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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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.

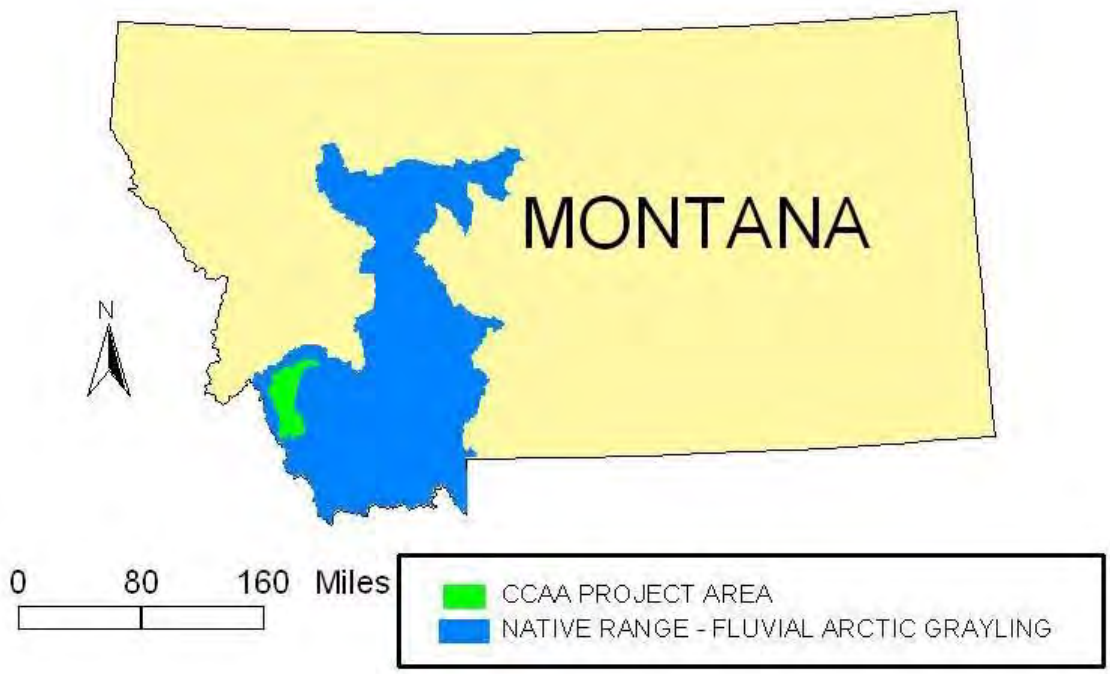


Figure 1. Proposed Project Area Within Native Range of Fluvial Arctic Grayling in Montana.

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.

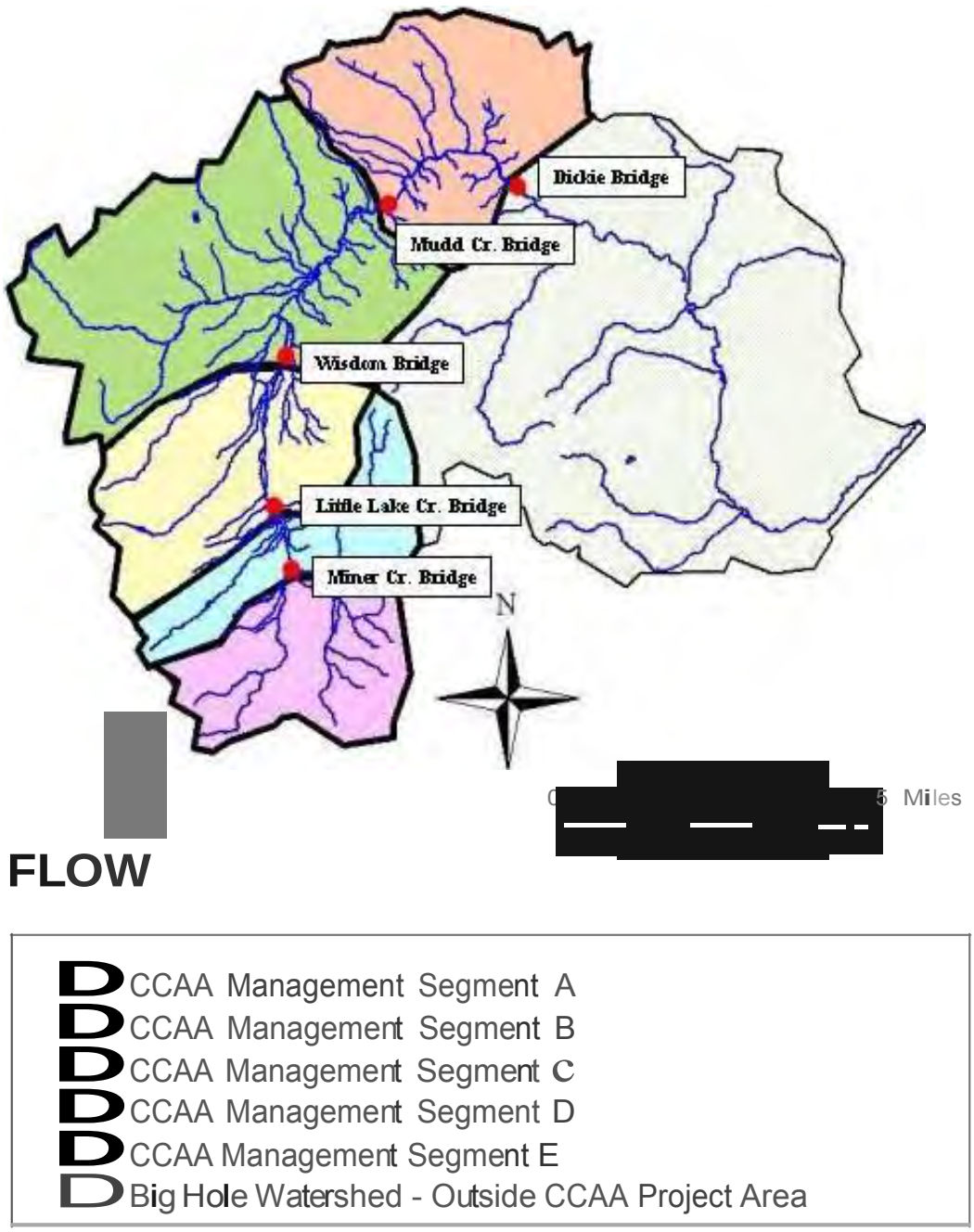
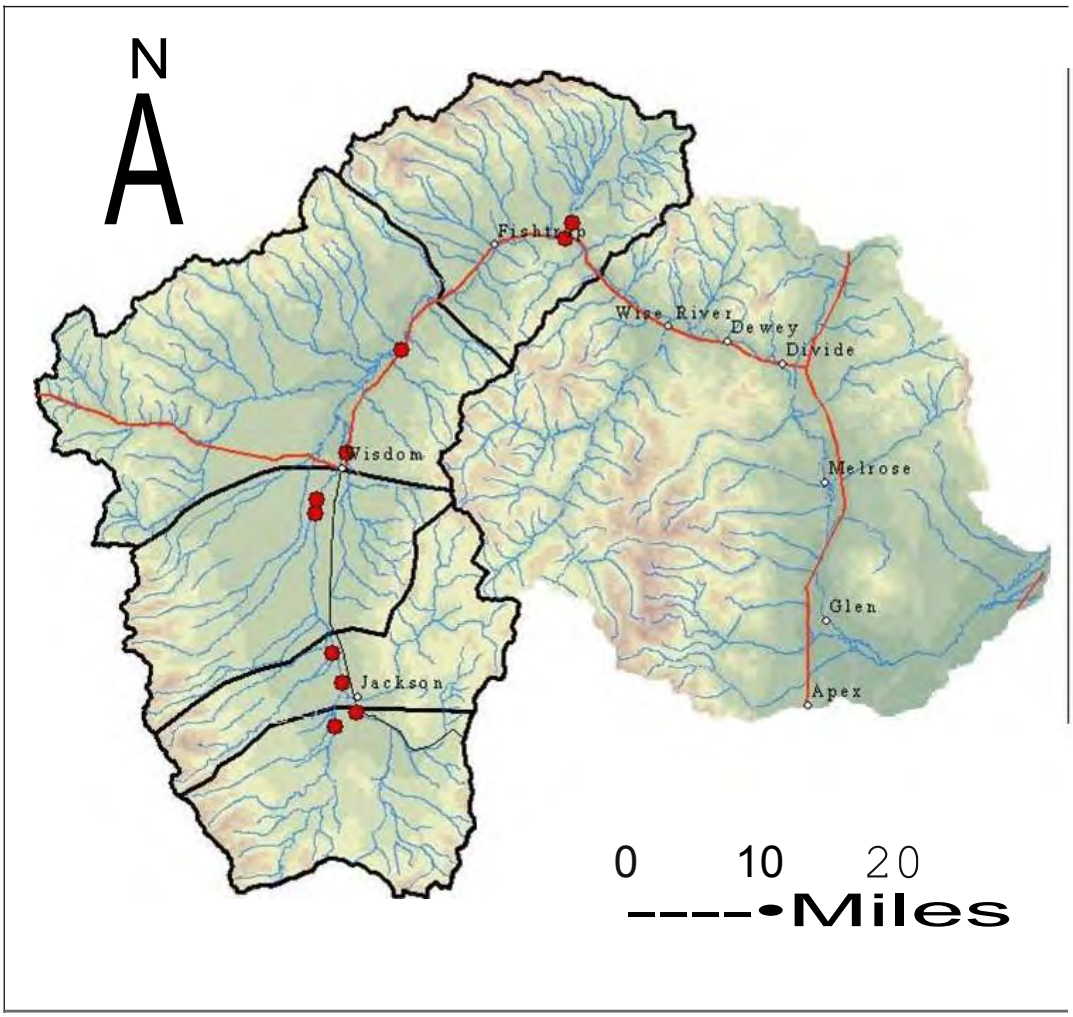


Figure 2a. Fluvial Arctic Grayling Agreement Management Segments for Upper Big Hole River Watershed Project Area



AREA OF DETAIL

Legend

grayling monitoring sites

Figure 2b. Location of CCAA Arctic grayling population monitoring sites.

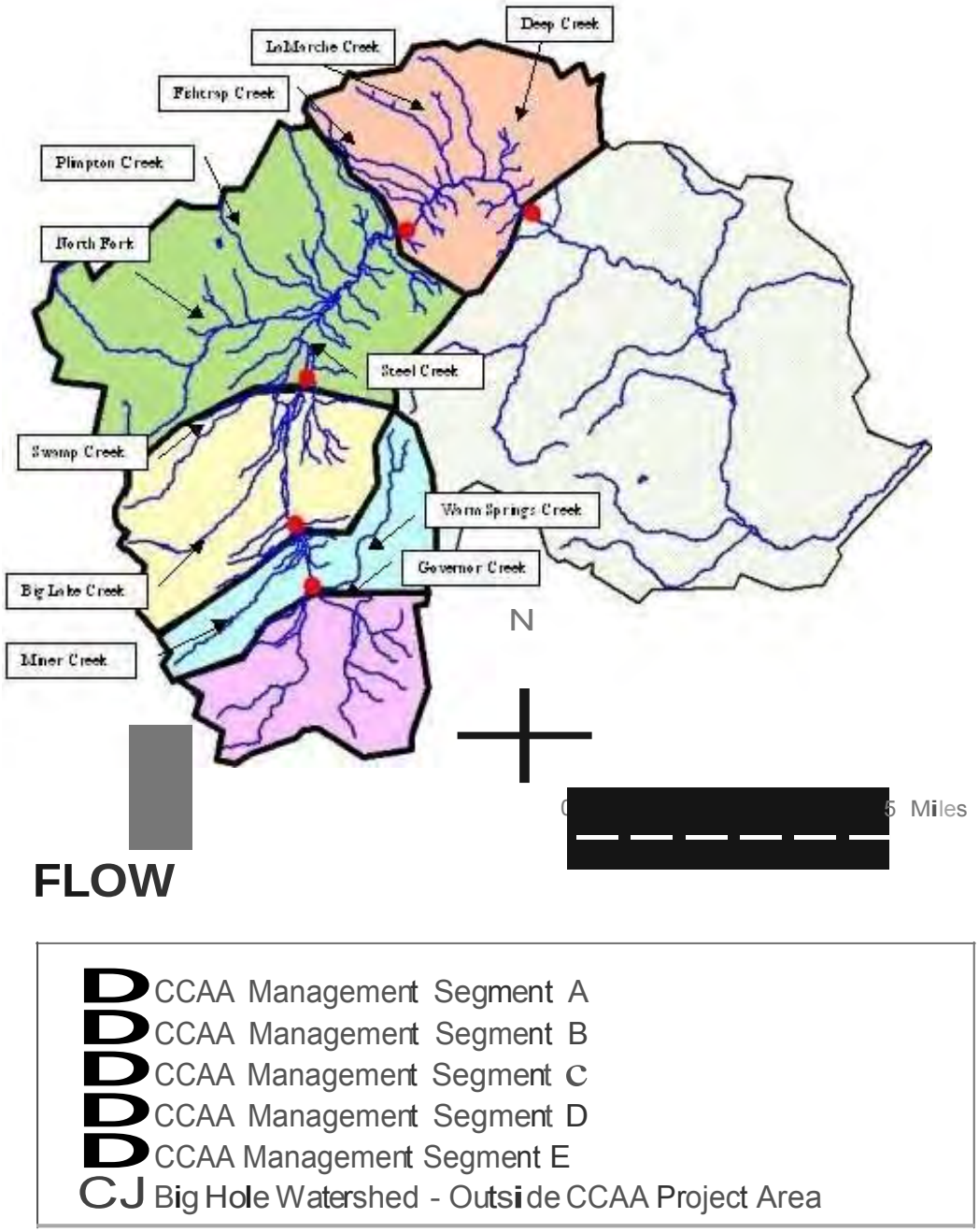


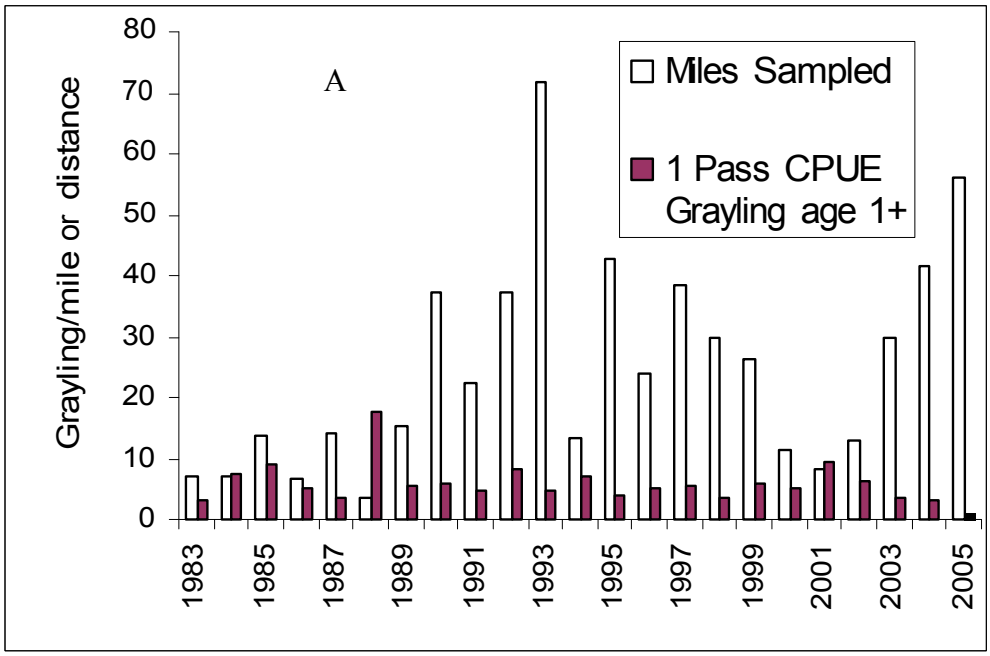
Figure3. :Major Tributary Streams to the Big Hole River in the Agreement Project Area.

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% 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% 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).



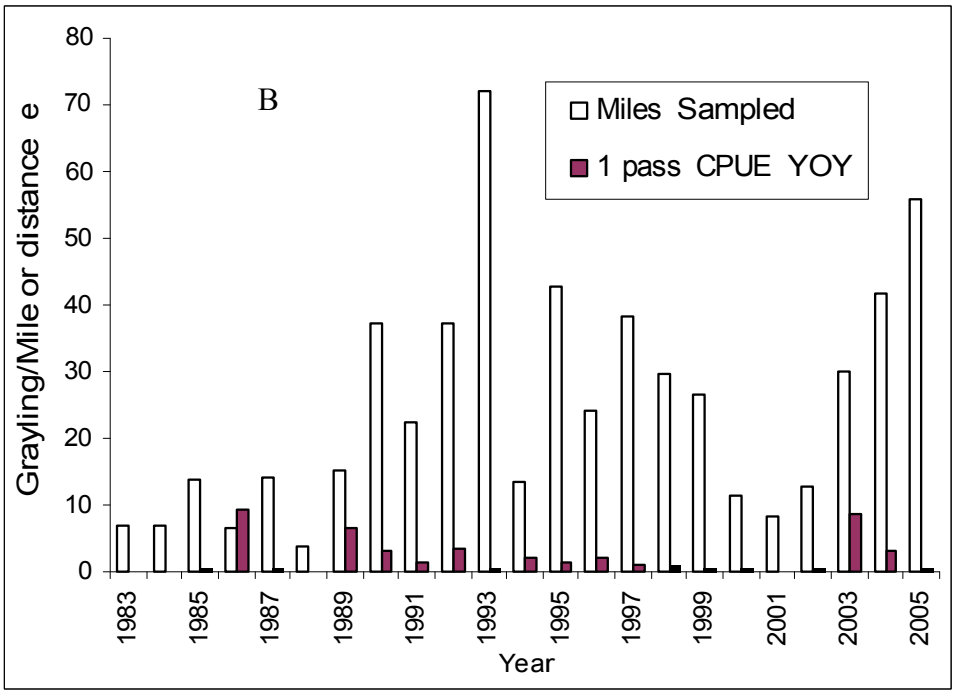


Figure 4 (A and B). Population Monitoring Data for age-1+ (panel A) and age-0 (panel B) Grayling in The Big Hole River during 1983-2005 standardized by one-pass catch-per-unit-effort electrofishing. The catch-per-unit-effort data plotted in reference to sample distance (miles) for that year.

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 2a). 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.

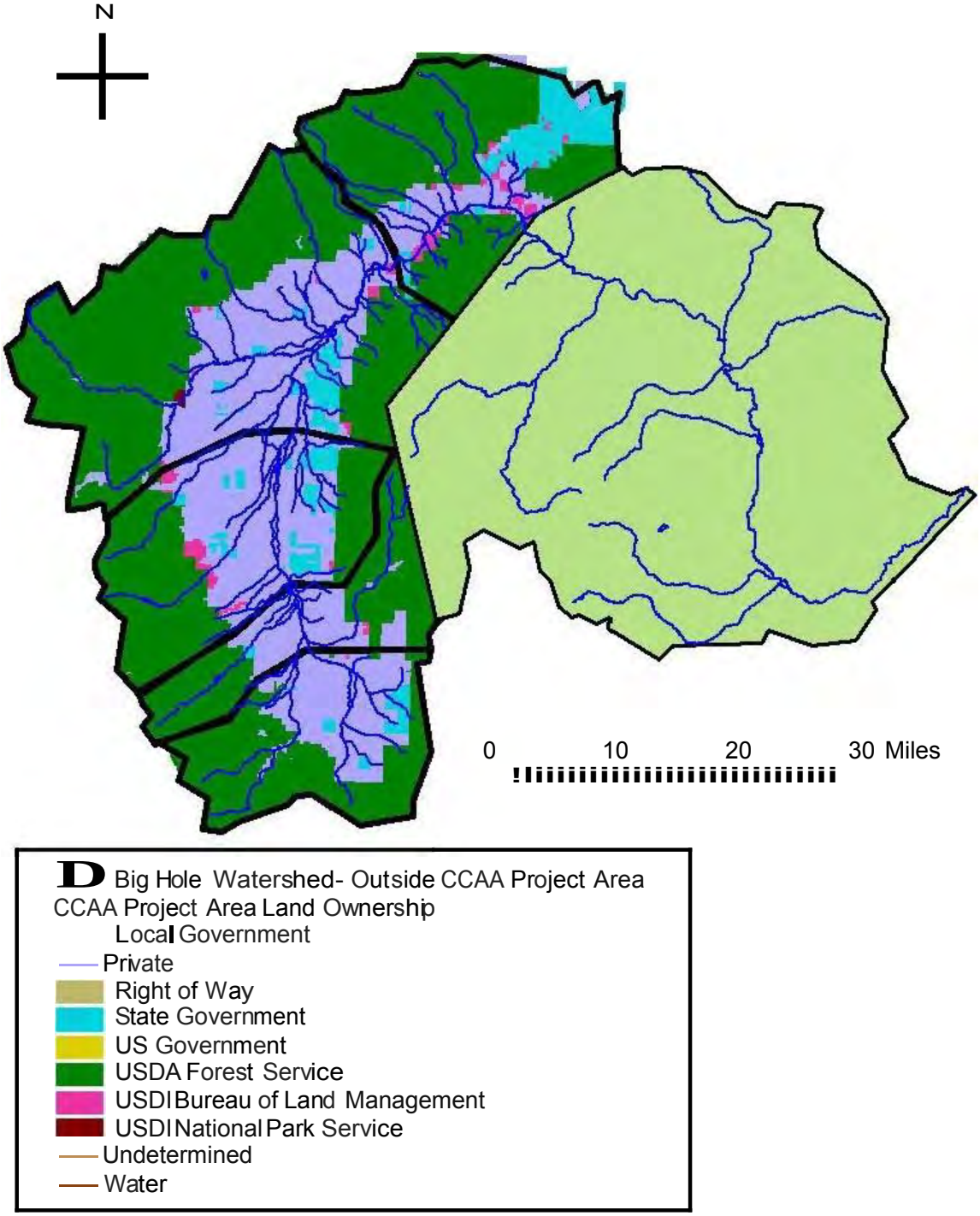


Figure 5. Land Ownership Within the Project Area. Project Area is Roughly Delineated by the Sum of State, Local Government (County And City), and Private Lands.

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% 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.

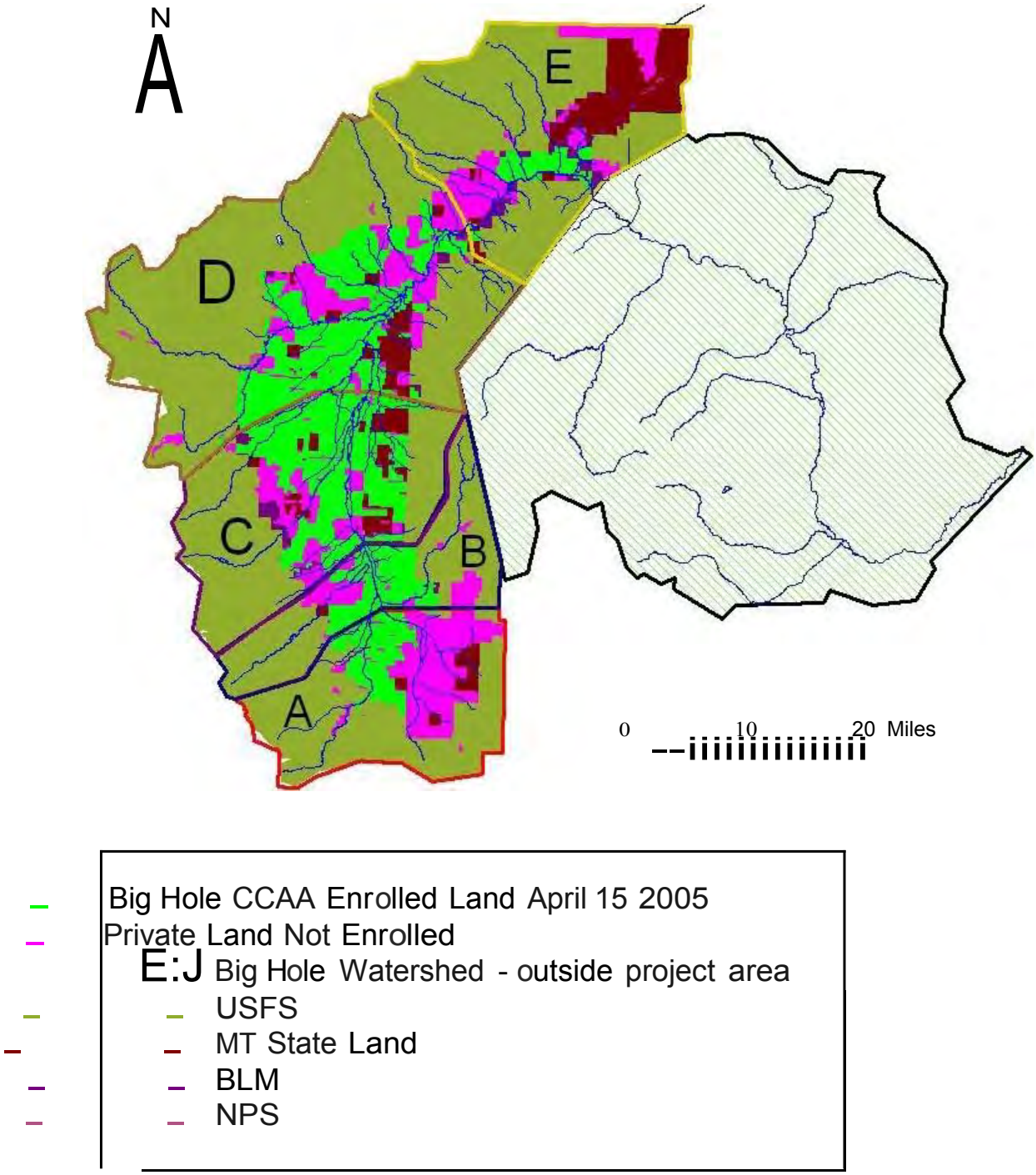


Figure 6. Area of Land Owned by Private Landowners Interested in Developing Site-Specific Plans Under the Potential Big Hole Grayling Agreement.

