Comparison of Litter Depths from 2005 and 2011 of the Long Island Central Pine Barrens in Order to Assess Forestry Health

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August 12, 2011

Prepared in partial fulfillment of the requirements of the Office of Science, Department of Energy's Science Undergraduate Laboratory Internship under the direction of Timothy Green in the Environmental Sciences Division at Brookhaven National Laboratory

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ABSTRACT

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The Long Island Central Pine Barrens is a very rare type of ecosystem. Over the years this forest type has progressively diminished because of commercial and residential development. Environmentalists, concerned by this loss, are researching the health status of the Pine Barrens to decide whether or not they should implement methods to maintain the diversity within this ecosystem. In 2005-06, 93 - 25x16 meter random plots were established throughout the Central Pine Barrens of eastern Long Island and baseline data was collected with the intention of data comparison 10 years later. Ecologists predicted that they could detect about a 10% change in the forest health in the next 10 years. In this study, seven of the plots were revisited to see if change could be detected earlier. The plots were identified using the coordinates from the 2005-06 data and for each plot ten transects were set up horizontally along the 25m side. Vegetation types were recorded at random points along each transect and belt transects recorded the number of seedlings and saplings. Litter and duff depths were recorded at 4 points per transect. Soil pH was recorded at 4 points on transects 1, 3, 5, and 7. Analysis revealed that there wasn't a significant change in the data. Even so, it still provides more updated data that will help in future natural resource management planning to maintain the ecological diversity of the Long Island Central Pine Barrens

INTRODUCTION

The Long Island Central Pine Barrens is made up of 102,500 acres of land and is considered Long Islands' largest natural area. The Pine Barrens sit atop Long Island's sole-source aquifer and this is why the health of the forests is so important. Ecologist's efforts to preserve the forests began in the 1970's when residential and commercial development was first disturbing the area. The Foundation for Ecological Research in the Northeast (FERN) developed protocols for the Upton Ecological and Research Reserve to collect baseline data in 2005-06 at random plots in the Pine Barrens with the intention of data comparison in 2015. The protocols were designed to measure ecological attributes in order to assist adaptive management programs. After data comparison FERN will be able to ascertain and record the change in the forest health and help develop natural resource management requirements as needed. (Batcher 2005).

The Central Pine Barrens Monitoring Program is one of FERNs' major projects. The goal of this project is to track the current and future health of the Pine Barrens so that future research needs and priorities can be identified. For example, properly timed wildfires would benefit the Pine Barrens by reducing the amount of litter (which is composed of leaves, twigs, pine needles, and other dead vegetation) and canopy cover in the forest. This would provide more direct sunlight onto the soil, which would trigger new tree growth. Furthermore, the pitch pine cones germination multiplies after fires as well. Melting of the resin coating enables the cone to burst open and scatter seeds directly on bare soil. Knowing the right time to conduct prescribed forest fires would not only better the health of the Pine Barrens, it would also increase their longevity.

The Central Pine Barrens is made up of a variety of forest types. Coastal oak forests

are oak-dominated communities that are restricted to interior portions of the coastal plain in New York. Pitch pine forest types are dominated by pitch pine, meaning the total tree cover is >90% of pitch, with a continuous shrub layer of huckleberry, blueberry and scattered scrub oak. Pitch pine-oak forest types have a canopy of both pitch pine and tree oaks, but with pine being 51-90% of total tree cover and same vegetation. Oak-pitch pine forest types have a canopy of both pitch pine and tree oaks, but with tree oaks 51-90% of total tree cover with also the same vegetation.

MATERIAL AND METHODS

Our equipment list consisted of a tent pole, 7 ½ meter pole, densitometer, densiometer, clinometer, soil pH meter, augar, 50-meter tapes, tripod, camera, dry erase board, laser rangefinder, backpacks, batteries, calculator, calipers, cell phone, chain pins, spray paint, clipboard, compass, data sheets, dbh tape, field binder, first aid kit, flags, GPS unit, white board, dry erase markers, maps, meter stick, pencils, dionized water, and water bottles.

