Preliminary work on using image analysis for South Sudan species conservation efforts

Bucknell received a $1,000 grant from PA View to support the efforts of Prof. DeeAnn Reeder and student Laura Kurpiers in their biology research in South Sudan. We proposed to use the $1,000 grant to hire a team of consultants from Penn State University to train Prof. Reeder and Ms. Kurpiers in basic techniques related to remote sensing, image analysis using ENVI software, and remote sensing methodologies used to identify land cover change related to human activity in a former conflict zone in south Sudan. The consultations took place at Bucknell (full day on Wednesday, June 4th) and Penn State (full day on Thursday, June 5th) with an agreement that Prof. Reeder and Ms. Kurpiers could contact the consultants as needed for follow-up guidance. Below is a summery of the preliminary work completed for this phase of the project.

The objective of this work was to use U.S. Geological Survey's Landsat satellite imagery to quantify and visualize land-use change and land-cover change in South Sudan from 1985 to 2011. The imagery also provided information on the location and distribution of different habitat types. We were able to classify habitat types and will use the images to "ground-truth" or verify habitat classifications while we are on the ground. Two specific areas of interest, Bangangai and Bire Kpatuos Game Reserves of Western Equatoria State, were analyzed.

The information gained from this image analysis will be used as a resource while we are conducting field research in South Sudan. Camera traps will be deployed throughout the game reserves and information on species composition, diversity, and distribution will be compared to different habitat types and level of land cover change over time. We will also try to predict species distribution across a landscape by using camera trap data and habitat classification and mapping.

Surprisingly, satellite imagery shows that there has been re-forestation between 1985 and 2011 in the two reserves. This may be due to the civil war that was occurring in the area that forced people to flee. The first image in this report shows this increase. ENVI software was used to conduct an NDVI assessment (Normalized Difference Vegetation Index). Blue represents areas with increased vegetation, red represents areas with decreased vegetation, and black indicates no change.

We have pasted images into the following pages of this document to demonstrate the type of work that was accomplished during our 2 day work sessions with the Penn State consultants. Images 2 and 3 in the report show how different habitat types have changed over time. Image 2 shows habitat distributions in 1985 and image 3 shows habitat distributions in 2011. By comparing the two images one can see that change in habitat composition in the reserves has occurred. Once Prof. Reeder and Ms. Kurpiers are on the ground in South Sudan they intend to describe and verify the different habitat types.

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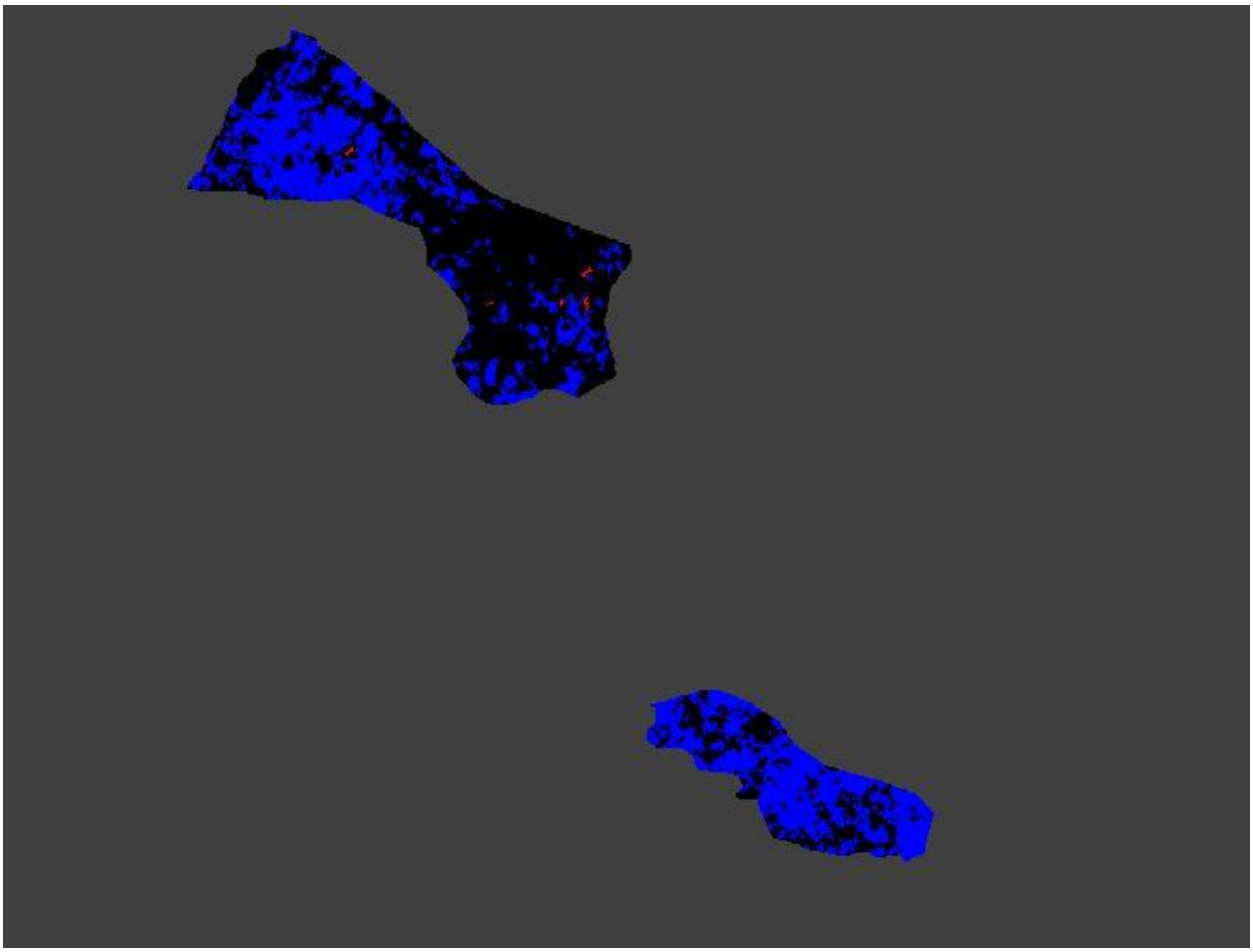
ENVI_1 = change in vegetation cover from 1985 to 2011 in the two reserves we're interested in. Blue = increased vegetation, Red = decreased vegetation, black = no change



