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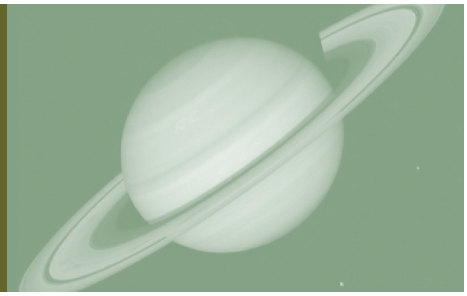

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Editorial

The purpose of the *Science and Technology Undergraduate Research Notes (SATURN) Journal* is to provide a venue for publication of undergraduate research. This research may include any novel findings of note while providing an opportunity for undergraduates to experience dissemination of their findings to the scientific community. Our goal is for the *SATURN Journal* to serve as both an educational and research tool.

The National Science Foundation has recommended that undergraduate students participate in research experiences during their freshman and sophomore years. The data from most classroom laboratory exercises is discarded. Worthwhile data from embedded research in laboratory course curricula can be disseminated to the world community. By contributing their own novel findings for the greater good, students can be more engaged in science through embedded research pedagogy than through conventional pedagogy. This is a primary motivating factor that is experienced by successful scientists. Additionally, a source of valuable, large scale screening and cataloging information can be provided through having many students contributing novel data.

In the first issue of the *SATURN Journal*, students from a Principles of Biology class at Suffolk County Community College (SCCC) in New York contributed their findings from a research project embedded in the laboratory curriculum. Specimens of each tree found on properties where the students reside were brought to class, and the circumference of the trunk of each tree was measured at its base. The species of each tree was identified by using a traditional dichotomous key. Students collaborated in groups containing between two and six students. They developed hypotheses based on the locations of the properties where the trees were found, the distribution of species, sizes of trees and population densities. The students followed the instructions for authors at the web site for the *SATURN Journal* (www.saturnjournal.org), and submitted their manuscripts to their instructor who acted as a peer reviewer. Those students whose manuscripts were accepted upon revision received a grade of 'A' and were given extra credit for the revision and publication. This has been a cost effective exercise that has resulted in enthusiastic student engagement, and is providing a catalogue of the distribution of tree species on residential properties in Suffolk County, New York. There was also a publication in this issue by a group of students taking a course in statistics in which they compared the growth rates of different cultivars of the American Elm (*Ulmus Americana L.*) planted in an on campus experiment at SCCC.

In the second issue of the *SATURN Journal* there was a continuation of student publications pertaining to the tree species distribution research project embedded in introductory biology courses. Students found it helpful to compare their findings to the findings of student investigators who have published previously in the *SATURN Journal*, which resulted in citations of previously published students. Subsequent follow up with cited students resulted in great expressions of enthusiasm and pride in their work. In this second issue, there were also publications from a research project embedded in a microbiology course. Students reported their findings from tests of the antimicrobial properties of spices.

In this third issue of the *Saturn Journal* there is continuation of research projects that produced publications in the previous journals. New publications have compared findings to a larger battery of previously identified trees and an extensive catalog of tree species on residential properties in Suffolk County N.Y. is developing. Previous authors now have multiple citations. Students used the web site from the United Stated Geological Survey (www.usgs.gov) to report the latitude and longitude of properties included in the studies. Additional web based tools used by students include online dichotomous keys such as vTree at Virginia Tech located in Blacksburg, Virginia (http://dendro.cnre.vt.edu/dendrology/idit.htm).

We encourage instructors to have their students participate in the *SATURN Journal*. The publications in the journal are a source of embedded research project designs that instructors may include in their curricula. Instructors are welcome to design additional projects from which their students can submit manuscripts.

Louis Roccanova, Ph.D.
Editor in Chief
SATURN Journal

Comparing Tree Species from Northern and Central Long Island

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Abstract:

Sample trees were collected from residential properties in northern and central Long Island in order to compare the species. Once the samples were collected two dichotomous keys and an android mobile application were used to verify the different species. The following species were found on the North Shore of Suffolk county: one Atlantic White Cedar (*Chamaecyparis thyoides*), one Arbor Vitae (*Thuja occidentalis*), one Red Spruce (*Picea rubens*), two Red Cedar (*Juniperus virginiana*), one Honey Locus (*Gieditsia triacarithos*), two Black Spruce (*Picea mariana*) for a total of eight samples. In Central Suffolk County the following tree species were found: two Arbor Vitae (*Thuja occidentalis*), one Atlantic White Cedar (*Chamaecyparis thyoides*), one Red Spruce (*Picea rubens*), two Siberian Elm (*Ulmus pumila*), two White Pine (*Pirius strobus*), One Horse Chestnut (*Aesulus hippocastamum*) and one unidentifiable species. A total of ten specimens were taken from central Suffolk County. Our unidentifiable specimen resembles *Quercus muehlenbergii* and *Q. marilandica* but it also has features that differ from the characteristics of these possible species. The following tree species were found on both parts of the island: Arbor white (*Thuja occidentilis*), Atlantic White Cedar (*Chamaecyparis thyoides*), and Red Spruce (*Picea rubens*).

Introduction:

Throughout the state of New York there are approximately 18 Million acres of trees, which cover 62% of New York State (Leopold 2003). Due to the Northeastern Region having such dramatic climate changes, the variety of different species is much more unique compared to that of different parts of the United States. It's pertinent to the local conservationists and researchers to know what types of trees are invasive and native to the environment. In order to identify tree species in this study, dichotomous keys were used. Dichotomy means a division or contrast between two things that are or are represented as being opposed or entirely different. This type of key gives a description of different traits that lead to the species of tree being identified. There is also new technology that allows mobile phone cameras to identify the tree species through an electronic dichotomous key application. The dichotomous key is one of the best methods adopted by biologist to identify plants and trees. The Samples collected for this experiment came from Northern or Central Long Island, New York. The towns include: Kings Park and Deer Park which both had a variety of similar and different tree species. Many tree species may differ due to their locations and climate. For example, because the Northern part of Long island is close to the water and Central Long island is surrounded by land, this causes the species of trees in these areas to differ.

Methods:

Samples of trees were taken from both Northern and Central residential locations in Suffolk County, Long Island. The Northern samples were taken from the town of Kings Park and the Central location samples were taken from the town of Deer Park. To conduct this experiment multiple dichotomous keys were used to determine the species of the trees collected from the two different properties in two different towns. Initially the possible species of a tree was identified using "Tree Finder" (Watts, 1991). We studied the characteristics of the samples and eliminated the tree specimens

depending on their color, shape, size, whether they had pine needles or leaves and the location where they were most commonly found. After finding the common name and kingdom for the samples, they were cross checked to findings with two other dichotomous key sources (Petrides, 1998, Peterson 2013).

Results:

Table I - Tree Species Found in Northern and Central Long Island

	Northern Long Island	
Amount Found	***Common Name***	***Species***
1	Atlantic White Cedar	*Chamaecyparis thyoides*
1	Red Spruce	*Picea rubens*
2	Red Cedar	*Juniperus virginiana*
1	Honey Locus	*Gieditisia triacanthos*
1	Arbor Vitae	*Thuja occidentalls*
2	Black Spruce	*Picea mariana*

	Central Long Island	
Amount Found	***Common Name***	***Species***
2	Arbor Vitae	*Thuja occidentalls*
2	Siberian Elm	*Ulmus pumila*
2	White Pine	*Pinus strobus*
1	Horse Chestnut	*Aesulus hippocastamum*
1	Unknown	Unknown
1	Atlantic White Cedar	*Chamaecyparis thyoides*
1	Red Spruce	*Picea rubens*

Table II- Property Specimen Location

	Northern Long Island	Central Long island
GPS Coordinates	40.88838, -73.225713	40.752649,-73.333291
Town	Kings Park	Deer Park

As seen in table I above, the following species were found on the Kings Park property: one Atlantic White Cedar (*Chamaecyparis thyoides*), one Arbor Vitae (*Thuja occidentalis*), one Red Spruce (*Picea rubens*), two Red Cedar (*Juniperus virginiana*), one Honey Locus (*Gieditsia triacarithos*) and

two Black Spruce (*Picea mariana*) for a total of eight samples.

From the Deer Park property the following specimens were collected: two Arbor Vitae (*Thuja occidentalis*), one Atlantic White Cedar (*Chamaecyparis thyoides*), one Red Spruce (*Picea rubens*), two Siberian Elm (*Ulmus pumila*), two White Pine (*Pirius strobus*), One Horse Chestnut (*Aesulus hippocastamum*) and one unidentifiable species. This sample was searched through three tree species identification tools. There were a total of ten specimens taken from central Suffolk County.

The unknown species collected can be described as having alternate buds which gather in bunches located mostly on the tip of the stem and have a pointed shape. The buds are a yellow-green color and have many scares on the stem. It has been found that, Atlantic White Cedar (*Chamaecyparis thyoides*), Red Spruce (*Picea rubens*) and Arbor Vitae (*Thuja occidentalls),* (highlighted in the chart above) are located on both properties.

Discussion:

When comparing the results with the findings of other investigations from the *Saturn Journal*, tree studies from Northern and Central Long Island show many differences and similarities between the specimens gathered on all of the properties. On Northern Long Island properties, Puca et al.(2013) found Silver Maple (*Acer saccharinum*), Tree of Heaven (*Ailanthus altissima*) and Sassafras (*Sassafras albidum*), and Ambrogio et al. (2013) discovered, Black Walnut (*Juglans naira*), Mimosa Silk Tree (*Albizin julibriss*), Horse Chestnuts (*Aescuius hippocastanum*), Flowering Dogwoods (*Cornus florida*), White Pines (*Pinus strobes*), Water Oak (*Quercus naira*), Eastern Hemlock (*Tsunace canadensis*), Black Locust (*Robinia psedoacacia*), Cockspur Hawthorn, (*Crateaequs crusgalli*), Gray Birch (*Betula populitolia*), English Holly (*Ilex aquifolium*), Arbor Vitae (*Thuja occidentalis*).

From Central Long Island, Marrone (2013) identified the following species in Brentwood: Balsam Poplar (*Populous balsamifera*), Seviceberry (*Morus alba*), White Mulberry (*Amelanchier arborea*) and European Beech (*Fagus syluatica*). Siddiqui et al. (2013) found a Sugar Maple Tree (*Acer saccharum*), Black Lotus (*Robinia psedudoacacia),* Norway Maple Tree *(Acer platanoides)* Black Gum Tree (*Nyssa sylvatica*) and Red Spruce (*Picea rubens*) in Central Long Island. From the samples gathered from our properties and the properties of other investigators, Arbor Vitae was found to be a popular species on the North Shore and Central Long Island. From the findings on Central Long Island properties, Red Spruce was found to be common.

Conclusion:

Eighteen tree species, eight from the North Shore and nine from Central Long Island, were identified and verified using three dichotomous keys. Based on our results, we found that Arbor Vitae (*Thuja occidentals*) were the most commonly planted trees on both properties. One sample from Central Long Island was unidentifiable. It is possible that it is an undiscovered or hybrid species of tree that resembles, *Quercus, Muehlenber gii or Q. marilandica.*

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Classification and Diversity of Twenty-seven tree species in the Tri State Region

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Keywords: New Jersey, native, species, tree, New York

Abstract:

Trees branches with different leaves and buds attached to them were picked from residential properties in New Jersey, Central Islip, Dix Hills, Amityville, and Copiague. Each species was classified and verified by using two dichotomous keys. Five tree species were found in Copiague, five in New Jersey, ten in Central Islip, eleven in Dix Hills and six in Amityville. The square footage of the Copiague residential property was 0.23 acres, the square footage of the residential in New Jersey was 0.19, the square footage of the residential property in Central Islip was 1.20 acres, the square footage of the residential property in Dix Hills was in 0.23, and the square footage of the residential property in Amityville is 1.80 acres.

The tree species found in Copiague were identified as Witch-hazel (*Hamamelis virginiana),* Chokecherry (*Prununs virginiana),* Pine Cherry (*Prunus pennsylvania),* American Holly (*Ilex opaca).* The trees species identified in New Jersey were Smooth Sumac (*Rhus glabra),* Swamp Titi (*Cyrilla racemiflora),* Northern Red Oak (*Quercus rubra),* Pitch Pine *(Pinus pigida),* and Silver Maple *(Acer saccharinum).* The tree species found in the property of Central Islip were identified as Weeping Willow *(Salix babylonica),* Autumn Blooming Cherry *(Prunus subhirtella autumnalis),* Austrian Pine *(Pinus nigra),* Pin Oak *(Quercus stellata),* Red Maple *(Acer rubrum),* Italian Cypress *(Cupressus sempervirens),* Silver Maple *(Acer saccharinum),* Cranston Spruce *(Picea abies cranstonii),* White Ash *(Fraxinus americana),* and Yoshino Cherry *(Prunus x-yedoensis).* The tree species found in Dix Hills were identified as Arborvitae *(Thuja plicata),* Balsam fir *(Abies balsamea),* White Oak *(Quercus alba)* Leyland Cypress *(Cupressocyparis leylandii*), Japanese Maple *(Acer palmatum),* White Pine *(Pinus strobus),* Red Oak *(Quercus rubra),* American Linden *(Tilia americana),* Pitch Pines *(Pinus rigida).* The tree species found in the property of Amityville was identified as Weeping Willow *(Salix babylonic),* Italian Cypress *(Cupressus sempervirens,* Chokecherry (*Prununs virginiana),* Pine Cherry (*Prunus Pennsylvania),* Red Oak *(Quercus rubra),* and Pitch Pine *(Pinus rigida)* .

We found that the Weeping Willow *(Salix babylonic)* and Italian Cypress *(Cupressus sempervirens)* were both found in Central Islip and Amityville. Chokecherry (*Prununs virginiana)* and Pine Cherry (*Prunus pennsylvania),* were both found in Copiague and Amityville. The Silver Maple *(Acer saccharinum)* was found in residential areas of Dix Hills and New Jersey. Finally, both Red Oak *(Quercus rubra)* and Pitch Pine *(Pinus rigida)* was found in residential areas of Dix Hills and Amityville.

