

Big Hole River Drought Management Plan

The Big Hole Watershed Committee

Adopted 1997

(Amended 1999, 2000, 2002, 2004, 2005, 2007, 2008, 2012, 2012V2)

Purpose

The purpose of the Drought Management Plan (DMP) 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 to this DMP to help mitigate impacts to fish populations 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 the DMP is to be successful, 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 gages, and from the experiences gained by implementing this plan. The DMP will be reviewed by the Big Hole Watershed Committee every January and modified as needed..

Roles and Responsibilities

Big Hole Watershed Committee roles:

- ❖ Educate interested and affected parties;
- ❖ Develop, adopt, and modify annually the DMP;
- ❖ 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.

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 Maiden Rock, USGS Melrose, and USGS Glen gaging stations will be used to initiate specific voluntary actions to conserve water and mitigate the effects of dry year conditions on fish populations from **May 1 through October 31, unless otherwise noted.**

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

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

Note: MFWP has a statewide Drought Plan that is referenced within several trigger descriptions. The MFWP reaches referenced for fishing closures are "Upper River", "Middle River" and " Lower River." The DMP has broken the lower reach into two reaches Dickie Bridge to Melrose and Melrose to the Mouth. These two reaches have the same low flow trigger s and will be referred to as A and B respectively. See the MFWP Drought Plan here: <http://fwp.mt.gov/news/drought/closurepolicy.html>

I. Upper Reach: ROCK CREEK ROAD TO MOUTH OF THE NORTH FORK OF THE BIG HOLE RIVER

Note: Unique to the upper and middle reaches of the Big Hole River is the implementation of the Candidate Conservation Agreement with Assurances (CCAA) for grayling restoration. While this program is in place, DNRC and MFWP will be responsible for contacting water users to engage in water conservation measures in response to the flow triggers specified for this reach. All other facets of this plan, including contacting outfitters, sportsmen, and the media, will be implemented as described below. For more information on the CCAA visit http://www.fws.gov/mountain-prairie/species/fish/grayling/CCAA_June2006.pdf.

Flow: *May 1 - October 31*

Monitored at the USGS Wisdom Gage: "Big Hole River bl Big Lake Cr at Wisdom", Number 06024450

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|---------|--|
| 160 cfs | <i>May 15 - June 30.</i> When flow decreases below 160 cfs DNRC and MFWP will contact water users advising of flow conditions and encouraging conservation measures. This target is specific to the CCAA goal of maintaining spawning and rearing flow requirements for Arctic grayling. |
| 60 cfs | <i>July 1 – October 31</i>
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. DNRC and MFWP will contact water users. A phone tree is initiated to advise 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. DNRC and MFWP will contact waterusers. A phone tree will advise 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 | MFWP will close the Upper River to fishing according to the <u>MFWP Drought Plan</u> , 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. DNRC and MFWP will 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. |

Temperature

Monitored at the USGS Wisdom Gage: "Big Lake Creek at Wisdom", Number 06024450

- Step 1 When water temperature exceeds 70°F for over 8 hours per day for three consecutive days at the USGS Wisdom gage and flow is 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 flow is 25-30 cfs at the USGS Wisdom gage and water temperature exceeds 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 according to the [MFWP Drought Plan](#). News releases will be issued and a phone tree will again contact local outfitting businesses. The upper river will be closed until water temperature does 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 flow is 25 cfs or less at the USGS Wisdom gage and water temperature exceeds 70°F for more than 8 hours per day, for three consecutive days, MFWP will close the upper river to fishing according to the [MFWP Drought Plan](#). News releases will be issued and a phone tree will again contact local outfitting businesses. The upper river will be closed until water temperature does 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. Fish 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, provide connectivity to thermal or flow refugia habitats and ensure survival of the grayling population during brief, critical periods.

Water temperature above 70°F is generally considered stressful to salmonids. Warm water temperatures typically occurs between July 15 - September 1 in the Big Hole River. Although water temperature above 70°F can occur before and after this period, cooler night temperatures alleviate long periods of warm daytime temperatures. The upper incipient lethal water 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 for Arctic grayling is 85°F resulting in instantaneous death.

II. Middle Reach: MOUTH OF THE NORTH FORK OF THE BIG HOLE RIVER TO DICKIE BRIDGE

Note: Unique to the upper and middle reaches of the Big Hole River is the implementation of the Candidate Conservation Agreement with Assurances (CCAA) for grayling restoration. While this program is in place, DNRC and MFWP will be responsible for contacting water users to engage in water conservation measures in response to the flow triggers specified for this reach. All other facets of this plan, including contacting outfitters, sportsmen, and the media, will be implemented as described below. For more information on the CCAA visit http://www.fws.gov/mountain-prairie/species/fish/grayling/CCAA_June2006.pdf.

