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Prioritizing The Upper Clark Fork River Tributaries for Instream Flow Restoration

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for Instream Flow Restoration

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ABSTRACT

Off stream uses of water in the west have left many rivers and streams depleted, including the Upper Clark Fork River and its tributaries. As drought conditions persist or worsen, this issue will become more critical. Public-private partnerships, like the Upper Clark Fork Steering Committee, have formed to monitor the flow of our rivers. In order to assist the Steering Committee and river advocacy groups working within the Upper Clark Fork River Basin, this paper provides a comprehensive review of the studies on existing flows and target flows in the upper river, synthesizes past priorities for stream restoration, and provides a case study on how to find flows to rewater a key tributary. With this information, government agencies, nonprofit organizations, and others will have a more complete understanding of how to prioritize tributaries for rewatering and restoration with their limited budgets and personnel. This will also aid in the development of the report due to the legislature every five years by the Upper Clark Fork River Basin Steering Committee that is intended to review the basin closure and make recommendations to the legislature regarding necessary changes.

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Understanding the Problem

Like all societies, the American West draws much of its wealth and culture from its natural resources. This region has undergone booms and busts from resource extraction in the timber, mining, energy, and agricultural industries. All these industries are highly dependent on the availability of water because arid western landscapes receive, on average, less than twenty inches of rain per year[1]. In Montana many of our river basins are fully appropriated for offstream uses, and it is clearly understood that there may not be enough water to support all water uses in the future. Globally, 70% of freshwater is used for agriculture while in the western United States, 90%, and in Montana 96% of freshwater is used for irrigation[2]. The management of water resources for agriculture has led some to question existing water use practices. The dewatering of streams and rivers by extensive networks of manmade diversion structures leaves some streams completely dry during drought years. As a result, the Montana Department of Fish Wildlife and Parks has classified more than 2,300 miles of Montana streams as chronically dewatered[3]. Within the Upper Clark Fork River Basin (i.e. above the confluence with the Blackfoot River), more than 388 river miles are chronically dewatered, 296 of those miles are within the tributaries to the Upper Clark Fork while the rest are on the mainstem[4]. Historic mining in the headwaters of the Upper Clark Fork River basin has produced toxic pollutant levels in the mainstem of the river and some of its tributaries, resulting in

[1] Cori S. Parobek, "Of Farmers' Takes and Fishes' Takings: Fifth Amendment Compensation Claims When the Endangered Species Act and Western Water Rights Collide," 2003, p.180.
[2] Hannah Gosnell, Julia H. Haggerty, and Patrick A. Byorth, "Ranch Ownership Change and New Approaches to Water Resource Management in Southwestern Montana: Implications for Fisheries," 2007, p.2.
[3] Montana DFWP. *Fish, Wildlife, and Parks Dewatering Concern Areas*, 2005, p.2-8.
[4] Ibid., p.4-9.

the upper river's designation as the country's largest complex of superfund sites. However, the depletion of stream flows within the river basin, and specifically the Upper Clark Fork's tributaries, is considered by many to outweigh pollution as the greater threat to the river's health[5].

The Upper Clark Fork River Basin Steering Committee (the Steering Committee) was created in 1991 by an act of the Montana State Legislature. Pursuant to Montana Statute, the Steering Committee includes representation of many basin water interests, state agencies, and local governments within the basin[6]. In 1994, the Steering Committee adopted the *Upper Clark Fork River Basin Water Management Plan* (the Plan). The goals of the Plan were to "provide for continued planning and management of the waters of the Upper Clark Fork River Basin rooted at the local level, and to balance all of the basin's beneficial water uses"[7]. This Plan has become the guiding document for the Steering Committee as they work to fulfill the duties of their legislative mandate. As outlined in Montana statute, the Steering Committee's duties include: a review of the Upper Clark Fork River basin closure every five years that includes recommendations to the legislature, a duty to identify water management issues, and a duty to inform government agencies about water management and permitting activities[8].

To assist the Committee in their identification of water management issues, and required reporting to the legislature, I have identified the following objectives that will be addressed in this paper:

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[5] Brick, Philip, Donald Snow, and Sarah F. Bates, ed. *Across the Great Divide: Explorations in Collaborative Conservation and the American West*, 2001, p.92.
[6] Montana Code Annotated § 85-2-338
[7] Upper Clark Fork River Basin Steering Committee, *Upper Clark Fork River Basin Water Management Plan*, 1994, p.9.
[8] Montana Code Annotated § 85-2-338(5)

1. Examine how to protect instream flows under Montana Water Law;
2. Review how target flows have been set for the Upper Clark Fork River Basin;
3. Summarize stream rewatering priorities of various stakeholders within the Upper Clark Fork River Basin;
4. Synthesize those past priorities so as to achieve greatest benefits for the fishery and water quality; and
5. Provide a case study on how to find flows to rewater a key tributary.

The summarization and synthesis of past priorities for tributary rewatering will be completed through looking at all of the studies that have been done and attempting to consolidate them into one prioritization scheme. Through this, organizations working in the basin will understand what work has been accomplished to date. This analysis will allow for agencies, nonprofit organizations, and others doing work in the Upper Clark Fork Basin to have a better understanding of where flow analysis studies have been completed, how various stream reaches within the basin have been prioritized, where there is a need for further study, and where there is the greatest need for stream rewatering[9]. This will also aid in the development of the report due to the legislature every five years by the Upper Clark Fork River Basin Steering Committee that is intended to review the basin closure and make recommendations to the legislature regarding necessary changes[10].

Protecting Instream Flows Using Montana Water Law

The Upper Clark Fork River Basin is defined as the drainage area of the Clark

[9] Hannah Gosnell, Julia H. Haggerty, and Patrick A. Byorth, "Ranch Ownership Change and New Approaches to Water Resource Management in Southwestern Montana: Implications for Fisheries," 2007, p.8.
[10] Montana Code Annotated § 85-2-338(5)(a).

Fork River, above the confluence with the Blackfoot River (Figure 1). The Upper Clark Fork River Basin (the Basin) drains approximately 3,700 square miles of mountainous and forested areas, interspersed with populated valleys that rely on the availability of river water and associated ground water. The elevations within the Basin range from 3,250 feet at the confluence with the Blackfoot River to more than 10,600 feet along the basin's rim[11].

Water use within the Upper Clark Fork River, and throughout Montana, is governed by the Prior Appropriation Doctrine. As development in the late 19th century expanded, the Prior Appropriation Doctrine emerged as the governing water use policy for most of the West, including Montana. Under this doctrine, surface water within our streams and river systems is held in trust by the State, and users are permitted to divert water from a natural stream only if and when it is put to "beneficial use"[12]. Beneficial uses were defined as agriculture, mining, energy and domestic use. Historically, an appropriator was given a priority date upon implementation of a new water diversion for beneficial use. This method of water management was thought to be egalitarian and protected early users from loss of water they had invested in diverting[13]. The prior appropriation doctrine is often stated as "first in time, first in right."

The state of Montana has consistently been on the forefront of water conservation and protection in the West. The state's 1967 passage of the Water Resources Act[14] was a

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[11] Upper Clark Fork River Basin Steering Committee, *Upper Clark Fork River Basin Water Management Plan*, 1994, p. 4.
[12] Brian Morris, "When Rivers Run Dry Under a Big Sky: Balancing Agricultural and Recreational Claims to Scarce Water Resources in Montana and the American West," 1992, p.263.
[13] Ibid., p.265.
[14] Montana Code Annotated § 85-1-101 (1967).

legislative acknowledgement of the state's need to more adequately manage the limited water resources throughout the state. The statutory language of the act went so far as to explicitly state "water resources of the state must be protected and conserved to assure adequate supplies for public recreational purposes and for the conservation of wildlife and aquatic life"[15]. With this statutory language established, the state of Montana took the first step to protect instream flows in 1969 when James E. Murphy sponsored legislation that allowed for the Montana Fish and Game Commission to file to appropriate water for instream use on twelve blue ribbon streams for the preservation of fish and wildlife habitat. These rights are commonly referred to as "Murphy Rights"[16]. Two tributaries to the Upper Clark Fork River Basin were included in this legislation, the Blackfoot River and Rock Creek[17]. The Murphy Rights designated within these two tributaries continue to exist today. Murphy Rights are the most senior instream use rights in the state. However, having either a 1970 or 1971 priority date makes them junior to numerous off stream rights, many of which were established as early as the mid-1860s[18].

Following these initial efforts to preserve the state's water resources, the Montana Water Use Act of 1973 was the most comprehensive change and advancement in water resources management in the state's history[19]. This legislation also created a system for

[15] Montana Code Annotated § 85-1-101(5) (1967).
[16] Murphy Rights, Montana Department of Fish, Wildlife & Parks, accessed December 28, 2012, http://fwp.mt.gov/fishAndWildlife/habitat/fish/waterManagement/murphy WaterRights.html.
[17] Matthew J. McKinney, "Instream Flow Policy in Montana: A History and Blueprint for the Future," 1990, p.86.
[18] Brunner, Ronald D., Christine H. Colburn, Christina M. Cromley, Roberta A. Klein, and Elizabeth A. Olson, *Finding Common Ground: Governance and Natural Resources in the American West*, 2002, p.50.
[19] Montana Department of Natural Resources and Conservation, *Water Rights in Montana,* 2012, p.2.

the management of both existing and future water rights. This legislation also enacted a method to reserve water for future consumptive uses and to reserve water for the maintenance of minimum instream flows for the protection of existing water rights, fish and wildlife, and water quality[20]. The reservation statute that was included in the Water Use Act legislation allows for the state, or "any political subdivision or agency of the state, or the United States or any agency of the United States [to] apply to the department to acquire a state water reservation for existing or future beneficial uses or to maintain a minimum flow, level, or quality of water throughout the year or at periods or for a length of time that the department designates"[21]. As part of the application process, the agency making the application must provide adequate evidence showing: the purpose, the need, the amount necessary for the purpose, and that the reservation will be in the public interest[22]. An important distinction within the water reservation statute is that for reservations with the purpose of maintaining minimum flow, water level, or water quality, the reserved amount at any point on the creek shall not exceed 50% of the average annual flow for the period of record on gaged streams[23]. This limitation will only become more important as we face increased drought along with increased appropriations. The seniority date for off stream water rights is typically the date the water was put to a beneficial use, or the date the use claim was filed with the state. In contrast, the seniority date of water rights associated with a water reservation application is the date the water reservation was filed.

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[20] Matthew J. McKinney, "Instream Flow Policy in Montana: A History and Blueprint for the Future," 1990, p.87.
[21] Montana Code Annotated § 85-2-316(1).
[22] Montana Code Annotated § 85-2-316(4).
[23] Montana Code Annotated § 85-2-316(6).

The statute also gives the Department of Natural Resources and Conservation (DNRC) the charge of reviewing all state water reservations at least once every ten years to ensure that the original objectives of the reservation are being met. If the objectives are not being met, the department reserves the right to change the reservation as they see fit[24]. The water reservations program has had somewhat limited success in protecting minimum streamflows. There have been three successful cases: in the Yellowstone River basin, the upper Missouri Basin, and the lower Missouri River basin. Although an application was made for the Upper Clark Fork River basin in 1986[25], a final water reservation for the maintenance of stream flow was never completed. Instead the legislature created the Upper Clark Fork River Basin Steering Committee, which recommended closing the basin to further appropriations.

As the state of Montana began to experience more frequent and prolonged droughts through the mid to late 1980s, the legislature was pushed again to create a statutory provision that allowed for the transfer of water rights to instream flow[26]. In 1989 the legislature adopted a process for the temporary leasing or converting of water rights for instream flow. Initially this provision was limited to the Department of Fish, Wildlife and Parks (DFWP). The DFWP had the exclusive authority to lease water for instream use and rights, and the conversion lease was limited to ten years[27]. Further legislation was enacted in 1991 when a ten-year pilot leasing study was approved in

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[24] Montana Code Annotated § 85-2-316(10).
[25] Montana Department of Fish, Wildlife & Parks. *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.1.
[26] Montana Department of Fish, Wildlife & Parks, *Biennial Progress Report FWP Water Leasing Study – 2008 & 2009,* 2009, p.3.
[27] Montana Code Annotated § 85-2-436.

statute.[28] This study was to be completed by the Department of Fish Wildlife and Parks along with the Environmental Quality Council, and it collected detailed technical and legal data on each designated stream reach and each pilot lease to develop a model of a water lease and the associated process of lease authorization, from initiation to completion[29].

Beginning in the 1991 legislature, instream flow advocates began introducing bills that would expand the instream flow program. Their efforts were aimed at allowing private parties to work with water rights holders. It had become clear that not all water rights holders would be willing to work with the Department of Fish, Wildlife and Parks, but might be willing to lease to private entities[30]. There was an attempt again in 1993; however, these efforts failed in both the 1991 and 1993 legislative sessions. It was not until 1995 that the goals of these proposed bills would be realized. The 1995 legislature enacted two bills related to instream flow. One bill was aimed at the entire state of Montana, whereas the other was specific to the Upper Clark Fork River Basin, and both allowed for private parties to either change or lease water rights for instream use[31].

The bill that supported statewide instream flow needs was sponsored by several organizations, namely "Trout Unlimited, the Montana Wildlife Federation, the Montana Stockgrowers Association, the Montana Farm Bureau Federation, the Montana Water Resource Association, and the Montana Association of Conservation Districts, with the

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[28] Upper Clark Fork River Basin Steering Committee, *Ten Years of Private Instream Flow Rights in the Upper Clark Fork Basin Report to the Legislature,* 2005, p.1.
[29] Montana Code Annotated § 85-2-436, (1995).
[30] Upper Clark Fork River Basin Steering Committee, *Ten Years of Private Instream Flow Rights in the Upper Clark Fork Basin Report to the Legislature,* 2005, p.2.
[31] Ibid., p.1.

assistance of the Montana Consensus Council"[32]. This bill led to the development of statutory language that allowed for the temporary change of water rights to instream use in order to enhance flows and the condition of the fishery[33]. By temporary, the statute means "not to exceed 10 years" [34], however there is no limit to the number of renewals.

The bill specific to the Upper Clark Fork Basin was sponsored by the Upper Clark Fork Steering Committee and was based upon the recommendation that came out of the 1994 *Upper Clark Fork Basin Management Plan*. Although the statewide bill and the bill specific to the Upper Clark Fork were similar, the statutory language for the Upper Clark Fork had specific language that required the "The Upper Clark Fork River basin steering committee… [to submit] a report evaluating the effects of all change approvals issued to maintain and enhance streamflows to benefit the fishery resource"[35]. This report addressed questions about the effects the program might have on the ecological health of the watershed, tax and revenue effects, and other social effects, while providing recommendations as to how to expand, eliminate, or modify the program in the future[36]. In accordance with the statute, the Upper Clark Fork Steering Committee submitted a report, *Ten Years of Private Instream Flow Rights in the Upper Clark Fork Basin* to the legislature. This report included a review of water conversions and presented case studies of three leases of water rights for instream use that had been completed in the Blackfoot River Basin. It also provided an overview of leases and conversions throughout the State of Montana. The report reviewed the concerns that many had voiced regarding the effects

[32] Ibid., p.4.
[33] Montana Code Annotated § 85-2-408
[34] Montana Code Annotated § 85-2-407(2-3)
[35] Montana Code Annotated § 85-2-439(9), (1995).
[36] Montana Code Annotated § 85-2-439(9), (1995).

of the leasing statutes and the effect they might have on existing water uses. The report found that due to the diligence required in the change of use process, adverse effects on other water users were never realized[37].

Initially, both of the 1995 water leasing statutes were temporary provisions designed to terminate on June 30, 2005. However river advocates and the 2005 report generated by the Steering Committee recommended that the leasing statute be codified as a permanent statute and be modified to apply to the entire state. As recommended, the leasing statute was adopted for the whole state by the 2005 legislature[38]. The state's current leasing program still limits water rights holders to converting their water rights for a period of ten years, with the ability to renew the conversion for as many successive ten-year periods as they wish. However, if the conversion project includes the development of new conservation or storage techniques, the lease may be approved for a period of thirty years[39]. The ten-year leasing provision has been used to some extent; however, the thirty-year lease has been used very little due to the extent of the requirements needed to prove that water conservation is being achieved[40]. Both water leasing provisions might be used more frequently if not for the extensive time and resources that are needed to show that the change of use "will not adversely affect the water rights of other persons"[41], and to document adequately the amount of water

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[37] Upper Clark Fork River Basin Steering Committee, *Ten Years of Private Instream Flow Rights in the Upper Clark Fork Basin Report to the Legislature,* 2005, p.14.
[38] Montana Department of Fish, Wildlife & Parks, *Biennial Progress Report FWP Water Leasing Study – 2008 & 2009,* 2009, p.3.
[39] Montana Code Annotated § 85-2-436(3)(e).
[40] Barbara Hall, personal correspondence, April 5, 2013.
[41] Montana Code Annotated § 85-2-408(3)(a).

historically diverted versus the amount historically consumed[42]. The maximum quantity of water that may be converted to instream use is the amount historically diverted, at the point of diversion. The maximum quantity of water that may be converted to instream use below the diversion is only the amount historically consumed[43].

Organizations like the Clark Fork Coalition and Montana Trout Unlimited continue to work to create innovative solutions within the current regulatory system that both support agriculture operations and return water to Montana's streams and rivers.

Setting Target Flows in the Upper Clark Fork River Basin

Motivated by the new ability to lease water rights for instream use, many organizations and agencies have sought to understand what flow levels would support a healthy fishery and associated habitat. The Wetted Perimeter methodology has been used almost exclusively in the establishment of target instream flows throughout the Upper Clark Fork River Basin, and throughout western Montana[44]. In 1986 the Department of Fish, Wildlife and Parks (formerly the Department of Fish and Game) applied the Wetted Perimeter method to the tributaries of the Upper Clark Fork River Basin in a document titled *Application for Reservations of Water in the Upper Clark Fork River Basin.* This Application used the Wetted Perimeter method to determine target flows for the tributaries and the mainstem of the Upper Clark Fork River. Although many studies have been done on the tributaries and the mainstem of the Upper Clark Fork River in

[42] Montana Code Annotated § 85-2-408(7)
[43] Montana Code Annotated § 85-2-408 (7).
[44] Montana Department of Fish, Wildlife & Parks, *A Literature Evaluation of Montana's Wetted Perimeter Inflection Point Method for Deriving Instream Flow Recommendations,* 1986, p.1.

subsequent years, the target streamflows that were established in this 1986 Application have continued to be the standard used.

This section will first explain the wetted perimeter analysis and how it is applied, followed by a discussion of how the flow targets were developed for specific tributaries in the *Application for Reservations of Water in the Upper Clark Fork River Basin*. This 1986 Application was intended to reserve flows for the protection of fish, wildlife, recreation, and water quality.

Using the Wetted Perimeter Method to Determine Target Flows

The Wetted Perimeter methodology has been widely used because of its simplicity as a field-based and site-specific method[45]. Stream flow regulates fish populations through its effect on fish habitat, specifically water velocity, depth, bank cover, and the availability of food supply[46]. The Wetted Perimeter methodology is based on the fact that as discharge decreases, riffles are the first areas that become exposed, or dry. Typically, riffles are some of the most productive areas of a stream for invertebrates; therefore, riffle dewatering affects the food source of many cold-water fisheries. In Montana, caddisflies, stoneflies, mayflies, and other aquatic invertebrates are the primary food source for salmonid fish populations[47]. In the wetted perimeter analysis, transects are located at riffle sites, and the relationship between the wetted cross-section and

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[45] Christopher J. Gippel and Michael J. Stewardson, "Use of Wetted Perimeter in Defining Minimum Environmental Flows", 1998, p.54.

[46] Montana Department of Fish, Wildlife & Parks, *A Literature Evaluation of Montana's Wetted Perimeter Inflection Point Method for Deriving Instream Flow Recommendations,* 1986, p.9.

