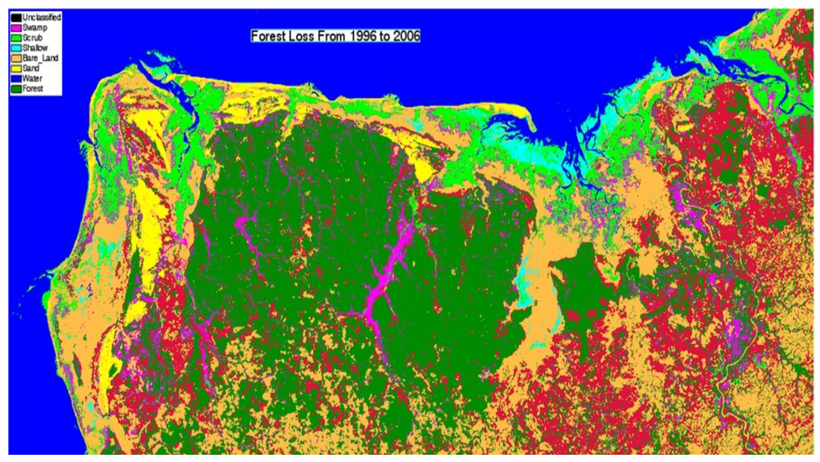
Reforestation in Madagascar

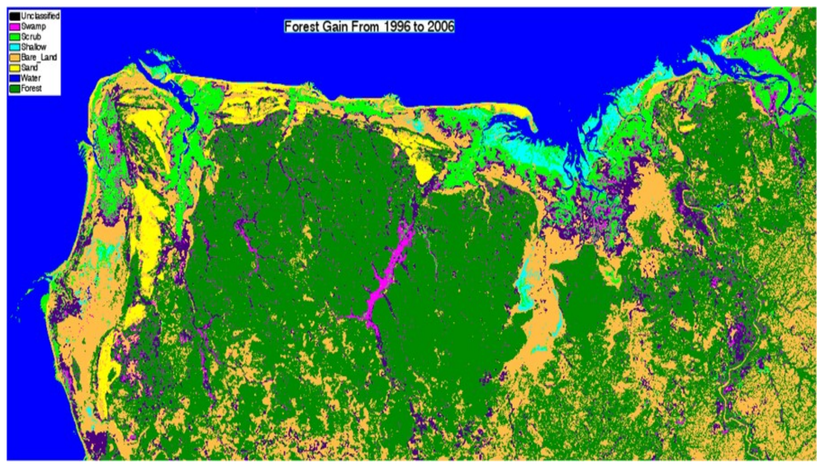
INTRODUCTION

Madagascar is rich in forest resources and a wide variety of wild animals and plants, which have been gained much reputation and should be protected for the natural gift. However, it is facing the threat of a sharp decline in biodiversity due to the deterioration of the natural environment and the growing population who depend on the forest for survival. While primary causes of forest loss, generally, have been slash-and-burn for agricultural land and for pasture, selective logging for precious woods or construction materials, the collection of fuel wood and in certain sites, forest clearing for mining. In recent years, people have realized that the protection of natural resources is not only as important as the economic and social growth. Lots of efforts have been made to save and recover the forests. Eden Reforestation Projects, along with help of the local and international volunteers, launched its Madagascar project sites in 2007 by restoring ecologically devastated mangrove estuaries in the northwest of the country. This project aims to find out how serious the deforestation was and if any efforts people have made had good consequence for recovering forests.

