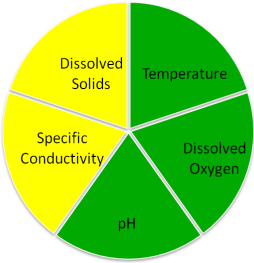
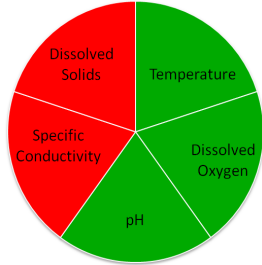


UPPER SAN PABLO CREEK REPORT CARD

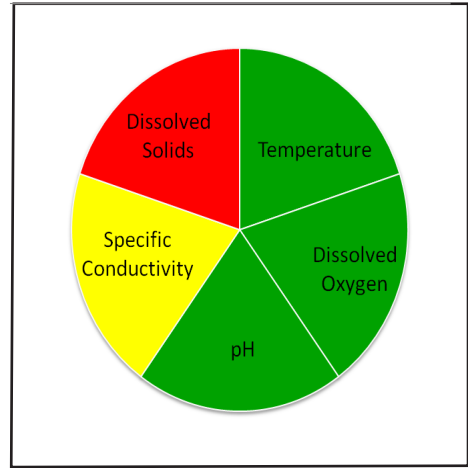
August 2017-July 2018



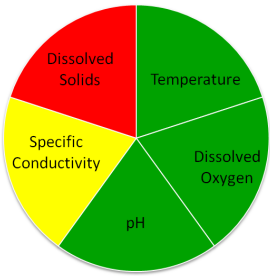
SPA180: SP @ Manzanita



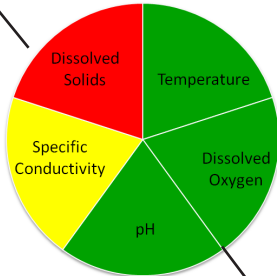
SPA210: Lauterwasser Creek



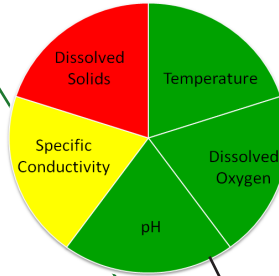
Overall Score



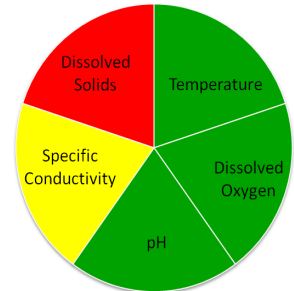
SPA230: SP tributary Brookwood & Moraga



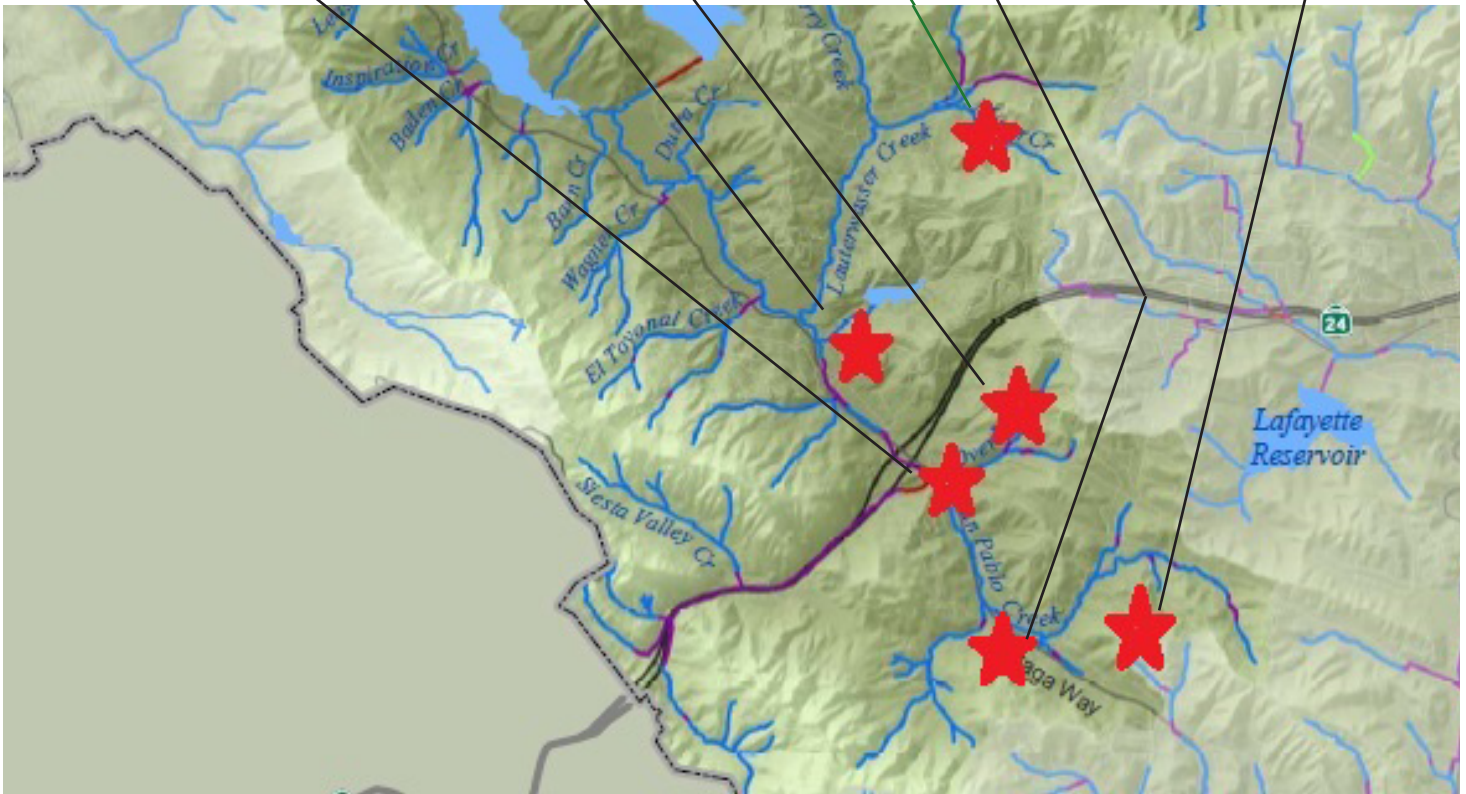
SPA231: Brookside & Moraga



SPA250: SP @ Brookside & Moraga



SPA260: SP @ Orchard & Glorietta



TEMPERATURE IN UPPER SAN PABLO CREEK

Water temperature affects all creatures living in the stream, as well as directly influencing water chemistry, including Conductivity and Dissolved Oxygen. Different animals have different preferred temperature ranges; cold water fish such as rainbow trout like water to be less than 16°C, although they can tolerate higher temperatures. However, temperatures above 24°C can be lethal to fish.

