CANDIDATE CONSERVATION AGREEMENT WITH ASSURANCES FOR ARCTIC GRAYLING IN THE CENTENNIAL VALLEY, MONTANA

Between

Montana Department of Fish, Wildlife and Parks

and

U.S. Fish and Wildlife Service

September 5, 2018

EXECUTIVE SUMMARY

Arctic grayling were historically widespread but patchily distributed throughout the upper Missouri River basin above Great Falls, Montana. Distribution and abundance of Arctic grayling in the basin has declined since the late 1800s in response to land use changes and natural factors. This decline led to formal consideration for listing Arctic grayling under the Endangered Species Act (ESA) in the 1990s. Conservation efforts by federal and state agencies, private landowners and conservation groups have improved the resiliency, redundancy, and representation of Arctic grayling over the past 30 years. As a result, the U.S. Fish and Wildlife Service (USFWS) determined Arctic grayling were not warranted for protection under the ESA in 2014. However, Arctic grayling remain a Species of Concern in Montana (Montana State Wildlife Action Plan 2105), and conservation efforts continue to be a focus of resource agencies, non-governmental conservation organization, and private landowners.

A population of Arctic grayling in the Centennial Valley in Beaverhead County, Montana is currently increasing in abundance and distribution in and around Red Rock Lakes National Wildlife Refuge. However, limiting factors on non-Federal land surrounding the Refuge are likely precluding further increases in distribution and abundance. To promote conservation efforts on non-Federal lands in the Centennial Valley, the USFWS and Montana Fish, Wildlife & Parks (FWP) have developed a programmatic Candidate Conservation Agreement with Assurances (CCAA). A CCAA is a voluntary agreement whereby non-Federal landowners agree to manage their lands to remove or reduce threats to species at risk of being listed under the ESA. In return for managing their lands to benefit Arctic grayling, these landowners receive assurances against additional regulatory requirements should Arctic grayling be listed under the ESA in the future. Under this CCAA, the USFWS will issue FWP an Enhancement of Survival Permit pursuant to Section 10(a)(1)(A) of the ESA for a period of 20 years. FWP will enroll non-federal landowners and issue Certificate of Inclusions to Participating Landowners contingent on development of a site-specific conservation plan for Arctic grayling. This CCAA includes:

- Background and status of Arctic grayling in the Centennial Valley
- Potential limiting factors to Arctic grayling on non-Federal land in the Centennial Valley
- Identification and expected benefit of habitat conservation measures that remove or reduce limiting factors to Arctic grayling on non-Federal land in the Centennial Valley
- Area covered under the Centennial Valley CCAA
- Responsibilities of all involved participating agencies and landowners towards implementation of the Centennial Valley CCAA
- Level of potential take of Arctic grayling from CCAA activities
- Required monitoring and reporting.

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Acronym List

CCAA	Candidate Conservation Agreement with Assurances
ESA	Endangered Species Act
FWP	Montana Fish, Wildlife & Parks
CI	Certificate of Inclusion
SSP	Site-Specific Plan
USFWS	U.S. Fish and Wildlife Service

I. INTRODUCTION

A Candidate Conservation Agreement with Assurances (Agreement/CCAA) is a conservation agreement between the U.S. Fish and Wildlife Service (USFWS) and any non-Federal landowners. In a CCAA, non-Federal landowners voluntarily agree to manage their lands or waters to remove or reduce threats to proposed and candidate species, or species of concern that could become candidates. In return, the USFWS provides Participating Landowners with assurances that it would not impose further land, water, or resource use restrictions or commitments beyond those agreed to in the CCAA, should that species be listed under the Endangered Species Act (ESA). These assurances are conveyed to the landowner through an Enhancement of Survival Permit (Permit) under section 10(a)(1)(A) of the ESA, issued in association with the CCAA. If the species becomes listed, the Permit also authorizes specified "take" of the covered species resulting from implementation of the CCAA and associated management and land uses. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.

CCAA Rationale

On August 20, 2014, the USFWS determined that listing of the Upper Missouri River Distinct Population Segment (DPS) of Arctic grayling was not warranted (79 FR 49384). The Centennial Valley Arctic grayling are included in the Upper Missouri River DPS. Currently the majority of Arctic grayling in the Centennial valley are using habitat on Federal land on the Red Rock Lakes National Wildlife Refuge (Refuge). The USFWS concluded that the historic threats to the Centennial Valley population of Arctic grayling had been sufficiently minimized, due in large part to collaborative State and Federal conservation efforts and adequate regulatory mechanisms on Federal land.

Since 2014, Arctic grayling have been documented on non-Federal land in the Centennial Valley in areas where previously believed to be extirpated. Although it is unclear whether these new occurrences represent an expansion of the core population or are a product of updated (and more thorough) sampling, they represent an increase in the distribution of Arctic grayling in the Centennial Valley. However, the occurrence or expansion of Arctic grayling into waters on non-

Federal property is a concern to non-Federal landowners because of potential regulatory restrictions on livestock operations, should Arctic grayling be listed as threatened or endangered under the ESA in the future. Thus, landowner concern in the Centennial Valley about the legal status of Arctic grayling, coupled with the success of the nearby Fluvial Arctic Grayling in the Upper Big Hole River CCAA (hereafter, Big Hole CCAA), prompted discussions between agencies and non-Federal landowners to pursue developing a CCAA for Arctic grayling in the Centennial Valley.

The initiation of this CCAA represents an opportunity to conserve and restore Arctic grayling habitat on 52 stream miles on non-Federal lands in the Centennial Valley. Initial meetings between agency staff and non-Federal landowners in the Centennial Valley have been positive, with many landowners interested in enrolling in a CCAA.

CCAA Structure

Once this Agreement is executed, USFWS will issue Montana Fish, Wildlife and Parks (FWP) an ESA section 10(a)(1)(A) Permit. Thereupon, FWP will issue Certificates of Inclusion (CI) under the Permit to non-Federal landowners within the Project Area (see description below in the Purpose Section) who agree to comply with all of the stipulations of the Agreement and develop an approved Site-Specific Plan (SSP). Site-Specific Plans are habitat conservation plans that are specific to an enrolled property and designed to address the conservation needs of Arctic grayling as well as the needs of the landowner. Site-Specific Plans will be developed within 30 months after baseline data collection for each property by an interdisciplinary technical team made up of individuals representing FWP, USFWS, and other agencies, as needed (collectively, the Agencies). Landowner involvement in the development of SSPs will be needed and encouraged.

The Agencies have established a programmatic conservation framework to benefit Arctic grayling in the Centennial Valley and will work with non-Federal landowners to comprehensively implement conservation measures across a large area. A programmatic agreement is expected to be a more efficient approach to enrolling landowners to help implement Arctic grayling conservation and habitat restoration in the Centennial Valley. The planning and regulatory approval process for a programmatic CCAA would occur only once, and non- Federal landowners will be able to enroll under the programmatic agreement, rather than repeating the process and applying for individual permits for each individual landowner agreement. Further, a programmatic

agreement is expected to generate greater collective support and participation from non-Federal landowners, provide a more holistic approach to developing and implementing basin-wide conservation, and provide the Agencies with a program structure and process to ensure that landowners in the Centennial Valley will be able to fully participate in the conservation of Arctic grayling.

II. PURPOSE

The purpose of this Agreement is to encourage non-Federal landowners to voluntarily implement proactive habitat conservation measures that benefit Arctic grayling on non-Federal land in the Centennial Valley in Beaverhead County, Montana (Figure 1). Non-Federal landowners enrolled in the CCAA will be provided assurances that their land and water management activities will not be required to change beyond the remedies identified in their SSPs, should Arctic grayling become listed under the ESA in the future. This approach is expected to reduce or alleviate non-Federal landowner concerns regarding potential implications from an ESA listing that could affect a activities related to agricultural and ranching (i.e. irrigation or stockwater withdrawals, livestock grazing etc.), as well as generate support to improve habitat conditions for Arctic grayling on non-Federal land throughout the Project Area.

Conservation Goal

The goal is to ensure the long-term, self-sustaining persistence of Arctic grayling in the Upper Missouri River Basin by maintaining the geographic distribution, abundance and genetic diversity of existing populations, and where feasible, reestablishing populations in suitable habitats. This conservation goal was adopted from the Upper Missouri River Arctic Grayling Conservation Plan (Montana Arctic Grayling Plan; see below in Integration of CCAA and Existing Conservation Plans Section).

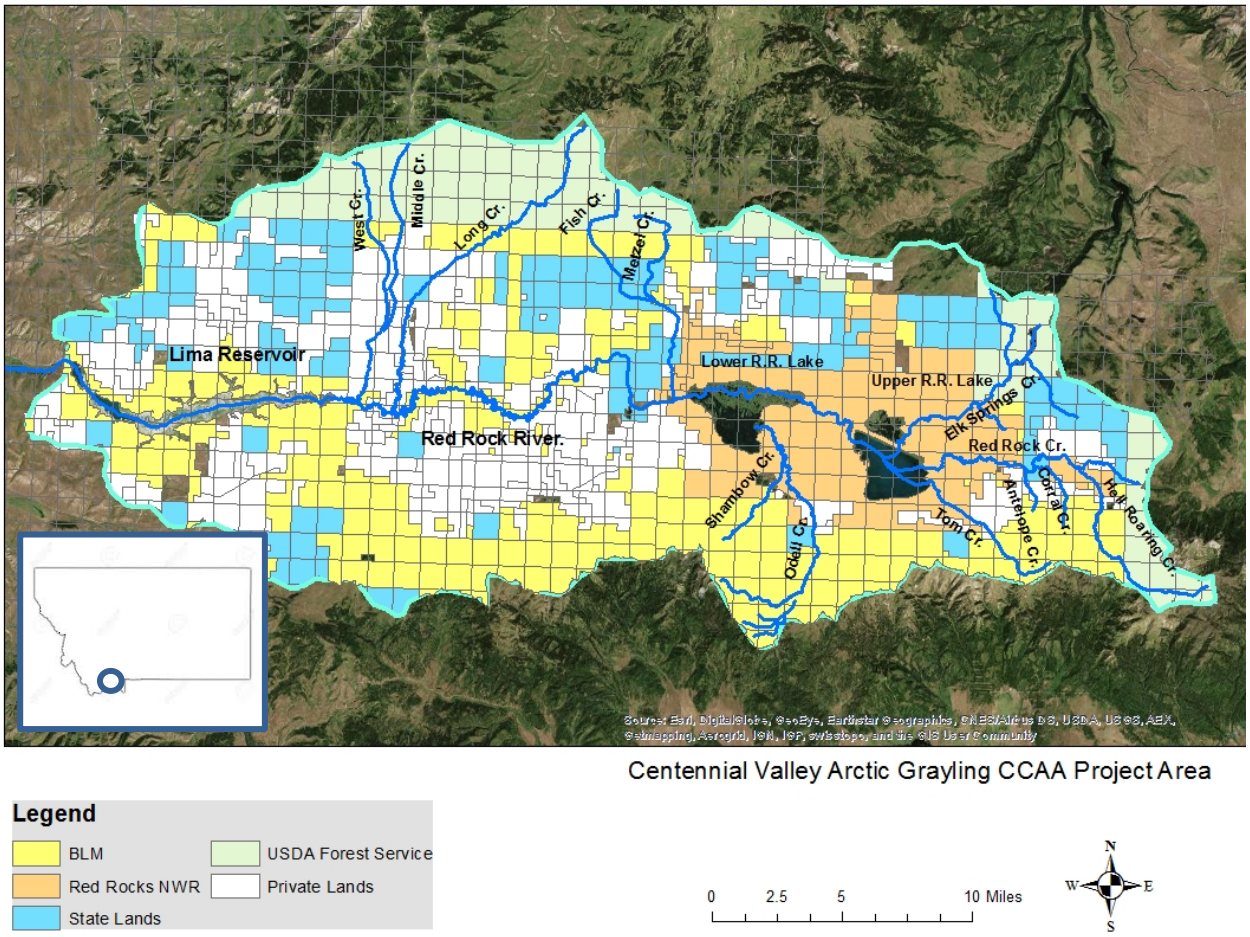

Figure 1. Centennial Valley Arctic Grayling CCAA proposed Project Area, with land ownership and major hydrologic features. The proposed Project Area includes non-Federal lands upstream of Lima Dam and includes the mainstem Red Rock River, West Creek, Middle Creek, Long Creek, Metzel Creek, Odell Creek, Shambow Creek, Tom Creek, Corral Creek, Antelope Creek, Red Rock Creek and Hell Roaring Creek.

Conservation Objectives

Three conservation objectives have been identified that, when attained, are expected to contribute to the long-term, self-sustaining persistence of Arctic grayling in the Centennial Valley. These objectives have been adopted from the Montana Arctic Grayling Plan and include:

1) Conserve existing Centennial Valley Arctic grayling genetic diversity,
2) Establish or maintain Arctic grayling spawning or refugia in at least two tributaries up and downstream of Upper Red Rock Lake and connectivity among tributaries, and
3) Increase or maintain suitable habitat for all life history stages for the Centennial Valley Arctic grayling population.

The objectives of the CCAA will be met by implementing habitat conservation and restoration measures that:

1) Improve and maintain streamflows
2) Improve and maintain the function of instream and riparian habitats
3) Remove barriers to Arctic grayling migration
4) Identify and reduce or eliminate entrainment

CCAA Standard for Net Conservation Benefit

The 2016 revised CCAA Policy (81 FR 95164) considers that all CCAAs will provide benefits to covered species through implementation of voluntary habitat conservation measures that are agreed to and implemented by non-Federal landowners. Before entering into a CCAA, the USFWS must determine that the benefits of the conservation measures implemented by a property owner under a CCAA will reasonably be expected to provide a net conservation benefit and to improve the status of the covered species. Net conservation benefit for species covered by a CCAA is defined as the cumulative benefits of the CCAA's specific conservation measures designed to improve the status of a covered species by removing or minimizing threats so that populations are stabilized, the number of individuals is increased, or habitat is improved.

The habitat conservation measures proposed in the Centennial Valley CCAA are similar to those implemented in the nearby Big Hole River under the Big Hole CCAA. Conservation measures implemented through the Big Hole CCAA were effective at improving habitats, which resulted in increased Arctic grayling abundance and distribution, and the maintenance of genetic diversity (79 FR 49383). Landowner participation and implementation of the conservation measures in the Big

Hole CCAA contributed to the Service's 2014 determination that listing of the Arctic grayling was not warranted (79 FR 49383). The potential limiting factors to Arctic grayling on non-Federal lands in the Centennial Valley are similar to the threats that were identified in the Big Hole River; these included inadequate instream flows, degraded riparian and stream habitat, barriers to fish passage and potential entrainment. Because the potential limiting factors and the proposed conservation measures in the Centennial CCAA are very similar to the successful Big Hole CCAA, we expect to see similar, positive effects on the Centennial Valley Arctic grayling population. Thus, implementation of the Centennial Valley CCAA would result in a net conservation benefit to the Arctic grayling that will further improve its status and continue to support the determination that listing of the species is not warranted.

Integration of CCAA and Existing Conservation Plans

The Centennial Valley CCAA will be integrated into two existing conservation plans for Arctic grayling in Montana. First, the Centennial Valley CCAA will be a management action integrated into the Centennial Valley Arctic Grayling Adaptive Management Plan (Adaptive Management Plan). By doing this, grayling response to the CCAA will be evaluated relative to other management actions and help inform future management decisions. In turn, management decisions resulting from implementing the Adaptive Management Plan will help achieve the broader, overarching goals for Arctic grayling distribution, abundance, and genetic diversity outlined in the Montana Arctic Grayling Plan.

III. BACKGROUND AND STATUS OF ARCTIC GRAYLING

Introduction

Arctic 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 1998, pp. 301-302). In North America, two disjunct populations of Arctic grayling, representing stocks isolated during Pleistocene glaciation, have been recorded outside of Canada and Alaska (Vincent 1962, p. 11; Hubbs and Lagler 1949, p. 44). The first was found in streams and rivers of the Great Lakes region of northern Michigan, but these Arctic grayling were extirpated in the 1930s (Hubbs and Lagler 1949, p. 44). The second isolated population historically inhabited the upper Missouri River basin above

Great Falls, Montana. The Arctic grayling of the Centennial Valley represent the southern-most distribution of Arctic grayling of the upper Missouri River basin and are the conservation focus of this Agreement.

Centennial Valley Historical and Present Distribution

Arctic grayling were historically distributed among at least a dozen Centennial Valley streams and three lakes (Nelson 1954, p. 324-329). Distribution appeared to decline sometime between the 1950s and mid-1990s, but has since improved (Table 1; Cayer et al. in press). Currently, Arctic grayling occupy about half of the streams that were historically occupied on non-Federal land outside the Refuge in the Centennial Valley (Jaeger 2014, unpublished data).

Life History/Biology

In general, native Arctic grayling in the upper Missouri River exhibit two life history strategies common to salmonids: fluvial and adfluvial. Fluvial fish use river or stream habitat for all of their life cycle and may undergo extensive migrations within river habitat (Shepard and Oswald 1989, p. 18). Adfluvial fish live in lakes and migrate to tributary streams to spawn. Historically, the fluvial life-history predominated in the Missouri River basin above the Great Falls, perhaps because there were only a few lakes accessible to natural colonization of Arctic grayling that would permit expression of the adfluvial ecotype (Kaya 1992, p. 47).

Fluvial and adfluvial life-history strategies of Arctic grayling in the upper Missouri River do not appear to represent distinct evolutionary lineages. Instead, they appear to represent an example of adaptive radiation (Schluter 2000, p. 1), whereby the life history strategies developed to allow Arctic grayling to exploit different habitats. The primary evidence for this conclusion is genetic data that indicate that within the Missouri River basin, the two ecotypes are more closely related to each other than they are to the same ecotype elsewhere in North America (Redenbach and Taylor 1999, pp. 27–28; Stamford and Taylor 2004, p. 1538; Peterson and Ardren 2009, p. 1766).

Plasticity between life histories is evident in the Centennial Valley Arctic grayling population. Many Arctic grayling reside in Upper Red Rock Lake for most of the year, likely only leaving in the spring to spawn in Red Rock Creek, then returning to the lake.

Table 1. Distribution of Arctic grayling in the Centennial Valley, by waterbody for four periods of time (1950s – 2010s). X's denote Arctic grayling presence, blank spaces denote Arctic grayling absence, dashes (-) denote no sampling was conducted, and asterisks denote a stream that is no longer present in the historic channel.

Waterbody	1950s	1970s	1990s	2010s
Red Rock Creek	X	X	X	X
Hell Roaring Creek	X	-		
Corral Creek	X	-	X	X
Antelope Creek	X	-	X	
Battle Creek	X	-	*	*
Elk Springs Creek	X			X
Picnic Creek	X			X
Tom Creek	X	X		X
East Shambow Creek	-		X	
Arctic grayling Creek	-			
O'dell Creek	X	X	X	X
Metzel Creek	X	-	-	
Long Creek	X		-	X
West Creek	X	-	-	X
Narrows Creek	X	X		
Elk Lake	X	X		X
Upper Red Rock Lake	X	X	X	X
Lower Red Rock Lake	X	X	X	-
Lima Reservoir	X			X

However, recent electrofishing and radio-telemetry work has indicated some Arctic grayling reside yearlong in Red Rock Creek (Jaeger, unpublished data). In addition, Arctic grayling sampled in late summer in Long Creek appear to be fluvial, based on the timing of their occurrence in the stream and the distance to the nearest lake or reservoir habitat. Thus, it appears that Arctic grayling in the Centennial Valley exhibit a continuum between and including fluvial and adfluvial life histories.

Arctic grayling in the Centennial Valley spawn from mid-May to mid-June by depositing adhesive eggs over sand and gravel without excavating a redd or nest (Kaya 1990, p. 13; Mogen 1996, pp. 18-24, 44; Patterson, unpublished data). Rate of egg development and subsequent hatching times vary with water temperature, with development progressing faster at warmer temperatures. Young-of-the-year Arctic 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. Arctic grayling in the Centennial Valley typically reach maturity in their third year of life, and seldom live beyond age 6 (Mogen 1996, p. 32-34). Arctic grayling of all ages typically feed opportunistically on invertebrates (Cutting, unpublished data).