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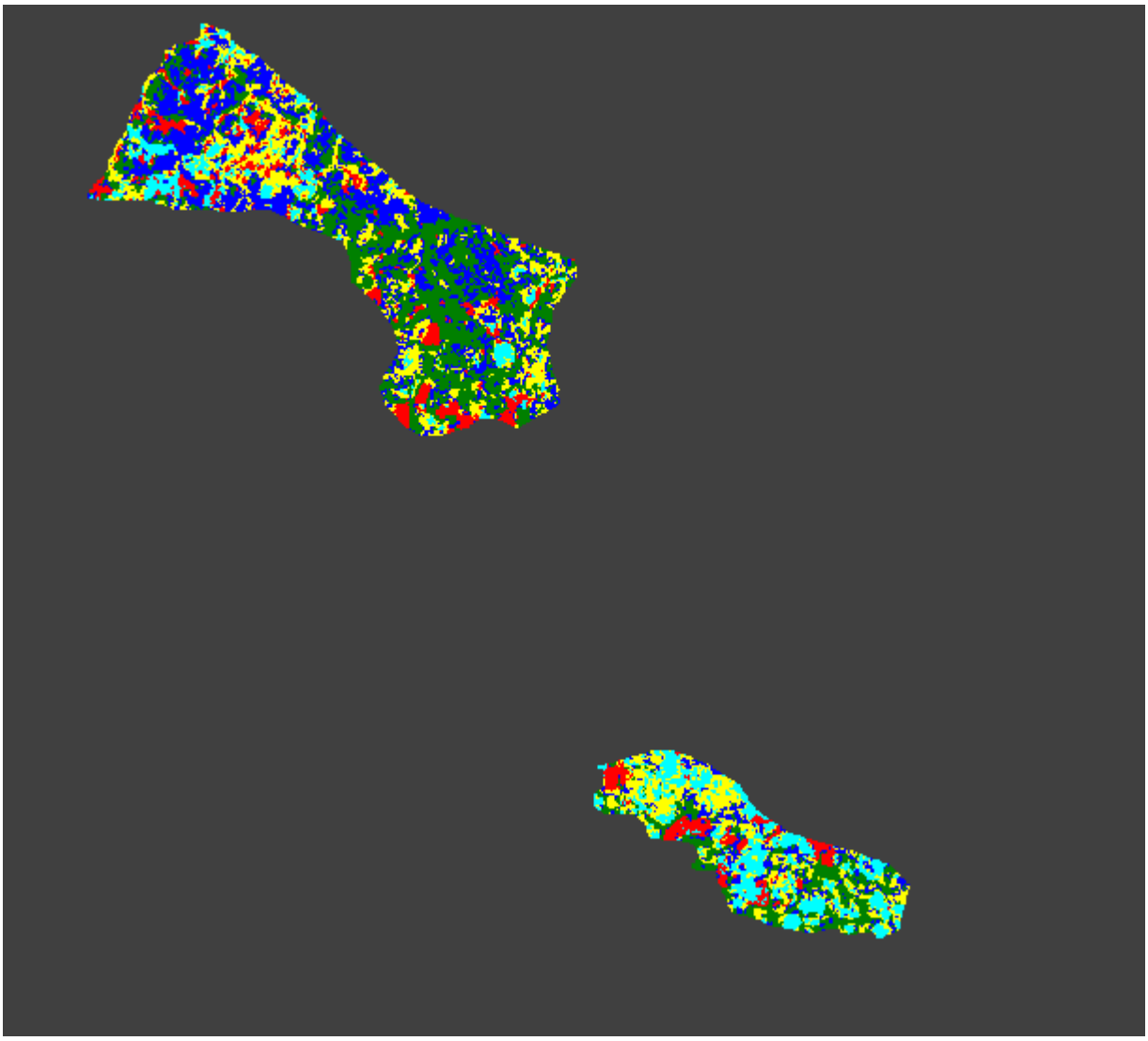
ENVI_2 = 1985 image with 5 different habitat types classified with individual colors (the ENVI program calculated the habitats)



