

# Bloom in the Boroughs: DNA Barcoding Flowering Plants at The Ursuline School

Authors: Jenna Gleeson & Katrina Malaickal  
Mentors: Dr.Oxana Litvine and Peter Popov

## Abstract

Biodiversity is vital for ecosystem balance and environmental health. Flowering plants otherwise known as angiosperms help to support pollinators, regulate climate, and provide food and habitat. Urban areas, like the Ursuline School campus in New Rochelle, NY, contain both native and non-native flowering plants, often due to landscaping. This study assessed local plant biodiversity using iNaturalist and DNA barcoding. Thirty plant specimens were collected and identified through field observations and molecular techniques, including DNA extraction, PCR, gel electrophoresis, and DNA Subway analysis. Results showed extensive biodiversity, with 17 families and 9 ecological roles among the plants. Most species were non-native, but some native plants that benefit local pollinators were also found. DNA barcoding revealed several mismatches with iNaturalist identifications, underscoring its importance for species identification with multiple methods.

## Introduction

Biodiversity is essential for maintaining ecosystem stability and environmental health. Flowering plants, also known as angiosperms, support pollinators, contribute to food webs, and regulate climate. Urban environments often contain a mixture of native and non-native plant species due to landscaping practices. Traditional visual identification methods are not always accurate because many plant species appear similar. DNA barcoding uses standardized DNA regions, such as rbcL and matK, to improve species identification accuracy.

The Ursuline School campus in New Rochelle, NY contains a variety of flowering plants in gardens and landscaped areas. This study investigated campus biodiversity using iNaturalist observations and DNA barcoding techniques. We hypothesized that the majority of identified plant species would be non-native ornamental plants due to landscaping practices.

## Methods

### Sample Collection

- 30 flowering plant specimens were collected in September 2025 from gardens and landscaped areas around The Ursuline School campus in New Rochelle, NY.
- Small leaf samples were collected without damaging the plants.
- Photographs were uploaded to iNaturalist for species identification.
- DNA Extraction**
- DNA extraction was performed using the Urban Barcode Project protocol from the DNA Learning Center.
- Plant tissue was ground in lysis buffer using sterile plastic pestles.
- DNA was isolated using Whatman chromatography paper disks.

### PCR Amplification

- PCR amplification was performed using the rbcLaF and rbcLaR primer set.
- Thermal cycling conditions included:
  - Initial denaturation: 94°C for 1 minute
  - 35 cycles of:
    - 94°C for 15 seconds
    - 54°C for 15 seconds
    - 72°C for 30 seconds
- Samples were held at 4°C until analysis.

### Gel Electrophoresis & DNA Analysis

- PCR products were analyzed using 2% agarose gel electrophoresis stained with GelGreen.
- Successfully amplified samples were sequenced by Azenta.
- DNA sequences were analyzed using DNA Subway 2.0 and BLAST databases and compared with iNaturalist identifications.

