Distribution of Invasive Plants in Urban Riparian Areas: Baseline Inventory & Assessment of Roadside Effects

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ABSTRACT

Within urban areas of Connecticut, riparian areas are often degraded caused by pollution, damming, or invasive plant species. Invasive plants that dominate these areas destroy the root structure of the soil, resulting in erosion and flooding. One area in Connecticut that is affected by these factors is Gully Brook in Hartford, CT. The brook is surrounded by paved roads that give easy access for pollution to run off and make its way down to the brook. Farther down Gully Brook is an enclosed channel that has altered the ecosystem. Invasive plant species may be another potential issue to be addressed to restore Gully Brook, yet a basic inventory of invasive plants in the area has not been conducted.

My goal for this project was to evaluate the distribution of invasive plant species as well as the effects of proximity to road on invasive plant abundance to help guide management of the brook. I flagged all herbaceous invasive plants that I spotted along the brook and mapped their points using GPS and ArcGIS. Using a measuring tool in ArcGIS, I examined how far each individual was to the road.

Major findings from this study were (1) there were 5 herbaceous invasive plant species present in Gully Brook with Multiflora Rose being the most abundant, and (2) more invasive plants were found with greater distance from the road, which could be due to another trail running through the riparian area allowing for suitable conditions for invasive plants to prosper. This study provided important baseline data to aid removal and management of invasive plants along an important urban waterway.

INTRODUCTION

In Connecticut, there are 590 invasive plant species found in a variety of ecosystems,[1] one of them being Gully Brook (Fig 1), an important urban waterway. The top 10 invasive herbaceous plants in Connecticut have come from Europe and Asia through accidental transport of their seeds in agricultural products or introduced for ornamental use.[1] These invasive plants outcompete natives by altering soil pH levels, taking up space, removing nutrients, or inhibiting the growth.[1]

Dispersal and creation of suitable habitat conditions of invasive plants may be facilitated by roads.[2] This is a particular problem in urban areas where roads often cut through natural areas.

The objective of this project is to inventory invasive plants in an important waterway, Gully Brook, in Hartford, CT (3rd largest CT city) and evaluate how the proximity to roads affects the abundance of invasive plants.

I hypothesize that abundance of invasive plants increases with increasing proximity to road because there is an increase of light exposure that these species could utilize to grow and outcompete native species, and due to increased opportunities for dispersal from cars.

Fig 1. (Left) Surveying invasive plants in the less disturbed part of Gully Brook, which is the farthest point from the main road. (Right) The more disturbed end of the gradient closest to the road.

Fig 2. Photos of the five invasive herbaceous species present at Gully Brook from left to right: Japanese Barberry (*Berberis thunbergii*), Multiflora Rose (*Rosa multiflora*), Tree of Heaven (*Ailanthus altissima*), Japanese Knotweed (*polygonum cuspidatum*), and Oriental Bittersweet (*Celastrus orbiculatus*).

MATERIAL AND METHODS

I inventoried invasive plants in an important urban waterway and assessed the relationship between proximity of road on invasive plant abundance.

Study Area and Organism
- This study was conducted in Gully Brook in Hartford, CT.
- This brook is near Keeney State Park and contained copious amounts of trash (Fig 1) because of its close proximity to urban neighborhoods (Fig 3a).
- My main focus was on CT's top 10 most abundant herbaceous invasive plants (see Fig 2 for examples): Multiflora Rose (*Rosa multiflora*), Japanese Barberry (*Berberis thunbergii*), Tree of Heaven (*Ailanthus altissima*), Japanese Knotweed (*polygonum cuspidatum*), Oriental Bittersweet (*Celastrus orbiculatus*), Burning Bush (*Euonymus alatus*), Autumn Olive (*Elaeagnus umbellata*), Garlic Mustard (*Alliaria petiolata*), Purple Loosestrife (*Lythrum salicaria*), and Common Reed (*Phragmites australis*).

