Montana Fish, Wildlife & Parks

2007 Missouri River - Holter Dam Tailwater Monitoring,

Status Report for PPL-Montana
FERC License 2188

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In 2007 Montana Fish, Wildlife & Parks (MFWP) received $16,478 (MOTAC project #001-07) from PPL-Montana for monitoring the Missouri River below Holter Dam as part of FERC license 2188.

Missouri River Trout Fishery

The Missouri River-Holter Dam tail water fishery has ranked in the top five fisheries throughout the state during the past 15 years, and has ranked in the top 3 over the past 5 years (MFWP 1991-2007). This section of river has averaged nearly 90,000 angler days per year over the past 15 years (Table 1). For this reason, monitoring has been a vital component of the management of this fishery.

Table 1. Angler use statistics for Missouri River-section 9 (MFWP statewide angler pressure estimates 1991-2007).

year	Angler days	Reg 4 Rank	State Rank
1991	65,526	3	5
1993	62,179	3	5
1995	75,201	1	2
1997	88,576	1	4
1999	111,203	1	3
2001	123,472	1	1
2003	106,447	1	2
2005	93,229	1	2
2007*	78,495	2	3
avg	89,369	1.5	3

* provisional

Each year since 1982 the MFWP regional staff conduct population estimates for rainbow and brown trout in two sections of the 35 mile river reach between Holter Dam and the town of Cascade (Craig section = 5.6 miles, Pelican Point section = 4.1 miles). Population estimates are derived using standardized methods including night electrofishing to mark and recapture fish in the spring and fall. Data are analyzed with the departments FA+ statistical program using the partial log-likelihood method. We report on estimates of trout 10 inches long and greater. The log-likelihood estimator relates all fish in the population to each other, so length groups less than 10 inches are important in the evaluation process.

In 2007, rainbow trout in the Craig section were estimated at 3,511 fish per mile (Table 1). This number is slightly higher than the 26 year mean of 2,918. Brown trout in the Craig section were estimated at 715 per mile, which is higher than the long term average for this section (Table 2). In the Cascade section we estimated the number of rainbow trout per mile at 1,586 fish, which is slightly higher than the 24 year average (Table 3). Brown trout in this section were estimated at 573 per mile which is also higher than the long term average (Table 4).

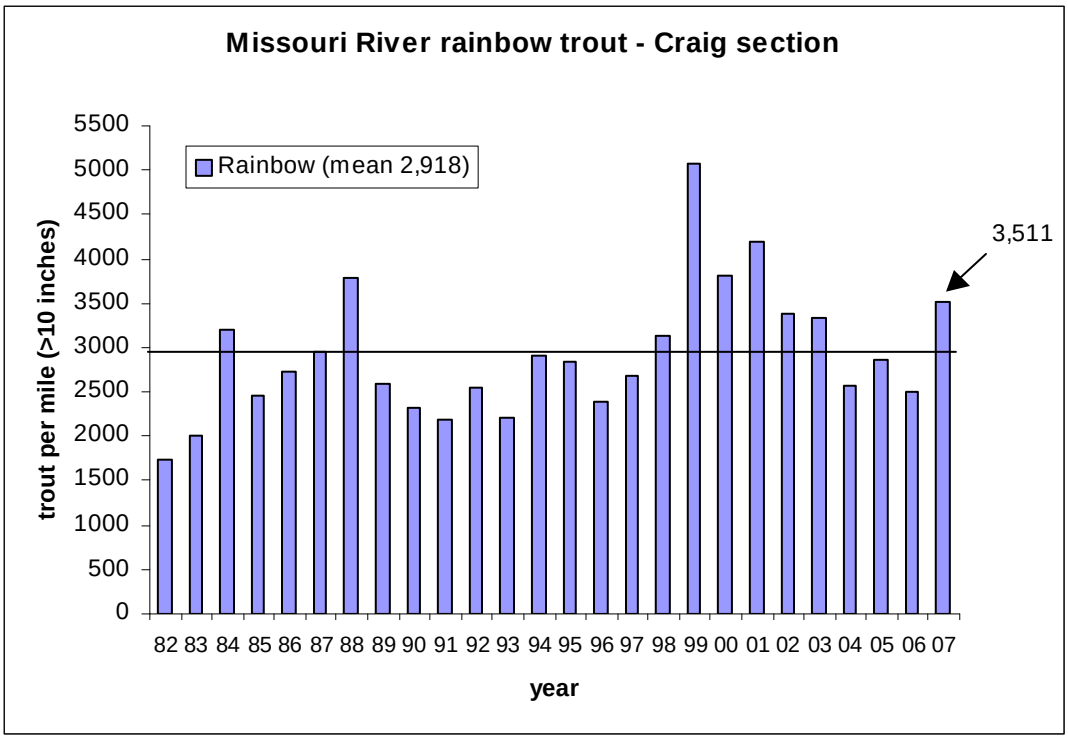

Figure 1. Estimates of rainbow trout per mile (>10 inches) in the Craig section of the Missouri River, 1982-2007.