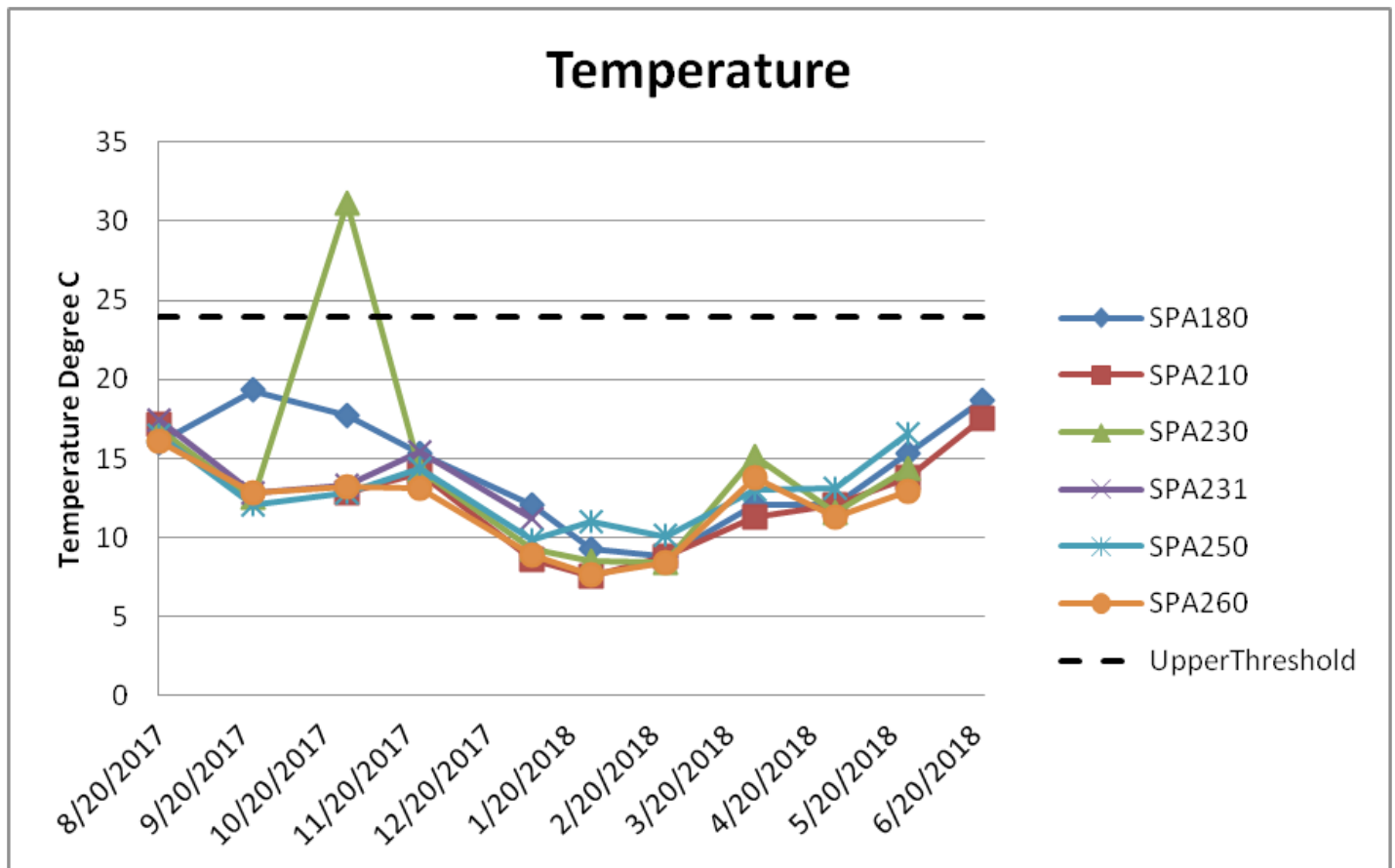
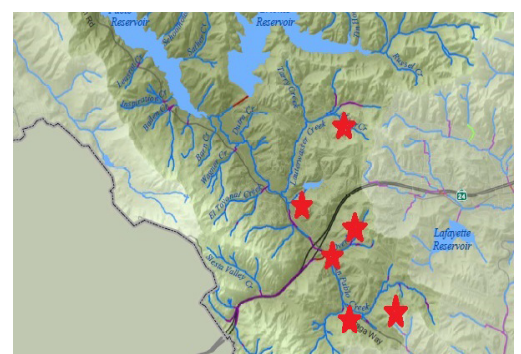


Figure 1: Recorded temperature levels were almost entirely within the healthy range for aquatic life, staying between 7-35 degrees Celsius, with the exception of SPA230 which reached 31 degrees Celsius in October 2017. This may have been an equipment error as the difference is so extreme.

Site Code	Site Name
SPA180	San Pablo Creek at Manzanita Bridge
SPA210	Lauterwasser Creek
SPA230	San Pablo tributary behind Brookwood & Moraga
SPA231	Main stem at Brookside & Moraga
SPA250	San Pablo Creek at Brookside & Moraga
SPA260	San Pablo Creek at Orchard and Glorietta



DISSOLVED OXYGEN IN UPPER SAN PABLO CREEK

Dissolved Oxygen refers to free O₂ molecules in the body of water. Aquatic organisms depend on oxygen for respiration. Oxygen is dissolved in water through aeration, via moving over rocks or waterfalls, and photosynthesis by plants living in the creek. Cold water can hold more dissolved oxygen than warm water because the molecules in the water move slower and, thereby, retain more oxygen. Healthy streams should have more than 5 milligrams per liter (mg/L) dissolved oxygen.

