

FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION



All sections must be addressed, or the application will be considered invalid

I.	AP	APPLICANT INFORMATION			
	A.	Applicant Name: Montana FWP			
		Mailing Address: 1420 E. Sixth Ave.			
		City: Helena State: MT Zip: 59620			
		Telephone: E-mail:			
	В.	Contact Person (if different than applicant): Ryan Kreiner			
		Address: 730 1/2 Montana St.			
		City: Dillon State: MT Zip: 59725			
		Telephone: 406-431-3509 E-mail: rkreiner@mt.gov			
	C.	Landowner and/or Lessee Name (if different than applicant): USFWS- Red Rock Wildlife Refuge			
		Mailing Address: 27650B South Valley Road			
		City: Lima State: MT Zip: 59739			
		Telephone: 406-276-3536 E-mail: micheal_j_beyant@fws.org			
II.	PR	OJECT INFORMATION			
	A.	University also Overwhelm Charling Hebitat Income cont			
	River, stream, or lake: Upper Red Rock Lake				
		Location: Township: 14S Range: 2W Section: 20			
		Latitude: 44.59400 Longitude: -111.74588 vithin project (decimal degrees)			
		County: Beaverhead			
	В.	Purpose of Project:			
	The purpose of Project: The purpose of this project is to prevent extirpation of one of the last aboriginal graylin populations in the lower 48 states by increasing suitable over-winter habitat in Upper FRock Lake (Upper Lake) to at least 25 acres. Suitable habitat is defined as areas of the last 25 acres.				

lake where water depth below the ice is >1 m and dissolved oxygen is >4 ppm. Monitoring data has shown that when suitable winter habitat is >25-acres in a given year, the grayling

population exhibits a stable or increasing growth trend.

C. Brief Project Description (attach additional information to end of application):

The grayling is a rare endemic species found in the contiguous United States only in the Upper Missouri River Basin of southwest Montana. The majority of the Centennial Valley grayling population migrates into and occupies Upper Red Rock Lake (Upper Lake) within Red Rock Lakes National Wildlife Refuge (RRL) for the majority of the winter. The Upper Lake is a high-elevation, shallow (1 m during winter), postglacial wetland depression where hypoxia (low oxygen) can persist for months due to prolonged ice and snow cover and enriched organic sediments that represent high oxygen demand. The Centennial Valley Arctic Grayling Adaptive Management Plan (AMP) between Montana Fish, Wildlife and Parks (FWP) and the United States Fish and Wildlife Service (USFWS) has tested three hypotheses to determine the limiting factors of the grayling population in Upper Lake since 2012: 1) Competition/Predation from non-native Yellowstone Cutthroat Trout, 2) Over-winter conditions in Red Rock Lake, and 3) Access to quality spawning habitat. After implementing this program for the past nine years, hypothesis 2 has emerged as the primary driver of the population (over-winter habitat). Consequently, due to poor over-winter conditions in the lake, the grayling population has declined from a spawning population of >2,500 adults in 2014 to an all-time low population of 88 adults in 2021.

Based on the on-going results from the AMP, the USFWS and FWP initiated an alternatives analysis to evaluate the different options (alternatives) which may help to improve over-winter habitat. After careful consideration, three alternatives emerged as the top choices: 1) solar aeration, 2) a pipeline to deliver oxygenated water to the deeper portions of Upper Lake, and 3) dredging. In 2020, a solar aerator was tested but quickly became covered by drifting snow and failed to work. Dredging was determined to be the most expensive alternative, the most visually damaging, and was expected to have short-lived results. The pipeline is currently the only feasible option.

This project proposes to pipe oxygenated water from a nearby tributary (Shambow Pond/East Shambow Creek) and deliver it to the deeper portions of Upper Lake. This project will run a buried 12 HDPE pipe approximately 5,500 feet from the outlet of Shambow Pond to a location in Upper Lake with a minimum depth of greater than 3 feet. Approximately 3,450 feet of the pipeline will be buried on land and 2,050 feet will be within Upper Lake. An intake pipe and flow control system will be installed near the pond outlet which will allow managers to control flow and shut down the pipeduring spring-fall (ice-off periods). A Cascade aeration structure will be also be installed near the pond outlet to increase dissolved oxygen of water in the pipe.

A similar approach has been taken in Utah to improve over-winter habitat at two sport fisheries previously impacted by chronic winter-kill (Pine and Navajo lakes). Both projects have worked for over 25 years with minimal maintenance. Based on similar or more favorable physical characteristics of this proposed project site (greater elevation drop, higher volume discharge in donating tributary, similar travel distance), this project has a high likelihood of success. Shambow Creek will not be negatively impacted as the creek will be returned to its appropriate channel during the growing season (spring through fall) to maintain riparian vegetation. East Shambow Creek and Shambow Pond are fishless and Shambow Pond is an artificial reservoir.

