Analysis of Phosphorus Load in Sediment Collected From the Laguna de Santa Rosa Watershed

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Background

Although phosphorus is a crucial element in plant growth, an excess of phosphorus in riparian ecosystems can lead to algal blooms and eutrophication. Due to an accumulation of phosphorus in the Laguna de Santa Rosa over the past century, the current allowable amount of phosphorus that can be discharged into the Laguna de Santa Rosa is zero. Wastewater treatment plants in Santa Rosa and Windsor do not have the capacity to completely remove phosphorus from their effluent, which they discharge into the Laguna de Santa Rosa during unusually high rain events.

A new Water Quality Trading Credit program allows the cities to purchase phosphorus credits from Sonoma Water when needed. To generate these credits, Sonoma Water removes large volumes of phosphorus-rich sediment from the watershed. In addition to generating water quality trading credits, sediment removal projects provide an opportunity to improve flood control channel morphology to improve habitat for native species.

In 2019, 15,000 phosphorus credits were created by removing 11,104 cubic yards (1,388 truckloads) of sediment from Laguna de Santa Rosa at Stony Point Rd in Rohnert Park. One credit (1lb phosphorus) had a value of approximately $50, therefore generating ~$750,000 in water quality trading credits.

Roseland Creek and Colgan Creek in Santa Rosa are candidates for future sediments removal projects to generate additional trading credits. We have taken samples of sediment from Roseland Creek, Colgan Creek, the Laguna de Santa Rosa, and from Copeland Creek in order to determine the relative levels of phosphorus concentrations in different channels to allow Sonoma Water to determine which site could potentially remove the most phosphorus.

Methods

- Approximately one cup of sediment sample per location was taken using a split spoon sampler (6-12" deep)
- Samples were collected at the water's edge, or if the channel was dry, in the center of the channel
- Rocks and organic material were discarded
- Samples were dried, pulverized, and sieved using a standard kitchen colander
- Samples were analyzed for total phosphorus at Santa Rosa's Laguna Treatment Plant