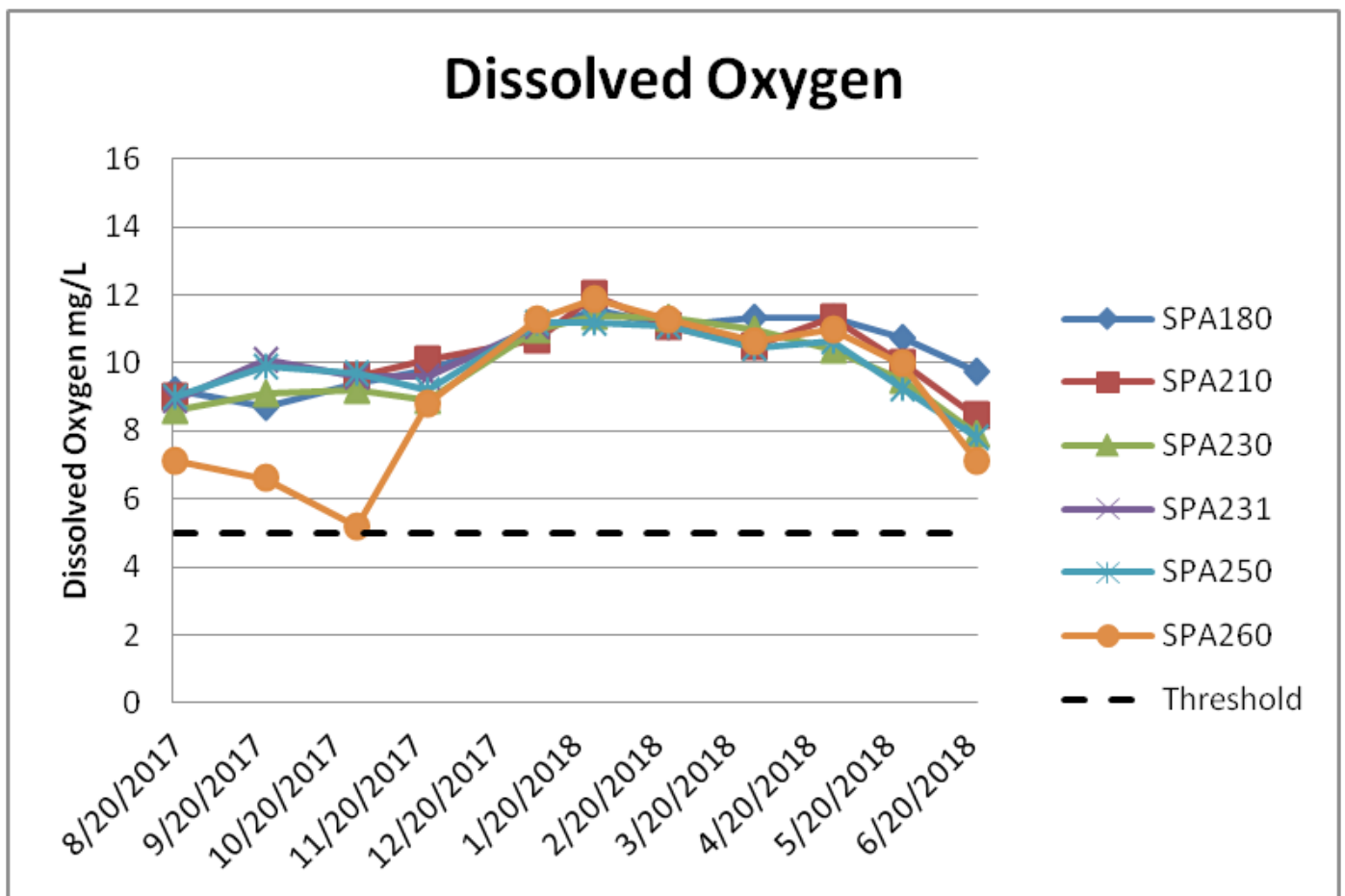
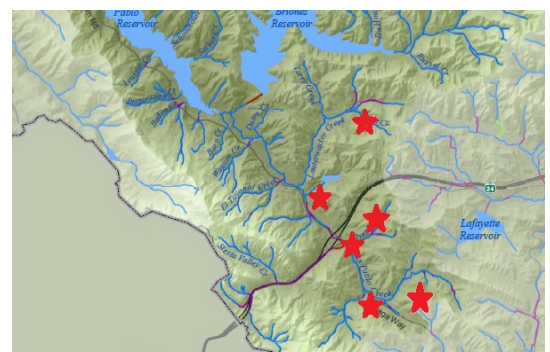


Figure 2: All dissolved oxygen readings were above the critical lower threshold deemed ideal for supporting aquatic life. SPA260 reaching the lowest measurement of 5.2 mg/L in October 2018.

