



The purpose of the Big Hole Watershed Committee is to seek understanding of the river and agreement among individuals and groups with diverse viewpoints on water use and management in the Big Hole watershed.

2009 Drought Newsletter May, 2009

www.bhwc.org

To All Members of the Big Hole Community:



Once again, it is time for a comment from the BHWC chairman about the state of the watershed. This year has been challenging, but as spring weather approaches we are hopeful that this growing season will bring bountiful crops as well as water levels above average to benefit all the water users and the river system.

Snowpack started a little behind this winter but is now ahead of normal. As everyone knows, "normal" is not the same as it used to be, but we have learned to live with a lesser normal. When I look at the East Pioneers, west of my family's ranch, I see a lot of snow. If the snow comes out in an orderly fashion we will be in great shape. As we head into the rainy season, we can only hope that ample moisture keeps coming. Levels of soil moisture are adequate in most areas and irrigation will soon follow. Hopefully, all irrigators will work with the Watershed Committee and others to ensure that river levels remain healthy.

The BHWC Drought Management Plan (DMP) will be instituted the same way as it has in the past. The Watershed Committee will notify the media and call our comprehensive phone tree list of irrigators if river levels begin to drop.

So many watershed groups have drought management plans now that it bears remembering the BHWC developed the first drought management plan in Montana. Our pioneering efforts were recognized when we received Montana's Watershed Stewardship Award in 1999 for our innovative, locally-led approach to restoring and enhancing our watershed.


With the advent of the agency-sponsored Arctic grayling recovery plan instituted in the upper-half of the Big Hole River in 2006, the Watershed Committee agreed to let the agency staffs of Montana Department of Fish

Wildlife and Parks (MFWP), Montana Department of Natural Resources Conservation (DNRC), and US Fish and Wildlife Service (USFWS) manage river levels above Dickie Bridge. In that upper reach, MFWP and DNRC will notify irrigators of needed voluntary reductions and any changes in fishing or outfitting use. This approach seems to work well for everyone involved.

Irrigators know the importance of balancing their water use against the river flows. Most river users also realize the importance of balance of use: trying not to cause harm to their livelihoods. If any river users don't understand the DMP and its use to minimize damage to the resource, please call a BHWC member or the executive director to get details. It is very important for all users to participate. Remember we are all in this together and if we work together the Big Hole will remain "the last best place".

The BHWC is currently working on many projects to enhance the river. Projects include: irrigation structure replacement, changing the way diversions withdraw water from the river, and restoring spring creek trout spawning habitat. These projects will be chronicled on our website or in our newsletter as they are completed. If there are projects along the river that need the support of the Watershed Committee, be sure and bring them to our attention. It is very important to the BHWC to have people submit projects for consideration.

The BHWC continues to raise funding for our operations and project areas. If you are reading this message and would like to contribute financially to the committee please do so. We welcome new members all the time and would love to have all readers of this newsletter as members. Please remember that all committee members volunteer their time and efforts towards the betterment of the river and the surrounding areas.

 Randy Smith, Chairman

BIG HOLE BASIN SNOWPACK SUMMARY

2008-2009

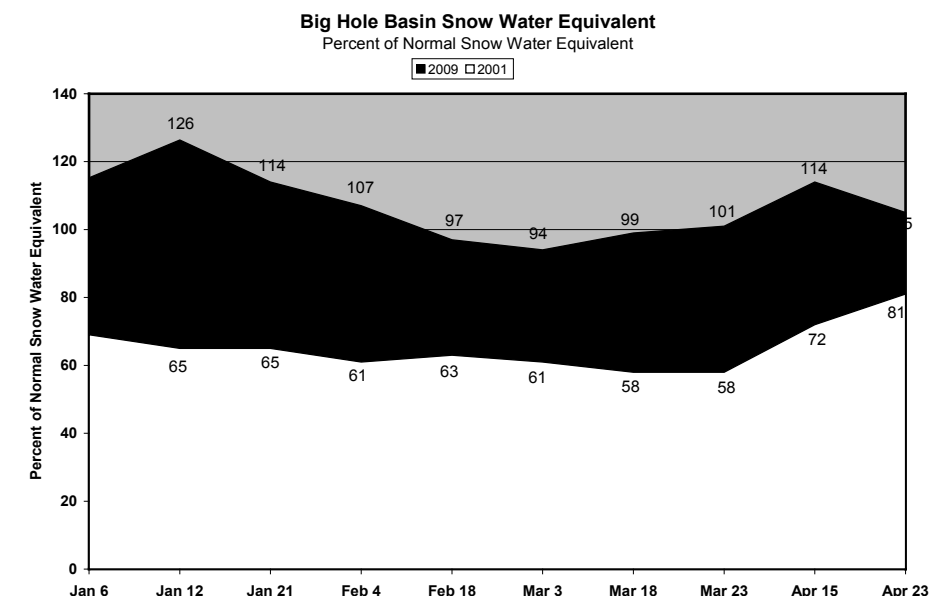
(by Dave Amman, DNRC Hydrologist¹)

The snow pack at lower elevations has been diminished somewhat over the past two weeks (early April 2009), due to warm weather. Peak flows typically occur in early June near Melrose, and in late May at Wisdom. This year flows have already exceeded 2000 cfs at Wisdom, which is greater than the 2-year event of 1680 cfs. At Melrose, flows have already exceeded 5000 cfs, not quite up to the 2-year event of 7160 cfs.

The Natural Resources Conservation Service (NRCS) issued a flow volume forecast on April 15. This latest estimate predicts a very good water supply for the Big Hole River.

Below are the summer flow estimates at the 50% (best estimate at this time) and 70% (conservative) chances of exceedance:

	50% Exceedance	70% Exceedance
at Wisdom:	108%	88%
near Melrose:	125%	117%



Last year at this time, the predictions were for 100% of normal flow volume at Wisdom, and 109% of normal at Melrose. In 2001, the prediction was 47% of normal at either location. So the supply is in place and the future hydrograph will be shaped largely by air temperatures and the resultant timing of the snow melt.

¹ Note: Dave Amman and Mike Roberts are Surface Water Hydrologists with the Montana Department of Natural Resources Conservation (DNRC). Dave's geographic area of concern includes the Big Hole River from Dickie Bridge, near Wise River, to her confluence with the Jefferson River. Mike Roberts is part of a multi-agency effort called the Fluvial Arctic Grayling Candidate Conservation Agreement with Assurances (CCAA) program. The scope of the CCAA is the upper Big Hole River from her headwaters above Jackson, Montana to Dickie Bridge.

The CCAA is an agreement between the U.S. Fish and Wildlife Service (USFWS) and any non-Federal entity whereby non-Federal property owners who voluntarily agree to manage their lands or waters to remove threats to species at risk of becoming threatened or endangered receive assurances against additional regulatory requirements should that species be subsequently listed under the Endangered Species Act (ESA). The conservation goal of this Agreement is to secure and enhance a population of fluvial Arctic grayling (*Thymallus arcticus*) within the upper reaches of their historic range in the Big Hole River drainage.

UPPER BIG HOLE RIVER 2008 Streamflow Report by Mike Roberts, DNRC Hydrologist

In 2008, streamflows in the upper Big Hole River (above Wise River) were maintained by an average to slightly above average snowpack and the voluntary water conservation efforts of several irrigators. These conditions along with average seasonal air temperatures, helped to offset poor summer precipitation to maintain adequate flows throughout the upper basin and keep the Wisdom reach of the river from being closed to fishing for the first time since the late nineties.

