Montana Fish, Wildlife & Parks

2016 Missouri River – Holter Dam Tailwater Monitoring

Status Report for Northwestern Energy
FERC Project 2188

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In 2016 Montana Fish, Wildlife & Parks received $24,286 from Northwestern Energy for monitoring the Missouri River and the fishery below Holter Dam as part of FERC license 2188.

Missouri River trout populations

Two sections of the Missouri River downstream from Holter Dam were electrofished at night using aluminum jet boats. The Craig section is 5.6 miles long and located from river mile (RM) 2.5 to 8.1 (Figure 1). The Cascade section is 4.1 miles long and is located from RM 24.2 to 28.3 (Figure 2). Jet propelled boats were equipped with headlights and fixed boom-type electrofishing systems using stainless steel cable droppers suspended from each boom. Electricity from 240-VAC generators was converted to smooth DC using Coffelt or Smith-Root rectifying units. Brown trout (*Salmo trutta*) estimates were conducted in each section in spring from the 27th of April to the 12th of May. Two jet boats were used in the Craig section, and one boat was used in the Cascade section. Rainbow trout (*Oncorhynchus mykiss*) estimates were conducted in fall from the 4th to the 20th of October and two boats were used in each section. Data were analyzed using the Montana Fish, Wildlife and Parks (MFWP) FA+ statistical software (MFWP 2004). Population estimates were calculated using the partial Log-likelihood or modified Petersen's methods. The significance level for all estimates was $\alpha \leq 0.05$.

2016 Missouri River trout population summary

In spring 2016 in the Craig section, the estimate of brown trout 10 inches long and greater was 269 (SD 11.5) per mile (Figure 3). The mean for years when population estimates were calculated based on data since 1982 (n = 32) was 563 per mile (Figure 3). While reported estimates include only fish greater than 10 inches, the 2016 estimate for brown trout less than 10 inches was the most since 2012. We sampled 11 burbot (*Lota lota*) and 18 walleye (*Sander vitreus*). The burbot sampled ranged from 13.6 to 27.6 inches long and 0.60 to 4.35 lbs. The walleye sampled ranged from 16.1 to 28.0 inches and 1.31 to 9.70 lbs.

A substantial number of rainbow trout were flushed into the Missouri River from Holter Reservoir in 2011. Of the 5,787 rainbow trout handled in 2011 in the Craig section, approximately 19 percent (1,125) were hatchery fish. The number of hatchery trout has declined in each year since then to 79 hatchery rainbows handled in the Craig section in 2016 (1.5 % of the total fish handled).

In fall 2016 in the Craig section, the estimate of rainbow trout 10 inches long and greater was 4,816 (SD 159.7) per mile (Figure 3). The estimate of 4,816 fish per mile, was 143% of the long-term average of 3,350 fish per mile based on annual estimates since 1982. We sampled 7 walleye and 26 burbot. The burbot samples ranged from 9.6 to 26.5 inches and 0.25 to 3.54 lbs. The walleye samples ranged from 11.3 to 23.1 inches and 1.72 to 4.96 lbs.

In spring 2016 in the Cascade section, the estimate of brown trout 10 inches long and greater was 433 (SD 66.2) per mile (Figure 4). This was 108% of the long-term average of 398 per mile. We sampled 5 burbot and 0 walleye. The burbot ranged from 11.1 to 27.4 inches and 0.24 to 3.84 lbs.

In fall 2016 in the Cascade section, the estimate of rainbow trout 10 inches long and greater was 2,156 (SD 80.2) per mile (Figure 4). This was 133% of the long term average of 1,616 per mile. We sampled 5 walleye and 49 burbot in the Cascade section. The walleye ranged from 8.4 to 26.7 inches long. The walleye sampled ranged from 8.4 to 26.7 inches and 0.19 to 5.4 lbs. The burbot sampled ranged from 9.9 to 27.9 inches and 0.22 to 4.5 lbs.

Water flow

For the 2016 calendar year, the Missouri River below Holter Dam had a mean discharge of 4,033 cfs, which was 76.1% of the 70-year mean ($\overline{x}$=5,297 [3,120-8,493]) (Figure 5). This mean discharge ranked in the 27th percentile for the 70-year period of record (51st of 70). The peak discharge in 2016 was 7,060 cfs, which occurred on May 28th (Figure 6, Table 1). The 2016 peak flow is 50.1% of a 71-year mean peak flow ($\overline{x}$ = 14,082 cfs) and is in the 22nd percentile (55th of 71) (Figure 7). In 2016, the daily discharge from 1 May to 30 June was slightly higher than 2015 but lower than many of the past years (Figure 8). The average May to June daily flow for 2016 was 4,928 cfs which is 75% of a 20-year mean ($\overline{x}$ = 6,489 cfs) and in the 42nd percentile (12th of 20).

Water temperature

When monitoring water temperature of the Missouri River, regional personnel rely on the information provided from the USGS gauging stations as the 'first line' of notification. When temperature reaches the critical threshold of 70^{o} F, we switch to data monitored by several thermographs located at strategic locations in the Missouri River. These thermographs are used in making management decisions that could include providing recommendations to the regional Fish, Wildlife & Parks Commissioner to institute time of day angling restrictions of certain fisheries to reduce stress from angling on the trout populations. It is the policy of MFWP that such closure requests may be made when "…daily maximum water temperature reaches or exceeds 73° F (23° C) for at least some period of time during three consecutive days…"

In 2016, the USGS gauging site below Holter Dam recorded a maximum daily temperature of 68.72^{o} F on August 2nd (Figure 6, Table 1). While temperatures were relatively high in August they did not warrant recommending angling restrictions on this valuable fishery.