D.	Length of stream or size of lake that will be treated (project extent): 25 ac (entire lake 2,950 ac) Length/size of impact, if larger than project extent (e.g. stream miles opened): 17 (Red Rock, Elk Springs cks)						
E.	Project Budget:						
	Grant Request (Dollars): \$ 100,000						
	Matching Dollars: \$ 502,956						
	Matching In-Kind Services:* \$						
	*salaries of government employees <u>are not</u> considered matching contributions						
Other (Contributions (not part of this application) \$ Total Project Cost: \$ 602,956						
	Total Project Cost: \$ 602,956						
F.	Attach itemized (line item) budget – see budget template						
G.	Insert or attach a project location map showing the project area in relation to a major landmark or town. Please indicate if the project location is on public or private property.						
	(See attachment). The project is on National Wildlife Refuge managed by the USFWS.						
	(Coo attachment). The project is on Hational Wilding Relayed by the Ool Wo.						
	Attach specific project plans (e.g. detailed sketches, plan views [showing location and type of channel modifications], example photographs), current condition photographs, and maps. *If						
H.	project involves water leasing or water salvage complete and attach a supplemental questionnaire						
	(fwp.mt.gov/habitat/futurefisheries/supplement2.doc).						
	Attach letters or statements of support. This includes landowner consent, community or public						
I.	support, and fish biologist support.						
	The project agreement includes a 20-year maintenance commitment. Please indicate (yes or no)						
J	The project agreement includes a 20-year maintenance commitment. Please indicate (yes or no) that you will ensure project protection for 20 years. Discuss your ability to meet this commitment.						
	Yes No No						
	The project is on USFWS National Wildlife Refuge. Grayling are a top priority for the USFWS and FWP.						
	Similar projects in Utah have resulted in little need for maintenance. Maintenance will be the responsibility of the refuge. The life expectancy of the project is 30-50 years						
K.	Describe or attach land management & maintenance plans, including changing to grazing						
IX.	regimes, that will ensure protection of the restored area.						
	None necessary. The over-winter conditions are the primary factor driving the grayling population. Once the conditions are improved and stabilized, the population will persist.						

- **III. PROJECT BENEFITS** (attach additional information to end of application):
 - A. What species of fish will benefit from this project?

Arctic grayling. The grayling in Upper Red Rock Lake (Upper Lake) are one of two indigenous populations remaining in the lower 48 states. Due to poor over-winter conditions in the lake, the population has declined from a spawning population of >2,500 adults in 2014 to an all-time low population of 88 adults in 2021.

B. How will the project protect or enhance wild fish habitat?

The project will increase suitable over-winter habitat for grayling in Upper Lake. Suitable habitat is defined as >4 mg/L of dissolved oxygen in water depths >1 m. Over the past three winters, less than 2% of the 893-ha lake has been found to be suitable.

C. Will the project improve fish populations and/or fishing? To what extent? What are the expected short term and long term benefits to the fishery?

Yes. Although Upper Lake is closed to fishing to protect waterfowl, the tributary streams to the lake provide a popular fishery for grayling and Yellowstone cutthroat trout. Both species migrate to Upper Lake for all or most of their life cycles and will beneift from this project. Upper Lake also contains a fast-growing population of burbot.

D. Will the project increase public fishing opportunity for wild fish and, if so, how?

This project will increase opportunity for fishing by enhancing the two species of fish that anglers seek in the Centennial Valley. Grayling are a highly desirable fish and are readily caught when their populations are high. Yellowstone cutthroat trout are a popular sport fish in the Centennial Valley and will benefit from this project.

E. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?

The Upper Lake is a high-elevation, shallow (1 m during winter), postglacial wetland depression where hypoxia can persist for months due to prolonged ice and snow cover and enriched organic sediments that represent high oxygen demand. Research has shown that lake level going into winter can fluctuate by up to 1 m, and that a lower lake level results in unsuitable over-winter conditions. Climate change, especially in the Centennial Valley, has resulted in consistently less snowpack, precipitation, and more years with a reduced lake level (i.e., shallower lake). Historic land-use such as grazing and the construction of Lima Reservoir has increased sediment in the system and altered the hydrology. This project will correct the unsuitable conditions by increasing dissolved oxygen to at least 4 ppm in 20-40 acres of the lake which exceed 1 meter in depth.