[47] Ibid., p.9.

discharge is compared graphically[48]. In the graphical analysis, a line is fitted through the points, and typically there are two breakpoints in the fitted curve. These breakpoints are commonly known as the lower inflection point and upper inflection point[49] (Figure 2). The lower inflection point is meant to represent the critical discharge rate below which fish habitat is rapidly lost as flow declines[50]. At this point, it is assumed that some sport fishing would be available, but marginalized and endangered species would exist at only a marginal level[51]. Above this lower point, the water moves up the sides of the channel, and the wetted perimeter increases at a slower rate of increase. Flow rates above the upper inflection points do not greatly affect the wetted perimeter and reflect flows approaching the maximum width of the stream channel, so little additional habitat is gained as flow increases[52]. This upper point is also considered to facilitate the maximum production of the invertebrates as a food supply for salmonid fish populations[53]. At this point, it is assumed that some sport fishing would be good or excellent, and would provide the flow levels that would allow threatened species to thrive[54]. Although this analysis primarily takes food production into account, it has been determined that these flows are also indicative of healthy habitat characteristics, such as overhanging banks and

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[48] Christopher J. Gippel and Michael J. Stewardson, "Use of Wetted Perimeter in Defining Minimum Environmental Flows", 1998, p.53-54.
[49] Montana Department of Fish, Wildlife & Parks, *A Literature Evaluation of Montana's Wetted Perimeter Inflection Point Method for Deriving Instream Flow Recommendations,* 1986, p.50.
[50] Christopher J. Gippel and Michael J. Stewardson, "Use of Wetted Perimeter in Defining Minimum Environmental Flows", 1998, p.54.
[51] Montana Department of Fish, Wildlife & Parks, *Wetted Perimeter Manual*, p.6.
[52] Montana Department of Fish, Wildlife & Parks, *A Literature Evaluation of Montana's Wetted Perimeter Inflection Point Method for Deriving Instream Flow Recommendations,* 1986, p.50.
[53] Ibid., p.50.
[54] Montana Department of Fish, Wildlife & Parks, *Wetted Perimeter Manual*, p.6.

vegetation, and submerged vegetation. Riffles are also key areas for spawning and rearing of game fish[55].

Although the breakpoints in the fitted curve are known as "inflection points," mathematically these are not inflection points at all. Rather each point is "where the curvature is maximized, or where there is a marked change in the slope of the curve"[56]. The actual location of these points has been debated mathematically, and depending on the scale of the graph and the shape of the channel, the "inflection points" can vary to a great extent. It has also been acknowledged that some professional judgment by biologists may be required in the establishment of an inflection point flow. For example, a biologist must verify that the flow level determined by this method would not be harmful to existing species and habitats,[57] while also considering the recreational use, existing water quality, water availability, and the complexity of existing fish populations[58]. Ultimately, the Wetted Perimeter method provides a range between the upper and lower inflection points between which a recommended flow might be established. Because of the relative simplicity of the Wetted Perimeter discharge relationship, it has been used consistently over the past thirty years as limited budgets and personnel continue to plague local nonprofits and state agencies.

Target Flows and Water Reservations in the Upper Clark Fork River Basin

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[55] Montana Department of Fish, Wildlife & Parks. *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.21.
[56] Ibid., p.55.
[57] Montana Department of Fish, Wildlife & Parks, *A Literature Evaluation of Montana's Wetted Perimeter Inflection Point Method for Deriving Instream Flow Recommendations,* 1986, p.31-32.
[58] Montana Department of Fish, Wildlife & Parks. *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.55.

The Department of Fish, Wildlife, and Parks' 1986 *Application for Water Reservation in the Upper Clark Fork River Basin* was intended to preserve streamflow in the mainstem and tributaries of the Upper Clark Fork River Basin for "existing or future beneficial uses in the basin where it is reserved"[59]. The application took advantage of the water reservation statute enacted with the Water Use Act. Local governments, conservation districts, and local, state and federal agencies are allowed (and often encouraged) to apply to reserve water both for existing and future consumptive water uses, and for the maintenance of stream flow, water levels, and for the preservation and maintenance of water quality[60]. To date, the Montana Department of Natural Resources and Conservation (DNRC) has processed four sets of water reservation applications:

1976: Yellowstone River Basin

1986: Upper Clark Fork River Basin – above the confluence with the Blackfoot

1989: Upper Missouri River Basin – upstream of the Fort Peck Dam

1991: Lower Missouri River Basin – below the Fort Peck Dam

Each of these water reservation applications were subject to both the Montana Water Use Act (WUA)[61] and the Montana Environmental Policy Act (MEPA)[62], hence, the DNRC prepared an Environmental Impact Statement (EIS) for each. Each of the four water reservation applications included requests from a multitude of water users, including conservation districts, irrigation districts, municipalities, and other state agencies. In each of the applications, one or more state agencies applied for water reservations for instream

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59 Montana Code Annotated § 85-2-316(2)(a).
60 Montana Department of Natural Resources and Conservation, *Missouri River Basin Draft Environmental Impact Statement for Water Reservation Applications Above Fort Peck Dam,* 1991, p.1.
61 Montana Code Annotated § 85
62 Montana Code Annotated § 75-1-101 through 324

flow. In the water reservation applications the Department of Fish Wildlife and Parks has sought instream flows to "protect fish, wildlife, recreation, and water quality"[63]. The Bureau of Land Management requested instream flows "for fish, wildlife, recreation, and to maintain channel form"[64]. Furthermore, the Department of Health and Environmental Science (now the DEQ) has made similar requests; however, their requests have focused on supplementing water flows and volumes to improve water quality rather than quantity[65].

Each of the water reservation applications drafted by the Department of Fish Wildlife and Parks (DFWP) began similarly, addressing the purpose of the reservation, the need, the amount of water necessary for the purpose, and affirming that the water reservation was in the public interest. All these statements are requirements of the Montana Water Use Act[66].

The applications each stated that the purpose of the water reservation was to reserve water for the benefit of the public, allowing for the enjoyment of both fish and wildlife uses, and for recreational uses. It was intended that these uses would be preserved through the protection of fish and wildlife habitat with the intent to perpetuate a diverse fishery, through the commitment to maintaining a clean and healthful environment, through the preservation of high water quality, and through the preservation

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[63] Montana Department of Natural Resources and Conservation, *Missouri River Basin Draft Environmental Impact Statement for Water Reservation Applications Above Fort Peck Dam,* 1991, p.S-1.
[64] Ibid., p.S-1.
[65] Montana Department of Natural Resources and Conservation, *Draft Environmental Impact Statement for Water Reservation Applications in the Yellowstone River Basin Volume I,* 1976, p.51.
[66] Montana Code Annotated § 85-2-316(4)(a).

of existing water rights[67]. All the applications' statements of need outlined the importance of natural flows within the rivers and their tributaries for all wildlife. The importance of adequate water for "maintenance of spawning and rearing areas, shelter, and food sources"[68] for the fisheries was emphasized. Specifically in the Upper Clark Fork Application, there was an additional commitment to the level and quality of water in order "to prevent further deterioration of the quality of water in the Clark Fork River, and to protect the investment being made in pollution abatement and containment throughout the basin"[69]. This provision was drafted as a response to the continued concern over the river's contamination – a result of the basin's history of mining.

The need for such water reservations is based upon the vulnerability of the water that is not yet appropriated in the basin. It is very likely that, without these reservations, the waters that fish and wildlife require in order to flourish will be depleted, and there will be no future opportunity to reserve water for instream purposes[70]. At the time of all of the water reservation applications, under Montana statute, this was the only method for obtaining a water right for instream beneficial use for fish, wildlife, and recreational use[71].

Each of the applications cited the following reasons the reservation of water was in the public interest:

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[67] Montana Fish and Game Commission, *Application for Reservation of Water in the Yellowstone River Basin,* 1976, p.2.
[68] Ibid., p.4.
[69] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.3.
[70] Ibid., p.4.
[71] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Missouri River Basin Above Fort Peck Dam*, 1989, p.1-6.

1. "continued perpetuation of the fish and wildlife resources whose very existence is in the public interest;
2. prevention of the gradual depletion of streamflows currently enjoyed by the public for recreational uses;
3. continued perpetuation of the fish and wildlife resources for current and future utilization by the public;
4. preservation of the opportunity for a substantially improved aquatic ecosystem;
5. maintenance of water quality which contributes to the state and nation; and
6. contribution to the protection of and continued utilization of existing water rights"[72].

The economic benefit to the public has been harder to identify. The availability of fish for recreational purposes has been recognized as important to both the citizens of Montana along with visitors who come to enjoy Montana's rivers[73]. The actual monetary value of fishing has been difficult to calculate over time because how one balances the economic and social values, and the means of measuring the value of the fishery has not been universally accepted. However, in an attempt to quantify stretches of river without an economic assessment, a stream classification committee classified 452 stream miles statewide as "blue ribbon" in 1965[74].

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[72] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.4.
[73] John W. Duffied, Christopher J. Neher, and Thomas C. Brown, "Recreation Benefits of Instream Flow: Application to Montana's Big Hole and Bitterroot Rivers," 1992, p.2169.
[74] Montana Fish and Game Commission, *Application for Reservation of Water in the Yellowstone River Basin,* 1976, p.5.

The amount of water requested for reservation varies from river to river and even within a river for each stream reach, under many varying conditions[75]. The process and science behind the requested flow rates and volumes in the four applications has varied over time and with each application.

In the Application for Reservations of Water in the Upper Clark Fork River Basin (the Application) by the Department of Fish Wildlife and Parks (DFWP), the department outlined their two-fold charge to "protect and enhance the abundant and diverse fish, wildlife, and recreational resources, and to provide optimum opportunities for diverse outdoor recreation"[76]. Protection and enhancement of wildlife and fisheries is tied to their riverine and riparian habitat, including the physical structure of the stream, and the quality and quantity of water in the streams. This Application sought to reserve water for instream use in the mainstem and its tributaries from the headwaters of the Clark Fork River near Warm Springs to the Milltown Dam, at the confluence of the Clark Fork and the Blackfoot rivers[77]. This Application was developed as citizens and agencies began to realize the effects that mining in Butte had on the Clark Fork River, and the importance of maintaining adequate flows in the tributaries. The DFWP ultimately made a decision to make an application on the Upper Clark Fork for the reservation of water, because that the process had worked well on the Yellowstone[78].

There were two types of flow requests in the Application for the Upper Clark Fork:

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[75] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.4.
[76] Ibid., p.1.
[77] Ibid., p.1.
[78] Mike McLane, personal correspondence, January 22, 2013.

1. requests for flows required for the maintenance of physical fish habitat quality year-round,
2. flows required for the maintenance of existing water quality from January through April[79].

In this application the DFWP used the Wetted Perimeter Inflection Point Method (WETP) to determined flow needs of the fisheries within the basin. As mentioned in the last section, this method is based on the assumption that the principal food supply for the fisheries develops in the riffle sections of a stream, and game fish populations are proportionally dependent on the area of riffles, or wetted perimeter of riffles in the stream[80]. As flow increases, so will the wetted perimeter. Although the DFWP also made flow requests for water quality, the WETP-determined flow needs for fish habitat are the target flow levels that are typically referenced.

With this analysis, the DFWP developed a range of flows between the two inflection points from which to choose when making water reservations requests for 20 tributary reaches and 4 mainstem reaches (Table 1). When making a choice, biologists considered the recreational use of the area, current degradation levels, as well as known fish populations[81]. While this food source maintenance flow (lower inflection point's identified flow rate) is to be applied year-round, it does not address the value of flushing flows but is intended to address quality of aquatic species and fish food habitat. This must be balanced with what is practical to request as a water right.

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[79] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* 1986, p.16.
[80] Ibid., p.17.
[81] Ibid., p.21.

Along with the WETP analysis, for each stream reach where a flow was requested, the Application also physically described the stream reach, listed the game fish species present, described the fishery, listed the wildlife present, summarized the wetted perimeter methodology (with corresponding graphical analysis), described the need for flow, and finally requested a flow (and annual volume)[82].

The mainstem of the Upper Clark Fork River was broken into four sections, and a single instantaneous flow rate (and volume) equal to the upper inflection point of the wetted perimeter analysis was requested for each of these reaches[83]. Similarly, a single instantaneous flow rate (and volume) equal to the upper inflection point of the wetted perimeter analysis was requested on each of 8 studied tributary streams, and 20 tributary stream reaches that were addressed in the Application. However, there were a few exceptions. The exceptions were on Cable Creek where WETP could not be applied due to consistent flows (between 10.2 and 12.1 cfs). In this case, observational data were used to determine the requested flow (and volume)[84]. A similar scenario occurred on Stuart Mill Creek (known as Spring Creek), where observed flows (14.5 cfs) were also used to determine the requested flow (and volume)[85]. The Upper Clark Fork Application did not make a request for a high-level flushing flow, meant to simulate spring runoff conditions. Such flows are important for flushing out fine sediment and reworking stream banks. However, it was decided that flushing flows would negatively impact the basin as high flows would increase copper concentration levels by eroding existing deposits within the

[82] Ibid., p.32-35.
[83] Ibid., p.35-48.
[84] Ibid., p.64.
[85] Ibid., p.115.

floodplain[86]. This decision could be reconsidered once remediation efforts have been completed.

The Application also addressed water quality concerns within the basin due to the history of mining near the headwaters. Within the basin there was significant concern about the concentration of various pollutants, but especially the copper left in deposits along the streambed and floodplain. Because of this, the inflows of clean, uncontaminated water from the tributaries were determined to be "vital for dilution of copper"[87]. And as a result, the Application requested for "all of the instantaneous flow [within the tributaries]… until such time as mine waste reclamation allows copper concentrations… to reach acceptable levels"[88] for the period from January 1st through April 30th. Practically this means all legally available water in the stream. During this time of year, copper concentrations increase due to output from the Warm Springs ponds, which frequently cause copper criteria to be exceeded. However, as stated earlier, the WETP determined flow needs are the target flow levels that have been typically referenced.

This water reservation application was completed in 1986, and in 1989 the Department of Natural Recourses and Conservation (DNRC) began their review with the issuance of a Draft EIS analyzing the impacts of the water reservation application. Although both a Draft and Final EIS were produced by the DNRC, the controversy surrounding the DFWP's application stopped the DNRC's potential approval process. In an unprecedented move, the water users within the basin, in order to avoid costly

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[86] Ibid., p.209.
[87] Ibid., p.145.
[88] Ibid., p.147.

litigation, requested that the 1991 Montana legislature consider a new approach. The idea was to temporarily close the basin, and to allow the water users to work collaboratively to resolve the allocation problems within the basin[89]. The legislative result of this collaborative effort was the formation of the Upper Clark Fork River Basin Steering Committee[90].

Since its founding, The Upper Clark Fork River Basin Steering Committee has been active in creating new policy and studies related to instream flow within the Basin. However, the target flows that were requested as part of the DFWP's application have been used extensively since their development in 1986, and are still in use today.

Reviewing Past Priorities for Tributary Rewatering

The target flows that were delineated in DFWP's 1986 *Application for Water Reservation* have been used extensively in the development of tributary prioritization plans for restoration efforts. Through the past 30 years, many studies have addressed the restoration of the Upper Clark Fork Basin. The studies have focused on the mainstem and the tributaries, and many of the studies have ranked, or prioritized, areas of greatest importance for restoration. Depending on the organization and the funding of the study, different tributaries have been prioritized for different reasons. As part of this analysis, I looked at all of the studies that have been done and attempted to consolidate them into one prioritization scheme, so that organizations will understand what work has been accomplished to date.

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[89] Brunner, Ronald D., et al, *Finding Common Ground: Governance and Natural Resources in the American West*, 2002, p.50
[90] Montana Code Annotated § 85-2-338

The prioritization assessments related to instream flow rates can be grouped into three categories. The first includes state agency reports; most of the reports by the Department of Fish Wildlife and Parks (DFWP), the Department of Justice's Natural Resources Damages Program (NRDP), and the Department of Environmental Quality (DEQ). The second category includes reports created or commissioned by the Upper Clark Fork River Basin Steering Committee. The third category of prioritization assessments have been developed by nonprofit organizations, mainly by Montana Trout Unlimited (TU), the Clark Fork Coalition (CFC), and the Water Restoration Coalition (WRC). Each entity's reports are summarized below.

Montana Department of Fish, Wildlife, and Parks

The reports by the Department of Fish, Wildlife, and Parks (DFWP) have guided many other documents that came after the initial 1986 DFWP *Water Reservation Application*. One of the primary documents used by the DFWP for reference is the agency's list of *Dewatering Concern Areas*. This list was initially drafted in 1991 and has been updated as recently as 2005, with a slight revision in 2007. Streams on the list are grouped into two categories: those affected by chronic dewatering and those affected by periodic dewatering. Chronic dewatering is defined as "streams where dewatering is a significant problem in virtually all years"[91] and periodic dewatering is defined as "streams where dewatering is a significant problem only in drought or water-short years"[92]. The statewide dewatered streams list compiled in 2005 includes 323 chronically

[91] Montana Department of Fish, Wildlife & Parks. *Fish, Wildlife, and Parks Dewatering Concern Areas*, 2005, p.1.
[92] Ibid., p.1.

dewatered stream reaches on 314 streams, and 113 periodically dewatered reaches on 109 streams. Within the Upper Clark Fork River Basin on 46 stream reaches, more than 388 river miles are chronically dewatered, and 296 of these river miles are within the tributaries to the Upper Clark Fork, above the confluence with the Blackfoot River[93] (Table 2).

Many of the studies that the DFWP has completed in recent years were initiated by the litigation between the State of Montana and the Atlantic Richfield Corporation (ARCO). The lawsuit sought to quantify damages to natural resources that occurred within the Upper Clark Fork River Basin due to historic mining activities. Ultimately, a consent decree was drafted and approved by the federal district court, that included a monetary settlement intended to fund remediation and restoration efforts[94]. With the amount of money that became available through the settlement process, the State identified a need to prioritize habitat protection and restoration efforts, and in 2007, through a Memorandum of Understanding between the DFWP and the NRDP, a "phased tributary restoration prioritization effort was initiated"[95]. Three goals were established for the prioritization process: first, restore the fishery in the Clark Fork River to levels similar to the other rivers in the region; second, maintain and enhance native trout populations through the basin; and third, replace angling opportunities lost along the mainstem of the Clark Fork with angling opportunities within the tributaries[96]. The intent of the DFWP was to inform the restoration process, beyond the superfund remediation, in

[93] Ibid., p.4-9.
[94] Montana Department of Fish, Wildlife & Parks, *An Assessment of Fish Populations and Riparian Habitat in Tributaries of the Upper Clark Fork River Basin: Phase II,* 2009, p.8.
[95] Ibid., p.8.
[96] Ibid., p.8.

order to restore the fisheries that were lost in the mainstem of the Clark Fork River. In doing so, the agency needed to collect fishery health data for the assessment of watershed health. These data had not been collected previously to prevent complication of the settlement agreement [97]. The data collected included fish distribution data, riparian habitat, and fish habitat assessment. Ultimately, after two years of data collection *An Assessment of Fish Populations and Riparian Habitat in Tributaries of the Upper Clark Fork River Basin* as was published in April 2008, and after yet another year, *An Assessment of Fish Populations and Riparian Habitat in Tributaries of the Upper Clark Fork River Basin: Phase II* (the Assessments) was published in March 2009[98].

The streams selected for data collection and analysis were chosen primarily by their size and presumed importance to the reestablishment of the trout fishery within the mainstem of the Upper Clark Fork River[99]. Tributaries that were known to have bull trout or westslope cutthroat trout were also targeted for study. Both of these species are indicator species of stream health. Bull trout are listed as a threatened species under the U.S. Endangered Species Act, and westslope cutthroat are listed as a Species of Special Concern by the State, and as a Sensitive Species by the US Forest Service[100]. Along the selected tributaries, multiple sites were studied. At each site, fisheries were analyzed through electroshocking methods, riparian assessments were performed, and water temperature was monitored. Dewatering was noted in some of the stream reach assessments; however, all data were simple visual observations, and no stream flow

[97] Pat Saffel, personal communication, January 23, 2013.
[98] Pat Saffel, personal communication, January 23, 2013.
[99] Montana Department of Fish, Wildlife & Parks, *An Assessment of Fish Populations and Riparian Habitat in Tributaries of the Upper Clark Fork River Basin,* 2008, p.9.
[100] Ibid., p.9.

measurements were completed[101]. Data were collected on 56 streams within the Upper Clark Fork Basin and presented in the DFWP's 2008 Assessment. The 2009 Assessment was done on 64 additional streams and on four streams that had been studied as part of the 2008 Assessment. Once again, multiple reaches were typically analyzed on each stream in the study[102]. With the data presented in both the Assessment reports from 2008 and 2009, the DFWP was able to prioritize certain tributaries through their assessment of the current fishery and to rate the potential value of fishery habitat protection and enhancement[103].

