Comparison of Litter and Duff Depths between 2005 and 2011 of the Long Island Central Pine Barrens

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ABSTRACT

The Long Island Central Pine Barrens is a very rare type of ecosystem. Over the years this forest type has progressively diminishing 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

TERMS

Litter: material fallen to the surface that has gone under little to no decay.

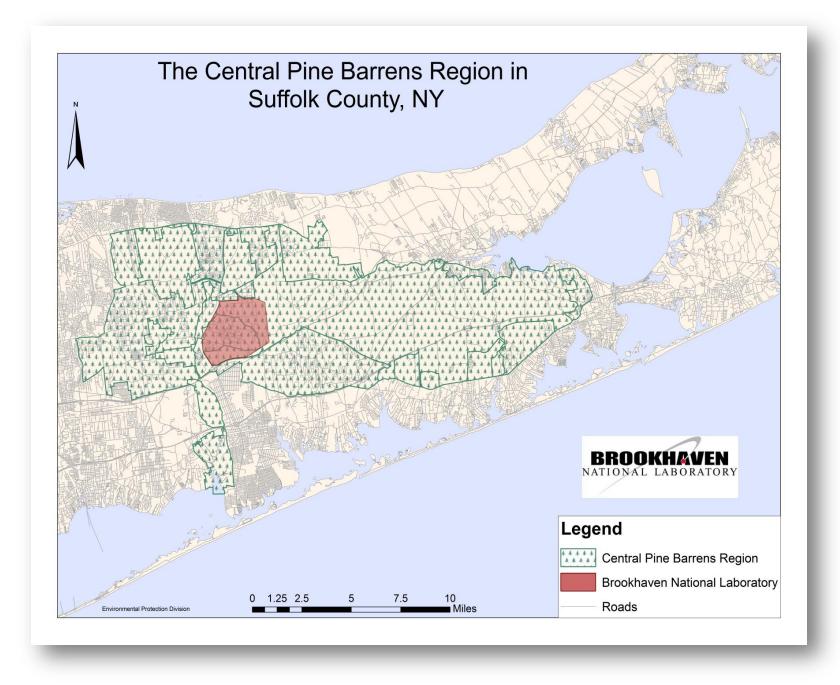
Duff: the decaying and decayed organic matter below the litter level and above the mineral soil. It appears dark or even black and may include some fine roots, decomposed stems and charcoal.

Mineral soil: a light gray, yellow, or orange.

MATERIALS AND METHODS

•Plots were located using GPS to ensure target community type and minimum of 50 meters from disturbed area





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. 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. Collecting and analyzing the data about the Pine Barrens will help determine the actions of future management and conservation efforts. After data comparison FERN will be able to detect and document the change in the forest health and help develop management methods when needed. The protocols were designed to measure signs of main ecological attributes of the Long Island Central Pine Barrens of New York to assist adaptive management programs (Batcher 2005). In the 1970's, with the knowledge that residential and commercial development was disturbing and potentially destroying the area, conservation efforts began. A major project of FERN is the Central Pine Barrens Monitoring Program. The goal of this longitudinal project is to track the current and future health of the Pine Barrens so that future research needs and priorities can be identified. Properly timed wildfires benefit the Pine Barrens. Reduction of litter (which is composed of leaves, twigs, pine needles, and other dead vegetation) and canopy cover in the forest provides for direct sunlight on the soil and triggers new tree growth. Furthermore, pitch pine cones germination is augmented after fires. 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 are 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 and blueberry and scattered scrub oak. Pitch pineoak 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.

• 7 of 93 permanent plots in the Central Pine Barrens were revisited and transects were established every 1.5 meters

•Shrub, tree, and herbaceous cover was recorded

•A densitometer was used to determine canopy cover (pine, hardwood, or nothing)

•Litter and duff depths were recorded with a soil corer and ruler

•The diameter at breast height (dbh) was measured for all trees over 10cm at breast height

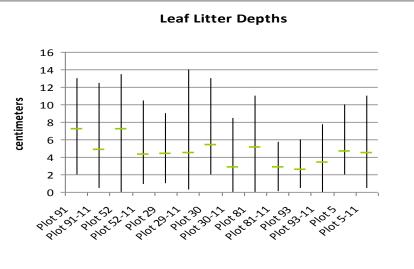


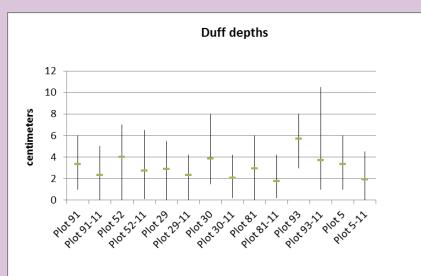
DISCUSSION

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.

RESULTS

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





The chart 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]. 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, there wasn't any 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.

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.

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