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 Research, Inc., [OEA] 1995; Lohr et al. 1996; Lamothe and Magee 2004b; Upper Big Hole Total Maximum Daily Load [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.

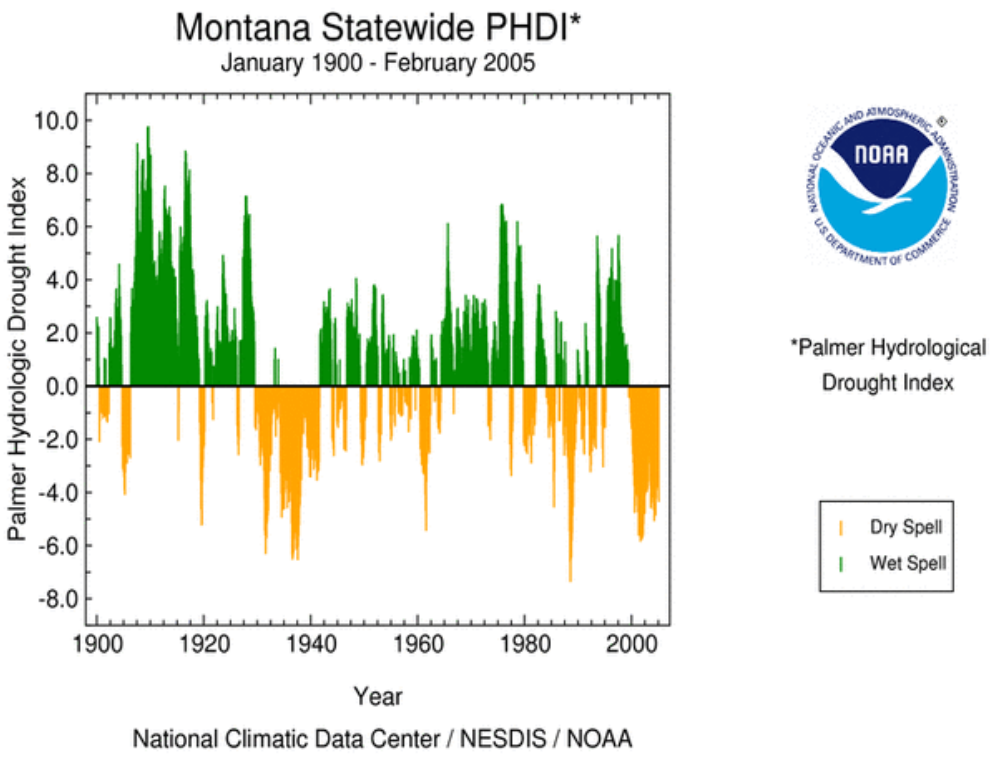


Figure 7. Historical Perspective of Current Drought Conditions in Montana. The Palmer Hydrological Drought Index indicator is based on moisture inflow (precipitation), outflow, and storage.

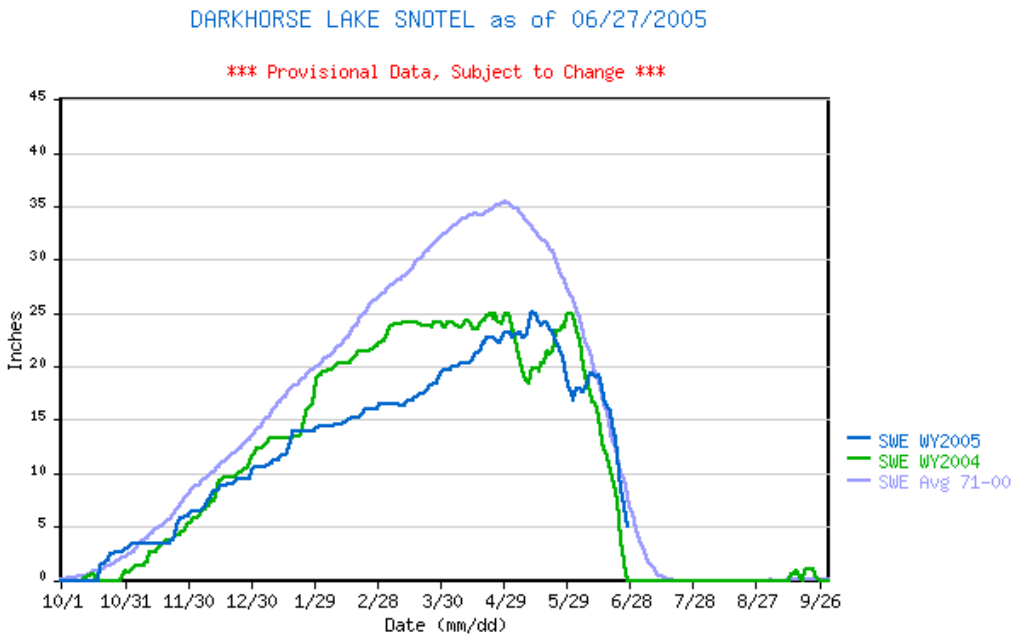


Figure 8. Current, Recent, and Historic Snowpack Conditions (Snow Water Equivalent (SWE)) from a NRCS Snowpack Monitoring Site in the Headwaters of the Big Hole River. Plots represent snow water equivalents for water years 2004 (SWE WY2004), 2005 (SWE WY2005), and the 30-year average over the period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

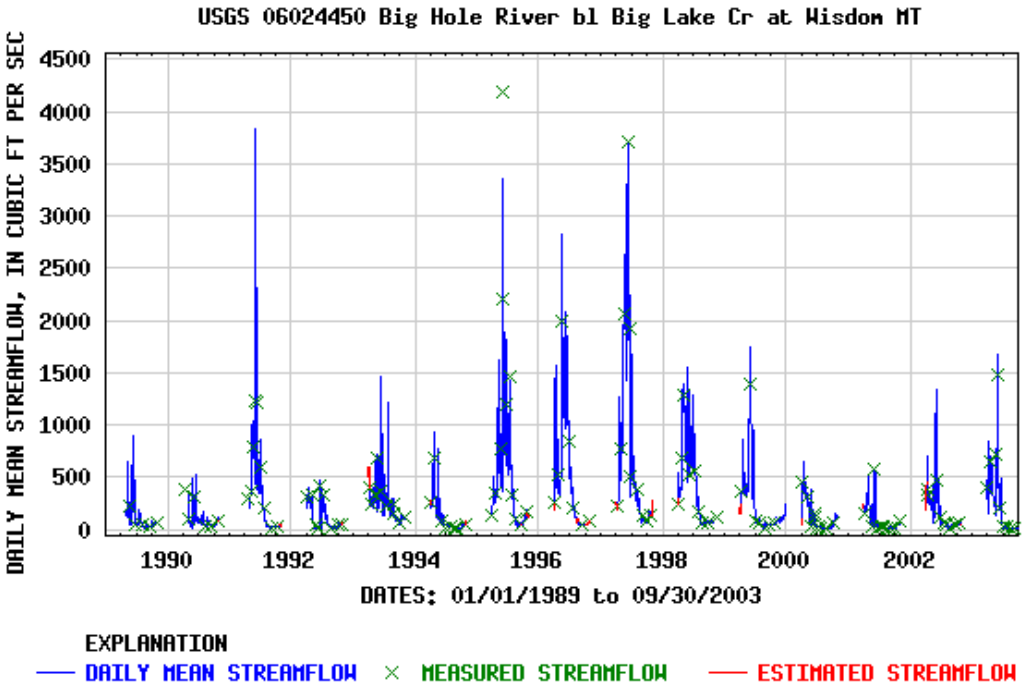


Figure 9. Historic Streamflows at the Big Hole River USGS Gauging Station at the Wisdom Bridge During 1989-2003.

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% 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 Supplemental Flow Agreementss (SFAs) 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.

Water Rights Technical Advisory Committee

Implementing the water-saving conservation measures of the Agreement may require the modification of existing water rights to maximize the benefits to instream flows for grayling. Additionally, various strategies may be needed to keep donated or saved water in stream channels to benefit instream flows. To provide technical guidance to the Agencies regarding water use, water rights and protection of instream flows and to assist with developing, negotiating and implementing SFAs and instream flow leases, a technical advisory team has been established. This team is comprised of representatives from FWP, DNRC, Montana Water Trust and the Trout Unlimited Montana Water Project with expertise in water rights, hydrology, water law, and water agreements.

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.

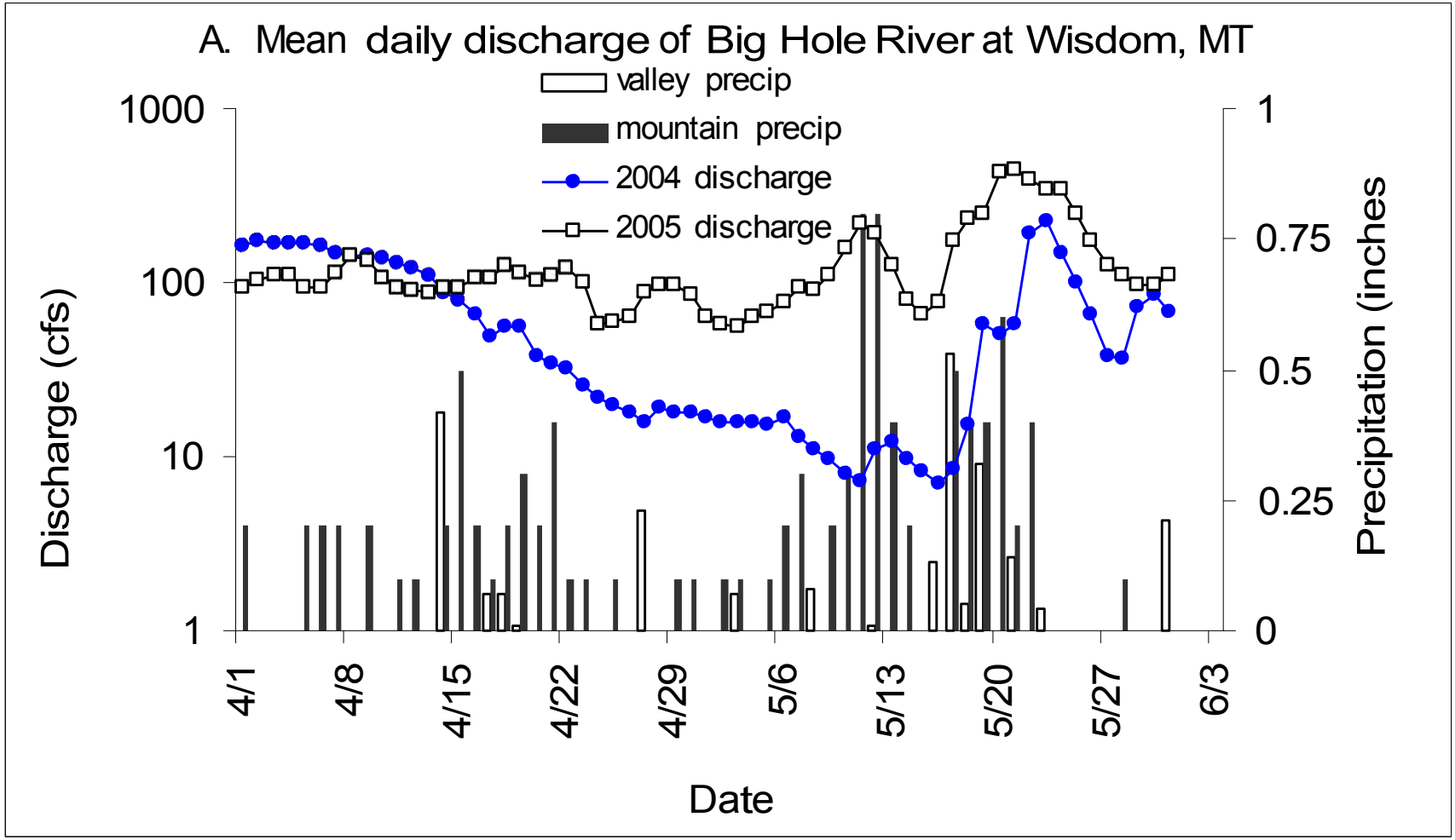
Reduced Irrigation Withdrawal Through Supplemental Flow Agreements

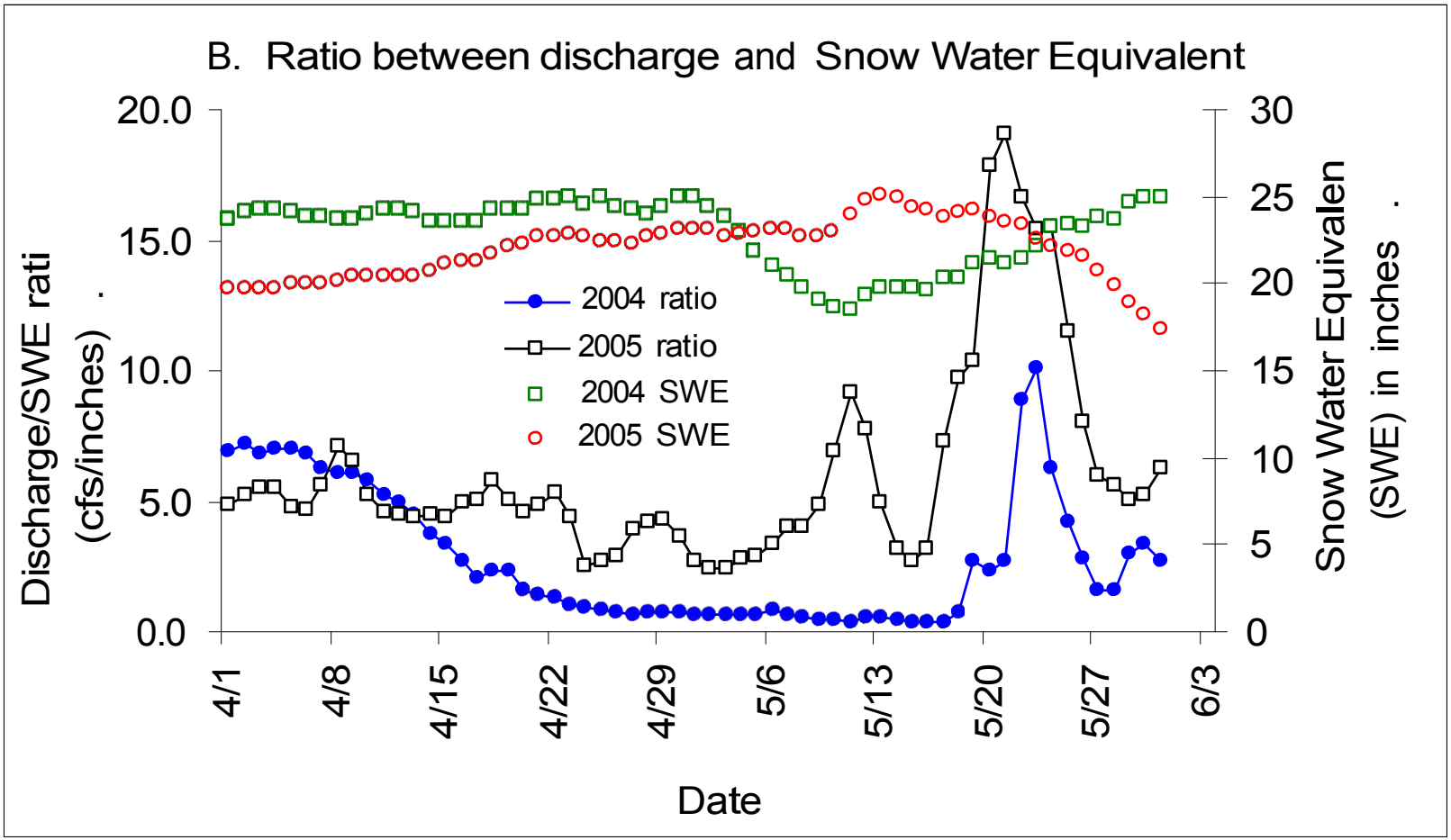
The Agencies shall negotiate reductions in irrigation diversions (from historic or legally-permitted levels) with Participating Landowners, as necessary, to benefit instream flows and respond to environmental stressors (e.g., drought). These flexible arrangements will take the form of a conditional arrangement 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 (i.e., spring spawning flows, bankfull discharge events, and 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 SFAs (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).


A. Mean daily discharge of Big Hole River at Wisdom, MT
valley precip
mountain precip
2004 discharge
2005 discharge
Discharge (cfs)
1000
100
10
1
Precipitation (inches
1
0.75
0.5
0.25
0
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
Date



Figures 10A & 10B. 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% of those at Jackson), water was actually being "gained" in 2005 (irrigation reduction program in place; flows at Wisdom 242% those at Jackson). On May 16, basin inflows were greater in 2005 (112 vs. 50 cfs in 2004) so absolute flows also were greater, but comparatively more water also was making it from Jackson to Wisdom in 2005 because flows at Wisdom were 66% of those at Jackson in 2005 (vs. 14% 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 2a). 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. This 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 Supplemental Flow Agreements - The Participating Landowner and the Agencies will retain the flexibility to revise the interim SFA 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 SFA may need to be revised in light of these new data and the implementation of the NRCS Irrigation Water Management guidelines. These longer-term SFAs will be similar in format to those "interim supplemental flow agreements" 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 10-15% (NRCS unpublished data). The NRCS Irrigation Water Management guidelines would require such a system to be upgraded to achieve 30% or greater efficiency (i.e., 50% or greater relative improvement). Similarly, the 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% 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% 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% (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, SFAs 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 2a.

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

It is the intention of the Agencies to strive toward 100% attainment and exceedance of flow targets within 10 years of Agreement implementation. However, existing hydrologic data and conditions beyond control of the CCAA indicate that these targets will not always be met. Uncontrollable circumstances such as delayed spring run-off, water use by non-enrolled landowners, and cumulative drought conditions may hinder full attainment of targets even during years with average snowpack conditions. Flows that approach the established targets, but may not always meet or exceed them, will still provide benefits to the system when compared to present conditions. Limited flow data precludes thorough analysis of pre-CCAA conditions for all management segments and three of five flow monitoring sites were newly established in 2005. However, data collected in 2005, the first season of monitoring at all CCAA segments, provides a "snapshot" of present conditions in terms of meeting flow targets.

2005 FLOW COMPARISON WITH CCAA FLOW TARGETS			
Spring = 80 x (very dry based on exceedance volume) Summer/Fall = 65x (dry based on exceedance volume)	Snowpack = 52% of 30-year average (May 1)		
Management Segment	Location	Spring April-June	Summer/Fall July-October
A	Miner Creek Rd	79%	13%
B	Little Lake Creek Rd	78%	50%
C	Wisdom	51%	13%
D	Mudd Creek Bridge	64%	77%
E	Dickie Bridge	--	60%

The Agencies estimate that after 10 years of Agreement implementation, streamflows in the Project Area will meet or exceed target values at least 75 % of the days during the spring period and during the summer and fall period in years with an average snowpack (based on NRCS snow water equivalent estimates for the Big Hole basin).

This 75% estimate is based on comparing minimum flow targets to streamflows recorded at Wisdom (Management Segment C) and Mudd Creek (Management Segment D) (see Appendix B). This should be interpreted as a general target because it is not currently possible to provide a valid quantitative prediction of streamflow improvements resulting from CCAA implementation. At a minimum, CCAA implementation will increase the number of days that meet or exceed flow targets in any given year. Additionally, daily flows relative to snowpack and precipitation during the spring and summer/fall periods will increase even if flow targets are not always met and this will be an improvement over present conditions.

As stated above, a thorough historical analysis of hydrologic conditions at all management segments is not possible because no data were collected on three of five sites until 2005. The streamflow gage at Wisdom, which is used to monitor flows in Segment C, has the only significant record of flows in the upper basin, 18 years. Compiled historic streamflow data at the Wisdom gage provides baseline data from which to roughly assess success of the CCAA implementation and gauge the scope for improvement (see following table). The retrospective analysis indicates that, on average over 18 years, flow targets at this one location would not have been met 100% of the time during wetter than normal, normal, or drier than normal water years.

PERCENT OF DAYS TARGETS MET AT WISDOM GAGE (Segment C) for 18-year period of record		
Water Year (exceedance)	Spring	Summer & Fall
wetter than normal (30x)	99	44
normal (50x)	79	34
drier than normal (70x)	51	9

Collectively, both the snapshot data and retrospective analysis indicate that meeting the summer-fall flow targets in Management Segment C 75% of the time after 10 years will be difficult. Similar analyses at the other management segments are not possible because of lack of data.

It is not possible at any location to predict the actual improvements to streamflows from the CCAA and account for the effects of drought and cumulative drought years, natural variability in the timing of snowmelt, or lack of control over non-enrolled water users. However, a number of comments can be made with greater certainty:

- The probability of meeting streamflow targets at every location will increase;
- CCAA implementation will increase the number of days that meet or exceed flow targets in any given year;
- Daily flows relative to snowpack and precipitation during the spring and summer/fall periods will increase even if flow targets are not always met; and,
- The CCAA will result in an improvement over present conditions.

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% 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 the grayling population has not met both the expected 5-year abundance trend and 10-year distribution increase, then the Agencies will pursue all available options, both within (enrolled landowners) and outside the Agreement (nonenrolled 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.

To measure the effectiveness of irrigation management during these periods, the Agencies will actively monitor the relationship between the timing and magnitude of snowmelt and precipitation to the frequency and duration of high flow events in the Big Hole River at all management sections. Pre-CCAA conditions at the Wisdom Bridge indicate a recurrence interval of bankfull discharge every 1.8 years (i.e., 10 of the 18 years of record).

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% and 76% of the time, respectively; whereas during 1991-94 the flows met or exceeded spring and summer-fall targets 72% and 45% 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.

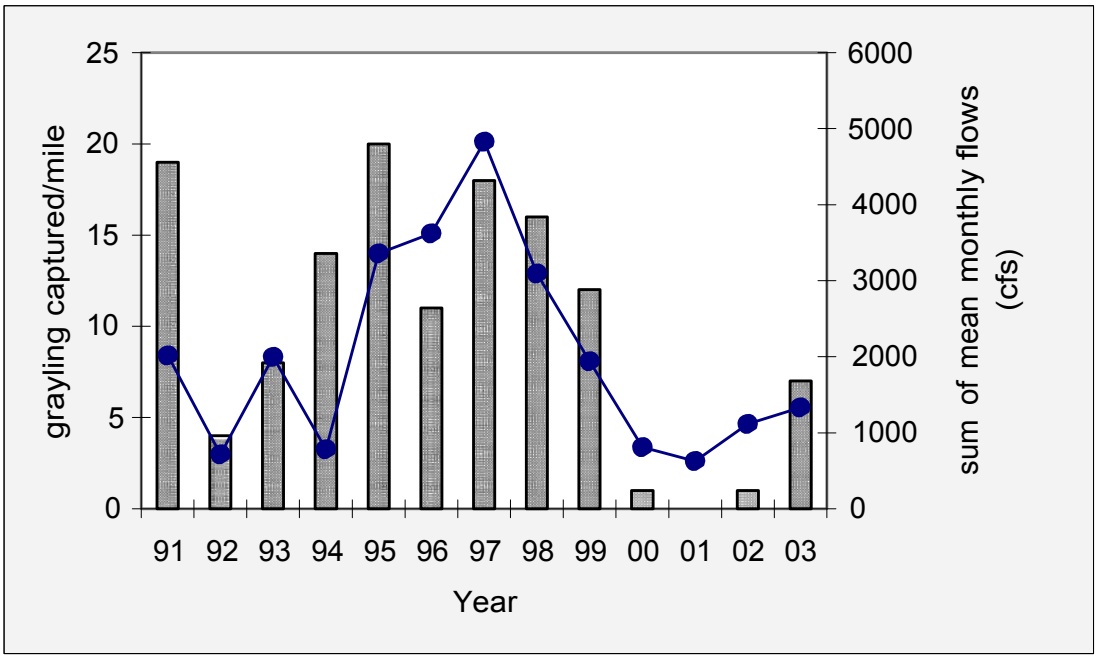


Figure 11. Relationship Between Discharge and an Index of Grayling Abundance (CPUE Including All Age Classes) in the Wisdom Reach During 1991-2003. Discharge represented by the sum of the mean monthly flows between April-October at the Wisdom bridge. Grayling surveys were restricted during 2001 because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

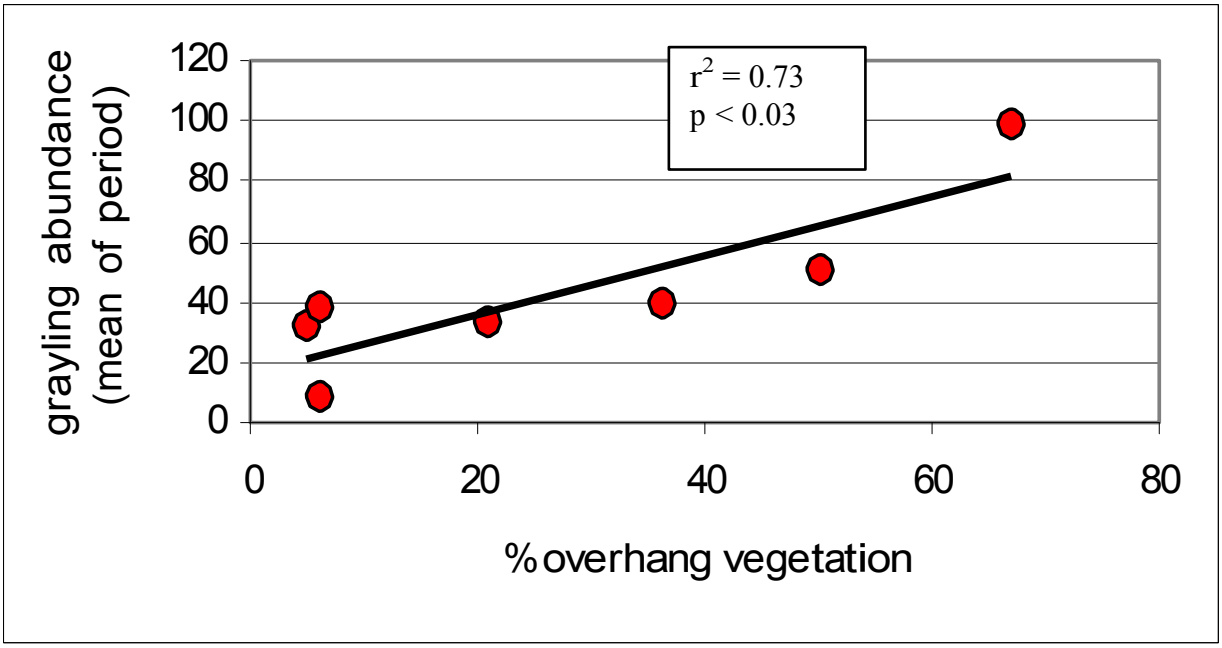


Figure 12. Relationship Between Arctic Grayling Abundance and the Abundance of Overhanging Vegetation Within an Inventory Reach Based on Data Collected During 1992-96 (from Lamothe and Magee 2003).