The DFWP and the NRDP partnered in an initial attempt at prioritization which was documented in a report in which four stream reaches were rated Priority 1 for fishery enhancement, fourteen were rated Priority 2, eleven Priority 3, seventeen Priority 4, and eighty-six were "unranked"[104] (Table 3). All of the 46 stream reaches that were prioritized were assessed for their "Value as a Recruitment/Restoration Fishery for the Clark Fork River (or tributary to the Clark Fork River)"[105], their "Value as a Tributary/Replacement Fishery"[106], and their "Value as a Native Fishery"[107]. In addition,

[101] Ibid., p.19.
[102] Montana Department of Fish, Wildlife, & Parks. *An Assessment of Fish Populations and Riparian Habitat in Tributaries of the Upper Clark Fork River Basin: Phase II,* 2000, p.9.
[103] FWP-NRDP Reports Help Shape Clark Fork Restoration Plan, Clark Fork River Technical Assistance Committee, accessed March 20, 2013 http://www.cfrtac.org/fwp-nrdp-reports-help-shape-clark-fork-restoration-plan.html.
[104] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Rating Summaries for the Prioritization of Tributaries of the Upper Clark Fork River Basin for Fishery Enhancement Draft Final,* 2010, p.iv.
[105] Ibid., p.1.
[106] Ibid., p.1.
[107] Ibid., p.2.

a "Habitat Description"[108] was completed. Although the assessment of the reaches in this report focused on the health of the fisheries, it is acknowledged that the fisheries are obviously dependent on the availability of water in the stream. In the analysis of each of the 132 stream reaches, their connectivity with the Clark Fork River was addressed, barriers such as irrigation withdrawals and diversion structures were acknowledged along with acknowledgement that "increased summer flows… would likely enhance conditions"[109]. Habitat security was also addressed and the cumulative effect that irrigation, agricultural practices, and potential residential development are having on the flows of the various stream reaches were also acknowledged[110]. Each of the stream reaches were assessed for both their current value and for potential protection and enhancement value. The habitat description was merely stated without a resulting assessment. Although flow was not directly measured, the visual observation assessments of each of the stream reaches weighed on the value assessments for both current value and for protection and enhancement value, which ultimately led to the priority ranking of each stream reach.

A few organizations recognized the gap in data related to measured flow needs within the tributaries during the public comments period. The organizations that acknowledged this need included the Clark Fork Coalition, the Missoula County Health Department Water Quality District, and the Pat Barnes Chapter of Trout Unlimited[111]. These groups urged the State to recognize flows as a limiting factor, and to consider

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[108] Ibid., p.3.
[109] Ibid., p.5.
[110] Ibid., p.9.
[111] Montana Natural Resource Damage Program and Montana Department of Fish, Wildlife & Parks, *Final State of Montana's Response to Public Comments on the May 2010 Draft Final Upper Clark Fork River Basin Tributary Prioritization Plan*, 2011, p.7.

stream flow needs further when setting restoration priorities. The State responded that it recognized the need for flow restoration, however, "determining the flow needs for all tributaries is [not] necessary at this time"[112], and deferred this final determination to future projects within the priority reaches.

Alongside this wide ranging tributary assessment, the Montana DFWP and the NRDP commissioned Fisheries Consultant Dennis Workman (a retired DFWP fisheries biologist and manager), to analyze the lower reaches of eight selected tributaries to assist in the prioritization of restoration work[113]. For Workman's report, Workman, along with DFWP and NRDP staff members, specifically selected the eight study tributaries and prioritized them using subjective, qualitative assessment methods[114] (Table 4). Tributaries were ranked based on their potential for improving fish populations within the mainstem of the Clark Fork River, and based on the need for restoration[115].

Finally in December of 2011, the Montana DFWP with the NRDP released a final *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement*. Again, the objectives of this effort and the settlement money that resulted from the Natural Resources Damages lawsuit were twofold. The first objective was to restore the fishery and angling opportunities to the mainstem of the Clark Fork River to baseline conditions, and the second was to replace fishery resources and angling opportunities

[112] Ibid., p.7.
[113] Dennis Workman, *Qualitative Assessment of Habitat in Eight Tributaries to the Upper Clark Fork River*, 2009, p.1.
[114] Ibid., p.3.
[115] Ibid., p.4.

within the tributaries when restoration of the mainstem was not possible[116]. The most significant change between the 2010 prioritization plan by the DFWP and NRDP and this "final" 2011 plan by the DFWP and NRDP was a shift in thinking, broadening the final scope to include prioritization of areas along the mainstem, including Silver Bow Creek[117]. It was thought that through a prioritization that included the mainstem, in addition to its tributaries, further recovery could be accomplished in the most valuable and cost-effective way[118]. With the expansion of the priority areas to include the mainstem, the 2011 DFWP/NRDP report also identified restoration of stream flows as a priority. It was acknowledged that flows are important to fishery habitat through the moderating of water temperatures, and additional flows could dilute various pollutants that are found in the mainstem of the river. The "final" 2011 DFWP/ NRDP prioritization report included a reference to the Upper Clark Fork River Basin Steering Committee's *Upper Clark Fork River Flow Story*, which made the request for specific flow targets of 40 cfs at Galen and 90 cfs at Deer Lodge[119]. Along with the establishment of flow targets in the mainstem, the "final" 2011 DFWP/NRDP plan prioritized reaches of the mainstem that had water quality problems. Because of the significant effect water quality has on

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[116] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*, 2011, p.1.

[117] Montana Natural Resource Damage Program and Montana Department of Fish, Wildlife & Parks. *Final State of Montana's Response to Public Comments on the May 2010 Draft Final Upper Clark Fork River Basin Tributary Prioritization Plan*, 2011, p.6.

[118] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program. *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*, 2011, p.2.

[119] Upper Clark Fork River Basin Steering Committee. *Upper Clark Fork River Flow Story*, 2006, p.7.

health of the fisheries, it was decided that the mainstem of the Clark Fork River from Warm Springs to Deer Lodge should be prioritized for instream flow projects[120].

The 2011 DFWP/NRDP prioritization of the tributaries for fishery habitat protection and enhancement was based on the following fishery goals: to restore the mainstem fish populations through improvements in the recruitment of fish from the tributaries, to replace lost angling opportunities in the mainstem with improved opportunities and fisheries in the tributaries, and to maintain and improve native fish populations with the goal of diversifying the populations to make them more resilient[121]. With these goals in mind, and as stated earlier, the current value of each of stream reach was assessed and rated as "very high, high, medium, low, or very low"[122]. Similarly, each stream reach's protection and enhancement value was assessed. In the 2011 DFWP/NRDP prioritization process, only the reaches with at least one rating of high or very high were considered, and of those only the reaches that reflected the restoration goals of the NRDP were considered for prioritization[123]. Ultimately, the 2011 DFWP/NRDP prioritization was specific to the native fishery health in the tributaries to the Upper Clark Fork River Basin, and focused on instream flow needs in Silver Bow Creek and the mainstem of the Upper Clark Fork River[124] (Table 5). The document sought to identify priority areas but is in no way specific to projects, and is meant to be a working document revisable as more information is available.

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[120] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*, 2011, p.4.
[121] Ibid., p.5.
[122] Ibid., p.8.
[123] Ibid., p.10.
[124] Ibid., p.16.

The Montana Department of Fish, Wildlife, and Parks worked jointly with the State's Natural Resource Damage Program to produce the studies that led to the preliminary prioritization documents as well as the "final" 2011 *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement* itself. With the completion of this tributary assessments and prioritization plan, the Natural Resource Damage Program continued to study and identify projects to be funded by the ARCO lawsuit's settlement funds within the Upper Clark Fork River Basin.

Montana Natural Resources Damages Program

The Natural Resource Damage Program (NRDP) was initiated in 1990 as the Montana Department of Justice began to prepare for a lawsuit with the Atlantic Richfield Corporation (ARCO). Some of the initial efforts in the lawsuit included a restoration plan, which sought to identify and quantify damages to Montana's natural resources. Based on this assessment of natural resource damages, NRDP built their case for the amount of money the State was entitled to for remediation and restoration of the injured natural resources was determined[125].

In 2007 under the direction of the EPA, a "final" revised restoration plan was issued, called *State of Montana's Revised Restoration Plan for the Clark Fork River Aquatic and Riparian Resources*. This plan acknowledged the need for flow restoration and again referenced the DFWP Water Reservation Application from 1986, along with the assessments commissioned by the Upper Clark Fork River Basin Steering Committee

[125] Montana Natural Resource Damage Program, *State of Montana's Revised Restoration Plan for the Clark Fork River Aquatic and Riparian Resources*, 2007, pg.1.

and the assessment by Dennis Workman[126]. The plan spoke to the multiple habitat variables that would benefit from flow restoration through the mainstem, including the dilution of hazardous substances, reduced water temperatures, and increased aquatic habitat[127]. Four separate restoration alternatives were analyzed as part of the report, and all four included flow restoration as one of the key elements of the alternative[128].

The NRDP along with Governor Schweitzer approved a number of funding plans that outlined the process for restoration funding and project approval. The first, the *2011 Final Upper Clark Fork River Basin Long Range Priorities and Fund Allocation Guidance Plan* spoke primarily to the funding of the general areas of groundwater resource projects, terrestrial resource projects, and aquatic resource projects[129]. With this approved funding plan, the NRDP developed a restoration process plan that was meant to describe the process the State will use in the development and funding of specific restoration projects[130]. This process plan outlined the requirement that all aquatic restoration projects be located in either the injured resource areas identified by the State in the lawsuit against ARCO, or within the priority areas outlined in the Prioritization Plan for Fishery Enhancement developed by DFWP and NRDP in 2011. The process plan further delineated the types of projects that "are most likely to cost-effectively address restoration needs in priority areas"[131] by listing each of the priority reaches and identifying the priority restoration activities within each stream reach that were identified

[126] Ibid., p.37-38.
[127] Ibid., p.38.
[128] Ibid., p.42-44.
[129] Montana Natural Resource Damage Program, *2011 Final Upper Clark Fork River Basin Long Range Priorities and Fund Allocation Guidance Plan*, 2011, p.1.
[130] Montana Natural Resource Damage Program, *Final Upper Clark Fork River Basin Interim Restoration Process Plan,* 2012, p.1.
[131] Ibid., p.19.

as Priority 1 or 2 reaches in the DFWP and NRDP's 2011 *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*[132]. Of the eleven Priority 1 stream reaches, nine had flow restoration projects listed as one of the top two priority projects for the reach[133]. Fifteen of the twenty listed Priority 2 reaches identified flow restoration as a preferred restoration activity[134]. With the approval of this process plan, the State clearly outlined how projects would be considered for funding. Proposal submittal opportunity was opened to any and all interested parties, and the State set a project proposal abstract submittal due date of June 15, 2012.

By June 15, 2012 more than eighty abstracts had been submitted to the State for consideration. Upon review of the abstracts, the NRDP released a restoration projects plan in December of 2012 that first outlined the analysis of aquatic restoration alternatives, and then provided a description of how the State developed the proposed set of aquatic restoration actions and budgets. The proposed actions were broken into two groups: flow restoration projects and other restoration actions[135]. The restoration projects plan recognizes the importance of flow restoration throughout the basin, and when determining the needed flow levels, the restoration projects plan references the DFWP's *Application for Reservation of Water in the Upper Clark Fork River Basin* from 1986. Flow restoration remains the most recommended and highest priority activity for

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[132] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program. *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*, 2011, p.24.
[133] Montana Natural Resource Damage Program, *Final Upper Clark Fork River Basin Interim Restoration Process Plan,* 2012, p.48.
[134] Ibid., p.52.
[135] Montana Natural Resource Damage Program, *Final Upper Clark Fork River Basin Aquatic and Terrestrial Resources Restoration Plans,* 2012, p.3-1.

restoration[136]. This need was reflected in the abstracts submitted as twenty-four of the eighty abstracts related to flow restoration or the management of stream flows. The mainstem of the Clark Fork between Galen and Deer Lodge was identified as the most critically dewatered reach of the basin; therefore, projects that might aid in the rewatering of this reach have been given the highest priority. Second in priority are injured reaches that have also been determined to be listed as Priority 1 or Priority 2 by the 2011 DFWP/NRDP prioritization plan, and the third priority are those reaches not in the injured areas but listed as either Priority 1 or 2[137].

Montana Department of Environmental Quality

The Montana Department of Environmental Quality (DEQ) finalized a TMDL assessment in 2010 for nineteen of the Upper Clark Fork River's tributaries. The pollutant impairment categories that were assessed in the *Upper Clark Fork River Tributaries Sediment, Metals, and Temperature TMDLs and Framework for Water Quality Restoration* included sediment, metals, and temperature[138]. The purpose of this TMDL assessment is to analyze the selected tributaries to determine whether or not each stream's water quality meets State of Montana standards. Although the DEQ's TMDL did not address flows directly, it did address the link between water temperature and the maintenance of instream flows. The plan also identified "improving riparian shade, maintaining current stream dimensions, improving irrigation infrastructure, and reducing

[136] Ibid., p.3-11.
[137] Ibid., p.3-12.
[138] Montana Department of Environmental Quality, *Upper Clark Fork River Tributaries Sediment, Metals, and Temperature TMDLs and Framework for Water Quality Restoration*, 2010, p.16.

human caused surface water inflow"[139] as restoration goals for the improvement of temperature related impacts. However, when the 2010 TMDL was drafted, flow alterations and dewatering were not considered "pollutants"[140]. Although this TMDL report did not prioritize tributaries for enhancement or restoration, the data gathered for this TMDL report should be used in the prioritization of restoration activities, as some tributaries were impaired by multiple flow related pollutants (Table 6).

Upper Clark Fork River Basin Steering Committee

The Upper Clark Fork Basin Steering Committee has commissioned a number of studies over the years that look at flow targets, and the prioritization of restoration projects within the Upper Clark Fork River Basin in accordance with Montana statute[141]. The Steering Committee commissioned a number of studies beginning in 1999, in conjunction with the update of the DFWP's list of dewatered concern areas[142]. The studies were completed in phases by Dennis Workman. The Workman reports focused on the flows along the mainstem of the river with some mention of the contributing tributaries[143]. Workman referenced the 1986 DFWP *Water Reservation Application* when discussing target flows, and then completed his own analysis of major diversion ditches along the mainstem. His analysis of the major diversions was focused on better understanding how much water is being diverted, and what water might be lost through seepage in these ditches. Workman concluded that only one of the ditches studied,

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[139] Ibid., p.2.
[140] Ibid., p.97.
[141] Montana Code Annotated § 85-2-388(5)
[142] Dennis Workman, "Upper Clark Fork Instream Flow Project", 2002.
[143] Dennis Workman, "Upper Clark Fork Instream Flow Project", 2004.

Westside ditch, would benefit from a lining project to prevent leakage. Workman stated that losses in the Westside ditch "could make up nearly 50% of the recommended minimum flow for that reach of [the Clark Fork] river"[144].

Through Workman's initial research, the Steering Committee determined that the Upper Clark Fork River Basin was in need of a water management plan. Workman's reports in 2003 and 2004 outlined the next steps in creating this plan, and in January 2004, Workman wrote a *Draft Upper Clark Fork River Management Plan* for the Steering Committee. The hope was that this draft plan would outline the need for restoration of instream flow, aiding water users within the basin in the creation of a fully voluntary water management plan[145]. The draft plan named stakeholders and identified instream flow needs at four points along the mainstem and at one point on Warm Springs Creek. The draft plan also identified some of the existing efforts that have been made to augment flows, specifically outlining the efforts by ARCO in their natural resource damages settlement agreement, although a complete settlement had not been determined at the writing of the draft plan[146]. With the compilation of Workman's reports, the Steering Committee was able to summarize the current flow status within the mainstem of the river and outline opportunities to improve stream flows in a 2006 report titled *Upper Clark Fork River Flow Story*[147]. The 2006 report identified four methods for improvement of flows: water conveyance efficiency upgrades, water rights changes, split-season water right leases, and the development of drought plans. The report underscored

[144] Dennis Workman, "Upper Clark Fork Instream Flow Project", 2002.
[145] Dennis Workman, "Upper Clark Fork River Water Management Plan", 2004, p.2.
[146] Ibid., p.7.
[147] Upper Clark Fork River Basin Steering Committee. *Upper Clark Fork River Flow Story*, 2006, p.13.

the need for both cooperation and funding in order for any of these four options to succeed.

As previously summarized in this paper, in accordance with state statute, the Steering Committee reported to the legislature on the instream flow program in a 2005 report titled, *Ten Years of Private Instream Flow Rights in the Upper Clark Fork Basin*[148]. This 2005 report included a review of off stream to instream water rights changes of use and presented case studies of three leases of water rights for instream use that had been completed in the Blackfoot River Basin. It also provided an overview of leases and conversions throughout the state. This document helped to persuaded the Montana legislature to adopt a permanent instream flow leasing statute.

Montana Trout Unlimited

Montana Trout Unlimited (MTU) has worked extensively to restore fisheries and protect habitat throughout Montana. With the potential for basin wide restoration in the Upper Clark Fork River, MTU has focused much of its efforts in recent years on the Upper Clark Fork River. In 1999, MTU prepared a restoration guideline report titled *Restoring the Upper Clark Fork: Guidelines for Action*. The MTU report sought to guide the millions of dollars in restoration funds that were recovered from the Atlantic Richfield Company by the State of Montana[149]. The MTU report outlined the need to take a whole-basin approach, with an understanding of the interconnectedness of the basin and

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[148] Upper Clark Fork River Basin Steering Committee, *Ten Years of Private Instream Flow Rights in the Upper Clark Fork Basin Report to the Legislature*, 2005, p.2.
[149] Dennis Workman, et al, “Restoring the Upper Clark Fork: Guidelines for Action,” 1999, p.2.

the restoration efforts within the basin. It also emphasized the importance of monitoring to more fully ensure that restoration efforts are appropriate and effective.

MTU's report identifies the following six goals for restoration: "restore water quality and streamflow, restore riparian habitat, improve aquatic habitat and fisheries, improve recreational opportunities, promote public participation in restoration, and create initiatives for long-term conservation of restored areas"[150]. In connection with the first goal of restoring the water quality and quantity of stream flow, the report identifies the inextricable link between water quality and streamflow. The report identifies irrigation conservation technologies, improved reservoir operations, the leasing of water rights, and contracts for stored water as tools for the restoration of streamflows[151]. With these tools in mind, the report prioritized the funding of, and incentives for, increased irrigation efficiency projects. The improvement of flows in Deer Lodge, the Little Blackfoot, and "other key areas of the upper Clark Fork"[152] were also specifically identified for flow restoration projects. The MTU report also prioritizes the improvement of reservoir operations to increase water availability for instream flows at Silver Lake, Georgetown Lake, East Fork of Rock Creek and "other storage sites"[153]. The identified benefits of these specific efforts include increased recreation value as well as more consistency of streamflows for irrigation and aquatic species.

The identified goal of improving aquatic habitat and fisheries speaks similarly to flow restoration through the improvement of irrigation techniques and reservoir operations, and places a priority on tributaries and other areas that will support fish

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[150] Ibid., p.11.
[151] Ibid., p.12-13.
[152] Ibid., p.13.
[153] Ibid., p.14.

populations and further recruitment and spawning success[154]. Although the other four goals did not specifically address the restoration of instream flows, the MTU report underscores the interconnectedness of the restoration of water quality, riparian and stream bank stability, and instream flows.

The MTU report breaks the Upper Clark Fork River Basin into four river reaches in the identification of priorities. It establishes fishery restoration priorities within the reaches based on whether a tributary could contribute a clean water supply, or contribute fish to the mainstem, and whether a tributary was worth the investment in the near future[155]. In Reach 1, the mouth of Warm Springs Creek to the mouth of the Little Blackfoot River, the high-priority tributaries were selected primarily for their ability to dilute toxic metals in the mainstem. In contrast, the medium- and low-priority tributaries were selected primarily due to their impairment by habitat alteration along with fish passage and dewatering issues[156]. In Reach 2, the Little Blackfoot River to Flint Creek, it was acknowledged that restoration in Reach 1 would be highly beneficial to this downstream reach. The high-priority tributaries of Reach 2 were selected primarily due to their impairment by habitat alteration, and the medium-priority tributaries were selected primarily due to their impairment by habitat alteration along with fish passage and dewatering issues[157]. In Reach 3, Flint Creek to Rock Creek, the high-priority tributaries were selected due to their impairment by habitat alteration and channel instability, whereas medium priorities were based on impairment by habitat and fish passage[158]. In

[154] Ibid., p.19-20.
[155] Ibid., p.26.
[156] Ibid., p.28.
[157] Ibid., p.29.
[158] Ibid., p.30.

the lowest reach, Reach 4, from Rock Creek to the Big Blackfoot River, the tributaries were assessed as medium priorities due to their need for habitat alteration and siltation resulting from the reservoir behind the Milltown Dam[159]. The report similarly recommends the prioritization of tributaries for recreational opportunities and improvements, however these priorities are based primarily on access and not the availability of instream flow (Table 7).

Clark Fork Coalition

The Clark Fork Coalition (CFC) has emerged as a leading organization in the protection and restoration of the Clark Fork River Basin. The CFC's founding in 1985 aligned well with the State of Montana's lawsuit with ARCO and resulting planning for remediation and restoration. In 2011, the CFC developed a guidance document for restoration within the Upper Clark Fork watershed that stated that new "partnerships, strategic planning, and more coordinated action"[160] will be necessary to restore the Upper Clark Fork River to its full potential. The guidance document titled *Aquatic Restoration Strategy for the Upper Clark Fork Basin* prioritized two subbasins within the seven subbasins in the Upper Clark Fork Watershed. The headwaters subbasin was prioritized, and includes Silver Bow, Mill, Willow, and Warm Springs Creeks. The other subbasin that was identified and prioritized was Reach A of the mainstem, from Warm Springs to Garrison, including all of the contributing tributaries[161]. These two subbasins were prioritized based on their upstream hydrologic location, and because the most significant

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[159] Ibid., p.31.
[160] Clark Fork Coalition, *Aquatic Restoration Strategy for the Upper Clark Fork Basin*, 2011, p.2.
[161] Ibid., p.5.

metal contamination areas are within these basins. Also, the Deer Lodge Valley draws high volumes of water off the mainstem and its tributaries through Reach A for use in irrigation, more than any other section of river in the Upper Clark Fork River Basin[162]. Ultimately, the CFC chose Reach A as a first priority for restoration work, while supporting other organizations and agencies in their work within the Headwaters subbasin[163].

