

Monitoring a Chicago Area Re-created Natural Environment

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Abstract

Extensive monitoring was employed in an attempt to document some of the factors responsible for the changes taking place in Dixon Prairie. The increase and decrease of many species was quantified, and an inventory of the plant life was estimated. Elevations and soil bulk densities were also recorded. The presence of *Pycnanthemum virginianum* was associated with plots of low to medium diversity as well as higher elevation. Taxa native to the Skokie River floodplain were found predominantly at the lower elevations at the perimeter of the prairie area. Most importantly, the percentage of graminoids decreased from roughly 50% in 1983 to roughly 11%.

Introduction

Since planting began over 22 years ago, the Savannah/Mesic portion of Dixon Prairie at the Chicago Botanic Gardens has yet to stabilize. Beginning in 1982, the Chicago Botanic Garden began to create an exhibit representative of the pre-settlement tallgrass prairie. Engineering this type of ecosystem is difficult due to the Garden site's isolation from many native plant and animal species as well as the wide variety of anthropogenic forces exerted upon the surrounding area. In addition to these obstacles, the river floodplain location of the Garden never supported a prairie environment in the first place.



Background

With the understanding that this exhibit would be a constant work-in-progress, the Chicago Botanic Garden set to work creating as much of the natural prairie environment as possible. Despite the import of local soils, the process of transporting and creating the desired contours inevitably affected the quality of the otherwise favorable medium. In addition to the weed seeds carried in with the soil, other problems with the manufactured site included unnatural soil compaction and the lack of a legitimate soil profile.

The site was weeded as thoroughly as possible using glyphosate and tillage. The Garden crew plugged approximately 28,000 plants of 60 species throughout the growing season of 1982 and then approximately 28,000 more in 1983 of over 80 species. The plants of the various species were plugged at random, controlling only for the 1:1 ratio of graminoids to forbs. The most common grass species was *Andropogon gerardii*.

After the first few years, the grasses began to disappear as various forbs (including volunteer species not originally plugged) began to colonize the areas formerly dominated by the crowns of *Andropogon gerardii*, *Sorghastrum nutans*, etc... At present, the remaining grasses do not make up a significant percentage of the prairie matrix. A hypothesis that this research tested was that variations in soil bulk density and/or elevation may be associated with the forces shaping the composition of the prairie.

Materials & Methods

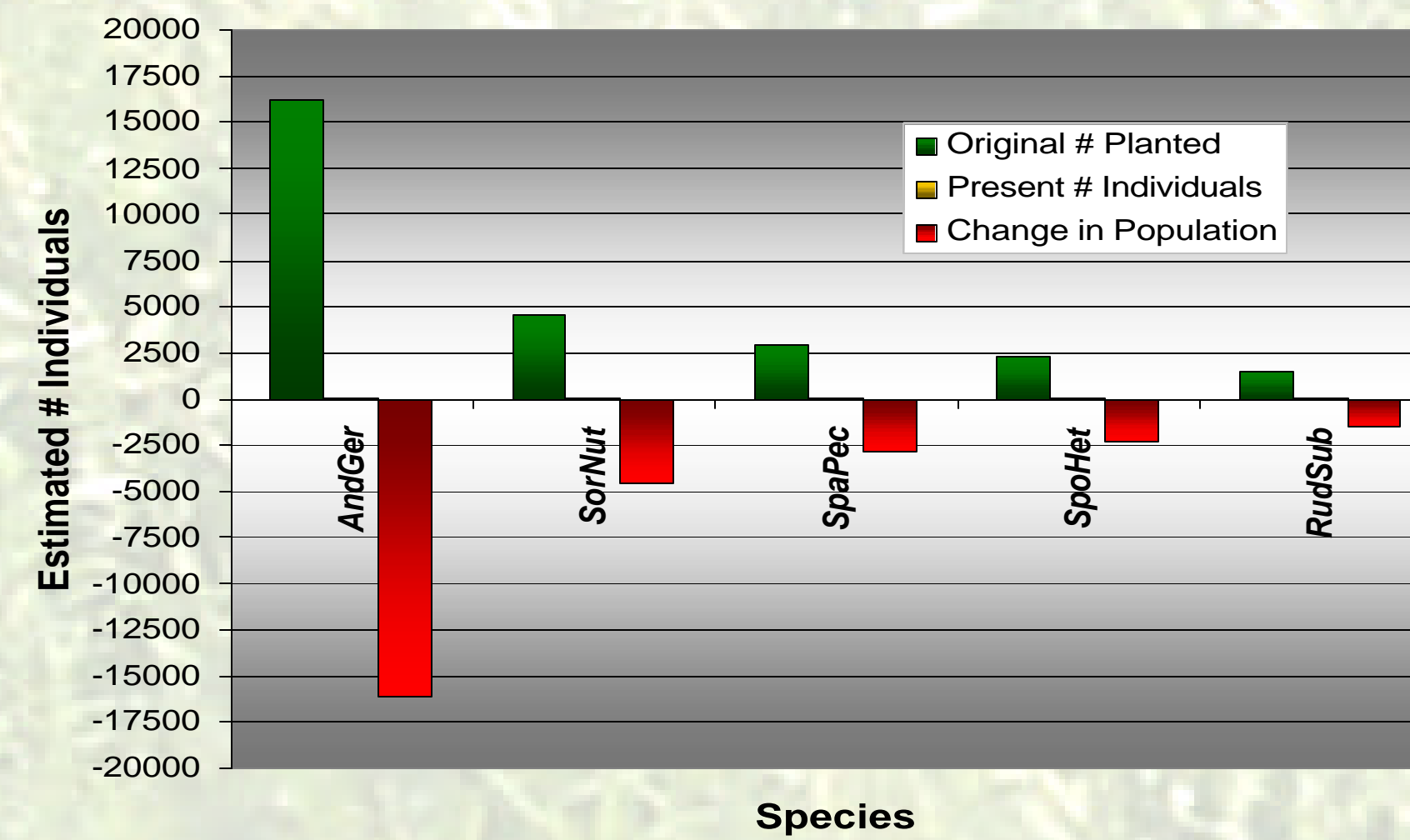
In order to collect the data, a grid was laid out with transect lines at ten meter intervals from a random starting point. The site was surveyed with a Topcon Total Station using State Plane UTM coordinates. Lines running due north were labeled a letter (A through N). Those running due east

