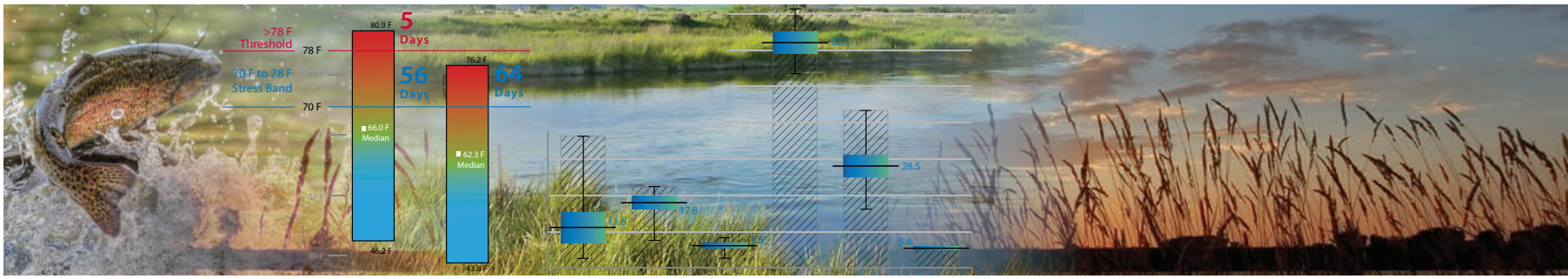
2019

Silver Creek Annual Report

Ecosystem Sciences Foundation



Ecosystem Sciences Foundation

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2019 Annual Report

Silver Creek Watershed

Photo: Shutterstock/CSNatzger

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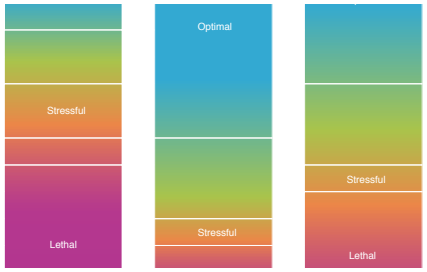
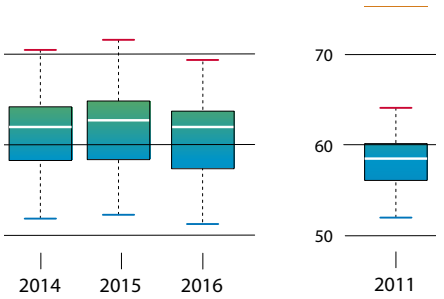




Silver Creek Watershed

Ecosystem Sciences Foundation (ESF) has been working in the Silver Creek watershed since 2009, when it partnered with The Nature Conservancy to develop a Restoration and Enhancement Strategy for the Silver Creek Watershed. The strategy identified numerous actions to be taken, including addressing data gaps on stream flow, temperature and sediment conditions. To address these data gaps, ESF began its monitoring program in 2010 to increase our understanding of the Silver Creek system. This past year, ESF and its partners continued to gather critical data on stream flows, temperature, and dissolved oxygen. In addition, ESF conducted statistical analyses of temperature monitoring results and prepared an in-depth review of recent water quality research performed by the U.S. Geological Survey.

To date, our Silver Creek program has enjoyed support from numerous stakeholders. Most of the land within the watershed is privately owned; landowners in the watershed recognize the need to protect the ecological health of the watershed, as well as their rights as landowners. Our partners and stakeholders have been integral in helping us achieve our vision of providing direction for stewardship of the Silver Creek Watershed and in designing and promoting appropriate stream restoration and enhancement actions.

The significant conclusions and findings from 2019 are:

- In 2019, Silver Creek flows were above the historic average discharge within the system. A relatively high snowpack into late spring resulted in a high water volume in all tributary streams, as well as a higher second peak of water volume in June 2019, as compared to June 2018.
- With some exceptions, temperatures in the Silver Creek system are lower as compared with the last several years. Some reaches still saw temperatures above the stressful limit for fish for prolonged periods.
- Dissolved oxygen monitoring indicated that in some areas of Silver Creek, dissolved oxygen concentrations have become so low that they stress all life stages of trout, most notably in Butte Creek and Lower Silver Creek. However, these conditions are generally limited to early morning hours. In the afternoon, dissolved oxygen levels rise rapidly. Cold tributary creeks like Grove, and Upper Loving maintained higher dissolved oxygen levels than Butte Creek and Lower Silver Creek.

For more details please visit: www.savesilvercreek.com

The information that is presented in this report reflects summarized analysis of all data. We are presenting the most important aspects of the past season's work in a way that tells a story of the stream system and watershed. The information presented here is a result of detailed, scientifically rigorous analysis, and reflects a considerable amount of field work to collect. The website, which has been recently updated and redesigned, has additional information on programs in the watershed, including raw and tabulated data.

Summary
Silver Creek Ecology

The Silver Creek watershed is host to an array of ecological and physical factors that work together to create the habitat necessary for trout to thrive. Among those factors are submerged aquatic vegetation, gravel and sediment, riparian vegetation, stream temperature and dissolved oxygen. A summary of these primary characteristics that make up Silver Creek are outlined here.

Submerged Aquatic Vegetation

Submerged aquatic vegetation (or aquatic macrophytes) is important for the food base of trout (due to their association with stream macroinvertebrates), but Chara beds (a type of submerged aquatic vegetation) that grow on gravel substrates with higher velocities are superior to the communities that flourish in slow-moving silty areas. There have been conflicting reports of Chara being present in silty areas as well.

Aquatic vegetation volume in the creek follows a seasonal cycle, with lower densities in the late winter and early spring, and higher densities in mid-to-late summer. This affects channel conditions, as water levels and velocity profiles are modified by the vegetation volume. The vegetation also affects dissolved oxygen concentrations, which can vary greatly during summer months.

The aquatic vegetation provides cover for trout. When vegetation is absent, trout require cover in the form of deep pools, overhanging streambanks and large wood. Much of Silver Creek lacks deep pools, and fish congregate in those that do exist.

An over abundance of aquatic vegetation, however, can also trap fine sediment, covering gravels and changing hydraulics.

Silt and Fine Sediment

In its original form, Silver Creek was likely a gravel bed system.

Silt and fine sediment have been identified as a problem in Silver Creek since at least the 1940s. Land use practices, both past and present, are most often cited as being responsible for the excessive sediment loads, which vary between tributaries and the main stem reaches.

Loving Creek, Stalker Creek and portions of Chaney Creek are noted as containing high volumes of silt, while certain reaches on Stalker Creek and Loving Creek have been identified as the largest sources of sediment to Silver Creek.

Silt deposition areas that lack aquatic vegetation are associated with a community of insects considered undesirable for producing a trout food base.

Silty areas have also been attributed to increased stream temperatures and a decrease in suitable spawning habitat.

Removal of silt, coupled with increased depths and velocities through restoration actions have been shown to benefit macroinvertebrate community composition.

A diversity of substrates, including multiple gravel sizes as well as areas of fine sediment have been associated with higher macroinvertebrate species richness.

Riparian Vegetation

Many investigations have noted the need for woody riparian vegetation along streambank margins. They stabilize stream banks, provide food and cover for fish, and reduce airborne sediment inputs to the creek. Species such as Booth's willow, Yellow Willow, Coyote willow, Drummonds willow, red-osier dogwood and water birch are considered to provide these benefits.

Reed canary grass has invaded the system and has moved into the channel in shallow areas with low velocities, negatively affecting stream morphology. To prevent reed canary grass invasion into the channel, restoration that creates increased depths and velocities is recommended.

Riparian buffer zones are being evaluated as permanent solutions to address sediment reduction.

Temperature and Dissolved Oxygen

Temperature in portions of Silver Creek reach over 70°F in mid-summer, which is stressful for trout. These conditions most often occur in Upper Stalker Creek, Lower Mud, Loving Creek (especially the North Fork of Loving) and lower reaches of Silver Creek (downstream of HWY 20).

Dissolved oxygen levels can fluctuate from super-saturated to very low levels in some reaches of Silver Creek during summer months. Fish kills and closures of the fishery have been attributed to these extreme dissolved oxygen levels.

Habitat Use by Fish

Although fish are known to migrate within the stream, many reports indicate that fish do not move large distances in Silver Creek.

Having a diversity of habitats where fish can hold, feed, and even spawn in close proximity is desired. Having riffles and pools in close proximity will allow trout to move between holding and feeding areas.

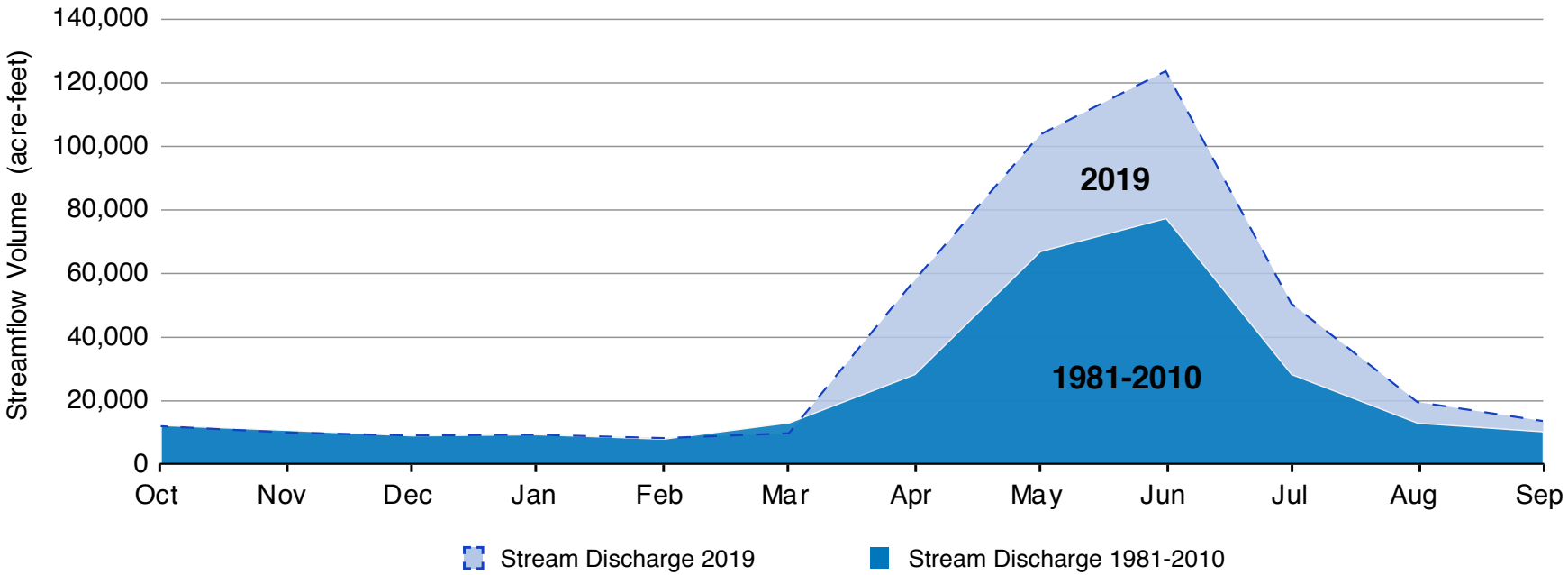
Deep, large hiding pools have been associated with high trout numbers.

