

**Final Report WNTI No: 2022-SG-01**

**Rainey Creek Restoration Kiosk**



**Report completed by**

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**Prepared for Western Native Trout Initiative**

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The Rainey Creek Restoration Kiosk was constructed and installed along the Rainey Creek Phase 1 (Bridge to Bridge) project location in Swan Valley, Idaho to showcase the Rainey Creek stream restoration and habitat improvements for Yellowstone Cutthroat Trout (YCT) and other cold-water aquatic species. Three panels were constructed with each panel presenting the work completed on lower Rainey Creek, Yellowstone Cutthroat Trout life cycles, macroinvertebrates, and local volunteer efforts. In addition to the work captured, all of the supporting partners were included in the kiosk.

**Location description:**

The project is located ~2.5 miles upstream from the confluence of Rainey Creek and the South Fork Snake River in Swan Valley, Idaho.

GPS coordinates; 43.447119°, -111.331457°

**Kiosk Panels**


## WHY RAINEY CREEK?

Rainey Creek is one of four major tributaries to the South Fork Snake River that supports Yellowstone Cutthroat Trout and other cold water aquatic species. Although the largest of the four tributaries, Rainey Creek is the least productive and has suffered from degraded stream habitat and increasing stream temperatures. The Henry's Fork Foundation's South Fork Initiative (HFF-SFI) and critical partners have been collaborating to restore over 8 miles of Rainey Creek.

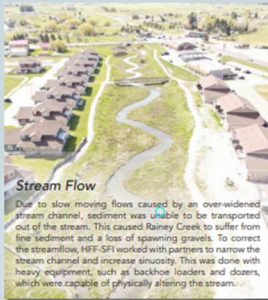
### PROBLEMS

- Solar Loading
- Stream Flow
- Spawning and Rearing Habitat


### SOLUTIONS



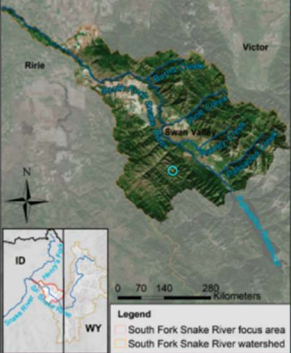
**Solar Loading**  
Solar loading is where thermal stress is felt due to solar radiation. Species such as YCT are very sensitive to water temperatures and need cool water for survival. A loss of riparian habitat along the lower 8 miles of Rainey Creek caused the stream to experience warmer stream temperatures. Partners such as Madison High School and Swan Valley Elementary school have helped HFF-SFI to riparian the riparian zone with native plants such as shrubs, cottonwoods, and willows to offset solar loading and lower the water temperatures.



**Stream Flow**  
Due to slow moving flows caused by an over-widened stream channel, sediment was unable to be transported out of the stream. This caused Rainey Creek to suffer from fine sediment and a loss of spawning gravels. To correct the streamflow, HFF-SFI worked with partners to narrow the stream channel and increase sinuosity. This was done with heavy equipment, such as backhoe loaders and dozers, which were capable of physically altering the stream.




**Spawning and Rearing Habitat**  
Trout look for shallow, rocky areas to deposit their eggs. To create more opportunities for spawning and rearing, HFF-SFI and partners added gravel to the stream. As trout grow, they also need places to hide from predators during the day and shade where they can stay out of the sun. Woody debris were placed throughout the stream, providing for the perfect hiding places.













**Legend**  
South Fork Snake River focus area  
South Fork Snake River watershed

### WANT TO KNOW MORE?

You can find out what else the Henry's Fork Foundation's South Fork Initiative is doing in the South Fork watershed to improve river and stream health, improve fishing and floating experiences, as well as any local education and outreach by visiting [Henrysfork.org](http://Henrysfork.org).



### THANK YOU TO OUR PARTNERS

Madison High School, Swan Valley Elementary  
Landowners: Shane Fleming and Brad Elg, and the public

Panel 1. Background of Rainey Creek representing habitat problems and solutions. The panel also represents the partners that have played a role in Rainey Creek restoration projects.