Data Collection and Analysis
- Day 1 (Oct 3, 2015): scanned Gully Brook to learn species identification and took samples (Fig 1) .
- Day 2 (Oct 10, 2015): surveyed from the area closest to urban development to the area closest to Keeney Park (Fig 3b).
- Used a GPS unit and ArcGIS Online to map the distribution of each invasive plant species along the Gully Brook
- I measured the distance to the road for all types of invasive plants (Fig 3).
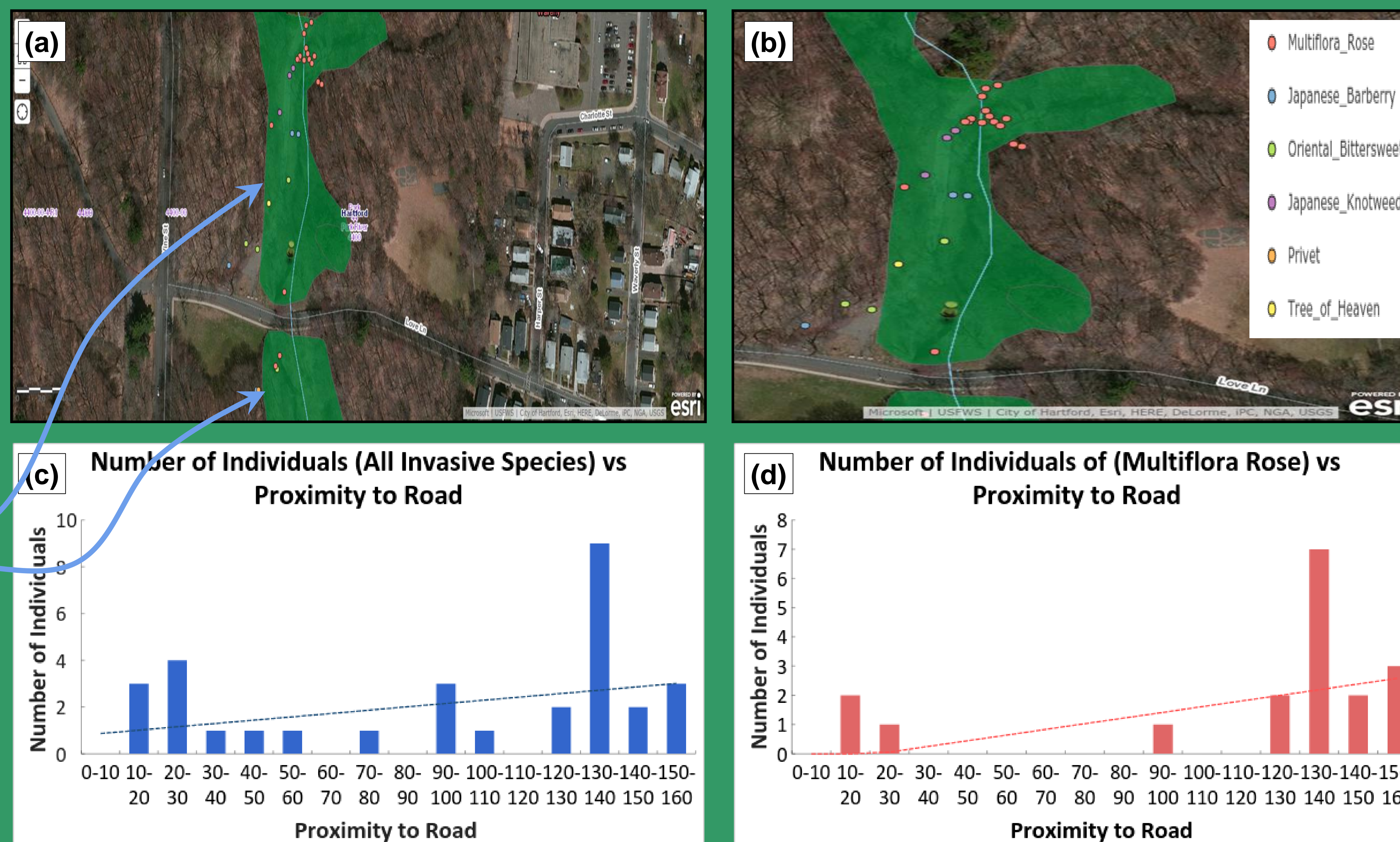

Fig 3. (a) Depicts the nearby neighborhoods and urbanization around Gully Brook (represented by green shading). (b) Shows the number of invasive species on one side of the road compared to the other side. (c) Number of individuals of all herbaceous plants at different distances from the road. (d) Number of individuals of Multiflora Rose with regard to distance from road.

RESULTS

Inventory
- I found 5 out of the 10 focal invasive plant species: Multiflora Rose, Japanese Barberry, Tree of Heaven, Japanese Knotweed, and Oriental Bittersweet (Fig 2).
- I found 18 individuals of Multiflora Rose, 4 Japanese Barberry, 1 Tree of Heaven, 3 Japanese Knotweed and 4 Oriental Bittersweet (Fig 3a).
- Most invasive plants were found in the side closest to Keeney Park (Fig 3b).

