CANDIDATE CONSERVATION AGREEMENT WITH ASSURANCES FOR FLUVIAL ARCTIC GRAYLING IN THE UPPER BIG HOLE RIVER

BETWEEN

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

AND

U.S. FISH AND WILDLIFE SERVICE

IN COOPERATION WITH

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

AND

USDA NATURAL RESOURCES CONSERVATION SERVICE

FWS Tracking # TE104415-0

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TABLE OF CONTENTS

I. INTRODUCTION

A Candidate Conservation Agreement with Assurances (Agreement/CCAA) is an agreement between the U.S. Fish and Wildlife Service (USFWS) and any non-Federal entity whereby non-Federal property owners who voluntarily agree to manage their lands or waters to remove threats to species at risk of becoming threatened or endangered receive assurances against additional regulatory requirements should that species be subsequently listed under the Endangered Species Act (ESA).

The conservation goal of this Agreement is to secure and enhance a population of fluvial (river-dwelling) Arctic grayling (*Thymallus arcticus*) (grayling) within the upper reaches of their historic range in the Big Hole River drainage. Under this Agreement, Montana Fish, Wildlife and Parks (MFWP) will hold an ESA section 10(a)(1)(A) Enhancement of Survival Permit issued to it by USFWS once this Agreement is executed, and will issue Certificates of Inclusion to non-Federal property owners within the Project Area who agree to comply with all of the stipulations of the Agreement and develop an approved site-specific plan. Site-specific plans will be developed with each landowner by an interdisciplinary technical team made up of individuals representing MFWP, USFWS, USDA Natural Resources Conservation Service (NRCS), and Montana Department of Natural Resources and Conservation (MDNRC) (collectively, the Agencies). The conservation guidelines of the Agreement will be met by implementing conservation measures that:

1) Improve streamflows

2) Improve and protect the function of riparian habitats

3) Identify and reduce or eliminate entrainment threats for grayling

4) Remove barriers to grayling migration

These objectives will be met through development of site-specific plans intended to address in detail, these issues.

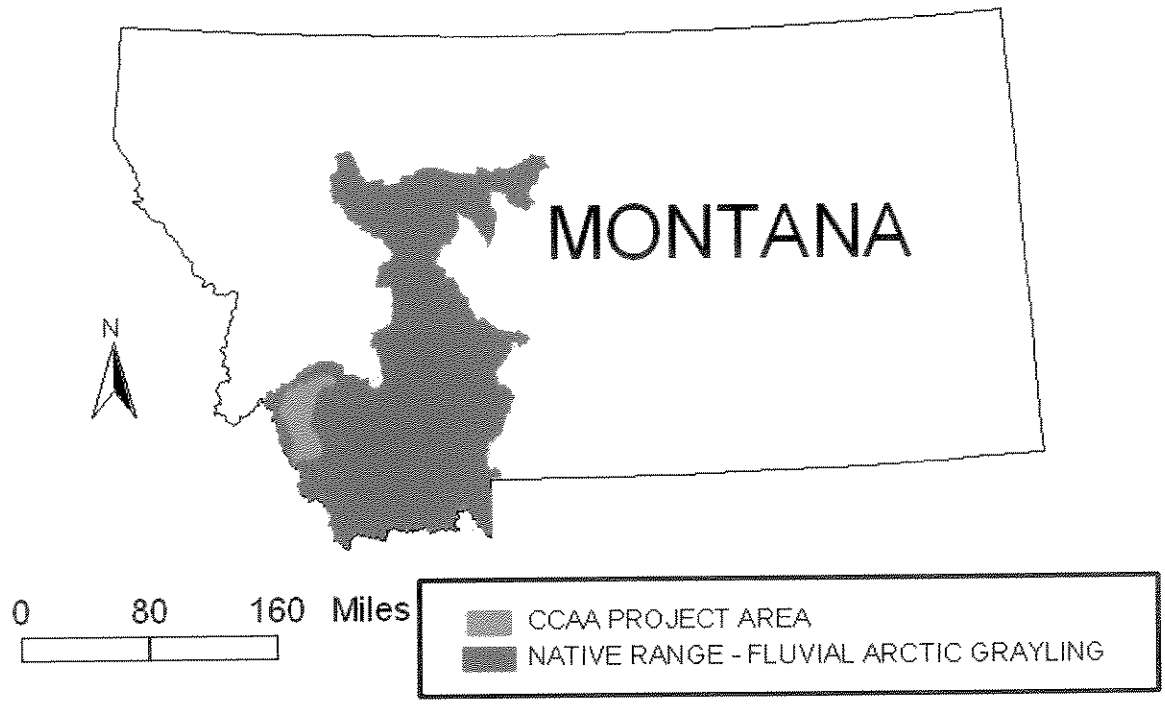


Figure 1. The Proposed Project Area Within the Native Range of Fluvial Arctic Grayling in Montana.

II. PURPOSE

The purpose of this Agreement is to encourage non-Federal landowners to voluntarily implement proactive conservation measures that benefit grayling in the upper Big Hole River Project Area in Beaverhead and Deer Lodge Counties, Montana, (Figures 1-3) by providing them with assurances that their land and water management activities will not be required to change beyond the remedies identified in their site-specific plan should grayling become listed as threatened or endangered. This planning effort will help alleviate private property concerns, as well as generate support from private landowners which will improve habitat conditions for grayling throughout the Project Area. The conservation goal of this Agreement is to secure and enhance populations of grayling within the historic range of the species in the upper reaches of the Big Hole River drainage, and is consistent with the USFWS "Candidate Conservation Agreement with Assurances Final Policy" (64 FR 32726, June 17, 1999) and the regulations that implement the policy (69 FR 24084, May 3, 2004).

Most of the habitat occupied by Arctic grayling in the Big Hole River is on or adjacent to non-Federal lands. The decline of grayling in the system has been primarily linked to agricultural activities on these lands, so the active involvement of non-Federal landowners is viewed as critical to the conservation of the species in the Big Hole. However, the occurrence or expansion of grayling in waters on their properties is a concern to private landowners because of

potential regulatory restrictions on farm or ranch operations should grayling be listed as threatened or endangered under the ESA in the future. These restrictions may affect landowner willingness to participate in efforts to conserve the species.

The complexity of water use, water rights and water conveyance for agricultural purposes in the upper Big Hole drainage requires an approach where the majority of water users and landowners are engaged in basin-wide solutions to land and water uses that affect grayling. Changes in the operations of one landowner may affect the operations of one or more neighboring landowners, so coordination among landowners is essential. Such coordination will require significant personal attention and communication among both landowners and Agency personnel to foster the collaboration needed to restore grayling in the Big Hole River.

A comprehensive umbrella-type arrangement is addressed by MFWP and the Agencies in this Agreement whereby the Agencies have established a conservation framework to benefit grayling and will work with landowners to comprehensively implement conservation measures across a large area. An umbrella agreement is expected to be a more effective approach to grayling restoration in the Big Hole River than would a large number of individual agreements that would impose unnecessary burden on the Agencies and landowners during the planning and regulatory approval process. A piecemeal approach would lead to a less-consistent and less-widespread implementation of necessary conservation measures. In this instance, an umbrella-type agreement is expected to generate greater collective support from private landowners; to provide a more holistic approach to developing and implementing basin-wide conservation that recognizes the ecology of grayling in the Big Hole River must be addressed at a large spatial scale; and to provide the Agencies with a manageable method to ensure that landowners in the upper Big Hole watershed will be able to fully participate in the conservation of this species.

III. BACKGROUND AND STATUS OF FLUVIAL ARCTIC GRAYLING

Grayling have a primarily holarctic distribution, occurring in northern freshwater habitats from the western edge of Hudson's Bay, west across north/north-central Canada, throughout Alaska, and into northern Eurasia (Scott and Crossman 1973). In North America, two disjunct populations of grayling, representing stocks isolated during Pleistocene glaciation, have been recorded outside of Canada and Alaska (Vincent 1962). The first was found in streams and rivers of the Great Lakes region of northern Michigan, but these grayling were extirpated in the 1930s (Scott and Crossman 1973). The second isolated population historically inhabited the upper Missouri River basin above Great Falls, Montana. Grayling in Montana were the subject of a status review by the USFWS in 1994 (59 FR 37738), which identified grayling indigenous to the Big Hole and Madison Rivers as elements of a fluvial Distinct Population Segment (DPS) in the upper Missouri River. The grayling of the Big Hole River constitute the lone intact, confirmed fluvial, element of the upper Missouri River basin grayling DPS, and are the conservation focus of this Agreement.

Life History of Grayling in the Project Area

Grayling are adapted to life-long residence in stream environments and make seasonal migrations, sometimes in excess of 50 miles between spawning, feeding, and wintering areas within the river system (Shepard and Oswald 1989, Lamothe and Magee 2003). Grayling inhabit cool water streams having low to intermediate gradients, and adults prefer pool habitat (Kaya 1990; Byorth and Magee 1998). In Montana, they spawn from late April to mid-May by depositing adhesive eggs over sand and gravel without excavating a redd or nest (Kaya 1990; Shepard and Oswald 1989). Eggs develop and hatch within a few weeks. Young-of-the-year (YOY) grayling are weak swimmers and prefer rearing habitat along stream margins that serve as velocity refuges, back-waters in side channels, or waters adjacent to beaver dams. Grayling in Montana typically reach maturity in their third or fourth year of life, and seldom live beyond age 6 (Magee and Lamothe 2003). Grayling of all ages feed opportunistically on drifting invertebrates (Hughes 1992, 1998). The aggressive feeding behavior of grayling is linked to their pattern of habitat selection whereby they often reside in deep pools with little large woody debris that allow for efficient and opportunistic feeding by this visual predator (Lamothe and Magee 2003, 2004a). Water depth may function as cover from potential predators.

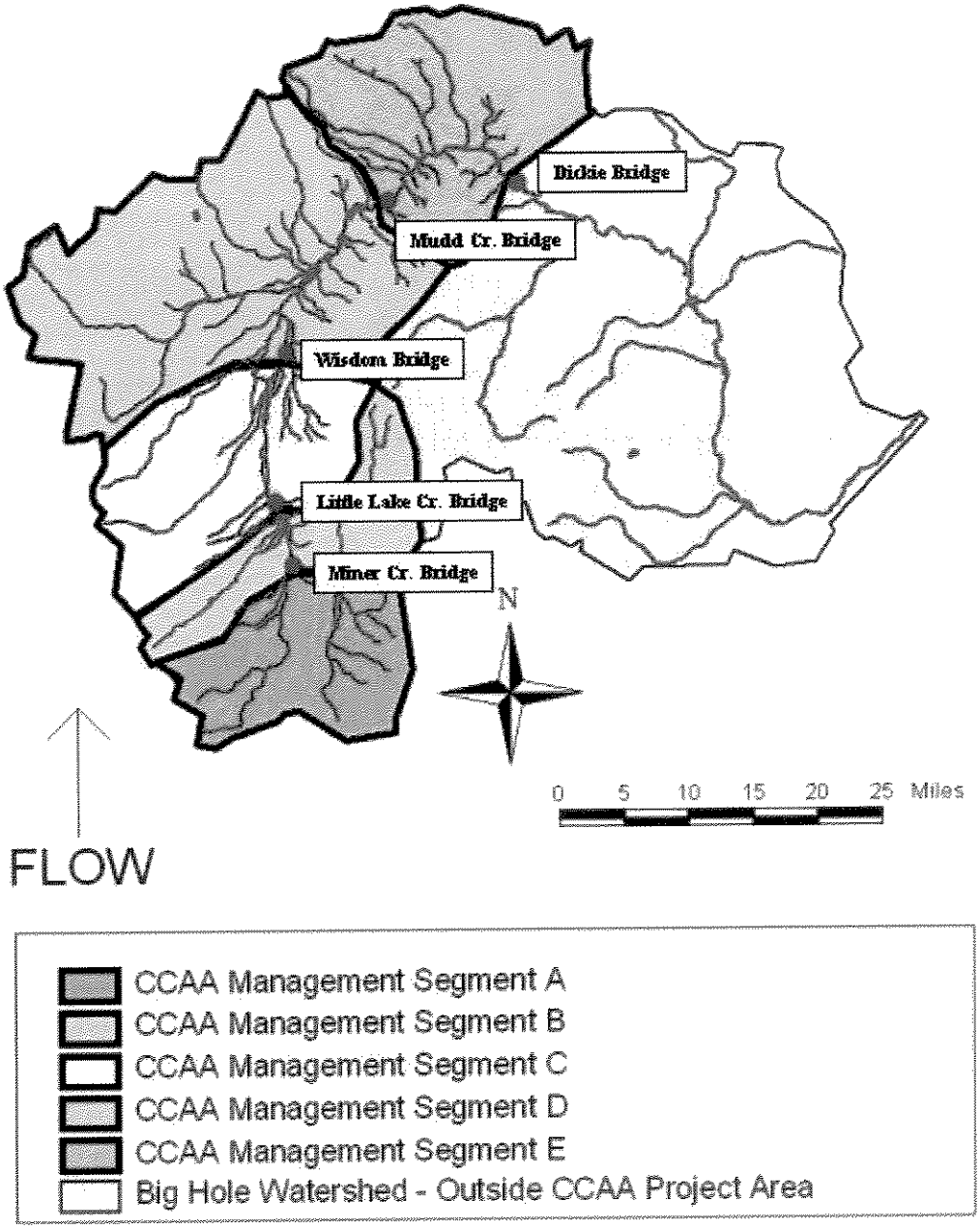


Figure 2. The Fluvial Arctic Grayling Agreement Management Segments for the Upper Big Hole River Watershed Project Area.

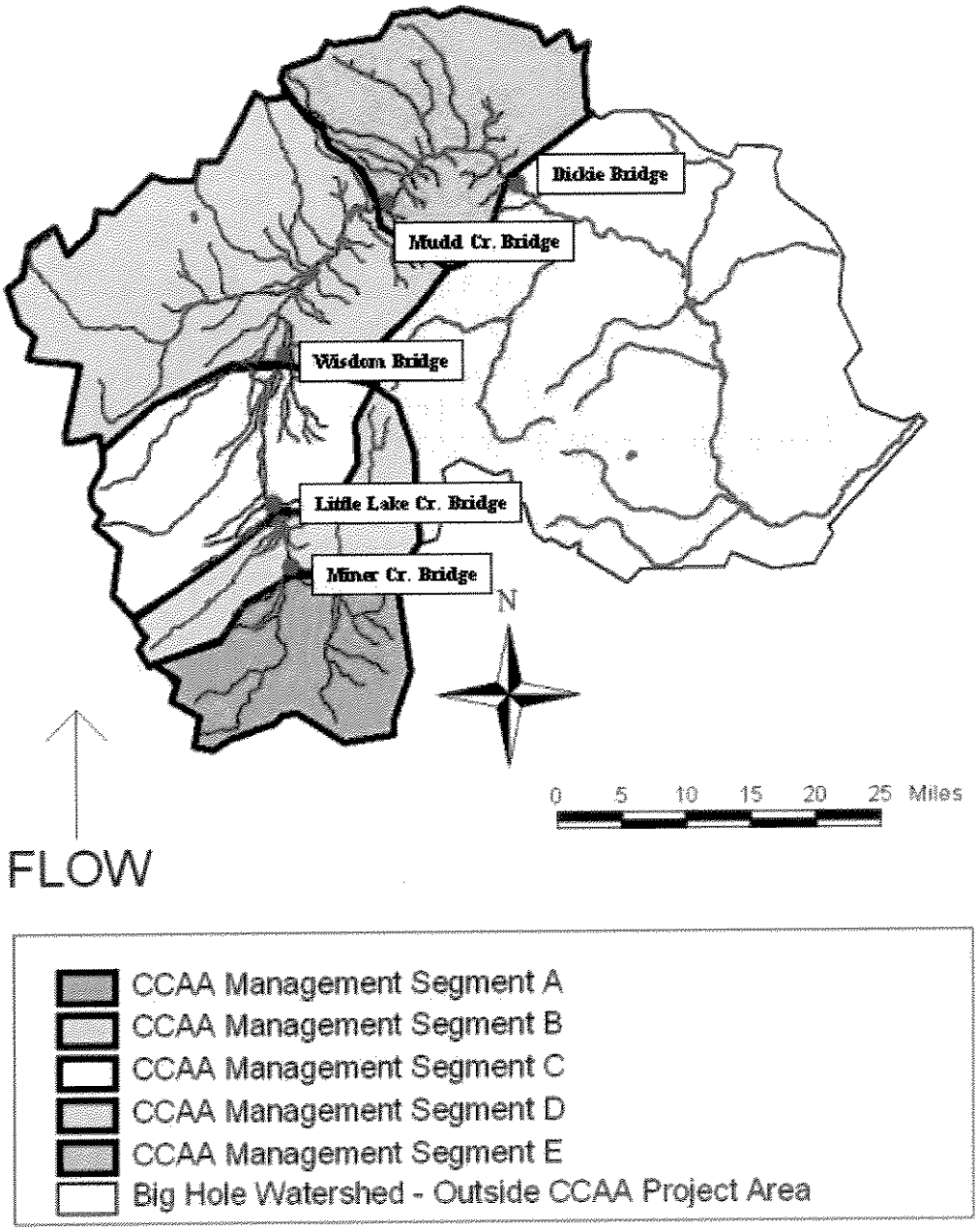


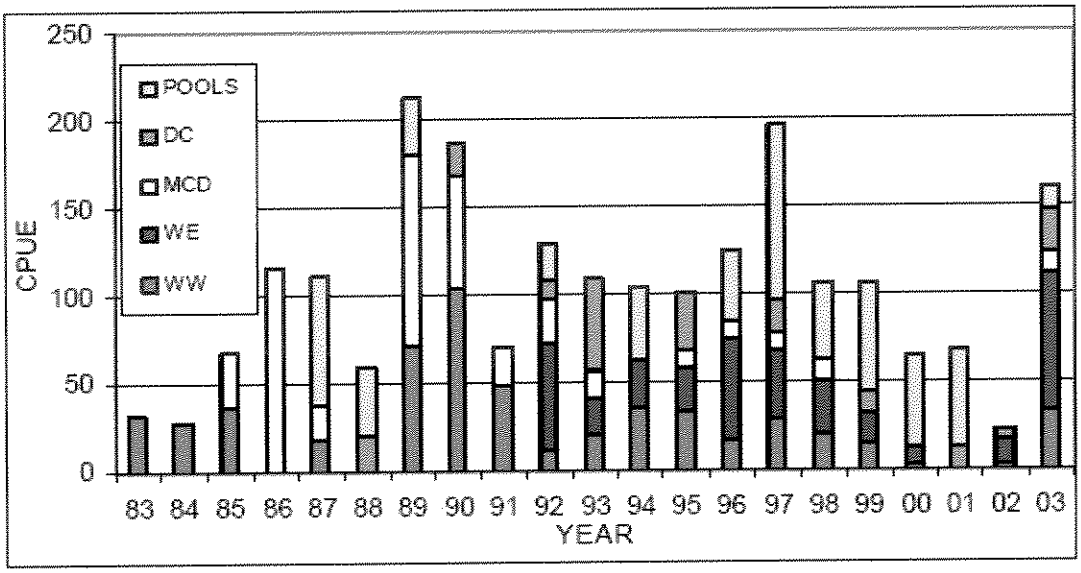
Figure 3. Major Tributary Streams to the Big Hole River in the Agreement Project Area.

Historical and Present Distribution

The native grayling of the upper Missouri River were predominantly fluvial (Vincent 1962), exhibiting a life history adapted to streams and rivers (Behnke 2002). The indigenous grayling of the upper Missouri River basin was widely but irregularly distributed above the Great Falls (Vincent 1962), and inhabited up to 2,000 kilometers (1,250 miles) of stream habitat in Montana and portions of northwestern Wyoming until the early 20th century (Kaya 1990, 1992a). In addition to the waters of the mainstem upper Missouri River, fluvial Arctic grayling were documented in the drainages of the Sun, Smith, Jefferson, Beaverhead, Big Hole, Madison, Gallatin, Gibbon, and Firehole Rivers; and Grayling, Bridger, Bozeman, and Fan Creeks. Present grayling distribution has been reduced to less than 5 percent of historic range, and the only remaining indigenous self-sustaining confirmed fluvial population is found in an approximately 80-mile segment of the upper Big Hole River and associated tributary streams (Shepard and Oswald 1989; Kaya 1990, 1992a).

Current Population Status in the Project Area

The USFWS determined in 1994 that the DPS of grayling in the upper Missouri River basin warrants consideration for listing under the ESA. In 2004, the grayling DPS was elevated in listing priority from a level 9 to a level 3. This is the highest listing priority level that can be assigned to this DPS. This listing priority level is justified by two assumptions--1) the current distribution of grayling represents 5 percent of its historic range and 2) recent population surveys have resulted in historic low numbers for the Big Hole River grayling. The MFWP annually conducts spring and fall surveys of grayling in the upper Big Hole River. Surveys did not occur during fall 2001 due to severe drought conditions. Spring 2002 spawning surveys resulted in the lowest number of grayling captured in 14 years of spring sampling. That fall, in traditional survey sections grayling population numbers remained at historic lows. Although YOY grayling numbers appear to have increased slightly in the Wisdom area since the historic lows of 2002 indicating the population can still reproduce given suitable environmental conditions, the overall population still appears to be at risk because of low abundance and irregular recruitment (Figure 4).



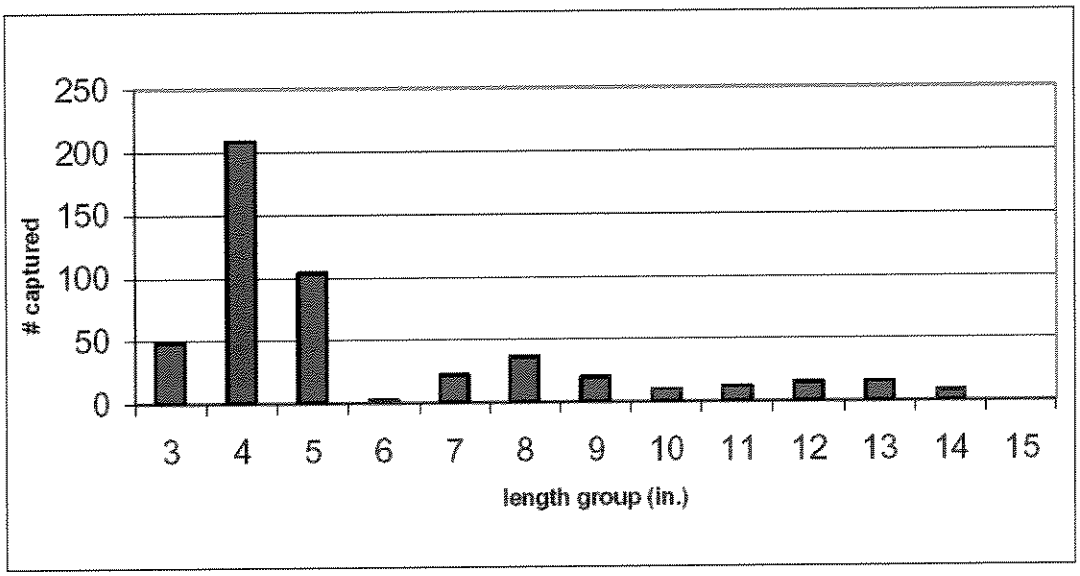


Figure 4 (A & B). Population Monitoring Data for Grayling in The Big Hole River. Panel A shows Catch-Per-Unit-Effort (CPUE) electrofishing of all-aged Arctic grayling from MFWP fall electrofishing surveys in the pools, Deep Creek (DC), McDowell (MCD), Wisdom East (WE), and Wisdom West (WW) sections in the Big Hole River, Montana, from 1983-2003. Panel B shows the length frequency of grayling captured in the 2003 surveys, showing that over 70 percent of the grayling captured in fall surveys that year were age-0 (length ≤ 6 inches).

Existing Conservation Measures

Conservation and restoration activities for grayling have been ongoing in Montana for nearly 2 decades. The Montana Fluvial Arctic Grayling Workgroup (Workgroup) was established in the 1980s as an interagency committee to provide guidance on grayling research, management, and restoration. A major accomplishment of the Workgroup was the development and approval of a Montana Fluvial Arctic Grayling Restoration Plan (Restoration Plan). In 1995, the Restoration Plan was recognized by MFWP and the USFWS as the conservation strategy that would guide restoration and monitoring for grayling in the upper Missouri River (MFWP 1995). The Restoration Plan called for the establishment of four additional fluvial populations in native waters, and outlined monitoring goals for the grayling population in the Big Hole River. At this time, there is no evidence that reintroduction efforts have produced self-sustaining populations (Lamothe and Magee 2004a). Further efforts to reestablish self-sustaining grayling populations will continue within the context of the Restoration Plan. Monitoring data from the Big Hole River do not indicate a secure or expanding grayling population (Magee and Lamothe 2004). The Restoration Plan is currently being revised to reflect these trends.

The restoration efforts of the Agencies over the past decade have resulted in cooperative relationships with the non-Federal property owners within the proposed Project Area. Research investigating the life history patterns of grayling inhabiting the Big Hole watershed has been conducted since the late 1970s (Byorth 1993). The MFWP has relied on landowner cooperation for access to the river to conduct population monitoring since the 1980s. Since 1994, the USFWS Partners for Fish and Wildlife Program and MFWP have provided technical and financial assistance to Big Hole valley property owners willing to implement water conservation measures and restore degraded riparian habitat. In response to a severe drought in 2004, NRCS Environmental Quality Incentives Program (EQIP) provided financial incentives to Big Hole River Valley landowners willing to temporarily remove acreage from irrigation and construct off-stream livestock watering facilities. In addition, several landowners have voluntarily allowed water, which they could have utilized under their existing water right under according to Montana law, to remain in the river. All of these efforts would not have been possible without the voluntary cooperation of non-Federal property owners.

The current status of grayling in the Big Hole River and the apparent lack of success of reintroductions increase the possibility that the USFWS will have to list grayling as either threatened or endangered under the ESA. The potential regulatory requirements associated with the listing of this fish may strain the relationship developed by the Agencies and the non-Federal property owners of the Big Hole River Valley. This Agreement provides the Agencies and the non-Federal property owners the opportunity to work together to develop site-specific plans that will significantly improve habitat conditions for grayling within the Project Area while offering property owners relief from the threat of additional regulatory burdens should grayling be listed. This Agreement represents a logical extension and enhancement of ongoing efforts to coordinate with landowners to improve conditions for grayling in the upper Big Hole River watershed.

IV. PROJECT AREA AND PARTICIPATING LANDOWNERS

This Agreement is an umbrella ("programmatic") plan covering approximately 382,200 acres of non-Federal lands within the 1,785,600-acre Big Hole River watershed in southwest Montana (Figures 2 and 3). Approximately 313,000 acres of the 382,200-acre non-Federal project area are privately owned, with the remainder owned by State, city, or county government or in right-of-way designation (Figure 5). The Project Area has approximately 318 private property owners. The non-Federal land within the Project Area is located primarily on the valley bottom with the surrounding uplands being owned primarily by the U.S. Forest Service (Figures 4 and 5). Of the 318 private property owners, 132 own parcels that are located adjacent to the Big Hole River or one of its tributaries (Table 1). The Project Area covers the Big Hole River and its tributaries upstream of Dickie Bridge to its headwaters. This area of the watershed supports the last remaining native population of fluvial grayling in the contiguous 48 States. While grayling are found within the Big Hole River downstream of the Project Area, the core of the population occurs within the Project Area. For the purposes of this Agreement, the Project Area has been divided into five management segments to make the conservation guidelines more spatially meaningful to property owners interested in developing site-specific plans and to allow the Agencies to track the progress of the conservation measures both temporally and spatially (Figure 2). The conservation guidelines described in this Agreement apply to the whole Project Area and will be necessary to secure the population and expand the abundance and distribution of grayling in the Project Area.

