

A Comparison of Invasive Species Presence on the Edge of a Habitat vs. the Center

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Introduction

- The purpose of this project is to determine whether areas closer to human pathways contain a higher proportion of invasive species than habitats farther away. An invasive species is any non-native species that outcompetes the local species for essential resources such as nutrients or space (United States Department of Agriculture, 2025).

- Habitat fragmentation is a result of human interference and it produces an ecological phenomenon called the “edge effect.”

- The edge effect describes the ecological differences that tend to exist between the edge of a habitat and the interior. These differences can make edges more hospitable to invasive species, which often establish and grow rapidly while thriving in high light (International Fund for Animal Welfare, 2025).

- We hypothesize that invasive species’ preference for abundant sunlight will allow them to outcompete native species near the edges of forests, pathways, and meadows.

Methods

Thirty samples were collected along two 15-foot-long transects with 2 by 2 meter quadrats every 5 ft of the transect. DNA from the samples was isolated by using the centrifuge, lysis solution, silica resin, and cold wash buffer. The DNA was then replicated using PCR and the issued RBCL primer. After this, the amplified DNA was run on a gel to confirm its success. 25 samples were sent to be sequenced. The newly sequenced DNA was then run through BLAST on DNA Subtree v.2 to identify the species of plant. The identified samples were then run in the MUSCLE program to align the DNA sequences and then input into PHYLIP to create a phylogenetic tree that best represents the evolutionary relationships between the plants collected.

Results

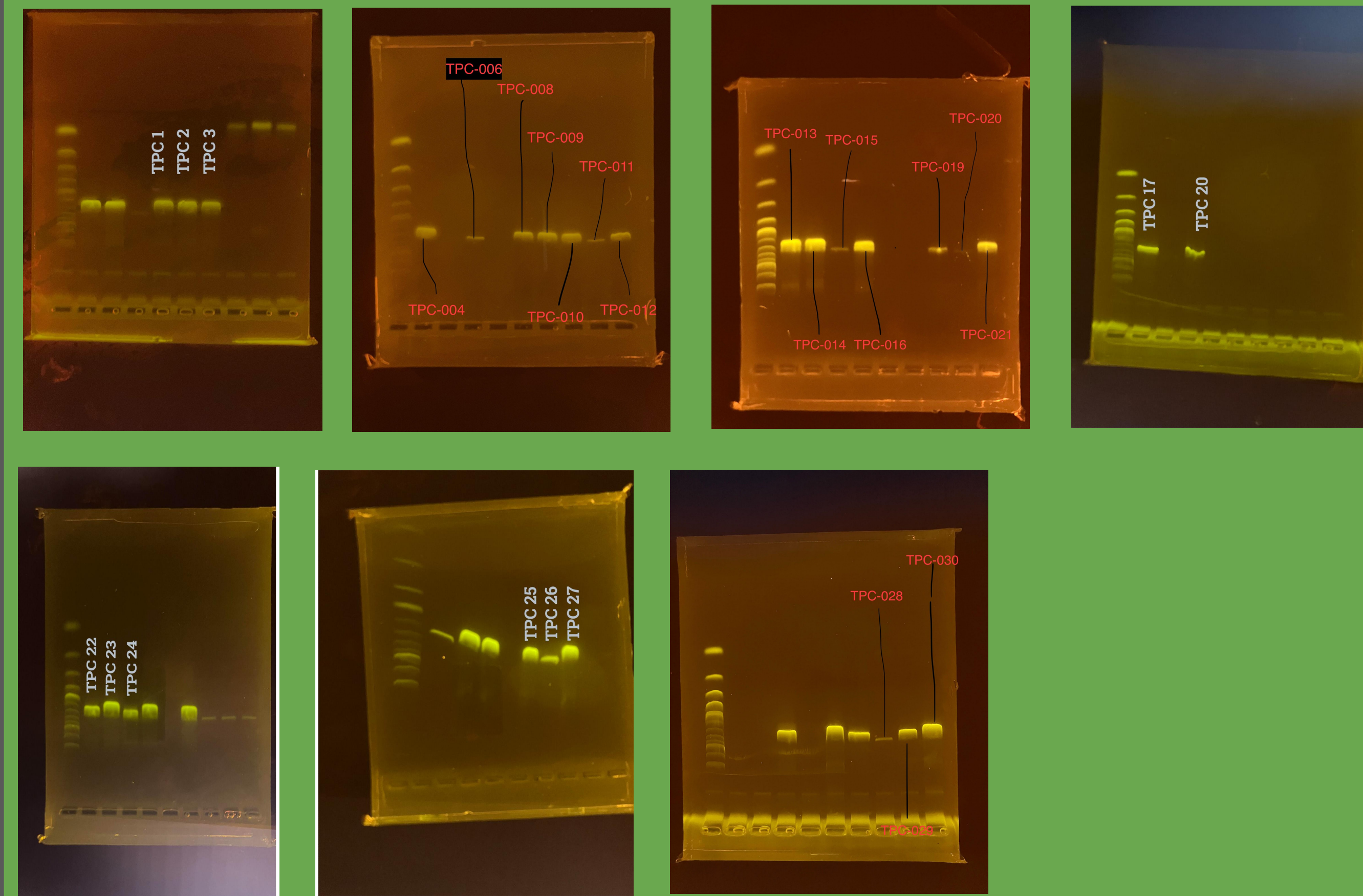


Figure 1a/1b/1c/1d/1e/1f/1g Gel Electrophoresis results Results of all gel electrophoresis tests with successful bands labeled with sample names.