Within Reach A, the CFC focused on priority tributaries, with a commitment to both long-term and multifaceted restoration efforts[164]. Within these priority tributaries, the CFC also identified ecological restoration priorities of flow restoration, reconnection of tributaries to the mainstem, enhancement of aquatic and riparian habitat, and improvements to upland watersheds[165]. The CFC report identified four specific flow restoration projects and described eight priority tributaries within Reach A (Table 8). Flow targets that were established by the DFWP in 1986 were identified where available, and major issues and opportunities were listed for each tributary[166]. The report articulated a need for between 24 and 53 cfs of additional flow within the identified priority tributaries.

Watershed Restoration Coalition

The Watershed Restoration Coalition (WRC) started as a coalition of the Conservation Districts in the Upper Clark Fork River Basin and was eventually joined by

162 Ibid., p.17.
163 Ibid., p.24.
164 Ibid., p.19.
165 Ibid., p.21.
166 Ibid., p.28-35.

other stakeholders. The WRC's mission is to develop and implement conservation and restoration projects in an effort to improve the quality of life for residents of the upper river basin. The WRC initiated a Montana Department of Environmental Quality funded study in 2010 that sought to better understand the water quality and habitat conditions of tributaries to the Upper Clark Fork basin[167]. This effort follows up on recommendations made in the approved Total Maximum Daily Load (TMDL) for the upper Clark Fork tributaries by the DEQ in 2010. This study looked at the following water quality issues: "low-flows, water temperature, and sedimentation/siltation"[168]. The WRC chose to analyze eleven tributaries in the Upper Clark Fork River TMDL planning area based on the 303d list of impaired streams, and knowing which other streams could potentially be impaired. The WRC report included seven tributaries that were studies in the 2010 DEQ TMDL, and four tributaries that are not listed. The WRC report compared the measured parameters, collected by the WRC, to standard or target values when available for sediment, flow, and temperature[169]. The report broke the various tributaries into sections, and assessed each section individually. The WRC considered a stream impaired if any stream reach was determined to meet the standard or target values, WRC characterized those reaches as "impaired"[170] (Table 9).

To determine if a stream reach was impaired by low flows, the WRC collected continuous flow data through the 2010 and 2011 summer-fall season and compared these

[167] Watershed Restoration Coalition of the Upper Clark Fork, *Upper Clark Fork Tributary Assessment for Restoration Planning: WRC Assessment and Monitoring Project, 2010-2011 – "Watershed Health Monitoring Report"*, 2012, p.4.
[168] Ibid., p.5.
[169] Ibid., p.11.
[170] Ibid., p.11

flow rates to target flows developed by the DFWP in 1986, when available[171]. Through this analysis the report concluded that four of the selected streams were impaired for low-flows, because optimum target flows were not consistently met. Along with low-flows, all of the selected tributaries were impaired by sediment, five tributaries exhibited temperature impairment, three tributaries were highly channelized, and four tributaries were affected by altered riparian vegetation[172].

The WRC report did not give recommendations on how tributaries might be prioritized for restoration efforts, but the information gathered has since been used to prioritize the WRC's restoration work. The report did recommend that the information in the report be used in the formal listing of impaired streams when the DEQ updates the 303d list in 2014[173].

Synthesizing Past Priorities for Tributary Rewatering

Criteria for Synthesis

After reviewing the restoration studies that have been completed over the past 30 years, it is clear that many of the studies have produced very similar lists of priorities because they have drawn upon the finding of the DFWP's 1986 *Application for Water Reservation,* without further analysis of flow needs in the basin. The mainstem and tributary flow targets that were established by the DFWP's 1986 report have become

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[171] Ibid., 12.
[172] Ibid., p.13-18.
[173] Ibid., p.27.

benchmarks that have been referenced throughout many of the restoration plans. The goal of the majority of the reports has been a restored fishery in the mainstem, combined with the goal of replacing lost angling opportunities in the mainstem with angling opportunities in the tributaries. In order to meet these goals, flow restoration has been identified throughout the reports as a first priority in the restoration of the fishery and angling opportunities.

After completing the collection and analysis of the identified assessment and prioritization reports, I synthesized the priorities of these studies in order to achieve these objectives:

1. identify most dewatered reaches of the Upper Clark Fork River and key tributaries, and
2. within these dewatered reaches – identify those with most fisheries potential and those with greatest water quality impairments.

From my analysis of the existing reports, it became clear that the dewatering of the mainstem of the Upper Clark Fork River was of highest concern in the basin. Workman and the Steering Committee in the 2006 *Flow Story* report identified 180 cfs as the optimum flow at the US Geological Survey gage in Deer Lodge, MT, and 90 cfs as the minimum flow[174] (Table 1 and Figure 2). These flows were the wetted perimeter upper and lower inflection points identified in the DFWP's 1986 *Application for Water Reservation*[175]. In order to understand the relationship between these target flows and actual flow levels, I plotted seasonal hydrographs using the data from the USGS gage on

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[174] Upper Clark Fork River Basin Steering Committee, *Upper Clark Fork River Flow Story*, 2006, p.7.

[175] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin*, 1986, p.36.

the Clark Fork River at Deer Lodge (Figure 3). For comparative purposes I plotted one dry year (2001), two average years (2010 and 1999), and wet year (2011). These classifications were based on the Surface Water Supply Index determined by the Natural Resource Conservation Service[176]. Figure 3 reveals that during the dry year of 2001, the Clark Fork River was below the DFWP's wetted perimeter upper inflection point of 180 cfs from mid-June through mid-October. During the wet year of 2011, daily-average flows within the Clark Fork at Deer Lodge only dropped below 180 cfs for 9 days during the year.

Along with the Steering Committee, the Clark Fork Coalition also identified the mainstem from Warm Springs to Garrison Junction as a priority because of its upstream location, contamination concern, and because the Deer Lodge Valley is "the area with the highest volume of diverted irrigation water"[177] in the basin. The Clark Fork Coalition has also created the Vital Rivers Program, intended to focus on ecological restoration within this stretch of the mainstem.

Montana state agencies also identified the mainstem through the Deer Lodge Valley as a priority. In their 2011 *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement* both the Department of Fish, Wildlife, and Parks and the Natural Resources Damages Program emphasized the importance of the mainstem of the Clark Fork River from Warm Springs to Deer Lodge. This reach of the mainstem was identified as a high priority along with instream flow projects within the tributaries that

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[176] Natural Resource Conservation Service, Historical Surface Water Supply Index Maps: 1992 – Present, accessed on April 10, 2013, http://nris.mt.gov/NRCS/swsi/SWSIhistory.asp.

[177] Clark Fork Coalition. *Aquatic Restoration Strategy for the Upper Clark Fork Basin*, 2011, p.17.

would benefit the mainstem flows[178]. Most recently in the 2012 *Final Upper Clark Fork River Basin Aquatic and Terrestrial Resources Restoration Plans,* the NRDP again acknowledged the importance of augmenting flows along the mainstem of the river, and specifically stated that "projects that may supply instream flows to the area of the Clark Fork River between Galen and Deer Lodge [shall] receive the highest priority"[179]. The plan also references the DFWP's assessment that 90 cfs is the minimum flow needed at Deer Lodge[180]. The DFWP has assessed the Clark Fork River from Warm Springs to Racetrack Creek as periodically dewatered, and from Racetrack to Rock Creek, the river has been determined to be chronically dewatered.

Although Montana Trout Unlimited has not prioritized this stretch of the mainstem specifically, they have prioritized the tributaries that flow into this section of the river. Montana Trout Unlimited has acknowledged that tributaries have been studied extensively because "experience has shown that changing a water right to instream uses for fishery purposes is most effective on tributaries, as opposed to mainstem rivers, which is why groups like [Montana] Trout Unlimited and the Montana Water Trust [now part of CFC] have focused on those streams"[181]. Because of the agreement between multiple organization's assessments, I have determined that the mainstem from Warm Springs to Garrison is the dewatered areas of highest concern within the Upper Clark Fork River Basin.

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178 Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program. *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*, 2011, p.4.
179 Montana Natural Resource Damage Program. *Final Upper Clark Fork River Basin Aquatic and Terrestrial Resources Restoration Plans,* 2012, p.3-12.
180 Ibid., p.3-11.
181 Trout Unlimited, "Private Water Leasing A Montana Approach: A report on the 10year history of a unique Montana program", 2005, p.18.

Having established the mainstem of the Clark Fork River from Warm Springs to Garrison as the highest priority for flow restoration, I sought to prioritize the tributaries for rewatering and restoration that are most likely to directly benefit this reach of the river. My first step in prioritizing the tributaries was to list each of the tributaries that was analyzed in the prioritization reports I reviewed. I then determined which river or stream each tributary fed into. I prioritized the tributaries that directly flow into Silver Bow Creek and the Clark Fork River. I then divided the Clark Fork tributaries into their various subbasins: Reach A (the headwaters, the mainstem from Warm Springs to Garrison and contributing tributaries), Reach B (the mainstem from Garrison to Drummond and contributing tributaries), and Reach C (the mainstem from Drummond to the confluence with the Blackfoot River and contributing tributaries)[182]. Having established the mainstem of the Clark Fork River from Warm Springs to Garrison (Reach A) as the highest priority for flow restoration, I then prioritized for rewatering and restoration the 11 tributaries that contributed to Reach A of the river (these streams are in bold in Table10).

My second step in prioritizing the tributaries was to list again all of the tributaries that were analyzed in the prioritization reports I reviewed. I then noted how many reports studied each tributary, and how many times that tributary was placed in one of the top two categories for prioritization (either Priority 1 or 2, or high or medium priority). Through this process, 11 tributaries rose to the top as tributaries that had been consistently studied and given high priority, between the headwaters and the Clark Fork River's confluence with the Blackfoot River (see last column of Table 10).

[182] Clark Fork Coalition, *Aquatic Restoration Strategy for the Upper Clark Fork Basin*, 2011, p.8.

I then combined these two lists (Reach A tributaries and tributaries with consistently high priority) to identify tributaries that should be prioritized for rewatering and restoration. Some of the reports gave different priorities to upper and lower reaches of the tributaries. Where this was the case, I gave the tributary the higher of the two prioritizations. This compilation resulted in a total of 8 tributaries that directly contribute to the mainstem of the river between Warm Springs and Garrison that have been consistently studied and given a high prioritization for restoration and rewatering (Table 11).

The second objective of my synthesis is to identify the tributaries within the flow depleted areas with the greatest fishery improvement potential. In order to do this I applied the fishery data from the *Rating Summaries for the Prioritization of Tributaries of the Upper Clark Fork River Basin for Fishery Enhancement*[183] to the 29 tributaries (or reaches) within Reach A and the headwaters that contribute directly to the Clark Fork River. Within this prioritization report, each studied tributary, or tributary reach, was ranked (very high, high, medium, low, very low) based on six criteria:

1. Current value as a recruitment/restoration fishery for the Clark Fork River,
2. Protection and enhancement value as a recruitment/restoration fishery,
3. Current value as a tributary/replacement fishery,
4. Protection and enhancement value as a tributary/replacement fishery,
5. Current value as a native fishery, and
6. Protection and enhancement value as a native fishery.

[183] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Rating Summaries for the Prioritization of Tributaries of the Upper Clark Fork River Basin for Fishery Enhancement Draft Final,* 2010, 1-131.

For each of these criteria, I gave the 29 tributaries a score based on their rank; they received 4 for very high, 3 for high, 2 for medium, 1 for low, and 0 for very low. I then added together the scores for the six criteria to generate a cumulative score, and ranked the 15 tributaries according to their cumulative score (Table 12).

The third and final objective of my synthesis was to identify the tributaries with the most critical flow related water quality impairments within the dewatered areas of the basin. Although the reports that studied the water quality within the tributaries to the Upper Clark Fork River did not rank the studied tributaries, they did identify the tributaries that are impaired by low flow conditions, temperature, metals, and sediment[184]. I did not include impairments by channelization or alteration of riparian vegetation in my analysis because these conditions are not as affected by flow restoration projects. In order to understand which tributaries should be prioritized for rewatering, I listed all of the tributaries studied, and counted the number of flow related impairments within each tributary. Of the 24 tributaries studied for water quality impairment, 6 were determined to be impaired by 3 or more flow related factors (Table 13).

Putting it all Together

Of the tributaries that directly contribute to the mainstem of the river between Warm Springs and Garrison (Reach A), 8 have been consistently given a high priority for restoration. In addition 6 tributaries have been determined to be impaired by 3 or more

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[184] Montana Department of Environmental Quality, *Upper Clark Fork River Tributaries Sediment, Metals, and Temperature TMDLs and Framework for Water Quality Restoration,* 2010, p.10-15. And, Watershed Restoration Coalition of the Upper Clark Fork, *Upper Clark Fork Tributary Assessment for Restoration Planning: WRC Assessment and Monitoring Project, 2010-2011 – "Watershed Health Monitoring Report"*, 2012, p.5.

factors related to flow. With this information I ranked the tributaries in Reach A into three priorities:

Priority 1: Reach A tributaries consistently ranked high for restoration, and determined to be impaired due to 3 or more flow related factors,

Priority 2: Reach A tributaries consistently ranked high for restoration, and impaired by less than 3 flow related factors, and

Priority 3: Other Reach A tributaries.

And within each of these priority groups, I have ranked the tributaries based upon their tabulated score for the tributary's fishery value (see Table 14).

Finding Flows to Rewater: Racetrack Creek – A Case Study

Racetrack Creek joins the mainstem of the river approximately 8 miles upstream, or south, of Deer Lodge, Montana. This creek has been ranked high for restoration by many studies over the years, and is impaired by low flow, temperature, and sediment conditions. I placed it as one of the top priorities because of its location within the basin, and because of the creek's flow related impairments, and moderately high fishery potential. I will look at Racetrack Creek as a case study to determine what steps need to be taken to develop a plan to augment flows within this creek.

Determining what flows are currently typical within Racetrack Creek is a critical first step. This requires gathering flow data for a number of years. The Clark Fork Coalition (CFC) and the Watershed Restoration Coalition (WRC) have been collecting continuous flow data at upper reach and lower reach sites on Racetrack Creek for the past three years (summers of 2010, 2011, and 2012). I collected some of these flow data during the summer of 2012. 2011 was a particularly wet year, while 2010 and 2012 were closer to average[185]. If flow data were available for dry years, such as 2001, 2002, or 2005, this would allow for a better understanding of what water might be available during dry years, which are the most critical years for flow restoration. Unfortunately dry water year data is not available for Racetrack Creek.

Racetrack Creek is one of the tributaries that the DFWP assessed in the 1986 *Water Reservation Application*. For the upper reach of the creek to the Deerlodge National Forest Boundary[186] The DFWP requested 26 cfs, which is the wetted perimeter's upper inflection point (the lower inflection point was 13 cfs) (Figure 4; map in Figure 9). For the lower reach below the National Forest Boundary, to the confluence with the Clark Fork River, the DFWP completed an additional wetted perimeter analysis, and requested the wetter perimeter's upper inflection point of 3 cfs (the lower inflection point was 1 cfs)[187] (Figure 5). I have plotted these flow requests along with the corresponding hydrographs developed by the CFC and WRC (Figure 6, Figure 7, and Figure 8). These figures show that there is a larger flow deficit through the lower section of the creek. Even in 2011, a year when August was determined to be "Extremely Wet"[188] by the Natural Resource Conservation Service, the creek experienced flows below the DFWP's determined lower inflection point of 1 cfs through the entire month of August.

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[185] Natural Resource Conservation Service, Historical Surface Water Supply Index Maps: 1992 – Present, Accessed on April 10, 2013, http://nris.mt.gov/NRCS/swsi/SWSIhistory.asp.

[186] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin*, 1986, p.77-78.

[187] Ibid., p.82.

[188] Natural Resource Conservation Service, Historical Surface Water Supply Index Maps: 1992 – Present, Accessed on April 10, 2013, http://nris.mt.gov/NRCS/swsi/SWSIhistory.asp.

Racetrack Creek's stream channel's morphology varies drastically from the upper to the lower section of the creek. There are few water right claims above the National Forest Boundary, and in this section the creek flows through timbered mountain terrain. The lower section flows through the valley where the creek's flow has been critically depleted for irrigation purposes. The lower reach's flows are also naturally depleted due to the gravel alluvium that exists along the valley's floor, and is considered a loosing reach[189]. With the complicated and well established irrigation system along the creek, combined with the complexities of gaining and loosing reaches, Racetrack Creek is not a simple tributary to understand. However, this creek is typical of many drainages within the Upper Clark Fork River.

Knowing the critical state of flows within Racetrack Creek, I began to research the water rights associated with the creek. After collecting all of the rights associated with Racetrack Creek, I identified the diversion points associated with each of these rights. I did not perform this analysis on rights that did not have an associated flow rate, as these were mainly rights held for stock use. I also eliminated groundwater rights that were associated with springs, or unnamed tributaries of Racetrack Creek (Table 15). The remaining rights that I analyzed were all surface rights, mainly held for irrigation purposes; however, there are 10 water rights within the basin held by the US Forest Service for fish and wildlife. These rights held for fish and wildlife are all small (0.10 cfs), held high in the headwater lakes of the creek, and are unique because there is some question as to how enforceable they truly are[190]. The documentation of these rights states

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[189] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin*, 1986, p.76.
[190] Bryan Gartland, Personal Correspondence, April 26, 2013.

that the Montana Water Court has acknowledged that the use of the water identified may not be considered a "beneficial use or appropriation of water"[191]. Currently, it is difficult to identify exactly what these small rights protect, if anything[192].

The irrigation rights along Racetrack Creek are primarily diverted between mile 7.5 and 6.5 of the creek (Figure 10). A few major ditches divert the water associated with many of the creek's water rights in this section. The two most prominent ditches on the creek are Cement Ditch and Morrison Ditch. Because the ditch systems in this section of the creek are complex, it is difficult to quantify accurately the water rights associated with each specific ditch. However, above Racetrack Creek's river mile 6.5, approximately 300 cfs have been claimed for irrigation purposes. There are a few water rights with diversion points between river miles 6 and 4 that mainly draw from springs and unnamed tributaries to Racetrack Creek. The claimed water rights through this section total only approximately 8 cfs. There are a number of water rights that are claimed between miles 3.6 and 3 of the creek, the claimed rights through this reach total over 63 cfs. And finally, through the lower section of Racetrack Creek, from river mile 2.2 through 0.4, the total claimed rights are just over 23 cfs (Table 15).

The most senior rights on Racetrack Creek are diverted from the creek via Cement Ditch at approximately river mile 6.8 and from Morrison Ditch at approximately river mile 7.5 (Figure 10). These rights date back to 1860's and have all been used for irrigation purposes. When deciding which water rights would be most effective in protecting instream flows, both the location and seniority date are of utmost importance.

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[191] Natural Resource Conservation Service, Historical Surface Water Supply Index Maps: 1992 – Present, Accessed on April 10, 2013, http://nris.mt.gov/NRCS/swsi/SWSIhistory.asp.

[192] Bryan Gartland, Personal Correspondence, April 26, 2013.

A senior right, close to the mouth of creek, or confluence with the Clark Fork River, would be ideal. Having a senior right, low on the river system would allow the owner of this right to make a call on all upstream junior users, requiring them to allow the amount of water equal to the senior user's right to pass their diversion. If the senior user's right was, for example, 1.25 cfs, this would mean that 1.25 cfs would have to remain in the stream to the point at which that amount was historically diverted. The flow rate of 1.25 cfs is only protected at this historic point of diversion, below this point of diversion "only the amount historically consumed, or a smaller amount… may be used to protect, maintain, or enhance streamflows below the point of diversion that existed prior to the change in appropriation right"[193].

This process does appear to be fairly straight forward upon initial review. However, a full analysis of the water right becomes complicated quickly, which is why watershed and river advocacy organizations, despite their efforts, have not made significant progress in protecting flows for instream use. For example, the 5th oldest right on Racetrack Creek has a priority date of April 1st, 1869[194]. The water right's claim is for 1.25 cfs, totaling 525 acre-feet; it is to be used to irrigate 500 acres; and the points of diversion are at approximately river miles 3.1 and 3.3. It does appear that this water right would be worth targeting for transfer to instream use; it is fairly near the mouth of the creek and there are only 4 water rights more senior to this right.

