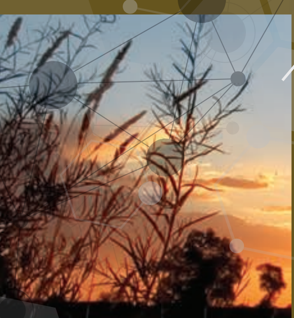
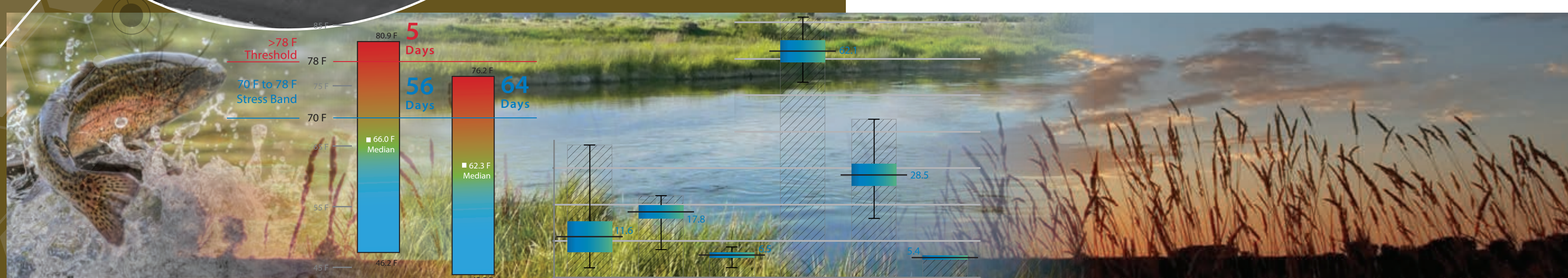
Silver Creek

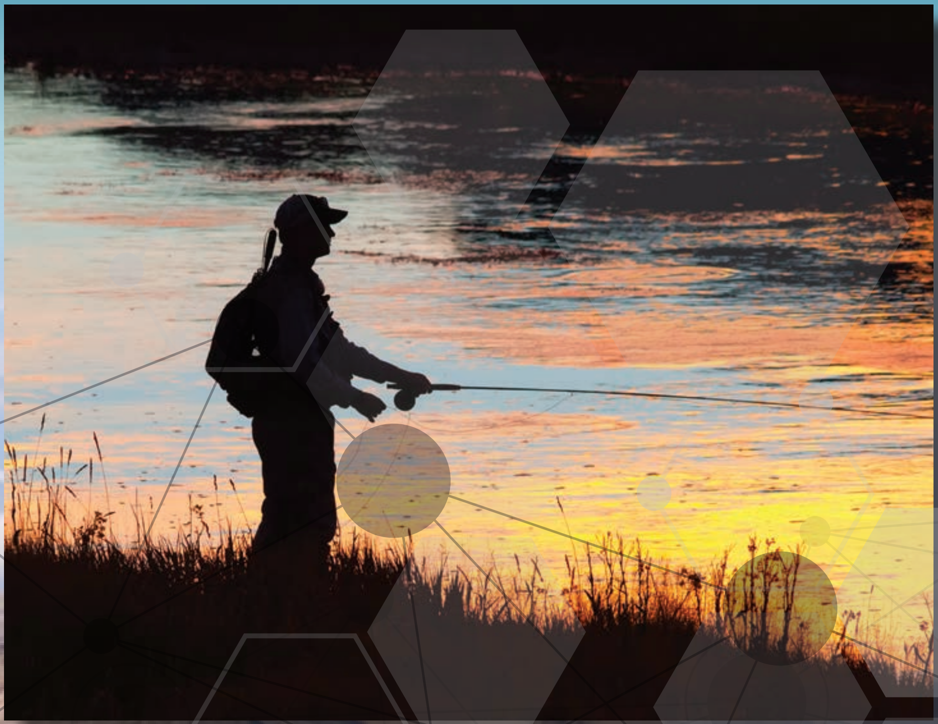
Annual Report

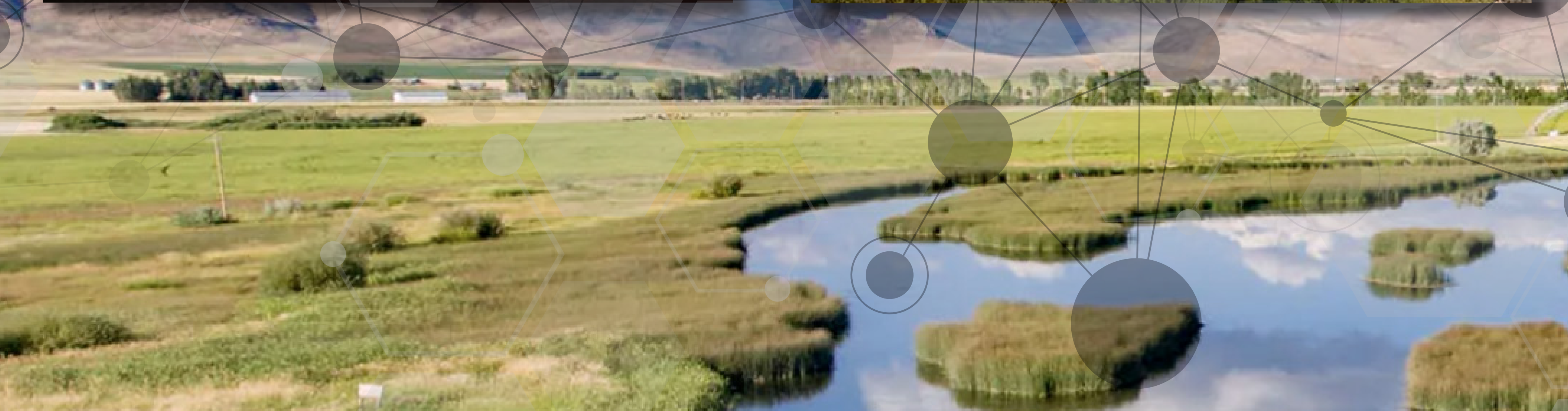
2021





Ecosystem Sciences Foundation





Ecosystem Sciences Foundation

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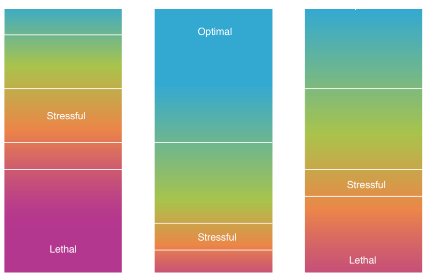
Silver Creek Watershed

2021 Annual Monitoring Report

Contents



Silver Creek Watershed

Ecosystem Sciences Foundation (ESF) has been working in the Silver Creek watershed since 2009, when it developed the watershed's first comprehensive Restoration and Enhancement Strategy. 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 dissolved oxygen levels, along with stream flow characterization.

To date, the Silver Creek program has enjoyed support from numerous stakeholders. Most of the land within the watershed is privately owned; consequently, 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 2021 are:

- Silver Creek streamflows were well below the historic average discharge within the stream system. The basin's weak snowpack resulted in lower than average streamflow volume in Silver Creek and all of its tributaries.
- With some exceptions, temperatures in the Silver Creek system were much higher as compared to 2020. Some areas recorded temperatures above the stressful limit for fish for prolonged periods of time. The number days in which temperatures rose above the 70 °F stress band threshold increased from 2020.
- Dissolved oxygen monitoring indicated that areas of Silver Creek recorded concentrations so low that they stress all life stages of trout. However, these conditions are generally limited to early morning hours. In the afternoon, dissolved oxygen levels rise rapidly.
- The challenging instream water quality conditions led to fish mortality observations in Silver Creek. IDFG conducted a brief field visit and provided observations of the fish mortality and conditions.

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 / last 10-year's work in a way that tells a story of the stream system and watershed. The information presented here is the result of detailed, scientifically rigorous analyses, 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.

Climate Change and The Future of Water

Water is a key driver of a sustainable future in the Wood River Basin as it is essential to the production of most goods and services. The natural ecosystems that convey runoff from the highlands to the lowlands are critical for preserving biodiversity, regulating the environment, providing amenities, and sustaining life.

Today, the Wood River Basin, and especially Silver Creek, face severe water shortages. Extended periods of drought, increased water demand, a shifting climate, water governance, and fundamental changes in agriculture have led to a tenuous water situation. Innovative approaches to water management are needed to better match water demand with available water supply. Cooperation and compromise are needed to improve efficiency in water systems, implement enhanced water accounting methods, increase flexibility of water use, and advance water governance. Investment in new and cooperative approaches to addressing the water issues of today will pay off in the future by protecting the water resources that sustain the farms, ranches, cities, and aquatic ecosystems within the Wood River Basin and Silver Creek.

Current water policies are not addressing the risks that climate change is posing to the way of life in the west. As the demand for water continues to grow, climate change will exacerbate inequities in access to water and increase the frequency and ferocity of water disputes. That reality provides an opportunity to recalibrate customs to bring them in line

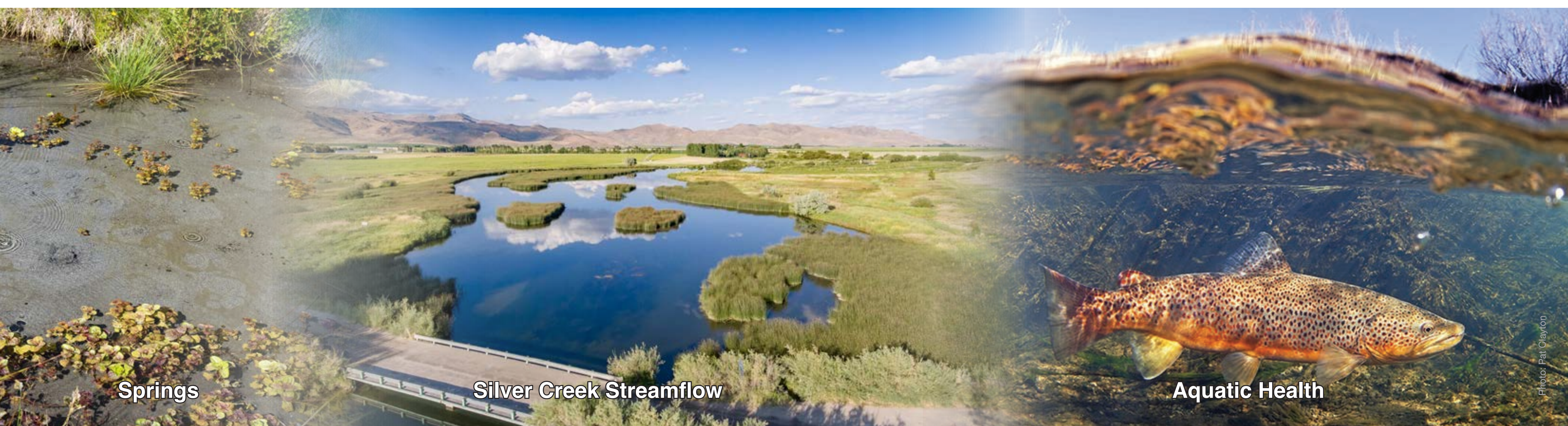
with twenty-first century values that emphasize efficiency, access, and equity. Ultimately, the changes that are needed cannot be imposed but instead must be the product of consensus among water users. That requires cooperation between groups that have historically competed for finite water resources.