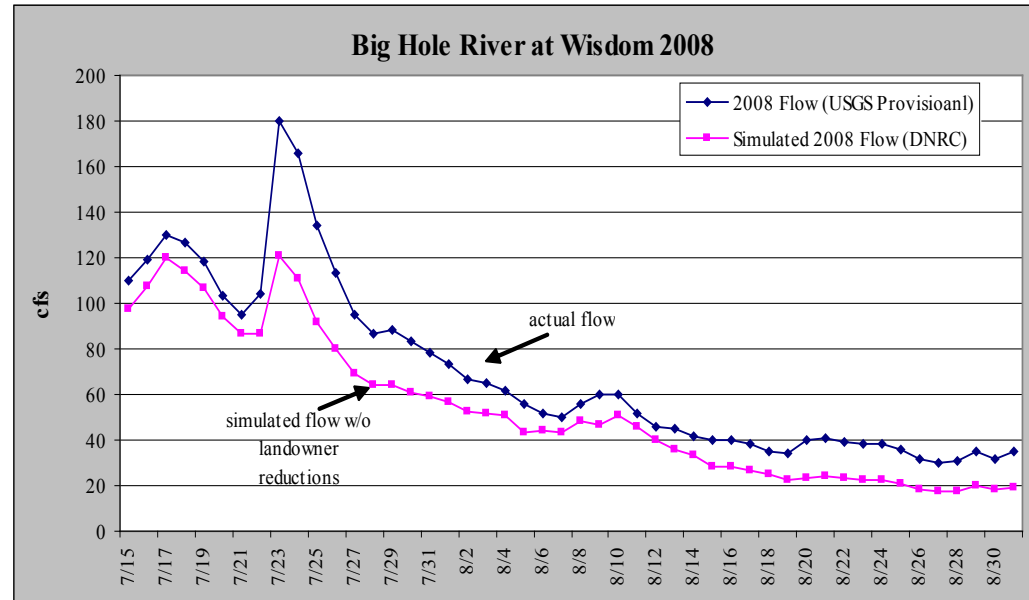
Target flows established by the CCAA in five upper reaches of the Big Hole River were achieved during most

of the spring period with the exception of early April, which was prior to runoff as well as irrigation. During the summer period, target flows were maintained over 80% of the time in all reaches except the Wisdom Reach (Reach C = 48%).

Spring runoff resulted in several bankfull events including a 20-day period in late May and early June that averaged bankfull flows for 12 days. This is a departure from the one-to-two day bankfull durations in recent years that resulted predominantly from high intensity rainfall events. Sustained bankfull flows are important to provide effective channel and floodplain maintenance.

As river flows subsided in late July, water conservations tied to the CCAA were initiated. Several landowners voluntarily reduced diversions to help maintain river flows above target levels and, in the case of the Wisdom reach,

closure levels. Without landowner reductions, simulations based on historic practices indicate flows would likely have reached the 20 cfs closure threshold at Wisdom (see Figure below).



Conservation efforts in 2008 were the result of voluntary agreements between landowners participating in the CCAA and the state and federal agencies working with them. A few flow agreements associated with CCAA site-specific plans have been completed and signed marking 2009 as the beginning of a transition from voluntary water conservation to water conservation implemented by the agreements. In addition to the flow plans, diversions infrastructure improvements, riparian restoration, and fish passage issues continue to be addressed through CCAA implementation.

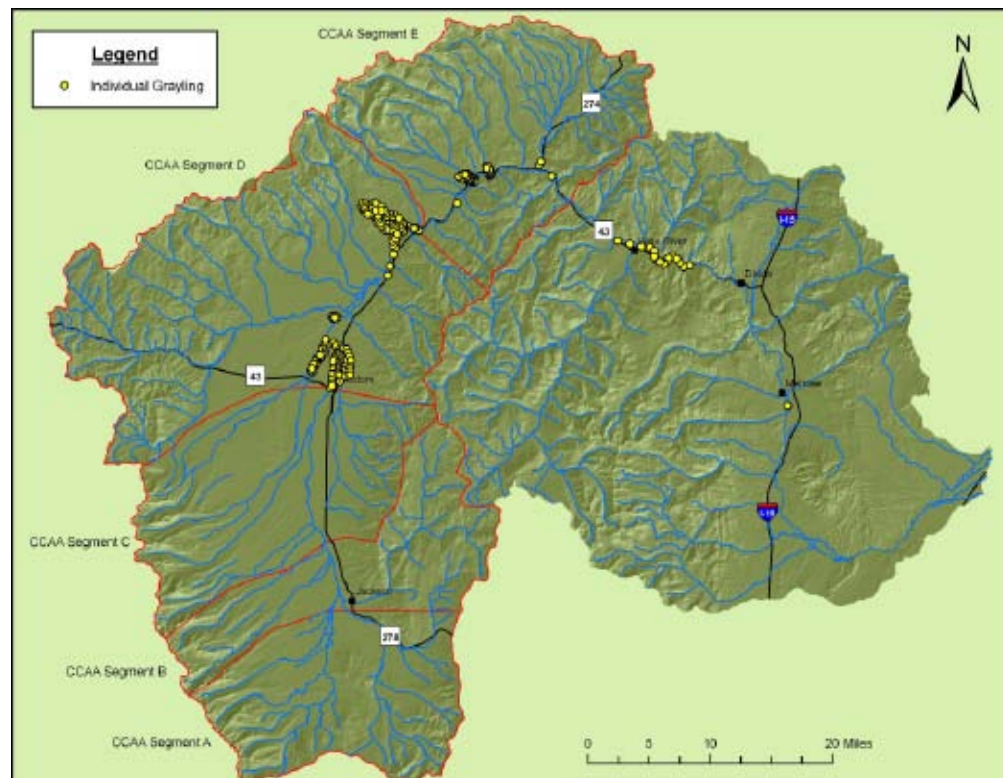
“Integrity without knowledge is weak and useless, and knowledge without integrity is dangerous and dreadful..”
~ Samuel Johnson ~

ARCTIC GRAYLING RECOVERY PROGRAM
Big Hole Population Monitoring and Conservation Efforts 2008
by Jim Magee, MFWP Arctic Grayling Biologist

Population surveys were completed on a mainstem and a tributary reach for each CCAA management reach. These survey sites were established in 2006 with the advent of the CCAA. In addition, all of the historical reaches were surveyed both in and out of the CCAA management area.

In fall 2008, electrofishing surveys were completed on 70 miles of the river and 253 grayling were captured (Figure 1). Surveys completed in 1990 (N= 532) and 1998 (N=351), showed a similar clustered distribution of grayling; however, the distribution has diminished as well as the abundance.

Figure 1. Montana Fish, Wildlife and Parks fall 2008 electrofishing surveys in the Big Hole River drainage. Surveys were completed on 70 miles of the mainstem Big Hole River and tributaries. Arctic grayling (N=253) were found in a clustered distribution primarily between Divide and Wisdom.