As of 6/30/2014

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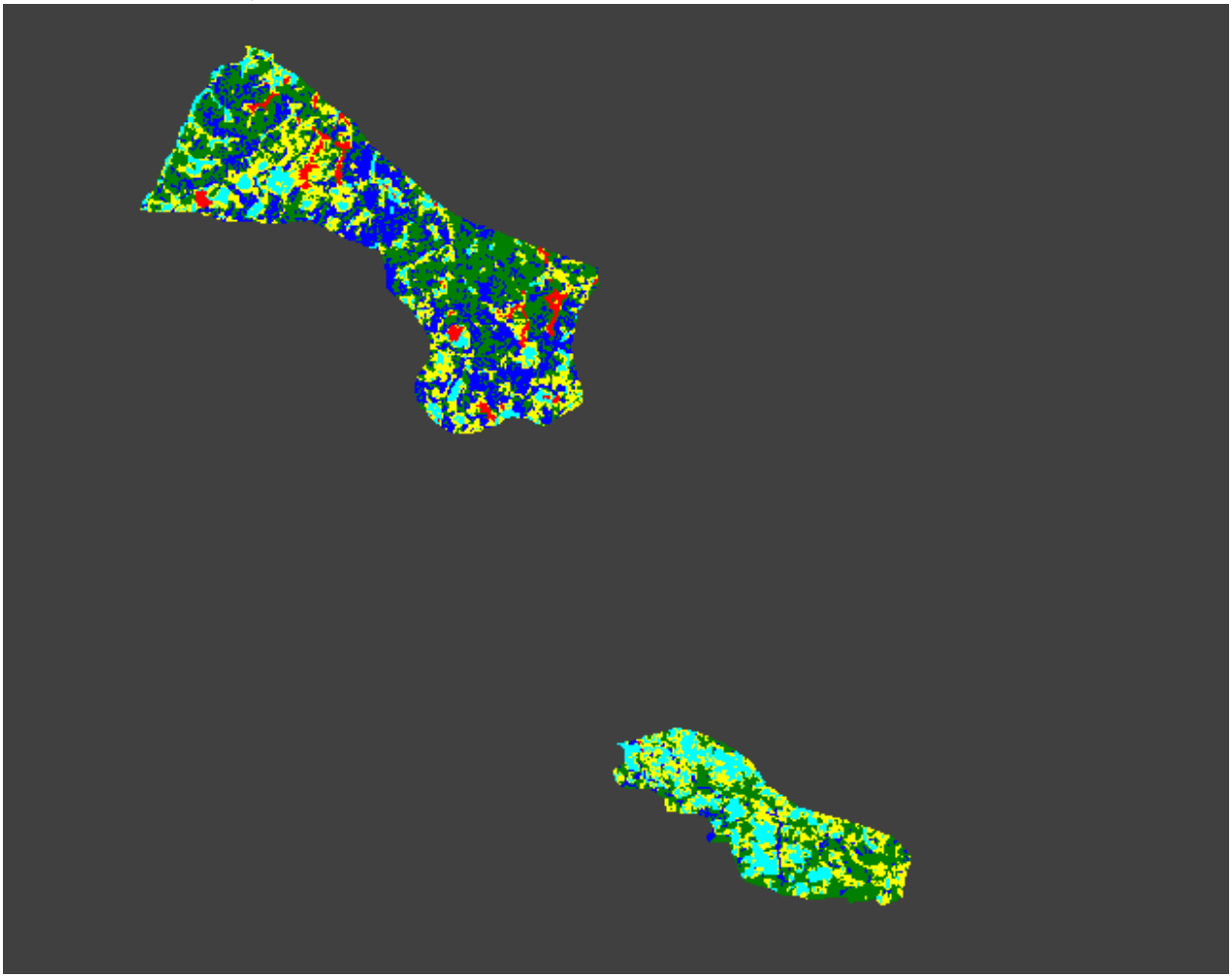
ENVI 3 = 2011 image with 5 different habitat types classified with individual colors (the ENVI program calculated the habitats)



