



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

2023 Annual Report



Montana Fish, Wildlife & Parks



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Table of Contents

I. Introduction	3
II. Legal Status of Montana Arctic Grayling	5
III. Landowner Enrollment	5
IV. Big Hole Arctic Grayling CCAA Rapid Assessments and Compliance Monitoring	7
<i>A. Surveys for Immediate Threats to Arctic Grayling</i>	7
<i>B. Water Rights Compliance Evaluation</i>	7
<i>C. Streamflow Monitoring Required by CCAA</i>	7
V. Site-Specific Plans	8
<i>A. Completed and Approved</i>	9
<i>B. Extension Requests Approved by the USFWS</i>	9
VI. Conservation Measures	11
<i>B. Projects to Minimize or Eliminate Entrainment of Arctic Grayling</i>	11
<i>C. Projects to Enhance Fish Passage</i>	12
<i>D. Projects to Enhance Riparian and Stream Channel Habitat</i>	12
<i>E. Projects to Improve Streamflow and Irrigation Water Management</i>	13
<i>F. Projects to Expand Arctic Grayling Distribution into Historically Occupied Waters</i>	14
VII. Monitoring	15
<i>A. Fish Population Monitoring</i>	15
<i>B. Stream Temperature Monitoring</i>	18
<i>C. Streamflow Monitoring</i>	22
<i>D. FWP Monitoring of Compliance with Approved Site-Specific Plans</i>	25
VIII. Summary of Estimated Take Associated with the Big Hole Arctic Grayling CCAA	25
IX. NRCS Special Funding	26
X. Literature Cited	26

I. Introduction

A Candidate Conservation Agreement with Assurances (CCAA) is an agreement between the U.S. Fish and Wildlife Service (USFWS) and any non-Federal entity whereby property owners who voluntarily agree to manage their lands or waters to remove threats to species at risk of becoming threatened or endangered receive assurances against additional regulatory requirements should that species be subsequently listed under the Endangered Species Act (ESA). Since 2000 there have been 50 CCAA's approved in 24 different states that have more than 25.2 million acres enrolled by 717 landowners that cover 84 species. CCAA project areas range in size from one-acre aiming to protect the Greater and Lesser Adam Cave Beetles in Kentucky to 7,214,287-acres to protect Lesser Prairie Chicken in Colorado, Kansas, Oklahoma, New Mexico, and Texas (USFWS 2018). The Fluvial Arctic Grayling in the Upper Big Hole River CCAA Program (Big Hole Arctic Grayling CCAA) began in July 2006.

The conservation goal of the Big Hole Arctic Grayling CCAA is to secure and enhance fluvial (river-dwelling) Arctic Grayling (*Thymallus arcticus*) within the upper reaches of their historic range in the Big Hole River drainage. Montana Fish, Wildlife & Parks (FWP) holds an ESA section 10(a)(1)(A) Enhancement of Survival Permit and issues Certificates of Inclusion to non-Federal property owners within the Project Area who agree to comply with all stipulations of the Program and develop a site-specific conservation plan (SSP; Figure 1). SSP are collaboratively developed by each landowner and an interdisciplinary technical team made up of individuals representing FWP, USFWS, USDA Natural Resources Conservation Service (NRCS), and Montana Department of Natural Resources and Conservation (DNRC; collectively known as the Agencies). The conservation goal of the Big Hole Arctic Grayling CCAA will be met by implementing measures that:

- 1) Improve streamflows
- 2) Improve and protect the function of riparian habitats
- 3) Identify and reduce or eliminate entrainment threats for Arctic Grayling
- 4) Remove barriers to Arctic Grayling migration

The Big Hole Arctic Grayling CCAA is a collaborative effort among private landowners, state and federal agencies, and non-government organizations. These stakeholders have agreed to work together for the common goals of conserving Arctic Grayling, improving Big Hole fish populations, addressing private property concerns, and enhancing the overall health of the upper Big Hole watershed.

The 2023 Big Hole Arctic Grayling CCAA report summarizes current enrollment, approved SSPs, implemented conservation actions, and completed projects as part of the Big Hole Arctic Grayling CCAA.

Big Hole Arctic Grayling CCAA Project Area & Management Units

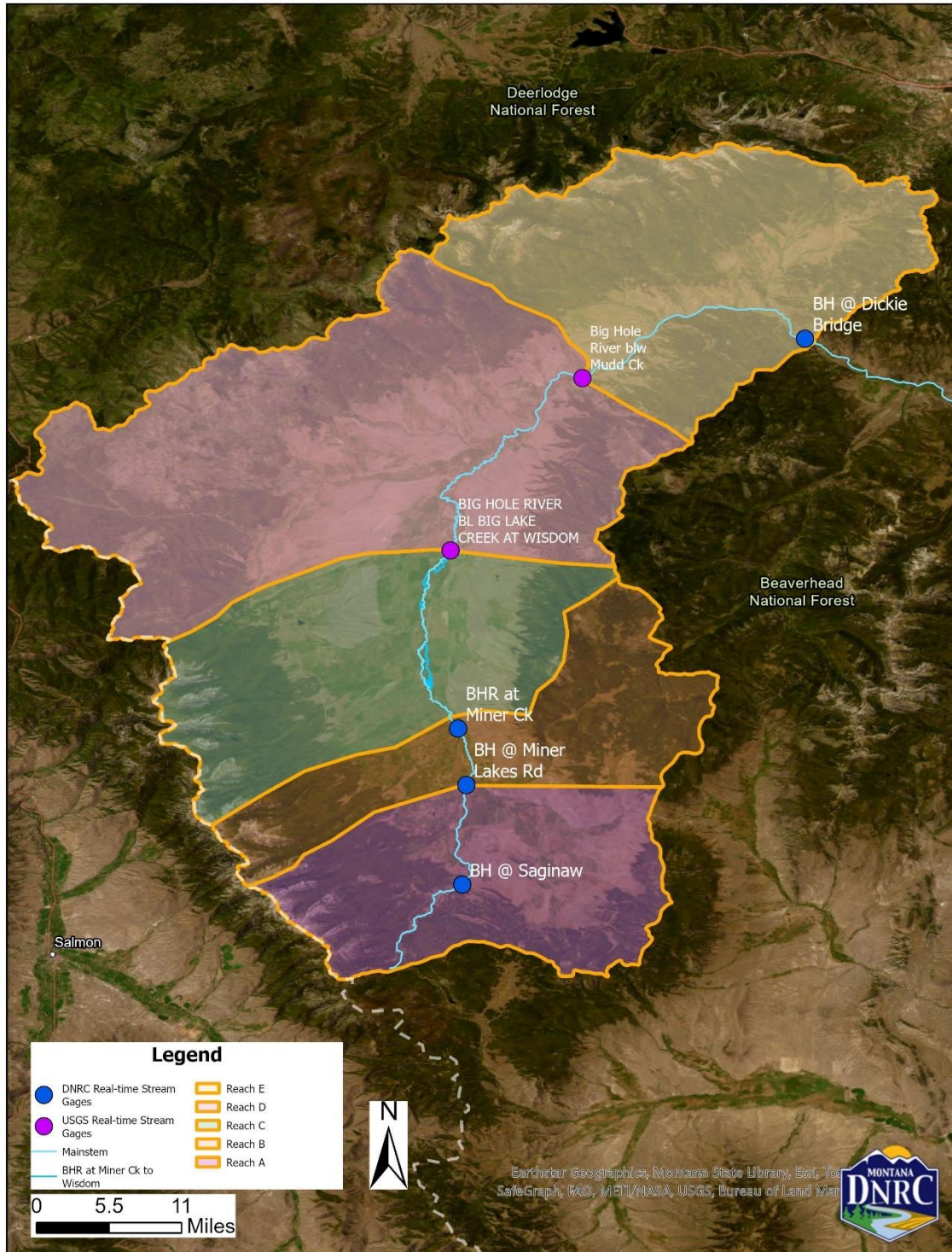


Figure 1. The Big Hole Arctic Grayling CCAA Project Area & Management Segments.