We looked up the coordinates for the plots, plugged them into the GPS and hiked through the forest with our equipment. When we found the markers, each corner of the plot and center, we outlined the perimeter of the plot with measuring tapes. Form 1 includes writing down the directions to the plot, taking pictures from the center marker to each of the corners, recording their distance and bearing, record information about the witness tree (tree type, dbh, distance and bearing to m1, cm, and mx), record the degrees for each picture taken and photo number. Form 2 includes writing the percent canopy, sub-canopy, and emergent canopy cover, percent of different types of vegetation and micro-topography. In form three, a random starting point is picked along the 16-meter

tape to position the first of ten line transects, each 1.5 meters apart after that; and then another random number was chosen to determine the starting point for data collection along each transect. Shrub, tree, and herbaceous cover was recorded at twenty points, each one meter apart, along every transect using a tent pole to determine each "hit" point on the transects'. A densitometer was also used at each point to determine an exact reading of the canopy cover and recorded as pine, hardwood, or nothing. Litter and duff depths were measured to the nearest millimeter at points 3, 8, 13, and 18 along each transect. A soil corer was used to measure the duff and litter layer. Litter represents leaves and other dead vegetation with a distinguishable structure and the duff layer is a dark brown soil resulting from decomposed stems, roots, and charcoal between the litter and the mineral soil, which is usually gray or yellow. Form 4 is where belt transects are completed following the line transects. Tapes were placed at two, four, six, and eight meters along the sixteen-meter edge of the plot so that seedling and sapling data could be collected for four belts transects. Saplings that were >2.0 meters tall and ≤2.5 centimeters diameter at breast height (dbh) were tallied separately from those that were between 0.5 and 2.0 meters tall. Tree seedlings less than 0.5 meters tall were recorded by species and placed into the following categories; 1-5, 5-10, and >10. Since more than 10 seedlings per belt transect is considered to be a good amount for regeneration, 11 was the cap counted per species. Scrub oak seedlings were not counted. Lastly, form 5 data on trees, snags, and downed logs were collected. The diameter at breast height (dbh) was measured for all trees >10 centimeters dbh and data were recorded by species. Trees >2.5 centimeters and <10 centimeters dbh were tallied by species. Trees with multiple stems were counted as one tree, but the dbh of both trunks were measured and recorded.

Downed logs greater than one meter in length and 10 centimeters dbh were measured in length and dbh at the middle and both ends.

RESULTS

Table 1 illustrates the community type and average litter depth of each plot in 2005 and 2011 used for this research. The range of average litter depth for the 7 plots in 2005 was [2.53, 7.23 cm] and in 2011 is [2.84, 4.86] as shown in figure 1. Pine dominated forests have the most litter, with an average depth of 7.21 centimeters (cm) and standard deviation of 2.77 cm in 2005 and an average depth of 4.58 cm and standard deviation of 2.80 cm in 2011 . The oak dominated forests had an average litter depth of 4.35 cm and standard deviation of 2.24 cm in 2005 and average litter depth of 3.59 cm and standard deviation of 2.44 cm in 2011. According to the graphs (figure 1 and 2), no vital changes in leaf litter or duff depths from 2005 to 2011. Regardless, the data will still be able to help detect and document the severity and direction of change in forest health; and to assist in future natural resource management planning to maintain the ecological diversity of the Long Island Central Pine Barrens.

TABLES Plot #	Community Type	Average Litter depth (in centimeters) 2005	Average Litter depth (in centimeters) 2011
5	Coastal Oak	4.65	4.49
91	Pitch Pine	7.23	4.86
93	Oak-Pine	2.53	3.39
81	Oak-Pine	5.06	2.84
52	Pine-Oak	7.19	4.31
30	Oak-Pine	5.4	2.84
29	Oak-Pine	4.33	4.42

