

Bibkey: 593457

Vegetation Sampling of Deer Exclosures within Morristown National Historical
Park for 1991, 1995 and 2000

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August 12, 2000

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Introduction

There has been a large increase in the deer population at both Morristown National Historical Park and the surrounding area in recent years. This development has prompted the gathering of data to test the null hypothesis that the deer population has no effect on the vegetation within the park (Russell, 1991). A series of five deer exclosures were established, one in each major vegetation area, in order to gather the appropriate data (Russell, 1991).

Exclosure one was set in up a mature broadleaf forest of mixed oak (Quercus spp.) and tulip poplar (Liriodendron tulipifera). Exclosure two was placed in a successional forest of white ash (Fraxinus americana) and tulip poplar. An open field that is mowed occasionally was chosen for the third exclosure. Exclosure four was set up in a successional forest of white ash and black locust (Robinia pseudoacacia) and the fifth exclosure was placed in a mature forest of mixed oak (Russell, 1991).

A Deer Exclosure Manual has been kept recording the data collected each year (Anonymous, n.d.). Each exclosure is twelve feet high and twenty feet by twenty feet in measurement. There are two eight inch by eight inch holes in each exclosure fencing to permit smaller herbivores to go into the exclosures (Russell, 1991).

Methods

In October of 1987, the first two exclosures were constructed and each species was listed and by what percentage of the area each one covered. In

June of 1988, three more exclosures were constructed and sampled in the same manner (Anonymous, n.d.). Since this time, a person from the natural resources staff has gone to each of these plots in the summer months and surveyed the exclosures by noting species present and the percent cover within each exclosure (Russell, 1991).

Beginning in 1991, a control area was set up to compare a region where deer could gain access. Bars mark the perimeter of the area and provide a place for birds to perch, as they could on the fences of the exclosures. Also in 1991, a new way of sampling the vegetation was engaged (Anonymous, n.d.). A five by five meter plot was marked off in the center of each exclosure and control plot. This avoided issues involving the edges of the exclosures, which could be influenced with the possibility of birds depositing seed as they perch. Three points were then chosen and used to mark a corner of each one by two meter plots created. These points were located by pairs of random numbers and data of the recorded plant life was documented according to a cover class (Russell, 1991). The cover classes are as follows: r equals solitary with small cover, + equals few with small cover, or solitary with <5% cover, 1 equals numerous with <5% cover, 2 equals 5 – 25% cover, 3 equals 26 – 50% cover, 4 equals 51-75% cover, 5 equals 76 –95% cover, 6 equals 96 – 100% cover (Anonymous, n.d.).

In 1994, a new grid was made of each exclosure and recorded as to ensure that the plots were not longer sampled at random. The height of the vegetation was noted beginning in 1998 with the qualifications of <1m, 1-2m, and >3m (Anonymous, n.d.). Also beginning in 1998, all nine plots were sampled

each year using a meter square (Anonymous, n.d.). This process is what is presently being practiced when gathering data.

Within this report, the years 1991, 1995 and 2000 are being considered. The year 1991 was chosen due to the fact that this was the first year that specific square meter plots were examined and the possibility of missing lesser occupancy species was less likely. The year 2000 was considered since it is the most recent date available and was thoroughly examined with all nine of the plots being sampled within each area. A year that was approximately halfway between these two years was also taken into account as to have a comparison year of how things had progressed over time. All three years have control areas that can be used to make a comparison to the exclosures.

As the data was examined, the numbers of species were tallied according to the exclosure, its control plot and the year. Also, for each year, all species were looked at and where they were found (control or exclosure). The most abundant and dominant species, as compared to by examining the higher cover classes listed, and considering the number of one meter square plots it was found in, were also taken notice of as they differed from year to year.

Results

When comparing the number of different types of species observed, the average number seen per year was shown to be 12.6 in 1991, 12.4 in 1995, and 13.6 in 2000 among all five exclosures. Within the control areas the averages of the number of species seen were 7.2 in 1991, 8.4 in 1995, and 15.8 in 2000. Overall there were ninety-seven different species observed. In 2000, eighteen of

sixty-one species, twenty-one of fifty in 1995 and in 1991, twelve species of thirty-nine were observed only in the exclosed areas.

In exclosure one, the most dominant species in 1991 was white snakeroot (Eupatorium rugosum) in both the exclosure and the control area. However, in 1995, white wood aster (Aster divaricatus) was dominant along with spicebush (Lindera benzoin). In the control area, this was not the case since white snakeroot was still dominant along with Japanese Barberry (Berberis thunbergii). In 2000, white wood aster was beginning to dominate along with spicebush within the exclosure. In the control area, Japanese barberry was noted to be dominant.