were labeled a number (1 through 11). Each intersection of transects was marked using a rebar stake with ribbon label. Elevation was also recorded at each intersection. As these intersection points fell at consistent, unbiased intervals throughout the prairie, they satisfied the need for a random sampling method. These coordinates would be the center of the 1 meter square sample quadrats in which the number of species, the percent coverage of each species, and the number of individuals in each species would be measured. In addition to the inventory information and elevation recorded at each coordinate, soil plugs were taken at approximately 6-8" below the surface for the A horizon and then at another 6-8" further down for the B horizon. The soil samples were dried in an oven at 55 degrees Celsius for 96 hours, the dry mass was recorded and then divided by the volume of the cylindrical soil core to calculate bulk density. The data was organized by plot on a scale of 1-3 for Simpson's Index of [species] Diversity as well as elevation, and a scale of 1-5 for both A-horizon and B-horizon bulk density. The data was analyzed using PCORD ordination software.

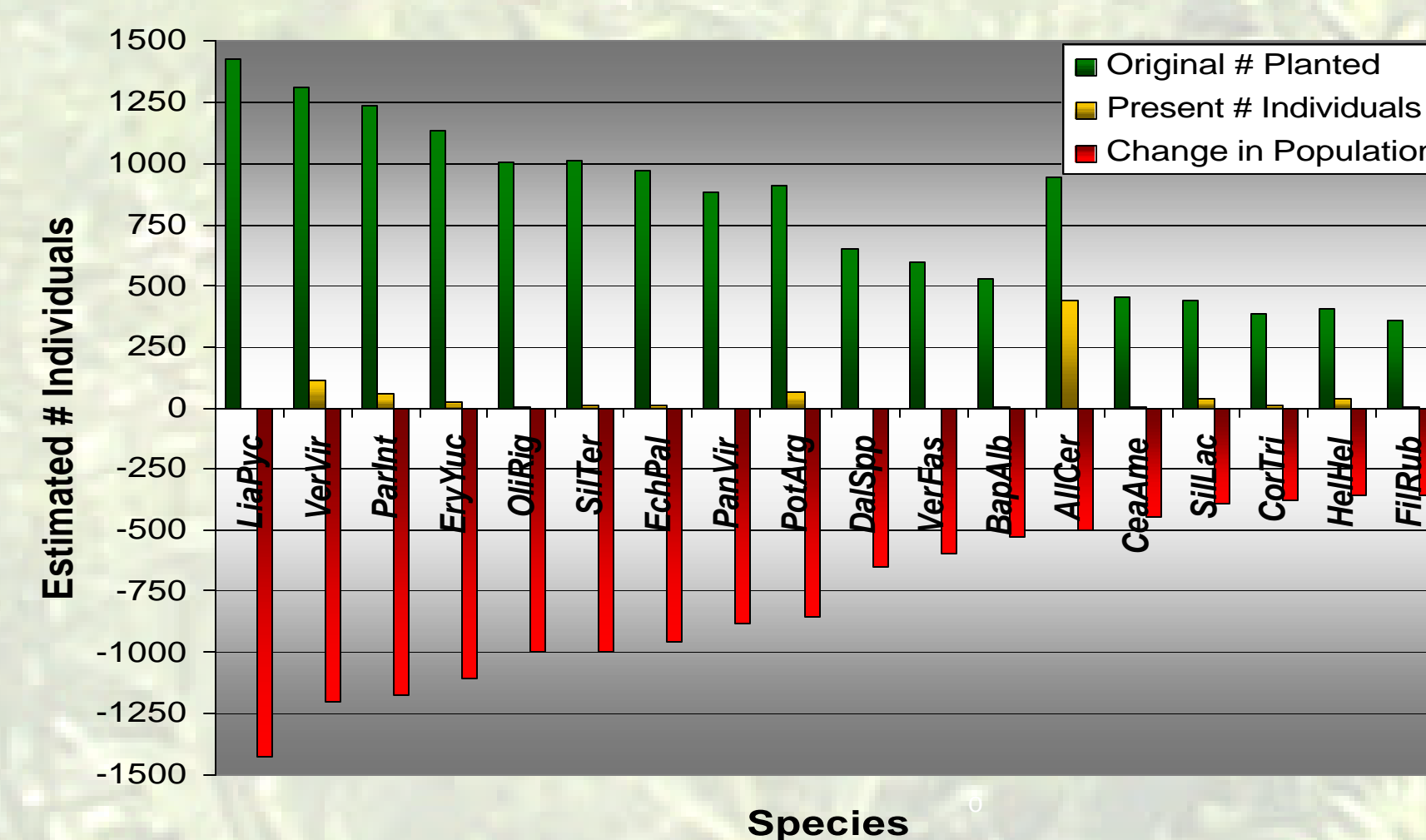
Results

Of the original 92 species plugged in the '82 and '83 seasons, 46 remain. However approximately 40 more species which were never planted have been found throughout the prairie. PCORD identified some patterns based