Population age structure shows a change in 2008 from the previous 5 years. From 2003-2007 young-of-the-year (YOY) dominated the age structure, comprising 67% of the total captured grayling. In 2008, YOY comprised 50% of the total captured grayling indicating better survival of older age grayling (Figure 2)

The Steel Creek restoration project continues to show improved channel and riparian conditions. Cross sections, substrate analysis, and photographs show a narrowing and deepening of the channel with improved bank stability, decreased fine sediment, and improved vegetative cover (Figure 3). Population monitoring shows an increased abundance of Arctic grayling, eastern brook trout, and burbot since the project began in 2003. In 2003, grayling utilizing this reach of Steel Creek were all YOY (N=3) whereas in 2008, 35% were YOY (N=16) and 65% were age 1+ (N=31) indicating improved habitats (pools) for older age grayling (Table 1).

In 2008, numerous conservation projects were implemented to address the four conservation actions outlined in the CCAA to: 1) Improve instream flows, 2) Improve riparian and channel function, 2) Reduce and eliminate entrainment and 4) Improve fish passage.

Projects completed in 2008 include 25 miles of riparian fencing, 9 miles of stream restoration, 14 stock water systems, 3 irrigation diversions, and a weed management project. (These projects do not include NRCS irrigation improvements or fish ladders). The total number of projects that have been completed include 73 miles of

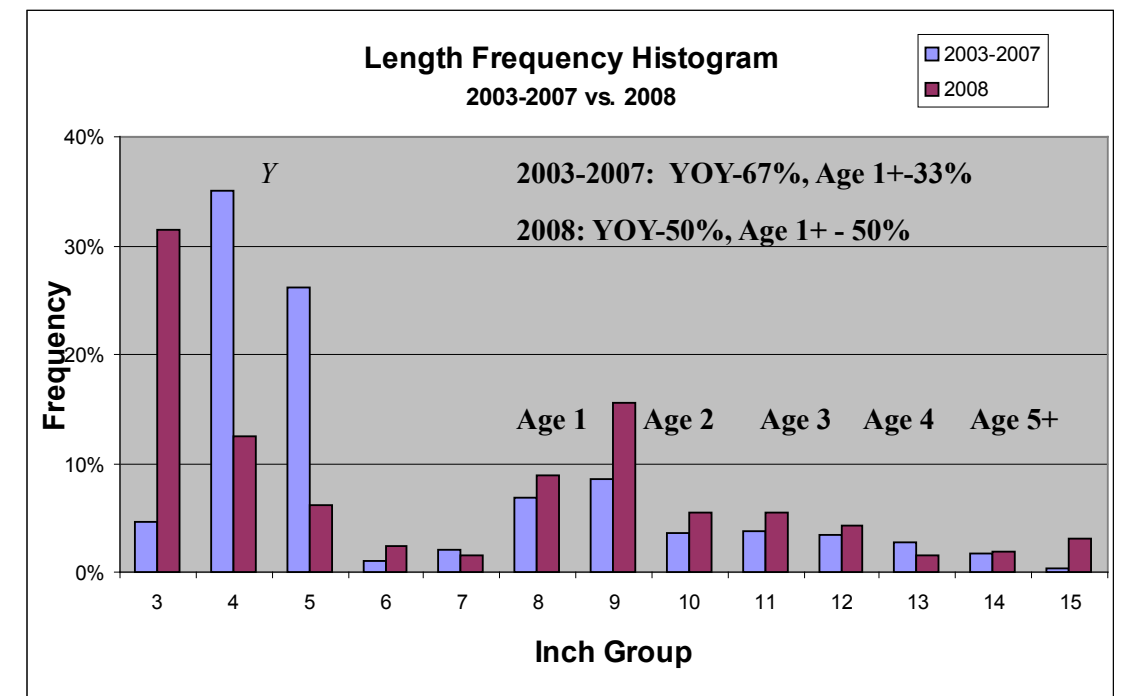


Figure 2. Length Frequency Histogram of Big Hole Arctic grayling from 2003-2007 and in 2008 from Montana Fish, Wildlife and Parks fall electrofishing surveys.

Parameter	2005	2008
Width/Depth Ratio	21.2	19.8
% Fines Pools	14 %	7%
D50	48.5 mm	48.5 mm
D Max	3.46 ft	3.73 ft
EBT > 8"/Mile	23.6/mile	94.5/mile
Burbot	13.5/mile	15.6/mile
Grayling	1.0/mile	13.5/mile
YOY Grayling	3	16
Grayling 7+"	0	31

Table 1. Steel Creek Restoration Project habitat and substrate parameters and number of Arctic grayling, eastern brook trout, burbot, captured in Montana Fish, Wildlife and Park's fall electrofishing surveys in 2005 and 2008.



Figure 3. Steel Creek Cross section in fall, 2006 and fall, 2008

riparian fencing, 17 miles of stream restoration, 47 stock water systems, 20 irrigation improvement projects (not including NRCS projects), and 9 fish ladders (not including NRCS projects). (Figure 5).

Additional projects are scheduled for 2009 including 25 miles of riparian fence (North Fork, Warm Springs Creek, Miner Creek, Fishtrap, mainstem Big Hole), stream restoration (Swamp Creek, Schindler, Wisdom Bank, North Fork car removal project), designs for Big Lake Creek and North Fork restoration, and fish screens on two sites on the North Fork. Other projects will include stock water systems, irrigation infrastructure measuring devices and a noxious weed management project.

I would like to thank the numerous partners that have joined together to implement this watershed scale restoration effort which include the Big Hole landowners, the Big Hole Watershed Committee, the Agencies (MFWP, DNRC, NRCS, USFWS, BLM, USFS, BOR), the Arctic Graying Recovery Program, The Nature Conservancy, Trout Unlimited, the Big Hole River Foundation, University of Montana Western, The Avian Science Center, Montana Water Trust, and Ditchrider, Jim Boetticher.

