WHO DOMINATES GRAVEL HILL: COMPARISON OF 1992 & 2005

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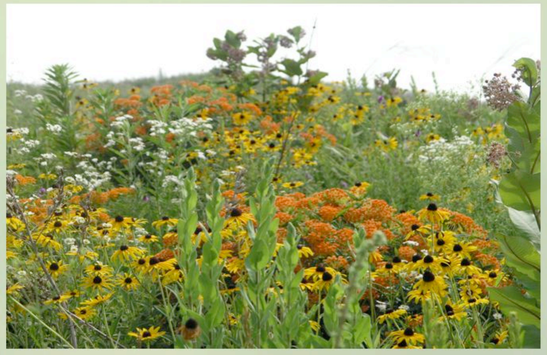


Figure 1: Northeast view of Gravel Hill Prairie

Abstract

Over a 13 year time span, plant coverage data was collected from Gravel Hill Prairie (GHP) in 10 specified transects at approximately the same time once a year. For this project, the specified goal was to analyze and correlate plant coverage data from 1992-2005 with respect to 7 variables. Fifteen over all dominating species from both years were identified using statistical analysis. One species, Bouteloua curtipendula, dominates the recreated gravel hill prairie. Factors influencing soil moisture were significant influences on species survival and distribution.

Background

Among the five other prairie recreations of Chicago Botanic Garden (CBG) under construction in the 80's and early 90's, GHP was constructed at the highest point of all the areas designated for prairies. Bank run gravel was brought from the glacial pits of Fox River Valley in McHenry county because of the lack of gravel and other needed ingredients on site. Construction of Gravel Hill Prairie was over a 2 year period (1991-soil layering established & 1992-planting of approximately 60 species) with continuous installations of new plants or seeds over time to increase or maintain diversity.

Methods & Materials

- Latitude, longitude and altitude were collected in each quadrant at 1 meter increments from the base to the center in all transects using TOPCON Total Station and maps created in ARCGIS
- Plant cover data was taken at each quadrant of all transects and evaluated by Floristic Quality Assessment Program
- Data Analysis was performed using JMP SYSTAT and tables created using Excel spreadsheets
- Results presented using Microsoft PowerPoint

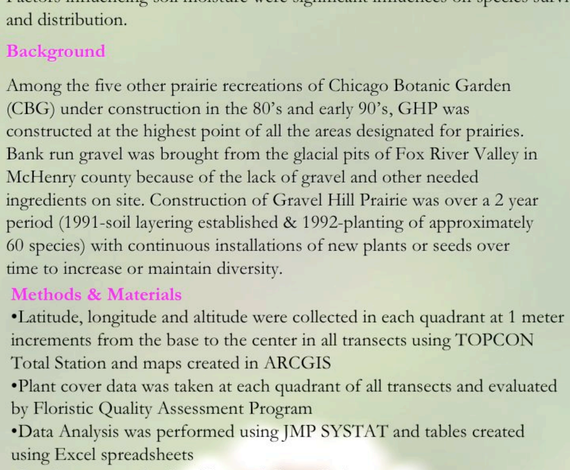
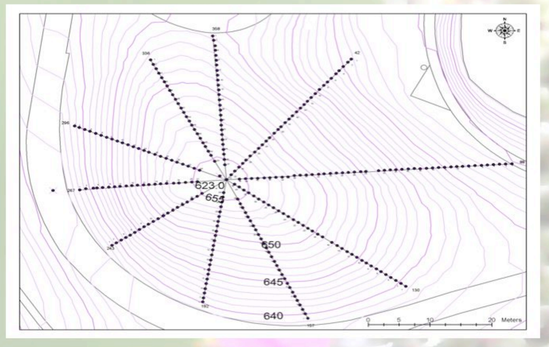


Figure 2: Transect plant data being recorded for 2005

Results



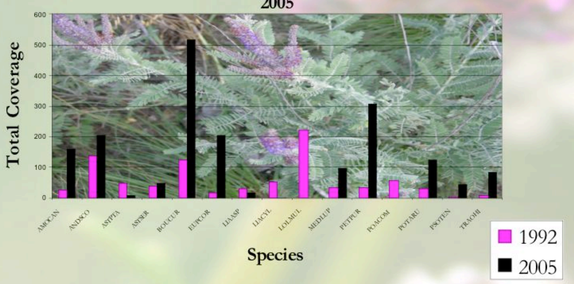
Map 1: Plotted quadrant points of each transect

Map 1 was created using ARCGIS. It graphically illustrates the relationship between transect, quadrant, and elevation to support analysis. Each dot represents a 0.25 m quadrant used for collecting data.