Irrigation is Central to Silver Creek Streamflow

The Big Wood River / Silver Creek water system is a complex, interconnected hydrologic network. The system of canals, diversions, groundwater wells and springs have successfully served the needs of the valley since 1881. However, population growth and changes in irrigation technology, crop selection, land use, and the climate have fundamentally altered the water resources that have shaped the Basin. As a result, the Big Wood River and Silver Creek are experiencing inconsistent streamflow, which is, in turn, threatening the very existence of the habitat and fisheries within the Basin. In addition, the reduction in water availability and the restrictions placed on irrigation use are threatening the viability of agricultural in the Basin.

Silver Creek rises from a series of springs and flows eastward to the Little Wood River. Groundwater contributes to the streamflow by means of upwelling from the aquifer to the surface at springheads and upper tributary creeks. These springs are, in large part, fed through the application of irrigation water that exceed the consumptive use requirements of crops, as well as from seepage from canals and ditches, and the northern part of the Big Wood River channel and its tributary streams. Landowners also divert surplus canal water to designated ponds that recharge the aquifer. Since much of the flow of Silver Creek is the result of irrigation water recharging the groundwater system, the delivery of surface water from the Big Wood River is critical to the maintenance of Silver Creek streamflows.

Other than irrigation, the major sources of recharge to the groundwater system are snow melt and precipitation. In the Big Wood Basin, most of the annual precipitation falls during the winter months, yet the highest demands for water use are in the summer and early fall.



Compromise, innovation, investment, and a willingness to work together.

Ideally, river basins have the capability to store water from the wet season until it is needed. The largest storage of water in the Big Wood Basin occurs naturally in the form of annual snowpack. As such, streamflow volumes in the Big Wood River and Silver Creek are particularly sensitive to annual snowpack levels, which have decreased on average over the past 100 years. Also, in recent years spring runoff from the snowpack has begun earlier, and streamflow volumes have been declining earlier. The consequences of earlier spring runoff and reduced total stream discharge volume greatly affect the delivery, timing and availably of water for irrigation use. This is particularly problematic as it affects irrigation diversions, priority water cuts and delivery, and use of water later in the irrigation season.

Agriculture, deeply rooted in Idaho heritage, is synonymous with the Big Wood River Basin. It is a way of life that has been passed down from one generation to the next since the Wood River Valley was settled. Agriculture depends on irrigation water availability and delivery, and this is a major influence on Silver Creek streamflow. Silver Creek, now more than ever, needs targeted management that builds long-term resilience. It requires flexibility to manage the delivery and use of water.

Disputed Water, Increased Demand and Reduced Availability

Water shortages affect all users, and increased water demand and climate change are presenting significant challenges to water resource management within the Wood River Valley. In recent years, downstream Big and Little Wood River surface water rights holders have issued water calls against upstream groundwater users. Such water calls stemming from water shortages are not new and have impacted water users within the Basin since the Valley was first settled; however, in recent years water disputes have increased.

The recent litigation and hearings over water rights and water use has led to strict water administration procedures and diminished availability of water for irrigation. This is the latest chapter in the history of fights over water in the Wood River Valley. These latest developments threaten many aspects of the Basin's economy, viability, and way of life. Productive agriculture, open space, recreation, and vibrant stream ecosystems are the mainstay of the Basin's identity. Agriculture is an important local tradition and economic resource that local government intends to preserve. However, diminished irrigation water availability and restrictions on water rights administration threaten the Valley's agriculture and puts Silver Creek at a crossroads.

Agriculture in the Basin acquires irrigation water from two primary sources: 1) surface water diversions from streams, and 2) groundwater diversions from pumping. In general, surface water diversions are available from late spring to early summer. Once streamflows diminish, most irrigators utilize groundwater to supplement irrigation water for crops through the remainder of the season. On average water years, most users have been able to get their full water allotment. However, groundwater availability has become an issue through the current multi-year drought that has worsened substantially.

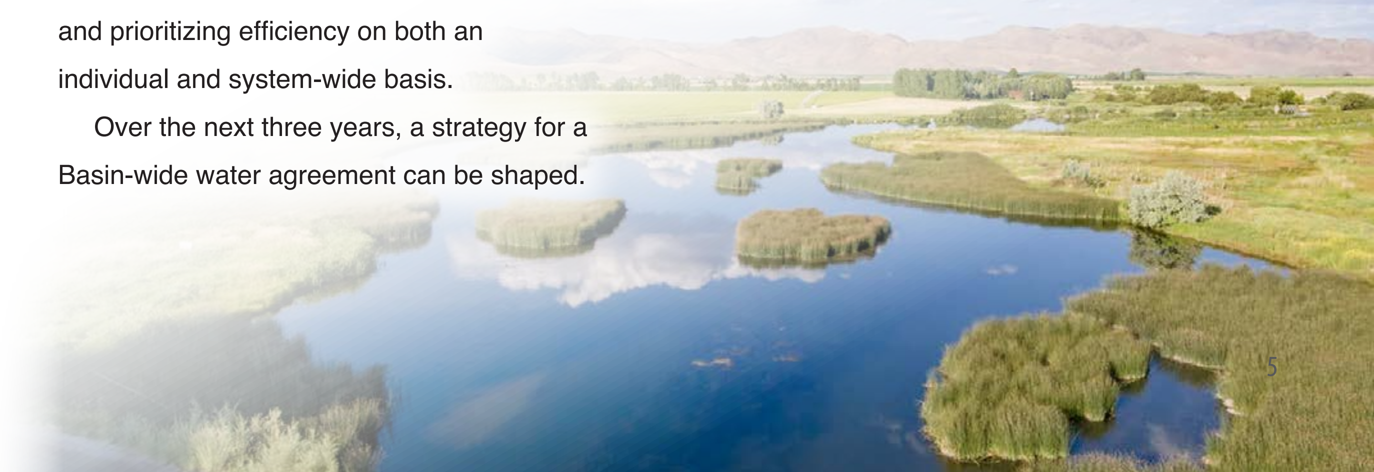
With dwindling water supplies, competition for water has increased. Silver Creek is an arid watershed receiving a scant 6 to13 inches of precipitation per year. This condition is further compounded by multiple years of drought, spring runoff that comes earlier each year, increased water demand, limited water storage and all-time low stream flows in Silver Creek. Low stream flows during the heat of summer elevate water temperature and deplete dissolved oxygen levels, which results in stress to the fishery and raises concerns for potential fish kills.

Most of Idaho's water rights originate from diversions. The state manages its water according to the prior appropriation doctrine, which is based on the idea beneficial use. In essence, this means that those with older water rights get higher priority during times of water scarcity. The appropriation doctrine has also been called "first in time is first in right", because the priority date determines who gets water when there is not enough to go around.

Early in Idaho's history, most water rights were for a fixed amount of water, which was determined based on a particular beneficial use and the prevailing climatic, topographic, and geographic conditions. As such, nearly all water requirements for water rights are tied to the climatic conditions that existed at the time the water right was assessed, many decades, if not a century, ago. This process has led to an over allocation of water rights as water availability has become more limited. Consequently, as water supply becomes scarcer, junior users will face increasing pressure by senior users to curtail their use. Compounding this problem, some senior water rights for a fixed maximum quantity are becoming insufficient in the region due to climate change. The overall result will be more conflict, as each individual user seeks to protect their interests. All of this adds up to uncertainty. In an era of climate change, the priority must focus on flexibility for water use and water sharing, and prioritizing efficiency on both an individual and system-wide basis.

Over the next three years, a strategy for a Basin-wide water agreement can be shaped.

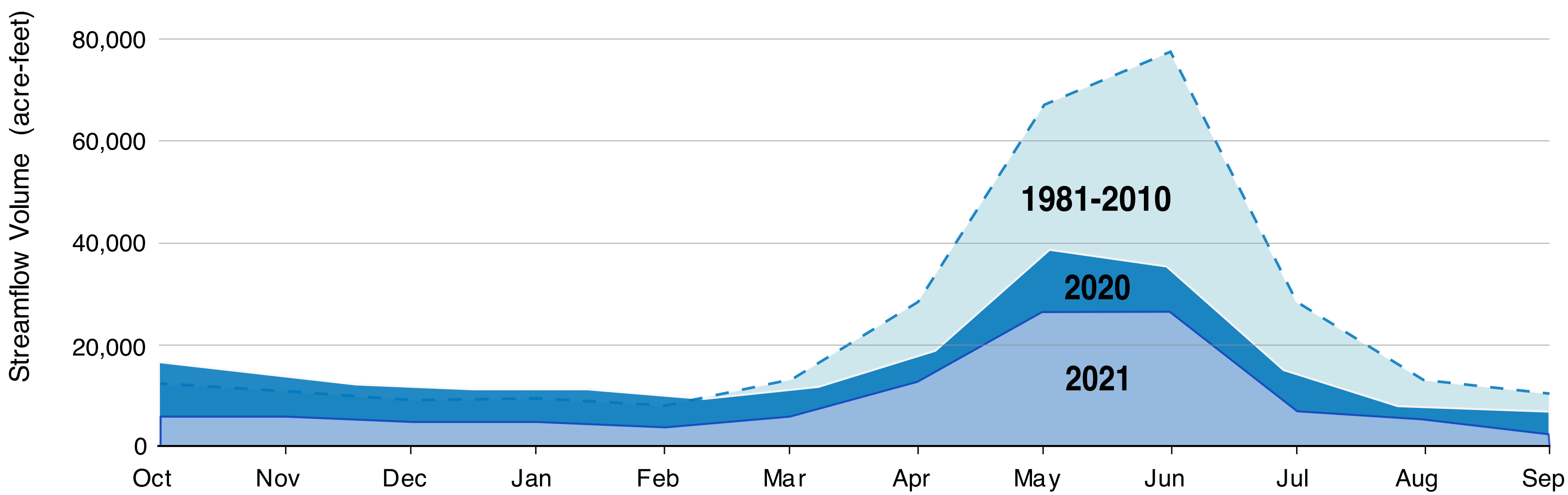
To seize this opportunity requires leadership and cooperation. Leadership will need to address water right reforms, along with efficiency incentives and significant investments in water infrastructure. Ultimately, however, the changes needed cannot be imposed; rather, they must be the product of consensus among water users. That requires cooperation between groups that have traditionally competed for the limited water resources. Climate change presents an opportunity to shift to a cooperative model that could prove to be the key to pooling resources and expertise, and gathering the political will that is necessary to move toward more holistic water resource management. Although not impossible, the political realities of this approach will require significant leadership, investment, and cooperation.