Table 1. Average litter depth data 2005 and 2011

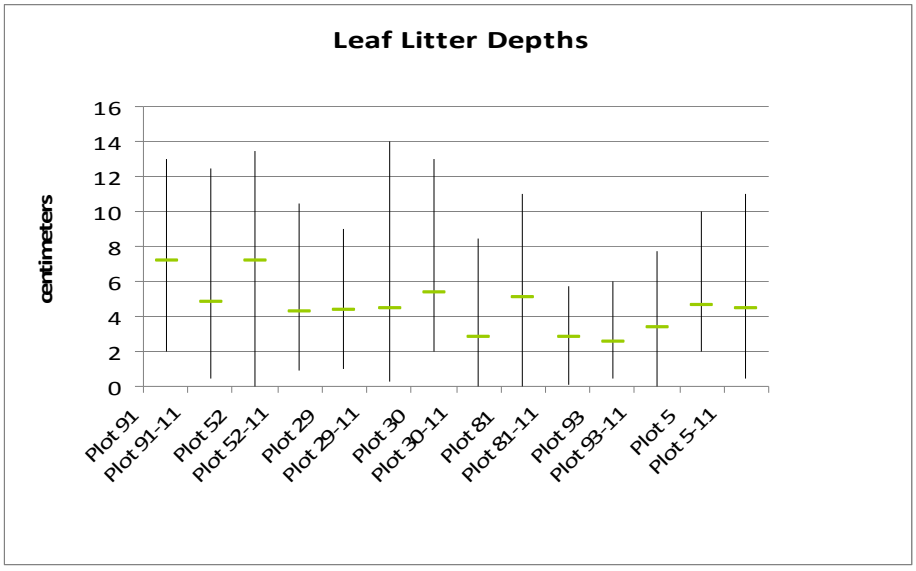

Figure 1 Plot of leaf litter depths.

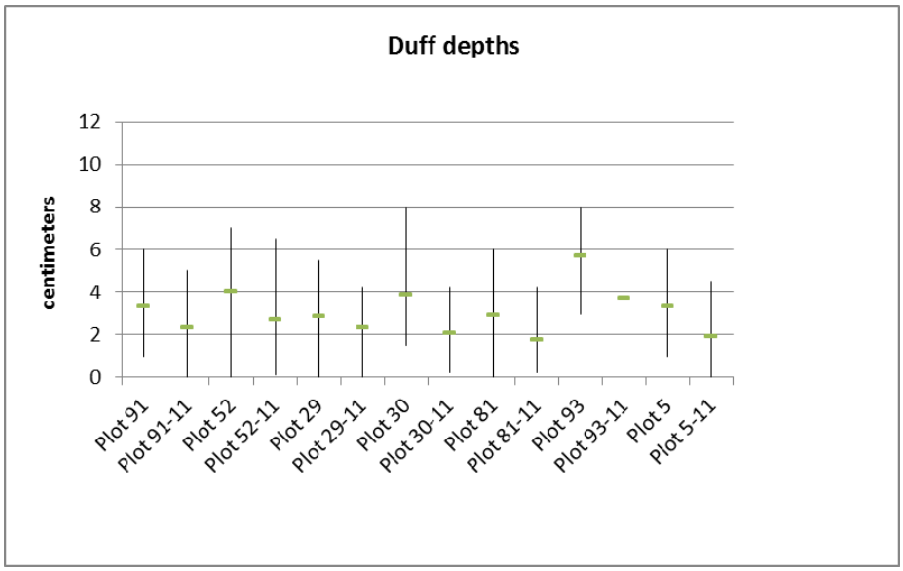

Figure 2 Plot of duff depths

DISCUSSION AND CONCLUSION

Litter depth plays an important role in the transitions of forest succession. The early stages of succession have a higher average litter depth than do the later stages of succession. Similarly, there is better regeneration in the later stages of succession.

Coastal Oak and Oak-Pine forests have a higher density of seedlings per plot than Pine-Oak and Pitch Pine forests, suggesting that relatively shallow litter depth permits sunlight to directly reach the soil for better tree regeneration. This coincides with findings of a higher density of tree oaks in areas of reduced litter depth. Pine requires exposed mineral soil, i.e. absence of litter, and partial to full sun for seedling growth. It should also be noted that pitch pine cones can require exposure to fire in order to spread the pine seeds for growth. Because community transitions occur very slowly, it is sometimes necessary to prescribe forest fires.

Researchers should use the data findings of the Central Pine Barrens Monitoring

Program to determine a litter depth threshold to enable prescribed fires to be properly timed for maximum conservation effort. The restoration and management of the Pine Barrens should be established and started as soon as possible so that future generations can enjoy the unique and fascinating resources that it holds.

ACKNOWLEDGMENTS

This research was conducted in association with Brookhaven National Laboratory. I would like to thank my mentor Tim Green, advisors Kathy Schwager, Jennifer Higbie and project manager Noel Blackburn for all of their direction and guidance during the course of the summer. Additionally, I would like to thank the U.S. Department of Energy, Office of Science, and the CCI program for allowing me the opportunity to participate in such fulfilling internship program. Lastly, I would like to thank Lyndsay McCabe and Brittany Hernon for helping with the research.