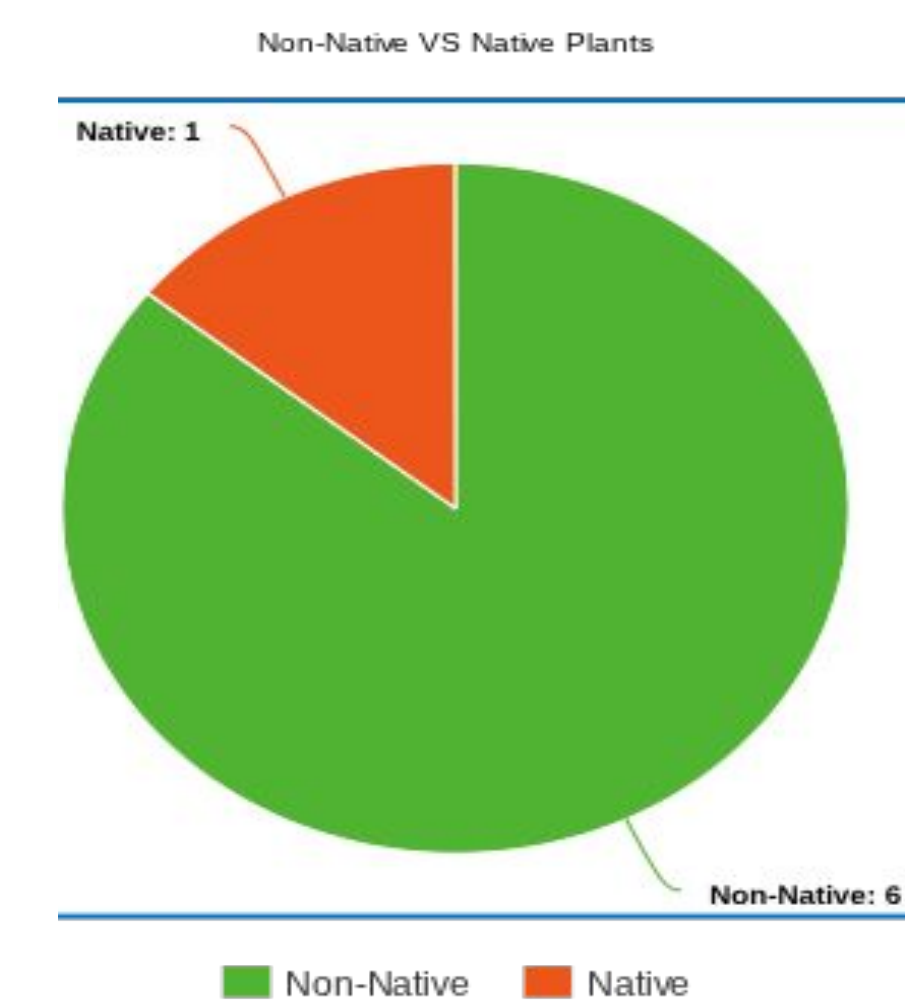


Fig 1. Gel Electrophoresis Samples 1-12

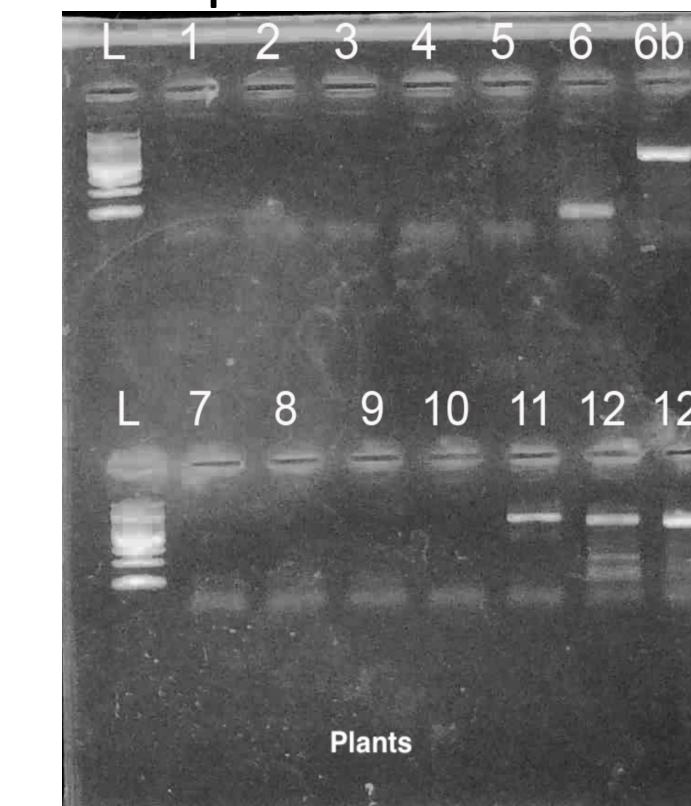


Fig 2. Gel Electrophoresis Samples 13-23

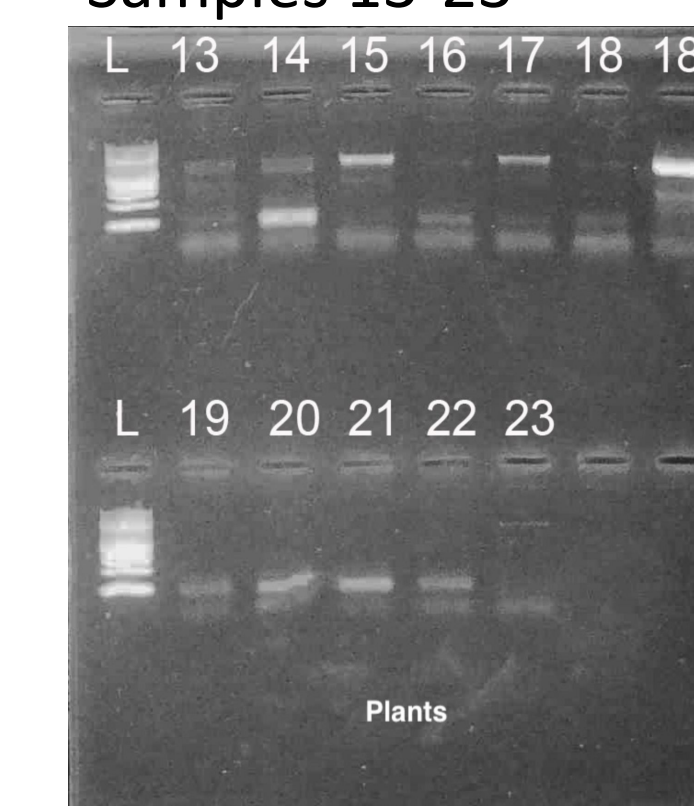


Fig 3. Gel Electrophoresis Samples 24-30



Sample #	iNaturalist Identification	BLAST Identification	Ecological Role	Native/Non-Native?
11	Camellia sasanqua (AI)	Pieris Japonica	Provides support for pollinators	Non-Native
12	Genus Setaria (AI)	Spinacia oleracea	Provides habitat for soil microorganisms	Non-Native
13	Viburnum taitoense (AI)	Ligustrum lucidum	N/A	Non-Native
15	Nyssa sylvatica (AI)	Magnolia x soulangeana	Provides support for pollinators	Non-Native
17	Aucuba japonica	Prunus pensylvanica	Prevents erosion	Native
27	Class Magnoliopsida	Prunus avium	Provides support for pollinators and mammals	Non-Native
29	Genus Begonia	Petunia integrifolia	N/A	Non-Native

## Discussion

- Our hypothesis was supported because the majority of successfully identified specimens were non-native decorative species commonly used in urban landscaping. The predominance of non-native ornamental species suggests that the biodiversity of The Ursuline School campus is strongly influenced by intentional landscaping choices rather than naturally occurring native plant communities.
- A major limitation of this study was the relatively low PCR success rate, with only 7 out of 30 samples producing successful amplification. This is primarily due to an issue we encountered in the process of preserving them.

## Acknowledgements

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## References

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