Location of Sediment Sampling from Creeks
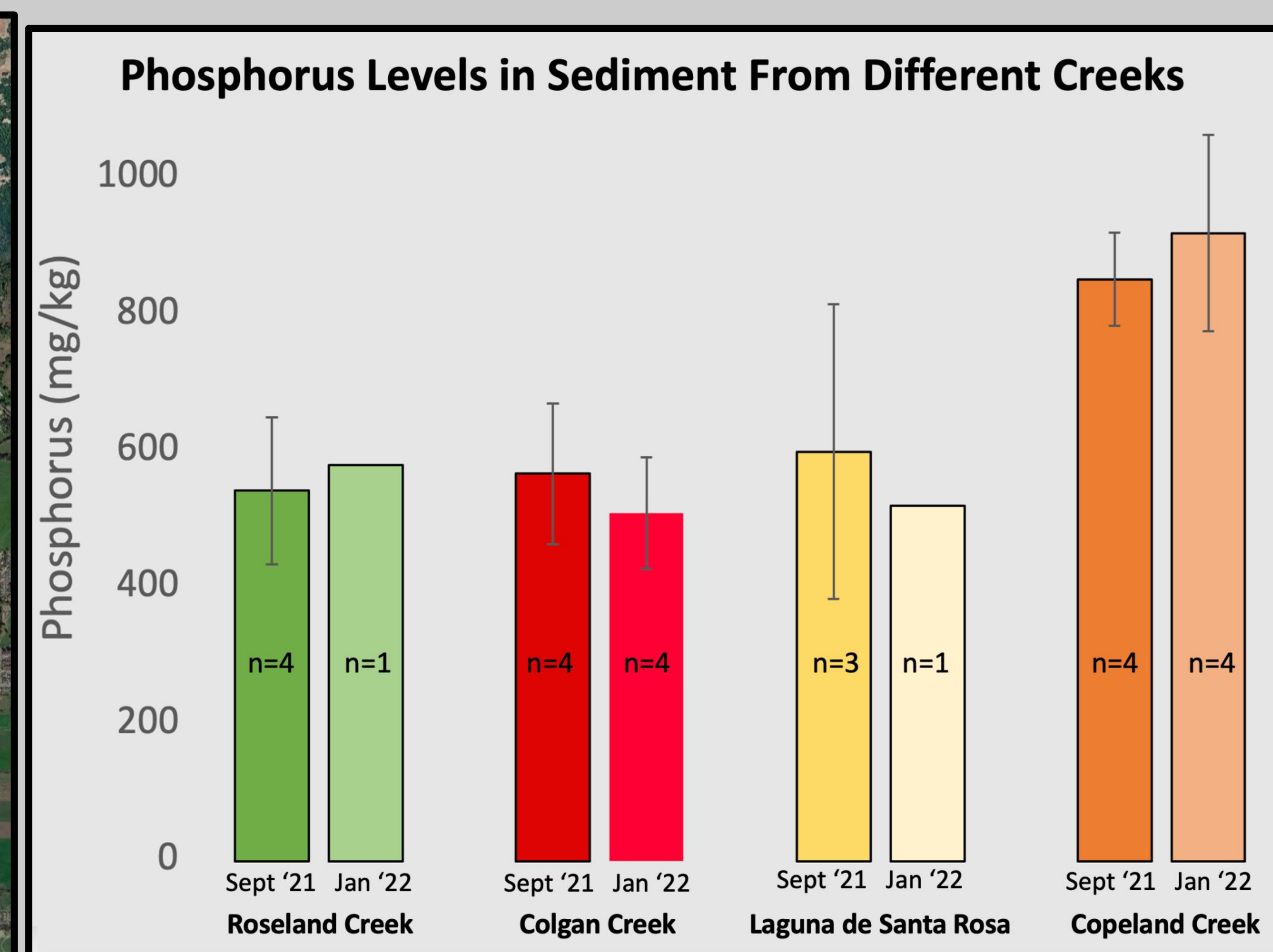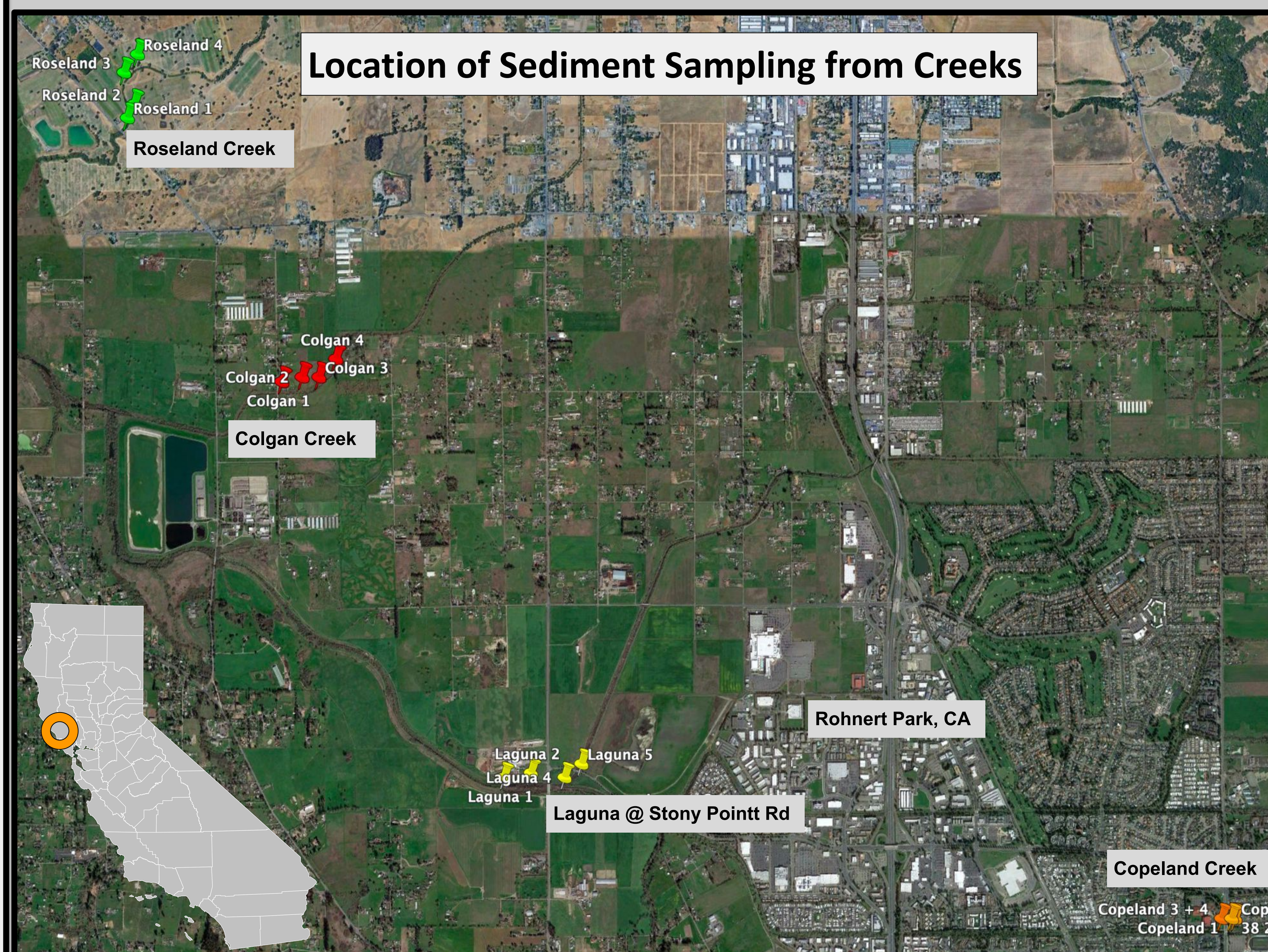
Results