Missouri River YOY walleye survey

FWP employees conducted 48 seine hauls in 2016 to evaluate young of the year (YOY) walleye abundance at 12 sites in a 47 mile-long reach of the Missouri River between Cascade and Great Falls. The protocol and site descriptions have been described by Grisak and Tribby (2011). Young of the year walleye abundance has been variable at these sites over the past seven years. Abundance of YOY in 2016 and 2015 were much less than in all the previous years. In 2016, 0 YOY walleye were collected and in 2015, only 1 YOY was collected (Figure 9). This is compared to 2009 and 2010, when 213 and 235 YOY were collected across the 12 sampling locations. A general decline in YOY walleye abundance has been observed over the monitoring period with the highest abundance in the first two years of sampling and the lowest abundance in the last two years of sampling.

Individual sites where YOY walleye were most abundant has also varied over the years. In 2011, YOY walleye numbers were highest in the middle sites (6-9). In 2012 the highest abundance of YOY walleye occurred at sites (1-4). In 2013, YOY walleye were found only at sites 3 and 12. In 2014, YOY walleye were collected from 6 of the 12 sites; however, 51 of the 60 walleye were collected from sites 2, 6, and 9.

Missouri River trout spawning

To evaluate trout production in the main stem Missouri River, trout redds are counted when flows conditions are suitable for viewing and counting redds by helicopter. In 2010, 2013, 2015, and 2016, visibility was adequate to conduct rainbow trout redd counts. The protocol

follows that described by Grisak et al. (2012) and the survey area spans from Holter Dam to the Pelican Point FAS (26.2 miles). In 2010, 1,644 rainbow trout redds were counted in this reach of river, 3,113 rainbow trout redds were counted in 2013, 2,793 rainbow trout redds were counted in 2015, and 1,557 rainbow trout redds were counted in 2016 (Figure 10, Table 2).

Rainbow trout population estimates spiked in 2011 (6,034 rainbow trout 10 inches and greater per mile) and 2012 (7,312 rainbow trout 10 inches and greater per mile) in the Craig section of the Missouri River (Figure 3). A corresponding spike in rainbow trout redds was observed in spring 2013 (n=3,113), followed by a decrease in redds in subsequent years as population estimates also decreased back toward the mean (Figures 3 and 10). While this decreasing trend of population estimates and redd counts from 2012 may initially be perceived as significant decreases in reproduction, the 2016 trout redd count (n=1,557) is similar to the 2010 count (n=1,644) prior to the large population peak in 2011 and 2012.

Rainbow trout redds counts were not conducted in the major spawning tributaries in 2016. In 2015, tributary spawning (except Dearborn River) was estimated to account for 57% of the total spawning with 43% of the spawning occurring in the mainstem of the Missouri River. In 2010, tributary spawning was 62% of total spawning with 38% occurring within the Missouri River, which is similar to that observed in 2015, especially had the Dearborn River been surveyed.

In 2016, conditions were not conducive to conduct brown trout redd counts in the same stretch of the Missouri River. In 2015, brown trout red counts were conducted on major tributaries to the Missouri River but not the mainstem Missouri (Figure 11). The 2015 brown trout redd counts in Little Prickly Pear Creek, Wolf Creek, Lyons Creek, and Sheep Creek were approximately 11 to 84% less than previous brown trout redd counts conducted in 2007 through 2009 (Table 3).

REFERENCES

Grisak, G., B. Tribby and A. Strainer. 2012. An Evaluation of walleye in the Missouri River between Holter Dam and Great Falls, Montana. PPL-Montana MOTAC projects 771-09, 771-10, 759-11, 771-11 and Fisheries Bureau Federal Aid Job Progress Report Federal Aid Project Number F-113-R9, R10, R11, R12. Montana Statewide Fisheries Management. Great Falls.

Grisak, G. and B. Tribby. 2011. 2010 Missouri River – Holter Dam tailwater monitoring report. Status report for PPL-Montana FERC Project 2188. Montana Fish, Wildlife & Parks, Great Falls.

Montana Fish, Wildlife & Parks. 2004. Fisheries analysis + program. Version 02152005-VB6-A2K-CR85. Montana Fish, Wildlife & Parks, Bozeman, MT.