Flow: May 1 - October 31

Monitored at USGS Mudd Creek Gage: "Big Hole River bl Mudd Cr nr Wisdom, MT", Number 06024540

- 100 cfs When flow decreases to 100 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. DNRC and MFWP will contact water users. A phone tree is initiated to advise, outfitters, and anglers of low water conditions and encourage conservation measures.
- 80 cfs When flow decreases to 80 cfs the BHWC will give to outfitters and anglers requesting fishing be voluntarily limited to morning hours. Well use will be encouraged for stock watering. DNRC and MFWP will contact water users. A phone tree will advise 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 flow decreases to 60 cfs MFWP will close the Middle Reach to fishing according to the [MFWP Drought Plan](#) 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 flow and encourages water conservation. The Middle Reach closed until flow exceeds 80 cfs for seven consecutive days and water temperature does not exceed 70°F for more than 8 hours per day for three consecutive days.

Temperature

Monitored by MFWP at the Sportsman's Park Thermograph Site

- Step 1: When water temperature exceeds 70°F for more than 8 hours per day for 3 consecutive days at the MFWP Sportsman's Park Thermograph and flow exceeds 90 cfs at the USGS Mudd Creek Gage, 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 flow is 70 – 90 cfs at the USGS Mudd Creek Gage and water temperature exceeds 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 water temperature does not exceed 70°F for more than 8 hours per day for 3 consecutive days and flow is 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 flow is 70 cfs or less at the USGS Mudd Creek Gage and water temperature exceeds 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 water temperature does 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: In years with clear-cut drought conditions under which triggers in both the Rock Creek to Mudd Creek 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 Gage 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.

III. Lower River Reach A: DICKIE BRIDGE TO MELROSE BRIDGE

Flow: May 1 - October 31

Monitored at USGS Maiden Rock Gage: "Big Hole River at Maiden Rock nr Divide, MT", Number 06025250

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| 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 | MFWP will close Lower Reach A to fishing according to the MFWP Drought Plan 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 flow exceeds 200 cfs for seven consecutive days. |

Temperature

Monitored at the USGS Melrose Gage: "Big Hole River nr Melrose, MT", Number 06025500

Step 1: When water temperature exceeds 70° F. for more than 8 hours per day for 3 consecutive days and flow exceeds 250 cfs at the USGS Maiden Rock Gage, 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 flow is 150 – 200 cfs at the USGS Maiden Rock Gage and water temperature exceeds 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 Lower River Reach A to fishing according to the [MFWP Drought Plan](#). News releases will be issued and a phone/Email tree will again contact local outfitting businesses. The Lower River Reach A will remain closed to fishing until water temperature does not exceed 70°F. for more than 8 hours per day for 3 consecutive days and flow is 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, concentrated numbers of fish; and Frenzied feeding activity at inappropriate times and under inappropriate conditions.

Step 3: When flow is 150 cfs or less at the USGS Maiden Rock Gage and water temperature exceeds 70°F for more than 8 hours per day for 3 consecutive days, MFWP will close the Lower River Reach A to fishing according to the [MFWP Drought Plan](#). News releases will be issued and a phone/Email tree will again contact outfitting businesses. The Lower River Reach A will remain closed until water temperature does not exceed 70° F for more than 8 hours per day for 3 consecutive days and flow is greater than 200 cfs for 7 consecutive days.

IV. Lower River Reach B: MELROSE BRIDGE TO CONFLUENCE OF THE BIG HOLE RIVER WITH THE JEFFERSON RIVER

Flow: *May 1 - October 31*

Monitored at USGS Glen Gage: "Big Hole River near Glen, MT", Number 06026210

- 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 MFWP will close the Lower River Reach B to fishing according to the [MFWP Drought Plan](#) 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 Lower River Reach B will remain closed until flows exceed 200 cfs for seven consecutive days.

Temperature

Monitored at the MFWP Notch Bottom Thermograph Site

Step 1: When water temperature exceeds 70° F. for more than 8 hours per day for 3 consecutive days at the MFWP Notch Bottom Thermograph and flow exceeds 250 cfs at the USGS Glen Gage, 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 flow is 150 – 200 cfs at the USGS Glen Gage and water temperature exceeds 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 Lower River Reach B to fishing according to the [MFWP Drought Plan](#). News releases will be issued and a phone/Email tree will again contact local outfitting businesses. The Lower River Reach B will remain closed to fishing until water temperature does not exceed 70°F. for more than 8 hours per day for 3 consecutive days and flow is 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, concentrated numbers of fish; and Frenzied feeding activity at inappropriate times and under inappropriate conditions.

