Mapping Some Invasive Plant Species of Long Island

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Introduction

An invasive species is defined as: "a species that is 1) non-native (or alien) to the ecosystem under consideration **and** 2) whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health". The Bureau of Land Management (BLM) identifies the rapid expansion of weeds across public lands as "one of the greatest obstacles" in trying to promote forest health. Invasive vegetation can be more generally characterized as an introduced (whether intentional or not) plant that takes over an area due to a variety of reasons such as its ability to reproduce at a fast rate, through the use of naturally occurring chemicals (allelochemicals) that are designed to eliminate competition for the available resources in the ecosystem in which that plant exists or by simply making better use of available resources. Once introduced, invasive plants do exactly that, effectively displacing the naturally occurring flora of an environment and have a distinct tendency to form monocultures. This can prove harmful to not only other plant life, but to the fauna which depend on the native species of vegetation to survive.

It is known that invasive species can be introduced and spread in a number of ways. They originate from places where they are considered native and have been known to "hitch a ride" with human traffic. Some species however, that are now considered invasive, were actually introduced intentionally for some seemingly helpful attribute. This is true in the case of the Multiflora rose (*Rosa multiflora*), a member of the rose family. Sometime in the mid 1860's this attractive shrub was introduced to the east coast of the United States as an ornamental plant. In the 1930's some other properties were also recognized and considered beneficial, particularly by the U.S. Soil Conservation Service. These include the plants ability to develop an impenetrable "living wall" or "living fence" of thorny vegetation that is still widely seen in the construction of natural barriers used for controlling erosion in disturbed areas. It has also proven useful in minimizing headlight glare experienced when driving into oncoming traffic when planted along the medians of roadways.

Purpose

This project was initiated in order to gain as much initial information about the invasive plant species known to exist in Long Island and their occurrence on both the Upton Ecological Research Reserve (Upton Reserve) and the surrounding areas of the Brookhaven National Laboratory (BNL). It is hoped that through the entry and application of data collected during this project, will ultimately aid in determining the rate of spread from year to year of certain invasive species common on Long Island. It will also help determine the best methods of dealing with/eliminating as many invasive plant species as possible from the areas in which they have become the biggest threat.

Figure 1. Expanse of Brookhaven/Upton Reserve and invasive/noxious weeds.

Materials and Methods

Since invasive species are known to be highly tolerant of a variety of somewhat adverse environmental conditions (including but not limited to shade tolerance and soil composition), it was expected that the primary areas of heavy invasive vegetation cover would be along roadsides, firebreaks and foot/horse trails and other areas subject to disturbance. Understanding this, these areas are where most of the effort was concentrated. This was done using state-of-the-art global positioning system (GPS) equipment. Based on factors including percent ground cover (density) and shape/size of area occupied, data was collected into specific shape files in the memory card of the GPS unit in one of three formats: point, line or polygon (area). Data collection began in the Upton Ecological Reserve with the belief that this area would be relatively low in infestation, and that those occurrences would be easily controlled.

The first step in obtaining accurate data for this research is the correct identification of those species categorized as invasive. Particular care in doing so was necessary during the beginning stages of data collection since a high degree of precision was desired.

A systematic approach to covering as much area as accurately and quickly as reasonably achievable was used in the data collection portion of this project. Data was first collected along the outer boundaries of the Upton Reserve, followed by data collection along trails that allow access to the interior of the Reserve. From there, the remaining area of BNL was divided by a grid system using the existing roads and firebreaks to create boundaries assuring no area was missed or incorporated more than once.

Once an area of infestation was found, it was necessary to determine the type of shape-file in which to record the data. This being a choice of three types as mentioned before; point, line or an area (polygon), was determined based on the length and width of the area in question. Areas containing one or a small number of plants (regardless of density of that area, noted separately) in a small area were recorded as point data (up to and including one square meter). Longer but not "deep" areas (areas such as in the case of many areas infested with Black locust which did not extend far into a forested area or away from the road/firebreak) found were recorded as line data. Finally, having infested areas such as in the case of many Phragmites and Japanese barberry infested areas having a significant amount of depth, as well as length, were recorded as "area" data. Also, it was noted that the amount of canopy cover and humidity seemed to affect the ability of the GPS unit to work effectively. Sometimes this limitation influenced the way in which data was recorded.