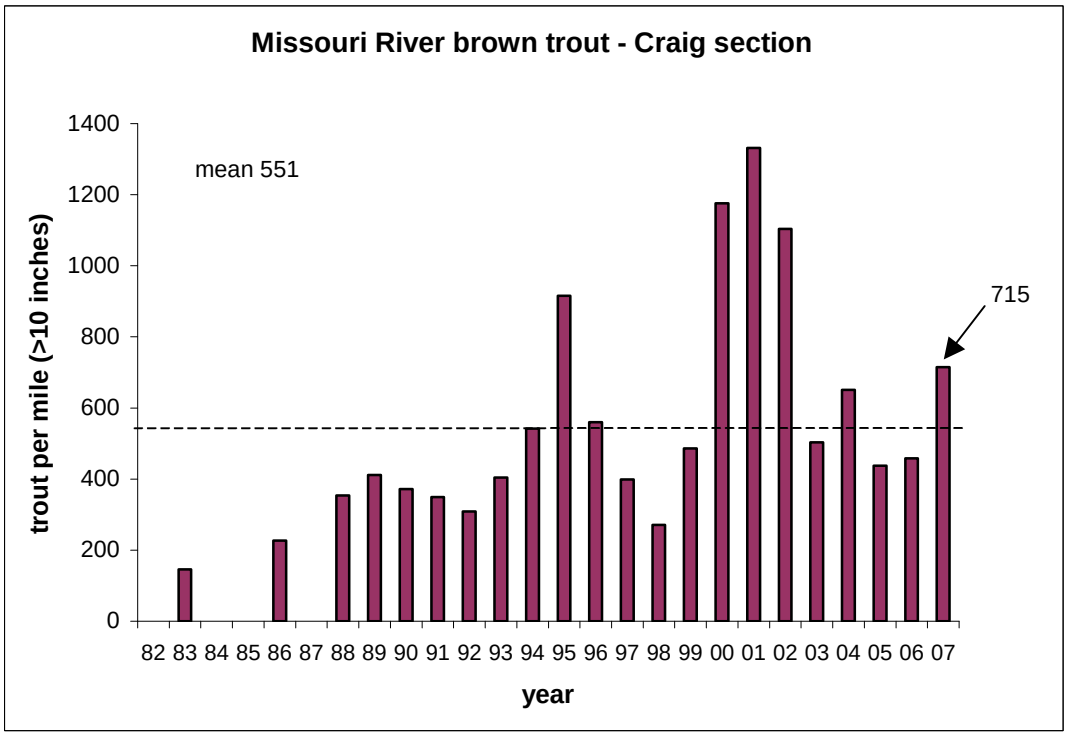

Figure 2. Estimates of brown trout per mile (>10 inches) in the Craig section of the Missouri River, 1982-2008.

