GIS Analysis of Rare Plant Species of Texas

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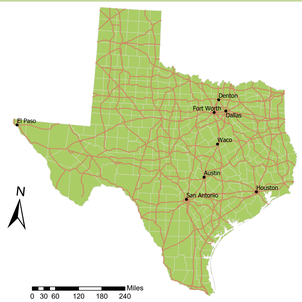
INTRODUCTION

The Botanical Research Institute of Texas (BRIT) was founded in 1987 in Fort Worth. Since its establishment, BRIT has served as both a scientific resource to the Fort Worth community and the world. BRIT scientists have discovered new species to science from their worldwide extensive research projects. Staff are also involved in community outreach and education with plant identification, early childhood education, and curation of herbaria specimens. BRIT houses about 1.5 million plant species in their state-of-the-art herbarium. Botanical research is important for understanding the agricultural, economic, environmental, medical, and social importance of the plants in our world. BRIT serves as teachers by communicating the importance of their findings with the local and scientific communities.

This GIS analysis aims to get a geospatial understanding of the rarity of plants in Texas dataset that BRIT is actively working on. The data includes the rarity indexes by the federal and state levels, as well as, endangered and threatened status of the species. According to the U.S. Fish & Wildlife Service, an endangered species are defined any species that is in danger of extinction throughout all or a significant portion of its range, and a threatened species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

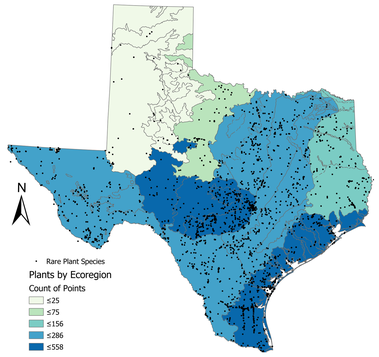


OBJECTIVES

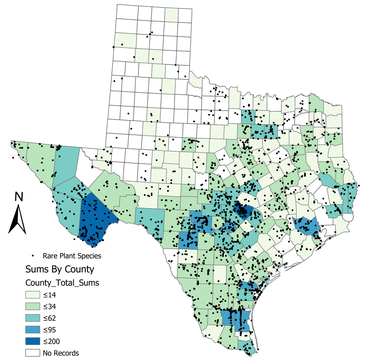
This project will use ArcPro to map the distribution of rare Texas plant species among the counties of Texas and by ecoregion. By mapping these species geographically, records can be summed by county and ecoregion to find under-researched regions in Texas. These maps will also show areas with large quantities and/or densities of rare species, which could lead to a better understanding of areas in need of conservation efforts.

ANALYSIS

Plants by Ecoregion



Plants by County



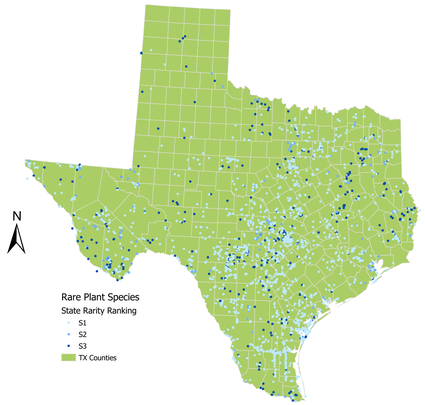
Plant Rarity

Spiranthes parksii

Found in Bastrop, Brazos, Burleson, Fayette, Freestone, Grimes, Jasper, Leon, limestone, Madison, Robertson, and Washington counties in eastern Texas. Its common name is Navasota ladies'-tresses, and it is both federally and state endangered.

Manihot walkerae

Found in Duval, Hidalgo, and Starr counties in south Texas. Its common name is Walker's manihot. It is both federally and state endangered.



Thymophylla tephroleuca

Found in Webb and Zapata counties in South Texas Bruch Country. Its common name is ashy pricklyleaf. It is both federally and state and endangered. It is a member of the sunflower family (Asteraceae).

Cryptantha crassipes

Found in Brewster County in west Texas. Its common name is Terlingua Creek cat's-eye. It is both federally and state endangered.

Quercus hinckleyi

Found only in Presidio and Brewster counties of west Texas. Its common name is Hinckley's oak. It is bother federally and State threatened. It is part of the beech family (Fagaceae).

Geocarpon minimum

Found only in Anderson, Gregg, Harrison, and Panola counties in Texas. Its common name is Earth fruit. It is both federally and state threatened. It is close to being removed from the endangered species list.

Zizania texana

Found only in Hays county in central Texas. Its common name is Texas wild-rice, and it is both federally and state endangered. It is a member of the grass family (Poaceae). Its populations have increased over the past 35 years while its range has simultaneously decreased.

METHODOLOGY

- Cleaned up the data, separating the data with latitude and longitude information and those that had only county wide data and fixed formatting issues so data can be input into ArcGIS Pro
- Uploaded and joined data information in ArcGIS Pro to form a master layer with all information
- Mapped the XY coordinates onto a Texas county file and an ecoregions file using a spatial join
- Summed the total numbers of species per county and ecoregion to understand where dense population are found in Texas using a join and field calculation

CONCLUSION

There are high densities of collections in central and west Texas. There needs to be more field efforts in the panhandle and northwest of the Dallas/Fort Worth area.

Further research is needed to determine the species richness, species diversity, and the Shannon index of these rare species. These three calculations will give a better understanding of the biological biodiversity of these plants in their habitats. More information is needed to be able to calculate these values, such as the area of the individual species' range. Also, more work is needed in combining and cleaning up the data provided by BRIT. With the numerous contributors to this project, the formatting has been inconsistent. Collecting all of the information to make all field complete among the different excel files will allow them to be combined into a master data file.

Once all of the data is complete and compiled in a master dataset, I would suggest using the local data points to run analyses on soil survey, precipitation, elevation, aspect, and geology maps. This information will get more detailed habitat information for the dataset that could not be collected easily in the field. All of the information to do these cross analyses is available through USGS and ArcOnline.

I also suggest a smart phone application similar to iNaturalist that would allow the public to help document these rare plant species. It should include a classification guide for identification. However, contributions must be anonymous to other users due to the endangered status of many of these plants. Much of botanic research is limited by grant money and field staff. This application would help these limitations.

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