II. Legal Status of Montana Arctic Grayling

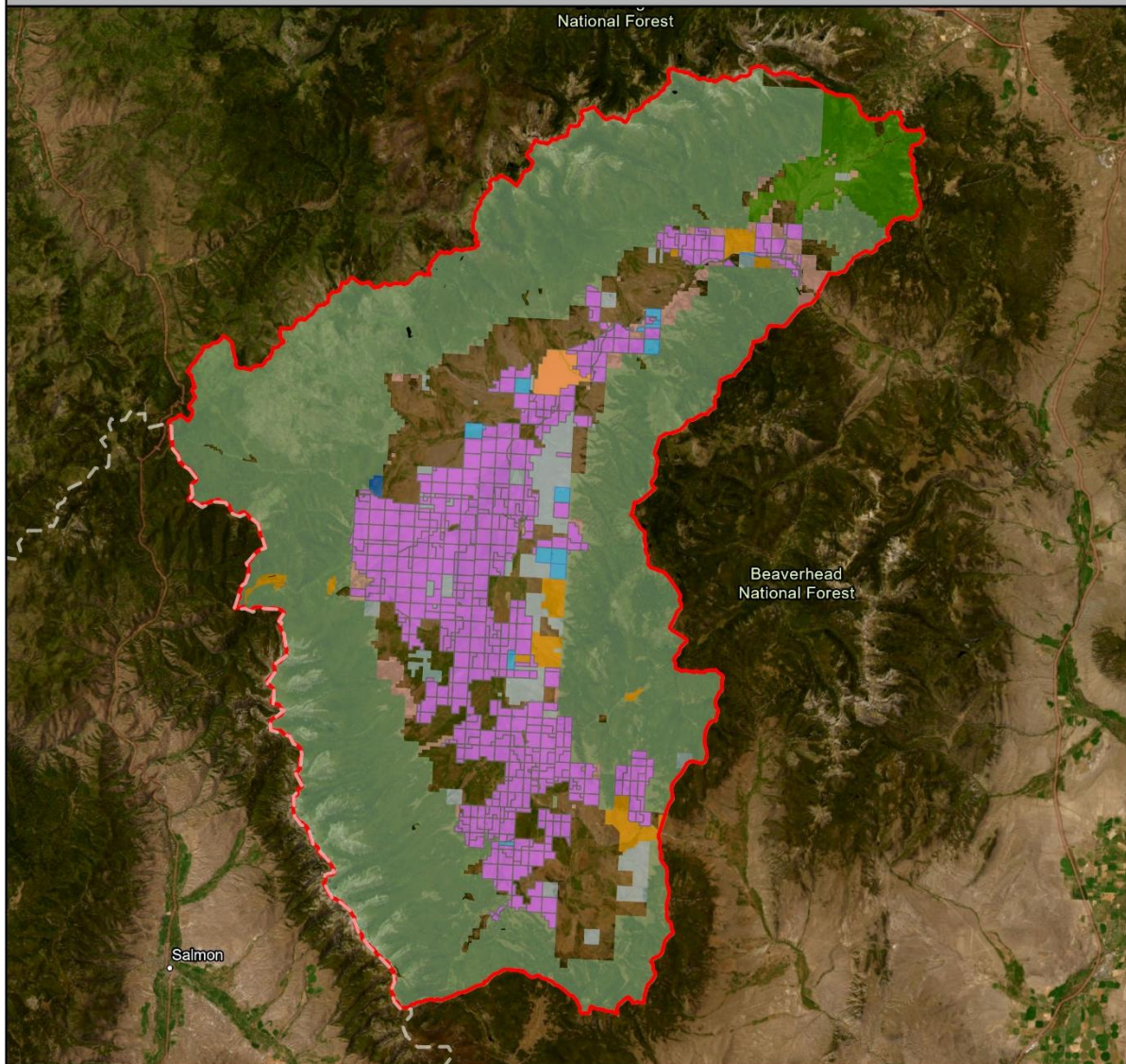
The present legal status of Arctic grayling was determined by a July 23rd, 2020, ruling where the USFWS announced that the Upper Missouri River Distinct Population Segment (DPS) of the Arctic Grayling did not warrant ESA protection. This decision was determined from the best available science, advances in the Big Hole Arctic Grayling CCAA, and critical conservation work completed by private landowners (Federal Register 2020). For complete legal review prior to 2020 please review the USFWS 2020 listing determination (Federal Register 2020).

On January 30th, 2023, Earthjustice sued the USFWS to list Arctic Grayling under the Endangered Species Act (ESA) due to climate change, poor habitat conditions (e.g., low river flows), and inadequacy of conservation efforts, including the CCAA program. The parties associated and represented by Earthjustice include the Center for Biological Diversity, Western Watersheds Project, and Butte resident Pat Munday.

III. Landowner Enrollment

On August 1, 2006, the USFWS issued FWP an ESA section 10(a) (1) (A) Enhancement of Survival Permit # TE-104415, authorizing the Big Hole Arctic Grayling CCAA. The permit allows enrollment of any non-federal landowner within the Big Hole Arctic Grayling CCAA Project Area. Enrolled non-federal landowners are provided incidental take coverage and regulatory assurances if Arctic grayling become listed under the ESA once the non-federal landowner, FWP, and the USFWS countersign a Certificate of Inclusion and the approved SSP for the enrolled property. Currently, there are 30 landowners (Participating Landowners) that have enrolled 161,564 acres of private and 5,520 acres of DNRC leased land into the Big Hole Arctic Grayling CCAA (Figure 2). In 2023, one operation was split. Enrollment for the Big Hole Arctic Grayling CCAA will remain open until 90 days prior to any final listing rule published by the USFWS in the Federal Register.

Big Hole CCA 2023 Enrollment and Public Lands **MONTANA FWP**



Legend

CCA Boundary	Local Government
CCA Enrolled 2023	Montana Dept of Transportation
CCA Participating Landowner Non-enrolled 2023	MT Fish, Wildlife & Parks
CCA Enrolled State Lands 2023	State Trust Lands
CCA Public Lands	Local Government
OWNER	County Government
County Government	US Forest Service



Map Produced by Katelin Killoy Fisheries Region 3
 Date Produced 2/1/2024

0 5 10
Miles

Figure 2. December 31st, 2023, Big Hole Arctic Grayling CCA Program of private and state land enrolled. Enrolled land includes 30 private landowners and 161,564 acres of private and 5,520 acres of DNRC leased lands.

IV. Big Hole Arctic Grayling CCAA Rapid Assessments and Compliance Monitoring

The Participating Landowners in the Big Hole Arctic Grayling CCAA allow the Agencies to complete a “rapid assessment” of the enrolled property within 90 days of enrolling. The rapid assessment focuses on identifying immediate threats to Arctic Grayling and validating water rights compliance. Immediate threats to Arctic Grayling may include structures, mechanical devices or pollutants that pose a threat of immediate mortality. Examples include unscreened pumping from or toxic effluent entering a stream. Additional information may be gathered during rapid assessments that assist with the development of the SSP with the Participating Landowner (Petersen and Lamothe 2006).