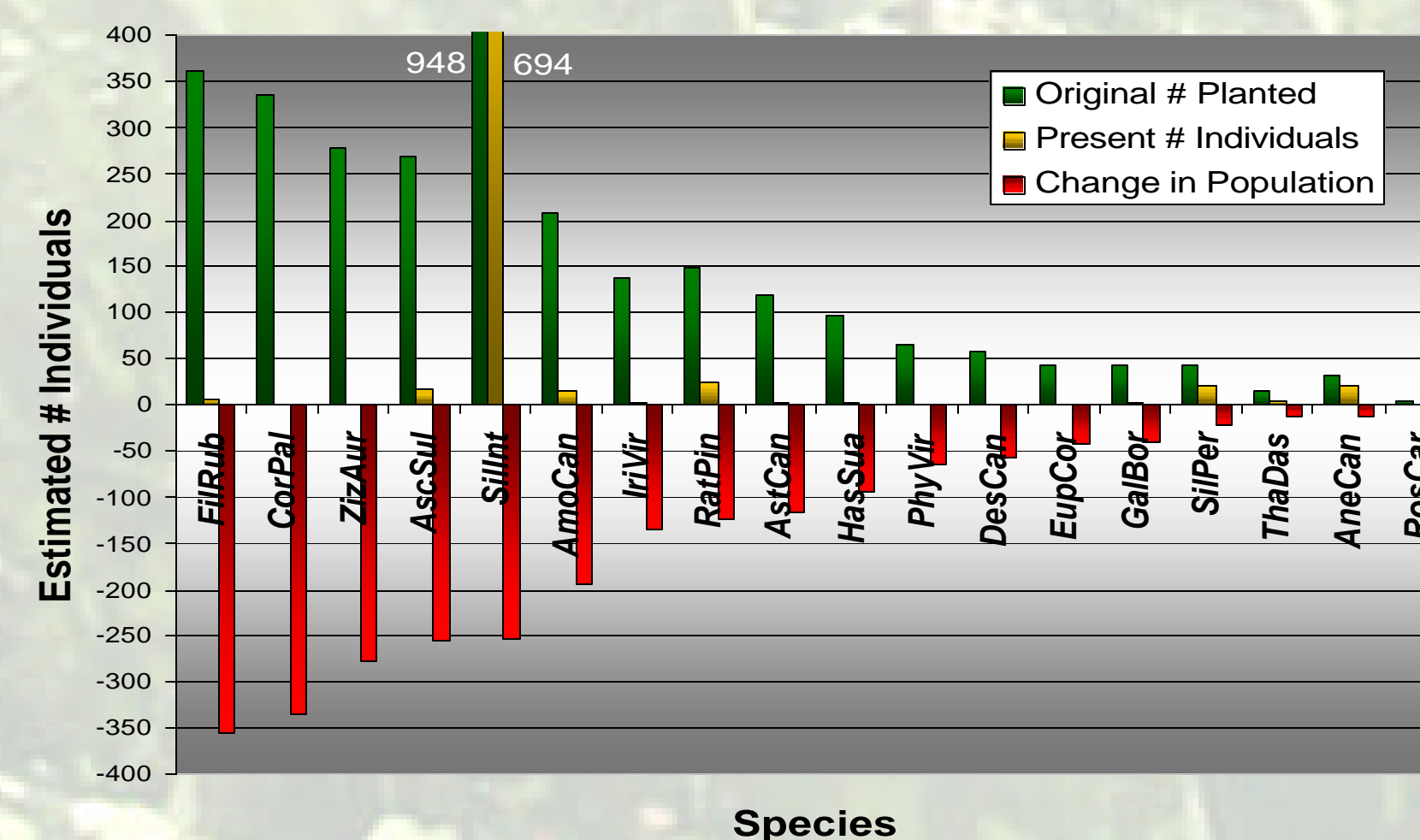
Drastically Decreasing Species