Winter Snow + Water Year 2021

The water year for 2020-21 featured snow pack levels below the most recent 30 year average. In April 2021, snow water equivalent (SWE) levels within the Big Wood Basin were measured at 76% of median from those measured from 1981-2010. Total streamflow volume of the Big Wood River at Hailey (USGS gauge #13139510) for the water year is 49% below median from streamflow measured 1981-2010. This is not good news for the Silver Creek system, which relies almost entirely on groundwater levels within the Wood River Valley Aquifer system in which three quarters of inflow is received directly from tributaries and streamflow losses. As a spring-fed system, Silver Creek's water relies on groundwater upwelling at springheads and streambed groundwater inputs for consistent flow. In 2021, monitoring within Silver Creek's tributaries showed a decrease in spring and streamflows. Additionally, some of the springs dried up mid-summer, a condition that 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 not sustained at most wells throughout the May to October 2021 timeframe. The consistent, cool groundwater inputs that are normal throughout the summer months were not as available this year and led to increases in average and maximum stream temperatures at most locations when compared to past monitoring years. These reductions underscore the importance of groundwater as the ecological driver of the Silver Creek ecosystem.

Photo: Ecosystem Sciences



Big Wood River stream flows (measured in acre-feet) for 2021 as compared to the 30-year median (1981-2010).

April 1, 2021

Idaho Water Supply Outlook Report

Big Wood Basin
76%
of median snowpack

Big Wood Basin
66%
of average precipitation

Streamflows up to
49%
of average

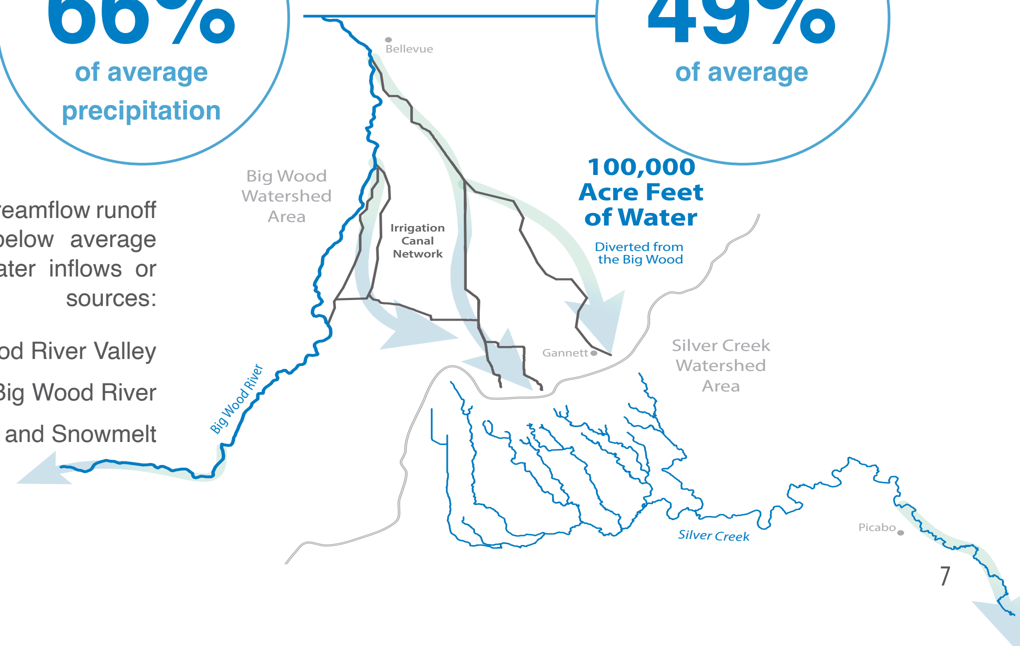
In 2021, the Big Wood Basin received below average precipitation between Oct 1 and April 1.

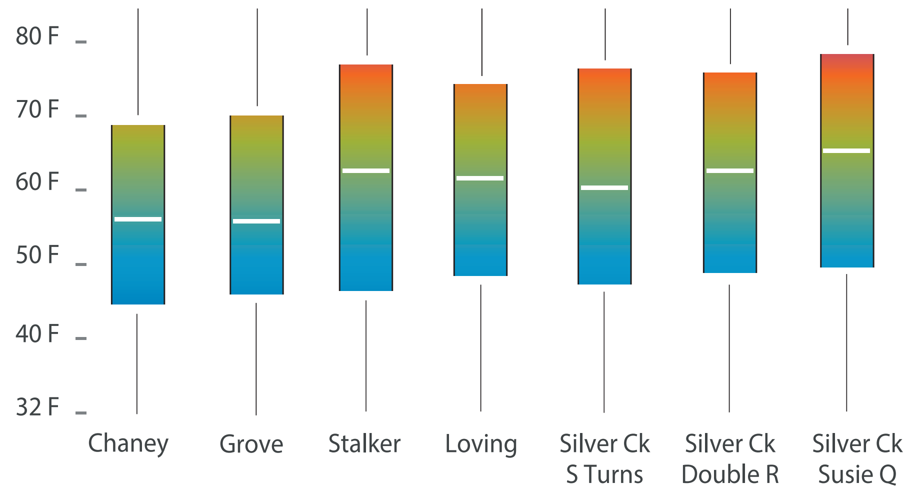
Snowpack conditions, forecast streamflow runoff and groundwater flows were below average in 2021. Major Silver Creek water inflows or sources:

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 11 year period (2011-2021). This year, 38 stream temperature loggers and 13 springhead loggers were monitored throughout Silver Creek and on each tributary to record data and track changes in the system.

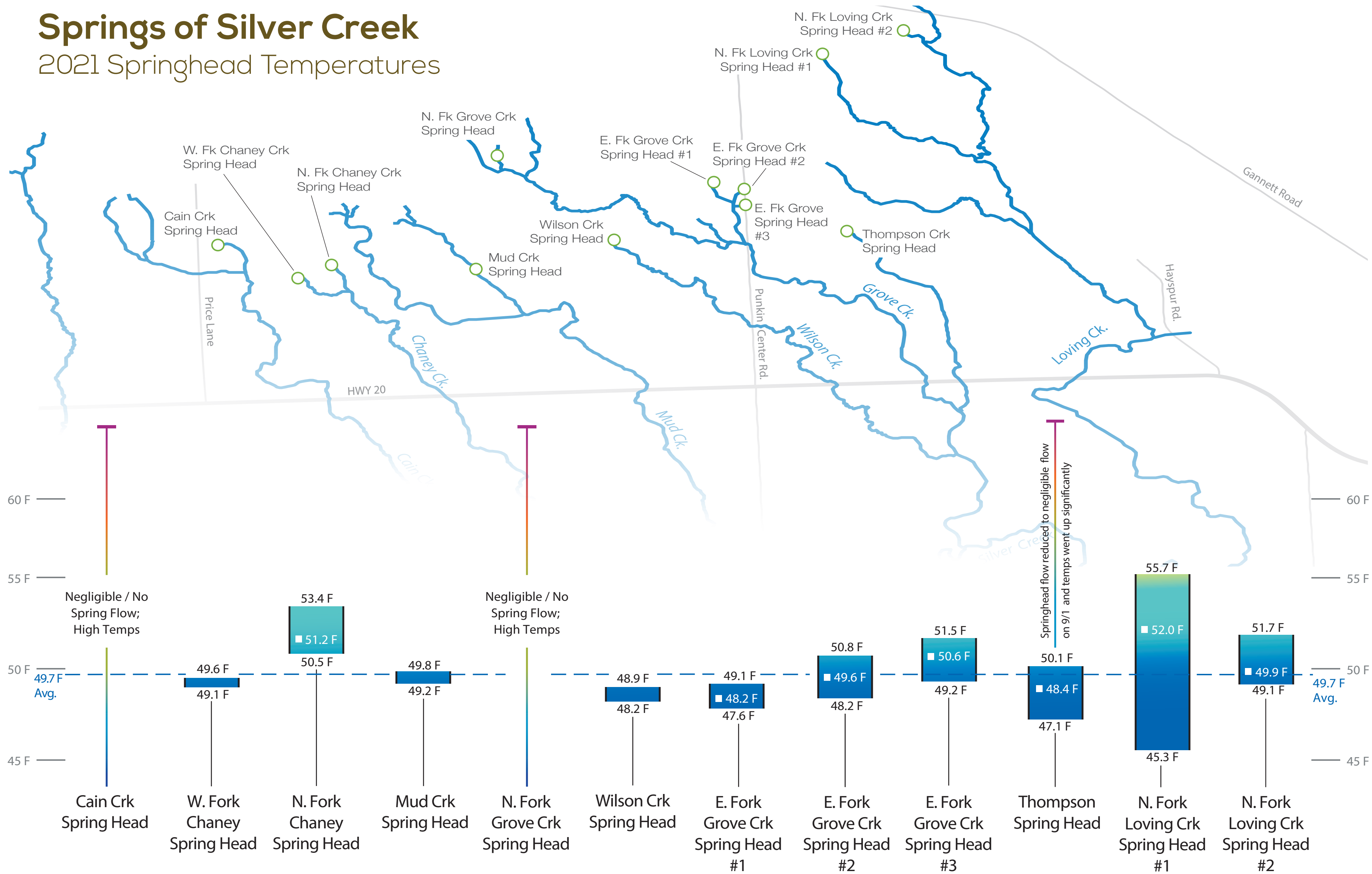
Stream Temperature

In 2021, 13 springhead and 38 stream temperature loggers were deployed 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 mitigate against changes in air temperature and climatic conditions. For the 13 springhead loggers, median temperatures stayed near 51.1°F throughout the summer of 2021. Unfortunately, a few springheads dried up mid-summer. The below average 2020 water year carried over to the 2021 water year; the below average water year in 2021 and a relatively dry spring and summer did not allow for near-normal groundwater levels to return to the valley like they did in 2020. As a spring-driven system, these springs are critical to the health and streamflow of Silver Creek.