Collection Dates
- 3-4 samples were collected from each channel in September 2021 (dry season)
- To check for repeatability, 1-4 samples were also collected from the same locations in January 2022 (following an atmospheric river rain event)

Roseland Creek at Llano Road
- Phosphorus values varied from 430-640mg/kg. This variability could be due to site proximities proximities to cattle crossings
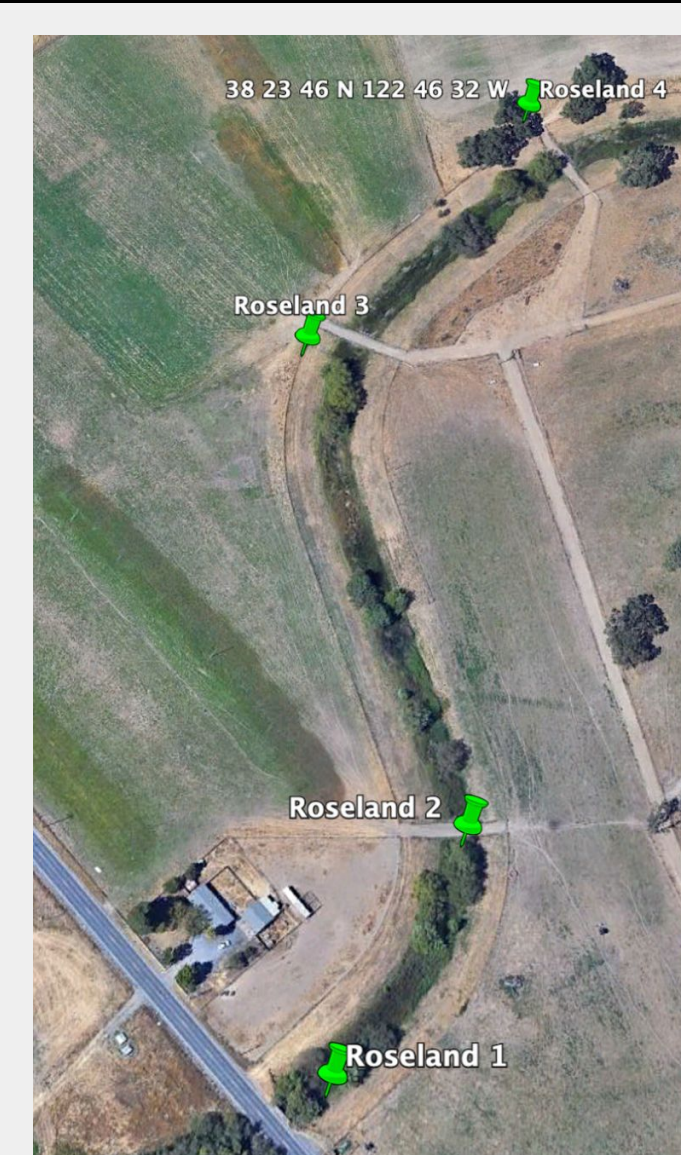
Colgan Creek at Walker Avenue
- Phosphorus values ranged from 420-670mg/kg

Laguna de Santa Rosa at Stony Point Road
- Phosphorus values ranged from 350-730 mg/kg
- Sediment samples were taken in the area where the 2019 sediment removal project took place

Copeland Creek at Snyder Lane
- The location sampled for Copeland Creek is an urban location location where where sediment has been regularly removed
- This location was chosen as a negative control for phosphorus since it was relatively rocky without as much fine sediment compared to the other locations
- Phosphorus values were consistently the highest (760 - 1100 mg/kg)

Phosphorus Levels in Sediment From Different Creeks

Conclusions

In September 2021, we found that the channel we had chosen as a negative control, Copeland Creek, unexpectedly had the highest levels of phosphorus found in sediment. This was surprising because Copeland Creek is a location where sediment is removed regularly by Sonoma Water as part of their routine Creek Maintenance Program.

To be sure that our results were reliable, we repeated collection of most of the sediment samples in January 2022, and found the same trend.

One explanation for high levels of phosphorus in the area of Copeland Creek that we sampled is that it is in an urban location. It is possible that the phosphorus could be entering the creek from point sources in Rohnert Park.

Copeland Creek is rockier than the other sites that we sampled from. During our sample preparation, we removed particles that would not pass through a colander. Therefore, although the fine particle sediment found in Copeland Creek is high in phosphorus, the area is mostly made up of rocks and not fine sediment. Further study is needed to determine how much sediment would need to be removed to generate a sufficient amount of water quality trading credits.