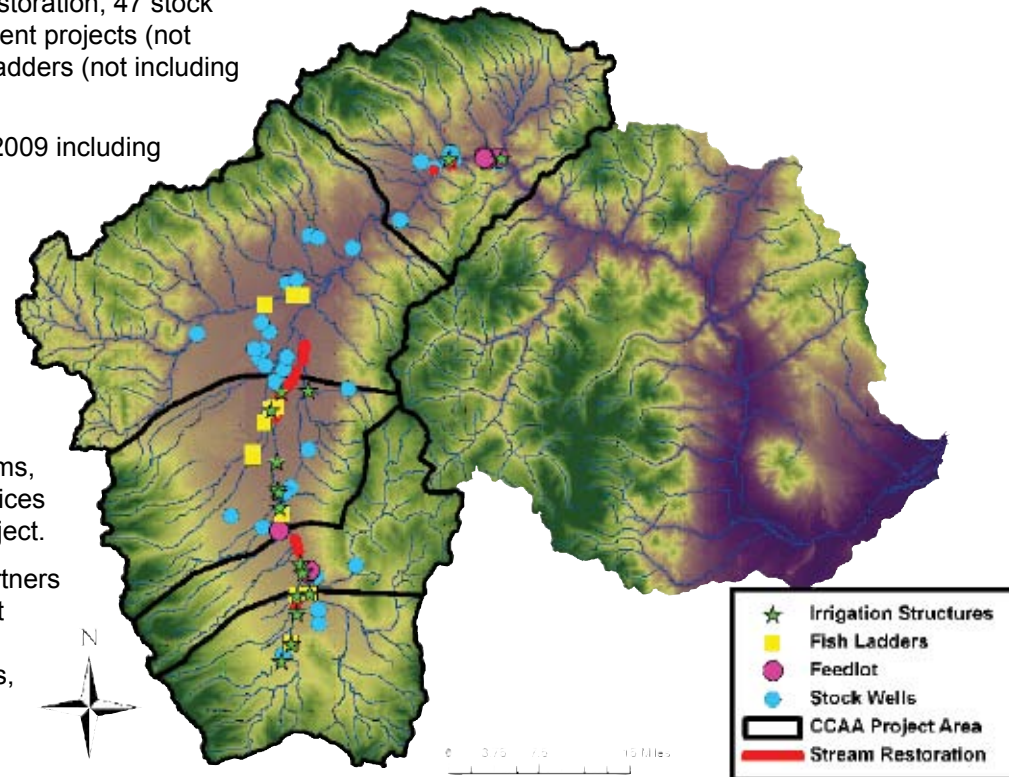


Figure 5. Big Hole habitat improvement projects implemented through the CCAA program to address conservation needs for Arctic grayling. Projects include 20 irrigation structure improvements, 9 fish ladders, 47 stock water systems, 17 miles of stream restoration, and 73 miles of riparian fence. Map does not include projects implemented through the NRCS.

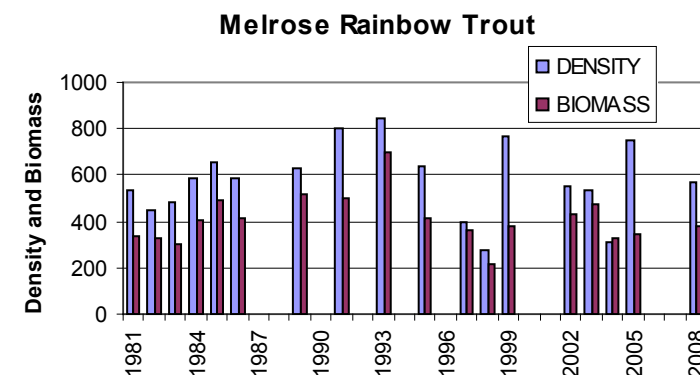
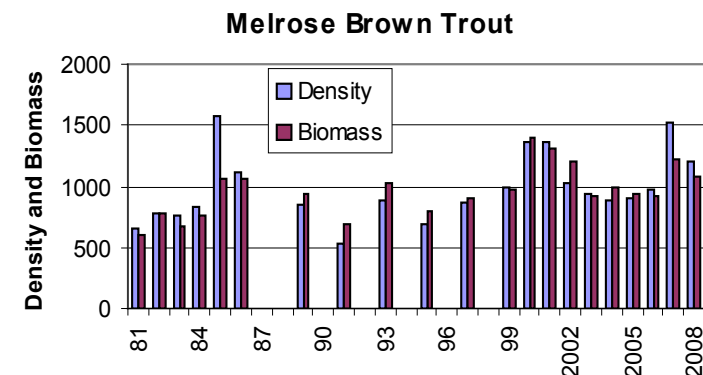
STATE OF THE BIG HOLE FISHERY

by Jim Olsen, MFWP Fisheries Biologist, Big Hole River

2008 marked the first average - or near average - water year in the Big Hole in the past 10 years. A healthy snowpack as well as average, and even below average, spring temperatures caused the snowpack and runoff to extend well into June. Despite a relatively dry summer, river flows stayed at - or near - average for most of the summer and there were no drought related fishing closures. This was a very welcomed event after the many years of dry conditions. It is still too soon to tell how the fish responded to the average water year because most of the potential effects on the fish won't be apparent until the

2009 data are analyzed.

In 2008 four sections of the Big Hole River were surveyed and trout populations were estimated. Brown and rainbow trout estimates were performed in the Melrose section (between Salmonfly and Brown's Bridge) in the spring and fall. The population estimate for brown trout in the Melrose section was 1,198 fish/mile, which was above the long-term average of 985 (Figure 1). An excellent crop of 2-year-olds sampled initially in 2007 has recruited well to age 3 fish (13-16 inches) and currently form the bulk of the brown trout population.



Similarly, good recruitment of rainbow trout in 2005 and 2006 has led to good numbers of 12-15 inch rainbows in this section. Whirling disease continues to impact the rainbow trout population in this section of the river; however, clinical signs of the disease in surviving fish (i.e., cranial deformities) appear to be less common than in years past. In 2008, whirling disease testing occurred throughout the drainage from the Pennington Bridge to Wisdom, but the results from that study are not yet available.

Because there was no drought related fishing closure on the Big Hole in 2008, a rainbow trout population estimate was performed in the Jerry Creek Section (from Jerry Creek to Dewey) for the first time in 3 years. The rainbow population was estimated to be 2,221 fish/mile, which was slightly above the long-term average of 1719. Similar to Melrose, a strong age class of 1 year olds in 2006 has grown and now forms the bulk of the rainbow trout population as 3 year olds ranging in size from 12-15 inches. Although many brown trout are resident in this section of river, a brown trout estimate has not been performed. In addition to rainbow and brown trout, Jerry Creek is a unique section of river due to populations of Arctic grayling, Westslope cutthroat trout, and brook trout. Starting in 2010, a spring estimate of brown trout in the Jerry Creek section will be performed on a biannual basis.

The brown trout population from the Hogback Section (between Glen and the Notch) was estimated at 559 fish/mile in 2008. Unlike the trout in the Melrose and Jerry Creek sections, which do not appear to show any marked changes in the fish population during the drought, the trout in the Hogback section have experienced a marked decline since the late 1990's. Total brown trout numbers and biomass in the Hogback

Section averaged well over 1,000 per mile in the mid to late 1990's, but through the last 10 dry years the fish population has been reduced by 1/2. Although it has not been extensively studied, it is likely that the significant ground water inputs to the Big Hole at Wise River and the buffering effects on flow and temperature of the canyon sections of the river affect the stability of the fish population in the Jerry Creek and Melrose sections. Lower in the river, where flows are less and temperatures are greater, appears to be where impacts to the fish population are more noticeable.

Beginning in 2009, a new population monitoring section was established from Pennington Bridge to High Road Bridge (Pennington Section). This section of river was rarely surveyed in the past, yet has good trout habitat.

Although fish population parameters are not yet available, rainbow and brown trout densities through this reach of river are low. An estimate was made on the numbers of mountain whitefish, the most abundant species in this reach of river. This is the only mountain whitefish estimate performed on the Big Hole. This section was established to monitor the changes in fish populations with changes in water conditions from year to year. In addition to this new section, portions of the Wise River are slated to be surveyed this summer to better understand the fish population in that stream and its importance to the mainstem Big Hole as a spawning and rearing stream.