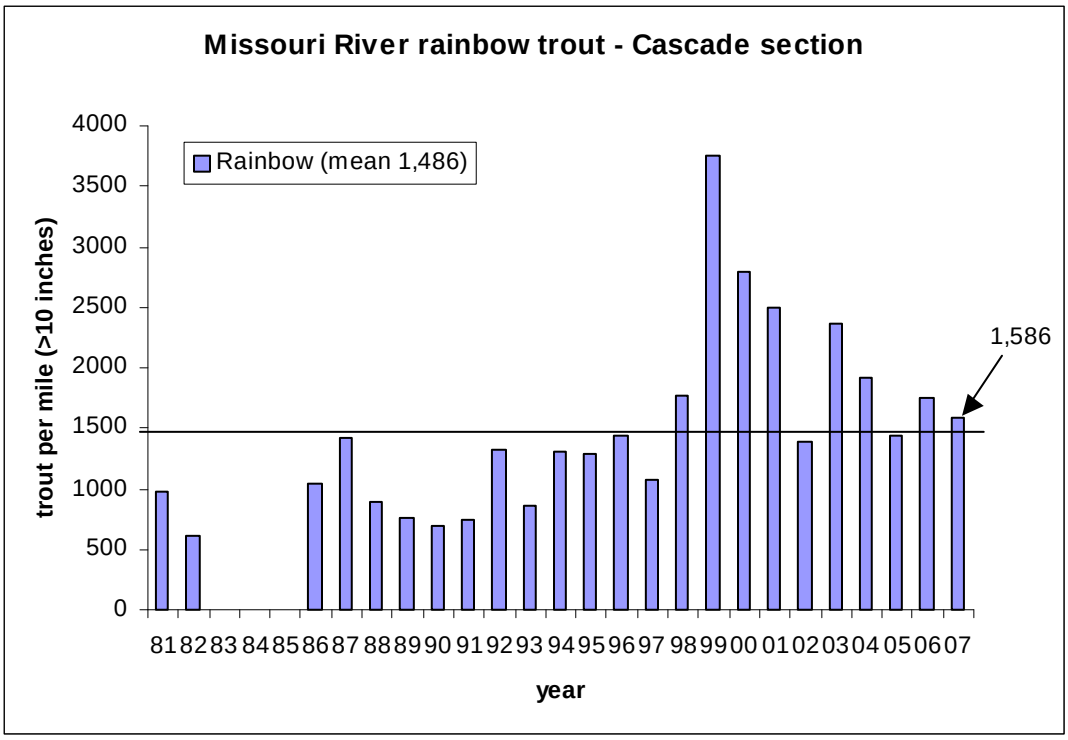

Figure 3. Estimates of rainbow trout per mile (>10 inches) in the Cascade section of the Missouri River, 1981-2007.

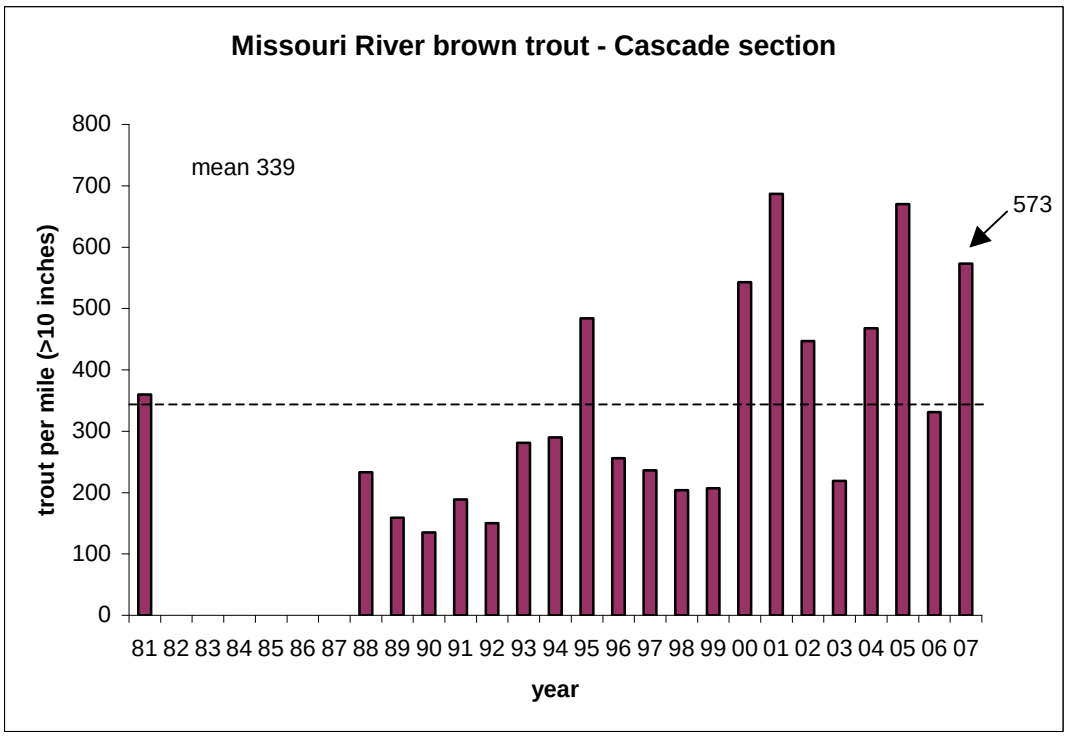

Figure 4. Estimates of brown trout per mile (>10 inches) in the Cascade section of the Missouri River, 1981-2008.

In 2005-06 MFWP began a study of the burbot population in the Missouri River (Horton and Strainer 2006). In 2007 we adopted a monitoring strategy from that study and incorporated burbot monitoring into the area management program. A total of 58 burbot were sampled in both sections in 2007 (Figure 5, Figure 6). Hoop nets continued to dominate the catch in both sections.