Figures

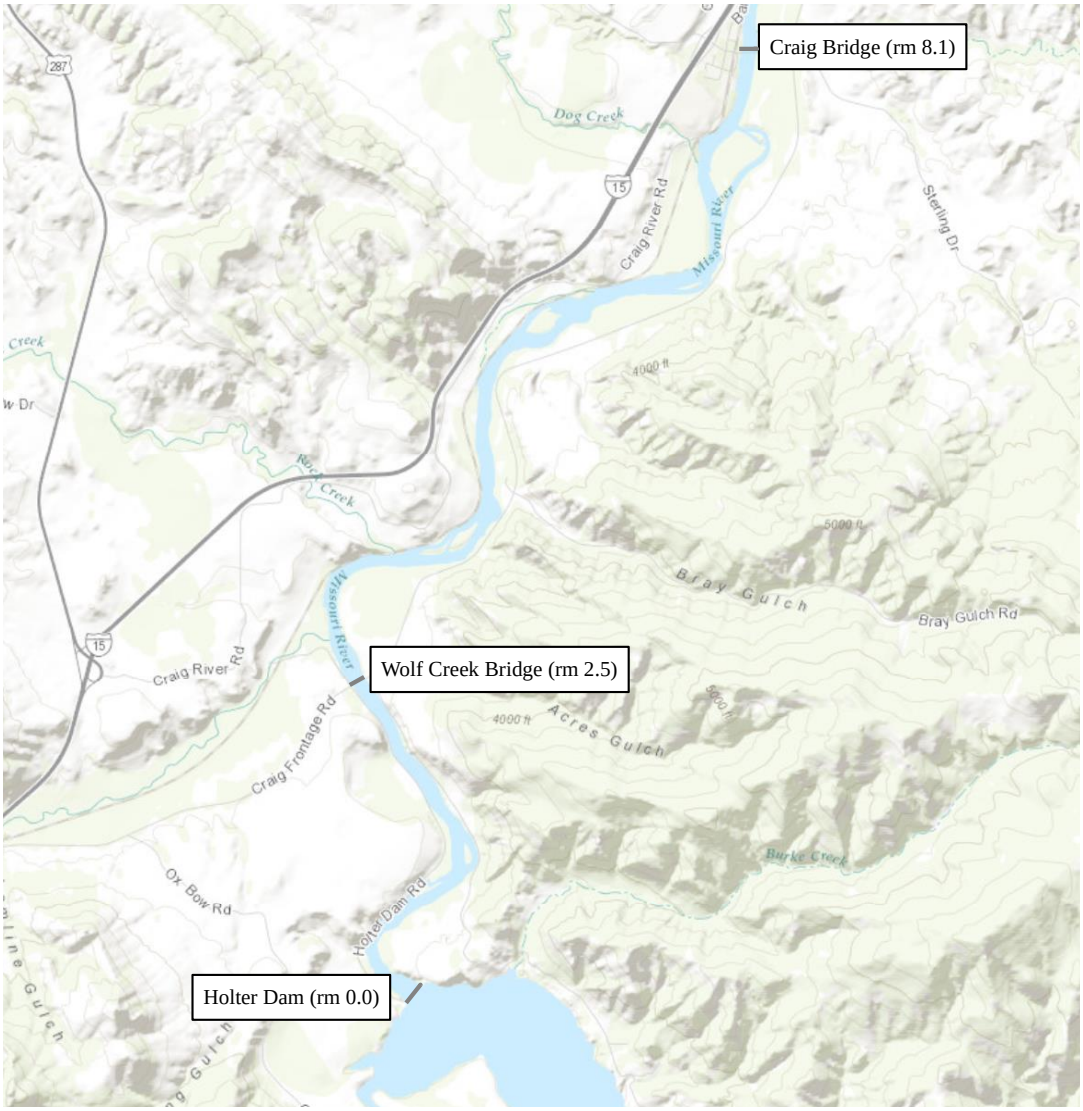

Figure 1. The Craig section of the Missouri River (river mile 2.5 to 8.1) near Craig, Montana. This section is annually electrofished at night for brown trout and rainbow trout population estimates.

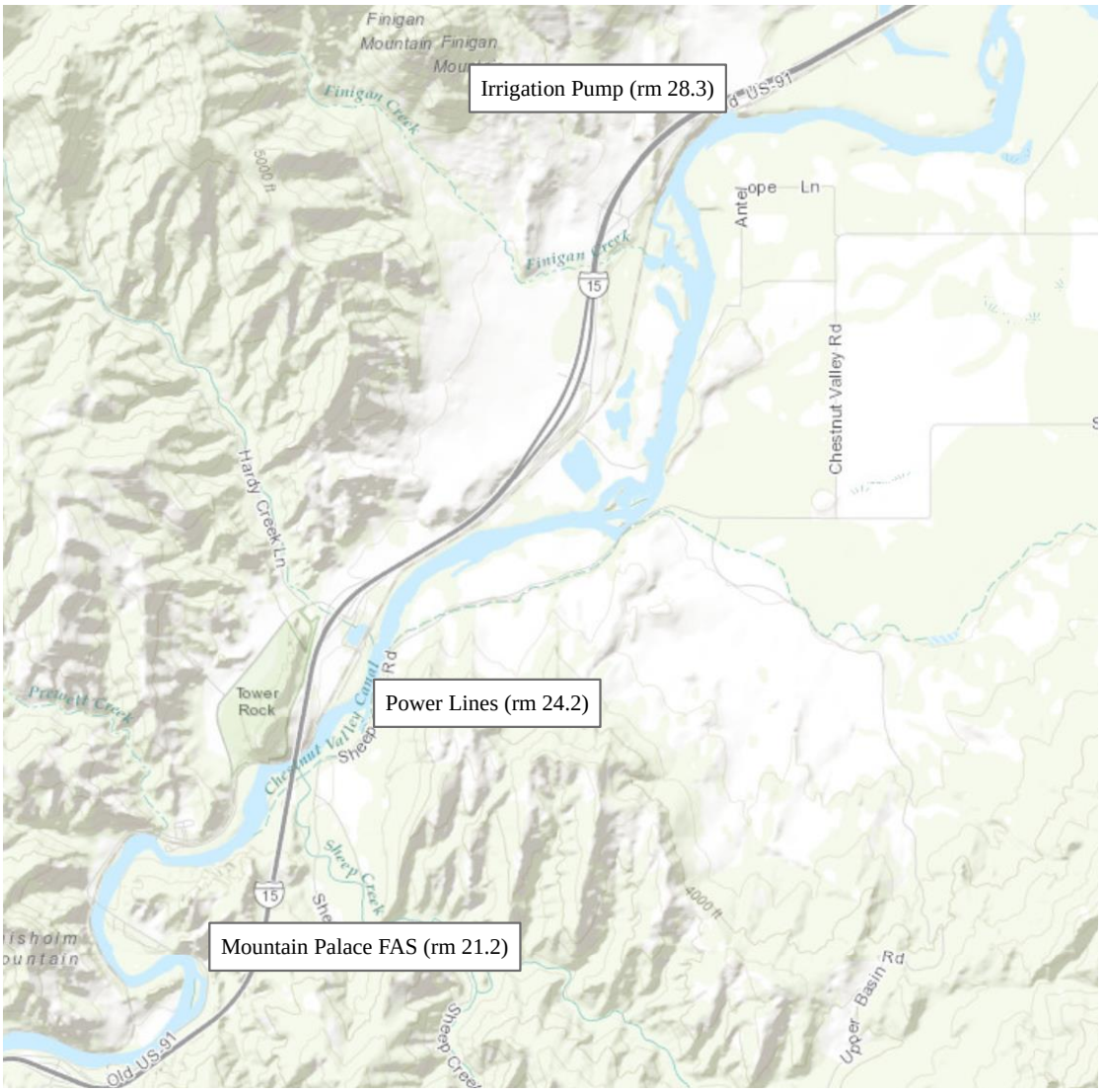

Figure 2. The Cascade section of the Missouri River (river mile 24.2 to 28.3) near Cascade, Montana. This section is annually electrofished at night for brown trout and rainbow trout population estimates.