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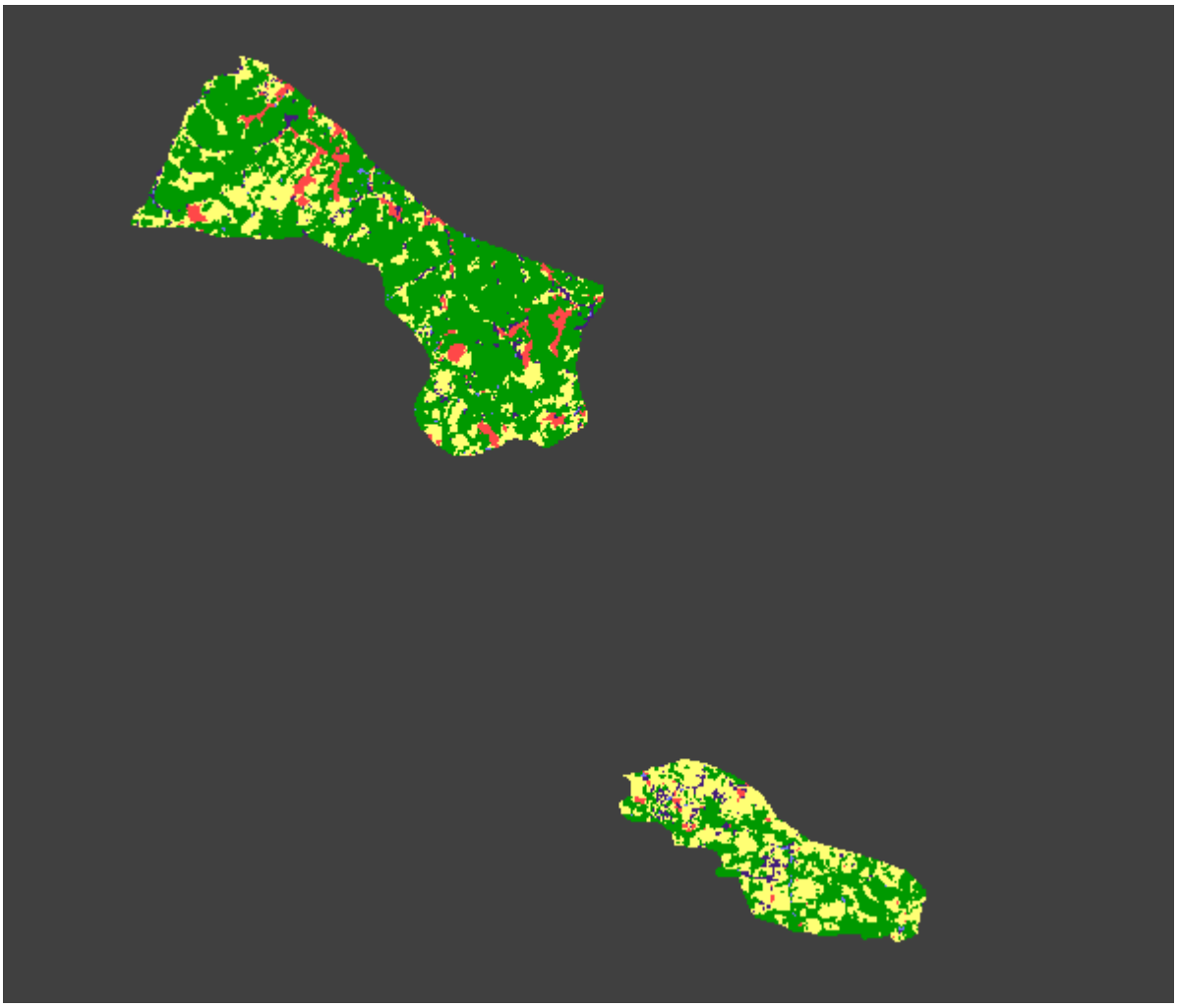
ENVI 4 = 2011 image with 5 different habitat types classified with individual colors. I manually identified habitats in a small area and the program took that info to classify habitat types across the entire protected areas. Green=forest, Yellow=open, Red=floodplain, LightBlue=Riparian Corridor, DarkBlue=Seasonal water



As of 6/30/2014