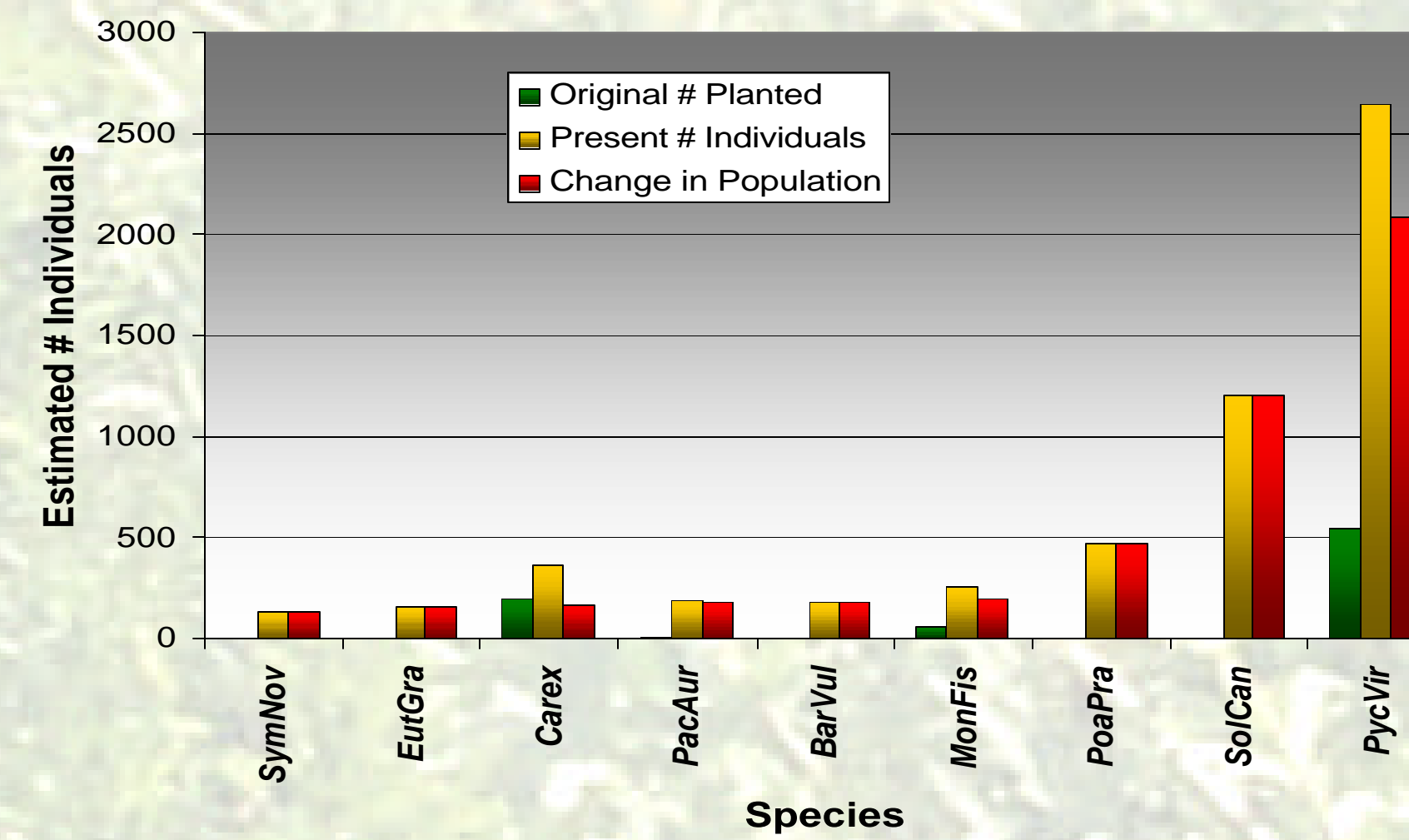
Significantly Decreasing Species