B. RIPARIAN ZONE CONSERVATION AND RESTORATION

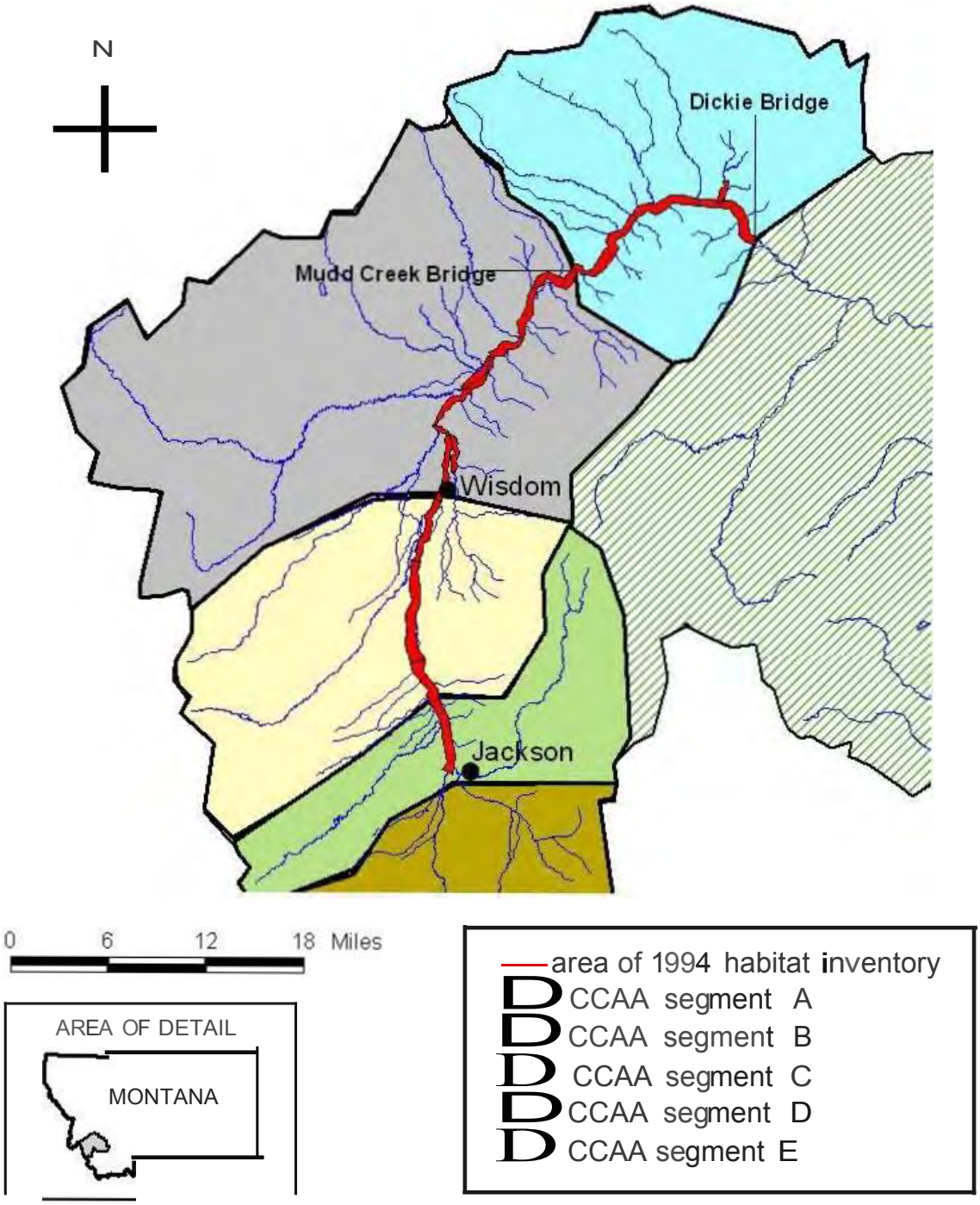
Limiting Factor - Degraded and Nonfunctioning Riparian Habitats

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% of the variation in Arctic grayling abundance was explained by the relative abundance of overhanging vegetation (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 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).



Figme 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%) of the willows in the area were found to be decadent or suppressed and less than 20% were found to be healthy (Figure 14).

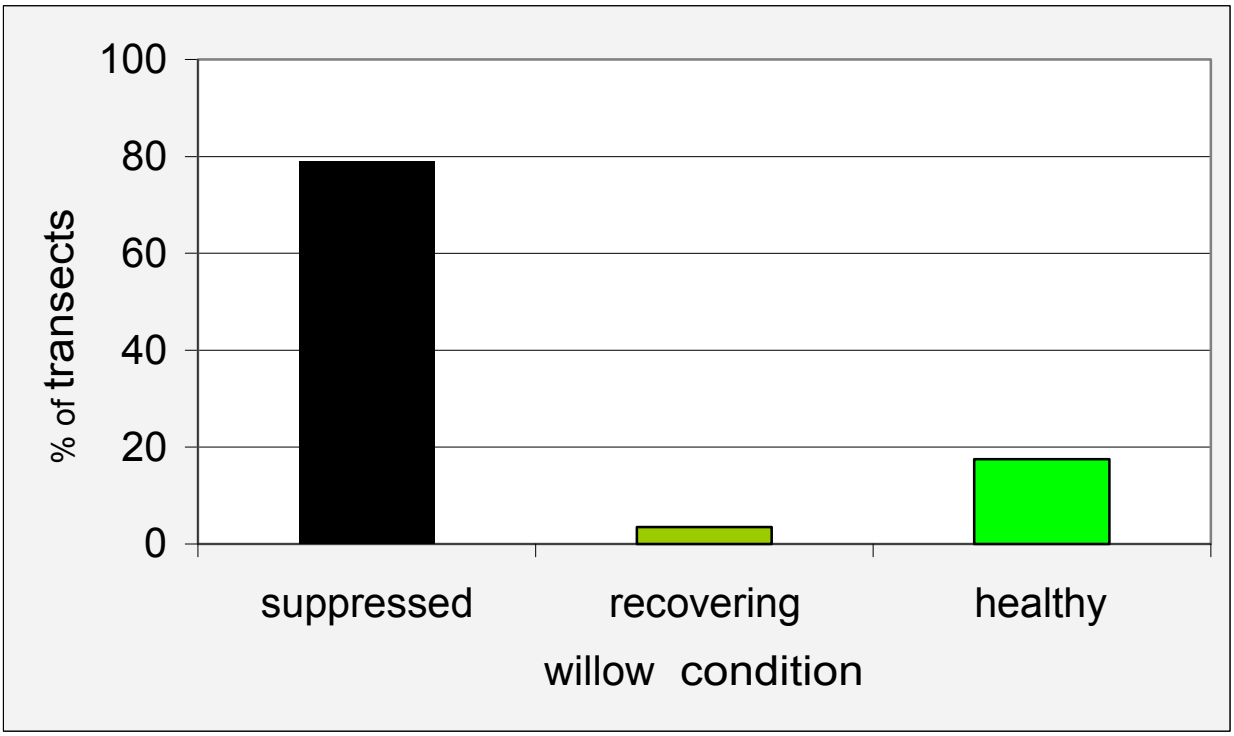


Figure 14. Condition of Willow Communities in Riparian Areas Within the 1994 OEA Habitat Inventory Area (Agreement Management Segments B-E).

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).

The OEA summuary 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 suggests that riparian areas within the Project Area are in need of some relief from the recent level of grazing pressure.

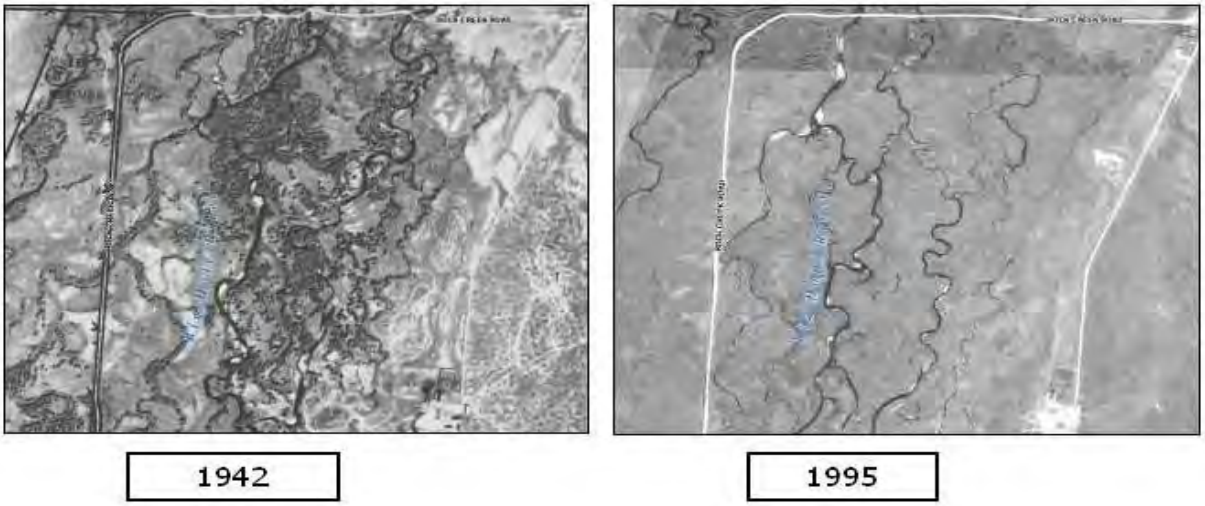


Figure 15. Aerial Photograph Showing a Significant Reduction in Riparian Coverage Within a Part of the Project Area Between 1942 and 1995.

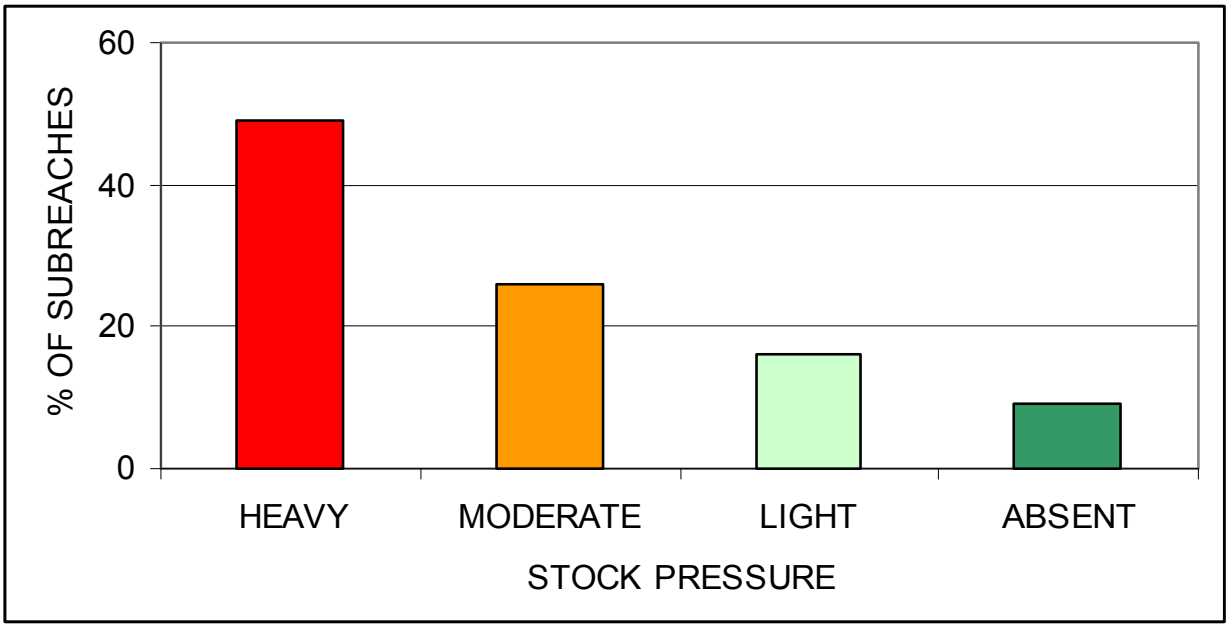


Figure 16. Estimated Stock Pressure in Riparian Areas from the 1994 OEA Habitat Inventory.

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%), 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% of the area inventoried had evidence of this transformation.

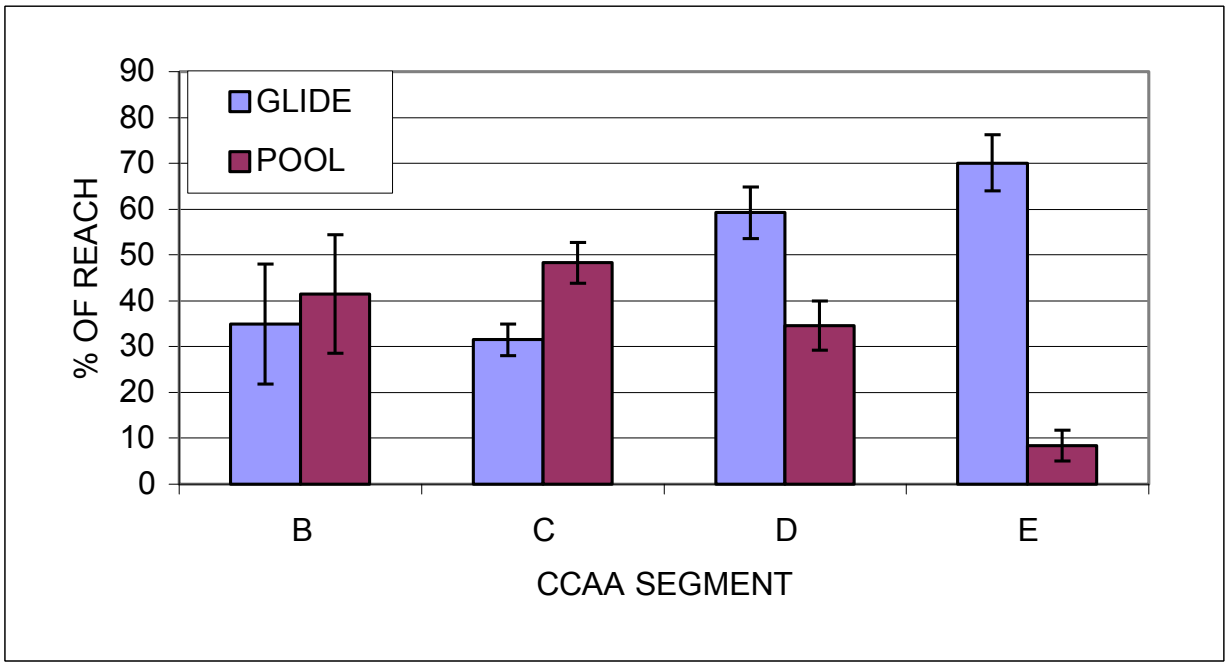


Figure 17. The Spatial Relationship Between the Relative Abundance of Pools and Glides Within the Project Area (OEA 1995).

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).

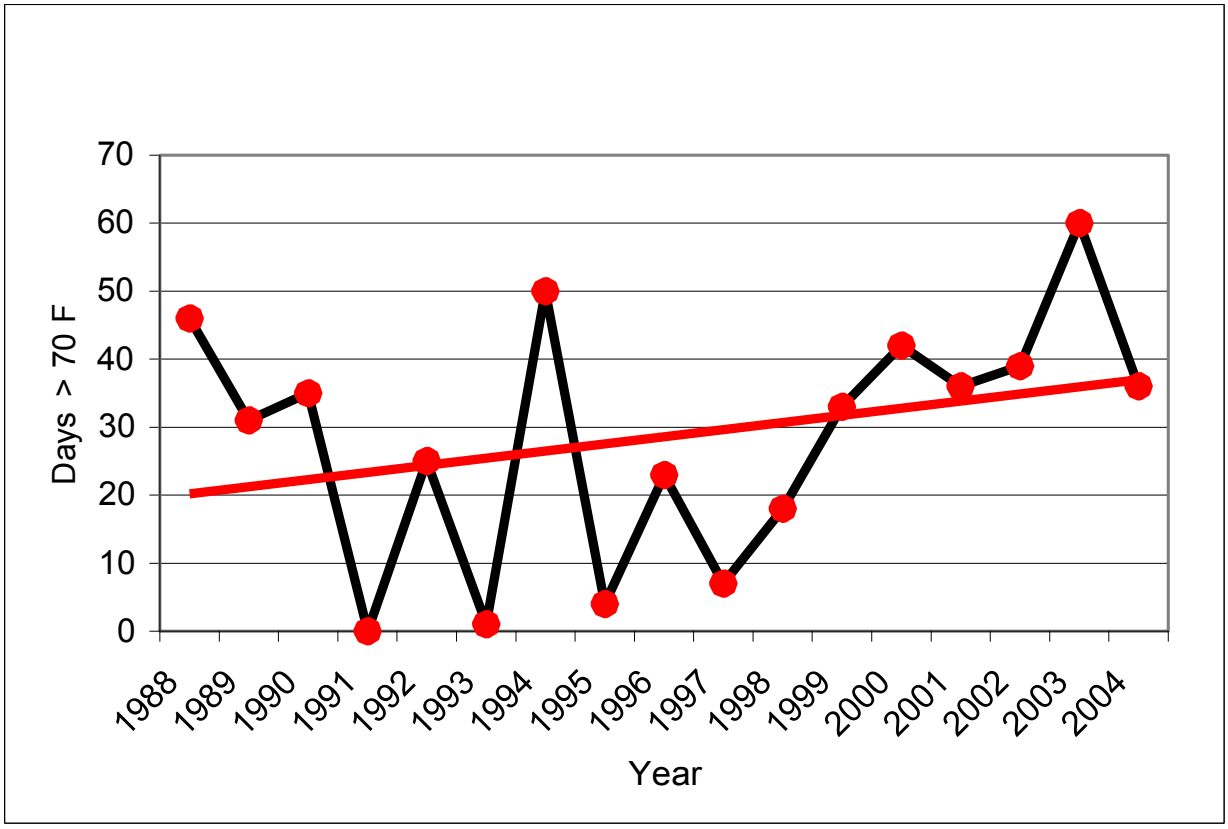


Figure 18. Plot of the number of days that water temperature in the Big Hole River at Wisdom exceeded 70°F (21°C), which is presumed to be stressful to salmonid fishes.

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%. 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. Active channel restoration may be necessary where the Agencies determine that passive restoration (i.e., natural channel adjustment) may not provide sufficiently rapid habitat improvements for grayling.

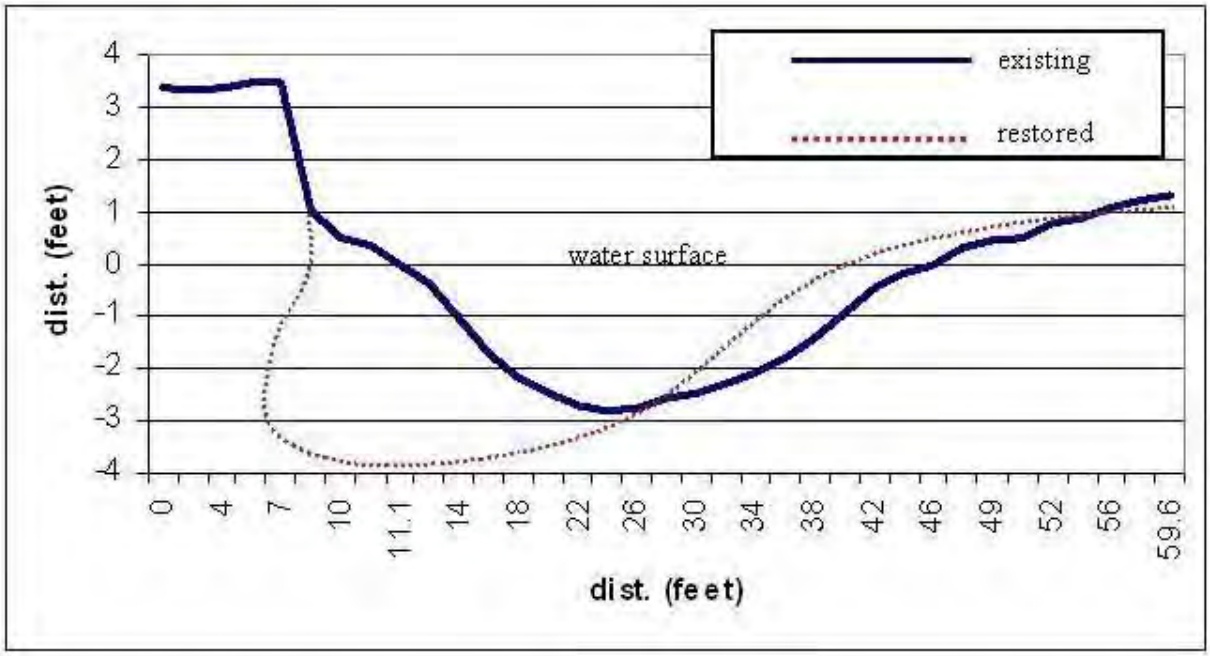


Figure 19. Cross-sectional elevation data from a typical pool within the Project Area (Steel Creek). The dashed line shows the expected restored condition from proposed conservation measures.

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%) 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).

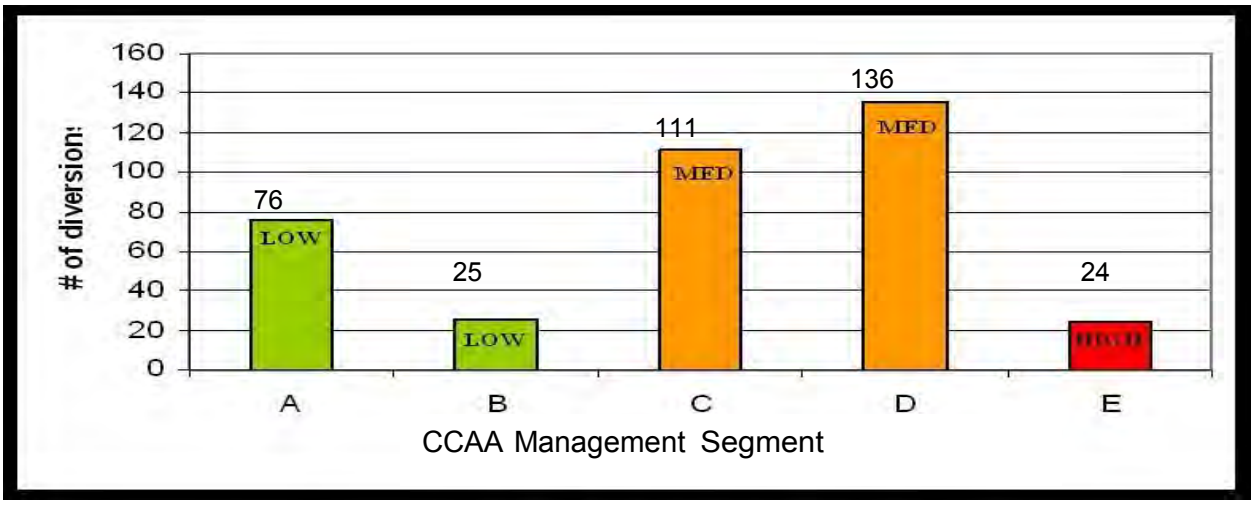


Figure 20. Distribution of the Approximately 372 Diversions Likely to be Entraining Grayling Within Irrigation Ditches by Management Segment Within the Project Area. The associated relative probability of grayling entrainment (HIGH, MED, or LOW) by management segment is based on the current known population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

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[*] 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.

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 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 SFAs, 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 reevaluation 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 is in the process of updating the existing Restoration Plan. 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 and comment on this plan.