A. Surveys for Immediate Threats to Arctic Grayling

Rapid assessment surveys for immediate threats to Arctic Grayling have been conducted on all enrolled properties. No immediate threats to Arctic Grayling were identified during the surveys. Monitoring of enrolled properties for immediate threats continues as SSPs are being developed by the Agencies.

B. Water Rights Compliance Evaluation

Water right and irrigation compliance monitoring was completed on the following properties: 1 – 12, and 14 – 29 (Table 1). These efforts, completed by DNRC and FWP, included site visits to each property to assess compliance of flow rate and period of use with the landowner’s water right. Some of the required monitoring for enrolled properties was provided by the District Court–appointed water commissioner. Continuous stage recorders installed in the Spokane, Stowbridge, Farris, Miller, Huntley, and Montgomery ditches provided flow information for water rights compliance, instream flow conservation projects, and ongoing development of the SSPs. During 2023, all enrolled landowner compliance monitoring and all flow plans were completed and adhered to (Table 1).

C. Streamflow Monitoring Required by CCAA

In concert with two USGS real-time streamflow gages located at Management Segments C and D (Figure 1), DNRC continued to operate and maintain four real-time streamflow gages located at Management Segments A, B, and E as well as a basin inflow gage. In addition, DNRC continuously monitored flow in at least one tributary within each Management Segment and six key irrigation ditches in 2023.

Table 1. 2023 Irrigation Meeting and Compliance Monitoring.

Property #	2023	
	Compliance Checks Completed	Irrigation Meeting
1	May/September	Yes, over the phone
2	May/September	No
3	May/September	**No
4	May/September	**No
5	May/September	No
6	May/September	No
7	May/September	Yes, in person
8	May/September	Yes, in person
9	May/September	Yes, over the phone
10	May/September	Yes, in person
11	May/September	No
12	May/September	Yes, in person
13	No	No
14	May/September	Yes, in person
15	May/September	Yes, in person
16	May/September	Yes, over the phone
17	May/September	No
18	May/September	Yes, over the phone
19	May/September	No
20	May/September	No
21	May/September	No
22	May/September	Bo
23	May/September	No
24	May/September	No
25	May/September	No
26	May/September	No
27	May/September	Yes, in person
28	May/September	No
29	May/September	**No
30	May/September	Yes, in person
31	September	Yes, in person
* New landowner		
** Property managed leased by differing enrolled landowner that completed irrigation meeting and compliance		

V. Site-Specific Plans

SSPs are developed for each Participating Landowner by the Agencies and the landowner. The SSPs identify conservation actions that will lead to improved streamflow, enhanced riparian and stream channel condition, improved fish passage and reduced levels of entrainment.

A. Completed and Approved

Currently 29 SSPs are being implemented in the Big Hole CCAA program (Table 2). One property was split, and each is receiving a new site-plan. Twelve SSPs will undergo the 10-year updates in 2024. All SSPs are 10-year agreements between the Participating Landowners, FWP, and the USFWS. Updates on the implementation of SSPs, including compliance monitoring results, will be included in future reports. No new property was enrolled in 2023.

B. Extension Requests Approved by the USFWS

FWP did not submit approval for extensions to complete SSPs in 2023. Extensions provided additional time to complete the SSP and document past and ongoing conservation actions for Arctic Grayling on the property receiving the extension.

Table 2. Property numbers of enrolled landowners and their associated CCAA management segment, enrolled acres, and enrollment status.

Property Number*	Management Segment(s)	Private Land Enrolled (Acres)	State Land Enrolled (Acres)	Enrollment Status	10 Year SSP Update
1	C & D	25,180	0	SSP in Draft	2024
2	A	6,327	0	SSP Completed	2029
3	A & B	2,931	0	SSP Completed	2026
4	D and C	2,265	0	SSP Completed	2025
5	D	2,514	640	SSP Completed	2025
6	B and C	2493	0	SSP Completed	2030
7	B	6,975	0	SSP Completed	2030
8	E	2,759	0	SSP Completed	2032
9	C	2951	0	SSP Completed	2032
10	C & D	23,458	560	SSP in Draft	2024
11	C & D	2,684	2,240	SSP in Draft	2024
12	D	1,118	0	SSP in Draft	2024
13	C	209	0	SSP Completed	2022
14	B & C	3,831	0	SSP in Draft	2024
15	C	4,487	0	SSP Completed	2026
16	D	8,771	640	SSP in Draft	2024
17	A and B	1337	0	SSP Completed	2025
18	C	1,555	0	SSP in Draft	2024
19	E	818	0	SSP Completed	2025
20	A, B, C & D	24,343	0	SSP in Draft	2024
21	C & D	5,010	0	SSP in Draft	2024
22	D & E	6,511	1,280	SSP Completed	2025
23	D	1474	0	SSP in Draft	2024
24	A and B	4186	0	SSP in Draft	NA
25	A and B	6164	0	SSP Completed	2025
26	A and B	880	0	SSP in Draft	2024
27	E	1967	0	SSP in Draft	2024
28	E	2473	0	SSP Completed	2032
29	B	3419	0	SSP Completed	2032
30	A and B	2474	160	SSP in Draft	NA

VI. Conservation Measures

Through the process of developing SSPs for Participating Landowners, the Agencies identify projects that reduce or eliminate entrainment of Arctic Grayling, eliminate barriers to fish passage, maintain adequate streamflow and protect and/or improve riparian and stream habitat quality. Projects and related conservation efforts completed in 2023 are reported below.

A. Entrainment Surveys

In 2023, FWP completed 10 entrainment surveys on 4.5 miles of irrigation ditches managed by four enrolled landowners (Table 3). Twenty-three grayling were collected from two ditches during these surveys. Other fish species present during entrainment surveys included: Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*), Mountain Whitefish (*Prosopium williamsoni*), Burbot (*Lota lota*), Longnose Dace (*Rhinichthys cataractae*), Rocky Mountain Sculpin (*Cottus bondi*), and White Sucker (*Catostomus commersonii*).

Table 3. FWP electrofishing entrainment surveys completed in 2023 in the upper Big Hole watershed as part of the Big Hole Grayling CCAA requirements.

Date	Source	Distance (mi.)	Number of Grayling Rescued
7/18/23	Big Hole	0.5	17
7/18/23	NF Big Hole	0.3	4
7/18/23	NF Big Hole	0.2	2
7/17/23	Steel Creek	0.7	0
7/17/23	Steel Creek	0.7	0
7/17/23	Big Hole	0.3	0
7/17/23	Big Hole	0.4	0
7/17/23	Big Hole	0.6	0
7/18/23	Big Hole	0.6	0
7/18/23	Big Hole	0.4	0
Total		4.5	23

B. Projects to Minimize or Eliminate Entrainment of Arctic Grayling

Low channel gradients preclude using fish screens to reduce entrainment in parts of the CCAA area; however, fish screens installed on La Marche and Rock creeks have successfully prevented grayling entrainment. The Agencies developed a headgate system with a return channel on a large ditch downstream of Wisdom where entrained grayling YOY were commonly observed

(Table 4). This project will allow any entrained fish to be flushed back into the Big Hole River at the end of irrigation season.

Table 4. Upper Big Hole Watershed fish entrainment project completed in 2023 as part of the Big Hole Arctic Grayling CCAA. Project details include installing headgates and a return channel.

