Land Use and Phosphorus Input Relationships

A Sample Comparison of Agricultural and Forested Sites

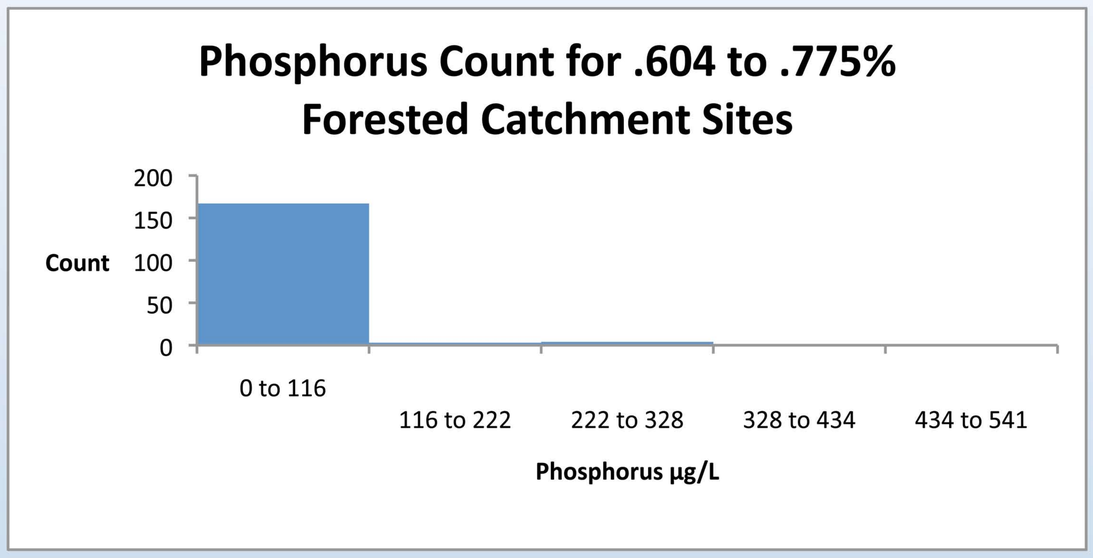
Introduction

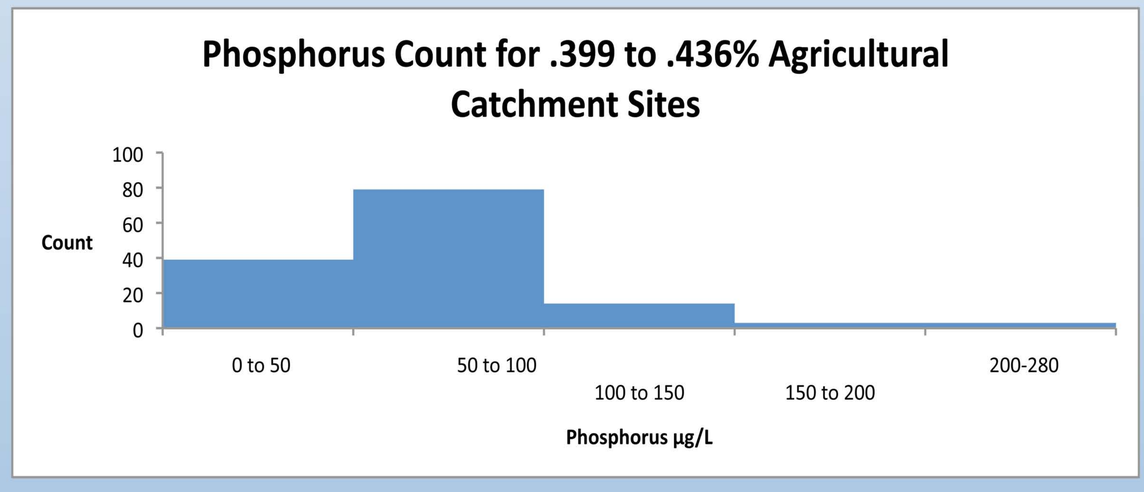
This project deals with the relationship between the quantity of phosphorous in streams of two different primary usages of the surrounding watershed. Is there a difference in the amount of phosphorous found in the nearby streams in an agricultural catchment compared to a forested catchment? A good question to answer first would be, what is phosphorous? Phosphorous is a nutrient which supports life. This may lead one to believe that the more phosphorous, the better, but this is not necessarily so. In fact, too much phosphorous is actually bad for a stream because too much algae will start to grow in the water and cause an overabundance (algal bloom) which then dies. This mass of decaying algae depletes the oxygen that the fish and other organisms also are trying to breathe. Furthermore, toxic forms of algae can be a hazard to animals and people that swim in these areas. Even if that is not the case, excessive algae formation in streams or lakes which may be popular swimming areas will deter swimmers and tourists. The algae reduces the natural beauty of the water and the desire to swim in the slimy algae. Many factors could cause phosphorous to run into or be contained in streams. Could agricultural watersheds be the cause of much of the phosphorous problem with their use of chemical fertilizers and cow manure that runoff into the streams, or does the rich soil of forests provide more phosphorous to run off and dissolve into the streams? To find this out, the data in this project contains phosphorous levels of 3 streams with agricultural watersheds and 3 with forested watersheds which have similar percentages of the same types of usage. Based on the phosphorous levels contained in each of the streams, one could determine which of the two watersheds add the most phosphorous to the streams by looking at the average amount of phosphorous per watershed. Our hypothesis is that there is a difference between the phosphorus in agricultural catchments and forested catchments. We think that there will be more phosphorus in the streams of agricultural catchments. Depending on the conclusion, this information could help in proposing possible solutions that could help to reduce the level of phosphorous in streams.