## RAINEY CREEK BRIDGE RESTORATION: PHASE ONE

Standing here, you will see the improved section of Phase 1 on Rainey Creek. From 2019-2022, HFF-SFI and partners worked with local landowners to improve over ½ a mile of Rainey Creek.



**Solar Loading:** Prior to restoration, this section of Rainey Creek had high amounts of solar loading, with little shade and slow moving water, which causes higher water temperatures. Fish need cool water to be healthy. Today, over 1,000 native plants have been planted along the streambanks, provide ample shade, which has reduced the solar radiation coldwater aquatic species are exposed to.

**Streamflow:** Prior to restoration, this section of Rainey Creek was wide and very straight with fine sediment that could not be transported out of the stream. Today, there are a diversity of habitats such as deep pools, riffles, and glides.

**Spawning and Rearing Habitat:** Prior to restoration, this section of Rainey Creek provided zero spawning gravels and very limited fish habitat. Today, there are plenty of areas for fish to spawn and for juvenile fish rearing, as well as cover for fish to hide. Immediately following the restoration project, several fish were observed spawning in this section, and juvenile fish were present.



### FUTURE RESTORATION

Phase 2 will be completed in May 2023, connecting an additional .30 miles to the upstream Phase 1. These two projects are part of the ongoing Rainey Creek Watershed Enhancement. Working with many partners, we plan to restore the lower 8 miles of Rainey Creek and tributaries to improve habitat for native Yellowstone Cutthroat Trout (YCT), macroinvertebrates, and other wildlife.

None of this work would be possible without critical partners. Thank you to all of the community members, volunteers, landowners, state, federal, and non-governmental partners. See a full list of SFI's partners and collaborators at <https://www.henryfork.org/partners>.

Panel 2. This panel represents the work that was completed on Rainey Creek-Phase 1, including pre and post photos. The panel is strategically located to allow visitors to learn about the projects and walk along the concrete path on Phase 1. The walking bridge allows visitors and residents to view the project from a different perspective and potentially see trout spawning during the spawning season.

# COLDWATER AQUATIC SPECIES OF THE SOUTH FORK



The South Fork of the Snake River is one of only 3 strongholds for native Yellowstone Cutthroat Trout (YCT) in the state of Idaho. YCT can be identified by the two prominent red slashes on its lower jaw.

## HABITAT

The South Fork of the Snake River Yellowstone Cutthroat Trout prefer cold, gravelly streams with naturally varying flow (such as pools and riffles). They generally feed on insects, invertebrates, and other smaller fish.

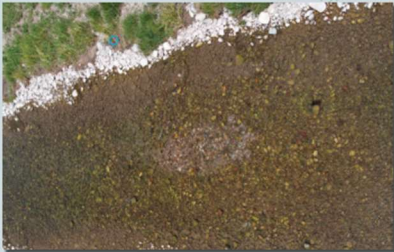
## OTHER SPECIES

The Yellowstone Cutthroat Trout is the only native trout species on the South Fork. Other trout species were introduced in the late 1800s and compete with the Yellowstone Cutthroat Trout for food and other resources.

## CAN YOU SPOT THE REDD?

Throughout the year, coldwater fish spawn in patches of gravel where they dig a small hole with their tail. This hole is called a redd. The female deposits fertilized eggs into the hole then covers it back up with gravel. YCT spawn (lay eggs) in the spring, whereas Brown Trout spawn in the fall.

Can you spot the redd?



**MOTTLED SCULPIN** (*Cottus bairdi*) – A native fish that lives amongst the rocks and gravel of stream beds.



**RAINBOW TROUT** (*Oncorhynchus mykiss*)/**CUTBOW TROUT** (*Oncorhynchus clarki* x *O. mykiss*) – A hybrid species, cross between Rainbow and Yellowstone Cutthroat Trout.



**BROWN TROUT** (*Salmo trutta*) – A native fish in the salmonid family.



**MOUNTAIN WHITEFISH** (*Phoxinotus willamsoni*) – A native fish in the salmonid family.

## A HEALTHY HABITAT

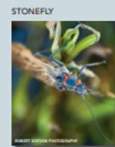
Did you know that Macroinvertebrates show how healthy a stream is? Macroinvertebrates such as Mayflies, Caddisflies, and Stoneflies need healthy, clean, cold water to survive. YCT and other salmonids rely on these macroinvertebrates for food.