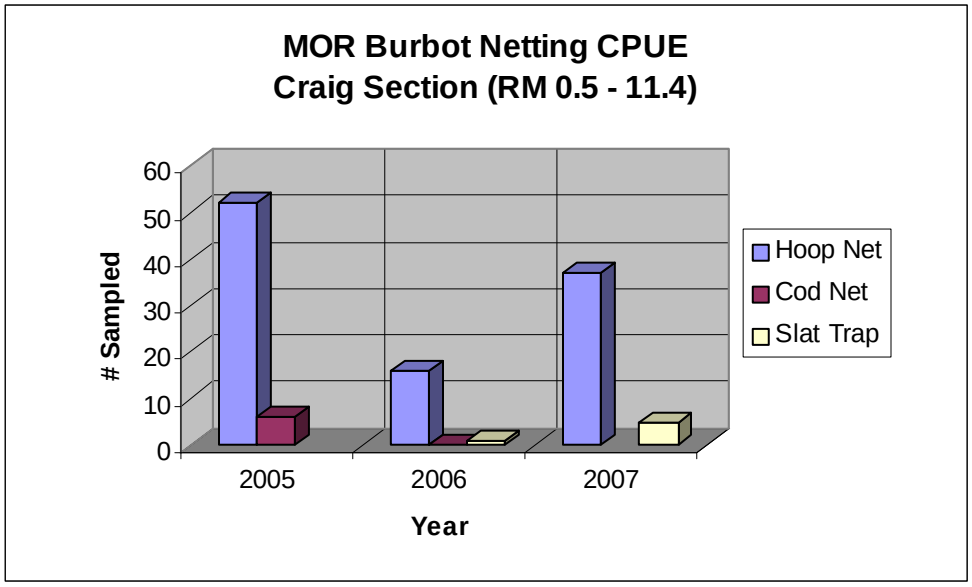

Figure 5. Burbot monitoring results by gear type in the Missouri River Craig section, 2005-07.

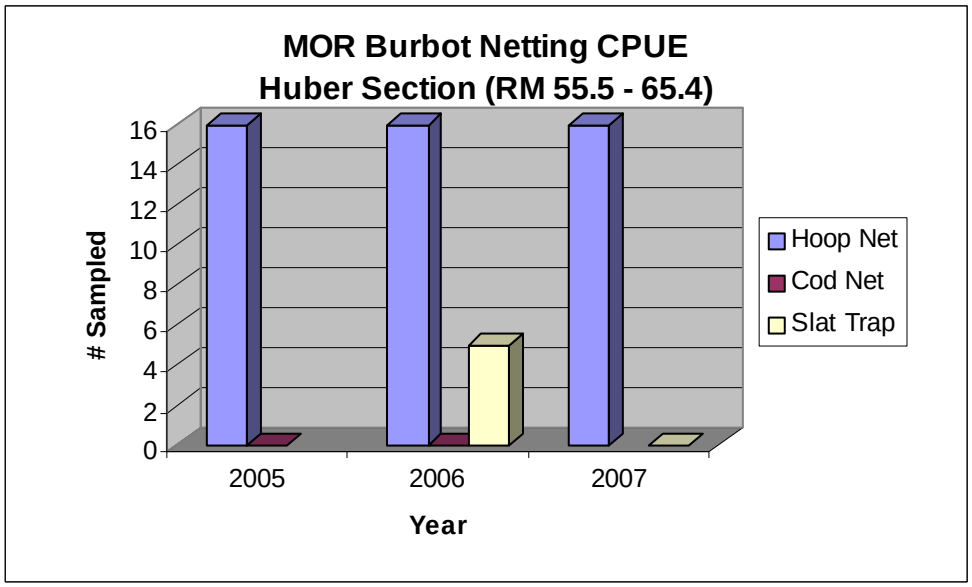

Figure 6. Burbot monitoring results by gear type in the Missouri River Huber section, 2005-07.

River Flow

In 2007, the mean monthly flow of the Missouri river below Holter Dam was 3,659 cfs, which was 69% of the 60 year average ($\bar{x}$ =5330 [3120-8493]) (Figure 7). The peak flow for 2007 occurred between June 10 and 14 when the flow exceeded 5,000 cfs. The maximum flow for 2007 was on June 12 when discharge reached 5,720 cfs (Figure 8). The minimum flow occurred on December 28 when the flow was 3,070 cfs.

