

TCii Question

How do the water quality factors (pH, turbidity, dissolved oxygen, temperature, and conductivity) change in Tumalo Valley above where Bridge Creek enters Tumalo Creek and below where Bridge Creek enters Tumalo Creek and in Bridge Creek before it enters Tumalo in October and November, 2015?

TCii Rationale

In July, 1979 Bridge Creek Fire swept through Tumalo Valley ruining the health of Tumalo creek. Trees all around the stream were burnt and fell around the stream. Salvage logging teams then came in and removed all of the trees which provided shade, hiding spots for creatures in and around the stream, and stabilised banks. Now the bank was unstable and eroded often, all the sediment raises the turbidity a lot, which then raises the temperature, higher temperatures resulted in less dissolved Oxygen in the water. All of these things are bad for organisms in the stream especially fish. Turbidity is the amount of sediments in the water. A higher level of turbidity traps sunlight in small particles in stream. The higher the temperature the more likely fish are to get diseases and will eventually die if the temperature is too high. Oxygen dissolves and stores easier in cold water, fish need oxygen dissolved in the stream to survive. Conductivity is how well water can conduct electrical currents. When there is a lot of dissolved solids in the water, too high of a level and fish will be affected. This chain of disaster needed to be stopped. People in the community and lots of organisations like the Upper Deschutes Watershed Council stepped up to the challenge and started to restore the creek. REALMS was among those people. 70,000 native plants and over 3,000 trees were planted in the valley. In 2005 the restoration was finally complete. REALMS wasn't finished with the creek though and started a annual monitoring of stream health. Students would go out and measure water quality, stream side vegetation, and macro-invertebrates. 8th graders are going to keep going out every year and experience the valley.

TCii Hypothesis

I think the water quality factors in Bridge Creek, Tumalo Creek above where Bridges creek connects, and Tumalo Creek below the connection point will be close together. I think that there isn't going to be a significant difference in the water quality between the different locations. I think this because the Bridge creek and upstream Tumalo creek measuring spots are very close and a large rainstorm or fire would effect both locations and the downstream merged Tumalo creek is a combination of the two so it shouldn't be much different. All three measuring points are close together and have the same climate so there shouldn't be much difference in all of the water quality.

TCii Procedure

- 1) Projects were assigned that had all the water quality factors to give us background on the subject. Certain people were experts on a certain factor so they could teach a group at Tumalo
- 2) All the tools that would be used in the field were introduced and we learned how to use them. We learned the procedure we would use while out on fieldwork.
- 3) We went into the field and used electronic Vernier probes to collect data on water quality in the stream. We followed a specific procedure so all the data was collected the same way. After we collected all the data we needed it was recorded for more work on campus.
- 4) On campus we put all the information together and saw how healthy the level of each one was.
- 5) We went back out once we had a specific question and got either new data or more data (using the exact same procedure as before to unsure the only variable changing was location) to build on what we already had. We still used the Vernier probe and any other tools we needed.

