University of North Florida: Measuring and Mapping the Footprint of Growth Over Time

Research by: Cheyenne Black, Autumn Cummings, Caroline Howard, Monica Murray, Evelyn Thorpe

Faculty Advisor: Dr. Baynard

Abstract

This study analyzes remotely sensed aerial imagery in 5-7 year increments to determine land use change of the University of North Florida from 1970 to 2017.By geo-referencing, digitizing and examining land-use data, we will map and measure the expansion of infrastructure as well as the loss of natural areas. We will compare the imagery of the original 1972 master plan to the current 2015-2025 master plan.

UNF
UNIVERSITY of NORTH FLORIDA

Introduction

1972 Master Site Development Plan:

"While this is an atypical college site by most standards we believe it offers some unique opportunities…"

"We are heartened by the fact that *immediately upon taking possession of this site the University of North Florida had it declared a wildlife sanctuary*. It is this kind of spirit that we hope to perpetuate through the development of the campus in accordance with this master campus development plan."

-John T. Brickert, Senior Project Manager

PURPOSE

This study is part of a larger effort of the university to celebrate the history of UNF as the 50th anniversary approaches.

FINDINGS

Demonstrated below, we see significant growth in UNF's land ownership and infrastructure with various changes within the five categories.

Data & Methods

- Faculty supplied data from the Engineering Department's, Dr Robert Richardson.
  - 1970 – 2017
- Years chosen based on availability and quality
- In 2006 UNF commissioned a plane to fly over our campus and acquire aerial imagery
- Boundary shapefiles were created from the published 2015-2025 master plan
- Aerial imagery digitized into five categories:
  - Paved Roads in kilometers
  - Paved Infrastructure per acre
  - Water Bodies per acre
  - Recreationally used Open Areas per acre
  - Forest Areas per acre.
- Polygon geometry calculations of each except for polyline paved roads

Discussion

- The table below displays the significant development since UNF's inception.
  - Broken down into 5 digitized categories
  - Percentages do not add to 100
- Further research will minimize errors
  - Calculating area of the roads
  - Further classification of maps to ensure correct categorization.

UNF Land Usage Overview

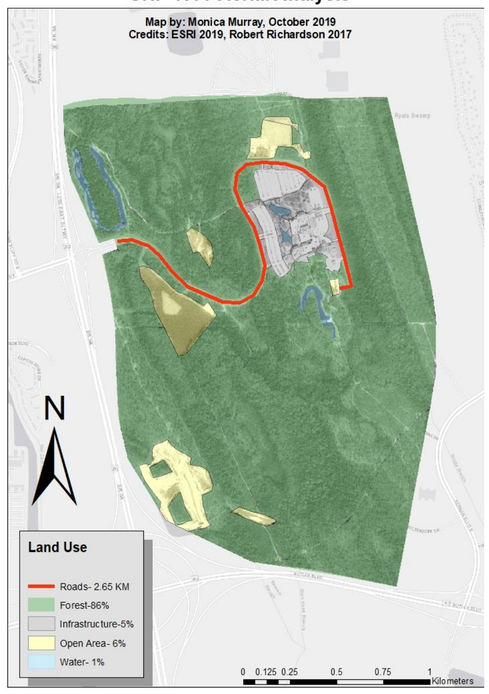
	Road	Forest	Infrastructure	Open Areas	Water
1970	0	97%	0	4.16 km	0
1977	2.65 km	86%	5%	6%	1%
1980	2.60 km	85%	7%	3%	3%
1983	2.63 km	86%	7%	1%	5%
1988	2.59 km	84%	7%	3%	4%
1994	4.23 km	83%	9%	3%	4%
1999	5.60 km	80%	11%	3%	4%
2006	8.57 km	78%	12%	5%	7%
2011	11.54 km	73%	14%	6%	6%
2017	11.54 km	73%	15%	5%	6%

Future Work

2020-2030 Master Plan Workshop:

- Vertical Development
  - Includes building and parking garages
- Decreasing Campus Footprint
  - Dealing with food waste
  - Adding mitigation lands
- Highlighting the Preserve
  - Accentuate the area
  - Introducing more hands-on field trips

UNF 1977 Aerial Analysis

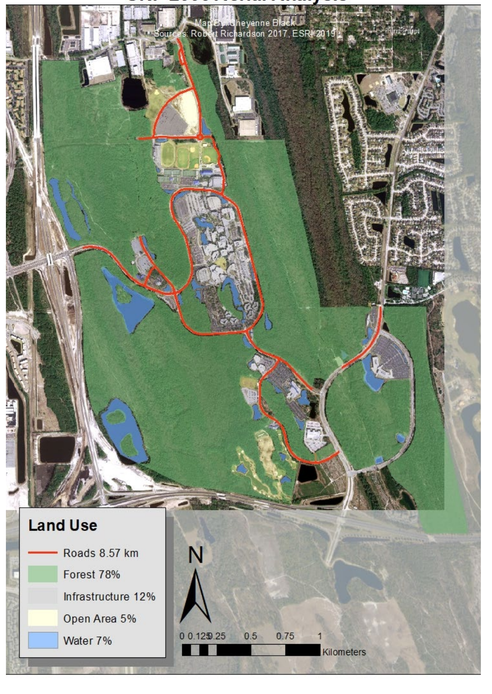


◆ **Figure 1:** Once the campus has opened this shows the introduction of a main road, new bodies of water, increased open areas, and an 11% decrease of forested areas.

UNF 1994 Aerial Analysis

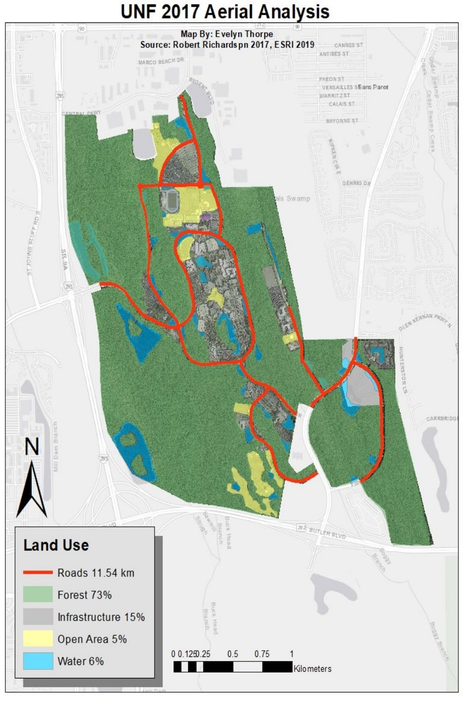
◆ **Figure 2:** At the 25th anniversary of opening, infrastructure has jumped to cover 9% of land, forest has again decreased by 15% since groundbreaking, where water bodies and open areas remain consistent.

UNF 2006 Aerial Analysis



◆ **Figure 3**. Including the 200 acres UNF acquired in 2005, the forest percentage has decreased only 2% from 1999.

UNF 2017 Aerial Analysis



◆ **Figure 4:** In this final year, the overall infrastructure has grown to 15%, forest decreased by 24%, and an increase in number of water bodies and open areas.