Current Population Status

Currently, the majority of the Centennial Valley Arctic grayling population resides in Upper Lake and Red Rock Creek on the Refuge. Abundance of spawning-aged Arctic grayling using Red Rock Creek has fluctuated through time (Figure 2; Paterson 2013). In general, abundance of spawners in a monitored portion of Red Rock Creek has increased since the mid-1990s and recently decreased in 2016 (Figure 2). Although preliminary, the recent decline in Arctic grayling is likely attributable to low dissolved oxygen throughout much of Upper Red Rock Lake during the 2015-2016 winter (Jaeger 2016, pers. comm.). Conditions similar to those observed in winter 2015-2016 were present in Upper Red Rock Lake during the winter of 1995-1996 and abundance of Arctic grayling the following year (1996) were similar to those observed in 2016 in Red Rock Creek (Figure 2). Thus, it appears that overwinter conditions in Upper Red Rock Lake may be a driver of Arctic grayling dynamics in the Centennial Valley.

Overwinter conditions have been unsuitable for Arctic grayling in parts of Upper Red Rock Lake in the past and are expected to occur in the future. However, refugia areas with higher dissolved oxygen for Arctic grayling exist in the upper water column and in the form of creek mouths, springs, and tributary streams (Davis 2016, pp. 29, 39-40; Jaeger 2016, pers. comm.). Thus, we expect Arctic grayling to persist in Upper Red Rock Lake even after harsh winters because of the refugia areas available to Arctic grayling (Davis 2016, pp. 29, 39-40), the observation that some Arctic grayling stay in Red Rock Creek yearlong (Jaeger 2016, pers. comm.) and past data showing the ability of Arctic grayling to rebound from periodic lows in abundance (Figure 2).

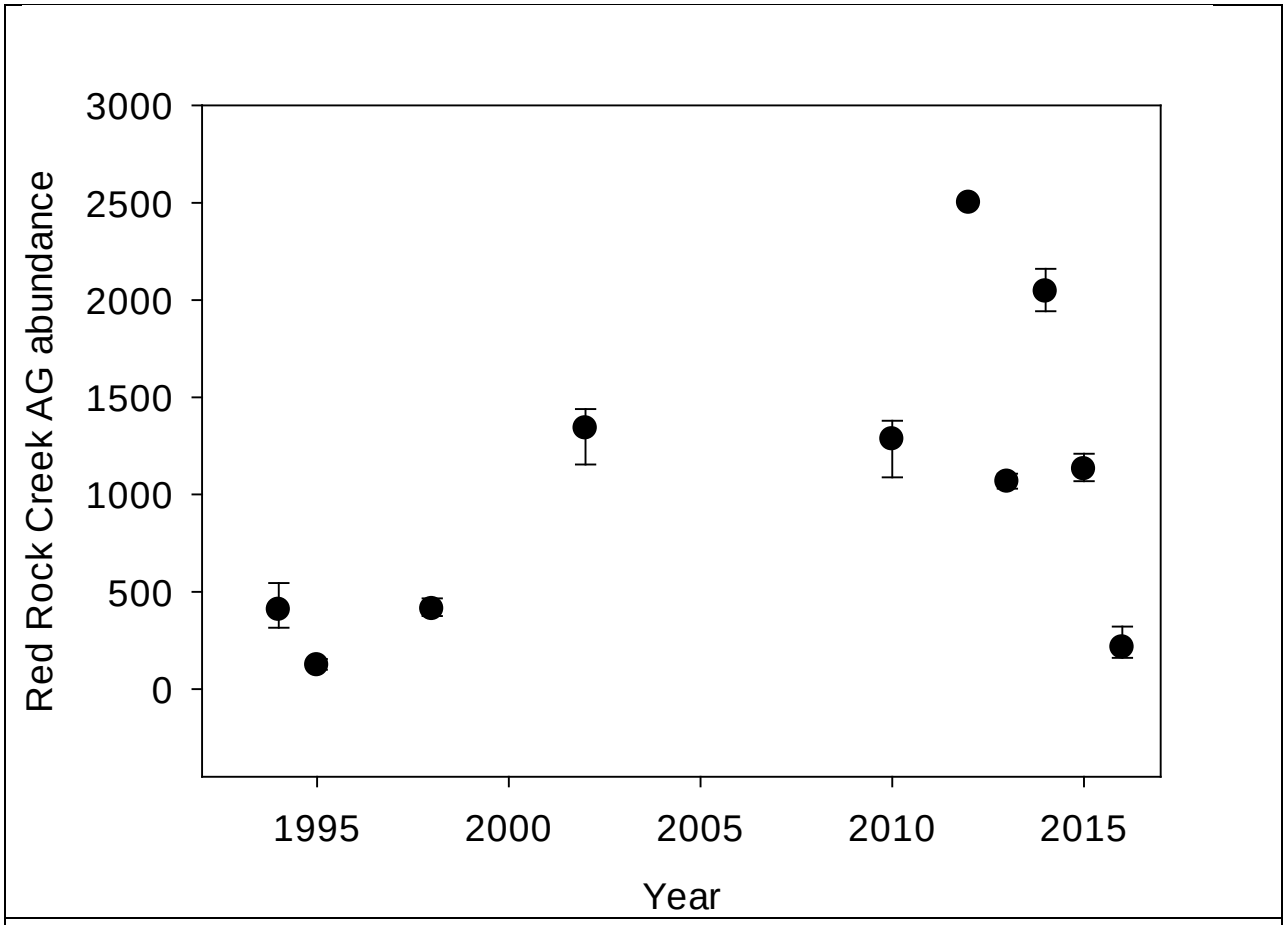

Figure 2. Abundance of Arctic grayling spawners in the monitored portion of Red Rock Creek, 1995-2016. Error bars denote 95% confidence intervals.

Two population parameters that influence population viability are N_b (the number of breeding adults that contributed genetics to a sample of offspring from a given population) and N_e (a theoretical size of a population that would result in the same level of inbreeding or genetic drift as that of the population under study). In 2012, N_b and N_e were estimated at 458 (253-1802, 95% CI) and 166 (106-272, 95% CI; DeHaan et al. 2001, p. 39), respectively, for the portion of the Arctic grayling population using the monitored section of Red Rock Creek for spawning. Number of breeders (N_b) has increased over the past 18 years (DeHaan et al. 2014, p. 39) and N_e has remained relatively stable over the same time period (DeHaan et al. 2014, p. 40).

Odell Creek, a tributary to Lower Red Rock Lake (Lower Lake), is also a spawning tributary for Arctic grayling, although with fewer spawning adults than Red Rock Creek. It is unknown whether Arctic grayling are spawning in any other tributaries in the Centennial Valley at this time. The Centennial Valley Arctic grayling population appears to be panmictic (a population that

exhibits random intermixing among individuals, with no detectable genetic structuring; DeHaan et al. 2014, Leary et al. 2014, p. 15). While genetic differences do exist within the Centennial Valley Arctic grayling population (e.g., Long Creek vs. Upper Lake), it is unclear whether these differences represent diverging populations or a source-sink dynamic (Leary 2014, p. 21). Genetic diversity of the Centennial Valley Arctic grayling population is relatively high, compared to other Arctic grayling populations in the Upper Missouri River basin (DeHaan et al. 2014, p. 39, Leary 2014, p. 19).

Additional Management and Research

The National Wildlife Refuge System Improvement Act requires the USFWS to develop a Comprehensive Conservation Plan to provide a foundation for the management and use of the Refuge (USFWS 2009, entire) in the Centennial Valley. The Refuge Comprehensive Conservation Plan prioritizes conservation of Arctic grayling and has guided numerous habitat conservation and restoration projects to benefit Arctic grayling, including: active riparian restoration to reconnect Elk Springs Creek to a historical channel, replacement of four culverts to allow for natural tributary migration across alluvial fans and removal of an earthen dam on Elk Springs Creek (West 2014a, pers. comm.). Remote site incubators have been used to establish spawning runs of Arctic grayling in tributaries to Upper Lake that were historically used by Arctic grayling (Boltz and Kaeding 2002, entire; Jaeger 2014d, pers. comm.). Currently, FWP and USFWS are collaborating on efforts to re-establish an Arctic grayling spawning run in Elk Springs Creek (West 2014a, pers. comm., Jaeger 2014e, pers. comm.) and a genetic reserve in Elk Lake.

In 1994, concern about the effects of angling harvest on some Arctic grayling populations led FWP to implement catch-and-release regulations for Arctic grayling captured in streams and rivers within their native range, which remain in effect today (FWP 2016, p. 57). Angling is not permitted in either of the Red Rock Lakes in the Centennial Valley to protect breeding waterfowl and trumpeter swans (*Cygnus buccinator*) (USFWS 2009, p. 147), and catch-and-release regulations are also in place for Arctic grayling captured in streams and in Elk Lake (FWP 2016, p. 57). Additionally, angling is closed in Red Rock Creek during the Arctic grayling spawning period (May 15 to June 14; FWP 2016, p. 73).

Multiple research projects have investigated the ecology and potential limiting factors of Arctic grayling in the Centennial Valley. Research has included status and biology of spawning

populations (Lund 1974, entire; Mogen 1996, entire), winter habitat and distribution (Gangloff 1996, entire; Davis, unpublished data), predation (Katzman 1998, entire), effects of beaver dams on Arctic grayling migrations (Levine 2011, entire), abundance and survival estimation (Patterson 2013, entire), Arctic grayling diet (Cutting, unpublished data), and migratory behavior of fry in Elk Springs Creek (Levine 2013, unpublished data). Most contemporary research is associated with the Adaptive Management Plan and is intended to refine future Arctic grayling management.

IV. PROJECT AREA AND PARTICIPATING LANDOWNERS

The Centennial Valley of southwestern Montana is a high-elevation (~6,600 feet) valley dominated by sagebrush steppe. The valley is bounded on the north by Gravelly and Snowcrest mountain ranges and on the south by Centennial Mountains. Extensive wetlands exist throughout the Centennial Valley, including a large shallow lake/wetland complex encompassed by the Refuge (Figure 1). The complex comprises Upper and Lower Red Rock Lakes, and Swan lakes and associated palustrine emergent marsh dominated by seasonally-flooded sedge (*Carex spp.*). The complex is a remnant of Pleistocene Lake Centennial, a prehistoric lake that formerly covered the valley floor to a depth of about 20 m (Mumma 2012, p. 34).

The Project Area is approximately 165,000 acres of non-federal lands with streams that Arctic grayling historically occupied upstream of Lima Reservoir, including the mainstem Red Rock River and West, Middle, Long, Metzel, Odell, Shambow, Tom, Corral, Antelope, Red Rock, and Hell Roaring creeks (Figure 1). The non-Federal land within the Project Area is located mostly on the valley bottom with the surrounding uplands being owned primarily by the U.S. Forest Service, Bureau of Land Management or State of Montana (Figure 1). The Refuge is located in the center of the Centennial Valley and encompasses approximately 50,000 acres. The project boundary on each stream will extend from the mouth to a point where gradient increases above that typically used by Arctic grayling or at the boundary of Federal lands. Of the 52 stream miles on non-Federal property, approximately 40 stream miles are on private land and 12 stream miles are on property owned by the State of Montana (Figure 1). The Project Area has 13 non-Federal landowners.

For the purposes of this Agreement, the Project Area has been divided into two management reaches based on biology of and potential limiting factors for Centennial Valley Arctic grayling. The upper management reach is the Red Rock Creek watershed upstream of the outlet of Upper Red Rock Lake and includes Upper Red Rock Lake and Red Rock, Tom, Corral, Antelope, and Hell Roaring creeks (Figure 1). The lower management reach is the Red Rock River watershed from Lima Dam to the outlet of the Upper Red Rock Lake and includes Lima Reservoir, Red Rock River, and West, Middle, Long, Metzel, and Odell creeks (Figure 1). Implementation of the conservation measures described in this Agreement apply to the whole Project Area and will aid ongoing efforts to expand the abundance and distribution of Arctic grayling on non-Federal land in the Project Area.

Landowner Interest in the Centennial Valley CCAA

In 2014 FWP and USFWS discussed the concept of developing the Centennial Valley CCAA with eight non-Federal owners of lands that comprise the majority of the Project Area. All landowners expressed interest in development of this program and meeting again to explore the potential of enrolling and implementing conservation measures to benefit Arctic grayling.

V. LIMITING FACTORS TO ARCTIC GRAYLING TO BE ADDRESSED UNDER THE AGREEMENT

In the Centennial Valley, conservation by the Red Rock Lakes National Wildlife Refuge and cooperative State, Federal and private efforts have sufficiently minimized threats to Arctic grayling for the USFWS to preclude the need to list the species (79 FR 49384). Conservation efforts are expected to persist into the future and maintain the integrity of the habitat on Federal, state and private lands (79 FR 49384). However, some factors remain that limit distribution and abundance of Arctic grayling in the Centennial Valley. To augment on-going conservation efforts, this CCAA will address these limiting factors on non-Federal land in the Centennial Valley. Limiting factors to Arctic grayling on non-Federal land in the Centennial Valley are:

1) Reduced streamflows
2) Degraded and non-functioning instream and riparian habitats
3) Barriers to Arctic grayling movement; and

4) Arctic grayling entrainment in irrigation ditches

These habitat-related limiting factors can be directly addressed by conservation measures implemented or allowed by Participating Landowners in the Agreement.

Reduced Stream Flows

Demand for irrigation water in combination with drought in the semi-arid upper Missouri River basin historically dewatered many rivers formerly or currently occupied by Arctic grayling. Dewatering likely influenced distribution, abundance, and life history strategies of Arctic grayling throughout the basin (Vincent 1962, pp. 97-121; Randall 1978, pp. 18, 169-170) by reducing connectivity and available habitat.

In the Centennial Valley, dewatering of streams may be a limiting factor to Arctic grayling on non-Federal land. Non-Federal landowners within the Centennial Valley have the right to withdraw water from the Red Rock 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. However, establishment of minimum instream flow reservations (FWP 1989, entire; Kaeding and Boltz 1999, p. 13), compact settlement between the Montana Reserved Water Rights Compact Commission and the Refuge (2002), Refuge acquisition of private lands, and changes in management practices on private lands have greatly reduced the impact of irrigation diversion in Upper and Lower Lake tributaries.
The complexity of the Red Rock Water Compact, water use, water rights and water conveyance for agricultural purposes in the Centennial Valley requires an approach where the majority of water users and landowners are engaged in basin-wide solutions to land and water uses that affect Arctic 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 continued communication among landowners and Agency personnel to foster the collaboration needed to enhance Arctic grayling habitat in the Centennial Valley.

Degraded and Non-functioning Instream and Riparian Habitats

Riparian corridors are important for maintaining ecological function of aquatic systems (Gregory et al. 1991, entire). Riparian corridors 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, pp. 43-46; Prichard et al. 1998, entire). These processes are necessary for creating and maintaining necessary instream habitat features (i.e., pools, riffles, and scour areas) used by Arctic grayling to meet its life-history requirements (Lamothe and Magee 2004, pp. 21-22; Hughes 1992, pp. 1997-1998). Thus, healthy riparian corridors are vital for maintaining instream habitat for Arctic grayling in the Centennial Valley.

In the Centennial Valley, historical land use practices both within the Refuge and on adjacent private lands impacted riparian conditions on tributaries to the Red Rock Lakes (Mogen 1996, pp. 75-77; Gillin 2001, pp. 3-12, 3-14). Stream surveys by FWP and USFWS completed in 2011 and 2012 identified some degraded areas on non-federal properties in most streams in the Project Area. The Refuge has changed livestock grazing systems and reduced grazing intensity to promote passive riparian restoration and actively restored other riparian areas, including reconnecting Red Rock Creek to a historic channel and replacement of four culverts to allow natural hydrologic function of a tributary and alluvial fan (West 2014a, pers. comm.). However, degraded riparian areas and instream channel habitat may be limiting Arctic grayling on non-Federal lands up and downstream of the Refuge.

Some stream reaches within the Project Area are incised (streams or rivers that have cut downward through the streambed) and have lost connection with the floodplain and ground water. These reaches lack riparian vegetation and channel habitat necessary to support Arctic grayling (K. Boyd 2014, pers. comm.) and will consequently be focus areas for restoring riparian areas and suitable Arctic grayling habitat.

Barriers to Arctic Grayling Movement

Barriers to fish passage can fragment habitat by blocking access to spawning, rearing and refuge habitats under all or some flow conditions. In the Centennial Valley, the construction of Lima Dam in 1909 (and reconstruction in 1934) (Unthank 1989, p. 9) blocked Arctic grayling movement and connectivity with downstream reaches. A control structure at the outlet of Lower Lake in 1930 (and reconstruction in 1957 (USFWS 2009, p. 74)) further blocked Arctic grayling migrations and connectivity; however, the Refuge now leaves the Lower Lake structure open most

years (~90%). When the Lower Lake structure is used, it is not lowered enough to impede fish passage so Arctic grayling can access upstream and downstream habitats (West 2014, pers. comm. 2016). Barriers on non-Federal lands like irrigation diversions, poorly designed or degraded culverts, or beaver dams may prevent fish passage and limit Arctic grayling access to desired habitats. Stream dewatering can also act as a migration barrier and prevent Arctic grayling movement to seasonal habitats.

Entrainment

Entrainment (inadvertent capture of fish into an irrigation ditch) can permanently remove individual fish from a population and strand them when irrigation headgates are closed, resulting in mortality of entrained Arctic grayling. In the Centennial Valley, entrainment was likely a historical threat for Arctic grayling at some locations (Unthank 1989, p. 10; Gillin 2001, pp. 2-4, 3-18, 3-25), particularly outside of the Refuge (Boltz 2010, pers. comm.). Currently, one irrigation ditch is present on the Red Rock Lakes National Wildlife Refuge. To minimize entrainment of fry, this ditch is not operated when Arctic grayling fry are expected to be migrating and vulnerable to entrainment in Red Rock Creek (West 2014a, pers. comm.). However, entrainment of older and larger Arctic grayling at other times of the year is unknown. Other irrigation ditches are present upstream and downstream of the Refuge boundary; however, there is currently no information about entrainment of Arctic grayling in ditches on non-Federal land in the Centennial Valley.

Other Factors Considered Under the Agreement

Climate Change: The effects of climate change are predicted to influence many of the basic physical and biological processes in aquatic systems (e.g., hydrology, water temperature). Observations on flow timing in Red Rock Creek in the Centennial Valley indicate a tendency toward earlier snowmelt runoff (DeHaan et al. 2014, p. 41). However, abundance of spawning Arctic grayling in Red Rock Creek has increased in recent years, despite earlier runoff (Patterson 2013, DeHaan et al. 2014, p. 17), suggesting that altered hydrology is not likely driving populations dynamics in this system. The effect of warming water from increased air temperatures due to climate change could affect survival or optimal growth for Arctic grayling (Selong et al. 2001, p. 1032); however, the transfer of heat from air to water (i.e., convection) is a relatively small proportion of the energy exchange that occurs (Johnson 2003, p. 497). A larger factor influencing water temperature is likely solar radiation (Johnson 2003, p. 497; Cassie 2006, p.

1393). Changes in channel morphology (reducing width-to-depth ratios) and riparian vegetation (shading) resulting from the conservation actions being implemented for Arctic grayling are expected to reduce water temperatures by blocking some solar radiation and reducing surface area that solar radiation can interact with. In other systems in Montana (e.g., Big Hole River, Blackfoot River) where riparian areas and narrower channels are being restored, substantial reductions in water temperature have been observed (79 FR 49384; Pierce et al. 2014, p. 72). These reductions in water temperature are expected to buffer any potential increases in water temperature from increased air temperatures due to climate change.