RESULTS

Forest Change Between 1996 and 2006

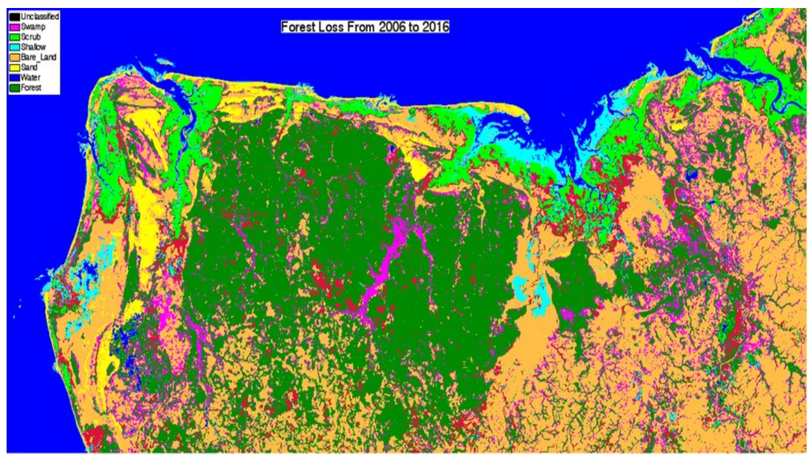


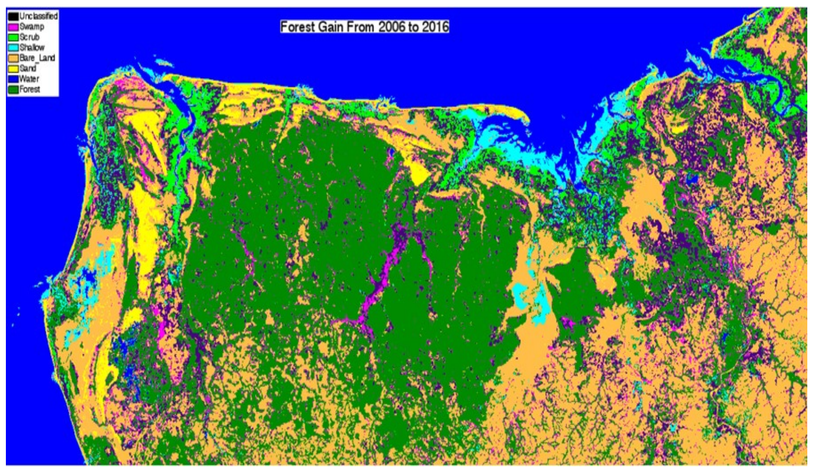


Land Cover Types	Land Cover 1996 (%)	Land Cover 2006 (%)	Change (%)
Unclassified	0	0	0
Swamp	3.32	0.89	-2.43
Scrub	6.91	6.30	-0.61
Shallow Water	3.29	2.96	-0.37
Bare land	20.83	34.48	13.65
Sand	2.21	3.84	1.63
Deep Water	23.80	24.38	0.58
Forest	39.64	27.15	-12.51

Visually there was a large portion of forest areas had been lost, which was approximately 327.25 square kilometers. Even though forest gain can be noticed, they were not able to cover forest loss. Total forest gain from 1996 to 2006 was only 142.39 square kilometers.