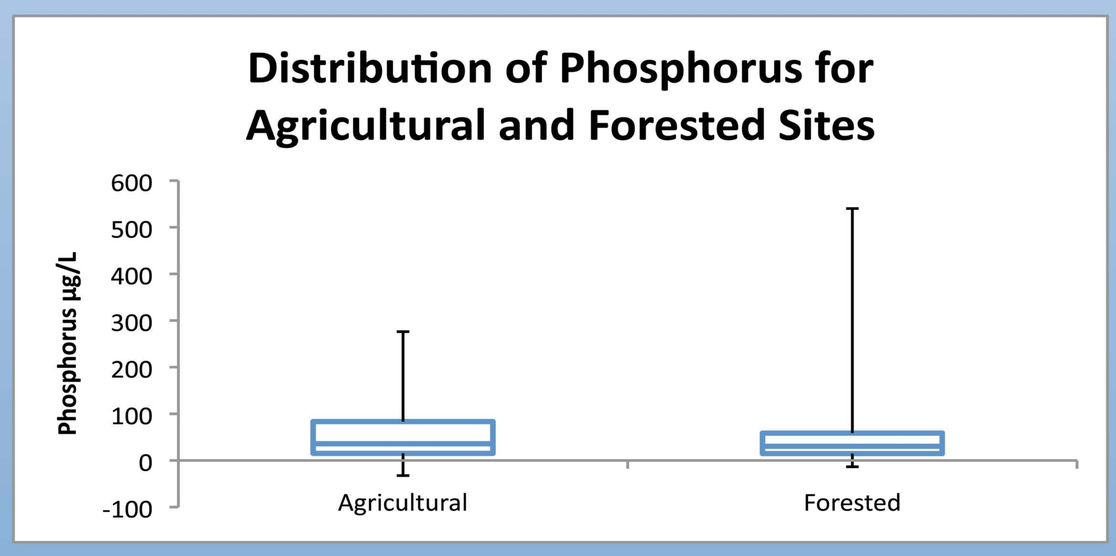
Conclusion

Even though we were able to support our hypothesis, a larger body of data would help create a more accurate depiction of what is occurring in the streams of Vermont. We chose these streams purely because they had similar catchment percentages. We could have chosen them based on location and had different results. Further research on the cause of high phosphorus levels in agricultural catchments could help farmers determine the best safeguards to protect our streams. Causes could be natural or human or both. Even though the extra phosphorus in fertilizers may attribute to phosphorus amounts, the phosphorus also has to have a mode of transportation to the streams. Rainfall may be a major factor and larger buffer zones of absorption may be required to stop phosphorus runoff. One consideration is the acceptable amount of phosphorus in a stream. Phosphorus is necessary in small quantities. The Lake Champlain Basin Program has set target phosphorus levels ranging between 10 µg/L to 54 µg/L phosphorus in various areas of the lake. Setting target levels for each river in the state may be the next logical step to monitoring and motivating residents to protect their streams.

Results







P Value .0000255

As is evident by our histograms and box plot, our data was left skewed. The majority of phosphorus amounts were between 0 and 150mg/ L however, we did have a few much higher amounts that skewed the data. Since our p value was much lower than .05 (.0000255) we can conclude that our data supported our hypothesis. Phosphorus levels were lower at the forested sites than they were at the agricultural sites.

We would like to say thank you to the Vermont EPSCoR Streams Project for making this great experience available!

Sydney Whipple, Jacob Borsari, Ellen Swenson

United Christian Academy