Step 3: When flow is 150 cfs or less at the USGS Glen Gage and water temperature exceeds 70°F for more than 8 hours per day for 3 consecutive days, MFWP will close the Lower River Reach B to fishing according to the [MFWP Drought Plan](#). News releases will be issued and a phone/Email tree will again contact outfitting businesses. The Lower River Reach B will remain closed until water temperature does not exceed 70° F for more than 8 hours per day for 3 consecutive days and flow is greater than 200 cfs for 7 consecutive days.

Notification and Monitoring Process

MFWP and DNRC 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 online on the BHWC website and social media sites.

While most attention is on late summer conditions, spring flows are equally important for channel maintenance, bed load and sediment movement and spawning habitat for spring and early summer spawners including Arctic grayling, rainbow trout, cutthroat trout, long nose and common suckers.

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.

MFWP and DNRC 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.

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;
- ❖ 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; Elimination of fall recreation uses at critical times.
- ❖ Encourage Big Hole and Butte watershed residents to reduce unnecessary water use including lawn watering, small irrigation systems, washing, etc.

Resources

For Information Contact:

Randy Smith BHWC Chairman 406-835-3451
Jen Titus Executive Director 406-960-4855 jtitus@bhwc.org

Other Contacts:

Montana Department of Fish, Wildlife & Parks (MFWP)
Jim Olsen Big Hole River Fisheries Biologist 406-533-8451 JimOlsen@mt.gov

Montana Department of Natural Resources & Conservation (DNRC)
Mike Roberts Hydrologist 406-444-6641 miroberts@mt.gov

Montana Drought Monitoring
406-444-5354

Internet Resources

NRIS Drought Report
<http://nris.mt.gov/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://fwp.mt.gov/news/drought/closurepolicy.html>
<http://fwp.mt.gov/news/drought/>

Big Hole Watershed Committee
<http://bhwc.org/>

Chronological Listing of Amendments

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 (MFWP 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) MFWP 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 Gage, 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 Gage 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 Gage 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 Gage*.

***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 Gage. 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 Gage 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.

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.

Addendum 2012: Add CCAA Note to Reaches I and II. Several formatting and logistical updates.

CCAA Note for reaches I and II: *Note:* Unique to the upper reaches of the Big Hole River is the implementation of the Candidate Conservation Agreement with Assurances (CCAA) for grayling restoration. While this program is in place, DNRC and FWP will be responsible for contacting water users to engage in water conservation measures in response to the flow triggers specified for this reach. All other facets of this plan, including contacting outfitters, sportsmen, and the media, will be implemented as described below. For more information on the CCAA visit http://www.fws.gov/mountain-prairie/species/fish/grayling/CCAA_June2006.pdf.

Add bullet to "Public Education": Encourage Big Hole watershed residents to reduce unnecessary water use including lawn watering, small irrigation systems, washing, etc.

Update website addresses, contact information, add footer,

Two New Drought Management Sections Proposed for 2013:

1. Split Existing Melrose to Confluence to Jefferson River into two sections: Melrose to Notch Bottom and Notch Bottom to Confluence with Jefferson River.

Melrose to Notch Bottom: Keep the existing parameters and triggers for drought related management for the Melrose to Confluence with Jefferson River section. Flow monitored at USGS gage at Notch Bottom and temperature by FWP thermograph at Notch Bottom.

Notch Bottom to Confluence with Jefferson River: Establish new drought monitoring section. Flow and temperature measured USGS High Road Bridge Gage. Flow and temperature triggers and language would be the same as the existing for Melrose to Confluence with Jefferson River section. No additional data are available for instream flow recommendations for the lower river. However, only 3 perennial tributaries are present between the Melrose-Notch Section (Rock, Willow and Birch creeks) and the morphology of the river downstream of Kalsta Bridge is similar to that of the river downstream of the Notch. Therefore, we recommend the flow triggers for the Melrose to Mouth section be applied also to the proposed Notch to Mouth Section until such a time when these additional data become available. These flow triggers are 200 and 150 cfs as measured at the Highroad USGS gage.

Action: The proposed drought management change is in draft form for comment in 2012 and proposed for inclusion in 2013.

2. Wise River Drought Management Section

We proposed addition of Wise River to the Drought Management Plan for inclusion in 2013. Flow and temperature monitoring will begin 2012 and some historical data exists. In order to create triggers, we need an analysis of the wetted perimeter and initial flow and temperature data -- planned for 2012. A proposal for a Wise River Drought management section will be prepared in 2012 for comment and subsequent inclusion in 2013. Two considerations should be made when developing this section: 1. Should the Wise River DMP be separate from the Big Hole River DMP? 2. If/when the Big Hole River closes according to the DMP, does that increase pressure on Wise River? Perhaps the Wise River triggers need to be coordinated with Big Hole triggers at least somewhat.

2012V2:

After further review in June 2012, we found several additional edits that were missed in the spring 2012 review. Since these edits did not change the intention of the plan, but did clarify implementation, a second version was produced July 2012.