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# Great Falls Management Area Fisheries Progress Report

2008 Annual Report

by

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#### ABSTRACT

Rainbow trout and brown trout estimated in the Craig section of the Missouri River were 86% and 84% of the long-term average in 2006, respectively. In 2007 these species were estimated at 20% and 41% higher than the long term average, respectively. In the Cascade section, rainbow trout and brown trout estimates were 18% and 1% higher than the long-term average, respectively. In 2007 rainbow trout in the Cascade section were 6% higher than the long-term average, and brown trout were 84% higher than the long term average. The limited whirling disease data collected in 2006 showed unusually low infection levels in the Missouri River, but comparison with past years confirmed the data represented only a portion of the infection period. In 2007 Little Prickly Pear Creek provided lethal amounts of TAM's to the Missouri River. Lyons Creek continued to show no infection.

Water temperature in the Missouri River exceeded  $70^{\circ}$ F in some sections during 2006 but only for a short period of time. In 2007, the maximum water temperature recorded was 68 degrees.

There were 26 rainbow spawning sites identified in the Missouri River from Holter Dam to Hardy Creek. Peak rainbow trout spawning in 2007 was near April 15<sup>th</sup> in Wolf Creek and 1,289 redds were counted in the first 7.8 miles. Peak rainbow spawn in Sheep Creek was near April 5<sup>th</sup> and 282 redds were counted in the first 2 miles. High and turbid water in Little Prickly Pear and Lyons creeks precluded peak spawn estimates, but the basin-wide counts resulted in 2,125 redds in Little Prickly Pear Creek and 847 in Lyons Creek.

Hoop nets were most successful at catching burbot in the Missouri River. Catch rates in the Craig section were higher in 2007, and the catch in the Huber section was sustained among years.

The Eagle Creek and Deep Creek sections of the Smith River were sampled in 2006, but only the Eagle Creek section in 2007. The estimated number of  $\geq 8$  inch rainbow trout and brown trout in the Eagle Creek section in 2006 was 325 and 370 per mile, respectively. In 2007 the estimated number of rainbows in this section was 291 and browns were 254 per mile. In the Deep Creek section, the estimated number of  $\geq 8$  inch rainbow trout and brown trout in 2006 was 126 and 485 per mile, respectively. Water temperature reached critical levels in the upper Smith River basin in both years, but was the highest and most prolonged in 2007. Time of day angling closures were instituted in both years due to high water temperatures. Fish kills were reported in both years, but follow-up investigations showed they were likely isolated events.

Longnose suckers continued to dominate the catch in Newlan Creek Reservoir gill nets, and burbot and trout had similar relative abundances between years. Both longnose and white suckers dominated the catch in Smith River Reservoir in both years and burbot and trout had about the same relative abundances between years.

In 2007 the mean size of walleye and yellow perch in Wadsworth Pond was down slightly from 2006. Trapping failed to capture bass from Kolar ponds, but angling confirmed their presence.

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# **OBJECTIVES**

The purpose of this project is to implement the Fisheries Program in the Great Falls Management Area in Northcentral Montana. Major watersheds include the Missouri, Little Prickly Pear, Dearborn, Smith, and Belt Creek drainages.

The mission of the Fisheries Division of the Montana Fish, Wildlife & Parks (MFWP) is to preserve and enhance aquatic species and their ecosystems to meet the public's demand for recreational opportunities while assuring stewardship of aquatic life. The Fisheries Program is divided into four major elements, with objectives and outcomes as follows:

The **Fisheries Management** element of the fisheries program has 21 objectives and the following desired outcomes:

- 1. A healthy aquatic resource, including native-species fisheries and sport fisheries.
- 2. Public satisfaction with available angling opportunities.
- 3. Public support for ongoing efforts to restore, maintain, and protect the state's aquatic resources.

The **Habitat** element of the fisheries program has 15 objectives and the following desired outcomes:

- 1. Diverse, high-quality aquatic ecosystems that support healthy fish populations and provide fishing opportunities.
- 2. Public participation in efforts (MFWP's as well as other state and federal agencies) to conserve and improve fish habitat through formation of watershed protection groups and partnerships for the protection and restoration of habitat.

The **Fishing Access** element of the fisheries program has 16 objectives and the following desired outcomes:

- 1. Provide a diversity of fishing opportunities throughout the state that might otherwise be unavailable.
- 2. Provide the public with a variety of incidental, non-angling recreational activities by maintaining access to Montana's waters through the fishing access site program.

The **Aquatic Education** element of the fisheries program has 11 objectives and the following desired outcomes:

- 1. Opportunities for the public, youth and adults, to learn about the state's aquatic ecosystems and their importance.
- 2. Fishing and water-safety skills for program participants.
- 3. Enhanced public understanding of Montana's natural and cultural resources.
- 3. An educated public able to make informed decisions about using and preserving Montana's aquatic resources.

### Procedures

In 2008 two sections of the Missouri River downstream from Holter Dam [Craig section (rm 2.5 to 8.1) and the Pelican Point section (rm 24.2 to 28.3)] were electrofished at night using aluminum jet boats. Boats were equipped with headlights and fixed booms with stainless steel droppers suspended from each boom. Electricity from 240-VAC generators was converted to smooth DC using Coffelt rectifying units. Brown trout estimates were conducted in each section in April-May each year and two ject boats were used in the Craig section, but only one boat was used in the Cascade section. Rainbow trout estimates were conducted in October and two boats were used in each section.

During the report period fish populations were sampled in the Eagle Creek section of the Smith River using a drift boat equipped with a mobile anode, a 240-VAC generator, and a Smith-Root VVP-15B rectifying unit was used to convert the waveform to smooth DC. Fish sampling was not conducted in the Deep Creek section of the Smith River since 2006 because access to the river was not permitted to FWP through private land. The estimate was conducted in September each year and both rainbow and brown trout are estimated at this time.

In 2008 rainbow trout redds were not counted in the Missouri River, Dearborn River, Little Prickly Pear, Lyons, Wolf and Sheep creeks due to high water.

