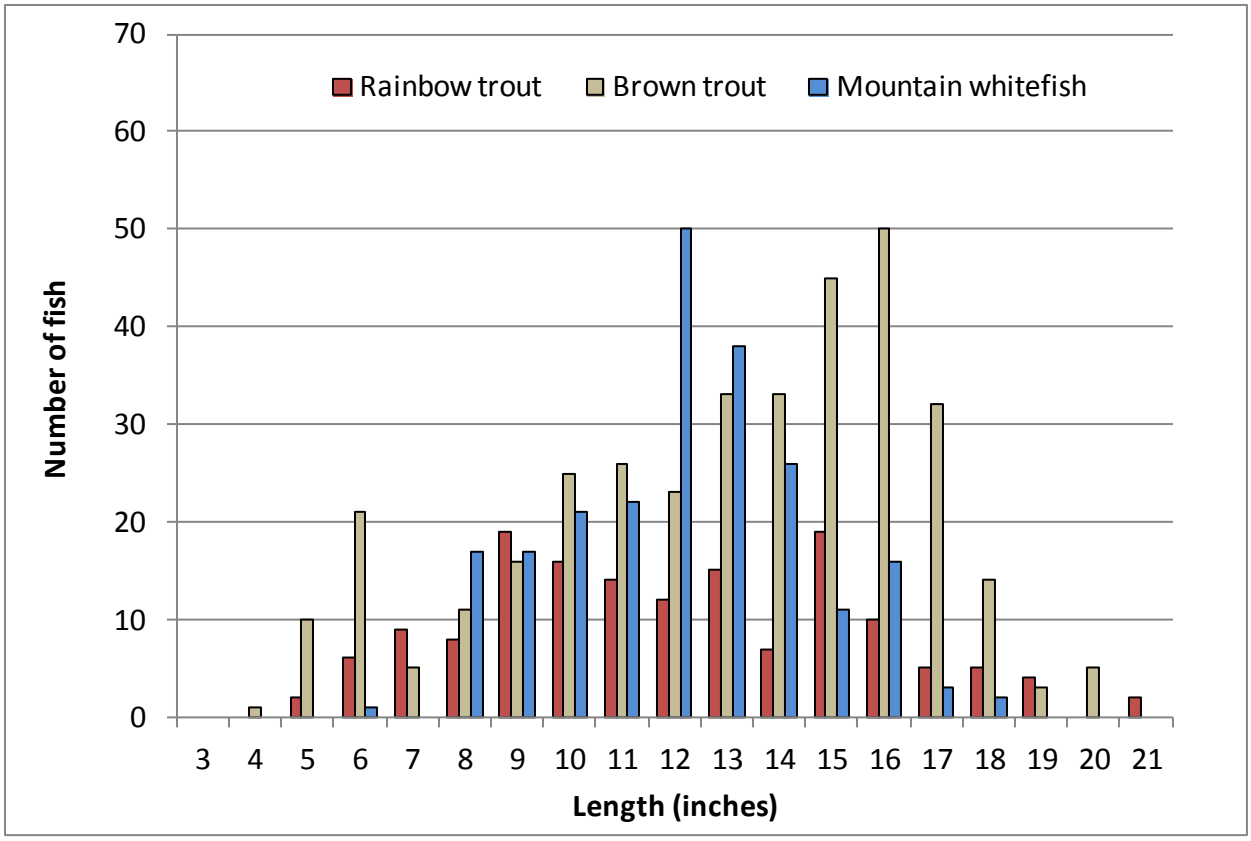


Figure 2. Size distribution of tagged fish from the Sun River drainage.

Remote Stations

To date, five remote PIT tag monitoring stations have been installed in the Missouri River drainage, three in the Sun River drainage, and fifteen in the Smith River drainage (Table 4). The five monitoring stations in Missouri River drainage were installed spring 2014 and the three stations in the Sun River drainage were installed spring 2015. Many of the stations in the Smith River drainage were installed during summer 2014, with the remaining stations installed in 2015 by the graduated student at Montana State University.

Mobile Tracking

Mobile tracking has been conducted using rafts and kayaks in an attempt to increase the number of detections and to determine fish locations in areas where remote monitoring stations are not present. Two mobile tracking trips have been conducted on the Sun River, resulting in seven brown trout detections and one rainbow trout detection. Three mobile tracking trips have been conducted on the Missouri River resulting in four detections. Many mobile tracking trips have been conducted by MSU on the Smith River, resulting in numerous detections. An increased effort on mobile tracking in the Missouri and Sun River drainages is planned for 2016. An effort will also be made to improve mobile tracking detection efficiency by attempting alternative antennae configurations and techniques.