2023		
Associated Waterbody	Enrolled Landowner	Project Component
Big Hole River	16	3 Diversions, 1 Return Channel

C. Projects to Enhance Fish Passage

During 2023 the Agencies completed two fish passage improvement projects on two properties (Table 5). Additionally, beaver dams were notched on six tributaries to improve passage after observations of reduced abundance and distribution of grayling below dams in recent years. This resulted in increased access and use of several streams by grayling. Accessible habitat was increased by eight miles between 2021 and 2023 on six streams when dams were removed. Four miles were made accessible by notching and four miles became accessible due to natural conditions (high run-off). Increases in use were most notable in Steel and Fishtrap creeks. The distribution and abundance of YOY grayling in Steel Creek was increased from six YOY in the lower 0.25 miles of stream to 25 YOY in the lower 3 miles of stream. In Fishtrap Creek, 25 age-1+ grayling were captured in 2023, which is the first time they were observed there since 2009.

Table 5. Upper Big Hole Watershed fish passage projects completed in 2023 as part of the Big Hole Arctic Grayling CCAA. Projects include installing a bridge and fish ladder.

2023		
Associated Waterbody	Enrolled Landowner	Project Component
Big Swamp Creek	6	Bridge
Howell Creek	10	Fish Ladder

D. Projects to Enhance Riparian and Stream Channel Habitat

During 2023 the Agencies and Participating Landowners implemented 11 riparian habitat projects to enhance stream function and riparian habitat on 6 properties (Table 6). Construction of the stock water systems from the completed well projects are slated to be all completed by fall of 2024.

Table 6. Upper Big Hole Watershed riparian and stream channel improvement projects completed in 2023 as part of the Big Hole Arctic Grayling CCAA. Projects include improving riparian habitat through stock water development, stream restoration, and channel activation.

2023		
Associated Waterbody	Enrolled Landowner	Project Component
Big Hole River	13	Big Hole River Restoration and High Flow Channel Activation
Big Hole River and Tributaries	14	2 Stock Water Systems from Spring Developments
Big Hole River and Tributaries	6, 14, 20, and 24	11 Stock Water Systems from Wells
Big Hole River and Tributaries	1, 9, 20, and 21	8 Wells for Stock Water Systems

E. Projects to Improve Streamflow and Irrigation Water Management

During 2023 the Agencies partnered with participating landowners to implement eight irrigation projects on seven enrolled properties to enhance the ability to control and measure irrigation withdrawals and reduce the need to divert water for livestock watering (Table 7).

In addition to improvements to irrigation infrastructure, the Big Hole Arctic Grayling CCAA requires reductions of irrigation diversions in response to streamflows dropping below established seasonal flow targets at each of the five gaging stations (Miner Lakes Road, below the mouth of Miner Creek, Wisdom Bridge, Mudd Creek Bridge, and Dickie Bridge; Figure 1). A total of 50.2 ft³/s was returned to the Big Hole or its tributaries in 2023 in accordance with site plans and flow targets. These flows were returned in July, August and September.

Table 7. Upper Big Hole Watershed streamflow and irrigation management projects completed in 2023 as part of the Big Hole Arctic Grayling CCAA. Projects include installing headgates, ditch maintenance, and stock tank maintenance.

2023		
Associated Waterbody	Enrolled Landowner	Project Component
Big Lake Creek	1	Stock Tank Repair
Rock Creek	9	2 Headgates
Howell Creek	10	Headgate and Flume
Fishtrap Creek	27	Headgate and Flume
Fishtrap Creek	28	Headgate and Flume
East Fishtrap Creek	28	Flume
Miner Creek	29	Headgate

F. Projects to Expand Arctic Grayling Distribution into Historically Occupied Waters

French Creek is a tributary to Deep Creek which flows into the Big Hole River. A fish barrier was constructed in 2019 which isolated over 40 miles of habitat for native fish restoration. Non-native fish removal occurred in 2020 and 2021 followed by eDNA testing in 2022 and 2023, which indicated that non-native fish had successfully been removed the watershed. Restocking of the stream with Arctic grayling and westslope cutthroat trout began in 2022. About 10,500 Arctic Grayling were introduced into fishless reaches of tributary streams to French Creek in the fall of 2022. A small proportion of these fish were age-1 fish. Subsequent visual surveys in California Creek in early summer 2023 found age-0 fish which appeared to be grayling. The presumed presence of age-0 grayling suggests the age-1 fish stocked the previous year successfully reproduced in the stream. There were no other fish species present in the stream in this reach so the fish were presumed to be grayling.

Electrofishing done in the mainstem of French Creek in 2023 verified that the grayling stocked the previous year had survived the winter. This electrofishing effort occurred in early summer which was too early to detect any naturally produced age-0 grayling. Subsequently, 4,408 additional grayling were stocked into French Creek and its tributaries with suitable habitat. Stocking of French Creek will likely continue for 2 or 3 years. To date only age-1 (7-inch) and age-0 (3-inch) grayling have been stocked in French Creek. In 2024 it is anticipated that remote

stream-side incubators will be used to stocked eyed eggs. The overarching goal of this project is to establish a self-sustaining population of grayling upstream of the barrier.

VII. Monitoring

The Big Hole Arctic Grayling CCAA requires monitoring of Arctic grayling population response to conservation measures implemented under this agreement. In 2016, FWP began using genetic monitoring to document population trends in Big Hole grayling under the guidance of geneticists and with the approval of USFWS (Kovach et al. 2020; Table 9). Genetic monitoring was justified for two reasons, 1) Determining trends in population abundance of rare or highly migratory fish species can be difficult, and 2) Genetic analysis is an effective alternative or supplemental method to determine the health and long-term persistence of fish populations (Schwartz et al. 2007). Genetics are used to analyze the structure of an Arctic Grayling population and determine its long-term viability by estimating genetic diversity in a population (A_r), effective number of breeding individuals that produced a given cohort (N_b), and ultimately the overall genetic effective population size (N_e). These estimates provide important population information on potential rate of loss of genetic variability and inbreeding depression, population dynamics, and the efficacy of management actions. Moreover, genetic data ensure that conservation efforts maintain the historic diversity found within and among Arctic Grayling populations, and thus, the continued evolutionary legacy of the species [Upper Missouri River Arctic Grayling Conservation Strategy, in preparation].

Additionally, stream temperature and discharge are monitored on each of the 10 reaches (FWP and USFWS 2006). Mainstem reaches are located near the lower boundary of each management segment (A through E) and tributary reaches include Governor Creek, Miner Creek, Rock Creek, Steel Creek and Deep Creek. Additional monitoring is conducted to evaluate restoration projects.

A. Fish Population Monitoring

In 2023, FWP completed 16 miles of electrofishing surveys in 12 waterbodies to determine N_b in the Big Hole River drainage. A total of 147 young of year (YOY) and 56 Age 1+ grayling were captured during these surveys (Table 8). One hundred thirty-seven YOY grayling genetic samples were used to calculate N_b . N_b for the 2023 grayling cohort was 167 (95% CI: 140-205; Figure 3). The 2023 estimate is slightly higher than the median N_b estimated since genetic monitoring began (155.4). Other species sampled included brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), burbot (*Lota lota*), mountain whitefish (*Prosopium williamsoni*), Rocky Mountain sculpin (*Cottus bondi*), longnose dace (*Rhinichthys cataractae*), white suckers (*Catostomus comersonii*), and longnose suckers (*Catostomus catostomus*).

Table 8. Grayling captured during 2023 electrofishing surveys in the Big Hole River watershed.