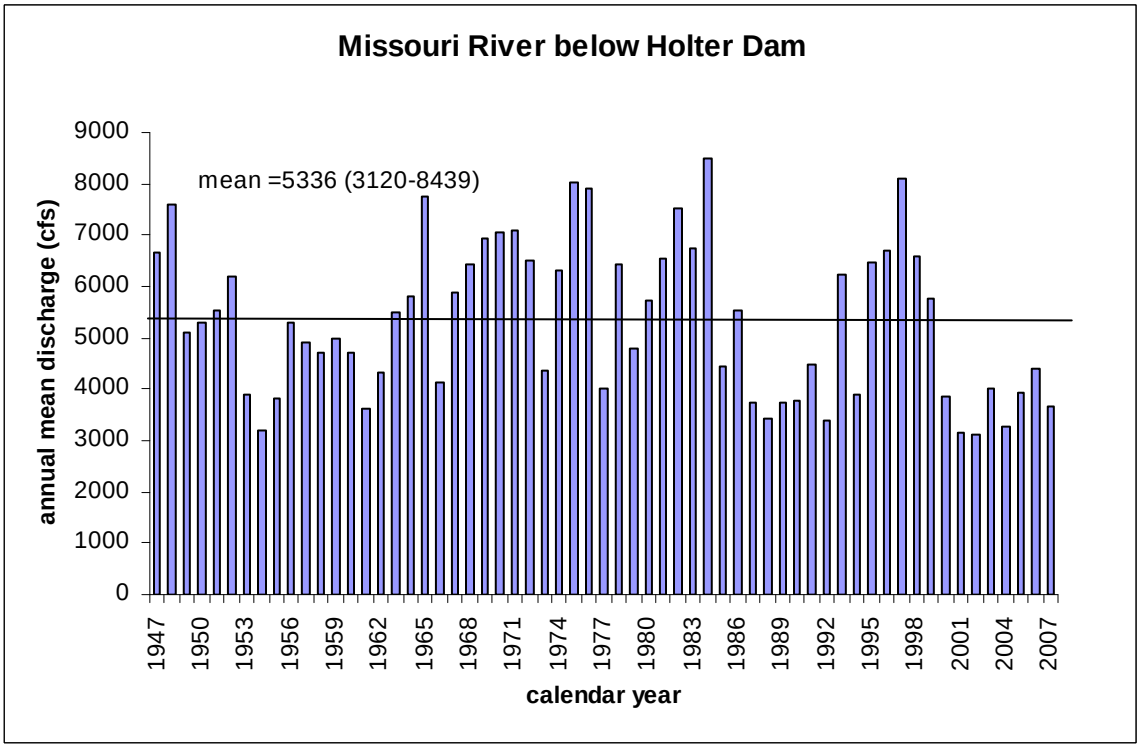

Figure 7. Annual mean discharge of the Missouri River below Holter Dam for the period 1947-2007.

