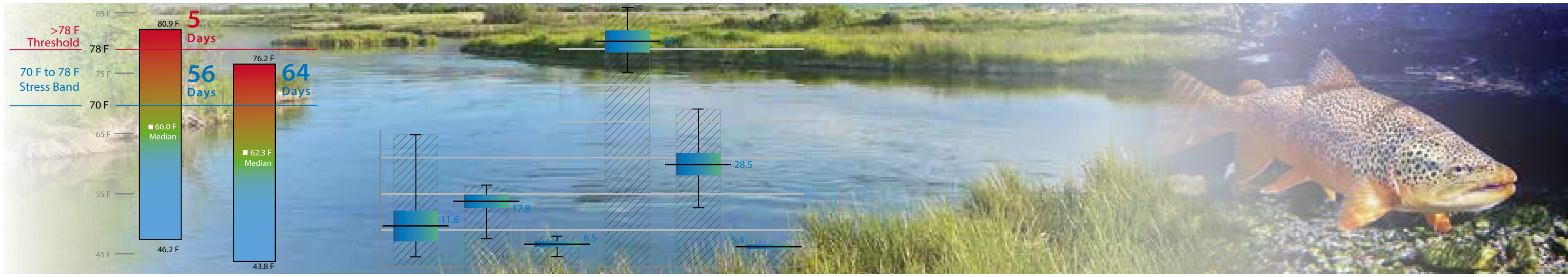
2015

Silver Creek Annual Report

Ecosystem Sciences Foundation



Ecosystem Sciences Foundation

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2015 Report

Silver Creek Watershed

Photo: Shutterstock / Megan Carley

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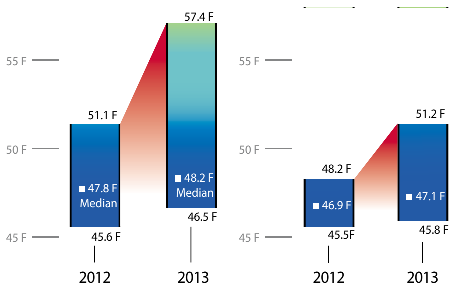
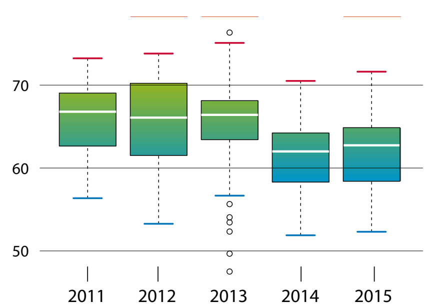


57.4 F
55 F
51.1 F
50 F
47.8 F Median
48.2 F Median
46.5 F
45 F
45.6 F
2012
2013
55 F
51.2 F
50 F
48.2 F
46.9 F
47.1 F
45 F
45.5F
45.8 F
2012
2013



70
60
50
2011
2012
2013
2014
2015

Silver Creek Watershed

Since 2010, Ecosystem Sciences Foundation (ESF) has developed a better understanding of the Silver Creek Watershed through targeted monitoring. ESF developed a Restoration and Enhancement Strategy for the Silver Creek Watershed (2009). The strategy identified numerous actions to be taken, including filling critical data gaps on stream flow, temperature, and sediment conditions.

A logical outcome of the Silver Creek Watershed Enhancement Strategy was to implement monitoring to better understand the creeks and then to develop effective management and restoration tools. This past year ESF and its partners made a significant effort to gauge stream temperatures and the primary reasons why they are rising.

Many of the numerous stream restoration projects which have been performed throughout the watershed have been on private land using private funds. In addition to ensuring that previous restoration investments are maintained, landowners want stream reaches located within their property to support a healthy fishery and be ecologically functional. Additionally, landowners recognize that all of the streams in the watershed are maintained primarily by spring flows and irrigation water diverted from the Big Wood River into the Silver Creek system.

The significant conclusions and findings from 2015 are:

- Reduced flows in all streams have had a considerable impact on temperatures.
- Several creeks continue to exhibit temperatures above the threshold for trout.
- A five year statistical analysis of stream temperature shows that, overall, 2012 was the coldest year, and 2013-2015 were significantly warmer.
- Increases in stream temperatures do not appear to be correlated with air temperatures, and may have less influence than previously thought. Water flow volume has greater influence on stream temperatures.
- Brown trout has replaced rainbow trout as the most prevalent game fish in Silver Creek.
- 2015 exhibited stressful conditions related to flow, water quality and the effects on the fishery. If the trend in low flow continues to worsen, an ecological tipping point will be reached with detrimental effects to the fishery.
- The Kilpatrick Pond enhancement project appears to have had a positive effect on stream temperatures. How the dam is operated is an important factor in the project's effectiveness.

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 rigourous analysis, and reflects a considerable amount of field work to collect. The website has additional information on programs in the watershed, including raw and tabulated data.

Silver Creek Fishery

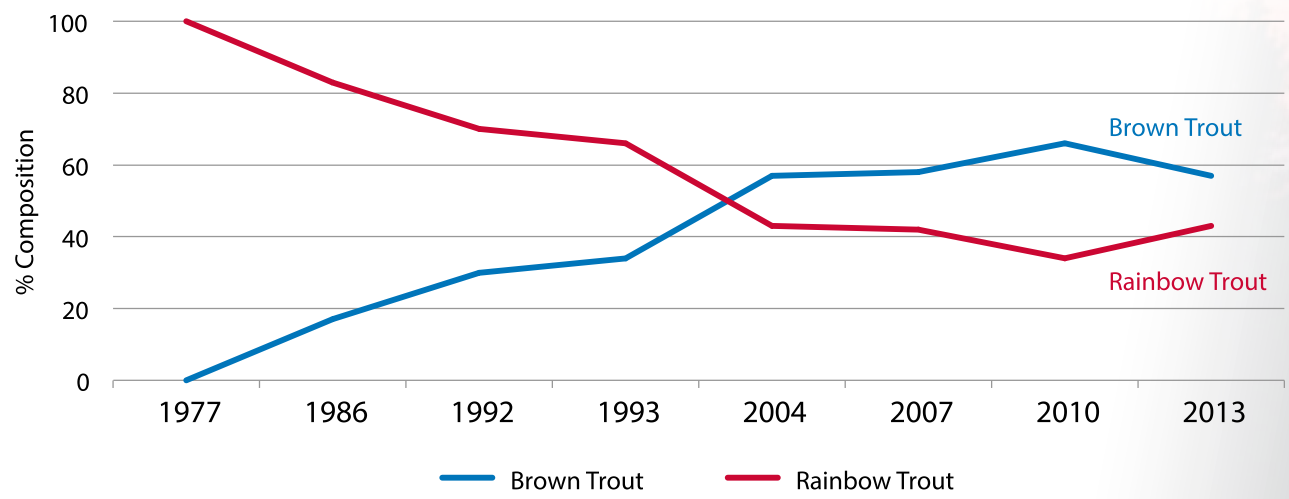
History of Change in Gamefish

Silver Creek has been noted for its excellent fishery since the turn of the twentieth century. One of the earliest Idaho Fish and Game (IDFG) studies to estimate gamefish population was performed in 1947 by Forrest Hauk. Since then, both the University of Idaho and Idaho State University have used Silver Creek for research and numerous graduate theses, in addition to monitoring by Idaho Fish and Game. Because of this interest in Silver Creek and its tributaries, there is a substantial database on everything ranging from the fishery, insects, and plants, to water quality. However, the data base is fragmented, discontinuous, and dated because researchers have worked with different goals in mind.

Historical data from the years of fishery studies can be pieced together for a broad look at game fish conditions and trends through time.

Rainbow Trout have been the traditional gamefish in Silver Creek in recent history.

Photo: Shutterstock/ IDAK



Percent Fish Composition Data 1977-2013 (IDFG population surveys)

The native fish species in Silver Creek and its tributaries include: bridgelip sucker, longnose dace, redside shiner, speckled dace, Paiute sculpin, Wood River sculpin, mountain whitefish, and cutthroat trout. Gamefish consist of non-native species, including: brown trout, rainbow trout and brook trout.

Measurements by IDFG in 2004 indicated that the total fish population in Silver Creek is about 53% gamefish and 47% non-gamefish species.

