



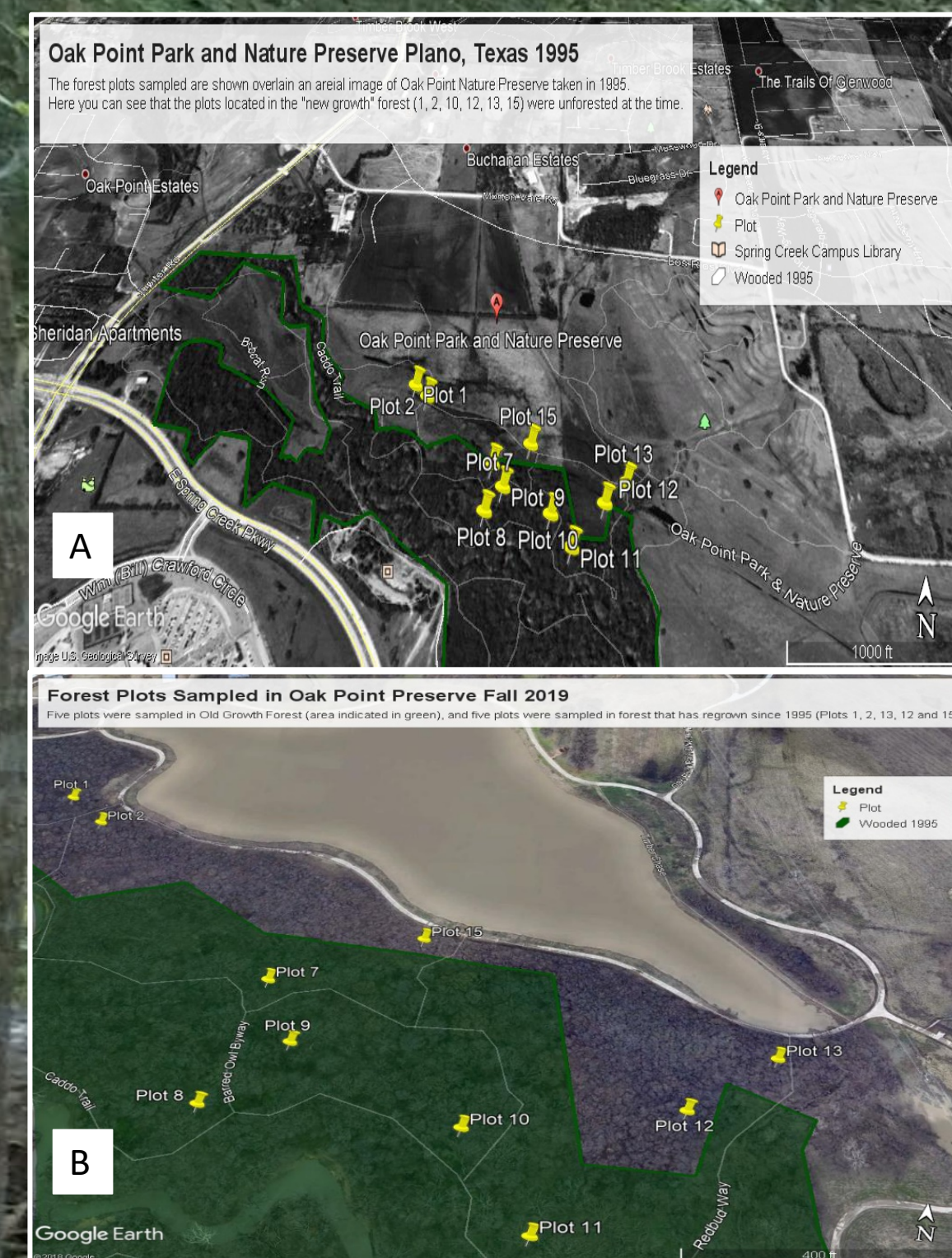
# Comparing Primary and Secondary Growth Forest in the Oak Point Nature Center and Preserve Forest, Plano Texas: A Forest Ecology Course-based Undergraduate Research Experience (URE) for Non-Majors and Lower-Level Majors Courses