F.	What public benefits will be realized from this project?
	This project will help conserve one of two remaining indigenous grayling populations in the lower 48 states. This species provides a popular sport fishery where it occurs (including the Centennial Valley) and has been petitioned for listing on the Endangered Species list twice. Ongoing restoration efforts for grayling in the Big Hole and Centennial valleys have thus far kept the species off the list.
G.	Will the project interfere with water or property rights of adjacent landowners? (explain):
	No. If this species were to be listed on the ESA, the rights of adjacent landowners, water users, and grazers would be interfered with.
H.	Will the project result in the development of commercial recreational use on the site? (explain):
	No.
ı.	Is this project associated with the reclamation of past mining activity?
	No.
Parks s	pproved project applicant must enter into a written agreement with Montana Fish, Wildlife & pecifying terms and duration of the project. The applicant must obtain all applicable permits project construction. A competitive bid process must be followed when using State funds.
l (v	JTHORIZING STATEMENT we) hereby declare that the information and all statements to this application are true, complete, and curate to the best of my (our) knowledge and that the project or activity complies with rules of the ture Fisheries Improvement Program.
Applicar	nt Signature: Can Deany Date: 1/15/21
	r (if applicable):
	tal: Applications must be signed and received on or before November 15 and May 15 to be lered for the subsequent funding period. Late or incomplete applications will be rejected.

Electronic submissions must be signed. For files over 10MB, use PO Box 200701 https://transfer.mt.gov & send to mmcgree@mt.gov Helena, MT 59620-0701 Applications may be rejected if this form is modified.

Email:

Future Fisheries Coordinator at: FWPFFIP@mt.gov

Mail to:

FWP Future Fisheries

Fish Management Bureau

012-2022

BUDGET TEMPLATEPSHEFFTGCROR/TILEREFUSHERIFFSIPRESEM APPLICATIONS Both tables must be completed or the application will be returned

			יסווו נמטוסס ווומסי א	מלום מווו מלוווים מלוווים מלווים	בסנון ומפוכז וומני בס סטולונים כן יווים מלאווימנים ו				
	PROJ	PROJECT COSTS	,			CONTRI	CONTRIBUTIONS		
WORK ITEMS (Itemize by Category)	NUMBER OF UNITS	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST	FUTURE FISHERIES REQUEST	MATCH (Cash or Services)**	OTHER (Not part of this application)	TOTAL	
Personnel***									
Survey		133 HR	\$150.00	\$ 19,960.00		19,960.00		\$ 19,96	19,960.00
Design		200 HR	\$150.00	\$ 30,000.00		30,000.00			30,000,00
Taxes/Bonds/Insurance	90.0	0.05 % of Total		\$ 22,316.25		22,316.25		\$ 22,3	22,316.25
Permitting		80 HR	\$150.00	\$ 12,000.00		12,000.00			12,000.00
Oversight		0.08 % of Construction				34,947.79			34,947.79
Overhead (3.2% of \$100,000 from		0000 % of Total				0000			0000
(5)	2000	200		12	·	\$ 122,424.04			122,424,04
Travel					•		-		
Mileage				- \$				8	
Perdiem								\$	
			Sub-Total	-	· \$	٠	- \$	\$,
Construction Materials****									
Pipe- (Inland Trench- installed)	3310	Linear Foot	\$50.00	\$ 165,500.00	100,000.00	65,500.00		\$ 165,50	165,500.00
Pipe- (Lake- Installed)	2270	Linear Foot	\$37.50	\$ 85,125.00		85,125.00		\$ 85,12	85,125.00
Aeration Structure (Installed)	1	Lump Sum	0	\$ 50,000.00		50,000.00			50,000.00
Contingency (10% of construction, labor, and mobilization costs)	0.1	0.1 % construction	\$436,847.24	\$ 43,684.72		43,684.72		\$ 43,66	43,684.72
								↔ €	
				-				٠,	
								₩ €	
				- -				÷>	
				\$ 344.200.72	000000	\$ 244.200.72	6	\$	- 000 770
Equipment, Labor, and Mobilization	on						- -		27.600
	0.05 HR	光	\$88,000.00	\$ 88,000.00		88,000.00		\$ 88,00	88,000.00
Access Road	870	870 Linear Foot	\$32.90	\$ 28,622.24		28,622.24		\$ 28,62	28,622.24
Seeding/Reclamation	2.8	2.8 Acres	\$4,500.00	\$ 12,600.00		12,600.00		\$ 12,60	12,600.00
Clearing and Grubbing	2.8	2.8 Acres	\$2,500.00	\$ 7,000.00		7,000.00			7,000.00
				\$ -				\$	1
				\$ -				\$	
				\$ -				\$	
				-				\$	
								\$	
								\$	
				- 8				€	
					•				
				\$ 136,222.24	\$	_		\$ 136,22	136,222.24
			TOTALS	\$ 602,956.00	\$ 100,000.00	502,956.00	-		602,956.00

OTHER REQUIREMENTS:

or the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used). Do not use government salaries as match. Describe here or in text.