Trout behavior was monitored in the Missouri River and its tributaries using radio telemetry. Lotek model MCFT 3A frequency modulating transmitters operating in the 148 MHz band at 1 pulse per 5 seconds were surgically implanted in adult trout. The longevity of the transmitters was 880d. Passive monitoring was conducted using fixed base ground stations consisting of Lotek model SRX 400 W7 and W31 code-logging receivers with two directional 4 element Yagi antennae. Ground stations were installed at the mouth of LPP Creek, Craig Bridge, mouth of Dearborn River, and mouth of Sheep Creek and antennae transects were situated to record transmitted radio signals from both the river and respective tributary at each site. Active monitoring was conducted using a Lotek W5 receiver and a boat, truck and airplane. A Piper PA-18 Super Cub, fitted with a rigid 4 element Yagi antenna, was used to track fish from the air.

Water flow was monitored at five USGS stations that report daily flow and long-term flow statistics. Water temperature was monitored using a combination of USGS data collected from five stations and Onset temperature data loggers installed at strategic locations in each of the principle waters within the management area.

Several lakes, reservoirs and ponds throughout the management area are routinely sampled using gill nets and traps nets. Unless otherwise stated, the standard gill netting procedure involves using an equal number of 125-foot monofilament experimental sinking gill nets and 125-foot multifilament experimental floating gill nets in proportion to the size of the water being sampled. Data from these catches are averaged as CPUE. It is understood that sinking or floating gill nets will be selective for certain species of fish, but using multiple gear types maximizes probability of capture of all species in most of the waters that are gill netted. Gill net sets are generally standardized as overnight sets. All sampled fish are identified, counted, measured to the nearest 0.1 inch, and weighed to the nearest 0.01 pound.

Belt Creek –pop est Angler use stats

Pelican Point

Missouri River YOY walleye survey

Lewis ponds

### **Coldwater Stream Ecosystems**

### **Missouri River**

The Missouri River Holter Dam tailwater fishery requires the majority of the management attention in the Great Falls management area. Angler use statistics over the past 12 years show that the Missouri River is the number one fishery in region 4 and consistently ranks in the top 4 fisheries in the state; having an average of 99,680 angler days per year (Table 1) (MFWP 1995-2005). Angler use is approximately 65% resident and 35% non-resident.

Table 1. Angler use statistics for Missouri River (section 9) Holter tail water fishery (Montana statewide angler pressure MFWP 1995-2005).

	Angler	State	Reg		%Non		Angler
year	days	rank	rank	%Res	Res	No. 1 fishery	days
2007	78,468	4	2	68	32	Madison R. (sec 2)	106,330
2005	93,229	2	1	64	36	Madison R. (sec 2)	116,345
2003	106,447	2	1	61	39	Madison R. (sec 2)	115,342
2001	123,427	1	1	69	31		
1999	111,203	3	1	79	21	Canyon Ferry Res.	119,886
1997	88,576	4	1	75	25	Fort Peck Lake	108.562
1995	75,201	2	1	75	25	Canyon Ferry Res.	94,731

In 2006, Rainbow trout (> 10 inches) in the Missouri River Craig section were estimated at 2,497 per mile, which was 86% of the long-term average for this species in this section (Figure 1). Brown trout (> 10 inches) in this section in 2006 were estimated at 458 per mile, which was 84% of the long term average. In the Cascade section rainbows were estimated at 1,754 per mile which was 18% higher than the long term average and browns were estimated at 331 per mile which is slightly above the long term average (Figure 2).

In 2007, the rainbow trout in the Craig section were estimated at 3,511 per mile, which is 20% higher than the long term average and was the fourth highest number of rainbows on record (Figure 1). Brown trout in this section were estimated at 777 per mile, which is 41% higher than the long term average and is also the fourth highest number of browns on record. In the Cascade section in 2007 the rainbow trout were estimated at 1,586 per mile which is about 6% higher than the long term average (Figure 2). Brown trout in this section were estimated at 594 per mile, which was about 75% higher than the long-term average.



Figure 1. Estimated number of rainbow and brown trout greater than 10 inches per mile in the Craig section of the Missouri River 1982-2007 (solid line is long-term rainbow mean, dashed line is long-term brown mean).



Figure 2. Estimated number of rainbow and brown trout greater than 10 inches per mile in the Cascade section of the Missouri River 1981-2007 (solid line is long-term rainbow mean, dashed line is long-term brown mean).

#### Whirling Disease Monitoring

The Missouri River trout fishery has been a high priority for the statewide whirling disease investigations over the past ten years. Typically sentinel cages are installed at strategic sites to measure the annual rise (mid May), peak (early June) and recession (mid June) of the infection, but high flows in May 2006 precluded installing cages in the Missouri River for the late May and early June time periods and allowed only one ten-day evaluation from June 12 through June 20. Initially, the results of this experiment showed an alarmingly low incidence of infection at the Craig and Mid-Canon sites and no infection was detected at the Pelican Point and Cascade sites. However, comparing these results with those of the previous year showed consistency in infection intensity for this time period, and reaffirmed that the 2006 cages likely monitored the descending limb of the infection curve (Figures 3 and 4).



Figure 3. Result of 2006 whirling disease monitoring compared with 2005 infection curve, Missouri River, Craig site.



Figure 4. Result of 2006 whirling disease monitoring compared with 2005 infection curve, Missouri River, Mid-Canon site.

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).

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

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

### Missouri River trout spawning study

In 2007, we initiated a comprehensive evaluation of trout spawning in the Missouri River that involved 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 10<sup>th</sup> 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).

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

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

# Flow

In 2006 the Missouri River below Holter Dam had a mean discharge of 4388 cfs, which was 81% of the 59 year mean ( $\bar{x}$ =5356 [3120-8493]). The maximum discharge in 2006 was 6590 cfs, which occurred on May 3 (Appendix 1). There were 34 days in 2006 (from April 14 to May 17) where the river discharge was sustained above 6000 cfs.

In 2007, the mean monthly flow was 3,659 cfs, which was 69% of the 60 year average ( $\bar{x}$ =5330 [3120-8493]). The peak flow for 2007 occurred between June 10 and 14 where the flow exceeded 5,000 cfs. The maximum flow for 2007 was on June 12 when discharge reached 5,720 cfs (Appendix 1). The minimum flow occurred on December 28 when the flow was 3,070 cfs.