Figure 3: Trimmed Multiple Alignment Created by MUSCLE. These are sequences of results illustrated by the MUSCLE program. This image shows 400 bp of sequence conservation, with the color demonstrating different nucleotides. In both the sequence conservation bar and the sequence variation bar, conservation is represented by gray and variation by white.

Sample	Transect	Species	Invasive
1	E1	<i>Celtis cinensis</i>	0
2	E1	<i>Artemisia vulgaris</i>	1
3	E1	<i>Mikania scandens</i>	0
4	E1	<i>Galium aparine</i>	0
5	E1	<i>Parthenocissus inserta</i>	0
6	E2	<i>Galium aparine</i>	0
8	E2	<i>Celtis sinensis</i>	1
9	E2	<i>Alliaria petiolata</i>	0
10	E2	<i>Alliaria petiolata</i>	0
11	E3	<i>Parthenocissus quinquefolia</i>	0
12	E3	<i>Oxalis dillenii</i>	0
13	E3	<i>Celtis occidentalis</i>	0
14	E3	<i>Galium aparine</i>	0
15	E3	<i>Saururus cernuus</i>	0

Table 1: Table 1 shows the results of DNA sequencing for samples on edge transects (samples 1-15, #7 excluded for inconclusivity). Whether a species is invasive is denoted by a 1 or 0 in the invasive column. 2 of 14 samples, or 14%, were identified as invasive.

Sample	Transect	Species	Invasive
16	I1	<i>Symphyotrichum lateriflorum</i>	0
17	I1	<i>Oligoneuron album</i>	0
19	I1	<i>Solidago nemoralis</i>	0
20	I1	<i>Symphyotrichum lateriflorum</i>	0
21	I2	<i>Parthenocissus inserta</i>	0
22	I2	<i>Oligoneuron album</i>	0
23	I2	<i>Symphyotrichum lateriflorum</i>	0
24	I2	<i>Ageratina riparia</i>	0
25	I2	<i>Lythrum salicaria</i>	1
26	I3	<i>Mikania scandens</i>	0
27	I3	<i>Phragmites australis</i>	1
28	I3	<i>Dryopoa dives</i>	0
29	I3	<i>Symphyotrichum lateriflorum</i>	0
30	I3	<i>Poa compressa</i>	1

Table 2: Table 2 shows the results of DNA sequencing for samples on edge transects (samples 16-30, #18 excluded for inconclusivity). Whether a species is invasive is denoted by a 1 or 0 in the invasive column. 3 of 14 samples, or 21%, were identified as invasive.

Discussion

Findings Contradicted Original Hypothesis:

- Two invasive plants found in edge transect
- Three invasive plants found in center transect

Potential Errors:

- Invasive plants being manually removed by park staff

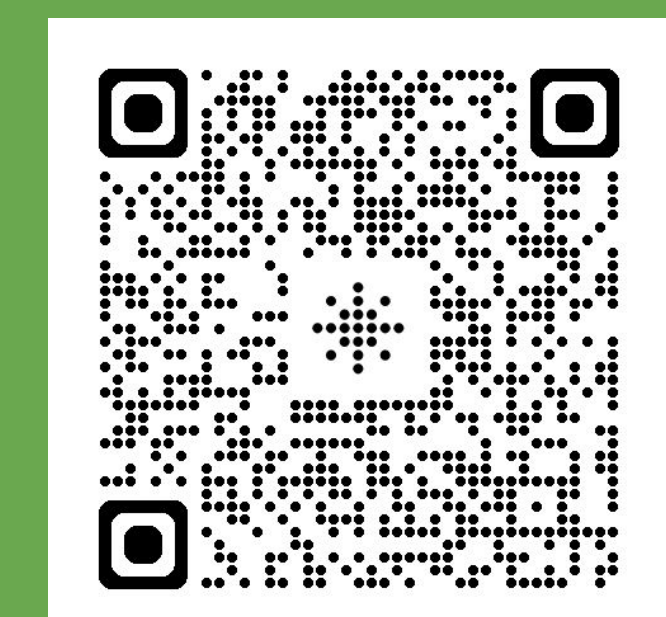
Our hypothesis was:

invasive species’ preference for abundant sunlight will allow them to outcompete native species near the edges of forests, pathways, and meadows.

Out findings did not support our hypothesis:

This is because in addition to the small scale of our research, we found only 2 invasive plants near the path. That contradicts our hypothesis because we found 3 invasive species within the the forest.

References



Acknowledgements

Thank you Dr. Koppa leading us in this project. Thank you to DNA Learning Center for providing the supplies and reagents. Thank you to Randall’s Island Park Alliance educating and letting us collect samples.

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