Temperature monitoring within Silver Creek and its tributaries found median and maximum stream temperatures to be above average at most locations, with a few exceptions in tributaries throughout the Silver Creek subbasin. This illustrates the connection between the below average water-year which led to a decrease in the duration and quantity of groundwater. The most notable increase in temperature was measured in North Fork Loving

Springs of Silver Creek

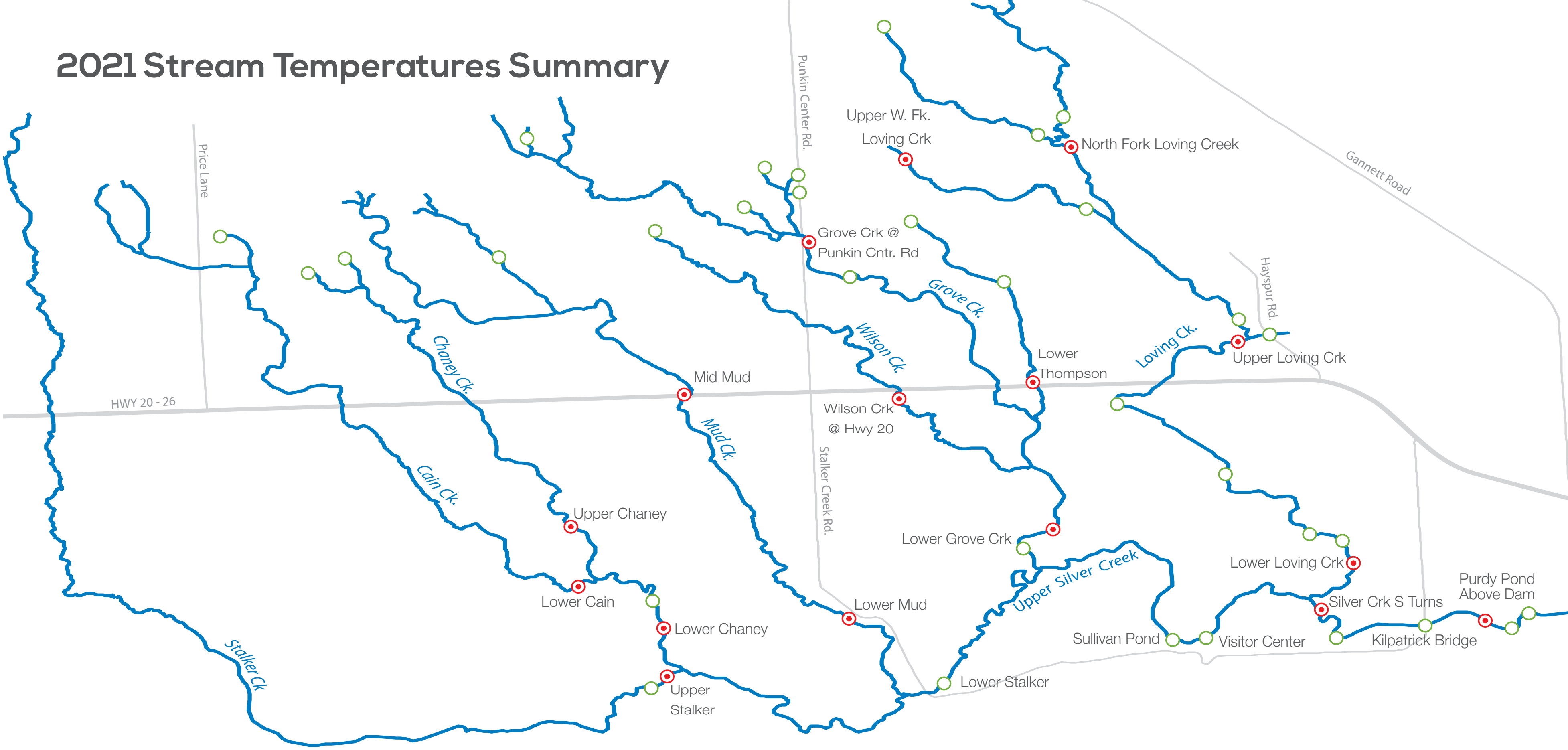
2021 Springhead Temperatures

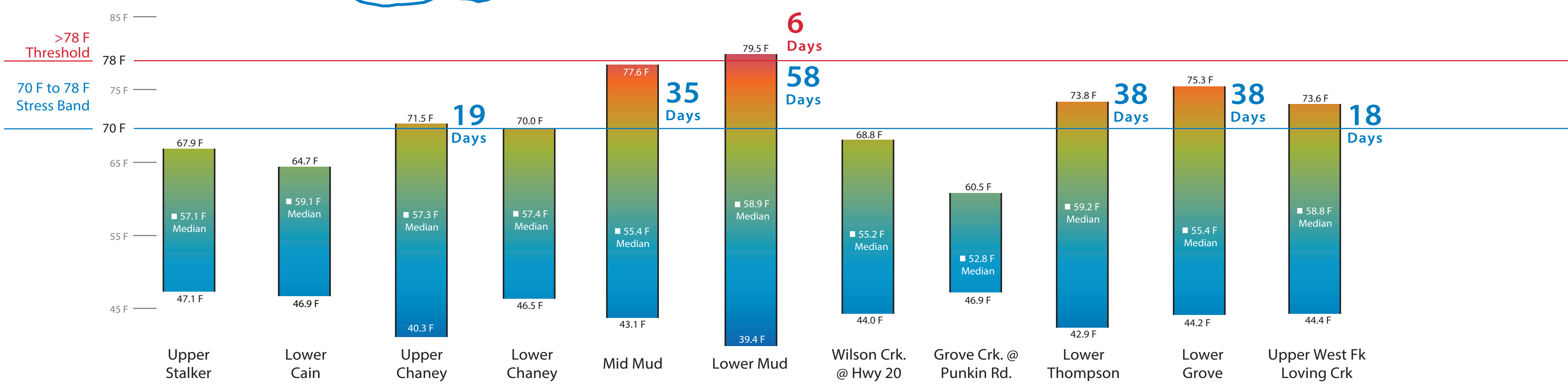


Springhead Temperature Bands The above graphic depicts the summarized spring head temperature data for the entire summer season. The data were analyzed for the summer season to illustrate the spring temperatures that occurred for the period of June through September 2021. Each graph displays the total 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.

Creek, which had temperatures above the stress band (70°F) for 69 days during the monitoring period and experienced an increase in median temperature of 4.1°F from 2020. Other tributaries that saw increases in median temperatures from 2020 include Lower Loving Creek (2°F), Upper Chaney Creek (2°F), and Lower Thompson Creek (1°F). Tributaries that saw decreases in median temperatures from 2020 include Upper Stalker Creek (3°F), Lower Grove Creek (1°F), and Mid Mud Creek (1°F).

2021 Stream Temperatures Summary





Stream temperature bands The above graphic depicts the summarized stream temperature data for the entire summer season for a selected group of data loggers and locations. 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 2021. Each graph displays the total temperature range for the period of record; the absolute high and low temperatures are given, and the median stream temperature is shown for that particular stream.

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:

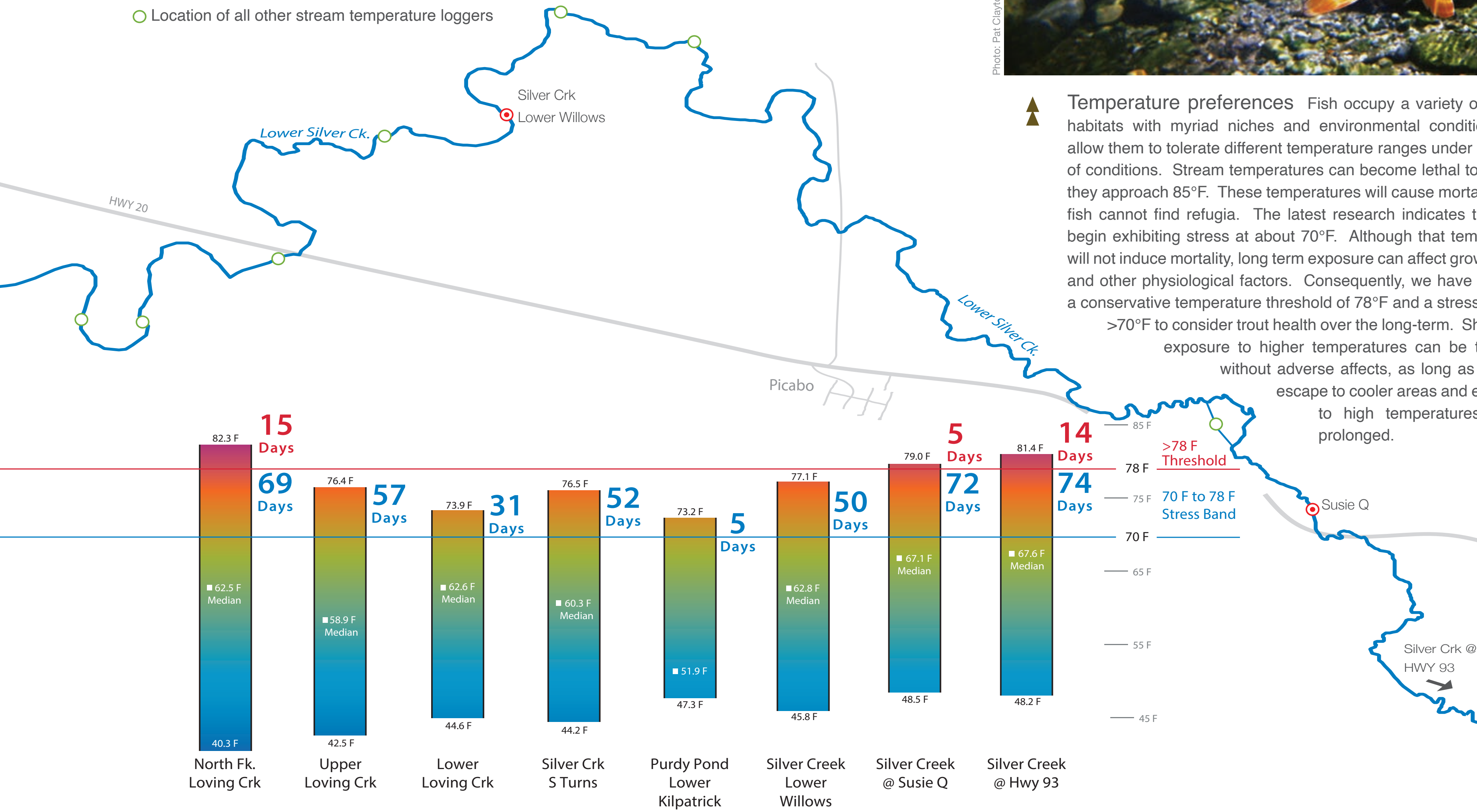
Location of stream temperature loggers illustrated in bottom graphic of seasonal temperatures

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.