Unfortunately, recent survey work indicates that mountain whitefish and cutthroat trout may be extirpated from the stream or occurring in very low numbers.

The two primary gamefish are rainbow and brown trout. Data show that over time the trend has been for brown trout to increase while rainbow trout decrease.

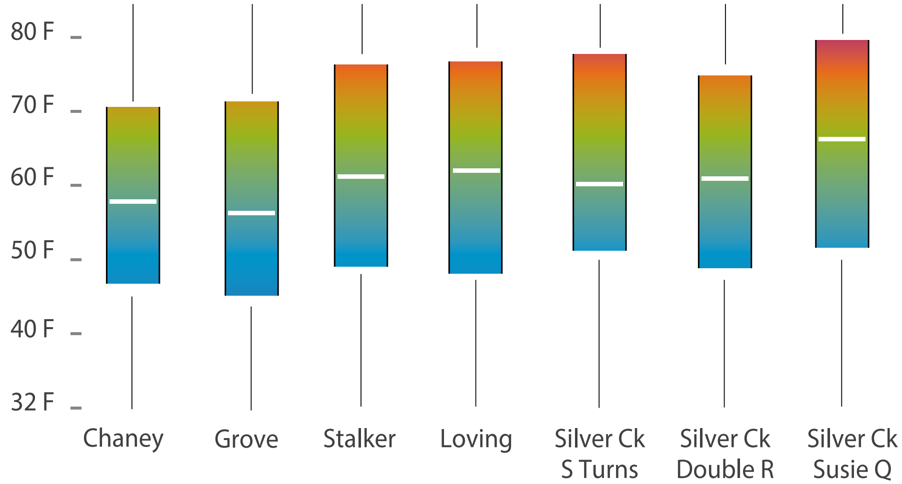
The percent composition shown in the figure above clearly shows that, from 1977 to the last IDFG monitoring year in 2013, brown trout have overtaken rainbows. Components missing from the historic database are fish habitat and limiting factors; both of which would help explain change in gamefish composition.

Silver Creek Fishery

47%	53%
Non-Gamefish	Gamefish

IDFG 2004 Population Surveys

Photo: Shutterstock/ IDAK



Summer Stream Temperatures: The graph above indicates the maximum, average and minimum summer water temperatures on selected areas of Silver Creek over a four year period (2011-2015). This year, 50 stream temperature loggers and 13 springhead loggers were monitored throughout Silver Creek and on each tributary to record critical information and track changes in the system.

Stream Temperature

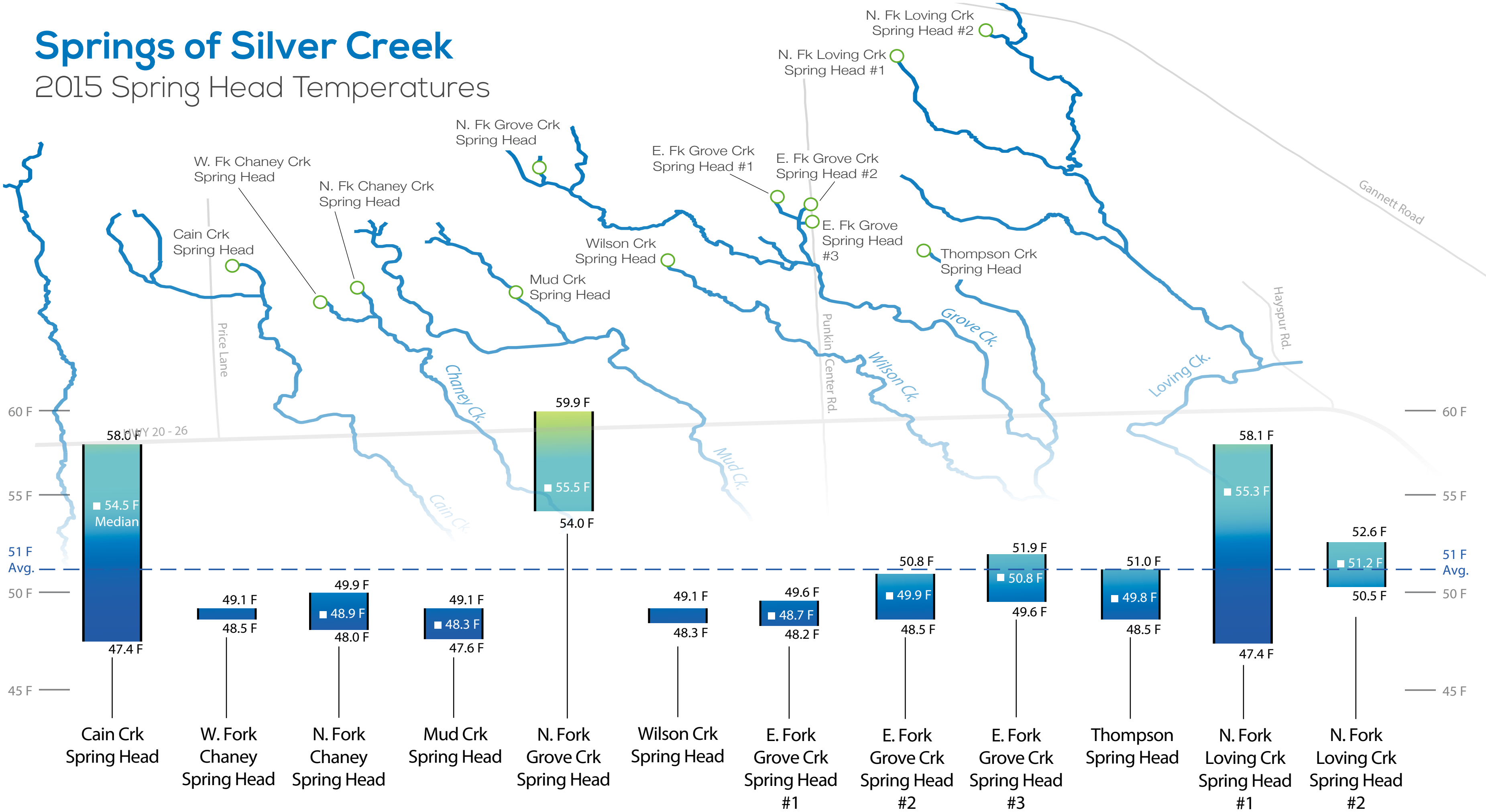
In 2015, ESF completed its fifth year of stream temperature monitoring within the Silver Creek watershed. Beginning with 44 loggers in 2011, the monitoring array now consists of 50 stream temperature loggers and 13 spring head temperature loggers. 2015 was another warm year for the Silver Creek watershed, with water temperatures closely matching those of 2014.

Spring Driven Ecosystem

Spring head water temperatures in a spring driven system, such as Silver Creek, should be relatively constant and not fluctuate greatly with changes in air temperature or climatic conditions. Such was the case for 10 of the 13 spring head loggers that have maintained median temperatures at around 51°F throughout the summer months since monitoring began in 2012. However, since 2013, we have seen an increase in mid-summer temperatures at three spring heads on Cain, North Fork Grove and North Fork Loving creeks (median temperatures around 55°F). A field investigation confirmed that the springs dried periodically throughout the summer, allowing water to sit in the springhead pool and consequently heat up. The cause of