# Temperature

When monitoring temperature data, 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°F, we switch to data monitored by several thermographs located at strategic locations in each the Missouri, Smith, Sun and Dearborn rivers. These thermographs are used in making management decisions that could include recommending to the regional Fish, Wildlife & Parks Commissioner 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 2006 the USGS Wolf Creek Bridge site below Holter Dam recorded a maximum daily temperature of 67.1°F in early August (Appendix 1). The FWP thermographs recorded slightly higher readings in the lower river. For instance, at Pelican Point a maximum temperature of 71°F was recorded on July 26. There was a 4 d period from July 26-29 where the temperature reached 70°F, and again on August 9. Water temperature reached 70°F in both the Mid Cannon and Craig sites on August 2 and 10, and on august 2, 9 and 10, respectively. Fortunately, the relatively critical water temperatures in 2006 were sporadic and did not warrant recommending angling restrictions on this valuable fishery.

In 2007 the highest mean daily temperature recorded at the Wolf Creek Bridge site below Holter Dam was 68°F on August 3<sup>rd</sup> (Appendix 1). The Onset temperature loggers in the lower river each recorded temperatures slightly over 70 degrees in 2007. For instance the Holter site recorded a single reading above 70 (71.1) on July 25. The Craig site had 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.

# Burbot monitoring

In 2005-06 a study was conducted on 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 and 2007 (Figure 6, Figure 7). Hoop nets continued to dominate the catch in both sections.



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



Figure 7. Burbot monitoring results by gear type in the Missouri River Huber section, 2005-07.

### **Smith River**

The Smith River requires the second most management attention in the region. This float section of the Smith River ranks in the top 88 fisheries in the state and is in the top 16 regionally. It receives an average of 10,406 angler days per year (Table 6). Average use by resident anglers is 62% and average non-resident use is 38%.

Table 6. A	Ang	ler u	ise stati	stics fo	or Smit	h Riv	er (sect	ion 2) (N	Aontana	a statev	vide ar	ngler j	pressure
MFWP 1	995	-200	)5).										
		1	1	<b>C</b> ( )	1	D	1	0/ <b>D</b>			р		

year	Angler days	State rank	Reg rank	% Res	% Non Res
2005	14,188	51	8	59	41
2003	6,854	88	15	40	60
2001	9,088	64	10	70	30
1999	7,645	83	16	84	16
1997	13,391	47	9	62	38
1995	11,272	50	8	57	43

The Eagle Creek section of the Smith River has been sampled in 30 of the past 39 years (Figure 8). In 2006, the number of rainbow trout greater than 8 inches per mile was estimated at 325 per mile and the number of browns was 370 per mile. Compared to the long term average of rainbow and brown trout in this section (541 and 325 respectively), the 2006 rainbow numbers were 40% below the long term average whereas brown numbers were 13% above the long term average. In 2007 the rainbow numbers were 291 per mile which was 45% lower than the long term mean (533) and the brown numbers were 254 per mile which was 21% lower than the long term mean (323).

The Deep Creek section of the Smith River has been sampled in 20 of the past 38 years (Figure 9). In 2006, the number of rainbow trout per mile greater than 8 inches was estimated at 126, which was 75% of the long term mean (168). The number of brown trout greater than 8 inches was estimated at 485 per mile, which was 80% higher than the long term mean (269). The Deep Creek section was not sampled in 2007 due to restricted access to the sampling site through private land.

From 1969 through 1990 rainbow trout were the predominant species in the Eagle Creek section. During this time rainbow trout estimates were higher than brown trout by an average of 544 (3-1023) fish per mile each year. In 1991 an apparent shift occurred in which rainbow numbers decreased and brown trout numbers increased (Figure 8). From 1991 through 2007, with the exception of four years ('97,'98,'04,'07), brown trout were the predominant species and outnumbered rainbows by an average of 256 (35-512) fish per mile per year.

During the period of record for the Deep Creek section there were more brown trout estimated in than rainbows trout in 14 of 20 years. The average number of brown trout estimated per mile during those years was 175 (19-359). On years that rainbow trout estimates were higher than browns, the average number per mile was 71 (1-185) greater than browns.



Figure 8. Estimated number of rainbow and brown trout greater than 8 inches per mile in the Eagle Creek section of the Smith River 1969-2007 (solid line is long-term rainbow mean, dashed line is long-term brown mean).



Figure 9. Estimated number of rainbow and brown trout greater than 8 inches per mile in the Deep Creek section of the Smith River 1970-2007 (solid line is long-term rainbow mean, dashed line is long-term brown mean).

# Flow

In 2006 the Smith River below Eagle Creek had a mean monthly discharge of 216 (75-586) cfs, which was 101% of the 10 year mean ( $\bar{x} = 212$ ). The maximum discharge in 2006 was 1,290 cfs, which occurred on June 11 (Appendix 1).

In 2007 the Smith River below Eagle Creek had a mean monthly discharge of 198 (59-532) cfs, which was 93% of the 11 year mean ( $\bar{x} = 211$ ). The maximum discharge was 806 cfs, which occurred on May 30 (Appendix 1).

# Water temperature

In 2006 water temperature in the Smith River was measured over 70°F in June, July and August. During these three months, there were 30 days when water temperature was 73 degrees or greater, and 8 of those 30 days had temperatures greater than 75 degrees. The maximum temperature recorded was 78.07°F, which occurred on July 22 and July 28. In compliance with department policy, FWP recommended and subsequently implemented a time-of-day fishing closure for the entire Smith River from noon to midnight between July 31 and September 15. Angling restrictions were lifted on September 16.

In 2007 the maximum temperature recorded in the Smith River was 81.02 degrees, which occurred on July 18. There were 48 days during June, July and August in which temperature was greater than 70 degrees. All 31 days of July had water temperature over 70 degrees, and 30 of those had temperatures over 73 degrees. For the second year in a row, FWP officials implemented a time of day fishing closure on the 125-mile reach of the Smith River between the hours of 2 pm and 12:01 am from July 12 through September 15. Angling restrictions were lifted on August 30 after conditions improved.

Water temperature data for 2006-2007 are summarized in Appendix 1.

# Smith River whirling disease investigations

Three sites on the Smith River were sampled twice for whirling disease over a 20 d period in 2007 (Table 7). Two sites, 6666 Ranch and Buckingham Bridge, showed infection grades consistent with lethal infection for trout. The Sheep Creek site showed slightly lower infection which would likely not cause an impact to young trout in that area.