Management Segment A

Management Segment A includes the area of the Big Hole River and its tributaries between Dark Horse Creek and the mouth of Hamby Creek. Management Segment A includes an area of approximately 54,325 acres of private lands and includes 23 private property owners (Table 1). Of the 23 private property owners, 21 own property that is adjacent to either the Big Hole River or a tributary (Table 1). Management Segment A contains the headwaters of the Big Hole River and Governor Creek. Historically, Governor Creek supported grayling. The flow conditions of this management segment affect the flow conditions of all downstream segments.

Management Segment B

Management Segment B includes the reach of the Big Hole River and its tributaries between the mouth of Hamby Creek and the mouth of Little Lake Creek (Figures 2 and 3). Management Segment B covers an area of approximately 33,700 acres and includes 53 private property owners (Table 1). Of these 53 private property owners, 18 own property that is adjacent to either the Big Hole River or a tributary (Table 1). Historically this segment of the Project Area supported grayling. Recent population monitoring efforts failed to capture grayling. This area of the watershed could potentially serve as a reintroduction area once limiting factors have been identified and removed. Management Segment B is where Miner Creek, Governor Creek, and Warm Springs Creek enter into the Big Hole River. These tributaries are all important contributors to the flows of the Big Hole River.

Management Segment C

Management Segment C includes the reach of the Big Hole River and its tributaries between the mouth of Little Lake Creek and the Wisdom Bridge (Figures 2 and 3). Management Segment C covers an area of approximately 84,531 acres and includes 131 private property owners (Table 1). Of these 131 private property owners, 25 own property that is adjacent to either the Big Hole River or a tributary (Table 1). Historically this has been an important reach of the Big Hole River for grayling spawning and juvenile rearing. According to landowner accounts, the tributaries flowing into this management segment once supported grayling, but this no longer seems to be the case. With improvements to flow and habitat quality conditions these waters may once again support grayling. These tributaries also are important contributors to the flows of the Big Hole River.

Management Segment D

Management Segment D includes the reach of the Big Hole River and its tributaries between the Wisdom Bridge and Mudd Creek Bridge (Figures 2 and 3). Management Segment D covers an area of approximately 112,605 acres of private lands and includes 61 private property owners (Table 1). Of these 61 private property owners, 40 own property that is adjacent to either the Big Hole River or a tributary (Table 1). This reach of the river includes important grayling spawning (upstream of the North Fork) and wintering habitat. This management segment has historically supported significant numbers of grayling. Recent declining population trends for grayling in this management segment are not encouraging and this segment would benefit greatly from improved flow and habitat conditions. The North Fork, Steel Creek, and Swamp Creek are all important tributaries that join the Big Hole River in this management segment. Grayling have been documented during fall population monitoring efforts in each of these tributaries.

Management Segment E

Management Segment E includes the reach of the Big Hole River and its tributaries between the Mudd Creek Bridge and Dickie Bridge (Figures 2 and 3). Management Segment E covers an area of approximately 27,796 acres of private lands and includes 50 private landowners (Table 1). Of these 50 private property owners, 28 own property adjacent to either the Big Hole River or a tributary (Table 1). This reach of Big Hole River has served as a critical wintering habitat for grayling. This management segment also includes Fishtrap, Lamarche, and Deep Creeks (Figure 3). The results of fall population monitoring efforts show some of the highest densities of grayling in the Big Hole watershed exist within these tributaries (Magee and Lamothe 2003).

Table 1. Summary of Private Lands in the Agreement Project Area by Management Segment.

Management Segment	Number of Private Landowners*	Area of Private Land (acres)	Range of Parcel Size per Landowner (acres)	Number of Private Landowners Owning Streamside Parcels	Total Area of Private Land with Streamside Parcels (acres)
A	23	54,325	20 – 19,045	21	4,215
B	53	33,700	18 – 6,179	18	24,900
C	131	84,531	20 – 19,825	25	52,565
D	61	112,605	5 – 14,730	40	73,404
E	50	27,796	20 – 3,662	28	17,381
TOTAL	**318**	**312,957**		**132**	**172,465**

* Some landowners own parcels in multiple management segments, so the total of this column will be greater than the total number of individual landowners in the Project Area.

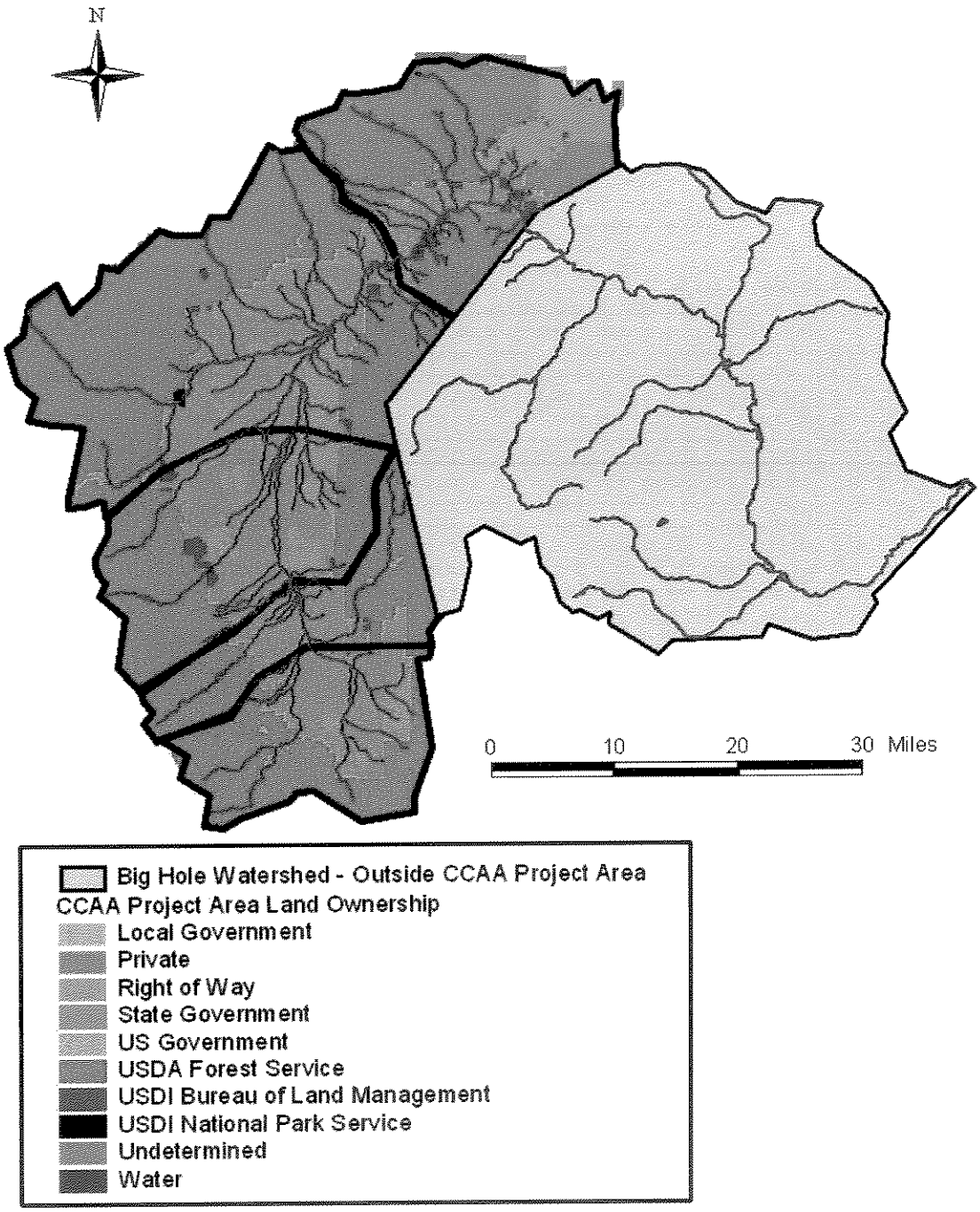


Figure 5. Land Ownership Within the Project Area. Project Area is Roughly Delineated by the Sum of State, Local Government (County And City), and Private Lands.

Landowner Interest in Implementing Conservation Measures to Benefit Grayling

In April 2005, MFWP and NRCS announced a program for landowners in the upper Big Hole River valley to implement actions to benefit grayling and participate in a voluntary irrigation reduction program during 2005. The MFWP made available "Applications for Development of a Site-Specific Plan for a Potential Candidate Conservation Agreement with Assurances for fluvial Arctic grayling" to address species needs in 2005 and to obtain information from individuals interested in voluntarily participating in a potential Agreement for grayling. The MFWP received outstanding interest in the program from over three dozen private landowners who cumulatively own over 208,000 acres, which is over 66 percent of the approximately 313,000 privately-owned acres in the Project Area (Figure 6). A majority of these lands are located in areas with the greatest Habitat Significance, as identified in Figure 22. These landowners have already committed to implementing the measures identified in Phases I and II of the Agreement (Appendices E and F) and rapid assessments (presented in Part VIII) have been initiated.

V. THREATS, ESA LISTING CRITERIA, AND THE CCAA POLICY

The following section provides a brief summary of the major threats to the existence of fluvial Arctic grayling in the upper Missouri River and in the Big Hole River using the ESA's five threat factor categories--A) the present or threatened destruction, modification, or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific, or educational purposes; C) disease or predation; D) the inadequacy of existing regulatory mechanisms; and E) other natural or manmade factors affecting the species' continued existence.

A detailed description of the threats facing grayling in the Big Hole River that that will be reduced by landowner participation in this Agreement appears in a subsequent section of this document (see Conservation Measures Part VI). The USFWS' annual Candidate Notice of Review contains a detailed analysis of the threats facing grayling across the range of the DPS, whereas the following sections (A-E below) provide a summary discussion of threats addressed by the Agreement (Part VI) in relation to the overall threats facing the grayling in response to Part 3 of the Candidate Conservation Agreement with Assurances policy (64 FR 32734). The policy states that the USFWS will only enter into an Agreement "when they determine that the benefits of the conservation measures implemented by a property owner under a Candidate Conservation Agreement with Assurances, when combined with those benefits that would be achieved if it is assumed that conservation measures also were to be implemented on other necessary properties, would preclude or remove any need to list the covered species" (69 FR 32734-32735). In addition, this section highlights the major threats to grayling that are under the direct control of MFWP and the Participating Landowners and will be addressed in this Agreement's Conservation Measures.

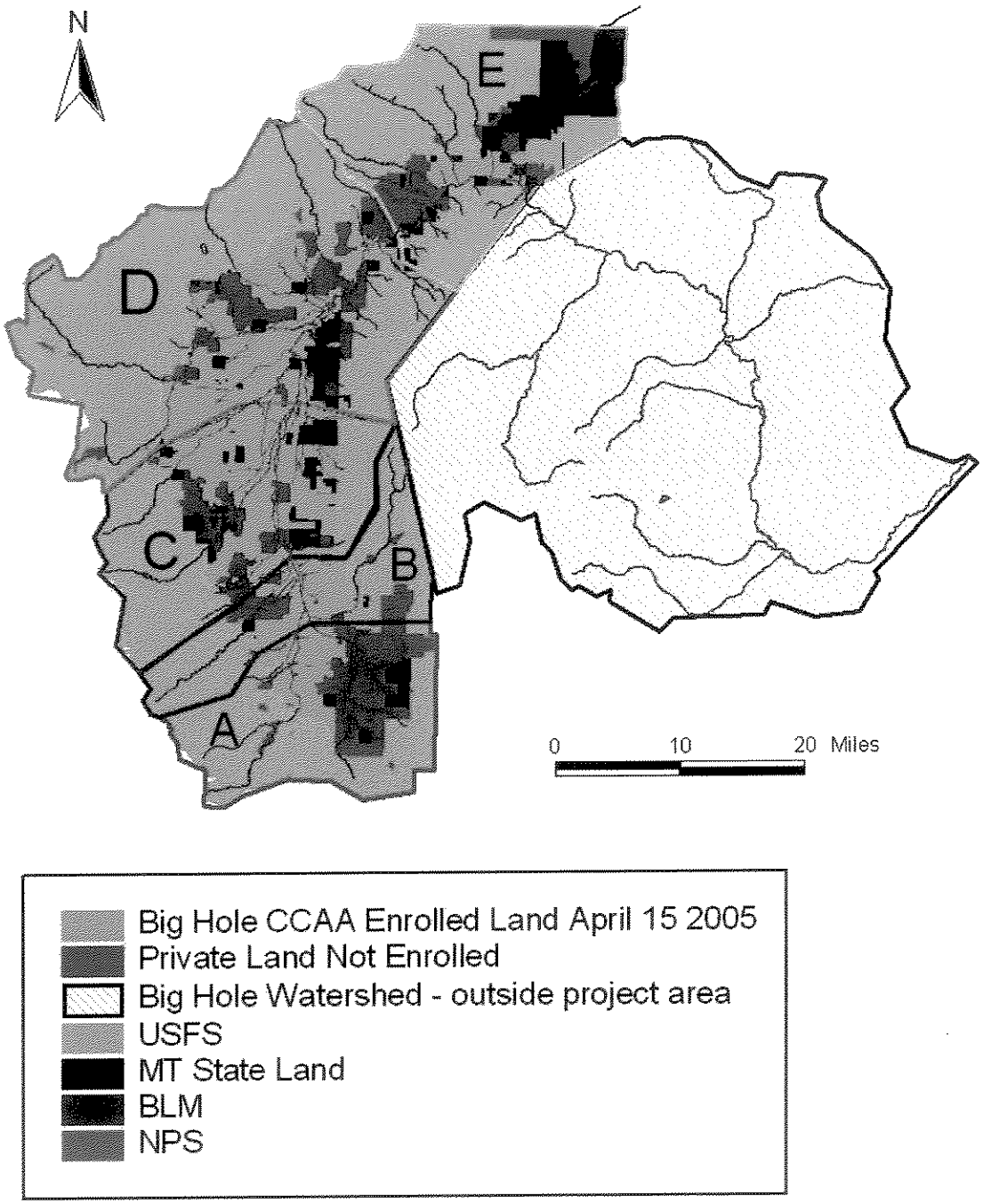


Figure 6. Area of Land Owned by Private Landowners Interested in Developing Site-Specific Plans Under the Potential Big Hole Grayling Agreement.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range. The majority of the historic range of the upper Missouri River fluvial Arctic grayling DPS has been altered by the construction of dams and reservoirs that created barriers that obstructed migrations to spawning, wintering or feeding areas; inundated grayling habitat; and impacted the historical hydrology of river systems (Kaya 1990). In the Big Hole River watershed, local land and water use has affected surface water hydrology, riparian zone conditions, stream morphology, thermal characteristics, and possibly nutrient inputs to the aquatic system (Kaya 1990; OEA 1995; Lohr et al. 1996; Lamothe and Magee 2004b; upper Big Hole TMDL 2003). The operation of irrigation systems in the Big Hole has apparently led to the direct fragmentation of stream habitats.

Surface Water Hydrology - The predominant land use in the upper Big Hole watershed is irrigated agriculture for hay production and livestock pasture. Irrigation demands on the system are very high because of the over-allocation of water rights, the difficult-to-control and inefficient surface water (flood) irrigation systems, a recent shift to increased pasture grazing, and a continuing drought. These demands have resulted in significantly reduced instream flows that pose a major threat to grayling. Reduced streamflows can reduce the growth and survival of grayling through reducing the available habitat. The details of these mechanisms are discussed in the following section (Part VI).

Riparian Zone (Streamside) Conditions - Riparian zones are critical for the ecological function of most aquatic systems (Gregory et al. 1991). Riparian habitats dissipate stream energy during floods, filter sediments and pollutants, facilitate ground-water recharge, cool streams by shading, stabilize streambanks, maintain channel characteristics, promote floodplain development, and input woody debris, organic material, and terrestrial insects (e.g., Murphy and Meehan 1991; Prichard et al. 1998). Loss of riparian zones through streamside livestock grazing and direct removal of natural vegetation has led to degradation of adjacent stream habitat in the upper Big Hole River (OEA 1995; Upper Big Hole TMDL 2003; Lamothe and Magee 2004b). Healthy riparian corridors are vital for maintaining instream habitat for Arctic grayling in the upper Missouri River basin.

Stream Morphology - The combination of reduced instream flows and loss of riparian habitats in the Big Hole River has led to decreased channel stability, increased erosion, and channel widening (e.g., Upper Big Hole TMDL 2003). In concert, these changes have led to habitat simplification such as a reduction in pool and riffle sequences. Reduced habitat diversity affects grayling by decreasing the distribution and frequency of necessary spawning, feeding and refuge habitats.

Water Quality - Thermal Impairment and Nutrients - Reduced stream flows during summer, reduced shading because of riparian vegetation removal, and channel widening are factors combining to increase water temperatures by making surface waters more sensitive to solar radiation. Thermal alterations via increased summer water temperatures pose a threat to grayling in the mainstem Big Hole River (e.g., Lohr et al. 1996; Magee and Lamothe 2004).

Nutrient enrichment may be a potential problem in the upper Big Hole River (Upper Big Hole TMDL 2003 and reference therein). Further data are needed to determine if nutrient enrichment is affecting water quality to the extent that grayling are being harmed. However, the potential for fertilizers applied to irrigated lands and livestock waste provide sources of nutrients to the river appears substantial given the surface (flood) irrigation techniques utilized in the upper Big Hole basin.

Habitat Fragmentation - Habitat fragmentation is often considered one of the most significant threats to the survival to salmonid fishes in the western United States (Behnke 1992, 2002) and to species in general (Wilcox and Murphy 1985). In addition to the effects of habitat loss and fragmentation from stream dewatering by irrigation, the presence and operation of irrigation diversions can fragment grayling habitat in two additional ways. First, cross-channel diversions may block fish passage under all or some flow conditions, impeding grayling access to necessary spawning, rearing and refuge habitats. Second, irrigation diversions and ditches may entrain (inadvertently capture) grayling (e.g., Shepard and Oswald 1989).

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes.
Arctic grayling in the upper Big Hole River are handled for recreational and scientific purposes. Arctic grayling are easily caught by anglers (e.g., Alberta Sustainable Resource Development 2005), and historical angling exploitation likely contributed to, or initiated, past declines or local extirpations throughout the upper Missouri River DPS (Vincent 1962). Currently, catch-and-release regulations are in effect for Arctic grayling in rivers in Montana. Under provisions of the Big Hole River Drought Management Plan, angling is closed when specific low flow and high temperature thresholds at the U.S. Geological Survey (USGS) Wisdom (#06024450) and USGS Melrose (#06025500) gauging stations are exceeded (Big Hole Watershed Committee 1997).

The MFWP has consistently monitored populations of fluvial Arctic grayling in the Big Hole River since the early 1980s. The experience of MFWP fishery biologists, combined with sampling restrictions when environmental conditions are stressful, indicates negligible effects on grayling from scientific and resource management sampling. In the Big Hole River, overall threats to fluvial Arctic grayling from overutilization are not significant compared to those posed by direct alteration of habitat.

C. Disease, Competition, or Predation.
Arctic grayling are resistant to whirling disease (Hedrick et al. 1999), but are susceptible to bacterial kidney disease. However, bacterial kidney disease tends to affect captive rather than wild populations (Myers et al. 1993; Peterson 1997).

Predation and/or competition with nonnative trout is thought to limit fluvial Arctic grayling in some situations (Kaya 1992a). Nonnative brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*) are well-established with locally abundant populations throughout the upper Missouri River drainage including the Big Hole River. Research on competition between grayling and nonnative brook trout found little evidence that brook trout negatively affected microhabitat use or growth of juvenile (age-1) hatchery-reared and wild Arctic grayling (Byorth and Magee 1998). However, further studies

are necessary to determine whether competition or predation occur at other life stages or with brown or rainbow trout. Grayling apparently have particular difficulty coexisting with brown trout (e.g., Kaya 2000). Overall, the decline of grayling in the upper Missouri River coinciding with encroachment by nonnative trout (Vincent 1962; Kaya 1990, 1992a, 2000), and the difficulty in reestablishing grayling populations where nonnatives are present (Kaya 1992b) provide circumstantial evidence of threats from nonnative trout.

Piscivorous American white pelican (*Pelecanus erythrorhynchos*), bald eagle (*Haliacetus leucocephalus*), osprey (*Pandion haliaetus*), great blue heron (*Ardea herodia*), and belted kingfisher (*Ceryl alcyon*) are seasonally present in Big Hole River valley, and can be effective fish predators. However, there are no data demonstrating these avian species are having a negative impact on fluvial Arctic grayling populations in the Big Hole River.

D. The Inadequacy of Existing Regulatory Mechanisms.
State and Federal natural resource agencies in Montana are aware of the current population status of fluvial Arctic grayling and have been actively involved in conservation and restoration activities. However, despite the attention grayling receive as a species of concern in Montana and a candidate species under the ESA, there are no specific Federal regulatory mechanisms currently in place to protect fluvial Arctic grayling in Montana.

The MFWP instituted catch-and-release angling restrictions for fluvial Arctic grayling and increased possession limits for nonnative brook trout, and also have a policy to suspend recreational angling under drought conditions when water temperatures in the Big Hole River exceed 70°F for more than 8 hours per day for 3 consecutive days (MFWP Fishing Closure Policy, MFWP Headquarters, Helena, Montana). The Big Hole River is currently being evaluated under section 303(d) of the Federal Clean Water Act. Moreover, much of the Big Hole River system may soon be subject to water rights adjudication under Montana State water law.

E. Other Natural or Manmade Factors Affecting Its Continued Existence.
Drought is a significant threat to the well-being of fluvial Arctic grayling populations in the upper Missouri River basin. Southwestern Montana has experienced a severe drought since 1999 (see Figure 7) which has exacerbated the impacts of water withdrawals in the upper Missouri and Big Hole River basin. Reductions in populations of fluvial Arctic grayling and nonnative trout in the Big Hole River appear to coincide with periods of drought (Magee and Lamothe 2003, 2004).

Climate change (global warming) is predicted to result in habitat loss and fragmentation for salmonid species in the Rocky Mountains (Keleher and Rahel 1996), and should place further thermal constraints on grayling in the Big Hole River (Lohr et al. 1996) if other habitat conditions do not improve.

Fluvial Arctic grayling in the Big Hole River are possibly subject to environmental and genetic problems that threatens many small populations. The importance of demographic uncertainty, environmental uncertainty, natural catastrophes, and genetic uncertainty on population dynamics all increase with decreasing population size (Shaffer 1987). Fluvial Arctic grayling in Montana appear to have low genetic variability compared to populations elsewhere (Everett 1986; Redenbach and Taylor 1999). Thus, effects from random survival and reproduction of

individuals (demographic uncertainty); variation in climate, food resources, competitors, parasites (environmental uncertainty); random occurrence of floods and drought (natural catastrophes); and genetic drift (genetic uncertainly) may threaten the long-term persistence of this population.

THREATS TO GRAYLING TO BE ADDRESSED UNDER THE AGREEMENT

For this Agreement, the most immediate human-influenced threats to fluvial Arctic grayling in the Big Hole River are habitat loss, degradation and fragmentation resulting from:

1) reduced streamflows
2) degraded and non-functioning riparian habitats
3) barriers to grayling movement; and
4) the potential for grayling entrainment in irrigation ditches

These habitat-related limiting factors (1-4 above) can be directly addressed by conservation measures implemented by landowners participating in the Agreement. Participating Landowners are not responsible for addressing threats to grayling from nonnative trout species. However, the partnering Agencies believe that actions may be necessary if nonnative trout limit the ability of grayling to positively respond to the Agreement's conservation measures.

VI. CONSERVATION MEASURES

The general conservation measures identified below are intended to address the significant limiting factors to grayling habitat and populations within the Project Area. These measures address potential limiting factors to grayling that non-Federal property owners will be addressing within the Project Area. The benefits of the conservation measures implemented by a property owner under an Agreement, when combined with those benefits that would be achieved if it is assumed that conservation measures also were to be implemented on other necessary properties, would preclude or remove any need to list the covered species. "Other necessary properties" are properties in addition to the property that is the subject of an Agreement with assurances on which conservation measures would have to be implemented in order to preclude or remove any need to list the covered species (64 FR 32735).

A. Instream Flows

Limiting Factor - Reduced Streamflows

Southwest Montana is currently experiencing severe drought conditions that are putting exceptional levels of stress on the aquatic species in this region (A. Brummond, April 19, 2005, MFWP memorandum). The current drought is at historic levels (Figure 7). The current drought conditions have resulted in below-average snowpack conditions in the mountains surrounding the Big Hole River (Figure 8). The lack of snow equates to reduced availability of water for grayling and irrigators in the Project Area (Figure 9).

The predominant land use in the upper Big Hole watershed is irrigated agriculture, specifically hay production and livestock pasture. This land use has resulted in changes to the system's natural hydrology. Under current State law many non-Federal landowners within the Project Area have the right to withdraw water from the Big Hole River and its tributaries for irrigation

and stock watering purposes. The right to use this water is regulated in terms of location of diversion, period of use, the amount of water removed from the source, and location where the water is used.

A natural hydrograph for a system like the Big Hole River should exhibit a seasonal peak during snowmelt runoff (late spring/early summer), declining flows through the summer, and base flow conditions from late summer through winter. The spatial and temporal variation in streamflows within the Project Area can be dramatic. During spring 2004, streamflows were observed to be in excess of 200 cfs in the North Fork of the Big Hole River while the USGS streamflow gage located at the Wisdom Bridge was recording streamflows of less than 10 cfs (MDNRC

unpublished data). This spatial variation in streamflow conditions prevents grayling access to streamflow refugia during environmental extremes. The spatial variability in streamflows may cause shifts in grayling movement patterns that are not captured in annual population monitoring efforts.

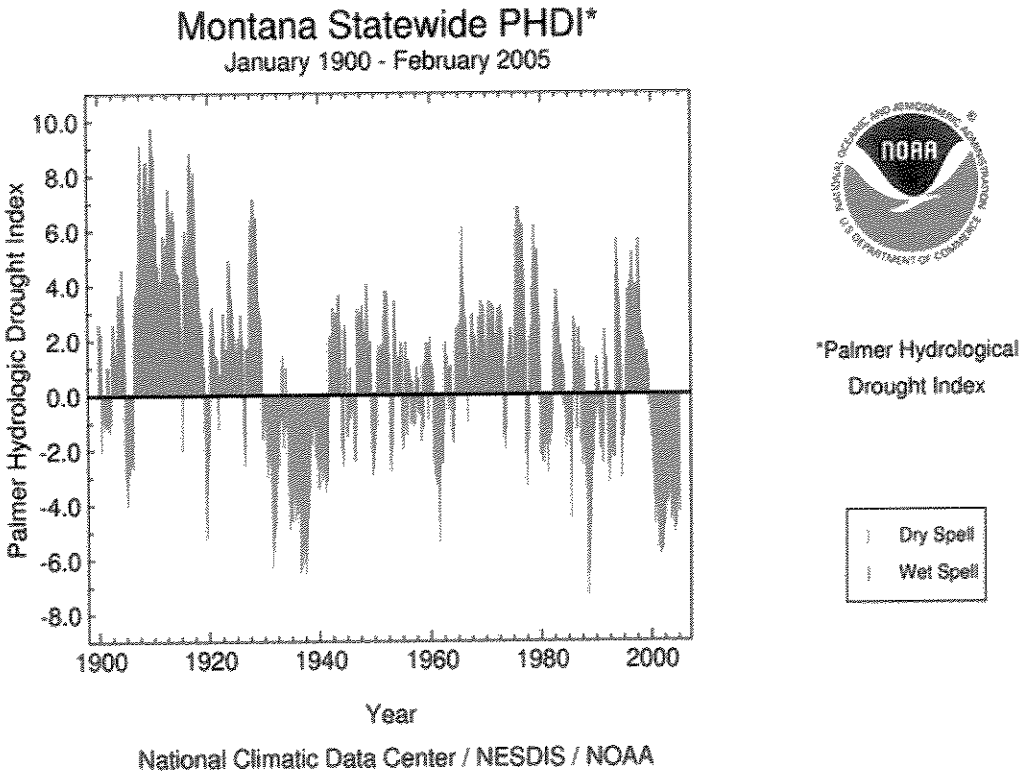


Figure 7. Historical Perspective of Current Drought Conditions in Montana. The Palmer Hydrological Drought Index indicator is based on moisture inflow (precipitation), outflow, and storage.