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. The increase in the number of monitoring reaches dictates that a combination of single-pass CPUE and multiple-pass mark recapture techniques will be used to characterize grayling abundance within each of these

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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.

monitoring reaches. All grayling captured will be given an identifying mark and when 10 or more age-1+ grayling are captured and marked on the initial pass, a second-pass will be performed to provide the data necessary for an estimate of age-1+ grayling abundance.

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) based on the 10 CCAA monitoring sites, the index of abundance (CPUE based on cumulative total captures/total distance) for age-1 and older grayling will exhibit a positive trend over the 5-year period following execution of the Agreement. Appropriate statistical methods will be used to estimate this trend; 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 over the 5-year period following the execution of this Agreement and 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.

VIII. IMPLEMENTATION OF THE AGREEMENT

Upon execution of this Agreement by all parties and compliance with all applicable laws, the USFWS will issue a section 10(a)(1)(A) Enhancement of Survival Permit to MFWP. This Agreement will constitute the Candidate Conservation Agreement with Assurances consistent with the USFWS' final policy (USFWS and National Marine Fisheries Service 1999). The Permit will include, among other things, ESA regulatory assurances set forth at 50 CFR §§ 17.32(d)(5) and 17.22(d)(5). As described below, assurances are provided to the Permittee and Participating Landowners that have a Certificate of Inclusion and an approved "Phase III" site-specific plan that their land and water management activities will not be curtailed or modified beyond what is stipulated under the Agreement and their site-specific plan so long as all requirements identified in Phases I, II, and III are being properly implemented.

The Agencies have developed a phased implementation schedule to provide immediate and long-term benefits to grayling, facilitate maximum landowner participation, enable development of meaningful site-specific plans that are tailored to the property, and make the most efficient use of agency financial and personnel resources. This schedule initially addresses threats to grayling that can immediately be affected by Participating Landowner and Agency actions, then moves toward the development of a long-term plan that attends to the overall conservation needs of grayling. The length of time required to complete the development of a long-term plan (i.e., site-specific plan) on a specific property will depend on the size and complexity of the land units, which influences the time needed to collect baseline data and develop a scientifically and economically sound site-specific plan. The Agencies anticipate that the enrolled lands to receive the most immediate attention in the assessment and planning phases will be those where land and water management are predicted to have the greatest influence on grayling (see Prioritization Ranking). Many of the initial site-specific plans are expected to be complex and among the most time consuming to complete, so the completion rate for site-specific plans is expected to increase through time as the Agencies progress through the prioritized list of enrolled lands.

Upon signature by the Participating Landowner to the "Phase I" stipulations, the Participating Landowner is considered to have entered (is enrolled in) the Agreement and must comply with all the applicable Phase I requirements described below and in Table 6. In exchange for agreeing

to implement conservation measures identified by the Agencies during the Phase I rapid assessment, the Participating Landowner receives (during Phase II) a Certificate of Inclusion, counter-signed by the appropriate representatives of both MFWP and USFWS, that allows a specified level of take of grayling associated with covered activities, which are standard agricultural and restoration activities on the enrolled lands (see Appendix F). This take authority is only effective if grayling are listed under the ESA and if a Participating Landowner is properly implementing the conservation measures to remove threats to grayling on enrolled lands that were identified by MFWP during the rapid assessment in Phase I (regulatory assurances are granted later in the implementation schedule – see below).

Table 5. Summary of Threats to Fluvial Arctic Grayling in the Big Hole River Watershed, the Conservation Measures Proposed in the Agreement to Reduce These Threats, and the General Timeline for Implementation and Threat Reduction Under the Agreement.

THREAT	CONSERVATION MEASURES TO ADDRESS THREAT	GENERAL TIMELINE FOR IMPLEMENTATION & THREAT REDUCTION UNDER THE AGREEMENT
HABITAT		
Water quantity (reduced instream flows)	Increased flows through: water rights compliance, improved irrigation management, less water intensive crops, instream flow leases, stock-water wells, etc.	• Immediate improvements through water rights compliance & installation of headgates/measuring devices to be installed within 5 years • Flow targets met 75% of time by year 10 & more frequently thereafter as the more complex site-specific plans reach full implementation
Riparian zone	Conservation & restoration of riparian habitats by fencing, off-channel livestock watering facilities, prescribed grazing plans, more active livestock management, etc.	• Frequency of livestock presence in riparian areas will decrease significantly during first 5 years leading to rapid improvement. • Steady riparian recovery thereafter with "sustainable" status achieved on 95% of enrolled lands by year 15.
WATER QUALITY		
• Thermal	Increased flows, conservation & restoration of riparian habitats	• Immediate reduction in thermal loading in relation to increased streamflows. • Longer-term reductions in temperatures from riparian zone recovery & channel morphology adjustments
• Nutrients†	Nutrient management per NRCS Field Office Technical Guide 590	• Immediate reduction in threat at time of site-specific plan implementation.
FRAGMENTATION		
• Dewatering	Increased flows (see above)	• Implementation & threat reduction timeline same as for "Water quantity."
• Migration Barriers	Remove barriers to grayling movement & install fish ladders on permanent barriers	• All barriers & grayling passage problems will be resolved within 5 years after identification.
• Entrainment	Survey & rescue, fish screens, improved headgates, reduced irrigation withdrawals, gradual ramping of irrigation withdrawals	• Immediate benefit of grayling rescue & installation of fish screen on a major diversion known to entrain grayling. • Entrainment problems addressed over time in order of priority (threat magnitude).
• Habitat simplification (reduced pool frequency, channel widening, etc.)	Increased instream flows, conservation & restoration of riparian habitats, active in-stream restoration projects	• Immediate effect from active restoration projects • Longer-term effect (>10 years in some cases) resulting from conservation measures (flows, riparian) that influence processes leading to natural changes in channel & streambed morphology
BIOLOGICAL		
Nonnative trout	Outside landowner control – Technical Committee will provide an annual assessment & management recommendations to the Agencies	• MFWP will determine appropriate actions to address identified threats • Management actions to address threats will require Environmental Assessment per Montana Environmental Policy Act. • Implementation timeline will depend on threat urgency & meeting any necessary regulatory requirements for the proposed management action

† Threats to grayling from nutrient loading have been putatively identified but are not among the four central grayling conservation issues (instream flows, riparian habitat, movement barriers, entrainment) identified in the Agreement. However, any observed problems with nutrient loading will be addressed during the development and implementation of the site-specific plan using NRCS guidelines.

Upon completion and approval of a site-specific plan at the end of Phase II and the counter signatures of both MFWP and USFWS, the Participating Landowner initiates Phase III of the Agreement and receives regulatory assurances that, should grayling be listed as either threatened or endangered under the ESA, the Participating Landowner will not be required to implement conservation measures above and beyond those described in the site-specific plan, so long as all requirements are being properly implemented. The take authority granted during Phase II is extended through implementation of the site-specific plan (i.e., Phase III). The take authority extended during Phase III is only effective if and when the grayling is listed under the ESA and if a Participating Landowner is properly implementing their site-specific plan.

PHASE I – Program Enrollment, Rapid Assessment, and Actions to Remove Immediate Threats to Grayling

Non-Federal property owners interested in developing a site-specific plan under this Agreement must contact MFWP at: Montana Fish, Wildlife and Parks, Dillon Field Office, Attn: CCAA Program Coordinator, Dillon, Montana 59725, phone 406-683-2675, plamothe@mt.gov, to receive and fill out an official application form. The enrollment period will begin after the effective date of the Agreement and continue until 90 days prior to the publication in the Federal Register of a final determination about the listing status of the grayling under the ESA (see Figure 39). At the time of enrollment the landowner shall:

1. Provide signature(s) that represents the intent to voluntarily participate in this Agreement.
2. Identify the enrolled lands and the intent to develop a site-specific plan under this Agreement.
3. Comply with all water rights associated with the enrolled lands and assist with monitoring of withdrawals made for irrigation, watering of livestock, and other authorized uses.
4. Allow access to the Agencies, or a designated representative, under mutually agreeable conditions, for:

    - The development of the site-specific plan.
    - Validating compliance with water rights.
    - Conducting a "rapid assessment" of the enrolled lands within 90 days of enrollment to identify threats to grayling that can be immediately remedied and barriers to grayling movement that will be addressed beginning in Phase II (see Appendix E for Rapid Assessment form).
    - Conducting entrainment surveys of irrigation ditches.

5. Read an educational pamphlet provided by MFWP that describes the ecology of grayling within the Project Area, the associated habitat requirements, and simple actions that landowners can take to provide immediate benefit to grayling (see Appendix E for educational pamphlet).

6. After reviewing the education pamphlet, the Participating Landowner will work the Agencies to identify, document, and implement measures they can take to immediately improve conditions for grayling on their land prior to completion of the rapid assessment (see Appendix E for checklist of potential threats to grayling).
7. Negotiate and implement an interim SFAs as applicable. This also may begin at Phase II depending upon the data required and irrigation infrastructure required to implement such an arrangement (see Appendices E and G).
8. Allow the agencies to develop, in consultation with the landowner, a list of activities (covered activities) for which incidental take will be permitted during Phases I and II of the Agreement to the extent that landowners are carrying out those activities.

PHASE II – Implementation of Rapid Assessment Measures and Development of Site-Specific Plan

Phase II begins immediately after the completion of the rapid assessment (i.e., no more than 90 days after beginning Phase I) and concludes with the approval of a site-specific plan. Duration of Phase II will be no longer than 30 months, unless the Participating Landowners and the Agencies submit an extension request to USFWS (see Appendix F). Stipulations of Phase II include:

1. Participating Landowner's implementation of measures to remove threats to grayling on enrolled lands that were identified during the rapid assessment. This action leads to the issuance of a Certificate of Inclusion. Associated Agency requirements are as follows:

    a. The MFWP will document any actions the Participating Landowner took to benefit grayling prior to or during Phase I.

    b. The MFWP will provide the Participating Landowner with a specific list of conservation measures based on the rapid assessment surveys that shall be implemented throughout Phase II, along with a schedule for that implementation. This will include a plan and timetable to remove barriers and provide passage for grayling, as appropriate.

    c. A Certificate of Inclusion is only valid if signed by the Participating Landowner and the appropriate officials from both MFWP and the USFWS. Within 30 days of receiving a Certificate of Inclusion signed by the Participating Landowner and MFWP and the documentation described below, the USFWS will provide its review, and if appropriate, concurrence and sign the Certificate of Inclusion. The MFWP shall provide the USFWS a copy of each Certificate of Inclusion with all necessary signatures. The documentation that must be reviewed before USFWS can sign a Certificate of Inclusion includes:

        i. Phase I enrollment information.

        ii. Summary of any actions described in part 1a (above).

        iii. Results of rapid assessment survey and the resulting conservation measures that the Participating Landowner will be implementing during Phase II (as described in 1b above).

2. Agency verification of Participating Landowner compliance with water rights.
3. The completion of a survey of irrigation ditches on the enrolled lands to quantify grayling entrainment. Entrainment surveys also will entail the salvage of all grayling captured. Re-survey of some ditches may be necessary based on initial results.
4. The collection of data necessary for the development of the site-specific plan. The final site-specific plan will be negotiated, in good faith, between the Agencies and the Participating Landowner and shall, at a minimum, include:

    a. A detailed description of existing habitat conditions for grayling in waters on or adjacent to enrolled lands.
    b. A description of the threats to grayling on the enrolled lands and the conservation measures to be implemented to reduce those threats.
    c. A commitment to implement all the conservation measures listed above and a detailed description and timeline for how these conservation measures will be implemented (Participating Landowners are responsible for implementing all the conservation measures identified in the site-specific plan that are within their control on their property).
    d. A list of activities for which the Participating Landowner will be receiving assurances and incidental take authority.
    e. Level of take to be authorized on that property.
    f. A monitoring schedule to ensure compliance with the site-specific plan.

5. The final site-specific plan will reflect the needs of the Participating Landowner and will lead to either the long-term protection or restoration of grayling habitat on the enrolled lands.
6. The proposed site-specific plan will be reviewed by the Agencies, and an approved site-specific plan will bear the signatures of the Participating Landowner and the appropriate representatives from both MFWP and USFWS. The USFWS shall review each proposed site-specific plan after MFWP and landowner development and make a determination to accept or deny a plan within 30 days of receipt.

PHASE III – Implementation of the Site-Specific Plan

Phase III of the development of the site-specific plan requires the Participating Landowner to:

1. Initiate the implementation of the agreed-to site-specific plan for the enrolled lands.

FINAL APPROVAL PROCESS FOR SITE-SPECIFIC PLANS

The final approval of site-specific plans by MFWP and USFWS, in consultation with NRCS and MDNRC, will conclude Phase II (development of the site-specific plan) and initiate Phase III (implementation of site-specific plan) of this Agreement. Approval of site-specific plans will reflect the recommendations of and the information gathered by the Agencies and the Participating Landowner. Approval is contingent on determining that the plan is consistent with

the provisions of the Agreement and will provide a net benefit to grayling on the enrolled lands. A site-specific plan will be considered "approved" when it has been reviewed and signed by the Participating Landowner, the Permit holder (MFWP), and the USFWS. Approval of the site-specific plan provides regulatory assurances to the Participating Landowner and extends the incidental take coverage provided during Phase II (see Table 6).

Should grayling be listed under the ESA prior to the completion and final approval of site-specific plans for enrolled landowners holding a Certificate of Inclusion, MFWP and NRCS shall provide the USFWS a timetable for the completion of these plans and will submit extension requests, as necessary, to complete these plans.

IX. RANKING CRITERIA TO PRIORITIZE CONSERVATION EFFORTS IN THE PROJECT AREA

All non-Federal property owners in the upper Big Hole River watershed above Dickie Bridge are eligible to enroll in the Agreement. Due to the large size of the Project Area and the significant landowner interest in the program, a prioritization scheme is necessary to efficiently allocate Agency resources during the implementation of the Agreement and the development of site-specific plans. The following ranking scheme prioritizes enrolled lands within the Project Area based on their potential to provide the greatest benefit to grayling and minimize the level of take during development of site-specific plans. The ranking scheme considers--1) the location of enrolled lands in relation to known and historical habitat use by grayling, 2) the potential (or observed) entrainment, 3) the amount of riparian habitat and 4) the potential to positively influence instream flows.

Grayling Habitat Significance (Criterion 1) characterizes habitat importance to grayling in terms of the location of enrolled lands relative to the known and historical distribution of grayling and the location-specific life history requirements. More weight is given to Management Segments C and D because of the importance of this area for spawning and rearing and the significant impacts resulting from irrigation water withdrawals. Attention to this area will help address reproductive bottlenecks for the grayling population. Management Segment E receives less weight in the scoring system because is somewhat less affected by irrigation practices and this area is primarily adult grayling habitat. Historic grayling habitat (Management Segments A and B) represents habitat that could be reoccupied as the population responds, but receives less weight in the scoring system because grayling are not currently present.

Initial Entrainment Significance (Criterion 2) considers whether grayling have ever been captured in irrigation ditches on enrolled lands or whether enrolled lands contain any of the 296 points of diversion considered likely sites of entrainment in the Project Area.

Table 6. Generalized Phased Implementation Responsibilities, Timelines, and Legal Protections Under the Agreement. Associated monitoring requirements are described elsewhere in the Agreement (*Extension of Phase II possible upon request and review by USFWS).

LANDOWNER ACTIONS	AGENCY ACTIONS	IMPLEMENTATION PHASE AND DURATION

ENROLLMENT
• Complete application
• Comply with water rights
• Allow access for:
  o Development of site-specific plan
  o Water use monitoring
  o Rapid Assessment
  o Entrainment Surveys
• Read pamphlet
 	
Remedy immediate threats to grayling on enrolled lands
 	
Define "covered activities"
 	
Implement interim irrigation arrangements
	Enroll landowners
	
	Perform Rapid Assessments
	
	Perform Entrainment Surveys
	
	Monitor water use
	
	Identify immediate threats to grayling on enrolled lands
	
	Define "covered activities"
	
	Negotiate interim irrigation arrangements
		PHASE I
		Up to 90 days from Enrollment

Receive Certificate of Inclusion with Incidental Take coverage Implement conservation measures to remedy threats identified in Rapid Assessments Develop & approve site-specific plan & implementation schedule Continue to implement Phase I conservation measures	Issue Certificate of Inclusion with incidental take coverage Assist landowner address conservation measures identified in Rapid Assessments Gather data for site-specific plan Develop & approve site-specific plan & implementation schedule Continue entrainment surveys / salvage Perform necessary monitoring	PHASE II Up to 30 months (Extension may be requested*)
Receives assurances & continued Incidental Take coverage upon approval of site-specific plan Implement conservation measures identified in site-specific plan	Activate Assurances component of Certificate of Inclusion upon approval of site-specific plan Assist landowners implement conservation measures identified in site-specific plan Perform necessary monitoring	PHASE III At least 10 years (May be extended prior to expiration of Certificate of Inclusion)

RELATIVE RANKING ORDER AND ADDITIONAL CRITERIA TO RESOLVE TIED SCORES AND ESTABLISH FINAL RANKING

The first two criteria will be totaled to establish the initial relative ranking of each enrolled property. Two additional criteria will be used, as necessary and in the order they appear below, to resolve tied scores--Potential to Improve Instream Flows and Riparian Habitat Significance. These criteria will be invoked in order, so Riparian Habitat Significance is only scored to resolve any remaining tied ranks after the Potential to Improve Instream Flows has been assessed. The final relative ranking list will be used to prioritize implementation of the Agreement.

Potential to Improve Instream Flows (Criterion 3) considers the extent to which water management practices on an enrolled property can influence instream flows. The metric utilized is area of irrigated land which is assumed to be proportional to the amount of water used for agricultural practices on the land. The criterion recognizes the potential for a landowner to provide water for instream flows to benefit grayling.

Riparian Habitat Significance (Criterion 4) considers the influence land use practices on enrolled lands have on adjacent stream habitat. The scoring system reflects the amount of riparian habitat on an enrolled property relative to the total amount of riparian habitat in the Project Area.

GRAYLING HABITAT SIGNIFICANCE

Ranking Criteria Worksheet

1. Grayling Habitat Significance	POINT VALUE
a) Enrolled lands in historic spawning and juvenile rearing segments (Segments C and D)	50
b) Enrolled lands in adult feeding and wintering habitat (Segment E)	20
c) Enrolled lands in area of historic presence--habitat use unknown (Segments A and B)	10
2. Initial Entrainment Significance	
a) Entrainment of grayling has been documented in irrigation ditches on the enrolled lands	20
b) Entrainment of grayling has not been documented in the irrigation ditches on the enrolled lands <u>but</u> enrolled lands <u>include</u> at least one of the 296 points of diversion considered a likely site of entrainment	5
c) Entrainment of grayling has not been documented in the irrigation ditches on the enrolled lands <u>and</u> enrolled lands <u>do not include</u> any of the 296 points of diversion considered a likely site of entrainment	0
SUMMARY OF RANKING CRITERIA 1 AND 2	
A. Score	(max 50)
B. Score	(max 20)
TOTAL	(max 70)
SEQUENTIAL CRITERIA TO RESOLVE TIED SCORES	
3. Potential to Improve Instream Flows	
Acres of irrigated land on enrolled lands	Number of Acres
4. Riparian Habitat Significance	
Linear length of riparian habitat on enrolled lands (sum of both sides of channel)	Miles of Riparian Habitat

(Note: The above information will be used to establish a relative ranking list to prioritize implementation of the Agreement. Criteria 3 and 4 are only used to resolve any tied scores after Criteria 1 and 2 have been evaluated).

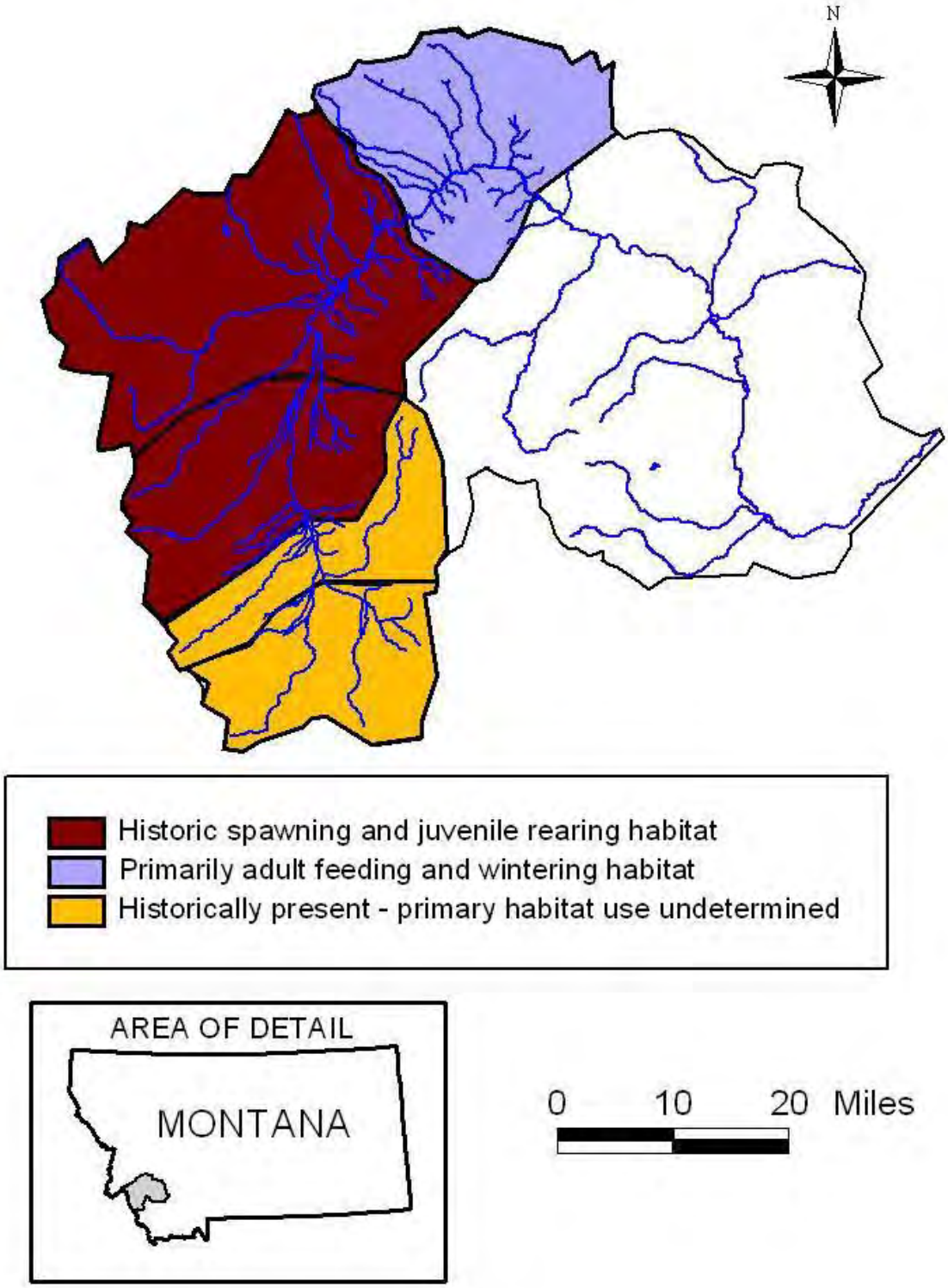

Figure 22. Distribution of three Grayling Habitat Significance ranking criteria across the Project Area. Letters represent the Agreement Management Segments.

X. OBLIGATIONS OF THE PARTNERS

The following is a summary of the Obligations of the Participating Landowners and the Agencies to the Agreement that are intended to reduce the threats to grayling and its habitat in the Project Area within the upper Big Hole River. Participating Landowners shall adhere to both the general obligations described here, and the particular obligations described in their site-specific plan. Similarly, the Agencies must fulfill the general obligations below (and any described elsewhere in this Agreement) and those agreed to in any site-specific plan.

A. PARTICIPATING LANDOWNERS

1. Implement all phases of the Agreement as specified, beginning at the time of enrollment.
2. Permit the Agencies to conduct an assessment of baseline environmental conditions and land use practices leading to the cooperative development of a comprehensive site-specific plan for their enrolled lands. Implement the site-specific plan which meets the conservation guidelines of this Agreement.
3. As identified in the site-specific plans, Participating Landowners shall cooperatively implement water conservation measures to improve streamflows, which benefit grayling. These measures may include, but are not limited to--repairing leaking head gates and water diversion structures, reducing irrigation withdrawals, complying with water rights (period of use and amount of water withdrawals), improving irrigation ditches to reduce water losses, installing and maintaining off-stream livestock watering facilities, and using alternative less water-intensive livestock forage.
4. As identified in the site-specific plan, cooperatively implement riparian habitat conservation measures that maintain or improve existing conditions on enrolled lands. These measures may include, but are not limited to--installing and maintaining fences that manage livestock within or exclude livestock from the riparian zones, installing and maintaining off-stream livestock watering facilities, replanting or transplanting native riparian vegetation such as willows, and curtailing or relocating any ranching activities that degrade riparian habitats.
5. As identified in the site-specific plan, cooperatively implement conservation measures that promote grayling passage and reduce entrainment of fishes in irrigation ditches. These measures may include, but are not limited to--installing fish ladders or other appropriate fish passage devices to permit grayling movement past irrigation structures (diversions) at all flows, redesigning and reconstructing diversion structures to facilitate grayling passage where ladders or retrofitting is not feasible, installing screening or other exclusion devices to keep grayling out of irrigation ditches, and altering the time of diversion to avoid entraining grayling when they are present or migrating through the area.
6. Permit translocation of grayling into suitable unoccupied habitats in streams on or adjacent to their enrolled lands to expand the distribution and abundance of grayling.