Winter cover and food are needed in Silver Creek, as they are lacking. Fish go into a metabolic deficit in September, and winter brings reduced swimming abilities. A diversity of habitats with cover throughout the stream is therefore desirable.

Additional cover in the form of undercut banks, large wood, and deep pools is also desirable.

The water year 2018-19 featured snow pack levels above the most recent 30-year average. In April 2019, snow water equivalent (SWE) levels within the Big Wood Basin were measured at 127% of median as measured from 1981-2010. We calculate the total streamflow volume for the Big Wood River at Hailey (USGS gauge #13139510) to be 149% above median from streamflow measured 1981-2010. This is good news for the Silver Creek system that relies entirely on groundwater levels within the Wood River Valley Aquifer system. As a spring-fed system, Silver Creek's water comes from groundwater upwelling at springheads and streambed groundwater inputs. In 2019, monitoring within Silver Creek's tributaries showed an increase in spring and stream flows. Additionally, none of the springs dried up mid-summer, which has been documented in past low water years. Well water monitoring within the South Valley Groundwater District found that groundwater depth and artesian pressure was sustained at most wells throughout the June to November 2019 timeframe. The consistent, cool groundwater inputs that continued throughout the summer months led to a reduction in average and maximum stream temperatures at most locations when compared to some other monitoring years. These benefits underscore the importance of groundwater as the ecological driver of the Silver Creek ecosystem.

Winter Snow + 2019 Water Year



Big Wood River stream flows (measured in acre-feet) for 2019 as compared to the most recent 30 year mean (1981-2010).

April 1, 2019

Idaho Water Supply Outlook Report

Big Wood Basin
127%
of median snowpack

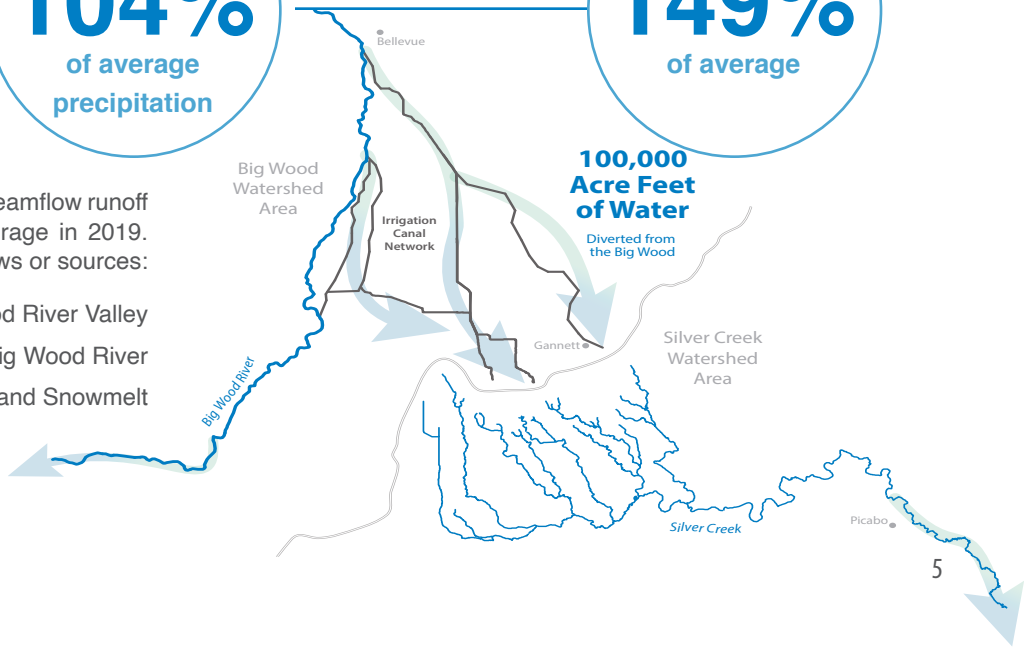
Big Wood Basin
104%
of average precipitation

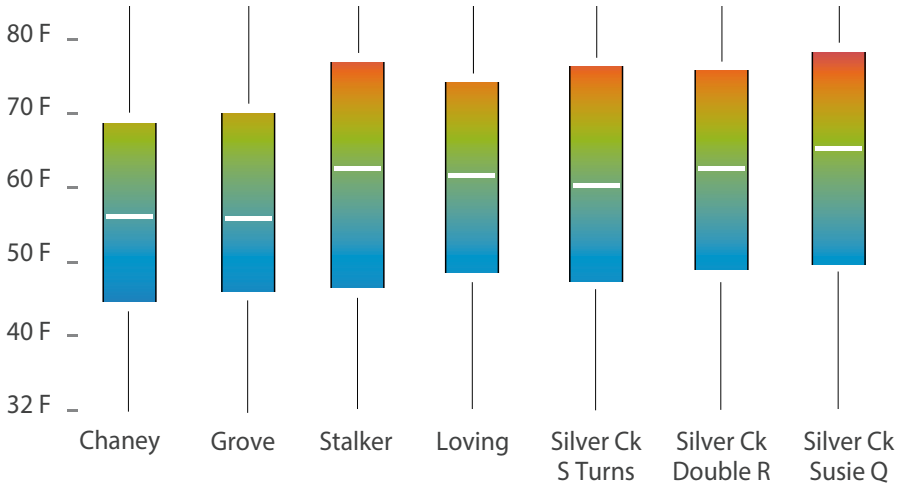
Streamflows up to
149%
of average

In 2019, the Big Wood basin received average precipitation between Oct 1 and April 1.

Snowpack conditions, forecast streamflow runoff and groundwater flows were average in 2019. Major Silver Creek water inflows or sources:

1) Groundwater inflows, Wood River Valley
2) Irrigation diversions from the Big Wood River
3) Precipitation and Snowmelt





Summer Stream Temperatures: The graph above indicates the maximum, average and minimum summer water temperatures on selected areas of Silver Creek over an eight year period (2012-2019). This year, 38 stream temperature loggers and 12 springhead loggers were monitored throughout Silver Creek, and on each tributary to record critical information and track changes in the system.

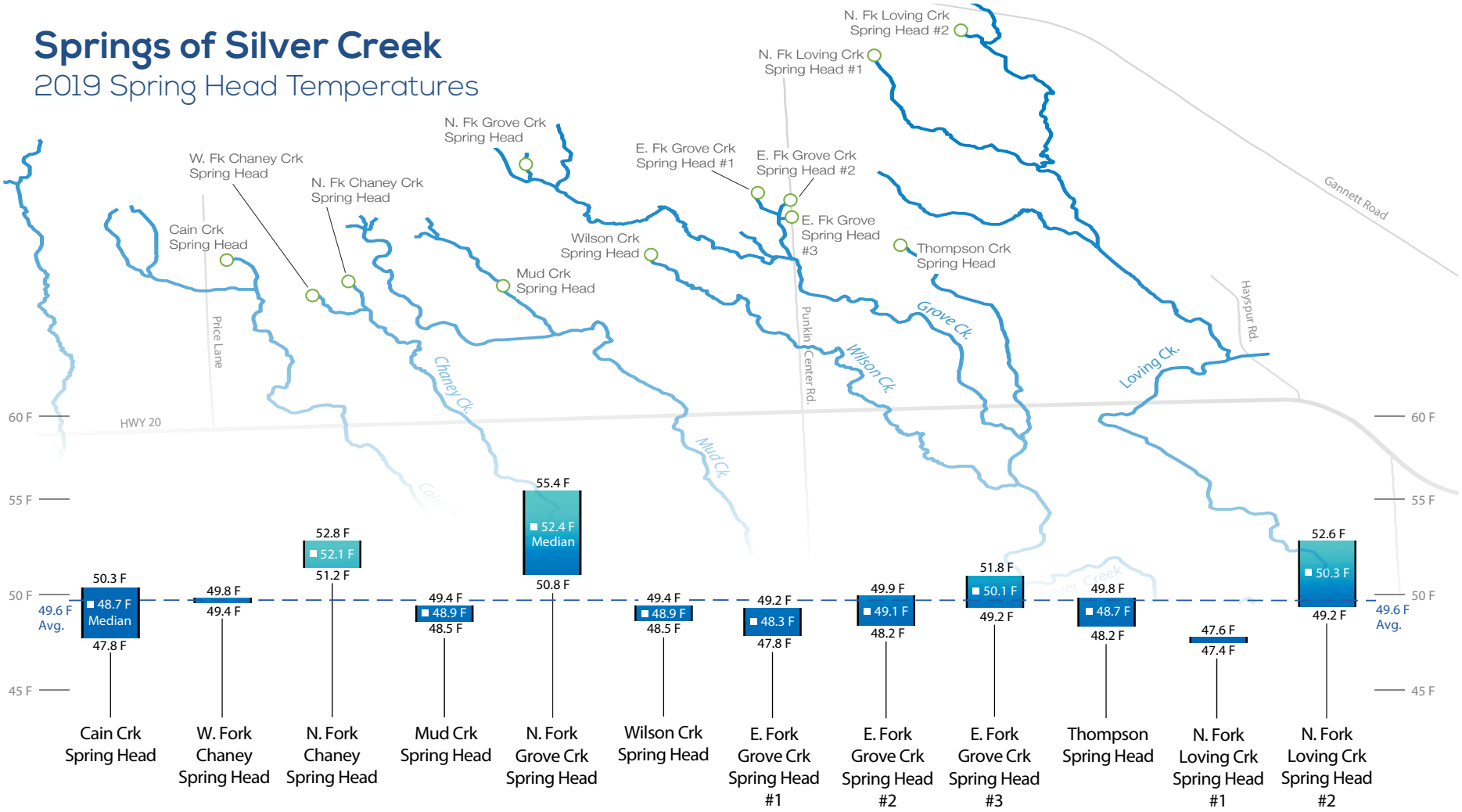
Stream Temperature

In 2019, we deployed 12 springhead and 38 stream temperature loggers in key locations throughout the Silver Creek Watershed. It is important to monitor the springs that feed Silver Creek because they are the primary source of water to the system and these springs provide consistent, cool water to Silver Creek's tributaries that can protect against increasing air temperatures and changing climatic conditions. The median temperatures throughout the summer of 2019 for all 12 spring head loggers was 49.6°F. The higher than normal water years recorded from 2016-18 carried over to 2019 resulting in increased groundwater levels that allowed for both a longer duration of high springhead flows and reduced extraction of groundwater for agricultural use. As a spring-driven system, these springs are critical to the health and persistence of Silver Creek.