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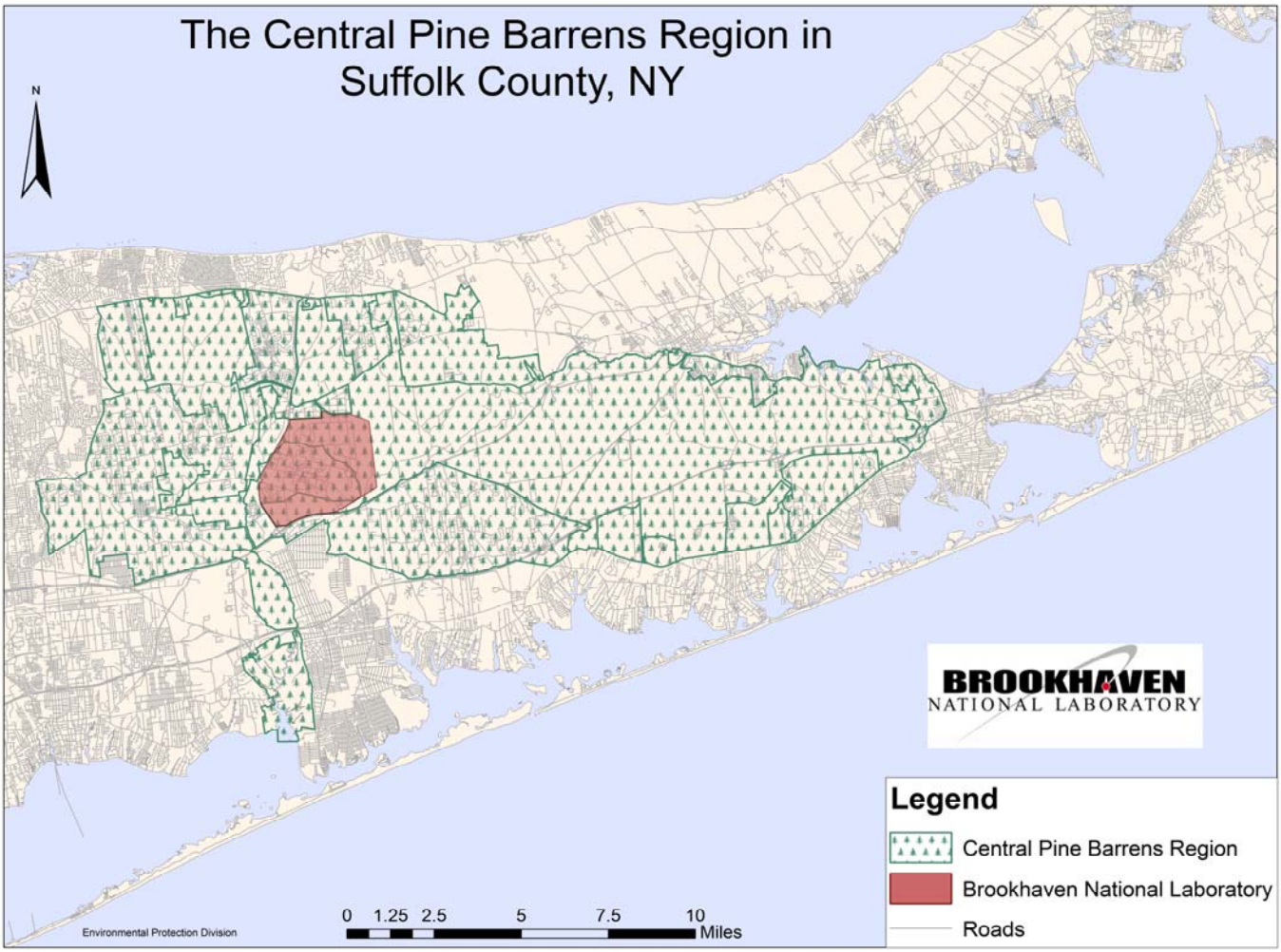
The Central Pine Barrens Region in
Suffolk County, NY
N
BROOKHAVEN
NATIONAL LABORATORY
Legend
Central Pine Barrens Region
Brookhaven National Laboratory
Roads
0 1.25 2.5 5 7.5 10
Miles
Environmental Protection Division