Jim Hagenbarth completed a substantial irrigation infrastructure improvement project between Melrose and Glen. As part of the diversion structure, he paid to have fish ladders installed, which would allow fish entrained in the ditch during the summer the ability to migrate back to the river later in the fall once the headgate was closed. Prior to the improvements in 2007, the system was surveyed in the fall to determine the number of fish left in the ditch once the headgate was closed. Over 170 brown trout were captured in the ditch and returned to the Big Hole. In 2008, after the ditch improvements were made and the fish ladder was installed only 98 brown trout were captured in the ditch, most of which were 'young of the year' fish, less than 6 inches long, and located immediately

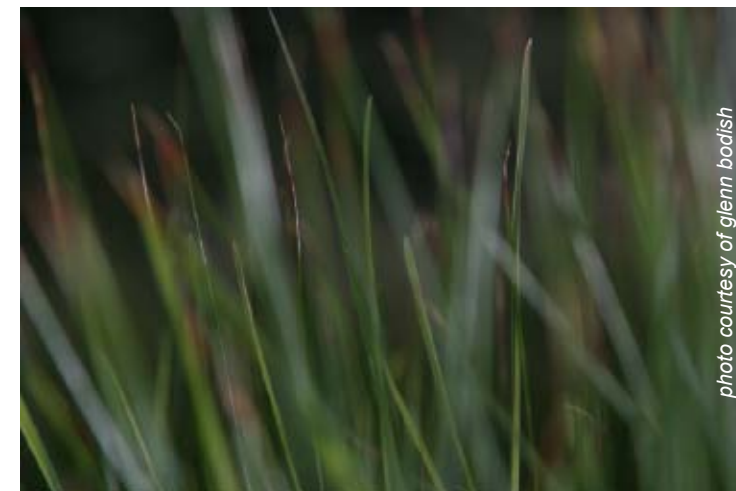


photo courtesy of glenn bodish

below the headgate. The fish that remained in the ditch had easy access back to the river and would have likely moved back to the river as temperatures cooled. The total fish loss in the ditch as a result of the fish ladder was potentially reduced by nearly 50%. The fish ladder requires very little maintenance, has no moving parts, and cost around \$4,000. Further study on the efficacy of the fish ladder is planned for the fall of 2009.

The rumors that you have probably heard about Dick Oswald are true. After threatening for many years, it looks like he will be officially entering the ranks of the retired early this summer. As MFWP Southwest Montana Fisheries Biologist, Dick has performed a tremendous service for all the folks of southwest Montana who enjoy its fisheries resources. His science-minded approach to fisheries management and his tenacious attention to thoroughness and detail, whether in the field or out inspecting stream related projects, has earned him a reputation as one of the top resource-minded biologists in the state. If you happen to see Dick out and about, give him a pat on the back and tell him **thanks** for his dedication to the fish and people of the Big Hole and surrounding waters. "Dick, we all hope you enjoy retirement!"

Big Hole River Drought Management Plan

The Big Hole Watershed Committee

Adopted 1997

(Amended 1999, 2000, 2002, 2004, 2005, 2007, 2008)

Purpose

The purpose of the drought management plan is to mitigate the effects of low stream flows and lethal water temperatures for fisheries (particularly fluvial Arctic grayling) through a voluntary effort among agriculture, municipalities, business, conservation groups, anglers, and affected government agencies.

Overview

The Big Hole Watershed Committee has agreed on this dry year plan to help mitigate damage to the fishery during dry years as indicated by flows and temperature. This plan has been designed to take into full account the interests of all affected parties including ranching, municipalities, anglers, and conservation groups.

The Big Hole Watershed Committee agrees that if this plan is to be successful in a dry year, it will need broad-based support and understanding. Big Hole Committee members are committed to helping secure the support of their constituencies for the successful implementation of this plan.

This initial plan is intended as a starting point from which modifications can be made based on the lessons learned from research projects, such as the Big Hole Watershed Committee's return flow study, increased information from new river gauges, and from the experiences gained by implementing this plan. The plan will be reviewed by the Big Hole Watershed Committee every January for modifications.

Definition of Dry Year Conditions and Recommended Actions

The Big Hole Watershed Committee will monitor snow pack levels and forecasted low stream level information provided by the USGS and NRCS throughout the year to prepare for potential water conservation measures. Stream flow information gathered from the USGS Wisdom, USGS Mudd Creek, USGS Melrose, and USGS Glen gauging stations will be used to initiate specific voluntary actions to conserve water and mitigate the effects of dry year conditions on fisheries from May 1 through October 31.

Roles and Responsibilities

Big Hole Watershed Committee roles:

- ❖ Educate interested and affected parties;
- ❖ Develop, adopt, and modify annually the dry year plan;
- ❖ Receive, monitor, and act on information regarding stream conditions and snow pack levels throughout the year;
- ❖ Notify interested and affected parties of implementation and secure support; and
- ❖ Evaluate the environmental, social, and economic impact of the plan.

Montana Fish, Wildlife and Parks (MFWP), Montana Department of Natural Resources and Conservation (DNRC), and the United State Natural Resource Conservation Service (NRCS) roles;

- ❖ Provide accurate and timely information regarding stream conditions and snow pack levels throughout the year;
- ❖ Provide technical assistance in reviewing the plan and monitoring its implementation; and
- ❖ Ensure coordination of effort among all affected government agencies.
- ❖ *Contacts and informs media of dry year plan implementation and stream flow and temperature status.*

The following flow targets take into consideration preparation time necessary to implement this voluntary plan. The annual evaluation of the effectiveness of the dry year plan will provide information to more intensively analyze the minimum in stream flows necessary to sustain adequate habitat quality and buffer water temperatures.

I. Rock Creek Road to Mouth of the North Fork

Flow Monitored at the USGS Wisdom Gauge

160 cfs May 15 – June 30. When flows decrease below 160 cfs a phone tree will be used to contact water users advising of flow conditions and encouraging conservation measures.

60 cfs DNRC and MFWP officials will meet with the Big Hole Watershed Committee to present data; formulate options including voluntary reduction of irrigation, stock water diversions, municipal water use, angling, and encourage the use of stock watering wells; and prepare to take action. A phone tree is initiated to advise water users, outfitters, and anglers of low water conditions and encourage conservation measures.

40 cfs Notice to outfitters and anglers requesting they voluntarily limit their angling activities to earlier, cooler hours of the day. Well use will be encouraged for stock watering. A phone tree will advise water users and outfitters of low water conditions and encourage conservation measures. The media will be contacted and news articles released to inform publics of low flow conditions.

20 cfs FWP will close the upper river to fishing, MFWP will close the upper river to fishing, and will not conduct electrofishing surveys (subject to approval or change by the Fluvial Grayling Workgroup). Voluntary reduction of irrigation and public municipal water use is initiated, and continued well use for stock watering encouraged. The phone tree is again initiated to contact water users advising of extreme low water conditions and encourage conservation measures. The media is contacted and informed of fishing closures and encourages public conservation efforts. The river remains closed until flows exceed 40 cfs for seven consecutive days.

Note: Definition: Flow trigger levels will be based on the Average Daily Flow measured in cubic feet per second (cfs). Therefore, flows will be reviewed the following day to determine trigger levels and fishing closures.

Temperature July 15-September 1:

Step 1 When temperatures exceed 70°F for over 8 hours per day for three consecutive days at the USGS Wisdom gauge and flows are above 30 cfs, a phone tree is used to contact outfitting businesses and a news release is issued advising publics and anglers of potential stressful conditions to the fishery and encouraging anglers to seek other destinations (mountain lakes and streams, spring creeks).

Step 2 When flows are 25-30 cfs at the USGS Wisdom gauge and temperatures exceed 70°F for more than 8 hours per day for three consecutive days, and evidence of thermally induced stress to the fishery occurs, MFWP will close the upper river to fishing. News releases will be issued and a phone tree will again contact local outfitting businesses. The upper river will be closed until temperatures do not exceed 70°F for more than 8 hours per day for three consecutive days and flows are greater than 30 cfs for seven consecutive days.