Photo: Pat Clayton

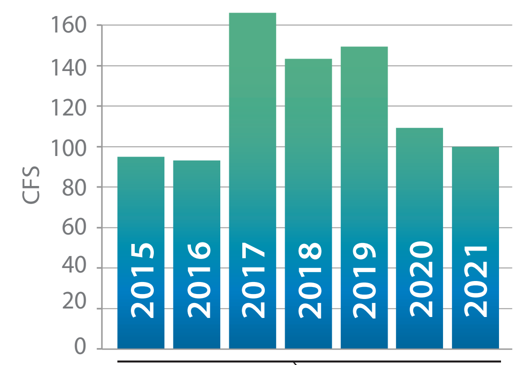
Temperature preferences Fish occupy a variety of stream habitats with myriad niches and environmental conditions that allow them to tolerate different temperature ranges under a variety of conditions. Stream temperatures can become lethal to trout as they approach 85°F. These temperatures will cause 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.

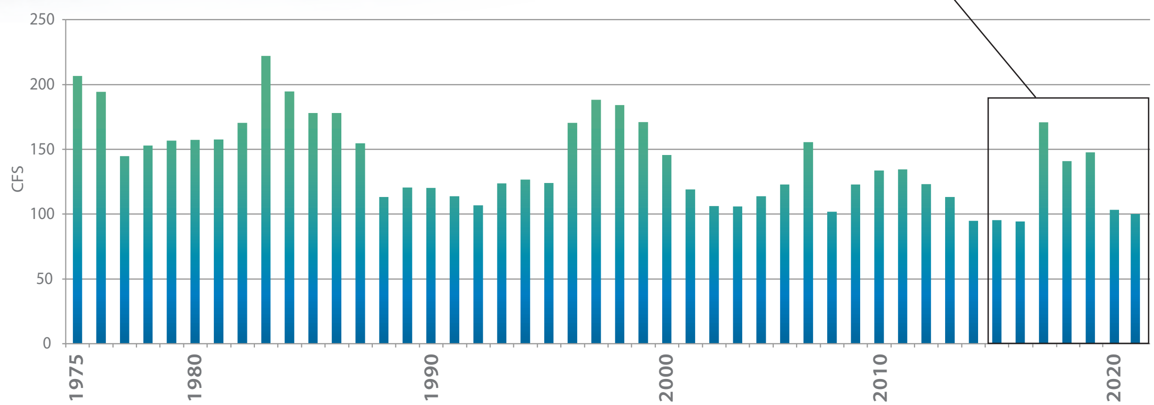


The overall median temperatures throughout the summer remained within the preference range for trout (around 55-60 degrees) in Cain (59F), Chaney (57F), Mud (55-59F), Wilson (54F), Grove (53F), Thompson (59F), the upper reaches of Loving Creek (55-58F), and S-Turns at Silver Creek (60F). The North Fork of Loving Creek, and the Lower reaches of Silver Creek all had median temperatures at or above 60°F. The number of days that temperatures were within the stress band for trout (70°F-78°F) increased compared to measurements taken in 2020, and several sites had multiple days above the threshold (78F).

Stream Hydrology

Annual average streamflow (cfs) at USGS gage (Sportsman Access) 1975 - 2021.





Silver Creek annual average streamflow (cfs) at USGS gage (Sportsman Access) 1975 - 2021.

Monitoring streamflows 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 at Sportsman Access in 2021 was below average and flows were below the 30-year average. Silver Creek's tributaries varied slightly but in general were below average in flows recorded since monitoring began in 2011. It was a below average water year for Silver Creek and its tributaries. The Big Wood River had a below average annual discharge in 2021.

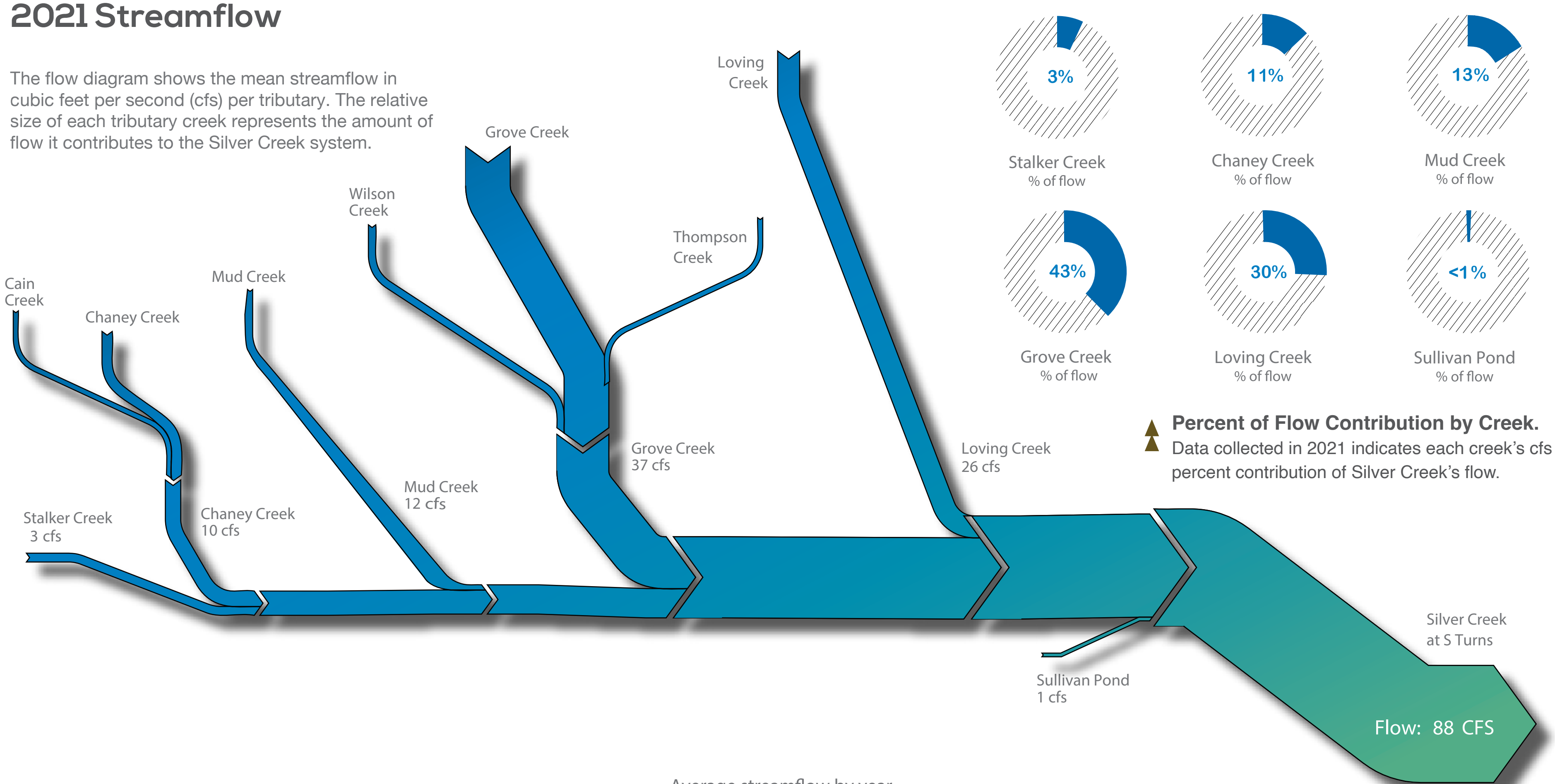
Big Wood River Average Annual Discharge at Hailey gage (cfs):

2015	**311.5**
2016	**406.4**
2017	**1,003.0**
2018	**478.6**
2019	**598.9**
2020	**253.9**
2021	**188.2**

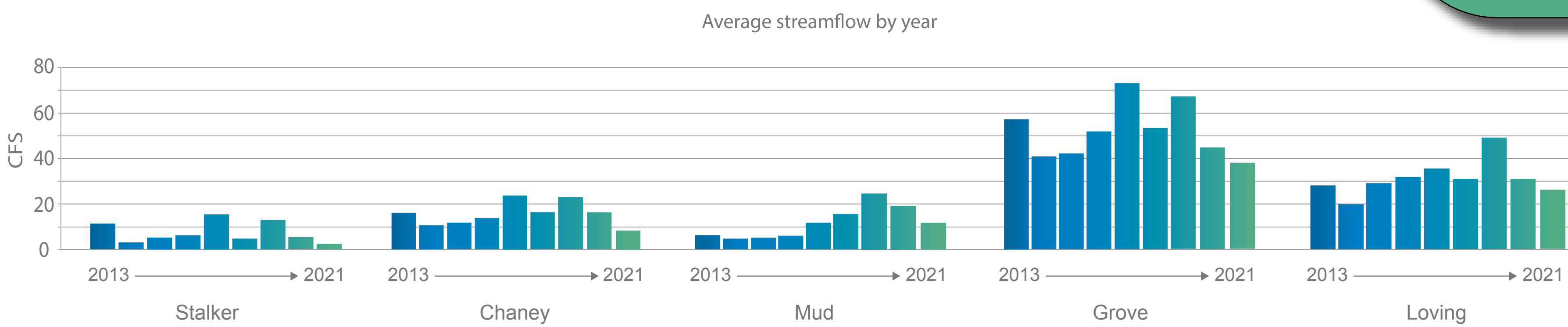
The 2021 water year resulted in below-average flows in the Wood River, Silver Creek, and its tributaries. This is due to a below average snowpack combined with a carryover in lower groundwater levels from the 2020 water year. In addition, a relatively dry spring and summer in 2021 decreased streamflows and the stream system did not approach average streamflows.