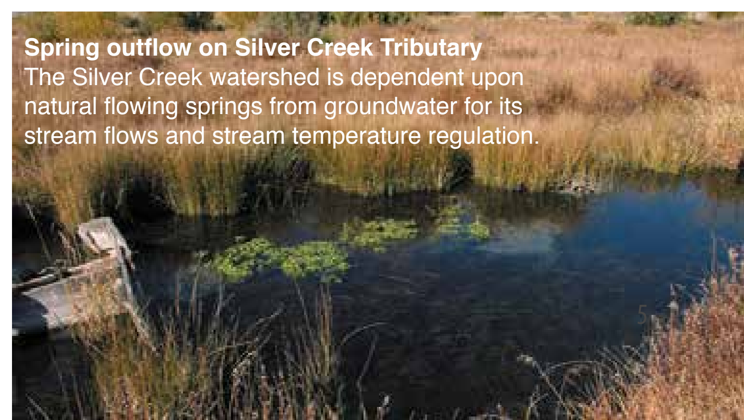
Springs of Silver Creek

2015 Spring Head Temperatures



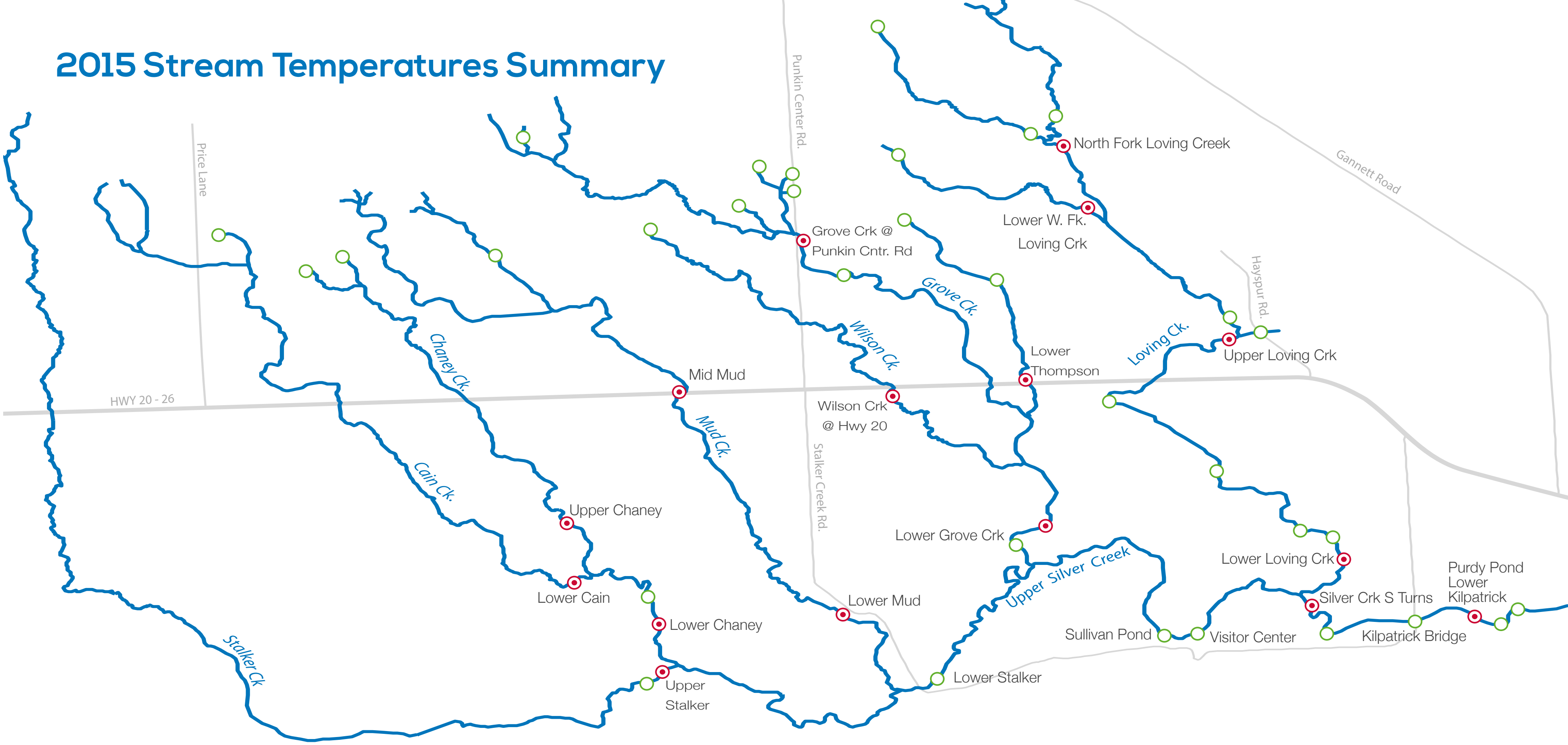
Stream temperature bands The above graphic depicts the summarized spring head temperature data for the entire summer season. The data were analyzed for the summer season to illustrate the spring temperatures that occurred for the period of June through September, 2015. Each graph displays the total temperature 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.

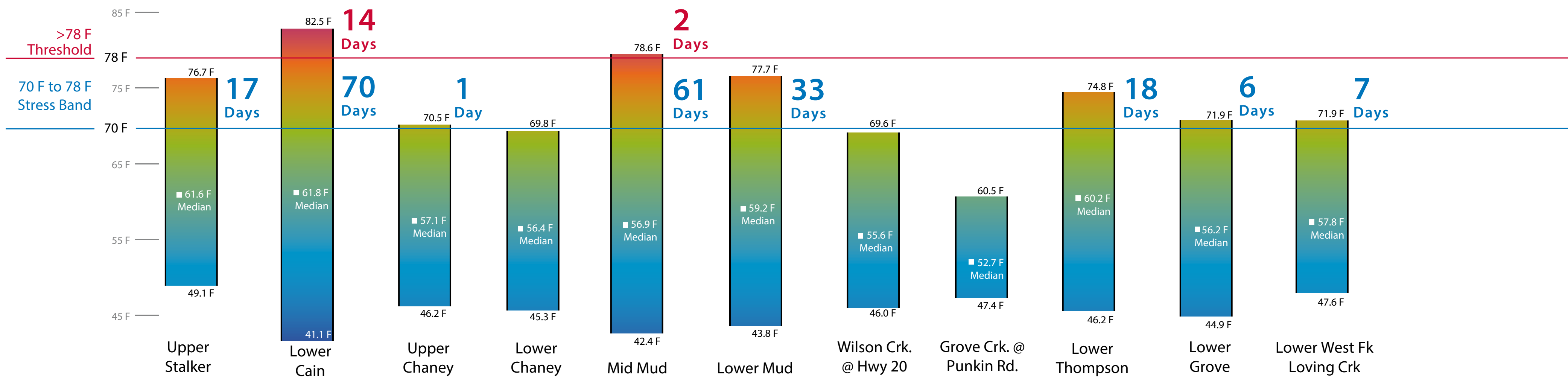
these flow reductions is not fully understood but could be attributed to changes in land use practices, changes in groundwater flow, or a combination of factors. As a spring-driven system, these springs are paramount to the health and persistence of Silver Creek.



Spring outflow on Silver Creek Tributary
The Silver Creek watershed is dependent upon natural flowing springs from groundwater for its stream flows and stream temperature regulation.

2015 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, 2015. 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

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

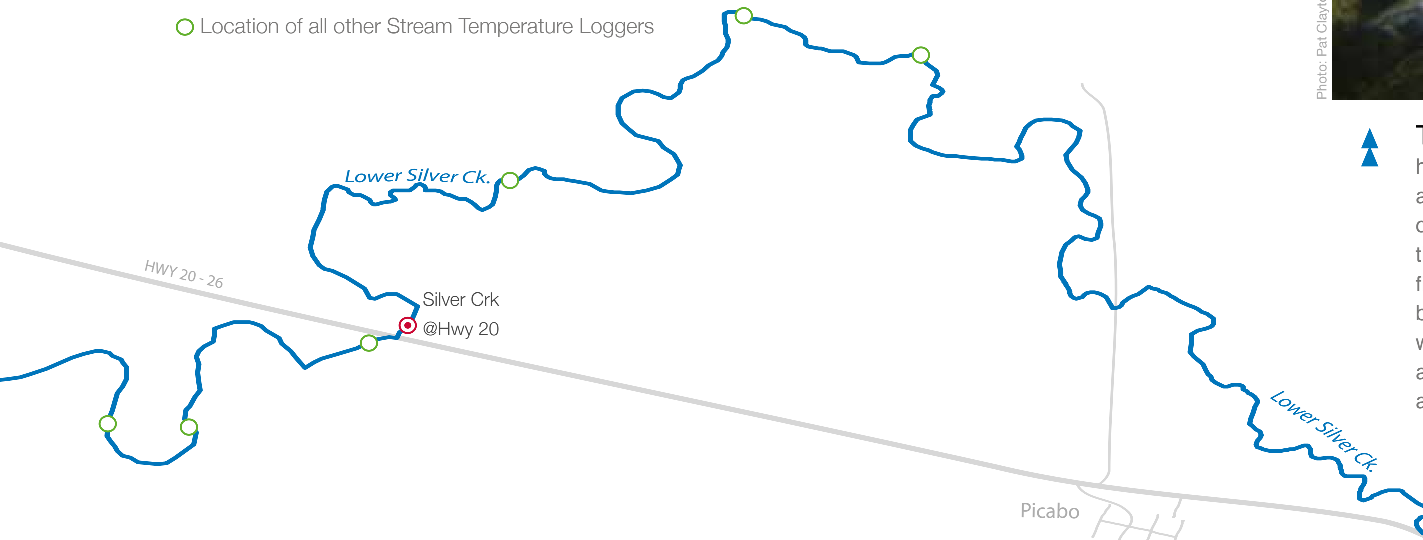
⊙ Location of Stream Temperature Loggers illustrated in bottom graphic of seasonal temperatures