 Table 7. Whirling disease test locations and McConnell-Baldwin histology ranking for the Smith
 River, 2007.

Date In	Date Out	Stream	Sample location	Histology
8-Jun	18-Jun	Smith River	6666 Ranch downstream fm Sheep Cr	2.97
8-Jun	18-Jun	Smith River	Buckingham Bridge*	3.60
8-Jun	18-Jun	Smith River	Sheep Cr Site	1.26
18-Jun	28-Jun	Smith River	6666 Ranch downstream fm Sheep Cr	
18-Jun	28-Jun	Smith River	Buckingham Bridge*	3.14
18-Jun	28-Jun	Smith River	Sheep Cr Site	1.90

# Sun River

### Temperature

The Sun River is subject to dramatic temperature conditions during critical parts of the year. In 2006 we monitored temperature at 13 sites on the Sun River (Appendix 2) using Onset Hobo water temp probes temperature loggers. The maximum temperature recorded on the Sun River occurred in July at the Lowry Bridge site. During the same time, the maximum temperature recorded below the Pishkun Diversion Dam was 61.9 degrees. This 45-degree temperature differential occurs over a 48-mile reach of river. Temperature loggers at the Lowry Bridge site recorded the highest water temperatures for the greatest period of time during 2006 (Table 8, Table 9). The slight decrease in water temperature at the Simms Bridge site is likely attributed to increase influence of irrigation return to the Sun River, and greater water flow at this site. In 2006, FWP implemented a time of day fishing closure on the 101 mile reach of the Sun River from Gibson Dam to the mouth from noon to midnight from July 13 through September 15. Angling restrictions were lifted on September 16.

In 2007, the Sun River had water temperature above 73 degrees from June 27 through July 9. On July 5, the water temperature reached 81.5 degrees near Simms. On Thursday July 12, FWP implemented a time of day angling closure on a 97 mile reach of river between Diversion Dam and the mouth from 2:00 pm to 12:01 am through September 15. The restrictions were lifted on September 16.

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Location	Number of Hours >73F	Number of Hours >77F	Number of Hours >80F
Simms Bridge	379.5	126	6
Lowry Bridge	449	166.5	63.5
Below Fort Shaw Irrigation	277.5	43.5	0
Diversion			
Above Fort Shaw Irrigation	277.5	42.5	0
Diversion			
Highway 287 Bridge	175	4	0
Below Willow Creek Canal	11	0	0
Above Willow Creek Canal	93.5	0	0
Morris Ranch	0	0	0
Alkali Flats	0	0	0
Siphon Bridge	0	0	0
Below Diversion Dam	0	0	0
Below Hannan Gulch	0	0	0
Gibson Dam Tailrace	0	0	0

Table 8. Number of hours water temperatures exceeded 73°, 77°, and 80°F at thirteen sites on the Sun River from May to December 2006.

Table 9. Number of days water temperatures exceeded 73°, 77°, and 80°F at thirteen sites on the Sun River from May to December 2006.

Location	Number of Days >73F	Number of Days >77F	Number of Days >80F
Simms Bridge	51	26	4
Lowry Bridge	61	31	13
Below Fort Shaw Irrigation	38	13	0
Diversion			
Above Fort Shaw Irrigation	40	12	0
Diversion			
Highway 287 Bridge	35	3	0
Below Willow Creek Canal	6	0	0
Above Willow Creek Canal	18	0	0
Morris Ranch	0	0	0
Alkali Flats	0	0	0
Siphon Bridge	0	0	0
Below Diversion Dam	0	0	0
Below Hannan Gulch	0	0	0
Gibson Dam Tailrace	0	0	0

### Warmwater Lake Ecosystems

### Wadsworth Pond

Each year this pond receives about 220 angler days per year (MFWP 2005). It has become a vital component of the fisheries program in Great Falls by generating interest in the sport of angling by area children. Each year area sporting groups such as Walleye Unlimited and Trout Unlimited sponsor the annual Kids Fishing Day at Wadsworth Pond, which generally attracts approximately 3,000 participants.

In 2006 gill nets in Wadsworth Pond sampled 67 fish of which 51% were game species (Appendix 3). Of the three games species sampled, yellow perch dominated the catch (CPUE=6.7), followed by walleye (CPUE=3.7), then pumpkinseed sunfish (CPUE=1).

In 2007 game fish numbers increased in gillnets to represent 81% of the catch. Rainbow trout was the most abundant species sampled representing 48% of the catch (CPUE=6.7, followed by walleye (CPUE=2.7, then yellow perch (CPUE=1.7), then pumpkinseed sunfish (CPUE=0.33). In 2007 the mean size of walleye and yellow perch was down slightly from 2006.

In February 2007, a draft MEPA EA was conducted to evaluate the proposed action to transfer wild yellow perch into Wadsworth Pond to maintain or improve angling quality. After a public comment period, a decision was made to implement the proposed action. After thorough consideration of sources of perch, and disease screening, the Municipal Water pond at Kremlin was selected as a source. We set four trap nets for two nights and captured and transferred approximately 4,100 perch averaging 5.47 (4.2-8.3) inches long. Although these fish were small, successful spawn is expected to boost the perch population in Wadsworth Pond to improve perch angling, and provide a limited forage base for bass and walleye.

### Kolar Reservoirs

In 2006, Kolar Reservoir # 1 and Kolar Reservoir #2 were sampled by gill net. Only one sinking gill net per reservoir was used due to their small size. In addition to gill nets, we set one 3/8 inch mesh trap net to capture small minnows which have been abundant in these reservoirs historically. In Kolar #1 we sampled approximately 2,000 small fish comprised of 40% fathead minnow, 30% chub species, and 30% white sucker young of the year (Appendix 3). In Kolar #2 we sampled 4,000 small fish comprised of 90% fathead minnows and 10% chub species (Appendix 4). Although no bass were sampled by nets, field crews observed largemouth bass and angled a few approximately 12 inches long.

### **Coldwater Lake Ecosystems**

### Newlan Creek Reservoir

Longnose suckers dominated the net catch in Newlan Creek Reservoir during the report period. Game species represented 14% of the catch in 2006 and 17% of the catch in 2007 (Appendix 5, Appendix 6).