Introduction:

In some trees the buds were wrapped in one or more modified leaves called bud scales, this protects them from elements. When spring comes, flowers and leaf buds open and shoot growth begins (Kershner 2008).

Silver Maple *(Acer saccharinum)* tree grows from 70 to 100 feet tall, a spread of 40 to 60 feet, this tree produces up to 3 to 5 inches long leaves that are green on top and silver on the bottom with a combination of atoms colors green, yellow and brownish in the fall. This tree produces both male and female flowers that open in the spring; this type of tree prefers sun and can take a wide variety of soil

type. The Chokecherry *(Prunus virginia)* has a hardness zone of 2-6 with a moderate growth rate and a medium texture. The Chokecherry has a height of 20 to 30 feet and a width of 18 to 25 inches wide. It has alternated simple leaves between 1.5 to 5 inches. This type of tree species forms oval rounded crown, crooked stems and white flowers in spring. The Northern Red Oak (*Quercus rubra)* is typically between 65 to 98 feet tall and is often used in the production of lumber. The Northern Red Oak can survive in a variety of soil and topographic regions and is also known as the red oak or gray oak. The Weeping willow *(Salix babylonica)* can grow to a height of 30 to 50 feet, while its width could start at 20ft and go up to 40ft. It generally has a short trunk and broad rounded crowns. The leaves could grow between 3cm to 6 cm and there are also narrow simple leaves. The Red Maple *(Acer rubrum)* tree can grow to 40 to 60 feet tall. Width is 25 to 45 feet. Leaves can go 2 to 5" opposite simple leaf with 3 to 5 lobes they will often have a triangular shape to them. This tree could be different colors such as yellow, yellow-green, orange to red. Silver maple can grow from 50 to 70 feet tall. The width is 40 to 60 feet and the leaves are 2 to 5". The simple leafs that have 3 to 5 lobes are often a triangular shape; the color of the tree could be any of the following yellow, yellow-green, orange to red. The Autumn Blooming Cherry (*Prunus subhirtella autumnalis)* can grow to 20 to 40 feet height with a width of 15 to 30 feet and the leaves are simple. The flowers in fall, winter and also during warm spells, and early spring could cause the rose buds to open with a soft pink color and fading to almost white. The Austrian Pine *(Pinus nigra)* can grow 30 to 60 feet tall and its width could be 20 to 40 feet. The leaves are 3 to 6" and have stiff needle look that comes in pairs. They could appear dark green to black green. Pin Oak *(Quercus stellata)* can grow up to 60 to 80 feet and can have a width of 40 to 50 feet. The leaves are 3 to 6" and are 5 to 7 deeply cut lobes and can be russet, bronze, red fall color. Italian Cypress *(Cupressus sempervirens)* can grow 20 to 30 feet and the width could be 3 to 5 feet. The leaves are green. Cranston Spruce *(Picea abies cranstonii)* can grow 35 to 50 feet. The leaves are small widely and spaced dark with green needles that are arranged radially and could also appear kind of wavy. White Ash *(Fraxinus americana)* can grow from 60 to 80 feet tall and the width could be 50 to 70 feet. The leaves are 8 to 15" that are compound and can appear yellow, maroon, to a purple fall color. Yoshino Cherry *(Prunus x yedoensis*) can grow 30 to 40 feet tall and the width could be 30 to 50 feet. The leaves are 2.5 to 4.5" a simple leaf that can either be yellow or gold fall color. The Witch-hazel *(Hamamelis virginiana)* grows very slow to moderate, with a medium texture. The Witch-hazel has a height of 15 to 30 feet and a width of 15 to 25 feet. It has dark green glossy leaves, bright yellow fall colors. This kind of tree has the most cold, hard witch hazels of all; roots are very sensitive to disturbance. The Giant arborvitae *(Thuja plicata)* is a 50 to 80ft tree with a width of 15 to 20'. It has a leaf that is rich green foliage with white marks underneath and keeps its color in winter. The Balsam Fir *(Abies balsamea)* is 40 to 70 feet in height with a width of 15 to 20". It has 1" dark green needles with two white lines on the underside. The White Oak tree *(Quercus alba)* is 60 to 100' in height with a width of 50 to 90".The leaves are 4 to 8.5" alternating, and they have a simple dark green color with round lobes. The leaves are brown and red in fall and sometimes brown into winter. The Leyland Cypress (*Cupressocyparis leylandii*) is a 60 to 90ft tree with a width of 12 to 15" and bluish green needles. The Japanese maple tree *(Acer palmatum)* has a height of 15 to 25ft and has a width of 10 to 25". The leaf is a 2 to 5" opposite, simple leaf with 5 to 9 lobes. The color is green during summer and yellow, bronze, purple to red in the fall. Spruce pine *(Pinus glabra)* is a 40 to 60ft tree with a width of about 30". The needles are a dark green color in bundles of two. They are 2 to 4" and slightly twisted. Red Oak tree *(Quercus rubra)* is 60 to 75ft in height and 60 to 75" in width. The leaf is 4.5 to 8.5" alternating simple leaves with 7 to 11 lobes. It is a russet red to bright red fall color. The American linden tree *(Tilia americana)* is 60 to 100ft with a width of 45 to 60" and the leaves are 4 to 8" alternating simple leaves with a modest yellow, green fall color. Pitch Pine *(Pinus rigida)* is 40 to 60ft in height and 30 to 50' in width and has 3 to 5"rigid, twisted dark green needles in bundles of 3. The American Holly (*Ilex opaca)* has a thick, smooth, dark green, spiny leaves that are a yellowish green

underneath. Unlike some hollies, the American Holly keeps its foliage from top to bottom for the life of the tree. It can easily reach a height of 50ft with a 35” spread. American Holly tree widely adapts to any soil and has a medium growth weight. The Smooth Sumac (*Rhus glabra)* has a height and width of 9 to 15 feet long and wide, with a rapid growth rate. This tree species has alternate, compound medium green leaves; red orange, scarlet, and red velvet fall color 12 to 15 inches, 6 to 10" panicle of greenish white flowers in summer; velvety red fruit in late summer on female plants. The Pitch Pine *(Inus rigida)* has a height of 40 to 60 feet and a width of 30 to 50 feet. This kind of tree has rigid, and twisted dark green needles in bundles of 3 to 5 inches and light brown cones in whorls of 3 to 5 or 3 to 4 inches. This type of specie prefers moist well drained soil but will tolerate a wide range of soils including poor, dry soil; salt tolerant. The Swamp Titi (*Cyrilla racemiflora)* is a small, graceful tree, reaching a height of 25-35 feet and 8-16 inches in width. It divides a short distance from the ground into several arching limbs, resulting in a spreading, round-topped crown. The leaves are simple, opposite, and deciduous. The flowers of these species are perfect, fragrant, and occur on erect stalks that are 4-6 inches long. The fruit is a small conical, 2-celled, 2-seeded, dry, light brown capsule, 1/8 inch long.

Method:

Tree branch sample were collected approximately 10 to 15 cm long with leaves and buds attached. Tree samples were located on the following residential homes of 1200 Hawkins Blvd, Copiague, NY 11726, 716 Carlock Avenue, Perth Amboy, NJ 08861, 18 long Acre Lane Dix Hills, NY 11746, 495 Elmore street, Central Islip, NY 11722, 499 Elmore street, Central Islip, NY 11722, 485 Elmore street, Central Islip, NY 11722, and 65 Parkway Avenue, Amityville NY 11701.Two dichotomous keys were used to identify and confirm tree species, Winter Tree Finder a Manual for Identification of Trees by Their Leaves and, Tree Finder a Manual for the Identification of Trees by Their Leaves (Watts 1998).

Results:

Table 1: Species of trees location

Species of Trees	Central Islip	Dix Hills	Copiague	New Jersey	Amityville
Weeping Willow *(Salix babylonica)*	**X**				**X**
Autumn Blooming Cherry *(Prunus subhirtellaAutumnalis)*	**X**				
Austrian Pine *(Pinus nigra)*	**X**				
Pin Oak *(Quercus stellata)*	**X**				
Red Maple *(Acer rubrum)*	**X**				
Italian Cypress *(Cupressus sempervirens)*	**X**				**X**
Silver Maple *(Acer saccharinum)*	**X**				
Cranston Spruce *(Picea abies cranstonii)*	**X**				
White Ash *(Fraxinus americana)*	**X**				
Yoshino Cherry *(Prunus x-yedoensis)*	**X**				
Witch-hazel (*Hamamelis virginiana)*			**X**		
Chokecherry (*Prununs virginiana)*			**X**		**X**

Pine Cherry (*Prunus pennsylvania)*			**X**		**X**
American Holly (*Ilex opaca)*			**X**		
Smooth Sumac (*Rhus glabra),*				**X**	
Swamp Titi (*Cyrilla racemiflora)*				**X**	
Northern Red Oak (*Quercus rubra)*				**X**	
Pitch Pine *(Pinus rigida)*				**X**	
Silver Maple *(Acer saccharinum)*		**X**		**X**	
Arborvitae *(Thuja orientalis)*		**X**			
Balsam Fir (*Abies balsamea)*		**X**			
White Oak *(Quercus alba)*		**X**			
Leyland Cypress *(Cupressocyparis leylandii)*		**X**			
Japanese Maple *(Acer palmatum)*		**X**			
White Pine (*Pinus strobus*)		**X**			
Red Oak *(Quercus rubra)*		**X**			**X**
American Linden *(Tilia americana)*		**X**			
Pitch Pines *(Pinus rigida)*		**X**			**X**

The result in the table above shows in which town each tree was located.

Discussion:

The Weeping Willow *(Salix babylonica)* tree is a native of Asia and it belongs to the group the Crack Willows. This oriental tree's bark owns mainly all of the medicinal and tanning properties of the willow group. It has been long known in China and Turkey that the Weeping Willow is known for its tearful symbolism. It has been used in some places as a cemetery ornament signifying an association of grief for the loved one in the grave. In the ancient times the torches used in funerals were made precisely by Willow wood. What is very unique of the tree is that the sad droopy look of the braches hanging down, "Crying" of the tree when it rains.

The Autumn Blooming Cherry (*Prunus subhirtella autumnalis)* is a beautiful flowering cherry tree that blooms twice a year. The Autumn Cherry tree is heat resistant, cold hardy and longer living than most ornamental cherry trees. In the fall, the Autumn Cherry will brighten landscapes with bronze to yellow gold leaves and sometimes tinged with red. In addition it will also attract birds in areas with its small black berries. The Autumn Cherry can flower on and off during the milder fall and winter months, but its real show happens in the spring.

Austrian Pine *(Pinus nigra)* an evergreen conifer, is native from Western Europe to Asia Minor including Austria in central Europe, for which it is named. It has been widely planted in eastern and Midwestern North America because of its bold texture, fullness of foliage, dark-green needles, and adaptability to urban conditions.

Pin Oak *(Quercus stellata)* is an oak distributed from the Middle Atlantic States westward to the edge of the Great Plains, and encompassing most of the Midwest. It is often seen in the wild in wet areas. In floodplains, wetlands, and low areas, Pin Oak may form nearly pure stands, and is distinctive in its dense growth habit: ascending upper branches, horizontal middle branches, and strongly down swept lower branches. Pin Oak requires moist and acidic soils to reach its full growth potential, which is a medium to rapidly growing tree. It is probably the favorite Oak to use as a shade tree, because its fibrous root system re-establishes quickly after root pruning, and because of its symmetry and the

potential for quick shade with russet fall color.

Red maple *(Acer rubrum)* is common in swamps and moist slopes throughout New York and is also abundant on dry slopes. It is an extremely rapid-growing tree, furnishing a fairly strong, close-grained wood, and is used extensively for inexpensive furniture, in the manufacture of baskets and crates, for mine props, railroad ties, and fuel wood. The fruit, a samara, is an important wildlife food as it develops in the spring when other foods typically are not yet available.

The Italian Cypress *(Cupressus sempervirens)* is an evergreen conifer densely branched with a columnar form and a triangular, cone-shaped peak. The compact, dense blue-green leaves are often planted in lines as a property privacy screen. In the United States, Italian cypress trees' evergreen characteristic makes it a popular tree to plant as shrubs (when young) to grow into huge towering specimens in the garden landscape. Italian Cypress trees are generally slow growing, but maintain their upright dark green growth throughout the years. Italian cypress trees have been grown for centuries as memorial plants in honor of famous people, and are often planted in groups of three.

The Silver Maple Tree *(Acer saccharinum)* is one of the most common maple trees in the central United States. It is a medium to large tree and one of the fastest growing maple trees. It is ideal for wet lowland sites, and will easily recover from periods of extended flooding. Silver maple trees are some of the best for poor soil and can be transplanted easily. The wood is soft and can be damaged by sever wind or ice storms. The leaves are deeply cut and silvery white on the undersides, giving the tree its name. The leaves of the silver maple appear as a light green and turn to a yellow gold in the fall.

White Ash *(Fraxinus americana)* is one of the more common and rapidly growing trees of the forests and fields in eastern North America. White Ash is also a popular shade tree for urban areas. From the forest, its wood is harvested to make baseball bats, tool handles, furniture, and for use as firewood. Among the ashes, its wood is considered the best. Its shape is upright oval when young, becoming upright spreading to rounded with maturity. As a member of the Olive Family, White Ash is related to the Fringe Trees, Forsythias, Privets, and Lilacs, as well as other species of Ash.

Yoshino Cherry Tree *(Prunus x-yedoensis)* is native of Japan and China. It is a deciduous flowering tree. The almond scented blooms of a Yoshino cherry tree are clusters of white or pink. The bloom time usually lasts for about two weeks, and then the leaves will appear. The Yoshino cherry tree has been bred for its ornamental quality, as opposed to its fruit. This tree, like all other flowering cherry trees, prefers full sun and well-drained soil in order to grow and flower properly. The Yoshino cherry tree works great as a specimen planting, or as a border or mass planting in an open area.