7. With agreed-to notification, allow agency or agency representatives access to Participating Landowner's property for the purposes of assessing the fishery resources and status of grayling in natural streams and irrigation ditches, salvage of entrained fish in irrigation ditches, removing barriers, assessing riparian habitat conditions and associated land-use activities, implementing conservation measures, and conducting compliance and biological monitoring pursuant to the Agreement and site-specific plan.
8. Implement the specific conservation measures agreed upon within the site-specific plans for the duration of the Agreement.
9. Remain in compliance with the terms of the Agreement and their site-specific plan to maintain their Certificate of Inclusion. 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)). If MFWP or the USFWS determines that a Participating Landowner is violating the terms of the site-specific plan, written notice shall be sent to the Participating Landowner advising the Participating Landowner of the nature of the violation and identifying corrective actions required to bring the Participating Landowner back into compliance with the site-specific plan. Take authorization and the regulatory assurances associated with the Certificate of Inclusion may be suspended or revoked if the landowner does not remedy the violation within seven (7) days after receipt of the notice.

B. MONTANA FISH, WILDLIFE AND PARKS

1. Hold the 10(a)(1)(A) Enhancement of Survival Permit issued under the Agreement.
2. Participate in the implementation of all phases of the Agreement, including, but not limited to--enrollment of landowners; rapid assessment surveys; entrainment surveys; negotiation of interim SFAs; collection of baseline data on enrolled lands; and development, negotiation and implementation of site-specific plans.
3. Develop mutually agreeable site-specific plans in cooperation with Participating Landowners and the other Agencies. Issue Certificates of Inclusion to Participating Landowners under the terms of this Agreement.
4. Carry out any responsibilities for implementing conservation or other measures assigned to MFWP under this Agreement and in any site-specific plan.
5. Carry out responsibilities for compliance and biological monitoring assigned to MFWP under this Agreement and in any site-specific plan.
6. Participate in the formation of a technical committee to assess threats to grayling in the Project Area from nonnative trout species.
7. Translocate grayling gametes into suitable unoccupied habitat in the Project Area, where appropriate, to meet guidelines for distribution and abundance of grayling. The reintroduction process may require the capture of fish, relocation of wild fish, and the collection of gametes.
8. Suspend or revoke, in whole or in part, the Certificates of Inclusion of Participating Landowners found to be in non-compliance with the requirements of the Agreement or their mutually-developed site-specific plans. The MFWP and USFWS may suspend or

revoke 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)). If MFWP or the USFWS determines that a Participating Landowner is violating the terms of the site-specific plan, written notice shall be sent to the Participating Landowner advising the Participating Landowner of the nature of the violation and identifying corrective actions required to bring the Participating Landowner back into compliance with the site-specific plan. Take authorization and the regulatory assurances associated with the Certificate of Inclusion may be suspended or revoked if the landowner does not remedy the violation within seven (7) days after receipt of the notice. Notices of compliance violations will be copied to the USFWS. A summary of noncompliance variances also will be included in the MFWP annual report.

9. Actively pursue the funding necessary to implement the Agreement and each site-specific plan. Funding may be provided by a variety of sources including any appropriate Federal, State, and private source but is not guaranteed.
10. Prepare annual reports in accordance with the Agreement and the site-specific plans.
11. Maintain records for all phases of the Agreement's implementation for each enrolled Participating Landowner.

C. MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

1. Participate, as necessary, in the implementation of all phases of the Agreement, including, but not limited to--enrollment of landowners; rapid assessment surveys; entrainment surveys; negotiation of interim SFAs; collection of baseline data on enrolled lands; and development, negotiation and implementation of site-specific plans.
2. Participate in the development of mutually agreeable site-specific plans in coordination with Participating Landowners, and the other Agencies. Provide expert analyses of water rights and hydrologic issues. Assist in the development of a water-rights database that may assist in the development of site-specific plans.
3. Monitor daily flow in the five flow management segments. Carry out any responsibilities for implementing conservation or other measures assigned to MDNRC under this Agreement and in any site-specific plan.
4. Carry out hydrologic monitoring as assigned to MDNRC under this Agreement and in any site-specific plan. Assist the other Agencies with the evaluation of instream flow recommendations, including professional evaluation of methods, data collection, and analyses.
5. Provide any requested information to MFWP to assist with preparation of annual reports.

D. USDA NATURAL RESOURCES AND CONSERVATION SERVICE

1. Participate, as necessary, in the implementation of all phases of the Agreement, including, but not limited to--enrollment of landowners; rapid assessment surveys; entrainment surveys; negotiation of interim SFAs; collection of baseline data on enrolled lands; and development, negotiation and implementation of site-specific plans.

2. Participate in the development of mutually agreeable site-specific plans in coordination with Participating Landowners, and the other Agencies. Specifically, NRCS will prepare the portion of the site-specific plans that ensures NRCS' quality criteria for soil, water, air, plants, and animals are met. This plan may include, but is not limited to--specific assessments and recommendations for riparian habitats, irrigation water management, prescribed grazing, and nutrients.
3. Carry out any responsibilities for implementing conservation measures in any site-specific plan that is contracted through a conservation program for which NRCS has administrative responsibility.
4. Carry out the responsibilities for riparian vegetation monitoring as assigned to NRCS under this Agreement and in any site-specific plan. Carry out any monitoring necessitated by NRCS contractual requirements or cost share programs.
5. Provide MFWP with information relating to plans written and practices planned and/or installed to assist with the preparation of annual reports, within statutory limitations and Participating Landowner approval.
6. Actively pursue and provide available Federal funding to support implementation of the Agreement and any site-specific plan.
7. Designate EQIP focus areas and provide financial assistance to private landowners as available.

E. U.S. FISH AND WILDLIFE SERVICE

1. Participate, as necessary, in the implementation of all phases of the Agreement, including, but not limited to--enrollment of landowners; rapid assessment surveys; entrainment surveys; negotiation of interim SFAs; collection of baseline data on enrolled lands; and development, negotiation and implementation of site-specific plans.
2. Participate in the development of mutually agreeable site-specific plans in coordination with Participating Landowners, and the other Agencies.
3. Upon execution of the Agreement and compliance with all applicable laws, issue MFWP the Permit, in accordance with 50 CFR 17.32 (d), that would provide MFWP and Participating Landowners authorization for take of grayling associated with covered activities at specified levels and provide regulatory assurances to Participating Landowners should the upper Missouri River grayling DPS be listed under the ESA. Take and regulatory assurances for covered activities will become effective according to the phased implementation schedule described in this Agreement.
4. Carry out any responsibilities for implementing conservation or other measures assigned to the USFWS under this Agreement and in any site-specific plan.
5. Carry out any responsibilities for implementing conservation measures in any site-specific plan that is contracted through a conservation program for which USFWS has administrative responsibility.
6. Carry out any responsibilities for compliance and biological monitoring as assigned to the USFWS under this Agreement and in any site-specific plan.

7. Participate in the formation of a technical committee to assess threats to grayling in the Project Area from nonnative trout species.
8. Provide oversight on the issuance of Certificates of Inclusion and approval of site-specific plans. Review and reach a determination (i.e. approve or deny) on-- a) implementation of rapid assessment provisions and Certificate of Inclusion issuance, and b) individual site-specific plans. The USFWS will make these determinations within 30 days of receipt.
9. Suspend or revoke, in whole or in part, the Certificates of Inclusion of Participating Landowners found to be in non-compliance with the requirements of the Agreement or their mutually-developed site-specific plan. The MFWP and USFWS may suspend or revoke 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)). If MFWP or the USFWS determines that a Participating Landowner is violating the terms of the site-specific plan, written notice shall be sent to the Participating Landowner advising the Participating Landowner of the nature of the violation and identifying corrective actions required to bring the Participating Landowner back into compliance with the site-specific plan. Take authorization and the regulatory assurances associated with the Certificate of Inclusion may be suspended or revoked if the landowner does not remedy the violation within seven (7) days after receipt of the notice.
10. Suspend or revoke, in whole or in part, the Permit if the Permit terms are not being properly implemented.
11. Assist MFWP with the compilation of information and the preparation of annual reports.

XI. DURATION OF THE AGREEMENT, PERMIT, AND SITE-SPECIFIC PLANS

The duration of this Agreement will be 20 years from the date all parties have executed it. The Permit issued in accordance with this Agreement will become effective after the Agreement is executed and will expire on the same date upon which this Agreement expires. The MFWP will notify the USFWS prior to expiration of the Agreement to allow sufficient time to extend the Agreement, if desired.

The minimum duration of site-specific plans and the Certificate of Inclusion shall be 10 years. Upon agreement of the partners, the duration of a Participating Landowner's Certificate of Inclusion can be extended to accommodate continued participation in the Agreement as long as the Permit is in effect. If a Participating Landowner wishes to extend their participation, they must notify MFWP as soon as possible. Extension may involve re-evaluation and revision of the site-specific plan to reflect the existing conditions in the Project Area.

XII. MONITORING AND REPORTING

The monitoring component of the implementation of this Agreement strongly relies on the commitment of the partnering agencies. Responsibility for monitoring will be shared by the partnering agencies and will cover all aspects of the conservation measures of this Agreement. The monitoring occurring under this Agreement is composed of four components:

1. Biological response of grayling to conservation measures.
2. Habitat responses to conservation measures.
3. Performance or effectiveness of specific projects implemented as conservation measures.
4. Landowner compliance with Agreement stipulations and their site-specific plans.

A summary of the monitoring responsibilities and timelines of this Agreement appears in Table 7.

BIOLOGICAL MONITORING

Grayling Population Status and Response Monitoring

The MFWP has sampled the grayling population of the Big Hole River each fall to document population abundance, recruitment, age class strength, and distribution since 1983 (Magee and Lamothe 2004). Under this Agreement, MFWP shall continue annual monitoring of grayling in the upper Big Hole River. In order to show the effectiveness of the conservation measures described in this Agreement and measure progress toward the restoration targets of the Agreement (see Part VII), MFWP will establish a monitoring reach in a mainstem and tributary reach in each of the 5 management sections, for a total of 10 monitoring sites across the Project Area (Figure 2b) . Each fall throughout the duration of the Agreement, MFWP will conduct a combination of mark-recapture and CPUE electrofishing sampling to measure grayling abundance, distribution and age class structure in each of the 10 monitoring reaches.

The MFWP will use seasonal streamflow data (either from USGS gages or continuous recording instruments installed by MDNRC), channel morphology parameters (measured by USFWS Partners for Fish and Wildlife) and stream temperature (monitored by MFWP) in each management segment to correlate grayling population trends to habitat conditions. The data collected from these monitoring reaches and the resulting analysis will help the Agencies implement adaptive management plans and respond to changing conditions.

Entrainment

Entrainment surveys by MFWP or an MFWP-approved contractor will be conducted using the Entrainment Survey Protocol (Appendix E). The initial assessment of entrainment will be determined as part of the development of the site-specific plans. Entrainment monitoring will continue on unscreened ditches as described in conservation measures. When entrainment in a specific ditch or canal is greater than 20 juvenile and/or adult grayling, MFWP will conduct repeat rescue efforts annually until fish exclusion devices are installed. When no entrainment is documented, MFWP will reinitiate monitoring when the expansion of grayling distribution causes an expectation that grayling are being entrained.

HABITAT MONITORING

Riparian Assessment

The NRCS will be responsible for monitoring riparian condition and improvement. Riparian monitoring will be initiated during the development of site-specific plans in Phase II using their riparian assessment protocol. Monitoring of riparian conservation measures implemented on each landowner's enrolled property will be performed every 5 years for the duration of the site-specific plan.

Channel Morphology

The USFWS Partners for Fish and Wildlife will establish and monitor channel cross-sections within the biological monitoring reaches. Permanent cross-sections will be established within each of the 10 grayling population monitoring reaches. The width, depth, and channel shape will be determined bi-annually using general surveying techniques.

Stream Water Temperature

The MFWP will monitor stream water temperatures in each of the 10 population monitoring reaches. Continuous recording thermographs programmed to record temperature on an hourly basis from April 1-October 31 will be installed in each monitoring reach and downloaded as needed. This data will allow for the determination of daily mean, maximum, and minimum temperatures.

Streamflow Monitoring

Streamflows will be monitored continuously from April 1-October 31 for the duration of the Agreement. Where USGS gaging stations are not present to provide measurements, continuous recording instruments (i.e., Aqua Rods or their equivalent) have been installed by MDNRC. Currently, streamflows will be monitored within Management Segments C and D using USGS gaging stations and MDNRC will monitor streamflows in Management Segments A, B, and E using continuous recording instruments.

The MFWP will compile seasonal streamflow data and summarize these data in terms of their relation to historical flow conditions, grayling abundance, and the extent to which target flows were attained.

PROJECT PERFORMANCE

Fish Exclusion

The MFWP will monitor the effectiveness of all installed fish exclusion devices within 1 year of their installation using the entrainment monitoring protocol.

Fish Passage

The MFWP will verify the effectiveness of all installed fish passage devices within 1 year of their installation. The MFWP will use either mark-recapture or trapping techniques to ensure the structure is functioning properly and providing access to upstream habitats.

COMPLIANCE MONITORING

MFWP has the right to enter the enrolled land, with reasonable prior notice to the Participating Landowner, to monitor the Participating Landowner's compliance with the site-specific plan. Monitoring of compliance will occur at a minimum of every six months for the duration of the site-specific plan. At the time of entering the enrolled land for the purpose of compliance monitoring, MFWP will determine whether the Participating Landowner is complying with the components of the site-specific plan.

If MFWP or the USFWS determines that a Participating Landowner is violating the terms of the site-specific plan, written notice shall be sent to the Participating Landowner advising the Participating Landowner of the nature of the violation and identifying corrective actions required to bring the Participating Landowner back into compliance with the site-specific plan. Take authorization and the regulatory assurances associated with the Certificate of Inclusion may be suspended or revoked if the landowner does not remedy the violation within seven (7) days after receipt of the notice.

Notices of compliance violations will be copied to the USFWS. A summary of non-compliance variances also will be included in the MFWP annual report.

Water Rights

Water rights compliance monitoring will be initiated as part of Phase I Rapid Assessments and will continue for the duration of the Agreement. Flow measuring devices will be installed in irrigation ditches where needed within the Project Area to quantify the results of site-specific plans. Landowners will be responsible for monitoring, managing and recording their water withdrawals. The MDNRC will be responsible for monitoring Participating Landowners' compliance with water rights.

Landowner Contact

Successful implementation of the Agreement will require repeated contacts between Agency personnel and landowners to document their concerns related to the Agreement, discuss compliance issues and to maintain working relationships. The MFWP will contact and visit each Participating Landowner at least twice a year, at mutually-agreeable dates and times, throughout the landowner's enrollment in the Agreement. The MFWP will collect irrigation withdrawal monitoring data at these times.

General Compliance

The MFWP is responsible for the oversight of all compliance monitoring. The MFWP will determine landowner compliance with site-specific plans based on findings from its monitoring actions and the information provided from partnering agencies. The MFWP also will monitor compliance with negotiated reductions in irrigation withdrawals and any project maintenance agreements. Each agency will be responsible for monitoring the progress and quality of projects and contracts that it sponsors.

REPORTING

The MFWP will be responsible for completion of an annual report on Agreement implementation by February 1 each year. This report will include, but is not limited to--1) a summary of Certificates of Inclusion issued and site-specific plans approved over the past year; 2) a summary of the grayling entrainment surveys and rescue efforts, 3) a summary of the estimated take from the implementation of conservation measures, monitoring activities, and any other take obviously resulting from land and water use related to the Agreement's covered activities; 4) a summary of projects related to the conservation measures described in the Agreement, including an accounting of project expenditures; 5) the results of completed biological, habitat project performance and compliance monitoring; 6) recommendations for future management activities consistent with the Agreement; and 7) a summary of enforcement actions associated with landowner compliance with site-specific plans. The annual report will be presented to the Grayling Workgroup at its annual meeting. Copies of the report will be sent to the Agencies and will be available to the public and Participating Landowners via MFWP and USFWS websites.

Table 7. Summary of the Responsibilities and Implementation Timeframe for the Four Monitoring Components (biological, habitat, project performance and compliance) Proposed in the Agreement.

Monitoring Type	Parameter	Phase of Monitoring	Frequency	Description
Biological	Grayling Population	Independent of site-specific plans	Fall monitoring will occur for duration of the Agreement	10 monitoring reaches among 5 management segments
Biological	Entrainment	Initiated in Phase II & monitored in Phase III	When entrainment is greater than 20 juvenile (age-1+) and/or adult grayling MFWP will conduct repeat rescue efforts annually until fish exclusion devices are installed. When no entrainment is documented MFWP will reinitiate monitoring when grayling entrainment is suspected.	MFWP will monitor entrainment using the protocol described in this Agreement.
Habitat	Riparian Assessment	Initiated in Phase II & monitored in Phase III	Every 5 years	NRCS will monitor using its riparian assessment protocol
Habitat	Channel Morphology	Phase III	Annual	USFWS (Partners) will establish & monitor channel cross-sections within the biological monitoring reaches
Habitat	Streamflows	Independent of site-specific plans	Annual (April – October)	Streamflows will be monitored within Management Segments C & D at USGS gaging stations. MDNRC will monitor streamflows in Management Segments A, B, & E using continuous recording instruments.
Habitat	Stream water temperature	Independent of site-specific plans	Annual (April – October)	MFWP will monitor stream water temperatures in one mainstem & one tributary reach with each management segment. These reaches will be associated with grayling population monitoring reaches.
Project Performance	Fish Exclusion	Phase III	Within 1 year of installation	MFWP will monitor the effectiveness of all installed fish exclusion devices.
Project Performance	Fish Passage	Phase III	Within 1 year of installation	MFWP will verify the effectiveness of all installed fish passage devices.
Compliance	Water Rights	Ongoing – through Phase III	Ongoing for the duration of the Agreement	Landowners will monitor withdrawals – MDNRC will monitor compliance
Compliance	Landowner Contact	Phase III	Every 6 months (Minimum)	MFWP will meet with Participating Landowners twice a year to discuss the status of site-specific plans
Compliance	General Compliance	Phase III	Annual	MFWP has oversight of compliance monitoring. MFWP will determine landowner compliance with site-specific plans based on its findings & the information provided from partnering agencies.

XIII. LEVEL OF IMPACTS TO GRAYLING FROM THE AGREEMENT AND TAKE

Should the grayling of the upper Missouri River be listed under the ESA, take will be authorized through the Permit, consistent with the terms of this Agreement, the Permit, and the Participating Landowners' Certificates of Inclusion.

Implementation of the Agreement could result in take of grayling in the Project Area should the fluvial Arctic grayling of the upper Missouri River be listed in the future as threatened or endangered under the ESA. Actions posing a risk of take to grayling generally include--1) covered activities relating to land and water use (agriculture and ranching), and 2) restoration and monitoring activities required by the Agreement. Risk of take over the term of the Agreement will vary by activity.

A. COVERED ACTIVITIES – AGRICULTURE AND RANCHING

Covered activities related to agricultural and ranching activities that are anticipated to have the most significant risk of incidental take can be categorized into three general areas--a) irrigation withdrawals, b) maintenance of physical structures that block fish migration (barriers), and c) livestock grazing in the riparian zone.

Take in the form of harm results from irrigation and stock water withdrawals that reduce habitat quality and quantity for grayling in the Project Area. Currently, little information is available on the amount of water taken by a given diversion, but the Agencies will be gathering these data over time as a result of this Agreement. Determining the exact number of grayling likely to be taken as a result of water diversion is difficult because--(1) determining whether an individual did not spawn as a result of water depletions versus natural causes would be extremely difficult to determine; (2) effects that reduce fecundity are difficult to quantify; (3) finding a dead or injured listed fish would be difficult, due to the large size of the Project Area and because carcasses are subject to scavenging; and (4) natural fluctuations in river flows and species abundance may mask project effects.

The Agencies anticipate that any take associated with irrigation withdrawals will generally be reduced in proportion to the water saved through implementation of the Agreement's provisions. Immediate water savings in years 1-5 of the Agreement, through improved landowner control of irrigation water, will greatly reduce the risk of take and full implementation of site-specific plans will steadily reduce that risk in subsequent years.

Take in the form of harm or death could result where grayling are entrained in irrigation ditches, which is a function of irrigation and stock water withdrawals. Rescue of grayling encountered in irrigation ditches will alleviate short-term risk of take, and the threat assessment and resulting prioritization scheme will establish a framework to deal with this threat over time. Lack of information about entrainment precludes a specific estimate for how the risk of entrainment will be reduced over time, but the prioritization scheme will ensure that the largest threats are dealt with first.

Fish screens or other exclusion devices can minimize entrainment and reduce potential incidental take, but will not eliminate the possibility because devices that can exclude tiny larval grayling are not currently available. Thus, a low level of entrainment positively related to fluvial grayling spawning success in that year or population size may occur, but the relative population-level impact of that entrainment on the grayling population should be less because of the increased abundance of the population.

Barriers result in take in the form of harm by preventing natural movement and decreasing genetic exchange and spawning opportunities. Barriers also can decrease survival if grayling are prevented from reaching sections of stream where environmental or habitat conditions are more favorable. This form of take will likely be highest during the first year of the Agreement, but will decrease quickly upon implementation of the rapid assessment recommendations and site-specific plans. The Agencies have committed to removing all man-made barriers on enrolled lands within 5 years of finalizing a site-specific plan. Therefore, little or no take of grayling from fish barriers is expected in years 6-20 of the Agreement.

Take of grayling also occurs from livestock entering riparian areas. This practice has the following negative effects, including but not limited to--1) direct trampling of habitat and streambanks; 2) sedimentation of streams; 3) removal of riparian vegetation; and 4) providing a pathway for animal wastes to enter streams and promote nutrient loading. The stressor (i.e., livestock grazing) causing take from riparian habitat degradation will be removed during the early years of the Agreement's implementation. Although it may take years for the riparian habitat to recover to "sustainability" as defined by NRCS assessment methods, actual incidental take should cease once the stressor is removed. Under this Agreement, all riparian areas on enrolled lands will be restored to or maintained at "sustainable." Therefore, take will only occur until the measures in the rapid assessment and site-specific plan, which detail prescribed grazing plans or other actions to protect riparian habitats, are implemented. By years 6-20 of the Agreement, little actual take should result from livestock entering riparian areas.

B. COVERED ACTIVITIES – RESTORATION AND MONITORING

Take in the form of harm may result from restoration and monitoring activities required under this Agreement. These activities may include construction activities or active restoration projects required to implement the conservation measures. Installation of fish screens, replacement or installation of irrigation diversion structures (headgates), and riparian restoration projects such as construction of livestock exclusion fences or willow planting may result in temporary sediment input to adjacent and downstream aquatic habitat used by grayling. These effects on water quality and grayling habitat are expected to be small in magnitude, emphemeral, and occur primarily in the first 5 years of the Agreement. Effects will be minimized by utilizing expert personnel wherever conservation measures require construction or ground-disturbing activities, and by scheduling the work when streamflow and environmental conditions are suitable to reduce site impacts and sediment input. Channel restoration projects pose a similar risk to grayling, and may pose additional risks of harm from physical contact with equipment or movement of stream substrates (cobbles and boulders). However, active restoration projects are anticipated to be less frequent than passive restoration, which will be the primary method for stream channel restoration.

Take could result from biological monitoring of grayling populations as stipulated in this Agreement. Grayling monitoring and entrainment surveys may result in harm or direct mortality of grayling from tissue or skeletal injury or acute stress. Additional practices that involve the capture and handling of grayling by MFWP include, but are not limited to--1) the collection of gametes for brood stock management; 2) the collection of genetic material from Big Hole River grayling; and 3) translocation of fish. The MFWP anticipates that no more than 15 individual grayling per year would die as a result of its biological monitoring program, and the actual number will probably be much less. The risk of take for these ongoing and long-term activities will be minimized by having professional fishery biologists familiar with grayling oversee surveys, providing proper training to supporting personnel, anesthetizing and handling grayling under approved protocols (MFWP, Electrofishing and Fish Handling Policy, undated) so that injury and stress to grayling are minimized, and curtailing or suspending monitoring surveys when environmental conditions are stressful (e.g., high water temperature or low flow).

Overall, the Agreement and site-specific plans will provide a net conservation benefit toward the conservation goal of increasing the abundance and distribution of grayling in historic waters within the Big Hole River watershed even with the anticipated effects of the covered activities. The USFWS will estimate take of grayling resulting from issuance of the Permit and implementation of the Agreement in a Biological Opinion, pursuant to section 7 of the ESA.

C. NOTIFICATION OF INCIDENTAL TAKE

The Participating Landowner shall give MFWP and USFWS reasonable advance notice (at least 30 days) of when he or she expects to incidentally take any listed species (i.e., grayling) covered under the Permit and Certificate of Inclusion. Such notification will provide MFWP and USFWS with the opportunity to relocate affected individuals of the species, if possible and appropriate. The same notification requirement will be in effect for grayling even if they are not listed.

XIV. TAKE, REGULATORY ASSURANCES, CHANGED AND UNFORESEEN CIRCUMSTANCES

TAKE

The Permit issued to MFWP will authorize MFWP, and Participating Landowners holding a Certificate of Inclusion, to take grayling while performing certain activities. Specifically for this Agreement, the Permit will authorize take of grayling by Participating Landowners (who hold a Certificate of Inclusion) as a result of otherwise-lawful agricultural and ranching activities on the enrolled lands (Appendix F). Take coverage also shall be extended to restoration and monitoring activities necessary for the implementation of the Agreement as described in Appendix F. The level of take associated with the aforementioned activities is described in Part XIII. Take coverage shall not extend to non-enrolled lands or to activities not specified in the Agreement and site-specific plans. Take coverage is only effective if and when grayling are listed under the ESA.