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a justification or minimum of two competitive bids for the cost of undertaking the project.

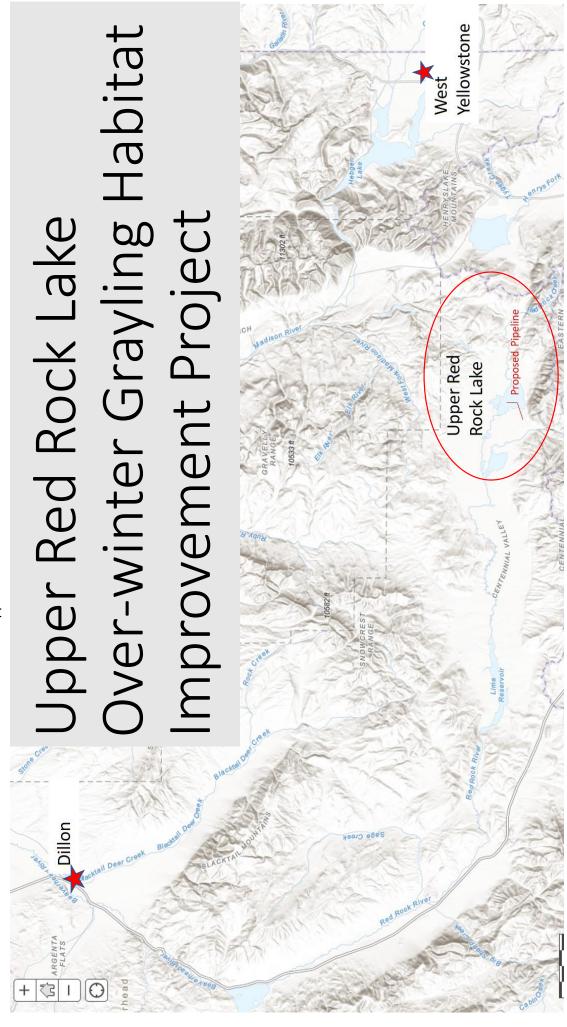
****The Review Panel recommends a maximum fencing cost of \$1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

Additional details: Per FWP's overhead policy, we have included a 3.2% overhead on non-federal match brought in through Trout Unlimited (0.032*\$100,000= \$3,200). We have also included a 10% contingency on all construction costs including Materials, Equipment, Labor, and Mobilization). Mobilization costs are high due to the remote site location, the specialized equipment needed (e.g., amphibious excavator), and non-conventional construction techniques. The project is also within a designated wilderness and archaeological site.

APPLICATION MATCHING CONTRIBUTIONS	HING CONTRI	SUTIONS		
(do not include requested funds or contributions not associated with the application)	outions not associate	d with the application)		
CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
National Fish and Wildlife Foundation (NFWF)	•	\$ 200,000.00 \$	\$ 200,000.00 Y	λ
Trout Unlimited (TU) (Private Donations and Grants) (Includes \$3,200 overhead)	- ↔	\$ 98,320.00 \$	\$ 98,320.00 N	z
State Wildlife Grant (SWG)	- \$	\$ 73,500.00 \$	\$ 73,500.00 N	z
Malteuro	- \$	\$ 38,685.00	\$ 38,685.00 N	Z
USFWS (For Oversight)	- \$	\$ 37,491.00 \$	\$ 37,491.00 N	Z
USFWS (Survey/Design)	- \$	\$ 49,960.00	¥ 49,960.00 Y	Y
Trout and Salmon Foundation (TU- applicant)	- \$	\$ 5,000.00	¥ 5,000.00 Y	Y
	- \$	- \$	-	
\$ 101ALS \$	- \$	\$ 502,956.00	\$ 502,956.00	

OTHER CON	OTHER CONTRIBUTIONS			
(contributions not associated with the application)	iated with the applica	ation)		
CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
	· \$	٠	- \$	
	•	- +	- +	
	•	- +	- +	
	- \$	٠	- &	
	•	- +	- +	
	- \$	٠	- &	
	- \$	٠	- &	
	- \$	- \$	- \$	
\$ STATOT	· ·	- \$	- \$	

Pages 2 of 2 (Revised 11/16/2021)