Exclosure two had a domination of Japanese wiregrass (Microstegium vimineum) exclusively in all three years taken into account within the control plot. The exclosure area was observed in 1991 to contain an equal dominance of Japanese honeysuckle (Lonicera japonica) and multifloral rose (Rosa multiflora). In both 1995 and 2000, multifloral rose was the most dominant followed by Japanese honeysuckle in this exclosure.

Japanese barberry was seen to be the most prevalent within exclosure three for all years considered. In 1991, the control plot had "grasses" with no specific genus listed as being dominant. Therefore, the specific genus or species are unknown. Leafy spurge (Euphorbia esula) was also prominent in 1991 within the control area. In 1995, Japanese wiregrass was the most dominant but in 2000 the leafy spurge was seen to be more prevalent along with Pennsylvania Bittercress (Cardamine pensylvanica).

In 1991 exclosure four was seen to contain an abundance of Japanese wiregrass in both the control and exclosure plots. In 1995, the control was nearly exclusively Japanese wiregrass. In 2000, the exclosure was too dense to enter and make accurate plot samplings, but multiflora rose, Japanese honeysuckle and spicebush were dominant.

Within exclosure five, there is mainly a covering of leaf litter throughout all the years considered. Therefore the species seen were sparse, yet they were considered dominant since they were the most prevalent species seen. During the years of 1991 and 1995, a type of blueberry (Vaccinium spp.) and partridgeberry (Mitchella repens) were dominant considering the leaf litter. In 2000, blueberry was seen along with witch hazel (Hammamelis virginiana) and maple viburnum seedlings (Viburnum acerifolium) as the dominant species within the exclosure.

Discussion

The average number of species seen were noted to be more diverse within the exclosures themselves as opposed to the control areas near them during 1991 and 1995. However, in 2000, the species appeared to be more diverse in the control area. Two of the five exclosures were not able to be accessed due to the denseness of the vegetation growth during this year, which could have had an impact on the observations taken since less could be seen from the outside of a fence. All five of the control regions were sampled as indicated. The two exclosures that had been recorded as having the vegetation too dense to enter had fewer species noted than their respective control plots.

The average number of species seen in 2000 was notably higher than the previous years in this report. Since the total sampling of all nine plots per area was implemented after the first two years examined in this plot as opposed to three plots per area, some species were likely to be missed in both 1991 and 1995.

Overall, there were thirty-eight species that were not seen in the control areas of the exclosures. It was noted that eighteen of these plants were observed elsewhere in the park. That leaves twenty of the ninety-seven total species seen that were noted exclusively in the exclosures. Some of the plants observed in either the control area or the exclosure were only identified to the genus and this specific genus was seen in other years identified to the species, so it was unknown if they were actually the same plant or not. This could alter the total number of species seen. In this report it was assumed that they were not the same species.

The prevalence of Japanese wiregrass has shifted over the years within the exclosures. In 1991, Japanese wiregrass, when present, was observed to be in both in the exclosures and the control areas. In 1995, it was noticed to be within two of the three exclosures but in all three control groups. There appeared to be quite a turnover in 2000 since Japanese wiregrass was seen in four control areas and was not found in any of the exclosures. This could possibly be related indirectly to deer browsing. It is quite obvious that deer do not eat Japanese wiregrass considering it's dominance in the control areas. However, since it was not found to be in any of the exclosures, it could be reasoned that plants growing

inside these exclosures could negatively influence the growth of this exotic species. Another possibility is the lack of a browse line which could prevent more sunlight from reaching the forest floor, which was the area that Japanese wiregrass was found.

A trend can be observed from examining how the species have shifted over the years. Four of the five exclosures in the year 2000 had exotic species as their dominant species. In order to see if deer browsing has had any effect on the vegetation within the park, the vegetation before the deer populations increase would have to be noted. This information was looked for and found that the types of forest indicated earlier in this report were found with little information on herbaceous species within the park before the increase of the deer population.

Conclusion

In all the exclosures, a change could be seen as the years considered progressed. The exclosures were seen to have a shift in dominance, at least to a small degree, which is seen in these years. This report only looks at three years of data, in order to draw more complete conclusions, all years should be considered. As stated earlier, several of the differences noted have involved exotic species. The presence of these plants shows that since the deer may favor native species, exotic species could take over the disturbed native flora.

There was some question on some of the identification of the plants listed when comparing the years. It is known that botanists have not done the primary sampling and that mistakes could have been made. Another factor is that there

is not a great deal of consistency on the whole for the sampling methods that could have an effect of the species found. However, in the same respect, the changes made have been seemingly more beneficial and have added greatly to the quality of the data gathered.

Since the exclosures have been in existence for only approximately twelve years, the changes seen are hard to compare to what the vegetation was like before the increase of the deer population. The data collected does seem to point to disprove the null hypothesis to a degree due to the fact of the increased species diversity and also the differences between the control areas and the exclosures. However, since so many factors contribute to plant growth no specific conclusions can be drawn up.

References Cited

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