The difficulties in transferring a right such as this to instream use come in the processing of an Application for Change of Water Right with the Department of Natural Resources and Conservation. When making any change to the use of a water right, one

[193] Montana Code Annotated § 85-2-436(3)(d)
[194] Montana Water Court, Case 76G-549.

must ensure that the change will not adversely affect existing water rights, certificates, permits, and water reservations. Proving this can be difficult. The DNRC requires that the applicant document, at least the potential effects to "water rights using the existing or proposed point of diversion, other ditch users, down-slope users, the effect to water rights dependent on the return flow, [and] the effects of changing the historic diversion pattern including rate and timing of depletions"[195]. Along with this, the applicant must adequately document the historic use of the water right, including the historic diversion and operation pattern, conveyance losses, place of use for each purpose, historic on-farm efficiency, and the pattern of return flows[196]. The state has made attempts to standardize the required analysis of historic irrigation water use and application; however, on creeks like Racetrack with gaining and loosing reaches, and return flows being lost to neighboring drainages, it becomes increasingly difficult to have a standard approach. All of these considerations and requirements can appear daunting, when in fact they may take less time than the initial relationship building with irrigators and other water users, that is required to initiate any water use transfer. The relationship building step is typically the most complicated, and difficult to quantify.

Racetrack Creek has a complicated history of water use, ditch management, and hydrology. Because of this, it may be difficult for watershed groups, and environmental non-profits to work with irrigators to transfer specific water rights to instream use. One way organizations may gain trust amongst Racetrack Creek's water users, and return water to the creek could be through investing in increased water use efficiency. Some groups have worked with irrigators to upgrade irrigation systems. Because the users of

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[195] Administrative Rules of Montana § 36.12.1903
[196] Administrative Rules of Montana § 36.12.1902(7)

the Cement and Morrison Ditch systems claim approximately 300 cfs on Racetrack Creek, an investment in these ditches to reduce conveyance losses could be highly effective. An efficiency project such as this has the potential to augment flows within Racetrack Creek, allowing low flows to increase to at least the 1 cfs, as requested by the DFWP. The project would also allow for many irrigators to become familiar with the benefits of instream flows and river groups will be willing to invest in efficiency. Hopefully such interactions will assuage the fears many have of river advocacy groups and state agencies. Finally, because this project could be considered a water-saving method, resulting in the "salvage"[197] of water, the lease of the water for instream flow purposes could be for 30 years, rather than the typical lease length of 10 years[198]. Ultimately, a project such as this would require extensive public outreach, and would require support from the irrigators of Racetrack Creek. An effort such as this would allow for more instream flow on a critical creek in the Upper Clark Fork River basin, and it may foster increased trust and understanding between river groups and the agricultural community. Obviously, if well managed, it could be a highly effective demonstration project that would allow for more projects to occur in the basin.

Conclusions and Recommendations

Priorities for Funding

This review and synthesis of existing stream restoration prioritization reports is merely a first step in the restoration and reestablishment of flows in the Upper Clark Fork River Basin. The recommendations I have made suggest where flow restoration could

[197] Montana Code Annotated § 85-2-102(20)
[198] Montana Code Annotated § 85-2-436(3)(e).

have the greatest water quality and fishery benefits within the Upper Clark Fork River basin. Such information allows organizations like the Upper Cark Fork River Basin Steering Committee, the Clark Fork Coalition, the Watershed Restoration Coalition, Trout Unlimited, Granite Headwaters Watershed Group, and Montana Fish, Wildlife, and Parks to focus their funds, so as to get the most return on their investments. The state of Montana is in the process of distributing some of the final NRDP funds. After these are all allocated, organizations will need to be even more strategic in their investment in the Upper Clark Fork River.

Within this report I suggested that tributaries within the Upper Clark Fork River Basin be prioritized based upon: one, their location within the basin, and ability to aid in the rewatering of flow depleted sections of the mainstem of the river; two, their flow related water quality impairments; and three, each tributary's fishery value (Table 15). As further study is completed, individual tributary rankings may change; flow related water quality impairments may become more critical in certain streams; and it may become apparent that additional areas within the basin are severely flow depleted.

Priorities for Research

There are still many information gaps in our understanding of the current needs of the river and its tributaries. An expanded effort to quantify flow targets within the tributaries that contribute to the Clark Fork River above Garrison Junction should be completed. Synoptic analyses of gaining and losing reaches should be completed in each of the targeted tributaries. Along with this analysis, the wetted perimeter should be used and applied to multiple reaches, above and below losing sections of the creek, within the prioritized tributaries as well as the mainstem of the river. The combination of these two analyses would allow for a more comprehensive understanding of each tributary's natural flow patterns and needs.

With a better understanding of flow needs within the basin, an analysis of the claimed water rights associated with each tributary should be completed. An initial understanding of where the majority of water is diverted from the creek will allow river advocates to better invest their funds. Efficiency projects, such as the lining or piping of ditches, upgraded irrigation practices, and improved diversion structures, are all options that would likely have less impact on agricultural practices than a full conversion of an irrigation water right to instream flow. Targeting irrigation efficiency projects would also allow for organizations to aid irrigators, and for the development of stronger relationships between the agricultural community within the Deer Lodge Valley and river advocacy organizations.

Priorities for Outreach and Cooperation

The personalities and needs of irrigators will continue to be a critical component of any flow restoration project. Not only will river advocacy groups need to work with irrigators in the development of new projects, but once they have a project identified and apply for a change of use, any water user that may be affected by that change has an opportunity to object to the proposed change. Through stronger relations with the agricultural community these objections, and issues might be resolved prior to the DNRC's change application public process.

As drought conditions persist or worsen throughout the west and within the Upper Clark Fork, it should be a goal of the Upper Clark Fork River Basin Steering Committee to complete a drought plan for the basin. The recommendations that I have made would be a helpful part of such a drought plan. We know where the critically low points are, and where there is potential for further study. Until there is a more comprehensive understanding of the needs of the Upper Clark Fork River and its tributaries, it will be even more difficult to assemble water users to agree upon a drought management plan, no matter how critical the drought conditions may become.

Act Now; It Won't Get Easier

The protection of flows within the Upper Clark Fork River basin will continue to be fiercely debated topic. One recent example of an attempt to reserve flow for instream use was the Water Rights Compact proposed by the Confederated Salish and Kootenai Tribes, the State of Montana, and the United States. This compact identified a 1,167 cfs water right for instream fishery, with a priority date of December 11, 1904, at the site of the old Milltown Dam. This right would be junior to many rights within the basin. For example, of the 102 surface rights I studied on Racetrack Creek, only 30 are junior to the December 11, 1904 Milltown water right. Despite the multi-year effort by many organizations and state agencies, the compact was derailed by the 2013 Montana Legislature. So the need to find solutions within the basin, build understanding and trust, and the willingness to experiment and manage water adaptively continues to be paramount. Organizations and agencies have been working to protect instream flows since the DFWP's 1986 *Application for Water Reservations,* and although the policy and law around instream flow have developed considerably, the rivers and fisheries have not seen the benefits as of yet. It will only become more important to identify and develop effective water resource management schemes in the Upper Clark Fork River basin and throughout Montana.

Figure 1: Map of the Upper Clark Fork River Basin

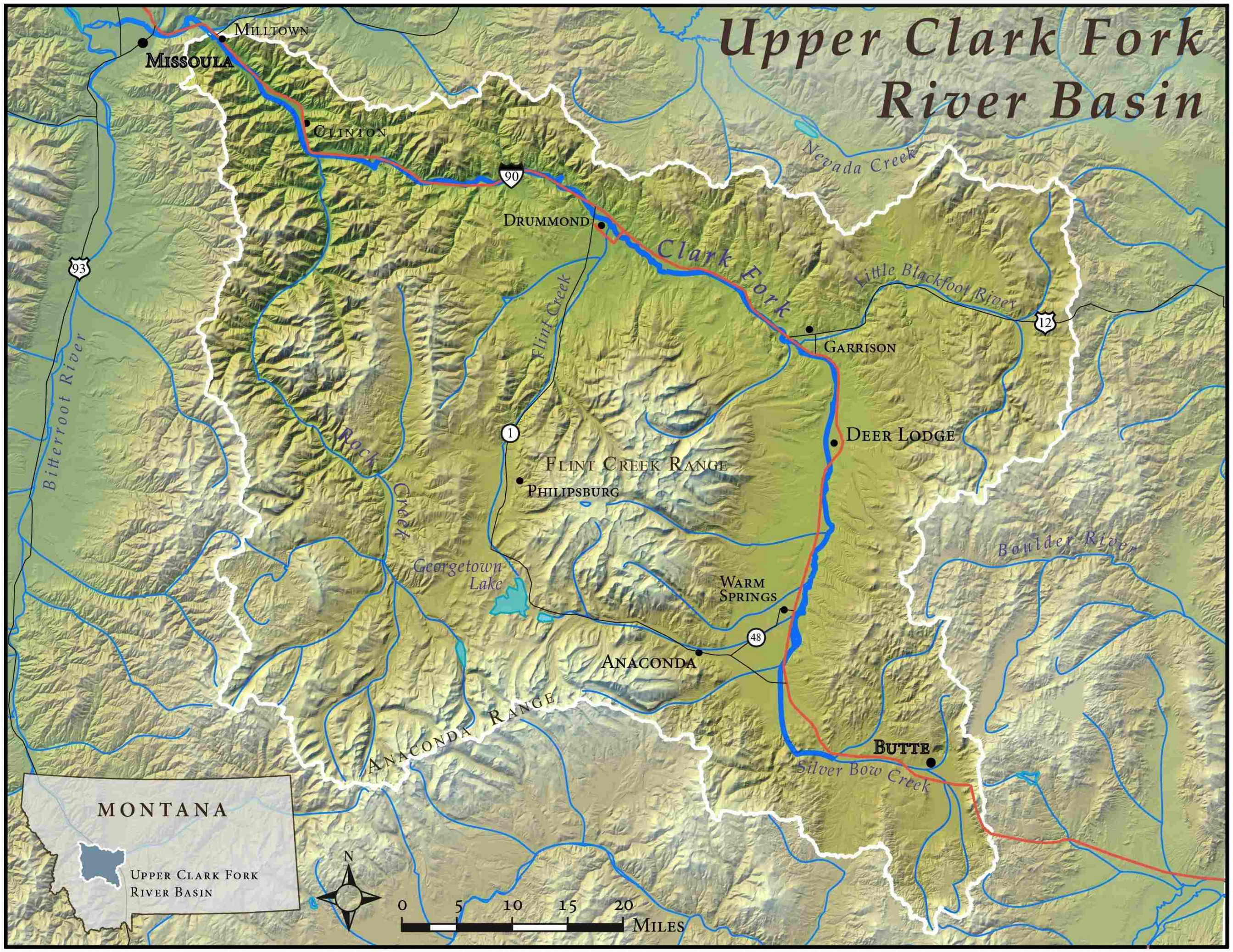
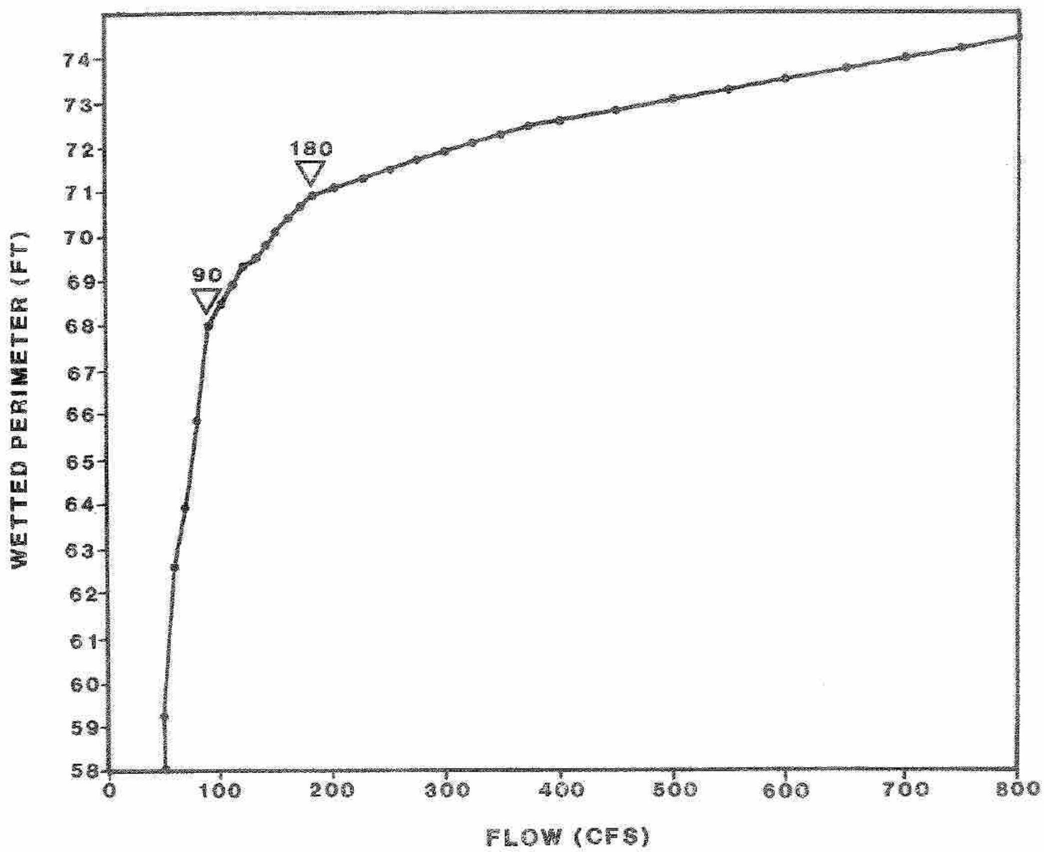


Figure 2: Wetted Perimeter analysis for the Clark Fork River near Deer Lodge showing upper and lower inflection points[199]



Note: 90 cfs = critical discharge rate below which habitat is rapidly lost.
180 cfs = upper discharge rate, above which little additional riffle habitat is gained.

[199] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* Helena, MT: Montana Department of Fish, Wildlife & Parks, November 1986, p.36.

Figure 3: Hydrograph for the Upper Clark Fork River at Deer Lodge

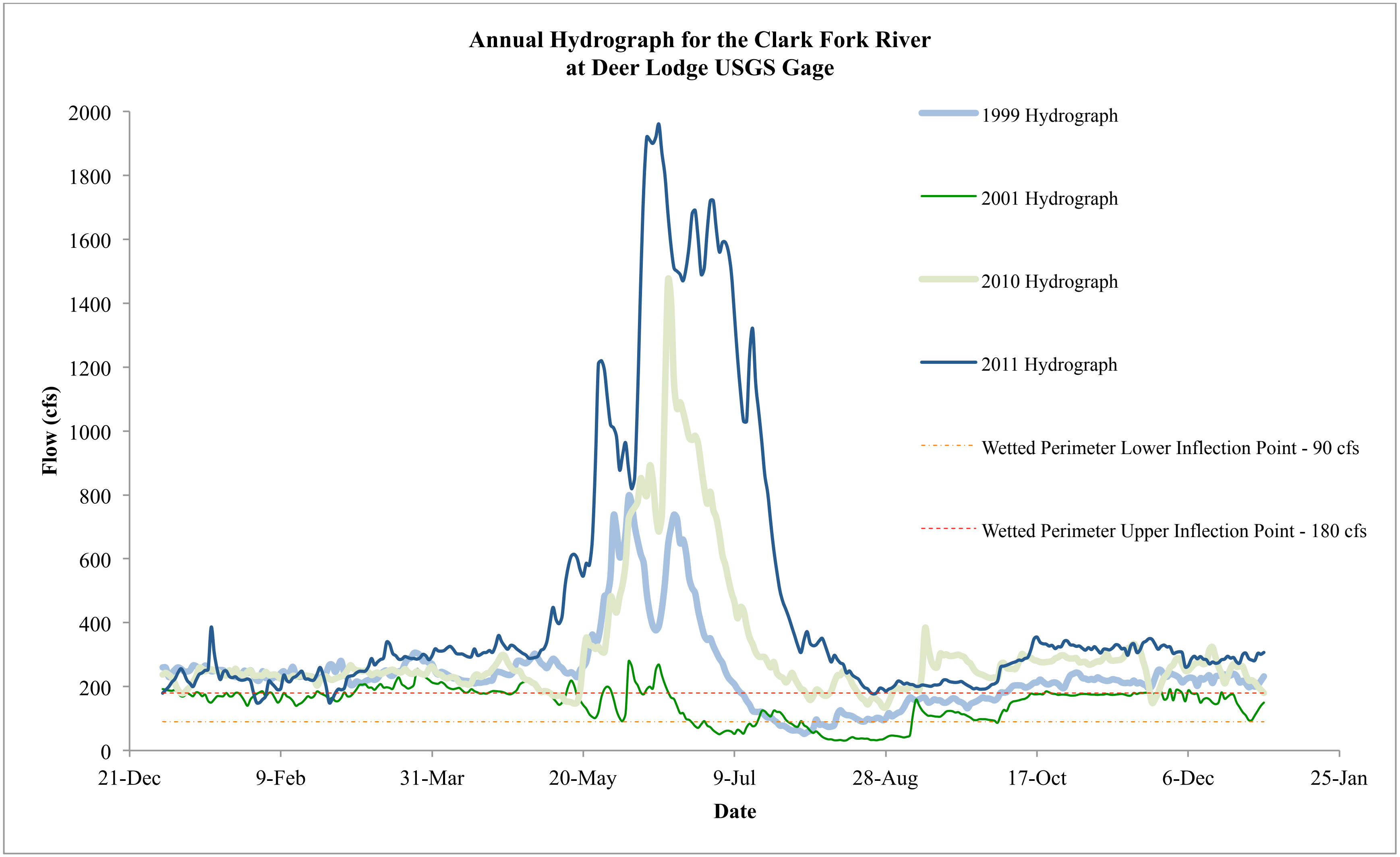
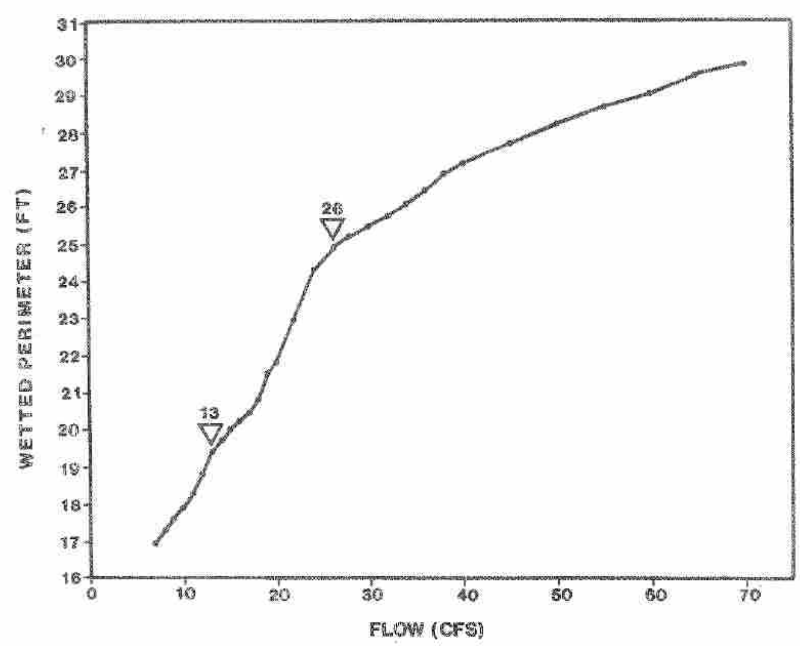
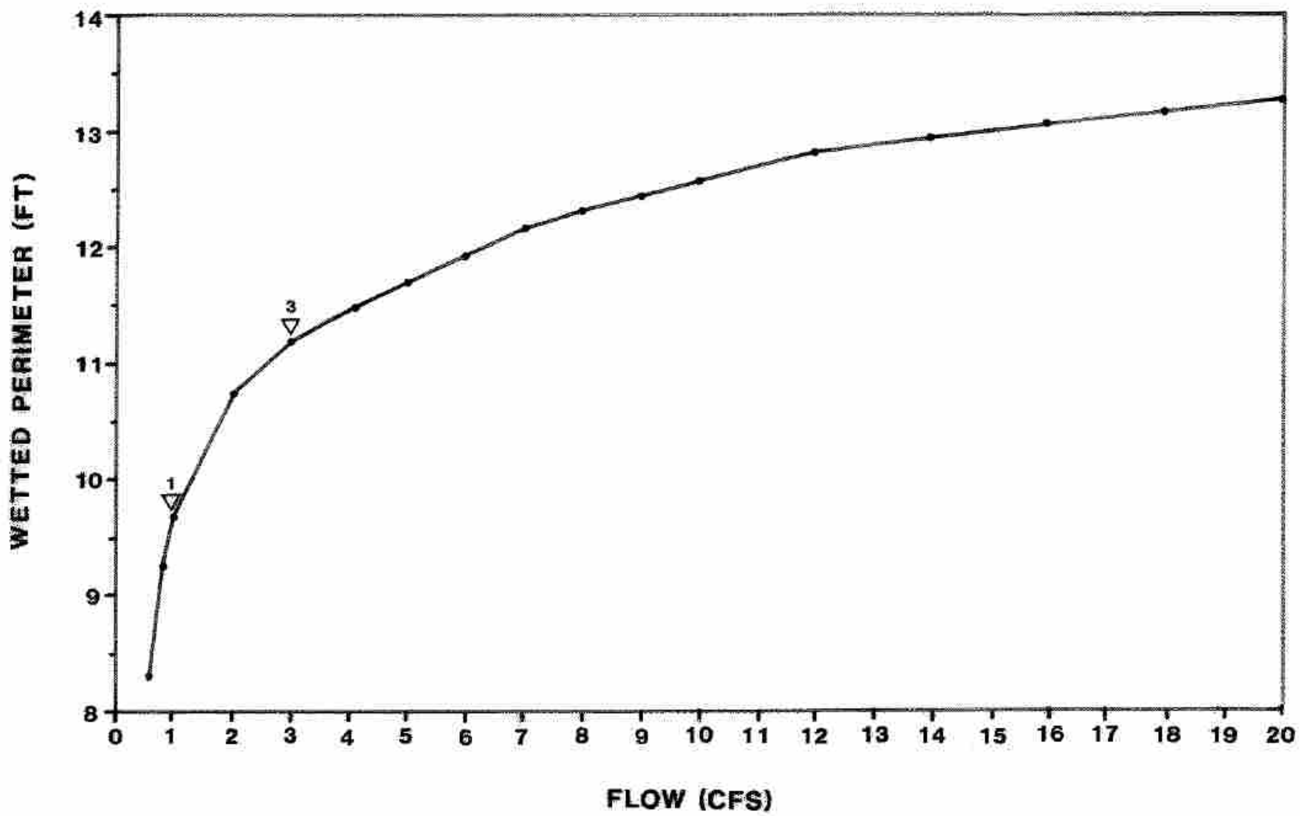


Figure 4: Wetted Perimeter analysis for Upper Racetrack Creek near the USFS boundary [200]



[200] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* Helena, MT: Montana Department of Fish, Wildlife & Parks, November 1986, p.79.