MAYFLY



CADDISFLY



STONEFLY

**Adult**  
Adult trout are strong enough to swim around in pools of lakes and eat insects and even other fish.

**Eggs**  
Trout eggs are in nests, or redds, buried in the gravel of streams and absorb oxygen through their shell.

**Fry**  
Trout fry are tiny when they first hatch and must eat small insects and other organisms.

**Alevin**  
As alevin, trout breathe through gills and eat all the naturally occurring food from their parents.

Panel 3. This panel provides the background of the cold-water aquatic species of the South Fork Snake River and trout life cycles. In addition, one photo captures a trout redd that was constructed in the following Spring, immediately following the Rainey Creek Phase 1 stream restoration project completion.

## Rainey Creek-Project Background

### Project summary:

Historic land-use practices have over-widened, impounded, and degraded much of the lower five miles of Rainey Creek, and Rainey Creek is the least productive Yellowstone Cutthroat Trout (YCT) tributary of the four major South Fork Snake tributaries. Over the last four years, the Henry's Fork Foundation (HFF) - South Fork Initiative (SFI) program has collaborated with state and federal agencies and local landowners to work towards the goal of restoring the lower five miles of Rainey Creek. In general, restoration goals are focused on restoring the heavily degraded riparian and instream habitat and improving habitat complexity to promote native YCT spawning and rearing, as well as improve habitat for other native, cold-water aquatic species.

The Rainey Creek Bridge-to-Bridge: Phase 1 and 2 projects aimed to restore natural stream function in the reach by restructuring 1,390 feet and 1,638 feet, respectively, of stream channel that would increase water velocity, habitat complexity, stream cover, and reduce fine

sediments in the channel. The Phase 2 project connected the upper Phase 1 project for a combined total of 2,753 feet of restored channel. During construction, shallow channels were narrowed, fine sediment was removed from the streambed, gravels and cobbles were introduced into the system, and the restructured reach incorporated deep pools, spawning-pool tail outs, riffles, and glides. Additionally, large woody debris and riparian vegetation were placed and planted throughout reach to provide cover and decrease solar loading, effectively decreasing water temperatures within, and below, the reach. SFI and volunteer crews will revegetate Phase 2 with native plants in the Fall of 2023. Phase 1 revegetation was completed in 2022. Below are Before and After photos of Rainey Creek Phase 2.



**2021-Rainey Creek Phase 2- Before Restoration**



**2023-Rainey Creek Phase 2-After Restoration (revegetation will occur in Fall, 2023)**

## Other completed projects in the Rainey Creek Watershed

In addition to competing the Rainey Creek (Bridge to Bridge) projects where the Kiosk is located, SFI and partners have completed the following projects:

### Rainey Creek-U.S. Forest Service Work Station

#### Forest Service Rainey Creek Restoration - Results

The Rainey Creek restoration narrowed the channel from an average of 36ft to 18-20ft and restored lost pool, riffle and spawning habitats to improve aquatic conditions for native Yellowstone Cutthroat trout and improve water quality conditions for a IDEQ 303 (d) listed water body. This also increased wetlands along the 1,840ft (0.35 miles) length of channel converting 0.55 acres of open water to emergent and shrub wetland community types.

New bridge and armored water gap was installed in winter 2019/20 and channel narrowing was completed in winter of 2020/21. The stream restoration and the newly created 0.55 acres of wetland is protect with a new livestock enclosure that replaced the old fence.

This project was made possible through a partnership with Local Highway Technical Assistance Council (LHTAC), South Fork Initiative of the Henry's Fork Foundation and the Caribou-Targhee National Forest. This restoration provide important wetland mitigation acres for LHTAC to support local roads projects and in return provide needed restoration funds to improve stream and riparian conditions on Rainey Creek.