Should grayling be listed, take coverage for the implementation of conservation measures or restoration and monitoring activities not specifically described in this Agreement but subsequently implemented by MFWP or MDNRC would require an agreement between the USFWS and the State of Montana under section 6 of the ESA.

ASSURANCES

The Permit provides Participating Landowners holding Certificates of Inclusion with the ESA regulatory assurances found at 50 CFR §§ 17.22(d)(5) and 17.32(d)(5) that will be in place when the USFWS approves the final site-specific plan and initiates Phase III of this Agreement's implementation. Consistent with the USFWS Candidate Conservation Agreement with Assurances Final Policy (64 FR 32706, June 17, 1999), conservation measures and land, water, or resource use restrictions in addition to the measures and restrictions described in this Agreement and the site-specific plans will not be imposed with respect to the specified covered activities on the Participating Landowner's enrolled land should grayling of the upper Missouri River DPS become listed under the ESA in the future and if Participating Landowners are properly implementing their site-specific plans (i.e., Phase III of this Agreement). These assurances are authorized by the Permit issued under section 10(a)(1)(A) of the ESA for the enrolled lands identified in the site-specific plans. Regulatory assurances are only effective if and when grayling are listed under the ESA. However, arrangements to reduce irrigation withdrawals and water conservation plans developed in any or all phases of this Agreement do not supersede the prior appropriations doctrine under Montana water law. This Agreement recognizes the Participating Landowners have claimed water rights and shall not be interpreted as transfer of the Participating Landowners' use and enjoyment of these water rights to the public or any State or Federal agency.

CHANGED AND UNFORESEEN CIRCUMSTANCES

The regulatory assurances provided by the Permit are linked to the existence of changed circumstances and unforeseen circumstances. "Changed circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement that can reasonably be anticipated by plan or agreement developers and the Service [USFWS] and that can be planned for (e.g., the listing of new species, or a fire or other natural catastrophic event in areas prone to such events)" 50 CFR 17.3. "Unforeseen circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement that could not reasonably have been anticipated by plan or agreement developers and the Service [USFWS] at the time of the conservation plan's or agreement's negotiation and development, and that result in a substantial and adverse change in the status of the covered species" 50 CFR 17.3. In the event of changed and unforeseen circumstances the Agencies are committed to working with the Participating Landowners to implement measures that limit the level of authorized take of grayling and allow the Participating Landowner to continue to implement their site-specific plan in compliance with this Agreement and the Permit.

Drought, wildfire, floods, adjudication of water rights, and invasion of nonnative species are changed circumstances which may affect grayling in the Project Area. Should any or all of these events occur and pose a threat to grayling or its habitat which can be addressed by actions on enrolled lands, then the Participating Landowners and the Agencies will work in good faith to develop and implement conservation measures to minimize or reverse the detrimental effects.

CHANGED CIRCUMSTANCES PROVIDED FOR IN THE AGREEMENT

Effects of drought are mitigated, to some extent, by the Agreement's existing conservation measures. However, additional conservation measures may be warranted to address special situations such as extreme or extended drought or unanticipated effects of drought. In the circumstance that extreme or extended drought is reducing the abundance and distribution of grayling below current levels, the Agencies will pursue all available options, both within (enrolled landowners) and outside the Agreement (non-enrolled landowners), to address the consequences of extreme or extended drought and help achieve the flow targets at the frequency expected given the status of Agreement implementation at that time. These options may include, but are not limited to, seeking additional Agreement participants (if enrollment is still open), seeking participants in additional 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.

Wildfire is presumed to be a low frequency event on enrolled lands, because such properties will primarily be riparian habitats or agricultural lands. However, more frequent wildfire in adjacent uplands and mountains may indirectly affect grayling. For example, mountain fires followed by heavy precipitation may cause excessive sediment input from headwater streams, causing fine sediment deposition at grayling spawning sites adjacent to enrolled lands. In the event of a large-scale fire in the watershed or an intense localized fire in a sub-watershed containing grayling, the Agencies will assess whether debris flows pose a significant risk for grayling in specific river reaches or tributaries, and if rescue operations or any other protective actions are warranted to forestall potential extirpation of those population units. The MFWP and USFWS will collaborate on any rescue efforts, and Participating Landowners will provide necessary access to their property to assist these efforts.

Floods have been infrequent in the Project Area during the current drought, which began in 1999, but are nonetheless anticipated to occur during the term of the Agreement. Floods may displace grayling of all ages, causing injury, death, or stranding them in inhospitable habitats (e.g., irrigation ditches, depressions in agricultural fields). Late spring floods also can scour spawning beds, causing mortality to developing grayling embryos. Floods also may compromise the effectiveness of structures installed or upgraded under the Agreement's conservation measures. In the event of a 5-year flood event (i.e., magnitude of a flood with a 5-year occurrence interval), the Agencies and Participating Landowners shall conduct an assessment of all physical structures installed or maintained as a provision of this Agreement to ensure they are in proper working order. A 5-year flood event at the Wisdom Bridge, for example, would represent a flow of approximately 3,000 cfs (or over 18 times the minimum spring target flow at that location) and would probably move significant amounts of sediment in the more disturbed

management segments (e.g., Management Segments B and C). Sediment movement or the sheer force of the flood event may affect physical structures operated under the Agreement. Such structures to be inspected following a 5-year flood event may include, but are not limited to, diversion structures, fish ladders, fish screens, irrigation ditches, and riparian zone fences. Damaged or destroyed structures will be noted and a prioritization list developed to implement repairs as soon as possible.

The adjudication of water rights in the Big Hole River system may result in widespread effects to irrigation and stream flow patterns. The adjudication process will likely be completed during the term of the Agreement. After the adjudication process has been completed, the Agencies shall evaluate whether the changes in water rights in the Project Area negatively affect the Agreement's conservation strategy with respect to instream flows and whether they render obsolete any element of the Agreement (e.g., minimum flow targets). The Agencies and Participating Landowners shall amend, modify, and/or revise the Agreement or any site-specific plan, as necessary, if adjudication negatively affects the ability of the Agreement or site-specific plan to recover grayling in the Project Area. Even if adjudication does not affect the Agreement's overall conservation strategy, it may still be necessary to amend or revise site-specific plans to ensure consistency between the Montana Water Law and the provisions of the site-specific plan. Participating Landowners and the Agencies shall amend or modify interim SFAs and/or site-specific plans to account for situations where the adjudication process reduces the rate of water legally diverted and this adjudicated amount is less than that specified under terms of the Participating Landowner's interim SFA or site-specific plan. Revising a Participating Landowner's irrigation SFA and site-specific plan to reflect decrees issued by the Montana Water Court will remove any potential confusion over the implementation of the Agreement's conservation measures and ensure the conservation measures conform to State water law.

Encroachment by nonnative species is probable in the Project Area, but the specific species involved (apart from nonnative trout) and the precise consequences for grayling are not known at this time. Negative effects are predicted, for example, where nonnative plant species invade and alter the structure and function of existing riparian habitats on enrolled lands. Negative effects also might be predicted where invasion by exotic aquatic or terrestrial microorganisms, invertebrates, or vertebrate animals degrades aquatic habitat, increases the incidence of disease, or competes with and/or preys on grayling. The technical committee to be established as a requirement of this Agreement will advise the Agencies on strategies to deal with nonnative trout in the Project Area. Any effects of other nonnative species on grayling may be detected through MFWP's ongoing monitoring program for grayling, the additional grayling monitoring provisions outlined in the Agreement, and the synthesis of data collected while developing and implementing site-specific plans. Identified population-level threats to grayling will be addressed by the collective efforts of the Agencies and Participating Landowners.

UNFORESEEN CIRCUMSTANCES

If additional conservation measures are necessary to respond to unforeseen circumstances, the Director [of the USFWS] may require additional measures of MFWP and the Participating Landowner, but only if such measures are limited to modifications within the Agreement's

conservation strategy for the affected species, and only if those measures maintain the original terms of the Agreement to the maximum extent possible. Additional conservation measures will not involve the commitment of additional land, water, or financial compensation, or additional restrictions on the use of land, water, or other natural resources available for development or use under the original terms of the Agreement without the consent of the Participating Landowner and the Agencies.

The USFWS will have the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available. These findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of grayling. The USFWS will consider, but not be limited to, the following factors related to grayling--1) size of the current range; 2) percentage of range adversely affected by the Agreement; 3) percentage of range conserved by the Agreement; 4) ecological significance of that portion of the range affected by the Agreement; 5) level of knowledge about grayling and the degree of specificity of the conservation program under the Agreement; and 6) whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of grayling in the upper Missouri River basin.

XV. PUBLIC INVOLVEMENT

This Agreement will be circulated for public review and comment, and comments received will be considered and, if appropriate, incorporated into the Agreement prior to the USFWS making a decision on execution of the Agreement and issuance of the Permit to MFWP.

XVI. TERMS AND CONDITIONS OF THE AGREEMENT

A. Modifications of the Agreement. Any party may propose modifications to this Agreement 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 consistent with applicable laws. 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. Amendment of the Permit. The permit may be amended to accommodate changed circumstances in accordance with all applicable legal requirements, including but not limited to the ESA, the National Environmental Policy Act, and the USFWS permit regulations at 50 CFR 13 and 50 CFR 17. The party proposing the amendment shall provide a statement describing the proposed amendment and the reasons for it.

C. Permit Suspension or Revocation. The USFWS may suspend or revoke the Permit for cause in accordance with the laws and regulations in force at the time of such suspension or revocation (50 CFR 13.28(a)). As a last resort, the USFWS also may revoke the permit if continuation of permitted activities would likely result in jeopardy to covered species (50 CFR 17.22/32(d)(7)). The USFWS will revoke the Permit because of jeopardy concerns only after first implementing all practicable measures to remedy the situation.

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

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

F. Availability of Funds. Implementation of this Agreement is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this Agreement will be construed by the parties to require the obligation, appropriation, or expenditure of any money from the U.S. Treasury. The parties acknowledge that the USFWS and NRCS will not be required under this Agreement to expend any Federal agency's appropriated funds unless and until an authorized official of those 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.

G. No Third-party Beneficiaries. This Agreement 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 Agreement to maintain a suit for personal injuries or damages pursuant to the provisions of this Agreement. The duties, obligations, and responsibilities of the parties to this Agreement with respect to third parties shall remain as imposed under existing law.

H. Relationship to Authorities. The terms of this Agreement shall be governed by and construed in accordance with applicable State and Federal law. Nothing in this Agreement is intended to limit the authority of MFWP and USFWS to fulfill their responsibilities under State and Federal laws. All activities undertaken pursuant to this Agreement or the permit must be in compliance with all applicable State and Federal laws and regulations.

I. Succession and Transfer of the Permit and Certificates of Inclusion. This Agreement shall be binding on and shall inure to the benefit of the parties and their respective successors and assigns in accordance with applicable regulations (50 CFR 13.24 and 13.25). The 10(a)(1)(A) permit issued in association with this Agreement can be transferred in accordance with applicable regulations (50 CFR 13.25). Should any non-Federal property owner who is participating in this Agreement 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.

J. Relationship to Other Agreements. Should grayling be listed, take coverage for the implementation of conservation measures or restoration and monitoring activities not specifically described in this Agreement but subsequently implemented by MFWP or MDNRC may require an agreement between the USFWS and the State of Montana under Section 6 of the ESA.

K. Notices and Reports. Any notices or reports required by this Agreement shall be delivered in writing to:

Supervisor, Montana Field Office
U.S. Fish and Wildlife Service
585 Shepard Way
Helena, Montana 59601
406-449-5225 (Telephone)
406-449-5339 (Fax)

Fisheries Management Bureau Chief
Montana Department of Fish, Wildlife and Parks
P.O. Box 200701
Helena, Montana 59620
406-444-7409 (Telephone)
406-444-4952 (Fax)

Water Resources Division
Department of Natural Resources and Conservation
P.O. Box 201601
Helena, Montana 59620-1601
406-444-2074 (Telephone)
406-444-2684 (Fax)

State Conservationist
Natural Resources Conservation Service
10 East Babcock Street
Federal Building, Room 443
Bozeman, Montana 59715-4704
406-587-6813 (Telephone)
406-587-6761 (Fax)

IN WITNESS WHEREOF THE PARTIES HERETO have executed tbis Agreement to be in effect as of the date that the USFWS issues the permit.

Montana Fish, Wildlife and Parks — **Date** 7/26/06

Montana Department of Natural Resources and Conservation — **Date** 7/26/06

USDA Natural Resources Conservation Service — **Date** 7-26-06

U.S. Fish and Wildlife Service — **Date** 7-24-06

APPENDIX A.

THE NRCS PLANNING PROCESS IN DEVELOPMENT OF SITE-SPECIFIC PLANS

The NRCS planning process, as defined in the National Planning Procedures Handbook (NRCS 2000), will be utilized to develop part of the site-specific plan. This part of the site-specific plan will be developed to the Resource Management System (RMS) level where practicable. An RMS is a combination of practices that, when installed, will meet or exceed established quality criteria for identified soil, water, air, plants, and animal resource problems for sustainability. A variance will be required for any practices that will not achieve quality criteria. Practices that cannot achieve quality criteria will result in an improvement to and an upward trend for the resource concerned. The implementation of the planned practices will provide long-term conservation, protection, and/or improvement of the resource base. This approach will allow for careful examination of the entire agricultural operation and will allow the Participating Landowner to have a comprehensive plan that is compatible with a sustainable agriculture operation.

Goals and objectives will vary slightly among specific Participating Landowners' plans depending on Participating Landowner preference, site conditions, and conservation opportunities present. However, all site-specific plans will have the following, where applicable:

Maintenance or Establishment of Functioning Riparian Habitat

Degradation and loss of riparian habitat, in conjunction with other factors, is believed to play a major role in the decline of grayling in the Big Hole River. Grayling tend to be associated with high quality pool habitat (Lamothe and Magee 2003). These important habitats exist most often in stream reaches with high quality riparian buffers. Unfortunately, the loss of riparian vegetation in the watershed has been accelerated in recent decades through poor land-use practices and direct removal of vegetation (Upper Big Hole TMDL 2003; Lamothe and Magee 2004b).

The guidelines for riparian conservation in this Agreement are to maintain and restore sustainability to all riparian habitats on enrolled lands. 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 use actions. 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; replanting or transplanting native riparian vegetation such as willows; and curtailing or relocating any ranching activities which degrade riparian habitats.

The NRCS' Riparian Assessment Method will be used to determine the present condition of riparian habitats, 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 (NRCS 2004). Under the NRCS protocol, the desired condition of riparian habitats under the Agreement is a score of at least 80%. 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.

Irrigation Water Application and Efficient Delivery of Stock Water

Control of irrigation water application and diversion is a necessity to achieve increased flows in the Big Hole River system. Currently, the majority of lands included in this Agreement are irrigated through uncontrolled surface water (flood) irrigation techniques. To improve irrigation efficiency on enrolled lands, a comprehensive assessment will be performed detailing topographic features, water availability, diversion points, crop needs, soils, etc. From the assessment, several options will be developed to improve the overall application of irrigation water on the enrolled lands which will lead to reduced irrigation water requirements for irrigation purposes and may reduce the amount of water diverted thus improving instream flows.

Irrigation Water Management (IWM) and/or water spreading plans will specify irrigation practices to be developed on enrolled lands. Land smoothing[*], borders, ditches, diversions are examples of projects that could be implemented to achieve the desired irrigation savings. The Participating Landowner would agree to leave all water saved through irrigation improvements in the source from which the irrigation water was withdrawn. This means that the Participating Landowner can only withdraw the allotted irrigation volume minus the amount saved by the irrigation improvements and that the saved water cannot be used elsewhere on land controlled by the participant. This action will benefit instream flows by preventing "excess" diversions for irrigation purposes.

Diversions for livestock water also are a significant concern in some areas of the Big Hole watershed. There are many areas where water is diverted several miles for livestock consumption. Stock water uses will be analyzed on a site-specific basis and alternatives developed to reduce withdrawals from the river and tributaries. Many opportunities exist to supply stock water via wells, pipelines, and troughs instead of surface water diversions. If surface water is the viable alternative, the plan will detail the measures needed to deliver the water to livestock as efficiently as possible. The Participating Landowner agrees to leave all water saved through stock water improvements in the source from which the stock water was withdrawn regardless of environmental conditions such as drought status. This means that if stock water is provided wholly by ground water developments, then no surface water shall be diverted for stock water needs. If conveyance systems are improved (i.e., pipelines, ditch lining, etc.), the surface water diversion will be reduced by the amount currently diverted for stock water minus the amount saved through conveyance efficiencies.

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[*] Land Smoothing: Removing irregularities on the land surface to improve surface drainage, provide for more uniform cultivation, and improve equipment operation and efficiency (NRCS Field Office Technical Guide 466).

Proper Nutrient Management And Fertilizer Application

Nutrients from animal waste and commercial fertilizers pose a potential threat to water quality. Participating Landowners will implement a Nutrient Management plan ensuring proper management of all nutrients in their control. Nutrient sources may include, but are not limited to, agro-chemicals (fertilizers) and livestock wastes, which may directly or indirectly affect aquatic habitat conditions. Nutrient plans will be based on soil tests and phosphorus and nitrogen indexes, and will be closely linked to the Prescribed Grazing and Irrigation Water Management practices.

The parts of the site-specific plan developed and implemented by NRCS will adhere to NRCS format to include timelines for implementation and will contain fully developed specifications and job sheets for each conservation measure or practice required. Details on the guidelines and protocols to be used above, including RMS, National Planning Procedures Handbook (NPPH), Riparian Assessment, and Field Office Technical Guides for Irrigation Water Management (FOTG 449), Prescribed Grazing (FOTG 528A), and Nutrient Management (FOTG 590) can be accessed through the NRCS Montana website at >http://www.mt.nrcs.usda.gov<.

APPENDIX B.

DERIVATION OF INSTREAM FLOW TARGETS AND DESCRIPTION OF HYDROLOGIC CONDITIONS EXPERIENCED AT USGS STREAMFLOW GAGES AT WISDOM AND MUDD CREEK BRIDGE

FRAMEWORK FOR DEVELOPING STREAMFLOW TARGETS – THE WETTED PERIMETER INFLECTION POINT

One of the key conservation strategy of this Agreement is to maintain streamflows that promote stream ecosystem function and benefit grayling. This strategy should generally consist of three components--1) facilitating adequate seasonal high-flow events; 2) maintaining adequate baseflow conditions; and 3) eliminating human-caused dewatering events. Declines in grayling abundance coincident with drought and irrigation demands strongly suggest that hydrologic alterations in the Big Hole River watershed periodically cause streamflows to drop below optimum levels for providing maximum habitat availability. In addition, high-flow events, which typically result from snowmelt runoff, also have been attenuated by drought and irrigation. These high flows are critical in the establishment and maintenance of channel form, thus creating and maintaining habitat; and also may serve as a spawning cue for grayling in the river. The maintenance of base flows throughout the rest of the year is equally important. This Agreement seeks to provide base flows that are sufficient to provide grayling suitable habitat conditions, maintain a healthy thermal regime, and allow for suitable foraging conditions (stream productivity). Through this Agreement, streamflow targets to maintain minimum flows necessary for grayling have been based on the wetted perimeter inflection point method (Leathe and Nelson 1989).

The wetted perimeter inflection point method has been widely applied to Montana rivers including the Big Hole River (MFWP 1989), where it also is described as a habitat retention method (Leathe and Nelson 1989). This method examines a stream's hydraulic characteristics at various flows, and attempts to identify abrupt changes in the wetted perimeter-discharge relationship (i.e., inflection points) that can be subsequently used to make minimum flow recommendations. For a sensitive species such as grayling, the minimum flows should be based on the upper inflection point (Leathe and Nelson 1989). Leathe and Nelson (1989) describe the upper inflection point as the point at which the stream is approaching its maximum width and begins to move up the bank as flows increase. Thus, large increases in flow above the upper inflection point provide only nominal increases in wetted perimeter. The ecological rationale behind this method is to keep the main river channel full to maximize primary and secondary production in (primarily) riffle habitat (Leathe and Nelson 1989; Jowett 1997). In order to take into account the hydrological realities that occur within the Project Area, the Agreement will utilize the upper inflection point as a minimum flow target during spring (April-June) and the lower inflection point as the minimum flow target during summer and fall (July-October) for each Management Segment.

HYDROLOGIC CONDITIONS AT WISDOM IN RELATION TO FLOW TARGETS

While the wetted perimeter method represents guidelines for biologic needs, the hydrologic reality is such that these minimum flows may not be met during water years with flow less than normal (based on the period of record) even with the implementation of conservation measures, especially at the Wisdom location (CCAA Management Segment C). For example, based on the 17-year period of record at the Wisdom gage, a median of 82 days per irrigation season fall below 60 cfs flow, which is the minimum instream flow target for summer. The implementation of conservation measures will likely reduce the occurrence of these low flows. However, based on historical data, they will not eliminate them altogether (Table B1). Factors unique to this gage, such as "losing" conditions in late summer and large irrigation diversions immediately upstream of the gage versus the associated return flows re-entering the river downstream of the gage, likely makes the Wisdom location the "worst case scenario" among the management segments in terms of not meeting flow guidelines.

Table B1. Predicted number of days with streamflows less than 60 cfs at the Wisdom gage during May 1-October 1 in relation to estimated increases in irrigation system efficiencies. May 1-October 1 (153 days) represents a typical period of use and includes effects of water diversion for pasture irrigation.

MAY 1-OCTOBER 1			% Increase on Top of Present System Efficiency & Corresponding Days <60 cfs at Wisdom Gage**			
Water Year Exceedance (%)*	Equivalent To	No Changes	10%	20%	30%	40%
5 (wet)	1 in 20 years	0	0	0	0	0
30		26	26	26	25	25
50 (median)	1 in 2 years	82	79	74	71	67
70		88	80	74	69	63
90 (dry)		112	109	105	104	101

*Based on Wisdom gage flow data (1988-2004).
**Assumes percent efficiency increase equals percent increase in flows for entire irrigation season.

Further evidence shows that basin inflows (above irrigation diversions) in August of 2002, 2003, and 2004 were on the scale of 70-90 cfs (MDNRC unpublished data). Even if conservation measures had been implemented during those years it is unlikely flows would have resulted in 60 cfs at the Wisdom Bridge. This leads to the conclusion that due to cumulative drought and natural hydrologic variability, some management segment targets may not be attainable in some years regardless of water conservation efforts implemented through the Agreement.

USING EXISTING USGS STREAMFLOW DATA TO ESTIMATE FREQUENCY OF MEETING FLOW TARGETS

There are existing real-time flow monitoring stations located at only two of the five CCAA Management Segments--Management Segment C (Wisdom) and Management Segment D (Mudd Creek Bridge). The Wisdom gage has been maintained since 1988, whereas the Mudd Creek Bridge gage has been operated since 1998. Data from these stations was used to tabulate the frequency with which the minimum flows exceeded the minimum flow targets at these locations during 1998-2004.

LOCATION (MANAGEMENT SEGMENT)	SPRING MINIMUM Flow Exceedance	SUMMER/FALL MINIMUM Flow Exceedance
Wisdom (Segment C	69x	31x
Mudd Creek Bridge (Segment D)	93x	72x

Based on the available data during 1998-2004, flows at Wisdom exceeded the minimum CCAA Management Segment targets 69% and 31% of the time during spring and summer/fall, respectively. During the same time period, flows at the Mudd Creek Bridge exceeded the targets 93% and 72% of the time during spring and summer/fall, respectively. This brief summary again highlights that conditions at Wisdom likely represent a "worst case" scenario for flows among the five management segments.

DATA TABLE - FLOW TARGETS AND GRAYLING POPULATION MONITORING AT WISDOM

Table B2. Streamflow characteristics in the Big Hole River at Wisdom during 1988-2004 in relation to the proposed CCAA minimum instream flow targets for spring and summer/fall periods (160 and 60 cfs, respectively) and an index of grayling abundance 1991-2003 estimated by catch-per-unit electrofishing conducted by MFWP. Grayling index of abundance data are presented graphically in Figure 11.

FREQUENCY OF AVERAGE DAILY DISCHARGE MEETING PROPOSED MANAGEMENT SEGMENT FLOW TARGETS AT WISDOM			
YEAR	April–June (n=91 days)	July–September (n=92 days)	CPUE of Grayling (total all age classes) Near Wisdom
1988	78%	0%	*
1989	74%	25%	*
1990	52%	35%	*
1991	100%	41%	19
1992	43%	38%	4
1993	97%	100%	8
1994	48%	0%	14
1995	99%	65%	20
1996	100%	61%	11
1997	100%	100%	18
1998	100%	79%	16
1999	98%	28%	12
2000	54%	0%	1
2001	52%	2%	0
2002	80%	18%	1
2003	91%	0%	7
2004	13%	46%	Data not yet compiled

* Data specifically from the Wisdom reach during 1988-90 were not included in MFWP monitoring reports.

APPENDIX C.

DESCRIPTION OF POSSIBLE FUNDING SOURCES AVAILABLE TO IMPLEMENT THE AGREEMENT'S CONSERVATION MEASURES

While no funding is allocated specifically for the implementation of this Agreement or private landowners site-specific plans, the cooperating agencies have multiple funding options that they may utilize and/or pursue to assist in implementing this Agreement and any site-specific plan. A list of applicable programs and a general description of each is contained below. This is not intended to be an exhaustive list of possible funding sources. Interested landowners should contact the local Agency representative for further information, program details, and application requirements. The cooperating Agencies have already obligated staff to conduct the rapid assessment surveys required at Phase I of the Agreement.