Figure 5: Wetted Perimeter analysis for Lower Racetrack Creek near confluence with Clark Fork River[201]



[201] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* Helena, MT: Montana Department of Fish, Wildlife & Parks, November 1986, p.82.

Figure 6: Upper Racetrack Creek Hydrographs – Summers of 2010, 2011, 2012
Developed by the Clark Fork Coalition and Watershed Restoration Coalition Staff, inflection points by DFWP 1986

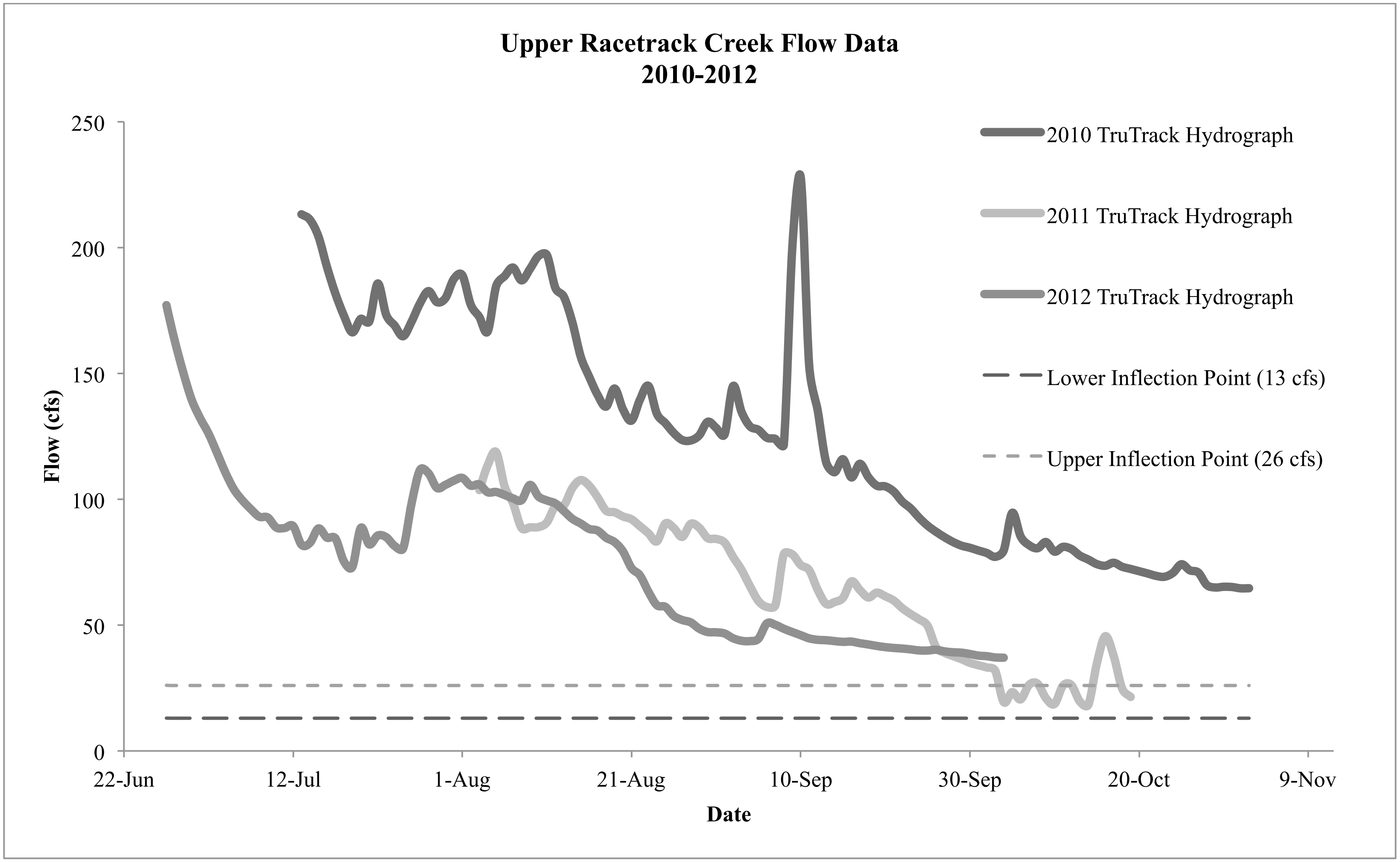


Figure 7: Lower Racetrack Creek Hydrographs – Summers of 2010, 2011, 2012
Developed by the Clark Fork Coalition and Watershed Restoration Coalition Staff, inflection points by DFWP 1986

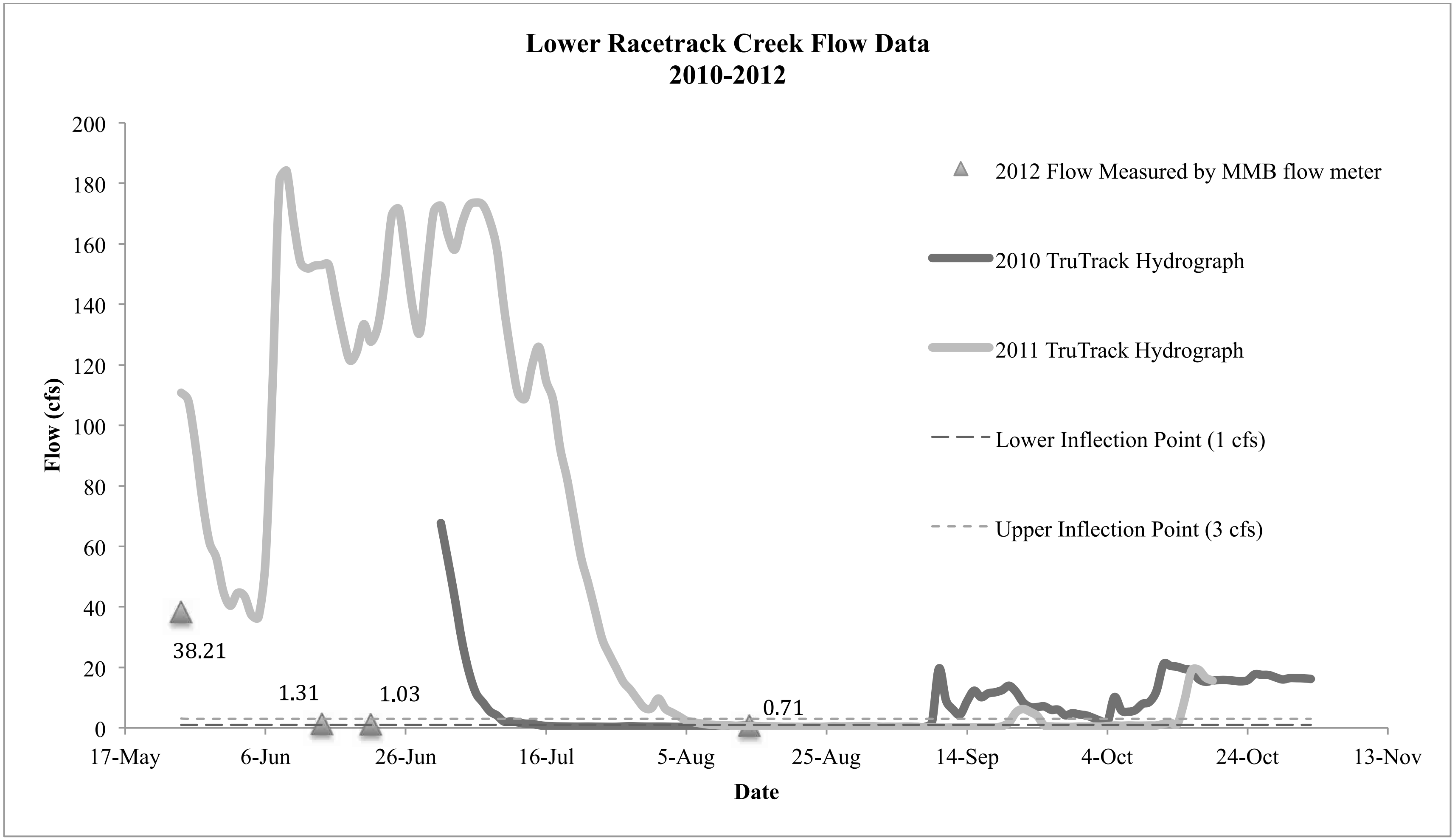


Figure 8: Lower Racetrack Creek Hydrographs – cropped to better show low flow conditions
Developed by the Clark Fork Coalition and Watershed Restoration Coalition Staff, inflection points by DFWP 1986

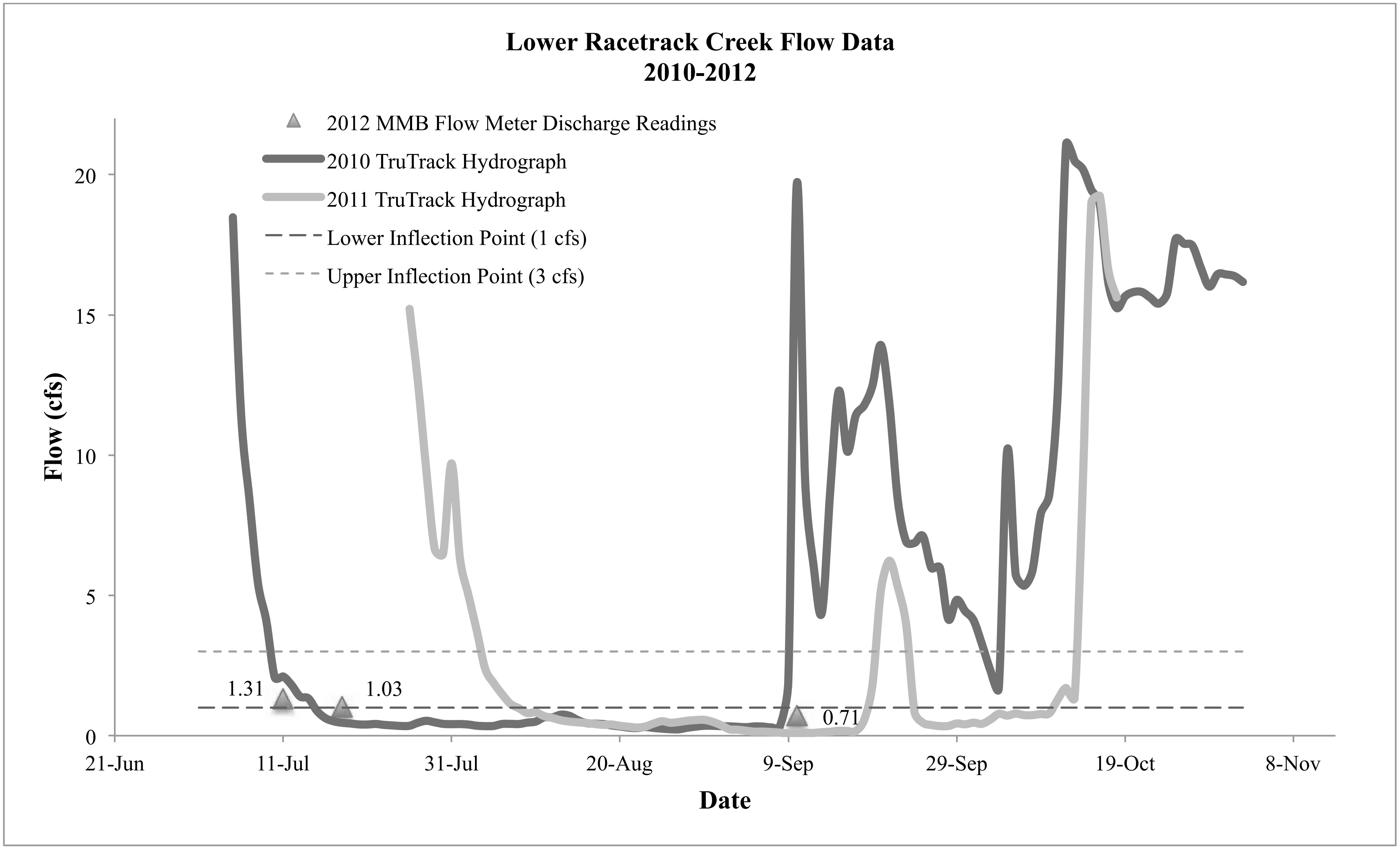


Figure 9: Map of Racetrack Creek

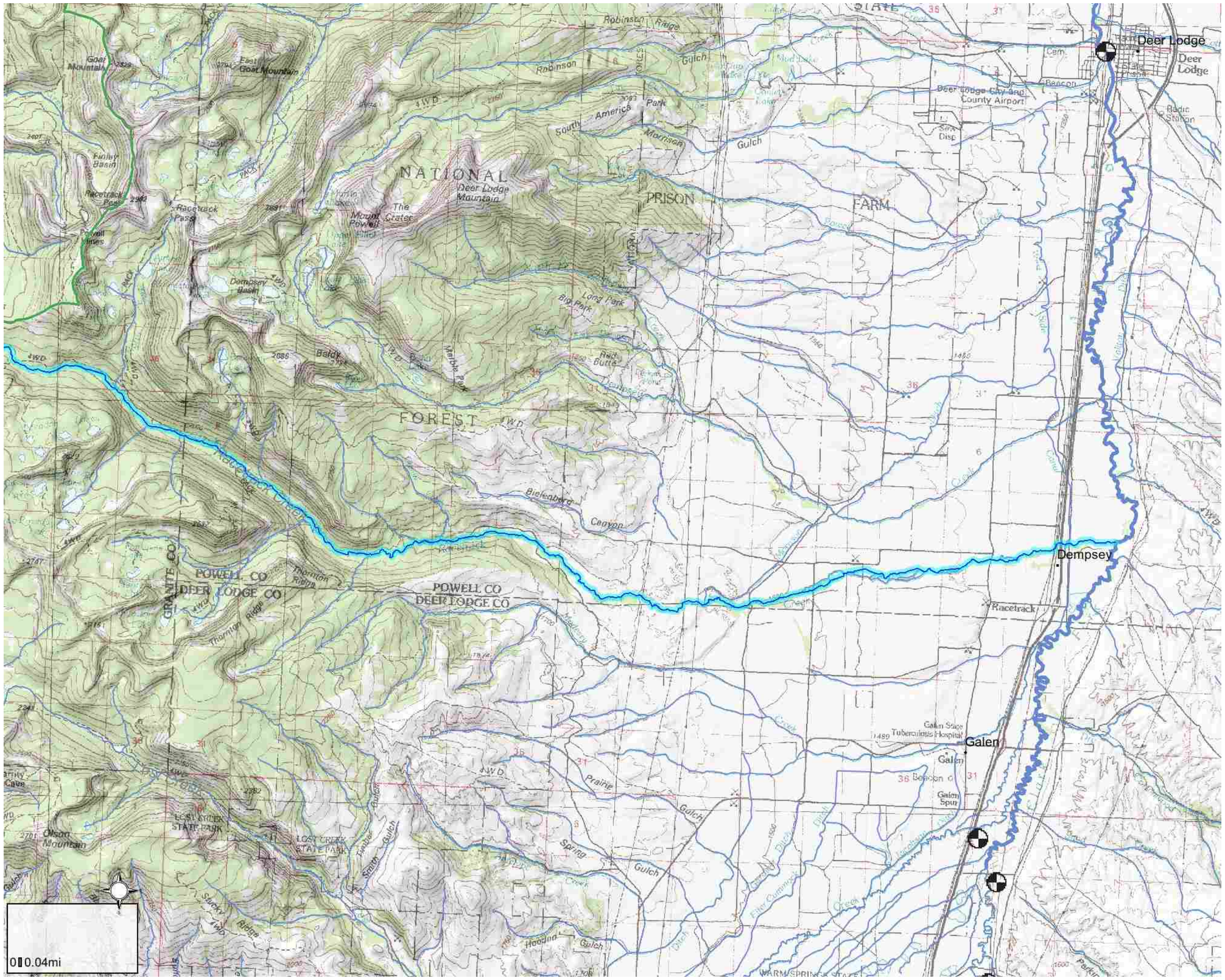


Figure 10: Map of lower Racetrack Creek with river miles

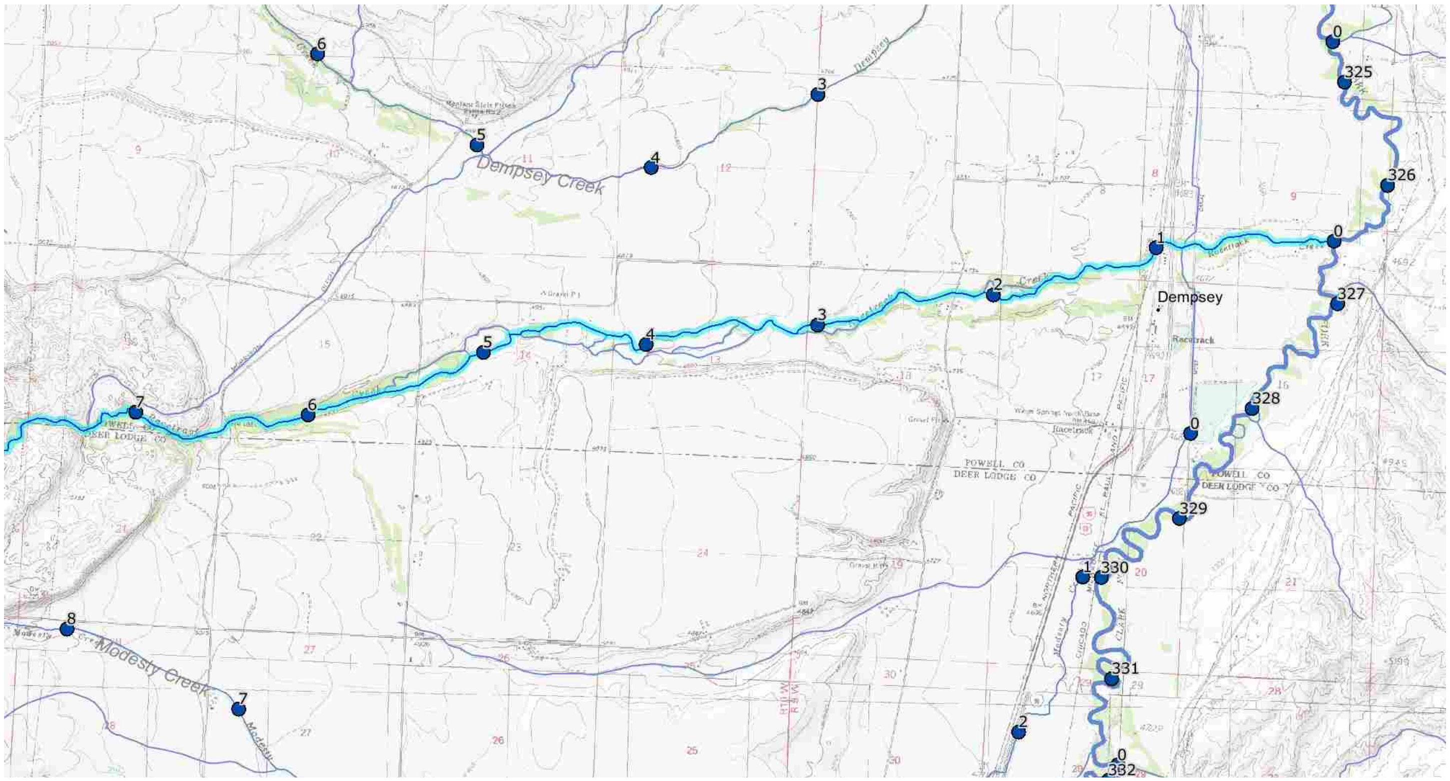


Table 1: Summary of Requested Water Flow Rates and Volumes in 1986 Application for Reservations of Water in the Upper Clark Fork River Basin[202]