Interactions with Nonnative Salmonids: Interactions among native and nonnative fish species often results in competition or predation. However, strength of competition and predation can be very difficult to measure in wild trout populations (Fausch 1988, pp. 2238, 2243; 1998, pp. 220, 227). In the Centennial Valley, Arctic grayling have coexisted with brook trout and hybrid Yellowstone cutthroat trout for over 60 years. Recent increases in Arctic grayling abundance occurred concurrently with increases in hybrid cutthroat trout abundance. This may indicate predation or competition by hybrid cutthroat trout is not a limiting factor to Arctic grayling in the Centennial Valley. This Agreement does not propose direct measures for Participating Landowners to limit interactions between Arctic grayling and nonnative salmonids in the Project Area. These interactions are not a direct result of landowner activities and subsequently are not the responsibility of landowners. However, if interactions with nonnative trout limit the ability of Arctic grayling to respond to improved habitat conditions as a result of this CCAA, other conservation strategies (e.g., Montana Arctic Grayling Plan, Adaptive Management Plan) will address this issue.

Lima Dam/Reservoir: Lima Reservoir is located at the lower end of the CCAA Project Area (Figure 1). The reservoir is managed by the Red Rock Water Users Association with the primary purpose of supplying irrigation water to downstream water users. Prior to the construction of Lima Dam, some Arctic grayling used the Red Rock River as a migratory corridor to access the Centennial Valley. However, the construction of Lima Dam in 1890 created an upstream fish passage barrier. Despite the presence of Lima Dam, Arctic grayling persisted upstream of the dam but no longer migrated from below the dam into the Centennial Valley (Vincent 1962, p. 116). While Lima Dam fragmented grayling habitat, it also prevented upstream migrations of non-native

trout (e.g., brown trout) into the Centennial Valley, thereby mitigating potential impacts between Arctic grayling and brown trout.

Lima Reservoir extends approximately 12 miles upstream from Lima Dam and provides habitat for Arctic grayling. Arctic grayling have been captured in recent years in Lima Reservoir (Matt Jaeger 2014, pers. comm.); however, little is known about Arctic grayling use of Lima Reservoir. The Agencies recognize the historical importance of Lima Dam as a migration barrier to Arctic grayling. However, the Agencies also recognize that Lima Dam is preventing brown trout invasion into the Centennial Valley and that Lima Reservoir provides habitat for Arctic grayling, including potential overwintering habitat for Arctic grayling not wintering in the Upper Management Segment. If preventive maintenance or alternative management is needed to maintain Lima Dam as an upstream fish barrier or to improve habitat in Lima Reservoir, FWP and the USFWS are committed to working with stake holders and water users to address issues that are of mutual concern.

VI. LIMITING FACTOR GOALS, CONSERVATION MEASURES, MONITORING, and EXPECTED BENEFITS

The goals, conservation measures, expected benefits and monitoring protocols identified below are intended to address the limiting factors to Arctic grayling habitat and populations within the Project Area. The expected benefits to Arctic grayling are derived from previous experience with implementing similar conservation measures in other watersheds in Montana, particularly the implementation of the Big Hole CCAA (79 FR 49384).

Instream Flows

The implementation of this Agreement will provide streamflows that promote ecosystem function and benefit Arctic grayling by facilitating adequate high and base flows and eliminating human-caused dewatering events. This Agreement provides biologically based instream flow targets that are sufficient to create and maintain Arctic grayling habitat conditions, provide an adequate thermal regime, and allow suitable stream productivity.

Goal: Meet or exceed stream flow targets within the Project Area (refer to Table 2 below).

Conservation Measures: The following conservation measures will be implemented to attain the instream flow goal.

1) Improved Irrigation Management: The Agencies and Participating Landowners will ensure that all flow diverted for irrigation or stockwater can be managed and measured. Improved irrigation water management includes control over water diversions (i.e., infrastructure), measuring withdrawals, and quantifying the amount of irrigation water required for Participating Landowners to meet their production goals.

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). The current known points of diversion from streams in the Project Area are shown in Table 3.

2) Water Rights Management and Compliance: Participating Landowners shall monitor, record and comply within the decreed or permitted limits and constraints of their water rights under Montana water law. A summary of water rights in the Centennial Valley can be accessed at the Montana Department of Natural Resources and Conservation (DNRC) website at nris.state.mt.us/dnrc/waterrights/default.aspx.

Period of use of water rights in the Project Area range from January to December for some stock watering rights, and more commonly, from May through September for most irrigation water rights. The priority date for water rights is variable across the Project Area.

3) Alternative Stock Water: Site-specific stock water needs will be assessed 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 and help attain stream flow targets in the Project Area.

Table 2. Streamflow targets by tributary and flow year (dry or normal) in the Centennial Valley CCAA Project area, for spawning/rearing period (April 15-July1) and base flow period (remainder of year). The specific stream flow targets for April 15 and July 1 are transitional targets (between spawning/rearing and base flow periods) and are the average of the adjacent targets. Targets differ depending on streamflow conditions (i.e., dry and normal) shown in Appendix A, Table 1. All values denoted in the table are cubic feet per second.

	Dry Year Targets								
	Corral	Antelope	Red Rock Creek	Tom	Odell	Long	West	Red Rock River	Period
March	1.5	0.4	15.0	1.4	11.0	2.2	2.8	32.8	Base Flow
April 1	1.5	0.4	15.0	1.4	11.0	2.2	2.8	32.8	Base Flow
April 15	3.4	1.5	21.5	7.2	16.4	4.8	6.6	77.9	Spawning
May	5.2	2.5	27.9	13.0	21.8	7.5	10.3	123.0	Spawning
June	5.2	2.5	27.9	13.0	21.8	7.5	10.3	123.0	Spawning
July 1	3.4	1.5	21.5	7.2	16.4	4.8	6.6	77.9	Spawning
July 15	1.5	0.4	15.0	1.4	11.0	2.2	2.8	32.8	Base Flow
August	1.5	0.4	15.0	1.4	11.0	2.2	2.8	32.8	Base Flow
September	1.5	0.4	15.0	1.4	11.0	2.2	2.8	32.8	Base Flow
	Normal Year Target								
	Corral	Antelope	Red Rock Creek	Tom	Odell	Long	West	Red Rock River	Period
March	6.0	1.3	15.0	1.4	11.0	3.4	5.9	55.0	Base Flow
April 1	6.0	1.3	15.0	1.4	11.0	3.4	5.9	55.0	Base Flow
April 15	7.2	2.6	28.1	10.6	21.1	7.0	10.2	114.0	Spawning
May	8.3	3.9	41.1	19.8	31.2	10.5	14.5	173.0	Spawning
June	8.3	3.9	41.1	19.8	31.2	10.5	14.5	173.0	Spawning
July 1	7.2	2.6	28.1	10.6	21.1	7.0	10.2	114.0	Spawning
July 15	6.0	1.3	15.0	1.4	11.0	3.4	5.9	55.0	Base Flow
August	6.0	1.3	15.0	1.4	11.0	3.4	5.9	55.0	Base Flow
September	6.0	1.3	15.0	1.4	11.0	3.4	5.9	55.0	Base Flow

Table 3. Number of known active Non-Federal Points of Diversions (PODs) by Stream for the Centennial Valley CCAA based on Baseline survey Stream Surveys, DNRC water right database, aerial photograph interpretation and field reconnaissance visits. All PODs will be verified with landowner and baseline surveys.

Stream	Number of known PODs
West	9
Middle	4
Long	4
Metzel	0
Red Rock River	1
Red Rock Creek	0
Corral	3
Tom	0
Antelope	0
O'Dell	1
Shambow	2
Hell Roaring	3
Total	27

4) Changes to Water Rights: Changes to water rights outside the adjudication process that convert an irrigation right to an instream flow right may help maintain instream flow targets. Agencies will work with Participating Landowners to identify potential changes to water rights. Any official change to a water right, which can include changes in the point of diversion, place of use, purpose of use (such as instream flow leases) and storage, must be established through Montana DNRC'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. For example, if two or more landowners have points of diversion on the same stream (e.g., Hell Roaring, Long, Middle and West Creek), the priority of water rights will be used to determine which water user must reduce their diversion and the extent of the reduction. Other arrangements for reducing diversions can be implemented instead of using priority date if all water users on the stream agree. All water rights limitations (i.e., flow rate, period of use, etc.) will be followed by cooperators at all times.

Any changes to water rights cannot adversely affect other water rights including those of the USFWS Red Rock Lakes - Montana Compact. The CCAA is consistent with the Red Rock Water Compact in that the CCAA base flow period instream flow targets for Red Rock, Tom and O'Dell Creeks match the instream flow levels defined in the Compact (MCA 2015, entire). The Compact does not define instream flow levels for other streams that are part of the CCAA.

Montana statute §85-2-404(3), provides protection from claims of abandonment due to reduced use of water in compliance through a CCAA. The statute provides that if an appropriator ceases to use all or part of an appropriation right in compliance with a candidate conservation agreement (pursuant to 50 C.F.R. § 17.32), the resulting reduction in use of the appropriation right does not represent an intent by the appropriator to wholly or partially abandon the appropriation right or to not comply with the terms and conditions attached to the right. Even with this provision, there may be circumstances when changes to instream flow may be desirable to achieve conservation goals.

5) Instream Flow Conservation Plan: The Instream Flow Conservation Plan is a plan developed by the Agencies and the Participating Landowner to maintain instream flows consistent with a natural hydrograph (i.e., spring spawning flows, bankfull discharge events, and sustained baseflows) to support all Arctic grayling life histories in the Centennial Valley. Under this Plan, Participating Landowners would agree to reduce irrigation or stockwater diversions at certain times of the year to maintain flow targets. For flow target development and methodologies, see Appendix A.

Application of the Instream Flow Conservation Plan

Following is the description of how the streamflow targets are applied in the Centennial Valley CCAA.

- Total available streamflow in each stream is determined. This may include direct wading measurement using area-velocity, staff gage and rating table, ditch measuring flumes or a combination of these methods.

- Normal or dry year targets for each stream are determined for spawning/rearing or base flow conditions (Table 1, Appendix A)

- Once a dry or normal year target determination is made, it will remain in effect through the remainder of the period (i.e., spawning/rearing or early spring or summer base flow period). Within the next period, the target condition will be reassessed.

- The diversion of water will be curtailed so that the flow targets are met. FWP or agent(s) will contact Participating Landowner to adjust the amount of diverted flow needed to meet the stream flow targets in Table 2. Priority water calls can still be placed from senior users to junior users regardless of agreements or arrangements formed under the Agreement.

- The natural flow of the stream without any diversion will be the default flow target if it is less than the target listed.

Expected benefit: The combination of improved irrigation management, management and compliance of water rights, providing alternative stock water sources, potential changes to water rights and implementing Instream Flow Conservation Plans will lead to improvements in streamflows within the Project Area. The cumulative effect of the individual actions described above will improve available habitat and maintain migratory corridors for all life history stages of Arctic grayling.

Monitoring: Monitoring will occur for each of the conservation measures (1-5) as follows and be included in the Centennial Valley CCAA Annual Report (See Reporting below).

1) Improved infrastructure: The Agencies and landowner will inspect irrigation infrastructure during baseline data collection to evaluate if improvements are needed. Inspections will also be completed after each infrastructure improvement to ensure the diverted flow can be controlled and measured.

2) Landowner will record diverted flow and water rights compliance at each point of diversion initially one time per week during irrigation season with the frequency potentially being modified as part of SSPs as more hydrologic and water management data is evaluated Agencies or partners will check compliance one time every two weeks. Documentation will include staff readings in the measuring flume and amount of flow diverted from the stream into the ditch.

3) Landowner and Agencies will inspect and determine impacts to stream flow for any new stock water systems that will provide alternative stock water sources other than diverting stockwater from stream. Monitoring will include the stockwater system period of use and the amount of flow kept instream and not diverted for stockwater.

4) Agencies will document and determine any effects to instream flow from changes to water rights. Documentation will include locations, time and amount of flow kept instream from changes of water right to instream beneficial use.

5) Instream Flow Conservation Plan Monitoring. Discharge will be monitored in each stream downstream of all active diversions (Figure 3). For most streams, measurement will consist of a water level data logger and staff gage. Periodic measurements will be taken at varying discharges to establish a stage-discharge relationship for each site. This relationship will be used to convert the water level logger data into discharge. Tables relating the staff gage reading to discharge will also be developed. Periodic discharge measurements will continue as necessary to maintain the accuracy of the stage-discharge relationships.

The point of measurement for Red Rock Creek is US Geological Survey gage 06006000. The point of measurement for the Red Rock River is between the mouth of Long Creek and the headwaters of Lima Reservoir and inflow data for Lima Reservoir (http://www.usbr.gov/gp-bin/arc040_form.pl?LIMR) less the West Creek measured inflow will be used to approximate the flow.

For Odell and Tom creeks, the monitoring locations will generally be the locations defined in the USFWS Red Rock Lakes-Montana Compact. Odell Creek will be measured in both of its channels at the South Valley Road or below their confluence. Metzel Creek will be measured at the North Valley Road by summing the flow in Metzel Creek with that of the tributary spring creek immediately to the east which joins Metzel Creek downstream of the North Valley Road.

Stream flow monitoring will occur from approximately April – October depending on snow and ice conditions. Monitoring will occur annually on all streams. Intermediate monitoring points may be developed upstream of the designated measurement points as part of an SSP to ensure connectivity and account for tributary contributions (e.g. Middle and West Creeks) and losing and gaining reaches, etc. Streamflow targets may be developed for these intermediate monitoring points if necessary and will be calibrated to preserve the ecological function of the stream and be consistent with the targets established in Table 2.

Landowners will record location of the point of diversion, time, date and amount of irrigation flow reduced to meet the flow targets. Landowner will turn in recorded reductions at the end of each irrigation season.

Degraded and Non-Functioning Instream and Riparian Habitats

Goal: Maintain and restore sustainability to all riparian habitats on enrolled lands within 15 years of the SSP implementation, or if a stream is incised, within 15 years of floodplain reconnection.

Sustainability is defined as the ability of a stream and its associated riparian area to perform specific physical and biological processes over time that contributes to the integrity, balance and stability of the riparian area (NRCS 2004).

Conservation Measures: Each landowner SSP will include a Riparian Management Plan for all enrolled streams. The conservation measures detailed below may be included in each Riparian Management Plan, as appropriate.

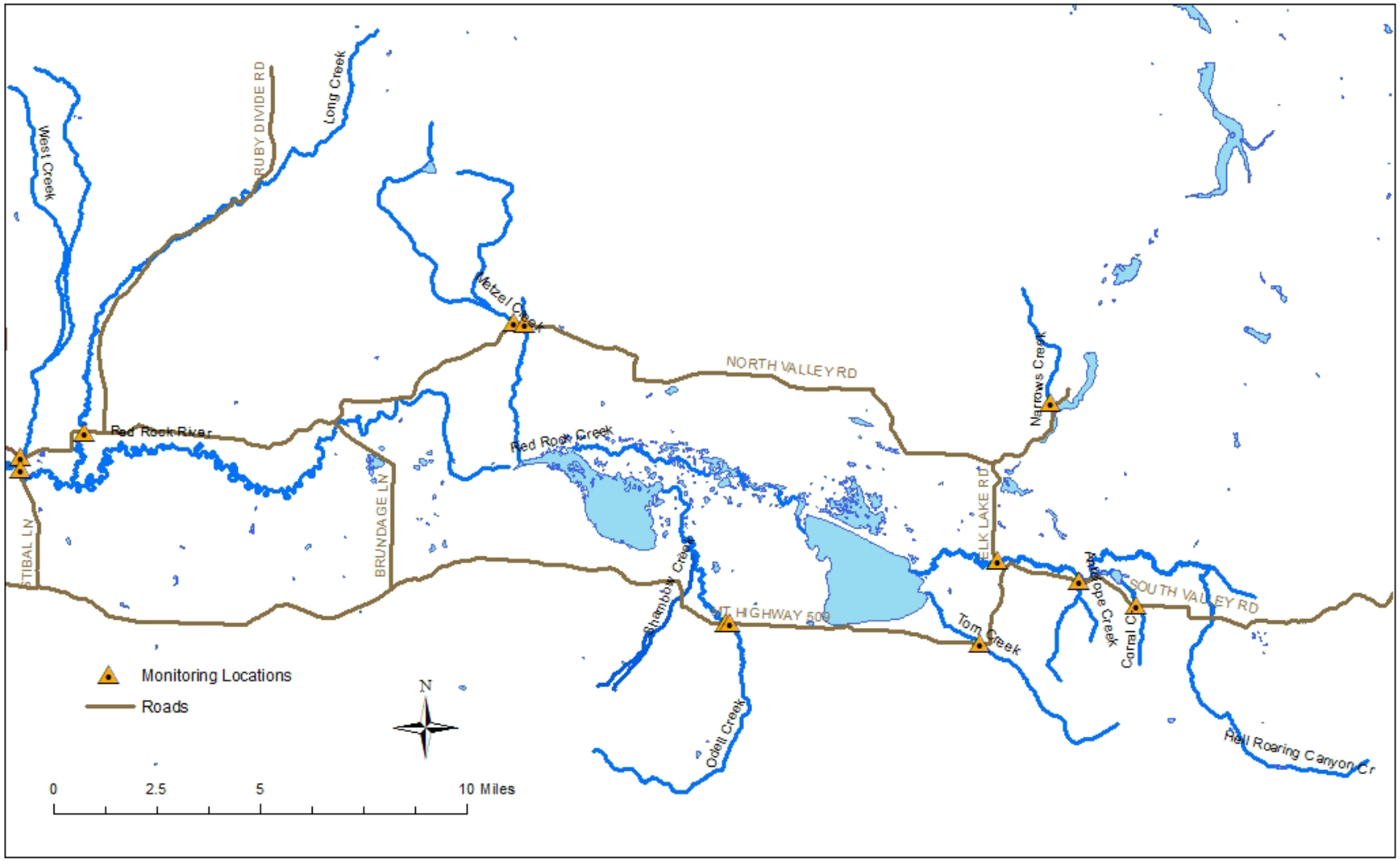

Figure 3. Instream flow monitoring locations for the Centennial Valley Arctic grayling Candidate Conservation Agreement with Assurances.

a) Prescribed grazing practices: Grazing plans may be developed, as part of a Riparian Management Plan, which detail the timing, intensity and duration of livestock use to promote healthy, sustainable riparian plant communities.

b) Installing riparian fencing: Installation of riparian fencing will aid in grazing management planning or exclude livestock from riparian areas until improved grazing strategies are implemented. Areas of stream restoration or newly planted vegetation may require fencing for additional protection until vegetation is well established.

c) Alternative stockwater facilities: Providing alternative stock water sources will avoid concentrating livestock and overuse of riparian vegetation, minimize stream banks degradation, decrease sediment input into the channel and prevent over-widened channels.

d) Stream restoration: Baseline and geomorphology surveys will be completed to identify reaches in need of restoration. Agencies will determine if passive or active restoration is appropriate to improve habitat, geomorphology, and hydrology on streams that are either incised or degraded. Stream restoration techniques may include floodplain reconnection, reshaping stream banks, developing appropriate geomorphic features, and planting native vegetation.

e) Weed management plans: Noxious weeds can compete with native species and degrade range and riparian health (Strang et al. 1979, pp. 141-143; Trammel and Butler 1995, entire; Sheley et al. 1999, entire). Landowner and Agencies will work together to identify and treat all noxious weeds.

Expected Benefits: Implementation of Riparian Management Plans is expected to significantly improve riparian health to a Sustainable condition (Appendix B). Restored riparian areas are expected to improve instream habitat and channel morphology parameters (e.g., lower summer water temperatures, lower width-depth ratios, increased pool quality, increased bank stability, and increased quality spawning habitat (Bjornn and Reiser 1991,

entire; Hunter 1991, entire; Poole and Berman 2001, entire; Opperman and Merenlender 2004, p. 832). Expected benefits to Arctic grayling include increases in distribution and abundance due to improved connectivity and availability of year-round habitat for all life stages.