### Smith River Reservoir (a.k.a. Sutherlin Reservoir)

There were five species of fish netted in Smith river Reservoir during the report period (Appendix 5, Appendix 6). Game species represented 23% of the catch in 2006 and 19% of the catch in 2007.

### **Fishing Access**

The Great Falls management area has two sites enrolled in the Private Lands Fishing Access (PLFA) program. This program provides controlled access, site development materials and in some cases compensation in exchange for public access to fishing sites. The Many Hills Ranch (Davison) PLFA site is located on Highwood Creek approximately 2 miles south of the town of Highwood. In 2006 there were 125 anglers who used this site. The return on FWP's landowner compensation investment in 2006 was \$0.25 per angler day.

The Novak Creek site is located on the popular Holter tail water section of the Missouri River, approximately 0.5 mile upstream of the I-15 exit 244. Angler use data is not recorded at this site, but empirical information suggests it receives use consistent with other walk in sites on the river. In early 2007, the landowner reported a gate was down and FWP responded by restoring the containment per the agreement.

### HABITAT PROTECTION

In 2006, FWP staff processed 29 Natural Streambed and Land Preservation Act (310) permits and 13 Stream Protection Act (124) permits in the Great Falls area. In 2007, at total of 92 permits were processed including 59 Natural Streambed and Land Preservation Act (310) permits and 20 Stream Protection Act (124) permits and 13 permits (318) for Short-term Exemption of Surface Water Quality Standards (Table 10). Table 11 lists the 310 permits by county.

	124 permit	310 permit	318 permit	total							
2007	20	59	13	92							
2008											
2009											

Table 10. Regulatory permits processed in the Great Falls management area, 2007.

Table 11. Natural Streambed and Land Preservation Act (310) permits by county, 2007.

	2007	2008	2009
Cascade	42		
Lewis & Clark	5		
Meagher	9		
Judith Basin	1		
Choteau	2		
total	59		

# **AQUATIC EDUCATION**

In 2007 the regional fisheries staff conducted a demonstration of radio telemetry equipment at the Cascade school. There were eight 45-minute demonstrations for approximately 150 children between the grades of 8 and 12.

The regional staff gave two presentations to the Pat Barnes Chapter of Trout Unlimited, and one to the Smith River Working Group, and the Smith River Outfitters. There were two newspaper articles in the Great Falls Tribune chronicling the results of trout population monitoring on the Missouri and Smith rivers.

Each year Helena Middle School sixth graders attend the annual Future Fisheries Aquatic Education program held at Giant Springs State Park. The course offers electrofishing demonstration, hatchery tour, fish dissection and fish trivia. The regional staff participated in several kids fishing events at Pelican Point, Pishkun Reservoir, unnamed pond in the Highwood Mountains, and Wadsworth Pond. School children from Highwood , Choteau, Bynum, Fairfield, Golden Ridge, Depuyer, Power and Dutton-Brady participated in the fishing programs.

#### ACKNOWLEDGMENTS

Thanks to: Kelly Smith, Randy Rodencal, Casey Jensen and Eli McCord for assistance with the Missouri River electrofishing estimates. A special thanks to numerous private landowners such as Josephine Lahti, Carl Taft, The Rocking C's Guest Ranch, Ron Burns from the Canyon Ranch, Harold 'Buck' Juedeman from Canyon Cattle Ranch, The Dearborn Ranch, The Baucus family from Sieben Livestock and Scott Blackman from the Sterling Ranch.

Submitted by; Grant Grisak

February 28, 2008

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# CODE NUMBERS OF WATERS REFERRED TO IN THIS REPORT

- 17-4896 Missouri River from Cascade, MT bridge to Holter Dam
- 17-6832 Smith River from Hound Creek to Camp Baker
- 17-9330 Newlan Creek Reservoir
- 17-9616 Smith River Reservoir (Sutherlin Reservoir)
- 20-8470 Wadsworth Pond
- 16-6340 Kolar Reservoir #1
- 16-6360 Kolar Reservoir #2
- 20-6100 Sun River (section 2)

Appendix 1. River flow (cfs) and temperature (°F) recorded at USGS station 06066500 (Missouri River below Holter Dam near Wolf Creek, Montana) and USGS station 06077200 (Smith River below Eagle Creek near Fort Logan, Montana) for the calendar years 2006-2007.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Missouri flow 2006	Mean	4294	4652	4928	5951	5840	4357	3996	3873	3790	3642	3667	3668
	Minimum	4160	4250	4530	5010	4620	3950	3800	3650	3610	3600	3510	3600
	Maximum	4360	4960	5360	6540	6590	5290	4350	4280	3930	3730	3970	3770
Missouri flow 2007	Mean	3837	3661	3562	3685	3906	4413	3732	3481	3390	3342	3327	3575
	Minimum	3520	3430	3410	3530	3580	3880	3380	3340	3300	3150	3070	3070
	Maximum	5120	4510	3790	3730	4300	5720	4010	3610	3530	3540	4130	4250
Missouri temp 2006	Mean	34.7	34.2	36.0	42.4		57.9	64.6	64.8	61.0	54.1	44.6	35.1
	Minimum	33.8	33.8	34.7	38.3		54.5	61.7	62.6	58.1	49.1	38.3	33.8
	Maximum	34.7	34.7	37.4	47.3		62.6	66.2	67.1	63.5	58.1	48.2	38.3
Missouri temp 2007	Mean		34.5	36.9	42.4	51.3	57.0	64.9	64.2	60.4	45.7	35.4	33.4
	Minimum		33.8	34.7	40.1	46.4	53.6	60.8	61.7	56.3	40.6	33.3	33.0
	Maximum		34.7	40.1	46.4	53.6	60.8	67.1	68.0	63.5	49.5	40.1	33.6
~		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smith flow 2006	Mean	117	96	136	468	587	530	153	75	94	131	126	84
	Minimum	100	50	100	172	443	207	84	60	70	80	55	55
	Maximum	130	230	220	680	764	1290	224	93	126	175	172	110
a 11 a 2005		60		200			0.01				100	101	2.40
Smith flow 2007	Mean	69	80	309	250	533	331	93	59	67	103	134	348
	Minimum	45	55	80	166	358	143	58	43	44	90	/3	246
	Maximum	85	100	8//	583	806	634	147	/6	103	113	241	402
S	Maria			25.1	42.0	40.0	50.7	<u> </u>	(2.5	540	40.1	25.1	22.0
Smith temp 2006	Mean			35.1	43.0	49.8	59.7	68.5	63.5	54.0	42.1	35.1	32.0
	Minimum			32.0	30.5	39.2	50.9	59.9 70.7	54.5 75.0	43.7	54.7	32.0	31.8
	wiaximum			45.5	33.0	39.9	13.4	19.1	15.2	08.0	54.5	42.8	32.2
Smith town 2007	Maan				122	40.2	50 C	70.5	627	52 6	217	22.0	
Siniui temp 2007	Minimum				42.3	49.3	J0.0	70.5	51 0	33.0	34.7	32.0	
	Movimum				527	50.0	40.4	39.U	J1.8	41.0	32.0	32.0	
	wiaximum				52.7	39.9	15.2	ð2.4	/0.1	15.4	40.5	32.2	

