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# Managing terrestrial invasive species in the City of Worcester

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## Executive Summary

This project examined the growing impact of invasive plant species in Worcester, Massachusetts, and worked to develop a clear, research-driven framework for management and prevention. Through field observations, background research, and interviews with local conservation experts, we identified major invasive species, their pathways of spread, and the ecological and economic challenges they pose across Worcester's varied landscapes.

Building on these findings, we outlined an integrated approach that combines prevention, targeted removal, and community education. Recommendations include promoting responsible practices to limit introduction, applying mechanical and chemical control methods within an integrated pest management framework, and expanding public outreach to strengthen local engagement. We also evaluated funding opportunities and emphasized the need for a sustainable disposal system for invasive plant waste. Together, these strategies offer Worcester a practical, long-term roadmap for reducing invasive species impacts and supporting healthier urban ecosystems.

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# Introduction

Invasive species represent a significant ecological and economic threat to Worcester, Massachusetts. These non-native organisms, when introduced into new environments, often proliferate aggressively, outcompeting native species and disrupting established ecosystems (Lockwood et al., 2013). Their rapid growth and adaptability allow them to establish dominance in various habitats, leading to a decline in native biodiversity and altering the natural balance of local ecosystems. The impacts of invasive plants and animals extend beyond ecological concerns; they also pose substantial economic challenges by increasing management costs, damaging infrastructure, and depleting resources that communities rely on for recreation, tourism, and overall quality of life. The presence and spread of these species threaten to undermine the ecological integrity of Worcester's natural landscapes and urban green spaces, which are vital for supporting local wildlife, providing recreational opportunities, and maintaining the city's aesthetic appeal.

In Worcester, the impact of invasive species is particularly evident given the city's extensive network of parks, waterways, and urban green spaces that serve as critical habitats for native flora and fauna. These areas offer residents recreational and aesthetic benefits, fostering a connection to nature within an urban setting. However, invasive plant species such as Japanese knotweed, bittersweet, and mugwort have begun to encroach upon these natural areas, threatening their ecological health (Mass Audubon, 2025; Worcester Native Plant Initiative, 2025). These invasive plants often outcompete native vegetation, leading to a decline in biodiversity and disrupting the delicate balance of local ecosystems. For example, Japanese knotweed is notorious for its aggressive growth, which can damage structures and displace native plants that provide habitat and food sources for local wildlife. Similarly, bittersweet and mugwort can alter the composition and structure of ecosystems, further contributing to ecological degradation and reducing habitat quality for native species.



Japanese Knotweed

The spread of invasive species in Worcester is facilitated by a range of factors, including ongoing urban development, landscaping practices, and recreational use of natural areas (O'Reilly, et al. 2016). As cities expand and landscapes are altered, disturbed environments create opportunities for invasive species to establish themselves and spread more rapidly. Once established, these species present a formidable challenge because of their high reproductive rates, resilience, and ability to disperse over long distances through wind, water, and animal vectors. Their adaptability makes eradication impractical, so management efforts must instead focus on implementing sustainable, targeted strategies designed to slow or halt their spread, restore native ecosystems, and minimize both ecological and economic damages. Moreover, prevention plays a crucial role; strategies that

focus on reducing the chances of new invasives being introduced into Worcester's environment are essential for long-term management success.



Worcester, MA

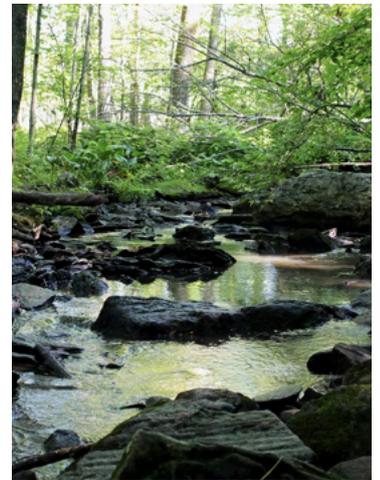
To address this complex issue, our study combines comprehensive academic research, local surveys, and fieldwork conducted at Coal Mine Brook Park, alongside interviews with local experts and conservation practitioners. Through this multidisciplinary approach, we aim to identify current challenges, assess the effectiveness of existing management practices, and develop targeted, practical strategies for invasive species control. We explored key topics such as what invasive species are, how they spread, their specific impact within Worcester, and how municipalities elsewhere have addressed similar challenges in the past. Working closely with the Worcester Native Plant Initiative, we engaged in fieldwork that provided firsthand insight into invasive plant populations and their ecological effects. Our goal is to develop informed, actionable recommendations that will help Worcester better manage and prevent invasive species, ensuring the protection and restoration of its native ecosystems for future generations.