Monitoring: A baseline riparian assessment using the NRCS Riparian Assessment method will take place during Phase I and then repeated every 5 years to determine if management actions are maintaining Sustainable reaches or improving At Risk or Not Sustainable reaches (Appendix B). The Agencies will develop a Riparian Assessment team and coordinate assessment with landowners. If a grazing strategy is developed, Landowners will be responsible for recording and reporting agreed upon grazing data (Period of use, livestock numbers, etc.) to the Agencies.

Barriers to Arctic Grayling Movement

Goal: To allow year-round passage of juvenile and adult Arctic grayling.

Conservation Measures: This Agreement will facilitate connectivity among and within streams for all life stages of Arctic grayling in the Centennial Valley.

a) Installation of fish ladders: Fish ladders will be installed on active diversions that prevent year-round fish passage. All boards from pin and plank diversions must be removed when the irrigation season is completed.

b) Installation of grade control diversions: Grade control diversions with fish passage are an alternative to fish ladders in diversions that are preventing fish passage. Grade control diversions allow fish passage the entire year and can minimize impacts to hydrology and geomorphology of the stream.

c) Replacing perched or non-functioning culverts: Undersized, perched or non-functioning culverts can result in poor sediment transport, ice jams, bank scouring and barriers to fish movement. All culverts will be evaluated and if necessary

replaced with appropriately sized and designed culverts or bridges. Any barrier caused by an irrigation structure or culvert will be addressed within 5 years of the individual landowners SSP approval.

d) Removal of beaver dams or log jams: Natural barriers like beaver dams or log jams may exist in the free flowing waters of the enrolled lands. It will be the Agencies' responsibility to determine if these natural barriers warrant removal. The protection of other native species (primarily westslope cutthroat trout) from invasion of nonnative fish species will be considered in determining if a barrier should remain in place. Typically, all barriers to Arctic grayling movement will either be removed or passage will be provided. If warranted, the Agencies will work with the landowner to remove these types of barriers. Evaluation of beaver dams or log jams and their influence on passage will be completed annually.

e) Enhancing stream flows in dewatered reaches: Instream flow conservation measures will reduce and eliminate dewatered stream reaches, thus improving connectivity and access for Arctic grayling to essential seasonal habitats.

Expected Benefits: Removal of migration barriers will allow Arctic grayling access to spawning, feeding, wintering, and refuge habitats throughout the year. The effects from removing barriers 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.

Monitoring: The Agencies will verify the effectiveness of all installed fish passage devices within 1 year of their installation. The Agencies will use design criteria, visual surveys, electrofishing, trapping, or tagging to determine if the structure is functioning properly and allowing access to upstream and downstream habitats.

Entrainment

Goal: Identify and reduce or eliminate entrainment in all irrigation systems in the Project Area.

Conservation Measures: This Agreement will reduce or eliminate entrainment for all life stages of Arctic grayling in the Centennial Valley.

a) Entrainment surveys: The Agencies will complete electrofishing or visual surveys of all irrigation ditches on enrolled lands to determine the extent of Arctic grayling entrainment, following the entrainment protocol (Appendix C).

b) Rescue operations: Arctic grayling salvage will occur during entrainment surveys. All Arctic grayling captured within irrigation ditches will be returned to the nearest point of stream downstream of the irrigation structure. If surveys find more than 20 Arctic grayling entrained in a particular ditch, the Agencies will make repeat rescue visits during the year, with a final visit occurring shortly after the diversion is shut down for the year. Twenty grayling represent approximately 1-2% of the estimated number of spawning adults using the monitored section of Red Rock Creek over the past 5 years (See Figure 2).

c) Modify points of diversions: Agencies will evaluate and determine if any diversion entraining Arctic grayling can be modified to reduce or eliminate entrainment, including installing headgates or other structures that would reduce the probability of entrainment.

d) Modify timing or amount of diverted flow: Reductions in amount of water diverted will be accomplished through an appropriate mix of improving irrigation efficiency, upgrading irrigation structures, implementing Instream Flow Conservation Plans, constructing stock-water wells, and water rights compliance. In addition, modifying the timing of diverting flows may decrease the potential for entrainment.

e) Install fish screens or other exclusion devices: Agencies will evaluate and determine whether installing a fish screen or exclusion device is appropriate to

reduce entrainment.

Expected Benefits: Entrainment surveys and Arctic grayling salvage efforts will lead to immediate reductions in mortality where entrainment is observed. Conservation measures that modify PODs or 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.

Monitoring: Entrainment will be monitored by FWP through electrofishing or visual surveys in all irrigation ditches for property enrolled in the CCAA. Any modification of a point of diversion or installation of a fish screen or exclusion device will be evaluated for effectiveness within 1 year of installation or implementation.

Cumulatively, the conservation actions described in this section will improve habitat and connectivity for the Centennial Valley Arctic grayling population. It is possible, though not expected, that positive habitat changes from the implementation of the CCAA in the Centennial Valley will not produce the desired biological response from Arctic grayling (e.g., increased abundance and distribution). In the event that Arctic grayling do not naturally recolonize habitats that have been restored under the CCAA, FWP may consider reintroducing or stocking grayling in these habitats. However, any Arctic grayling reintroduction or stocking by FWP would only occur with landowner approval and after the appropriate Montana Environmental Policy Act process, including public input.

VII. BIOLOGICAL MONITORING

Arctic Grayling Population Response Monitoring

The conservation measures implemented in this CCAA are expected to improve habitat and connectivity of those habitats and lead to a positive biological response in the Arctic grayling population. The biological response is expected to be increased distribution and abundance, which will lead to meeting the CCAA objectives of (1) Conserving the Centennial Valley Arctic grayling genetic diversity, (2) Establishing or maintaining Arctic grayling spawning or refugia in at least

two tributaries in the lower and upper reaches and (3) Increasing or maintaining suitable habitat for all life history stages for the Upper Red Rock Lake portion of Arctic grayling population. The effect of CCAA conservation measures on Arctic grayling populations will be evaluated as part of the Adaptive Management Plan (Warren and Jaeger, in press). FWP will annually complete genetic or demographic assessments of the population in both the lower and upper management reaches. Genetic assessments will estimate N_b from a sample of 25-50 fish from a common cohort in each management reach (for more information on genetic analysis techniques, see Leary 2014, entire). Estimation of N_b will be conducted annually and used to track genetic viability. Genetic assessments may be periodically augmented by demographic (i.e., abundance, relative abundance, population structure, condition, etc.) monitoring as needed. Arctic grayling will be captured using standard fisheries sampling techniques (i.e., electrofishing, trapping, netting, etc.). This monitoring will be used to assess population viability, indicate whether spawning is occurring in two tributaries in the upper and lower reaches, and if suitable conditions are being maintained in the upper management reach. Meeting these objectives will maintain genetic viability of the Centennial Valley Arctic grayling population, as stated in the Agreement goal.

VIII. IMPLEMENTATION OF THE AGREEMENT

The Centennial Valley CCAA will be broken down into the following four phases (Table 4); Enrollment, Baseline Surveys, Site-Specific Plan Development, Site-Specific Plan Implementation.

Phase I – Enrollment

Non-Federal Landowners interested in enrolling in the Centennial Valley CCAA and developing a site-specific plan under this Agreement must contact FWP at: Montana Fish, Wildlife and Parks, Dillon Field Office, Attn: Matt Jaeger, 730 ½ N. Montana, Dillon, Montana 59725, phone 406-683-9310, mattjaeger@mt.gov, or call FWP Fishery Division at 406-444-2449 to receive an official enrollment form. The enrollment period will begin on the date the USFWS cosigns this agreement (the effective date). It is the Agencies' intent to enroll any interested private landowner within one year of the effective date of the Agreement. However, in accordance with its policy, the Service will accept complete enrollment applications before the effective date of the final listing of Arctic grayling, should the species get listed as threatened or endangered under the ESA in the future.

Table 3. Summary of limiting factors, conservation measures, implementation timeline and monitoring protocol for conservation actions implemented under the Centennial Valley Candidate Conservation Agreement with Assurances.

				Monitoring		
Limiting Factor	**Conservation Measure**	**Conservation Measure Description**	**Implementation Timeline**	**Type**	**Interval**	**Responsibility**
Reduced streamflows	Irrigation Management	Improved infrastructure	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Water Rights Management and Compliance	Measuring diversions	Annually beginning at Enrollment	Management/Compliance Management/Compliance	Weekly Every two weeks	Landowner FWP
	Instream Flow Conservation Plan	Reduced diversion flows when flow triggers are met	Annually beginning at Enrollment	Habitat (streamflow) Habitat (temperature)	Intermittent Annually	FWP
	Alternative Stockwater	Wells, pipelines, troughs, lined ditches	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Water Rights Changes	Conversion of water rights	20 years	-	-	-
Degraded Riparian Habitat	Riparian Management Plan	Sustainable grazing system	Initiated w/i 1 year of SSP Approval	Habitat	Riparian Assessments Every 5 years	FWP/USFWS
	Riparian Pasture Fence	Fence riparian areas, sustainable grazing system	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Alternative Stockwater	Wells, pipelines, troughs, lined ditches	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Stream Restoration	Active restoration	Designed w/i 10 years, completed w/i 20 years	Project Performance	As needed	FWP/USFWS
	Weed Management	Spraying or other appropriate method	Initiated w/i 1 year of SSP Approval	-	-	FWP/USFWS
Barriers	Fish Ladders	Ladders for pin-and-plank diversions	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Grade Control Diversions	Alternative to pin-and-plank diversions	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Replace Perched Culverts	Replace with appropriate culvert or bridge	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Remove Natural Barriers	Beaverdams, logjams	Evaluate annually	Project Performance	As needed	FWP/USFWS
Entrainment	Entrainment surveys	Electrofishing or visual survey of ditches	Completed w/i 1 year of SSP approval	Biological	Arctic grayling present = every 2 years. No Arctic grayling present = every 5 years	FWP
	Rescue Operations	Electrofishing/netting operations	As identified	Biological	As needed	FWP
	Modify PODs	Modify location or angle	Completed w/i 5 years of SSP approval	Project Performance	As needed	FWP/USFWS
	Modify Timing/Amount of Diversion	Diversion reductions when fry are present	Completed w/i 5 years of SSP approval	Habitat	As needed	FWP
	Fish Screens	Install screens or other exclusion devices	Completed w/i 10 years of SSP approval	Project Performance	As needed	FWP/USFWS

At the time of enrollment the Landowner shall:

1. Provide signature(s) on the application and CI that represents the intent to voluntarily participate in this Agreement.

2. Identify acres of enrolled deeded and state lease lands and the intent to develop a SSP under this Agreement that will be included in the CI.

3. Agree to implement Instream Flow Conservation Plans when instream flow triggers are reached. Rapid Assessment Stream Surveys (RASS) designed to identify immediate threats and potential barriers, assess habitat condition and locate irrigation points of diversion have previously been conducted on all Project Area streams. More comprehensive baseline surveys will still be needed to develop a SSP; however, information gained from the preliminary RASS surveys is sufficient to warrant the issuance of a CI. Further, all enrolled landowners will be implementing Instream Flow Conservation Plans in Phase I, regardless of their property prioritization number (see Section IX below).

4. Allow the Agencies to develop, in consultation with the Landowner, a list of activities (covered activities) for which incidental take will be permitted during the life of the Agreement to the extent that Landowners are carrying out those activities.

5. Receive a CI with incidental take coverage. Such take coverage would become effective if Arctic grayling were listed under the ESA.

6. Read an educational pamphlet provided by FWP that describes the ecology of Arctic grayling within the Project Area, their associated habitat requirements, and simple actions that Landowners can take to provide immediate benefit to Arctic grayling.

Once enrolled, all properties will be assigned a property prioritization number using the prioritization criteria below in Section IX. Once property prioritization numbers have been assigned, the Agencies envision starting Phase II with two landowners every year (see Table 5). The goal of this strategy is to provide immediate and long-term benefits to Arctic

Table 4. Generalized Phased Implementation Responsibilities, Timelines, and Legal Protections Under the Agreement. Associated monitoring requirements are described elsewhere in the Agreement.

IMPLEMENTATION PHASE AND DURATION	AGENCY ACTIONS	LANDOWNER ACTIONS
PHASE I Begins with effective date of approved CCAA to publication of a final listing determination if species is determined to be threatened or endangered	• Enroll Landowners • Define covered activities • Issue Certificate of Inclusion • Water use monitoring	• Complete enrollment application • Comply with water rights • Implement Flow Conservation Plan • Define covered activities • Receive Certificate of Inclusion with incidental take coverage • Read Arctic grayling informational pamphlet
PHASE II Begins when the property prioritization number is due for the upcoming calendar year, and completed in 6 months	• Perform Baseline surveys for entrainment, geomorphology , fish passage and riparian conditions • Monitor water use	• Allow access for baseline survey and water use monitoring • Comply with water rights • Continue to implement Instream Flow Conservation Plan • Assist with irrigation and stockwater monitoring
PHASE III Up to 30 months (Extension may be requested)	• Assist landowner in implementing conservation measures • Develop & approve SSP/implementation schedule • Perform necessary monitoring	• Implement conservation measures during SSP development • Develop & approve SSP/implementation schedule • Comply with water rights • Continue to implement Instream Flow Conservation Plan
PHASE IV At least 10 years, from date of SSP acceptance (May be extended prior to expiration of Certificate of Inclusion)	• Activate Assurances component of Certificate of Inclusion upon approval of SSP, if species becomes listed • Assist landowners in implementing conservation measures identified in SSP • Perform necessary monitoring	• Implement conservation measures identified in SSP • Receive Assurances and continued incidental take coverage if species is listed

grayling, starting with the habitat that is most important to the species. Other enrolled landowners with properties that are lower on the prioritization scale will still be contributing to Arctic grayling conservation by implementing their Instream Flow Conservation Plans and water rights compliance, while awaiting initiation of Phase II by the Agencies. This schedule and the number of properties for which Phase II will be initiated in a given year may vary based on available resources and the complexity of the properties in question.

Table 5. Proposed implementation schedule with property prioritization number for the Centennial Valley CCAA*.

Year	Season	Property Prioritization Number	Action
2018	Spring/Summer	1 and 2	Baseline surveys
	Fall/Winter	1 and 2	Develop SSP
2019	Spring/Summer	3 and 4	Baseline surveys
	Fall/Winter	3 and 4	Develop SSP
2020	Spring/Summer	5 and 6	Baseline surveys
	Fall/Winter	5 and 6	Develop SSP
2021	Spring/Summer	7 and 8	Baseline surveys
	Fall/Winter	7 and 8	Develop SSP
2022	Spring/Summer	9 and 10	Baseline surveys
	Fall/Winter	9 and 10	Develop SSP
2023	Spring/Summer	11, 12 and 13	Baseline surveys
	Fall/Winter	11, 12 and 13	Develop SSP

- If resources are available, Agencies may initiate Phase II on more than two properties.

Phase II – Baseline Surveys

Phase II begins when the property prioritization number is scheduled for the upcoming calendar year (i.e., landowner will be informed in January that the Agencies will commence baseline surveys on their property in the Spring/Summer of that year). Phase II will be completed in 6 months. At this time, landowners shall:

1. Allow access to the Agencies, or a designated representative, under mutually agreeable conditions, for:

    a) Conducting baseline surveys (e.g., entrainment, geomorphology, riparian) of the enrolled lands.

    b) Validating compliance with water rights.

2. Assist with monitoring of irrigation and stockwater withdrawals and other authorized uses. In circumstances where new water rights have been developed or changes to existing water rights

were made without proper authorization, the landowner and Agencies shall immediately develop protocols for the operation of the unauthorized water uses and agree to specific timeframes for becoming compliant with state water law.

Phase III – Site-Specific Plan Development

Phase III begins immediately after the completion of the baseline surveys in Phase II and concludes with the approval of a SSP. Duration of Phase III will be no longer than 30 months, unless the Participating Landowners and the Agencies submit an extension request to USFWS. Stipulations of Phase III include:

1. Participating Landowner's implementation of conservation measures to remove limiting factors to Arctic grayling on enrolled lands that were identified during the baseline surveys.

a) FWP will document any actions the Participating Landowner took to benefit Arctic grayling prior to or during Phases I and II.

b) FWP will provide the Participating Landowner with a specific list of conservation measures based on the baseline surveys that shall be implemented throughout Phase III and IV, along with a schedule for that implementation (thus implementation of conservation measures will be ongoing, including throughout the period of SSP development). The Agencies and landowner will complete the Conservation Checklist (Appendix D) that will guide the development of the SSP.

2. Agency verification of Participating Landowner compliance with water rights.

3. The final SSP 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 Arctic grayling in waters on or adjacent to enrolled lands.

b) A description of the limiting factors to Arctic grayling on the enrolled lands and the conservation measures to be implemented to address those factors.

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 SSP 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 should Arctic grayling be listed under the ESA.

f) A monitoring plan and schedule to evaluate if conservation measures are effective and to ensure compliance with the SSP.

5. The SSP will reflect the needs of the Participating Landowner and will lead to either the long-term protection or restoration of Arctic grayling habitat on the enrolled lands.

6. The SSP will be reviewed by the Agencies, and an approved SSP will bear the signatures of the Participating Landowner and the appropriate representatives from both FWP and USFWS. The USFWS shall review each proposed SSP after FWP and Participating Landowner development and make a determination to accept or deny a plan within 30 days of receipt.

Approval of SSPs 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 Arctic grayling on the enrolled lands. A SSP will be considered approved when it has been reviewed and signed by the Participating Landowner, the Permit holder (FWP), and the USFWS. Approval of the SSP provides regulatory assurances to the Participating Landowner if Arctic grayling are listed as threatened or endangered and extends the incidental take coverage provided during Phase I and Phase II (see Table 4).

Should Arctic grayling be listed under the ESA prior to the completion and final approval of SSPs for enrolled landowners holding a CI, FWP shall provide the USFWS a timetable for the completion of these plans and will submit extension requests, as necessary, to complete these plans.

PHASE IV – Site-Specific Plan Implementation

Phase IV of the development of the SSP requires the Participating Landowner to:

1. Initiate the implementation of the agreed-to SSP for the enrolled lands for the term of CI.

IX. PRIORITIZATION STRATEGY FOR SSP DEVELOPMENT AND IMPLEMENTATION

A prioritization strategy for SSP development will assist Agencies in prioritizing where, when and how to implement the CCAA by efficiently allocating limited Agency resources. All enrolled lands will be prioritized based on their potential to provide the greatest benefit to Arctic grayling.

The SSP prioritization strategy delineates Arctic grayling habitat in the Project Area into three tiers (Table 6):

1) Tier I- core spawning, rearing and adult habitat that is currently occupied by Arctic grayling
2) Tier II- periphery habitat intermittently used by Arctic grayling
3) Tier III- currently unoccupied historical habitat

In general, SSPs for those lands encompassing Tier I habitat will be prioritized and developed first, then for Tier II, and finally for Tier III. However, deviations from this strategy will occur in instances where benefits to Arctic grayling can be maximized by developing SSPs on lands encompassing Tier II or Tier III habitat. For example, habitat degradation in Tier II or Tier III habitat may be impacting habitat quality in a downstream Tier I habitat; thus, prioritizing restoration of the Tier II or III habitat may be more beneficial to Arctic grayling than addressing lesser limiting factors on the Tier I property. The goal of the Agencies is to complete two SSPs per year, with the estimated timeframe for completing all SSPs on enrolled property in 7-9 years. Although the Agencies cannot develop all SSPs simultaneously, landowners who are enrolled but whose property prioritization number has not come due would still receive Certificates of Inclusion and take coverage in the interim because: (1) they would already be implementing Instream Flow

conservation measures (Water Rights Management Compliance and Instream Flow Conservation Plan) to benefit Arctic grayling; and (2) surveys for immediate threats to Arctic grayling have already been conducted for all potential enrollees and no immediate threats were documented, or any immediate threats were addressed. Implementation of SSPs would occur as soon as the plan is signed by the USFWS, FWP, and the Participating Landowner.

Table 6. Number of landowners in the Project Area by stream and tier.