Table 4. Remote station locations in the Missouri, Sun, and Smith River drainages arranged from upstream to downstream.

Drainage/ Stream	Lat	Long	Comments
Missouri River			
Lyons Creek	46.93827	-112.12581	Located just upstream of confluence with Little Prickly Pear Creek.
Wolf Creek	47.00597	-112.08026	Located just upstream of confluence with Little Prickly Pear Creek.
Little Prickly Pear Creek	47.02251	-112.02018	Located just upstream of confluence with Missouri River.
Dearborn River	47.13017	-111.91295	Located just upstream of confluence with Missouri River.
Sheep Creek	47.17681	-111.81165	Located just upstream of confluence with Missouri River.
Sun River			
Sun River – Hwy 287	47.54768	-112.36674	Located just upstream of Hwy 287 near Augusta at river 67.6.
Elk Creek – Scherrer	47.51229	-112.33641	Located at approx. river mile 2.8.
Sun River – Durocher	47.54413	-111.57848	Located upstream of Vaughn at river mile 20.
Smith River			
Birch Creek	46.58884	-111.05305	Located just upstream of confluence with Smith.
Newlan Creek	46.59094	-111.05070	Located just upstream of confluence with Smith.
Smith River – Canyon Ranch	46.60810	-111.06760	Located approx river mile 107.
Benton Creek	46.70542	-111.19305	Located just upstream of confluence with Smith.
Camas Creek	46.70542	-111.19305	Located just upstream of confluence with Smith.
Smith River @ Beaver Creek	46.75143	-111.16839	Located at approximately river mile 87.5.
Moose Creek	46.80292	-110.91484	Located just upstream of confluence with Sheep Creek.
Sheep Creek	46.81047	-110.92272	Located approximately 0.6 miles downstream of Moose Creek.
Sheep Creek	46.80443	-111.17403	Located approximately 0.5 miles upstream of confluence with Smith River.
Rock Creek	46.86935	-111.27185	Located just upstream of confluence with Smith.
Tenderfoot Creek	46.94185	-111.29404	Located just upstream of confluence with Smith.
Smith River – Castle Bar	46.97789	-111.28427	Located at approximately river mile 60.3.
Deep Creek	47.10581	-111.27255	Located just upstream of confluence with Smith.
Hound Creek	47.21261	-111.40371	Located at approximately river mile 1.5.
Smith River – Truly Bridge	47.35658	-111.44140	Located at approximately river mile 9.1.

Detection Summaries

Of the 3,574 fish tagged in the Missouri River drainage, 760 unique fish have been redetected (21.3%). Of these 760 fish, 573 were rainbow trout, 76 mountain whitefish, 73 brown trout, 21 white sucker, and 17 longnose sucker. All of these redetections have occurred on the Missouri River tributary remote monitoring stations, by mobile tracking, or by scanning fish during population estimates on the Missouri. None of the fish tagged in the Missouri River drainage have been detected in the Smith River or the Sun River drainages.

Of the 377 fish tagged in Lyons Creek, 112 (91 rainbow trout, 21 brown trout) have been redetected (29.7%). These 112 fish have been detected a total of 591 times, with 535 detections occurring at the Lyons Creek reader, 6 at the Wolf Creek reader, and 50 at the Little Prickly Pear Creek reader.

Of the 853 fish tagged in Wolf Creek, 145 (140 rainbow trout, 5 brown trout) have been redetected (17.0%). These 145 fish have been detected a total of 415 times, with 267 detections at the Wolf Creek reader, 7 at the Lyons Creek reader, 132 at the Little Prickly Pear Creek reader, 5 at the Dearborn River reader, 2 at the Sheep Creek reader, and 2 in the Missouri River mainstem near Craig.

Of the 619 fish tagged in Little Prickly Pear Creek, 185 (157 rainbow trout, 23 brown trout, 4 white sucker, and 1 longnose sucker) have been redetected (29.9%). The 185 fish have been detected a total of 493 times, with 213 detections at the Little Prickly Pear Creek reader, 237 at the Lyons Creek reader, 30 at the Wolf Creek reader, 3 in the Missouri River mainstem near Craig, 9 at the Dearborn River reader, and 1 at the Sheep Creek reader.