## Background

Invasive species, which are non-native organisms that establish and proliferate within ecosystems outside their natural range, pose significant ecological and economic challenges not only locally but across the globe. Their presence often results in the disruption of native habitats, leading to a reduction in biodiversity and the displacement of indigenous species. The ecological impacts include altering habitat structures, interfering with vital processes such as pollination, nutrient cycling, and water flow, which are essential for maintaining balanced ecosystems (Lockwood et al., 2013).

Beyond ecological harm, invasive species create substantial financial burdens for communities and governments due to increased management and control costs, damage to infrastructure, and loss of resources that support recreation and local economies. The widespread and aggressive nature of many invasive organisms makes their management complex, requiring a nuanced understanding of ecological processes, landscape patterns, and human activities that facilitate their spread.

In Worcester, recent research and surveys have documented a dramatic increase in non-native species over the past century, with established non-native flora now comprising approximately 21%-36% of all plant species across the city's towns and surrounding areas (Bertin and Parise, 2014). This proliferation is largely driven by land use changes, particularly increased residential development, urban expansion, and disturbed landscapes, that create favorable conditions for invasive species to establish and thrive. Additionally, the presence of human-made corridors such as roads, utilities, and pathways further facilitates their dispersal across different habitats. For instance, invasive plants like Japanese knotweed and bittersweet have contributed to ecological degradation and have led to considerable economic costs, exemplified by Worcester's expenditure of over \$270,000 on removing infested trees alone (Bertin and Parise, 2014). Recognizing these patterns emphasizes the urgent need for targeted management strategies that are landscape-specific, focusing on limiting land disturbance, reducing habitat fragmentation, and controlling pathways that enable invasives to spread further.



Cascades - Worcester

The International Convention on Biological Diversity offers a framework for understanding how invasive species are introduced into new environments, emphasizing the importance of pathways and vectors. A pathway refers to the geographic route or corridor, such as roads, canals, or shipping routes, that an invasive species uses to reach a new location, while a vector is the agent, like ships, airplanes, or vehicles, that physically transports the species across regions. Both pathways and vectors can lead to either intentional or unintentional introductions, with increasing globalization and transportation significantly accelerating the spread of invasives (Roy et al.). In Worcester, a notable example of an intentional introduction is the planting of non-native ornamental species for aesthetic

purposes, which has contributed to the spread of invasive plants in urban and suburban landscapes (Mass Audubon, n.d.). Understanding and identifying these pathways is crucial for developing preventative measures aimed at reducing new invasions and controlling existing populations.



Worcester, MA

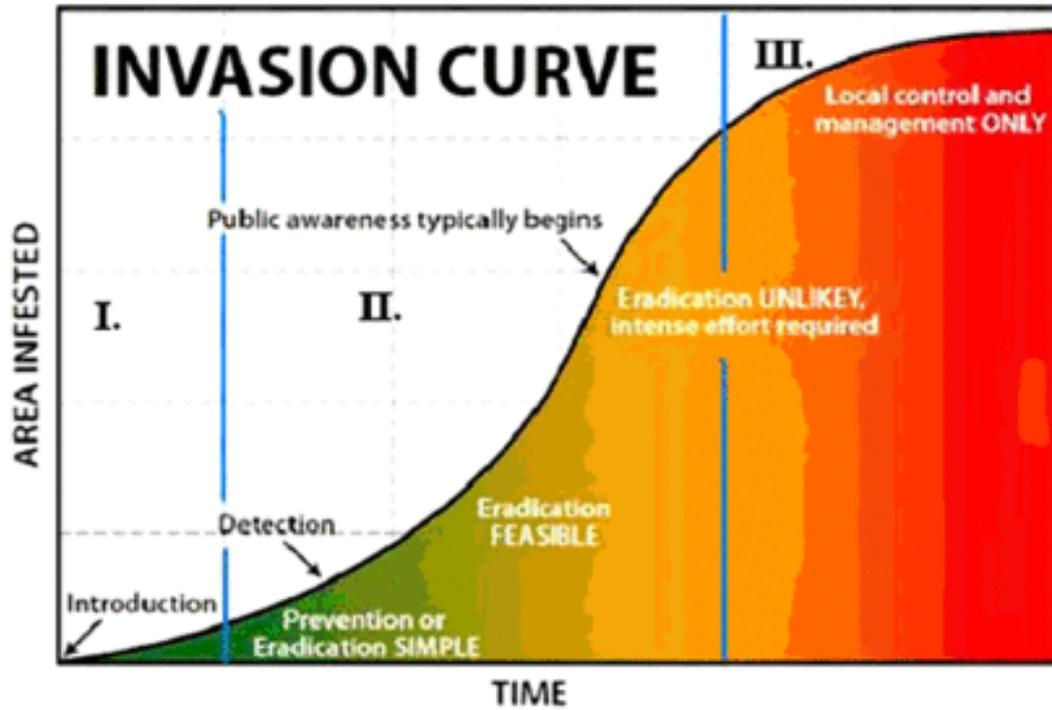
The mechanisms by which invasive plants disperse are diverse and often heavily influenced by landscape heterogeneity. According to O'Reilly-Nugent et al. (2016), features such as corridors, barriers, and habitat patchiness can either promote or hinder the spread of invasive species. For example, habitat corridors like roads, waterways, and utility rights-of-way can act as highways for invasive plants, enabling rapid, long-distance dispersal and colonization of new areas. Conversely, natural barriers such as dense forests, wetlands, or human-made barriers like fences can slow the invasion process. Worcester's landscape, a mosaic of rivers, forested areas, parks, and urban infrastructure, creates a complex environment where the spread of invasives is heavily influenced by these aforementioned features. Recognizing how dispersal is affected by these features is essential for designing effective management strategies.