	Number of landowners		
Stream	Tier I	Tier II	Tier III
West Creek	1	0	0
Middle Creek	0	0	1
Long Creek	3	0	1
Metzel Creek	0	0	1
Red Rock Creek	1	0	0
Hell Roaring Creek	0	0	2
Corral Creek	1	0	1
Antelope Creek	0	0	1
Tom Creek	0	0	1
ODell Creek	2	0	2
Shambow Creek	0	0	1
Red Rock River	0	4	0

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 Arctic grayling and its habitat in the Project Area within the Centennial Valley. Participating Landowners shall adhere to both the general obligations described here, and the particular obligations described in their SSP. Similarly, the Agencies must fulfill the general obligations below (and any described elsewhere in this Agreement) and those agreed to in any SSP.

Participating Landowners

1. Implement all phases of the Agreement as specified.

2. Allow the Agencies to conduct an assessment of baseline environmental conditions and land use practices leading to the cooperative development of a comprehensive SSP for their enrolled lands.

3. Implement the SSP and the conservation measures therein for the duration of the Agreement, as specified in Section XI below.

4. With agreed-to notification, allow agency or agency representatives access to Participating Landowner's property for the purposes of assessing the status of Arctic grayling and their habitat 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 SSP.

5. Remain in compliance with the terms of the Agreement and their SSP to maintain their CI.

Montana Fish, Wildlife & 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, baseline surveys, entrainment surveys, Instream Flow Conservation Plans, collection of baseline data on enrolled lands, and development, negotiation and implementation of SSPs.

3. Develop SSPs 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 FWP under this Agreement and in any SSP.

5. Carry out responsibilities for compliance and biological monitoring assigned to FWP under this Agreement and in any SSP.

6. Ensure compliance with the conditions of each CI. Work cooperatively with the Participating Landowner to find resolutions to non-compliance or potential non-compliance of a CI. If cooperative efforts fail to get the Participating Landowner into compliance with a CI, FWP shall send a written notice to the Participating Landowner advising the nature of the violation and identifying corrective actions required to bring the Participating Landowner back into compliance with the SSP. Take authorization and the regulatory assurances (which apply only if the species is listed under the ESA) associated with the CI 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 and included in the CCAA annual report.

7. Actively pursue the funding necessary to implement the Agreement and each SSP. Funding may be provided by a variety of sources including any appropriate Federal, State, and private source, but is not guaranteed.

8. Prepare annual reports in accordance with the Agreement and the SSPs and submit to USFWS annually.

9. Maintain records for all phases of the Agreement's implementation for each enrolled Participating Landowner.

10. Provide expert analyses of water rights and hydrologic issues.

11. Carry out hydrologic monitoring as assigned to FWP under this Agreement and in any SSP. Assist the other Agencies with the evaluation of instream flow recommendations, including professional evaluation of methods, data collection, and analyses.

US Fish and Wildlife Service

Subject to authorized and appropriated funds, the USFWS will:

1. Serve as advisors to the Agencies and Participating Landowners, providing expertise on the conservation of Arctic grayling and information on USFWS requirements regarding CCAAs.

2. Review and process CI applications in coordination with FWP.

3. In coordination with Agencies and Participating Landowners, provide assistance in developing and implementing CIs and SSPs.

4. Before accessing an enrolled property, ensure the Participating Landowner is personally notified at least 2 weeks in advance to identify or monitor Arctic grayling and their habitat, assist in implementation of conservation measures, and monitor CCAA compliance and effectiveness of conservation measures, as needed with a mutually agreed-upon time and location, as well as a list of all personnel to access the enrolled property.

5. Carry out any responsibilities for implementing conservation, monitoring or other measures assigned to USFWS under this Agreement and in any SSP.

6. Actively pursue the funding necessary to implement the Agreement and each SSP. Funding may be provided by a variety of sources including any appropriate Federal, State, and private source, but is not guaranteed.

7. In coordination with Agencies and Participating Landowners, evaluate any proposed modifications to CIs or the Agreement, and process any modifications to CIs or amendments to the Permit, where necessary and appropriate.

8. Ensure that the terms and conditions included in the Permit and CIs are being implemented as agreed upon.

9. In those cases where terms of any CI are not being met, work with the Agencies and Participating Landowners to resolve. If efforts to resolve compliance issues have not been effective, the USFWS can suspend or revoke, in whole or in part, the Permit (see Permit Suspension and Revocation below), if necessary.

10. Help coordinate completion of all monitoring requirements set forth in this CCAA and CIs.

11. Help coordinate completion of reports pertinent to CIs under this Agreement.

12. Review monitoring and other reports for CIs and this Agreement.

13. Meet annually with FWP to review annual and trend monitoring information

Other Potential Partners

Other partners may participate in the implementation of the Centennial Valley CCAA where additional expertise is needed to develop SSPs or assist in other areas of implementation. These partners, whose roles are not yet defined, may include other Federal or State agencies, county entities, or other conservation organizations. Some of these entities may possess expertise in specific areas of land and resource management and would be valuable partners in the conservation of Arctic grayling in the Centennial Valley.

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

This CCAA will be in effect for 20 years following its approval and signing by the USFWS, FWP, and any other Participating Party. Certificate of Inclusions for enrolled landowners, including any commitments related to funding under USFWS programs, will be in effect for 10 years following approval and execution of the CI by FWP and the USFWS, or until expiration of this CCAA, whichever is earlier. The Section 10(a)(1)(A) Permit authorizing incidental take of the species and providing the assurances described in this CCAA will be effective from the date of listing, should that occur, until the expiration date of this CCAA or the CI, whichever is earlier. The duration stated for this CCAA and the Permit is primarily determined based on a timeframe that is sufficient to realize the benefits of habitat conservation measures to Arctic grayling and its habitats. The stated duration for CIs also provides a reasonable and efficient timeframe before enrolled landowners, FWP, USFWS, and Cooperators would need to revisit the process for renewal, as appropriate. As long as the CCAA remains in effect, FWP and USFWS may renew CIs, based upon reevaluation of the CI's ability to continue to meet the CCAA standard and agreement of the Participating Parties, including the landowners enrolled in this CCAA through the CI. An enrolled landowner may also voluntarily terminate a CI, as described in the Terms and Conditions

of the Agreement section below.

XII. COMPLIANCE MONITORING AND REPORTING

Site-Specific Plan Compliance

FWP is responsible for compliance monitoring for implementation of SSPs. FWP will meet with landowners to discuss the SSP two times per year and determine landowner compliance with SSPs based on findings from its monitoring actions and the information provided from partnering agencies. FWP will also monitor compliance with negotiated reductions in irrigation withdrawals and any project maintenance agreements.

FWP may enter the enrolled land to monitor the Participating Landowner's compliance with the SSP, at a mutually agreed-on time between FWP and the Participating Landowner.
Notices of compliance violations will be copied to the USFWS. A summary of non-compliance variances also will be included in FWP annual report.

Reporting

FWP, with assistance from USFWS, will be responsible for completion of a report on Agreement implementation annually. This report will include, but is not limited to--1) a summary of Certificates of Inclusion issued and SSPs approved over the past year; 2) a summary of projects and monitoring related to the conservation measures described in the Agreement, including an accounting of project expenditures; 3) any proposed modifications to existing SSPs; and 4) a summary of enforcement actions, if any, associated with landowner compliance with SSPs. The report may be presented to the Centennial Valley Arctic 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 FWP and USFWS websites.

XIII. ANTICIPATED EFFECTS

Anticipated Types and Amount of Take

Take related to this CCAA may occur as a result of covered activities or implementation of conservation measures. Take that results from, but is not the purpose of, carrying out an otherwise lawful activity, such as rangeland and agricultural management or implementation of conservation measures, is known as incidental take. Incidental take will likely occur sporadically on enrolled

lands and is not expected to nullify the conservation benefits that are described under this CCAA.

Types of Incidental Take

We considered three primary types of incidental take related to this CCAA: (1) injury or death; (2) harm in the form of habitat fragmentation, loss, or degradation and (3) harassment in the form of human activities that significantly disrupt normal behavioral patterns such as breeding, feeding, or sheltering. For each type of take we describe the associated covered activities and conservation measures that will minimize the take.

Injury or death

- Genetic sampling will result in take in the form of injury and death. Fin clips taken for genetic analysis from Arctic grayling older than four months would constitute take, by injuring these fish. Additionally, take in the form of death would occur for Arctic grayling fry annually. Arctic grayling fry are too small to survive the clipping of fins, thus the whole fish would be used for genetic sampling. The risk of fin clipping and injury to Arctic grayling will be minimized by clipping the smallest portion needed for analysis. Take of Arctic grayling fry will be minimized by taking the minimum number of fry needed per genetic sampling recommendations.

- Electrofishing used to document Arctic grayling entrainment in irrigation ditches may injure and possibly kill some Arctic grayling. Injury and death of Arctic grayling from electrofishing will be minimized by following FWPs electrofishing guidelines and using experienced electrofishing crews.

- Irrigation or stockwater withdrawals may entrain Arctic grayling and result in death when withdrawals are ceased following the period of use for the water right. Take of Arctic grayling due to entrainment into ditches will be minimized by implementing the entrainment monitoring protocol and by implementing conservation measures designed to address entrainment (e.g., install new headgates, install fish screens).

Harm

- Barriers that preclude fish movement can harm Arctic grayling by restricting movement to more favorable stream locations (e.g., thermal refugia, spawning sites). This is expected to harm grayling by preventing them from spawning and by decreasing survival by

preventing Arctic grayling from finding cooler, feeding or shelter habitat. Take of Arctic grayling from fish barriers will be minimized by installing fish ladders and other infrastructure that allow fish passage.

- Livestock management may result in direct trampling of habitat and streambanks by livestock. This is expected to harm Arctic grayling by increasing sedimentation and reducing riparian habitat, both of which decrease quality of pool habitat used by Arctic grayling for resting and foraging. Excessive sedimentation also can reduce survival of Arctic grayling eggs. Take resulting from livestock management will be minimized by implementing riparian and grazing management plans and developing alternative stockwater sites.

- Habitat restoration activities are expected to result in take of Arctic grayling. These activities, including stream channel and riparian restoration, may temporarily increase sediment to adjacent and downstream habitats. Increased sedimentation may affect survival of Arctic grayling eggs. Take from these activities will be minimized by implementing projects outside the spawning season for Arctic grayling.

Harassment

- Noise from construction activities associated with habitat restoration may harass Arctic grayling, causing them to relocate out of the immediate area. Harassment may increase stress on individual Arctic grayling by forcing them to occupy less suitable habitat (e.g., higher water temperatures) while construction is ongoing, which could diminish survival. Take from construction noise will be minimized by ensuring connectivity to facilitate fish movement away from the immediate area and by adjusting project timing to coincide with time periods when Arctic grayling are less likely to be in the area.

Adverse Impacts Not Rising to the Level of Take

Disturbance of some individual Arctic grayling may occasionally occur from routine maintenance of irrigation infrastructure or from recreational activities (e.g., horseback or ATV riding across streams). These activities may result in individual fish moving away from the disturbance, but this is expected to occur only rarely. Furthermore, such disturbance to individual Arctic grayling is likely to be temporary, and, thus will not likely adversely affect the feeding, breeding or sheltering

of these fish. Therefore, we do not believe that any disturbance of individual Arctic grayling as a result of these activities rises to the level of take.

Take Estimate

Incidental take estimates were derived for Arctic grayling in the Project Area for each covered activity and conservation measure proposed under the Agreement. For most activities, comprehensive biological monitoring information was not available. However, some presence/absence surveys have been conducted in tributaries where the majority of conservation measures would be implemented. We infer from these surveys that densities of Arctic grayling on private lands are low because of the multiple surveys conducted, only a few have recorded grayling presence. Surveys that did detect grayling in these tributaries did not detect appreciable numbers of grayling (4 or less grayling per survey). We estimate that less than 1 percent of grayling currently occurring in the Centennial Valley occupy streams on private land.

Genetic sampling

Annually, 50 to 100 Arctic grayling fry are expected to die as a result of genetic monitoring in the Project Area. Geneticists recommend using 100 Arctic grayling fry (50 from each Management Segment) to ensure robust estimates of number of breeding adult Arctic grayling, although 25 fry per Management Segment would be considered the absolute minimum number of fry needed to run the analysis.

Electrofishing

Electrofishing will occur in irrigation ditches as part of the entrainment protocol and is expected to take Arctic grayling in the form of injury or death. It is difficult to predict how many Arctic grayling will be captured in irrigation ditches in the Project Area, although estimates of take expressed as percentages of total catch are possible by using published estimates of injury and mortality related to electrofishing. Growth of Arctic grayling initially captured with low voltage smooth DC electrofishing was not impaired at 100 days post capture (Dwyer and White 1997, p. 176), although growth was impaired when higher voltages of smooth DC were used for capture. Mortality (<1%) and injury (serious enough to affect growth; ~10%) were documented in rainbow trout (a similar species to Arctic grayling) captured with smooth DC electrofishing (the same mode recommended by FWP in their Electrofishing Protocol and that would be used to collect Arctic grayling; Dalbey et al. 1996, p. 564). Given these studies, it is reasonable to assume that <1% of electrofished

Arctic grayling from irrigation ditches are expected to die and likely less than 10% will be taken in the form of injury that rises to the level of affecting growth. It is important to note that any take from electrofishing in irrigation ditches is expected to be part of, not in addition to, take resulting from irrigation withdrawals (see discussion below), because many entrained Arctic grayling would likely die as a result of dewatering at the end of irrigation season.

Irrigation or stockwater withdrawals

Diversions for irrigation or stockwater are expected to take Arctic grayling in the Project Area. Typically, diversions withdrawing greater amounts of water from the stream or those that are situated immediately below Arctic grayling spawning areas are expected to take more Arctic grayling than smaller diversions located away from spawning areas. Spawning of Arctic grayling has not been documented in either of these streams, although spawning-aged fish were present in the sample collected from Long Creek. Given that the vast majority of Arctic grayling in the Centennial Valley reside on the Refuge, it is assumed that any take resulting from irrigation or stockwater withdrawals would constitute less than 1% of the total Arctic grayling population in the Centennial Valley. Arctic grayling have not been documented in other streams in the Project Area.

Barriers

Barriers are expected to take Arctic grayling in the form of harm by precluding fish from moving between or within suitable habitats, thereby preventing their ability to breed, feed, or find shelter. Barriers, or potential barriers, have been identified in RASS surveys on properties that may enroll in the CCAA. All documented barriers are on private land and are not currently impacting the movement of the core Arctic grayling population residing on the Refuge. Similar to irrigation diversions, it is expected that barriers currently take less than 1% of the total Arctic grayling population in the Centennial Valley because the vast majority of Arctic grayling reside and fulfill their life history needs on the Refuge.

Livestock management

Livestock management is expected to take Arctic grayling in the Project Area in the form of harm by degrading instream and riparian habitat. Trampling of instream and riparian habitat increases erosion, leading to excessive sedimentation which fills in pools used by

Arctic grayling to feed and shelter, and also can decrease survival of Arctic grayling eggs. Livestock management occurring on private lands in the Project Area are expected to take less than 1% of Arctic grayling because the vast majority of Arctic grayling reside on the Refuge.

Habitat restoration

Habitat restoration activities are expected to take Arctic grayling in the form of harm by increasing sedimentation, which can fill in pools used by Arctic grayling to feed and shelter, and also can decrease survival of Arctic grayling eggs. Increased sedimentation is expected to be temporary, until the next flushing flow. The vast majority of these restoration projects will occur downstream of the Refuge, away from the core population of Arctic grayling. Sediment from the few habitat restoration projects occurring upstream of the Refuge is not expected to reach the Refuge or affect feeding, breeding or sheltering of the core population. Given that increased sedimentation from habitat restoration activities is only expected to affect few grayling downstream of the Refuge, it is expected that take of Arctic grayling from these activities will amount to less than 1% of the population.

Construction noise

Construction noise from habitat restoration activities is expected to take Arctic grayling in the form of harassment. Noise generated by machinery or personnel conducting habitat restoration will likely cause Arctic grayling in the area to move or seek shelter. Movements to other less preferred habitats may reduce survival or recruitment by reducing cover, and increasing potential predation and competition, exposer to warmer stream temperatures and less productive feeding areas. Similar to increased sedimentation from habitat restoration, construction noise is not expected to impact the core Arctic grayling population on the Refuge, therefore take associated with construction noise is expected to be less than 1% of the total population.

Impacts of the Taking

The impacts of taking from all covered activities are expected to be small. All the covered activities will occur on private lands located away from the core population of Arctic grayling on the Refuge. Arctic grayling densities are assumed to be low on these private lands because presence/absence surveys indicate sporadic occurrences of Arctic grayling and professional judgement dictates that surveys would detect higher densities and wider distributions of Arctic

grayling if indeed they were present. While we cannot discount the impacts of taking Arctic grayling as a result of the covered activities, we expect the overall percentage of take to be minimal and less than 1% of the total population.

Implementation of conservation measures identified in the above sections will reduce the likelihood of incidental take to the small amount estimated. The sustainability of the Arctic grayling population in the Project Area is not likely to be impacted from this low level of take. Furthermore, any impacts from such take would be outweighed by the expected benefits, described in Section VI, of implementing the conservation measures in this CCAA and associated CIs.

Expected Conservation Benefits

Overall, the Agreement will provide a net conservation benefit toward the conservation goal of increasing the abundance and distribution of Arctic grayling in historically occupied waters within the Centennial Valley watershed, even with the anticipated effects of the covered activities. We expect distribution of Arctic grayling to increase within the Centennial Valley, as connectivity is restored and habitat conditions improve on private lands. Similar to distribution and abundance increases of Arctic grayling observed in the Big Hole CCAA, we expect Arctic grayling to use historically occupied stream habitats in the Centennial Valley. We do not expect all restored stream habitats to be permanently occupied by Arctic grayling, but that streams used historically for various life history purposes be used again for those purposes.

XIV. TAKE, REGULATORY ASSURANCES, CHANGED AND UNFORESEEN CIRCUMSTANCES

Take

The Permit issued to FWP will authorize FWP, and Participating Landowners holding a CI, to take Arctic grayling, if they become listed under ESA in the future, as specified on the Permit and CIs. Specifically for this Agreement, the Permit will authorize take of Arctic grayling by Participating Landowners (who hold a CI) as a result of otherwise-lawful agricultural and ranching activities on the enrolled lands, as described in this Agreement. The Permit will also authorize take from habitat restoration and monitoring activities necessary for the implementation of the Agreement. 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

SSPs. Take coverage becomes effective, only if and when Arctic grayling are listed under the ESA.

Notification of Incidental Take

While it will not be possible in all incidental take situations, to the extent that it is possible enrolled landowners agree to provide the FWS with an opportunity to rescue individuals of the covered species before anticipated and authorized take occurs (e.g., construction activities). In such cases, notification of take should be provided to FWS 30 days prior to the action; minimally, notification must occur no less than 14 days prior to the action.

For those situations in which unpredicted, authorized take has occurred, the enrolled landowner agrees to notify FWP or USFWS within 48 hours after any observation of take of Arctic grayling on the enrolled property. If FWP or other Cooperator observes or learns of any take of Arctic grayling on an enrolled property, it shall also notify the USFWS within 48 hours after learning of the take.

Regulatory Assurances

In return for committing to implement a CCAA to improve the status of Arctic grayling, the USFWS provides enrolled landowners with assurances of regulatory certainty. More specifically, upon USFWS approval and execution of a CI under this Agreement, the USFWS will provide the enrolled landowner with assurances that no additional conservation measures or additional land, water, or resource use restrictions, beyond those voluntarily agreed to and described in the CCAA and/or CI and associated SSP, will be imposed on enrolled properties should Arctic grayling become listed as a threatened or endangered species, provided that the CI and associated SSP are being implemented as agreed upon. These assurances, set forth in the Permit that will be issued to FWP, will be authorized with the approval of each CI. This is consistent with the Candidate Conservation Agreement with Assurances Final Policy (64 FR 32726) and the regulations implementing the policy (69 FR 24084).