Temperature monitoring within Silver Creek and its tributaries found average and maximum stream temperatures relatively normal at most locations as compared to temperatures measured from 2013-2018. This illustrates the connection between the near normal water-year, and carry-over from 2018, which led

Springs of Silver Creek

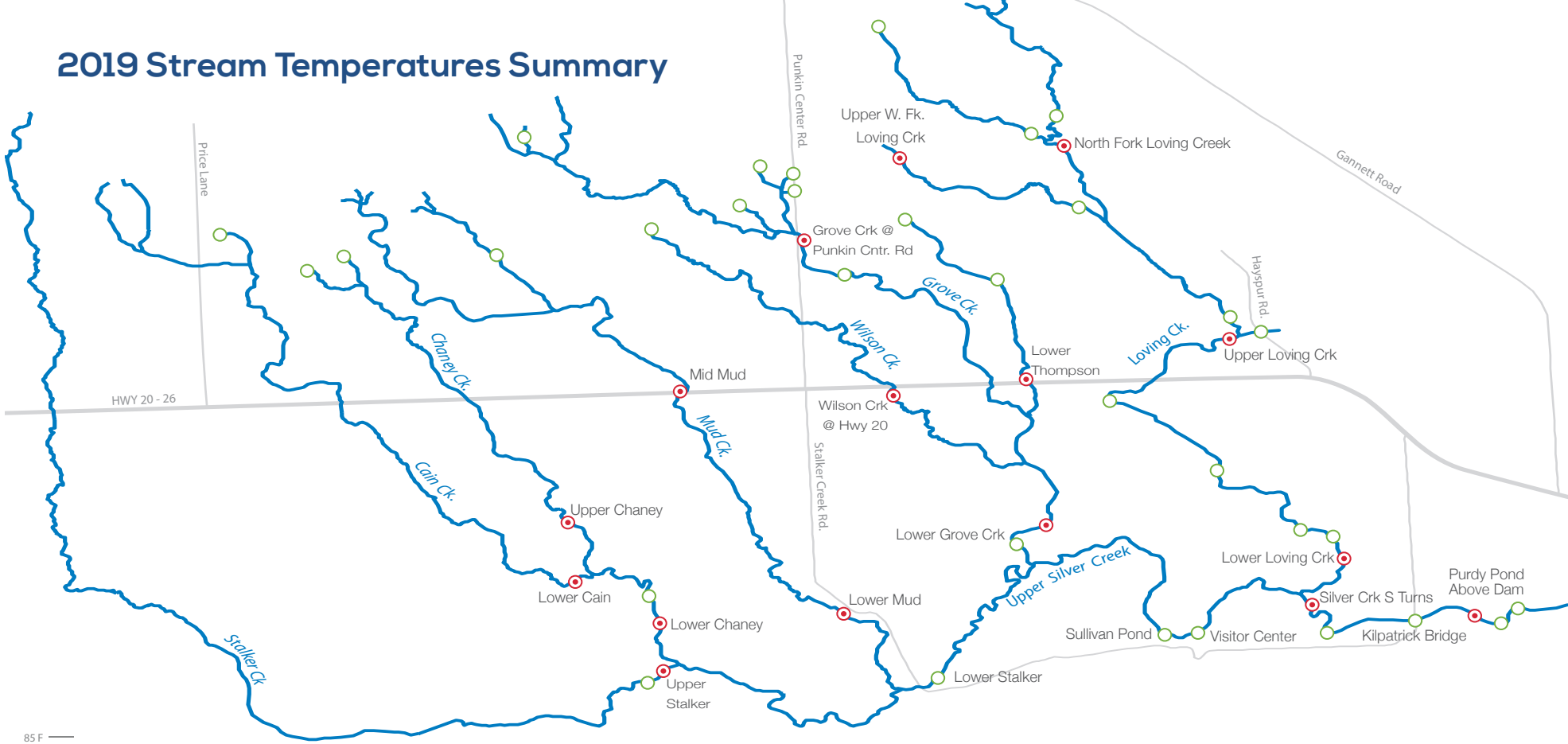
2019 Spring Head Temperatures

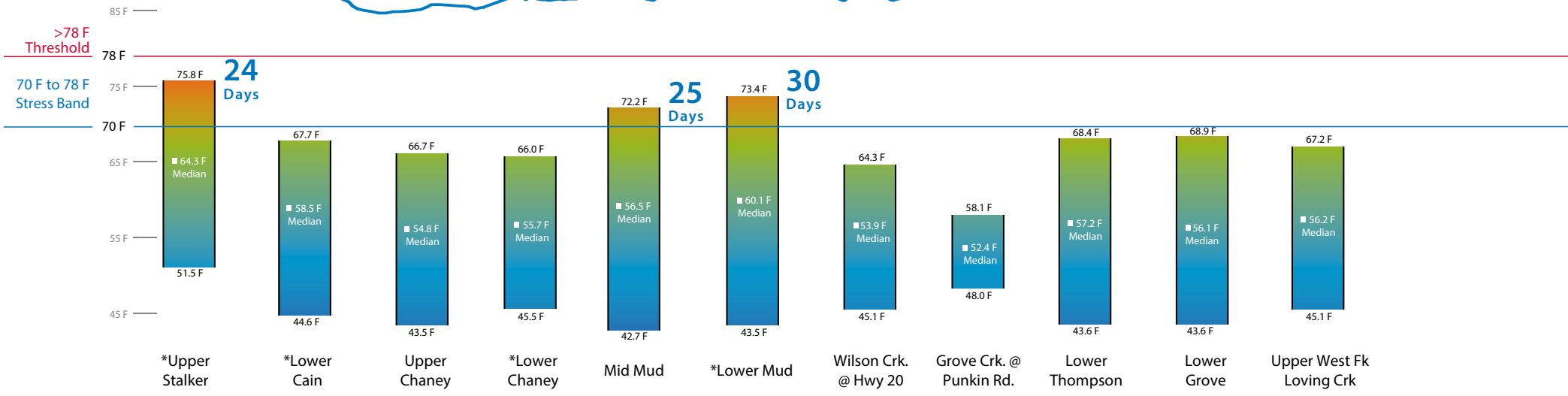


Spring Head Temperature Bands The above graphic depicts the summarized spring head temperature data for the entire summer season. The data were analyzed for the summer season to illustrate the spring temperatures that occurred for the period of June through September, 2019. Each graph displays the total temperature range from June 1 to September 30; the absolute high and low temperatures are given, and the median water temperature is shown for that particular spring.

to a slight increase in the duration and quantity of groundwater. The most notable decrease in temperature was measured in Cain Creek, which for the second time since 2012 remained below the stress band (70°F) for trout where average temperatures decreased by 2 to 4°F and maximum temperatures decreased by 4 to 10°F from those measured in 2013-2017. The reach that saw the biggest decrease in median temperatures from 2018 to 2019 was in Silver Creek at Kilpatrick Bridge, with a median temp decrease of 2.9°F. That was followed by Lower Mud Creek with a median temperature decrease of 2.6°F.

2019 Stream Temperatures Summary





Stream temperature bands The above graphic depicts summarized stream temperature data for the summer season for a select group of data loggers. The data were analyzed for the summer season to illustrate the high temperatures that occurred throughout the stream system for the period of June through the end of September, 2019. Each graph displays the total temperature range for the 2019 season; the absolute high and low temperatures are given, and the median stream temperature is shown for that particular stream temperature logger.