Site Code	Site Name
SPA180	San Pablo Creek at Manzanita Bridge
SPA210	Lauterwasser Creek
SPA230	San Pablo tributary behind Brookwood & Moraga
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SPA260	San Pablo Creek at Orchard and Glorietta



PH IN UPPER SAN PABLO CREEK

pH measures how acidic or basic the water is. The pH of water ranges from 0-14. A pH of 7 indicates a neutral measurement while measurements below 7 are more acidic, and above 7 indicates a base. The healthy pH range for life in streams is between 6-9.

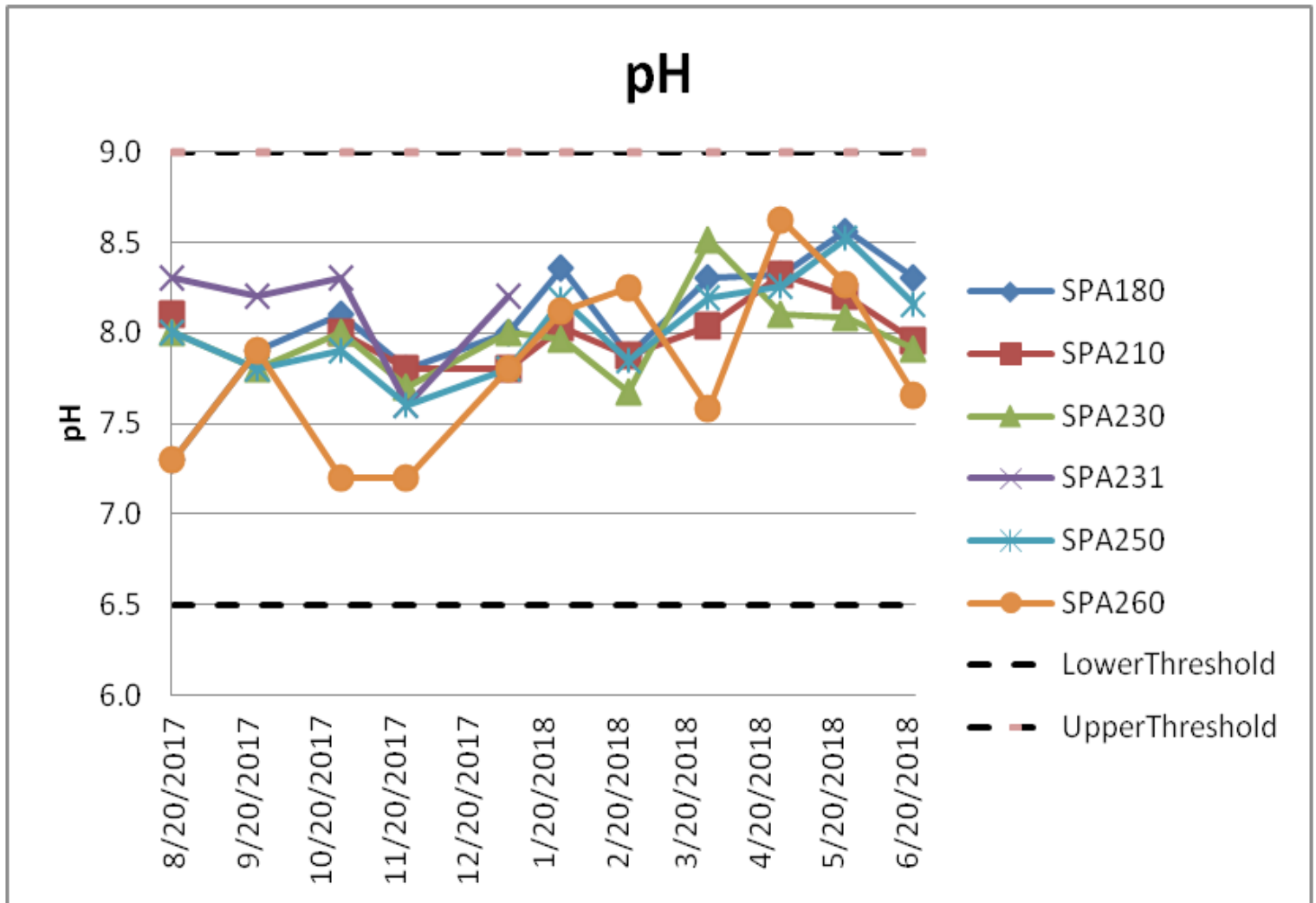
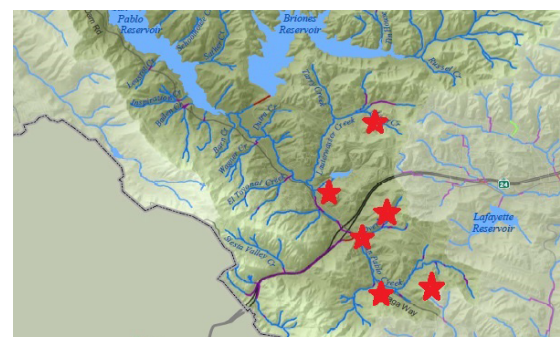