TCii Variables

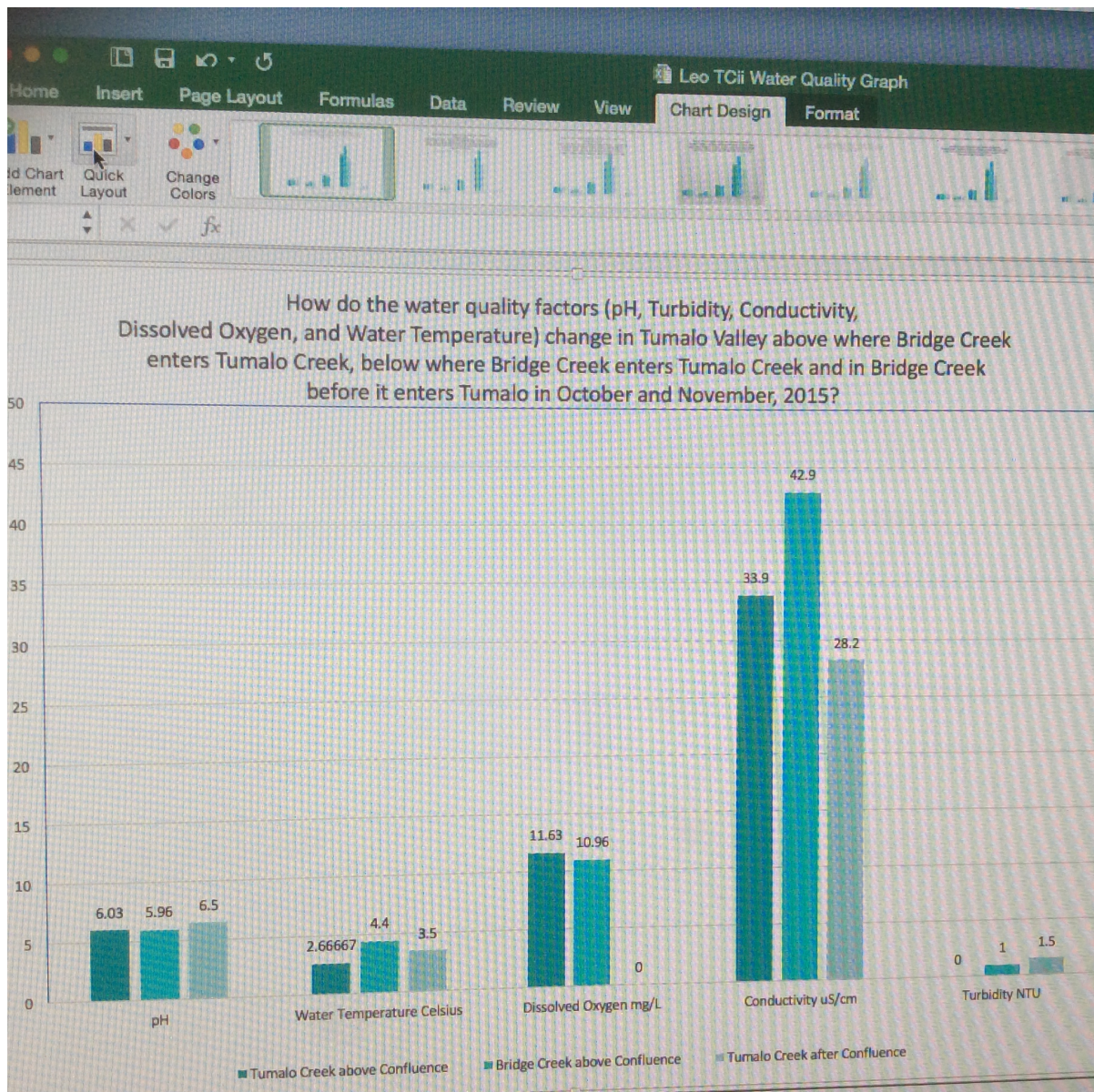
Independent - Location of Measurements

Dependent - Water Quality Factors (pH, turbidity, dissolved oxygen, temperature, and conductivity).

Constant - Equipment that we used, Procedure used.

Possible unwanted Variables - Weather on different days, errors with the equipment, human error, rounding and not rounding,

TCii Graph



TCii Analysis

Our data showed that the pH are all close together in the 3 study sites the low is 5.96 and the high is 6.5. After the two rivers combined the pH actually got closer to neutral which is the optimal for salmonids. When measuring pH there are different tools involved which could result in error and lots of chance for human error. These could result maybe in a 0.3 difference which could make the numbers a lot closer and back up my hypothesis.

Water temperature was also all fairly close the low was 2.6°C and the high was 4.4°C. This time it seemed like the temperature averaged out between the two rivers, after merging the temperature was in the middle of the two temperatures. The same tools are used and they could be a little off. The temperature is so close anyway I don't think it matters.

Dissolved oxygen varied from 10.96 to 11.63 mg/L. After the rivers combined the oxygen was also in the middle of the two previous measurements. Anything around 11 is very healthy for salmonids it's perfectly healthy for an adult and could support spawning as well.

Conductivity has a little more of a range 28.2-42.9 uS/cm. The conductivity number looks like it changes quite a lot it got down to 28.2 after the merge. However the optimal range for salmonids is 15-50 and all our data for conductivity is within that range. This is a bigger difference in numbers but a bigger optimal range I don't think any errors in the data would significantly change it.

Turbidity goes from 0-1.5 NTU almost no difference. The turbidity gets up to 1.5 downstream of the confluence and the optimal is 0-20 lower the better and the levels are well within that. Turbidity is likely to have

some error the machine could mess up the measure. Students could have put the wrong water for the baseline in. If you get a fingerprint on the bottle it would also mess up. To make a big difference you would need the level to go up about 10-15 NTU and none of those errors would effect it that much.

I really can't see any real pattern it seemed like on some after the merge the measure was in the middle and sometimes it was random. My hypothesis said there would be little difference in the water quality factors I think I am right because the only one that has a slightly larger difference is the conductivity. None of the factors range enough so one measurement is in the optimal zone for salmonids and one measurement isn't in that same optimal range for salmonids. What I thought would definitely not happen is for one measurement to be in the optimal and another to not be just by changing locations. None of the water quality factors changing dramatically enough to where that would happen. I would say the only thing that may go against my hypothesis is pH. The low measurement is 5.96 in bridge creek and the optimal is 7-8 this measurement is still survivable for fish. The high measurement is 6.5 after the confluence which could be considered in the very optimal zone. I still think it hasn't changed enough for my hypothesis to be wrong. The pH did change more than I was expecting from such a small change in location. I think pH is the only one that the error could effect significantly.

If I could do this experiment again I don't think very much would be changed. The only thing is get more measurements and then the average to get a more accurate data and see if they were error or actually what happens. I might change the question to Is there a significant difference of water quality factors in Tumalo valley above the confluence with Bridge Creek in Tumalo Creek in Bridge Creek and downstream of the confluence of Bridge Creek and Tumalo Creek? I would change the procedure to measure all the data on the same day and if possible the same people to stay consistent. It would be nice to use the same tools as well just to keep everything similar.

Other questions might be: Why does the pH change so much between close together locations? How do the water quality factors in the same locations compare between years? How do bugs and riparian vegetation compare between the two places? I could add Shevlin into the question and move the measurement spots upstream in Bridge Creek and in Tumalo Creek above the confluence and downstream after the merge. This might show different results because the factors barely changed but it was still more than I was expecting and that was a very small location change. Maybe even adding a little more could change the factors. How do the factors compare between seasons?