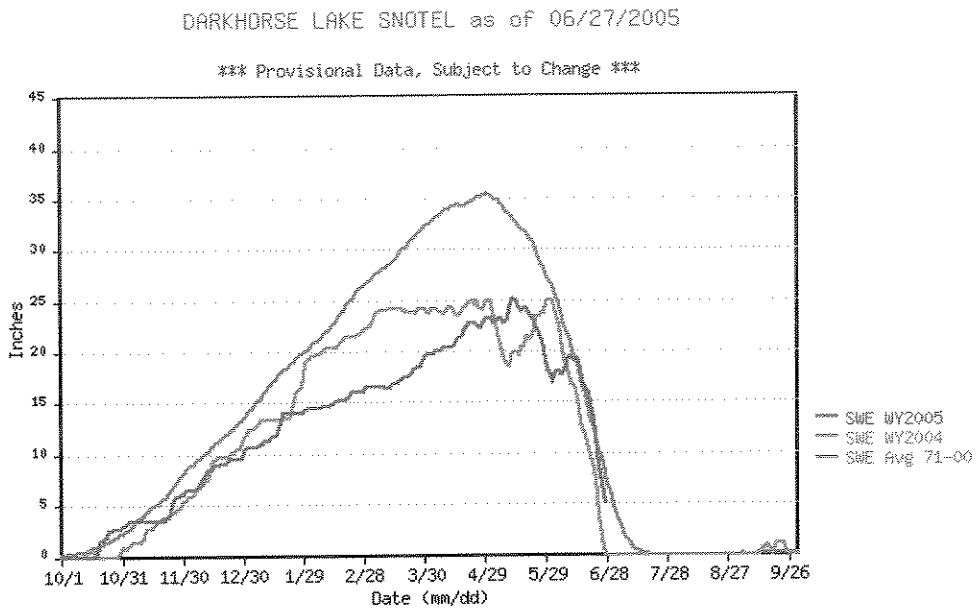


Figure 8. Current, Recent, and Historic Snowpack Conditions (Snow Water Equivalent (SWE)) from a NRCS Snowpack Monitoring Site in the Headwaters of the Big Hole River. Plots represent snow water equivalents for water years 2004 (SWE WY2004), 2005 (SWE WY2005), and the 30-year average over the period 1971-2000 (SWE Avg 71-00).

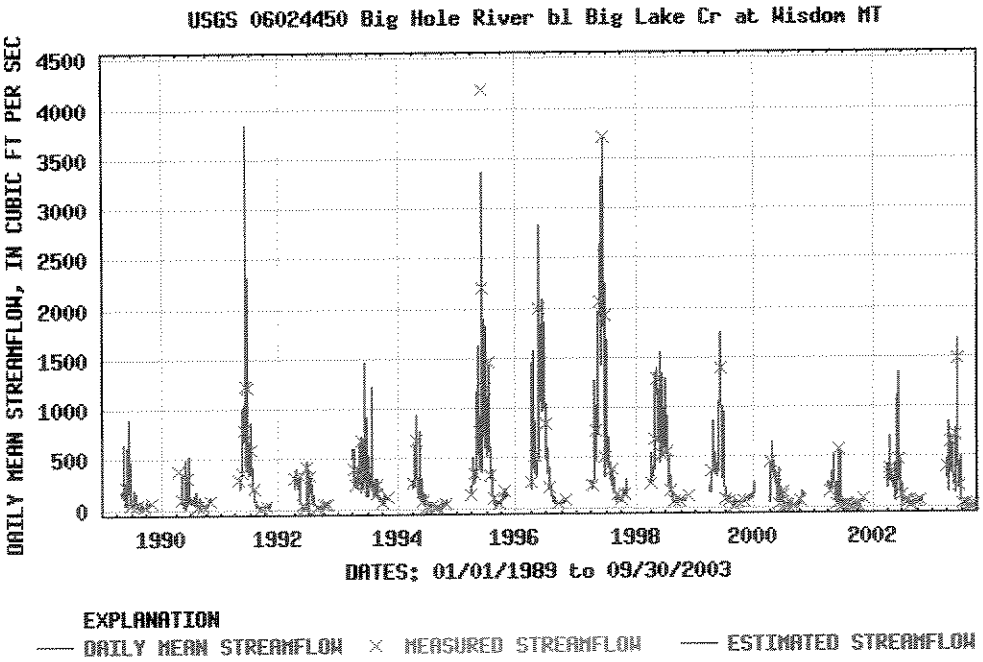


Figure 9. Historic Streamflows at the Big Hole River USGS Gauging Station at the Wisdom Bridge During 1989-2003.

Irrigation withdrawals, in concert with effects of drought, have attenuated high-flow events and lowered base flow conditions. Consequently, these hydrologic alterations are implicated in poor spawning success and recruitment of grayling, seasonal habitat degradation and fragmentation, and increased summer water temperatures (Magee and Lamothe 2003, 2004).

Early-season (April-May) irrigation withdrawals may dewater or block access to grayling spawning and rearing sites in the Big Hole River, which can prevent spawning, cause egg mortality, and reduce survival of YOY grayling and lead to reduced recruitment. For example, recent poor spawning and recruitment success has coincided with lower than normal spring flow conditions during 1999-2002 (Magee and Lamothe 2003). Low flows also can affect the quality of pool habitats preferred by older age classes of grayling (Byorth and Magee 1998; Lamothe and Magee 2004b), and reduce overall habitat volume.

Hydrologic alterations can affect all age classes or life stages of grayling by reducing connectivity between necessary habitats (i.e., fragmentation). Stream-dwelling fish such as grayling require distinct spawning, rearing, feeding, and refuge habitats located throughout the watershed. Movement between these necessary habitats is an important component of the ecology of Big Hole River grayling as these fish are known to move tens of miles on both a seasonal and daily basis (Shepard and Oswald 1989; Lamothe and Magee 2003). Habitat fragmentation can thus have detrimental consequences for all age classes of grayling, and lead to population declines.

Elevated summer water temperature in conjunction with low flows is a major water quality issue that impacts grayling. Irrigation and stock water removals during late summer reduce stream flows and lead to increases in water temperature in the river channel. For example, summer water temperatures during 2002-03 exceeded the upper incipient lethal temperature (UILT) for grayling (e.g., 25°C or 77°F; Lohr et al. 1996) at most monitoring stations throughout the Big Hole River (Magee and Lamothe 2003, 2004). The UILT is the temperature that is survivable indefinitely (for periods longer than 1 week) by 50 percent of the "test population" in an experimental setting. During mid-July 2004, water temperatures exceeded 25°C in a juvenile rearing area for grayling in the mainstem Big Hole River near Wisdom, Montana. Overall, summer water temperatures in the Big Hole River consistently exceed stressful levels for salmonids (e.g., 21°C or 70°F, Magee and Lamothe 2003).

Proposed Conservation Measures to Improve Streamflows in the Project Area

A key conservation strategy of this Agreement is to provide streamflows that promote stream ecosystem function and benefit grayling by facilitating adequate seasonal high-flow events, maintaining adequate baseflow conditions, and eliminating human-caused dewatering events. This Agreement seeks to provide base flows that are sufficient to create and maintain grayling habitat conditions, provide a healthy thermal regime, and allow for suitable foraging conditions (stream productivity).

To meet the objective of improving streamflows in the Big Hole River, three general approaches will be utilized in this Agreement--a) improving Participating Landowner control over diversion, delivery and measurement of water; and b) reducing the amount of water diverted and

c) increasing the effectiveness with which diverted water is delivered. Three complementary conservation measures will be implemented under these approaches--compliance with water rights, arrangements to reduce irrigation withdrawals, and improved irrigation management.

Landowner control over irrigation water at the point of diversion is a necessary pre-condition for each of the preceding conservation measures and is considered an over-arching objective for improving instream flows.

Implementation of the conservation measures detailed below will proceed in a tiered, sequential approach. First, the Agencies and Participating Landowners will ensure management and measurement of all irrigation water, and begin implementing measures to achieve this objective immediately after a landowner enters into the Agreement. Second, compliance (and monitoring of that compliance) with water rights shall begin immediately after a landowner enters into the Agreement. Third, interim diversion reduction arrangements shall be negotiated with a landowner upon entering into the Agreement. Fourth, implementation of improved irrigation management recommendations based on an irrigation system and agricultural operation assessment shall begin no later than the date upon which a site-specific plan is finalized for a Participating Landowner. The first and second steps will continue for the duration of the Agreement. The third step defines the amount and timing of a Participating Landowner's irrigation withdrawals, but these parameters may be revised or superseded by the fourth step (improved irrigation management).

Enrollment in the Agreement does not free the Participating Landowner of the responsibility of legal provisions provided in the Montana Water Use Act (MCA Title 85, Chapter 2) or the concept of "first in time, first in right." In other words, any official change to a water right, which can include changes in point of diversion, place of use, purpose of use (such as leases) and period of use, must be established through MDNRC's change authorization process. Also, priority water calls can still be placed from senior users to junior users regardless of agreements or arrangements formed under the Agreement.

Management and Measurement of Irrigation Diversions

Agencies will work with Participating Landowners, in order of priority, to ensure that all irrigation diversions on enrolled lands are properly functioning and have flow measuring devices within 5 years of enrollment (see Figure 22). Many existing diversion structures in the upper Big Hole River and its tributaries are only semi-functional. For example, a number of diversion structures, especially on tributaries, have no actual structure to stop diversion. Thus diversion becomes strictly a function of water availability (Roberts 2005). In addition, many diversions leak to varying degrees when closed (e.g., see Photo 2G). Agency personnel observed that many of the 40+ headgates monitored during the NRCS EQIP program during summer 2004 in the upper Big Hole system could not completely stop flow into irrigation ditches even when they were "closed;" however, the actual leak rates were not measured.

The primary mechanism to increase control of water at points of diversion will be to redesign, upgrade, and install physical diversion structures (e.g., headgates or the appropriate alternative) and flow measuring devices (e.g., flumes and weirs).

Water Savings 1 - The following is a simple example of how improving diversion structures will improve streamflows and assumes that water saved will be returned to the river system (but see Roberts 2005). This example should not be extrapolated to predict water savings across the Project Area, but is instead presented to highlight the potential for improving streamflows simply by installing, upgrading or otherwise improving diversion structures. A sample of irrigation diversions at both mainstem and tributary locations in the upper Big Hole River system were assessed on one day in May 2005 to provide a rough estimate of leak rates on closed headgates. The average leak rate of this sample was 1.25 cfs (n = 6, range = 0.1 – 2.63 cfs, standard error = 0.43). The amount of water that leaks through a "closed" diversion structure is a complex function of diversion type and its current physical condition, diversion location with respect to adjacent channel morphology and flow characteristics, and flow levels (among other variables); so estimating water savings across more than one thousand points of diversion is not possible at this time. However, improving diversion structures will raise the baseline for flow conditions, especially in the spring and fall (outside of the period of use for most water rights) when diversions should be closed.

Compliance With Water Rights

Participating Landowners shall comply within the historic limits and constraints of their claimed water rights in place at the time they enter into the Agreement. Under Montana water law, a water right describes the point of diversion, period of use, place of use, and the maximum flow rate. A summary of water rights in the Big Hole River basin can be accessed through MDNRC's website at >nris.state.mt.us/dnrc/waterrights/default.aspx<. The water rights on the mainstem Big Hole River and the majority of its tributaries in the Project Area are unadjudicated, and amendments to claimed water rights that happen through the adjudication process will be addressed in the "Changed and Unforeseen Circumstances" part of this Agreement.

Period of use of water rights in the Project Area can range from January to December for many stock watering rights to the more common May through September period for most irrigation water rights. Traditionally, much of the irrigation diversion ended in early July with the initiation of hay harvest; however, due to the recent conversion of hay meadows to irrigated pasture for livestock forage, irrigation during July thru September has become more common. The priority date for water rights is variable across the Project Area, but most of the pre-1890 water rights are located in the mainstem and tributaries of the Big Hole River above Wisdom (i.e., Management Segment C and upstream). Most of these senior water rights holders have already expressed interest in an Agreement (Figure 6), so priority calls for water rights made under Montana State water law are not likely to jeopardize the ability of the Agreement to augment flows for fluvial Arctic grayling in the Project Area if these same private landowners participate in the Agreement.

Most of the irrigation diversions in the Project Area do not have flow measuring devices that would permit landowners to measure irrigation withdrawals relative to their claimed water rights. As described earlier, the absence or condition of physical diversion structures also makes irrigation control very difficult in some situations. This combination of factors has resulted in some landowners inadvertently irrigating in excess of the water volume and period of use associated with their water right.

Improvements to irrigation structures and the installation of measuring devices described above will remove this problem and help Participating Landowner to comply with their water rights.

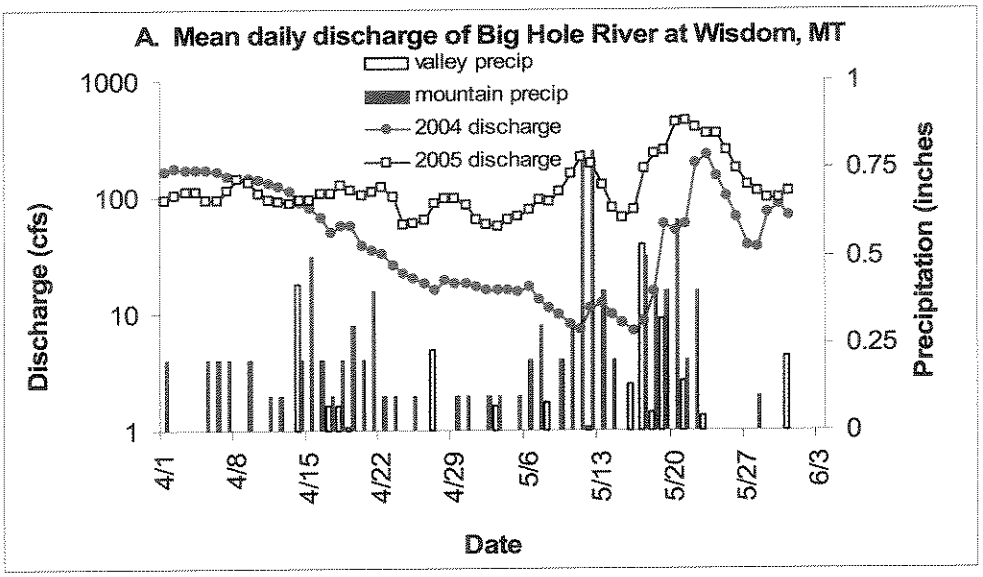
Water Savings 2 - The amount of water to be conserved through compliance with water rights is again difficult to estimate given the lack of historical data on diversion amounts and the large number of diversion points in the system. However, the timing of such conservation is more readily understood. For example, compliance with the timing of water rights will likely accrue benefits to instream flow at the beginning of the irrigation season when grayling typically spawn (e.g., mid-April and May), and in the late-summer and early fall when the river is at baseflow. Compliance with amount of diversion will increase streamflows throughout the irrigation season, roughly May-September.

Reduced Irrigation Withdrawal Through Interim Diversion Reduction Arrangements

The Agencies shall negotiate interim reductions in irrigation diversions (from historic or legally-permitted levels) with Participating Landowners, as necessary, to benefit instream flows and respond to environmental stressors (e.g., drought). These flexible arrangements will take the form of a conditional arrangement whereby Participating Landowners adjust (stop or reduce) diversions during specific calendar dates or flow conditions. These arrangements will be negotiated utilizing the analysis and professional judgment of fishery biologists and hydrologists from the participating agencies. The general strategy in negotiating these arrangements will be to keep water in the river at a timing that augments the form of the natural hydrograph (e.g., higher flows in spring, sustained baseflows in summer-fall) to permit grayling the full expression of their life histories in the system. These flexible arrangements can be negotiated beginning any time after a landowner enters into this Agreement (i.e., at "Phase I" of this Agreement – see Part VIII, Implementation of the Agreement), but in some cases data collection (diversion amounts) and physical upgrades to the irrigation system (diversion structures and flow measuring devices) will be necessary preconditions to negotiation and implementation of such arrangements. Stipulations of and compliance with provisions of the arrangements will be recorded and maintained in files held by MFWP.

Experience with existing voluntary diversion reduction arrangements (MFWP unpublished data), the summer 2004 EQIP flow enhancement program (e.g., Roberts 2005), and most significantly a voluntary diversion reduction program to address drought conditions in 2005 (MFWP unpublished data) demonstrates these conditional arrangements are effective mechanisms to augment streamflows and flexible enough to respond to changing conditions.

Over three dozen landowners in the upper Big Hole River, whose property encompasses over 200,000 acres, signed up to participate in the 2005 voluntary diversion reduction program coordinated by MFWP. Preliminary hydrologic data demonstrate the effectiveness of this program. First, streamflows at Wisdom in 2005 have been generally greater compared to 2004 in both absolute terms (Figure 10A) and in comparison to snowpack conditions in the upper watershed (Figure 10B), though valley and mountain precipitation also has played a factor (Figure 10A). The ratio between discharge and snowpack (Snow Water Equivalent) in 2005 is most striking, as the 2005 snowpack has been less than in 2004 for most of the year (Figure 10B) yet the discharge has generally been greater in 2005 (Figure 10A).



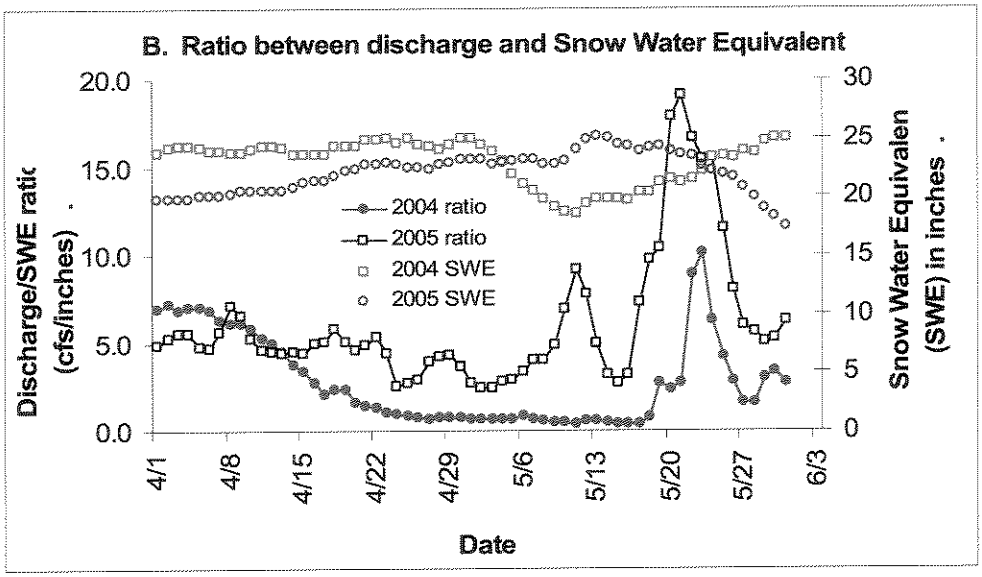


Figure 10 (A & B). Streamflow and Snowpack Conditions in the Upper Big Hole River Basin During April-May 2004 and 2005. Panel A shows the mean daily discharge recorded by a USGS streamflow gage at Wisdom, Montana, during 2004 and 2005 (y-axis at left) and observed precipitation in the Big Hole valley at Wisdom (y-axis at right) during April 13-May 31, 2005, recorded by a National Weather Service cooperative weather station (WISM8) and mountain precipitation during April 1-May 31, 2005, recorded at the Darkhorse Lake SNOTEL site (13d19s) operated by NRCS. Panel B shows the ratio between stream discharge at Wisdom and the Snow Water Equivalent (SWE); and the raw SWE data (y-axis at right) observed on the same day at the Darkhorse Lake SNOTEL site. Snow Water Equivalent is the amount of liquid water contained in a volume of solid snow.

Second, instantaneous stream discharge measurements taken on the same date at two locations in the upper Big Hole River give a snapshot view of the effect of voluntary irrigation reduction on streamflows (Table 2). On May 4, the inflows measured at Jackson were lower in 2005 vs. 2004, yet the flows downstream were greater; demonstrating, in part, the effect of voluntary irrigation closures between those locations on that date. Where water was being "lost" between the two locations by irrigation diversion on that date in 2004 (no irrigation reduction program in place during May and flows at Wisdom 23 percent of those at Jackson), water was actually being "gained" in 2005 (irrigation reduction program in place; flows at Wisdom 242 percent those at Jackson). On May 16, basin inflows were greater in 2005 (112 vs. 50 cfs in 2004) so absolute flows were also greater, but comparatively more water also was making it from Jackson to Wisdom in 2005 because flows at Wisdom were 66 percent of those at Jackson in 2005 (vs. 14 percent in 2004).

Table 2. Difference in Instantaneous Stream Discharge Measured at Two Locations on the Big Hole River on the Same Dates (May 4 And 16) in 2004 and 2005. The measuring locations at Jackson and Wisdom, Montana, are approximately situated at the downstream end of Agreement Management Segments A and C, respectively (see Figure 2). Snow water equivalent values are from the Darkhorse Lake SNOTEL site and represent mountain precipitation conditions in the upper Big Hole River basin.

Year	Date	Snow Water Equivalent (inches)	Big Hole River at Jackson (upstream)	Big Hole River at Wisdom (downstream)	Comparative Flow (Wisdom/Jackson)
			Discharge in cfs		
2004	May 4	23	69	16	23%
2005	May 4	22.9	26	63	242%
2004	May 16	19.6	50	7	14%
2005	May 16	24.2	112	74	66%

Improvements to irrigation systems at the points of diversion will help landowners to manage water (see previous sections), and increase the ability of landowners to respond to fluctuating streamflows and environmental conditions so that water can be returned to the river at a time that will benefit grayling. Water leases may be an appropriate tool to ensure that water saved will remain in the river and meet the requirements under State water law.

Water Savings 3 - The water conserved and returned to the river to benefit instream uses under these irrigation reductions is difficult to estimate given the lack of existing data on historical irrigation use and the site-specific nature of the arrangements. However, the cumulative contribution of these arrangements to instream flows may be substantial given the heavy water use that has historically occurred and the over-allocation of unadjudicated water rights in the Project Area. These arrangements also may provide more immediate benefits to instream flows compared to other measures that require more intensive assessments and have a longer timeline for implementation (see changes effected through IMPROVED IRRIGATION MANAGEMENT, below).

IMPROVED IRRIGATION MANAGEMENT

Improved irrigation water management involves both improving control over water diversions and measuring withdrawals, and quantifying the amount of irrigation water required for Participating Landowners to meet their production goals. Both approaches will result in less water diverted from the Big Hole River and its tributaries in the Project Area.

Irrigation Water Management - The NRCS will use its Irrigation Water Management guidelines to reduce irrigation demands to increase instream flows while helping producers maintain sustainable agricultural operations. Within 30 months of a Participating Landowner entering into the Agreement, the NRCS will conduct a comprehensive assessment of the irrigation system and current agricultural operation on the enrolled lands. This assessment will consider such attributes as water rights on the enrolled lands, water holding capacity of the soils (based on soil type, topography, etc.), the water requirement of the crop(s) (based on crop type and developmental condition, variability in environmental conditions, etc.), and cooperative use with adjacent landowners. This information will be used to estimate the irrigation water needed for production of hay and pasture forage. The final maximum irrigation diversion amount shall be determined by NRCS.

Based on final diversion amount, Participating Landowners will have the flexibility to upgrade their irrigation systems to achieve effective delivery of water to maintain agricultural production given existing crop type and distribution; or to adjust their operation such that agricultural production is maintained by altering the composition and distribution of irrigated crops on enrolled lands without intensive upgrades to the existing irrigation system (diversion structures excepted). A combination of these two options may be implemented in some cases--e.g., increased irrigation system efficiency (via ditch lining, land smoothing, system redesign, etc.) plus changing the location of irrigation or crop types. Changes in irrigation practices, such as altering the place of use or point of diversion, are subject to Montana State water law, which requires that such changes be filed with MDNRC. Whichever option or combination of options is utilized, the water savings will be substantial and the saved water will be turned back at the point of diversion to provide beneficial use for instream flows.

Revising the Interim Diversion Reduction Arrangement - The Participating Landowner and the Agencies will retain the flexibility to revise the interim diversion reduction arrangement in the context of a more comprehensive water management plan that will be implemented under the site-specific plan. During the time the interim arrangement is being utilized, the Agencies will be collecting baseline data toward development of the site-specific plan that establishes a final maximum diversion amount per NRCS' recommendations to improve irrigation water management that will meet Participating Landowner production goals while delivering water to the river system at a timing that benefits grayling. The interim diversion reduction arrangement may thus need to be revised in light of these new data and the implementation of the NRCS Irrigation Water Management guidelines. These longer-term diversion reduction arrangements will be similar in format to those "interim diversion reduction arrangements" described earlier in this section, and are expected to represent water saved in addition to that realized through implementation of NRCS Irrigation Water Management guidelines. Water leases may be used in conjunction with reductions in diversions.

Water Savings 4 - A Farm Irrigation Rating Index assessment of a representative surface water (flood) irrigation system in the upper Big Hole during 2005 indicated an efficiency of 15-20 percent (NRCS unpublished data). The NRCS Irrigation Water Management guidelines would require such a system to be upgraded to achieve 30 percent or greater efficiency (i.e., 50 percent or greater relative improvement). Similarly, the maximum irrigation diversion amount estimated by NRCS is anticipated to be substantially less than historic irrigation applications on many properties. Unfortunately, no quantitative data are available on historic irrigation volumes in the upper Big Hole because of the comparatively primitive irrigation system, the lack of control over diversions, and the widespread absence of flow measuring devices. Nonetheless, anecdotal observations of standing water in hay fields and pastures, inundated roads, conversion of upland vegetation (e.g., sagebrush) to wetland species, and presence of wetland plants in locations with >5 percent topographic slope provide circumstantial and direct evidence that over-irrigation has been widespread. The NRCS' strategy will help landowners avoid this practice and divert less water.

An example of NRCS' Irrigation Water Management strategy is presented in Appendix G (Example Site-Specific Plan). This example describes how the physical characteristics of the property, water requirements for crops, estimated irrigation system upgrades can be used to develop a comprehensive irrigation plan that results in a significant reduction in irrigation water needs relative to the existing water right (e.g., >50 percent reduction in diversion compared to the associated water right; Appendix G).

Stock Watering - Reducing the number and/or improving the conveyance efficiency of surface-water diversions for livestock watering will be another mechanism to reduce withdrawals from the Big Hole River and its tributaries. Some existing surface-water diversions deliver water to livestock >1 mile from the physical point of diversion (NRCS unpublished data), so water loss from evaporation and infiltration should be substantial. The net result is that the amount of water diverted greatly exceeds the actual consumptive use of livestock.