Witch hazel tree (*Hamamelis virginiana)* is a native tree from the southeastern United States. The witch hazel tree grows well in low-lying rich soil. Witch hazel trees can grow in central Canada, the central United States and southern U.S. states and can be often be found on partially shaded slopes, country lanes and lining fence rows. Witch hazel trees are popular ornamental trees and grow well in yards. One reason for their popularity is the fact that the leaves, twigs, and bark can be collected and used to make an extract that has medicinal qualities. Witch hazel extract can be used as a topical astringent and to treat bruising on the skin. The

Common Chokecherry (*Prununs virginiana)* is a small tree, sometimes a shrub, and often it forms dense thickets of woody growth. The bark of the tree is brown or gray, sometimes smooth, sometimes scaly. The Common Chokecherry grows commonly in rich moist soils, but often is found in poorer, drier soils. It grows in forest edges and openings, and often is found in uncultivated edges and corners of farmland. The natural range of this tree includes much of southern Canada and northern United States.

The Pine Cherry (*Prunus pennsylvania)* tree grows mainly in the northern regions of North America, ranging from Newfoundland to British Columbia in Canada and down the Appalachian Mountains to some areas of Tennessee. They are sometimes also called “fire cherry trees” because they grow rapidly in areas cleared out by forest fires. Though the pin cherry is considered nowadays to be

too sour for consumption except through jams and jellies, they were in widespread usage with the American Indians. Many ate them fresh or used them for preserves, including the Algonquin, the Cree, and the Cherokee Indians. The Iroquois Indians used the cherries in small cakes and breads, while the dried fruits were taken as hunting food. In addition, the pin cherry was also commonly used for an incredible variety of medicinal purposes by the American Indians too. The bark was of particular use for tribes. An infusion of the bark was used for cough medicines by too. A bark infusion was also used to treat blood poisoning, to treat sore eyes, and stomach pains. Other bark uses included dermatological uses, as a burn salve and measles. The Cherokee used the pin cherry fruit to treat gastrointestinal issues. The bark was also used in basketry, especially by British Columbians, who would soak it in a red or black color.

American Holly Tree *(Ilex opaca)* is a species of Holly native to the eastern United States, and can be found growing from coastal Massachusetts south to central Florida, and west to southeastern Missouri and eastern Texas. American Holly is a popular winter Christmas and holiday season decoration. They need to be planted in groups, so a large property is needed. The holy tree can grow in just about any type of soil; however, just do not plant it where it will be in the shade of another tree. The holly tree bark has a sliver color, young twigs are light green and the leaves a darker green. From early spring through the end of summer, the tree will produce clusters of white flowers, which bees love. It is the bees and other insects that pollinate the holly trees, which is necessary because a holly tree will be either feminine or masculine.

Smooth Sumac (*Rhus glabra)* is named because its first-year stems are smooth, rather than hairy, is present in all of Ohio, and in all of the contiguous 48 states of the United States, into southern Canada and northern Mexico. This is the classic large shrub or small tree that forms a colony by three methods: suckers from the base and roots, seeds from female shrubs, and the spreading and sprawling lateral trunks of this strongly multi trunked plant. In terms of hardiness, the Smooth Sumac can take cold winters and hot, dry summers. The leaves have a red rachis, medium to dark green leaves, and outstanding fall color, in combinations of yellow, orange, and red, or simply a solid dark red.

Swamp Titi (*Cyrilla racemiflora)* is native from southeastern North America, south through Central America, and the West Indies to northeastern South America. This tree stays under 30 ft., and, though it looks shrubby for several years, eventually makes a slender tree with smooth, cinnamon-colored trunks; abundant, showy, whorled clusters of airy, white blooms; and dark-green leaves. In the northern part of its range, the leaves turn rust-red in fall, dropping in spring just as the new leaves unfurl. Farther south, plants are nearly evergreen. Summer fruits are yellow-brown. In the upper mountain forests of Puerto Rico, Leatherwood is a large dominant tree known as Palo Colorado (red tree) because of its reddish-brown bark and wood. Bees produce a dark honey from the flowers.

Northern Red Oak (*Quercus rubra)* is commonly planted as a landscape tree in eastern North America and Europe. It is used as a shade tree on lawns, parks, campuses, golf courses, or where space is sufficient. It is fast growing, easy to transplant, tolerant of urban conditions including dry and acidic soil and air pollution. The abundant nuts attract wildlife, and the leaves develop a brick-red fall color. It has been used in various rehabilitation projects, including revegetation of coal mine spoils in the central part of the United States.

Pitch Pine *(Pinus pigida)* means rigid or stiff and refers to both the cone scales and the wide-spreading, sharply pointed needles. It is a medium sized tree with moderately strong, coarse-grained, resinous wood that is used primarily for rough construction and where decay resistance is important. Pitch pine is usually restricted to the less fertile soils to those of shallow depth, or of sandy or gravelly texture. Many of the northern stands are found on sandy outwash plains of glacial origin. The species also occupies sandy and gravelly soils of alluvial and marine origin. Pitch pine was an important tree during the days of wooden ships and iron men. They also serve as a food source for wildlife. Cones of pitch pine often remain on the trees unopened for several years or until the heat from a forest fire opens

them. Seeds shed in mid-winter are an important source of food for squirrels, quail, and small birds such as the pine warbler, pine grosbeak, and black-capped chickadee. White tailed deer and rabbits also browse young sprouts and seedlings.

The Silver Maple Tree *(Acer saccharinum)* is one of the most common maple trees in the central United States. It is a medium to large tree, and one of the fastest growing maple trees. It is ideal for wet lowland sites, and will easily recover from periods of extended flooding. Silver maple trees are some of the best for poor soil and can be transplanted easily. The wood is soft and can be damaged by sever wind or ice storms. Silver maples can up to 130 years or more in good conditions. Ducks often make their nests in silver maples. Birds, squirrels and chipmunks prefer the tree seeds for food. Beavers will eat the bark, and deer or rabbits eat the tree's twigs. The silver maple often attracts birds during their breeding. The silver maple tree sap makes satisfactory syrup, through the sugar content ranks lowest among tests conducted by the Ontario Department of Lands and Forests. It is also used as a windbreak on farms; the tree has brittle wood making it prone to breakage.

The Arborvitae *(Thuja orientalis)* is an evergreen tree or shrub from the cypress family. They are found primarily throughout eastern Canada and the northeastern United States. The arborvitae has scale like leaves that are soft to the touch, rather than prickly. Arborvitae prefers colder climates to warmer ones. Arborvitae is also adaptable to most soil conditions including poor soils that are rocky, sterile, dry or wet. An arborvitae will grow, though not as well in soils that are neutral or have an acidic pH level. They can be planted anywhere that has full to partial sun, and require minimal aftercare. The Green Giant Arborvitae is one of the fastest growing privacy trees available in the US.

The Balsam Fir *(Abies balsamea)* can be found in northeastern North America, from Virginia to Newfoundland and northwest towards Yukon and Labrador. The Balsam fir has a wide bask and narrow top that ends in a slender, spire like top. The branches grow from the trunk at right angles, with the lower branches spreading and drooping to the ground when the tree grows in the open. In a dense stands, many of the lower branches are dead. It can grow to be a maximum of 200 years old. The wood of the Balsam Fir is sometimes used as lumber. It is lightweight, low in bending and low in resistance to shock as well. The tree is often used as a Christmas tree, pulpwood, or cabin logs.

The White Oak *(Quercus alba)* is one of the pre-eminent hardwoods of eastern North America. It is a long-lived oak of the family Fagaceae, native to eastern North America and found from southern Quebec west to eastern Minnesota and south to northern Florida and eastern Texas. Specimens have been documented to be over 450 years old. White oak is one of the most important species in the white oak group. The wood is used for furniture, flooring, and specialty items such as wine and whiskey barrels. Moreover, they have been used for shipbuilding back in colonial times. In addition, the white oak continues to be displaced in the market place by several species of red oaks. Acorns are a favorite food source for birds, squirrels, and deer. Used as medication by Native Americans. The largest known white oak specimen had a circumference of 32 feet and grew in the Wye Oak State Park, Talbot County, Maryland. It was destroyed during a storm on June 6, 2002.

The Leyland Cypress Tree (*Cupressus x leylandii)* is a stately a pyramid shaped evergreen. It has a rapid growth rate (3 feet or more per year) and dense structure, making it ideal for use in privacy screens, windbreaks and hedges, and is used for Christmas tree production in some parts of the country. A single Leyland Cypress tree is also an impressive addition to the landscape. It has feathery, soft pointed needles arranged in flat sprays on long thin branches. Needles retain their rich color year round, starting out green in youth and turning a dark bluish-green hue as they mature. The tree's needles release a pleasant fragrance when broken. Leland Cypress trees should be grown in full sun to light shade and tolerate most soil types. They are deer resistant and drought and salt tolerant making them easy to grow in many areas.

The Japanese Maple *(Acer palmatum)* has a height and spread of about 20 feet, but there are much smaller selections available. The multiple trunks are muscular-looking, picturesque, and show

nicely when lit up at night. Japanese maple is known for its green or red colored leaves, interesting growth habit and fine leaf texture. Fall colors ranges from bright yellow through orange and red, and is often striking, even on trees grown in total shade. Growth habit varies widely depending on cultivar from globose, branching to the ground to upright, vase shaped. The globose selections look best when they are allowed to branch to the ground.

White Pine *(Pinus strobes)* is commonly known as the eastern white pine, is a large pine native to eastern North America. The tree occurs from Newfoundland west through the Great Lakes region to southeastern Manitoba and Minnesota, and south along the Mississippi Basin and Appalachian Mountains to northernmost Georgia and Mississippi. It is also known as the white pine, northern white pine, or soft pine. This tree is known to the Iroquois Indians as the "Tree of Peace." The white pine is easily grown in average, medium, well-drained soil in full sun. It prefers full sun, fertile soils and cool, humid climates. In addition it is tolerant of a wide range of soil conditions and intolerant of many air pollutants such as sulfur dioxide and ozone. The bark of white pine is used as an astringent and an expectorant, and the wood has been used to produce white pine tar, which is used as an antiseptic, expectorant, and protective. White pine wood has medium strength, is easily worked, and stains and finishes well. It is used for furniture, patterns, matches, and many other items. White pine is also planted for Christmas trees. The foliage has good color and responds well to shearing.

The Red Oak *(Quercus rubra)* is one of the largest and most important timber trees. One of the fastest growing of the oaks, it attains an 80 feet and a diameter of two to three feet. It has a wide, spreading head with few far reaching branches. The tree has a single, lobed leaf with seven to eleven pointed or bristly-tipped lobes. The lobe sinuses reach one-half way to mid-vein. The leaves are thin, firm, dull green above, yellow green below and varying considerably. The fruit is a large, broad, rounded acorn with a very shallow disk-like or saucer shaped cup or cap. The twigs are small, slender, greenish brown to dark brown. On young branches the bark is smooth and gray to greenish. On the trunk it breaks into long, narrow, shallow ridges flat and smooth on top. American linden tree is the native eastern North American species of linden, also known as basswood.

The American Linden *(Tilia americana)* is a stately tall tree, growing to more than 100 feet. Pyramidal in youth, the tree develops a more rounded crown at maturity. It has gray to brown bark and large, toothed, heart-shaped, deciduous leaves. The leaves are dark green above and pale beneath, turning yellow or yellow-green in the fall. The yellow flowers would not be particularly noticeable without their pervading fragrance. This tree transplants readily and does its best in deep, rich, moist, well drained soils with full sun or partial shade. Never plant the American linden over a parking area, such as a driveway; the sticky nectar that drips from the flowers can damage car paint. The American linden is a good choice for a specimen tree or for large lots and parks.

Cranston Spruce *(Picea abies cranstonii)* is highly valued as a specimen, perimeter planting or accent plant. It's a dense evergreen tree with a strong central leader and a narrowly upright and columnar growth habit. Its relatively fine texture sets it apart from other landscape plants with less refined foliage. The dark green needles are slightly curved on closely set branches. This tree makes an ideal windbreak or privacy wall and is highly recommended for cool climates with a short growing season. It also has green foliage. The needles remain green through the winter. Neither the flowers nor the fruit are ornamentally significant. The smooth gray bark is not particularly outstanding.

Conclusion:

Two of the tree species, Red Oak *(Quercus rubra)*, and Pitch Pines *(Pinus rigida)* were found on the North and South Shore of Long Island. The Choke Cherry *(Prununs virginiana)* and Pine Cherry *(Prunus pennsylvania)* were both found to be common to the South Shore. One species, the Silver Maple *(Acer saccharinum)* was found in New Jersey and Long Island. The remaining tree species found during this investigation were only found on one property indicating a great diversity of tree

species within the Tri-State area.

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Tree Species Vary Between Different Locations of Long Island As Compared Between the North Shore, Central, and South Shore Environments

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Abstract:
In this study, the different species of trees from three parts of Long Island were compared. Tree samples were collected from residential properties and identified using dichotomous keys. The only tree species obtained from the properties that was found on both the North Shore and the South Shore was the Pin Cherry (*Prunus pennsylvanica*). On the North Shore, the species found were the *Larix laricina, Larix decidua, Chamaearis, Tsuga canadenis, Ulmus rubra, Prunus pensylvanica, Nyssa sylvatica,* and the *Ulmus pumila*. The tree species found in Central Long Island were the *Yellow buckeye, Catapla speciusa, Magnolia tripetala, Gymnocladus dioucus, Liriodeudron tulipfera,* and *the Pyrus communis*. The tree species found on the South Shore were the *Aesculus galbra, Aesculus hippocast, Prunus pensylvanica,* and the *Prunus virginiana*.

Introduction:

Identifying the types of trees from different parts of Long Island can be a good way to study the origin of the tree species from the past. It's important to question how and where a certain species came about. In order to identify the trees that were collected, we used a dichotomous key to identify each species of tree. A dichotomous key is a modeling method used for categorizing species using logical choices. The only tree that was found on two of the three locations was the Pin Cherry (*Prunus pensylvanica*). The Pin Cherry is a small deciduous tree that can grow up to thirty feet tall (USDA 2010). The characteristics of the properties may be influential to our findings. The South Shore property is fairly close to the water, the North Shore property is more mountainous, and the property on the Central part of Long Island is located in a suburban area.