Statistical analysis of the data set revealed the following strong correlations:

- Higher slopes associated with low species diversity
- Wetness was most commonly a factor in differentiating species found on East versus (vs.) West slopes
- The greatest difference in species diversity was observed on North vs. South slopes

Graph 1. Species with the Largest Coverage in 1992 & 2005



Graph 1 & Table 1 document the species that were most common in 1992 and 2005. Of the 15 species shown all were upland except for four, MEDLUP, POACOM, POTARU, & TRAOHI. Two of the 4 species are weeds (MEDLUP & POACOM). Remarkably, two weeds present in 1992, LOLMUL & POACOM, were not recorded in 2005. Note on Graph 1 that 8 of the 15 species have more than doubled their coverage since establishment in 1992. Three of the upland species established in 1992 have decreased in coverage (ASTPTA, LIAASP, & LIACYL). Two of the species experienced a moderate increase in coverage over the past 13 years (ANDSCO & ASTSER).

Table 1. List of the Species with Acronyms and Common Names

Acronyms	Scientific Names	Common Name
AMOCAN	Amorpha canescens	LEAD PLANT
ANDSCO	Andropogon scoparius	LITTLE BLUESTEM GRASS
ASTPTA	Aster ptarmicoides	STIFF ASTER
ASTSER	Aster sericeus	SILKY ASTER
BOUCUR	Bouteloua curtipendula	SIDE-OATS GRAMA
EUPCOR	Euphorbia corollata	FLOWERING SPURGE
LIAASP	Liatris aspera	ROUGH BLAZING STAR
LIACYL	Liatris cylindracea	CYLINDRICAL BLAZING STAR
LOLMUL	Lolium multiflorum	ITALIAN RYE GRASS
MEDLUP	Medicago lupulina	BLACK MEDICK
PETPUR	Petalostemum purpureum	PURPLE PRAIRIE CLOVER
POACOM	Poa compressa	CANADA BLUE GRASS
POTARU	Potentilla arguta	PRAIRIE CINQUEFOIL
PSOTEN	Psoralea tenuiflora	SCURFY PEA
TRAOHI	Tradescantia ohiensis	COMMON SPIDERWORT

Discussion

Data collection of the plant species, latitude, longitude, and elevation of each quadrant in this project could be said to be important in documenting: species diversity, location, water preference, and orientation on GHP in relation to other environmental factors. Because of the size and shape of GHP, there are different microclimates. These microclimates experience different temperatures during the day, different evaporation rates, and the slope determines or influences the rate of run off of water.

Statistical analysis shows that other environmental factors also seem to be highly influential in determining location of species. Higher slopes are associated with low species diversity. In saying this, some upland species are apparently better adapted to dryer conditions than others. If the slope is steep enough, the run off of water can take place at a faster rate creating dryer soils.

We are assuming that the difference in soil moisture content between the East vs. West facing slopes influenced those species requiring wetter environments to survive on the East side of GHP.

The greatest difference in species diversity was observed on the North vs. the South slope. Different species seem to be adapted to the relatively hotter South side vs. the cooler North side.

Referring to Graph 1, coverage is the measurement of how much of the quadrant a species occupies. Coverage is measured on a scale between 1 and 5 with each measurement equaling 20%. The values shown in Graph 1 reflect total coverage of all 10 transects.

The 15 species shown are the top 10 with the highest coverage data in 1992 and 2005. Five of the species were found in both years.

In analyzing this data, all but 4 of the species (MEDLUP, POACOM, POTARU, & TRAOHI) were native to upland soil and therefore adapted to dryer soil types. The remaining species are facultative meaning, they can survive in both wet and dry soil type conditions. Of the facultative species, two (MEDLUP & POACOM) were non-native and introduced for erosion control during establishment in 1992.

Eight species (AMOCAN, BOUCUR, EUPCOR, MEDLUP, PETPUR, POTARU, PSOTEN, & TRAOHI) are very well adapted to the environmental conditions on GHP and have more than doubled in coverage over the 13 year period.

Two non-native species (LOLMUL & POACOM) were planted for erosion control during establishment and were not recorded in 2005. This exemplifies the temporary use of non-native species to recreate a natural environment.

Three species significantly decreased since establishment in 1992. Future statistical analysis will attempt to identify the factors influencing their decrease. Time was not available to attempt these analysis during this internship program.

Figure 3: Dave Sollenberger and author on Red Rider

Conclusion

This study documented the influence of environmental factors on survival and success of upland species in a recreated gravel hill prairie. As shown in Graph 1, *Bouteloua curtipendula* dominates GHP as of 2005.

I want to thank Dave Sollenberger for use of his data sets for 1992-2004 and his assistance with data collection in 2005; Veronica Harry-Jackson for her assistance in surveying and mapping techniques; Pren Sawyer for his assistance with data analysis; & Boyce Tankersley for his stories, mentorship, and help with this project.

In addition, I also want to thank National Science Foundation for funding; Chicago Botanic Gardens for their leadership and facilities to conduct this project; and Chicago State University for recommending me for this program.

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