Changed Circumstances

Changed circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement that Agreement developers and the USFWS can reasonably anticipate and plan for (50 CFR 17.3). If identified changed circumstances occur, the Agencies are committed to working with the Participating Landowners to implement measures that limit the level of authorized take of Arctic grayling and allow the Participating Landowner to

continue to implement their SSP in compliance with this Agreement and the Permit. Additional conservation measures beyond those agreed to in this section will not require the commitment of additional land resources, water resources, financial compensation, or additional restrictions on the use of land, water, or other natural resources, beyond the level otherwise agreed upon in this CCAA and the relevant CI, without the consent of the enrolled landowner(s).

Extended drought, wildfire, floods, adjudication of water rights, and invasion of nonnative species are changed circumstances which may affect Arctic grayling in the Project Area. Should any or all of these events occur and pose a threat to Arctic 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

Extended Drought

Drought is a natural phenomenon where precipitation varies over time and space. Periods of drought have occurred periodically throughout the range of Arctic grayling and are expected to occur again in the future. Drought can reduce streamflows, which reduces and fragments available habitat for Arctic grayling. Most of the Agreement's existing conservation measures are already intended to mitigate effects of drought on Arctic grayling. However, additional conservation measures may be warranted to address special situations such as extreme or extended drought. In the circumstance that extreme or extended drought is reducing the abundance and distribution of Arctic grayling below current levels, the Agencies will pursue all available options, both within (enrolled landowners) and outside the Agreement (non-enrolled landowners) to help achieve the flow targets at the frequency desired. These options may include, but are not limited to, seeking additional Agreement participants, seeking participants in other related conservation planning efforts, 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

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 Arctic grayling. For example, mountain fires followed by heavy precipitation may cause excessive sediment input from headwater streams, causing fine sediment deposition at Arctic 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 Arctic grayling, the Agencies will assess whether debris flows pose a significant risk for Arctic 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. FWP and USFWS will collaborate on any rescue efforts, and Participating Landowners will provide necessary access to their property to assist these efforts.

Floods

Floods may displace Arctic 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 Arctic 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. 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.

Adjudication of Water Rights

The adjudication of water rights in the Centennial Valley system may impact 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 SSP, as necessary, if adjudication negatively affects the ability of the Agreement or SSP to recover Arctic 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 SSPs to ensure consistency between the Montana Water Law and the provisions of the SSP. Participating Landowners and the Agencies shall amend or modify Instream Flow Conservation Plans and/or SSPs 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 Instream Flow Conservation Plan or SSP. Revising a Participating Landowner's irrigation Instream Flow Conservation Plan and SSP 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.

Flow Triggers

The flow triggers found in Table 3 may be overestimates of the actual monthly 80^{th} percentile exceedance streamflow values (see Appendix A for discussion). As additional streamflow data is gathered, more accurate estimates may be possible. The triggers may be adjusted downward based on additional data using accepted methodologies upon agreement of USFWS and FWP.

Streamflow Targets

Base flow period streamflow targets are based on wetted perimeter data. Additional wetted perimeter studies or other physical habitat studies may show adjustments to streamflow targets are necessary. The spawning period streamflow targets are based on depth of passage through riffles. Actual depth surveys of streams when at target flow may show

adjustments are necessary. Downward adjustments to streamflow targets based on newly acquired data and analysis may be made upon agreement of USFWS and FWP.

Unforeseen Circumstances

Unforeseen circumstances are those changes in circumstances affecting the Arctic grayling or its habitat in this CCAA Project Area that could not have been reasonably anticipated at the time of the CCAA's development, and that result in a substantial and adverse change in the status of the Arctic grayling. If additional conservation measures are necessary to respond to unforeseen circumstances with respect to a CI, FWP and the USFWS will work with the enrolled landowner to determine what additional conservation measures or modifications would be appropriate to address the circumstance. However, implementation of additional conservation measures or modifications would be based solely upon willing agreement by the enrolled landowner. Additional conservation measures will not require the commitment of additional land resources, water resources, financial compensation, or additional restrictions on the use of land, water, or other natural resources, beyond the level otherwise agreed upon in this CCAA and the relevant CI, without the consent of the enrolled landowner(s).

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 FWP.

XVI. TERMS AND CONDITIONS OF THE AGREEMENT

The USFWS and other Participating Parties may not, through modification of this CCAA, impose any new requirements or conditions on, or modify any existing requirements or conditions applicable to, FWP or an enrolled landowner (or successor in interest to FWP or an enrolled landowner), to compensate for changes in the conditions or circumstances of any species or ecosystem, natural community, or habitat covered by this CCAA, except as stipulated in 50 CFR 17.22(d)(5) and 17.32(d)(5) or as mutually agreed upon by the USFWS, FWP, and an enrolled landowner.

A. Modifications of the Agreement or CIs. Any party to the CCAA or a CI may propose modifications to the agreement to which they are party by providing written notice to, and obtaining the written concurrence of, the other parties to the agreement. Such notice shall include a statement of the proposed modification, the reason for it, and its expected results. The other parties to the agreement proposed for modification will use their best efforts to respond to proposed modifications within 60 days of receipt of such notice.
Landowners enrolled in CIs prior to a modification to the CCAA will not be required to implement additional conservation measures as a result of the modification, but they may voluntarily choose to do so. Landowners entering into CI after a modification or amendment to this CCAA will be required to include the CCAA requirements as modified in their CI if appropriate to their properties to be enrolled.

The USFWS must determine whether a proposed modification of this CCAA or CI would be a minor or major modification resulting in outcomes significantly different from those analyzed in the original agreement. Minor modifications involve routine administrative revisions or changes to the operation and management program associated with the CCAA or CI. Minor modifications do not include the addition or significant alteration of conservation measures.

Upon the written request of one of the parties to CI, the USFWS and FWP can approve minor modifications to CIs if the modification does not conflict with the purposes of the CCAA or would not result in some material change to the USFWS analyses (i.e., with respect to meeting the CCAA standard, the amount of take authorized, the section 7 determination, or the National Environmental Policy Act (NEPA) decision). Minor modifications do not require notice in the Federal Register, but do require written documentation that Participating Parties approved the modification prior to it becoming effective.

Major modifications may include, but are not limited to, those that result in (1) a different level or type of take than was analyzed in association with this CCAA or a CI or (2) a change to the cumulative conservation benefits to the Arctic grayling such that the CCAA standard might not be met. Proposed major CCAA modifications and Permit amendments must be approved by the USFWS in accordance with the procedural requirements of Federal laws and regulations, such as

NEPA, and may require additional analysis by the USFWS, public notification in the Federal Register, and a formal CCAA amendment process.

B. Amendment of the Permit. The USFWS will amend the Permit as appropriate to reflect any modifications to this CCAA approved through the process described in Section A above. Prior to doing so, however, the USFWS must comply with all applicable legal requirements, including but not limited to the ESA, NEPA, and the USFWS's Permit regulations at 50 CFR Part 13 and 50 CFR Part 17. The USFWS must determine that proposed amendments to the Permit conform with the general Permit (50 CFR Part 13) and section 10(a)(1)(A) Permit requirements before it can amend a Permit. The amendment procedure cannot be used to require conservation measures on enrolled properties that are not provided for in this CCAA, or to impose additional land, water, or resource use restrictions on enrolled properties, without landowner consent.

C. Termination of the CCAA. As provided for in the USFWS's Candidate Conservation Agreement with Assurances Policy (64 FR 32726), FWP may terminate the Permit or an enrolled landowner may terminate a CI prior to the CCAA's or CI's expiration date, even if all the requirements have not been implemented and the expected benefits have not been realized. If FWP terminates the Permit or is unable or unwilling to perform its obligations under this CCAA, FWP is required to surrender the Permit, thus extinguishing take authority (if the Arctic grayling has become listed at time of termination) and the assurances granted by the Permit. Likewise, if an enrolled landowner terminates the CI or is unable or unwilling to continue implementation of the conservation measures and stipulations of the CI or the CCAA and to otherwise comply with the CI, the take authority and assurances conveyed to the landowner by the Permit through the CI are relinquished. An enrolled landowner must provide 30-days written notice to FWP and USFWS of intent to terminate a CI. FWP must provide 30-days written notice to the USFWS, all enrolled landowners, and Cooperators of intent to terminate the Permit.

D. Suspension or Revocation of Permit or CIs. The USFWS may, in accordance with the procedures in 50 CFR 13.27 and 13.29, suspend the privileges of exercising some or all of the Permit authority if FWP is not in compliance with the conditions of the Permit or with any applicable laws or regulations governing the conduct of the permitted activity. Such suspension shall remain in effect until the issuing officer determines that FWP has corrected the deficiencies.

The USFWS may revoke a permit if reasons for the suspension are not addressed or other reasons set forth in 50 CFR 13.28(a)(1) through (4). The Service would work with FWP to resolve any issues prior to suspending or revoking the permit. The USFWS may also revoke a Permit if continuation of the permitted activity would either:

1) Appreciably reduce the likelihood of survival and recovery in the wild of any listed species; or,
2) directly or indirectly alter designated critical habitat such that it appreciably diminishes the value of that critical habitat for both the survival and recovery of a listed species.

Before revoking a Permit for either of the last two reasons, the USFWS, with the consent of the permittee, will pursue all appropriate options to avoid Permit revocation. These options may include, but are not limited to: extending or modifying the existing Permit, capturing and relocating the species, compensating the landowner to forgo the activity, and purchasing an easement or fee simple interest in the property.

In those cases where terms or conditions of any CI and included SSPs are not being met, FWP will work with the landowner and the USFWS to resolve the non-compliance. If efforts to resolve compliance issues are not been effective, FWP and USFWS can suspend or terminate, in whole or in part, the non-compliant CI, if necessary.

E. Remedies. Each party shall have all remedies otherwise available to enforce the terms of the CCAA and associated CIs and the Permit, except that no party shall be liable in monetary damages for any breach of this CCAA or CI, any failure to perform an obligation under this CCAA or a CI, or any other cause of action arising from this CCAA or a CI.

F. Dispute Resolution. The Agencies recognize that disputes concerning implementation of, compliance with, or termination of the Agreement, Permit, or CIs may arise from time to time. The Agencies and Participating Landowners agree to work together in good faith to resolve such disputes, using the informal dispute resolution procedures set forth in this section, or such other procedures upon which the parties involved in the dispute may later agree. However, if at any time any party determines circumstances so warrant, it may seek any available remedy without waiting

to complete informal dispute resolution.

Informal dispute resolution process – Unless the involved parties agree upon another dispute resolution process, or unless an aggrieved party has initiated administrative proceedings or suit in Federal court, the parties may use the following process to attempt to resolve disputes:

1) The aggrieved party will notify the other parties of the CCAA, Permit or CI provision potentially violated, the basis for contending a violation has occurred, and the remedies it proposes to correct the alleged violation.
2) The party alleged to be in violation will have 30 days, or such other time as may be agreed, to respond. During this time it may seek clarification of the information provided in the initial notice. The aggrieved party will use its best efforts to provide any available information responsive to such inquiries.
3) Within 30 days after such response was provided or was due, representatives of the parties having authority to resolve the dispute will meet and negotiate in good faith toward a solution satisfactory to all involved parties, or will establish a specific process and timetable to seek such a solution.

If any issues cannot be resolved through such negotiations, the parties involved will consider non-binding mediation and other alternative dispute resolution processes and, if a dispute resolution process is agreed upon, will make good faith efforts to resolve all remaining issues through that process.

G. 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 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.

H. No Third-party Beneficiaries. This CCAA and any subsequent CIs developed under the CCAA do not create any new right or interest in any member of the public as a third-party beneficiary, nor shall they authorize anyone not a party to this CCAA or an associated CI to maintain a suit for personal injuries or damages pursuant to the provisions of this CCAA or an associated CI. The duties, obligations, and responsibilities of the Participating Parties, Cooperators and enrolled landowners to this CCAA with respect to third parties shall remain as imposed under existing law.

I. 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 FWP 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.

J. Succession and Transfer. This CCAA shall be binding on and shall inure to the benefit of the landowners enrolled via CIs and their respective successors and transferees (i.e., new owners of the enrolled property) in accordance with applicable regulations (50 CFR 13.24 and 13.25). The new owner(s) will have the option of receiving the CCAA assurances and incidental take authorization provided by the Permit for the enrolled property by signing the existing CI through which the property was enrolled in this CCAA. The take authorization of the Permit and assurances conveyed to the previous enrolled landowners through the existing CI will only be extended to the new owner(s) if they choose to enroll by signing the existing CI. Upon signing the existing CI, the new owner(s) will have the same rights and obligations with respect to the enrolled property as the previous landowners. Alternatively, the new owners may enroll in a new CI, through the application process described in Section 7 above, and receive take authorization and assurances via the new CI upon its execution by the new landowner, FWP and the USFWS.

Enrolled landowners shall notify FWP and USFWS 30 days before any transfer of ownership of an enrolled property, so that FWP and USFWS can attempt to contact the new owner, explain the baseline responsibilities applicable to the property, and seek to interest the new owner in signing

the existing CI or a new one to benefit Arctic Grayling on the property. If a new owner chooses not to continue the property's enrollment in this CCAA, the Permit will terminate and the authorizations and assurances it provides with respect to the property will cease.

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

L. Notices. This Agreement was completed with the collaboration of FWP and the USFWS.

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

Director
Montana Department of Fish, Wildlife and Parks
P.O. Box 200701
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406-444-4952 (Fax)

SIGNATURE PAGE

IN WITNESS WHEREOF THE PARTIES HERETO have executed this Agreement to be in effect on the date the USFWS issues the Permit.

Matt Wilk — Sept. 11 2018

Montana Fish, Wildlife, and Parks — **Date**

Jodi B — Sept. 10, 2018

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

Appendix A

Flow Target Development

Flow targets were developed using existing data collected by Montana Fish, Wildlife & Parks (FWP) in the 1980s as part of wetted perimeter studies that were being conducted to quantify instream flow recommendations for obtaining instream water reservations. Data was collected on nine streams in the Centennial Valley, including six streams in Table 1. The nine streams are in the upper group of streams listed in Appendix A.

For the base flow period for streams for which a lower and upper inflection point was previously calculated, the lower inflection point is the dry condition instream flow target and the upper inflection point is the normal year target. For Antelope, Metzel and West Creeks where no wetted perimeter analysis was completed, the base-flow period dry and normal year targets were calculated using a modified fixed percentage method to estimate lower and upper inflection points.

The fixed percentage method (Montana 1989, entire) was used in the Upper Missouri Water Reservation process to estimate inflection points for streams where no data had been collected or where data produced anomalous results. The method calculates the percentage of the upper inflection point flow to the mean annual flow for all streams in a basin for which inflection points were determined. The average percentage for all streams is then multiplied by the estimated mean annual flow for a stream with no wetted perimeter data to estimate the upper inflection point for the stream. This is the method that was used to derive the water reservation value for the Red Rock River. This value (55 cubic feet per second) is adopted as the normal year base-flow target for the Red Rock River.

For the nine Centennial Valley streams for which wetted perimeter analysis was completed in the 1980s, the percentage of mean annual flow was calculated for the lower and upper inflection points. This value was then used to estimate lower and upper inflection points for Antelope, Metzel and West Creeks based on their estimated mean annual flow. The previously calculated inflection points for several of the smaller streams (Corral, Jones and East Fork Clover) were considerably higher as a percentage of mean annual flow than the other streams. For these streams the lower inflection point percentage of mean annual flow was averaged with the upper inflection point percentage for the other streams to calculate the Centennial basin upper inflection point percentage of 53.8% that was used to estimate the Antelope, Metzel and West Creek normal year targets. These same lower inflection point percentages were excluded in calculating the Centennial basin average lower inflection point percentage of 25.2% that was used to estimate the Antelope, Metzel and West Creeks and Red Rock River dry year targets. The table in Appendix A shows the values used and the results. For Narrows Creek a previous 0.5 cubic feet per second

Table 1. Instream flow trigger used to determine flow dry or normal year stream targets.

	Trigger							
Date	Corral	Antelope	Red Rock Creek	Tom	Odell	Long	West	Red Rock River
1-Apr	0.7	0.3	10.5	0.7	5.0	3.0	4.2	131.0
15-Apr	0.9	0.3	13.0	1.0	6.0	4.0	6.1	220.0
1-May	3.0	1.2	44.0	6.0	25.0	13.5	15.5	230.0
15-May	5.0	2.0	75.0	11.0	44.0	23.0	24.9	240.0
1-Jun	5.0	1.5	69.0	10.0	41.5	21.0	22.4	205.0
15-Jun	5.0	1.0	63.0	9.0	39.0	19.0	19.8	170.0
1-Jul	4.0	0.7	46.5	6.0	28.5	14.0	13.4	113.5
15-Jul	3.0	0.3	30.0	3.0	18.0	9.0	7.0	57.0
1-Aug	2.0	0.3	23.5	2.0	13.5	7.0	5.5	42.0
15-Aug	1.0	0.2	17.0	1.0	9.0	5.0	4.1	27.0
1-Sep	1.0	0.2	15.5	0.9	8.0	4.0	3.7	29.5
15-Sep	1.0	0.2	14.0	0.7	7.0	3.0	3.2	32.0

recommendation (Lund 1974, p. XX) was adopted for both dry and normal year conditions. For Red Rock, Tom and Odell Creeks the minimum instream flow targets of 15, 1.4 and 11 cubic feet per second respectively found in Article II.A.3 of the USFWS Red Rock Lakes - Montana Compact were adopted for both dry and normal year conditions because they are already part of cooperative agreements discussed in this document.

During the spawning/rearing period for streams for which wetted perimeter data was previously collected, the average depth of passage for each cross-section versus flow was analyzed to determine the flow at which the average depth was 0.50 ft, a reasonable depth of passage for salmonids (Marotz and Fraley 1986). For the cross sections yielding relevant data, the average of the flow yielding a 0.50 ft. depth was calculated and this value was adopted as the dry year target for the May-June trigger. The highest flow yielding an average depth of 0.50 ft. (most limiting riffle) was adopted as the normal year target for the May-June target.

For Antelope, Metzel and West Creeks and the Red Rock River for which no wetted perimeter data was collected, the May-June targets were estimated using the average of the average and highest cross section flows corresponding to a depth of 0.50 ft. as a percentage of mean annual flow for the streams for which wetted perimeter data exists. The results grouped differently with the smaller streams having a much higher percentage of mean annual flow (226% to 434%) and the larger streams having a lower percentage of mean annual flow (83% to 121%). The same held for the highest cross sectional flow value as a percentage of mean annual flow with the smaller streams having a much higher percentage of mean annual flow (303% to 750%) and the larger streams having a lower percentage of mean annual flow (109% to 173%). The small stream (higher) percentages were averaged for both the average and highest cross-sectional values and then multiplied by the estimated mean annual flow to derive the dry and normal year targets for Antelope Creek. The larger stream (lower) percentages were averaged for both the average and highest cross-sectional values and then multiplied time the estimated mean annual flow to derive the dry and normal year targets for Metzel and West Creeks and the Red Rock River. For Narrows Creek a previous 1.2 cubic feet per second recommendation (Lund 1974, p. XX) was adopted for both dry and normal year conditions and was not adjusted for monthly exceedance values. Appendix A shows the results of this process.

Determination of Conditions – Dry or Normal

Just prior to and during the irrigation season targets should be adjusted to “dry” or “normal” based on actual streamflow conditions. Before the commencement of irrigation and periodically throughout the irrigation season streamflow measurements will be used to determine whether dry or normal targets are applicable to a given stream during a given period. The trigger value (Table 1) for the 15th of each month is estimated 80th percentile exceedance flow for that month. The trigger value for the 1st of each month is the average of the trigger value for the preceding and following months. The triggers are applied by determining the actual the flow present, including all flow being diverted. This is compared to the trigger value closest to the date the flow is determined. If the flow is less than or equal to the trigger value, the dry condition target applies. Once a dry or normal target condition is determined, it will remain in effect through the remainder of the period (i.e. spawning or base flow).