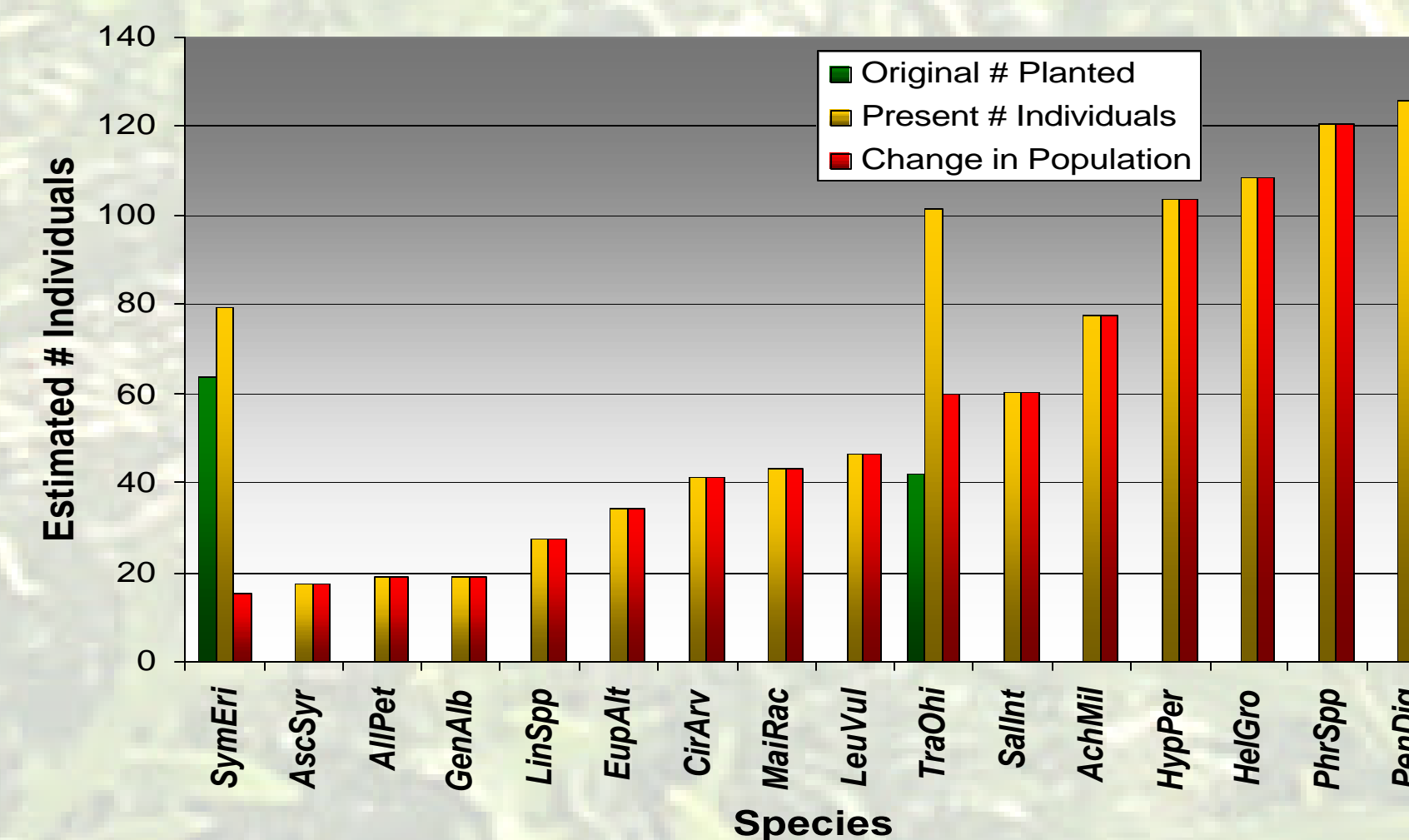
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