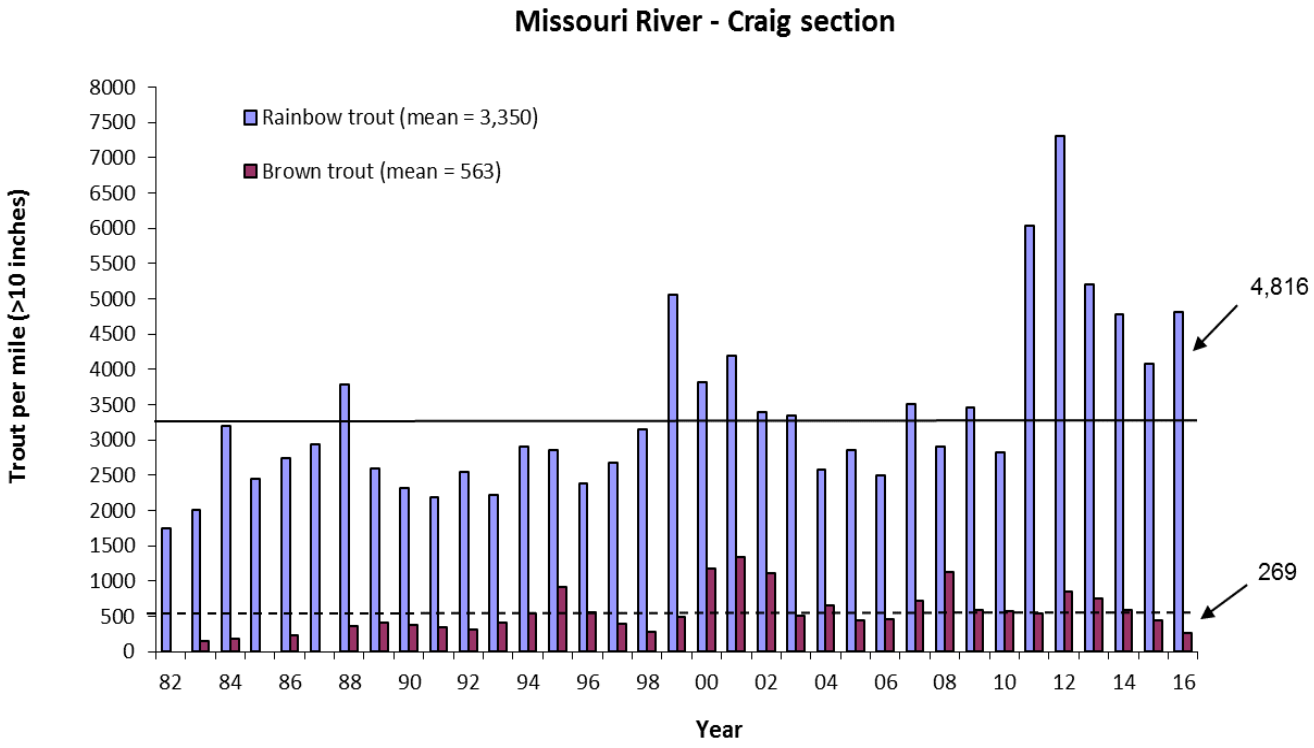

Figure 3. Population estimate of rainbow (*Oncorhynchus mykiss*) and brown (*Salmo trutta*) trout greater than 10 inches per mile in the Missouri River, Montana within the Craig sampling section from 1982 to 2016. Average number of rainbow (3,350) and brown trout (563) per mile within this sampling section is designated by horizontal lines.