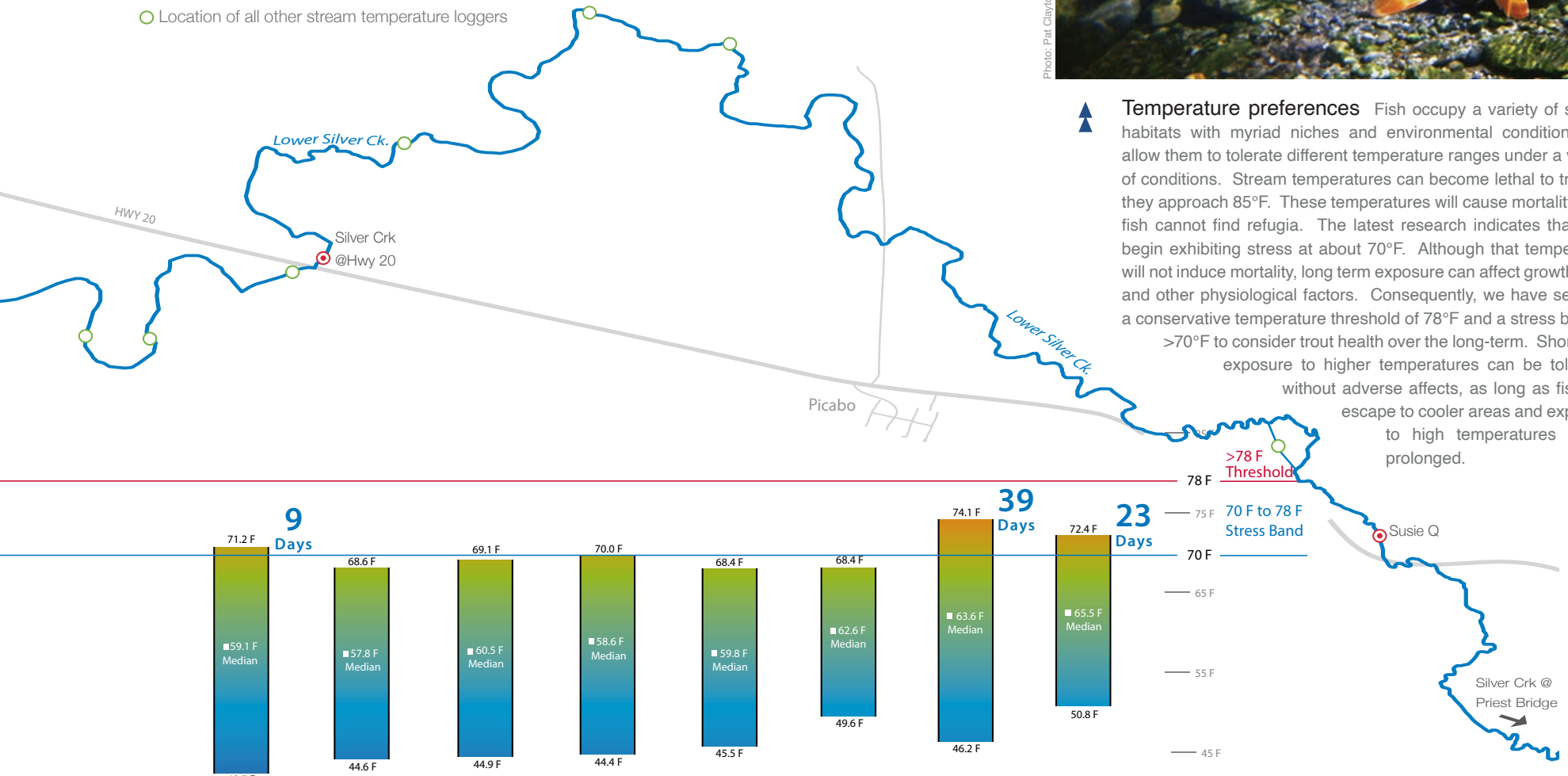
Locations of Stream Temperature Logger Array

This map illustrates the Silver Creek stream and tributary system along with the locations of the stream temperature loggers. The temperature loggers are expressed in two categories for discussion and analysis purposes:

- Location of stream temperature loggers illustrated in bottom graphic of seasonal temperatures
- Location of all other stream temperature loggers

Stream temperatures are logged continuously at one-hour intervals. The array of stream temperature loggers in the Silver Creek system is designed to capture temperature differences for each stream and tributary segment, from the spring source to Lower Silver Creek at the Highway 93 crossing. Due to battery failures, in 2019 several sites had data limitations (sites marked with asterisk in graphic).

Photo: Pat Clayton

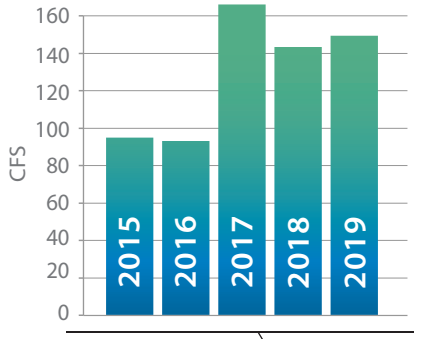


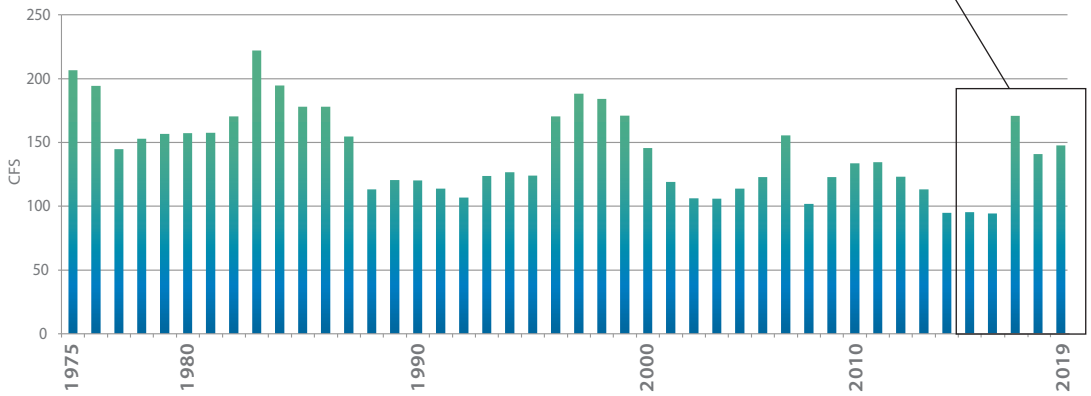
Temperature preferences Fish occupy a variety of stream habitats with myriad niches and environmental conditions that allow them to tolerate different temperature ranges under a variety of conditions. Stream temperatures can become lethal to trout as they approach 85°F. These temperatures will cause mortality if the fish cannot find refugia. The latest research indicates that trout begin exhibiting stress at about 70°F. Although that temperature will not induce mortality, long term exposure can affect growth rates and other physiological factors. Consequently, we have selected a conservative temperature threshold of 78°F and a stress band of >70°F to consider trout health over the long-term. Short-term exposure to higher temperatures can be tolerated without adverse affects, as long as fish can escape to cooler areas and exposure to high temperatures is not prolonged.

The overall median temperatures throughout the summer were within the preference range for trout (around 55-60 degrees) in Cain, Chaney, Mud, Wilson, Grove, Thompson, and the upper reaches of Loving Creek. Upper Stalker Creek, Lower Mud Creek and Silver Creek all had median temperatures above 60°F. However, the number of days that temperatures were within the stress band for trout (70°F-78°F) decreased significantly compared to measurements taken in 2013-2018. In 2019, there were no sites where temperatures exceeded the upper stress threshold (78°F) for trout.

Stream Hydrology

Annual average streamflow (cfs) at USGS gage (Sportsmans Access) 1975 - 2019.





Silver Creek annual average streamflow (cfs) at USGS gage (Sportsmans Access) 1975 - 2019.

Monitoring stream flows is important, as it helps build our understanding of the volume and origin of water entering Silver Creek's tributaries and its potential influence on water temperature, dissolved oxygen and other water quality parameters.

Total annual discharge in Silver Creek, at Sportsman's Access, was above average and flows were above the 30-year average. Silver Creek's tributaries varied slightly, but in general were similar to average flows recorded since monitoring began in 2011. It was an above average water year for Silver Creek and its tributaries. Similarly, the Big Wood River had an above average increase in annual discharge in 2019.

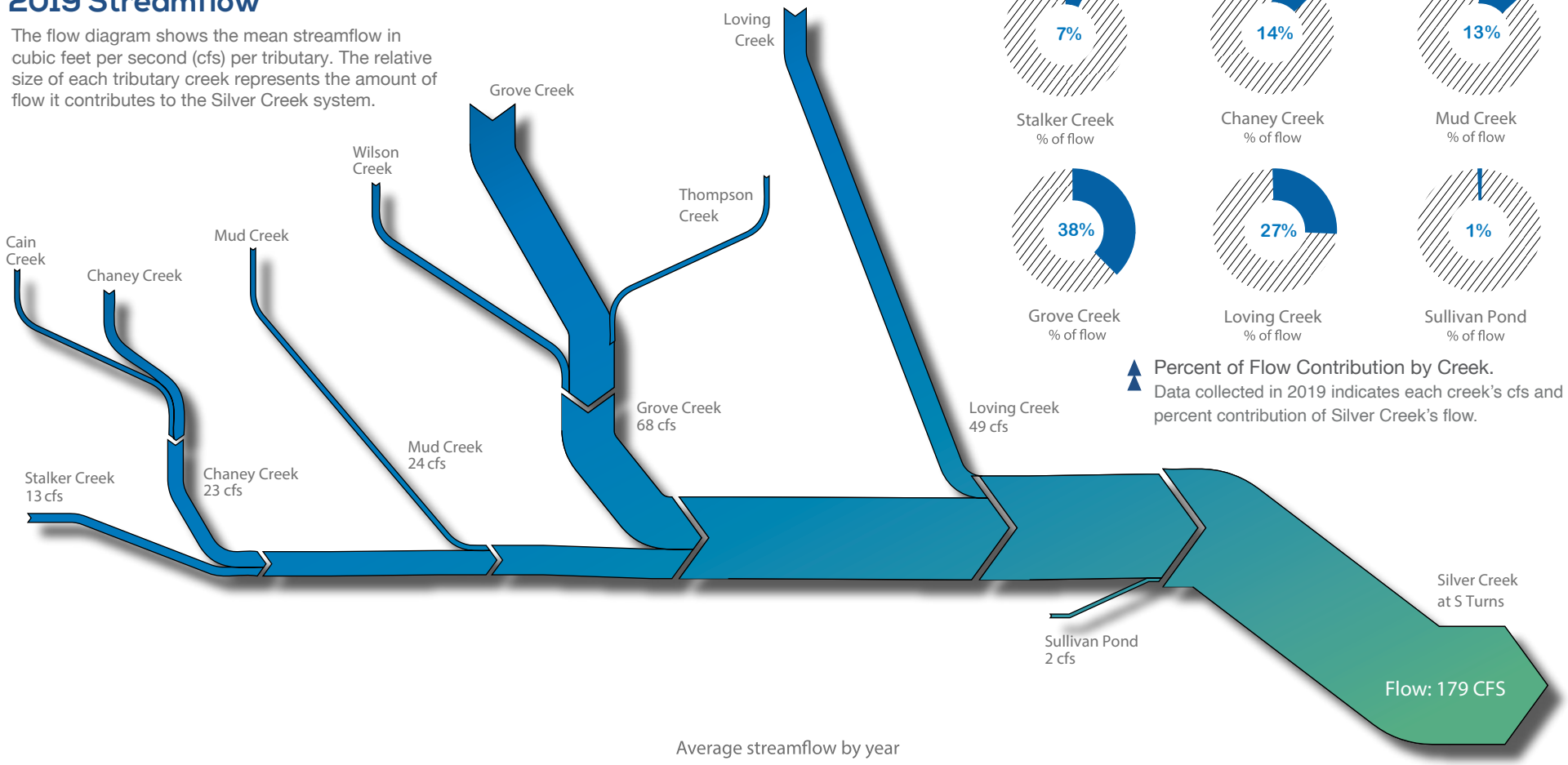
Big Wood River Average Annual Discharge at Hailey gage (cfs):

2015	311.5
2016	406.4
2017	1,003.0
2018	478.6
2019	598.9

The 2019 water year resulted in above-average flows in the Wood River, Silver Creek, and its tributaries. These systems are connected by a common groundwater system that is dynamic and complex.