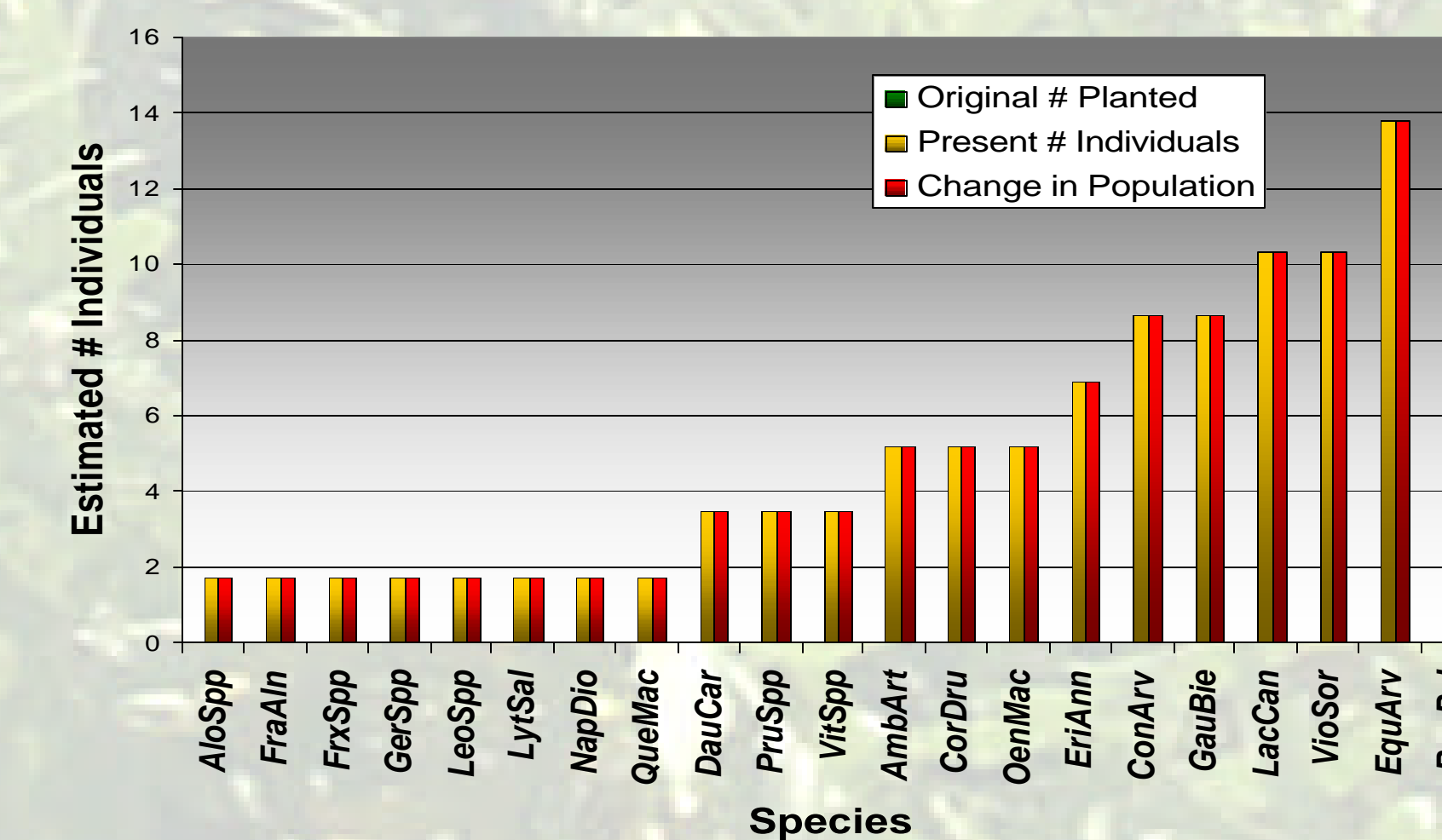
Drastically Increasing Species