Methods:

Four students took part in this study. Each student gathered branches from each of their own properties and had 27 branches altogether. Then they used the dichotomous keys Winter Tree Finder book (Watts & Watts 1970) or the Tree Finder (Watts & Watts 1970) book depending on the branches they obtained. (Branches that have leaves use the Tree Finder book and if it does not has leaves use the Winter Tree Finder book). Then they used the Eastern Tree Book (Petrides & Wehr 1998) to verify that they were correct.

Results:

The only tree species occurring on more than one location was the Pin Cherry (Prunus pensylvanica, Tables 1, 2, 3). No species was found in all three locations. The North Shore property was 1.2 acres, the South Shore property was .50 acres, and the Central part was .27 acres. This study demonstrates the large variety of trees across Long Island. After observing the three different parts of the island, it is evident that the part with the widest variety of trees is Central Long Island, where as the South Shore had many specimens belonging to a fewer number of species.

Table 1: Trees found on North Shore Long Island (Latitude: 40.8852 Longitude: -73.2806)

Tree Name	Tree Species	How Many Located In Area
American Larch	*Larix laricina*	2
European Larch	*Larix decidua*	2
Atlantic White Cedar	*Chamaecyparis thyoides*	2
Eastern Hemlock	*Tsuga canadenis*	1
Slippery Elm	*Ulmus rubra*	1
Pin Cherry	*Prunus pensylvanica*	1
Sour Gum	*Nyssa sylvatica*	1
Siberian Elm	*Ulmus pumila*	1

Table 2: Central Long Island (Latitude 48.067 Longitude -73.457)

Tree Name	Tree Species	How Many Located In Area
Sweet Buckeye	*Yellow buckeye*	1
Hardy Catalpa	*Catalpa speciusa*	1
Umbrella Magnolia	*Magnolia tripetala*	1
Kentucky Coffee Tree	*Gymnocladus dioucus*	1
Tulip Tree	*Lirideudron tulipifera*	1
Common Pear	*Pyrus communis*	1

Table 3: Trees found on South Shore Long Island (Latitude 43.152 Longitude -73.056)

Tree Name	Tree Species	How Many Located in Area
Ohio Buckeye	*Aesculus gabra*	4
Horse Chestnut	*Aeculus hippocast*	2
Pin Cherry	*Prunus pensylvanica*	2
Choke Cherry	*Prunus virginiana*	2

Discussion:

This study demonstrates the diversity of trees on Long Island. In total, there were twenty-seven tree branches collected from the North, Central, and South Shore. When compared to other studies, the tree Horse Chestnut (Aesculus hippocast) was found on the North and South Shores of Long Island (Ambrogio et al. 2013) but in our study, it was only found on the South Shore of Long Island. The Eastern Hemlock (Tsungce Canadensis) was also found on the North Shore of Long Island in both studies. ‘Ambrogio et al.’ (2013) found species on the North Shore and the South Shore that we did not find in our study, including the White Pine (*Pinus strobes*), Black Walnut (*Juglans naira*), Mimosa Silk Tree (*Albizin julibrissin*), Cockspur Hawthorn (*Crataegus crusgalli*), Gray Birch (*Betula populitolia*), Black Locust (*Rabinia pseudoacacia*), Water Oak (*Quercus nigra*) and the Arborviate (*Thuja occidentalis*). This suggests that there are a very wide variety of tree species on Long Island.

Conclusions:

By using dichotomous keys, we were able to classify soecies of trees by branch specimens from the North, Central, and South locations on Long Island. The data shows the series of different tree species on each part of the island. The classification of twenty-seven trees shows the difference between each

location. On the North Shore, the species found were the *Larix laricina, Larix decidua, Chamaearis, Tsuga canadenis, Ulmus rubra, Prunus pensylvanica, Nyssa sylvatica,* and the *Ulmus pumila*. The tree species found in Central Long Island were the *Yellow buckeye, Catapla speciusa, Magnolia tripetala, Gymnocladus dioucus, Liriodeudron tulipfera,* and *the Pyrus communis*. The tree species found on the South Shore were the *Aesculus galbra, Aesculus hippocast, Prunus pensylvanica,* and the *Prunus virginiana*.

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A Comparison of Coniferous to Deciduous Trees from Brentwood, Islip, and Bay Shore New York

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Abstract:

Tree samples were obtained from three residential properties located on Long Island, New York. By using three dichotomous keys, the characteristics and names of the twenty five tree specimens were able to be identified and confirmed. The samples of trees were identified as follows: American Beech (*Fagus gandifolia),* Arbor Vitae (*Thuja occidentails*), Black Willow (*Saxix nigra*), Black Spruce (*Picea mariana*), Common Apple (*Malus pumila),* Common Pear (*Pyrus communis*), English Holly (*Ilex aquifolium*), Eastern Hemlock (*Tsuga canadensis),* two specimens of Eastern Red Cedar (*Juniperus virginiana),* Gum Belia (*Bumelia lanuginose),* Flowering Dogwood (*Cornus florida),* Live Oak (*Querous virginiana*), Ornamental Privets (*Ligustrum* species), Pin Cherry (*Prunus pensylvanica*), Pin Oak (*Quercus palustris*), Pitch Pine (*Pinus rigida),* Serviceberry (Juneberry) (*Amelcanchier arborea),* Singleleaf Ash (*Fraxinus anomala),* Sourwood (*Oxydendum arboretum*), Shortleaf Pine (*Pinus enchinata),* Sweet Leaf (*Symplocos tinctoria),*Virginia Pine (*Pinus virginiana),* White Ash (*Franxinus americana*) and Yellow Birch (*Betula alleghaniesis).* The samples were inspected for noticeable features such as buds, simple leaves, thorns on the branch and flowers. The sample showed that there were six deciduous trees and three coniferous trees in Bay Shore. The deciduous trees were Common Apple, American Breech, Pin Cherry, White Ash, Sourwood, Serviceberry (Juneberry), and Black Willow. The coniferous trees were Black Willow, Eastern Hemlock and Pitch Pine. In Islip there were also six deciduous trees found and two coniferous. The deciduous trees were Common Pear, Eastern Cedar, English Holly, Flowering Dogwood, Gum Belia, and Ornamental Privets. The coniferous trees were Arbor Vitae and Shortleaf Pine. In the area of Brentwood there were five deciduous trees and three coniferous trees found. The deciduous trees were Eastern Red Cedar, Singleleaf Ash, Pin Oak, Sweet Leaf, and Yellow Birch. The coniferous trees were Black Spruce, Southern Live Oak, and Virginia Oak. The total number of deciduous trees was seventeen and the total number of coniferous trees was eight.

Introduction:

There is a wide variety of tree species on Long Island. The sample size included at least twenty five different varieties. A dichotomous key, or a taxonomic key, is a tool used to identify different types of tree species. Deciduous trees drop their leaves before winter because there is less of a chance for photosynthesis to occur. Deciduous trees are a part of temperate forests. A coniferous tree is a cone-bearing evergreen tree. Coniferous trees, such as pine, spruce and fir are dominant in the Northern Hemisphere. This forest is also called a taiga (Simon et al. 2010). Long Island typically has mild to hot summers and cold winters and due to that fact, temperature range allows a variety of trees to survive on Long Island. Therefore the dichotomous key is an important resource (Simon et al. 2010).

An American Beech is a medium sized tree, with simple leaves. It is a deciduous tree whose leaves are dark green, ovate with pointed tip and have pointed teeth along the margins. American Beech is also a flowering fruit tree (Kershner et al. 2008). Arbor Vitae is known as the Northern White Cedar, it is a small to medium sized tree, sometimes with several trunks, thin bark, fibrous and the foliage of the tree is arranged in flattened fan like sprays. Arbor Vitae are one of the longest lived species in Eastern North America (Petrides et al. 2008). Black Willow trees, also called Swamp Willow are a

small to medium sized tree that has several straight, stout trunks. They have thick branches but slender, large width trunk with rough bark (Kershner et al. 2008). Black Spruce also called Bog Spruce is often dwarfed and their height may not exceed average snow depth. Black Spruce has hairy twigs and small cones with tooth scaled edges making it easier to differentiate to other trees (Kershner et al. 2008).

The Common apple tree is a small tree with small shrubs. Common Apple is a deciduous tree with simple leaves. It has a short and rigid branches and broad leaves (Kershner et al. 2008). The common apple had a distinct branch color and specks that made it easier to find. The Common Pear tree is a small to medium tree with deciduous simple leaves. The Common Pear trees have a straight trunk, short and thick. The common pear was introduced to North America commonly planted near houses, roadsides (Kershner et al. 2008). English Holly also called European Holly was introduces to North America and is often planted in gardens; it has numerous cultivated varieties. Their leaves are long; glossy/waxy and can either have prickly teeth or not (Kershner et al. 2008). Eastern Hemlock also called the Canada hemlock is a coniferous tree that is a medium sized with very small needles (Kershner et al. 2008). Eastern Red Cedar or Red Cedar is a deciduous fruit tree. It is a medium sized tree with scale-like, three sided needle like leaves (Kershner et al. 2008).

Gum Belia is a small flowering deciduous tree with buds that are circular. Gum Belia twigs and buds are wooly (Kershner et al. 2008). Flowering Dogwood is a small to medium sized tree with hidden side buds and flowering buds. Flowering Dogwood tree leaves tend to be elliptic to egg- or wedge shaped; they are a deciduous tree (Kershner et al. 2008). Pitch Pine trees are small to medium sized coniferous evergreen trees that produce prickly cones (Kershner et al. 2008). Ornamental Privets are small trees with deciduous evergreen simple leaves (Kershner et al. 2008). Pin Cherry also called the Fire Cherry or Wild Cherry; is a small deciduous tree with large shrubs and simple leaves. Pin Cherry trees have a short, straight trunk and a narrow rounded crown. Leaves of the Pin Cherry trees are narrow, have a rounded base and finely toothed margins; they play an important role in vegetating eroded, cut over or fire-ravaged soil (Kershner et al. 2008). Pin Oak is a medium to large sized tree with deciduous simple leaves. The bark is simple gray and smooth. The Pin Oak leaves are often 5-lobed with a wedge-shaped base and the lobes taper toward the tips and the leaves are small (Watts 1998).

Singleleaf Ash trees are small, flowering trees. Singleleaf Ash is also a deciduous tree with nearly circular leaves with rounded or short-pointed tips (Kershner et al. 2008). Southern Live Oak also known as Live Oak is a short but massive tree with evergreen simple leaves. The Southern Live Oak has a thick, short broad trunk with a buttressed base. Its habitat is diverse, for example it can be found in parks, yards, pastures and roadsides (Kershner et al. 2008). The Shortleaf Pine is a medium sized tree with needles in bundles that are slender and flexible (Kershner et al. 2008). Sourwood also called Sorrel tree is a small to medium sized tree with deciduous simple leaves. They have slender trunks; narrow pyramidal crown of crooked, upright, spread out branches (Kershner et al. 2008). Serviceberry (Juneberry) has six species, they can be multi-stemmed and thicket formed, have deciduous simple leaves (Kershner et al. 2008). Service Juneberry's leaf base is either broadly rounded or slightly heart-shaped (Watts1998). Virginia Pine is a small to medium sized tree that can be recognized by its short twisted needles and its' purple waxy coating on the twigs (Kershner et al. 2008).White Ash is a medium sized tree with a tall straight trunk, it is a flowering tree that has leaves with grayish coating beneath its buds (Kershner et al. 2008).

Methods:

Three students participated in this classification study. There were a total of three properties and a combination of twenty five samples. The tree samples of each property were recorded in Table 1 based on their town and latitude and longitude. After the tree samples were collected and recorded, information was obtained from the dichotomous key which is a reference tool that helps in the

identification of tree species. From that key we recorded the name of the tree samples, their characteristics and origin. Based on the leaves and branches, the group was able to find the common name and species of the tree to which they belonged and background information. Using the leaves shape, structure, length, undersides, margins, tips and bases we were able to narrow which tree family to which it belonged. Using twigs and branches, we determined the tree species. The group checked for prickles, thorns, buds, and bud scales. Based on these characteristics, the samples were able to be identified as a flower, fruit or pine tree.

The chi-square goodness of fit analysis was done to see if the deciduous to coniferous ratio significantly differed from fifty percent.

Results:

The coniferous tree species identified are as follows, Arbor Vitae (*Thuja occidentails),* Black Willow (*Salix nigra),* Black Spruce (*Picea mariana*), Eastern Hemlock (*Tsuga Canadensis),* Shortleaf Pine (*Pinus enchinata*), Pitch Pine (*Pinus rigida),* Southern Live Oak (*Quercus virginiana*), and Virginia Pine (*Pinus virginiana).*

The deciduous tree species identified are as follows, American Beech (*Fagus gandifolia),* Common Pear (*Pyrus communis*), Common Apple (*Malus pumila),* two samples of Eastern Red Cedars (*Juniperus virginiana),* English Holly (*Ilex aquifolium*), Flowering Dogwood (*Cornus florida*), Gum Belia (*Bumelia lanuginosa*), Ornamental Privets (*Ligustrum* species), Singleleaf Ash (*Fraxinus amomala),* Serviceberry (JuneBerry) (*Amelanchier arborea),* Sourwood (*Oxydendrum arboreum),* Sweet Leaf (*Symplocos tinctoria),* Pin Oak (*Quercus palustris*), Pin Cherry (*Prunus pensylvanica*), White Ash (*Franxinus americana),* and Yellow Birch (*Betula alleghaniensis*).