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Simms Bridge					Month				
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Data	May	June	July	August	September	October	November	December	Grand Total
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Average Temp, °F	55.1	59.8	70.8	65.9	57.8	45.7	36.3	31.8	54.7
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Maximum Temp, °F	76.0	79.9	80.4	76.7	71.2	60.7	52.8	32.1	80.4
No.of Measurements         791         1440         1488         1480         1488         1440         553         10128           Lowry Bridge 2006	Minimum Temp, °F	45.6	49.1	57.9	52.7	46.2	31.8	31.7	31.8	31.7
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	No.of Measurements	791	1440	1488	1488	1440	1488	1440	553	10128
Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         54.7         59.5         70.9         66.1         57.5         45.5         36.3         32.0         54.7           Maximum Temp, °F         75.2         81.8         83.3         77.6         73.3         61.2         53.3         32.1         83.3           Minimum Temp, °F         45.4         48.8         57.5         51.1         45.3         31.9         31.9         31.9         31.9         31.9           No.of Measurements         789         1440         1488         1448         1448         1448         1448         1448         1448         1448         1448         1448         1448         1440         10083           Pointo fregation Diversion         Trigation Diversion         Mary         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.8         70.1         65.3         57.1         45.5         36.4         32.1         54.3           Maximum Temp, °F	Lowry Bridge 2006					Month				
Average Temp, °F         54.7         59.5         70.9         66.1         57.5         45.5         36.3         32.0         54.7           Maximum Temp, °F         75.2         81.8         83.3         77.6         73.3         61.2         53.3         32.1         83.3           Minimum Temp, °F         45.4         48.8         57.5         51.1         45.3         31.9         32.0         31.9         32.0         31.9         32.1         54.3         34.3         34.3         34.4         34.3         34.4         34.3         34.3         34.3         34.3         36.4	Data	May	June	July	August	September	October	November	December	Grand Total
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Average Temp, °F	54.7	59.5	70.9	66.1	57.5	45.5	36.3	32.0	54.7
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Maximum Temp, °F	75.2	81.8	83.3	77.6	73.3	61.2	53.3	32.1	83.3
No.of Measurements         789         1440         1488         1488         1440         1488         1440         510         10083           Below Ft Shaw Irrigation Diversion	Minimum Temp, °F	45.4	48.8	57.5	51.1	45.3	31.9	31.9	31.9	31.9
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	No.of Measurements	789	1440	1488	1488	1440	1488	1440	510	10083
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$										
Irrigation Diversion         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.8         70.1         65.3         57.1         45.5         36.4         32.1         54.3           Maximum Temp, °F         71.9         77.7         78.8         74.8         69.6         61.2         53.1         32.2         78.8           Minimum Temp, °F         45.1         48.5         58.5         51.8         45.7         32.0         31.9         32.0         31.9           No.of Measurements         787         1440         1488         1480         1488         1440         512         10083           Above Fort Shaw         Month           Irrigation Diversion         Month           Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7	Below Ft Shaw					Month				
Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.8         70.1         65.3         57.1         45.5         36.4         32.1         54.3           Maximum Temp, °F         71.9         77.7         78.8         74.8         69.6         61.2         53.1         32.2         78.8           Minimum Temp, °F         45.1         48.5         58.5         51.8         45.7         32.0         31.9         32.0         31.9           No.of Measurements         787         1440         1488         1440         1488         1440         512         10083           Month         Month           Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1 <t< td=""><td>Irrigation Diversion</td><td></td><td></td><td></td><td>1.</td><td>~ .</td><td></td><td></td><td></td><td></td></t<>	Irrigation Diversion				1.	~ .				
Average Temp, °F         53.9         58.8         70.1         65.3         57.1         45.5         36.4         32.1         54.3           Maximum Temp, °F         71.9         77.7         78.8         74.8         69.6         61.2         53.1         32.2         78.8           Minimum Temp, °F         45.1         48.5         58.5         51.8         45.7         32.0         31.9         32.0         31.9           No.of Measurements         787         1440         1488         1488         1440         1488         1440         512         10083           Above Fort Shaw         Month           Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2	Data	May	June	July	August	September	October	November	December	Grand Total
Maximum Temp, °F         71.9         77.7         78.8         74.8         69.6         61.2         53.1         32.2         78.8           Minimum Temp, °F         45.1         48.5         58.5         51.8         45.7         32.0         31.9         32.0         31.9           No.of Measurements         787         1440         1488         1488         1440         1488         1440         512         10083           Above Fort Shaw	Average Temp, °F	53.9	58.8	70.1	65.3	57.1	45.5	36.4	32.1	54.3
Minimum Temp, °F         45.1         48.5         58.5         51.8         45.7         32.0         31.9         32.0         31.9           No.of Measurements         787         1440         1488         1488         1440         1488         1440         512         10083           Above Fort Shaw         Irrigation Diversion         Month         Image: Month <td>Maximum Temp, °F</td> <td>71.9</td> <td>77.7</td> <td>78.8</td> <td>74.8</td> <td>69.6</td> <td>61.2</td> <td>53.1</td> <td>32.2</td> <td>78.8</td>	Maximum Temp, °F	71.9	77.7	78.8	74.8	69.6	61.2	53.1	32.2	78.8
No.of Measurements         787         1440         1488         1488         1440         1488         1440         512         10083           Above Fort Shaw Irrigation Diversion         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1440         1488         1440         513         10084	Minimum Temp, °F	45.1	48.5	58.5	51.8	45.7	32.0	31.9	32.0	31.9
Above Fort Shaw Irrigation Diversion         May         June         July         August         September         October         November         December         Grand Total           Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1440         1488         1440         513         10084	No.of Measurements	787	1440	1488	1488	1440	1488	1440	512	10083
Above Fort Shaw Irrigation Diversion         Month           Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1440         1488         1440         513         10084										
Infigation Diversion         Month           Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1440         1488         1440         513         10084	Above Fort Shaw									
Data         May         June         July         August         September         October         November         December         Grand Total           Average Temp, °F         53.9         58.7         70.0         65.2         57.1         45.5         36.4         32.1         54.2           Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1440         1488         1440         513         10084	Irrigation Diversion		T	T 1		Month	0 + 1	NT 1		
Average Temp, °F       53.9       58.7       70.0       65.2       57.1       45.5       36.4       32.1       54.2         Maximum Temp, °F       71.8       77.7       78.7       74.8       69.7       61.2       53.1       32.2       78.7         Minimum Temp, °F       45.0       48.5       58.5       51.7       45.6       31.9       31.9       32.0       31.9         No of Measurements       787       1440       1488       1440       1488       1440       513       10084	Data	May	June	July	August	September	October	November	December	Grand Total
Maximum Temp, °F         71.8         77.7         78.7         74.8         69.7         61.2         53.1         32.2         78.7           Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1440         1488         1440         513         10084	Average Temp, °F	53.9	58.7	/0.0	65.2	57.1	45.5	36.4	32.1	54.2
Minimum Temp, °F         45.0         48.5         58.5         51.7         45.6         31.9         31.9         32.0         31.9           No of Measurements         787         1440         1488         1488         1440         1488         1440         513         10084	Maximum Temp, °F	/1.8	//./	/8./	/4.8	69.7	61.2	53.1	32.2	/8./
No of Measurements /8/ 1440 1488 1488 1440 1488 1440 513 10084	Minimum Temp, °F	45.0	48.5	58.5	51./	45.6	31.9	31.9	52.0	31.9
	No of Measurements	/8/	1440	1488	1488	1440	1488	1440	513	10084
Highway 287 Bridge Month	Highway 287 Bridge	Month								
Data May June July August September October November December Grand Total	Data	May	Iune	Iulv	Anonst	September	October	November	December	Grand Total
Average Temp °F         50.7         54.8         67.1         65.8         56.7         44.7         35.4         31.9         52.8	Average Temp °F	50.7	54.8	67.1	65.8	56.7	44 7	35.4	31.9	52.8
Maximum Temp °F         65.5         71.9         77.2         76.5         70.2         59.2         52.6         32.0         77.2	Maximum Temp °F	65.5	71.9	77.2	76.5	70.2	59.2	52.4	32.0	77.2
Minimum Temp °F         44 2         45 9         57 8         51 3         44 1         31 7         31 8         31 7	Minimum Temp, <sup>o</sup> F	44.2	45.9	57.8	51.3	44.1	31.7	31.7	31.8	31.7
No of Measurements 780 1440 1488 1488 1488 1440 1488 1440 515 10079	No of Measurements	780	1440	1488	1488	1440	1488	1440	515	10079