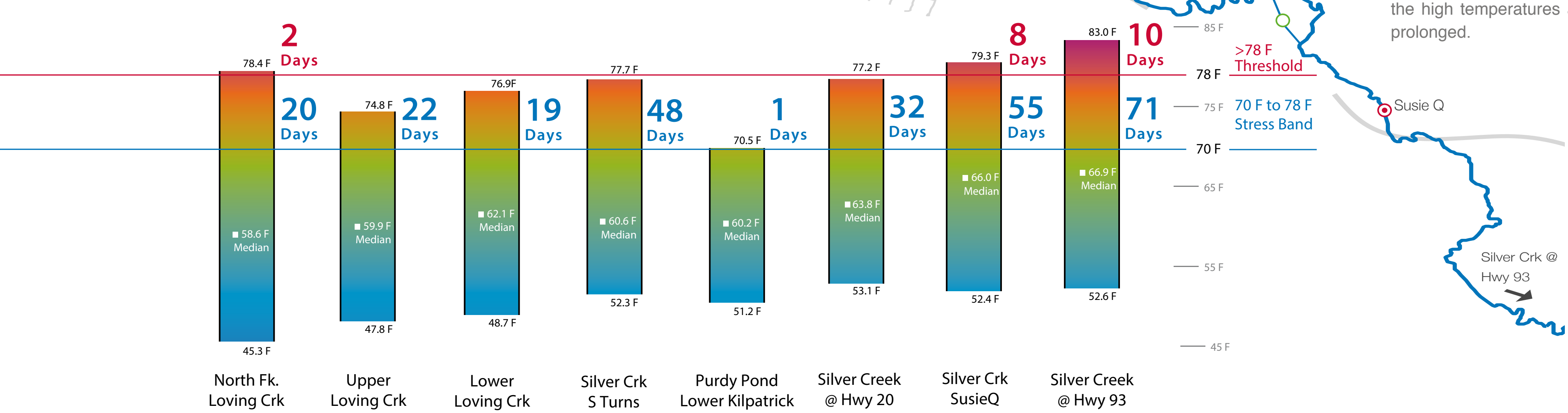
○ Location of all other Stream Temperature Loggers

Stream temperatures are logged at one hour intervals over a twenty four hour period for as long as the logger is left in place. 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 through 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 escape them. 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 rate 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 the high temperatures are not prolonged.



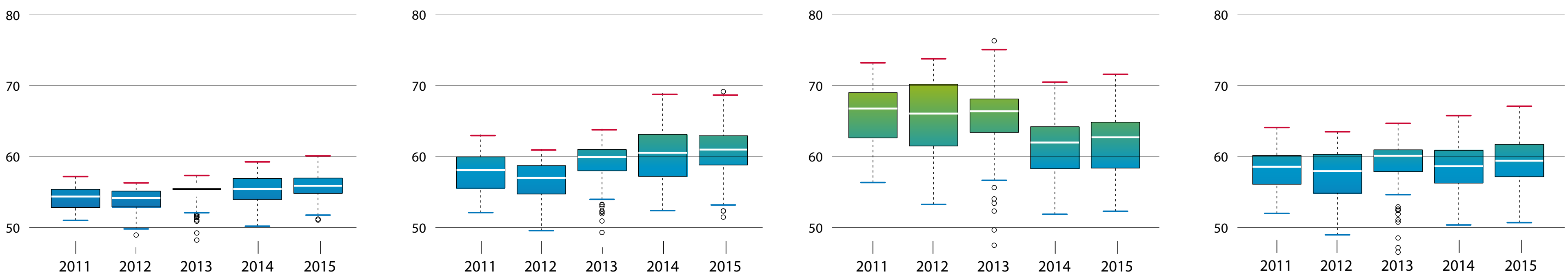


The overall median temperatures between night and day, throughout the summer, were within the preference range for trout (around 55-60 degrees) in Chaney, Mud, Wilson, Grove, and Thompson creeks. Stalker Creek, Cain Creek, Loving Creek and Silver Creek all had median temperatures above 60°F. Several streams, especially in lower Silver Creek, had max temperatures within the stress range (70°F-78°F) and above the threshold (78°F) over long periods of time.

Statistical Analysis

Stream Temperature Change - What Does it Mean?

Average Temperature Plots 2011-2015



Wilson Creek: Daily average temperatures on Wilson Creek exhibited an increasing trend over the period of record. As with many other creeks, 2011 and 2012 temperatures were similar, but 2012 was the coldest. Between 2013-2015, temperatures were 1.0-1.9°F higher than in 2012. Daily maximum temperatures (not shown) remained relatively steady from 2011 to 2013, but were about 1.4°F and 1.8°F warmer in 2014 and 2015, respectively, as compared to 2012 (the coldest year). However, maximum temperatures remain well below the stress threshold for trout (70°F).

Thompson Creek: Average temperatures on Thompson Creek followed the overall trend for all the creeks; 2012 was the coldest, 2014 and 2015 were the warmest. From 2011 to 2015 average temperatures increased by 2.8°F, while the increase from 2012 to 2015 was 4.1°F. Conversely, daily maximum temperatures (not shown) had a different pattern, as there was little difference between years. Furthermore, there was a decrease in average daily maximum temperature of 2.1°F between 2011 and 2015.

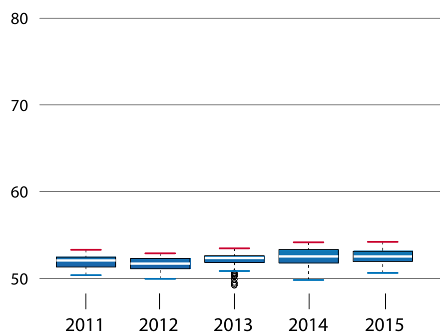
Stalker Creek: Stalker Creek was the only creek to exhibit a decreasing trend for the period of record. There was no difference in average daily stream temperatures between 2011 and 2013. The same can be said for 2014-2015, as temperatures remained constant over this time. 2014 and 2015 were colder than the 3-year period of 2011-2013, ranging between 3.7-4.4 °F colder. The largest difference was a drop in temperature of 4.4 °F (2.7-6.1 95%CI). Daily maximum temperatures (not shown) displayed the same pattern – as maximum daily temperatures declined between 3.8 and 5.7°F between 2011-2013 and 2014-2015.

Mud Creek: Mud Creek daily average temperatures have been mostly stable throughout the monitoring period. The only real differences in temperatures were between 2012 and 2013 (+1.6°F) and 2012 and 2015 (+1.8°F). The other years were all similar enough to be within the range of normal variability. In contrast, the maximum temperatures (not shown) were all similar with the exception of 2013, which was 3.6°F colder than 2011. Daily maximum temperatures for Mud Creek often exceed the stress threshold (70°F) for trout.