Proximity to Road
- When considering all invasive plants, the number of individuals tended to increase with distance away from road (Fig 3c).
- For Multiflora Rose (the most abundant invasive plant at Gully Brook), the increase in abundance was more apparent with distance away from road (Fig 3d).

CONCLUSIONS

By conducting this study I was able to assess the impacts of roads on the presence of invasive plants in an important urban riparian area.

I observed the opposite result than I hypothesize. The positive correlation between distance to road and number of invasive plants was due to an abundance of Multiflora Rose with a count of 18 individuals crowding about 130 meters away from the road. The dispersal of these plants was likely due to a trail that intersected the main road and ran parallel to the brook.

Surprisingly, there were very few invasive plants in the most disturbed end of the brook where there was a lot of trash. As we got closer to the main road the density of the invasive vegetation decreased. There were about 7 invasive plants 20-30 meters from the road.

This work highlights that unpaved trails could also promote the establishment of invasive plants. I recommend that managers of Gully Brook restore the trail with native vegetation or remove the invasive plants to prevent further dispersal of these plants along the trail system.
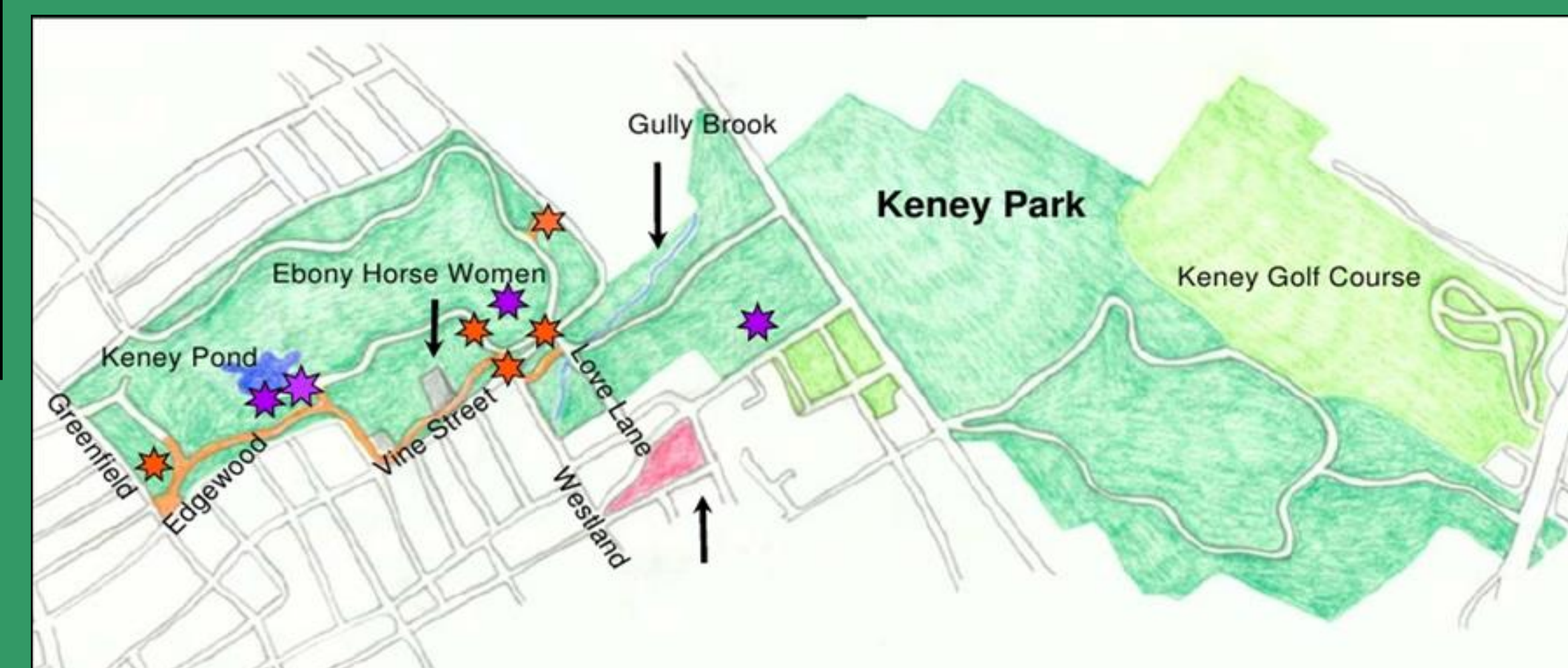
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