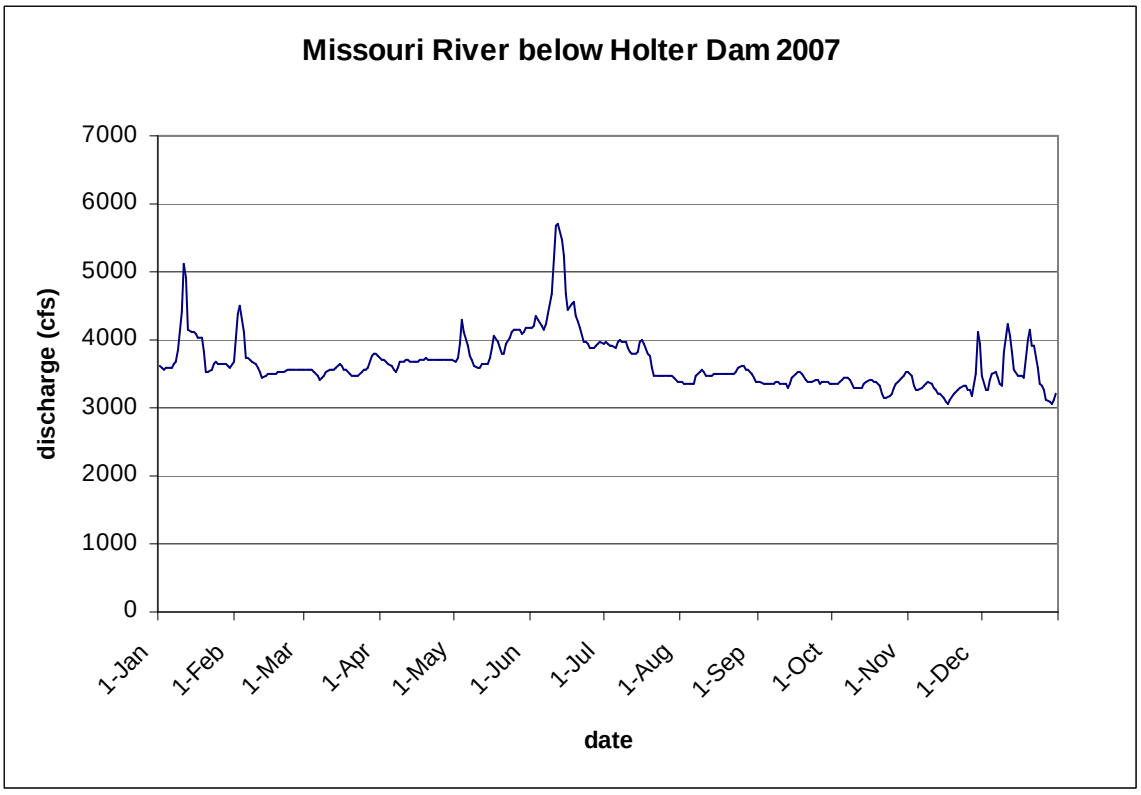

Figure 8. Missouri River discharge (Q) for the 2007 calendar year.

Temperature

Montana FWP uses the Internet to access information from several USGS gauging stations and specifically relies on information from the gauging site (# 06066500) located below Holter Dam to monitor the Missouri River. This site relays real time data for river flow, gauge height and temperature. In addition, we install thermographs at strategic sites on the Missouri River, Little Prickly Pear Creek, Dearborn River, and Sheep Creek. In recent years, great concern has been placed on the low river flows and high temperatures during summer months. These thermographs are used to monitor water temperatures during critical times of the year and the data are vital for making management decisions that could include recommending to the Fish, Wildlife & Parks Commission the temporary closing of certain fisheries to reduce stress from angling on the trout populations. It is the policy of MFWP to request such closures when "…daily maximum water temperature reaches or exceeds 73° F (23° C) for at least some period of time during three consecutive days…"

In 2007 the highest mean daily temperature recorded at the Wolf Creek Bridge site below Holter Dam was 68^{o}F on August 3rd. The Onset temperature loggers in the lower river each recorded temperatures slightly over 70 degrees in 2007. For instance at the Holter site there was a single recording above 70 degrees (71.1) on July 25. The Craig site

recorded 11 days over 70 degrees and the maximum temperature was 71.8 on July 28. At Mid Canon water temperature was above 70 degrees for 16 days and the maximum was 72.7 on July 19. At Pelican Point, there were 14 days where temperature exceeded 70 degrees and the maximum temp was 72.4 on July 26.

Whirling Disease Monitoring

In 2007, the whirling disease study design for the Missouri River focused on evaluating the spatial and temporal variation in WD infection, evaluate the possibility of LPP Creek serving as a TAM (*triactinomyxon*) source for the Missouri proper, and continued monitoring of the tributaries. Whirling disease infection in 2007 continued to be lethal in principal areas such as LPP Creek, Wolf Creek (Table 2). There were three sites in the Missouri River (Below LPP, Craig, Juedemans) that reached infection intensity of 2.0 and greater which raises concern about lethal infections in the river. These results at these sites were balanced by results at other sites that showed only trace level infections. These findings suggest that LPP Creek is a measurable producer of TAM's to the Missouri River and this source has the ability to cause infection in young trout produced in the river. Fortunately this infection seems to be localized below the mouth of LPP Creek. The two other sites in the Missouri River that reached lethal levels seem to be maintaining infection independent from LPP Creek. Lyons and Sheep creeks continue to show no infection while Wolf Creek maintains lethal levels (Table 2).

Table 2. Whirling disease test locations and McConnell-Baldwin histology ranking for the Missouri River and select tributaries, 2007.