Reach Name	Reach Length (mi.)	Grayling YOY Samples Collected	Age 1+ Grayling
Deep Creek	2.1	0	8
Fishtrap Creek	1.0	0	25
La Marche Creek	0.7	0	0
Seymour Creek	0.1	0	0
Squaw Creek Side Channel	0.8	1	7
Howell Creek Side Channel	1.2	20	1
Pintler Creek North	0.2	0	0
Pintler Creek South	0.5	11	1
Plimpton Creek	2.9	49	1
Steel Creek	2.7	25	7
Swamp Creek	3.0	18	6
Big Hole River-Daniels	0.5	17	0
NF Big Hole Ditch	0.5	6	0
Total	16.2	147	56

Table 9. Estimates of family summary statistics and N_b for Arctic Grayling from the Big Hole River. N is number of individuals genotyped. N_b shows estimates of the effective number of breeders, based on 12 microsatellites. LCI and UCI are the lower and upper (respectively) 95% confidence intervals for the N_b estimate from each year.

Year	N	N_b	LCI	UCI
2007	50	107.1	76.2	171.7
2008	30	77.2	47.6	175.7
2009	128	77.6	66.7	91.4
2010	46	92.4	66.1	146
2011	66	81.9	64.5	108.9
2012	56	289	142.8	5050.9
2013	49	432.7	171.7	∞
2014	88	268.4	166.8	614.1
2015	56	181.9	109.2	465.5
2016	51	96.1	68	155.3
2017	63	155.4	103.3	289.7
2018	128	145.2	115.1	191.3
2019	145	332.8	203.7	510.1
2020	119	208	166.6	271.3
2021	119	172	141.2	216.8
2022	144	116.9	102.8	134.3
2023	137	167.2	139.8	205.1

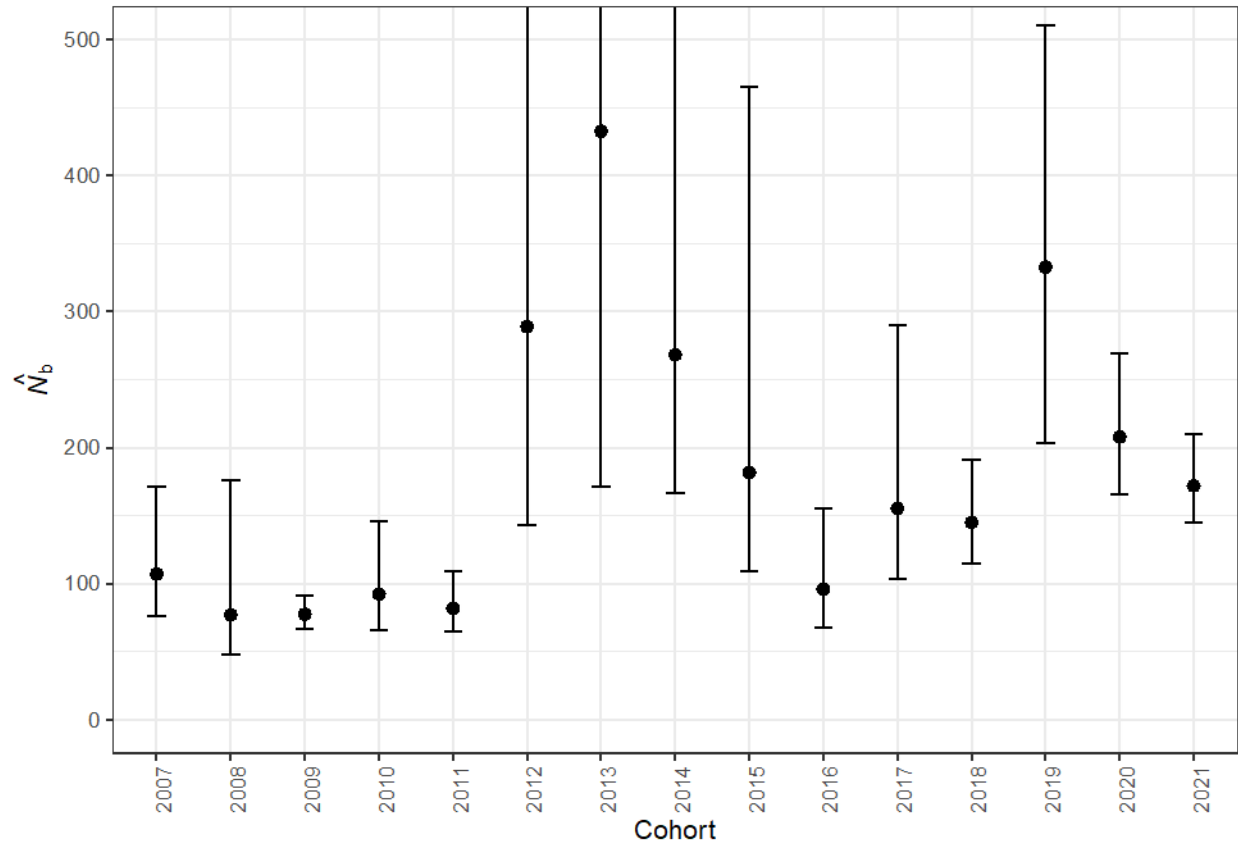


Figure 3. Estimates of the number of effective breeders (N_b) in Arctic grayling from the Big Hole River over time. Error bars indicate 95% confidence intervals.

B. Stream Temperature Monitoring

In 2023, FWP collected stream temperature data from May 1st to October 1st at 37 sites within the Big Hole drainage (Figure 4). Monitoring was conducted at 7 sites on the Big Hole River and 30 sites across significant tributaries. Data from one site on Howell Creek and one site on McVey Creek were deemed unusable due to losses or logger beaching. Additionally, data on LaMarche Creek 2, Pintler Creek 2, Plimpton Creek 2, Steel Creek 4, and Trail Creek begins May 5th due to ice and Smith Springs 1's data from July 26th-August 3rd and Steel Creek 3's data from July 31st-August 19th has been omitted due low flows or loggers being beached. Stream temperature data were collected in 60-minute intervals over the 5-month monitoring period. The 2023 data were summarized at mean and maximum seasonal temperature and cumulative hours exceeding 21.1°C (70°F) and 25°C (77°F; Table 10). The thermal stress threshold for salmonid species is considered 21.1° C (70 ° F; Behkne 1992), and 25° C (77° F) represents the upper incipient lethal temperature for Arctic Grayling (Lohr et al. 1996).