Further understanding of dispersal dynamics is enhanced through models such as integrodifference equations (IDEs), which incorporate seed dispersal methods and population growth rates. As Neubert and Parker (2004) highlight, long-distance dispersal via wind, water, animals, or human activities can significantly accelerate invasion rates, making early detection and rapid response critical. Species capable of dispersing seeds over greater distances pose particular challenges for management, as they are more likely to establish in new locations before detection. This underscores the importance of modeling dispersal patterns to assess invasion risks, prioritize areas for intervention, and develop targeted management strategies tailored to Worcester's diverse landscapes.

Finally, invasion spread often follows feedback-driven and nonlinear patterns influenced by biological and environmental factors. Arim et al. (2005) demonstrates that mechanisms such as reproductive delays, Allee effects, and density-dependent reproduction can create thresholds where invasive populations either rapidly expand or decline. These nonlinear dynamics mean that invasives can remain relatively stable for extended periods but may suddenly experience explosive growth if environmental conditions become conducive. Recognizing these feedback mechanisms is vital for designing strategies aimed at disrupting invasion trajectories and protecting native ecosystems.

To combat the spread of invasive species effectively, many municipalities have adopted ecological assessments and management plans based on land use data and biological inventories. For example, Westford, MA, has established a comprehensive inventory and prioritization process for invasive species, guiding both short-term removal efforts and long-term ecological restoration, including mechanical removal, herbicide application, and native replanting (Davey Resource Group & Dodson & Flinker, Inc., 2023). These integrated approaches emphasize community engagement and public participation, which are critical components of successful invasive management. Implementing

similar strategies in Worcester will require recognizing invasion pathways and developing policies that effectively limit the introduction and spread of invasive species.



Invasion Curve - Cornell University

# Research Methodology

**The Goal:** We want to assist the Worcester Sustainability and Resilience Department in the management and prevention of terrestrial invasive species across the city by developing a comprehensive, multi-faceted framework that will mitigate the negative effects of certain invasive species in Worcester. We will propose strategies to limit the spread of new invasive species, tools to mitigate the effects of existing invasives, and develop a way to dispose of invasive plant material.



## Interviews

We interviewed two Worcester officials (Katie Liming, Lakes and Ponds Coordinator, and Eric Flint, Conservation Planner) to understand the city's priorities and approaches to managing terrestrial invasive species. We entered the interview with a number of set questions and went on to discuss which species are prioritized, key management goals, common control methods, and how funding and staffing limitations shape implementation. We also learned about disposal practices, decision-making frameworks, and Worcester's long-term plans for adapting or expanding its management strategies.



## Field Work

Our visit to Coal Mine Brook Park with members of the Worcester Native Plant Initiative (WNPI) gave us an overview of the invasive species affecting the area and the strategies used to manage them. WNPI representatives Elizabeth Flemming and Nicole Conzo explained how invasives threaten local ecosystems, discussed common control methods such as manual removal and targeted herbicide use, and showed us their native plant garden and highlighted how native species can improve ecological resilience.



## Academic Research

In our research, we observed the different ways invasive species can dominate ecosystems, as well as policies on how to prevent the spread of the invasive plants. We also studied various methods of reducing and removing non-native plants, and how to educate the public on issues regarding invasive plants.