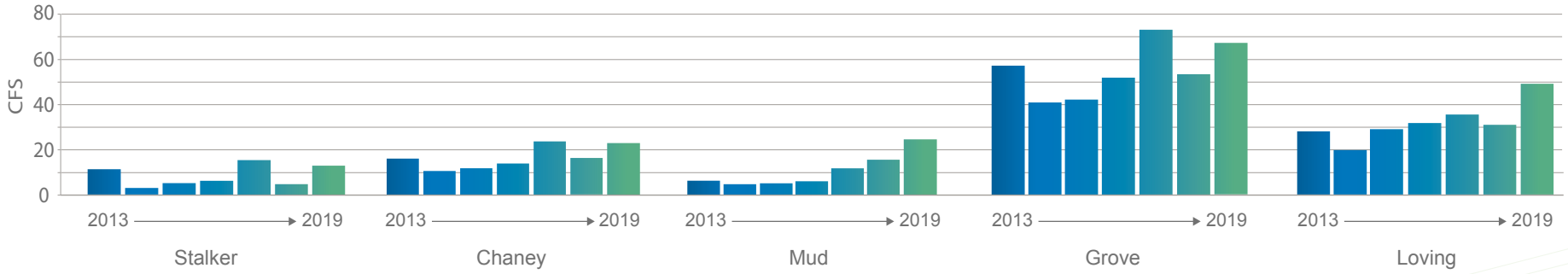
2019 Streamflow

The flow diagram shows the mean streamflow in cubic feet per second (cfs) per tributary. The relative size of each tributary creek represents the amount of flow it contributes to the Silver Creek system.



Percent of Flow Contribution by Creek. Data collected in 2019 indicates each creek's cfs and percent contribution of Silver Creek's flow.

Average streamflow by year



Annual average streamflow by creek for 2013-2019. Data collected from 2013 - 2019 shows each creek's average flow. Recent increases in overall streamflow affects many critical components of the aquatic ecosystem. Measurements were not continuous, but were distributed throughout the spring, summer and fall.

Water Quality

Dissolved Oxygen

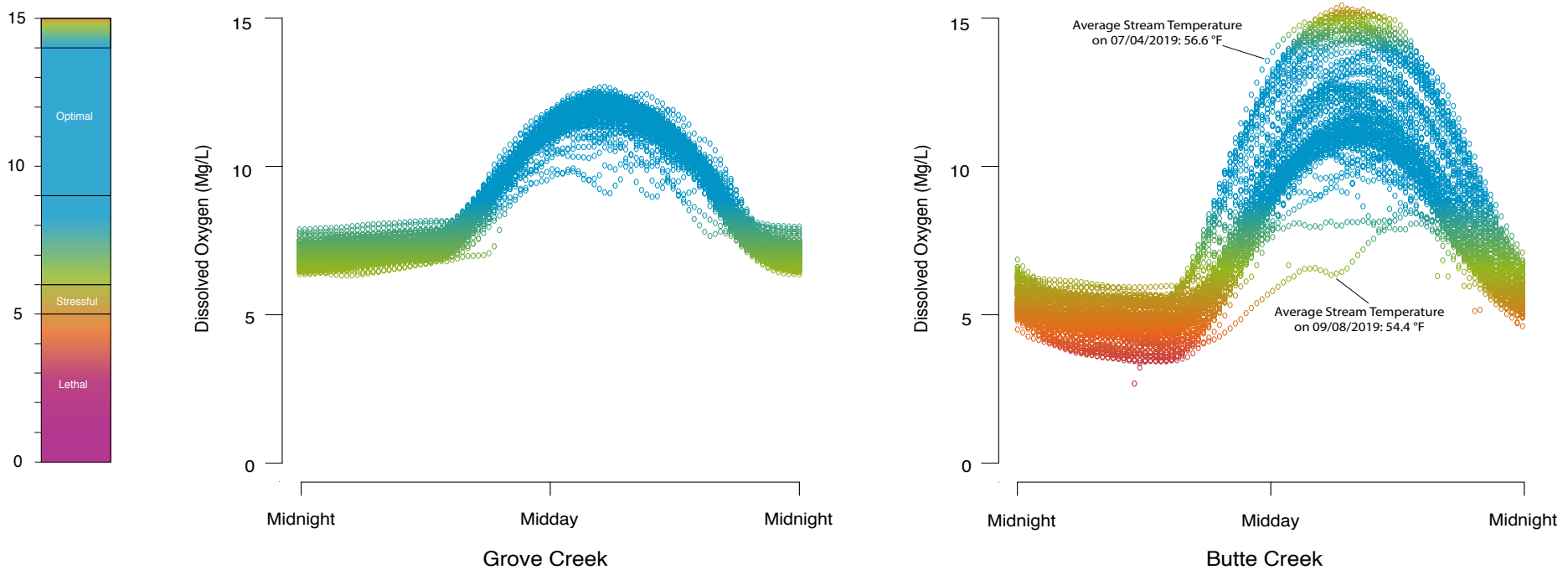
Since 2017, dissolved oxygen (DO) has been measured continuously from June through October at 7 sites. Data is recorded using optical sensors that record DO and temperature values every 15 minutes.

Similar to past year's results, the data indicated that not all of Silver Creek's waterways exhibit the same pattern of DO values, and that DO levels stress fish in certain locations at certain times of the day. Seasonal fluctuations also occur, as changes in sunlight, temperature, flow and aquatic plant growth vary throughout the year.

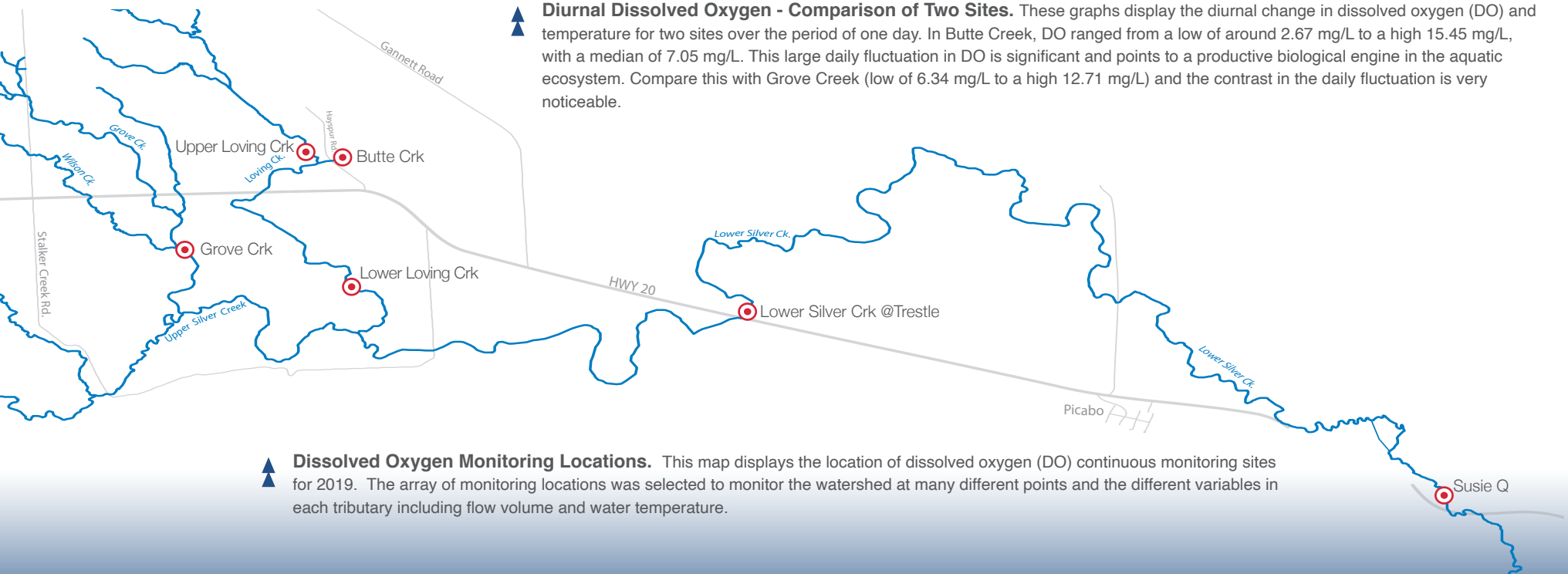
In many areas of the Silver Creek system, the daily fluctuations in DO are significant, which points to a productive biological engine in the aquatic ecosystem. As aquatic plant life within the stream utilizes photosynthesis to create energy, they produce oxygen. This process raises DO levels, which peak in the afternoon.

Overnight, plants continue to respire without photosynthesis, which requires oxygen (this demand is called biological oxygen demand) that is taken directly from the water. This daily process causes DO levels to be lowest just before dawn and highest in the afternoon exhibiting a distinct diurnal cycle. As shown by the diurnal graphs presented, not all cycles are the same. The sensor placed at Grove Creek is in close proximity to the Butte Creek sensor location, but on different tributaries. Despite their close proximity in geographic space, their DO levels vary significantly (see diurnal plots on the facing page). This is due to a combination of factors, including streamflow, temperature, nutrient concentrations, and aquatic plant life, among others.