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## Abstract:

Over the course of three lab periods, students use their knowledge of ecological succession and forest ecology to develop and test their hypotheses about how forest stand characteristics differ between two forest types: 1) primary forest and 2) secondary forest that has been re-growing since 1995. This activity can be conducted as a field exercise followed by two lab periods in which students process and analyze collected data using Excel, and then present their findings in a poster format. Alternatively, the exercise can be conducted online using previously collected data. I use this exercise to compliment course discussions of land use change and management in my predominantly non-majors Second Semester Environmental Science course. This activity also acts as a prelude to a guest speaker presentation from our city's Urban Forester.



**Figure 1** Locations of the plots sampled within the Oak Point Preserve Forest overlaid A) 1995 and B) 2018 aerial images of the forest. The area of the preserve that was forested in 1995 is outlined in green. C) Students record tree species, density and basal area in a total of ten plots (yellow pins), each measuring 10 m in diameter, encompassing 78.5 m<sup>2</sup>.

## Methods and Site Description:

Oak Point Nature Center and Preserve is an 800-acre urban forest and grassland preserve that borders Rowlett Creek in the City of Plano, Texas. The 120-acre forest patch that we sample is comprised of two sections: 1) primary forest that was not clear cut and 2) secondary forest that was clear cut for agricultural purposes and has been re-growing since 1995 (figures 1 A & B).

Students sample ten randomly distributed plots within the forest: 5 plots located in the primary growth area and 5 plots located in the secondary growth area (figure 1C). After data collection, students use pivot tables to process their data before they produce bar graphs of average plot-level species richness, tree density and forest basal area by forest type (primary or secondary growth). Data collected by students will provide a long-term data set that can be used by the park superintendent to make management decisions.

## Possible Expansions for this Exercise:

- 1) Introduce standard error and statistical analyses of the data. Currently, students base their conclusions of graphical analysis of the data.
- 2) Increase sample size and test for “edge effect” using plot distance from a forest patch edge.
- 3) Have student calculate species diversity using recorded abundance and species data .
- 4) Have students sample and compare soil characteristics between the two forest types.
- 5) Use *iTree* to estimate and compare ecosystem services between the two forest types.
- 6) Anything else you can think of! Please, share your ideas!

## Implementation:

This exercise can be implemented in a variety of methods: 1) in-person as a series of field/ lab exercises, 2) fully online or 3) as a blended combination of online pre- and post-lab and in-person field exercise.

Prior to conducting the lab, students are introduced to forest ecology and ecological succession in lecture and a short pre-lab lecture. During the prelab lecture and discussion, students are asked to develop their hypotheses for how each of our measured variables will or will not differ between the two forest types.

**In-person/ blended course version:** During one three-hour lab period, students work in groups of 4-6 to collect data in the field. Student groups compile their field collected data into a collaborative Excel file online. During a second in-person or online meeting, student groups process and analyze their data using instructions in a worksheet and guidance from the instructor. After submitting completed individual worksheets, student groups then prepare and present their work in a poster format.

**Online Version:** Students work individually to analyze provided data using a self-guided worksheet and a provided recorded Excel tutorial. After submitting completed individual worksheets, students work in groups to prepare and present a poster of their findings.

## Assessment:

Students are assessed using a lab exercise worksheet (individual grade) and a poster presentation (group grade combined with peer reviews to determine individual student grades).

## Online Teaching Materials Provided:

1. Excel Spreadsheet containing data (Student Version and Instructor version with Answers).
2. Student Pre-lab Homework
3. Student Instructions for Processing Data in Excel.
4. Student Data Analysis Worksheet
5. Student Poster Instructions and Rubric.

**Thank you to Kym Hughes, Park Natural Resources Superintendent for the City of Plano, Texas.**

Background Photo: Collin College students sample forest characteristics in primary hardwood forest in the Oak Point Preserve. Photo: T. Basham