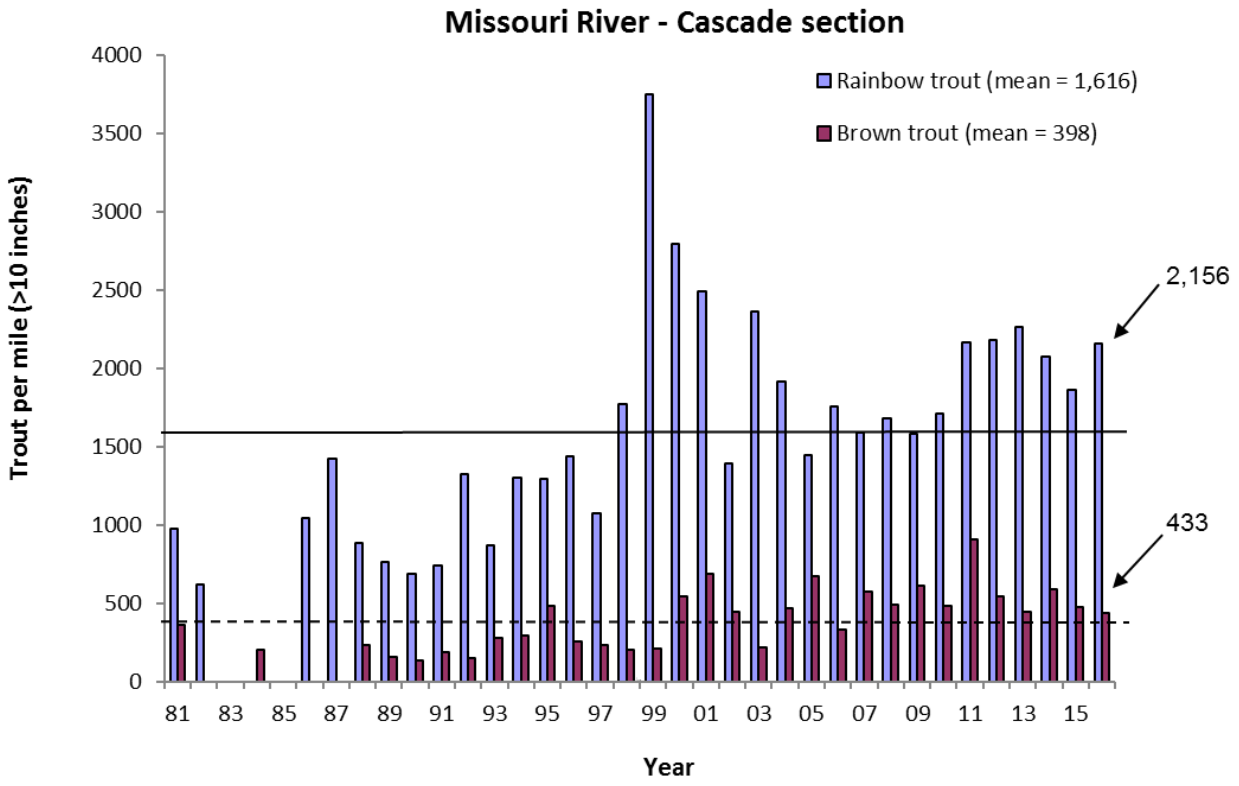

Figure 4. Population estimate of rainbow (*Oncorhynchus mykiss*) and brown (*Salmo trutta*) trout greater than 10 inches per mile in the Missouri River, Montana within the Cascade sampling section from 1981 to 2016. Average number of rainbow (1,616) and brown trout (398) per mile within this sampling section is designated by horizontal lines.

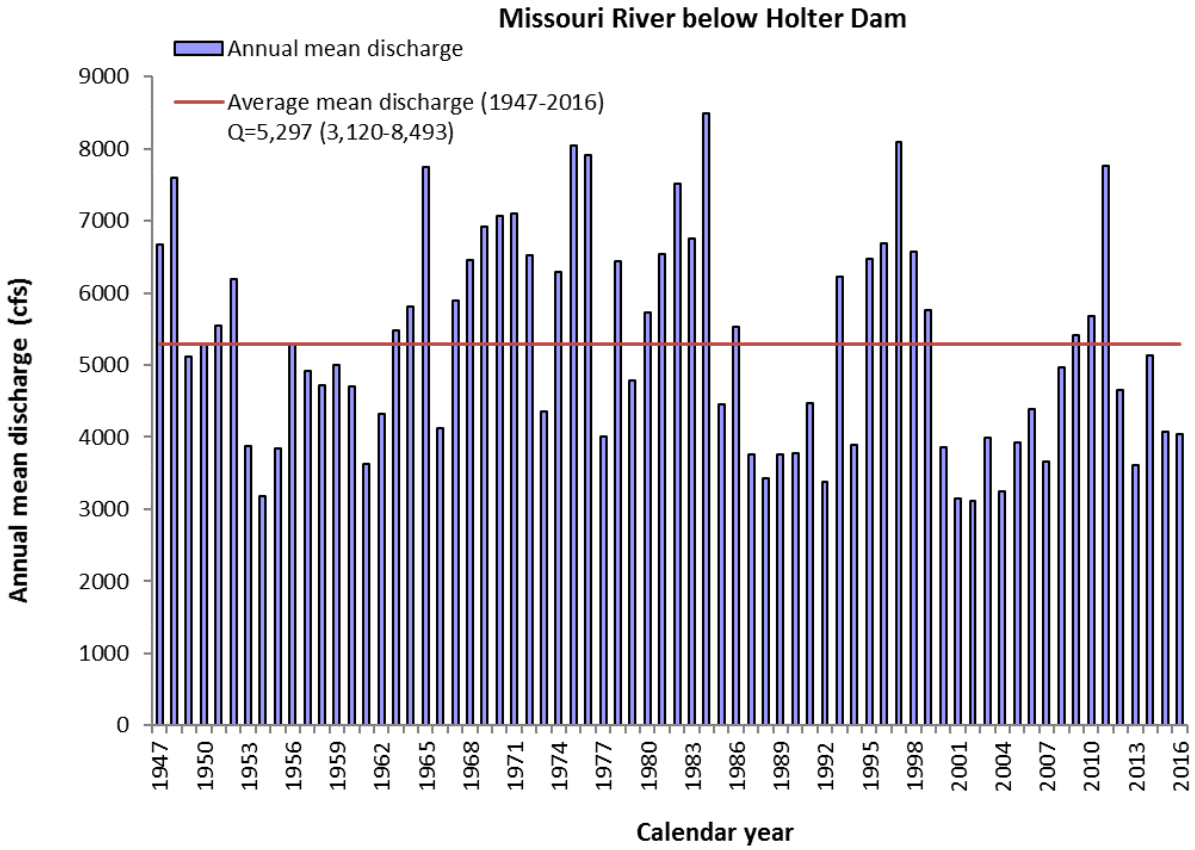

Figure 5. Annual mean discharge (cfs) of the Missouri River below Holter Dam from 1947 to 2016. The annual mean discharge for 2016 was 4,033 cfs.