Step 3 When flows are 25 cfs or less at the USGS Wisdom gauge and temperatures exceed 70°F for more than 8 hours per day, for three consecutive days, MFWP will close the upper river to fishing. News releases will be issued and a phone tree will again contact local outfitting businesses. The upper river will be closed until temperatures do not exceed 70°F for more than 8 hours per day for three consecutive days and flows are greater than 30 cfs for seven consecutive days.

The wetted stream perimeter (flow below which standing crops of fish decrease (DNRC 1992)) of the upper Big Hole River is 60 cfs. While this flow may be reasonable to maintain in ample moisture years and should be the goal for flow preservation efforts, in most years it is not a realistic quantity. Data from the USGS Wisdom gauge from 1988 -1999 recorded flows below 60 cfs in each of the twelve years. Population and flow data indicate 40 cfs is feasible to maintain while still sufficient to protect the Arctic Grayling population. A minimum survival flow of 20 cfs will provide flows necessary to maintain a wetted channel and ensure survival of the grayling population during brief, critical periods.

Temperatures above 70°F are generally considered stressful to salmonids. Warm water temperatures typically occur between July 15 - September 1 in the Big Hole River. Although temperatures above 70°F can occur before and after this period, cooler night temperatures alleviate long periods of warm daytime

temperatures. The upper incipient lethal temperature (e.g. that temperature that is survivable indefinitely for periods longer than one week by 50% of the population) for Arctic Grayling is 77°F (Loher et. al. 1997). Critical thermal maximum temperature is 85°F resulting in instantaneous death.

Middle Reach to fishing. News releases will be issued and a phone/Email tree will again contact outfitting businesses. The Middle Reach will remain closed until temperatures do not exceed 70° F. for more than 8 hours per day for 3 consecutive days and flows are greater than 80 cfs for 7 consecutive days.

Reach and the Mudd Creek to Dickie Bridge Reach are met, or about to be met, these two reaches could be treated as one unit (Rock Creek Road to Dickie Bridge). The Mudd Creek Gauge has limited data (beginning in 1998). Continued data on various flow scenarios will allow better analysis of wetted perimeter and in stream flow regimes. This plan should be fine tuned or modified as needed as additional data becomes available.

II. Mouth of the North Fork to Dickie Bridge

Flow Monitored at USGS Mudd Creek Gauge

100 cfs When flows decrease to 100 cfs or temperatures exceed 70°F for over 8 hours per day for three consecutive days. DNRC and MFWP officials will meet with the Big Hole Watershed Committee to present data; formulate options including voluntary reduction of irrigation, stock water diversions, municipal water use, angling, and encourage the use of stock watering wells; and prepare to take action. A phone tree is initiated to advise water users, outfitters, and anglers of low water conditions and encourage conservation measures.

80 cfs When flows decrease to 80 cfs or temperatures exceed 70°F for over 8 hours per day for three consecutive days. Notice to outfitters and anglers requesting fishing be voluntarily limited to morning hours. Well use will be encouraged for stock watering. A phone tree will advise water users and outfitters of low water conditions and encourage conservation measures. The media will be contacted and news articles released to inform public of low flow conditions.

60 cfs When flows decrease to 60 cfs or temperatures exceed 70°F for over 8 hours per day for three consecutive days, MFWP will close the river to fishing and not conduct electrofishing surveys. Voluntary reduction of irrigation and water use is initiated. A phone tree and media releases inform water users, outfitters, angler, and public of water the continued decline of in stream flows and encourages water conservation. The river remains closed until flows exceed 80 cfs for seven consecutive days and temperatures do not exceed 70°F for more than 8 hours per day for three consecutive days.

Temperature Monitored at the Sportsman's Park Thermograph Site (July 15 – September 1)

Step 1 When Temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days at the MFWP Sportsman's Park Thermograph and flows exceed 90 cfs at the USGS Mudd Creek Gauge, a phone/Email tree is used to contact outfitting businesses and a news release is issued advising publics and anglers of potential stressful conditions to the fishery and encouraging anglers to seek other destinations (reservoirs, mountain lakes and streams, spring creeks, etc.).

Step 2 When flows are 70 – 90 cfs at the USGS Mudd Creek Gauge and temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days, and evidence of thermally induced stress to the fishery occurs*, MFWP will close the Middle Reach to fishing. News releases will be issued and a phone/Email tree will again contact local outfitting businesses. The Middle Reach will remain closed to fishing until temperatures do not exceed 70° F. for more than 8 hours per day for 3 consecutive days and flows are greater than 80 cfs for 7 consecutive days.

Note: Thermally induced stress as observed by trained, experienced observers may include any of the following: Observed mortality in significant numbers of Age I and older mountain whitefish and other salmonid species in lieu of other logical sources of mortality; Outbreaks of stress related piscid diseases such as Bacterial Furunculosis; Extraordinary concentrations of fish in thalweg or riffle tailout habitats; Hyperactivity to include gasping, rolling, jumping, etc., of large, concentrated numbers of fish; and frenzied feeding activity at inappropriate times and under inappropriate conditions.

Step 3 When flows are 70 cfs or less at the USGS Mudd Creek Gauge and temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days, MFWP will close the

Note: In years with clear-cut drought conditions under which triggers in both the Rock Creek to Mudd Creek

III. Dickie Bridge to Melrose Bridge

Flow Monitored at USGS Melrose Gauge

250 cfs DNRC and MFWP officials meet with Big Hole Watershed Committee to present data; formulate options including the voluntary reduction of irrigation, municipal water use, and angling; and prepare to take action. A phone tree is initiated to advise irrigators and outfitters of stream flow conditions.

200 cfs Notice to outfitters and anglers requesting they voluntarily limit their angling activities to earlier, cooler hours of the day. The phone tree will inform local water users, anglers and outfitters of stream flow conditions.

The media will be contacted and news articles released to inform public of low flow conditions.

150 cfs FWP will close the river to fishing and not conduct electrofishing surveys. Voluntary reduction of irrigation and water use is initiated. A phone tree and media releases inform water users, outfitters, anglers, and public of the continued decline of in stream flows and encourages water conservation. The river will remain closed until flows exceed 200 cfs for seven consecutive days.

Temperature triggers are the same as previous Reach.

IV. Melrose Bridge to confluence with the Jefferson River

Flow Monitored at USGS Glen Gauge

250 cfs DNRC and MFWP officials meet with Big Hole Watershed Committee to present data; formulate options including the voluntary reduction of irrigation, municipal water use, and angling; and prepare to take action. A phone tree is initiated to advise irrigators and outfitters of stream flow conditions.

200 cfs Notice to outfitters and anglers requesting they voluntarily limit their angling activities to earlier, cooler hours of the day. The phone tree will inform local water users, anglers and outfitters of stream flow conditions. The media will be contacted and news articles released to inform public of low flow conditions.

150 cfs FWP will close the river to fishing and not conduct electrofishing surveys. Voluntary reduction of irrigation and water use is initiated. A phone tree and media releases inform water users, outfitters, anglers, and public of the continued decline of in stream

flows and encourages water conservation. The river will remain closed until flows exceed 200 cfs for seven consecutive days.