	Dates Requested	Rate Requested		Volume Requested		Method Used to Determine Request
Clark Fork River						
Warm Springs to the Little Blackfoot	Jan 1 - Dec 31	**180**	cfs	130,314	AF/yr	wetted p, upper inflection point
Little Blackfoot to Flint Creek	Jan 1 - Dec 31	**400**	cfs	289,587	AF/yr	wetted p, upper inflection point
Flint Creek to Rock Creek	Jan 1 - Dec 31	**500**	cfs	361,983	AF/yr	wetted p, upper inflection point
Rock Creek to the Blackfoot	Jan 1 - Dec 31	**600**	cfs	434,380	AF/yr	wetted p, upper inflection point
Dempsey Creek						
Caruthers lake to the mouth	Jan 1 - Dec 31	**3.5**	cfs	2,534	AF/yr	wetted p, upper inflection point
Flint Creek						
Georgetown Lake to Boulder Creek	Jan 1 - Dec 31	**50**	cfs	36,198	AF/yr	wetted p, upper inflection point
Boulder Creek to the mouth	Jan 1 - Dec 31	**45**	cfs	32,578	AF/yr	wetted p, less than upper inflection point
Boulder Creek, headwaters to mouth	Jan 1 - Dec 31	**20**	cfs	14,479	AF/yr	wetted p, upper inflection point
North Fork of Flint Creek, headwaters to lake	Jan 1 - Dec 31	**6**	cfs	4,344	AF/yr	wetted p, upper inflection point
Spring/Stuart Mill Creek	Jan 1 - Dec 31	**14**	cfs	10,136	AF/yr	based on observation
Gold Creek						
Headwaters to the mouth	Jan 1 - Dec 31	**34**	cfs	24,615	AF/yr	wetted p, upper inflection point
Harvey Creek						
Otter Creek to the mouth	Jan 1 - Dec 31	**3**	cfs	2,172	AF/yr	wetted p, less than upper inflection point

[202] Montana Department of Fish, Wildlife & Parks, *Application for Reservations of Water in the Upper Clark Fork River Basin,* Helena, MT: Montana Department of Fish, Wildlife & Parks, November 1986.

Table 1: Continued

Little Blackfoot River						
Blackfoot meadows to Dog Creek	Jan 1 - Dec 31	**17**	cfs	12,307	AF/yr	wetted p, upper inflection point
Dog Creek to the Mouth	Jan 1 - Dec 31	**85**	cfs	61,537	AF/yr	wetted p, upper inflection point
Snowshoe Creek, Deadwood Gulch to mouth	Jan 1 - Dec 31	**9**	cfs	6,516	AF/yr	wetted p, upper inflection point
Dog Creek, Dago Gulch to mouth	Jan 1 - Dec 31	**12**	cfs	8,688	AF/yr	wetted p, upper inflection point
Lost Creek						
Headwaters to the mouth	Jan 1 - Dec 31	**16**	cfs	11,583	AF/yr	wetted p, upper inflection point
Racetrack Creek						
North Fork to Deerlodge NF boundary	Jan 1 - Dec 31	**26**	cfs	18,823	AF/yr	wetted p, upper inflection point
Deerlodge NF boundary to the mouth	Jan 1 - Dec 31	**3**	cfs	2,172	AF/yr	wetted p, upper inflection point
Warm Springs Creek						
Middle Fork to Meyers Dam	Jan 1 - Dec 31	**50**	cfs	36,198	AF/yr	wetted p, upper inflection point
Meyers Dam to the mouth	Jan 1 - Dec 31	**40**	cfs	28,959	AF/yr	wetted p, upper inflection point
Barker Creek, lake to mouth	Jan 1 - Dec 31	**12**	cfs	8,688	AF/yr	wetted p, upper inflection point
Cable Creek, headwaters to mouth	Jan 1 - Dec 31	**10**	cfs	7,240	AF/yr	based on observation
Storm Lake Creek, lake to mouth	Jan 1 - Dec 31	**3 to 10**	cfs	2,172 to 7,240	AF/yr	wetted p, lower to upper inflection point
Twin Lakes Creek, lower lake to mouth	Jan 1 - Dec 31	**13**	cfs	9,412	AF/yr	wetted p, upper inflection point

Table 2: DFWP's 2005 Dewatering Concern Areas Within the Tributaries and Mainstem of the Upper Clark Fork River[203]

Chronically Dewaterd Streams:

Flint Creek	Upper Willow Creek
Cow Creek	CF River: Racetrack to Rock Creek
Douglas Creek	Bear Creek
Gird Creek	Blum Creek
Henderson Creek	Cottonwood Creek
Lower Willow Creek	Crevise Creek
Marshall Creek	Dempsey Creek
Little Blackfoot River	Gold Creek
Carpenter Creek	Harvey Creek
Dog Creek	Hoover Creek
Galleger Creek	Lost Creek
Jefferson Creek	Mill Creek
North Trout Creek	Morris Creek
Ophir Creek	Peterson Creek
Sixmile Creek	Powell Creek
Snowshoe Creek	Racetrack Creek
Spotted Dog Creek	Rock Creek
Threemile Creek	Storm Lake Creek
Washington Creek	Swartz Creek
Wilson Creek	Taylor Creek
Rock Creek	Tigh Creek
Brewster Creek	Tin Cup Joe Creek
North Fork Spring Creek	Twin Lakes Creek
Ranch Creek	Warm Springs Creek
Ross's Fork	Willow Creek
South Fork Spring Creek	

Periodically Dewaterd Streams:

CF River: Warm Springs to Racetrack

[203] Montana Department of Fish, Wildlife & Parks, *Fish, Wildlife, and Parks Dewatering Concern Areas*, Bozeman, MT: Montana Fish, Wildlife & Parks, 2005.

Table 3: Prioritization of Tributaries based on the 2010 DFWP and NRDP *Rating Summaries for the Prioritization of Tributaries of the Upper Clark Fork River Basin for Fishery Enhancement – Draft Final*[204]

Priority 1
German Gulch
Little Blackfoot River (lower)
Racetrack Creek (lower)
Warm Springs Creek (lower)

Priority 2
Boulder Creek
Cottonwood Creek (lower)
Dempsey Creek (lower)
Dog Creek
Gold Creek (lower)
Little Blackfoot River (upper)
Lost Creek (lower)
Flint Creek (lower)
Mill Creek (lower)
Snowshoe Creek (lower)
Spotted Dog Creek (lower)
Upper Flint Creek
Warm Springs Creek (upper)
Willow Creek

Priority 3
Beefstraight Creek
Blacktail Creek
Deer Creek
Douglas Creek (lower Flint Creek)
Middle Fork Rock Creek
Ranch Creek
Rock Creek (mainstem)
Stony Creek
Trout Creek (flint creek)
Welcome Creek
West Fork Rock Creek

Priority 4
Barker Creek
Butte Cabin Creek
Carpp Creek
Copper Creek
Cramer Creek
East Fork Rock Creek (dam to mouth)
East Fork Rock Creek (reservoir to headwaters)
Fred Burr Creek (Flint Creek)
Harvey Creek
Hogback Creek
North Fork Flint Creek
North Fork Rock Creek
South Fork Lower Willow Creek
Storm Lake Creek
Swartz Creek
Warm Springs Creek (near Garrison)
West Fork Warm Springs Creek

[204] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Rating Summaries for the Prioritization of Tributaries of the Upper Clark Fork River Basin for Fishery Enhancement Draft Final.* Helena, MT: Montana DFWP and Montana NRDP, May 2010.

Table 4: Prioritization of 8 Selected Tributaries based on Dennis Workman's 2009 *Qualitative Assessment of Habitat in Eight Tributaries to the Upper Clark Fork River*[205]

Clark Fork River Diversion	High
Cramer Creek	High
Flint Creek (Mullan Trail to Mouth)	High
Tyler Creek	High
Flint Creek (Hall Birdge to Mullan Trail)	Medium
Flint Creek (Douglas Creek to Hall Bridge)	Medium
Antelope Creek	Low
Hoover Creek	Low
Flint Creek (Allendale Div to Hwy 1)	Low
Flint Creek (Hwy 1 to Douglas Creek)	Low
Turah Creek	Low
Warm Springs Creek	Low

[205] Workman, Dennis for Montana Natural Resource Damage Program and Montana Department of Fish, Wildlife, and Parks, *Qualitative Assessment of Habitat in Eight Tributaries to the Upper Clark Fork River*, Missoula, MT, Montana NRDP and Montana DFWP, June 2009.

Table 5: Prioritization of Tributaries based on the DFWP and NRDP 2011 *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement - Final*[206]

Priority 1
Browns Gulch
German Gulch
Racetrack Creek (lower)
Warm Springs Creek (lower)
Warm Springs Creek (upper)
Storm Lake Creek
Barker Creek
WF Warm Springs Creek
Twin Lakes Creek
CF River above Deer Lodge

Priority 2
Baggs Creek
Beefstraight Creek
Blacktail Creek
Cottonwood Creek (lower)
Cottonwood Creek (upper)
Dempsey Creek (lower)
Dog Creek
Foster Creek
Lost Creek (lower)
Mill Creek(lower)
Snowshoes Creek (lower)
Spotted Dog Creek (lower)
Willow Creek
Little Blackfoot River (upper)
Flint Creek (lower)
Flint Creek (upper)
Boulder Creek
Harvey Creek
CF River below Deer Lodge and Silver Bow Creek

Priority 3
Alaska Gulch
American Gulch
Basin Creek (lower)
Flume Gulch
Racetrack Creek (upper)
Douglas Creek (lower)
Trout Creek
Gold Creek (lower)
Deer Creek
Rock Creek
Ross Fork Rock Creek
MF Rock Creek
WF Rock Creek
Stony Creek
Welcome Creek
Ranch Creek

Priority 4
Bock Creek
Warm Springs Creek
NF Flint Creek
Fred Blurr Creek
EF Rock Creek
Buttee Cabin Creek
Hogback Creek
Cramer Creek
Swartz Creek
Greenough Creek
SF Lower Willow Creek
Carpp Creek
Copper Creek
EF Rock Creek
NF Rock Creek

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206 Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Prioritization of Areas in the Upper Clark Fork River Basin for Fishery Enhancement Final*. Helena, MT: Montana DFWP and Montana NRDP, December 2011.

Table 6: Summary of Stream Impairments within Tributaries to the Upper Clark Fork River as determined by the DEQ in 2010[207]

	Sediment	Metals	Temperature
Antelope Creek	S		
Beefstraight Creek		M	
Brock Creek	S		
Cable Creek	S		
Dempsey Creek	S		
Dunkleberg Creek		M	
Gold Creek		M	
Hoover Creek	S		
Lost Creek		M	
Mill Creek			
Modesty Creek		M	
Peterson Creek	S	M	T
Tin Cup Joe Creek	S		
Warm Springs (near Ananconda)		M	
Warm Spring (near Phosphate)	S		
Willow Creek	S	M	
Storm Lake Creeks	S		
German Gulch		M	
Mill-Willow Bypass		M	

[207] Montana Department of Environmental Quality, *Upper Clark Fork River Tributaries Sediment, Metals, and Temperature TMDLs and Framework for Water Quality Restoration*, Helena, MT: Montana DEQ, March 4, 2010.

Table 7: Prioritization of Tributaries based on Montana Trout Unlimited's 1999 Report *Restoring the Upper Clark Fork: Guidelines for Action*[208]

High Priority
Cramer Creek
Gold Creek
Harvey Creek
Mill Creek
Rock Creek (at Garrison)
Rock Creek (near Clinton)
Silverbow Creek
Warm Springs Creek
Willow Creek

Medium Priority
Blackfoot River
Crystal Spring Creek
Deer Creek
Flint Creek
Lost Creek
Racetrack Creek
Schwartz Creek
Turah Spring Creek
Tyler Creek
Warm Springs Creek (at Phosphate)

Low Priority
Cottonwood Creek
Dempsey Creek
Dutchman Creek
Little Blackfoot River
Peterson Creek

[208] Workman, Dennis, James Kuipers, Bruce Farling, and Paul Callahan for Trout Unlimited, "Restoring the Upper Clark Fork: Guidelines for Action," Bozeman, MT: Trout Unlimited, April 1999.

Table 8: Prioritization of Tributaries based on the Clark Fork Coalition's 2011 report, *Aquatic Restoration Strategy for the Upper Clark Fork Basin*[209]

Cottonwood Creek
Dempsey Creek
Dry Cottonwood Creek
Lost Creek
Modesty Creek
Perkins/Girard Gulch
Peterson Creek
Racetrack Creek

[209] Clark Fork Coalition, *Aquatic Restoration Strategy for the Upper Clark Fork Basin*, Missoula, MT: Clark Fork Coalition, 2011.

Table 9: Summary of Stream Impairments in 11 Tributaries to the Upper Clark Fork River based on Stream Data Collected in 2010-11 by WRC[210]

	Sediment Impairment	Water Temperature	Low Flow	Channelization	Highly Altered Riparian Veg
Brown's Gulch	S	T	F	C	
Cottonwood Creek	S	T		C	
Dempsey Creek	S	T	F	C	R
Dry Cottonwood Creek	S				
Dunkleberg Creek	S			C	R
Gold Creek	S	T	F		
Lost Creek	S				
Peterson Creek	S				
Perkins Gulch	S				R
Racetrack Creek	S	T	F		
Willow Creek	S				R

[210] Watershed Restoration Coalition of the Upper Clark Fork, *Upper Clark Fork Tributary Assessment for Restoration Planning: WRC Assessment and Monitoring Project, 2010-2011 – "Watershed Health Monitoring Report,"* Deer Lodge, MT: Watershed Restoration Coalition, August 25, 2012.

Table 10: Clark Fork River Tributaries most often given priority across surveyed reports (Reach A tributaries are in BOLD)

Tributary Name	Tributary to…	# of times studied	# times listed as top priority
Alaska Gulch	Browns Gulch	1	
American Gulch	Browns Gulch	1	
Antelope Creek	CFR Reach B	1	
Baggs Creek	Cottonwood Creek	1	
Barker Creek	Warm Springs	1	1
Basin Creek (lower)	Silver Bow Creek	1	
Beefstraight Creek	German Gulch	1	
Blackfoot River	CFR Reach C	1	
Blacktail Creek	Silver Bow Creek	2	
Bock Creek	CFR Reach B	1	
Boulder Creek	Flint Creek	1	1
Browns Gulch	Silver Bow Creek	2	2
Buttee Cabin Creek	Rock Creek	1	
Carpp Creek	Rock Creek	1	
Cramer Creek	CFR Reach C	3	2
Crystal Spring Creek	CFR Reach C	1	1
Copper Creek	Rock Creek	1	
Cottonwood Creek	**CFR Reach A**	4	**3**
Deer Creek	CFR Reach C	2	1
Dempsey Creek	**CFR Reach A**	4	**3**
Dog Creek	Little BF River	1	1
Dry Cottonwood Creek	**CFR Reach A**	1	1
Douglas Creek (lower)	Flint Creek	1	1
Dutchman Creek	Lost Creek	1	
Flint Creek	CFR Reach B	4	**4**
Flume Gulch	Browns Gulch	1	
Foster Creek	Warm Springs	1	1
Fred Blurr Creek	Flint Creek	1	
German Gulch	Silver Bow Creek	2	2
Gold Creek	CFR Reach B	2	1
Greenough Creek	CFR Reach C	1	
Harvey Creek	CFR Reach B	3	**3**
Hogback Creek	Rock Creek	1	
Hoover Creek	CFR Reach B	1	
Little Blackfoot River	**CFR Reach A**	3	2

Table 10: Continued.

Tributary Name	Tributary to…	# of times studied	# times listed as top priority
Lost Creek	**CFR Reach A**	4	**3**
Mill Creek	**CFR Reach A**	3	**3**
Modesty Creek	**CFR Reach A**	1	1
Perkins/Girard Gulch	CFR Reach B	1	1
Peterson Creek	**CFR Reach A**	2	2
Racetrack Creek	**CFR Reach A**	4	**4**
Ranch Creek	Rock Creek	1	
Rock Creek (at Garrison)	CFR Reach B	1	
Rock Creek (near Clinton)	CFR Reach C	2	1
Ross Fork Rock Creek	Rock Creek	1	
Schwartz Creek	CFR Reach B	2	1
Silverbow Creek	CFR	1	1
Snowshoes Creek (lower)	Little BF River	1	1
Spotted Dog Creek (lower)	Little BF River	1	1
Stony Creek	Rock Creek	1	
Storm Lake Creek	Warm Springs	1	1
Trout Creek	Little BF River	1	
Turah Spring Creek	CFR Reach C	2	1
Twin Lakes Creek	Warm Springs	1	1
Tyler Creek	CFR Reach C	2	2
Warm Springs Creek	**CFR Reach A**	4	**3**
Welcome Creek	Rock Creek	1	
Willow Creek	**CFR Reach A**	3	**3**

Table 11: Tributaries of the Clark Fork River basin – Reach A consistently given high priority for restoration by several studies

Cottonwood Creek
Dempsey Creek
Little Blackfoot River
Lost Creek
Mill Creek
Racetrack Creek
Warm Springs Creek
Willow Creek

Table 12: Fisheries potential of 29 tributaries of the Clark Fork River basin – Reach A[211]

Tributary Name	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6	Cumulative Score
Little Blackfoot River	4	4	4	4	2	2	20
Warm Springs Creek	4	4	3	3	2	2	18
German Gulch	3	4	2	3	2	2	16
Beefstraight Creek	3	3	2	2	2	2	14
Dog Creek	2	3	2	3	2	2	14
Foster Creek	2	2	2	2	3	3	14
Mill Creek	2	3	2	3	2	2	14
Racetrack Creek	3	4	2	3	1	1	14
Spotted Dog Creek (lower)	2	3	2	3	2	2	14
Willow Creek	2	3	2	3	2	2	14
Baggs Creek	2	3	2	3	1	2	13
Cottonwood Creek	2	3	2	3	1	2	13
Storm Lake Creek	1	1	2	2	3	4	13
Twin Lakes Creek	1	2	2	2	3	3	13
Barker Creek	1	1	1	1	4	4	12
Blacktail Creek	2	3	1	2	2	2	12
Snowshoes Creek (lower)	2	3	2	3	1	1	12
Dempsey Creek	2	3	2	3	0	1	11
Lost Creek	2	3	2	3	0	1	11
Peterson Creek	1	2	1	2	2	3	11
Dry Cottonwood Creek	1	2	1	1	2	2	9
Alaska Gulch	n/a	n/a	n/a	n/a	n/a	n/a	0
American Gulch	n/a	n/a	n/a	n/a	n/a	n/a	0
Basin Creek (lower)	n/a	n/a	n/a	n/a	n/a	n/a	0
Browns Gulch	n/a	n/a	n/a	n/a	n/a	n/a	0
Flume Gulch	n/a	n/a	n/a	n/a	n/a	n/a	0
Modesty Creek	n/a	n/a	n/a	n/a	n/a	n/a	0
Silverbow Creek	n/a	n/a	n/a	n/a	n/a	n/a	0
Trout Creek	n/a	n/a	n/a	n/a	n/a	n/a	0

[211] Montana Department of Fish, Wildlife & Parks and Montana Natural Resource Damage Program, *Rating Summaries for the Prioritization of Tributaries of the Upper Clark Fork River Basin for Fishery Enhancement Draft Final,* 2010, 1-131.