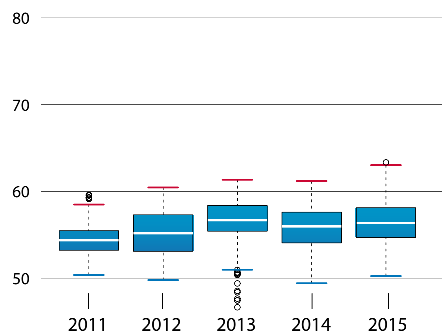
It is easy to look at average temperatures or maximum temperatures and see that numbers are increasing or decreasing from year to year. However, temperatures and climate are highly variable and “real” differences can be difficult to perceive. Statistical tools provide mathematical methods to test for differences in temperatures. For each of the tributaries to Silver Creek, we compiled all of the stream temperature measurements within that creek and analyzed the daily average and maximum temperatures for the summer months between 2011 and 2015. The average temperature captures the overall trend, while the maximum temperatures have high biological significance as these temperatures indicate thresholds that greatly impact fish health. The specific date ranges of each analysis are slightly different for each creek, as the data sets have some missing values and this analysis requires that all years have data for all days. Some creeks (like Stalker) only had one temperature logger that contained a sufficient data set to analyze. Other creeks had several loggers which were pooled together (Loving had eight loggers). The graphs below summarize the statistical tests performed for average temperature on these data sets. [1]

Box Plot Legend

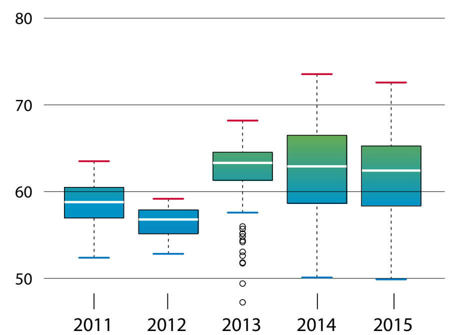
Average Temperature Plots 2011-2015



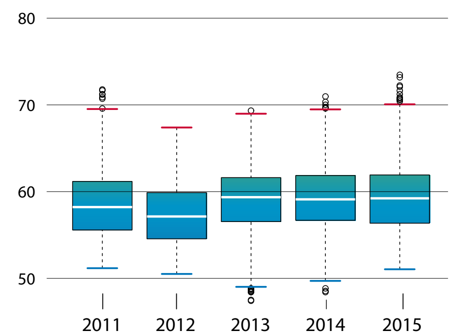
Grove Creek: Grove Creek, the largest tributary to Silver Creek, has the coldest and most stable temperatures of all the tributary creeks over the period of record. As with many of the other creeks, 2012 was the coldest and 2015 was the warmest. Over the period of record, temperatures changed less than 1°F, with the largest difference being between 2012-2015, which saw an increase of 0.8°F. Maximum daily temperatures (not shown) increased by 2.3 and 2.4 °F from 2012 to 2014 and 2015 respectively. Maximum temperatures remain well below the stress threshold (70°F) for trout.



Chaney Creek: Chaney Creek’s average temperatures have been different every year except for 2013 and 2015, which were similar. Increases have been modest – between 0.7 and 2.0° F (the largest increase was between 2011-2015), with a decrease of 0.6°F between 2013 and 2014. Daily maximum temperatures (not shown) on Chaney follow a similar pattern, but 2012 had the lowest daily maximum temperatures. The 2015 daily maximum temperature was 2.1°F higher than 2012. Maximum temperatures for Chaney occasionally exceeded the stress threshold (70°F) for trout.

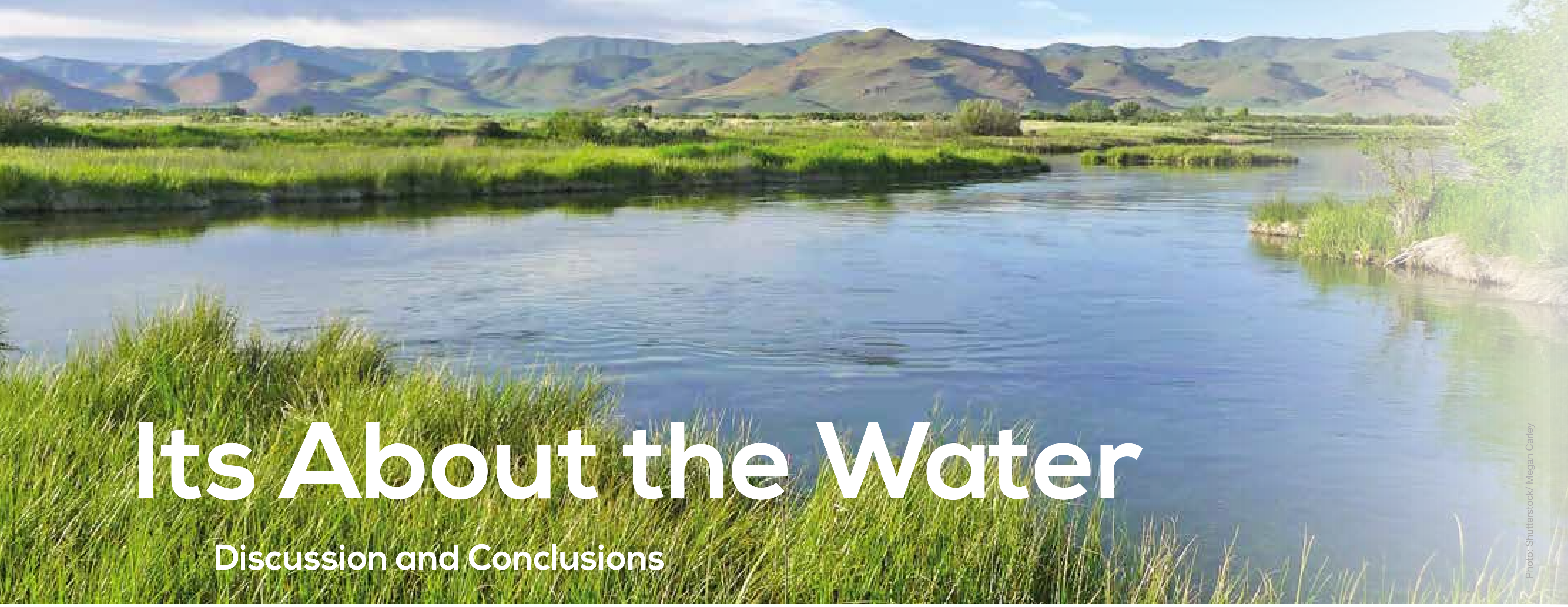


Cain Creek: Cain Creek’s average daily temperatures declined from 2011-2012 (by 2.3°F), but then increased during the 2013-2015 period. The increases in temperature were between 3.1°F and 5.7 °F. In general, temperatures in 2013-2015 were 3.1-3.4 °F warmer than 2011, and 5.4-5.7 °F warmer than 2012. Maximum daily temperatures (not shown) increased even more dramatically, as the average high temperature increased an estimated 16°F between 2012-2014. Maximum temperatures frequently exceeded the stress threshold (70°F) for trout over the 2013-2015 period.



Loving Creek: For Loving Creek, average daily temperatures were the coldest in 2012, and the warmest during the 2013-2015 period. The 2013-2015 period remained stable and was 1.6-2.0°F warmer than 2012 and 0.3-0.7°F warmer than 2011. Maximum daily temperatures (not shown) followed the same trend. During the 2013-2015 monitoring period, maximum temperatures in Loving Creek frequently exceeded the stress threshold (70°F) for trout.

[1] All stream temperature statistical analyses were performed in the R programing environment. All results shown were derived from a Tukey multiple comparisons of means test with a 95% familywise confidence level. Throughout this analysis we present results with p-values <.01.



Its About the Water

Discussion and Conclusions

Over the summer months between 2011 and 2015 a few patterns have emerged from our analysis. The summer of 2012 was the coldest year for stream temperatures. The summers between 2013-2015 were a warmer period. The creeks have each exhibited their own patterns, with Stalker Creek reversing the trend seen in other creeks that exhibited a decline in temperatures over this period. The reason for this is unclear.

One potential reason is that 2012 was an especially cold year for stream temps or it may have been closer to the long-term average; our period of record is not long enough to determine this from our data alone. Air temperatures did not follow the pattern as water temperatures, as 2012 and 2013 were the warmest summers[2]. In fact, the only summers that had significant differences in air temperatures, were 2011 and 2013, the coldest and the warmest summers in the period.

This indicates that although we know that higher air temperatures and solar input to streams contributes to stream temperatures, it is not the driving factor in Silver Creek.