Site-specific stock water needs will be assessed by NRCS who will present a set of alternatives, as necessary, to supply livestock with adequate water while minimizing diversions from stream channels. Wells, pipelines, troughs, and lined ditches are potential alternatives to, or modifications of, existing surface water diversions that will reduce water loss during conveyance.

Water Savings 5 - Conveyance efficiency for stock water diversions is estimated to be about 50 percent (NRCS unpublished data). Stopping these diversions or dramatically improving their ability to deliver water will again help Participating Landowners divert less water and correspondingly improve instream flows.

Livestock Forage - On some properties, shifting the composition of livestock forage to less water-intensive "tame" or native hay or grass species will decrease irrigation demand and reduce diversions. Over-irrigation at some locations in the Big Hole River valley has converted upland grass-sage vegetation communities to wetland communities (e.g., dominated by sedges) that not only require more water but provide comparatively less nutritional benefit to livestock. If plant communities become dominated by wetland species and do not revert back to native upland

species without active intervention, this could theoretically create a situation where irrigation must be increased to support a forage base that is not sustainable for the climate and soil conditions.

The NRCS has expertise with helping producers utilize less water-intensive forage crops in other locations in the Rocky Mountain region, and is acquiring the site-specific data to do so in the Big Hole River watershed. In 2004 the NRCS initiated a pilot study at a ranch in the upper Big Hole to determine the most productive species of livestock forage across a variety of irrigation levels for the prevailing climate. Results will be implemented on enrolled lands to produce the same or greater livestock forage per area and water application, thus reducing irrigation demands while maintaining or increasing agricultural output.

Water Savings 6 - Increased instream flows resulting from a shift to less water-intensive livestock forage will likely accrue more slowly compared to other methods described above or below, but will have a long-lasting impact on the reducing irrigation demands in the system. An estimate of the relative consumptive water use for sedges or other wetlands plants is not possible because these species are not listed as forage (see NRCS' "Crop Consumptive Use" program >http://www.mt.nrcs.usda.gov/technical/eng/software.html<).

Cumulative Effect Of Conservation Measures Implemented To Improve Minimum Instream Flows

The combination of improved control over diversions, compliance with water rights, diversion reduction arrangements, and irrigation management will lead to dramatic improvements in streamflows within the Project Area. The best available data do not permit a precise estimate of the water conservation of the Agreement, but the cumulative effect of the individual actions described above will without question raise the baseline flow conditions under all environmental conditions. To guide implementation of the plan and measure the progress and accrual of benefits to streamflow under the conservation measures, the Agencies have developed interim minimum flow targets within the Project Area (Table 3 below).

The minimum flow targets presented in Table 3 were derived by MFWP and MDNRC based on the best available data and application of the wetted perimeter inflection point method (Leathe and Nelson 1989; Appendix B) and area-discharge relationships. The wetted perimeter method is a "standard setting" method concerned with protecting instream flows and providing minimum flows for fishery resources. Utilization of the method, in conjunction with professional judgment, is required to make final recommendations. The targets presented in this Agreement must thus be interpreted as baseline or minimum values to ensure instream flow resources sufficient to promote recovery of grayling above their current population level, and so should not be construed as final endpoints for the implementation of the Agreement. The parties to this Agreement recognize that--(a) streamflows fluctuate in unregulated (undammed) rivers so flows both above and below the targets should be expected, (b) the wetted perimeter method does not specify the high flows necessary for channel maintenance (which are primarily controlled by snowmelt runoff), and (c) they will strive, through implementation of the conservation measures, to provide flows that exceed the minimum flow targets presented here.

The optimal flow regime for each life stage of grayling in the Big Hole River is currently unknown, but the minimum target values presented are considered adequate to protect their habitat. The wetted perimeter method was developed to ensure adequate flows over riffle habitats, which are generally important for stream productivity. In addition to providing a source of aquatic invertebrates for grayling, riffles also are used by grayling for spawning. Riffle habitat, being comparatively shallow, tends to be affected earlier by dewatering compared to other stream habitats. Thus, when flows are maintained over riffles, deeper water habitats utilized by adult grayling (e.g., pools) also are protected. Cover at or near the stream bank appears to also be provided for salmonid fishes under flows at or above the upper inflection point under the wetted perimeter method (see Leathe and Nelson 1989).

Table 3. Minimum Flow Targets for the Agreement's Management Segments in the Big Hole River. Location of discharge measurements correspond to the points presented in Figure 2.

Management Segment	Approximate Location of Discharge Monitoring	Spring (April – June)	Summer and Fall (July – October)
		Minimum Flow Targets (cfs)	
A	Miner Creek Road	60	20
B	Little Lake Creek Road	100	40
C	Wisdom	160	60
D	Mudd Creek Bridge	350	100
E	Dickie Bridge	450	170

The Agencies estimate that after 10 years of Agreement implementation, streamflows in the Project Area will meet or exceed target values at least 75 percent of the days between April-October in years with average snowpack (based on Snow Water Equivalent estimates in the upper basin). This estimate is based on comparing minimum flow targets to streamflows recorded at Wisdom (Management Segment C) and Mudd Creek (Management Segment D), and assumes that conditions at Mudd Creek (Management Segment D) are more representative of Management Segments A, B, and E than conditions at Wisdom (Management Segment C; see Appendix C). The agencies expect the target values in Management Segment C (i.e., USGS gauge at Wisdom, Montana) to be met less frequently (see Appendix B). Based on the correlation between snowpack and streamflow in the upper basin (MDNRC unpublished data), the expected frequency of meeting minimum streamflow targets at any of the management segments should decline when the system has below-average snowpack. The natural variability in environmental conditions will thus exert a strong effect, apart from the Agreement's conservation measures, on the frequency of meeting the minimum instream flow targets.

Implementation of the conservation measures to improve instream flows will progress through time (see Table 5), but, as described above, the Agencies expect the flow targets will be achieved 75 percent of the time after 10 years of implementing the Agreement (i.e., 10 years after this Agreement is finalized and enrollment begins). If after this 10-year period the flow targets are not being met at the expected frequency and grayling abundance and distribution has not increased above current levels, then the Agencies will pursue all available options, both within (enrolled landowners) and outside the Agreement (non-enrolled landowners), to increase

instream flows in the Project Area. These options may include, but are not limited to, seeking additional Agreement participants (if enrollment is still open) or participation in other conservation planning efforts, compensation for additional reductions in irrigation diversions or water use, additional negotiated reductions in irrigation diversions or water use, water leases, and organization of hay banks to feed livestock so that irrigation diversions can be reduced. Similar options may be used to help grayling where drought is affecting grayling (see Changed and unforeseen circumstances, Part XIV).

Approach To Promote High-Flow Events

This Agreement does not establish specific minimum target values for high flows in the Big Hole, which are primarily influenced by climatic factors (i.e., snowmelt runoff and localized precipitation). However, irrigation withdrawals very likely influence the amplitude and duration of these flows. Through the implementation of site-specific plans, the Agencies and the Participating Landowners will manage irrigation withdrawals during times of anticipated high streamflows to reduce the impact of irrigation withdrawals on the amplitude and duration of high-flow events necessary for channel maintenance.

Expected Benefits To Grayling From Improved Streamflows

Historically, grayling were most abundant in parts of the Project Area during years when streamflows were relatively high (Figure 11). The timing of spawning in the spring is dependent on streamflow dynamics (Shepard and Oswald 1989). The availability of water directly influences habitat availability (wetted perimeter), habitat quality (depth and water temperature), and stream productivity (Leathe and Nelson 1989). Abundant water also is critical to maintaining habitat connectivity that allows grayling to complete its annual life cycle (spawning, feeding, and wintering). While it is true that due to the uncertainty associated with precipitation dynamics the proposed streamflow targets in this Agreement may not always be met under drought conditions, the conservation measures proposed in this Agreement will lead to direct benefits to grayling by improving streamflows throughout the year and improving overall habitat quality and availability.

The available data do not permit a thorough quantitative analysis, but a qualitative inspection indicates that the index of grayling abundance recorded at Wisdom has been higher in years where the proposed flow targets were consistently exceeded and lower when they were not. The 1991-2003 index values indicate grayling were comparatively most abundant during 1995-98 (mean 16.25 grayling/mile) and somewhat less abundant during 1991-94 (mean 11.25 grayling per mile from Figure 11; note that index values from 2000-03 are excluded because of limited fish surveys). During 1995-98, mean daily flows at Wisdom met or exceeded the spring and summer-fall targets 99 percent and 76 percent of the time, respectively; whereas during 1991-94 the flows met or exceeded spring and summer-fall targets 72 percent and 45 percent of the time, respectively. While this retrospective inspection is very limited in that it considers only one location (Wisdom), one component of fish habitat (instream flow), and does not make any distinction between how age classes of grayling may respond differently to variation in flow, it indicates that more grayling were captured during annual monitoring surveys in years when the proposed flow guidelines are met or exceeded at a high frequency.

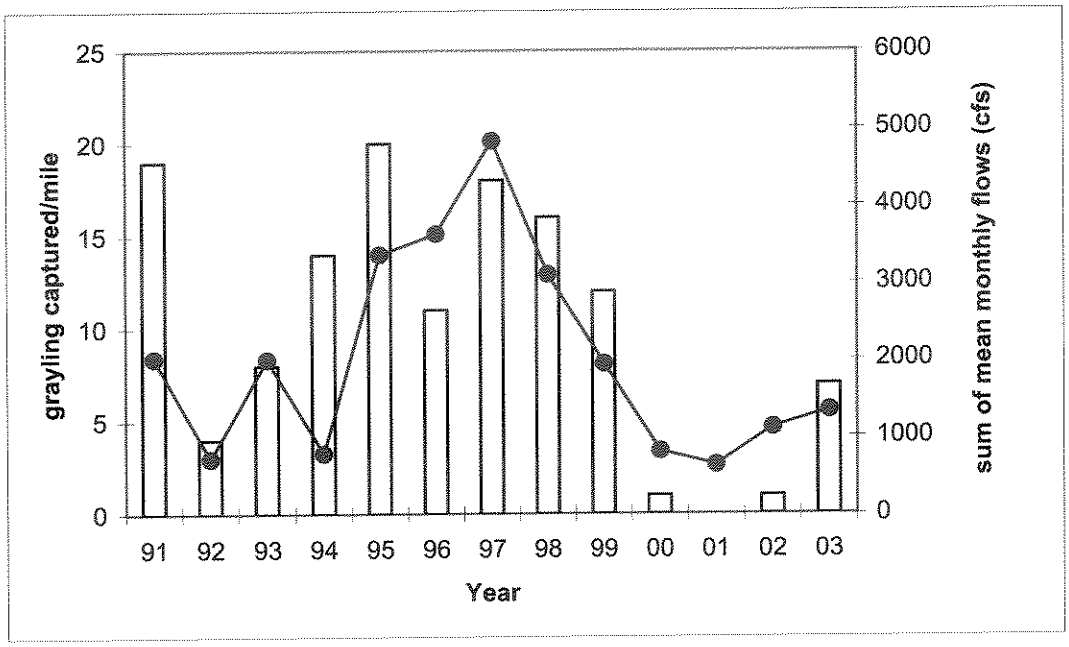


Figure 11. Relationship Between Discharge and an Index of Grayling Abundance (CPUE Including All Age Classes) in the Wisdom Reach During 1991-2003. Discharge represented by the sum of the mean monthly flows between April-October at the Wisdom bridge. Grayling surveys were restricted during 2001 because stream temperatures exceeded MFWP guidelines for electrofishing.

B. Riparian Zone Conservation and Restoration

Limiting Factor - Degraded and Non-Functioning Riparian Habitats

A healthy, functioning riparian corridor provides shade to the stream, water storage during flooding, and food sources for stream microbes and insects (Hunter 1991). Rivers with healthy riparian vegetation have a high degree of bank stability, pool quality and habitat diversity.

In the upper Big Hole River, Lamothe and Magee (2003) found a direct correlation between the abundance of overhanging vegetation and the quality of instream habitat and Arctic grayling abundance. Arctic grayling abundance in the upper Big Hole River is correlated to the abundance of overhanging vegetation (Figure 12), with one study concluding that 73 percent of the variation in Arctic grayling abundance was explained by the relative abundance of overhanging vegetation (Lamothe and Magee 2003).

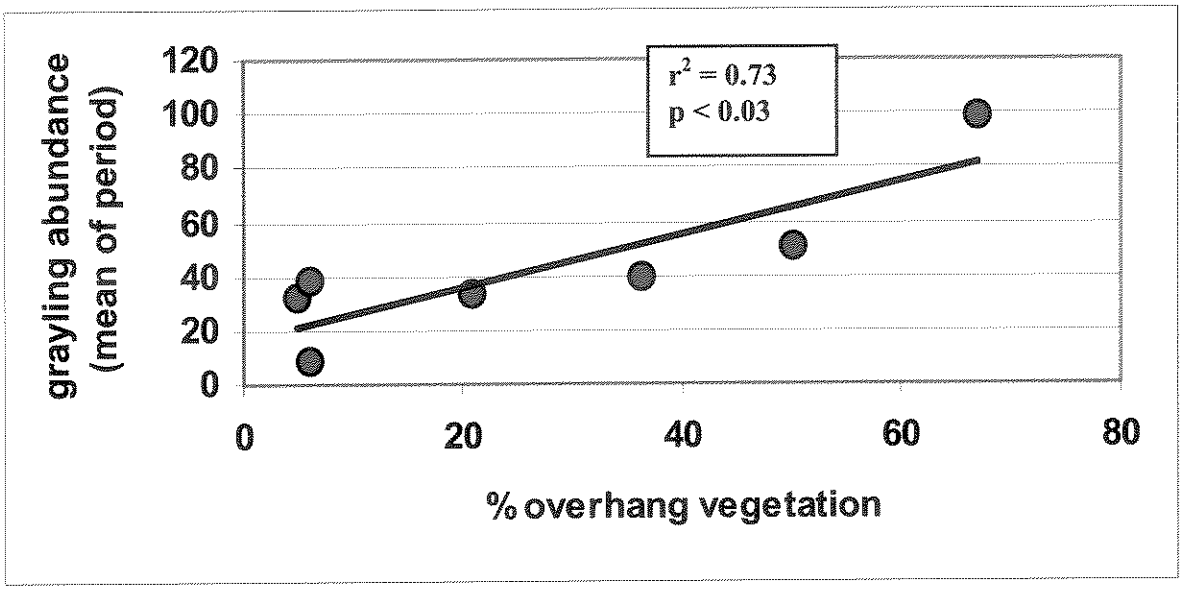


Figure 12. Relationship Between Arctic Grayling Abundance and the Abundance of Overhanging Vegetation Within an Inventory Reach Based on Data Collected During 1992-96 (from Lamothe and Magee 2003).

High quality pools are important to the life history of grayling as they provide critical feeding, wintering, and refuge habitats (Hughes 1992, 1998; Lamothe and Magee 2003). The abundance of relatively high quality pools in the upper Big Hole River is correlated to the presence of overhanging vegetation, with the river reaches with high quality pools and a diversity of pool types supporting a relatively high abundance of Arctic grayling. Lamothe and Magee (2004) observed that the current condition of much of the riparian vegetation and stream banks along the upper Big Hole River is poor.

The Fluvial Arctic Grayling Workgroup retained OEA Research, Inc., to conduct an inventory of the riparian and fisheries habitat in the upper Big Hole River during 1994. The habitat inventory generated baseline data for riparian conditions for much of the Project Area (Figure 13).

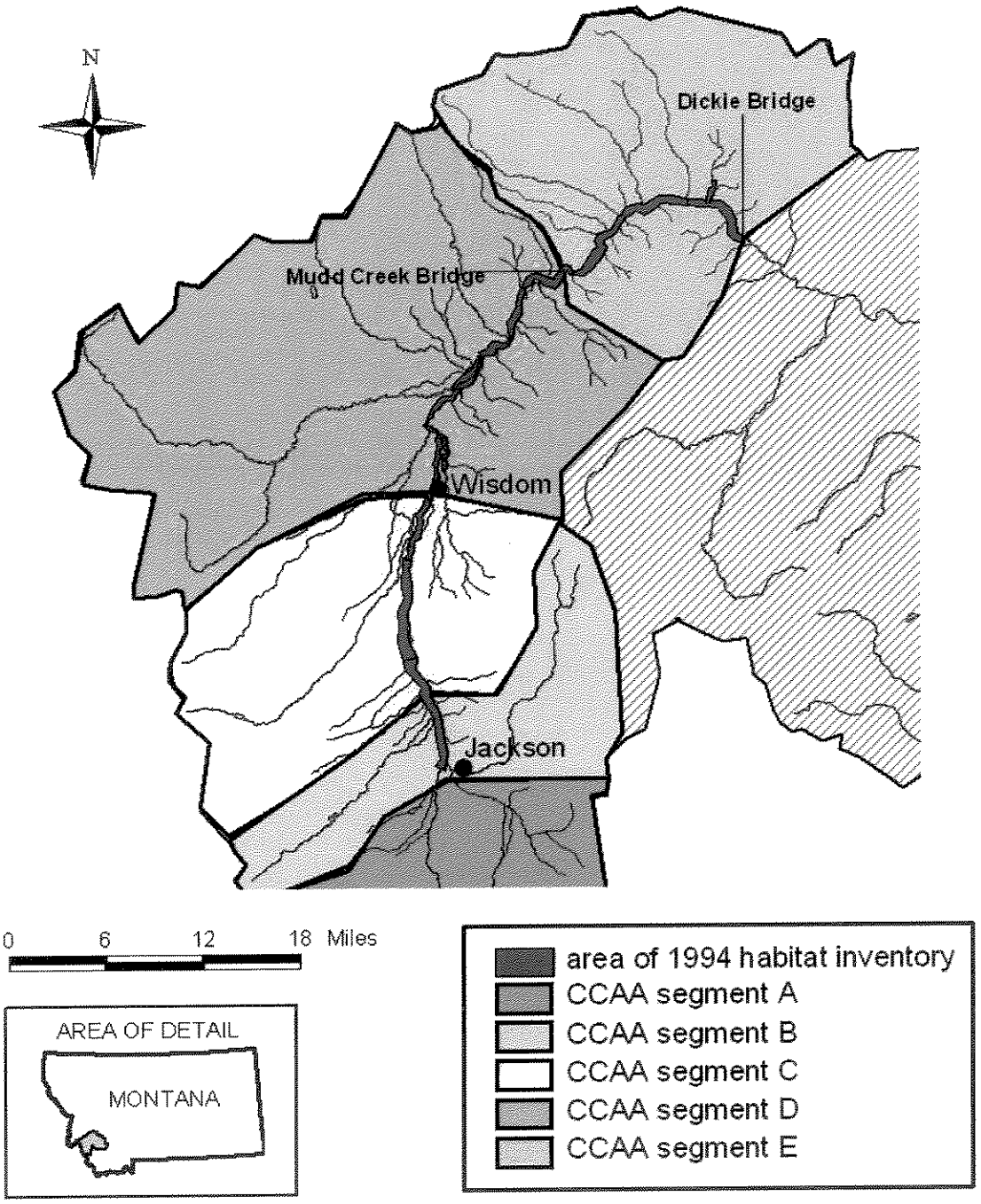


Figure 13. The Spatial Relationship Between the 1994 OEA Habitat Inventory and the Proposed Agreement Management Segments.

In 1994, healthy willow communities forming riparian areas were found to be rare within the inventory area. The majority (approximately 80 percent) of the willows in the area were found to be decadent or suppressed and less than 20 percent were found to be healthy (Figure 14).

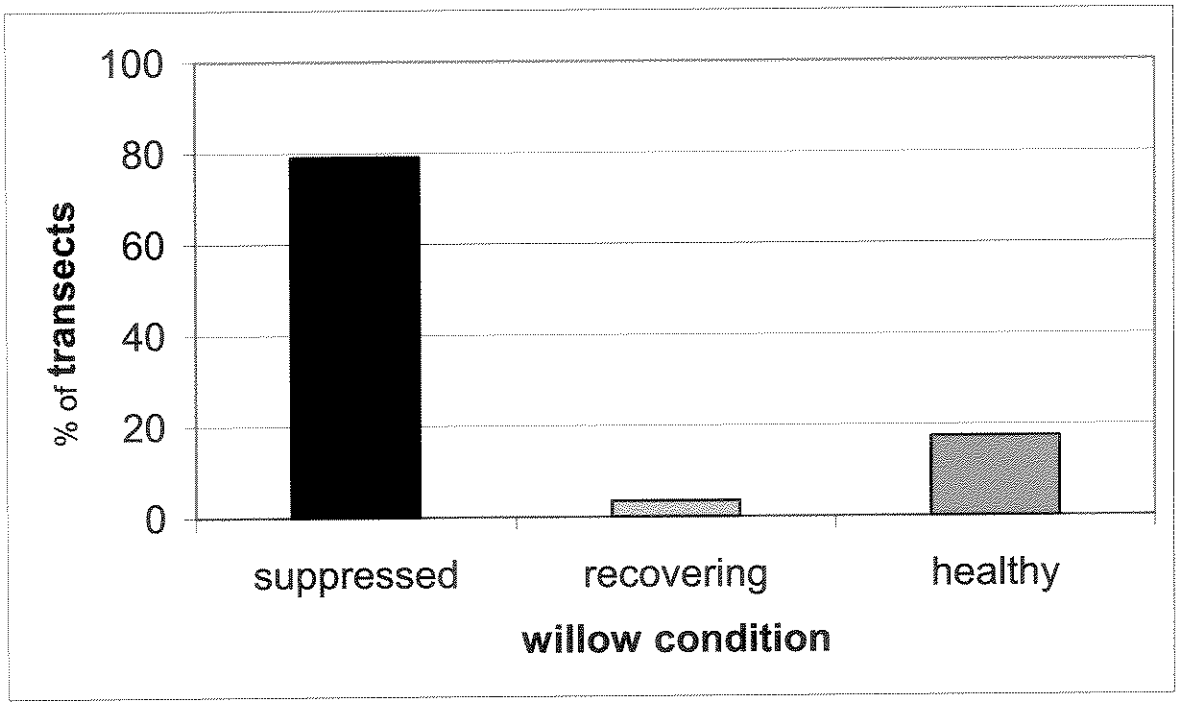


Figure 14. Condition of Willow Communities in Riparian Areas Within the 1994 OEA Habitat Inventory Area (Agreement Management Segments B-E).

The OEA summary report concluded that once these tall, suppressed plants die off, developed willow communities would be absent from the area. Thus, the willow communities in riparian zones of much of the Project Area have likely continued to decline since the 1994 surveys. Removal of willows and riparian vegetation clearing along the Big Hole River has apparently accelerated in recent decades (Figure 15), and, in conjunction with streamside livestock grazing, has led to localized bank erosion and channel instability (Upper Big Hole TMDL 2003).

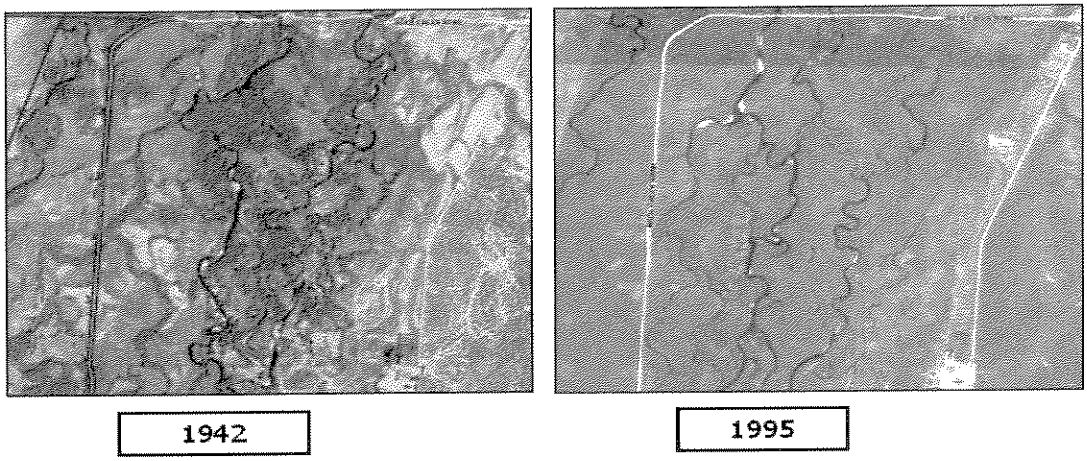


Figure 15. Aerial Photograph Showing a Significant Reduction in Riparian Coverage Within a Part of the Project Area Between 1942 and 1995.

The OEA summary report implicates the unregulated grazing of livestock and wildlife as the cause of the degraded condition of willow communities in riparian areas (Figure 16). The results of this inventory suggest that riparian areas within the Project Area are in need of some relief from the recent level of grazing pressure.

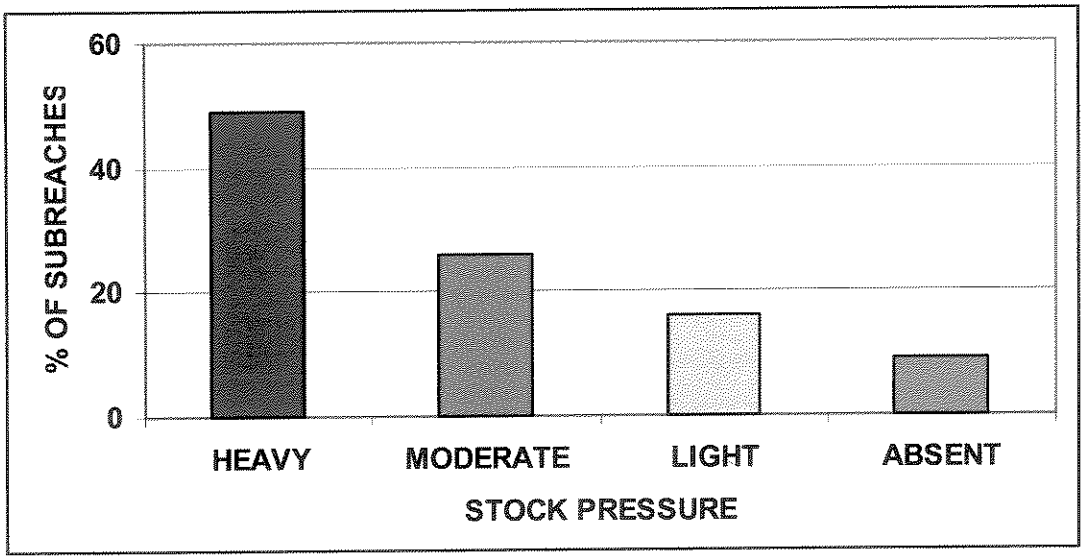


Figure 16. Estimated Stock Pressure in Riparian Areas from the 1994 OEA Habitat Inventory.

The land management practices associated with livestock production (OEA 1995, Upper Big Hole TMDL 2003) and the construction of bridges and roads has led to changes in channel morphology and function in reaches of the Big Hole River and its tributaries. The Upper Big Hole River Riparian and Fisheries Habitat Inventory (OEA 1995) classified the main channel of

the upper Big Hole River as predominantly C3 or C4 channel types (Rosgen 1994). These channel types are described as low gradient (< 2 percent), sinuous channels with high width-depth ratios (>12) and a riffle/pool sequence of approximately 5-7 bankfull channel widths in length (Rosgen 1996). The presence and condition of riparian vegetation is the primary regulating factor of lateral adjustment for these channel types (Rosgen 1996). In areas of the watershed where riparian function has been altered, a shift in channel type has occurred (OEA 1995). In areas where this transformation has occurred the channel has aggraded and widened, leading to a loss in aquatic habitat complexity (OEA 1995) including a shift from a multi-thread channels to a single, wide channel (Upper Big Hole TMDL 2003). This loss of complexity has lead to reductions in availability and quality of spawning (riffles, side channels), feeding and wintering (pools) habitats (Figure 17). According to OEA, approximately 20 percent of the area inventoried had evidence of this transformation.