Date In	Date Out	Stream	Sample location	Histology
22-May	1-Jun	Missouri River	Craig site	2.02
22-May	1-Jun	Missouri River	Mid-Cannon	1.96
22-May	1-Jun	Missouri River	Pelican Point	1.8
1-Jun	11-Jun	Missouri River	Just above mouth of LPP on west bank	0.00
1-Jun	11-Jun	Missouri River	Just below mouth of LPP on west bank	3.36
1-Jun	11-Jun	Missouri River	3 mi below mouth of LLP-Billings slough w. bank	0.58
1-Jun	11-Jun	Missouri River	Craig site	0.68
1-Jun	11-Jun	Missouri River	Just downstream of I-15 bridge west bank	0.12
1-Jun	11-Jun	Missouri River	Across from LPP east bank-control	0.00
1-Jun	11-Jun	Missouri River	Juedemans above mouth of Dearborn R.	2.20
1-Jun	11-Jun	Missouri River	Above Craig east side Lone Pine	0.00
1-Jun	11-Jun	Missouri River	Downstream of Mid Canon FAS I-15 bridge	1.09
11-Jun	21-Jun	Missouri River	Pelican Point #2	0.82
11-Jun	21-Jun	Missouri River	Craig site	0.00
11-Jun	21-Jun	Missouri River	Pelican Point #2	0.00
11-Jun	21-Jun	Missouri River	Downstream of Mid Canon FAS I-15 bridge	0.00
11-Jun	21-Jun	Missouri River	Giant springs 0.25 mile above hatchery	0.23
22-May	21-Jun	LPP Creek	Wirth diversion	4.72
22-May	1-Jun	Sheep Creek	At mouth	0.00
22-May	1-Jun	Lyons Creek	At mouth	0.00
22-May	1-Jun	Wolf Creek	At mouth	4.58

Missouri River trout spawning study

In 2007, we initiated a comprehensive evaluation of trout spawning in the Missouri River that involves redd counts in the tributaries and Missouri proper, and radio telemetry tracking of adult rainbow and brown trout in the Missouri River. Redd count methods and index sections (Table 3) on the tributary streams were similar to those described by Grisak (1999). Data from weekly counts were used to determine peak spawning and when to conduct the basin wide redd count.

In April, field crews breached five beaver dams on LPP Creek, which remained open throughout the spawning period. There were seven additional beaver dams that remained intact during the spawn. Determining peak spawning in Little Prickly Pear (LPP) Creek in 2007 was not possible due to turbid water conditions in late April, which precluded counting for two consecutive weeks. By early May water clarity improved and on May 10th the lower 13 miles of LPP Creek were surveyed by walking and 2,125 redds were counted (Table 4).

Peak spawning in Sheep Creek occurred near April 5, based on weekly cumulative counts. On April 26 the lower two miles of Sheep Creek were surveyed by walking and there were 282 redds counted (Table 4). Although the peak of the 2007 spawned occurred about 10 days earlier than in 1998, the number of redds counted in this section was similar between the two years (Table 5).

On March 9, one small beaver dam in Lyons Creek, near the I-15 culvert, was breached and it remained open for the duration of the spawning period. Determining peak spawning in Lyons Creek was not possible because of high and turbid water during the second and third weeks of April. By April 27 water conditions were such that accurate counts could be made on the lower 7 miles of Lyons Creek, which resulted in counting 847 redds (Table 5). During the basin wide count on April 27, one large dam was encountered at stream mile 2.8 and there were an estimated 150 large river-sized rainbows below this dam. There were 631 redds counted in the 2.6 miles of stream below this dam, and only 216 redds counted in the 5.1 miles above this dam. Based on this observation, it appears as if this dam may be restricting upstream passage for spawning fish. This is of particular concern because Lyons Creek remains whirling disease negative, so maximizing rainbow trout production in this stream is important to the management of the Missouri River trout population.

Based on weekly redd counts peak spawning in Wolf Creek occurred near April 15, which is about three weeks earlier than the peak spawn during the 1998 study (Table 4). On April 27 the lower 7.8 miles of wolf Creek were walked and 1,289 redds were counted (Table 5).

Table 3. Spawning redd index sections in Missouri River tributaries, 2007.

stream	*Section name*	*Stream mile*	*Dist (mi)*
LPP Creek	Wolf Creek to Wirth diversion	3.4-4.7	1.3
Lyons Creek	Mouth to aluminum culvert	0-0.8	0.8
Wolf Creek	Clonninger ford to next bridge	1.75-2.7	0.95
Sheep Creek	Mouth to North and South forks conf	0-2.0	2.0

Table 4. Weekly cumulative redd statistics for Missouri River tributaries, 2007.

Date	LPP Creek	Lyons Creek	Wolf Creek	Sheep Creek
March 22	40	9	2	46
March 29	96	51	5	125
April 1	161	116	12	212
April 10	189	195	---	---
April 12	---	---	33	256
April 18	---	---	66	270
April 20	a	235	---	---
April 26	319	280	96	282

Table 5. Rainbow trout redds and redd density counted during the basin wide surveys in Missouri River tributaries, 1998, 2007.

stream	distance	1998	Redds/mi	2007	Redds/mi
LPP Creek	13 miles	3939	303	2125	163
Lyons Creek	7 miles	1391	198	847	121
Wolf Creek	7.8 miles	1981	253	1289	165
Sheep Creek	2 miles	312	156	282	141

On April 27, 2007 we conducted a helicopter flight over the Missouri River to confirm rainbow trout spawning in the Missouri proper and to note the spawning locations. Light conditions and water clarity were ideal for observing rainbow trout redds from the air. We identified redds at 26 sites spanning from Holter Dam to Hardy Creek (Figure 9). High winds on the plains precluded flying between Hardy Creek and Cascade. During this flight we also observed rainbow trout on redds. The Dearborn River was too turbid on this day for counting.