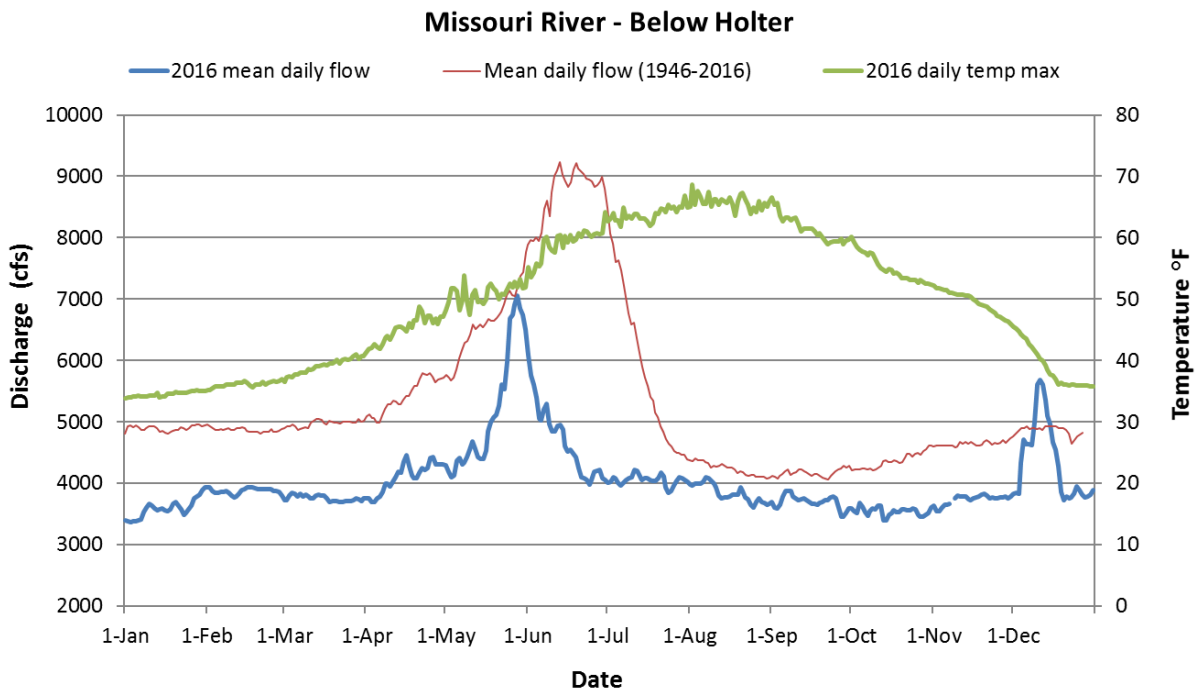

Figure 6. Missouri River discharge below Holter Dam, Montana from 1 January 2016 to 26 December 2016. Mean daily discharge is indicated in blue, mean daily flow from 1946 to 2016 is in red and daily max water temperature °F is in green. Data collected from a USGS gauge (06066500) located below Holter Dam near Wolf Creek, Montana.

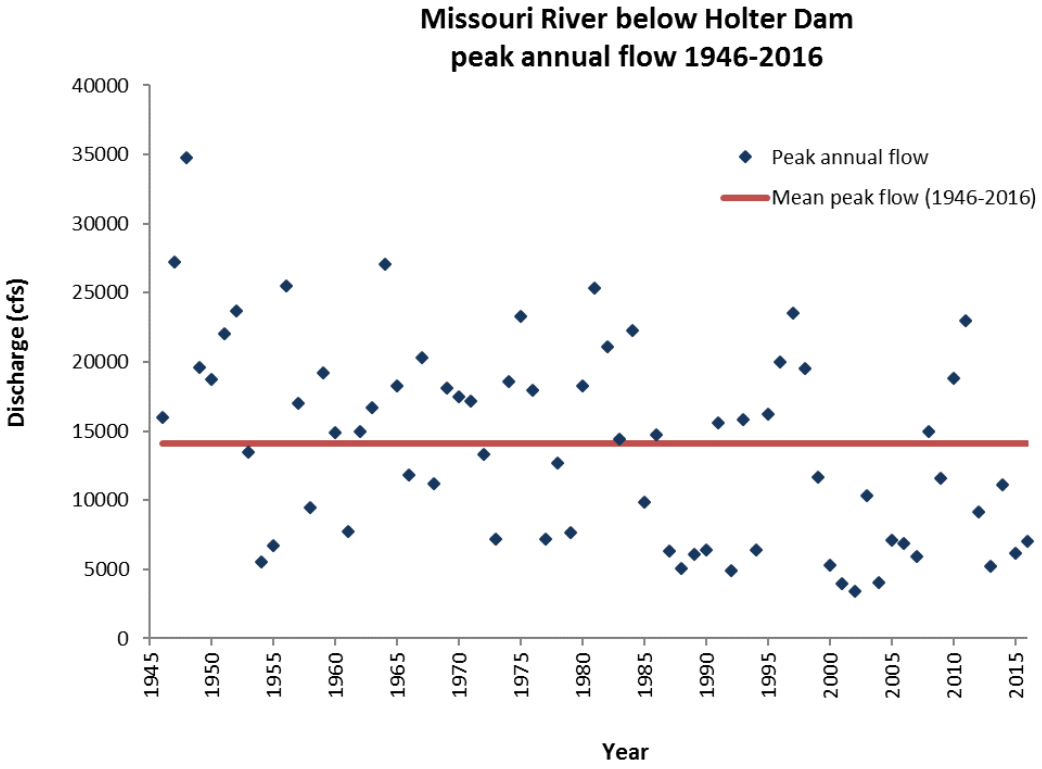

Figure 7. Peak annual discharge of the Missouri River below Holter Dam, Montana from 1946 to 2016.