Forest Change Between 2006 and 2016

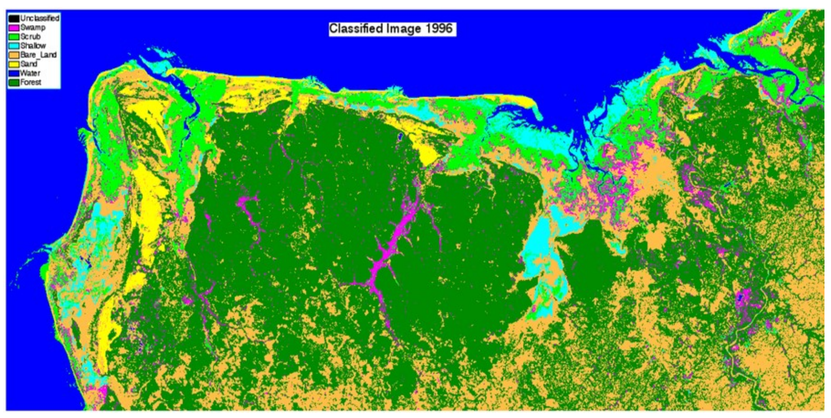


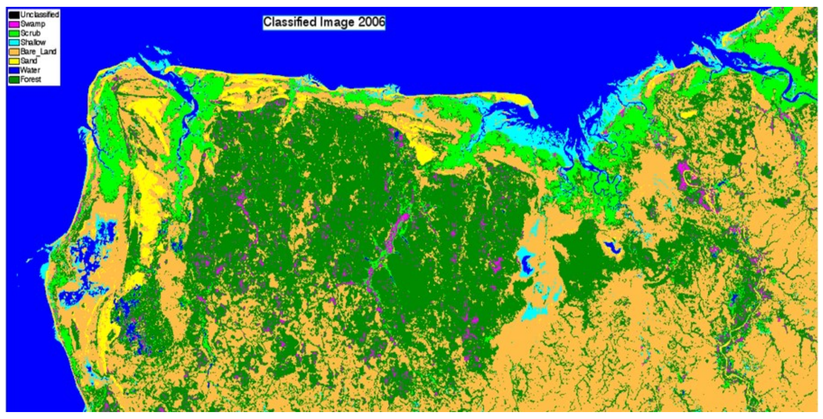


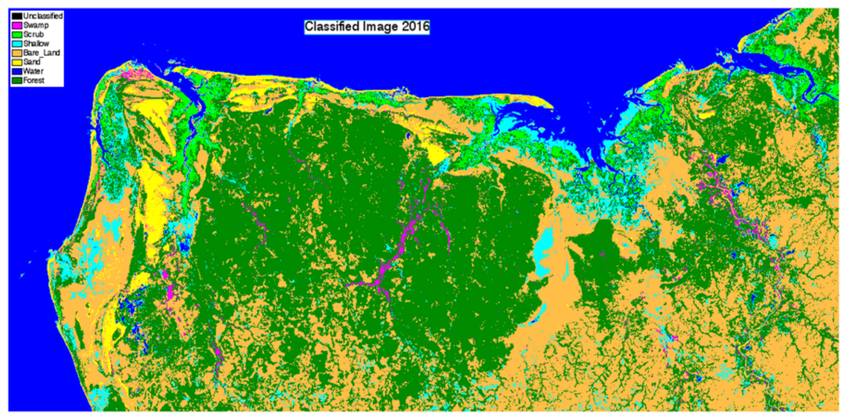
Land Cover Types	Land Cover 2006 (%)	Land Cover 2016 (%)	Change (%)
Unclassified	0	0	0
Swamp	0.89	1.99	1.10
Scrub	6.30	1.39	-4.9
Shallow Water	2.96	4.65	1.69
Bare land	34.48	30.51	-3.95
Sand	3.84	2.08	-1.76
Deep Water	24.38	25.54	1.14
Forest	27.15	34.02	6.87

The forest loss basically distributed along the right side coastal line, lower right and some are in main forest on the left side. As a result, the forest loss was about 104.87 square kilometers, while forest gain was 201.25 square kilometers.

SUPERVISED CLASSIFICATION RESULTS







POSSIBLE CAUSES OF OBSERVED TRENDS

NEGATIVE CONTRIBUTORS

Illegal Logging

Weak Laws

POSITIVE CONTRIBUTORS

Reforestation Projects

Awareness of Protection for Forests

CONCLUSION

It has been discovered that deforestation was a big problem between 1996 and 2006 in Madagascar. No matter from the tree loss distribution in image or statistics, they show a huge forest reduction in this decade. Only if there has forest loss in the first decade, the change of forests in the following decade could be good to illustrate how the reforestation projects works. Surprisingly, the forest areas happened to increase between 2006 and 2016, which indicates that not only the rate of forests' loss had been under control, but more forests had been recovered. It is happy to know that most forest areas recovered from either scrub, probably density of trees getting higher, or bare lands. This pretty matches with the goal of reforestation projects, which are to plant trees on the bare lands. However, there still exists areas of forest loss after 2006. Generally, the forests in the northwest corner of Madagascar had been experienced a great reduction of trees and after variety of reforestation projects and efforts local citizens made, they had turned to be in a relatively healthy situation. The reforestation projects had achieved success and deforestation had been under control.

LIMITATIONS

1. ACCURACY OF IMAGE CLASSIFICATION

The most important step for this project was image classification. Therefore, the accuracy of classified images played pivotal roles demonstrating what land cover types in images. It also had huge influence on the change detection analysis. Even though necessary process for increasing accuracy such as ground truthing or supervised classification had been taken, it was still controversial to guarantee the classified images had very high accuracy.

2. SEASONAL INFLUENCE

Image obtained from 2006 showed it was in flooding season, while other two images were not. That decreased the accuracy and persuasiveness of this project. Noticing there were relatively big areas of shallow water had been recovered to forests between 2006 and 2016. Areas that were supposed to be classified as forests had been seen as shallow water in 2006. That was main reason why lots of shallow water change to forests. As a consequence, forests that been recovered was actually more than that in reality. Another reasonable approach will be using images from different dates that avoid the flooding seasons to do change detection.

Tufts UNIVERSITY | School of Engineering

ZEXING LIN

CEE 189 Introduction to Remote Sensing

Instructor: Magaly Koch

Presented on May 8, 2018