2021 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 2021 indicates each creek's cfs and percent contribution of Silver Creek's flow.



Annual average streamflow by creek for 2013-2021. Data collected from 2013 - 2021 shows each creek's average flow. Recent decreases in overall streamflow affects many critical components of the aquatic ecosystem. Measurements were not continuous, but were distributed throughout the spring, summer, and fall.

Dissolved Oxygen

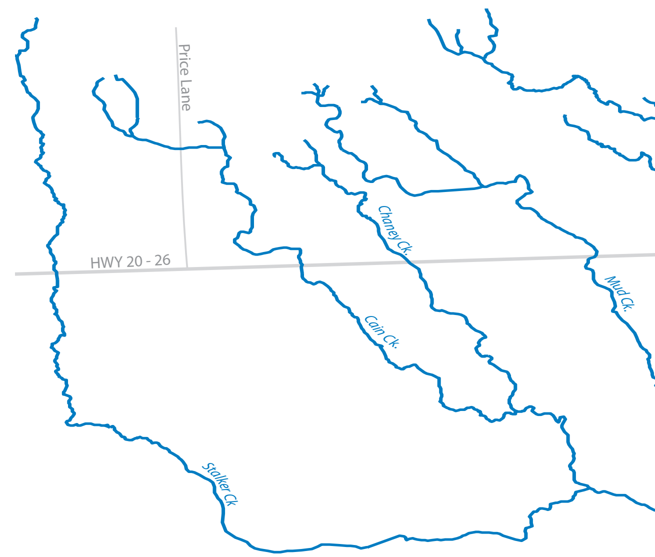
Since 2017, dissolved oxygen (DO) has been measured continuously from June through September at 7 sites. Data is recorded using optical sensors that record DO and temperature values every 15 minutes throughout the season.

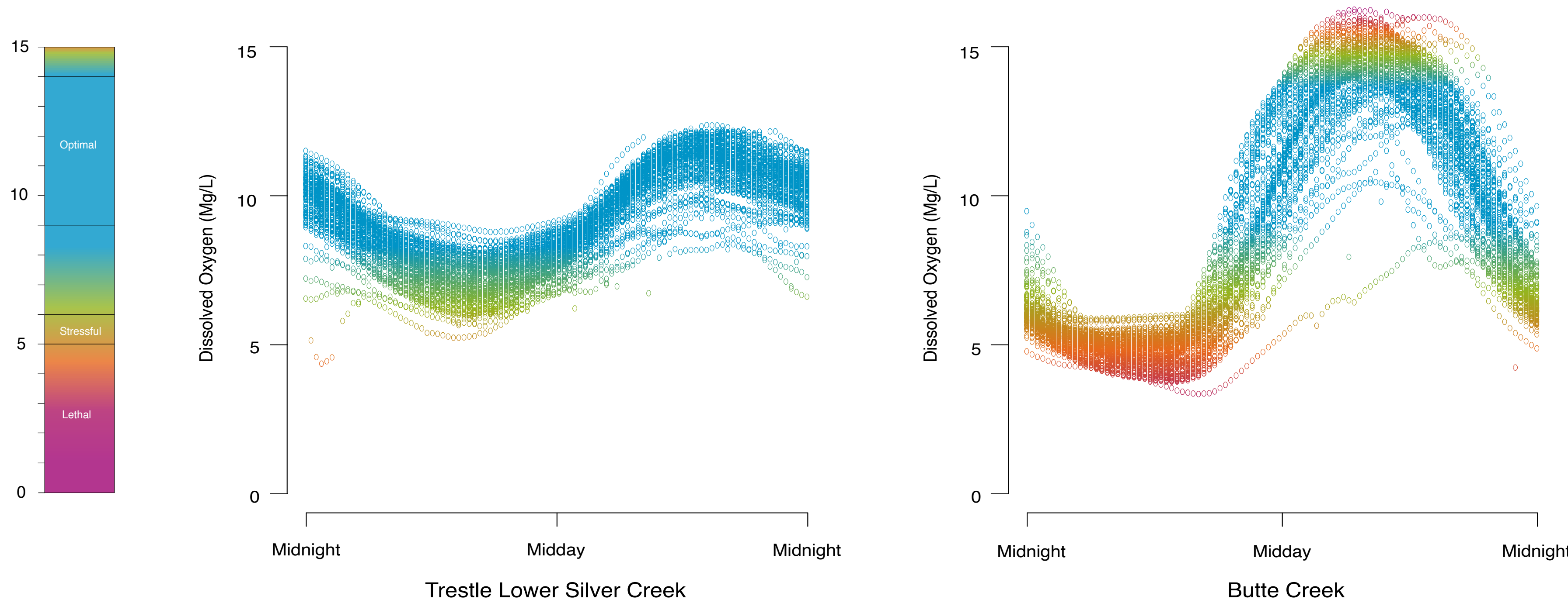
Similar to results from past years, the data indicated that not all of Silver Creek's waterways exhibit the same pattern of DO values and that DO levels stress fish in certain locations at certain times of the day. Seasonal fluctuations also occur, as changes in sunlight, temperature, flow and aquatic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

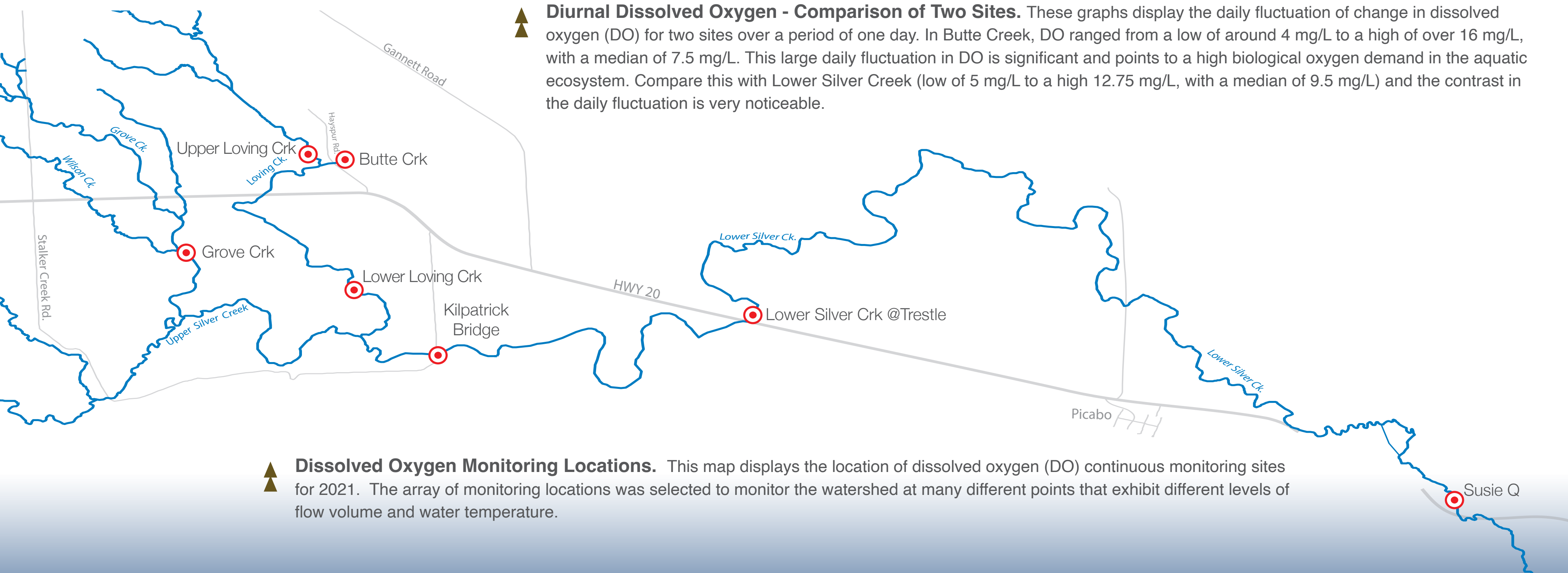
Overnight, plants continue to respire without photosynthesis, which requires oxygen (this demand is called biological oxygen demand) that is taken directly from the water. This daily process causes DO levels to be lowest just before dawn and highest in the afternoon; exhibiting a distinct diurnal cycle. As shown by the diurnal graphs presented, not all cycles are the same. The sensor placed at Lower Silver Creek exhibits a much different diurnal characteristic as compared with the Butte Creek sensor location. Despite the relative 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 volume, 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. These refugia are critical to the aquatic biota of Silver Creek and its tributaries. The seasonal graphs present all data points taken during the 2021 season.



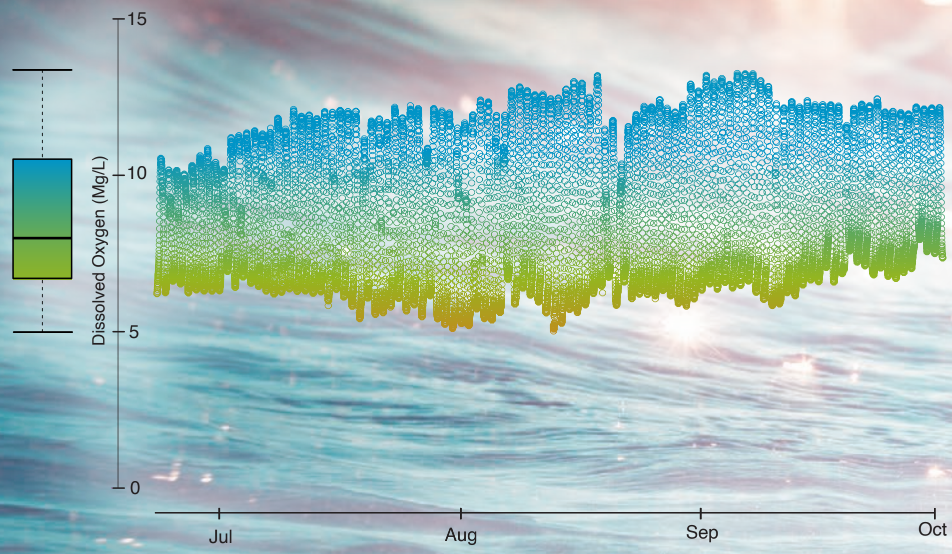


Diurnal Dissolved Oxygen - Comparison of Two Sites. These graphs display the daily fluctuation of change in dissolved oxygen (DO) for two sites over a period of one day. In Butte Creek, DO ranged from a low of around 4 mg/L to a high of over 16 mg/L, with a median of 7.5 mg/L. This large daily fluctuation in DO is significant and points to a high biological oxygen demand in the aquatic ecosystem. Compare this with Lower Silver Creek (low of 5 mg/L to a high 12.75 mg/L, with a median of 9.5 mg/L) and the contrast in the daily fluctuation is very noticeable.