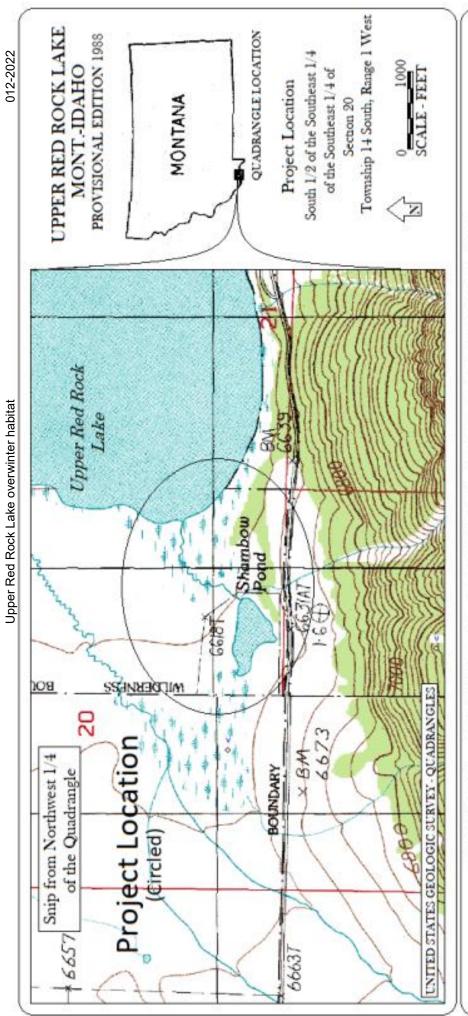


FIGURE 1 - VICINITY - PROJECT - TOPOGRAPHIC MAP

PREPARED FOR: MONTANA FISH, WILDLIFE & PARKS

PREPARED BY CASTLE ROCK GEOTECHNICAL ENGINEERING

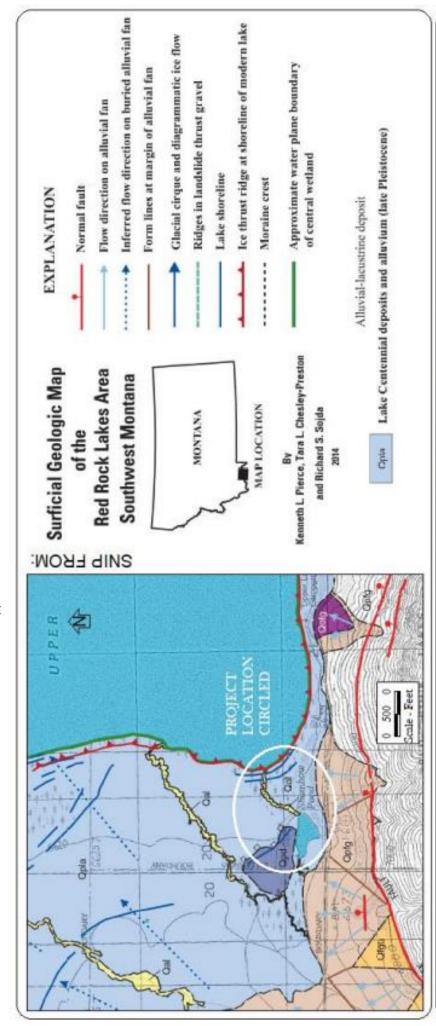


FIGURE 3 - GEOLOGIC MAP

PREPARED FOR FISH WILDLIF AND PARKS

ARCTIC GRAYLING HABITAT IMPROVEMENT WATER PIPELINE

PIPELINE OPTION

Pipe Sizing and Bury Depth

Based on the design flow of 2 cubic feet per second (cfs) and a minimum design pipe velocity of 2.5 feet per second, a 12-inch diameter (nominal) pipe should be needed.

The pipeline should be buried below frost depth in the area, which is approximately 4-4.5 feet deep. In areas where minimum bury depths can not be achieved, provisions for pipe insulation, heat tape, or other means to mitigate potential for pipe freeze should be implemented.

Pipe Materials

The recommended pipe material for this project is High Density Polyethylene (HDPE) pipe. This pipe material is generally readily available, the fastest to install in the field, and has excellent hydraulic properties. This pipe does require imported bedding material to adequately support the pipe under load when installed in a trench. Figure 2 presents the general site plan of this option.

The proposed pipeline from Shambow Pond to Upper Red Rock Lake (URRL) is approximately 5,500 feet in length and generally runs north by northeast to URRL east of Grayling Creek and west of Shambow Creek. Approximately 3,450 feet of this stretch is located on land. The additional 2,050 feet of pipeline is located within URRL.

A flow control structure is proposed near Shambow Pond that should control the outflow into the pipeline. Flow should be conveyed to URRL through the proposed pipeline out to the nearest area within the URRL that reaches a minimum depth of greater than 3 ft (\sim 1 meter). The proposed pipeline termination is approximately 1,400 – 1,500 feet east of the nearest URRL shoreline edge.



INTAKE/FLOW CONTROL SYSTEM

connected to a subsurface vault which should provide the primary head pressure to the pipeline to convey The intake and flow control system should generally consist of an intake pipe complete with fish screen from Shambow Pond into a flow-control structure. From this structure, a short run of pipe should be the design flows to URRL. Figure 3 shows a conceptual rendering of this system.