Table 13: Impaired Tributaries within the Upper Clark Fork River Basin[212],[213] (Tributaries in BOLD have 3 or more flow related impairments)

	Causes of Impairments			
	Low Flow	Temperature	Metals	Sediment
Antelope Creek				S
Beefstraight Creek			M	
Brock Creek				S
Brown's Gulch	F	T		S
Cable Creek				S
Cottonwood Creek		T		S
Dempsey Creek	F	T		S
Dry Cottonwood Creek				S
Dunkleberg Creek			M	S
Gold Creek	F	T	M	S
Hoover Creek				S
Lost Creek			M	S
Mill Creek				
Modesty Creek			M	
Peterson Creek		T	M	S
Perkins Gulch				S
Racetrack Creek	F	T		S
Tin Cup Joe Creek				S
Warm Springs (near Anaconda)			M	
Warm Spring (near Phosphate)				S
Willow Creek				S
Storm Lake Creeks				S
German Gulch			M	
Mill-Willow Bypass			M	

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Table 14: Prioritization of Reach A tributaries within the Upper Clark Fork River basin based upon previous restoration prioritization, flow related impairments, and fisheries potential

	Tributary	Tributary to:	Fishery's score:
Priority 1:	Racetrack Creek	CFR - Reach A	14
Highest agreement on restoration priority and most flow impairments.	Cottonwood Creek	CFR - Reach A	13
	Dempsey Creek	CFR - Reach A	11
Priority 2:	Little Blackfoot River	CFR - Reach A	20
High agreement on restoration priority and fewer flow related impairments.	Warm Springs Creek	CFR - Reach A	18
	Mill Creek	CFR - Reach A	14
	Willow Creek	CFR - Reach A	14
	Lost Creek	CFR - Reach A	11
	Brown's Gulch	Silver Bow Creek	---
Priority 3:	German Gulch	Silver Bow Creek	16
Little agreement on restoration priority and few identified flow related impairments.	Beefstraight Creek	German Gulch	14
	Dog Creek	Little Blackfoot	14
	Foster Creek	Warm Spring Creek	14
	Spotted Dog	Little Blackfoot	13
	Baggs Creek	Cottonwood Creek	13
	Storm Lake Creek	Warm Spring Creek	13
	Twin Lakes Creek	Warm Spring Creek	13
	Barker Creek	Warm Spring Creek	12
	Blacktail Creek	Silver Bow Creek	12
	Snowshoes Creek	Little Blackfoot	11
	Peterson Creek	CFR Reach A	11
	Dry Cottonwood Creek	CFR Reach A	8
	Alaska Gulch	Browns Gulch	---
	American Gulch	Browns Gulch	---
	Basin Creek	Silver Bow Creek	---
	Flume Gulch	Browns Gulch	---
	Modesty Creek	CFR Reach A	---
	Silverbow Creek	CFR Reach A	---
	Trout Creek	Little Blackfoot	---

Table 15: Racetrack Creek Water Rights

Name of Ownership	Flow Rate (cfs)		Volume (af)	Acres (ac)	Source Name	Ditch Name (if known)	River Mile Of Diversion
5 ROCKIN' MS ANGUS RANCH INC	2.50	CFS		1800	RACETRACK CREEK	Ditch	7.5
ROBINSON OLIVE L	2.50	CFS		1800	RACETRACK CREEK		
ROBINSON WILLIAM L	2.50	CFS		1800	RACETRACK CREEK		
WESTERN MONTANA LAND & LIVESTOCK LLC	1.25	CFS	450	165	RACETRACK CREEK	Morrison Ditch	7.5
WESTERN MONTANA LAND & LIVESTOCK LLC	0.63	CFS	225	165	RACETRACK CREEK	Morrison Ditch	7.5
BARNARD LONNA G	2.75	CFS	774.36	252	RACETRACK CREEK	Morrison Ditch	7.5
BARNARD RICHARD H	2.75	CFS	774.36	252	RACETRACK CREEK		
WESTERN MONTANA LAND & LIVESTOCK LLC	0.63	CFS	225	165	RACETRACK CREEK	Morrison Ditch	7.5
5 ROCKIN' MS ANGUS RANCH INC	1.50	CFS	770.4	1844.5	RACETRACK CREEK	Ditch	7.5
ROBINSON OLIVE L	1.50	CFS	770.4	1844.5	RACETRACK CREEK		
ROBINSON WILLIAM L	1.50	CFS	770.4	1844.5	RACETRACK CREEK		
5 ROCKIN' MS ANGUS RANCH INC	3.75	CFS	1925.99	1844.5	RACETRACK CREEK	Ditch	7.5
ROBINSON OLIVE L	3.75	CFS	1925.99	1844.5	RACETRACK CREEK		
ROBINSON WILLIAM L	3.75	CFS	1925.99	1844.5	RACETRACK CREEK		
FLEMING KENNETH P	0.08	CFS	10	206	RACETRACK CREEK	Morrison Ditch	7.5
FLEMING SHIRLEY L	0.08	CFS	10	206	RACETRACK CREEK		
JOHNSON AMANDA L	0.08	CFS	10	206	RACETRACK CREEK		
JOHNSON NORMAN R	0.08	CFS	10	206	RACETRACK CREEK		
WESTERN MONTANA LAND & LIVESTOCK LLC	0.63	CFS	225	165	RACETRACK CREEK	Morrison Ditch	7.5

Table 15: Continued.

5 ROCKIN' MS ANGUS RANCH INC	3.23	CFS	1656.35	1844.5	RACE TRACK CREEK	Ditch	7.5
ROBINSON OLIVE L	3.23	CFS	1656.35	1844.5	RACE TRACK CREEK		
ROBINSON WILLIAM L	3.23	CFS	1656.35	1844.5	RACE TRACK CREEK		
5 ROCKIN' MS ANGUS RANCH INC	3.75	CFS		69.5	RACETRACK CREEK	Ditch	7.5
WESTERN MONTANA LAND & LIVESTOCK LLC	1.25	CFS	450	165	RACETRACK CREEK	Morrison Ditch	7.5
WESTERN MONTANA LAND & LIVESTOCK LLC	7.50	CFS	1402.5	165	RACETRACK CREEK	Morrison Ditch	7.5
WESTERN MONTANA LAND & LIVESTOCK LLC	10.00	CFS	1448	352	RACETRACK CREEK	Morrison Ditch	7.5
WESTERN MONTANA LAND & LIVESTOCK LLC	2.50	CFS	815	352	RACETRACK CREEK	Morrison Ditch	7.3
BARNARD LONNA G	3.90	CFS	1053	252	RACETRACK CREEK	Morrison Ditch	7.3
BARNARD RICHARD H	3.90	CFS	1053	252	RACETRACK CREEK		
TWO BAR RANCH LP	1.00	CFS	360	298	RACETRACK CREEK	Morrison Ditch	7.3
TWO BAR RANCH LP	1.25	CFS	450	298	RACETRACK CREEK	Morrison Ditch	7.3
TWO BAR RANCH LP	0.63	CFS	225	298	RACETRACK CREEK	Morrison Ditch	7.3
FLEMING KENNETH P	0.30	CFS	48.78	206	RACETRACK CREEK	Morrison Ditch	7.3
FLEMING SHIRLEY L	0.30	CFS	48.78	206	RACETRACK CREEK		
JOHNSON AMANDA L	0.30	CFS	48.78	206	RACETRACK CREEK		
JOHNSON NORMAN R	0.30	CFS	48.78	206	RACETRACK CREEK		

Table 15: Continued.

KRAMER JOIE A	0.61	CFS	99.19	207	RACETRACK CREEK	Morrison Ditch	7.3
KRAMER JOIE E	0.61	CFS	99.19	207	RACETRACK CREEK		
WESTERN MONTANA LAND & LIVESTOCK LLC	3.75	CFS	802.5	352	RACETRACK CREEK	Morrison Ditch	7.3
TWO BAR RANCH LP	0.63	CFS	225	298	RACETRACK CREEK	Morrison Ditch	7.3
BARNARD LONNA G	1.25	CFS	351.98	252	RACETRACK CREEK	Morrison Ditch	7.3
BARNARD RICHARD H	1.25	CFS	351.98	252	RACETRACK CREEK		
KRAMER JOIE A	0.17	CFS	20	207	RACETRACK CREEK	Morrison Ditch	7.3
KRAMER JOIE E	0.17	CFS	20	207	RACETRACK CREEK		
TWO BAR RANCH LP	0.63	CFS		298	RACETRACK CREEK	Morrison Ditch	7.3
BARNARD LONNA G	2.50	CFS	703.97	252	RACETRACK CREEK	Morrison Ditch	7.3
BARNARD RICHARD H	2.50	CFS	703.97	252	RACETRACK CREEK		
TWO BAR RANCH LP	1.25	CFS	450	298	RACETRACK CREEK	Morrison Ditch	7.3
TWO BAR RANCH LP	7.50	CFS	2145.6	298	RACETRACK CREEK	Morrison Ditch	7.3
NICHOLES CHERYL D	4.28	CFS	2330	570	RACETRACK CREEK	Ditch	6.8, 7.4
NICHOLES LEO A	4.28	CFS	2330	570	RACETRACK CREEK		
NICHOLES CHERYL D	2.50	CFS	1360	570	RACETRACK CREEK	Ditch	6.8, 7.4
NICHOLES LEO A	2.50	CFS	1360	570	RACETRACK CREEK		
NICHOLES CHERYL D	17.50	CFS	4845	570	RACETRACK CREEK	Cement Ditch	6.8, 7.4
NICHOLES LEO A	17.50	CFS	4845	570	RACETRACK CREEK		

Table 15: Continued.

NICHOLES LEO A	6.00	CFS	2535	1125	RACETRACK CREEK	Ditch	6.9
UELAND RANCHES INC	6.00	CFS	2535	1125	RACETRACK CREEK		
DIAZ RAOUL F	20.00	CFS	7200	1125	RACETRACK CREEK	Ditch	6.9
DIAZ THERESA M	20.00	CFS	7200	1125	RACETRACK CREEK		
BECK TED R	1.88	CFS	1364.46	756	RACETRACK CREEK	Cement Ditch	6.8
VANISKO JOHN J	1.29	CFS	546	320	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DAN J	1.83	CFS		300	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DEBORAH D	1.83	CFS		300	RACETRACK CREEK		
R BAR N RANCH LLC	1.83	CFS		979.04	RACETRACK CREEK	Cement Ditch	6.8
HANSON MARLA A	0.13	CFS	30	17.5	RACETRACK CREEK	Cement Ditch	6.8
HANSON ROGER L	0.13	CFS	30	17.5	RACETRACK CREEK		
KESLER DAVID O	1.88	CFS		424	RACETRACK CREEK	Ditch	6.8
DALLASERRA PETER J	1.00	CFS	350	80	RACETRACK CREEK	Cement Ditch	6.8
R BAR N RANCH LLC	2.73	CFS	1160.3	979.04	RACETRACK CREEK	Cement Ditch	6.8
VANISKO JOHN J	0.56	CFS	231	320	RACETRACK CREEK	Cement Ditch	6.8
BERG KAEHL P	2.50	CFS	105	142	RACETRACK CREEK	Cement Ditch	6.8
R BAR N RANCH LLC	7.50	CFS	3210	979.04	RACETRACK CREEK	Cement Ditch	6.8
BECK TED R	1.25	CFS	907.22	498	RACETRACK CREEK	Cement Ditch	6.8
R BAR N RANCH LLC	10.00	CFS	4280	979.04	RACETRACK CREEK	Cement Ditch	6.8
SMITH MIKE	0.44	CFS	159.63	40	RACETRACK CREEK	Cement Ditch	6.8
SMITH PEGGY	0.44	CFS	159.63	40	RACETRACK CREEK		
BECK DONALD W	3.68	CFS	1445	170	RACETRACK CREEK	Cement Ditch	6.8
KESLER DAVID O	1.23	CFS		424	RACETRACK CREEK	Ditch	6.8

Table 15: Continued.

KELLEY DAN J	1.24	CFS	594	300	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DEBORAH D	1.24	CFS	594	300	RACETRACK CREEK		
MODESTY CREEK STOCK RANCH LLC	3.68	CFS	1379.22	719	RACETRACK CREEK	Cement Ditch	6.8
SMITH MIKE	5.0	CFS	340	40	RACETRACK CREEK	Cement Ditch	6.8
SMITH PEGGY	5.0	CFS	340	40	RACETRACK CREEK		
KELLEY DAN J	3.23	CFS	1548	300	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DEBORAH D	3.23	CFS	1548	300	RACETRACK CREEK		
R BAR N RANCH LLC	3.75	CFS	1605	979.04	RACETRACK CREEK	Cement Ditch	6.8
BECK DONALD W	6.44	CFS	1445	170	RACETRACK CREEK	Cement Ditch	6.8
BECK ELIZABETH A	6.44	CFS	1445	170	RACETRACK CREEK		
BECK DONALD W	10.00	CFS	1445	170	RACETRACK CREEK	Cement Ditch	6.8
BECK ELIZABETH A	10.00	CFS	1445	170	RACETRACK CREEK		
HANSON MARLA A	0.69	CFS	50	17.5	RACETRACK CREEK	Cement Ditch	6.8
HANSON ROGER L	0.69	CFS	50	17.5	RACETRACK CREEK		
KELLEY DAN J	7.50	CFS	850	100	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DEBORAH D	7.50	CFS	850	100	RACETRACK CREEK		
KELLEY DAN J	10.00	CFS	2550	300	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DEBORAH D	10.00	CFS	2550	300	RACETRACK CREEK		
R BAR N RANCH LLC	7.50	CFS	3210	979.04	RACETRACK CREEK	Cement Ditch	6.8
VANISKO JOHN J	6.25	CFS	1120	320	RACETRACK CREEK	Cement Ditch	6.8
KESLER DAVID O	11.83	CFS		504	RACETRACK CREEK	Ditch	6.8
MODESTY CREEK STOCK RANCH LLC	10.00	CFS	4826.7	719	RACETRACK CREEK	Cement Ditch	6.8
BECK TED R	7.50	CFS	4233	498	RACETRACK CREEK	Cement Ditch	6.8
MODESTY CREEK STOCK RANCH LLC	15.00	CFS		719	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DAN J	3.79	CFS	850	100	RACETRACK CREEK	Cement Ditch	6.8
KELLEY DEBORAH D	3.79	CFS	850	100	RACETRACK CREEK		

Table 15: Continued.

BECK TED R	1.25	CFS	907.22	258	RACETRACK CREEK	Right 21 Ditch	6.7
BECK ELIZABETH A	3.68	CFS	1445	170	RACETRACK CREEK	Right 21 Ditch	6.7
BECK TED R	10.00	CFS	4233	498	RACETRACK CREEK	Right 21 Ditch	6.7
BECK TED R	2.50	CFS	1814.45	258	RACETRACK CREEK	Right 21 Ditch	6.7
DIAZ RAOUL F	9.84	CFS	3537	1125	RACETRACK CREEK	Ditch	6.6
DIAZ THERESA M	9.84	CFS	3537	1125	RACETRACK CREEK		
DIAZ RAOUL F	2.50	CFS	900	1125	RACETRACK CREEK	Ditch	6.6
DIAZ THERESA M	2.50	CFS	900	1125	RACETRACK CREEK		
BEST WILLIAM J	6.25	CFS	200	50	RACETRACK CREEK	Ditch 2	6
MONTANA. STATE OF DEPT OF CORRECTIONS	2.25	CFS		487	RACETRACK CREEK	Ditch	5.6
JETTE CAROL J	0.25	CFS		15	RACETRACK CREEK	Ditch	5.6
JETTE JOSEPH H	0.25	CFS		15	RACETRACK CREEK		
JETTE CAROL J	0.09	CFS		15	SPRING. UNNAMED TRIBUTARY OF RACETRACK CREEK	Spring	5.4
JETTE JOSEPH H	0.09	CFS		15	SPRING. UNNAMED TRIBUTARY OF RACETRACK CREEK		
BEST WILLIAM J	0.56	CFS	200	50	RACETRACK CREEK	Pump	5.1
JETTE CAROL J	0.11	CFS		5	UNNAMED TRIBUTARY OF RACETRACK CREEK	Springs	4.6

Table 15: Continued.

JETTE JOSEPH H	0.11	CFS		5	UNNAMED TRIBUTARY OF RACETRACK CREEK		
HIRSCH PAMELA B	1.25	CFS	907.22	126	SPRING. UNNAMED TRIBUTARY OF RACETRACK CREEK	Spring	4.2
HIRSCH RICK A	1.25	CFS	907.22	126	SPRING. UNNAMED TRIBUTARY OF RACETRACK CREEK		
HIRSCH PAMELA B	1.25	CFS	907.22	126	UNNAMED TRIBUTARY OF RACETRACK CREEK		
HIRSCH RICK A	1.25	CFS	907.22	126	UNNAMED TRIBUTARY OF RACETRACK CREEK		
KELLEY JAMES A	3.50	CFS	1260	158	RACETRACK CREEK	Ditch	4
BECK. MELVIN R RANCH LLC	1.25	CFS	525	500	RACETRACK CREEK	Ditch and Dick Carr Ditch	3.1, 3.3
HIRSCH PAMELA B	1.13	CFS		222	RACETRACK CREEK	Various	3 - 3.6, 11
HIRSCH RICK A	1.13	CFS		222	RACETRACK CREEK		
BECK. MELVIN R RANCH LLC	2.60	CFS	1092	500	RACETRACK CREEK	Ditch and Dick Carr Ditch	3.1, 3.3
VANISKO CHARLES G	6.25	CFS		560	RACETRACK CREEK	Ditch	3.1, 4
VANISKO JOHN J	6.25	CFS		560	RACETRACK CREEK		
VANISKO JUANITA	6.25	CFS		560	RACETRACK CREEK		
VANISKO RANCHES INC	6.25	CFS		560	RACETRACK CREEK		
VANISKO CHARLES G	6.25	CFS		560	RACETRACK CREEK		
VANISKO JOHN J	6.25	CFS		560	RACETRACK CREEK		

Table 15: Continued.

VANISKO JUANITA	6.25	CFS		560	RACETRACK CREEK		
VANISKO RANCHES INC	6.25	CFS		560	RACETRACK CREEK		
TWO BAR RANCH LP	2.50	CFS		250	RACETRACK CREEK	Ditch	3.1
DIPPOLD MARTIN J	1.88	CFS	900	231	RACETRACK CREEK	Ditch	3
DIPPOLD MARTIN W	1.88	CFS	900	231	RACETRACK CREEK		
DIPPOLD MARTIN J	5.00	CFS	1963.5	231	RACETRACK CREEK	Ditch	3
DIPPOLD MARTIN W	5.00	CFS	1963.5	231	RACETRACK CREEK		
HIRSCH PAMELA B	3.75	CFS	1887	222	RACETRACK CREEK	Various	3 - 3.6
HIRSCH RICK A	3.75	CFS	1887	222	RACETRACK CREEK		
HIRSCH PAMELA B	7.50	CFS	1887	222	RACETRACK CREEK	Various	3 - 3.6
HIRSCH RICK A	7.50	CFS	1887	222	RACETRACK CREEK		
VANISKO CHARLES G	6.25	CFS	1177.41	480	RACETRACK CREEK	Ditches	3.4, 4
VANISKO JOHN J	6.25	CFS	1177.41	480	RACETRACK CREEK		
VANISKO JUANITA	6.25	CFS	1177.41	480	RACETRACK CREEK		
VANISKO RANCHES INC	6.25	CFS	1177.41	480	RACETRACK CREEK		
BECK. MELVIN R RANCH LLC	7.50	CFS	1350	500	RACETRACK CREEK	Ditch	3.1
BECK. MELVIN R RANCH LLC	10.00	CFS	1800	500	RACETRACK CREEK	Ditch and Dick Carr Ditch	3.1, 3.3
TWO BAR RANCH LP	7.50	CFS	805	250	RACETRACK CREEK	Ditch	3
JOHNSON CARL A	0.63	CFS	119.93	160	RACETRACK CREEK	Ditch 1	2.2
JOHNSON SUSAN C	0.63	CFS	119.93	160	RACETRACK CREEK		
JOHNSON CARL A	2.50	CFS	475.92	160	RACETRACK CREEK	Ditch 1	2.2
JOHNSON SUSAN C	2.50	CFS	475.92	160	RACETRACK CREEK		

Table 15: Continued.

JOHNSON CARL A	1.25	CFS	237.96	160	RACETRACK CREEK	Ditch 1	2.2
JOHNSON SUSAN C	1.25	CFS	237.96	160	RACETRACK CREEK		
TWO BAR RANCH LP	3.75	CFS	600	110	RACETRACK CREEK	Ditch	0.7
TWO BAR RANCH LP	3.75	CFS	600	110	RACETRACK CREEK	Ditch	0.7
TWO BAR RANCH LP	7.50	CFS	452	110	RACETRACK CREEK	Ditch	0.7
WABER GLENN R	1.88	CFS	169.2	60	RACETRACK CREEK	Ditch 3	0.4
WABER JULIS R	1.88	CFS	169.2	60	RACETRACK CREEK		
WABER GLENN R	2.50	CFS	510	60	RACETRACK CREEK	Ditch 3	0.4
WABER JULIS R	2.50	CFS	510	60	RACETRACK CREEK		

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