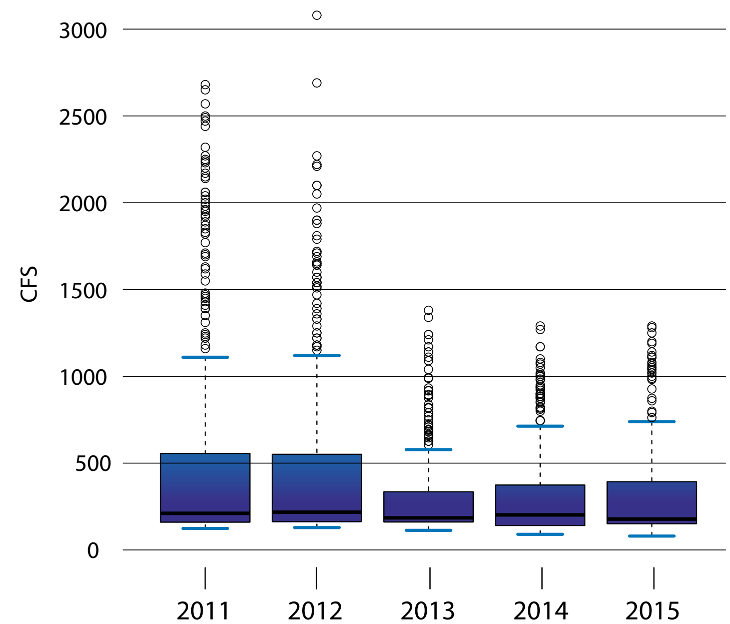
Stream discharge and origin of the water entering Silver Creek must be considered when evaluating stream temperatures within the Silver Creek tributaries. To examine the relationship between discharge at the Hailey Gauge (USGS 13139510) and stream

Photo: Pat Clayton

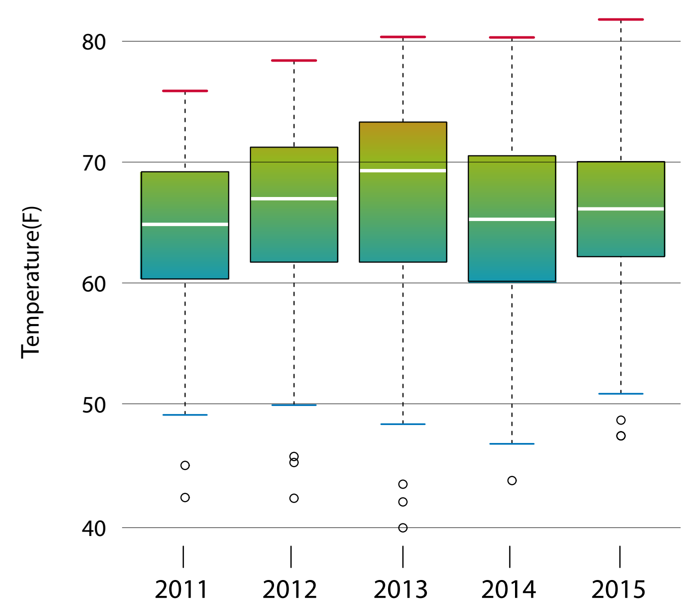
temperatures, a box and whisker plot of the mean daily discharges is presented. It shows that 2011 and 2012 were bigger water years and 2013-2015 were lower water years. The prevailing trend in the temperature data is that 2011 and 2012 were cooler years and 2013-2015 were warmed years, following the same pattern as discharge, not air temperature.

These data indicate that stream temperatures in Silver Creek are more likely a function of the amount of water coming out of the Big Wood Valley than they are a function of the air temperature, shade, or other factors. These factors have been proven to affect stream temperatures, but our data indicate that the volume of water in the Big Wood River is the main driver of Silver Creek stream temperatures.

[2] As measured at the Picabo Agrimet Weather Station.



Silver Creek - Stream Flows 2011 - 2015.



Silver Creek - Air Temperatures 2011 - 2015.

Silver Creek Restoration at Kilpatrick

Two projects were performed on Kilpatrick Pond in 2014 in an effort to increase fish habitat and fisherman access, as well as to reduce temperature loading of the stream. We examined temperature logger data for 2015 (post-restoration) and 2013 (pre-restoration). We looked at the temperatures during summer months (June to September) at temperature monitoring sites above, within and below Kilpatrick Pond (see map with logger locations).

To examine the pond influence on stream temperatures, new loggers were placed in the pond, below the dam and at a new location near the S-Turns. The Kilpatrick Pond logger (located about six feet below the surface), recorded the coldest temperatures in 2015 (see boxplots of temp data). Water temperatures are likely elevated in the upper water column as compared with this logger location. Most of the other loggers are about two feet below the water surface.

The data shows that temperatures declined from the S-turns to the Kilpatrick Pond data logger, then increased in a downstream direction. In fact, the average

Change Pair - Comparison of Conditions Upstream and Downstream of Kilpatrick Bridge, 2013 - 2015 The above two aerial images depict the changes at Kilpatrick bridge that occurred as a result of restoration efforts. The image on the left is from 2013, pre-restoration project. The image on the right is from 2015, post-restoration efforts. While the physical changes are easy to see in the imagery, the results to aquatic conditions are more subtle and complex. Will this project have an overall benefit to the aquatic conditions?

daily temperature was higher at the logger near the dam outlet than it was at the S-turns.

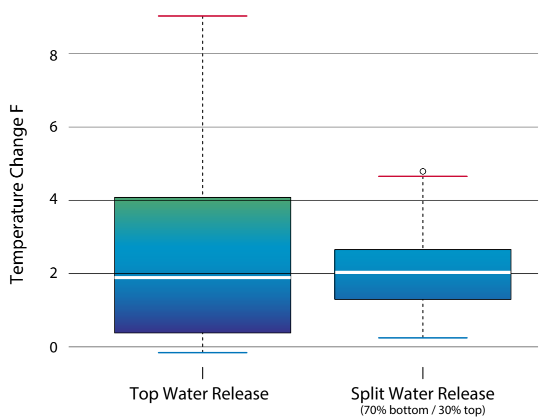
This logger was warmer than the one immediately downstream at the Trestle. This indicates there could be something about the logger placement that is leading to higher temperatures or that the logger at the Trestle is affected by a cooling influence.

The daily maximum temperatures (see boxplot Daily Max Temps) showed more variability and higher maximum temperatures at the S-turns than the pond and downstream, suggesting that the large thermal mass of the pond serves to buffer these areas from extreme temperatures. We looked at the temperature differences between the loggers upstream and downstream of the pond (Temp Changes 2015 boxplot). The larger changes were between the S-turns and the dam outlet. Temperatures slowly increased below from the Trestle to the Lower RR site. The temperatures at the dam outlet were slightly higher than the S-turns.

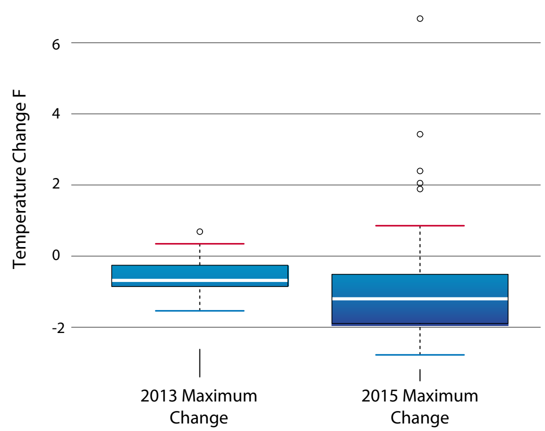
Restoration at Kilpatrick

Dam Operations

The new Kilpatrick Dam includes both bottom and top release capabilities. For the summer period, the dam was operated as 100% top release from June 1 to July 10. From that point until the end of the summer it was operated at 70% bottom release and 30% top release. We looked at temperature change based on the release configuration and found that the exclusive top release configuration resulted in an average increase of 2.67 °F (maximum of 9°F), while the split release had an average increase of 2.07 °F (maximum of 4.79 °F). This represents an average reduction in temperature gain of 23% with a maximum reduction of 47%, demonstrating the benefits that the split release has on cold water aquatic biota.