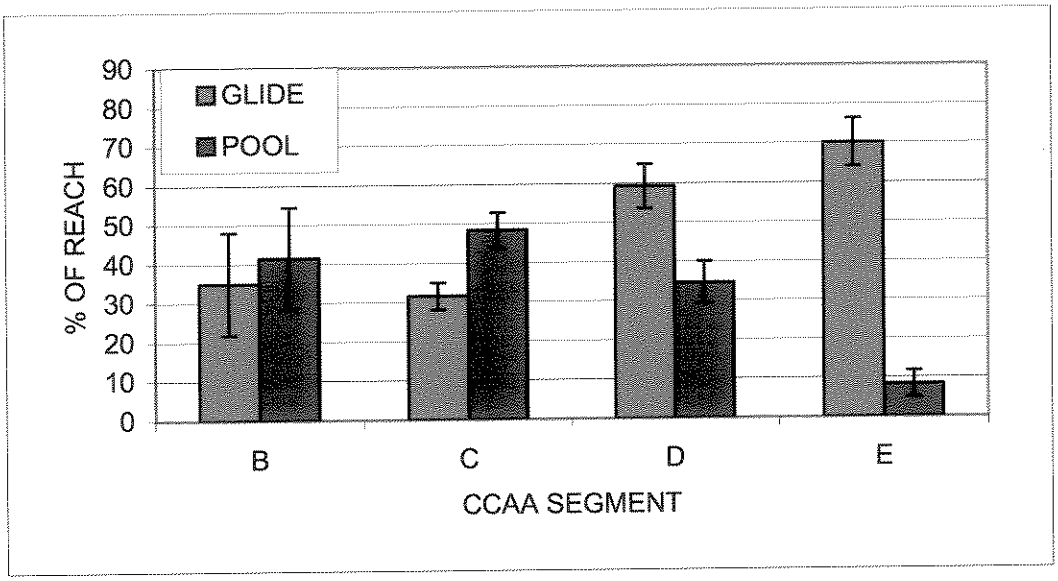


Figure 17. The Spatial Relationship Between the Relative Abundance of Pools and Glides Within the Project Area (OEA 1995).

The recent positive warming trend in water temperatures in parts of the Project Area may be attributed, in part, to reduced shading of the stream channel from the loss of riparian vegetation and the associated widening and shallowing of the stream channel where riparian vegetation has been removed (Figures 15 and 18). Previous studies have identified a similar relationship between the health of riparian vegetation and stream water temperature (Bjornn and Reiser 1991; Poole and Berman 2001; Opperman and Merenlender 2004). The specific thermal tolerances of grayling are undetermined and are dependant on various parameters such as time of exposure, dissolved oxygen content and acclimation (Kaya 1990). When monitoring and reporting temperatures as part of its Big Hole grayling monitoring program, MFWP has adopted 70°F (21°C) as the standard for determining when water temperature becomes unsuitable for grayling. If water temperatures in a reach of the Big Hole River exceed 70°F for more than 8 hours per day for 3 consecutive days, this reach will be remain closed to fishing until water temperatures do not exceed 70°F for more than 8 hours per day for 3 consecutive days (MFWP Fishing Closure Policy, MFWP Headquarters, Helena, Montana).

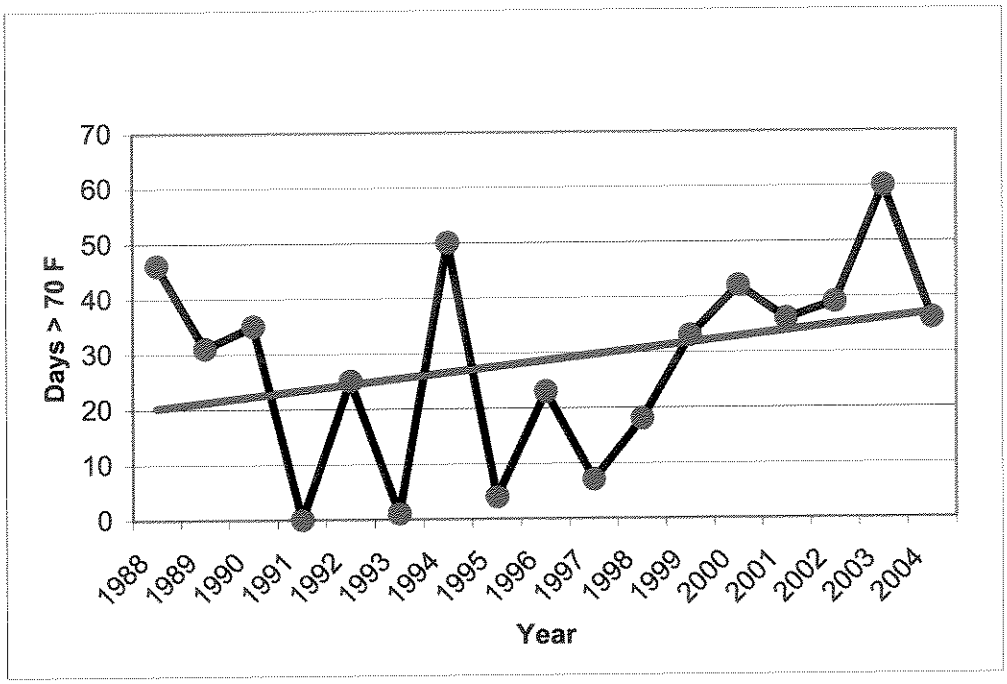


Figure 18. Plot of the number of days that water temperature in the Big Hole River at Wisdom exceeded 70°F (21°C), which is presumed to be stressful to salmonid fishes.

Proposed Conservation Measures to Protect and Restore Riparian Function in the Project Area

A goal of this Agreement is to maintain and restore sustainability to all riparian habitats on enrolled lands. The NRCS defines "sustainability" as the ability of a stream and its associated riparian area to perform specific physical and biological processes over time that contribute to the integrity, balance and stability of the riparian area (NRCS 2004). General conservation measures to achieve these guidelines include maintaining existing high-quality riparian habitats, implementing active restoration actions to replace lost riparian habitat, or permitting passive recovery of degraded riparian habitat through land management actions that allow recovery of willow and riparian vegetation communities. Specific conservation measures include, but are not limited to, development of prescribed grazing practices that detail the timing, intensity and duration of livestock use to promote healthy, sustainable riparian plant communities (e.g., using NRCS Prescribed Grazing guidelines); installing and maintaining fences which exclude or manage cattle within the riparian zone; installing and maintaining off-stream livestock watering facilities; and replanting or transplanting native riparian vegetation.

The NRCS' Riparian Assessment Method will be used to determine the present condition of riparian habitats on enrolled lands, and monitor progress toward the riparian conservation guidelines outlined in the Agreement and in any site-specific plan. The NRCS' Riparian Assessment Method categorizes riparian zone condition as--1) sustainable, 2) at risk, or 3) not sustainable based on a numerical score from 10 assessment questions (Natural Resources Conservation Service 2004). The 10 assessment categories include stream incisement, lateral

bank erosion, sediment balance, streambank vegetation, riparian vegetative cover, noxious weeds, undesirable plants in the riparian area, woody species establishment and regeneration, tree and shrub utilization, and floodplain characteristics. Participating Landowners will coordinate with the Agencies and any mutually agreed upon parties to assess riparian habitats on enrolled lands, and this information will serve as the basis for specific conservation measures to implement under the site-specific plan. Using the NRCS protocol for riparian assessment, the guideline for riparian condition for each management segment is set as "sustainable" with a ranking score of at least 80 percent. For individual landowners who develop a site-specific plan and have riparian habitats in the "at risk" or "not sustainable" categories, measurable improvements will be made throughout the duration of the site-specific plan. The health of riparian areas on enrolled lands will be assessed every 5 years for the duration of the Agreement using NRCS Riparian Assessment protocols.

Under this Agreement the parties are required to maintain or restore "sustainability" (per NRCS' definition) to all riparian habitats on enrolled lands, and that progress will be defined as measurable improvement (trending upward) or reaching the target of "sustainable" based on an NRCS riparian assessment to be conducted every 5 years. Progress will depend on baseline conditions on enrolled lands such as soil chemistry, age structure of existing riparian vegetation, the potential for existing vegetation to naturally recolonize open habitats, and degree of degradation of the stream channel. Given this site-specific variability, the Agencies anticipate that meeting the "sustainability" guidelines will take up to 15 years on some properties. Effectively, the Agencies and the Participating Landowners have agreed to a recovery timeline of 15 years for riparian habitats, and the parties have agreed to implement the measures necessary to achieve this goal. Consequently, the parties have agreed that measures in addition to those originally described in a site-specific plan may be required and will be implemented as soon as possible if, for whatever reason, it is evident that sustainability will not be attained within 15 years of beginning the implementation of the site-specific plan. Such measures may include expanding the extent of or accelerating the timeline for implementation of the specific riparian-related conservation measures described above (including active restoration) and identified after this Agreement or any site-specific plan have been finalized.

Expected Benefits to Riparian Health from Conservation Measures

The development of prescribed grazing plans that manage cattle in riparian areas will lead to significant improvements in riparian health (Borman et al. 1999). Restoring riparian areas in the Project Area can be expected to lead to dramatic improvements in stream habitat and channel morphology parameters such as lower summer water temperatures, lower width-depth ratios, increased pool quality, increased bank stability, and higher spawning habitat quality (Bjornn and Reiser 1991; Hunter 1991; Poole and Berman 2001; Opperman and Merenlender 2004). Analysis of the OEA habitat inventory data shows a significant relationship between the abundance of overhanging vegetation (i.e., healthy riparian areas) and the quality and diversity of pools, and reduced bank cutting (erosion) in the proposed Project Area (Lamothe and Magee 2003). The result of this analysis illustrates the expected response of habitat parameters in restored riparian areas. The restoration of riparian habitats is anticipated to result in changes to channel morphology that should benefit grayling, including increasing the depth of pools and frequency of undercut streambanks as depicted in Figure 19.

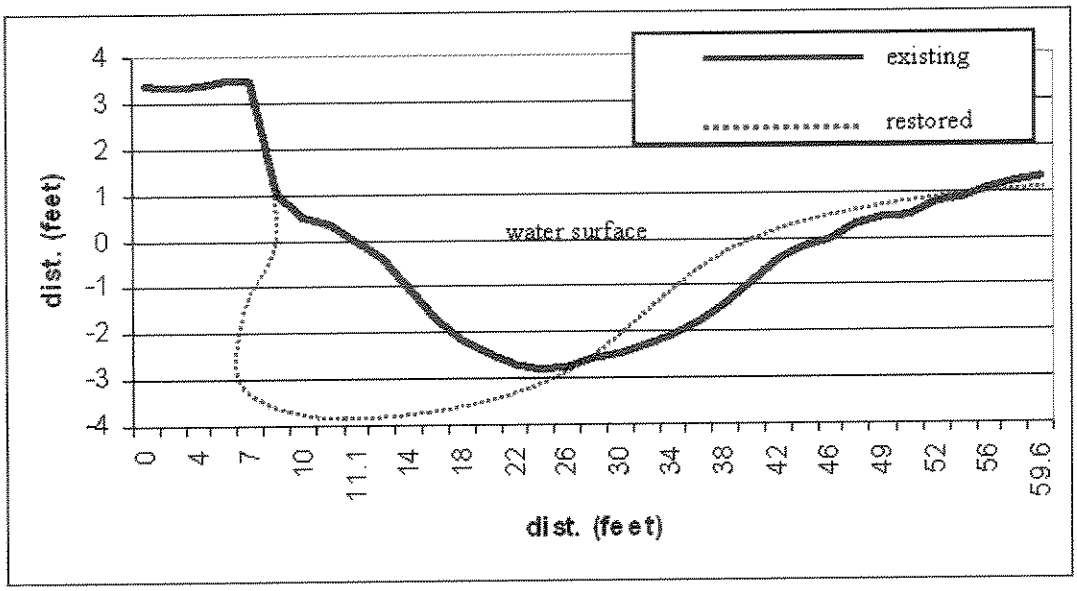


Figure 19. Cross-sectional elevation data from a typical pool within the Project Area (Steel Creek). The dashed line shows the expected restored condition from proposed conservation measures.

Expected Benefits to Grayling from Conservation Measures

The improvements in riparian vegetation, stream habitat and channel morphology expected from the proposed conservation measures for restoring riparian areas will lead to an increased abundance and distribution of grayling in the Project Area.

C. Identifying and Reducing Entrainment Threats

Potential Limiting Factor – Entrainment

The available information indicates there are numerous points of irrigation diversion in the Project Area and that grayling have been captured in a handful of irrigation ditches over the past 17 years, but the magnitude of the threat to grayling posed by entrainment is largely unknown. Water rights information on file with MDNRC indicates there are 1,014 distinct surface water points of diversion in the Project Area (MDNRC unpublished data); however, this number has not been verified by field surveys and should be considered a tentative estimate. Of the 1,000+ points of diversion preliminarily identified by MDNRC, approximately 372 are located where grayling are presently documented to occur (i.e., Management Segments B-E and lower 1 mile of tributaries in those same segments; Figure 20). These 372 points of diversion are considered the most likely sites of entrainment into irrigation ditches, 247 (or 66 percent) of which are located in Management Segments C and D that are considered high priorities for assessment and implementation of the Agreement's conservation measures (see Figure 22).

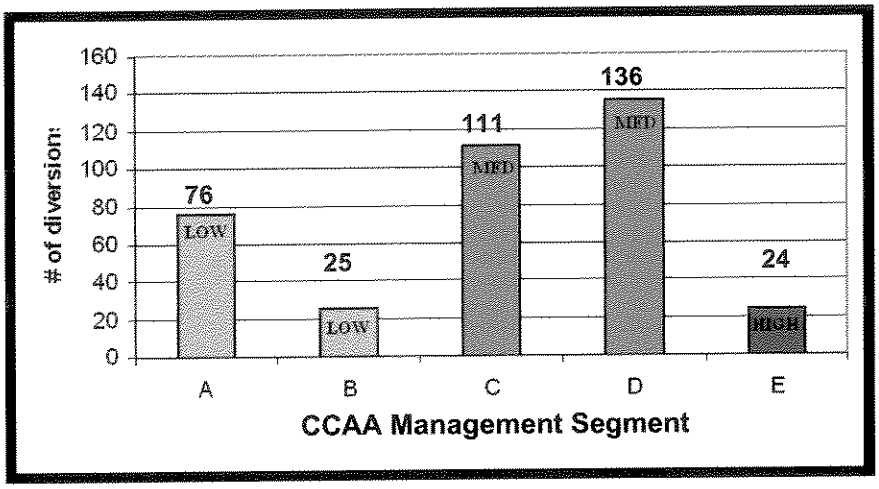


Figure 20. Distribution of the Approximately 372 Diversions Likely to be Entraining Grayling Within Irrigation Ditches by Management Segment Within the Project Area. The associated relative probability of grayling entrainment (HIGH, MED, or LOW) by management segment is based on the current known population status and range of grayling in the Project Area.

Grayling have occasionally been captured in irrigation ditches, primarily in Management Segment C, but a comprehensive entrainment survey has never been conducted in the irrigation system in the upper Big Hole River system. Skaar (1989) found YOY (age-0) grayling in 2 of 3 ditches surveyed during summer 1988 (65 and 4 age-0 grayling in the 2 ditches). Streu (1990) found age-0 and adult grayling in one of three ditches surveyed in summer 1990 (12 age-0 and 2 adult grayling). For the respective surveys, the greatest number of age-0 grayling entrained (Skaar 1989) or the only evidence of entrainment (Streu 1990) was found in the irrigation ditch with the comparatively greatest flow. Recent surveys have demonstrated that low numbers of grayling are being entrained in the ditches surveyed (Table 4).

Table 4. Summary of Recent Grayling Entrainment Surveys in Irrigation Ditches Conducted by MFWP Within the Proposed Agreement Project Area.

Year	Ditch ID#	Total # of Grayling Captured (# of YOY in Total Captures)	Length of Survey (miles)
1999	1	0	1.0
2000	1	0	1.0
2001	1	0	1.0
2003	1	3 (all YOY)	1.0
2003	2	3 (1 YOY)	0.5
2003	3	1	0.25
2003	4	0	0.25
2004	1	2 (1 YOY)	1.0

The existing data show that entrainment can and does occur in the Project Area. However, the frequency and extent of such entrainment is mostly unknown given the limited nature of the previous entrainment surveys. Entrainment appears to be a large potential threat to grayling because of the large number of diversions and associated ditches and may affect the grayling population in the Project Area and the Big Hole River in general, but a comprehensive and systematic survey of irrigation ditches is a prerequisite for a valid assessment of the threat. Lack of data on the impacts of entrainment on sensitive fish populations can compromise prioritization schemes, reduce the effectiveness of entrainment mitigation programs, and potentially lead to inefficient use of public funds (Moyle and Israel 2005).

Proposed Conservation Measures to Address Potential Entrainment Threats

This Agreement will address entrainment by conducting a comprehensive fish survey of all irrigation ditches on enrolled lands, rescuing grayling from ditches concurrent with the surveys, and conducting a thorough analysis and assessment of the threat posed by entrainment. Identified population-level entrainment threats will obligate the Agencies and Participating Landowners to implement conservation measures to reduce or eliminate the specific threat.

The Agencies will coordinate and fund a comprehensive fishery survey of all irrigation ditches on enrolled lands to estimate grayling entrainment (see Appendix E). This survey will produce data necessary for an entrainment threat assessment, and if necessary, will be used to prioritize the mitigation of entrainment problems in the Project Area. Participating Landowners shall provide all reasonable access to the Agencies or their representatives so that the entrainment surveys can be conducted as soon after landowner enrollment as practicable.

Grayling rescue or salvage efforts will be conducted concurrent with the entrainment surveys. All grayling captured within irrigation ditches will be returned to the nearest point of the Big Hole River or a tributary downstream of the irrigation structure. Grayling rescue operations will be conducted in a manner that will minimize stress to individuals. For example, entrainment surveys and rescue operations will be curtailed when environmental conditions are potentially stressful to salmonid fishes. The Agencies anticipate, based on previous MFWP experience with the capture and handling of grayling, that nearly 100 percent of grayling captured in irrigation ditches will be released alive and unharmed into natural stream channels. Repatriation of these grayling will directly reduce the take of grayling in the Project Area.

In addition to potential rescue of grayling from irrigation ditches, other conservation measures are expected to directly or indirectly reduce the threat of entrainment in the Project Area. Fish entrainment is usually positively related to the amount of water being diverted at a given point, so reducing the amount of water diverted through compliance with water rights, upgrade of irrigation structures, interim diversion reduction arrangements, construction of stock-water wells, and implementation of the NRCS Irrigation Water Management plan is expected to decrease the probability of grayling entrainment. The ability to completely shut a diversion, by installing headgates or other structures, also will reduce the probability of entrainment outside of the period of use associated with the water right for that diversion.

Results of the comprehensive entrainment surveys will be published in MFWP's annual report required under the Agreement's monitoring provisions (see Part XII). Entrainment of grayling in irrigation ditches has been previously documented in a handful of irrigation ditches in the Project Area (Skaar 1989; Streu 1990; Table 4 above), but the impact of this and any other entrainment on the grayling population is largely unknown. Thus, MFWP's annual report shall include a thorough analysis of grayling entrainment on enrolled lands that will lead to an assessment by the Agencies of the population-level threat to grayling caused by entrainment. If this assessment indicates that that entrainment poses a population-level threat to the grayling population in the Project Area, the Agencies shall:

a) Develop a ranking system weighted primarily by number of individuals entrained, to prioritize entrainment mitigation efforts.
b) Resolve entrainment problems in order of the above priority.
c) Develop a framework to systematically reduce entrainment in the Project Area that includes, but is not limited to techniques such as redesigning or relocating diversions and associated structures, installing fish-exclusion devices, installing fish passage structures, changing the timing of water diversion and adjusting diversion amount relative to presence of grayling (e.g., Moyle and Israel 2005).
d) Install a minimum of three fish exclusion devices or screens per year*.

Regardless of the result of any entrainment assessment, the parties to this Agreement commit to the following:

a) Participating Landowners will continue to provide access to the Agencies for the duration of their site-specific plan to monitor entrainment in irrigation ditches, as necessary.
b) Incorporate adaptive management provisions in site-specific plans to include conservation measures to mitigate entrainment threats on enrolled lands if entrainment is determined to be population-level threat to grayling.
c) Irrigation ditches found to entrain juvenile and adult (age-1 and older) grayling will be re-surveyed by the Agencies at least every other year to permit an update to the threat assessment and to salvage grayling until a permanent solution to the entrainment problem is implemented.
d) Irrigation ditches not found to entrain juvenile and adult grayling in the initial comprehensive survey will be re-surveyed when they are suspected or expected to entrain adult grayling (i.e., when grayling are found or believed to be occupying or moving through habitats in the proximity of the diversion).
e) All grayling exclusion devices and techniques will be evaluated for effectiveness within 1 year of installation or implementation.

The Agencies have developed a mechanism to address population-level entrainment threats to grayling in the Project Area and are committed to dealing with entrainment as a dynamic threat that may change through time and will depend on the population status of grayling in the Project Area. For example, no entrainment threat exists for diversion structures and irrigation ditches

* Given current technical limitations, fish screens are not expected to be effective at limiting entrainment of young-of-the-year grayling because of their small body size. Exclusion devices installed under this Agreement will likely only be effective at excluding grayling age-1 and older.

located in habitats not currently occupied by grayling, but the expected increase in the distribution of grayling as a consequence of the Agreement's conservation measures may make these sites entrainment threats in the future. The existing conservation measures in this Agreement require the resurvey of ditches not found to entrain fish in the initial comprehensive survey (see "d" above). This will ensure the Agencies remain abreast of changes in entrainment over time and space. A reassessment of the overall entrainment threat, which considers all available entrainment information and mitigation, shall be conducted by the Agencies annually to determine if any ongoing entrainment poses a population-level threat to grayling. The Agencies will adjust their prioritization list accordingly using this information.

Whether entrainment poses a population-level threat to grayling is unknown at this time, but will be determined and addressed, as necessary, through the Agreement's conservation measures. However, the Agencies feel that a strategy should be in place to provide short-term mitigation (i.e., rescue) in cases where particular ditches entrain significant numbers of grayling. If surveys reveal that significant numbers of juvenile and adult grayling are being entrained in a particular ditch, MFWP will make repeat rescue visits during the year, with a final visit occurring shortly after the diversion is shut down for the year. Initially, 20 adult and/or juvenile grayling[†] will be the trigger to initiate repeat visits until a more refined estimate of "significant entrainment" can be determined based on the assessment of the comprehensive entrainment surveys and the annual reassessment of entrainment threats. If any of the visits reveal no grayling, future visits will not be necessary until the following year. These visits will continue annually for ditches meeting the trigger value until the entrainment problem for that diversion is permanently solved using one of the conservation measures described above.

Expected Benefits

Entrainment surveys and grayling rescue efforts will lead to immediate reductions in take where entrainment is observed. If entrainment turns out to be a factor that limits the grayling population in the Project Area, then returning these individuals to a natural stream channel will "rescue" individuals who may in turn contribute to the population's stabilization and expansion. Conservation measures described elsewhere in the Agreement that reduce the volume of surface water diversions and lead to increased streamflows relative to adjacent irrigation ditches, also should reduce the probability and/or frequency of entrainment. A rigorous assessment of the entrainment threat across enrolled lands will allow the Agencies to prioritize conservation measures implemented to reduce entrainment should it be a population level threat, and also help to prioritize conservation measures to reduce entrainment relative to those for other identified threats. This prioritization will facilitate the effective allocation of financial and technical resources under the Agreement by targeting conservation actions where they will produce the greatest benefit to grayling.

[†] Twenty grayling represents approximately 5 percent of the mean number of grayling captured during MFWP's fall population monitoring efforts in 2003 and 2004. This number of grayling also is greater than the number of grayling captured in 20 of 34 electrofishing runs conducted by MFWP over that 2-year period.

D. Removing Barriers to Grayling Movement

Limiting Factor: Barriers to Grayling Movement

Many existing irrigation diversions lack fish passage structures and may be impassible under certain flows (e.g., Figure 21). These diversions may impede normal grayling migratory behavior and preclude them from accessing necessary spawning, feeding, and refuge habitats.

Figure 21. Example of Cross-Channel Diversion Structure in the Project Area That Likely Impedes Grayling Movement But Would Be Remedied Under the Agreement.

Proposed Conservation Measure to Remove Movement Barriers

Pursuant to this Agreement, Participating Landowners are required to remove any structure that is a barrier to grayling movement or modify it to permit passage of juvenile and adult grayling within 5 years of the determination that the structure impedes grayling passage.

Effective fish passage will be verified by the Agencies where barriers or physical structures are modified or removed to provide fish passage. This verification will occur within 1 year of completing the action, and any identified problems will be remedied as soon as possible.

Natural barriers also may exist in the free flowing waters of the enrolled lands. It will be the Agencies' responsibility to remove any natural barriers determined to warrant removal. The protection of other native species (primarily westslope cutthroat trout) from invasion by nonnative fish species will be considered in determining if a barrier should remain in place. Typically, all barriers to grayling movement will either be removed or passage will be provided. However, removal of some natural and man-made barriers may have a negative impact on other native fish species, particularly cutthroat trout. Barriers that provide isolation from neighboring rainbow trout populations maintain the genetic purity of many cutthroat trout populations in the Big Hole River drainage. These rainbow populations are a potential source of hybridization should these barriers be removed. Most cutthroat trout populations in the Project Area are associated with the headwaters of many of the tributaries to the Big Hole River, while grayling are associated with the Big Hole River and the lower portions of the tributaries. Since the range of the two species within the Project Area does not overlap, maintaining barriers that provide genetic isolation for cutthroat trout will not impact grayling. The potential impacts to native fish species, primarily westslope cutthroat trout, will be taken into consideration by the Agencies prior to making a decision to remove a barrier.

Adaptive management provisions for this conservation measure are not required because Participating Landowners, through enrolling in this Agreement and implementing their site-specific plans, are required to remove any structure that is a barrier to grayling movement or modify it to permit passage of juvenile and adult grayling within 5 years of the determination that the structure impedes grayling passage.

Expected Benefits to Grayling From the Conservation Measure

The removal of migration barriers will allow access to a greater portion of watershed for grayling throughout the year. The removal of barriers will increase access to seasonally important habitats including spawning, feeding, wintering, and refuge. Since most of the barriers are expected to be associated with irrigation diversion structures, the modification of these structures to allow passage also may reduce entrainment of grayling during downstream migrations. The combination of these two effects will provide significant benefit to the grayling population in the Project Area.

E. Nonnative Trout (Agency Oversight)

Limiting Factor: Interactions with Nonnative Salmonids

The presence of nonnative salmonids in the Project Area has the potential to limit the response of the grayling population in the Project Area to the conservation measures proposed in this Agreement (Kaya 1992a).

Proposed Agency Actions to Reduce Interactions Between Grayling and Nonnative Salmonids

This Agreement does not propose direct measures for Participating Landowners to undertake to limit interactions between grayling and nonnative salmonids in the Project Area because this threat is not a result of landowner activities and directly addressing this threat is not the responsibility of landowners. However, the partnering Agencies believe that action may be necessary if interactions with nonnative trout limit the ability of grayling to respond to improved habitat conditions. At a minimum, the Agencies shall take the following actions:

1) Continuation of catch-and-release regulations for grayling and liberal bag limits for nonnative brook trout (MFWP 2004).