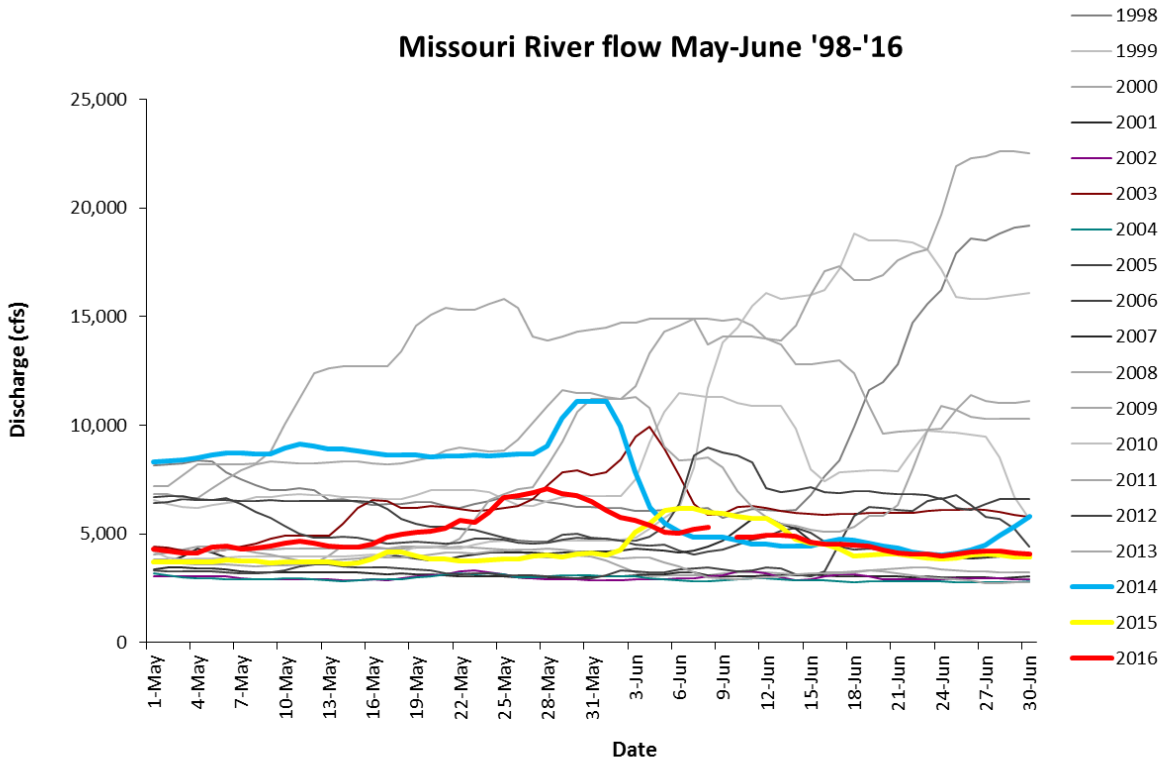

Figure 8. Daily discharge of the Missouri River below Holter Dam, Montana from 1 May to 30 June 1998 to 2016.

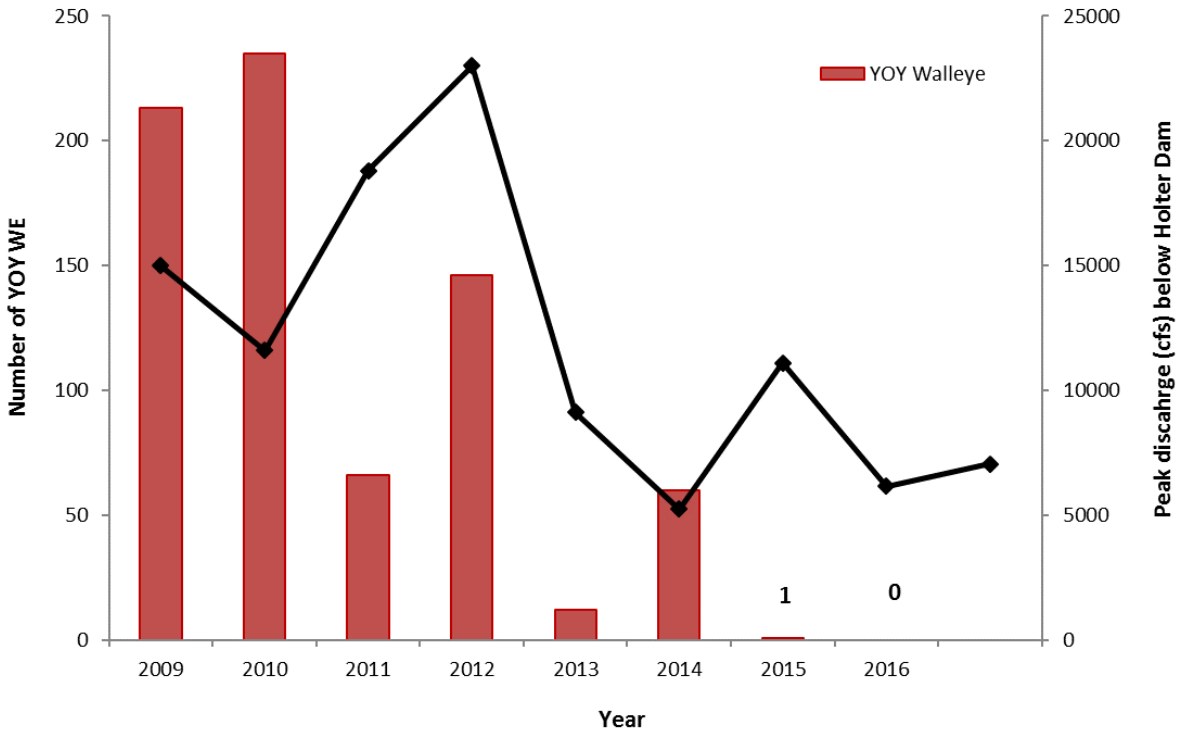

Figure 9. Total abundance by year, of young of the year walleye from seining sites along the Missouri River from Cascade to Great Falls, Montana.