NRCS

Environmental Quality Incentives Program - The EQIP was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. The EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

The EQIP offers contracts with a minimum term that ends 1 year after the implementation of the last scheduled practices and a maximum term of 10 years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. The EQIP activities are carried out according to an EQIP plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

The EQIP may cost-share up to 75% of the costs of certain conservation practices. Incentive payments may be provided for up to 3 years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90%. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.

Special initiative EQIP programs have already been used to promote fluvial Arctic grayling conservation in the upper Big Hole River. In 2004, NRCS spent over $700,000 to provide technical and financial assistance to producers willing to shorten their irrigation seasons and implement alternate stock-water methods to provide instream flows for grayling. This program

resulted in 14,491 acres of deferred irrigation and construction of 12 off-channel stock-watering facilities. In 2005, NRCS committed $500,000 to provide technical and financial assistance to producers in the upper Big Hole River watershed upstream of Dickie Bridge who install conservation practices in a continuing effort to benefit fluvial Arctic grayling habitat. The 2005 EQIP program focuses primarily on improving the management of irrigation water through the installation of water control structures and measuring devices, and providing grayling passage past irrigation diversion structures.

Wildlife Habitat Incentives Program - The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, the NRCS provides both technical assistance and up to 75% cost-share assistance to establish and improve fish and wildlife habitat. The WHIP agreements between NRCS and the participant generally last from 5-10 years from the date the agreement is signed.

The WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to conservation-minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs.

The Farm Security and Rural Investment Act of 2002 reauthorized WHIP as a voluntary approach to improving wildlife habitat in our Nation. Program administration of WHIP is provided under NRCS.

Wetland Reserve Program - The Wetland Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. Options offered under WRP include perpetual conservation easements and 100% cost-share for wetland restoration projects, 30-year conservation easements and 75% cost-share for wetland restoration projects, and 10-year restoration only (non-easement) cost share assistance.

Conservation Security Program - The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and rangeland, as well as forested land that are an incidental part of an agriculture operation. The program is available in all 50 States, the Caribbean Area, and the Pacific Basin area. The program provides equitable access to benefits to all producers, regardless of size of operation, crops produced, or geographic location.

The Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) (Pub. L. 107-171) amended the Food Security Act of 1985 to authorize the program. The CSP is administered by NRCS.

Grassland Reserve Program - The Grassland Reserve Program (GRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property. Section 2401 of the Farm Security and Rural Investment Act of 2002 (Pub. L. 107-171) amended the Food Security Act of 1985 to authorize this program. The NRCS, Farm Service Agency, and Forest Service are coordinating implementation of GRP, which helps landowners restore and protect grassland, rangeland, pastureland, shrubland and certain other lands and provides assistance for rehabilitating grasslands. The program will conserve vulnerable grasslands from conversion to cropland or other uses and conserve valuable grasslands by helping maintain viable ranching operations.

"Grasslands provide critical ecological benefits and play a key role in environmental quality, as well as contributing to the economies of many rural areas," said Secretary of Agriculture Ann Veneman. "This voluntary program helps protect valuable grasslands from conversion to other land uses, thus helping to ensure this national resource is available to future generations."

Grasslands make up the largest land cover on America's private lands. Privately-owned grasslands and shrublands cover more than 525 million acres in the United States. For the first time, the USDA will direct financial resources and technical expertise to help landowners protect and restore these lands.

Farm and Ranchland Protection Program - The Farm and Ranch Land Protection Program provides matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses. Working through existing programs, USDA partners with State, Tribal, or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. The USDA provides up to 50% of the fair market easement value.

To qualify, farmland must--be part of a pending offer from a State, Tribe, or local farmland protection program; be privately-owned; have a conservation plan for highly erodible land; be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production. Depending on funding availability, proposals must be submitted by the eligible entities to the appropriate NRCS State Office during the application window.

Conservation Technical Assistance - The Conservation Technical Assistance program provides voluntary conservation technical assistance to landusers, communities, units of State and local government, and other Federal agencies in planning and implementing conservation systems. This assistance is for planning and implementing conservation practices that address natural resource issues. It helps people voluntarily conserve, improve and sustain natural resources.

MFWP

Future Fisheries Improvement Program - The MFWP currently has nearly a million dollars a year available to fish habitat improvement projects through Future Fisheries Improvement Program (FFIP). Projects are funded through a competitive review process. Preference is given to projects that restore habitats for native fishes. Potential projects that FFIP may provide funding for include--1) improvements to fish passage; 2) restore naturally functioning stream banks; 3) prevention of loss of fish into diversions; and 4) projects that enhance stream flows in dewatered areas.

Landowner Incentive Program: The USFWS' Landowner Incentive Program (LIP) provides funding to States to establish or supplement landowner incentive programs that protect and restore habitats on private lands, to benefit federally-listed, proposed or candidate species, or other species determined to be at-risk. The MFWP has secured an $180,000 Tier I LIP grant through 2006 to fund a fisheries biologist to identify habitat restoration opportunities and implement corrective actions in the Project Area. The MFWP plans on continuing this position beyond 2006. The MFWP is currently seeking a $700,000 Tier II LIP grant to implement the conservation measures identified in the Agreement.

USFWS

The USFWS' Montana Partners for Fish and Wildlife program receives and annual project allocation to implement conservation projects with private landowners in the Big Hole River watershed. Typically, this allocation averages $30,000 per year and a portion of this funding may be used to implement conservation measures identified in the Agreement.

APPENDIX D.

REFERENCES CITED

Alberta Sustainable Resource Development. 2005. Status of the Arctic grayling (Thymallus arcticus) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report No. 57, Edmonton, Alberta. 41 pp.

Angermeier, P.L., and I.J. Schlosser. 1989. Species-area relationship for stream fishes. Ecology 70:1450-1462.

Baron, J.S., N.L. Poff, P.L. Angermeier, C.N. Dahm, P.H. Gleick, N.G. Hairston Jr., R.B. Jackson, C.A. Johnston, B.D. Richter, and A.D. Steinman. 2002. Meeting ecological and societal needs for freshwater. Ecological Applications 12(5):1247-1260.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. Bethesda, Maryland.

Behnke, R.J. 2002. Trout and salmon of North America. The Free Press, New York.

Big Hole Watershed Committee. 1997. Big Hole River drought management plan. Unpublished report. Butte, Montana. 4 pp.

Bisson, P.A., J.L. Nielson, R.A. Palmeson, and L.E. Grove. 1982. A system of naming habitat types in small streams, with examples of habitat utilization by salmonids during low stream flows. Pages 62-73 in N.B. Armantrout [ed.] Acquisition and utilization of aquatic habitat inventory information. American Fisheries Society, Bethesda, Maryland. 376 pp.

Bjornn, T.C., and D.W. Reiser. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:83-138.

Borman, M.M., C.R. Massingill, and E.W. Elmore. 1999. Riparian response to changes in management. Rangelands 21(3):3-7.

Brummond, A. 2005. Drought update, April 19, 2005. Unpublished report by Montana Fish, Wildlife and Parks. 6 pp.

Byorth, P.A. 1993. Big Hole River Arctic grayling recovery project: Annual monitoring report 1992. Unpublished report submitted to Fluvial Arctic Grayling Workgroup. Montana Fish, Wildlife and Parks, Bozeman.

Byorth, P.A., and J.P. Magee. 1998. Competitive interactions between Arctic grayling and brook trout in the Big Hole River drainage, Montana. Transactions of the American Fisheries Society 127: 921-931.

Dunham, J.B., G.L. Vinyard, and B.E. Rieman. 1997. Habitat fragmentation and extinction risk of Lahontan cutthroat trout (Oncorhynchus clarki henshawi). North American Journal of Fisheries Management 17:910–917.

Everett, R.J. 1986. The population genetics of Arctic grayling (Thymallus arcticus) of Montana. MS Thesis, University of Montana, Missoula. 83 pp.

Fausch, K.D., and T.G. Northcote. 1992. Large woody debris and salmonid habitat in a small coastal British Columbia stream. Canadian Journal of Fisheries and Aquatic Sciences 49:682-693.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An ecosystem perspective on riparian zones. Bioscience 41:540-551.

Hauer, F.R., and W.R. Hill. 1996. Temperature, light, and oxygen. Pages 93-106 in F.R. Hauer and G.A. Lamberti (eds). Methods in stream ecology. Academic Press, San Diego, California.

Hedrick, R.P., T.S. McDowell, K. Mukkatira, M.P. Georgiadis, and E. MacConnell. 1999. Susceptibility of selected inland salmonids to experimentally induced infections with Myxobolus cerebralis, the causative agent of whirling disease. Journal of Aquatic Animal Health 11(4):330-339.

Hilderbrand, R.H., and J.L. Kershner. 2000. Conserving inland cutthroat trout in small streams: how much stream is enough? North American Journal of Fisheries Management 20:513-520.

Hill, M.T., and W.S. Platts. 1998. Ecosystem restoration: a case study with the Owens River Gorge, California. Fisheries 23(11):18-27.

Hughes, N.F. 1992. Selection of positions by drift-feeding salmonids in dominance hierarchies: model and test for Arctic grayling (Thymallus arcticus) in subarctic mountain streams, interior Alaska. Canadian Journal of Fisheries and Aquatic Sciences 49:1999-2008.

Hughes, N.F. 1998. A model of habitat selection by drift-feeding stream salmonids at different scales. Ecology 79:281-294.

Hunter, C.J. 1991. Better trout habitat – A guide to stream restoration and management. Montana Land Reliance.

Jowett, I.G. 1997. Instream flow methods: a comparison of approaches. Regulated Rivers: Research and Management 13:115–127.

Kaya, C.M. 1990. Status report on fluvial Arctic grayling (Thymallus arcticus) in Montana. Unpublished Report to Montana Department of Fish Wildlife and Parks, Helena. 97 pp.

Kaya, C.M. 1992a. Review of the decline and status of fluvial Arctic grayling, Thymallus arcticus, in Montana. Proceedings of the Montana Academy of Sciences 1992:43-70.

Kaya, C.M. 1992b. Restoration of fluvial Arctic grayling to Montana streams: assessment of reintroduction potential of streams in the native range, the upper Missouri River above Great Falls. Unpublished report to Montana Chapter of the American Fisheries Society; U.S. Fish and Wildlife Service; and U.S. Forest Service Bozeman, Montana. 102 pp.

Kaya, C.M. 2000. Arctic grayling in Yellowstone: status, management and recent restoration efforts. Yellowstone Science 8:12-17.

Keleher, C.J., and F.J. Rahel. 1996. Thermal limits to salmonid distributions in the Rocky Mountain region and potential habitat loss due to global warming: A Geographic Information System (GIS) approach. Transactions of the American Fisheries Society 125:1-13.

Lamothe, P., and J. Magee. 2003. Movement and habitat selection of Arctic grayling, brook trout, and mountain whitefish during drought conditions in the Big Hole River, Montana. Unpublished report submitted to Fluvial Arctic Grayling Workgroup. Montana Fish, Wildlife and Parks, Bozeman.

Lamothe, P., and J. Magee. 2004a. Reintroducing fluvial Arctic grayling (Thymallus arcticus) to the upper Ruby River, Montana: a progress report. Unpublished Report, Montana Fish, Wildlife and Parks, Dillon. 46 pp.

Lamothe, P., and J. Magee. 2004b. Linking Arctic grayling abundance to physical habitat parameters in the upper Big Hole River, Montana. Montana Fish, Wildlife and Parks, Dillon. 29 pp.

Leathe, S.A., and F.A. Nelson. 1989. A literature evaluation of Montana's wetted perimeter inflection point method for deriving instream flow recommendations. Montana Fish, Wildlife and Parks, Helena. 70 pp.

Lohr, S.C., P.A. Byorth, C.M. Kaya, and W.P. Dwyer. 1996. High-temperature tolerances of fluvial Arctic grayling and comparisons with summer river temperatures of the Big Hole River, Montana. Transactions of the American Fisheries Society 125:933-939.

Lonzarich, D.G., and T.P. Quinn. 1995. Experimental evidence for the effect of depth and structure on the distribution, growth, and survival of stream fishes. Canadian Journal of Zoology 73:2223-2230.

Magee, J., and P. Lamothe. 2003. Big Hole River fluvial Arctic grayling monitoring report 2002. Unpublished report submitted to Fluvial Arctic Grayling Workgroup. Montana Fish, Wildlife and Parks, Dillon. 37 pp.

Magee, J., and P. Lamothe. 2004. Fluvial Arctic grayling monitoring report 2003. Unpublished report submitted to Fluvial Arctic Grayling Workgroup, Beaverhead National Forest, U.S. Bureau of Land Management, Montana Chapter of the American Fisheries Society, Montana Council of Trout Unlimited, and U.S. Fish and Wildlife Service. Montana Fish, Wildlife and Parks, Dillon. 27 pp.

Montana Fish, Wildlife and Parks. 1989. The Application for Reservations of Water in the Missouri River Basin Above Fort Peck - Volume 2. Montana Fish, Wildlife and Parks, Helena.

Montana Fish, Wildlife and Parks. 1995. Montana Fluvial Arctic Grayling Restoration Plan. Unpublished report by Montana Fish, Wildlife and Parks, Helena. 20 pp.

Montana Fish, Wildlife and Parks. Undated. Electrofishing and fish handling protocols. Unpublished Montana Fish, Wildlife and Parks Policy, Fisheries Division, Helena.

Montana Fish, Wildlife and Parks and U.S. Fish and Wildlife Service. 1996. Memoranda of Agreement for Implementation of the fluvial Arctic grayling restoration plan. Unpublished document by Montana Fish, Wildlife and Parks and U.S. Fish and Wildlife Service. 6 pp.

Murphy, M.L., and W.R. Meehan. 1991. Stream ecosystems. Pages 17-46 in W.R. Meehan (ed). Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Special Publication 19. Bethesda, Maryland.

Myers, T.R., S. Short, C. Farrington, K. Lipson, H.J. Geiger, and R. Gates. 1993. Comparison of the enzyme-linked immunosorbent assay (ELISA) and the fluorescent antibody test (FAT) for measuring the prevalences and levels of Renibacterium salmoninarum in wild and hatchery stocks of salmonid fishes in Alaska, USA. Diseases of Aquatic Organisms 16:181-189.

Natural Resources Conservation Service. 2000. Natural Planning Procedures Handbook, Amendment 3. USDA Natural Resources Conservation Service, 180-vi-NPPH.

Natural Resources Conservation Service. 2004. Riparian Assessment: using the NRCS riparian assessment method. Natural Resources Conservation Service, Bozeman, Montana. 43 pp.

Northcote, T.G. 1995. Comparative biology and management of Arctic and European grayling (Salmonidae, Thymallus). Reviews in Fish Biology and Fisheries 5:141-194.

OEA Research, Inc. 1995. Upper Big Hole River riparian and fisheries habitat inventory. Volumes I, II, III, IV, and V. Prepared for Montana Department of Fish, Wildlife and Parks, Helena.

Opperman, J.J., and A.M. Merenlender. 2004. The effectiveness of riparian restoration for improving instream fish habitat in four hardwood-dominated California streams. North American Journal of Fisheries Management 24:822-834.

Pearsons, T.N., H.W. Li, and G.A. Lamberti. 1992. Influence of habitat complexity on resistance to flooding and resilience of stream fish assemblages. Transactions of the American Fisheries Society 121:427-436.

Peterson, J. 1997. BKD/Renibacterium salmoninarum Policy Survey and Grayling at Bozeman Fish Technology Center. Unpublished memo to Montana Fish, Wildlife and Parks, Fish Health Committee, Helena. 6 pp.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestegaard, B.D. Richter, R.E. Sparks, and J.C. Stromberg. 1997. The natural flow regime: a paradigm for river conservation and restoration. BioScience 47:769–784.

Poole, G.C., and C.H. Berman. 2001. The ecological perspective on in-stream temperature: natural heat dynamics and mechanisms of human-caused thermal degradation. Environmental Management 27(6):787-802.

Prichard, D., J. Anderson, C. Correll, J. Fogg, K. Gebhardt, R. Krapf, S. Leonard, B. Mitchell, and J. Staats. 1998. Riparian area management: a user guide to assessing proper functioning condition and supporting science for lotic areas. Technical Reference 1737-15, U.S. Bureau of Land Management, BLM/RS/ST-98/001+1737, National Applied Resources Science Center, Denver, Colorado. 126 pp.

Redenbach, Z., and E.B. Taylor. 1999. Zoogeographical implications of variation in mitochondrial DNA of Arctic grayling (Thymallus arcticus). Molecular Ecology 8:23-35.

Roberts, M.J. 2005. Big Hole River: an assessment of irrigation water management during the 2004 irrigation season. Unpublished report to Montana Department of Natural Resources and Conservation, Helena. 10 pp.

Rosgen, D.L. 1994. A classification of natural rivers. Pages 169-199 in R.B. Bryan, R. Herrmann, P.D. Jungerius, J. Poesen, R. Webster, D.H. Yaalon (eds.), Catena. Volume 22, No. 3.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Sedell, J.R., G.H. Reeves, F.R. Hauer, J.A. Stanford, and C.P. Hawkins. 1990. Role of refugia in recovery from disturbances: modern fragmented and disconnected river systems. Environmental Management 14:711-724.

Schlosser, I.J., and P.L. Angermeier. 1995. Spatial variation in demographic processes of lotic fishes: Conceptual models, empirical evidence, and implications for conservation. American Fisheries Society Symposium 17:392-401.

Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Bulletin 184, Ottawa.

Shaffer, M. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86 in M.E. Soulé (editor), Viable Populations for Conservation. Cambridge University Press, New York.

Shepard, B.B., and R.A. Oswald. 1989. Timing, location, and population characteristics of spawning Montana Arctic grayling [Thymallus arcticus (Milner)] in the Big Hole River drainage, 1988. Report to Montana Department of Fish, Wildlife and Parks; Montana Natural Heritage Program – Nature Conservancy; and U.S. Forest Service – Northern Region. 38 pp.

Skaar, D. 1989. Distribution, relative abundance and habitat utilization of the Arctic grayling (Thymallus arcticus) in the upper Big Hole River drainage, Montana. Unpublished report to Montana Natural Heritage Program, Montana Fish, Wildlife and Parks, and Montana Cooperative Fishery Research Unit, Bozeman. 52 pp.

Upper Big Hole Total Maximum Daily Load. 2003. Upper Big Hole River planning area phase 1 total maximum daily load assessment. Report to Big Hole River Watershed Council, Big Hole Foundation, and Montana Department of Environmental Quality. Confluence Consulting, DTM Consulting, and Applied Geomorphology, Bozeman, Montana. 95 pp.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1999. Joint final policy on Candidate Conservation Agreements with Assurances. Federal Register Vol. 64, No. 116, Thursday, June 17, 1999, pp. 32726-32736.

U.S. Fish and Wildlife Service. 2003. Draft Candidate Conservation Agreements with Assurances Handbook. 50 pp.

U.S. Fish and Wildlife Service. 2004. Final rule for Safe Harbor Agreements and Candidate Conservation Agreements with Assurances. Federal Register Vol. 69, No. 85 / Monday, May 3, 2004, pp. 24084-24094.

U.S. Fish and Wildlife Service. 2005. Review of Native Species That Are Candidates or Proposed for Listing as Endangered or Threatened (Candidate Notice of Review). 24870 Federal Register Vol. 70, No. 90, Wednesday, May 11, 2005, pp. 24870-24934.

Vincent, R.E. 1962. Biogeographical and ecological factors contributing to the decline of Arctic grayling Thymallus arcticus Pallus, in Michigan and Montana. PhD thesis. University of Michigan, Ann Arbor. 169 pp.

Wilcox, B.A., and D.D. Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. American Naturalist. 125:879-887.

APPENDIX E.

TEMPLATE FORMS FOR PHASE I OF AGREEMENT

LANDOWNER ENROLLMENT

GRAYLING ECOLOGY INFORMATION PAMPHLET

CHECKLIST OF POTENTIAL THREATS TO GRAYLING

RAPID ASSESSMENT

INTERIM SUPPLEMENTAL FLOW AGREEMENT

DRAFT ENTRAINMENT SURVEY PROTOCOL

Application to enter (enroll) into the Candidate Conservation Agreement with Assurances (Agreement) for fluvial Arctic grayling in the Big Hole River, Montana--

LANDOWNER ENROLLMENT

Participating Landowner's name, address, phone #, etc:

_____

_____

_____

_____

Ranch Name:_____

Ranch Manager and phone # (if different than Participating Landowner):

_____

_____

Property Information

Entire property to be Enrolled in Agreement?

___ Yes: Legal description (and/or map) and acreage

___ No: Legal Description (and/or map) showing location of enrolled lands and acreage

Resources to Implement Conservation Measures

Are you interested in cost share for implementing projects (if available)? Yes__ No__

Participating Landowner must adhere to the following conditions under Phase I of the Agreement:

- Compliance with all water rights on enrolled lands (a water right describes the point of diversion, period of use, place of use, and the maximum flow rate of water).
- Allow access to enrolled lands and necessary properties for Agency personnel (i.e., MFWP, USFWS, NRCS, or MDNRC) or representatives of the Agencies for the purposes of:
  - Validating Participating Landowner compliance with water rights.
  - Performing a "Rapid Assessment" to identify immediate and other threats to fluvial Arctic grayling on enrolled lands no later than 90 days after the date of the last signature below.
  - Conducting a survey of fishes present in irrigation ditches and other irrigation structures (entrainment surveys) to determine the presence of fluvial Arctic grayling and salvage any entrained grayling.
- Read Montana Fish, Wildlife and Parks' information pamphlet "Fluvial Arctic Grayling in the Big Hole Valley."
- Identify and take corrective action to address any of the potential "immediate threats" that are applicable on enrolled lands using the accompanying "Checklist of threats" that will form the basis of the Rapid Assessment surveys to be conducted during Phase I of the Agreement.
- Negotiate and implement an interim irrigation withdrawal reduction arrangement, as necessary, to improve instream flow conditions to benefit grayling (see accompanying template form – Interim SFA [Phases I and II]).

MFWP fluvial Arctic grayling information pamphlet (page 1 of 2)

WHAT YOU CAN DO

Conserve Water

✓ If you don't need the water, turn it back into the river.

✓ Close diversions that are not being used.

✓ Maintain properly functioning headgates.

✓ Coordinate irrigation efforts with your neighbors.

✓ Contact cooperating agencies about measuring devices and headgates.

Ensure Grayling Migration

✓ Ensure fish can migrate upstream or downstream through irrigation diversions.

✓ Leave a gap in or board out of the diversion for fish passage.

✓ Contact cooperating agencies with questions about barriers.

Protect Riparian Health

✓ Rest stressed areas to promote healthy willow and other vegetation growth on stream banks.

✓ Locate stock water wells away from streams and rivers.

✓ Place mineral/salt blocks away from streams and rivers.

✓ Remove feedlots and calving areas from stream and river bottoms.

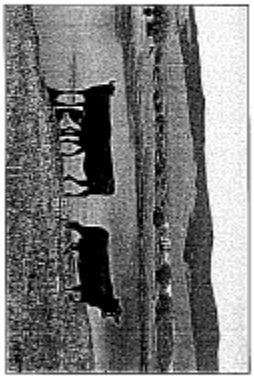
✓ Contact cooperating agencies for assistance with riparian grazing plans.

Keep Grayling Out of Ditches

✓ Leave a gap in or board out of the diversion to allow fish to stay in the stream.

✓ Contact agency personnel to assess and quantify fish in diversions.

Please document your efforts.



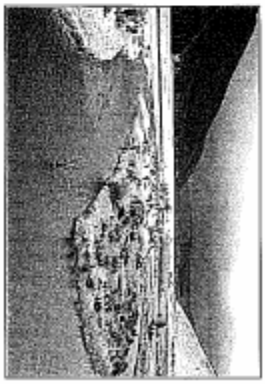
For more information, contact:

Jim Magee, FWP Fisheries Biologist
Peter Lamothe, FWP Fisheries Biologist

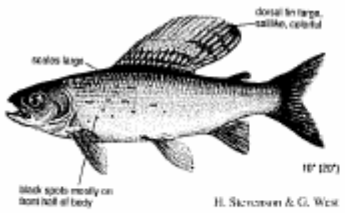
Montana Fish, Wildlife and Parks
Dillon Fisheries Office
730 N. Montana Street
Dillon, MT 59725
Phone: 406-683-2675
Email: plamothe@mt.gov

Montana Fish, Wildlife & Parks

Fluvial Arctic Grayling in the Big Hole Valley



GRAYLING FACTS



In Montana, the fluvial or river-dwelling Arctic grayling was once widespread throughout the upper Missouri River drainage upstream of Great Falls. Today, however, the upper Big Hole River population is now the last remnant of this native fluvial fish.

Big Hole River grayling spawn in late April and early May. They do not build redds like trout, but deposit adhesive eggs over clean, freshly scoured gravels in the mainstem, side channels, and tributaries.

Grayling fry are very small and fragile when they emerge from the gravels in mid-May. The fry need slower backwaters and stream margin habitats to survive and grow. They grow rapidly (4-6 inches by the first fall), reaching spawning maturity at age three. Mature grayling move extensively in the Big Hole and its tributaries to find spawning, summer, and winter habitats. They are aggressive feeders with a diet consisting primarily of aquatic insects. Big Hole River grayling typically grow to 13-15 inches and live 5-6 years.

GRAYLING NEEDS

Adequate Flows Throughout the Year
Grayling need adequate stream flows that maintain pool habitats for feeding, resting, and cover; provide for up and downstream movement; maximize spawning habitat; provide slower velocity backwater and stream margin habitats for juveniles; and accommodate production of aquatic insects for food.