Table 10. Stream temperature monitoring results for 2023

Monitoring Site (Big Hole Arctic Grayling CCAA Management Section)	Mean Seasonal Temperature °C (°F)	Maximum Seasonal Temperature °C (°F)	Cumulative hours exceeding 21.1°C (70°F)	Cumulative hours exceeding 25°C (77°F)
Big Hole River Side Channel	13.27 (55.90)	21.75 (71.15)	11	0
Big Hole River Miner Creek Confluence	13.76 (56.77)	23.28 (73.90)	65	0
Big Lake Creek 1	14.98 (58.97)	26.48 (79.68)	283	24
Big Lake Creek 2	13.93 (57.07)	22.72 (72.89)	38	0
Deep Creek 1	12.50 (54.50)	22.63 (72.74)	35	0
Deep Creek 2	11.58 (52.84)	21.18 (70.12)	1	0
Fishtrap Creek 1	10.94 (51.68)	19.51 (67.11)	0	0
Fishtrap Creek 2	10.27 (50.49)	17.77 (63.99)	0	0
French Creek 1	12.81 (55.06)	21.06 (69.90)	0	0
French Creek 2	12.23 (54.01)	22.61 (72.70)	30	0
French Creek 3	12.02 (53.64)	22.44 (72.39)	28	0
Governor Creek 1	13.89 (57.00)	23.91 (75.03)	101	0
Howell Creek 2	14.93 (58.87)	25.67 (78.21)	225	4
LaMarche Creek 1	9.98 (49.96)	19.67 (67.41)	0	0
LaMarche Creek 2	9.68 (49.42)	18.60 (65.49)	0	0
Miner Creek 1	16.09 (56.57)	26.89 (80.40)	205	23
Miner Lakes Road Bridge Big Hole River	12.64 (54.76)	23.04 (73.47)	44	0
Mudd Creek Bridge Big Hole River	15.45 (59.81)	25.14 (77.25)	267	2
NF Big Hole River 1	14.24 (57.63)	23.57 (74.42)	114	0
NF Big Hole River 2	13.49 (56.28)	23.14 (73.65)	75	0
Pintler Creek 1	12.80 (55.04)	24.12 (75.42)	38	0
Pintler Creek 2	13.11 (55.59)	24.45 (76.01)	120	0
Plimpton Creek 1	15.00 (59.01)	24.80 (76.64)	189	0
Plimpton Creek 2	15.33 (59.60)	26.10 (78.98)	258	6
Rock Creek 1	13.60 (56.49)	20.53 (68.96)	0	0
Saginaw Bridge Big Hole River	10.52 (50.94)	20.41 (68.74)	0	0
Seymour Creek 1	10.91 (51.65)	20.77 (69.39)	0	0
Smith Springs 1	13.84 (56.91)	28.07 (82.53)	131	22
Steel Creek 1	15.08 (59.14)	24.99 (76.99)	209	0
Steel Creek 2	14.01 (57.23)	23.50 (74.30)	90	0
Steel Creek 3	10.73 (51.32)	22.47 (72.44)	5	0
Steel Creek 4	9.42 (48.95)	15.7 (60.26)	0	0

Swamp Creek 1	15.00 (59.00)	24.45 (76.01)	188	0
Trail Creek	11.34 (52.41)	19.28 (66.71)	0	0
Warm Springs Creek 1	12.81 (55.05)	21.38 (70.48)	3	0

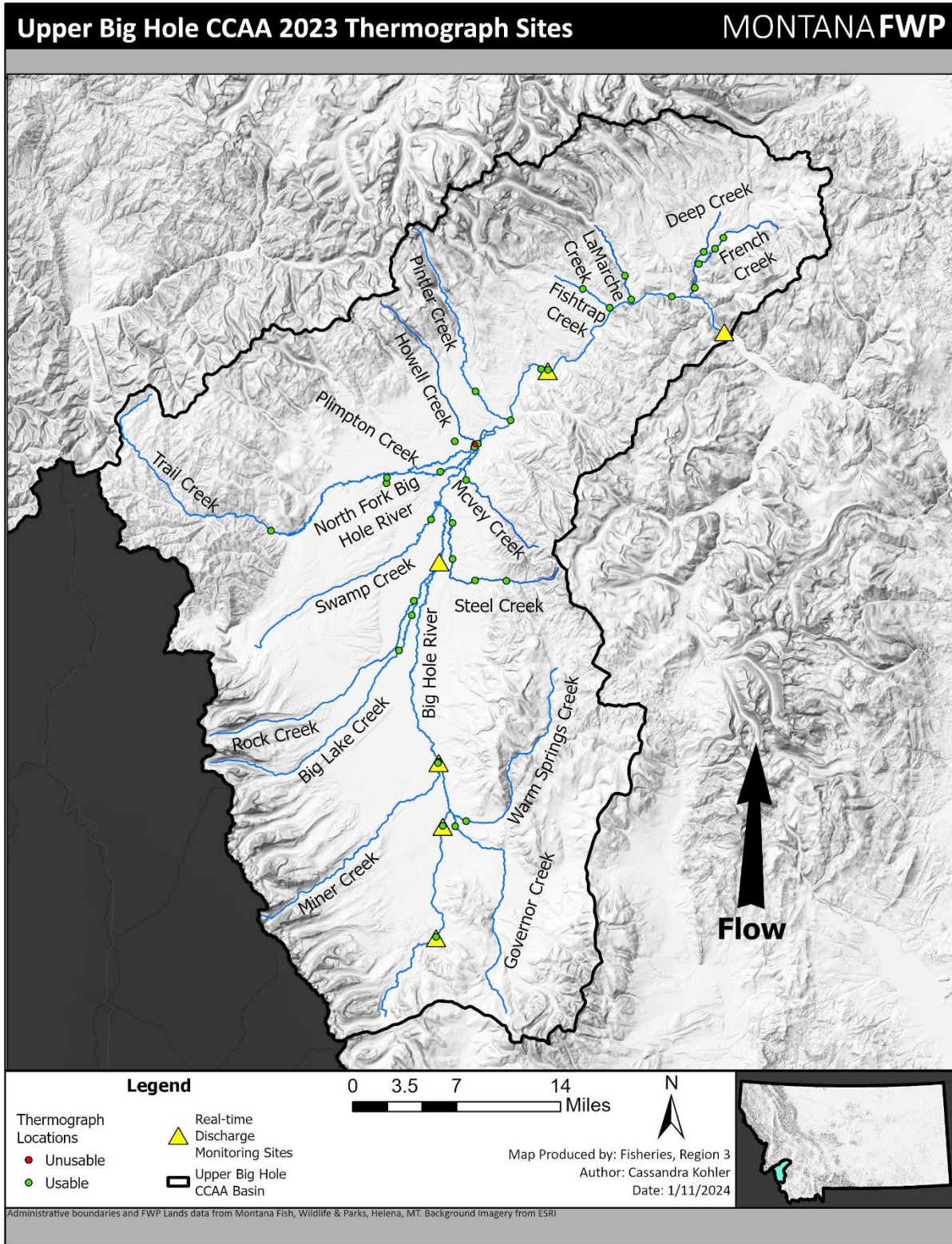


Figure 4. Stream temperature (green circle) and stream discharge (yellow triangle) monitoring sites in the Big Hole Arctic Grayling CCAA Project Area.

C. Streamflow Monitoring

Along with two USGS real-time streamflow gages located at management segments C and D, DNRC continued to operate and maintain four real-time streamflow gages located at the upper project boundary and at management segments A, B, and E (Figure 1) as part of a Furnished Record Policy with the USGS. Ownership of the Furnished Record gages was transferred to DNRC on July 1st, 2021. DNRC continues to operate and maintain these four gages in a real-time capacity. In addition, DNRC continuously monitored flow in at least one tributary within each management segment and six key irrigation ditches.

Snowpack and precipitation data were monitored by NRCS (available at [NWCC iMap \(usda.gov\)](https://www.nwcc.gov/)), and results are based on the period-of-record (1991–2020).

In 2023, the Big Hole basin snowpack peaked at 104% of median values, and snowpack receded at a normal rate. Total precipitation in the Big Hole basin was 108% of median values. Spring precipitation was 98%, Summer was 103% and fall ended the water year at 108% of median values, respectively. Air temperatures in the Big Hole were average or slightly below throughout the summer. Big Hole Arctic Grayling CCAA stream discharge targets (in all reaches) were met 81% of the time in 2023 (Figures 5-10).