When DO readings fall into the stressful range for fish, they will seek refuge in areas that have higher DO concentrations. Fish eggs are buried in gravels and lack the mobility to escape these conditions. At the selected sites, 21% of all measurements made were between stressful to lethal levels for fish and their eggs (1st quartile at Suzie Q: 8.4mg/L; Butte: 5.2 mg/L; Lower SC at the Trestle: 6.7mg/L). The seasonal graphs present all data points taken during the 2019 season.

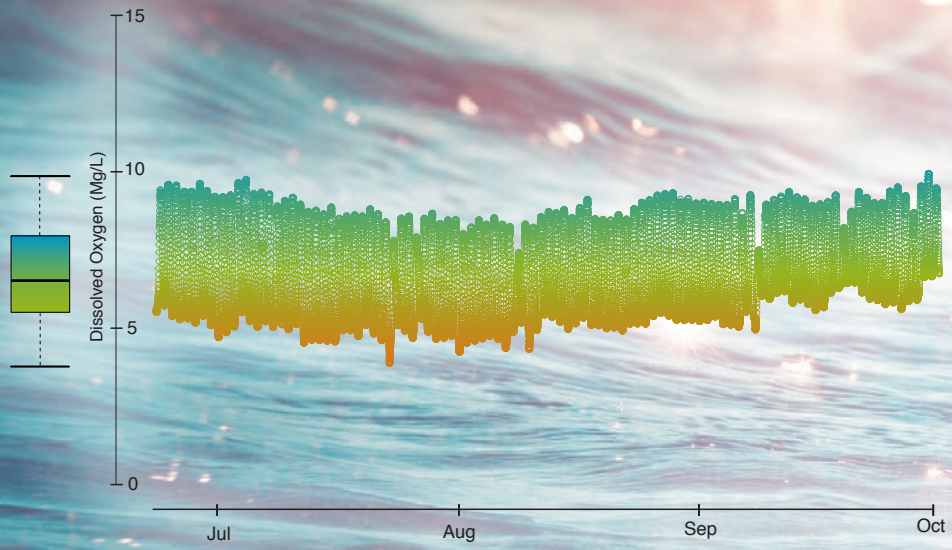


Diurnal Dissolved Oxygen - Comparison of Two Sites. These graphs display the diurnal change in dissolved oxygen (DO) and temperature for two sites over the period of one day. In Butte Creek, DO ranged from a low of around 2.67 mg/L to a high 15.45 mg/L, with a median of 7.05 mg/L. This large daily fluctuation in DO is significant and points to a productive biological engine in the aquatic ecosystem. Compare this with Grove Creek (low of 6.34 mg/L to a high 12.71 mg/L) and the contrast in the daily fluctuation is very noticeable.

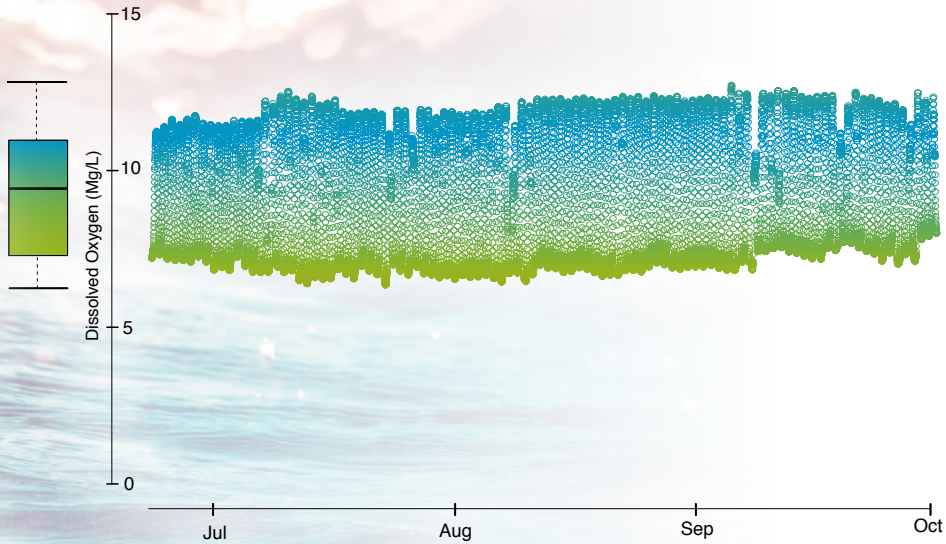


Dissolved Oxygen Monitoring Locations. This map displays the location of dissolved oxygen (DO) continuous monitoring sites for 2019. The array of monitoring locations was selected to monitor the watershed at many different points and the different variables in each tributary including flow volume and water temperature.

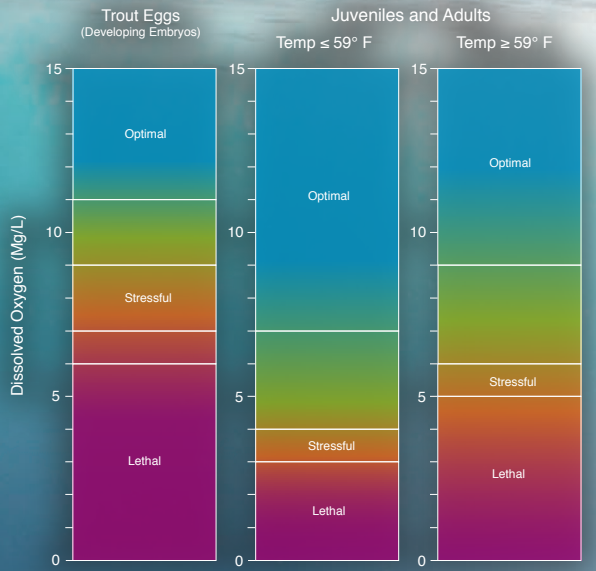
Dissolved Oxygen Results



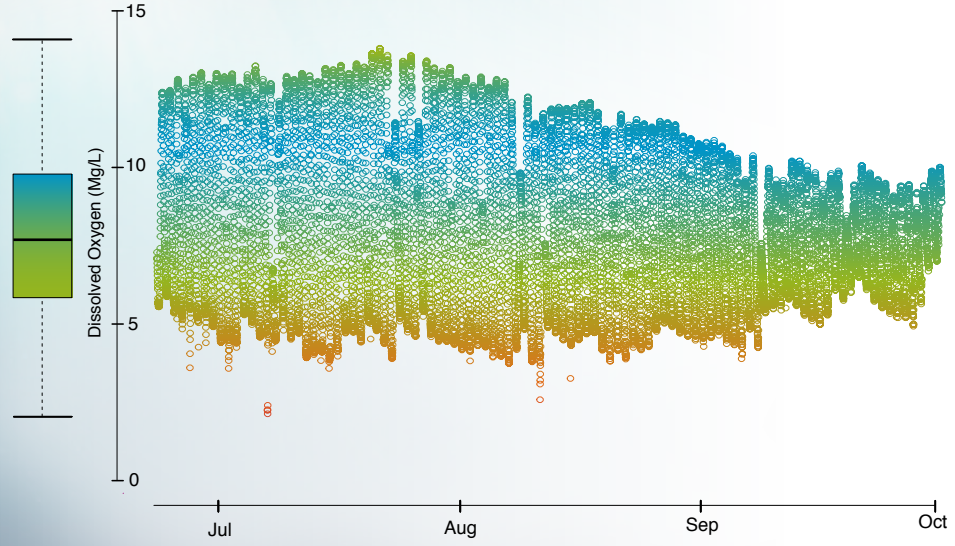
Upper Loving Creek



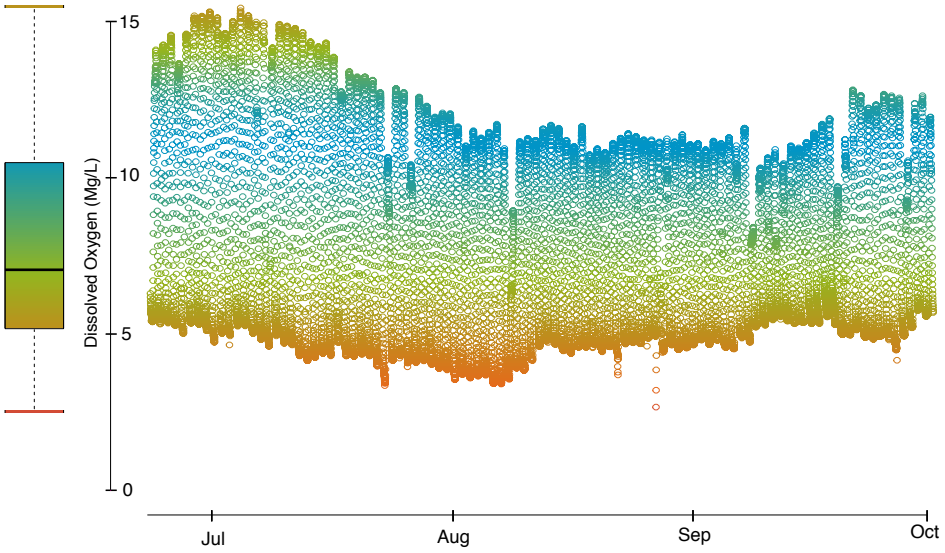
Grove Creek



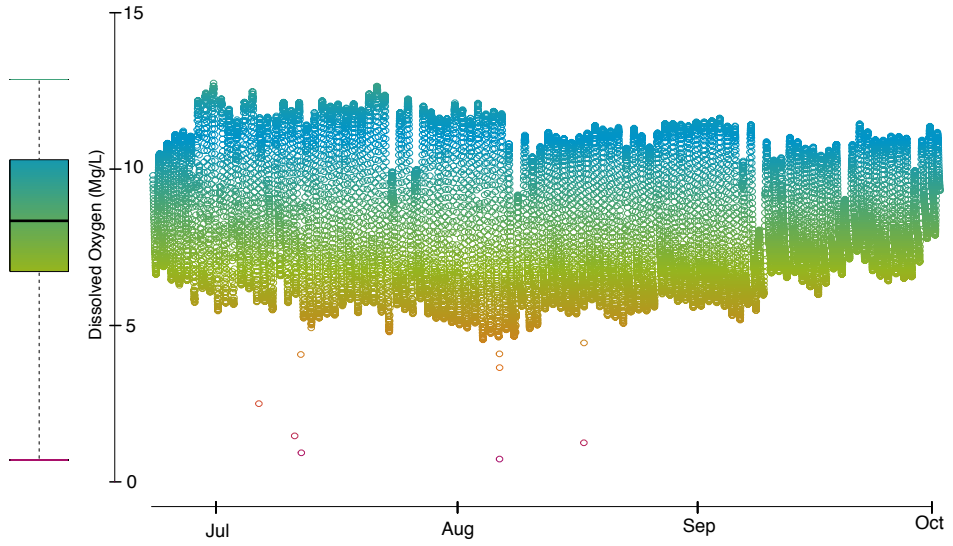
Average Dissolved Oxygen Requirements for Salmonids. Trout, depending on thier particular life stage (egg, Juvenile, Adult), have differing requirements and thresholds for dissolved oxygen levels. Water temperature also plays a major role in dissolved oxygen levels. (Adapted from EPA's Chapman, 1986, and USFWS's Raleigh et al 1984, and Raleigh et al 1996).