2) Establishment and subsequent annual meetings of a technical committee with expertise in the ecology and management of stream salmonids to review existing trout and grayling population monitoring data in the Big Hole River. The technical committee will assess the threat of nonnative trout to grayling and provide written recommendations to the Agencies. The MFWP has the legal mandate to manage fishery resources in the State of Montana and will determine appropriate management actions to address nonnative trout. Types of management actions to address threats from nonnative trout may include adjusting fishing regulations to encourage harvest of nonnative trout in the Project Area; and trapping, netting, electrofishing or other methods to suppress nonnative trout in certain habitats.

F. Summary and Integration of the Expected Benefits From Conservation Measures

The conservation measures to be implemented by Participating Landowners with assistance from the Agencies will improve stream flow conditions, maintain or restore riparian habitats, rescue any grayling entrained in irrigation ditches and provide a comprehensive assessment of entrainment threat, and facilitate fish passage within the Project Area. Collectively, these measures are expected to increase the abundance and distribution of fluvial Arctic grayling in upper Big Hole River by addressing key impairments to properly functioning stream ecosystems including alterations in the flow regime, reduced water quality and quantity, and degradation and fragmentation of habitat (see Table 5). Based on the characteristics of landowners already expressing interest in the program (e.g., water rights and size of ranching operations), the anticipated overall level of landowner participation, and the timeline for implementing conservation measures; the Agencies expect that the abundance of grayling in currently-occupied habitats will exhibit a positive trend within 5 years of the execution of this Agreement and that grayling will begin to reoccupy historic waters within 10 years of the execution of this Agreement (see Part VII, Restoration targets for grayling).

An objective of the Agreement is to improve streamflows in the Project Area such that they follow a more natural flow regime (e.g., Poff et al. 1997). The Agencies anticipate meeting this objective will promote stream ecosystem function and benefit grayling by facilitating adequate seasonal high-flow events, maintaining adequate baseflow conditions, and eliminating human-caused dewatering events. This Agreement will especially address these latter two

concerns, but also includes an approach to promote the first. The best available data indicate that grayling populations in the Big Hole River are more abundant when there is more water in the river (Figure 11).

Increased streamflows will reduce the frequency of thermal impairments to water quality in the Big Hole River, especially high summer water temperatures known to be stressful to salmonid fishes like grayling that depend on cold, clean water (Lohr et al. 1996; Magee and Lamothe 2003). Increased flows will result in lower summer water temperatures because a larger volume of water takes more energy (solar radiation) to heat. Increased flows, in combination with improved riparian conditions that increase stream shading and restored channel morphology that results in narrower, deeper channels will further reduce thermal impairments. Stressful thermal conditions may naturally occur in the system, for example during drought or climate change, but increased flows will increase the abundance and quality of cool-water refuge habitats like the deep pools (Hughes 1992, 1998; Byorth and Magee 1998; Lamothe and Magee 2003) or tributary streams utilized by grayling (Magee and Lamothe 2004).

The increased flows produced by implementing the conservation measures of the Agreement will ensure that habitats needed by grayling remain connected. Stream fishes like fluvial Arctic grayling typically require spawning, rearing, and refuge habitats that are often separated in space and time (Northcote 1995; Schlosser and Angermeier 1995). Fluvial Arctic grayling in the Big Hole River undertake extensive seasonal intra-basin movements to access these habitats in response to life history requirements or stressful environmental conditions (Shepard and Oswald 1989; Lamothe and Magee 2003). Dewatering impedes movement between habitats, thus reducing growth, survival, or reproduction.

High flows are critical for maintaining the fluvial processes of erosion and deposition that influence channel morphology and creation of habitat (Baron et al. 2002 and references therein). High discharge events mobilize streambed sediments and promote scour, leading to creation of pool habitat often utilized by fluvial Arctic grayling (e.g., Byorth and Magee 1998; Magee and Lamothe 2003). Working with Participating Landowners to reduce irrigation diversions during periods of high streamflows should increase the amplitude and duration of high-flow events, for example bankfull flows, that are expected to improve general habitat conditions for salmonid fishes by flushing fine sediments which tend to reduce spawning success (Bjornn and Reiser 1991), and by scouring excessive algal growth which, if left unchecked, can lead to increased biological oxygen demand and lower dissolved oxygen (e.g., Hauer and Hill 1996). Stream restoration strategies that utilize increases in peak and base flows to create and maintain habitat can benefit salmonids (e.g., Hill and Platts 1998).

Riparian zones are often critical for the ecological function of aquatic systems (Gregory et al. 1991). Riparian habitats dissipate stream energy during floods, filter sediments and pollutants, facilitate ground-water recharge, cool streams by shading, stabilize streambanks, maintain channel characteristics, promote floodplain development via deposition of sediments during overbank flows, input woody debris, organic material, and terrestrial insects (Bjornn and Reiser 1991; Hunter 1991; Murphy and Meehan 1991; Prichard et al. 1998; Poole and Berman 2001). Loss of riparian zones because of agricultural activities, including streamside livestock grazing and direct removal of natural vegetation, has led to degradation of adjacent stream habitat in the

upper Big Hole River (Upper Big Hole TMDL 2003; Lamothe and Magee 2004b). Fortunately, riparian habitats sometimes respond quickly when grazing pressure is reduced, depending on climate, soil characteristics, groundwater, and adjacent land use (Platts 1991). The development of prescribed grazing plans or exclusion fencing, like those to be implemented in this Agreement, that manage cattle in riparian areas will lead to significant improvements in riparian health (Borman et al. 1999) and channel morphology (e.g., Opperman and Merenlender 2004).

Site-specific data support a similar association between riparian conditions, in-stream habitat conditions and grayling abundance in the Project Area. For example, analysis of the OEA habitat inventory data shows a strong association between the abundance of overhanging vegetation (i.e., healthy riparian areas) and the quality and diversity of pools, and reduced bank cutting (erosion) in the proposed Project Area (Lamothe and Magee 2003). Grayling abundance in portions of the Project Area is positively correlated to overhanging vegetation (Figure 12). The protection of existing high-quality riparian habitats and the restoration of degraded or lost riparian habitats outlined in the Agreement are expected to result in increased streambank and channel stability, reduced erosion and fine sediment deposition, reversal of channel widening, improved water quality and availability, creation of pool habitats with adequate overhead cover utilized by grayling (Lamothe and Magee 2003), maintenance of high-quality spawning habitats, and reversal of thermal impairments.

Rescue (salvage) efforts, installation of fish screens, and improvements to irrigation structures reduce potential loss of fluvial Arctic grayling from entrainment in irrigation ditches. Mortality in irrigation ditches may result from stranding in a ditch or field, thermal stress, or predation. Sub-lethal effects, such as reduced growth or chronic stress, may be associated with temporary residence in irrigation ditches with poor water quality (e.g., high temperatures, agricultural runoff) or lacking adequate feeding or refuge habitat.

The comprehensive entrainment survey and threat assessment will produce a detailed prioritization list to focus the Agencies' efforts. If entrainment in irrigation ditches is identified as a population-level problem for grayling in the system, then reducing this threat will lead to a direct increase in the number of grayling in natural stream channels where their survival and growth would presumably be greater. The Agencies are committed to monitoring entrainment and conducting rescue operations throughout the term of the Agreement, as this threat may fluctuate in time and space depending on grayling population response and changes in habitat conditions in the system.

The removal of migration barriers will allow grayling access to a greater portion of the watershed, and increase access to seasonally important habitats including spawning, feeding, wintering, and refuge. Grayling should thus respond, if previously blocked from these necessary habitats, through greater reproductive success, and increased survival and growth of all age classes. Since most of the barriers are expected to be associated with irrigation diversion structures, the modification of these structures will not only allow passage also will reduce entrainment of grayling during downstream migrations. The combination of these two effects will provide significant benefit to the grayling population in the Project Area.

Population-Level Benefits of Conservation Measures to Improve Habitat Conditions for Grayling

The combined effect of the conservation measures described above will be to improve the extent and quality of grayling habitat in the upper Big Hole River. Size of habitat is critical to persistence of salmonid fishes (e.g., Dunham et al. 1997; Hilderbrand and Kershner 2000), so increasing the amount of habitat in the watershed will facilitate expression of grayling life history. The quality of habitat and the ability of individuals to move between habitats also are critical determinants of population persistence and abundance. Habitat quality is often couched in terms of complexity of combinations of water depth, water velocity and substrate (Angermeier and Schlosser 1989); structural elements such as overhead cover (Lonzarich and Quinn 1995) or habitat units (pool-riffle sequences) (Bission et al. 1982). More complex habitats often support a greater biomass of salmonids (Fausch and Northcote 1992), and increased habitat complexity can buffer a population against disturbance (e.g., Sedell et al. 1990; Pearsons et al. 1992). Connection of habitats permits grayling to access habitats necessary during different seasons or at different stages in their life (Northcote 1995), and may facilitate recolonization from former habitats. The Agencies predict the conservation measures will increase suitable grayling habitat, reconnect periodically or permanently isolated habitats, and increase habitat complexity, which will lead to a positive trend in grayling abundance in currently-occupied habitats (i.e., Management Segments C, D, and E) within 5 years of the execution of this Agreement and the reoccupation of historic waters (i.e., Management Segments A and B) within 10 years of the execution of this Agreement.

Uncertainty and the Proposed Conservation Measures

The conservation measures to be implemented to address problems with degraded riparian habitats, entrainment, and fish barriers have a more specific endpoint or level at which the problem may be fixed, compared to instream flows. For example, installing a fish screen or fish ladder is generally a clear fix of a specific problem. Apart from the general flow targets expected to benefit grayling (Table 3), the specific level of instream flows required to produce a specific population level response by grayling are largely unknown for grayling in the Big Hole River. The lack of quantitative data for irrigation use in the Project Area is a further complication that makes it difficult to estimate the specific response of the system to implementation of conservation measures to increase streamflows. Nonetheless, the best available data indicate that the conservation measures will dramatically improve habitat conditions even under pessimistic predictions of water conservation. For example, if all conservation measures except for instream flow augmentation were implemented at their expected levels, the Agencies would still, given natural variability in water supply (Figures 7-10), expect grayling populations to increase as a result of improved riparian conditions, habitat reconnection, and reduced entrainment in irrigation ditches. Clearly the integration of all these elements (including streamflows) defines suitable grayling habitat such that the whole is more than the sum of its parts, but it appears certain that the baseline flow conditions cannot help but improve under the Agreement's provisions for water rights compliance, irrigation diversion reduction arrangements, and irrigation water management plans.

VII. RESTORATION TARGETS FOR GRAYLING POPULATION WITHIN THE PROJECT AREA

The 1995 Grayling Restoration Plan and associated Memorandum of Agreement (MOA) between MFWP and the USFWS (MFWP and USFWS 1996) defined a set of guidelines for abundance and age-class structure thought to reflect a self-sustaining fluvial Arctic grayling population in the Big Hole River*. However, the Restoration Plan is currently being revised and its associated guidelines for population viability in the Big Hole River are undergoing re-evaluation to consider--(a) population monitoring data collected since the Restoration Plan and MOA were adopted, and (b) the spatial representation of sample sites necessary to properly characterize the status of the population. As in the 1995 Grayling Restoration Plan, abundance and age-class components will be included in the revised Grayling Restoration Plan's guidelines for defining a self-sustaining fluvial Arctic grayling population in the Big Hole River.

The abundance component of the definition for a self-sustaining grayling population will be expressed as CPUE by electrofishing, although the specific CPUE values are not known at this time. The MFWP is currently reviewing its grayling monitoring data for the Big Hole River and standardizing the existing data to index values of CPUE. Correlation analysis will be used to measure the association between CPUE index values and existing density estimates generated by capture-mark-recapture methods. The revised guidelines also will include a component describing an age class structure that minimizes the risks from demographic stochasticity. However, at this time both of these determinations await retrospective analysis of the standardized and updated dataset. The MFWP estimates a draft restoration plan may be completed by February 2006. Members of the Fluvial Arctic Grayling Workgroup with expertise in the management and ecology of grayling, and representing State and Federal agencies, academia, and the private sector, will review this draft in 2006.

The development of a measurable (quantitative) definition of a self-sustaining grayling population in the Big Hole River that might serve as a "restoration target" awaits further analysis (i.e., Restoration Plan revision). Nonetheless, a meaningful framework to measure progress of the Agreement in terms of increasing the abundance and distribution of grayling can be defined at this time. First, MFWP has committed to monitoring the abundance, distribution and age-class structure of fluvial Arctic grayling in each of the Project Area's 5 management segments, by sampling grayling in 2 monitoring reaches (1 mainstem and 1 tributary reach) per segment for a total of 10 monitoring reaches. These 10 reaches represent sites in addition to the existing long-term MFWP monitoring sites in the upper river. The expanded sampling framework is considered important to more accurately represent the status of the species at the watershed scale and to measure effects of the Agreement's implementation. Given current agency resources, the increase in number of monitoring dictates that single-pass CPUE electrofishing, and not mark-recapture, will generally be used to characterize grayling abundance within each of these monitoring reaches.

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* A. Based on an annual fall census of the McDowell-Wisdom section of the Big Hole River, the estimated density of age-1 and older Montana grayling in the Big Hole River must equal or exceed 30 grayling per mile.
B. Based on annual surveys, the proportion of age-1 and 2 grayling in the Big Hole River must constitute between 50 and 80 percent of the total population sampled in combined sections of the Big Hole River.

Second, success of the Agreement (i.e., progress toward a self-sustaining population) will be measured in terms of the trend in CPUE at occupied sites and presence/absence at currently unoccupied sites. The Agencies expect that the abundance and distribution of grayling will increase, and more specifically that--(a) the mean index of abundance (CPUE) of grayling at monitoring locations within currently-occupied habitats will exhibit a positive trend within 5 years of the execution of the Agreement, and (b) that grayling will begin to reoccupy or otherwise utilize habitats in historic waters within 10 years of the execution of this Agreement.

Systematic monitoring of the grayling population in the upper Big Hole River was not initiated until the 1980s, by which time grayling were presumably in decline, so the historical potential (abundance within the known historical distribution) for this population is uncertain. Therefore, developing specific restoration targets for currently unoccupied habitats or for habitat improved or created through Agreement conservation measures is difficult because the potential (carrying capacity) of or the specific life-stages of grayling that may reoccupy a given location are unknown. Also, currently unoccupied habitats may only provide seasonal habitat or may only be suitable habitat for specific life stages of grayling. For example if Management Section A and B were only used by grayling for spawning and juvenile rearing, then a restoration target based on fall sampling would have little meaning for adults because they would not be present and available for capture. Monitoring to detect reoccupation of currently unoccupied habitats will begin following the removal of existing passage barriers. Presence will be determined by the detection of grayling of any age class in any of the monitoring reaches established in currently unoccupied habitat within a given management segment. Once presence has been established, CPUE values can then be used to measure population trends for grayling within that management segment.

Revision of the Restoration Plan may lead to refinement in the definition of a self-sustaining population that can serve as a basis for evaluating the efficacy of the Agreement, and the Agreement will utilize these guidelines when they become available. However, progress and effectiveness of the Agreement can nonetheless be evaluated without this specific information through the assessment of trends in CPUE and presence/absence of grayling through time and across the Project Area as described above.

Adaptive Management Plan for Grayling Population Response to Conservation Measures

If abundance of grayling in currently-occupied habitat does not exhibit a positive trend within 5 years of the execution of this Agreement and/or if grayling do not begin to reoccupy historic waters within 10 years of the execution of this Agreement, then MFWP agrees to work with the USFWS to develop a plan that stabilizes the population. This plan may include, but should not be limited to, working with Participating Landowners to implement additional conservation measures. In severe situations, the Agencies may consider planting fertilized eggs into suitable areas of the Project Area in order to reestablish grayling.
New scientific data may become available which, if incorporated into the design and implementation of the conservation measures of the Agreement, may result in significant population-level conservation benefits for grayling. Such data might pertain to, for example, the ecology of grayling, the landscape-scale population structure of grayling, flow-habitat

relationships and flow requirements for grayling, competitive and predatory effects of nonnative trout species on grayling, stream restoration methods, or rangeland management methods. Should such data become available, MFWP and Participating Landowners agree to discuss in good faith how to modify or supplement the Agreement's existing conservation measures to produce the expected population-level conservation benefits for grayling.

DRAFT ENTRAINMENT SURVEY PROTOCOL

Big Hole River Arctic Grayling Entrainment Surveys

Purpose: To assess entrainment of Arctic grayling in irrigation diversions and ditches on enrolled lands in the upper Big Hole River. Objectives are to:

1) Determine the presence and or absence of Arctic grayling in irrigation diversions

2) Determine relative abundance of Arctic grayling in irrigation diversions

3) Determine distribution of Arctic grayling in irrigation diversions

4) Determine size distribution of Arctic grayling in irrigation diversions

Protocol:

1) Diversion surveys will be prioritized by CCAA landowner ranking and potential to entrain grayling (i.e., located near know spawning, rearing, summering habitats, size and location of diversion etc.)
2) Montana Fish, Wildlife and Parks will schedule surveys and contact landowners.
3) Total length of the diversion will be determined on the ground, beginning and ending points will be located and UTM coordinates collected.
4) One-pass electrofishing surveys will be conducted on 50 percent of the total length of diversion*. To spatially assess distribution and relative abundance of Arctic grayling, surveys will be broken down into three equal reaches (approximately 16 percent of the total length each) encompassing upper, middle and lower sections of the diversion. The upper reach will began at the point of diversion, the middle reach will be located half way between the point of diversion and the end of the diversion, and the lower section will be located near the end of the diversion.
5) Surveys will be conducted with backpack shocker or mobile anode electrofishing system mounted on a crawdad boat.
6) All grayling will be weighed, measured, tagged with Visible Implant tags (VI) and held in a live well until transported and released in the nearest tributary or the mainstem Big Hole River. Release locations must allow grayling to access the Big Hole River. The UTM coordinates will be taken at all release locations.
7) Presence of all other species will be recorded and classified as abundant, common, rare or absent as defined by Montana Fisheries Information System.
8) Continuous GPS locations and water temperature will be collected for each reach within the diversion.
9) Data will be entered into Excel Spreadsheet.

* Where practicable, the entire length of ditches on an enrolled property will be surveyed.

APPENDIX F.

Template Forms for Phases II and III of Agreement

TEMPLATE CERTIFICATE OF INCLUSION

REQUEST FOR EXTENSION TO COMPLETE PHASE II – DEVELOPMENT OF SITE-SPECIFIC PLAN

COVERED ACTIVITIES

TEMPLATE SITE-SPECIFIC PLAN

DRAFT EXAMPLE --- This certificate would be executed by the parties after the rapid assessment survey is completed and provided to the USFWS; MFWP would sign last and would send a copy to the Participating Landowner.

Participating Landowner Certificate of Inclusion
for the
Candidate Conservation Agreement with Assurances for Fluvial Arctic Grayling
in the Upper Big Hole River

This certifies that the property described in Attachment 1 to this Certificate of Inclusion [list **certificate number**], owned by [**Participating Landowner's Name**], is included within the scope of Permit No. [list number], issued by the U.S. Fish and Wildlife Service to the State of Montana Fish, Wildlife and Parks (MFWP) under the authority of 10(a)(1)(A) of the Endangered Species Act of 1973, as amended, 16 U.S.C. 1539(A)(1)(A). Such Permit authorized certain activities by Participating Landowners as part of a Candidate Conservation Agreement with Assurances for the fluvial Arctic grayling in the upper Big Hole River (Grayling CCAA).

Pursuant to that Permit and this Certificate of Inclusion, the holder of this Certificate will have incidental take coverage in association with certain activities if the holder implements MFWP's List of Rapid Assessment Measures and Interim Diversion Reduction Arrangement, if a landowner has developed a reduction plan. The incidental take coverage is extended after the Phase III site specific plan once it has been developed and is being implemented by the holder. Incidental take coverage extends to activities that may result in a take of grayling, to include the activities listed in Appendix F of the Grayling CCAA on the above-described property. Incidental take shall not exceed that resulting from the covered activities described in the attached site-specific plan. The take coverage is subject to the terms and conditions of--(1) the Permit identified above, and (2) the terms and conditions of the Candidate Conservation Agreement with Assurances, and (3) any and all Phase II conservation measures and Phase III site-specific plans for the property that have been executed with MFWP, USFWS, MDNRC, and NRCS.

Regulatory Assurances

Upon execution by Participating Landowner, USFWS, and MFWP of a Phase III Site-Specific Plan, as described in the Grayling CCAA, Participating Landowner shall have the assurances that are described in the Grayling CCAA.

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When MFWP receives this signed Certificate of Inclusion, coverage for incidental take under the Permit(s) will be provided. The MFWP will return a copy of the dated certificate to the Participating Landowner for his/her records.

_____

_____

_____

_____

Address

_____

Phone

_____

Signature of Landowner

_____

Signature of MFWP

Received by the MFWP:_____

Date

_____

Signature of USFWS

REQUEST FOR EXTENSION OF PHASE II IMPLEMENTATION OF THE AGREEMENT

Date:

Landowner name:

Certificate of Inclusion #:

Enrolled lands, etc:

Original date of Phase II completion:

Extension request to complete phase II: [xx days or months]

Revised date of Phase II completion:

An extension (maximum of 24 months) to the standard 30-month duration to complete Phase II implementation of the Agreement (implementation of rapid assessment measures and development of the site-specific plan) can be granted by USFWS provided the Participating Landowner and the Agencies meet the following conditions:

1. The Participating Landowner has complied fully with the provisions outlined during Phase I and II of the Agreement.
2. a) The Participating Landowner and Agencies are actively engaged and making progress in the development of the site-specific plan and must provide an estimate by when it will

be completed; ***or*** b) the Participating Landowner and the Agencies are not actively developing a site-specific plan and must justify why this is the case.

For 2a, the Agencies must provide a summary of the progress in completing the site-specific plan and an estimated completion date. For 2b, the Agencies must provide a justification why they are not actively working with the Participating Landowner. This justification must be based on the relative ranking of a Participating Landowner using the Agreement's habitat ranking criteria for grayling (Part IX, Figure 22) and/or prioritization of Agency resources given progress on site-specific plans on higher-priority habitats. In either case, the USFWS must determine that granting the extension to complete Phase II will not unduly delay the conservation of fluvial Arctic grayling.

DETAILS:

Participating Landowner **Date**

Montana Fish, Wildlife and Parks **Date**

U.S. Fish and Wildlife Service **Date**

COVERED ACTIVITIES

The following paragraphs summarize and describe activities which are covered by the Permit and regulatory assurances that are part of the Permit under the terms of this Agreement (covered activities). These covered activities can be generally grouped into agriculture and ranching, restoration and monitoring. These examples are representative, not exhaustive; not every activity listed below will be applicable on every property and some specific covered activities may not be included below. In general, covered activities are those activities implemented through the Agreement's conservation measures to reduce threats to grayling from habitat fragmentation and loss resulting from irrigation diversions, degradation of riparian habitats, entrainment in irrigation ditches, and barriers to movement. Actions not related to these threats are outside the scope of this Agreement and not considered covered activities. Participating Landowners will be primarily interested in the covered activities related to agriculture and ranching.

AGRICULTURAL AND RANCHING ACTIVITIES – Normal and accustomed agricultural and ranching activities or those specified by or consistent with the terms of the Agreement or site-specific plan that are being modified by Participating Landowners under the Agreement so that they reduce or eliminate threats to grayling as described in the Agreement are considered covered activities. In general, these activities involve the diversion and application of irrigation water, grazing and livestock management, and any legal associated activities that are specified in or are consistent with the Agreement and a landowner's site-specific plan. Examples of covered activities include water diversion for irrigating hay fields, pastures, or livestock; ground water pumping for watering livestock; prescribed grazing plans; harvest of hay or livestock forage; and actions necessary to accomplish the preceding.

For a practical example, a covered activity would be the legal diversion of an amount of water specified under NRCS' irrigation water management plan or a prescribed grazing plan implemented to recover a non-functional riparian habitat. Diverting water in excess of the agreed-upon amount or grazing livestock beyond that specified in the prescribed grazing plan would not be a covered activity. For another example, mining on enrolled lands would not be considered a covered activity because this Agreement addresses threats to grayling from land use associated with agriculture and ranching. It will not be possible to list each and every covered activity at the time the site-specific plan is being developed. Instead, the indicator for a covered activity will be that which is being agreed to or modified (i.e., conservation measures and supporting activities), in the context of the Agreement, to reduce or eliminate any of the threats to grayling described in the Agreement and the Certificate of Inclusion.

RESTORATION ACTIVITIES – Restoration activities include those actions generally described as "conservation measures" that are being implemented to benefit grayling but may result in take of grayling through short-term impacts. Restoration activities may be implemented entirely by Participating Landowner, entirely by one of the Agencies, or by collaboration between the Participating Landowners and the Agencies. Representative examples of restoration activities include:

- ☐ Replace or repair headgates
- ☐ Replace or repair diversion and flow-regulation structures
- ☐ Install flow monitoring devices
- ☐ Install off-channel livestock watering facilities
- ☐ Install ground water wells to supply off-channel livestock watering facilities
- ☐ Ditch lining or modification of existing irrigation conveyance
- ☐ Construction of irrigation canals or field ditches
- ☐ Land leveling or smoothing to facilitate efficient irrigation water application
- ☐ Install piping for irrigation or stock water transport
- ☐ Install fish passage structures (e.g., ladders) in existing or re-designed diversions
- ☐ Remove barriers to grayling migration
- ☐ Re-design and install "fish-friendly" irrigation diversion structures
- ☐ Install fencing to control livestock access to riparian zones
- ☐ Re-planting willows & natural vegetation (channel bank vegetation) in riparian zones
- ☐ Remove manure piles present in riparian zones
- ☐ Relocation of ranch structures posing a threat to grayling habitat
- ☐ Change fields or pastures to crop composition that uses less water
- ☐ Install fish screens on irrigation diversion structures
- ☐ Active in-stream restoration projects including pool excavation, bank stabilization, and channel stabilization
- ☐ Capture of grayling for collection of gametes or translocation
- ☐ Release free-swimming juvenile grayling
- ☐ Raise fertilized grayling eggs in Remote Site Incubators

MONITORING ACTIVITIES – Monitoring activities include mostly actions by the Agencies, especially MFWP, to measure the condition of grayling habitat and grayling population status in the Project Area. Some of these activities may result in take of grayling, but such take is anticipated to be minimal and the monitoring is necessary to determine the effectiveness of the Agreement's conservation measures. Representative examples of monitoring activities include:

- ☐ Capture and handling of grayling by various techniques including trapping, netting, electrofishing and angling
- ☐ Tagging of grayling to measure survival and movement
- ☐ Measurement of aquatic physical habitat, including, but not limited to channel cross sections, habitat unit mapping, riparian zone surveys, stream temperatures, etc.
- ☐ Ongoing operation of flow-monitoring devices (aqua rods, etc.)

OUTLINE AND TEMPLATE FOR SITE-SPECIFIC PLAN

Outline:

I. INVOLVED PARTNERS

II. ENROLLED LANDS

III. DESCRIPTION OF EXISTING CONDITIONS (BENCHMARK DATA)

IV. CONSERVATION MEASURES AND EXPECTED RESULTS

V. ADAPTIVE MANAGEMENT PLAN

VI. MONITORING

VII. STATUS REPORT

VIII. SITE-SPECIFIC PLAN DURATION

IX. COVERED ACTIVITIES

X. LANDOWNER AND AGENCY RESPONSIBILITIES

XI. IMPLEMENTATION AND COMPLIANCE MONITORING SCHEDULE

XII. TERMS AND CONDITIONS

XIII. SIGNATURES

Template which summarizes the information to be presented in each site-specific plan:

I. **INVOLVED PARTNERS** – names the parties (individuals and agencies) involved in the development, approval and implementation of the site-specific plan.