Adjustments to Streamflow Targets and Triggers

Because the streamflow targets for Antelope and West Creeks were not derived from physical data from the two streams, adjustments to the targets may be necessary. For example West Creek located adjacent to Long Creek has a normal year base-flow period target 74% higher than Long Creek while West Creeks estimated mean annual flow is only 21% higher than Long Creek. Adjustments may be necessary for the base-flow period based on actual observations and measurement of the streams.

The spawning/rearing period flows need to be evaluated on all streams based on actual depth of passage observed throughout the length of the streams. Adjustments may be necessary to reflect actual conditions.

Triggers may require adjustment as the errors of the estimated 80th percentile exceedance flows are considerable. The following section discusses this issue. As streamflow data and diversion data is gathered, triggers may need to be adjusted to reflect better estimates of 80th percentile exceedance flows.

Evaluation of Approach and Other Considerations

Streamflow Estimates

Both the streamflow triggers are dependent on the estimated monthly streamflow values either taken directly from USGS Report 89-4082 or derived from the USGS Report 89-4082 basin characteristic equation. These values are for the 1937-86 period. These estimates may be too high given recent changes in climatic conditions in the Centennial Valley in addition to errors in the estimates. A comparison of the Lima Reservoir inflow data calculated by the Bureau of Reclamation (1989-2014) to the estimated 1937-86 inflow calculated from USGS Report 89-4082 provides some insight (Figure 1). The 1937-86 calculated inflow is the sum of the Red Rock River April through June monthly exceedance data added to the sum of the calculated West Creek monthly exceedance data. West Creek was added to the Red Rock River data as the Red Rock data is for the former USGS station 06011000 site located immediately below the mouth of Long Creek which did not include West Creek contributions. The 1937-86 estimate does not include other tributary inflow such as Clover and Wolverine Creeks thus creating an underestimate.
Even with a likely underestimation, the 1937-86 inflow estimate is higher across all exceedance values than the 1989-2014 calculated inflow. This would indicate some caution should be used in strictly adhering to the 1937-86 estimates. Downward adjustments of flow triggers may be warranted as more flow data is collected and exceedance flow estimates are improved.

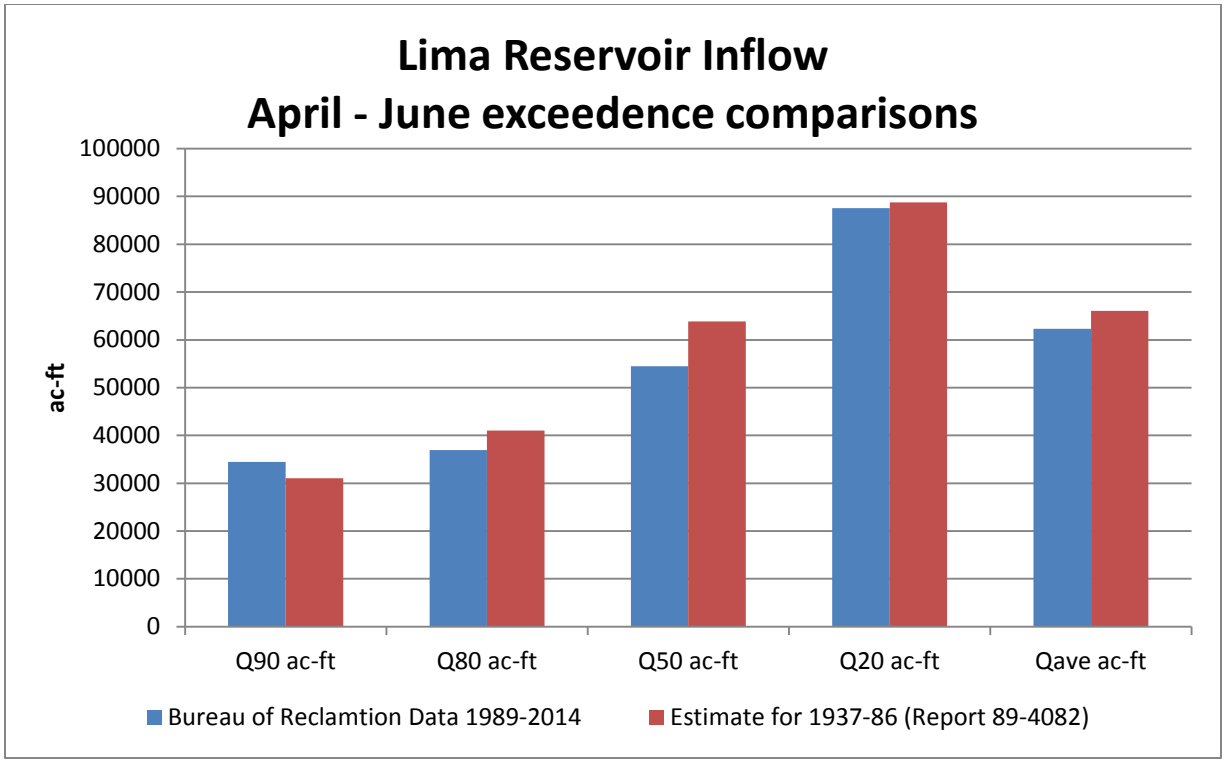

Figure 1. Comparison of exceedance inflows for Lima Reservoir.

Target Development Methodology

FWP previously used the general approach of using wetted perimeter inflection points and depth of passage through riffles in developing instream flow recommendations (Marotz and Fraley 1986, entire). However, dry and normal year values were not part of those recommendations. Dry, normal and wet-year instream flow values are included as part of the Confederated Salish Kootenai Tribes – Montana Compact. For streams with high value fisheries and/or sensitive species, FWP has recommended use of the high inflection point (Montana 1989, entire). The US Forest Service Montana Compact provides that the high inflection point is used for determining instream flow values for Arctic grayling (§85-20-1401, MCA). The proposed use of the lower inflection point for dry years raises the concern whether or not it is adequate to provide for conditions suitable to supporting the Arctic grayling population, albeit at somewhat suppressed levels. A comparison of actual changes in wetted perimeter also provides insight into the actual reduction in wetted perimeter due to implementing dry values (low inflection) instead of normal (high inflection). Figure 2 show the composite wetted perimeter curve for Red Rock Creek. The 7 cubic feet per second lower inflection point results in a 29% decrease it wetted streambed.

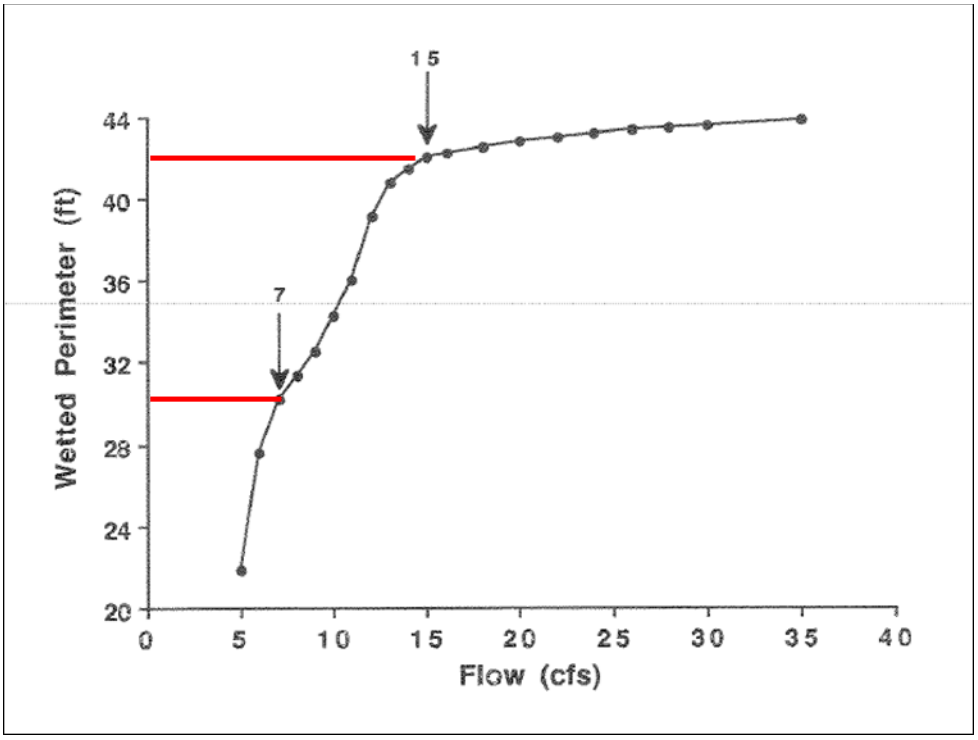

Figure 2. Red Rock Creek Wetted Perimeter Curve

Table 2 shows the results for Red Rock Creek and the other three other streams for which FWP data shows both lower and upper inflection points (Montana 1989, entire). While the wetted perimeter is reduced with a correspond reduction in habitat, the reduction is not profound.

Table 2. Percent Reduction in Wetted Perimeter Between Upper and Lower Inflection Points.

Stream	High Inflection Point Wetted Perimeter (ft.)	Low Inflection Point Wetted Perimeter (ft.)	Percent Decrease in Wetted Perimeter
Corral Creek	11.3	5.8	22%
Red Rock Creek	42	30	29%
Odell Creek	26	23	12%
Long Creek	12.3	10.8	12%

In determining the May-June dry and normal targets the average depth across riffle transects was considered, using the average of all transects for the dry value and the most limiting transect (i.e. most shallow transect) for the normal value. Using the most limiting transect is a conservative approach for determining the normal value. More importantly using the average value across the transects means there are likely deeper and more shallow areas, giving some areas across the riffle at depths of 0.5 ft. or greater when average depth is less than 0.5 ft. Further for smaller streams less than 20 ft. in width values lower than 0.5 ft. may be suitable (Marotz and Fraley 1986, entire). Given this conservative approach, the dry values are still viable for providing sufficient depth of passage for migrant fish, although normal values provide greater certainty that passage can be achieved.

This approach using dry and normal condition triggers for different flow target levels somewhat follows the naturally inter-annual variability in streamflow. Just as under natural conditions, grayling populations would be expected to positively respond to better water supply conditions, but still maintain a viable population under lower flow conditions and dry instream flow values.
Other methods of streamflow target development may be considered. More comprehensive field methods such as Phabsim could be used, although these would involve moderate levels of field work to collect data. This data could be applied to existing habitat suitability indices (Hubert et.al. 1985). Less intensive to collect but still valuable data could be collected and used. For example, measuring riffle coverage and depth of passage at differing flow levels could be undertaken to confirm or adjust the streamflow targets. Adaptive management of the targets is warranted as more information is collected about actual streamflow, water demand and instream flow needs.

Water Supply and Irrigation Demand

Antelope Creek as defined on the USGS topographic quadrangles does not have any irrigation rights, but does have direct diversion stock right. It further appears that the stream is being completely diverted to a stream and ponds to the east in section 21 near the buildings. This diversion appears to be for stockwater. DNRC records do not indicate that this diversion is authorized. There is an irrigation water right on an unnamed tributary of Antelope Creek associated with a spring in section 29. This right does not appear to be in active use. This unnamed tributary appears to be supply the full flow in lower Antelope Creek due to the upstream diversion of the main stem Antelope. At present it appears that limiting diversions for stockwater would resolve flow issues on Antelope Creek.

Red Rock Creek's major tributary Hell Roaring Creek has substantial irrigation demands, but water supplies are better able to meet both the irrigation demand and instream flow targets. Tom Creek appears to have one irrigation diversion. This diversion does not appear to be presently active. Odell Creek appears to have at least one irrigation diversions that may be active at times. Surprise Creek, a tributary to Odell Creek at the edge of the timber appears to have been permanently diverted into ditch that ultimately empties into Odell Creek, but at a location a mile or more downstream from its natural confluence. Irrigation demand on Odell Creek and its tributary Surprise Creek may be considerable.

The Red Rock River below the Lower Lake only has one lawn and garden irrigation diversion for 10 gpm and one acre. Diversion of tributary inflow, particularly from the southern tributaries could have a negative influence on the ability to meet the Red Rock River streamflow targets. Rapid assessments will be critical to determining the actual level of irrigation demand on streams.

Existing Cooperative Agreements

As part of the USFWS Red Rock Lakes - Montana Compact, the USFWS has entered into cooperative agreements with all of the water users upstream of the Red Rock Lakes Refuge. All of these agreements need to be reviewed and considered in development of SSPs. For example, the cooperative agreement with John Taft Corporation provides that domestic use, livestock drinking directly and diversion off-stream stockwater via pipeline and tank are not subject to curtailment to meet instream flow. Such consideration could be part of SSPs in general as long as domestic use precludes or significantly limits any lawn or garden irrigation. Also, the cooperative agreement allows for the continued disconnection of Montgomery and Surprise Creeks (mentioned previously). These provisions may or may not be suitable or desirable for the CCAA SSP. Further, the Taft cooperative agreement provides that water use must be curtailed to provide for 11 cubic feet per second. This is the normal year July-April value. The recommended Odell Creek values for May and June values are higher (21.8 and 31.2 cubic feet per second for dry and normal). The spawning/rearing targets provide for additional protection above the instream flow values define in the Compact. In cases where the Compact cooperative agreements and CCAA SSPs are not consistent, the CCAA SSPs shall govern.

Multiple Water User Implementation

On streams with multiple water users, as between participating water users, the priority of water rights will be used to determine which water user must reduce diversion and the extent of the reduction. Other arrangements for reducing diversions can be implemented if all water users on the stream agree. All water rights limitations (i.e. flow rate, period of use, etc.) will be followed by cooperators at all times.

On tributary streams with streamflow targets, such as Antelope and Corral Creeks which are tributary to Red Rock Creek, compliance with streamflow targets will be considered compliance with downstream flow targets even if the downstream flow targets are not met. Only Red Rock Creek and the Red Rock River are influenced by upstream tributaries with flow targets. Flow in Red Rock Creek the Red Rock River typically meets or exceeds streamflow targets under most conditions. The ability to meet flow targets on tributaries without reducing diversion is much more limited. Therefore, there will be little if any impact on the ability to meet their instream flow targets by relying on tributary flow targets because the tributary streamflow targets are more limiting than those for Red Rock Creek the Red Rock River. Tributary streams without flow targets may be subject to diversion reductions to achieve downstream targets.

Appendix B

NAME OF STREAM:_____ **REACH LOC OR ID:**_____

DATE:_____ **ID TEAM/OBSERVERS:**_____

LENGTH OF REACH:_____ **LAT/LONG - BEGIN/END:**_____

MAP OR QUAD NAME:_____ **PHOTO #S:**_____ **PRIMARY LAND USE:**_____

PLANT COMMUNITY:_____ **ROSGEN CHANNEL TYPE:**_____ **BFDEPTH:**_____**BFWIDTH:**_

WIDTH/DEPTH RATIO:_____ **CHANNEL SUBSTRATE :**_____

Geomorphic Considerations

Question 1. Stream Incisement (Downcutting)

8 = Channel stable, no active downcutting occurring; or, old downcutting apparent but a new, stable riparian area has formed within the incised channel. There is perennial riparian vegetation well established in the riparian area (Stage 1 and 5, Schumm's Model Figure 2).

6 = Channel has evidence of old downcutting that has begun stabilizing, vegetation is beginning to establish, even at the base of the falling banks, soil disturbance evident (Stage 4, Schumm's Model Figure 2).

4 = Small headcut, in early stage, is present. Immediate action may prevent further degradation (Early Stage 2, Schumm's Model Figure 2).

2 = Unstable, channel incised, actively widening, limited new riparian area/flood plain, flood plain not well vegetated. The vegetation that is present is mainly pioneer species. Bank failure is common (Stage 3, Schumm's Model Figure 2).

0 = Channel deeply incised, resembling a gully, little or no riparian area, active downcutting is clearly occurring. Only occasional or rare flood events access the flood plain. Tributaries will also exhibit downcutting or signs of downcutting (Stage 2, Schumm's Model Figure 2).

The presence of active headcuts should nearly always keep the stream reach from being rated Sustainable.

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

_____

_____

Question 2. Streambanks with Active Lateral Cutting (inspect banks on both sides of the stream)

8 = Lateral bank erosion is in balance with the stream and its setting.

5 = There is a minimal amount of human-induced, active lateral bank erosion occurring, primarily limited to outside banks.

3= There is a moderate amount of human-induced active lateral bank erosion occurring on either or both outside and inside banks.

0 = There is extensive human-induced lateral bank erosion occurring on outside and inside banks and straight sections.

SCORE: Potential_____ Actual_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

Question 3. The Stream is in Balance with the Water and Sediment Supplied by the Watershed

6 = The width to depth ratio appears to be appropriate for the stream type and its geomorphic setting. There is no evidence of excess sediment removal or deposition. There are no indications that the stream is widening or getting shallower. There may be some well-washed gravel and cobble bars present. Pools are common. Rosgen "B" and naturally occurring "D" channel types are exceptions.

4 = The stream has widened and/or has become shallower due to disturbances that have caused the banks to become unstable or from dewatering which reduces the amount of water and energy needed to effectively move the sediment through the channel. *(Note: Sediment sources may also be from offsite sources.)* Point bars are often enlarged by gravel with silt and sand common, and new bars are forming. Pools are common, but may be shallow. Rosgen "B" and naturally occurring "D" channel types are exceptions.

2 = The width to depth ratio exceeds what is appropriate for the stream type. Point bars are enlarged by gravel with abundant sand and silt, and new bars are forming that often force lateral movement of the stream. Mid channel bars are often present. For prairie streams there is often a deep layer of sediment on top of the gravel substrate. The frequency of pools is low. Rosgen "B" and naturally occurring "D" channel types are exceptions.

0 = The stream has poor sediment transport capability which is reflected by poor channel definition. The channel is often braided having at least 3 active channels. Naturally occurring Rosgen "D" channels types are exceptions. Pools are filled with sediment or are not existent.

SCORE: Potential_____ Actual_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

Vegetative Considerations

Question 4. Streambank with Vegetation (Kind) having a Deep, Binding Root Mass

Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped. (See Appendix I for stability ratings for most riparian, and other, species.) Presence generally means more than one or two, healthy individuals of a species in the reach.

6 = The streambank vegetative communities are comprised of at least four plant species with deep, binding root masses. 4

4 = The streambank vegetative communities are comprised of at least three plant species with deep, binding root masses.

2 = The streambank vegetative communities are comprised of two plant species with deep, binding root masses.

0 = The streambank vegetative communities are comprised of one or no plant species with deep, binding root masses.

SCORE: Potential_____ Actual_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

Question 5. Riparian/Wetland Vegetative Cover (Amount) in the Riparian/Flood plain Area

Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped.

6 = More than 85% of the riparian/wetland canopy cover has a stability rating ≥ 6

4 =75%-85% of the riparian/wetland canopy cover has a stability rating ≥ 6

2 =65%-75% of the riparian/wetland canopy cover has a stability rating ≥ 6

0 = Less than 65% of the riparian/wetland canopy cover has a stability rating ≥ 6

NOTE: A low score for this item may be enough to keep the stream reach from being rated Sustainable

SCORE: Potential_____ Actual_____

Question 5--continued

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

Question 6. Noxious Weeds in the Riparian Area

3 = None of the riparian area has noxious weeds present.

2 = Up to 5% of the riparian area has noxious weeds (a few are present).

1 = Up to 10% of the riparian area has noxious weeds present (abundant).

0 = Over 10% of the riparian area has noxious weeds (very apparent and extensive distribution).

SCORE: Potential_____ Actual_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments (NOTE--List all noxious weed species):_____

Question 7. Disturbance-Caused Undesirable Plants in the Riparian Area

3 = 5% or less of the riparian area with undesirable plants (very few present).

2 = 5-10% of the riparian area with undesirable plants (few are present).

1 = 10-15% of the riparian area with undesirable plants (commonly distributed).

0 = Over 15% of the riparian area with undesirable plants (abundant over much of the area).

SCORE: Potential_____ Actual_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments (NOTE--List all nuisance weeds and undesirable plants):_____

Question 8. Woody Species Establishment and Regeneration

Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped. At least 10 individuals in a class should be present in the reach to count. Count only 1+ years of age. Do not count seedlings of the year as mortality is very high the first year.