Table #1: Properties and Tree Types

	Property 1	**Property 2**	**Property 3**
Town	Bay Shore	Islip	Brentwood
Longitude/Latitude	Latitude:40º 43’19”N Longitude: 073º 14’49”W	Latitude: 40º 44’24” Longitude: 073º 12’22 W	Latitude: 40º 47’46”N Longitude: 073º 14’43”W
Tree Count	8	9	8
Deciduous Trees	6	6	5
Coniferous Trees	3	2	3

Table #2: Characteristics of the Sample

Common Name	**Deciduous Tree**	**Coniferous Tree**	**Small Sized Tree**	**Medium Sized Tree**	**Flowering Tree**
Arbor Vitae		✓	✓	✓	
Common Pear	✓		✓	✓	✓
Black Willow	✓			✓	✓
Black		✓	✓		

Spruce					
Pin Cherry	✓		✓		
Sweet Leaf	✓		✓	✓	
Ornamental Privets	✓		✓		✓
Live Oak		✓	✓		
English Holly		✓		✓	
Sourwood	✓		✓	✓	
Serviceberry (Juneberry)	✓		✓	✓	
Pin Oak	✓			✓	
Gum Belia	✓		✓		✓
Eastern Hemlock		✓		✓	
Virginia Pine		✓	✓	✓	
Common Apple	✓		✓		✓
American Beech	✓		✓		✓
Two Samples of Eastern Red Cedar		✓	✓	✓	
Yellow Birch	✓			✓	✓
Flowering Dogwood	✓		✓		✓
Singleleaf Ash	✓	✓			✓
Pitch Pine		✓	✓	✓	

Table #3: Observed versus expected frequency

Expected Ratio of:	**Observed number**	**Expected number**	**O - E**	**$(O-E)^2$**	**$(O-E)^2/E$**
Coniferous	8	12.5	-4.5	20.25	1.62
Deciduous	17	12.5	4.5	16	1.62
					Sum = 3.24

Chi-Square Analysis:

Σ= (Deciduous-Expected)^2/Expected + (Coniferous-Expected)^2/Expected

Σ= (8-12.5)^2/12.5 + (17-12.5)^2/12.5

Σ=1.62 + 1.62

Σ= 3.24

This chi-square Analysis resulted in 3.24 which is lower than 3.814 which is necessary for significance at the five percent level of probability. Therefore the deviation from the 50/50 ratio is not significant.

Discussion:

Most of the leaves present in the samples were simple leaves. They have unbroken margins that run continuously from one side of the leaf base to the other. There were also many needle-like trees. None of the samples obtained had thorns, spines or wings.

Other studies have found similar species on Long Island. Marrone (2013) found that there were Serviceberry (Juneberry) in Brentwood, and Pin Oak in East Northport. Those tree samples were similar to the samples of Serviceberry (Juneberry) found in Bay Shore and Pin Oak found in Brentwood. Glynn et al. (2013) also found Eastern Red Cedar, Pin Oak and Flowering Dogwood on Long Island. Both studies had the same conclusion, which is that there are more deciduous trees on Long Island than there are coniferous trees.

Conclusion:

The majority of the trees found in this study were deciduous. Seventeen out of twenty five samples were deciduous and the remaining eight were coniferous. However, this was not significant at the five percent level of probability according to a chi-square Analysis. Small or medium sized trees were common on all three properties which included Brentwood, Bay Shore and Islip. Eastern Red Cedar was common in two properties, Brentwood and Islip. Ten out of twenty five samples in the area were flowering trees which are more common in residential properties.

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The Proportion of Invasive Trees over the Total Sample Found on Residential Properties of Long Island

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Keywords: Conifer, Deciduous, Invasive, Long Island, Native, Residential, Tree Species

Abstract:

Samples of residential trees were collected from the *Saturn Journal* Volume 1 published in August 2012, and Volume 2 published in February 2013. These samples were then identified as Native/ Invasive and Conifer/ Deciduous. The estimated proportion of invasive coniferous trees and was calculated with a maximum error of estimate. We also calculated the number of trees needed to be included in the sample for a maximum error of 5%. Lastly, we calculated the testing difference of proportion of invasive coniferous trees in relation to invasive deciduous trees; the result showed that there were more invasive coniferous trees in proportion to invasive deciduous trees in X number of properties studied in residents on Long Island.

Introduction:

Coniferous trees thrive in soil that contains loam and has a slightly acidic pH (usna.usda.gov 2002). Loam is a type of soil comprised of relatively equal levels of sand, silt, and clay. On Long Island, however, the soil lacks this loam, and is made primarily of sands and gravels. Coniferous trees, whether native or invasive, are less common on Long Island in residential areas because their conditions for growth aren't met by our soil. Deciduous trees can best grow in an area characterized by a warm summer and moderately cold winter. The soil should be full of minerals and precipitation shouldn't exceed about 150cm; Long Island can accommodate these trees because it fulfills these requirements (tutorvista.com 2010). Native trees are preferable because they don't invade the niche of other species, and allow for maximum biological diversity. Invasive trees suffocate other trees and harm local wildlife by overtaking the area and the immediate environment. We collected data from *Saturn Journal* to investigate if the proportion of invasive conifer trees is significantly larger than the proportion of invasive deciduous trees.

Methods:

Samples of trees found on residential areas of Long Island were collected from *Saturn Journal* Volume 1(1-14), and Volume 2 (15-24). The data was grouped into four categories: Native, Invasive, Coniferous, and Deciduous based on the information from the US Department of Agriculture (25) and Virginia Tech website (26). We broke them into proportions in respect to each other and estimated them by calculating the "margin of error" using the Central Limit Theorem and finding the Z-interval. A 95% Confidence Level was used to calculate margin of error, sample size, and testing difference of proportions. Standard formula $\hat{p} \pm z_{\alpha/2}\sqrt{\frac{pq}{n}}$ is used for estimating proportion while formula $n \geq pq\left(\frac{z_{\alpha/2}}{E}\right)^2$ was used to determine the sample size. Test statistic $\frac{\overline{X}-\overline{Y}}{\sqrt{\frac{\hat{p}(1-\hat{p})}{n_1}+\frac{\hat{p}(1-\hat{p})}{n_2}}}$ with

$\hat{p} = \frac{\sum_{i=1}^{n_1} X_i + \sum_{i=1}^{n_2} Y_i}{n_1 + n_2}$ was used for testing difference of proportions where X_i, Y_j represent Bernoulli instances of invasive coniferous trees and invasive deciduous trees respectively. Non-coniferous evergreen species were not considered.

Results:

According to the *Saturn Journal* Volume 1 and Volume 2 the total number of native species found on X number of properties studied in residents on Long Island is 163, the invasive is 104, conifer is 65, and the deciduous is 202. Then we grouped them into Native Coniferous, Native Deciduous, Invasive Coniferous, Invasive Deciduous, as the table was shown.

Table 1: Distribution of Tree Species

	Coniferous	Deciduous
Native	30	133
Invasive	35	69

The estimated proportion of invasive over the total number of trees is 0.39 with a margin of error 0.0585. The proportion of invasive over the total number of coniferous trees is .5389 with a margin of error of .1212. The estimated proportion of invasive coniferous trees over the total number is .1311 with a margin of error of .0405.

We calculated the size of sample needed to have margin of error of less than 5%. The sample size of total tree species needs to be 366 in order for the margin of error of the proportion of invasive over total number of trees to be less than 5%. The sample size of coniferous trees needs to be 382 in order for the margin of error of the proportion of invasive coniferous over total number of coniferous trees to be less than 5%. The sample size of the total number of trees needs to be 267 in order for the margin of error of invasive coniferous trees over total number of coniferous trees to be less than 5%.

We also performed a testing difference of proportions for invasive coniferous trees and invasive deciduous trees over the total number of coniferous trees and deciduous trees respectively. Using p_1 (proportion of invasive coniferous) = p_2 (proportion of invasive deciduous trees), as the null hypothesis, we tested whether $p_1 > p_2$. The resulting test statistic is 2.83.

We used 5% significance level to see whether the data is statistically significant for us to reject the null hypothesis.

Discussion:

According to the results we had, in order for the data to be more significant for the estimation, we would have needed a larger sample size; especially for coniferous trees, since the total number of coniferous tree species is only 65. We needed at least 317 more coniferous trees for the margin of error of proportion of invasive coniferous trees over the total number of coniferous trees to be less than 5%.

Nevertheless the testing difference of proportions show that the number of invasive coniferous trees is greater than 1.96 (critical value for one-sided test with 5% significance level), Therefore, we rejected the null hypothesis. We concluded with statistical significance that there were more invasive coniferous trees than invasive deciduous trees in X number of properties studied in residents on Long

Island.

Conclusion:

The overall number of invasive trees found in X number of properties studied on long island is 104; the overall number of coniferous trees is 65. The percentage of invasive coniferous trees over total number of coniferous trees is 53.85%, and the percentage of invasive deciduous trees over total number of deciduous trees is 34.16%. We have a relatively large sample size to conclude that there were more invasive conifer trees than invasive deciduous trees studied on residential properties on Long Island. However, a larger sample size would be needed for the estimated proportions to have a margin of error of less than 5%.

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A Comparison of Tree Species from East Islip and Bay Shore in the State of New York

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Abstract:

Tree branches with at least three leaves and three buds attached to them were picked from a residential property in East Islip, and a residential property in Bay Shore. Each species was identified by using two dichotomous keys. Ten tree species were found in the property of East Islip, and eight species were found in Bay Shore. The Square footage of the East Islip residential property was 0. 20 acres, and the square footage of Bay Shore residential property was 0.17 acres. The tree species from East Islip were identified as White Ash (*Fraxinus americana*), Paper Birch (*Betula papyrifera*), Pin Cherry (*Prunus pennsylvania*), Red Maple (*Acer rubrum*), Red Pine (*Pinus resinosa*), Horse Chestnut (*Aescuius hippocastnium*), Red Cedar (*Junioerus virginia l*), Eastern White Oak (*Quercus alba*), White Oak (*Quercus alba*) and Douglas Fir (*Pseudotsuga menziesii*). The tree species from Bay Shore were identified as Red Maple (*Acer rubrum*), Bear Oak (*Quercus ilicifolia*), Sugar Maple (*Acer saccharum*), Sycamore Maple (*Acer pseudoplatanus*), Weeping Willow (*Salix babylonica*), White Oak (*Quercus alba*), Flowering Dogwood (*Cornus florida*) and Royal Fern (*Osmunda regalis*). The Red Maple (*Acer rubrum*) and White Oak (*Quercus alba*) species were found in both residential homes of East Islip and Bay Shore.

Introduction:

The following characteristics were all found using *Tree Finder A Manual For The Identification of Trees by Their Leaves* (Watts 1998). The Red Maple (*Acer rubrum*) is between two and five inches longer than wide it also has three or five shallowly divided, pointed lobes with two toothed margins. The Sugar Maple (*Acer sacchharum*) is between four and six inches long and is slightly wider than long. The Sugar Maple (*Acer sacchharum*) has five lobes, three are deeply divided and long pointed then two smaller, shallower ones toward base. The White Ash (*Fraxinus americana*) is between eight and twelve inches long (occasionally five or nine) . The Leaflet on the White Ash is between three and five inches long and between one and three inches wide finely toothed or untoothed margins and glossy. The Pin Cherry (*Prunus pennsylvania*) is between two and five inches long and has a long pointed tip and finely toothed margins. The Bear Oak (*Quercus ilicifolia*) produces acorns and has leaves are up to fifteen centimeters long and by ten centimeters wide. They have five to nine bristle tipped lobes with shallow sinsus. The Royal Fern (*Osmunda regalis*) has sterile fonds that are spread out from sixty to one hundred and six cm tall and thirty to forty cm broad with seven to nine pairs of pinnae up to thirty cm long. The Paper Birch (*Betula papyrifera*) is between two and five inches long and is ovate with pointed tips and has coarsely double-toothed margins. It has five to nine pairs of side veins. The Red Pine (*Pinus resinosa*) is between 50' to 70' tall and has brittle and sharp-pointed needles. The Douglas Fir (*Pseudotsuga menziesii*) typically reaches 35–45 m in height and 1 m in diameter and the buds are a distinctive narrow conic shape the buds reach up to 3–6 mm long. The Horse Chestnut (*Aescuius hippocastnium*) grows 50-75’ tall with an upright oval-rounded crown and has Light green palmate compound leaves . Red Cedar (*Junioerus virginia l*) foliage can be coarse or fine-cut, and varies in color from gray-green to blue-green to light- or dark-green. Sycamore Maple (*Acer pseudoplatanus*) is 40' to 60' tall and foliage and branching typically dense and compact. The Eastern White Oak (*Quercus alba*) Leaves are 10 - 23 cm long with wide spreading branches and a rounded crown. The Weeping Willow (*Salix babylonica*) has a short trunk and broad rounded crown

with a height of 30 to 50' and a width of 20 to 40'. The White Oak (*Quercus alba*) has ovate to elliptical leaves, 4 - 8 inches (101 - 203 mm) long. The Flowering Dogwood (*Cornus florida*) has a shape that is rounded to somewhat flat-topped and is oval to ovate shape and leaves 1.5 inches to 3 inches wide.

Method:

Two students took part in this experiment. They collected branches approximately 20 cm long with leaves and buds. Tree samples were located on the following residential homes of 1351 Brentwood Rd. Bay Shore NY 11706, (latitude 40.7221256, longitude -73.2470486) and 90 Dr. East Islip NY 11730 (latitude 40.730235, longitude -73.169751) . Three dichotomous keys were used to identify and confirm tree species, *Winter Tree Finder A Manual For The Identification of Trees by Their Leaves* (Watts 1998), *Tree Finder A Manual For The Identification of Trees by Their Leaves* (Watts 1998), and *Peterson Field Guides : Eastern Trees* (Petrides & Wehr, 1998).

Results:

Ten of the tree species are from East Islip. They are identified as Red Maple (*Acer rubrum*), White Ash (*Fraxinus americana*) Paper Birch (*Betula papyrifera*) Bear Oak (*Quercus ilicifolia*), Red Pine (*Pinus resinosa*), Douglas Fir (*Pseudotsuga menziesii*), Horse Chestnut (*Aescuius hippocastnium*), Red Cedar (*Junioerus virginia l*), Eastern White Oak (*Quercus alba*), White Oak (*Quercus alba*) and Pin Cherry (*Prunus pennsylvania*).