Figure 3: All pH levels recorded were within the healthy range for supporting aquatic life.

Site Code	Site Name
SPA180	San Pablo Creek at Manzanita Bridge
SPA210	Lauterwasser Creek
SPA230	San Pablo tributary behind Brookwood & Moraga
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SPECIFIC CONDUCTIVITY IN UPPER SAN PABLO CREEK

Conductivity measures the concentration of ions (charged particles) present in water. Conductivity is related to salinity, which measures just dissolved salts. Conductivity may be related to the underlying geology of the stream bed, or result from urban runoff containing nutrients like phosphates and nitrates, which are found in fertilizers. Freshwater animals prefer a conductivity under 500 micro-Siemens per centimeter ($\mu\text{mhos/cm}$).

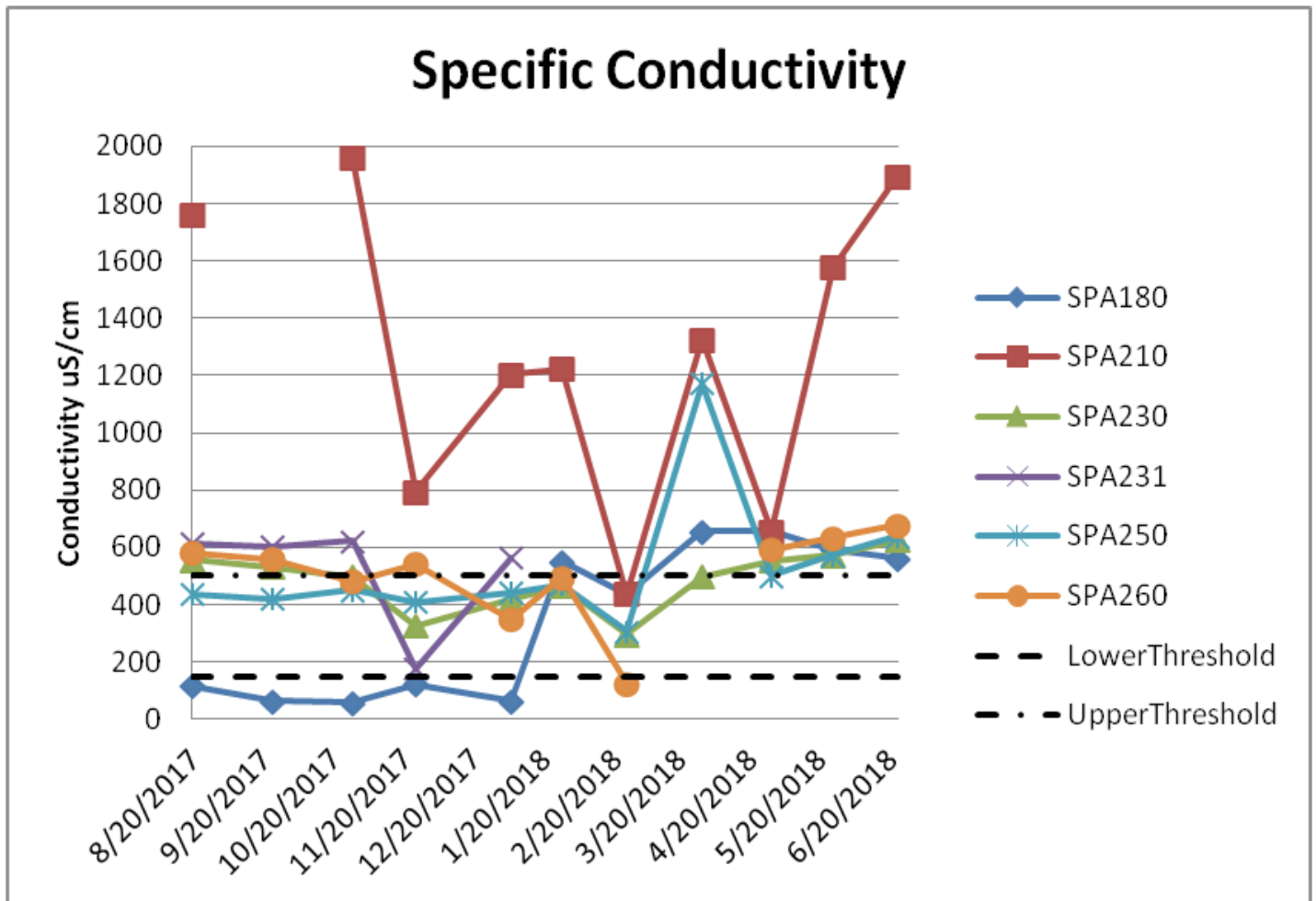
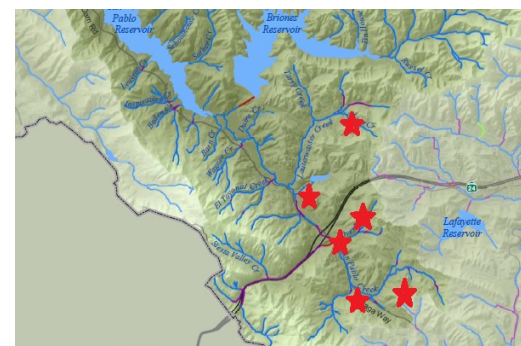


