DOMESTIC'S SEPTIC TANKS CONTRIBUTION TO THE POLLUTION OF THE RÍO GRANDE DE AÑASCO

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Geol 6225 Geological Applications of Remote Sensing

ABSTRACT: The identification of non-point pollutant sources is necessary to reduce the contamination to the water. Remote sensing can be an instrument that helps in the identification of the areas in which the pollutants are coming. The purpose of this work is try to establish a relationship between the NDVI of the forest near the river that is impacted by fecal coliforms and compare it with forest near the river that is not near possible areas that could be the fecal pollutant sources.

Introduction

A study that involved research and sampling of the Río Grande de Añasco found that the river is highly contaminated by many pollutants. One of them is fecal coliforms.

The feces probably came from agricultural farms, animal farms, and domestic septic tanks. These pollutant sources are classified as non-point pollutant sources.

Crops and domestic's septic tanks are very close to the Añasco River. Crops needs organic fertilizer and when rain the excess runoff to the river.

Forests near the domestic's septic tanks and near the crops absorb nutrients and probably are very health because of this pollutant.

Healthy vegetation reflects very well in the near infrared part of the spectrum. NDVI is a measurement of the vegetation index and can help in the identification of the health forest near the river. ENVI software was use to process IKONOS images for the area of interest.

Objectives

- Identify where and which are the non-point sources of fecal pollutants in the Río Grande de Añasco.
- Calculate the vegetation index (NDVI) to the forest that growth near the domestic's septic tanks, crops and far away from both sites, but near the river.
- Compare the NDVI of the forest that growth near the domestic's septic tanks with forests that growth near crops and forest that growth alone, near the river.

Methodology:

For the purpose of this project a true color image of IKONOS was use to identify the study area.

NDVI has to be applied to the original image to identify the forest vitality.

Because atmospheric effects can greatly alter the value of the ratio of the NDVI from its true value an atmospheric correction was apply to compare values and images.

By comparing visible and infrared light, scientists measure the relative amount of vegetation, combine infrared and visible light information gathered by satellites to derive the normalized difference vegetation index (NDVI).

Healthy vegetation reflects very well in the near infrared part of the spectrum. Very low values of NDVI (0.1 and below) correspond to barren areas of rock, sand, or snow. Moderate values represent shrub and grassland (0.2 to 0.3), while high values indicate temperate and tropical rainforests (0.6 to 0.8).

Results and Discussion

In the NDVI we can distinguish between forest, crops, rivers, cities, agriculture and soil. Forest that growth near houses that have domestic's tanks (Figure 1) has a higher value (Figure 2) in comparison with forest that growth near farmers – crops (Figure). Values of forest that growths alone, near the river (Figure) have the same value of forest that growth near crops.

Results of the values of tropical forest were 0.8-0.9 without an atmospheric correction (Figure 2). The values of the forest near the crops and the forest that growth far from the possible point sources were 0.7-0.8 (Figure)

Values of NDVI vary with the atmospheric correction. The atmospheric correction improves de NDVI ratio value, but increases the difficult to compare NDVI calculated values as a visual instrument (Figure 3, Figure and Figure).

Figure 1: A true color image of vegetation near houses and near the Rio Grande de Añasco

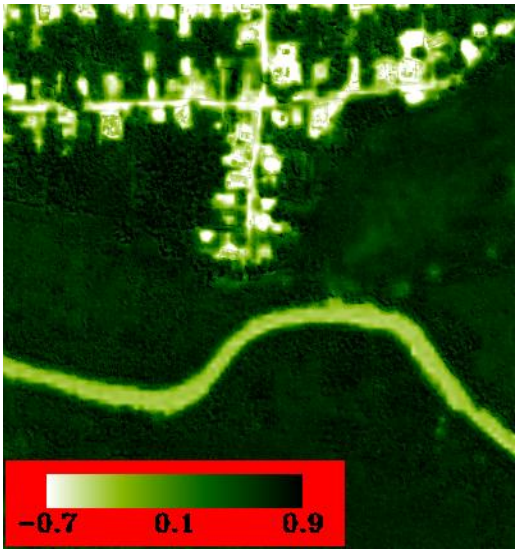

Figure 2: Image of NDVI for forest near houses and near the Rio Grande de Añasco

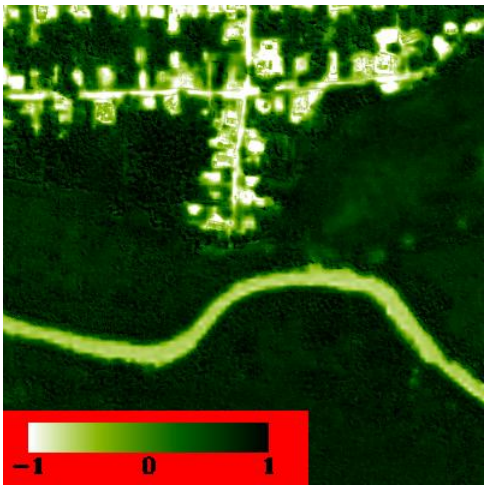

Figure 3: Image of NDVI for forest near houses and near Añasco River with atmospheric correction