"Arcview 8.3" computer software was used in developing detailed maps denoting the locations and amount of area covered for each of the occurrences found. Once this was accomplished, the generated layers (Figure 1 seen above) made it possible to make comparisons between specific uninfested areas and those which had become overrun. And since it is well known that these species thrive on disturbance, photographs of Brookhaven National Laboratory and the Upton Reserve from before1934, 1947 and 1966 were used to compare areas that are known to be infested now, to areas previously undisturbed where present day roadways, firebreaks and trails have since been introduced.

Invasive Plant Species Found on BNL and the Upton Reserve:

Japanese barberry *(Berberis thunbergii)* {Fig. 2}

Multiflora rose *(Rosa multiflora)* {Fig. 3}

Black locust *(Robinia pseudoacacia)* {Fig. 4}

Japanese/Shrub honeysuckle(s) *(Lonicera japonica)* {Fig. 5}

Common mullein *(Verbascum thapsus)* {Fig. 6, 6a}

Oriental bittersweet *(Celastrus orbiculatus*) {Fig. 7}

Bamboo (Bambusa spp; one isolated occurence) {Fig. 8}

Black swallowwort (*Cynanchum nigrum*) {Fig. 9}

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

Figure 6a.

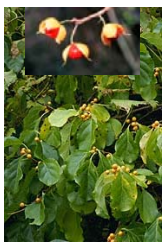

Figure 7.

Figure 8.

Figure 9.

Ultimately, data collected was incorporated into a database that was developed for use with the noxious weed problem in the western United States. This database will likely be the standardized database for the mapping of invasives on Long Island, because it serves as a collective source of information from all over the United States and can be used to compare and share information about the severity of invasive weed problems and their corresponding treatments.

Results

It was found that there is a particularly heavy amount of Japanese barberry infestation throughout the entire area of B.N.L., and that in almost all areas where some form of infestation was found, barberry was likely to be present in or near that area. It was also found that in many areas, no infestation was found at all. These seem to be those areas that experience the least amount of use whether from vehicular traffic or recreational use. One such area is that of the interior of the Upton Reserve. Although there is a large number of foot/horse trails found within this area, there was little infestation found in the Upton Reserve except along the southern and southeastern boundary where vehicular traffic seems to have a greater influence. Similarly, interior areas of BNL were much less likely to harbor invasive weeds than previously disturbed areas.

Some areas of infestation totaled many **hundreds and even thousands** of square meters. These areas have heavy Berberis and Robinia populations and include some occurrences of open infestations as well as areas of Berberis found within the realm of a dense canopy (comprised mostly of oak) containing upwards of 2,500 square meters in some cases.

It was also found that most "line" data ran exclusively along the areas of disturbance such as roads and trails where the competition for available resources such as sunlight was noticeably less. Maps from 1947 and 1966 distinctly show the boundaries of BNL and the roadways incorporated within.

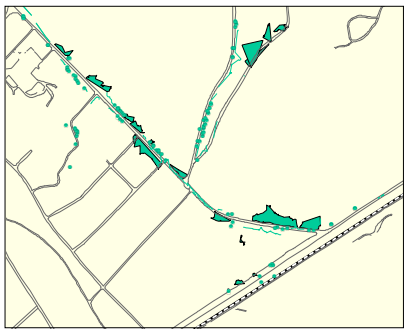

Figure 10. Japanese barberry infestation found along Brookhaven avenue.

Discussion/Conclusion

Active competition is a natural part of many plant species whereas some utilize a passive/indirect way of competing for available resources. If faced with the question of posing the most important as well as dangerous attribute of the invasive plant species studied here, some scientists might say that it is their ability to contend and survive in an extremely competitive environment such as (in most cases) on or very near the forest floor.

One may interpret these results and say that the species found on BNL and the Upton Reserve are opportunistic plant species that developed at, or shortly after the time of the establishment of trails, firebreaks and roadways now integrated into the property. Since the development of these, people have been granted an increased amount of access to the 5,265 acres of BNL giving rise to the distinct possibility that in addition to the suggestion that these introductions may have allowed for the initial incorporation of these species, it is the very use of them that has contributed to their spread.

What is unknown and may remain unknown for some time, is not only how fast these species may spread from their current state, but whether or not the rate of which they are currently spreading (if at all) will also accelerate. Also, to what extent do people influence the spread of already existing invasives? What about the role native fauna play in the spread of naturalized and in some cases, commonplace invasive plants? Perhaps the most important question that should be kept in mind concerning non-native invasive plants already established is this: "What can be done to stop them?"

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