Temperature Monitored at the MFWP Notch Bottom Thermograph Site (July 15 – September 1)

Step 1 When Temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days at the MFWP Notch Bottom Thermograph and flows exceed 230 cfs at the USGS Glen Gauge, a phone/Email tree is used to contact outfitting businesses and a news release is issued advising publics and anglers of potential stressful conditions to the fishery and encouraging anglers to seek other destinations (reservoirs, mountain lakes and streams, spring creeks, etc.).

Step 2 When flows are 180 – 230 cfs at the USGS Glen Gauge and temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days, and evidence of thermally induced stress to the fishery occurs*, MFWP will close the Melrose to the Mouth Reach

Chronological Listing of Amendments

to fishing. News releases will be issued and a phone/Email tree will again contact local outfitting businesses. The Melrose to the Mouth Reach will remain closed to fishing until temperatures do not exceed 70° F. for more than 8 hours per day for 3 consecutive days and flows are greater than 200 cfs for 7 consecutive days.

Note: Thermally induced stress as observed by trained, experienced observers may include any of the following: Observed mortality in significant numbers of Age I and older mountain whitefish and other salmonid species in lieu of other logical sources of mortality; Outbreaks of stress related piscid diseases such as Bacterial Furunculosis; Extraordinary concentrations of fish in thalweg or riffle tailout habitats; Hyperactivity to include gasping, rolling, jumping, etc., of large,

Notification and Monitoring Process

Montana, Fish, Wildlife and Parks and Montana Department of Natural Resources and Conservation Service will keep the Big Hole Watershed Committee fully informed throughout the year regarding stream flows, water temperature, and snow pack data. This will allow for timely information to help in encouraging appropriate courses of action.

Stream conditions, water temperature, and snow pack levels will be a standing agenda item at each Big Hole Watershed Committee meeting. Based on the year long monitoring of weather conditions that may influence flow, the Big Hole Watershed Committee will publish a notification of impending dry year conditions. Notifications will be sent to the press, ranchers, municipalities, outfitters, conservation and sportsmen groups, and posted on the "world wide web".

While most attention is on late summer conditions, it is crucial to certain species, including Fluvial Arctic Grayling, that spring flows are closely monitored.

The BHWC will issue weekly updates to irrigators during drought periods. Weekly updates will be provided in hard

Public Education

The BHWC will develop and distribute educational material with agency assistance, describing the need for a drought management plan, its provisions, and anticipated benefits.

Information will be provided on the possible actions people can take to mitigate damage from dry years including but not limited to:

- ❖ Voluntary reduction of irrigation and diversion stock watering during critical times;
- ❖ Increase flood irrigation during spring runoff to augment return flows;

concentrated numbers of fish; and Frenzied feeding activity at inappropriate times and under inappropriate conditions.

Step 3 When flows are 180 cfs or less at the USGS Glen Creek Gauge and temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days, MFWP will close the Melrose to the Mouth Reach to fishing. News releases will be issued and a phone/Email tree will again contact outfitting businesses. The Middle Reach will remain closed until temperatures do not exceed 70° F. for more than 8 hours per day for 3 consecutive days and flows are greater than 200 cfs for 7 consecutive days.

copy, electronic mailings and on the BHWC web site. In non-drought periods the BHWC will issue regular updates as needed.

The BHWC will work with MFWP on press releases and other public outreach efforts. The BHWC will work with local newspapers and televisions to secure flow updates in these communication mediums.

The BHWC will issue an annual update in the form of a mailing (hard copy and electronic) which will include: a copy of the most recent Drought Management Plan, flow forecasting, updates on water conservation programs and assistance, and other related news items.

Montana Fish, Wildlife and Parks will offer assistance to irrigators who are willing to cut back on water diversions. The BHWC will hold an open public meeting to present the information and conduct discussions with all parties concerning proposed actions.

Each caucus within the BHWC will communicate with their respective groups concerning implementation of the plan and secure support.

- ❖ Water conservation policies by municipalities and industries during sensitive times;
- ❖ Emergency water reduction policies by municipalities and industries during critical times;
- ❖ Reduced recreation uses during sensitive times; and
- ❖ Elimination of fall recreation uses at critical times.

Addendum 2002

Definition

Flow trigger levels will be based on the Average Daily Flow measured in cubic feet per second (cfs). Therefore, flows will be reviewed the following day to determine trigger levels and fishing closures.

Addendum 2002

Publicity

It is recognized that flow levels, forecasting and angling closures affect local businesses and residents. Whenever possible, maps and specific locations will be included in press releases and other communications (MT FW&P website).

Addendum 2004

Publicity and Outreach

The BHWC will issue weekly updates to irrigators during drought periods. Weekly updates will be provided in hard copy, electronic mailings and on the BHWC web site. In non-drought periods the BHWC will issue regular updates as needed.

The BHWC will work with MFWP on press releases and other public outreach efforts. The BHWC will work with local newspapers and televisions to secure flow updates in these communication mediums.

The BHWC will issue an annual update in the form of a mailing (hard copy and electronic) which will include: a copy of the most recent Drought Management Plan, flow forecasting, updates on water conservation programs and assistance, and other related news items.

Addendum 2004

May 15- June 30 Wisdom Reach Flow Levels

(J. Magee MFWP)

Upper Reach:

160 cfs May 15 – June 30. When flows decrease below 160 cfs a phone tree will be used to contact water users advising of flow conditions and encouraging conservation measures.

20 cfs MFWP will close the upper river to fishing, and

will not conduct electrofishing surveys. (Subject to approval or change by the Fluvial Grayling Workgroup)

Rationale:

1) The upper and lower wetted perimeter inflection points for the upper Big Hole River are 160 and 60 cfs respectively (MFWP 1989). The upper inflection point is the flow required to maximize standing crop. While this flow may not be realistic in most years it should be the target goal for conservation measures. Maintaining this flow during grayling spawning and emergence in May and June will enhance survival and recruitment. Reduction of wetted perimeter is accelerated below the lower inflection point of 60 cfs. The flow goal for late summer and fall should be to maintain flows at 60 cfs or greater to avoid accelerated losses in standing crop. A minimum survival flow of 20 cfs will provide flows necessary to maintain a wetted channel, allow for migration into flow and temperature refugia and allow survival of some portion of the population during brief, critical periods.

2) Montana Fish Wildlife and Parks will not conduct electrofishing survey in the Wisdom West reach (Wisdom bridge downstream approximately 5 miles) if flows are less than 20 cfs and maximum daily temperatures are greater than 64°F.

Addendum 2004

Thermal Series for the Middle Reach

(R. Oswald, MFWP)

Rationale: Last summer, we encountered extremely high water temperatures at the Sportsman's Park Thermograph (MFWP) in the Middle Reach. These temperatures often exceeded our Upper Reach Drought Plan standard of 70° F for more than 8 hours per day for 3 consecutive days. When we consulted the Drought Plan, we found a somewhat contradictory set of standards at the 3 triggers. That is, each flow trigger (100, 80, and 60 cfs) contained the same default thermal statement, i.e., "*or temperatures exceed 70° F for over 8 hours per day for 3 consecutive days.*" This left us with a situation in which the river would have closed to angling at any time we encountered the temperature standard at 100 cfs or less. Moreover, the only standard for reopening the river following closure was linked to seven consecutive days of flows greater than 80 cfs. Thus thermal closure at flows less than 80 cfs would have required the same reopening criteria as flows below 60 cfs. The alternative of changing "or" to

“and” in the thermal series also didn’t work because that would have rendered any temperature considerations redundant as the drought response actions would have defaulted to the flow triggers. In order to cope with the problem, we (MFWP) merely monitored key segments of the reach for biological indicators of thermal stress.