Appendix 2. Monthly Average, Maximum, and Minimum Water Temperature Data from thirteen sites on the Sun River from May to December 2006.

Appendix 2 (cont'd)

Below Willow Creek Canal					Month				
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	49.5	54.4	66.1	66.0	56.2	44.6	35.6	32.2	52.5
Maximum Temp, °F	61.0	70.6	73.8	73.2	68.4	59.1	52.8	33.2	73.8
Minimum Temp, °F	44.2	45.8	56.8	50.9	43.8	31.8	31.7	31.8	31.7
No.of Measurements	696	1440	1488	1488	1440	1488	1440	516	9996
Above Willow Creek Feeder Canal					Month				<u> </u>
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	50.2	54.0	66.4	64.1	56.2	44.6	35.4	31.9	52.1
Maximum Temp, °F	63.6	69.6	77.0	74.2	68.4	59.1	52.9	32.0	77.0
Minimum Temp, °F	44.1	45.5	54.8	51.3	44.1	31.8	31.7	31.8	31.7
No.of Measurements	782	1440	1488	1488	1440	1488	1440	563	10129
Morris Ranch		1		1	Month		•		-
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	48.4	53.1	61.5	62.3	55.4	44.1	35.7	32.4	48.3
Maximum Temp, °F	61.0	70.6	70.1	72.9	67.2	59.7	52.8	33.1	72.9
Minimum Temp, °F	43.5	45.2	54.3	50.5	44.3	31.9	31.9	31.9	31.9
No.of Measurements	692	1440	240	972	1440	1488	1440	602	8314
Alkali Flats					Month			<u> </u>	
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	47.1	50.3	60.0	60.7	53.7	43.7	35.8	32.1	49.5
Maximum Temp, °F	56.8	63.3	71.8	69.9	63.6	56.7	50.3	32.4	71.8
Minimum Temp, °F	43.2	44.2	50.3	49.0	43.0	31.9	31.9	32.0	31.9
No.of Measurements	737	1440	1488	1488	1440	1488	1440	556	10077
Sinhon Pridao					Month				
Data	Mov	Juno	Inty	August	Sontombor	October	November	December	Grand Total
Average Temp °F	1viay 15.6	18 0	55 Q	58 7	52.3	AA 7	36.3	3/ 0	
Maximum Tomp °E	52 0	52.8	65 7	66.8	50.7	5/ 0	45.2	36.2	66.9
Minimum Tomp °E	J2.0 43.0	13.0	48.6	51.8	15.0	33.6	4J.2 32.0	32.0	32.0
winnihum remp, г	43.0	43.7	40.0	110	43.0	33.0 1499	32.0	52.0	32.0
ino.or measurements	133	1440	1400	1400	1440	1400	1440	337	100/0