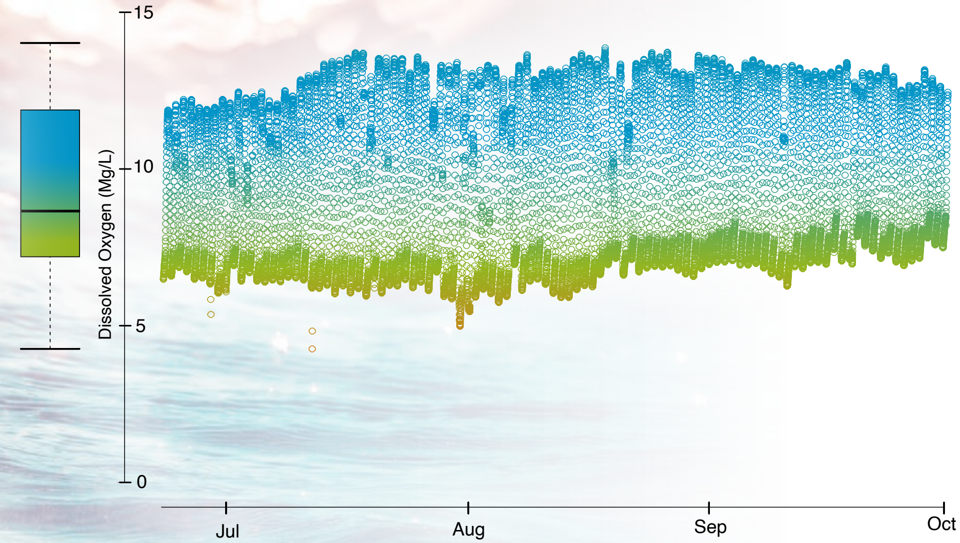


Dissolved Oxygen Monitoring Locations. This map displays the location of dissolved oxygen (DO) continuous monitoring sites for 2021. The array of monitoring locations was selected to monitor the watershed at many different points that exhibit different levels of flow volume and water temperature.

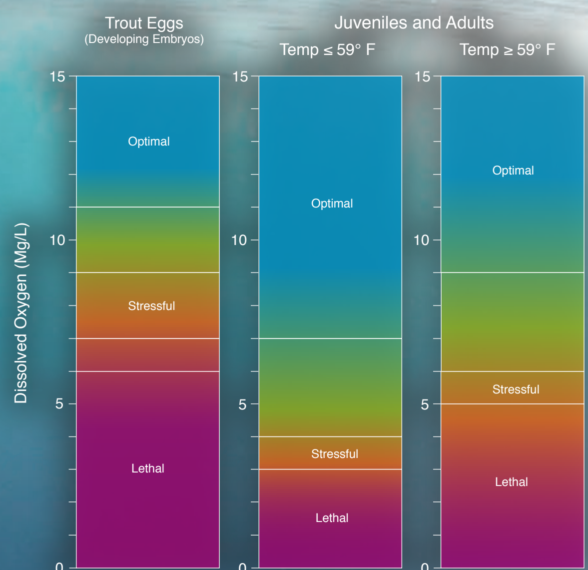
Dissolved Oxygen Results



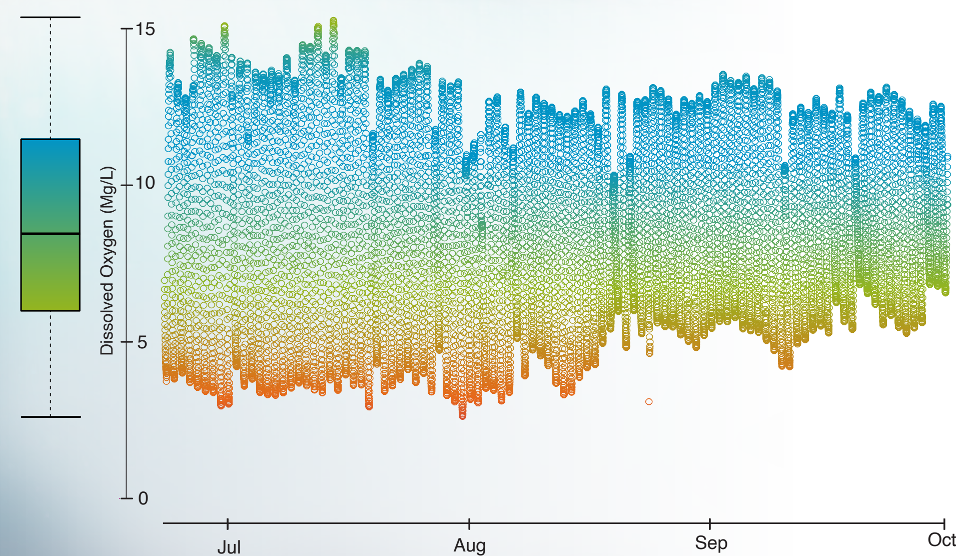
Upper Loving Creek



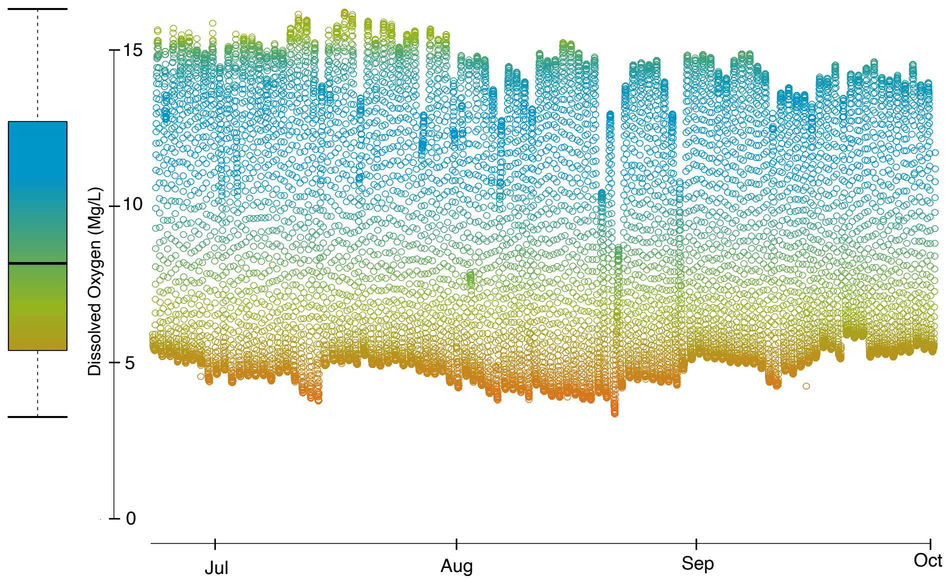
Grove Creek



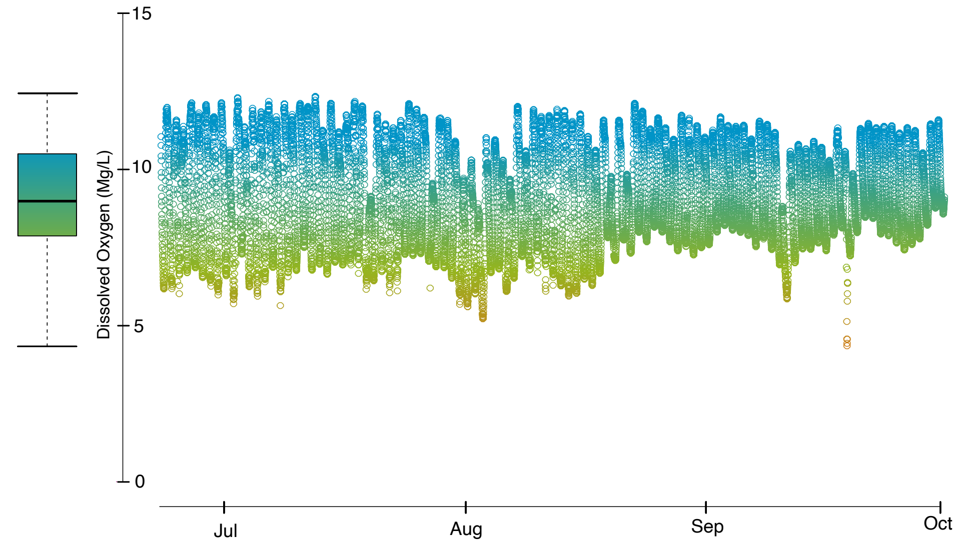
Average Dissolved Oxygen Requirements for Salmonids. Trout, depending on their particular life stage (egg, Juvenile, Adult), have differing requirements and thresholds for dissolved oxygen levels. Water temperature also plays a major role in dissolved oxygen levels. (Adapted from EPA's Chapman, 1986,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