**2019-Rainey Creek, USFS Work Station-Before Restoration**



**2021-Rainey Creek, USFS Work Station-After Restoration (Riparian Fencing included)**





**Spring 2021-Rainey Creek, USFS Work Station-Blue arrow points to trout redd in restored reach.**

### **Third Creek (a tributary to Rainey Creek)**

In November of 2018, the South Fork Initiative initiated a collaborative restoration project on Third Creek, a tributary to Rainey Creek. Support and partnership for this project were led by the Idaho Department of Fish and Game (IDFG) with the HFF's South Fork initiative.

As a potentially productive spring creek, Third Creek has stable flows of cold spring water and the potential to be great spawning and rearing habitat for wild and native trout, including YCT. However, years of historic land-use practices and an undersized culvert caused Third Creek to become over widened and full of sediment, which elevated water temperatures.

To restore Third Creek, a larger culvert was installed so the creek could flow easily downstream. The channel width was narrowed and riffles, runs, and meander pools were created, all leading to cooling the water temperatures. Willow trees and woody debris were also placed in and along the creek to stabilize banks, secure pools, and provide cover for trout. Third Creek has been restored to create critical spawning and rearing habitat for wild and native trout, including

YCT. Prior to the restoration of Third Creek, fish sampling showed no trout present. The following year fish sampling showed fifty-one live trout, with thirty-one being YCT.



**Before Restoration (2018)**



### **After Restoration (2019)**

In 2021, the second phase of Third Creek was implemented and an additional 3,351 feet of degraded stream channel was restored directly upstream of Lower Third Creek. In addition to this instream restoration work, a total of 4,745 feet of riparian fencing was installed and a larger culvert installed to allow fish passage. In addition to the completion of the second phase of Third Creek restoration, the landowner and SFI are working with the Natural Resource Conservation Service (NRCS) on installing a new solar water pumping station and installing water troughs for cattle to maintain cattle production, while excluding cattle from Third Creek.



Before Restoration (2020)



After Restoration (2022)

Before and After photos of the Third Creek (phase 2) stream restoration on the upper portion that was treated in the fall of 2021. The upper photo was taken before (7-12-2020) where the channel was impounded and over widened. The lower photos were taken the spring right after restoration occurred (5-19-2022) showing the narrowed channel conditions with a healthy expanded riparian floodplain that was protected with an enclosure fence.



**Before restoration (2021)**



**After restoration (2022)**

### **Rainey Creek-Matheson's (private landowner)**

SFI and partners worked with a local landowner to restore 1,007 feet of highly degraded stream banks. Excessive bank erosion was occurring on several banks that had led to decreases in the quality of aquatic habitat and water quality.



**Before Restoration (2021). Photo credit to Louis Wasnieski (Wild Waters Restoration)**



**After Restoration (2022)**

## **Future projects in the Rainey Creek Watershed**

SFI continues to lead the Rainey Creek Watershed Restoration Working Group (RCWRG) that is dedicated to restoring the lower 5 miles of Rainey Creek. This working group, consisting of state and federal agencies, nonprofits, and landowners, meets on a regular basis to prioritize projects that will have the largest impact for the watershed. SFI and RCWRG is currently working on the following projects:

### *Caboose Culvert-fish passage barrier*

The Caboose Culvert Replacement project will address an undersized culvert on Rainey Creek that is acting as a hydraulic barrier for upstream fish passage, sediment trap, and impediment for natural stream functions. SFI and partners are currently working with a consulting firm to complete the hydraulic assessment and choose the preferred alternative to address the undersized culvert. Alternatives include a bottom-less arch culvert or a bridge. Once completed, an additional 12-15 miles of prime stream habitat will be accessible for YCT and other trout.

### *Rainey Creek diversion fish drum*

SFI is currently working with Trout Unlimited (TU) on improving a diversion structure that has caused fish entrainment in the past. SFI and TU will be installing the new rotary fish drum screen in October, 2023.

### *Third Creek Temperature enhancement and riparian improvement project*

SFI and partners are working with a private landowner on improving returning agriculture flood irrigation water that enters Third Creek as solar loaded surface water. The project will entail constructing a small wetland feature that will capture returning flood irrigation water and return the water through groundwater and not surface water. Ultimately, this project will decrease returning stream water temperatures into Third Creek.