Figure 3. Proposed Shambow Pond Intake and Flow Control - Conceptual

very low maintenance. Figure 7 shows a rendering of a typical low profile cascade aeration structure. that no electricity is needed and there are no moving parts, which makes for an aeration system with increase dissolved oxygen by up to 6 mg/l in wastewater. The main advantage of these structures is Cascade aeration structures use a series of plates to increase turbulence in water flow, which can

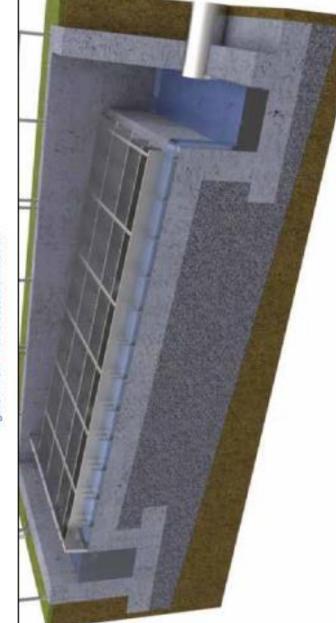


Figure 7. Low Profile Cascade Aeration

https://www.imsequipment.com/low-profile-cascade-aerator/

or 2) a larger diameter pipeline is installed. Literature indicates that up to 6mg/l of dissolved oxygen can be accomplished. However, if the water surface elevation in URRL were to rise more than a few inches, be added to water flowing through the structure. While no field data is available to confirm this number, inches) across the length of the structure. Based on the current configuration of the pipeline, this could this could be problematic for the function of the pipeline unless: 1) flow through the system is reduced Using a low-profile cascade aeration system requires a minimum of elevation drop of 2.5 feet (30 it is likely that a cascade aeration structure could supply the project minimum of 4 mg/L.

Additional References

https://www.youtube.com/watch?v=G3KG0wn TqE Video (saving grayling)-

Adaptive Management Plan-

%20Centennial%20Valley%20Arctic%20Grayling,most%20direct%20ben https://myfwp.mt.gov/getRepositoryFile?obiectID=95840#:~:text=The efit%20to%20grayling

2010-2018 Grayling Report

https://myfwp.mt.gov/getRepositoryFile?obiectID=91786

Centennial Valley Arctic Grayling Adaptive Management Project 2021 Spring Update

- The Centennial Valley Arctic Grayling Adaptive Management Plan (AMP) is being implemented to identify limiting factor(s) for Arctic grayling in the upper Centennial Valley (CV) of southwestern Montana. Non-native hybrid Yellowstone cutthroat trout, spawning habitat, and overwinter habitat have been identified as the three most likely factors that could limit long-term viability of grayling in the upper CV. Long-term viability is expected to be maintained by 1) conserving genetic diversity, 2) establishing spawning and/or refugia in at least two tributaries, and 3) maintaining a spawning population of ≥ 1,000 fish.
- An emphasis on learning through 'management as experiment' during the first phase of the AMP was accomplished via two experiments that 1) reduced non-native Yellowstone cutthroat trout population (2013–2016) and 2) maximized availability of spawning habitat (2017–2020). To date, natural variability has provided opportunity to explore the hypothesized relationship between grayling spawning population and area of suitable winter habitat in Upper Red Rock Lake (Upper Lake).
- The iterative phase of the AMP began in 2021. If grayling spawning population is less than 1,000 fish, management action(s) predicted to restore the population to objective will be implemented. Experimental actions (aeration and pulsed-flow from Widgeon Pond) to mitigate the primary population driver, winter habitat, have been unsuccessful to date. Therefore, the most influential secondary population driver, spawning habitat availability, was maximized in 2021 by notching beaver dams to ensure fish passage.
- The estimated number of Arctic grayling in the 2021 Red Rock Creek spawning population was 88 (95% CI = 26–176), which is not significantly different from annual estimates 2016–2020 (Figure 1). Peak predicted grayling spawning was 11 May.

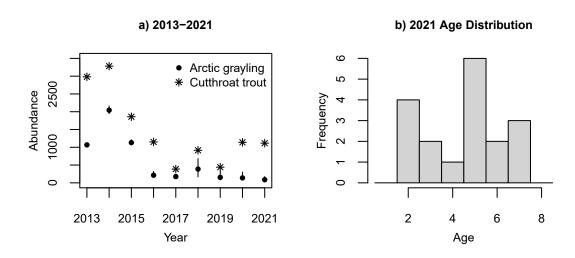


Figure 1. a) Arctic grayling and non-native hybrid Yellowstone cutthroat trout abundance estimates and 95% confidence intervals (grayling only) from Red Rock Creek, 2013–2021, and b) age distribution of the 2021 grayling spawning population.