Temperature Differences between Pond and below Dam Outlet



Temperature Differences between Kilpatrick Bridge and Tressle; 2013 & 2015

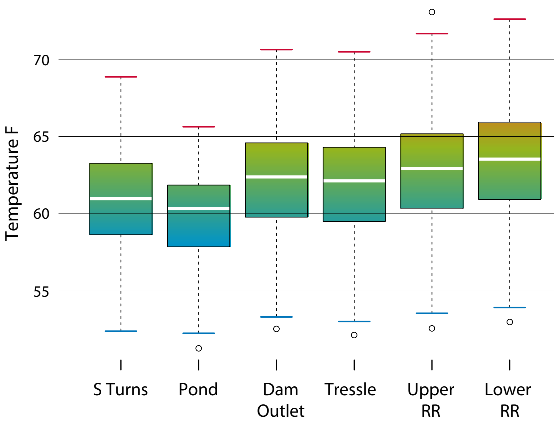
Enhancement Project Effects

Due to incomplete logger data and movement of loggers between 2013 and 2015, the ability to make comparisons between pre and post-project conditions is limited. However, the logger at Kilpatrick Bridge (not included in the analysis referenced above due to its small data range) did record data in 2013 and 2015 between June 1 and July 9 (these data correlate with the top release period in 2015).

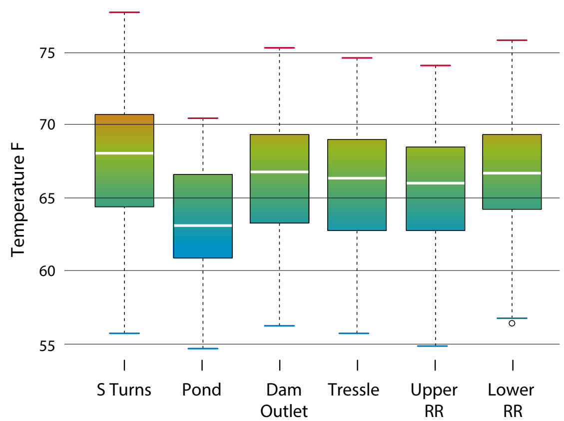
The average maximum daily temperature decreased 0.56 °F between Kilpatrick Bridge and the Trestle in 2013, while decreasing 0.74 °F in 2015 (boxplot of 2013-2015 max. temp change between Bridge and Tressle).

Due to the small sample size, this is not a statistically significant difference (at the .05 level), but it does indicate the possible influence of the dam.

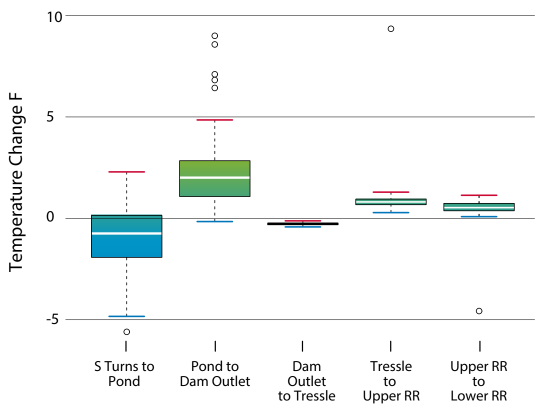
Based on the 2015 temperature data, this effect would likely have been greater during the split release period. The pond provides deeper, cooler water than is available both up and downstream. The pond's large thermal mass buffers downstream habitats by moderating daily maximum temperatures. The split dam release configuration (70% bottom, 30% top) results in lower downstream temperatures than the 100% top release. Based on the limited available data, the project has likely increased these benefits compared to pre-project conditions.



Temperatures Summer 2015



Daily Maximum Temperatures Summer 2015



Temperature Changes Moving Downstream Summer 2015

Fish Habitat Survey

Fall 2015 Redd Counts and Spawning Habitat

Preliminary results

Ecosystem Sciences Foundation, with the support of two other generous Foundations and Greg Loomis (savesilvercreek.org), performed fish habitat surveys and redd counts in the fall of 2015. Access was granted to almost all of the tributaries, with only a few exceptions. Stalker Creek was not surveyed due to its small size and logistical constraints. Fish habitat data is currently being analyzed and will be presented in future reports.

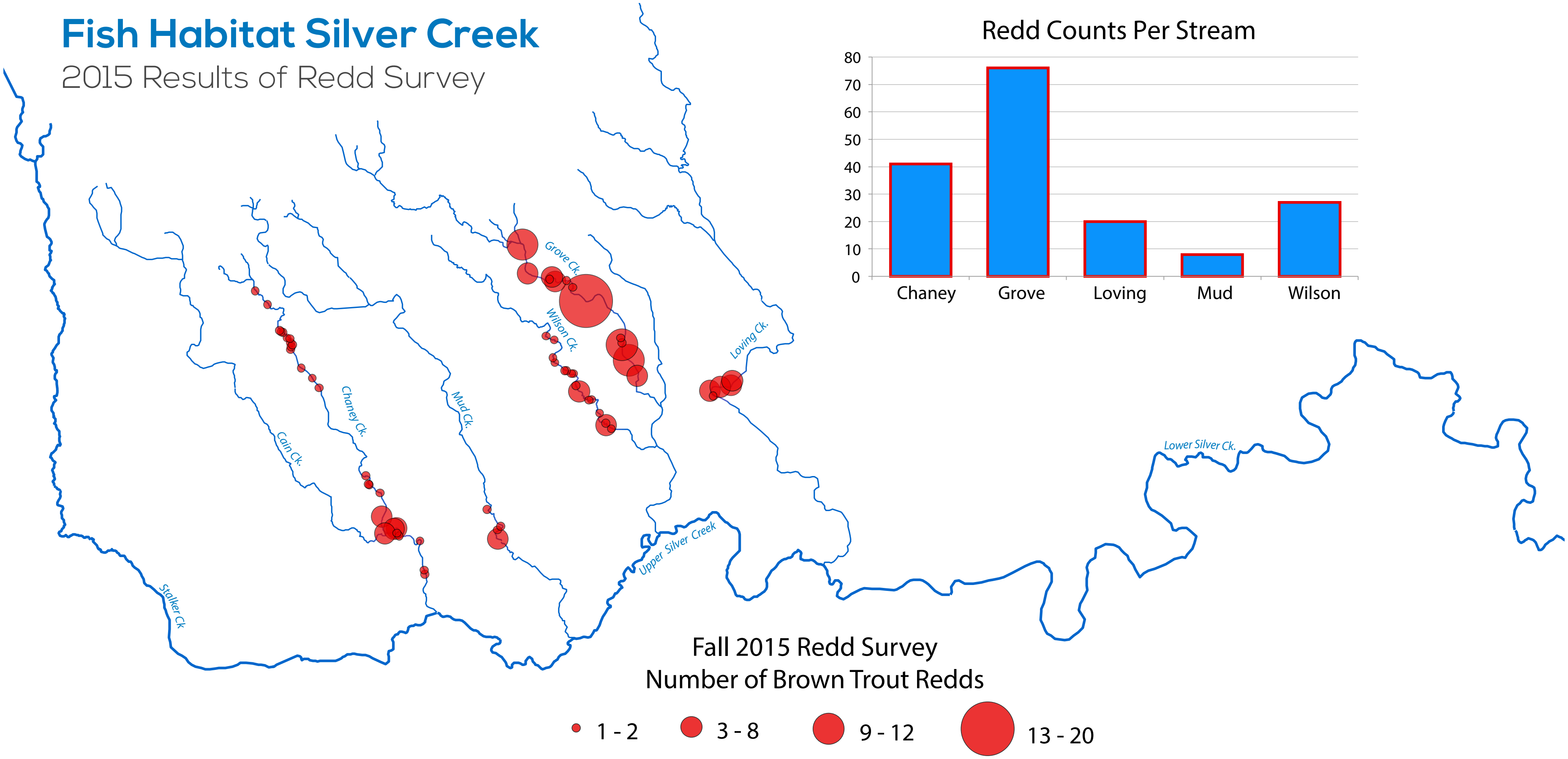
Brown trout are fall spawners, therefore they build their redds and spawn in the fall. The habitat survey was timed to take place just after the peak of spawning activity allowing for the highest detection of redds. Rainbow trout are spring spawners. Field surveys were performed in the spring of 2016, but this data is not yet available.

Brown trout were observed spawning on active redds. Older redds that had been built in previous weeks were also observed. However, it is likely that the spawning habitat on Lower Loving Creek was not well represented. Although no redds were recorded, later in the year brown trout redds were observed in this reach, indicating that the fish may have moved into this reach after the surveys were performed.