Eight of the species are from Bay Shore and are identified as Red Maple (*Acer rubrum*), Sugar Maple (*Acer saccharum*), Royal Fern (*Osmunda regalis*) Sycamore Maple (*Acer pseudoplatanus*) Weeping Willow (*Salix babylonica*), White Oak (*Quercus alba*),Flowering Dogwood (*Cornus florida*) and Bear Oak (*Quercus ilicifolia*) (Table 1).

In this study it was found that only one tree species was common in both areas of East Islip, and Bay Shore, and identified as the Red Maple (*Acer rubrum*).

The square footage of the East Islip residential property was 8,620 sq. ft. and the square footage of Bay Shore residential property area was 7,430 sq. ft.

It was also found that the specimens all trees native to North America.

Table 1 shows that in the East Islip and Bay Shore residential areas that the species Red Maple is present in both areas. The other six tree species are only seen in either Bay Shore or East Islip residential areas. These tree species are native to Long Island, New York.

Table 1 : Identification of Tree Species on Long Island, New York

Species of Trees	East Islip residence	Bay Shore Residence
Red Maple (*Acer rubrum*)	X	X
Pin Cherry (*Prunus pennsylvania*)	X	
White Ash (*Fraxinus americana*)	X	
Paper Birch (*Betula papyrifera*)	X	
Royal Fern (*Osmunda regalis*)		X
Sugar Maple (*Acer rubrum*)		X
Bear Oak (*Quercus ilicifolia*)		X
Red Pine (*Pinus resinosa*)	X	
Douglas Fir (*Pseudotsuga menziesii*)	X	
Horse Chestnut (*Aescuius hippocastnium*)	X	

Red Cedar (*Junioerus virginia l*)	X	
Sycamore Maple (*Acer pseudoplatanus*)		X
Eastern White Oak (*Quercus alba*)	X	
Weeping Willow (*Salix babylonica*)		X
White Oak (*Quercus alba*)	X	X
Flowering Dogwood (*Cornus florida*)		X

(The trees that are listed in this table include their common name, scientific name in parenthesis, and check marks indicating which trees are present in East Islip or Bay Shore residence).

Discussion:

The United States and Canada have fewer trees today than they did 500 years ago, but more than they did 100 years ago. There are several reasons for the increase; causes include invasive species, air pollution, and climate change. (Kershner et al, 2008). Invasive species is an organism that is not native to the ecosystem, which can cause harm to the human health and the environment.

The Red Maple is the only species found common to both properties in this study. LeGodais also found it in North Babylon and Centerport. (LeGodais & Weiss, 2012)

Sugar Maple's native habitat is on moist forests, is the star of eastern North America. Squirrels gnaw into the bark to reach the sweet sap, which is the principal source for syrup production in the Northeast (Kershner et al, 2008). Red Maple's habitat is diverse; low wetlands to moist forests to dry ridges. Spans an impressive range of climates and latitudes and occurs in a variety of habitats. It is planted as an ornamental and shade tree (Kershner et al, 2008). Bear Oak's habitat is ridges, sandy barrens, fire- adapted pine- oak woods, grow in eastern North America (Kershner et al, 2008). Pin Cherry's habitat is moist woodlands, clearings, and a roadside develops in areas of Eastern North America, and some areas of Canada (Kershner et al, 2008). White Ash's habitat is moist slopes, and valleys. Mainly develop in eastern North America and Southern states like Alabama, North and South Carolina and reaches up to the Northern part of Florida (Kershner et al, 2008). Paper Birch's habitat is rocky slopes at the base of cliffs, cutover and burned lands, and young forests. It is one of the most widely distributed trees of the North America, ranging from the Atlantic Ocean to the Pacific and north to the line tree (Kershner et al, 2008). Royal Fern's habitat is swampy areas, and steam sides. The Royal Fern is one of the most widespread of all living species and is found on every continent except Australia (Klekowski, 1997).

Conclusion:

In this study it was found that out of the 18 samples and 16 species collected from East Islip and Brentwood only the Red Maple (*Acer rubrum*) and White Oak (*Quercus alba*) were found in both locations.

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The Diversity and Concentration of different Tree species in Correlation with Property size in Lindenhurst and Brightwaters Long Island, N.Y.

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Keywords: Deciduous**,** Cornus**,** Dichotomous

Abstract:
Twenty five different species of trees were collected in different locations of Long Island. These locations are Brightwaters and Lindenhurst. Comparisons were then made to each different species of trees to see the differences in locations. We identified one Star Magnolia (*Magnolia stellate*), one Amur Maple (*Acer ginnala*), one Chokecherry (*Prunus Virginiana*) one Birch Bark Cherry (*Prunus serrula*) one Pin Oak (*Quercus palustris*) one Arborvitae (*Thuja Occidentalis emerald*) and one Douglas Fir *(Pseudotsuga menziesii*) from Lindenhurst, and one American Holly (*Ilex opaca*), eight Flowering Dogwoods *(Cornus florida*), one English Holly (*Ilex aquifloium*), two Umbrella Magnolia (*Magnolia tripetala*), two American Larch (*Larix laricina*), one Painted Buckeye (*Aesculus sylvatica*) and two Bald Cypress (*Taxodium distichum*) from Brightwaters. Our results show that the concentration of trees was greater on the larger property but the diversity of species was similar on both. Even though the Brightwaters property was larger (150 ft. x 200 ft.), it had the same number of tree species that the Lindenhurst property (100 ft. x 100 ft.) had.

Introduction:

There is a vast number of different types of trees in this world, especially here in Long Island. Location plays a major role when it comes to diversity of trees. Different types of species of trees grow in different location for many reasons. Reasons such as climate, environment and land sizes. Conditions such as wet lands and dry lands mostly affect the amount of diversity that you would find in trees across the world. Trees grow only in suitable environments that cater to their needs for survival.

Twenty four different tree specimens were collected. Both of the locations we sampled from are 7.4 miles away from each other according to Google Maps. For the month of April, the average high temperature is 58 degrees, average low is 42 degrees Fahrenheit, the mean is 50 degrees Fahrenheit the average precipitation is 4.20 inches, the record high is 89 degrees Fahrenheit in 2002 and the record low is 19 degrees Fahrenheit in 1982 for Lindenhurst and the average high temperature is 58 degrees Fahrenheit, the average low is 41 degrees Fahrenheit , the mean is 50 degrees Fahrenheit, the average precipitation is 4.34 inches, the record high is 94 degrees Fahrenheit in 2002 and the record low is 23 degrees Fahrenheit in 2008 according to The Weather Channel website.

Methods:

For this experiment two students took a small branch off of each tree that is located on the property where they lived. After they collected a sample from each tree they brought it to the lab to be examined. Once in the lab they identified each tree and found its common name and its scientific name. They then compared the types and amount of trees that they recorded from each property to see if there are any similarities or differences in trees located on the South Shore of Long Island.

Results:

According to the findings, bigger lot sizes of property on Long Island are likely to have more trees.

Property number two had almost twice the amount of trees than property number one had. Lot size varies by town. For example, in Lindenhurst more than eighty-five percent of the houses are close together which leaves little room left on the property for a large number of trees. It was also recorded that there was not one tree species that was on both properties. Furthermore, the students also discovered that, not only the concentration of trees was greater on the larger property but the diversity was similar on both. Even though property number two was larger, it had the same amount of tree species that property number one had.

TABLE 1: Property Characteristics

Property Address 1	**Property Address 2**
128 40th St.	558 Pine Acres Blvd.
Lindenhurst	Bright Waters
N.Y. 11757	N.Y. 11718
Lot Size = 100x100	Lot Size = 150x200

TABLE 2: Trees

Common/Scientific Names Of Trees Identified	
Property 1	Property 2
1) Star Magnolia-*Magnolia stellata*	1) American *Holly-ilex opaca*
1) Amur Maple-*Acer ginnala*	8) Flowering Dogwoods-*Cornus florida*
1) Chokecherry-*Prunus virginiana*	1) English *Holly-ilex aquifolium*
1) Birch Bark Cherry-*Prunus serrula*	2) Umbrella *Magnolia-Magnolia tripetala*
1) Pin Oak-*Quercus palustris*	2) American Larch- *Larix laricina*
1) Arborvitae-*Thuja occidentalis'emerald*	1) Painted Buckeye-*Aesculus sylvatica*
1) Douglas Fir-*Pseudotsuga menziesii*	2) Bald Cypress-*Taxodium distichum*

Discussion:

Long Island has a varied selection of tree species representing a multitude of regions of origin. Some of the trees we identified at both the Brightwaters and Lindenhurst locations were deciduous and local such as the American Holly (*Ilex aquifolium*). Others being non-local species and invasive to Long Island such as the two Umbrella Magnolia trees (*Magnolia tripetala*) found on the Brightwaters property. We found a disparity in both the number of trees, 18 trees of 7 identified species and one un-identified species on the Brightwaters property with only 7 total trees on the Lindenhurst property. The higher number of total trees on the Brightwaters property and possibly the differentiation of species may be attributed to the slightly larger lot size of the Brightwaters property as compared with the Lindenhurst Property. Another possible attributing factor of the difference in sample size between the locations might be attributed to higher tree casualties or loss on the Lindenhurst Property as a result of a recent hurricane. Hurricane Sandy which hit Long Island New York on 0ctober the 29th of 2012 decreased the sample size on the Lindenhurst property by two trees.

Bernero et al. (2013) found similar tree types at their Plainview location where the English Holly (*Ilex aquifloium*) and the Flowering Dogwood (*Cornus florida*) that were found there were two of the species also identified at the Brightwaters property. Abrosio et al. (2013) had a wide variety of species located on their four properties with only one common tree to the findings on the Brightwaters and Lindenhurst properties being the Flowering Dogwood (*Cornus florida*). This shows the great disparity of tree species encompassed among those of Long Island native and invasive species.

Conclusion:

It was found that the Flowering Dogwood (*Cornus florida*) was the most identified tree in the research representing eight of the eighteen specimens from the Brightwaters property. It is usually found on the eastern coast of the continental United States (Watts, 1998). The American Larch, (*Larix laricina*) and Umbrella Magnolia, (*Magnolia tripetala*) were each represented by two specimens on the Brightwaters property with one Painted Buckeye (*Aesculus sylvatica*) and one un-identified species. This tree species had bladed or winged ridges running out from the branch in an x pattern if viewed straight down the branch, alternating scars and buds every 1 ½" down the length of the branch apart on two sides of the branch.

The two locations had a vast disparity in both number of trees per property but not species diversity. The concentration of trees was greater on the larger property but the diversity of species was similar on both. The Brightwaters property (150 ft. x 200 ft.) had the same number of tree species that the Lindenhurst property (100 ft. x 100 ft.) but more than twice as many trees.

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A Comparison of Native and Non-Native Trees on Long Island

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Keywords: Biology, Invasive, Native, Trees, Long Island

Abstract:

A total of twenty four tree samples were collected from five different residential properties located on Long Island. Two of the properties were located on the South Shore of Nassau County and the three other properties were located in Suffolk County on the North Shore of Long Island. Between the samples obtained eighteen were found to be native to Long Island. Six trees were found to be foreign to Long Island. The tree samples obtained that were non-native to Long Island are as follows: two samples of Bamboo Cane (*Arundinaria michx.),* two samples of Japanese Maple (*Acer palmatum*), and two samples of Norway Maple (*Acer platanoides*). Sample of species native to Long Island collected were, two samples of White Oak (*Quercus alba*), three samples of Red Maple (*Acer rubrum),* one sample of American Holly (*Ilex opaca*), two samples of Eastern Red Cedar (*Juniperus virginiana*), one sample of American Elm (*Ulmus americana*), one sample of Green Ash (Fraxinus pennsylvanica), four samples of Short leaf pine (*Pinus echinata*); and four samples of Pin oak (*Quercus palustris*).

Introduction:

Long Island is located in North East America and is a part of New York. Long Island experiences all four seasons of the year with dramatic weather changes throughout the seasons. According to the Köppen Climate Classification Long Island is classified as a (D)-class which consists of a moist continental mid-latitude climates which have warm to cool summers and cold winters. The location of these climates is north ward of the “C” climates. The warmest month is greater than 10 degrees Celsius, while the coldest month is less than -30 degrees Celsius. Winters are severe with snowstorms, strong winds, and bitter cold from Continental Polar or Arctic air masses. With a minor climate classification of (DF) which denotes that we acquire precipitation year round.

Certain invasive trees have had negative effects on Long Island’s ecosystem. There are bans in place to prevent the sales of certain invasive trees. As a hypothesis we have assumed that more invasive tree growth will eventually occur as the temperature of the not only Long Island rises, but also the earths overall mean temperature rises. The definition of an invasive tree varies from author to author The Food and Agriculture Organization of The United Nations has compiled the following list:

- Le Roux, 1981; An invader plant is any indigenous or exotic plant species having a detrimental effect on the growth of commercial tree species, giving rise to particular management problems or growing where it is not wanted.
- Richardson et al., 2000a; Invasive plants are naturalized plants that produce reproductive offspring, often in very large numbers, at considerable distances from parent plants (approximate scales being more than 100 m in less than 50 years for taxa spreading by seeds and other propagules; more than 6 m/3 years for taxa spreading by roots, rhizomes, stolons or creeping stems) and thus have the potential to spread over considerable areas.
- Van Wilgen et al., 2001; Invasive tree species are species that are able to survive, reproduce and spread, unaided, and sometimes at alarming rates, across the landscape.

- IUCN, 1999; Invasive species means an alien species which becomes established in natural or semi-natural ecosystems or habitats, is an agent of change, and threatens native biological diversity.
- CBD News, 2001:Invasive alien species are species introduced deliberately or unintentionally outside their natural habitats where they have the ability to establish themselves, invade, out-compete natives and take over the new environments ().
- Richardson et al., 2000a; 'Transformer species' are a subset of invasive plants which are species that change the character, condition, form or nature of ecosystems over substantial areas relative to the extent of that ecosystem.