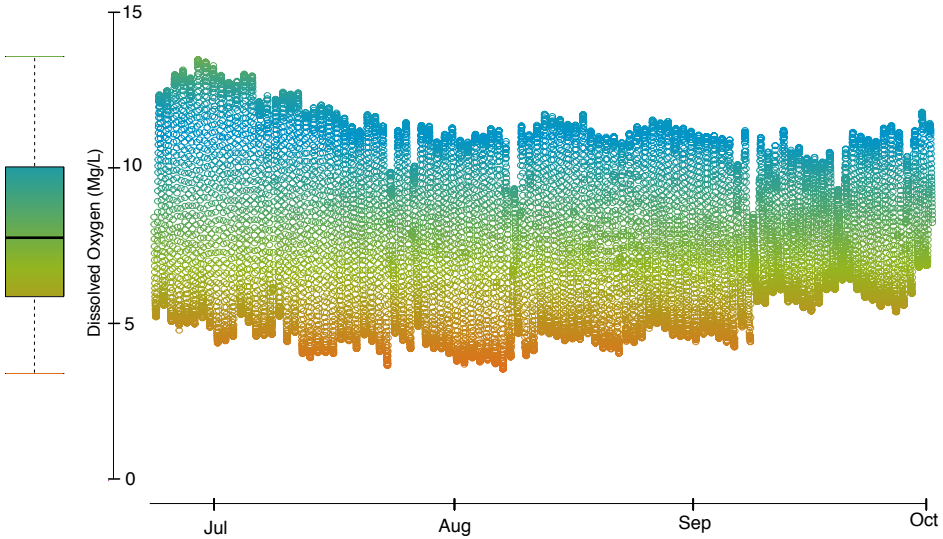
Lower Stalker Creek



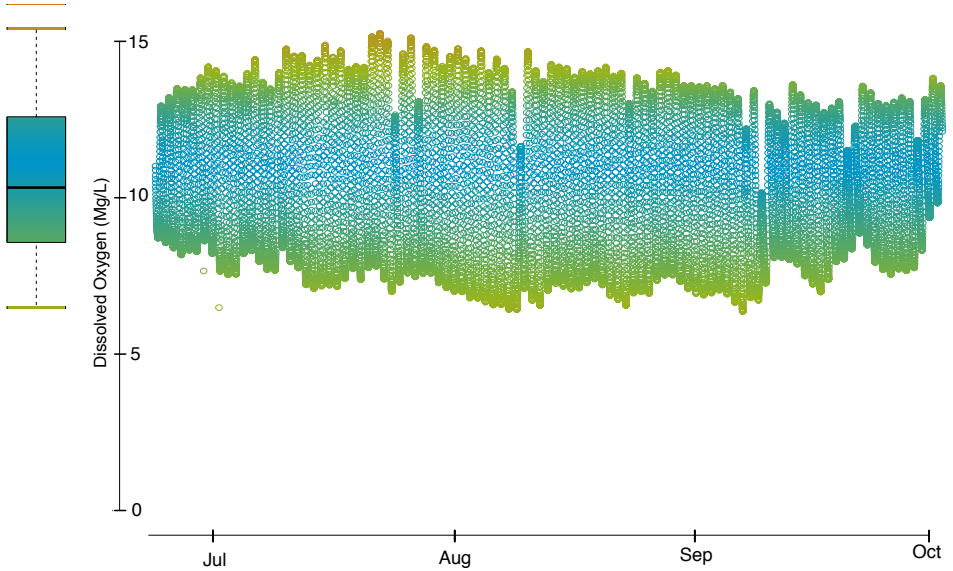
Butte Creek



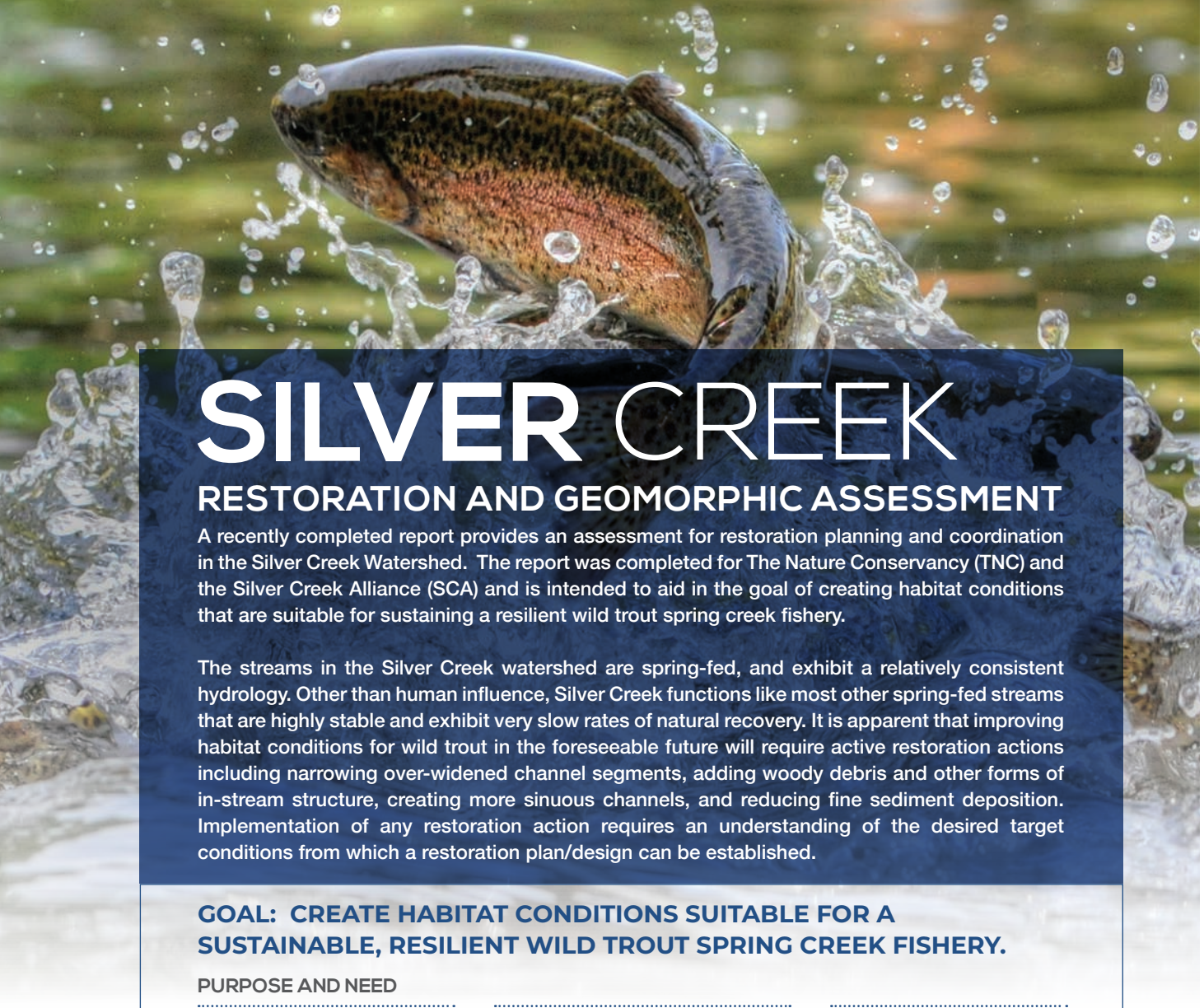
Lower Silver Creek at Trestle



Lower Loving Creek



Susie Q



SILVER CREEK

RESTORATION AND GEOMORPHIC ASSESSMENT

A recently completed report provides an assessment for restoration planning and coordination in the Silver Creek Watershed. The report was completed for The Nature Conservancy (TNC) and the Silver Creek Alliance (SCA) and is intended to aid in the goal of creating habitat conditions that are suitable for sustaining a resilient wild trout spring creek fishery.

The streams in the Silver Creek watershed are spring-fed, and exhibit a relatively consistent hydrology. Other than human influence, Silver Creek functions like most other spring-fed streams that are highly stable and exhibit very slow rates of natural recovery. It is apparent that improving habitat conditions for wild trout in the foreseeable future will require active restoration actions including narrowing over-widened channel segments, adding woody debris and other forms of in-stream structure, creating more sinuous channels, and reducing fine sediment deposition. Implementation of any restoration action requires an understanding of the desired target conditions from which a restoration plan/design can be established.

GOAL: CREATE HABITAT CONDITIONS SUITABLE FOR A SUSTAINABLE, RESILIENT WILD TROUT SPRING CREEK FISHERY.

PURPOSE AND NEED

Silver Creek is biologically, culturally, historically, and economically relevant to Idaho and the West: Silver Creek is prized for its stunning clear waters, catch and release trout fishery, abundant wildlife, and vibrant history.

An assessment like this has not been done previously. Although many isolated investigations concentrating on one part of Silver Creek or on general conditions within the watershed have been performed, a geomorphically-based assessment at multiple scales of this type has not been performed.

The overall purpose of the assessment is to develop a report that is suitable for guiding approaches and implementation strategies for future restoration and enhancement projects.

SILVER CREEK WATERSHED

ASSESSMENT & RESTORATION DESIGN

PROJECT OVERVIEW

Conditions in the Silver Creek watershed have changed over the decades, resulting in many of the observed impacts that now adversely affect fish habitat.