Below Diversion Dam					Month				
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	45.5	47.7	54.4	58.0	51.9	44.9	36.3	34.3	47.9
Maximum Temp, °F	48.2	51.7	61.9	61.6	55.6	51.5	43.3	35.4	61.9
Minimum Temp, °F	43.4	43.8	48.5	53.5	47.9	36.3	32.0	32.5	32.0
No.of Measurements	733	1440	1490	1488	1440	1488	1440	558	10077
Below Hannon Gulch					Month				
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	45.0	47.0	54.2	58.6	51.9	44.9	36.1	34.3	47.6
Maximum Temp, °F	48.8	50.0	63.0	64.1	59.7	53.6	42.7	36.3	64.1
Minimum Temp, °F	43.5	43.7	48.1	50.9	46.2	35.0	31.9	31.9	31.9
No.of Measurements	731	1437	1488	1365	1440	1488	1440	559	9948
Gibson Dam Tailrace					Month				
Data	May	June	July	August	September	October	November	December	Grand Total
Average Temp, °F	44.0	46.4	53.8	58.6	52.0	45.0	35.8	33.8	47.4
Maximum Temp, °F	45.7	48.4	62.5	63.3	58.5	51.5	40.6	35.4	63.3
Minimum Temp, °F	43.2	43.6	47.9	53.9	47.7	35.4	32.3	32.9	32.3
No.of Measurements	729	1440	1488	1357	1440	1488	1440	559	9941

			1		Length (in)		Weight (lbs)			Relative Weight			
Water	Gear	Effort	Species	n	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Wadswo	orth Pond	(May- trap nets)											
		overnight set	Walleye	4	15.7	11.7	26.5	2.14	0.47	7.0	84.0	77.9	91.5
			RB	22	17.8	11.6	21.7	2.72	0.70	4.54	111.6	87.8	141.1
			WSu	21	15.1	13.7	16.5	1.47	1.10	1.68	95.9	74.3	108.2
			LnSu	1			15.6			1.50	NA	NA	NA
			YP	17	10.4	9.2	11.1	0.50	0.37	0.70	81.1	63.5	94.3
			Pump	1	3.5	3.3	3.7	0.025	0.02	0.03			
Wadswo	orth Pond	(September) **											
		overnight set											
			Walleye	11	15.3	8.3	22.0	1.71	0.13	4.12	86.1	68.1	98.1
			WSu	28	14.4	13.7	16.0	1.14	0.98	1.60	84.5	74.3	94.1
			YP	20	7.0	6.6	7.4	0.13	0.11	0.17	75.9	68.5	86.7
			Pump	3			3.9						
			Carp	5	15.4	14.6	16.7	1.66	1.42	2.08	87.8	83.3	92.1

Appendix 3. Number sampled (n), mean, minimum (min), and maximum (max) length, weight, and relative weight by species, in north central Montana warm water lakes sampled during 2006.

NA- no relative weight standards for this species \*\* standard for this water is 3 gill nets

			•		Length (in)			Weight (lbs)			Relative Weight		
Water	Gear	Effort	Species	n	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Wadswe	orth Pond (Se	eptember) **											
		overnight set								1.00			100 <b>-</b>
			Walleye	8	14.5	8.9	17.4	1.15	0.23	1.82	91.9	84.0	100.7
			RB	20	9.8	8.8	10.7	0.36	0.22	0.48	95.0	76.5	122.5
			Wsu	8	13.5	11.9	15.5	0.95	0.63	1.26	86.2	74.9	99.6
			YP	5	6.6	5.5	7.9	0.14	0.08	0.24	101.9	64.7	131.6
			Pump	1			3.7			0.04			
Kolar R	leservoir #1												
		overnight set*	WSu	64	15.1	10.8	18.3	1.67	0.62	2.30	105.2	72.9	124.8
Kolar R	eservoir#2												
Kolai K		overnight set*	WSu	9	13.4	11.1	17.9	10.3	0.54	2.47	87.7	72.8	98.4

Appendix 4. Number sampled (n), mean, minimum (min), and maximum (max) length, weight, and relative weight by species, in north central Montana warmwater lakes sampled during 2007.

NA- no relative weight standards for this species \*\* standard for this water is 3 gill nets

					Length (in)			Weight (lbs)			Relative Weight		
Water	Gear	Effort	Species	n	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Newlan	Creek Re	eservoir											
		overnight set	Burbot	2	19.3	18.2	20.3	1.37	1.18	1.56	73.5	72.1	74.9
			LnSu	65	13.9	8.0	17.6	1.19	0.25	2.22	NA	NA	NA
			RB	8	14.1	8.5	16.0	0.9	0.18	1.34	76.0	61.2	86.0
			LL	1			9.7			0.32			
Smith R	River Rese	rvoir											
		overnight set	Burbot	5	15.4	12.5	18.3	0.71	0.4	1.18	67.9	61.8	75.4
		-	WSu	31	13.4	6.5	18.3	1.27	0.08	2.90	98.5	62.4	116.5
			LnSu	45	14.4	6.4	20.1	1.47	0.08	2.91	NA	NA	NA
			MWF	9	14.6	11.9	16.5	1.34	0.71	1.61	115.7	97.4	130.4
			RB	21	14.6	9.5	17.3	1.17	0.41	1.94	92.1	66.5	122.5

Appendix 5. Number sampled (n), mean, minimum (min), and maximum (max) length, weight, and relative weight by species, in north central Montana coldwater lakes sampled during 2006.

NA- no relative weight standards for this species

					Length (in)			Weight (lbs)			Relative Weight		
Water	Gear	Effort	Species	n	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Newlan	Creek Re	servoir											
		overnight set	Burbot	1			11.8			0.30			66.8
			LnSu	65	12.4	7.0	17.6	0.82	0.11	2.25	NA	NA	NA
			RB	12	13.5	8.8	18.5	0.91	0.21	2.38	77.8	52.0	94.8
			WCT	1			11.9			0.55			79.3
Smith R	River Rese	rvoir											
		overnight set	Burbot	5	16.8	15.0	18.4	0.95	0.71	1.15	74.8	70.7	78.9
		0	WSu	24	15.6	7.0	18.0	1.60	0.11	2.38	91.6	69.0	110.4
			LnSu	44	17.7	8.6	20.1	2.11	0.18	3.06	NA	NA	NA
			RB	10	12.4	9.9	17.6	0.72	0.35	1.47	89.0	68.1	104.5
			EB	1			10.9			0.40			81.7

Appendix 6. Number sampled (n), mean, minimum (min), and maximum (max) length, weight, and relative weight by species, in north central Montana coldwater lakes sampled during 2007.

NA- no relative weight standards for this species