

## Assessing the Risk of Road Salt to Trees in the WSU Woods Transcript

Hello everybody. We are a part of Dr McGowan's advanced environmental chemistry class and service learning experience and this semester we are assessing the risk of road salt to the trees in the Wright State Woods. Doing this we are using chloride. Chlorides as a target analyte- uh- yeah. We were using a chloride as our target analyte from the salt. So what's the issue? On December 20<sup>th</sup>, 2013 Wright State received a notice of violation from the Ohio EPA due to the high concentration of chlorides in the wellfield. Prior to this violation of Wright State brought in a court the third party consultant known as Terran Corporation to come and collect and test the samples in the vicinity of the wellfield. These samples consisted of groundwater and soil samples. The results that they found had a range of 247 parts per million to 611 parts per million, ah, and these were all around the wellfield. Uh, it's important to note that the maximum contaminant limit for chloride and drinking water is 250 parts per million. Now this is different from um the environmental standards but since we have uh pollution near the wellfield that could potentially affect our drinking water because of this violation we had a wellfield remediation and the salt barn was moved and relocated.

So here we have a map of our Wright State campus and we've marked the two streams that we took samples from throughout the semester. We have on the left hand side we have the Woods Creek which passes through our campus housing up in this area and then on the right we have Forest Creek which moves through a lot of the old growth forests that we have. Here we're looking at our sample sites we have DGB up in the corner which is the Disc Golf Bridge which goes through the the disc golf course that we have on campus and if you go a little bit farther upstream we have HH is the Honors Hall site which is across the street from the Honors Hall building which is right next to the woods campus housing as well and then farthest upstream from that creek we have the lot 4 site which is you guessed it right next to lot 4. um for the Forest Creek we have farthest up- downstream the outfall 15 which is right next to the campus surfaces complex which is where the wellfield is where we have our salt barn our Police Services Etc a little bit farther upstream we have FAB1 which is right behind the Fine Arts building right up there and then all the way down towards Colonel Glenn which is in this corner we have RWD and that's our retaining wall and that gets a lot of just general sewage and stuff coming from Colonel Glenn Highway and in the Fairborn and Beaver Creek areas and you'll see we have a little bit of a potential tree die outzone we'll get to later but those are the sample sites that we've been collecting throughout the semester.

Now this is a graph that details just uh how much salt use has increased over the years this doesn't go until you know present day but if it did we would likely see that salt levels being used especially in roadways in this darker Blue Area here are at an all-time high and just continue to go up this slides talk about the chloride measurement that was performed in the lab when we got our samples the method that was used to analyze our samples was from the EPA Method 300.1 and the instrumentation used for this analysis were the anion chromatography which is an environmental friendly instrument um which is used to measure and separate anions and this we use this technique because it's environmental friendly and because water is solvent is used for this analysis and here I'll be showing the chromatogram the one on the left hand side was the standard which was used and it's a mixed anion standard which shows five standards which shows five anions that we're looking for and the right one shows one of our sample sides the lot 4 which is down on a way into campus and here this

shows the area under the peak shows a very you can see a very um large area under the peak for chloride compared to other anions.

All right so analyzing our samples that we collected from the creek gave us the values that we see here in table one and then we plotted them on this graph to sort of help us visualize some of the trends that we see in our data and so the top three lines it's important to point out that those three sample sites all come from the same Creek which is the Forest Creek and then the bottom three lines come from the different creek so there is quite a significant difference between the two creeks with regards to how the like chloride levels in them and then some other trends that we see are due to the weather so on our second sampling day which was on October 5th it had been dry that we hadn't gotten rain in days so we see some really high concentrations on those days but then when you look at October 26th we got about an inch and a half of rain that day and rain does not typically contain any significant levels of chloride in it so when the rain comes down and mixes with the streams and The Creeks it ends up diluting the concentration of chloride that we see in the water and these values kind of help us to show that the the chloride that we're seeing in the creek is likely coming from the ground water and that's why on the dry days there's higher concentrations because there's not any rain water mixed with them.

So now that we've gotten to see some of our data it's getting important to take another look at the map and we see on the right hand side again Forest Creek goes through gets a lot of its water from the other side of Colonel Glenn it gets a lot of drainage from Colonel Glenn in that in the Fairborn and Beaver creek areas but there's also the potential tree die out Zone that I mentioned earlier it gets a lot of runoff from these student parking lots that come right into that zone and that's just a zone that we've noticed there's a lot of trees that are dead and or dying so we've tried to be investigating why that could be happening and we think chloride might be one of those possibilities and another important thing to note is that these streams both flow in a North Northeast Direction so all of the water that comes from Beaver creek, Fairborn and are runoff in this area flows through this Creek into the campus Services complex which is where our well field is so it's all going into our drinking water

Okay and then continuing with the retaining wall which was our sample site that we found the highest concentrations of chloride in we are comparing the data that we took from this year to the previous years as you can see up here each cluster is a different year and then each bar within the cluster is a different sampling day and all the days were pretty similar like taking around the same time throughout each year so they were comparable values on the graph we have human impact likely which is around 75 PPM and that just means that when someone consumes or like drinks water that contains higher than 75 PPM of chloride in it they're likely to notice some physical um problems with that and then the other one is the EPA drinking water limit at 250 PPM and as Mark and Ben both said these are important because the water from our Creeks is going towards the well field which is water that people rely on for their drinking water and for cooking and all kinds of things in their houses um one may have been fooled that in 2020 here are constant or things were getting better with the chloride problem but that was likely due to covid so there wasn't as many people here not as many cars in the parking lots waste being produced by the campus and so there wasn't as much pollution and we aren't seeing as much chloride in the water and um it is obvious that our problem has not gotten better because this year we have the highest concentration from one sample day that we have seen in this sample spot since 2018 or even before then um and that is at 505 PPM which is more than double the uh EPA limit