The magnitude of impacts relative to the rates of "natural" recovery suggest that habitat is unlikely to be repaired by natural stream evolution within the foreseeable future (i.e., many decades). To restore the fishery's high quality, accessible habitat for all life stages is needed: rearing habitats and refugia for juveniles; large pools for adults; and abundant, connected spawning and overwintering habitats. Channel restoration is therefore recommended to improve conditions by building new habitat (active restoration) and/or accelerating the stream's ability to naturally repair itself and create new habitat (passive restoration).

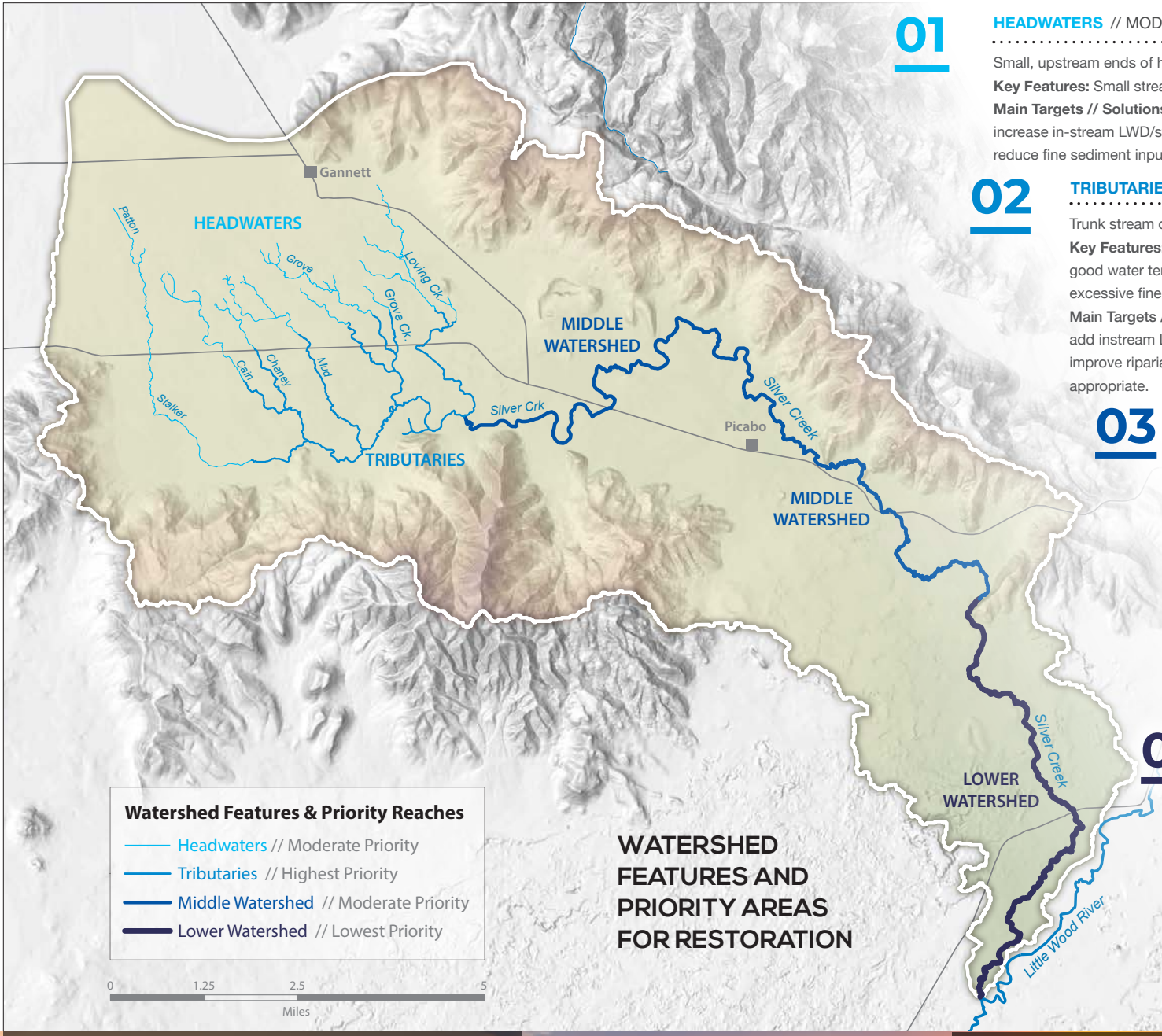
GOALS OF THE ASSESSMENT

- Document past, existing (baseline), and potential target conditions.
- Identify potential actions for improving habitat relative to the Silver Creek goal that can be applied throughout the watershed.
- Provide a conceptual restoration plan for two priority reaches within the watershed.

WHERE TO FIND THE ASSESSMENT

The assessment was prepared as a collaborative joint effort of Rio ASE and Ecosystem Sciences, and was commissioned by the Silver Creek Alliance and The Nature Conservancy. The Assessment can be found at: SaveSilverCreek.com

The assessment is intended to be utilized by stakeholders, landowners, and other groups within the watershed to inform future restoration and enhancement efforts. It seeks to provide information on the geomorphic setting, and key parameters representing watershed and reach conditions.



WATERSHED FEATURES AND PRIORITY AREAS FOR RESTORATION

01 HEADWATERS // MODERATE PRIORITY

Small, upstream ends of headwater tributaries.

Key Features: Small streams with mixed habitat and fish use potential.

Main Targets // Solutions: Increase sinuosity, reduce width-to-depth ratio, increase in-stream LWD/structure forcing constrictions and pools with cover, reduce fine sediment inputs. Increase riparian vegetation.

02 TRIBUTARIES // HIGHEST PRIORITY

Trunk stream of tributaries and Silver Creek Preserve.

Key Features: Over-widened, single-threaded channel, generally good water temperatures, high habitat connectivity, few pools, excessive fine sediment.

Main Targets // Solutions: Reduce stream width, increase sinuosity, add instream LWD/structure forcing constrictions and pools, improve riparian vegetation, and use ponds as sediment traps where appropriate.

03 MIDDLE WATERSHED // MODERATE PRIORITY

Main-stem Silver Creek from Preserve downstream to Priest Road (roughly 1 miles south of Hwy 20)

Key Features: Over-widened, single-threaded channel, poor summer water temperatures, many disconnected side channels, poor floodplain connection, poor riparian habitat.

Main Targets // Solutions: Reconnect relic side channels and habitat, reduce stream width, add LWD/structure forcing constrictions and pools with cover, improve riparian vegetation, use ponds as sediment traps where appropriate.

04 LOWER WATERSHED // LOWEST PRIORITY

From Priest Road downstream to the confluence with the Little Wood River.

Key Features: Confined valley with poor floodplain connection, high summer water temperatures, poor habitat connectivity.

Main Targets // Solutions: Low restoration potential, poor benefit-to-cost ratio, opportunities should focus on improving riparian vegetation and adding in-stream LWD/structure within existing channel.

Restoration objectives should focus on a sustainable, wild trout fishery by reducing over-widened and simplified channel forms, increasing in-stream hydraulic structural complexity, and improving riparian vegetation.

A SUSTAINABLE, RESILIENT WILD TROUT SPRING CREEK FISHERY

Next Steps

eDNA Monitoring

In partnership with the National Genomics Center for Wildlife and Fisheries Conservation, Ecosystem Sciences Foundation would like to conduct Environmental DNA (eDNA) sampling in Silver Creek and its tributaries in 2020. The collection of eDNA has become a common tool among researchers to detect the presence of macrobial species (i.e. fishes, amphibians, mollusks, crustaceans, and insects) based on the presence of their DNA in air, water and soil. The use of eDNA sampling has been found to be a simple and efficient tool for determining a species' presence in an ecosystem and is often as effective as traditional sampling techniques. Of interest, eDNA can be used to detect species that are rare, difficult to find, or are in low densities within the ecosystem. For streams, conducting eDNA sampling is non-invasive and generally involves filtering several liters of water from the area of interest and then testing for DNA signatures. This permits rapid collection of large numbers of samples, each with a high probability of species detection. In the Silver Creek watershed, eDNA sampling would be used to estimate the abundance and distribution of rainbow trout, brown trout and other fish species. This study will provide important information about Silver Creek's fish species for both conservation and recreational purposes. Please consider a donation to support this innovative project!

Riparian Buffers

Riparian buffer zones need to be evaluated as permanent solutions to address sediment reduction and removal. A field effort to collect data on the riparian buffer systems would be an important study and help to prioritize areas that need improvement, protection and restoration.

Fish Habitat Analysis and Mapping

Fish habitat features and redd counts were surveyed on nearly all the tributaries in Silver Creek in fall 2015 and spring 2016. However, due to lack of funding, the mainstem of Silver Creek has not been surveyed. ESF seeks funding to conduct redd counts in the mainstem Silver Creek during the spring season and fall seasons in 2020 / 2021. Our goal is to create a database of redd locations for brown and rainbow trout, as well as a map that identifies redd locations and delineates habitat such as: spawning areas, early rearing and nursery areas, side channels, pools, undercut banks, resting and feeding zones, and an evaluation of streambank conditions.

Monitoring and Maintenance

Over the past 9 years, the Silver Creek Program has monitored stream hydrology, water temperature, sedimentation and most recently dissolved oxygen. Combined, these parameters are indicators of ecosystem health much like checking our own body temperature and circulatory system. Monitoring is paramount to understanding ecological processes and relationships, identifying trends and establishing effective strategies for enhancement. However, monitoring is a long-term scientific tool that must be done consistently over time; the more data collected, the more meaningful the results. As our monitoring program continues, it is necessary to periodically replace temperature sensors and redeploy DO sensors, which comes at a capital cost. We are seeking additional funding to maintain our monitoring equipment and continue these important programs.

Funding

To continue our ongoing monitoring work and perform new analyses, as described above, our Silver Creek Program needs additional funding. Our program is heavily based on monitoring and data analysis; we have found that these activities alone are rarely funded through traditional grant programs. Please consider a donation to continue this important work. A substantial volunteer effort goes into the Silver Creek program each year and your donations directly support the Program. Thank you for your support!

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2019

Silver Creek Annual Report

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