Methods:

During March 2013, four students collected a sample of each tree on their residential property, and one additional property. Even though many of the samples were obtained after a recent snow storm they were sufficient enough to identify the species through the use of several dichotomous keys (Watts 1970, Petrides 1988, Watts, 1998). The latitude and longitude of each property was determined using www.earthexplorer.usgs.gov.

Results:

Samples collected and identified to be an invasive species to Long Island are Bamboo (*Arundinaria michx.)*, Japanese Maple (*Acer palmatum*), and the Norway Maple (*Acer platanoides*). Bamboo is an extremely quick reproducing species and a cold hardy tree. They were first introduced to Long Island for the use of landscape decoration. Just as the Bamboo the Japanese Maple was also introduced to Long Island for the use as landscape commodities. Though sometimes hard to care for the Japanese Maple is suitable for most of the North East Region of North America. The specimen we obtained was from a larger species of the Japanese Maple. The final invasive sample collected the Norway Maple are well adapted to almost all soil types, such as clay, sand, and low pH conditions. The Norway Maple is capable of growing in hot and dry conditions and is extremely tolerant to ozone and air pollution. Norway Maples are planted in vast amounts within North America and can be found from the northern border of Canada and as far south as the Carolinas. Invasive species often have one or more of the following characteristics; they tolerate a variety of habitats and conditions: they grow and reproduce rapidly; they compete aggressively for resources (like food, water, and nesting sites); and they lack natural enemies or pests in the new ecosystem.

Samples collected and identified to be a Native species to Long Island are White Oak (*Quercus alba*), Red Maple (*Acer rubrum)*, American Holly (*Ilex opaca*), Eastern Red Cedar (*Juniperus virginiana*), American Elm tree (*Ulmus americana*), Short Leaf Pine tree (*Pinus echinata*), Pin Oak tree (*Quercus palustris*),and the Green Ash tree (*Fraxinus pennsylvanica*).

White Oak (*Quercus alba*) are a slow growing species but can grow to lengths of 90 feet and they are capable of living up to 400-500 years of age. They are common and indigenous not only to Long Island but to most of the North American east coast. The Red Maple (*Acer rubrum)* tree obtained its name for its brilliant autumn foliage. They are common in moisture enriched area throughout New York, the Red Maple is also abundant in dry conditions. Red Maples reproduce rather quickly due to its capabilities to reproduce by seed and by sprouting when cutting a Red Maple. The American Holly (*Ilex opaca*) is an evergreen tree which is able to grow to the height of 40 plus feet. Though the American Holly exists best in warmer climate it is also able to survive lows temperatures up to -30 Celsius. The American Holly can be found all along the entire Northern Eastern Coast of North America. The Eastern Red Cedar (*Juniperus virginiana*) is a species of juniper and is a con native to eastern North America from southeastern Canada to the Gulf of Mexico and east of the American Great

Plains. The Eastern Red Cedar is a coniferous evergreen which is dioecious with pollen and seed cones on separate trees. The American Elm (*Ulmus americana*) is a fast growing native tree in North American which can grow up to 100 feet with a proportional spread. Due to the devastating outbreaks of Dutch Elm disease many of them were killed off. American Elm grows best in full sun in rich, well-drained soil---although it can tolerate light shade and compacted soils. Elms are drought resistant, but prolonged dry periods can increase the tree's susceptibility to disease. American Elm tree can be found from Florida into southern Canada. They grow best in full sunlight and in rich soils. Elms are resistant to droughts, however, extensive dry periods will increase the American Elm's susceptibility to disease. The Short leaf pine (*Pinus echinata*) is one of the most vastly growing pine in south and northeast North America and it is extremely adaptable to almost all condition, though it does prefer the humid weather. The Short Leaf Pine is monoecious; male and female strobili usually emerge in late March to the beginning of April. The Pin Oak tree (*Quercus palustris*) is found all throughout the southwestern New England all the way west to extreme southern Ontario, and stretches south to Virginia. Most of the Pin Oak regions are cover area classified as humid or sub-humid a Pin Oak is monoecious reproducing tree. The Green Ash tree (*Fraxinus pennsylvanica*) is found from Cape Breton Island and Nova Scotia west to southeastern Alberta; south through central Montana, northeastern Wyoming, to southeastern Texas; and east to northwestern Florida and Georgia. Green Ash trees are extremely resistant to disease and thrive in most weather conditions as long as there is a regular supply of water.

Table 1: Residential Property Locations from which samples were obtained

Location 1: South Shore, Long Island **Latitude:** 40.7152 **Longitude:** -73.4817 **Size of Plot:**100'x50'	**Location 2:** North Shore, Long Island **Latitude:** 40.9033 **Longitude:** -73.3374 **Size of Plot:** 150'x150'
Location 3: North Shore, Long Island **Latitude:** 40.8502 **Longitude:** -73.2912 **Size of Plot:** 250'x65'	**Location 4:** South Shore, Long Island **Latitude:** 40.7086 **Longitude:** -73.3607 **Size of Plot:** 100'x50'
Location 5: North Shore, Long Island **Latitude:** 40.8323 **Longitude:**-73.3053 **Size of Plot:** 100'x60'	

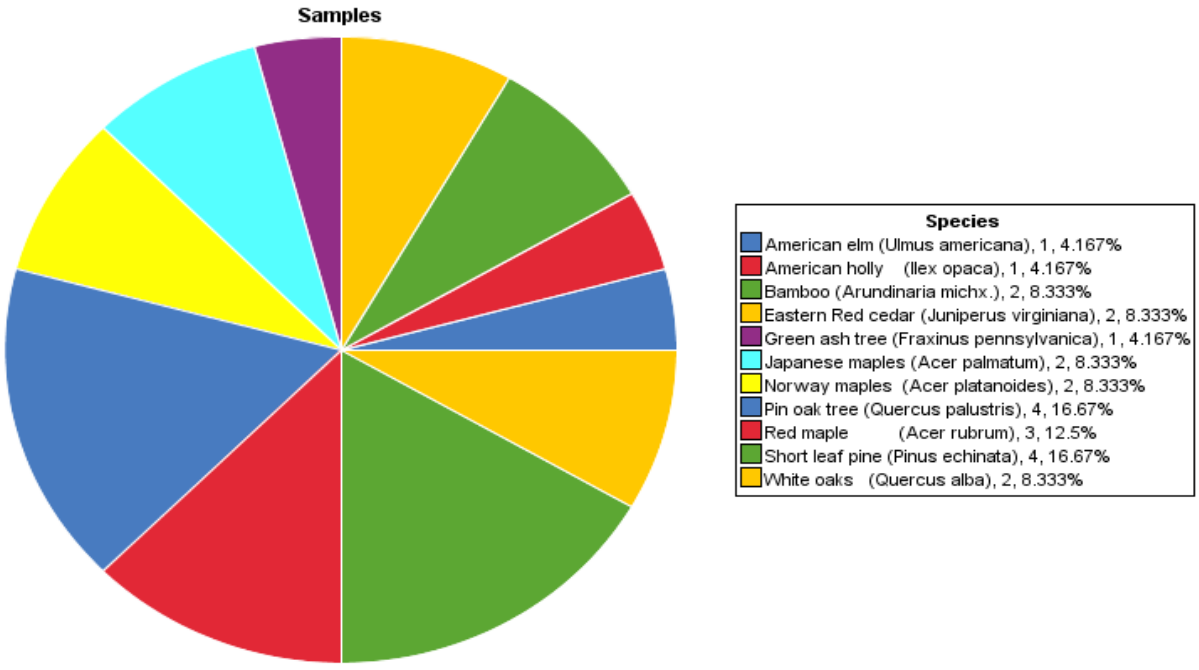
Table 2: Data on samples obtained

Tree Genus	Amount Found	Locations	Percentage of all samples	Native or invasive
Bamboo (*Arundinaria michx.)*	2	3, 5	8.33	Invasive
Japanese Maples *(Acer palmatum)*	2	3, 5	8.33	Invasive
Norway Maples (*Acer platanoides*)	2	2, 1	8.33	Invasive
White Oaks *(Quercus alba)*	2	3,4	8.33	Native
Red Maple *(Acer rubrum)*	3	3	12.5	Native
American Holly *(Ilex opaca)*	1	3	4.17	Native

Eastern Red Cedar *(Juniperus virginiana)*	2	2	8.33	Native
American Elm *(Ulmus americana)*	1	2	4.17	Native
Short Leaf Pine *(Pinus echinata)*	4	2,3,4	16.67	Native
Pin Oak tree *(Quercus palustris)*	4	2,3,5	16.67	Native
Green Ash tree *(Fraxinus pennsylvanica)*	1	5	4.17	Native
Total	24			

In our total sample of 24 trees, 6 were considered invasive which represents 25% of the total sample. The most common native trees found on our properties were the Red Maple which represented 12.50% of our total sample, the Pine Oak tree which represented 16.67%, and the Short Leaf Pine which also represented 16.67% of our total sample.

Figure 1: Species Percentage Distribution



Discussion:

There are several authors in the prior issues of the *SATURN Journal* (www.saturnjournal.org) which have performed studies on native and invasive trees. Our findings were combined with published data in order to provide a larger sample size for statistical analysis, the Pearson Chi-Square Goodness of Fit test. Our hypothesis is: out of the 102 total samples obtained, 10 percent or less would be non-native at a significance level of 5 percent.

Figure 2: Calculations

Hypothesis:
Ho: Data follows the predicted pattern
Ha: Data does not follow predicted pattern

Table 3: Raw Data

Study	Total Tree Species Observed	Expected Non-native	Actual Non-Native Species
1	12	1.2	4
2	17	1.7	14
3	12	1.2	5
4	8	.08	1
5	29	2.9	6
6	24	2.4	6

*Expected=Study's total sample size x .10

Table 4: Statistical Data

N	**DF**	**Chi-Square**	**P-Value**
102	5	59.717648	<0.0001

(The calculation conclusion is that since the P-Value < Alpha we reject the null hypothesis.)

The result of the Pearson Goodness of Fit test is that there is not enough evidence to support the claim that the percentage of non-native trees in our sample was equal or less than 10 percent. There are likely many factors which contribute to the reason why the invasive trees are not uniformly distributed such as location of where the samples were procured and also the amount of landscape work performed on properties in each study.

Conclusion:

The percentage of non-native trees on Long Island residential properties in Suffolk County is greater than 35 percent as calculated from a sample 102 trees obtained from 17 residential properties. This is inconsistent with our hypothesis which predicted that less than 10 percent of the trees would be non-native. This is significantly greater than our predicted value of 10 percent or less of non-native species at the 5 percent level of probability.

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A Comparison of Tree Species on the North Shore and South Shore of Long Island

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Keywords: Long Island, North Shore, South Shore, Centerport, Lindenhurst, Tree Species

Abstract:

Residential tree samples were gathered from the North Shore and South Shore of Suffolk County on Long Island, New York. The North Shore samples were taken from the town of Centerport and the South Shore samples were taken from the town of Lindenhurst. The samples were classified and confirmed using two dichotomous keys. The trees identified on the North Shore were; Red Cedar (*Juniperus virginiana*), three specimens of Arbor Vitae (*Thuja occidentalis*), Northern White Cedar (*Thuja occidentalis*), English Holly (*Ilex aquifolium*), Sour Gum (*Black tupelo*), Black Locust (*Robinia pseudo-acacia*), Laurel Oak (*Quercus laurifolia*), Southern Catalpa (*Catalpa bignonioides*), two specimens of Poison Sumac (*Toxicodendron vernix*), two specimens of Sycamore (*Platanus occidentalis*), Weeping Willow (*Salix babylonica*), two specimens of Choke Cherry (*Prunus virginian*), America Plum (*Prunus americana*), Norway Maple (*Acer platanoides*), and a Flowering Dogwood (*Cornus florida*). The trees identified on the South Shore were; two specimens of Ginkgo (*Ginkgo biloba*), Flowering Dogwood (*Cornus florida*), Northern White Cedar (*Thuja occidentalis),* Red Maple (*Acer rubrum*), American Larch (*Larix larcina*), Virginia Juniper (*Juniperus virginana*), two specimens of Blue Ash (*Fraxinus quadrangulata*), White Birch (*Betula papyrifera*), two specimens of White Mulberry (*Morus alba*), four specimens of Sycamore (*Platanus occidentalis*), Red Elm (*Ulmus rubra*), Balsam Fir (*Abies balsamea),* Sassafras (*Sassafras albidum*), and Black Locust (*Robinia pseudo-acacia*). The North Shore and South Shore residency samples had the following tree samples in common; Flowering Dogwood (*Cornus florida*), Northern White Cedar (*Thuja occidentalis*), Sycamore (*Platnus occidentalis*), and Black Locust (*Robina pseudo-acacia*).

Introduction:

The trees of Long Island are evidentially a beautiful part of the landscape and are essential for our ecosystem. To keep all the many different kinds of trees alive and growing, Long Island maintains 3,300 acres of preserves so the natural area is protected and people can understand and admire the beauty of Long Island's nature. In this study, we tested how location plays a role in the types of trees that grow on the North Shore and South Shore of Long Island. We also compared the difference between the North Shore and South Shore climate and soil.

The tree samples were gathered from two locations, Centerport and Lindenhurst. These locations both have similar climate however, the soil of the North Shore and South Shore differ. The North Shore of Long Island is just behind the ancient glacial moraine and has soil that tends to be acid rocky clay. The South Shore is consisted more of soil that tends to be light, sandy and well drained, which developed by "wash-out" from the ancient glacial moraine (Zimmerman 2013).

Methods:

Four students partook in this study. Samples were taken from residential locations on the North Shore and South Shore of Suffolk County, New York. Students from the North Shore collected a total of twenty tree samples and students from the South Shore also collected a total of twenty tree samples. Each tree sample had at least three buds or three leaves. The samples were then brought into class. The

students then identified the samples with two dichotomous keys (Watts 1998, Petrides & Wehr 1988). The different samples were then classified according to the species. The students then recorded which samples came from the North Shore and which samples came from the South Shore.

