TEMPORAL LAND COVER CHANGE RELATIVE TO LIVESTOCK GRAZING IN SAGEBRUSH STEPPE ENVIRONMENTS

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Abstract

Fire can have an initial devastating impact on vegetation of rangelands, and recovery of vegetation can take many years. This project describes the correlation between percent bare ground and the amount of time after a fire. The hypothesis is, as time progresses after a fire, the percent bare ground will diminish to a point, due to vegetation recovery. A polygon was created outlining a burned area of which LandSat imagery was available for a number of years since the fire. A model was created that classified the LandSat image as either greater than 50% bare ground or less than 50% bare ground. A neural networks classification was used to create the model. After the classification was complete the number of pixels from each class was recorded for all images used. The number of pixels from each class was also recorded from within the fire scene. The data was put into statistical software where it was graphed for visual analysis.

Introduction

The Big Desert of Southeast Idaho is managed by the Bureau of Land Management. Management strategies include grazing, resting, and burning of the land. Fire can have an initial devastating impact on the vegetation of these rangelands, many times leaving almost 100% bare ground in its wake. Recovery of vegetation can take many years. This study observes the rate and extent of recovery of rangelands after a fire. One of the indicators of amount of recovery is the percent bare ground. Bare ground was chosen as the most important indicator to be observed for the years following a fire. The hypothesis is, as time progresses after a fire, the percent bare ground will continue to diminish to a point, due to vegetation recovery. Below is a map of Idaho showing the location of the Big Desert, the area observed in this study.

Methods

A bare ground model was created using LandSat satellite imagery. The LandSat imagery was downloaded and then geo referenced. The geo referencing was done using a road coverage of the same area. The roads in the image were matched up with the coverage and the rectification was performed. This process was completed using ArcGIS 9.0 software. Vegetation indices were calculated using the rectified LandSat images. NDVI was the vegetation index selected and used in the analysis. Idrisi Kilimanjaro's image processing was used to create the NDVI. After the NDVI was created, training sites were selected based on areas observed in past field studies performed by researchers at the GIS TReC, Idaho State University. The points selected as training sites were given a classification of greater than 50% bare ground or less than 50% bare ground. Spectral signatures of the bare ground training sites were extracted for classification of the LandSat imagery. Idrisi Kilimanjaro's neural networks classification was used create the model. Neural networks classification utilizes the training sites and a number of spectral bands from the LandSat image. For this classification all bands and the NDVI were used. The best resulting RMS was .45. The following models were the result of the classification from the years 2002, 2003, and 2004.They are shown as figures 1-3 The models were then clipped to the boundaries of a burn area from the year 2001. The burn areas are shown below as figures 4-6.

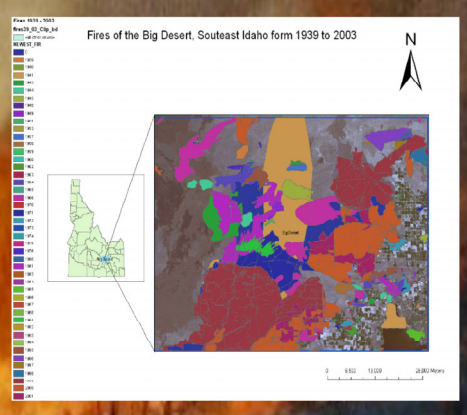


Figure 1

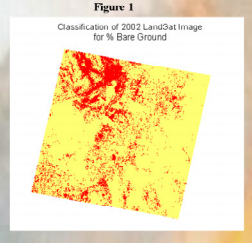


Figure 2

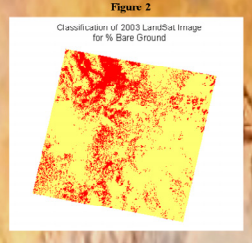


Figure 3

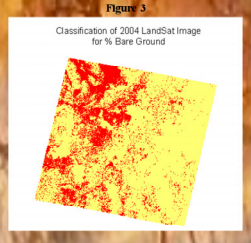


Figure 4

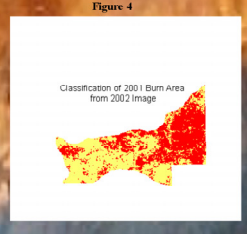


Figure 5

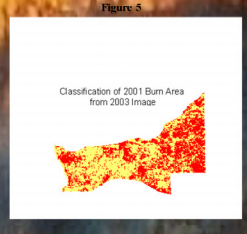
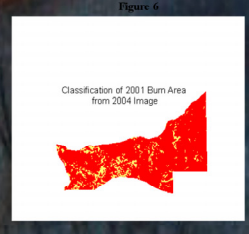
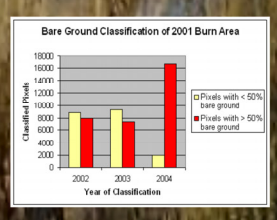
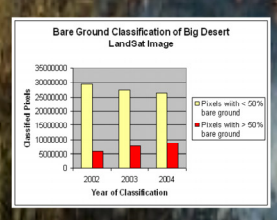


Figure 6



After the models were created the number of pixels from each class were recorded for all images used. The number of pixels from each class was also recorded for the scene of the fire. This was done to determine if bare ground within the burn area diminished, remained constant, or increased as time progressed. This information was used to determine if there was any temporal change in bare ground. The following graphs illustrate the changes in bare ground over time.





Results

The models created show that the percent of bare ground on the Big Desert, Southeast Idaho is increasing. The models also show that within the 2001 burn area, there was an increase in the amount of bare ground each year from 2002 to 2004. The hypothesis that the amount of bare ground within a burn area will decrease over time was not proven correct. There are a number of factors that could have an impact on the recovery of a burn area which will be addressed in the discussion section.

Discussion

Bare ground is an important indicator of rangeland health. For that reason bare ground was chosen as a variable of interest. The only indicator observed in this study was the percent bare ground. The study looked at areas that burned in the year 2001 and what has happened to these areas in the years since the fire. Because of data availability since the fire the 2001 fire was chosen as the area of interest.

A factor that has likely contributed to the increase in bare ground on the Big Desert and the burn area within the Big Desert is the drought. The area has been in a drought cycle for the past 6 to 7 years. As the drought intensifies, the amount of bare ground will likely increase. The distribution of precipitation throughout the year also affects the condition and recovery of the land. The Big Desert is in an area where most of the precipitation is received in the winter as snow. If there is not much spring moisture the recovery of the burn areas may be affected. This may have caused the overall bare ground of the area to increase.

Acknowledgements

This study was made possible by a grant from the National Aeronautics and Space Administration Goddard Space Flight Center. ISU would also like to acknowledge the Idaho Delegation for their assistance in obtaining this grant