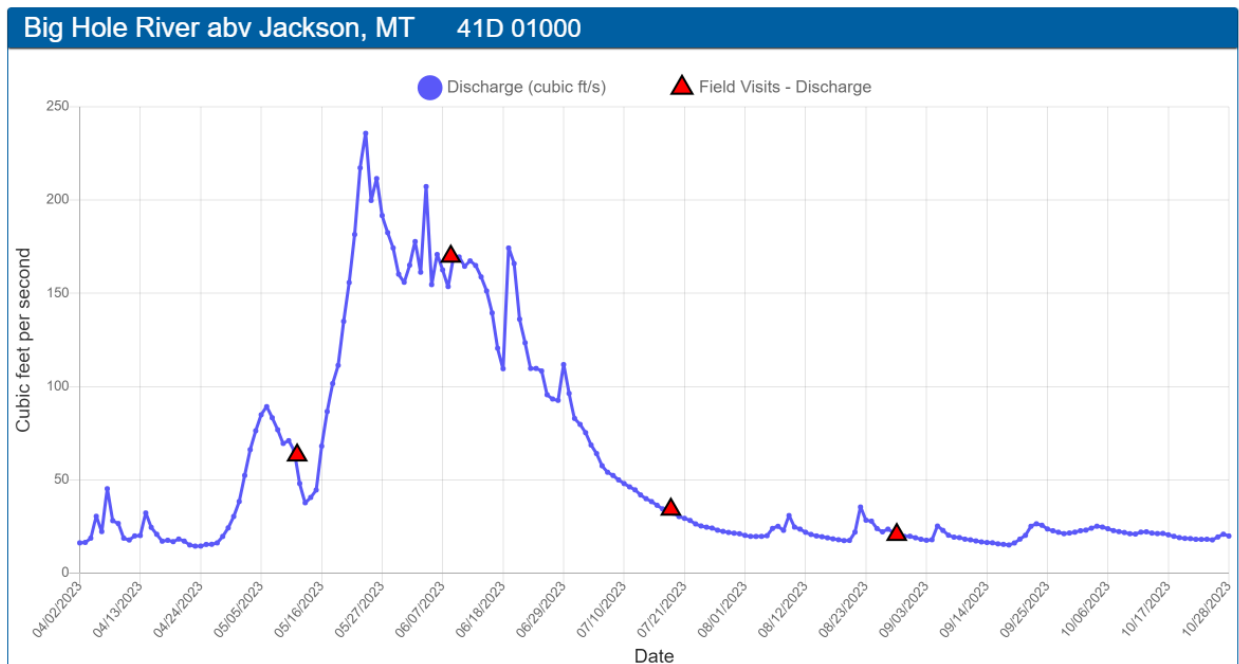


Figure 5. 2023 DNRC stream discharge data collected from the Big Hole River at the real-time gaging station located at the upper Big Hole Arctic Grayling CCAA project area boundary (Saginaw Bridge).

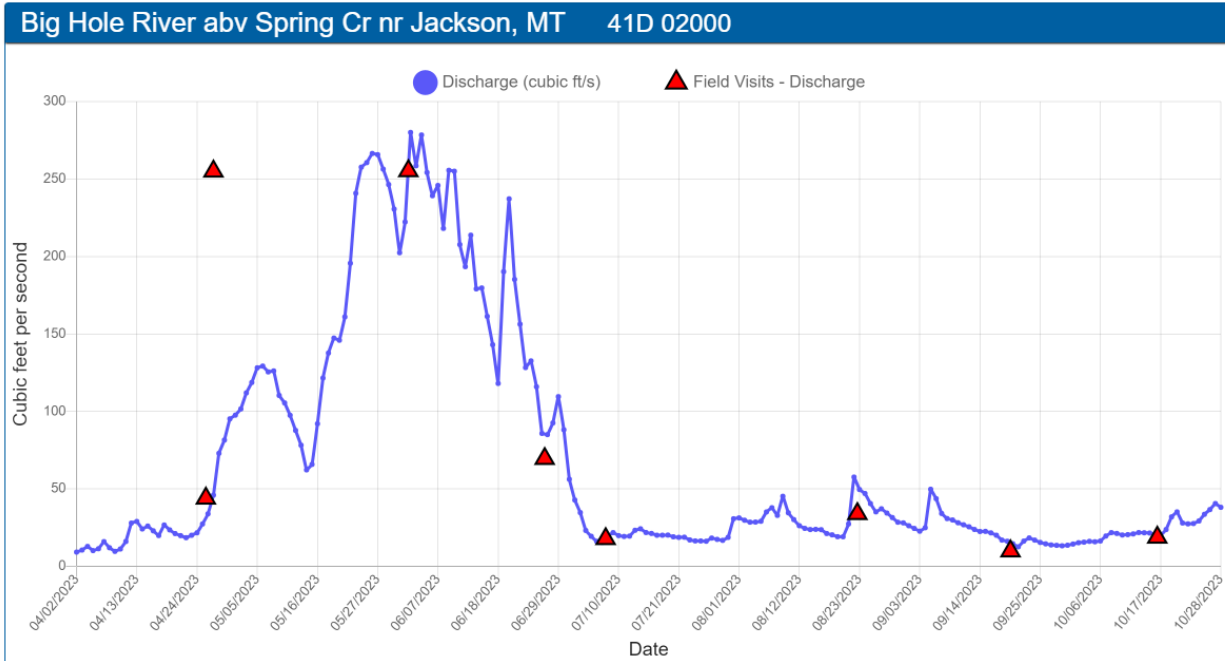


Figure 6. 2023 stream discharge data collected from the Big Hole River at the real-time gaging station located at the lower Big Hole Arctic Grayling CCAA Reach A boundary (Miner Lakes Road).

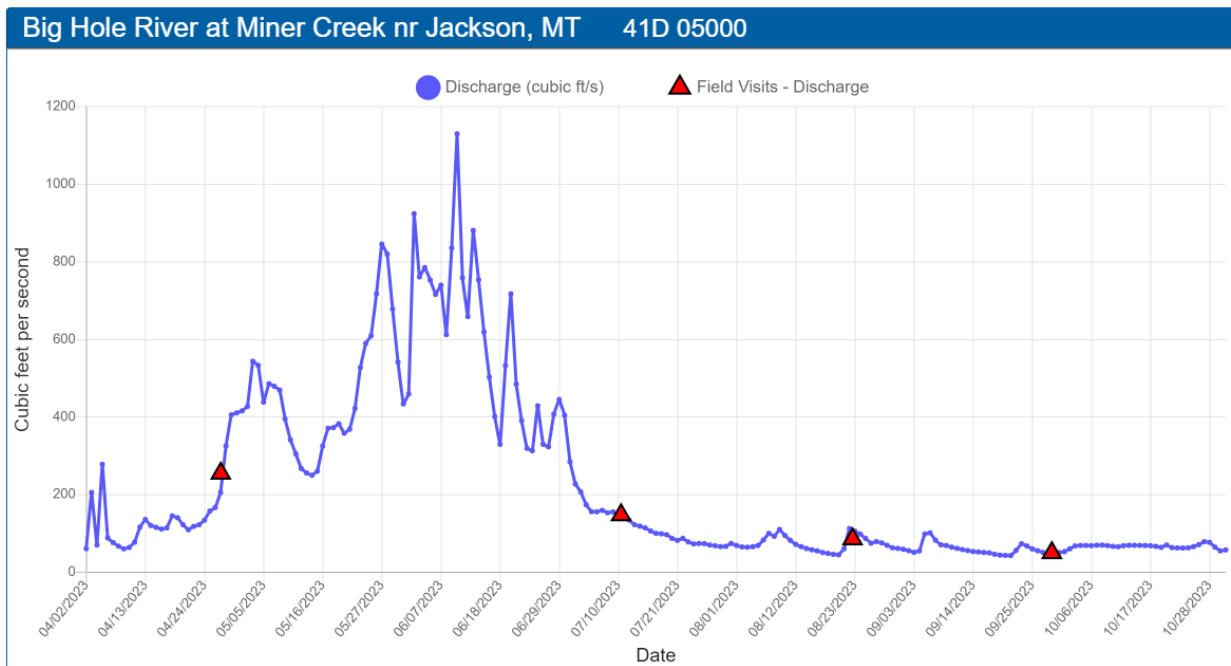


Figure 7. 2023 stream discharge data collected from the Big Hole River at the real-time gaging station located at the lower Big Hole Arctic Grayling CCAA Reach B boundary (confluence with Miner Creek).

