Investigation of the age class structures of Quercus species and Pinus rigida within the Long Island Pine Barrens Core Area is an important aspect of monitoring the health of the Pine Barrens. The age class structures of Quercus alba, Quercus velutina, Quercus coccinea, Quercus velutina, and Pinus rigida are primary indicators of successful reproduction and the possibility of the successional change between community types. By comparing the numbers of seedlings, saplings, and mature trees, the success of reproduction for these three Quercus species and Pinus rigida was analyzed. The numbers of seedlings and saplings were recorded through the use of four two-meter wide belt transects within 15 by 25 meter plots. These plots were located within the Pine Barrens subtypes of Pitch Pine–Pine–Oak–Pine, Coastal Oak, Scrub Oak, and Dwarf Pine Plains. This study found the success of reproduction for all the study tree species and the six community types to be varied. Quercus alba, Quercus coccinea, and Quercus velutina all displayed a low number of saplings in all community types surveyed, indicating that current reproduction is not very successful. In Coastal Oak and Oak-Pine communities, Quercus alba was the most successful in reproduction. The reproduction of Pinus rigida was dominant within Pine-Oak, Pitch Pine and Pitch Pine-Scrub-Oak Woodland communities. However, the low average number of Pinus rigida saplings found could possibly indicate the succession from pine-dominated forest to oak-dominated forest. There are several factors that may influence these trends in reproduction, including exposure to light, levels of litter and duff, and deer browse. Although the current levels of reproduction for Quercus species and Pinus rigida are varied and range across the different community types, they will still be an important indicator of forest succession from pine to oak dominated forests within the Long Island Pine Barrens Core Area. Forest succession is an important factor in this ten-year longitudinal study of the Long Island Pine Barrens Core Area, as forest succession and species competition are primary indicators of forest health.

METHODS
The data for this research was collected by following the Monitoring Protocols for Central Pine Barrens Field Plots. Data from 90 randomly generated plots located within six different community types was collected. The numbers of seedlings, saplings, and mature trees were recorded within various randomly generated plots within the core area of the Long Island Barrens. These plots within the different subtypes of the Central Pine Barrens target were generated using a Geographic Information System (GIS) software. The plots had dimensions of 16 by 25 meters, and were located at least 50 meters from any human disturbances (roads, houses, etc) and at least 25 meters from any ecological boundaries or differing community types. The subtypes studied were the communities of Pitch Pine forest, Pine–Oak forest, Oak–Pine forest, Coastal Oak forest, Scrub Oak forest, and Dwarf Pine Plains. To estimate the number of seedlings and saplings within each of the plots, four 2 by 25 meter transects were sampled. The entire area that was sampled were seedlings and saplings of different pine and hardwood species was 9 by 25 meters, or half of the surveyed plot.

To measure the number of mature trees within each of the plots, hardwood and pine species that had a dbh (diameter at breast height) greater than 2.5 cm and less than or equal to 10 cm, and those that had a dbh greater than 10 cm were recorded. The diameter of the trees was measured at 1.37 meters from the ground using standard calipers or a dbh tape. Trees that fell in these categories were measured by dbh in the nearest millimeter and then tallied. As was the case with seedlings and saplings, if trees split below the diameter at breast height into two or more stems, the tree was still counted as being singular.

The numbers of seedlings, saplings and trees collected throughout the surveying of these plots were compiled in a Microsoft Access database. After the completion of 90 plots, the averages of the numbers of seedlings, saplings, and trees were recorded. The averages were then used to generate graphs displaying the age class structures of Quercus species and Pinus rigida. The ages of each species can be studied. For successful reproduction, each of the species studied will have a moderate to high number of seedlings, followed by a lower number of saplings (between 0.5 m and 2 m and 2 m to >2.5 m). In healthy reproduction, the number of trees (both trees with a dbh >10 cm and trees with a dbh >10 cm) will increase to an average number higher than the average number of seedlings found.

In each of the figures and tables used for this research, the stages of growth are shown for each species across the six different community types. By viewing the transformation of Pinus rigida and the Quercus species from seedlings to saplings to mature trees, the age class structures of each species can be studied. For successful reproduction, each of the species studied will have a moderate to high number of seedlings, followed by a lower number of saplings (between 0.5 m and 2 m and >2 m with a dbh >2.5 cm). In healthy reproduction, the number of trees (both trees with a dbh >10 cm and trees with a dbh >10 cm) will increase to an average number higher than the average number of seedlings found.