II. **ENROLLED LANDS** – defines the lands enrolled in the Agreement and site-specific plan.
   a. Location – legal description, size (acreage) and map of enrolled lands.
   b. Access – stipulations to permit agency personnel or other agreed-to parties access to enrolled lands and properties necessary to implement the site-specific plan.

III. **DESCRIPTION OF EXISTING CONDITIONS**
   a. **Land Unit Description** – describes the land use and management on enrolled properties (e.g., location and area of hay production, pasture, etc.).
   b. **Population Status of Grayling** – description or summary of fishery resources, especially grayling, in or adjacent to enrolled lands.
   c. **Previous Actions Taken to Benefit Grayling** – description and date of any previous or ongoing actions taken on enrolled lands to benefit grayling (e.g., voluntary irrigation reductions, riparian or other habitat restoration projects, etc.).
   d. **Immediate Threats to Grayling** – summary of immediate threats to grayling that were identified during the Agencies' Rapid Assessment of enrolled lands during Phase I of the Agreement.
   e. **Water Rights** – summary of Participating Landowner compliance with water rights during Phases I and II of the Agreement; detailed description of existing water rights on enrolled lands (ID, date, period of use, purpose, amount/rate, place of use).
   f. **Water Control Structures (Irrigation Infrastructure)** – summary of NRCS' (Irrigation Water Management) and Agencies' assessment of the irrigation system including location, condition, and performance of diversion structures and flow measuring devices, irrigation ditches, and stock watering facilities.
   g. **Migration Barriers** – summary of any physical or man-made structures that potentially impede movement by grayling with a determination of whether these structures must be modified or removed to benefit grayling.
   h. **Grayling Entrainment** – detailed summary of entrainment surveys conducted in irrigation ditches on enrolled lands. Information will include, but is not limited to: survey crew, date of survey, sampling technique, length/area and location of ditches surveyed, species composition and abundance, length-weight or age-class data, and disposition of captured fishes (left in ditch, returned to natural stream channel, removed, etc.).
   i. **Riparian Conditions and Grazing Land Health** – assessment of riparian conditions (sustainable, at risk, not sustainable) by land use area (hay, pasture, etc.) using NRCS' riparian assessment protocol.
   j. **Stream Morphology and In-Stream Habitat** – detailed description of channel type and conditions, channel morphology, streambank conditions, habitat characteristics (pool-riffle sequences, beaver ponds, woody debris, etc.), width:depth ratios, substrate conditions, etc based on assessment by fishery biologists. Identification of deficiencies and conservation/restoration opportunities.

IV. **CONSERVATION MEASURES AND EXPECTED BENEFITS** – specific list of actions taken to address immediate and long-term threats to grayling on enrolled properties and their expected benefit to grayling.

a. **Actions Take t Eliminate Immediate Threats** – summary of actions implemented by Participating Landowner during Phases I and II of the Agreement.

b. **Water Use and Infrastructure**

i. **Control of Water** – description of irrigation system upgrades to improve control, measurement and delivery of diverted water.

ii. **Compliance with Water Rights**

iii. **Diversion Reductions** – plan that outlines the irrigation withdrawals on enrolled lands and how they have been modified to improve instream flows to benefit grayling.

1. **Reduced Diversion Arrangements** – updates or supersedes the arrangement implemented during phases I and II.
2. **Irrigation Water Management** – NRCS' plan [under Field Office Technical Guide (FOTG) 449] for efficient water use to meet Participating Landowner's needs; defines amount of water needed and provides an application schedule.

iv. **Migration Barriers** – describes the installation (or timeline for installation) of any fish ladders or removal of any barriers to facilitate passage of grayling.

v. **Entrainment** – describes any short- or long-term solutions to address entrainment problems identified in Part III and a schedule for re-surveying ditches.

c. **Land Use**

i. **Riparian Health and Grazing Management** – describes in detail any practices, such as Prescribed Grazing plans (under NRCS FOTG 528A) or construction of fences along riparian zones, recommended by NRCS or the Agencies to improve riparian conditions on enrolled lands; describes a timeline for implementation and a monitoring schedule.

ii. **Nutrient Management** – describes the utilization of NRCS FOTG 590 to address any threats to water quality from application of commercial fertilizers and livestock waste.

d. **Expected Benefits** – summarizes the expected benefits to grayling habitat and grayling populations from implementing the conservation measures on enrolled lands and the anticipated timeline over which those benefits will accrue.

V. **ADAPTIVE MANAGEMENT PLAN** – describes the parameters under which the Agencies and Participating Landowner will revisit and modify portions of the site-specific plan if conservation measures on enrolled lands are not adequately addressing streamflows, entrainment, migration barriers, riparian zone condition, and channel morphology or any element that threatens grayling on enrolled lands; defines anticipated modifications to the site-specific plan, where possible.

VI. **MONITORING** – describes measurements, timeline, and responsibilities (Agency or Landowner) for determining the effectiveness of conservation measures being implemented on enrolled lands.

VII. **STATUS REPORT** – describes the frequency with which Participating Landowner will provide required monitoring data or compliance information to MFWP, and the guidelines for periodic spot checks by the Agencies to document compliance with Agreement and site-specific plan provisions.

VIII. **SITE-SPECIFIC PLAN DURATION** – minimum duration is 10 years.

IX. **COVERED ACTIVITIES** – describes in explicit detail the specific activities on enrolled land that will receive regulatory assurances and incidental take coverage; activities not specifically listed in this section will not be considered "covered activities."

X. **LANDOWNER AND AGENCY RESPONSIBILITIES** – summarizes the obligations for implementation and monitoring of the provisions of the site-specific plan on the enrolled lands.

XI. **IMPLEMENTATION AND MONITORING SCHEDULE** – table or summary of the implementation and monitoring of the site-specific plan.

XII. **TERMS AND CONDITIONS** – summarizes the same terms and conditions the site-specific plan is subject to based on the Agreement as well as any additional provisions required under the site-specific plan (These are detailed in Appendix G).

XIII. **SIGNATURES**

IN WITNESS WHEREOF THE PARTIES HERETO have executed this site-specific plan to be in effect on the date of the last signature below.

Participating Landowner **Date**

Montana Fish, Wildlife and Parks **Date**

U.S. Fish and Wildlife Service **Date**

APPENDIX G.

Example of Fluvial Arctic Grayling Site-Specific Plan

EXAMPLE OF A SITE-SPECIFIC PLAN

Fluvial Arctic Grayling Site Specific Plan

Table of Contents

EXAMPLE OF A SITE-SPECIFIC PLAN

Fluvial Arctic Grayling Site Specific Plan

I. INVOLVED PARTNERS

This Site-Specific Fluvial Arctic Grayling Conservation Plan (site-specific plan), effective and binding on the date of the last signature below, between the Montana Fish, Wildlife and Parks (MFWP) and the U.S. Fish and Wildlife Service (USFWS); and **[insert landowner's name]** (Participating Landowner), is intended to conserve and enhance populations of fluvial Arctic grayling in the Big Hole River by implementing conservation measures on lands owned by the Participating Landowner. Approval of this site-specific plan by the Participating Landowner, MFWP, and USFWS is a prerequisite for obtaining regulatory assurances as described in the CCAA and continued incidental take authority through the Certificate of Inclusion.

II. ENROLLED LANDS

LOCATION

This site-specific plan pertains to 2,042 acres of land enrolled by Landowner "A" (i.e., enrolled lands) that are contained entirely within CCAA Management Segment B (Figure 1G). The enrolled lands are contained within **[enter legal description TRS]** and border the town of XXXXX, Montana (Figure 2G). Approximately 2.75 miles of stream "X" flow through the enrolled lands.

ACCESS

The Participating Landowner agrees to allow the Agencies, or any mutually agreed upon parties, reasonable access to his or her property for the purposes of assessing resource condition, monitoring implementation of conservation measures, and conducting compliance and biological monitoring. The Agencies will coordinate with the Participating Landowner to avoid unnecessary inconvenience and disruption of the Landowner's property use. The Agencies will notify the Participating Landowner in advance with their intent to enter their property and will further describe the activities and duration of the scheduled visit. The Participating Landowner shall not unreasonably withhold permission for such entry.

III. DESCRIPTION OF EXISTING CONDITIONS (Benchmark Data)

LAND UNIT DESCRIPTION

The enrolled lands currently contain a total of 2,042 acres, of which 4 acres are headquarters, 492 acres are hay land, 985 acres are irrigated pasture, and 561 acres are rangelands comprised primarily of native (Figure 2G). The ranch is fenced into three main management units and as such, combines several of the land uses into each unit (i.e., pasture and range land is fenced in with hay land). There are five water diversions on the ranch that provide irrigation water and one water diversion (#6) that provides water solely for livestock drinking water.

Population Status of Grayling

In April 2004, MFWP conducted grayling population monitoring efforts within a 1-mile section of Stream "X" flowing through the enrolled lands. The stream reach was surveyed by a 3-person electrofishing crew using a mobile-anode DC system mounted on a Coleman Crawdad boat. The results of the survey were:

SPECIES CAPTURED	# CAPTURED	LENGTH (range in.)	WEIGHT (range lbs)
grayling	27	6.7 - 12.4	0.28 - 0.81
brook trout	105	5.2 - 14.1	0.23 - 0.94
mountain whitefish	8	6.8 - 11.0	0.21 - 0.78

The results of this recent effort show that Stream "X" is an important component of grayling life-history patterns in the Big Hole watershed, and makes the conservation measures described in this plan a priority for the agencies to implement.

Previous Actions Taken to Benefit Grayling

There have been no documented conservation measures taken by the landowner that have lead to benefits for the grayling population within the project area.

Immediate Threats to Grayling

On May 2, 2005 a 2-person team (MFWP) assessed the enrolled land for "immediate threats" to grayling. The team identified 10 car batteries in Stream "X." The Landowner was contacted and the batteries were removed by the Participating Landowner by May 9.

Water Rights

On May 6, 2005, the irrigation withdrawals were measured using an electronic flow meter to ensure flow rate and point of diversion compliance with the associated water rights for the enrolled land. The MDNRC hydrologist monitoring water rights compliance found the landowner to be in compliance on that date with all water rights associated with the enrolled lands. Continued monitoring will be necessary to ensure continued flow rate, period of use, and place of use compliance.

Summary of Water Rights for the Enrolled Lands

Water Right ID	Priority Date	Period Of Use	Purpose	Flow Rate(cfs)	Max Acres
41DXXXX	1890-10-05	04-15 – 09-01	IRRIG	20	XX
41DXXXX	1895-06-30	04-15 – 09-01	IRRIG	25	XX
41DXXXX	1895-04-15	05-01 – 07-15	IRRIG	15	XX
41DXXXX	1900-08-18	05-01 – 08-01	IRRIG	10	XX
41DXXXX	1900-08-20	05-01 – 08-15	IRRIG	15	XX
41DXXXX	1901-09-15	04-01 – 10-01	STOCK	2	XX

All water rights associated with the enrolled lands are associated with Stream "X" as the source. Stream "X" is a unadjudicated system. There is no water commissioner for this stream.

Existing Migration Barriers

There are six legal points of diversion and each point of diversion has a headgate that was installed in the 1960s. The diversions structures currently consist of gravel piled across the stream channel (Photo 3G). The landowner currently has a long-term (10-year) maintenance agreement to maintain these "structures" associated with a 310 Permit (Montana Stream Protection Act). Gravel type diversions require the landowner to frequently excavate and pile gravel from the streambed to divert water into the ditch.

The existing irrigation diversion structures are potentially acting as barriers to grayling movement during low flow conditions. At the time of the assessment (May 6, 2005) there was no evidence that these structures were acting as barriers. Upgrading the existing diversion structures on the enrolled lands has the potential to better meet the needs of both the Participating Landowner and the grayling, so these structures will be improved or replaced. No other potential barriers were identified during the visual survey.

Existing Level of Grayling Entrainment

On May 7 and 8, 2005, two 2-person teams surveyed the irrigation ditches contained on the enrolled land to quantify the level of grayling entrainment within these structures with backpack electro fishing units. A single-pass survey was conducted over the entire length of the six irrigation ditches associated with the six points of diversion for the enrolled land. The results of the entrainment survey were:

Ditch ID	Survey Length (mi)	Species Captured	# Captured Length (range in.)	Length (range in.)	Weight (range lbs.)
A	1.0	grayling	5	7.0 – 12.3	0.28 – 0.72
"	"	brook trout	10	4.0 – 13.4	0.18 – 0.82
B	0.8	brook trout	12	4.5 – 11.1	0.24 – 0.61
C	0.7	brook trout	8	6.5 – 12.1	0.34 – 0.71
D	1.0	brook trout	20	5.0 – 14.0	0.26 – 0.98
E	1.0	brook trout	1	10.1	0.58
F	2.0	mountain whitefish	2	6.4 – 12.0	0.45 – 0.61
"	"	brook trout	7	6.4 – 12.0	0.31 – 0.75

The five Arctic grayling and the two mountain whitefish captured during the survey were tagged with VI tags, transported to Big Hole River and released. Landowner "A" was contacted about the results of the entrainment survey on May 10, 2005. The initial assessment of the enrolled land suggests that grayling are moving upstream past the property in the spring to spawn and some individuals are becoming entrained within the landowner's irrigation ditches as they move downstream and return to the Big Hole River.

Status of Water Control Structures

There are six legal points of diversion and 6.5 miles of irrigation ditches that provide irrigation and stock water for the enrolled land (Figure 2G). Each point of diversion has a headgate that was installed in the 1960s. Headgates consisted of a concrete foundation with angle iron formed to insert wooden planks for regulation of irrigation withdrawals from Stream "X" (Photo 2G). An assessment team (NRCS) found all diversions had cracked, boiled, or were in need of some repair. With diversions completely shut off 0.5 to 1.5 cfs was measured "leaking" through each headgate. The initial assessment suggests that each of these structures will need to be replaced. Five of the ditches (A-E) had functioning Parshall Flumes for measuring irrigation withdrawals. One of the ditches (F) had no flow measuring device.

The diversions structures currently consist of gravel piled across the stream channel (Photo 3G). The landowner currently has a long-term (10-year) maintenance agreement to maintain these "structures" associated with a 310 Permit (Montana Stream Protection Act). Gravel type diversions require the landowner to frequently excavate and pile gravel from the streambed to divert water into the ditch.

Existing Riparian Condition and Grazing Land Health

Riparian assessments were performed on May 6, 2005 (NRCS) in three reaches along stream "X", by assessing 0.25-mile long transects in each reach. The first assessment reach consisted of the riparian area associated with Field 8, the second evaluated riparian area in Field 6, and the third evaluated riparian habitat contained in Field 4 (Figure 2G). The results of the evaluations are listed below:

REACH	FIELD	LAND USE	SCORE %	CATEGORY
1	8	Pasture	52	AT RISK
2	6	Hay	60	AT RISK
3	4	Pasture	52	AT RISK

All riparian habitats on this property are currently functioning "at risk." Each area has mature willows present and is lacking other age classes as well as adequate vegetation (kind and amount) needed to stabilize the banks (primarily sedge species). The existing woody vegetation is attempting to re-vegetate; however, unrestricted livestock access has led to excessive browsing and reduced recruitment of young willows and herbaceous vegetation. The loss of stability and woody vegetation has apparently led to an increased channel width and decreased pool frequency in each reach. Restoration of this riparian corridor will be accomplished through implementation of the prescribed grazing plan which will change the duration, timing and intensity of grazing within the riparian corridor.

Stream Morphology and In-Stream Habitat

An assessment of stream morphology on the enrolled land by a USFWS and MFWP team on May 15-17, 2005, concludes that the reach of Stream "X" flowing through the enrolled land is a "C4" channel type under Rosgen classification system. Permanent cross-sectional (Figure 4G)

and longitudinal profile were generated for the stream channel on the enrolled property and compared with reference reaches located upstream. Sections of the stream on the enrolled property had high width-depth ratios indicating a widened channel from loss of riparian vegetation. Pool quality also has degraded due to increased sediment inputs from eroding streambanks and the reduced frequency of bankfull discharge events facilitated by the persistent drought currently plaguing southwest Montana and the unregulated early season irrigation withdrawals occurring within the system. The assessment team concluded that grayling habitat within Stream "X" would see significant improvements in overall quality simply through passive restoration techniques to enhance the riparian vegetative health, namely through the reduction of stock pressure through the implementation of a prescribed grazing plan, and through increased instream flow.

IV. CONSERVATION MEASURES AND EXPECTED RESULTS

ELIMINATE IMMEDIATE THREATS

The Rapid Assessment team identified 10 car batteries in Stream "X" and contacted the Landowner so he was aware of the situation. The Landowner, in consultation with Beaverhead County disposal experts, removed and properly disposed of the batteries.

IRRIGATION INFRASTRUCTURE

Migration Barriers and Water Control

The initial assessment suggests that each of the irrigation diversions is a potential migration barriers. All diversions, with the exception of #6, will be upgraded to permanent rock cross vane structures (Photo 4G). Upgrading diversions will ensure fish passage. Maintenance will decrease with permanent rock structures, therefore reducing streambed disturbance and effectively providing irrigation water to meet the needs of the landowner and the conservation measures of this agreement. Diversion #6, associated with ditch F, will be abandoned altogether as the ditches sole use is to provide livestock water and will be replaced through a deep well and stock tank.

The Participating Landowner agrees to repair or replace all the existing headgates to prevent unneeded leakage into the irrigation ditches. Installing new structures will lead to significant improvements (> 5 cfs) in stream flow conditions, particularly in early spring and fall (prior to and after the period of use associated with the landowner's water rights). These improvements also will assist the landowner to remain in compliance with both this Agreement and his water rights.

Entrainment

For the remainder of the calendar year, the landowner will close the headgate on Ditch A to prevent further entrainment of grayling on the enrolled lands. The Agencies and landowner have committed to upgrade the irrigation structure associated with this ditch within 6 months to include a fish screen that will prevent grayling entrainment.

Additional Reduction of Irrigation Diversion

The Participating Landowners and the Agencies agree to implement the following irrigation withdrawal arrangements to maximize the benefits of this site-specific plan to the streamflow conditions of Stream "X." This arrangement reflects the potential improvements to the existing irrigation system and irrigation management strategy, as well as the Participating Landowner's production needs.

From May 1 - July 15:

If discharge in Stream "X" is ≥ 200 cfs then the combined irrigation withdrawals for the enrolled land will be ≤ 35 cfs.

If discharge in Stream "X" is ≥ 150 to 200 cfs then the combined irrigation withdrawals for the enrolled land will be ≤ 30 cfs.

If discharge in Stream "X" is ≤ 150 cfs then the combined irrigation withdrawals for the enrolled land will be ≤ 20 cfs.

July 15 – September 1:

Regardless of discharge in Stream "X" the combined withdrawals for the enrolled land will not exceed 20 cfs.

After September 1:

All irrigation withdrawals from Stream "X" for the enrolled land will cease, per the associated periods of use for the Participating Landowner's water rights, including withdrawals for stock water.

Irrigation Water Management

The proposed contour ditch flood system is designed to provide adequate water for maximum growth for grass hay and pasture grass during the peak water use period of the year. This period generally occurs in July and August when plant use will average about 0.15 inch of water per day. Peak rates will be as high as 0.17 inch per day. Effective precipitation and unusual temperature and wind conditions will affect the water use.

The design is based on the water holding capacity of the soils and the rooting depth of the plants. The soils and associated total Available Water Holding Capacities (AWHC) are indicated in Table 1G, and the distribution of soil types on the enrolled land are presented in Figure 4G. For soil groups that are a complex of several soils, the soil with the least AWHC that comprises at least 20 percent of the area is used for water management. You may choose to manage for the soil that has the least AWHC; however, the set times and contour ditch spacing required will make management very difficult for the increased production. An effective rooting depth of 3 feet is used for grass. If soil features such as coarse sand and gravel are less than 3 feet deep, the AWHC and effective rooting depths are adjusted accordingly. To ensure peak production

and reduce plant stress, you should ensure you irrigate when no more than 50 percent of the AWHC is depleted from the soil profile. This is referred to as the Management Allowed Deficit (MAD) and is usually measured in inches of water.

The irrigation frequency or time between irrigations, during the peak use period can be determined by dividing the MAD by the expected water use in inches per day. It will take grass approximately 13 days to utilize the 2 inches available water during the peak water use period.

The water use efficiency of the Participating Landowner's contour ditch system will be dependent on soil type, land slope and topography, as well as your management skills. The system irrigation efficiencies expected are indicated in Table 1G. If the system irrigation efficiency is 35 percent and a net irrigation of 2 inches is planned, a gross water application of 5.7 inches is required.

An average flow rate of approximately 34.4 cfs will be needed to meet the peak daily water use by the crop. This is based on the net peak daily use rate and the estimated system irrigation efficiency (Table 1G, Appendix G).

During water-short years it will be important to have the soil profile filled entering the peak water use period, or entering periods when water availability is less than demand. The moisture stored during periods of low water use will help offset water demands when stream flows are low. A soil moisture budgeting procedure that tracks soil moisture conditions, crop water use, and effective rainfall will assist the irrigator in proper irrigation scheduling.

Yearly net irrigation requirements will vary due to weather, crop conditions, and crop type. The total seasonal net irrigation requirement for grass is approximately 11.1 inches. A gross water application of 31.7 inches will be needed to satisfy a net irrigation requirement of 11.1 inches if the system irrigation efficiency is 35 percent.

The recommended irrigation set times and distance between contour ditches will depend on soil types, the net irrigation required, field slope, and field topography. Table 1G provides the recommended contour ditch spacing and set times for each condition. If more water is applied than the soil can hold, the excess will percolate through the soil profile and below the normal root zone. This is an inefficient use of water and labor. The deep percolation also may transmit contaminants to the groundwater.

Soil, water, and crop data, as well as recommended set times and ditch spacing, for various irrigation conditions are shown in Table 1G. The attached guides will help in scheduling irrigation for optimum crop production and good water management:

1) Specific soils information for your fields
2) Irrigation Water Requirements-Crop Summary Data
3) Scheduling Worksheet for Flood Irrigation
4) Feel and Appearance Method of Estimating Soil Moisture
5) Mont guide: Irrigation Water Management-When and How Much to Irrigate

6) Irrigation Water Management Self Certification Form (Required for those receiving incentive payments for IWM)
7) The Montana Irrigator's Pocket Guide

Riparian Health and Grazing Management

Prescribed Grazing

The ranch is currently operated as a cow-calf operation and runs 130 cow-calf pairs and 21 replacement heifers annually. It is fenced into three main management units and as such, combines several of the land uses into each unit (i.e. pasture and range land is fenced in with hay land). This has greatly limited management options and also has led to decreased resource conditions. The existing two grazing units (fields 4 for Unit 1 and fields 3, 7, 8, and 9 for Unit 2) are utilized as season long (spring-fall) pasture and Unit 3 (fields 1, 2, and 6) is utilized in the fall, after hay is processed, through spring (Figure 2G). Livestock are provided unrestricted access to riparian areas in all units. This practice has led to overutilization of range and riparian areas and has significantly reduced the productivity and available fish and wildlife habitat of the ranch.

To meet the riparian conditions required in the CCAA, as well as meet the landowners' objectives to maintain livestock numbers, a comprehensive grazing plan was developed using NRCS prescribed grazing guidelines. This plan utilizes rotational grazing to achieve livestock feed and forage balance, variation in season of use, managed livestock access to water, and improved livestock distribution. Supplemental livestock (5 bulls and 2 horses) and known wildlife (4 moose reside on the ranch year round and 20 head of elk winter on the ranch from December–March) also were calculated into the forage demand. The resulting plan will ensure riparian area recovery and will maximize the production of the ranch for the desired livestock.

The existing operation is producing well below the potential for the given soils, slope, climate, etc. For example, the range units are producing 25 to 65 percent of the potential with the majority only producing at 25 percent of potential in terms of species composition and productivity. This translates into the loss of Blue bunch wheatgrass, which is the most productive and drought tolerant species possible. The pasture and hay land also are producing below the potential and currently produce 65 percent of the potential.

To maximize the productivity of the ranch and improve the riparian conditions several changes are planned in the infrastructure (livestock water and fences) and management of the livestock. The ranch will be divided into 16 management units (1 is the headquarters) by fencing and will include 7 riparian pastures (Figure 3G).

The benchmark UNIT 1 will be divided into four units and will be used to sustain the replacement heifers. These units will be utilized in the spring-fall and will be operated on a short duration (6-day) rotation to encourage riparian area recovery and maximize available forage. Off-site livestock water will be piped to a stock tank with water originating from an existing well located in the headquarters field.

The benchmark UNIT 2 will be divided into four units and will be used, along with new units from the original Unit 3, to sustain the remainder of the cow herd during spring-fall. The riparian area was separated from the hay fields in order to create a riparian pasture (field 12) and will eliminate the concentration of livestock in the riparian area during winter (when significant damage can occur on willows). Livestock will be wintered and fed hay on the hay fields (fields 2 and 18). Winterized livestock water will be provided through the addition of two stock tanks located at the fence lines separating the hayfields with the riparian pasture. These tanks also will serve as supplemental water for the riparian pasture when it is utilized in the rotation. Another benefit of this plan is that unit 3/4 also was separated from the hay fields and can now be utilized earlier in the year without any negative effects to the hay crops. Livestock water will be provided by the irrigation ditches that transect this unit. The grazing units (unit 3/4 and 12) will be utilized in the spring-fall, along with fall use of the hay aftermath (units 2 and 18) and will be operated on a short 6-day rotation to encourage riparian area recovery and maximize available forage.

The benchmark UNIT 3 will be divided into seven units and will be used in rotation with the previously described units. All units will be operated on a 6-day rotation and will have off-site livestock water provided to the riparian units from a tank centrally located. Livestock water in Unit 15 also will be provided through a stock tank and will replace the original irrigation diversion that historically provided the rangeland with water.

Facilitating Practices

To implement the prescribed grazing plan, several changes are needed with regards to infrastructure on the ranch. The installation of 8.9 miles of fence, five livestock watering facilities, and 2.6 miles of pipeline will be required for the implementation of this site-specific plan.

Channel Morphology

The Agencies and the Participating Landowners agree that the combination of improved riparian health and stream flows will lead to significant improvements in channel morphology and function within 15 years, which is related to the habitat quality and complexity for grayling in the system. While no specific agreement needs to be reached at this time between the Agencies and the Participating Landowner it is critical to state the significance of compliance with the prescribed grazing plan and the management plan for irrigation withdrawals in terms of improving channel morphology and function. The Agencies and the Participating Landowner agree to monitor the channel morphology (including channel cross section and longitudinal profiles) on the enrolled property every 3 years for the life of the Agreement (Figure 4G).

V. ADAPTIVE MANAGEMENT PLAN

STREAMFLOWS

The Agencies and the Participating Landowner agree to revisit this agreement if--1) production and / or conservation goals are not being achieved, or 2) the landowner is meeting production goals with less water diversion allowed in this plan. Modification to the agreement must be in writing and agreed to by all parties, per the Terms and Conditions in this Site Specific Plan.

ENTRAINMENT

Should entrainment of grayling be identified as a population level threat, the Agencies and the Participating Landowner shall investigate alternative methods to prevent entrainment, as identified in the Agreement.

MIGRATION BARRIERS

The Participating Landowner shall consult with the Agencies prior to installing any structure that potentially may act as a migration barrier to grayling on the enrolled lands.