So then what is sodium chloride or salt? It is a combination of two ions that being sodium and chloride these are naturally occurring in nature so it's nothing ridiculous to find any of them in any normal sample but the issue is with so much activity being around campus and especially with all the roads around we run into a lot of the pollution and contaminations that Courtney and everybody else have been mentioning uh and this leads to very high values which then becomes an issue in the environment around us as Courtney again mentioned earlier uh a lot of the chlorides and ions that we were looking for are likely existing in the groundwater and that is largely due to the fact that chloride has an incredibly slow transit time through soil being that 1.3 centimeters per day that you're looking at on the screen so it tends to build up in soil which is again why we are focusing on chloride in the pursuit of road salt being the issue behind this as even though we're not salting the roads during the summer or spring warmer months it chloride still is being present in the soil the sodium on the other hand is possibly an issue because it involves goes through cation exchange which I will go through in a moment a cation exchange being that the sodium found in the sodium chloride uh sort of knocks off any of the existing important metals found in the soil organic matter that functions as a important nutrient to plants around which is another reason why we think that road salt might be a potential problem and why that there is so much issues in the woods with these uh two things uh to continue-

There is- here is a small collection of the many species of trees that we can find in the Wright State Woods each of these are very sensitive to Salt in some capacity these specifically to chlorides in the soil around them not a total collection of those that are sensitive to the salt nor again the woods as a whole but just a good little collection to put that in your mind so overall sampling period we um have high value of chloride concentration in most of the creeks and this actually indicates that chloride could be a potential problem to most of the trees in the creek there I'm in the wood and not just that alone over the last year for instance in 2020 when there was restriction due to the coffee pandemic we recorded a very low um consideration of chloride which is about 235 PPM in fresh water however in this year we were able to detect over 500 PPM conservation of chloride and that's a big problem for for the trees and not just that alone it's a big problem for aquatic lives and most importantly

We at Wright State University we are most con we are most concerned about our groundwater and since chloride is a problem that could also contaminate the groundwater and that would affect our fresh water so more to this runoff from Colonel Glen Highway to The Creeks is the major source of this um chloride contamination in the creeks and in the woods in general So based on this uh my friend here my colleague um Mark walk us through some of this um future actions that can help us to control these um prevalence so what's next what are some things that we can do to continue decreasing the amount of chloride in our woods and protecting our woods so obviously we're going to continue monitoring the amount of chlorides in both creeks and near the dead zones where there are a lot of dead vegetation we're going to test for cations such as sodium calcium or yeah sodium calcium but potassium that's target analytes this will see how much cation exchanges actually affecting the the health and the nutrients in the soil um and another thing is increase awareness last presenter we talked about things that we can do in the community to increase awareness and what's actually going on in the woods implementing uh controlled salt spreads so not putting unnecessary salt places not getting our salt pushed out into uh near our groundwater near our streams and let's just kind of be more mindful of where the salt is going from the roads and plant high salt tolerate trees around the perimeter hopefully this will protect some of the more less tolera- the intolerant trees around the uh in the woods oh these are references is there any questions at this time?

[Applause]

[inaudible audience member]

Okay so the question is: has the results from the past the previous years been shared with the grounds keeping to prevent any unnecessary salt spread or contamination and the question or the answer to that is no um that was oh it has oh yeah Dr McGowan has she's on it.

[Dr. McGowan speaking inaudibly]

Colonel Glenn yeah.

[Dr. McGowan speaking inaudible]

Okay have we said anything to the fair okay so yes we have not said anything to Fairborn Beaver Creek but we have said stuff to the Wright State um and faculty any other questions? Oh-

[inaudible audience member]

Um could you repeat that again? Sorry.

[inaudible audience member]

Okay so the question is would the protection on the woods also protect the water surrounding the woods okay so um uh the protection of the woods would be um protection of like let's say we were to decrease the amount of chloride assault going around the woods unnecessary salting uh that yes that would both protect the woods and the water because the water that is feeding those trees would um not be as contaminated if that makes sense.

[inaudible audience member]

Okay I'm sorry could you say that again?

[inaudible audience member]

Um so just awareness uh spreading awareness about it our problem that we're having letting more people know that we're having this problem and how important the woods is to us and hopefully Beaver Creek Fairborn our surrounding areas uh can support us in that way.

[inaudible audience member]

So there's this salt issue is like Nationwide basically anything that's basically in the Midwest where it gets all the lake effect with the snow because Wisconsin Michigan they're having the same the same problems with salt it's also getting into the groundwater and then well it's all in the groundwater but it's also corroding out plants like Flint Michigan is like they have cited them saying Oh if it wasn't so much salt putting down on the roads then they wouldn't have like crowded out pipes and they wouldn't have had your water issue so the salt issue's like huge.

[Dr. McGowan speaking inaudible]

[Applause]