Unimpeded Migration
Grayling in the Big Hole River migrate up to 60 miles between seasons to find essential habitats. Barriers, such as irrigation diversions or dewatered channels, block migration and limit fish distribution and access to seasonal habitats. Grayling may also be flushed or move into irrigation diversions, disrupting migration patterns and increasing mortality.

Cold Water
Arctic grayling require cold summer water temperatures of 45-65° F to maximize reproduction, growth, and survival.

Healthy Riparian Habitat
Healthy vegetation along streams maintains channel width, depth, and bank stability, which is essential for productive fisheries. Healthy vegetation includes willows that provide stream shading, decrease water temperatures, create deep pools, and provide cover and protection.

CHECKLIST OF POTENTIAL THREATS TO GRAYLING

Checklist of potential threats to grayling to be addressed by Participating Landowners during Phases I and II of the Agreement. This form serves as a partial template for the Rapid Assessment survey.

YES	NO	UNK	DESCRIPTION OF POTENTIAL THREATS	CORRECTIVE ACTION
WATER QUANTITY				
			No flow measuring device (e.g., flumes) on some or all irrigation ditches	
			Headgates on some or all irrigation ditches leak when closed	
HABITAT FRAGMENTATION				
			Cross channel diversion or other physical obstruction blocking fish passage	
			Entrainment in irrigation ditches	
			Unused diversions on property	
			Unscreened siphoning or pumping from irrigation ditches	
RIPARIAN-STREAM CHANNEL-LIVESTOCK INTERACTIONS				
			No documented grazing plan to protect riparian habitats	
			Livestock watering in active stream channels	
			Livestock feeding, holding, or husbandry within 50 ft of active stream channel	
			Livestock grazing within 50 ft of active stream channel	
			Livestock crossing active stream channel	
WATER QUALITY				
			Effluent or discharge into the stream or river from agricultural or ranch-related activities	
			Manure piles in or adjacent to stream channels	
			Fertilizers applied to active pastures adjacent to stream channels	
			Debris, trash, or other non-natural items in stream channel	
			Mineral or salt blocks for livestock	
GENERAL RANCH OPERATIONS				
			Driving farm equipment through active channels	
MISCELLANEOUS (DESCRIBE)				

IN WITNESS WHEREOF THE PARTIES HERETO have executed this application to enter into the Agreement and begin the development of a site-specific plan.

_____ _____

Participating Landowner Date

_____ _____

Montana Fish, Wildlife and Parks Date

RAPID ASSESSMENT

Phase I Rapid Assessment Survey to Identify Threats to Grayling on Enrolled Lands--

Participating Landowner's name, address, phone #, etc:

_____

_____

_____

_____

Ranch Name:_____

CCAA Management Segment:_____

Survey Date:_____

Survey Crew (agency or affiliation):_____

Results of Survey:

- Items from "Threats checklist" and other threats to grayling as identified
- Location, GPS coordinates, and condition of irrigation diversion structures and barriers
- Summary of habitat conditions on the property including riparian (bankline) vegetation condition, land use in riparian zone, channel characteristics and condition, in-stream habitat conditions, etc.
- Maps or sketch of property showing location of pertinent natural or physical features

Measures to be implemented by the Participating Landowner during Phase II of the Agreement to address threats to grayling identified during the Rapid Assessment Survey:

- List of conservation measures and implementation schedule to address the threats to grayling identified during the Rapid Assessment. This list may consist of an annotated version of the "Threats checklist" or a summary or outline which contains the equivalent information.
- Participating Landowner shall implement these measures beginning in Phase II of the Agreement and shall continue to implement these measures unless they are modified or supplanted by those described in the final site-specific plan.
- This list will be submitted to USFWS who will review and provide concurrence/non-concurrence with the rapid assessment measures and counter-sign the Certificate of Inclusion.

INTERIM SUPPLEMENTAL FLOW AGREEMENT
PHASES I AND II

Template Agreement Form for voluntary water conservation measures prior to the completion of the site-specific plans--

The purpose of this arrangement is to provide suitable streamflows for fluvial Arctic grayling in the upper Big Hole River and its tributaries during the development of the site-specific plan. During the development of the site-specific plan the landowner [insert name] will limit irrigation withdrawals into irrigation ditch [insert irrigation ditch name and associated water right identification number] from [insert start date] until [insert completion date]. Irrigation withdrawals at this point of diversion will not exceed [insert percentage of the associated water right] of [insert authorized amount of irrigation withdrawal or other similar language] during the agreed-upon period. The headgate at the point of diversion will be regulated on a daily basis by [insert either landowner name, agency name, or name of water commissioner] to ensure that irrigation withdrawals do not exceed the agreed-upon amount in this agreement.

_____

[Signature of Landowner] [Date]

_____

[Signature of MFWP representative] [Date]

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% 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% 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 Supplemental Flow Agreement, 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.

//

//

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

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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 (SUPPLEMENTAL FLOW AGREEMENT)

The Participating Landowners and the Agencies agree to implement the following Supplemental Flow Agreement 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.

<u>From May 1 - July 15</u>:

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.

<u>July 15 – September 1</u>:

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

<u>After September 1</u>:

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% 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% 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% 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%.

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) IWM 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 25-65% of the potential with the majority only producing at 25% 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% 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 (Units 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 offsite 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 landuse 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

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

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

E 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).

The MFWP has the right to enter the enrolled land, with reasonable prior notice to the Participating Landowner, to monitor the Participating Landowner's compliance with the site-specific plan. Monitoring of compliance will occur at a minimum of every six months for the duration of the site-specific plan. At the time of entering the enrolled land for the purpose of compliance monitoring, MFWP will determine whether the Participating Landowner is complying with the components of the site-specific plan.

If MFWP or the USFWS determines that a Participating Landowner is violating the terms of the site-specific plan, written notice shall be sent to the Participating Landowner advising the Participating Landowner of the nature of the violation and identifying corrective actions required to bring the Participating Landowner back into compliance with the site-specific plan. Take authorization and the regulatory assurances associated with the Certificate of Inclusion may be suspended or revoked if the landowner does not remedy the violation within seven (7) days after receipt of the notice.

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 NONCOMPLIANCE

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.

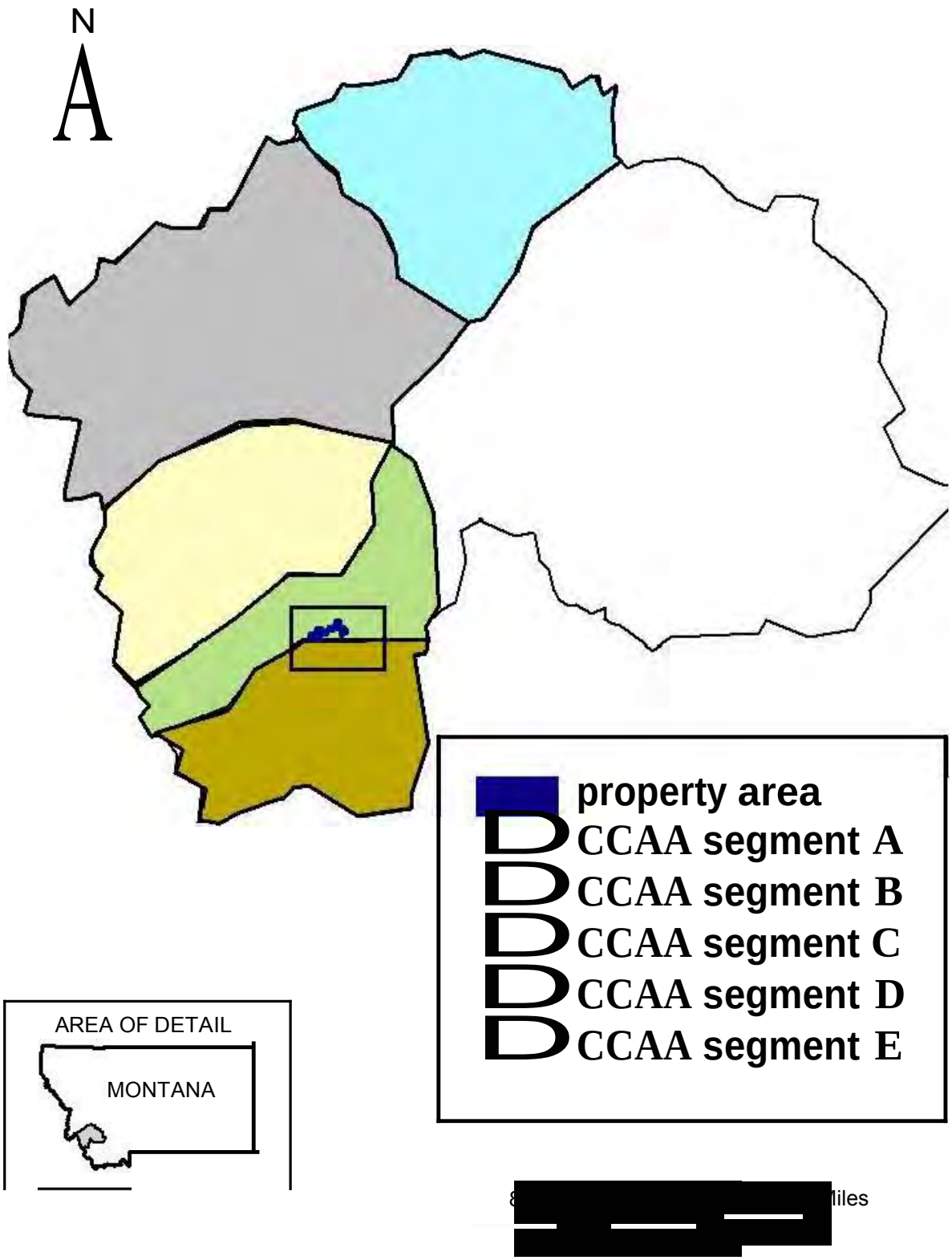
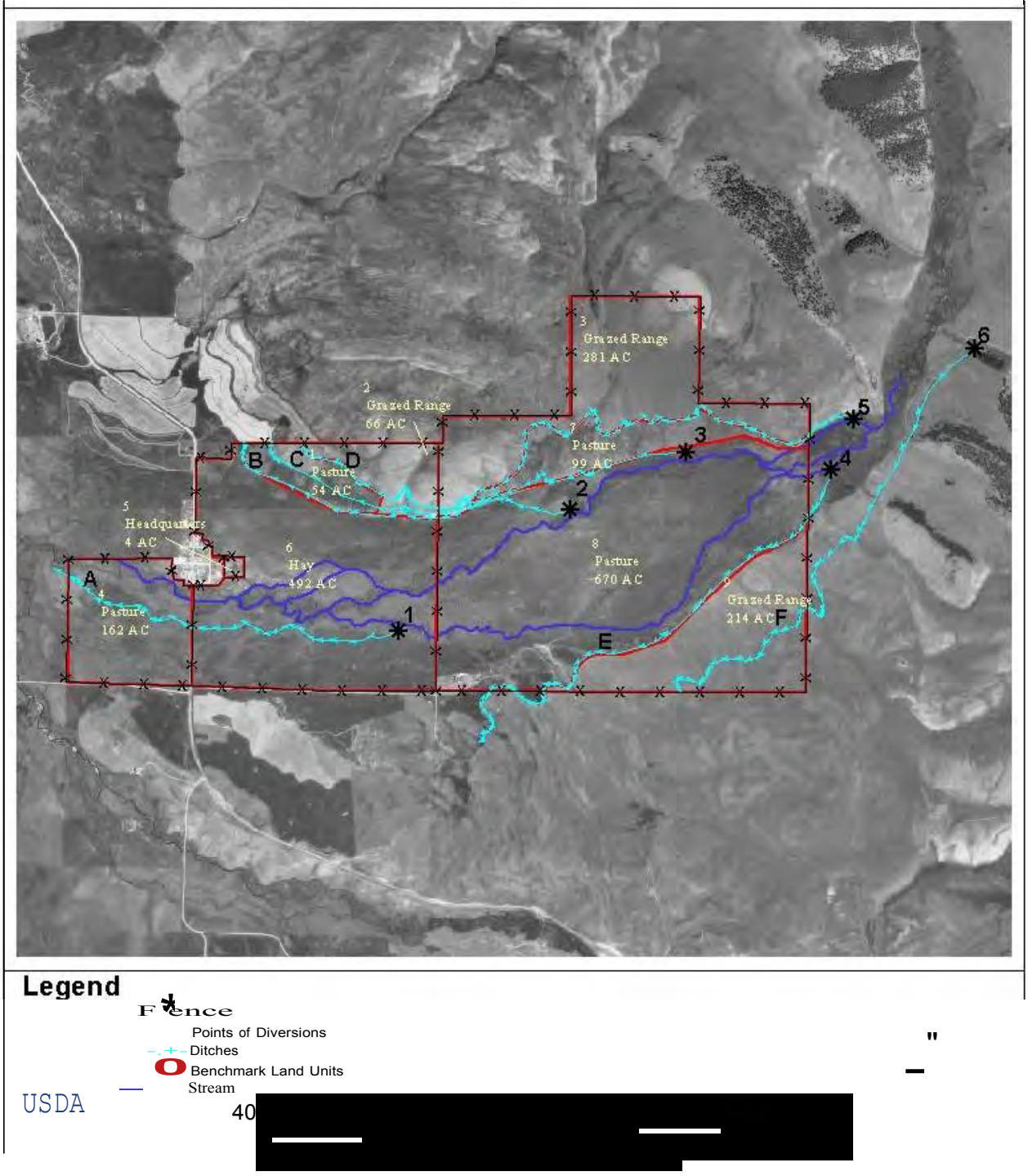


Figure lG. The location of enrolled land for Landowner "A" in relation to the CCAA management segments.

Landowner "A"

Benchmark Conditions

Date:03!.1312005



Legend

Fence

Points of Diversions

Ditches

Benchmark Land Units

Stream

USDA

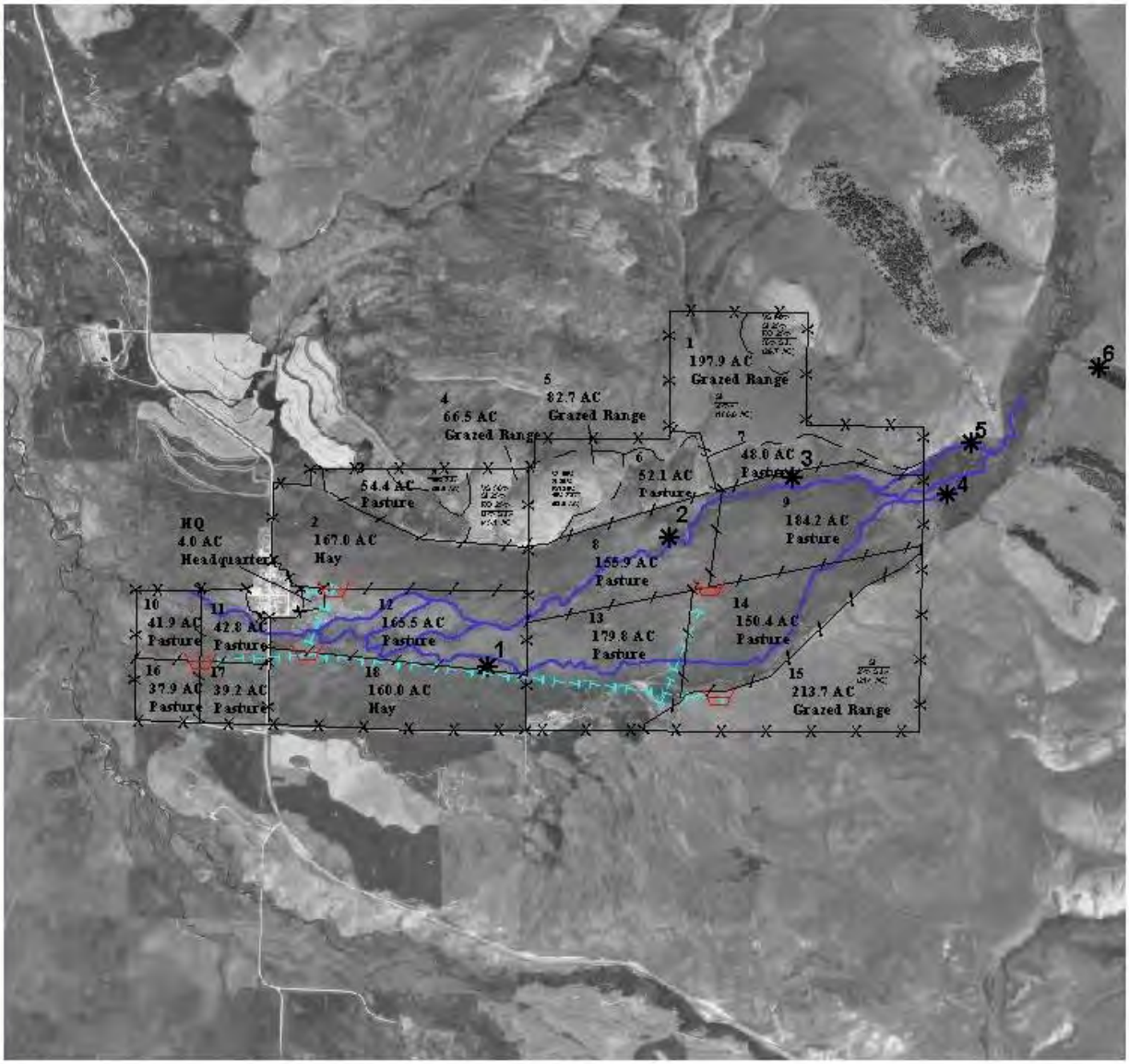
40 [redacted]

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

Landowner "A"

Site-specific plan map

Date:03!.1512005



Legend

Planned watering Facility

Planned Fence

Planned Pipeline

Existing Fence

Points of Diversions

Stream

Range Site Division

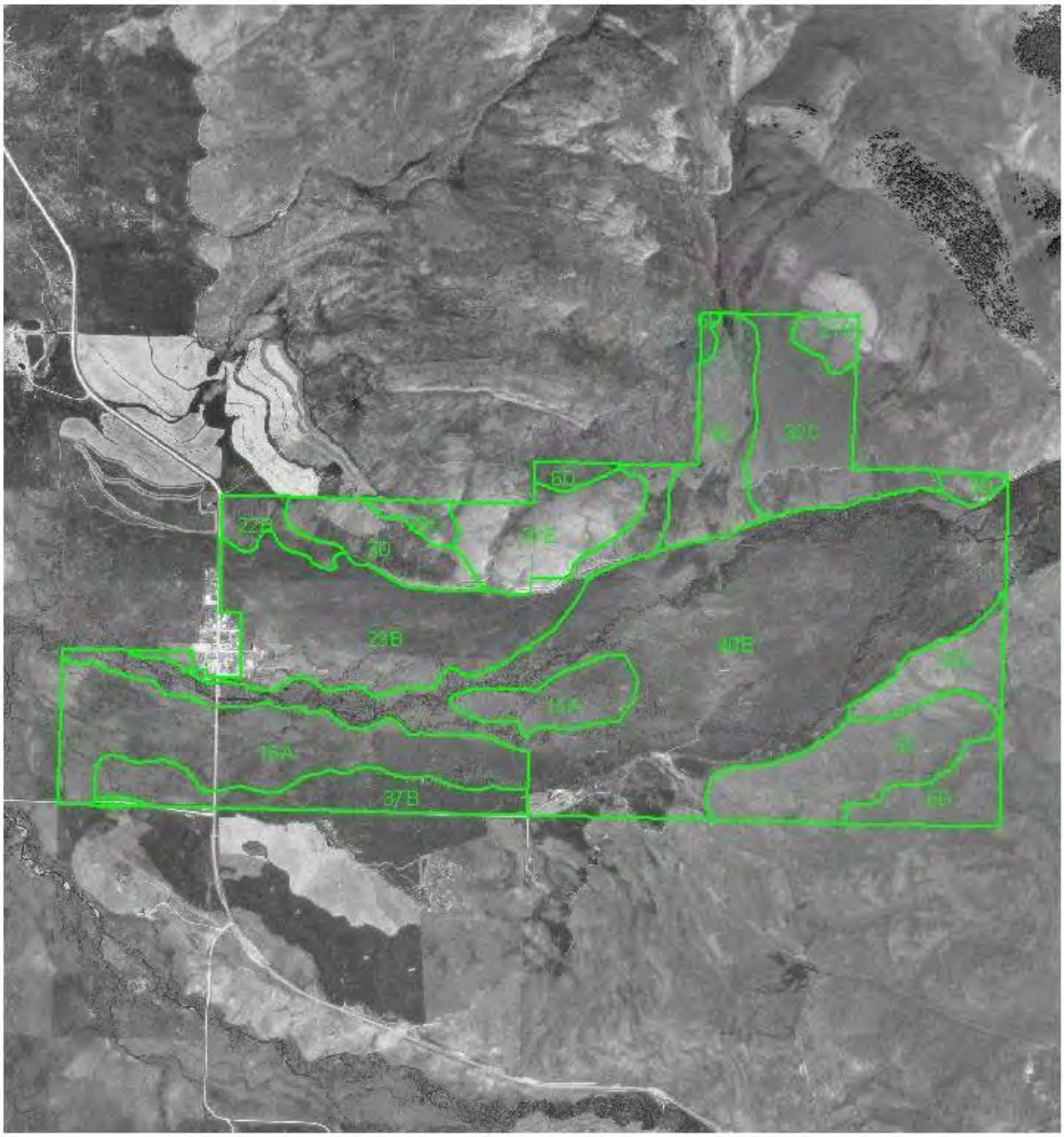
USDA

4000 0 4000 8000 Feet

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

Soils Map

Landowner "A"



40[redacted]

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 spout" 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.

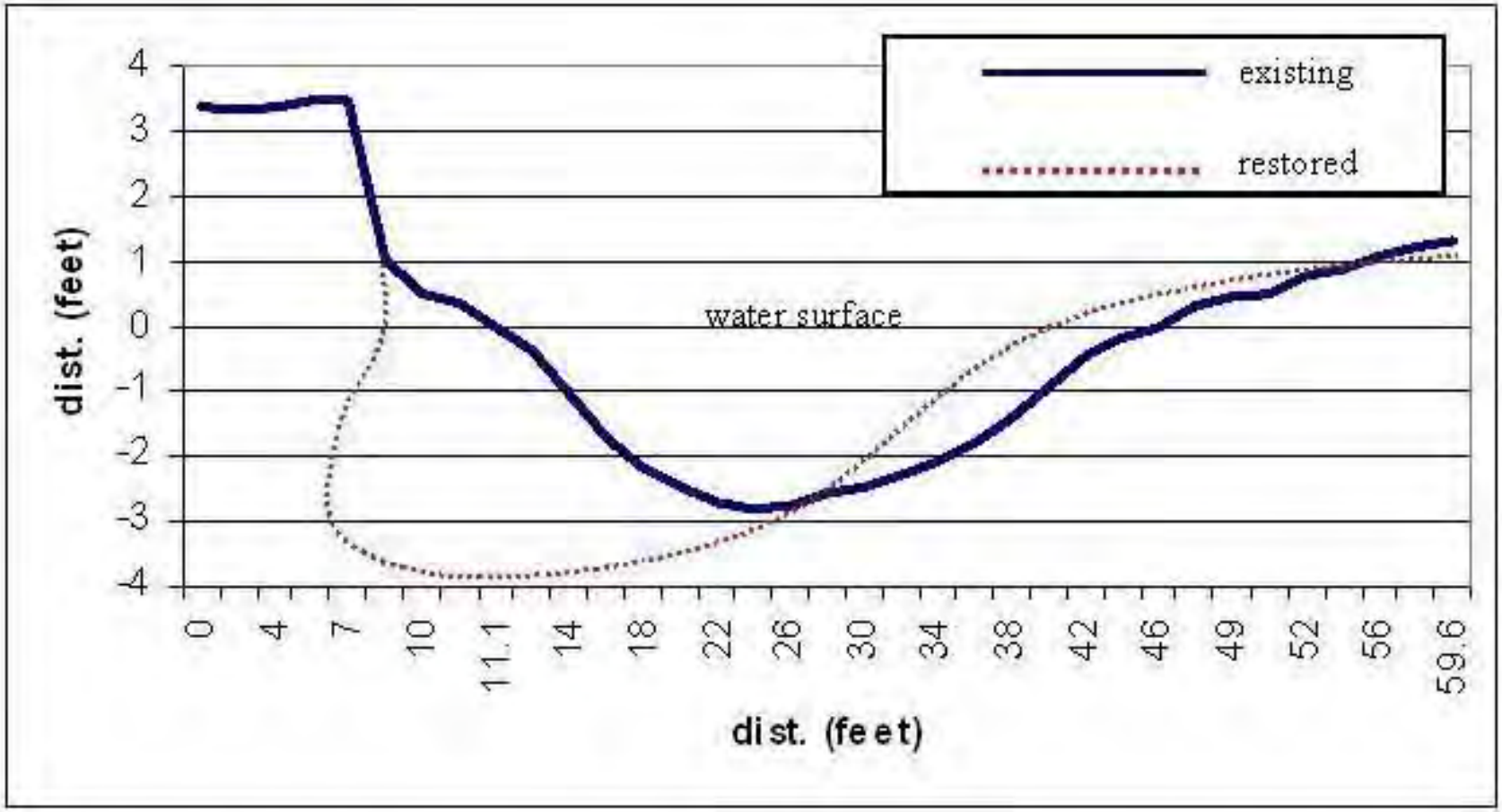


Figure 4G. Cross-sectional profile of Stream "X" showing the existing and expected restored morphology.

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 af)	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	1,902	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	4,444	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