Overall, 172 brown trout redds were observed, along with three brook trout redds. Grove Creek and its tributary Wilson Creek together accounted for 103 of the 172 redds

Fish Habitat Silver Creek

2015 Results of Redd Survey



Brown Trout Redds The above map depicts the location and count of brown trout redds that were identified during the 2015 Fall survey. The graph display the total number of redds per stream.

Redds Redds are the nests of spawning fish; clean oval patches of small to medium-sized gravel. Gravel is lighter-colored than surrounding gravel.

observed. The Grove system contained about 60% of the redds observed despite a portion of Lower Grove that was not surveyed due to lack of property access. Chaney Creek is also an important spawning stream for brown trout (41 redds). Loving Creek had one section (near HWY20 above Loving Creek Pond) that contained 20 redds, but the rest of this long tributary was devoid of active spawning. As stated earlier, Lower Loving Creek likely had some late-season spawners following the survey.

A report with habitat results and spawning habitat analysis for both brown and rainbow trout will be available later in 2016.

Photo: US Fish and Wildlife Service

New Imagery, Data and Tools

Photo: Leo Geis / Idaho Airships

In April 2015, Quantum Spatial collected Light Detection and Ranging (LiDAR) data for portions of the Big Wood River Watershed including many of the tributaries that feed Silver Creek and the main stem of Silver Creek from below Kilpatrick Dam to its confluence with the Little Wood River (Figure 1). LiDAR derived products include point cloud data, three-foot digital elevation models of highest hit (i.e., top of tree canopy) and bare earth ground and 1.5-foot intensity rasters (QSI 2015). All data are projected in UTM Zone 11 (QSI 2015).

In terms of Silver Creek, the LiDAR derived data supports existing monitoring (land cover and temperature) and research (fish habitat) efforts, while also providing sound baseline data for future studies. The LiDAR data is being used in the ongoing Silver Creek Tributary Fish Habitat study to quantify wetted channel area per creek (Figure 2). Within a Geographic Information System (GIS) it is possible to delineate each creek's channel banks and thus wetted area based on the LiDAR's high resolution digital elevation models (DEM). Figure 2 depicts the wetted area (yellow outline), or channel, of portions of Grove and Wilson creeks.

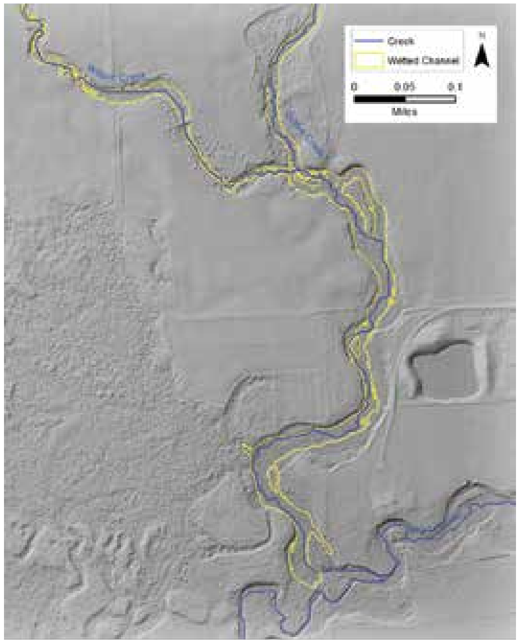


Figure 2. LiDAR derived wetted channel areas for portions of Wilson and Grove creeks.

Figure 3. 2015 NAIP imagery Wilson, Grove and Silver creeks are apparent on the map.

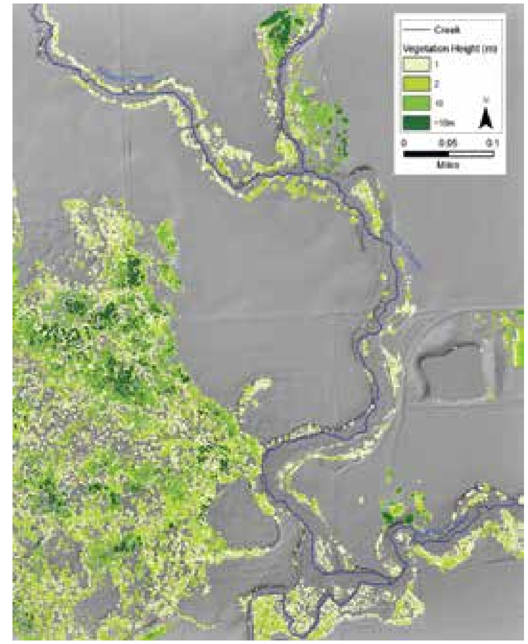


Figure 4. LiDAR derived Vegetation Height.

Another interesting aspect of LiDAR data is that during the acquisition process vegetation height (High Hit) is collected. The LiDAR sensor collects "ground hits" and "high hits" (i.e., top of canopy). These high hits document vegetation height. The LiDAR data supplements previous land cover mapping by providing vegetation height for mapped land cover polygons. Figures 3 and 4 depict the vegetation and vegetation height, respectively, for the same area shown in Figure 2. Figure 3 is the 2015 NAIP image, with trees and shrubs dominating the central portion of the map and adjacent to Wilson, Grove and Silver creeks. Figure 4 shows the vegetation height data from the Big Wood 2015 LiDAR data. The LiDAR data is categorized into classes depicting different vegetation heights (Figure 4).

The lowest class (<1m), that depicts grass and agricultural areas, has been removed from the dataset to highlight shrub and tree areas of the map. The LiDAR data will be used to support much of ESF's work in the Silver Creek Watershed.

Next Steps

Watershed Health

The critical environmental issues throughout the Silver Creek Watershed are temperature, sediments, and flow. These parameters are indicators of the health of the watershed much like checking our own body temperature and circulatory system. Consequently, it is important to maintain the temperature logger arrays and measure flows, water quality and sediment throughout the Silver Creek watershed on a seasonal basis.

Surface Hydrology and Temperature Monitoring

After five years of monitoring, it is clear that the hydrology and temperature monitoring must continue on Silver Creek, particularly as we continue to face reduced flows and drought conditions. We now better understand the system and are able to detect data trends that indicate problems.

Monitoring is a long-term scientific tool that must be performed consistently and funding is needed to continue such monitoring efforts.

Groundwater Protection

All of the surface water in all of the tributaries to Silver Creek originates, for the most part, in headwater springs. Thus, groundwater is the ecological driver for the entire watershed.

If groundwater levels drop such that spring flows are diminished or stopped, the ecosystem faces collapse. The 2015 spring head monitoring indicates that some springs have temporarily dried up. While temperature thresholds and sedimentation are critical parameters that influence the health of the ecosystem, it is groundwater which determines whether there is a ecosystem or not. Consequently, establishing a program to protect Silver Creek's aquifer (part of the Wood River Valley Aquifer) is of utmost importance. Before landowners can determine how the groundwater can be protected, we need to understand the fundamental dynamics of extraction versus recharge.

Severe drought could, in a short period of time, lead to the attenuation of spring flows with adverse ecological consequences to follow. Overdrafting of the aquifer as more groundwater wells go into production throughout the upper watershed can also result in degraded ecosystem conditions.

The cooperative effort between the USGS and IDWR to create a groundwater model for the Wood River Valley Aquifer will be a key tool to understand the greater aquifer dynamics. However, local dynamics can be better understood by implementing shallow monitoring of groundwater on a finer scale.

Fish Habitat Mapping

In 2015 and 2016, ESF began fish habitat mapping in the upper reaches of Silver Creek. This effort will delineate trout spawning areas, early rearing and nursery areas within Silver Creek and in side channels, pools (deep and shallow), undercut banks, resting and feeding zones, sediment conditions, beaver ponds, riparian vegetation and stream bank conditions, areas of reed canary grass growth, channel constrictions, and over-widened reaches. Fish are one of the treasured resources in Silver Creek and they should be understood and protected. This effort will aid in our understanding of conditions and habitat.

Funding

In order to continue this important work and increase our understanding of the Silver Creek system it requires funding. Please consider a donation to continue this important program. Without your contributions this work cannot be done. Substantial volunteer effort goes into the Silver Creek program each year and your donations directly support the work.

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Photo: Leo Geis / Idaho Airships

2015

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