Figure 4: A true color image of a Crops zone near the Rio Grande de Añasco

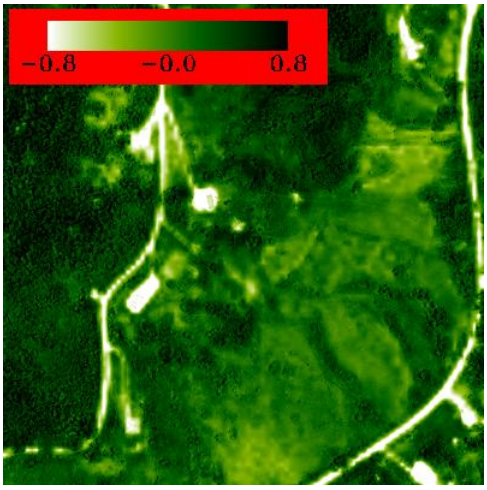

Figure 5: Image of NDVI for forest near Crops zone near the Rio Grande de Añasco

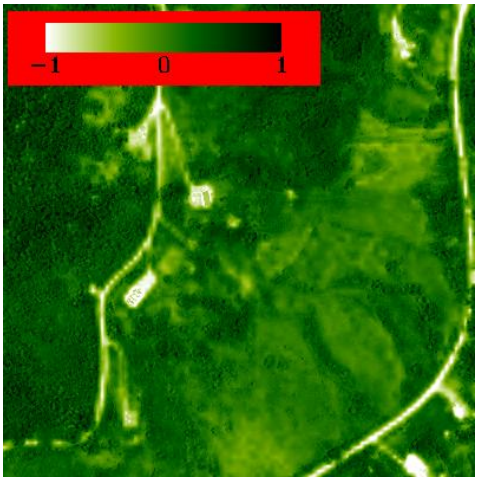

Figure 6: Image of NDVI for forest near Crops zone near the Rio Grande de Añasco with atmospheric correction

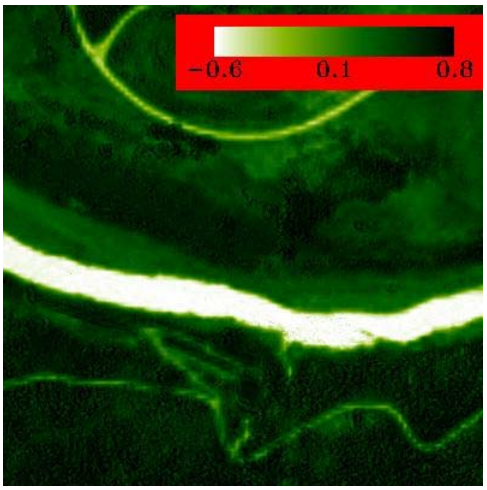

Figure 7: Image of NDVI for forest near the Rio Grande de Añasco

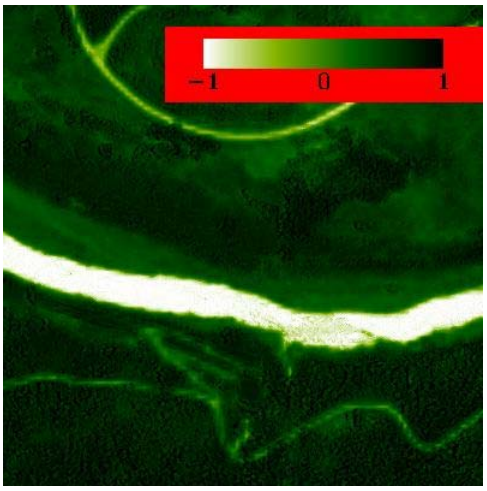

Figure 8: Image of NDVI for forest near the Rio Grande de Añasco with atmospheric correction

Conclusions

To identify forest, NDVI is a good tool because the values are very high.

The values of the NDVI were affecting by atmospheric correction. For the purpose of this project, an atmospheric correction was not needed.

Because of the lack of information of the image like date, the interpretation of the image can vary. For periods of high humidity values of forest in NDVI are different of values in dryness seasons.

Recommendations

Grab sampling of the water river and the soil at this points have to be perform to compare results.

A comparison of the image during a period of time can help in the interpretation of the NDVI values.

A comparison of season (dry and humid) would help in the interpretation and conclusions of the images and values of NDVI.

References

ENVI Manual

Lecture notes of Dr. Fernando Gilbes

Campbell J. B. *Introduction of Remote Sensing* 3rd ed. The Guilford Press, NY London