### *Rainey Creek Future Restoration projects- design and assessments*

SFI has recently secured funding with the Department of Energy and Idaho National Laboratory to complete three design and assessments on projects identified as degraded stream reaches on Rainey Creek.

## Water Quality, Macroinvertebrate Sampling, Education and Outreach

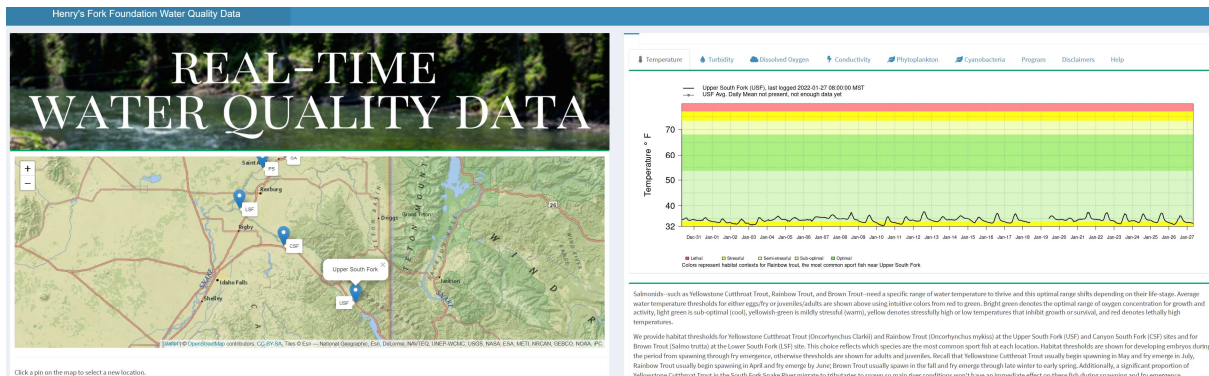
In addition to all of the Rainey Creek Restoration projects, SFI also conducts water quality sampling projects, and education and outreach with the local community and schools. Below is a brief summary of each project. Additional information about each project can be viewed at our South Fork Snake Story map created by Sydney Schmitter, a Stanford University intern that worked with the Henry's Fork Foundation in 2021.

### [South Fork Initiative Story Map Link](#)

<https://storymaps.arcgis.com/stories/9ab8d7c08d464f4f9aa8a13db2da49b9>

### *Water quality monitoring*

The HFF – SFI maintains water quality monitoring equipment at three locations along the SFSR that collect data on temperature, pressure, dissolved oxygen, turbidity, conductivity, blue-green algae, and chlorophyll at 15-minute intervals using YSI EXO 3 Multi-Parameter Sondes and corresponding probes. These data are transmitted back to an internal HFF server using Campbell Scientific data loggers, modems, and Verizon networks where they are processed, hosted, and publicly available on our real-time [HFF Water Quality Website](#).





*samples, we estimated 5,900 tons of sediment were mobilized out of Palisades Reservoir between July 14 - November 30, 2021. This was roughly 1,500 tons more sediment compared to the same period in 2020 when the reservoir was drafted to only 42.5% of capacity. The reach between the Upper South Fork water quality monitoring site and the Canyon South Fork water quality site had a net export of ~2,870 tons of sediment from July 14 – September 14, 2021, when flows were high and the reservoir was above 10% of capacity. When reservoir capacity dropped below 10%, sediment mobilization increased from Palisades Reservoir and there was a net deposition of ~1,500 tons of sediment in the reach between September 15 – November 30, 2021. This information provides valuable insight into the timing and abundance of sediment mobilization from Palisades Reservoir and will be used to inform future water management scenarios aimed at preventing or minimizing the draft of Palisades Reservoir below 10% capacity to protect downstream water quality and aquatic habitat.*

#### *Aquatic macroinvertebrate monitoring*

The HFF-SFI conducts annual monitoring of aquatic macroinvertebrates in the SFSR. Starting in 2019, HFF staff have used Hess samplers to take six replicate benthic samples at three distinct locations within the SFSR during the last week of February. Samples are put in a preservative and delivered to a lab in Manhattan, MT where expert entomologists sort, identify, and count macroinvertebrates within the sample and compile a summary report that includes raw data.