Big Hole River bl Big Lake Cr at Wisdom MT - 06024450

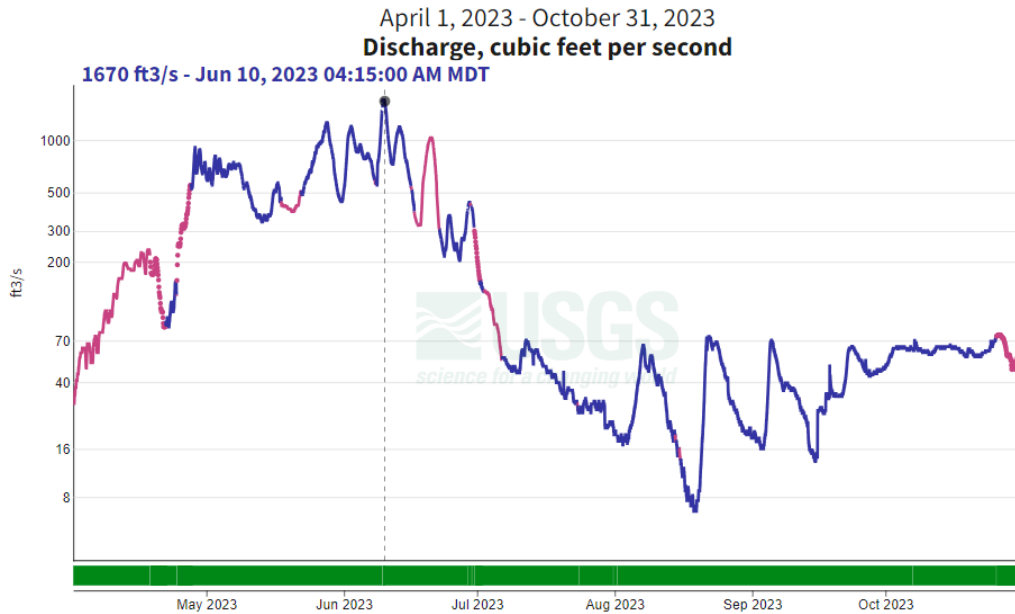


Figure 8. 2023 stream discharge data collected from the Big Hole River at the real-time gaging station located at the lower Big Hole Arctic Grayling CCAA Reach C boundary (Wisdom Bridge).

Big Hole River bl Mudd Cr nr Wisdom MT - 06024540



Figure 9. 2023 stream discharge data collected from the Big Hole River at the real-time gaging station located at the lower Big Hole Arctic Grayling CCAA Reach D boundary (Mudd Cr Bridge).

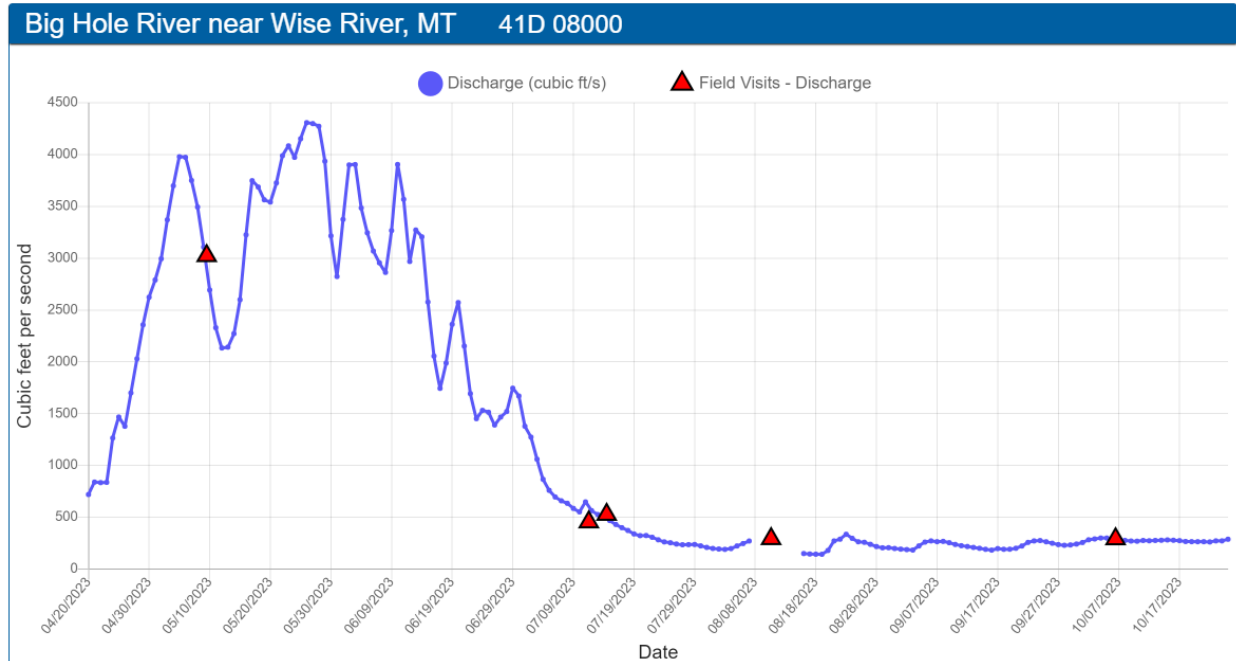


Figure 10. 2023 stream discharge data collected from the Big Hole River at the real-time gaging station located at the lower Big Hole Arctic Grayling CCAA Reach E boundary (Dickie Bridge).

D. FWP Monitoring of Compliance with Approved Site-Specific Plans

The monitoring of compliance with approved SSPs has occurred annually on the following Properties: 1– 2 and 4 – 30. All landowners with approved SSPs followed their plan in 2023, except for Property 3, which was attributed to new ownership. FWP field personnel checked the amount of water being diverted by the landowners, the trend of riparian areas under a grazing or riparian management plan, the ability of fish to access fish passage structures and for any evidence of immediate threats of harm or mortality to on the enrolled properties. The initial compliance meetings focus on expectations for monitoring the riparian management and irrigation diversion agreements in the approved SSP. The necessary field forms for documenting actions are provided to the landowners at that time.

VIII. Summary of Estimated Take Associated with the Big Hole Arctic Grayling CCAA

In 2020, the USFWS determined that listing the upper Missouri River Basin Distinct Population Segment of Arctic Grayling, as threatened or endangered under the Endangered Species Act was not warranted. Due to the current legal status of Arctic Grayling, ESA-defined take (harm, harass or kill) did not apply to the implementation or monitoring of the Big Hole Arctic Grayling in 2020.

IX. NRCS Special Funding

In 2022, the NRCS secured funding for a 3-year, permanent technician position in cooperation with FWP and DNRC. The position is managed by FWP to assist with CCAA irrigation compliance and riparian monitoring. This position was hired in June of 2022. The technician position will remain filled through the duration of the grant. In addition, NRCS will continue to pursue and meet the obligations of existing EQIP contracts with enrolled landowners in 2023, develop and implement stock water TIP proposals for the Reach A and B landowners, and develop and implement stock water TIP proposals for Reach C landowners.

X. Literature Cited

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