- The estimated number of Yellowstone cutthroat trout in the Red Rock Creek spawning population was 1116, an approximate reduction of 66% from the highest estimated population in 2014 ($\hat{N} = 3282$) and an increase of 288% from the population nadir in 2017 ($\hat{N} = 387$; Figure 1).
- The minimum area of suitable winter habitat within Upper Lake (i.e., water depth below the ice ≥ 1 m and dissolved oxygen ≥ 4 ppm) was estimated as 5 ha in March. Grayling spawning population was reduced to ≤ 214 fish in all years when <10 ha of suitable winter habitat was available in Upper Lake (Figure 2).
- Based on ten years when winter habitat and grayling spawning population were estimated, a threshold level of 10–25 ha of winter habitat appears necessary to overwinter grayling populations greater than the 1,000 fish objective (Figure 2).
- Suitable spawning habitat was most recently quantified in 2019, with an estimated weighted area of suitable habitat (A_t) of 7 ha in Red Rock and Elk Springs creeks. Surveys to estimate area of suitable spawning habitat will be completed again in 2021.
- The Winter Habitat, Spawning Habitat, and Non-native Fish models predicted 207, 361, and 323 grayling, respectively, in the 2021 Red Rock Creek spawning population; the model-averaged prediction of spawning grayling abundance was 269 fish. The Winter Model continues to be the most supported model, although the Spawning Habitat Model was also relatively well supported (Table 1). The Non-native Fish Model continued to poorly predict grayling population.

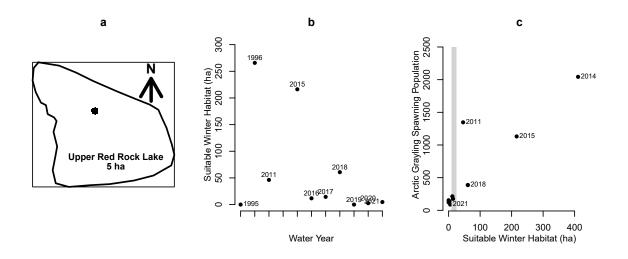


Figure 2. a) Extent of minimum area of suitable Arctic grayling winter habitat in Upper Red Rock Lake, 2021, b) annual estimate of minimum area of suitable habitat for water years 1995–2021, and c) grayling spawning population as a function of minimum area of suitable winter habitat for years when both were estimated (1995 [0 ha], 2016 [8 ha], 2017 [9 ha], 2019 [0 ha] and 2020 [0 ha] points are plotted but not labelled). The shaded polygon represents an hypothesized threshold (10–25 ha) of suitable winter habitat where 1) enough winter habitat is available to sustain grayling population at objective ($N \ge 1,000$ fish, > 25 ha suitable habitat), and 2) winter habitat presumably reduces grayling survival, resulting in grayling population below objective ($\hat{N} \le 214, <10$ ha suitable habitat).

Table 1. Arctic grayling spawning abundance model predictions, observed abundance, and relative model weights for 2021. Model weights, which sum to 1, are a measure of relative support for a model given the data.

Model	2021 Prediction	Observed	Model Weights
Winter Habitat	207	88	0.576
Spawning Habitat	361	88	0.333
Non-native Fish	323	88	0.090

- We will continue to learn how grayling respond to the Yellowstone cutthroat trout population and spawning habitat availability as 1) grayling cohorts spawned during low trout abundances and high availability of spawning habitat recruit, and 2) Yellowstone cutthroat trout spawning population recovers.
- An alternatives analysis was completed in 2019 to assess costs, logistical and legal feasibilities, and
 likely effects on grayling of all winter habitat enhancement approaches. Two alternatives, solar aeration
 and flow augmentation to Elk Springs Creek from Widgeon Pond, were experimentally assessed during
 the winters of 2019 and 2020, respectively. Neither approach successfully increased area of suitable
 winter habitat for grayling.
- Final engineering design of a tributary point-of-inflow modification will be completed in 2021 to further clarify the effectiveness, costs, and impacts of this alternative. Environmental compliance and identification of funding sources could occur winter 2021, with construction occurring summer 2022.

Authors:

Jeff Warren¹, Matt Jaeger², Tim Gander², Ryan Kreiner², Kyle Cutting³, Lucas Bateman², Terrill Paterson².

¹ U.S. Fish and Wildlife Service, Division of Science Resources,

² Montana Fish, Wildlife and Parks,

³ U.S. Fish and Wildlife Service, Red Rock Lakes National Wildlife Refuge.