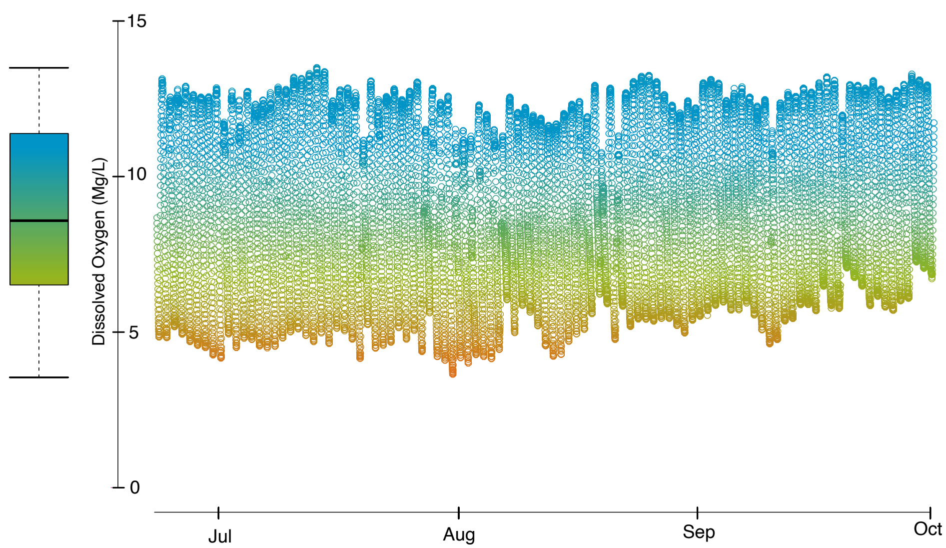
Kilpatrick Bridge Silver Creek



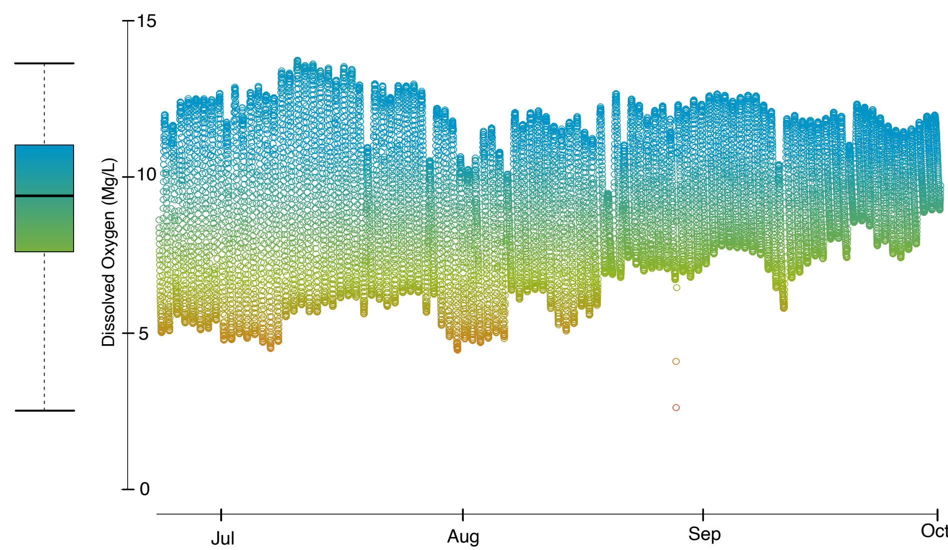
Butte Creek



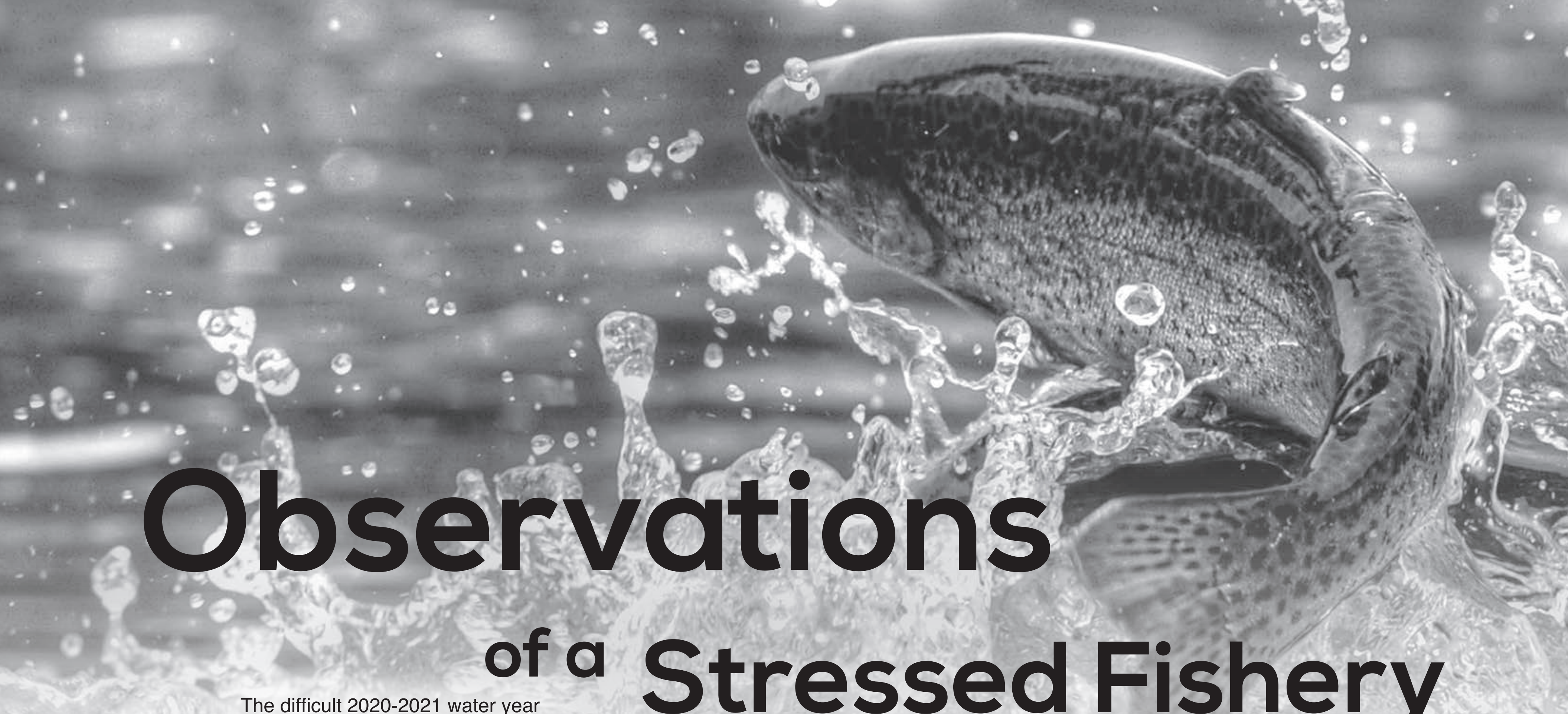
Lower Silver Creek at Trestle



Lower Loving Creek



Susie Q



Observations of a Stressed Fishery

The difficult 2020-2021 water year resulted in low streamflows, high stream temperatures and, in some instances, worrying dissolved oxygen (DO) levels. These factors led to extreme conditions for instream biota, particularly the fish, of Silver Creek. Several observations of dead fish and a potential fish kill led Idaho Department of Fish and Game (IDFG) to conduct a field inspection of Silver Creek. In early June, IDFG investigated reported fish kills and provided some field observations.

Results during the field investigations included the following notes and observations.

- Mid-column water temperature: 60.6 F
- Mid-column dissolve oxygen (DO): 45%, 4.36 mg/L
- Count of mortality: 28 fish dead (likely many more not observed)
- Size Range of Fish: 13 – 16 inches
- Sex Ratio: 29% female, 71% male
- Species Composition: all Rainbow Trout

There were no visible hooking scars observed and all fish exhibited post spawning attributes. There were ten live rainbow trout of similar size swimming near the dead fish observed. All live fish were lethargic and sluggish.

Spring flows from the aquifer are down this year and likely impacting the spring freshet flows and increased water temperatures throughout the summer season.

The macrophyte production over the past few good water years has resulted in a large amount of detritus deposition (an oxygen sink) throughout the stream system. As photosynthesis continues throughout the day, DO increases and fish recover from the nightly dips in DO to become more active. Longer summer days prolong the amount of photosynthesis in a day and increase the threshold of oxygen entering nightfall. Also, increases in aquatic vegetation during mid-summer bolsters photosynthesis, increasing daily oxygen inputs. Past DO readings show this pattern typically beginning in early July.

Moon phase plays a key role in nightly oxygen levels and thus it is not surprising the observed fish mortality event occurred a few days prior to a new moon. Like with cloud cover, photosynthesis cannot occur at night without the benefit of solar reflection from the moon and clear skies.

Fish densities observed from 2020 field efforts suggest higher than average densities of rainbow trout greater than 12 inches, which is likely a response from the past good water years (2017-2019). These increased fish densities often result in more competition for limited oxygen during the summer months, coupled with increased aquatic vegetation production and biologic oxygen demand. The competition from increased trout densities in a poor DO environment can lead to mortality.

All the dead fish observed exhibited post spawning attributes and, based on their lengths, are likely four years of age or older. It is very rare to see rainbow trout past age four in Silver Creek. As a result, this age class is already extremely stressed and vulnerable during this time of exacerbated stream conditions.

All the fish observed had copepods. Copepods are parasites and are common in freshwater fish and found throughout Idaho. Usually there are few parasites present on fish and they go unnoticed, however on occasion they can become numerous and quite evident on gills, in the mouth and at the base of the fish’s fins. When present in extremely high numbers, they can cause health issues. Copepods exacerbate the stress already found in the aquatic instream ecosystem. All the rainbow trout observed were stressed, of an older age class, and likely to die by this summer.

Unfortunately, outside of reducing fish densities through harvest or mechanical removal, there is little that can be done to address fish mortality in the short-term. There are many habitat-focused projects that can combat these issues in the future and protecting or enhancing instream refugia can help the fishery cope with difficult water quality conditions.

Next Steps

Stream Restoration

Stream restoration that balances water conservation values with agricultural land use is vital to the preservation of many fish. Stream restoration using natural channel design methods can be implemented to address these issues. Water conservation and stream restoration have become increasingly important to sustainable water resource management and finding equitable solutions that help reduce conflicts and solve complex economic and environmental problems. In the face of climate change, increased water demand and intensive land uses, adverse impacts to water quality and quantity are evident in Silver Creek. Among dwindling water supplies, competition for water has increased, especially within this arid watershed. Silver Creek has impaired stream and ecological functioning in many areas of the watershed that can be addressed through targeted restoration.

Silver Creek offers many opportunities to improve the in-stream conditions and restore an ecological balance. Restoration goals should include: (1) reconstruction of self-maintaining and resilient streams that connect to historical floodplains and contain high-quality, diverse habitats; (2) creation of off-channel oxbow ponds and restoration of productive wetlands and riparian habitats; (3) raising the groundwater table to improve subsurface saturation conditions; (4) enhancement of hydrological connections and baseflows to maintain fish habitat and ecological functioning; and, (6) improvement of wild trout populations and increasing diversity of non-salmonid fish and benthic invertebrate species in stream reaches identified as problematic.

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 yet. ESF is seeking funds to conduct redd counts in the mainstem Silver Creek during the fall and spring seasons in 2021-2022. Our goal is to create a database with redd locations for brown trout 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 streambank conditions.

Monitoring and Maintenance

Over the past 10 years, the Silver Creek Program has monitored stream hydrology, water temperature, sedimentation and 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 to 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!

Please send donations to:

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2021

Silver Creek Annual Report

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