Nitrogen and Phosphorous Export on North Saluda Crops

John Patrick

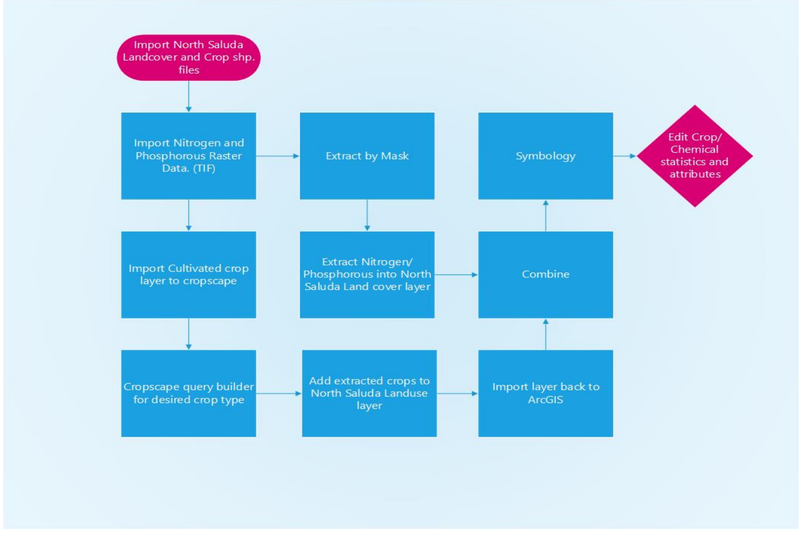
Introduction to GIS, Earth and Environmental Science, Furman University, Greenville, SC 29613

Abstract

Erosion is a serious environmental and anthropological issue. It negatively effects the productivity and sustainability of our agriculture and hydrological systems through land degradation and harmful chemical flows. Intensive runoff can transport sediment throughout an ecosystem, contributing to biogeochemical flows, which contaminates the environment and alters the nitrogen and phosphorous cycles. In this study, nitrogen and phosphorous export is modeled throughout the North Saluda Watershed and then compared to the agricultural areas that contain cultivated crops. It is uncommon to use the land for Agriculture in the North Saluda watershed because the conditions are inadequate for crop growth compared to other areas in South Carolina Upstate. The typical crops that are grown in the Upstate of South Carolina do not survive well in erosive conditions with significant nitrogen and phosphorous export in the waterways. Therefore, the goal of this study is to identify which crops are more common, while also being grown in the areas with high nitrogen and phosphorous export. This will give farmers and property owners a clearer understanding of which crops are the best to plant in specific areas of the North Saluda.

Methods

The data used in the Methodology of this study was provided by the GIS databases at Furman University. ArcMap 10.6 was the main GIS software used during the analysis and modeling of the data. North Saluda land cover and cultivated crops shp files were first uploaded as vector layers. Raster files, including nitrogen and phosphorous export of the Upstate of South Carolina were combined with the North Saluda land cover data to create one single layer. This task was completed with the extract by mask tool. A website called Cropscape was used to pinpoint the location and compute the statistics for several varieties of cultivated crops within the North Saluda land use data. Lastly, Nitrogen and phosphorous export was successfully modeled with the relative locations and sizes of the different plots of cultivated crops.



Results

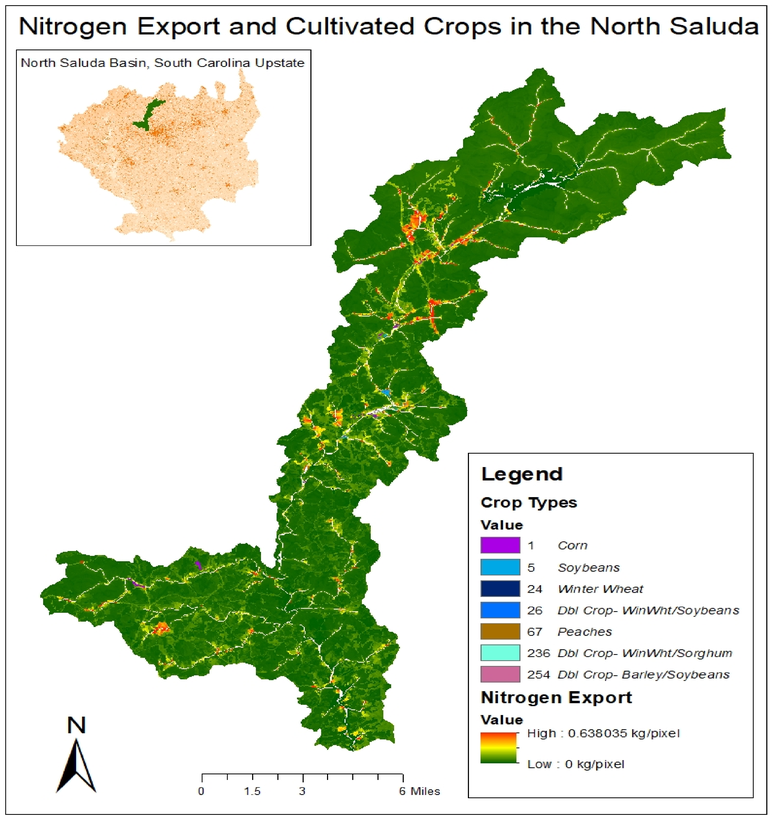


Figure 1. The map represents North Saluda land cover and the levels of nitrogen export present in that location. Signifying the agricultural zones that contain cultivated crops. Providing an analysis for which crop types have the highest production potential in an environment with nitrogen rich soil and water.