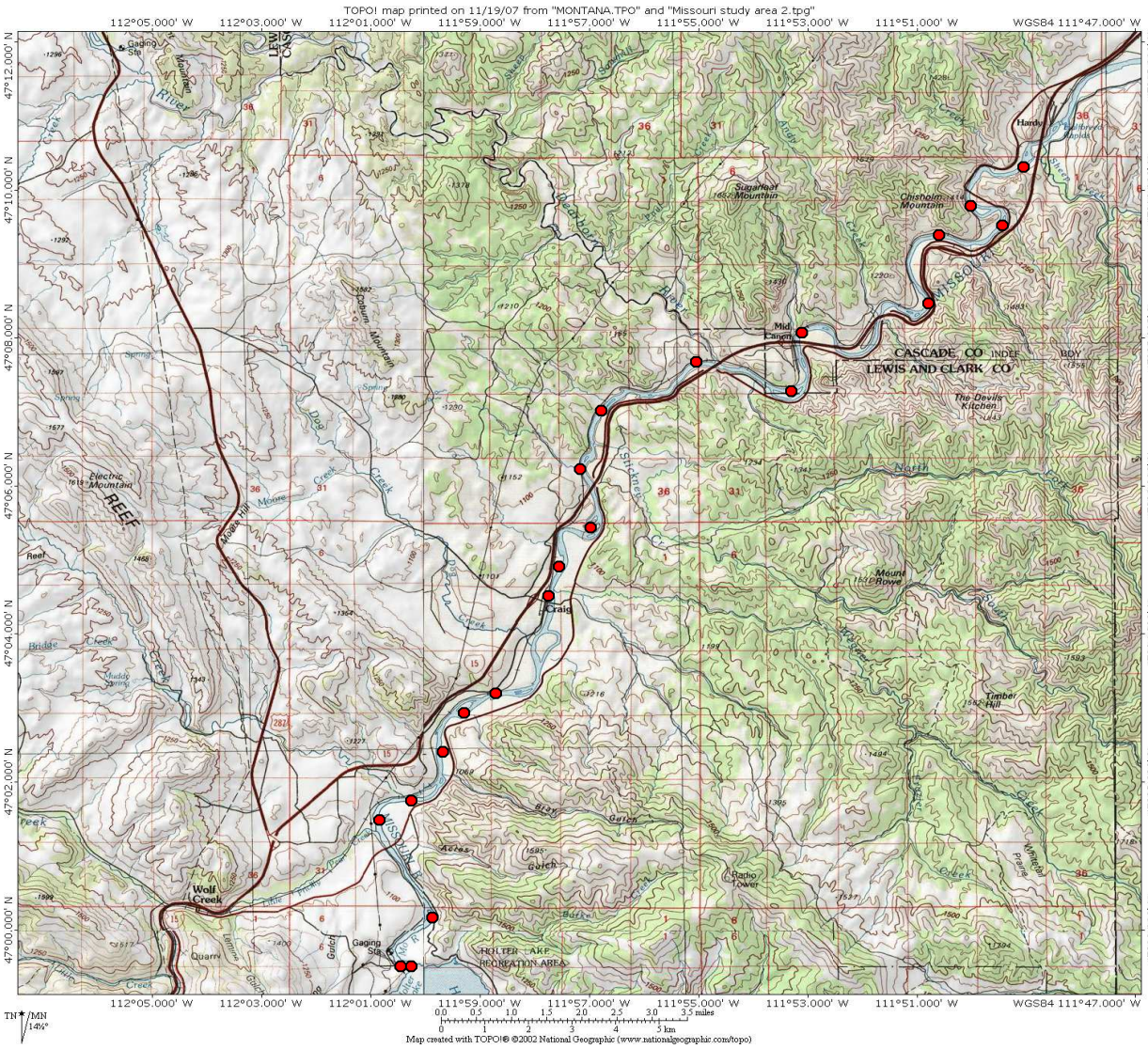

Figure 9. Rainbow trout spawning locations in the Missouri River identified by helicopter flight on April 27, 2007.

Submitted by; Grant Grisak, Fisheries biologist Date; August 6, 2008