Mapping Some Invasive Plant Species of Long Island

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Abstract

Mapping Invasive Plants of Long Island. Timothy C. Walters (SUNY Environmental Science and Forestry College, Syracuse, NY, 13206) Peter Kelly (USFWS, Brookhaven National Laboratory, Upton, NY 11973-5000).

Invasive plant species have been an issue of concern on Long Island for many years whose spread has become an issue of increasing concern due to their displacement of naturally occurring plants and natural habitat composition. In order to establish effective methods of eliminating/controlling these species on Long Island, information pertaining to the introduction into an area, rate of spread and likely vehicle(s) of transmission between areas is needed. Initial infestation data was collected and map overlays were developed using GPS and ArcMap/View software. In doing this, shape-files were created in three forms (point, line, polygon) depending on dimensional characteristics of infestations ensuring accuracy of data collected. Visual aides (map overlays) were then created allowing the comparison between previously undisturbed areas with disturbed areas that now serve as habitat for invasive plants. These weed occurrences were also imported into a database (along with additional field data collected) that may become the standard for all noxious/invasive weed occurrences nationwide. This will allow the sharing of information such as effective control measures. As may have been expected, there was a direct correlation between where these developments took place and the currently infested areas. It could also be seen that areas likely to receive the highest frequency of disturbance by people/vehicles, seemed to have a higher amount of (in some cases more dense) occurrences. This project will serve as a foundation for future comparisons and will serve as the initial data that will be used to compare changes in size, density, and number of occurrences in the years to come.

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" [1]. This definition encompasses a broad spectrum of possible adverse effects of an ongoing problem concerning particular invasive plants that will be discussed here. The Bureau of Land Management (BLM) identifies the rapid expansion of weeds across public lands as "one of the greatest obstacles" [2] in trying to promote forest health. Invasive vegetation, which should be recognized as its own entity rather than included under a noxious weed classification, can be more generally characterized as an introduced (intentional or not) plant that takes over an area due to either (or in combination with) its ability to reproduce at a fast rate, or 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.[1] 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. The specific species looked at during the course of this project are listed in the "Materials and Methods" portion of this report and **do not** include all invasive plants known to inhabit Long Island.

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[1] **Invasive** vegetation can be characterized, as vegetation, which spreads rapidly, however, has not been legally classified as a noxious weed. A **noxious** weed is one which has been designated a major pest and is subject to legal restrictions (Plant Invaders of Mid-Atlantic Natural Areas).

It is known that invasive species can be introduced in a number of ways, including the unintentional shipment of them from areas of the world where these plants are considered native and have been known to “hitch a ride” with human traffic. Though the most abundant source for the spreading of invasive plants are the animals that feed on them. 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 then soon recognized and were widely considered beneficial, particularly by the U.S. Soil Conservation Service. These include the plants ability to develop an impenetrable “living wall” of thorny vegetation that is still widely seen in the construction of natural barriers used for controlling erosion in disturbed areas, as well as reducing impact should a collision occur. It has also proven useful in minimizing headlight glare experienced when driving into oncoming traffic when planted along medians. It has also been used as “living fences” [3] to contain livestock. One may see the benefit in this sense, since financially, this application would cost a landowner nothing. Multiflora rose also serves as an excellent food source and habitat cover for wildlife such as deer and birds, which are known to be the primary form of seed dispersal. But in the 1930’s, people began to recognize the adverse effects of the introduction (such as unstoppable growth and interference with cattle grazing and agriculture) of Multiflora rose, which has long since naturalized into almost any area it has been introduced to. This species, along with some other invasives, is now seen as a noxious weed that has created more problems than solutions.

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 into a data base developed in Montana specifically for the mapping of invasive weeds, that this information 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.

Materials and Methods

The invasive/noxious plant species found on the nearly 5300 acre expanse of BNL include Japanese barberry *(Berberis thunbergii),* Multiflora rose *(Rosa multiflora),* Japanese/Shrub honeysuckle(s) *(Lonicera japonica),* Black locust *(Robinia pseudoacacia),* Common mullein *(Verbascum thapsus),* Oriental bittersweet *(Celastrus orbiculatus)* and in one isolated instance, bamboo (Bambusa spp.).

Using state-of-the-art global positioning system equipment (GPS), occurrence of invasive plant species was recorded according to the area occupied by the plant type in question. 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), the reason and application of which will be adequately explained in the procedure of this report. Data collection began in the Upton Reserve because it was least affected by invasives due to minimal disturbance within the area. This was done with the assumption that lower infestation would be met with the highest diversity of control measures, thus defining those practices with which the highest rate of success could be achieved.

"Arcview 8.3" computer software was used in developing detailed maps denoting the locations and amount of area covered for each occurrence. Maps generated using this program then allowed for the easy interpretation of affected areas, as well as the comparison of new invasive plant growth, as a function of time. Data based files (or DBFs) that serve as the charted information for the software are also exported, added to some other information (such as the date a weed occurrence was discovered, the collector's name, site description of infestation etc…) and properly formatted in order to enter the information correctly into the database. This database will likely be the standardized database for the mapping of invasives on Long Island, as 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.

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. During the first observations, location data was collected using three manuals used for accurate plant identification [5,6,7]. This allowed for positive identification based on easily recognizable differences between similar looking species, assuring the efficiency of future data collected.

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 were where most of the effort was concentrated.

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. Since it was unlikely that a one-person crew was going to be able to cover the entire expanse of the Upton Reserve and BNL's property, a careful record was kept of all areas covered. 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.[2] These smaller areas were covered moving in a westerly direction and working from the southern end of the Lab towards the north.

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 *common reed* 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. However, careful field notes were kept for data including length, depth, density, type of area infested and other information allowing accurate descriptions of infested areas to be entered into the database (In the cases where it was not possible to record area/polygon data, line data was recorded and the other dimension was recorded in note form and later applied to the recorded information). The three types of data could be taken for each species respectively (There was point, line, and polygon data recorded for common reed, as well as point, line and polygon data recorded for

[2] Incorporating data more than once would not affect the visual interpretation of weed occurrences as indicated on maps showing disturbances and location of infestation, but would lend inaccuracy to the information incorporated into the database.

Japanese barberry, etc.). The hard copies of infestations that were made for the input of additional information also provided a backup of electronically recorded data entries that allowed an immediate reference, which provided some basic information about each affected area.

Once the preceding steps were accomplished, the generated layers (maps) made it possible to make comparisons between specific, uninfested areas, and the severity of one infested area to another. And since it is well known that these species thrive on disturbance, photographs of Brookhaven National Laboratory and the Upton Reserve from before 1934, 1947 and 1966 were studied and 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. Since this project is a preliminary data collection, it is not possible to monitor the changes in population/density of each infested area yet. Therefore, the results section of this report will deal with how infestations found correspond with disturbed areas and how continuing disturbance (the use of roadways) seems to be a continuing factor in the driving force that is the spread of some invasive weeds of Long Island.

Results

It may have been expected that certain invasive plant species looked at during this project might have occurred with varying degrees of frequency. Using maps generated through the use of ArcMap/View software, this was in fact found to be true. It was noticed that there is a particularly heavy amount of Japanese barberry infestation throughout the entire area of BNL, 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 there was very little or no infestation in many areas. It can be seen that these areas are the areas that seem to 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. In fact, although there is a large number of foot/horse trails found within, 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 such as in some cases of *Robinia* 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. These maps are included in the index portion of this report and make it able to see that the areas of infestation correspond greatly to the areas where the present-day roadways and trails of BNL are now found.

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 while 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 as far as the problems of non-native invasive plants already established are concerned is this: “What can be done to stop them?”

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