Significantly Increasing Species



Slightly Increasing Species



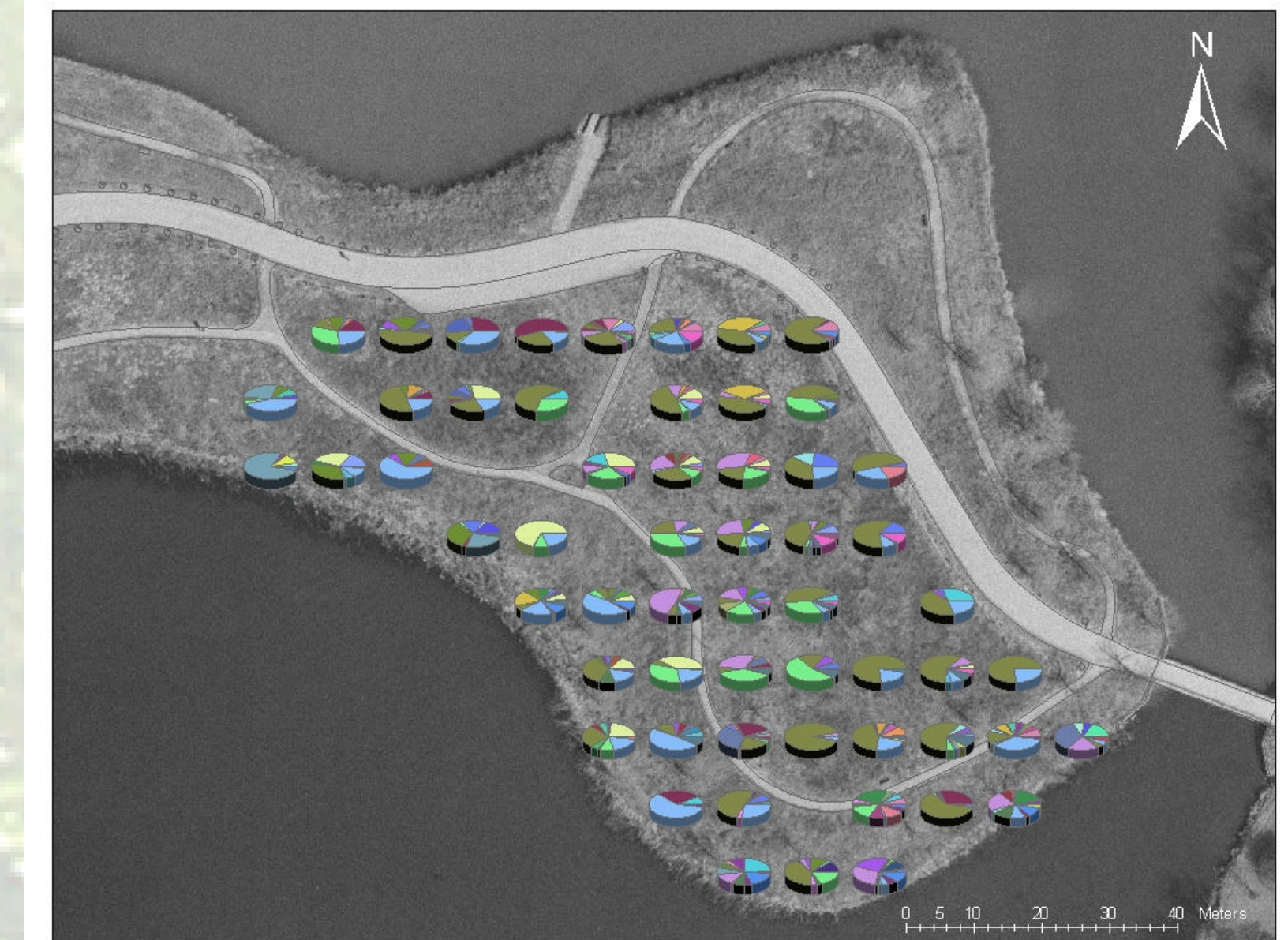
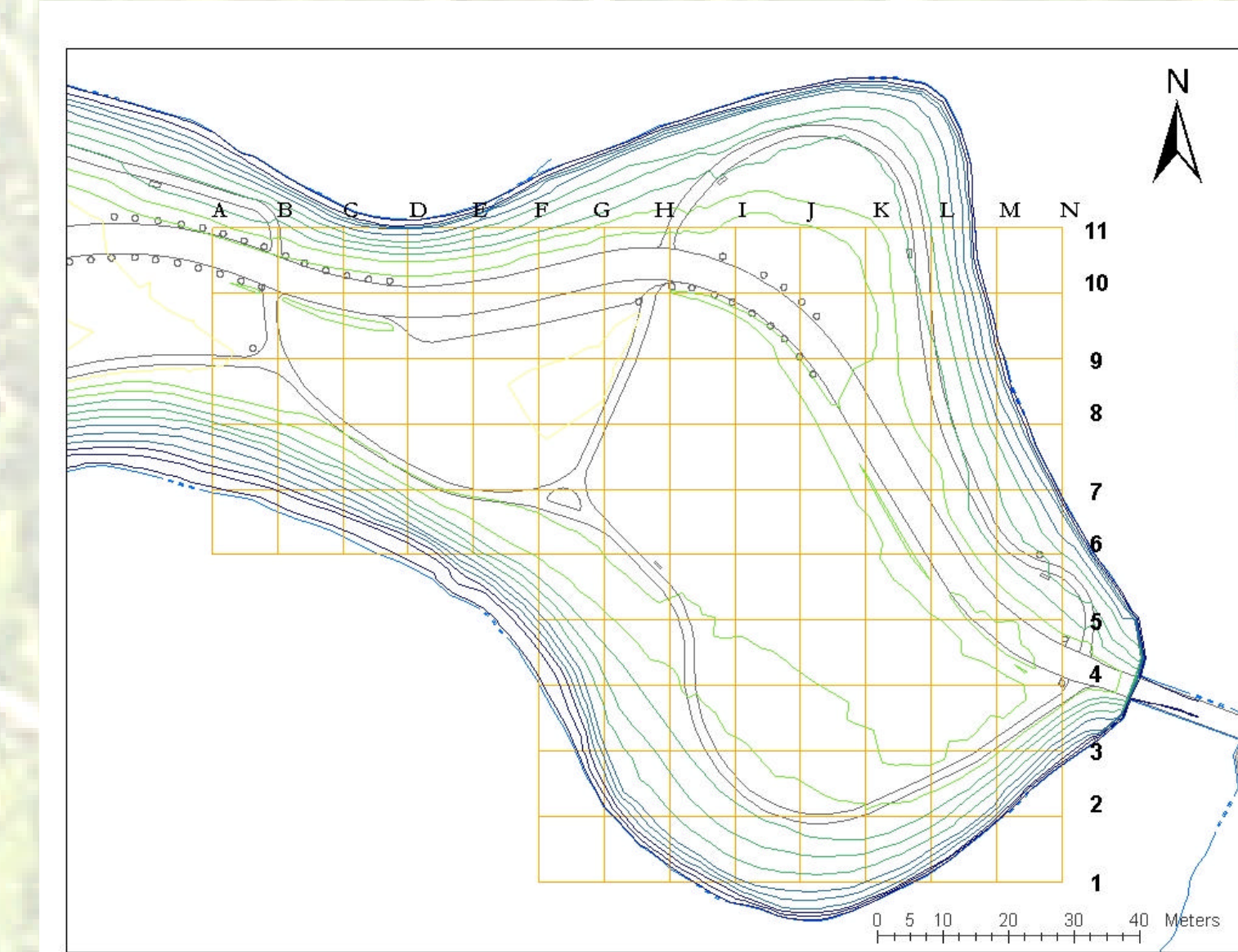
on the data. Certain species (including *Cornus drummondii*, *Phragmites sp.*, *Fraxinus sp.*, and *Salix interior*) are associated with sample plots in proximity to the Skokie lagoons along the perimeter of the prairie. These plots are, in general, at lower elevations and on south-facing slopes. Many of these species are considered weeds within the prairie but do reflect the more natural surroundings along the Skokie River corridor. Another strong association that the software identified was the correlation between the presence of *Pycnanthemum virginianum* and low species diversity. Other trends seem to be apparent according to the ordination analysis; however the strength of the correlations is difficult to interpret due to a lack of significant variation in the variables.

Discussion

Although the ordination analysis did not show any significant trends associated with bulk density, it is still possible that unnatural soil compaction exists below the A and B horizons. If the soil remains compacted, it may cause a perched water table that would affect the availability of water to the plants. Nutrition levels in the soil may also be a significant factor in shaping the composition of the prairie. Any data collected on other attributes of the prairie should be incorporated into the database to look for more definitive correlations.

Conclusion

Although this project was not necessarily conducted as a means of explaining the mechanisms which drive the ecosystem, the data collected is an indispensable reference point for future projects. It functions as the first step in a process that will have far stronger implications when studied over time. It will be part of the bigger picture in terms of qualifying (and when possible, quantifying) the changes that are taking place as this ecosystem evolves toward equilibrium. By leaving the sample sites permanently marked and recording the procedure so as to be repeated in the future, the process of data collection will involve less error, less preparation time, and therefore less future disturbance on the study area.



References:

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