For all figures and tables, the different stages of growth are represented by numbers. Seedlings are represented by A, saplings between 0.5 m and 2 m with B, saplings >2 m and having a dbh less than 2.5 cm with C, trees having a dbh less than 10 cm with D, and trees with a dbh >10 cm with E. The average number of seedlings and standard deviation for seedlings, saplings and mature trees found within the six different community types were found using the Microsoft Excel program. The possibility of successional change from pine dominated forest to oak dominated forest can be seen to be occurring. The availability of each of the species can be studied. For successful reproduction, each of the species from seedlings to saplings to mature trees, the age class structure of each community type can be studied.

RESULTS

The age class structures of Quercus alba, Quercus velutina, Quercus coccinea, and Pinus rigida normally show a high number of seedlings, followed by a decrease in numbers as seedlings mature into saplings [2:33]. In order for P. rigida and any of the Quercus species to successfully reproduce, the graph representing their age class structure should display an increased average number from saplings to mature trees, following the slight decrease in average number from seedlings. A high number of mature trees indicate successful reproduction patterns and overall forest health. Therefore, graphs representing the age class structure of the study species are supposed to resemble a “reverse V”. Although the average number of species found per plot is supposed to decline from seedlings to saplings, the scarcity of seedlings or saplings is an indicator of the possibility of failure of tree reproduction. If the numbers of seedlings and/or saplings are very low, reproduction can be seen to be struggling [2:33]. From this study, the range of success of reproduction between species and across the six different community types can be seen.

In studying the age class structures of the study species, it is important to look at these trends both in terms of individual species success and overall forest succession. Within the Coastal Oak and Oak–Pine communities, Q. alba appeared to have the most successful reproductive patterns. Factors which may influence the success of Q. alba over Q. coccinea and Q. velutina include exposure to light, litter and duff depth, and the extent of deer browse [2:34]. In order for Quercus species to grow, they need an adequate amount of light and fairly deep levels of litter and duff [4:15]. If these conditions are not met, and there is deer overbrowsing due to the increasing deer population in the area, the reproduction of Q. alba, Q. coccinea and Q. velutina will be unknown to [2:32].

The possibility of successional change from pine dominated forest to oak dominated forest across the six community types can be seen. If the numbers of seedlings and mature trees are high within the six community types, the age class structures can be studied. For successful reproduction, each of the species from seedlings to saplings to mature trees, the age class structure of each community type can be studied. By viewing the transformation of Pinus rigida and the Quercus species from seedlings to saplings to mature trees, the age class structures of each species can be studied. For successful reproduction, each of the species studied will have a moderate to high number of seedlings, followed by a lower number of saplings (between 0.5 m and 2 m and 2 m to >2.5 m). In healthy reproduction, the number of trees (both trees with a dbh >10 cm and trees with a dbh >10 cm) will increase to an average number higher than the average number of seedlings found. For all figures and tables, the different stages of growth are represented by numbers. Seedlings are represented by A, saplings between 0.5 m and 2 m with B, saplings >2 m and having a dbh less than 2.5 cm with C, trees having a dbh less than 10 cm with D, and trees with a dbh >10 cm with E. The average number of seedlings and standard deviation for seedlings, saplings and mature trees found within the six different community types were found using the Microsoft Excel program.

In each of the figures and tables used for this research, the stages of growth are shown for each species across the six different community types. By viewing the transformation of Pinus rigida and the Quercus species from seedlings to saplings to mature trees, the age class structures of each species can be studied. For successful reproduction, each of the species studied will have a moderate to high number of seedlings, followed by a lower number of saplings (between 0.5 m and 2 m and 2 m to >2.5 cm). In healthy reproduction, the number of trees (both trees with a dbh >10 cm and trees with a dbh >10 cm) will increase to an average number higher than the average number of seedlings found. For all figures and tables, the different stages of growth are represented by numbers. Seedlings are represented by A, saplings between 0.5 m and 2 m with B, saplings >2 m and having a dbh less than 2.5 cm with C, trees having a dbh less than 10 cm with D, and trees with a dbh >10 cm with E. The average number of seedlings and standard deviation for seedlings, saplings and mature trees found within the six different community types were found using the Microsoft Excel program.