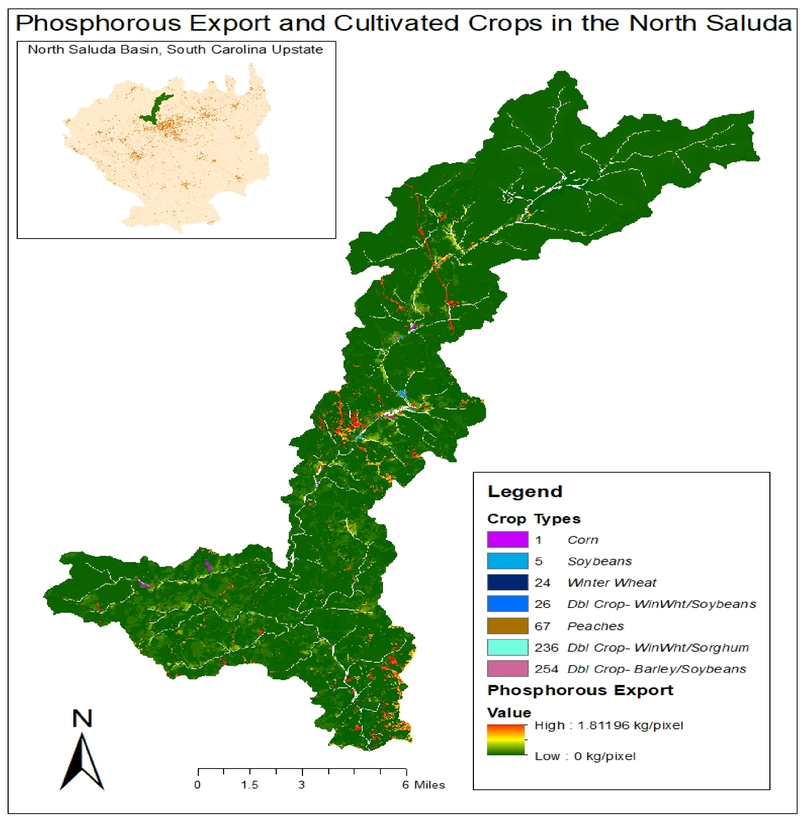


Figure 2. The Map represents North Saluda land cover and the levels of phosphorous export present. Agricultural zones containing cultivated crops are signified throughout the land. Providing an analysis for which crop types have the highest production potential in an environment with phosphorous rich soil and water.

Conclusion

Compared to other locations in the Upstate of South Carolina, the land of the North Saluda watershed has very few pieces of agricultural land. Being so close to a mountainous watershed, the land is burdened with heavy amounts of sediment runoff. Causing land degradation and biogeochemical flows, which are dominant agricultural inhibitors. This study specifically focuses on the biogeochemical flows that contribute to the high nitrogen and phosphorous export in the soil and water. Phosphorous has a higher export, ranging from 0 -1.81196 kg/pixel, where nitrogen ranges from 0 - 0.638035 kg/pixel. After analyzing the models and statistics, it is evident that corn and soybeans are the most prolific crops grown in this area compared to the other cultivated crops. Also, sorghum, barley and winter wheat and peaches are inclined to be further away from areas of high nitrogen and phosphorous export, whereas Corn and Soybeans can grow directly in these conditions. Therefore, it can be concluded that corn and soybeans have the most potential for survival and crop yield in this location.

Category	Count	Acreage
Corn	355	79
Soybean	253	56.3
Winter Wheat	45	10
Double crop- Winter Wheat/Soybean	16	3.6
Peaches	2	0.4
Double crop Winter Wheat/Sorghum	17	3.8
Double crop- Barley/Soybean	3	0.7

Table 1. The table shows the seven categories of cultivated crops that are analyzed in this study. Showing the total acreage and crop count of each crop type.

References and data Sources

- D__CDL_NASS_DATA_CACHE_extract_733683633_CDL_2017_stat_clip_20181130142323_869983291 (https://nassgeodata.gmu.edu/CropScape/)- **(Raster data)**
- cdl_2017_stat_clip_20181130142323_869983291 (https://nassgeodata.gmu.edu/CropScape/) **(Excel data)**
- Nitrogen_Export- **(Raster data- TIF file)**
- Phosphorous Export- **(Raster data- TIF file)**
- NorthSaluda_LandCover.shp- **(Vector data- Shp. file)**
- NorthSaluda_LandCover_CultivatedCrops.shp- **(Vector data- Shp. file)**
- nitro_extract- **(Raster data)**
- phos_extract- **(Raster data)**