Upper Red Rock Lake overwinter habitat United States Department of the Interior

O12-2022 FISHA WHIDLIFE SERVICE

FISH AND WILDLIFE SERVICE Red Rock Lakes National Wildlife Refuge 27650B South Valley Road Lima, Montana 59739

In Reply Refer to: FWS/IR05/IR07

November 12, 2021

Montana Fish, Wildlife & Parks
Fisheries Division - Future Fisheries Improvement Program
1420 E. Sixth Ave.
PO Box 200701
Helena, MT 59620-0701

Employees of Montana Fish, Wildlife and Parks (FWP) and the Fish and Wildlife Service (FWS) are working together to improve habitat that will benefit a rare endemic adfluvial population of Arctic grayling, and other species of wild native fish and invertebrates. This grayling population winters exclusively in Upper Red Rock Lake (URRL) within the Refuge. Research conducted by FWP and FWS indicate poor over-winter conditions are the limiting factor. Dissolved oxygen typically declines and becomes hypoxic over the course of winter. Several years ago 90% of the population perished in an apparent winterkill event. Since then the population has not recovered and is hanging on at a low level. Rapid action is necessary. This project is intended to deliver dissolved oxygen to the deepest part of URRL. Consultants are currently working out the specifics of the project and addressing important questions. Despite some uncertainty, this project is a high priority for the Refuge, and we support efforts to acquire funds necessary to complete it. Do not hesitate to contact me if I can answer any questions. Thank you for your consideration!

Mike Bryant

Wildlife Refuge Manager

406 276-3536 x103

406 596-1853 (c)

INTERIOR REGION 5 MISSOURI BASIN INTERIOR REGION 7
UPPER COLORADO RIVER BASIN



November 5, 2021

Montana Trout Unlimited PO Box 7186 Missoula, MT. 59827

Ryan Kreiner, Native Species Fisheries Biologist Montana Fish, Wildlife & Parks, R3 Fisheries Division 730 N. Montana Street Dillon, MT 59725

Re: Upper Red Rock Lake Overwinter Habitat Improvement for Native Arctic Grayling

Dear FWP, Future Fisheries Review Panel:

Montana Trout Unlimited (MTU), on behalf of more than 4,500 statewide members, including local membership in the Chuck Robbins Chapter of Trout Unlimited, supports Montana Fish, Wildlife & Parks' (FWP) Future Fisheries Improvement Program application. We ask that the Future Fisheries panel fully fund the request of \$100,000 to secure a future for this imperiled, endemic population of native Arctic grayling in Upper Red Rock Lake (URRL).

FWP's fishery management depends on sound science. FWP biologist, in partnership with US Fish & Wildlife Service biologist, have gone above and beyond in their due diligence to understand the limiting factors for the URRL grayling population. The development, implementation, and data analysis of the *Centennial Valley Arctic Grayling Adaptive Management Plan* (2013) has led to the determination that hypoxic conditions in URRL are the limiting factor for Arctic grayling, a species that inhabits approximately 4% of their native range.

After years of detailed research and design, all project partners came to a consensus on October 28, 2021, that developing a pipeline from the adjacent spring-fed Shambow Pond to deliver a new source of cold, well-oxygenated water to URRL is the only feasible path forward to restore one of the most unique populations of native fish in North America. During recent winters, the amount of suitable habitat for over-wintering grayling has shrunk to <5 acres. Research has shown that if suitable habitat declines below 25 acres in the winter, there is a corresponding decrease in the grayling population. Water from Shambow Pond will increase the area of oxygenated water in URRL to more than 25 acres. Projects across Southwest Montana that restore grayling populations have helped to keep them off the Endangered Species List. A win for conservation advocates and all citizens of Montana alike.

MTU's mission is to conserve, protect, and restore Montana's world class fisheries and their watersheds. We have been a steadfast partner in many projects in the Centennial Valley, including this one, that improve grayling habitat. In December 2020, MTU was awarded a \$200,000 grant for this project from the National Fish and Wildlife Foundation. We secured

\$5,000 from the Trout and Salmon Foundation in September, 2021. We will submit a \$5,000 grant to the Montana Trout Foundation by December 1, 2021. We are committed to raising up to an additional \$95,000 for this project. We have and will continue to raise awareness for native fish recovery through our quarterly newsletter, *Trout Line*, with a distribution of over 5,000 households in Montana, online, and elsewhere.

Like many Montanans, our members prize the opportunity to pursue native fish in their native habitat. That is why MTU advocates for the restoration of Arctic grayling across their native range. This is a unique opportunity to support a historically significant project for the benefit of Arctic grayling. Not to mention, future generations of fishermen, conservationist, and advocates for wild places that harbor wild, native fish and wildlife.

Thank you for considering our input on this project. Feel free to contact us with any questions regarding our comments.

Sincerely,

Dr. David Brooks Executive Director

Montana Trout Unlimited david@montanatu.org

De Old

Chris Edgington

Oh Egyfu

Jefferson Watershed Project Manager Montana Trout Unlimited

chris@montanatu.org