RIPARIAN HEALTH

The Agencies and the Participating Landowner shall revisit the grazing plan if--1) production and/or conservation goals are not being achieved, or 2) the riparian health is not improving as indicated by the assessment model used by NRCS to evaluate riparian health. Modification to the grazing plan must be in writing and agreed to by all parties.

CHANNEL MORPHOLOGY

If after 5 years the channel morphology of Stream "X' flowing through the enrolled lands has not improved or has continued to degrade the Agencies and the Participating Landowner agree to investigate conservation options that will lead to improvements. These options may include active stream restoration techniques such as physically restoring the channel to its "ideal" condition and/or accelerating vegetation community health by planting mature or sapling willow species.

VI. MONITORING

IRRIGATION

The landowner will document bi-weekly the amount of water diverted at each diversion structure and provide the data to MFWP every 6 months (i.e., frequency stated under Part XII of the Agreement – Compliance monitoring).

Grazing

All grazing monitoring shall follow approved NRCS methodology and provided by NRCS to MFWP each year. Minimum grazing land monitoring documentation includes grazing use records outlining grazing periods and livestock numbers in each grazing unit. Monitoring data shall be used to make adjustments to grazing management as needed.

Riparian Health

Reference photo plots (two) will be established and maintained for each pasture; one where the stream enters the pasture (photo looking downstream) and one where the stream leaves the pasture (photo looking upstream). A photo will be taken at least once per year at each site to compare with reference (initial) conditions. The NRCS shall conduct Riparian Assessments every 5 years for the life of the agreement to monitor long-term trend of the riparian area.

Structure Maintenance

The Participating Landowner will be responsible for inspecting and maintaining each diversion dam and headgate on enrolled lands to ensure they are functioning properly. The Participating Landowner will remove any sediment, debris, or blockage that restricts the flow; and will immediately repair any damage caused by vandalism, livestock, vehicles, or high flows. Normal wear to the structure due to weathering also must be repaired. Repair any areas around the structures that show signs of erosion to prevent further damage. The headgate will be shut off at the end of irrigation season to prevent water from entering the canal and to maintain stream flows.

VII. COMPLIANCE AND REPORTING

The Participating Landowner is responsible for providing copies of all required monitoring documentation to MFWP for inclusion in the Agreement's annual report

VIII. SITE-SPECIFIC PLAN DURATION

The Agencies and the Participating Landowner shall comply with the components of this site-specific plan for 10 years beginning on October 1, 2005. The regulatory assurances and the incidental take coverage provided by the Permit issued by MFWP are linked to compliance with this site-specific plan.

IX. COVERED ACTIVITIES

This site-specific plan covers the grazing, range management, irrigation, stock watering, and crop production activities as described in this site-specific plan. Coverage also is provided for activities associated with implementation of the conservation measures as described in or required by the site-specific plan. The assurances and incidental take authority provided under the Permit do not extend to incidental take resulting from changes in land-use not specified in the Site-Specific Plan.

X. LANDOWNER AND AGENCY RESPONSIBILITIES

PARTICIPATING LANDOWNER

1) Permit the Agencies to conduct assessment of baseline environmental conditions and land use practices leading to the cooperative development of a site-specific plan for their enrolled lands.

2) Implement this site-specific plan consistent with the Agreement, including water conservation measures to improve streamflows, eliminate migration barriers, reduce entrainment, improve riparian habitat, and reduce impairments to water quality.

3) Allow Agency access to enrolled lands, with prior notification from agencies, to assess environmental conditions, monitor success of conservation practices, and ensure compliance.

4) Comply with the specific conservation measures agreed upon within this site-specific plan.

MONTANA FISH, WILDLIFE, AND PARKS

1) Carry out responsibilities for implementing conservation measures as outlined in the Implementation Schedule of this agreement.

2) Actively pursue funding to assist the landowner with implementation of the conservation measures; however, this site-specific plan does not guarantee funding assistance to the participating landowner.

3) If needed, translocate grayling gametes into suitable unoccupied habitat on the enrolled lands project area to meet restoration targets for distribution and abundance of grayling.

4) Carry out responsibilities for biological monitoring and compliance as outlined in this site-specific plan and/or in the CCAA.

5) Suspend or revoke Certificate of Inclusion if the landowner is in non-compliance of the site-specific plan.

USDA NATURAL RESOURCES CONSERVATION SERVICE

1) Carry out responsibilities for prescribed grazing and riparian health monitoring as outlined in the umbrella CCAA Agreement and this site-specific plan.

2) Carry out responsibilities for designing and implementing conservation measures as outlined in the Implementation Schedule (Section VIII) of this Agreement.

3) Actively pursue funding to assist the landowner with implementation of the conservation measures; however, this site-specific plan does not guarantee funding assistance to the participating landowner.

XI. IMPLEMENTATION SCHEDULE

Every effort will be made to implement the conservation measures as soon as possible to provide maximum immediate benefit to grayling and minimize authorized take under this Agreement. At a minimum, the implementation of conservation measures in this site-specific plan will meet the Agreement's timeline to reduce the threats to grayling on the enrolled property (see Table 5 in Agreement).

XII. COMPLIANCE MONITORING

Monitoring of compliance will occur at a minimum of every 6 months for the duration of the site-specific plan. As part of the compliance monitoring process the Participating Landowner will provide MFWP with documentation of the amount and timing of irrigation on a monthly basis. Irrigation withdrawals must be recorded for each irrigation ditch a minimum of twice a month (i.e., once every 2 weeks).

XIII. TERMS AND CONDITIONS OF THE SITE-SPECIFIC PLAN

This site-specific plan is subject to all the Terms and Conditions described in the Agreement (**Part XVI**). It also is subject to the following additional Terms and Conditions:

A. Modifications of the Site-Specific Plan.

Any party may propose modifications to this site-specific plan by providing written notice to the other parties. Such notice shall include a statement of the proposed modification and the reason for the modification. The parties will attempt to respond to proposed modifications within 30 days of receipt of such notice. Proposed modifications will become effective upon all parties' written approval and completion of any necessary environmental analysis as required by the National Environmental Policy Act, ESA, or any applicable Federal or State laws.

B. Certificate of Inclusion Suspension or Revocation in Cases of Non-Compliance.

The MFWP and USFWS may suspend or revoke, in whole or in part, the Certificate of Inclusion for cause in accordance with the laws and regulations in force at the time of such suspension or revocation (50 CFR 13.28(a)). Participating Landowners will be given written notice, by MFWP and/or USFWS, of documented non-compliance with requirements of the Agreement and their site-specific plan.

C. Termination of the Site-Specific Plan.

As provided for in Part 8 of the USFWS' CCAA Policy (64 FR 32726, June 17, 1999), the Participating Landowner may, for good cause, terminate implementation of the site-specific plan's voluntary management actions prior to the plan's expiration date, even if the expected benefits have not been realized. However, if the site-specific plan is terminated without good cause, the Property Owner is required to surrender the enhancement of survival permit at termination, thus relinquishing his or her take authority (if the species has become listed) and the assurances granted by the permit. The Property Owner is required to give [90] days written notice to the other Parties of its intent to terminate the site-specific plan, and must give the USFWS an opportunity to relocate affected species within [90] days of the notice.

D. Succession and Transfer of Property.

This site-specific plan shall be binding on and shall inure to the benefit of the Parties and their respective successors and transferees, (i.e., new owners) in accordance with applicable regulations (50 CFR 13.24 and 13.25). Should any non-Federal property owner who is participating in this CCAA transfer any interest in his/her property, the non-Federal property owner will notify MFWP at least 60 days prior to any transfer. The MFWP, or at the request of MFWP, the USFWS, will contact the new owner to explain the responsibilities applicable to the property to determine if there is interest in participation in the Agreement. The MFWP will notify the USFWS of transfer of ownership of enrolled lands and the results of contacts with new property owners. The responsibilities of an existing executed site-specific plan and its associated Certificate of Inclusion may be transferred to a new landowner or entity holding an interest in the land (e.g., lessee) if the proposed landowner agrees in writing to implement all the commitments of the site-specific plan and to comply with the terms of the 10(a)(1)(A) permit. Assignment or transfer of the site-specific plan shall be governed by USFWS regulations in force at the time.

E. Regulatory Assurances.

The USFWS provides the Participating Landowner the ESA regulatory assurances found at 50 CFR §§ 17.22(d)(5), 17.32(d)(5) and in the Agreement.

F. Remedies.

Each party shall have all remedies otherwise available to enforce the terms of this site-specific plan, except that no party shall be liable in damages for any breach of this site-specific plan, any performance or failure to perform an obligation under this site-specific plan, or any other cause of action arising from this site-specific plan.

G. Dispute Resolution.

The parties agree to work together in good faith to resolve any disputes, using dispute resolution procedures agreed to by all parties.

H. Availability of Funds.

Implementation of this site-specific plan is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this site-specific plan will be construed by the partners to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury. The partners acknowledge that the USFWS and NRCS will not be required under this site-specific plan to expend any Federal agency's appropriated funds unless and until an authorized official of these agencies affirmatively acts to commit to such expenditures as evidenced in writing. Further, all partners to this Agreement agree and understand that the implementation of the Agreement is dependent upon the lawful appropriation, authorization, and allocation of funds. This Agreement does not obligate the appropriation or expenditure of State funding. All expenditures by State agencies must comply with all applicable statutes and regulations, and must be independently authorized by legislative appropriation and any appropriate statutory authorities.

I. No Third-party Beneficiaries.

This site-specific plan does not create any new right or interest in any member of the public as a third-party beneficiary, nor shall it authorize anyone not a party to this site-specific plan to maintain a suit for personal injuries or damages pursuant to the provisions of this site-specific plan. The duties, obligations, and responsibilities of the partners to this site-specific plan with respect to third parties shall remain as imposed under existing law.

J. Relationship to Authorities.

The terms of this site-specific plan shall be governed by and construed in accordance with applicable State and Federal laws. Nothing in this site-specific plan is intended to limit the authority of the MFWP and USFWS to fulfill its responsibilities under State and Federal laws. All activities undertaken pursuant to this site-specific plan or the permit must be in compliance with all applicable State and Federal laws and regulations.

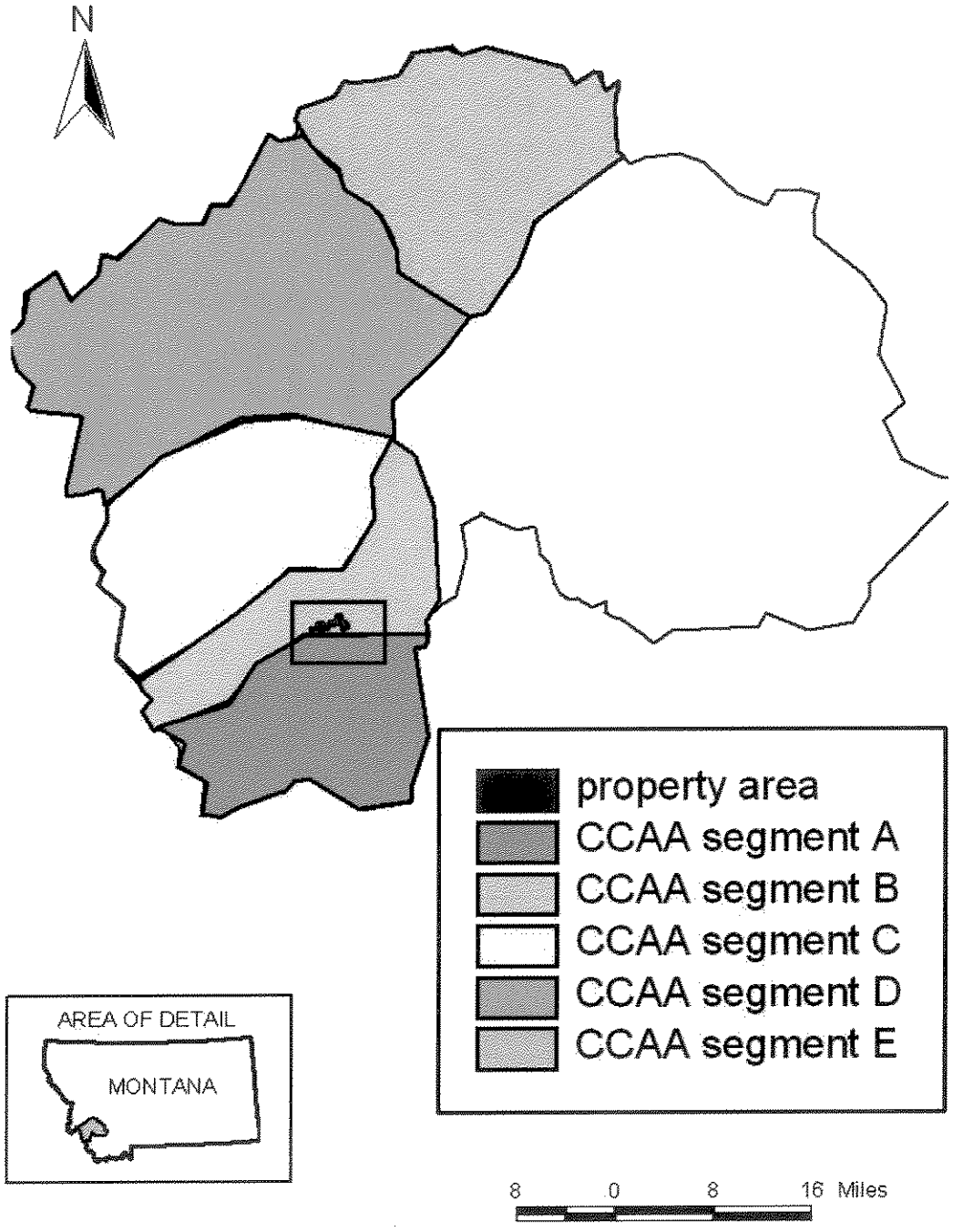

Figure 1G. The location of enrolled land for Landowner "A" in relation to the CCAA management segments.

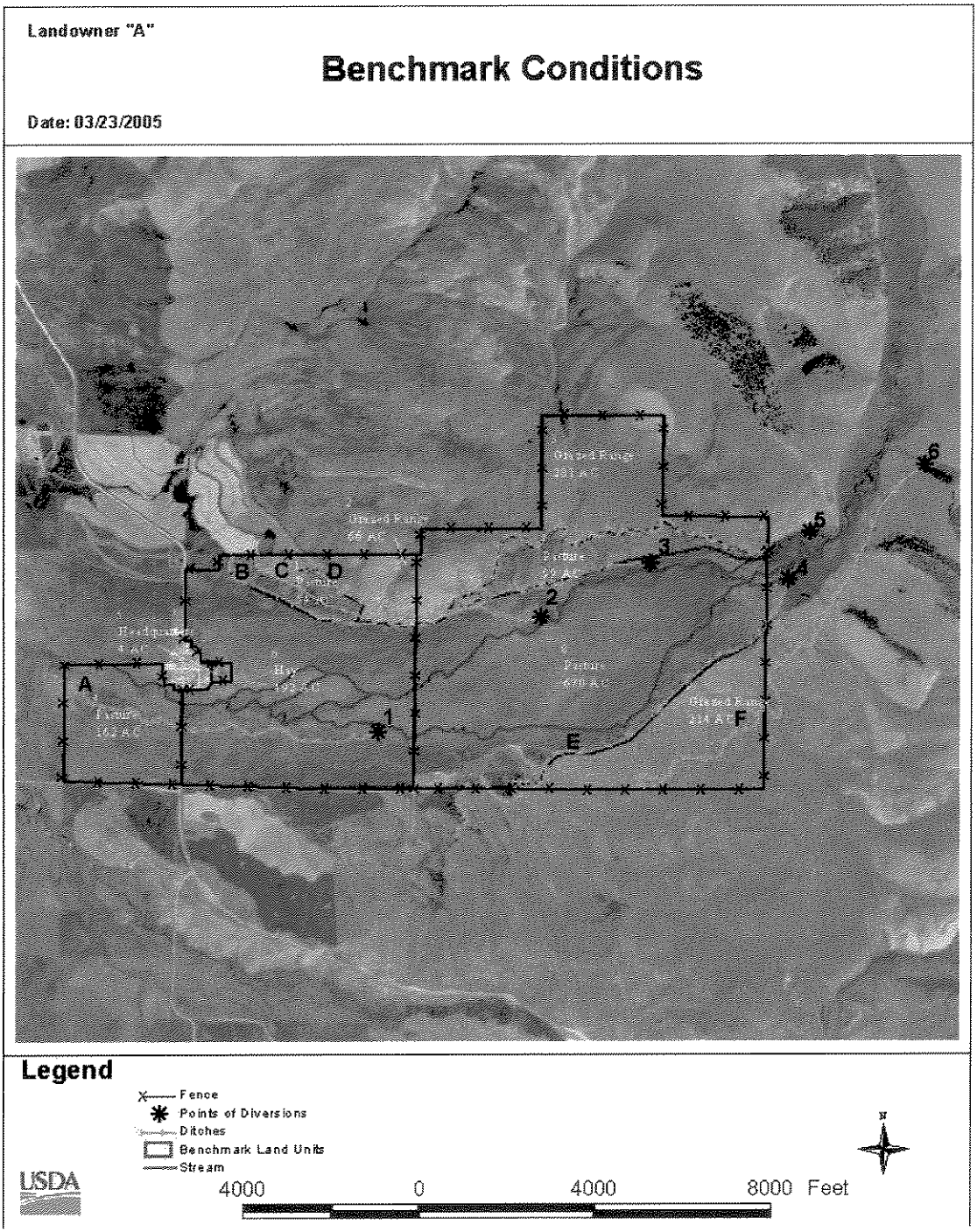

Figure 2G. The location and existing land management structures on the enrolled land for Landowner "A."

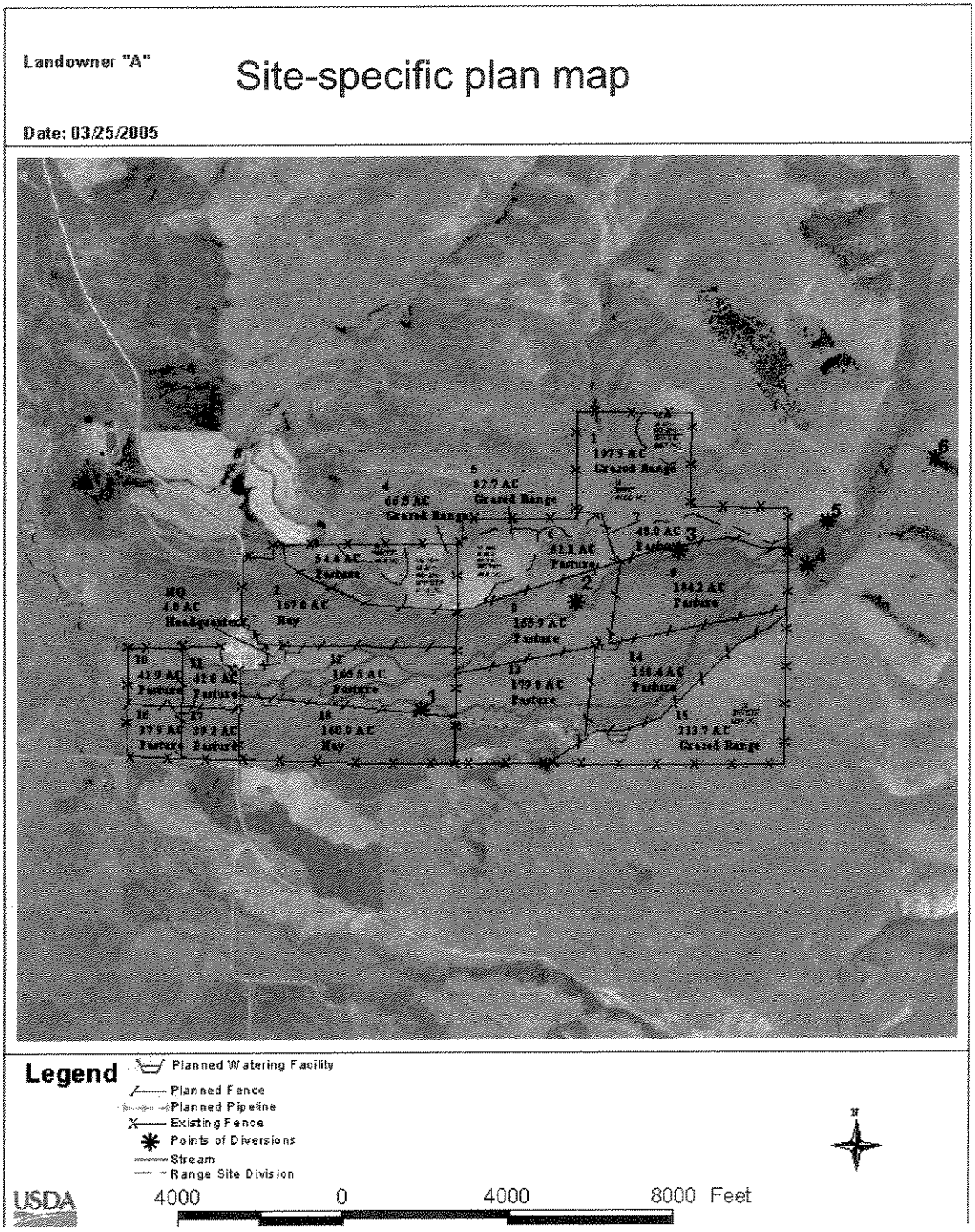

Figure 3G. The planned land use for the enrolled land of Landowner "A" and overview of structures needed to implement the site-specific plan.

Figure 4G. Distribution of soil mapping units on enrolled lands of Landowner "A" used to implement the landowner's irrigation water management plan. Soil types were used to derive the irrigation water management plan guidelines presented in Table 1G.

Photo 1G. Riparian and stream bank "trouble spot" along Stream "X."

Photo 2G. The current condition of a headgate on the enrolled land of Landowner "A."

Photo 3G. The current condition of diversion structures on the enrolled land of Landowner "A." The current diversion is called a "push up" diversion, that is maintained by redistributing (pushing up) streambed gravels with heavy equipment.

Photo 4G. The proposed diversion structure to replace and improve the current push up diversion structures found on the enrolled land of Landowner "A." This "rock-vane" diversion is self-sustaining (no streambed disturbance apart from installation) and allows fish passage.

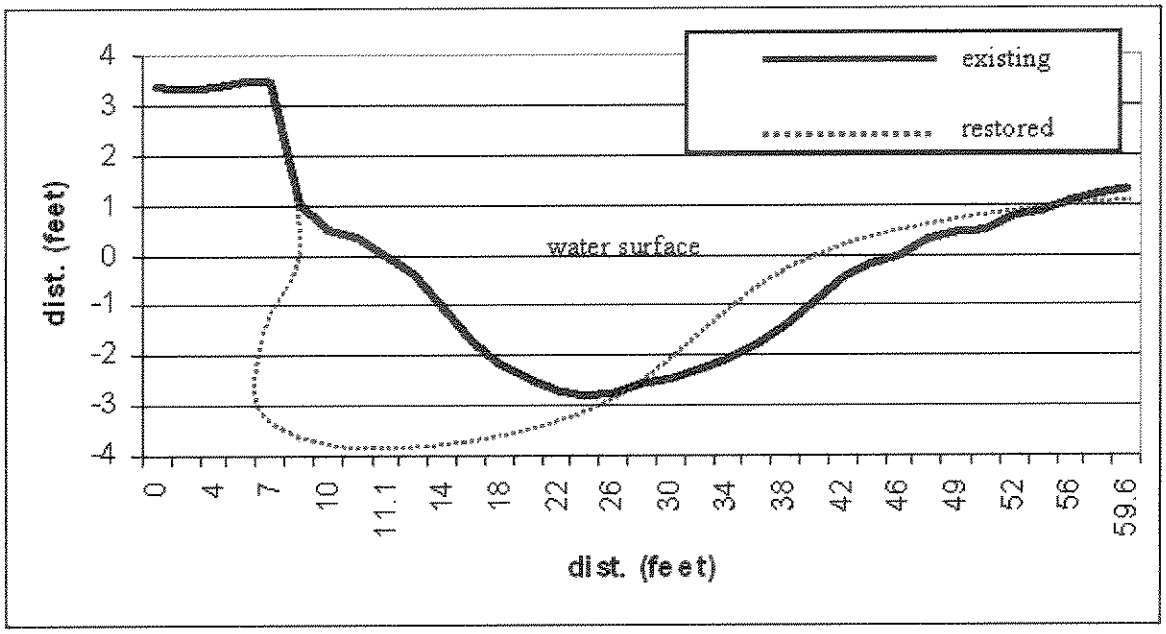

Figure 4G. Cross-sectional profile of Stream "X" showing the existing and expected restored morphology.

Table 1G. Irrigation Water Management Plan under the example site-specific plan. Gross irrigation requirements assume water is available when needed. The location of the specific irrigation requirements by soil type is presented in Figure 4G.

Soil Mapping Unit	Soil Name	Total Available Waterholding Capacity in Top 3 feet of Soil[1] (inches)	Management Allowable Deficit[2] (net irrigation reqd inches)	Estimated System Irrigation Efficiency[3] (%)	Gross Water Application per Irrigation[4] (inches)	Estimated Number of Irrigations per Year for Grass[5]	Gross Irrigation Reqd per Year for Grass[6] (inches)	Acres Irrigated	Water Diverted per Year[7] (est acre-feet)	Flow Reqd During Peak Use Period (est cfs)	Recommended Contour Ditch Spacing[8] (feet)	Recommended Set Time to Apply Mgmt Allowed Deficit[9] (hours)
3D	Libeg Stony Monad	4	2	28.1	7.1	5 to 6	39.5	44	145	1.1	90	15
5C	Hairpin Silt Loam	6.1	3	38.7	10.4	3 to 4	38.7	590	1902	14.7	125	30
15A	Fox Gulch Copperbasin Wisdom	4.6	2.3	40.7	5.6	5	27.3	59	134	1	250	19
23B	Wisdom Sheweg Mooseflat	2.8	1.4	32.9	4.2	8	33.7	296	831	6.4	175	10
32C	Philipsburg Silt Loam	6	3	27.1	11.1	3 to 4	40.9	44	150	1.2	125	15
37B	Wisdom-Big Hole	4.6	2.3	28.9	7.9	5	38.4	148	473	3.7	175	19
40B	Moose Flat Loam	2.8	1.4	33.8	4.1	8	32.8	296	809	6.3	175	10
								TOTAL	**4444**	**34.4**		
									Average = 3.0			

[1] Based on a 3-foot effective rooting depth for grass (Reference Table 3.2 and 3.4 Montana Irrigation Manual and soils limitations).
[2] Based on 50% allowable depletion of Total Available Waterholding Capacity (Reference Montana Irrigation Manual Table 3.2 and 3.3).
[3] Based on soils, field slope, topography, management factors, etc. (Reference Montana Irrigation Manual Table 6.5 and Farm Irrigation Rating Index).
[4] Management Allowed Deficit (or Net Irrigation Required) divided by System Irrigation Efficiency.
[5] Seasonal Net Irrigation Requirement for Crop divided by Management Allowable Deficit (or Net Irrigation Required).
[6] Net Irrigation Requirement for the season divided by System Irrigation Efficiency (Reference Irrigation Water Requirements software).
[7] Acre-feet per acre needed times acres.
[8] Based on Soil Intake Family, Net Irrigation Required, Field Slope, and Topography (Reference Montana Irrigation Guide Table 6.4).
[9] Based on Soil Intake Family and Land Slope (Reference Montana Irrigation Guide Table 6.4).

IN WITNESS WHEREOF THE PARTIES HERETO have executed this site-specific plan to be in effect on the date of the last signature below.

Participating Landowner	**Date**
Montana Fish, Wildlife and Parks	**Date**
U.S. Fish and Wildlife Service	**Date**