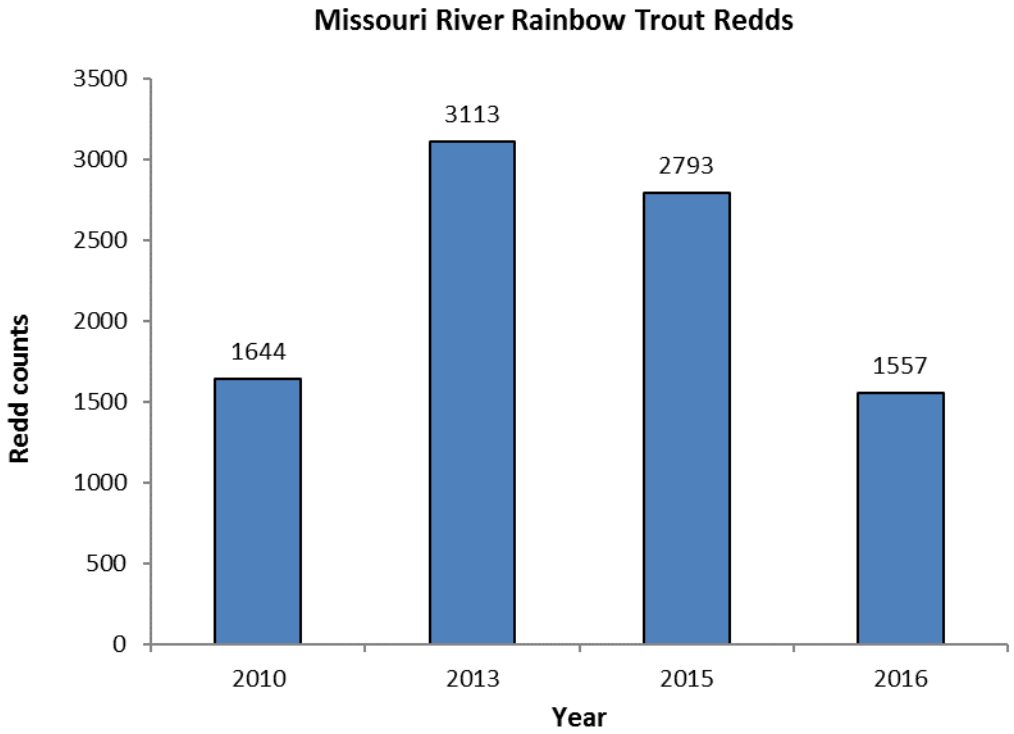

Figure 10. Mainstem Missouri River rainbow trout redd counts from 2010 to 2016. Redd counts were not conducted in 2011, 2012, and 2014 due to poor visibility conditions.

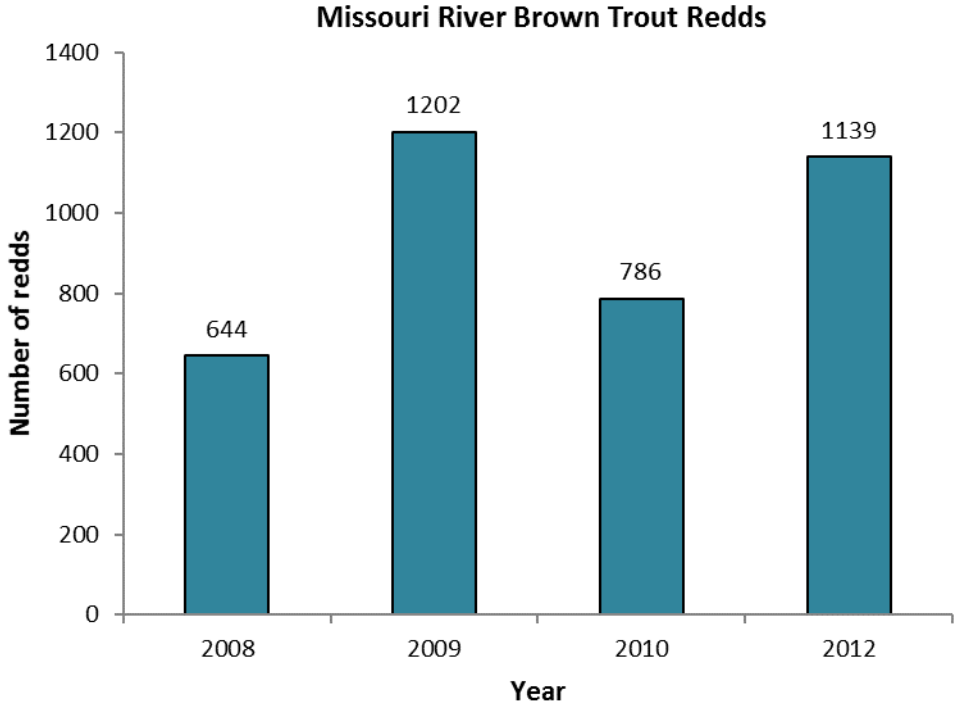

Figure 11. Mainstem Missouri River brown trout redd counts from 2008 to 2012. Redd counts were not conducted in 2011 or from 2013 to 2016 due to poor visibility conditions.

Tables

Table 1. River discharge (cfs) and temperature (°F) recorded at USGS station 06066500 (Missouri River below Holter Dam near Wolf Creek, MT) for the calendar year 2016.

Missouri River		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°F)	Mean	34.2	35.7	38.5	43.9	49.7	57.0	62.2	64.6	61.0	54.9	49.5	38.9
	Min	33.4	34.7	36.1	40.1	45.9	50.5	58.6	61.9	57.9	52.0	45.9	35.4
	Max	35.2	36.7	41.0	48.7	53.8	61.2	66.9	68.7	66.6	60.1	52.3	45.9
Discharge (cfs)	Mean	3370	3770	3690	3690	4100	3980	3840	3610	3450	3390	3540	3730
	Min	3940	3940	3840	4460	7060	6500	4220	4100	3870	3680	3830	5680
	Max	3583	3879	3756	4082	5090	4770	4054	3856	3698	3541	3729	4334

Table 2. Rainbow trout redd counts from 2007-2016 in the Missouri River and tributaries. Counts were not conducted if conditions were not suitable for viewing redds by helicopter.

Stream	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Missouri River	---	---	---	1644	---	---	3113	---	2793	1557
Dearborn River	---	---	---	632	---	---	---	---	---	---
Little Prickly Pear Creek	2125	1461	---	---	---	---	---	---	1466	---
Lyons Creek	847	897	---	386	---	---	---	---	373	---
Wolf Creek	1289	678	---	1451	---	---	---	---	1655	---
Sheep Creek	282	286	---	234	---	---	---	---	271	---

Table 3. Brown trout redd counts 2007-2016 in the Missouri River and tributaries. Counts were not conducted if conditions were not suitable for viewing redds by helicopter.

Stream	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Missouri River	---	644	1202	786	---	1139	---	---	---	---
Dearborn River	---	137	169	---	---	---	---	---	---	---
Little Prickly Pear Creek	1111	973	990	---	---	---	---	---	399	---
Lyons Creek	81	249	---	---	---	---	---	---	39	---
Wolf Creek	390	269	362	---	---	---	---	---	221	---
Sheep Creek	114	129	---	---	---	---	---	---	101	---