8 = All age classes of desirable woody riparian species present (see Table 3).

6 = One age class of desirable woody riparian species is clearly absent, all others well represented. Often, it will be the middle age group(s) absent. For sites with potential for both trees and shrubs there may be one age class of each absent. Having mature individuals and at least one younger age class present indicates the potential for recovery.

4 = Two age classes (seedlings and saplings) of native riparian shrubs and/or two age classes of native riparian trees are clearly absent, or the stand is comprised of mainly mature species. Other age classes well represented.

2 = Disturbance induced, (i.e. facultative, facultative upland species such as rose, or snowberry) or non-riparian species dominate. Woody species present consist of decadent/dying individuals. (Refer back to Question 1 if this is the situation. The channel may have incised.)

0 = A few woody species are present (<10% canopy cover), but herbaceous species dominate (at this point, the site potential should be re-evaluated to ensure that it has potential for woody vegetation); or, the site has at ≥ 5% canopy cover of Russian olive and/or salt cedar. On sites with long-term manipulation or disturbance, woody species potential is easily underestimated.

Question 8. Woody Species Establishment and Regeneration--continued

SCORE: Potential _____ **Actual** _____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments: _____

Functional Considerations

Question 9. Utilization of Trees and Shrubs

Note: For stream types where riparian vegetation is not required for sustainability, this question can be skipped and given an N/A, with an explanatory note or comment. Be sure to adjust the potential score if this question is skipped.

4 = 0-5% of the available second year and older stems are browsed.

3 = 5%-25% of the available second year and older stems are browsed (lightly).

2 = 25%-50% of the available second year and older stems are browsed (moderately..

1 = More than 50% of the available second year and older stems are browsed (heavily). Many of the shrubs have either a "clubbed" growth form, or they are high-lined or umbrella shaped.

0 = There is noticeable use (10% or more) of unpalatable and normally unused woody species

SCORE: Potential _____ **Actual** _____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments: _____

Question 10. Flood plain Characteristics for Dissipating Energy and Capturing Sediment

8 = Active flood or overflow channels exist in the flood plain. Large rock, woody debris, and/or riparian vegetation appropriate for the setting are sufficient to adequately dissipate stream energy and trap sediment on the flood plain. There is little evidence of excessive erosion or disturbance that reduces energy dissipation and sediment capture on the flood plain. There are no headcuts where either overland flow and/or flood channel flows return to the main channel.

6 = The flood plain meets the characteristics of the description in Question 8 above, but demonstrates slight limitations in the kind and amount of large rock, woody debris, and/or riparian vegetation present. Riparian vegetation structure is below that required to dissipate energy. There may be occasional evidence of surface erosion and disturbance, but generally not extensive enough to have affected channel development.

4 = Large rock, woody debris, and/or riparian vegetation is present, but generally insufficient (quality or quantity) to fully dissipate stream energy. Some sediment may be captured, but greater evidence of incipient erosion and/or headcuts is readily present.

2 = Inadequate Large rock, woody debris, and/or riparian vegetation is available for dissipation of energy or sediment capture. There is very little evidence of sediment capture. There is some streambank erosion due to human disturbance or alterations, and occasional headcuts where overland flows or flood channel flows return to the main channel.

0 = Flood plain area reflects the following conditions: 1) The flood plain area is very limited or not present and is inadequate to dissipate energy; 2) flood or overflow channels do not exist; and 3) large rock, woody debris, and/or riparian vegetation is not adequate to dissipate stream energy and trap sediment on the flood plain. Streambank and/or flood plain erosion and/or evidence of human alteration are common. “G”- and “F”-type channels (Rosgen) typically reflect these conditions.

SCORE: Potential_____ **Actual**_____

Please clarify the rationale for your score, including comments regarding *potential* and *capability* and document with photograph if appropriate.

Comments:_____

NAME OF STREAM:_____ REACH ID:_____ DATE:_____

SUMMARY

		SCORE		
		POTENTIAL	ACTUAL	POSSIBLE
QUESTION 1:	Stream Incisement			0, 2, 4, 6, 8
QUESTION 2:	Lateral Cutting			0, 3, 5, 8
QUESTION 3:	Stream Balance			0, 2, 4, 6
QUESTION 4:	Deep, Binding Rootmass			N/A, 0, 2, 4, 6
QUESTION 5:	Riparian/Wetland Vegetative Cover *			N/A, 0, 2, 4, 6
QUESTION 6:	Noxious Weeds			0, 1, 2, 3
QUESTION 7:	Undesirable Plants			0, 1, 2, 3
QUESTION 8:	Woody Species Establishment			N/A, 0, 2, 4, 6, 8
QUESTION 9:	Browse Utilization			N/A, 0, 1, 2, 3, 4
QUESTION 10:	Riparian Area/Flood plain Characteristics *			N/A, 0, 2, 4, 6, 8
	TOTAL			(60 total possible)

(POTENTIAL SCORE FOR MOST BEDROCK OR BOULDER STREAMS) (36)

(questions 1, 2, 3, 6, 7, 10)

(POTENTIAL SCORE FOR MOST LOW ENERGY "E" STREAMS) (48)

(questions 1 – 7, 10)

RATING: = Actual Score / rating Potential Score X 100 = %

80-100% = SUSTAINABLE

50-80% = AT RISK

LESS THAN 50% = NOT SUSTAINABLE

*** Only in certain, specific situations can both of these receive an "N/A".**

Please clarify the rationale for your rating, including comments regarding potential. Can the limitations be addressed by the decision maker?

NOTES_____

TREND: Does the reach appear to be improving or declining? Explain.

Appendix C

DESCRIPTION OF ENTRAINMENT MONITORING PROTOCOL

Identifying and reducing/eliminating the level of Arctic grayling entrainment into irrigation systems is a conservation measure that is required to be addressed in each SSP for properties enrolled in the CCAA program. A comprehensive survey of each property's irrigation ditch system based upon the criteria listed below will be conducted to identify the level of Arctic grayling entrainment at implementation of each SSP. The comprehensive survey will be repeated at least every five years for the life of the SSP. However, irrigation systems found to entrain Arctic grayling will be surveyed at a minimum of every other year to monitor trend in Arctic grayling entrainment for that specific irrigation ditch. The following criteria have been established to prioritize comprehensive surveys:

1. **Ditch location in relation to the current known Arctic grayling distribution.**
   Reaches with documented Arctic grayling presence within the last five years will be subject to a more rigorous survey schedule than those where Arctic grayling presence has not been documented in the last five years.

2. **Additive maximum flow rate for water rights associated with each POD.**
   Previous entrainment surveys in similar watersheds have indicated a positive relationship exists between the occurrence of Arctic grayling entrainment and the amount of flow diverted into the ditch both in terms of quantity and percent of flow available from the stream. Irrigation systems that are capable of diverting larger quantities of water will be considered a higher priority.

3. **Distance from the mainstem Red Rock River or Red Rock Creek .**
   The majority of Arctic grayling in the Red Rock watershed will likely utilize Red Rock River or Red Rock Creek and the lower reaches of tributaries. To focus entrainment monitoring efforts on irrigation ditch systems more likely to entrain Arctic grayling, surveys will be conducted in irrigation ditch systems within the first five stream miles of the tributary mouth. Surveys in irrigation ditch systems further than five stream miles from the mouth of the tributary will be conducted as time and resources allow.

Effects of conducting entrainment and fish salvage surveys on Arctic grayling will be minimized by having professional fishery biologists familiar with Arctic grayling oversee surveys, providing proper training to supporting personnel, and anesthetizing and handling Arctic grayling under approved protocols (FWP, Electrofishing and Fish Handling Policy, undated).

Appendix D

Literature Cited

Boltz, G.D. and L.R. Kaeding. 2002. Incubation of lacustrine Arctic grayling eggs using remote site incubators. Unpublished Yearly Report 2000-2002. US Fish and Wildlife Service, Bozeman, MT. 33 pp.

Boltz, G. 2010. Personal communication. US Fish and Wildlife Service, Bozeman, MT. E-mail and attachments to Doug Peterson, dated 3/24/2010.

Cassie 2006, p. 1393 Cassie, D. 2006. The thermal regime of rivers: a review. Freshwater Biology 51(8):1389-1406.

Cutting, K. 2012. Unpublished data, diet overlap between rainbow/cutthroat hybrids and Arctic grayling in Upper Red Rock Lake. US Fish and Wildlife Service, Lakeview, Montana.

Davis, M. 2014. Unpublished data, Winter habitat and survival as potential limiting factors of adfluvial Arctic grayling from Red Rock Lakes National Wildlife Refuge.

De Haan, P., D.P. Peterson, B. Adams, and V. O'Byrne. 2014. Genetic monitoring of Arctic grayling in the Big Hole River and Red Rock Creek and association with recent climate trends. Report to Montana Field Office, US Fish and Wildlife Service. Conservation Genetics Laboratory, Abernathy Fish Technology Center, US Fish and Wildlife Service, Longview, Washington.

Franklin, I. A. 1980. Evolutionary changes in small populations. Pages 135–150 in M. Soule´ and B. A. Wilcox, editors. Conservation biology: an evolutionary ecological perspective. Sinauer Associates, Sunderland, Massachusetts.

Gangloff 1996, entire; Gangloff, M.M. 1996. Winter habitat and distribution of Arctic grayling in Upper Red Rock Lake, Red Rock Lakes National Wildlife Refuge, Montana. MS Thesis, Montana State University, Bozeman, MT. 101 pp.

Gillin, G. 2001. Literature Review: Fisheries information for the Centennial Valley, Montana. Unpublished report prepared for US Fish and Wildlife Service. 64 pp.

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

Hubert, W. A., R. S. Helzner, L. A. Lee, and P. C. Nelson. 1985. Habitat suitability index models and instream flow suitability curves: Arctic grayling riverine populations. Biological Report 82, Division of Biological Services, U.S. Fish and Wildlife Service, Washington D.C.

Hughes, N.F. 1992. Ranking of feeding positions by drift-feeding Arctic grayling (Thymallus arcticus) in dominance hierarchies. Canadian Journal of Fisheries and Aquatic Sciences 49:1994-1998.

Hughes, N.F. 1998. Reduction in growth due to electrofishing and tagging may change interannual movement behavior of stream salmonids: evidence from Arctic grayling in an interior Alaskan stream. Transactions of the American Fisheries Society 127:1072-1077

Jaeger 2014d, pers. comm. Montana Fish, Wildlife and Parks, Dillon, MT. E-mail to James Boyd dated 5/18/2014.

Jaeger 2014e, Personal communication. Montana Fish, Wildlife and Parks, Dillon, MT. E-mail to James Boyd dated 3/29/2014.

Jaeger 2014, Unpublished data, summary stocking records for Centennial Valley. Powerpoint slide from SSA workshop.

Johnson 2003, p. 497 Johnson, S.L. 2003. Stream temperature: scaling of observations and issues for modelling. Hydrological Processes 17(2):497-499.

Kaeding and Boltz 1999 Kaeding, L.R. and G.D. Boltz. 1999. A study of Arctic grayling and their stream habitat in support of reserved water right applications, Red Rock Lakes National Wildlife Refuge, Montana. Unpublished Report. U.S. Fish and Wildlife Service, Bozeman, Montana

Katzman 1998, entire Katzman, L.M. 1998. Effects of predation on status of Arctic grayling at Red Rock Lakes National Wildlife Refuge, Montana. MS Thesis, Montana State University, Bozeman. 230 pp.

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

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

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

Leary, R., S. Painter, A. Lodmell, and F. Allendorf. 2014. High genetic variation among and within Arctic grayling populations introduced within the Upper Missouri River drainage, Montana. Report to the USFWS, 50 pp.

Levine, R. 2011. Unpublished data, effects of beaver dams on Arctic grayling in Red Rock Creek, University of Montana-Western, Dillon, MT.

Levine, R. 2013. Unpublished data, migratory behavior of Arctic grayling fry in Elk Springs Creek, Centennial Valley, University of Montana-Western, Dillon, MT.

Lund, J. A. 1974. The reproduction of salmonids in the inlets of Elk Lake, Montana. Thesis, Montana State University, Bozeman, Montana.

Marotz, B. and J. Fraley. 1986. Instream Flows Needed for successful migration spawning and rearing of rainbow and westslope cutthroat trout in selected tributaries of the Kootenai river. Bonneville Power Administration. Portland, OR.

Montana Fish, Wildlife & Parks. 1989. Application for reservations of water in the Missouri River basin above Fort Peck Dam: volume 1 – summary, purpose, need, amount, public interest, management plan and am. Montana Department of Fish, Wildlife and Parks, Helena, Montana.

Montana Fish, Wildlife and Parks (MFWP); US Fish and Wildlife Service; Montana Department of Natural Resources and Conservation; and USDA Natural Resources Conservation Service. 2006. Candidate Conservation Agreement with Assurances for fluvial Arctic grayling in upper Big Hole River.

Montana Department of Fish, Wildlife, and Parks (MFWP). 2014d. Unpublished data, Montana angling regulations for 2014, 96 pp.

Montana Reserved Water Rights Compact Commission and U.S. Fish and Wildlife Service. 2002. Compact settlement between the Montana Reserved Water Rights Compact Commission and the U.S. Department of the Interior, U.S. Fish and Wildlife Service Red Rock Lakes National Wildlife Refuge and Wilderness.

Mogen, J.T. 1996. Status and biology of the spawning population of Red Rocks lakes Arctic grayling. MS Thesis, Montana State University, Bozeman. 100 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.

Mumma, S. A. 2010. A 20,000-yr-old record of vegetation and climate from Lower Red Rock Lake, Centennial Valley, southwestern Montana. Thesis. Montana State University, Bozeman, Montana.

Nelson, P.H. 1954. Life history and management of the American grayling (Thymallus signifier tricolor) in Montana. Journal of Wildlife Management 18(3):324-342.

Paterson, T. 2014. Estimation of the abundance and apparent survival of spawning Arctic grayling in Red Rock Creek; Red Rock Lakes National Wildlife Refuge. Thesis, Montana State University, Bozeman, Montana.

Peterson and Ardren 2009, p. 1766). Peterson, D.P. and W.R. Ardren. 2009. Ancestry, population structure, and conservation genetics of Arctic grayling (Thymallus arcticus) in the upper Missouri River, USA. Canadian Journal of Fisheries and Aquatic Sciences 66:1759-1774.

Pierce, R., C. Podner, and K. Carim. 2013. Response of wild trout to stream restoration over two decades in the Blackfoot river basin, Montana. Transactions of the American Fisheries Society 142:68-81.

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.

Randall, L. C. 1978. Red Rock Lakes National Wildlife Refuge: an aquatic history 1899 – 1977. Unpublished report. U.S. Fish and Wildlife Service, Kalispell, Montana.

Redenbach and Taylor 1999, pp. 27–28; Redenbach, Z. and E.B. Taylor. 1999. Zoogeographical implications of variation in mitochondrial DNA of Arctic grayling (Thymallus arcticus). Molecular Ecology 8: 23-35.

Schluter, D. 2000. The ecology of adaptive radiation. Oxford University Press.

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

Selong et al. 2001, p. 1032 Selong, J.H., T.E. McMahon, A.V. Zale, and F.T. Barrows. 2001. Effect of temperature on growth and survival of bull trout with application of an improved method of determining thermal tolerances in fishes. Transactions of the American Fisheries Society 130:1026-1037.

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 US Forest Service - Northern Region. 38 pp

Stamford and Taylor 2004, p. 1538; Stamford, M. D., and E.B. Taylor. 2004. Phylogeographical lineages of Arctic grayling (Thymallus arcticus) in North America: divergence, origins and affinities with Eurasian Thymallus. Molecular Ecology 13(6):1533-1549.

Unthank, A. 1989. Historical overview of Red Rock Lakes National Wildlife Refuge grayling fisheries. Unpublished Report. U.S. Fish and Wildlife Service, Red Rock Lakes National Wildlife Refuge, Monida, MT. 18 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 (USFWS). 2009. Comprehensive Conservation Plan for Red Rock Lakes National Wildlife Refuge. Region 6, USFWS, Lakewood, CO. 211 pp.

U.S. Fish and Wildlife Service (USFWS). 2014. Endangered and threatened wildlife and plants: Not warranted Finding for Upper Missouri River Distinct Population Segment of Arctic Grayling. Federal Register 79 FR 49384.

Vincent, R.E. 1962. Biogeographical and ecological factors contributing to the decline of Arctic grayling, (Thymallus arcticus), in Michigan and Montana. PhD.

West, B. 2014a. Personal communication. US Fish and Wildlife Service-Refuges Lakeview, MT. E-mail to James Boyd, dated 5/08/2014.

Appendix E

Limiting Factor /Conservation Measures	Yes/No	Location (Creek/Reach/ Ditch/POD)	Implementation Date
Instream Flows			
Irrigation Management (functioning Headgates, Diversions, Measuring Devices			Completed within 5 years of SSP Approval
Water Rights Compliance			Annually starting at Enrollment
Flow Conservation Plan			Annually starting at Enrollment
Alternative Stockwater Systems			Completed within 5 years of SSP Approval
Changes to Water Rights			20 years as Identified
Riparian /Channel Habitat			
Prescribed Grazing Plan			Initiated within 1 year after SSP Approval
Riparian/Pasture Fencing			Completed within 5 years of SSP Approval
Alternative Stockwater systems			Completed within 5 years of SSP Approval
Stream Restoration			Designed within 10 years, Completed within 20 years
Weed Management Plan			Initiated within 1 year after SSP Approval
Barriers to Movement			
Install Fish Ladders in Pin and Plank Diversions			Completed within 5 years of SSP Approval
Install Grade Control Diversions			Completed within 5 years of SSP Approval
Replace Perched Culverts			Completed within 5 years of SSP Approval
Remove Natural Barriers (Beaver Dam and Log Jams)			Evaluated and modified Annually as needed
Entrainment			
Entrainment Surveys			All PODs: Completed within 1 year after SSP Approval Repeated every 2 years if Arctic grayling found, Repeated every 5 years if no Arctic grayling found
Entrainment Rescue			Completed during all Entrainment surveys
Modify PODs			Completed within 5 years of SSP Approval
Modify Timing or Amount of Diverted Flow at POD			Completed within 5 years of SSP Approval
Install Fish Screens or Exclusion Devices			Completed within 10 years of SSP Approval

Appendix F

Example CCAA SSP Compliance Work Sheet			
Date: October 1, 2015		**Attending:** FWP, USFWS , Ranch Owners	**COI:** CV CCAA- 005
Limiting Factor	**Conservation Measure**	**Note**	**TO DO**
Instream Flows	FCP: May 1-Setember 12	Turned on Irrigation May 1 and off September 12	Make new rating curve for Jones Creek Aqua rod
		Put back 2.2 cubic feet per second in Jones Creek and 4.8 cubic feet per second in Fish Creek to meet triggers	
		Frogwort Ditch Blew out in runoff so could not measure flows from May 7-May 18	
	Irrigation Infrastructure	New Headgate on Jones Creek POD #324	Check flume on POD 324
		New Flume on Fish Creek POD #7	
Riparian Management	Grazing Plan May 1-November 3	Trailed cows out of Valley November 3	
		Changed use in Pasture 8 due to lack of water in pasture 3	Develop alternatives for stockwater in Pasture 3
		Non-functioning fence in pasture 5. Cows got out	Repair Pasture 5 Fence
	Infrastructure	New gate on Jones Riparian Fence	
		New stock water well and solar tank in Serpentine pasture	Get Float for tank
Entrainment	Surveys	FWP surveyed 2.1 miles of Jones Creek captured 0 grayling	
		No surveys of Fish Creek this year . Will be surveyed in 2016	
Fish Passage	Structures	New culvert on Jones at road crossing open up 3.2 miles upstream during low flows	
	Management	FWP removed 2 beaverdams at mouth of Fish Creek In April for spawning	
		Landowner hired trapper	
Other			Sold 40 acres - change property boundary