In order to eliminate this problem in the future, I have drafted the following proposed Thermal set of Triggers for the Middle Reach. The set of Triggers parallels the series currently applied to the Upper Reach.

Temperature (July 15 – September 1)

Step 1 When Temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days at the MFWP Sportsman’s Park Thermograph and flows exceed 90 cfs at the USGS Mudd Creek Gauge, a phone/Email tree is used to contact outfitting businesses and a news release is issued advising publics and anglers of potential stressful conditions to the fishery and encouraging anglers to seek other destinations (reservoirs, mountain lakes and streams, spring creeks, etc.).

Step 2 When flows are 70 – 90 cfs at the USGS Mudd Creek Gauge and temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days, and evidence of thermally induced stress to the fishery occurs*, MFWP will close the Middle Reach to fishing. News releases will be issued and a phone/Email tree will again contact local outfitting businesses. The Middle Reach will remain closed to fishing until temperatures do not exceed 70° F. for more than 8 hours per day for 3 consecutive days and flows are greater than 80 cfs for 7 consecutive days.

* Thermally induced stress as observed by trained, experienced observers may include any of the following: Observed mortality in significant numbers of Age I and older mountain whitefish and other salmonid species in lieu of other logical sources of mortality; Outbreaks of stress related piscid diseases such as Bacterial Furunculosis; Extraordinary concentrations of fish in thalweg or riffle tailout habitats; Hyperactivity to include gasping, rolling, jumping, etc., of large, concentrated numbers of fish; and Frenzied feeding activity at inappropriate times and under inappropriate conditions.

Step 3 When flows are 70 cfs or less at the USGS Mudd Creek Gauge and temperatures exceed 70° F. for more than 8 hours per day for 3 consecutive days, MFWP will close the Middle Reach to fishing. News releases will

be issued and a phone/Email tree will again contact outfitting businesses. The Middle Reach will remain closed until temperatures do not exceed 70° F. for more than 8 hours per day for 3 consecutive days and flows are greater than 80 cfs for 7 consecutive days.

Addendum 2005

Voluntary Angling Limits

(R.Oswald, MFWP)

Modify the Second Trigger language to request anglers “voluntarily limit their angling activities to earlier, cooler hours of the day”.

Rationale: It does not necessarily make sense to limit angling to morning hours when some days, differing climatic conditions and flow regimes result in high water temperatures well before noon while other days exhibit cool water temperatures well into the early afternoon. This approach sends the message to consider the temperature and time of day as diminishing flows compound stress on the system.

Addendum 2007

Proposal to replace original language in the Drought Plan with the accepted Amendments.

Rationale: The current format of the Drought Plan is confusing. The initial read lists criteria that are no longer in affect and the Amendments in the back appear to contradict the Plan.

Recommendation: The original language of the Plan should be replaced by the current appropriate Amendments. Maintain the list of Amendments in the back of the Plan to maintain the history and reasoning behind the changes.

Addendum 2007 (a)

Split the lower reach into two reaches and incorporate a thermal series into the new lower reach (R. Oswald, MFWP)

Rationale: The present reach from Dickie Bridge to the mouth is 71 miles in length and spans a very wide range in flows, species composition, and thermal regime. A single set of triggers often spans a flow range of 200 cfs or more and temperature ranges of 8 degrees

or more. Moreover, trout species domination from approximately Melrose downstream favors brown trout which data show to be more severely affected by low flows than rainbow trout which increase in dominance upstream from Melrose.

Recommendation: Split current reach from Melrose Bridge (Salmon Fly Fishing Access) (about 33 miles downstream and 38 miles upstream) into the Dickie Bridge to Melrose Bridge Reach and the Melrose Bridge to the Confluence with the Jefferson River Reach. In the Melrose Bridge to Mouth Reach, maintain original flow triggers generated below the WETP Minimum Flow. Return Dickie Bridge to Melrose Bridge Reach to original 1994 calculations of 260 -200 -140 cfs (see Addendum 2007(b)). Incorporate a series of Thermal Triggers similar to those in place for the upper reaches of the river to be measured at MFWP Thermographs at Notch Bottom and at *Melrose Gauge*.

***Consider adding an additional component for PM closure under any flows below 260 cfs when temperatures at Notch Bottom or Pennington Bridge exceed 72 degrees for more than 8 hours per day for 3 consecutive days with lifting of closure when daily temperatures do not exceed 70 degrees for more than 8 hours per day for at least 3 consecutive days.

Addendum 2007 (b)

Return Dickie Bridge to Melrose Bridge Reach Flow Triggers to original 1994 calculations of 260 – 200 –140 cfs

(R. Oswald, MFWP).

The original triggers were generated from MFWP WETP Minimum Flow (and Instream Flow Reservation) of 260 cfs which represents a 40% depletion of wetted perimeter from the Upper Inflection Point Flow of 60 cfs. The original closure trigger was calculated to be 140 cfs, representing an additional 21% depletion in Wetted Perimeter from the minimum and closely approximating the August 95% Exceedence flow at the USGS Melrose Gauge. The second stage trigger represents the mid-point between the Upper and Lower Trigger Flows. Dropping the Stage 3 Closure Trigger from 150 to 140 cfs represents an additional loss in Wetted Perimeter of 5 feet and 4% of the total 21% depletion from the 260 cfs minimum. This would maintain a better biologically defensible base for the triggers and bring the Stage 3 (Closure) Trigger into compliance with current MFWP statewide Drought Policy.

Recommendation: Adjust the Dickie Bridge to Melrose Bridge Reach Triggers as recommended.

Addendum 2008

Dickie Bridge to Melrose Reach: Reassign Official Plan USGS Gauge Site from Melrose to Maiden Rock and adjust Flow Plan Triggers back to ADF’s of 250, 200, and 150 cfs with Angling re-opening trigger at 7 Consecutive Days at ADF’s at or above 200 cfs.

(R.Oswald and J. Olsen, MFWP)

Rationale: In 2007, the DMP was modified to establish two new management reaches within the old Lower Reach. The Dickie Bridge to Melrose reach was established in recognition of improvements in streamflow and thermal conditions over surrounding reaches as a result of significant tributary input. BHWC obtained funding to re-establish the USGS Maiden Rock Gage Site commencing in Water Year 2008. This Gage site is within the treatment reach and more accurately reflects improved streamflows within the reach. Prior operation of the gage and last year’s DNRC flow measurements indicate that the reach rarely declines below 175 cfs and largely maintains flows above 200 cfs within the Wise River to Melrose reach. Because flow triggers last year were predicated on readings outside the treatment reach, we recommend that the original DMP reach triggers of ADF’s of 250, 200, and 150 cfs be re-established for the DMP actions.

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Montana Drought Monitoring

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Internet Resources

Drought Report

<http://www.nris.state.mt.us/drought>

USGS Real Time Flow Data

<http://waterdata.usgs.gov/mt/nwis/current?type=flow>

NRCS Snowpack Monitoring

<http://www.wcc.nrcs.usda.gov/snow/>

Montana Fish, Wildlife & Parks Closure Policy

<http://www.fwp.state.mt.us/drought/closurepolicy.asp>

<http://www.fwp.state.mt.us/drought/default.asp>



photo courtesy of glenn bodish