Figure 4: For the most part, recorded specific conductivity levels were close to or within the range deemed healthy for aquatic life, with the notable exception of SPA210, which was almost entirely above the healthy range.

Site Code	Site Name
SPA180	San Pablo Creek at Manzanita Bridge
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SPA230	San Pablo tributary behind Brookwood & Moraga
SPA231	Main stem at Brookside & Moraga
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DISSOLVED SOLIDS IN UPPER SAN PABLO CREEK

Total Dissolved Solids is a measure of the amount of material dissolved in water, including organic and inorganic ions. A certain level of these ions in water is necessary for aquatic life. Changes in concentrations of dissolved solids can be harmful because the density of the water determines the flow of water into and out of an organism's cells. Healthy streams should have between 50-250 milligrams per liter (mg/L) of dissolved solids.

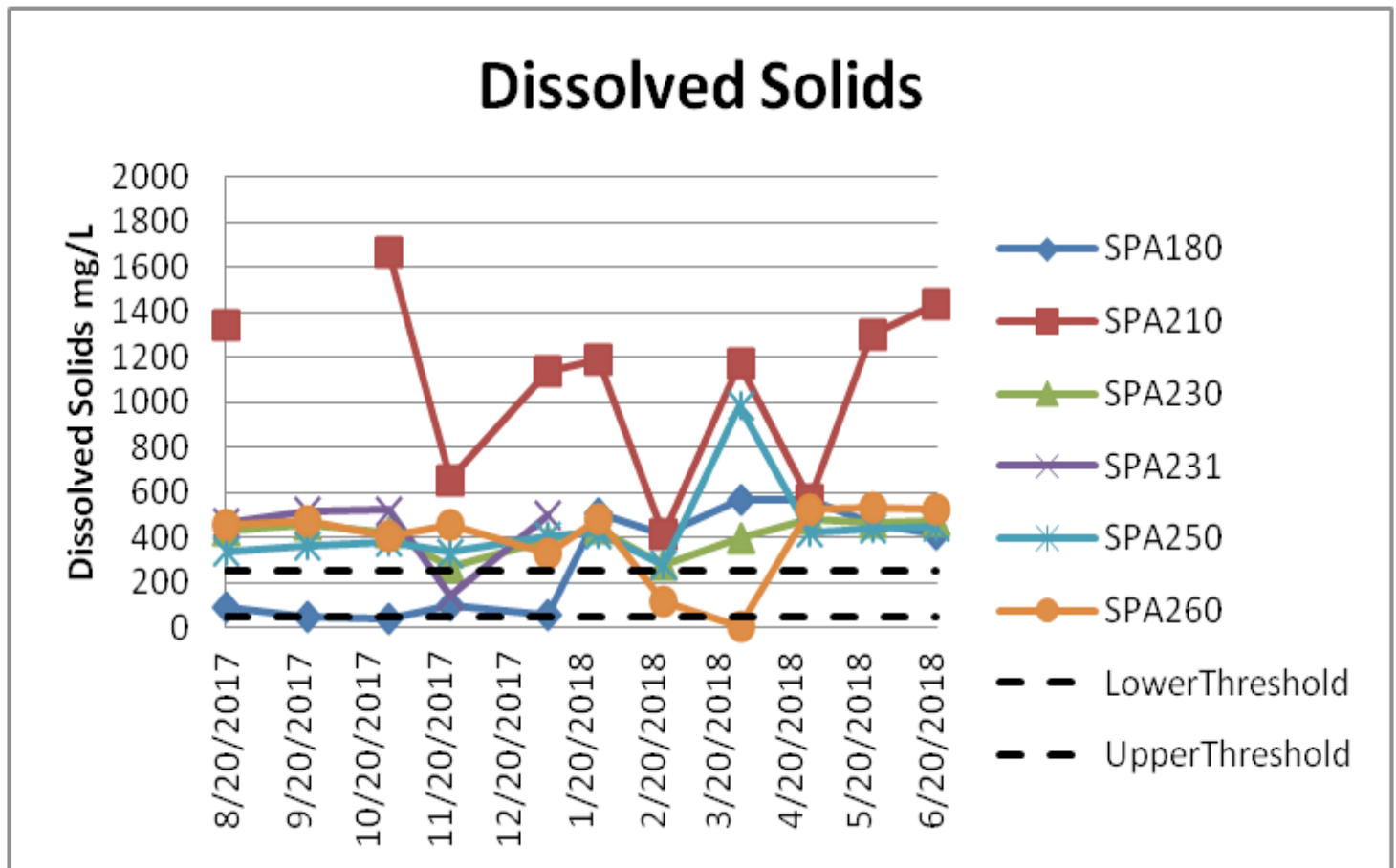
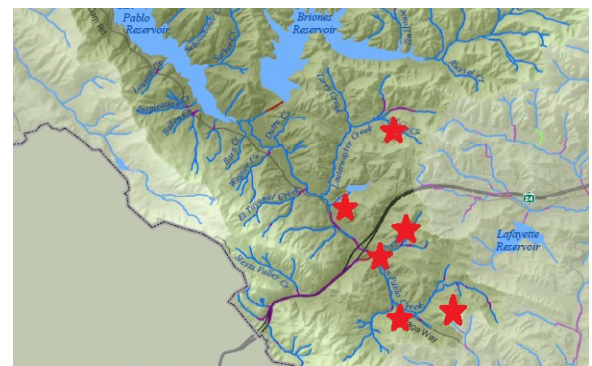


Figure 5: Total dissolved solids were mostly above the threshold deemed healthy for aquatic life, although SPA250 was lower than threshold for the summer and fall months. SPA210 in particular showed consistently high levels of dissolved solids.

Site Code	Site Name
SPA180	San Pablo Creek at Manzanita Bridge
SPA210	Lauterwasser Creek
SPA230	San Pablo tributary behind Brookwood & Moraga
SPA231	Main stem at Brookside & Moraga
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DISCUSSION

Assessing creek health in urban streams can be tricky because most of these areas will never be pristine again, and the same is true of the water quality in the creeks. For example, while the EPA states that conductivity in streams should be between 50-500 uS/cm to best support aquatic life, other sources indicate that conductivity is not a “problem” in urban streams until it surpasses 2,000 uS/cm. While it is good to keep these differences in mind, in this report card we’ve used the thresholds that are deemed best to support aquatic life rather than what is to be expected in urban streams.

Overall, dissolved solids are consistently higher than healthy thresholds in the Upper San Pablo Creek Watershed, while specific conductivity tends to be a little high as well, specifically at SPA210. These exceedances are not uncommon in urban streams, where runoff carries all manner of solids and charged particles into the creeks. It’s notable that water quality is better in the upper watershed than the lower watershed, where conductivity is significantly higher, and dissolved oxygen tends to be low in the summer months.

For more information on The Watershed Project’s Creek Monitoring Program, please contact Helen Fitanides at helen@thewatershedproject.org.



From the left: Grier Gammon, Matt Greer, and Elizabeth Dougherty monitor San Pablo Creek.