Of the 572 fish tagged in the Missouri River, 89 (19 rainbow trout, 17 brown trout, 44 mountain whitefish, 8 white sucker, and 1 longnose sucker) have been redetected (15.6%). These 89 fish have been detected a total of 205 times, with 14 detections at the Lyons Creek reader, 13 at the Wolf Creek reader, 69 at the Little Prickly Pear Creek reader, 4 in the Missouri River mainstem near Craig, 101 at the Dearborn River reader, and 4 at the Sheep Creek reader.

Of the 655 fish tagged in the Dearborn River, 156 (97 rainbow trout, 4 brown trout, 32 mountain whitefish, 8 white suckers, and 15 longnose suckers) have been detected (23.8%). These 156 fish have been detected a total of 607 times, with 14 detections at the Little Prickly Pear Creek reader, 590 at the Dearborn River reader, and 3 at the Sheep Creek reader.

Of the 498 fish tagged in Sheep Creek, 73 (69 rainbow trout, 3 brown trout, and 1 white sucker) have been redetected (14.7%). These 73 fish have been redetected 112 times, with 1 detection at the Little Prickly Pear Creek reader, 34 at the Dearborn River reader, and 77 at the Sheep Creek reader.

Of the 223 fish tagged in the Sun River at the Hwy 287 site, 90 (21 rainbow trout, 36 brown trout, 33 mountain whitefish) have been redetected (40.3%). The 90 fish have been redetected 252 times, with 244 detections at the Sun River Hwy 287 reader, 7 detected by mobile tracking in the Sun River near Hwy 287, and one detected at the Elk Creek reader.

Of the 142 fish tagged in Elk Creek, 12 fish (1 rainbow trout and 11 brown trout) have been redetected (8.5%). These 12 fish were all from tagging on the Scherrer property on Elk Creek, and have been detected a total of 70 times, all at the Elk Creek reader.

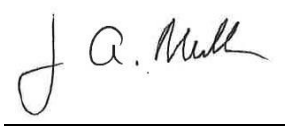
Of the 173 fish tagged in the Sun River at the Simms site, 4 (1 rainbow trout, 2 brown trout, and 1 mountain whitefish) have been redetected (2.3%). Three of the four fish were detected at the Sun River Hwy 287 reader, and one brown trout was detected at the lower Sun River reader.

Of the 201 fish tagged in the Sun River at the site near the town of Sun River, 6 (2 rainbow trout, 1 brown trout, 2 mountain whitefish, and 1 white sucker) have been redetected (3.0%). Four of the six fish were detected by the lower Sun River reader, 1 mountain whitefish was detected by the upper Sun Hwy 287 reader, and one rainbow trout was detected mobile tracking on the Sun River near the town of Sun River.

Of the 5,529 fish tagged in the Smith River drainage since the beginning of 2014, 1,433 have been redetected (25.9%). Several fish tagged in the Smith River drainage have been detected in the Missouri and Sun River drainages by remote reader stations. Two brown trout that were tagged on 7/1/2014 in Hound Creek (6.5 and 6.7 inches long when tagged), were detected at the Dearborn River reader on 9/24/2014 and 10/22/2014. Another brown trout that was tagged in Hound Creek on the same date and measured 7.4 inches long during tagging and was detected at the Sheep Creek (Missouri) reader several times from 3/19/2015 through 4/3/2015. Lastly, a mountain whitefish (17.2 inches at tagging) that was tagged in Tenderfoot Creek on 7/24/2014 was detected at the lower Sun Reader on 12/21/2015.

A total of 86 unique fish have been detected at the lower most reader on the Smith at Truly Bridge approximately 9.1 river miles upstream from the confluence with the Missouri. Fish that were tagged in the Smith River drainage and detected at this reader could represent use of the Missouri River, as fish could move downstream into the Missouri River and remain there with a low chance of redetection. Eighty-six detections is a small amount compared to the number tagged in the Smith River; however, low read range at this reader could result in fish passing this reader without getting detected. For example, three of the four fish detected at the Dearborn River, Sheep Creek (Missouri), and lower Sun Readers were not detected at the Truly Bridge reader. The Montana State University graduate student will be conducting tag detection efficiency tests at this reader in 2016.

Submitted by; Jason Mullen April 2016



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