Aquatic macroinvertebrates are an essential component of a functioning ecosystem. They convert primary energy sources into food for fish and other terrestrial species. Additionally, the abundance and composition of species within aquatic macroinvertebrate communities are great indicators of water quality and overall health of an ecosystem. By monitoring aquatic macroinvertebrate communities within the SFSR, we hope to be able to understand how flow conditions at different times of the year directly and indirectly impact water quality, habitat, and subsequent macroinvertebrate communities. Even though our macroinvertebrate monitoring program hasn't been going on long enough to provide real-world application of how the data have helped inform management on the SFSR, below is an example of how we used aquatic macroinvertebrate data from the Henry's Fork to help inform management that improves aquatic habitat quality.

*In the winter of 2019, high inflow and high reservoir carryover at Island Park Reservoir (major irrigation reservoir on the Henry's Fork) allowed state, federal, NGO, and irrigation entities the opportunity to discuss implementing a three-day managed freshet (high pulse of water) in early May to try and mobilize sediment from the reach of the Henry's Fork downstream of Island Park Dam that had an estimated 90,000 tons of sediment deposited when Island Park Dam was emptied in 1992. Understanding that the proposed freshet flow wouldn't impede storage or irrigation obligations for the upcoming year, water managers agreed to implement the managed freshet flow. Using water quality monitoring data from the Henry's Fork, an estimated 550 tons of sediment (25% of the mean annual scour) were transported out of the reach below Island Park Dam during the managed freshet and the net transport of sediment out of the reach*

*had a significant impact on the macroinvertebrate communities. The data from our annual macroinvertebrate monitoring in March, 2020 showed substantial changes in macroinvertebrate community compositions in the reach with all trends supporting significant improvements in habitat quality. The data collected from the macroinvertebrate and water quality monitoring programs highlight not only the benefits of the early spring freshet on habitat quality in the Henry's Fork, but the mechanistic drivers that are behind it. The intentional early-spring freshet on the Henry's Fork is now regularly implemented whenever winter water and storage conditions permit.*

More information regarding our macroinvertebrate sampling program and results from 2020-2021 can be found at the following link:

<https://www.henrysfork.org/post/henry-s-fork-macroinvertebrate-monitoring-2020-2021>

### *Community Involvement / Stewardship*

HFF has been active in engaging local citizens and students in all of our restoration projects to foster stewardship and appreciation for the Rainey Creek watershed. During 2021-2023, HFF employees gave seven presentations on the Rainey Creek restoration projects to >100 individuals from various state organizations, NGO's, and the general public; we had >50 local volunteers help cut and transport willows; our USFS partner hosted two field tours of fifty, fourth through eighth grade Swan Valley students; and HFF has partnered with Madison High School and the Future Farmers of America to propagate native plants for our restoration projects. We plan to maintain and expand these efforts with future restoration and fish passage projects.



USFS Hydrologist (Louis Wasnieski) providing a tour of the Bridge to Bridge - Phase 1 Rainey Creek Restoration project to local elementary students.

### *Fundraising Events*

Each year the HFF-SFI hosts a fundraising event to help support all of the work that is completed on the South Fork Snake River. In 2023, Shane Fleming (SFI committee member) hosted the annual Fleming Barn Party and SFI was the recipient. Over 450 guests joined the event to show their support and love for the South Fork Snake River. It was an incredible event, and over \$156,000 was raised to support ongoing projects in this amazing watershed. The community of Swan Valley and neighboring communities are very committed to protecting and persevering the South Fork Snake River and their continued support is truly amazing.



The Fleming Family, SFI, and volunteers accepting the check that was raised at the Fleming Barn party on behalf of SFI and the South Fork Snake River.

The Henry's Fork Foundation-South Fork Initiative truly appreciates that continued support from the Western Native Trout Initiative. Without you and so many of our funding partners, we could not complete this incredible work so vital to protecting and restoring our Western Rivers and salmonid habitat

Thank You,

David Weskamp, SFI Restoration manager