Results:

Table 1- North and South Shore Tree Species Found

North Shore Tree Species			South Shore Tree Species		
# of Samples Found	**Common Name**	**Scientific Name**	**# of Samples Found**	**Common Name**	**Scientific Name**
1	Red Cedar	*Juniperus virginana*	2	Ginkgo	*Ginkgo biloba*
3	Arbor Vitae	*Thuja occidentalis*	1	Flowering Dogwood	*Cornus florida*
1	Northern White Cedar	*Thuja occidentalis*	1	Northern White Cedar	*Thuja occidentalis*
1	English Holly	*Ilex aquifolium*	1	Red Maple	*Acer rubrum*
1	Sour Gum	*Black tupelo*	1	American Larch	*Larix laricina*
1	Black Locust	*Robinia pseudo-acacia*	1	Virginia Juniper	*Juniperus virginana*
1	Laurel Oak	*Quercus laurifolia*	2	Blue Ash	*Fraxinus quadrangulata*
1	Southern Catalpa	*Catalpa bignonioides*	1	White Birch	*Betula papyrifera*
2	Poison Sumac	*Toxicodendron vernix*	2	White Mulberry	*Morus alba*
2	Sycamore	*Platnus occidentalis*	4	Sycamore	*Platanus occidentalis*
1	Weeping Willow	*Salix babylonica*	1	Red Elm	*Ulmus rubra*
2	Choke Cherry	*Prunus virginian*	1	Balsam Fir	*Abies balsamea*
1	American Plum	*Prunus americana*	1	Sassafras	*Sassafras albidum*
1	Norway Maple	*Acer platanoides*	1	Black Locust	*Robinia pseudo-acacia*
1	Flowering Dogwood	*Cornus florida*			

Key	
	Grey filled indicate species common to both North Shore and South Shore

Table 2- Location of Properties and Lot Sizes

	North Shore Property	**South Shore Property**
GPS Coordinates	40.9019, -73.3639	40.6943, -73.3856
Town	Centerport	Lindenhurst
Lot Size in Acres	0.75	0.5

As seen in Table 1 above, the following species were found on the North Shore; Red Cedar (*Juniperus virginiana*), three specimens of Arbor Vitae (*Thuja occidentalis*), Northern White Cedar (*Thuja occidentalis*), English Holly (*Ilex aquifolium*), Sour Gum (*Black tupelo*), Black Locust (*Robinia pseudo-acacia*), Laurel Oak (*Quercus laurifolia*), Southern Catalpa (Catalpa bignonioides), two specimens of Poison Sumac (*Toxicodendron vernix*), two specimens of Sycamore (*Platanus occidentalis*), Weeping Willow (*Salix babylonica*), two specimens of Choke Cherry (*Prunus virginian*), America Plum (*Prunus americana*), Norway Maple (*Acer platanoides*), and a Flowering Dogwood (*Cornus florida*).

The Following species were found on the South Shore; two specimens of Ginkgo (*Ginkgo biloba*), Flowering Dogwood (*Cornus florida*), Northern White Cedar (*Thuja occidentalis),* Red Maple (*Acer rubrum*), American Larch (*Larix laricina*), Virginia Juniper (*Junipernus virginiana*), two specimens of Blue Ash (*Fraxinus quadrangulata*), White Birch (*Betula papyrifera*), two specimens of White Mulberry (*Morus alba*), four specimens of Sycamore (*Platanus occidentalis*), Red Elm (*Ulmus rubra*), Balsam Fir (*Abies balsamea),* Sassafras (*Sassafras albidum*), and Black Locust (*Robinia pseudo-acacia*).

The North and South Shore residencies had the following specimens in common, Flowering Dogwood (*Cornus florida*), Northern White Cedar (*Thuja occidentalis*), Sycamore (*Platnus occidentalis*), and Black Locust (*Robina pseudo-acacia*). It was also found that two different species of the genus, *Prunus* were found on the North Shore, the American Plum (*Prunus americana*) and the Choke Cherry (*Prunus virginian*), which were located in Centerport. All of the remaining species of trees found on the different residencies were distinctive to their particular locations in this study.

Discussions:

After comparing previous tree studies of Long Island, many similarities were found. Several other studies published in the *SATURN Journal* had similar findings of tree species on the North Shore and South Shore of Long Island.

In one study, Glynn et al. (2013) also found the Red Cedar (*Juniperus virginana*) and the Weeping Willow (*Salix babylonica*) to be on the North Shore. Similarly finding, the Flowering Dogwood (*Cornus florida*) on the South Shore as well.

When comparing our work to LeGodais et al. (2012), the English Holly (*Ilex aquifolium*) was also found in Centerport on the North Shore. The Red Maple (*Acer rubrum*) and the Flowering Dogwood (*Cornus florida*) were also found on the South Shore.

In another study, Marino et al. (2012) identified the Arbor Vitae (*Thuja occidentalis*) and the Flowering Dogwood (*Cornus florida*) to also be on the North Shore.

Ambrogio et al. (2013) discovered, the Flowering Dogwood (*Cornus florida),* Black Locust (*Robinia pseudo-acacia*), and Arbor Vitae (*Thuja occidentalis*) to also be present on the North Shore. The Flowering Dogwood (*Cornus florida*) was found to be on the South Shore as well.

Conclusions:

The following five tree species were found on the North Shore and the South Shore of Long Island, the Flowering Dogwood (*Cornus florida*), Northern White Cedar (*Thuja occidentalis*), Sycamore (*Platnus occidentalis*), and Black Locust (*Robina pseudo-acacia*). The tree species that were found only on the North Shore were a Red Cedar (*Juniperus virginiana*), three specimens of Arbor Vitae (*Thuja occidentalis*), English Holly (*Ilex aquifolium*), Sour Gum (*Black tupelo*), Laurel Oak (*Quercus laurifolia*), Southern Catalpa (*Catalpa bignonioides*), two specimens of Poison Sumac (*Toxicodendron vernix*), Weeping Willow (*Salix babylonica*), two specimens of Choke Cherry (*Prunus virginian*), America Plum (*Prunus americana*), and a Norway Maple (*Acer platanoides*). The tree

species found only on the South Shore were two specimens of Ginkgo (*Ginkgo biloba*), Red Maple (*Acer rubrum*), American Larch (*Larix laricina*), Virginia Juniper (*Juniperus virginiana*), two specimens of Blue Ash (*Fraxinus quadrangulata*), White Birch (*Betula papyrifera*), two specimens of White Mulberry (*Morus alba*), Red Elm (*Ulmus rubra*), Balsam Fir (*Abies balsamea)*, and a Sassafras (*Sassafras albidum*).

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Antimicrobial Properties of Herbs and Spices on *Proteus vulgaris* and *Klebsiella pneumoniae*

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Abstract:

The antimicrobial properties of basil, oregano and red pepper, extracts were tested on *Proteus vulgaris* and *Klebsiella pneumoniae* by using the disc diffusion method.
K. pneumoniae was sensitive to all three of the samples tested while *P. vulgaris* was sensitive only to the red pepper extract.

Introduction:

Herbs and spices are added to cooking food for flavor, scent, and visual liking to a meal. They are natural medicines used to treat many diseases and infections. Herbs and spices are not only antimicrobial agents, but also are related to preventing cancer, lowering cholesterol, and a general improvement in health (Lai, 2004). Basil's main ingredient is methyl chavicol, which is an antimicrobial compound (Viyoch, 2006). Phenolic compounds including cavracrol and hydrocarbons are in oregano, which give oregano its antimicrobial properties (Baydar, 2004). A study has shown that red pepper extract inhibited the production of cholera toxin by *Vibrio cholerae* (Yamasaki, 2011). In this present study,the effects of basil, oregano and red pepper extracts on the growth of *Klebsiella pneumoniae* and *Proteus vulgaris* were analyzed.

Methods and Materials:

The bacterial cultures, purchased from Carolina Biological, were inoculated in Brain Heart Infusion Broth (BHIB) and incubated at 37^{o}C for 24 hours. Crushed basil, oregano and red pepper were obtained from a local super market. Hundred milliliter of boiling water was added to 5 grams of each of the crushed samples and left at room temperature of 2 hours. Then, the suspensions were placed in the refrigerator for 48 hours. The flakes of the crushed samples were removed from the suspension using a Buchner funnel and then the extracts were sterilized by using nitrocellulose filters.
The antimicrobial activity was tested by performing the disc diffusion procedure. Mueller-Hinton plates were inoculated with the bacteria for confluent growth. The filter paper discs soaked in the extracts were placed on the surface of the inoculated media in the plates and then the plates were incubated at 37^{o}C for 24 hours. After incubation, the zones of inhibition were measured in millimeters.

Sterility of the extracts was checked by inoculating the extracts on the Brainn Heart Infusion Agar plates and incubating them at 37^{o}C for 24 hours. Filter paper discs soaked in sterile water were placed on a set of Mueller-Hinton agar plates that have been inoculated with the two bacteria used in this study and incubated at 37^{o}C for 24 hours. These plates were used as negative controls.

Results:

Table 1: Diameter of Zone of Inhibition Produced by Herb and Spice Extracts

Herb/Spice	***Proteus vulgaris***	***Klebsiella pneumoniae***
Basil	0 mm	9 mm
Oregano	0 mm	7 mm
Red pepper	9 mm	7 mm

mm-millimeters

Figure 1: Antimicrobial Activity of Basil, Oregano and Red Pepper on *P. vulgari. and K. pneumoniae.*

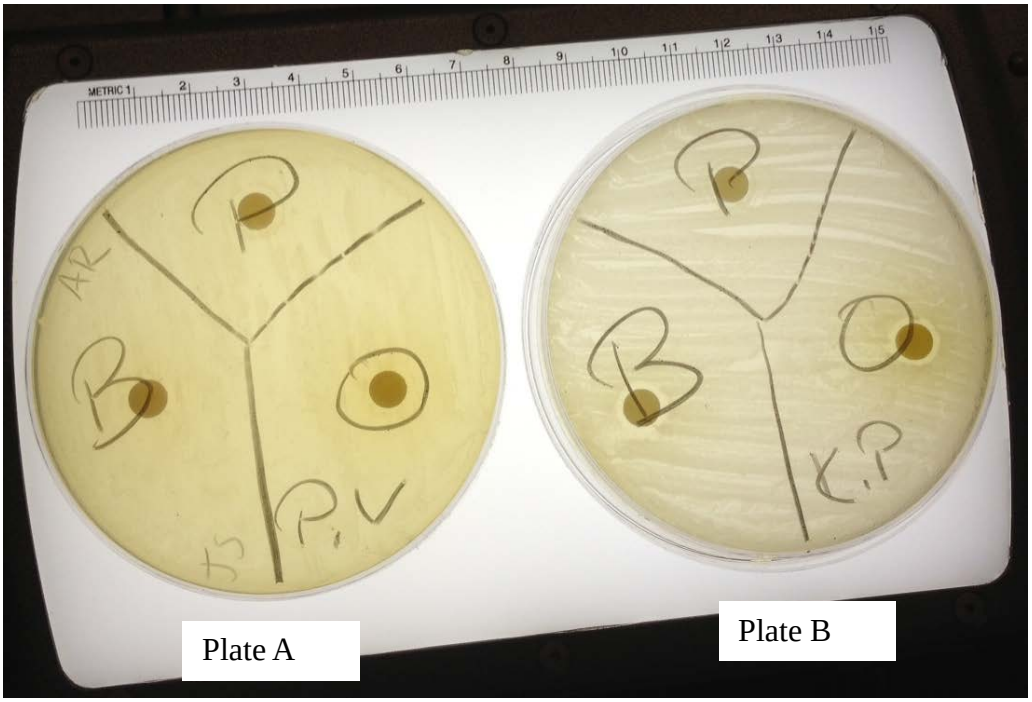

Plate A - *P. vulgaris*, Plate B - *K. pneumoniae* . B - Basil, O - Oregano, P – Red pepper.

In the case of *P. vulgaris*, a zone of inhibition of 9 millimeters (mm) in diameter was observed only with the red pepper extract. This bacterium grew around the discs that were soaked in basil and oregano (Table 1 and Figure 1). The growth of *K. pneumoniae*, on the other hand, was inhibited by all the extracts used in this study. However, the basil extract produced the largest zone of inhibition (Table 1 and Figure 1).

The negative controls did not have any zones of inhibition around the filter paper discs. The extracts used in this study were sterile as indicated by the absence of microbial growth on the plates inoculated with sterile extracts.

Discussion:

P. vulgaris is a gram-negative bacterium commonly found in the intestinal tracts of humans. *P.*

vulgaris did not produce a clear zone of inhibition when treated with basil (Satyan *et al*., 2011), which is consistent with this study. Red pepper has shown to be effective on inhibiting the growth of *Listeria monocytogenes* (Leuschner & Ielsch, 2003). *P. vulgaris*, in this study, showed 9 mm zone of inhibition with the red pepper extract and similar results were obtained by Joe *et al*., 2009. *K. pneumoniae* is a gram negative bacterium that causes infections such as meningitis, pneumonia and wound infections. It has been documented that some strains of this bacterium have developed a tolerance for antibiotics, which makes this bacteria very dangerous to humans (Correa, 2013). In this study, *K. pneumoniae* exhibited sensitivity to all three extracts, which is consistent with the previous studies (Chaudhry *et al*., 2007; Joe *et al.*, 2009). The zones of inhibition observed in this study were smaller compared to that of the previous studies, which may be due to the lower concentrations of the extracts used in this study. Gram negative bacteria are usually more resistant to antimicrobial substances (Falcon *et al*., 2013; Lopez & Lopez, 2013). However, *P vulgaris*, one of the gram negative bacteria used in this study, was slightly sensitive to red pepper extract. *K pneumoniae*, the other gram negative bacterium analyzed in this investigation, was somewhat susceptible to all three extracts.

Conclusion:

Red pepper extract inhibited the growth of *P. vulgaris* while the extracts of basil and oregano did not prevent the growth of this bacterium. The extracts of basil, oregano and red pepper were able to inhibit the growth of *K. pneumoniae*, but the strongest inhibitory activity against this organism was seen with the basil extract.

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