Through interviews with city officials, hands-on field work, and a review of existing academic literature, our research provided a well-rounded understanding of how terrestrial invasive species are currently managed in Worcester and where there are still gaps. These combined approaches highlighted the importance of planning, long-term restoration efforts, and public education in addressing invasive species effectively. The insights gained from local experts and community volunteers informed the development of a comprehensive framework that balances prevention, active management, and responsible disposal, while remaining realistic within the city's funding and staffing constraints. This work establishes a strong foundation for sustainable invasive species management strategies tailored to Worcester's unique environmental context.

# Findings

Our interviews with representatives from the Worcester Native Plant Initiative (WNPI), including Elizabeth Flemming and Nicole Conzo, provided valuable firsthand insights into current management efforts and challenges. They emphasized that community involvement, such as volunteer-led invasive plant removal and native planting projects, is critical for progress. Their work at Coal Mine Brook Park demonstrates how targeted removal efforts, like manual pulling and herbicide use, can reduce invasive populations in specific habitats. However, they also highlighted resource limitations, such as funding shortages and staffing constraints, which hinder large-scale or sustained management efforts. These insights underscore the importance of community partnerships and dedicated resources for long-term success.

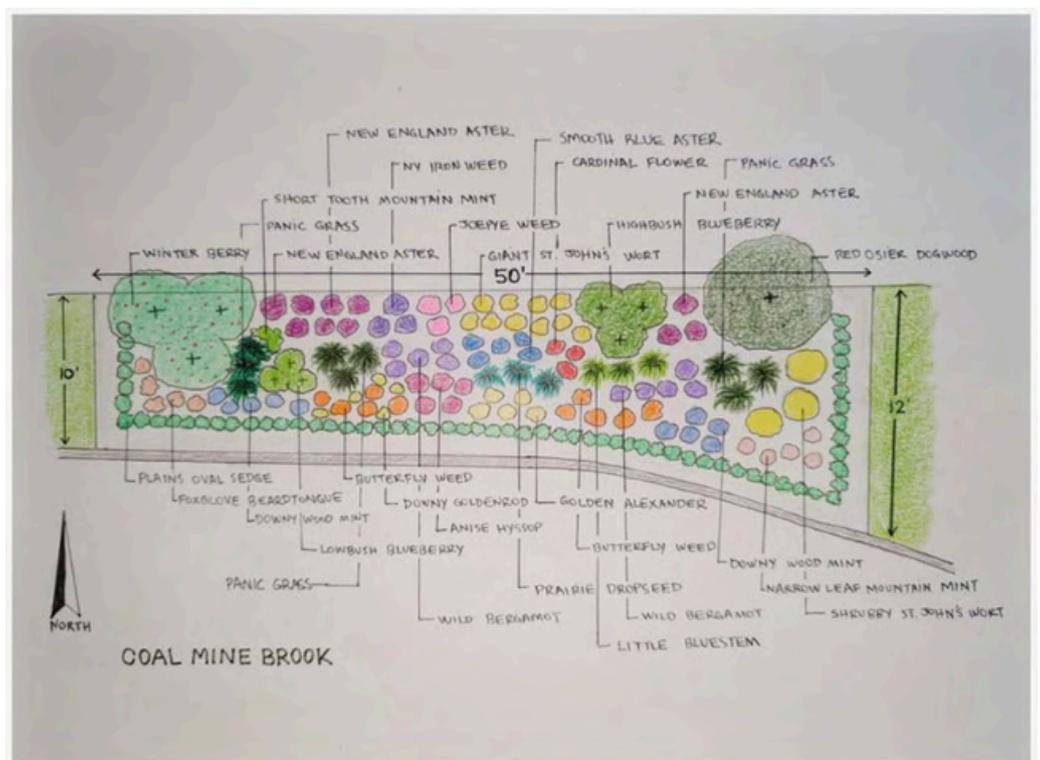
Our fieldwork at Coal Mine Brook Park revealed the presence of several invasive species, including Japanese knotweed, mugwort, phragmites, and oriental bittersweet. The park's location along waterways and its role as a spawning site for trout make it a critical habitat for native species, which are threatened by invasive encroachment. The invasive plants' ability to disperse via water, seed, and vegetative means allows them to colonize and dominate these disturbed habitats. The Worcester Native Plant Initiative's efforts to manage invasives here demonstrate both the challenges and opportunities for localized control strategies in ecologically sensitive areas.



Mugwort

Figure 1

Planting design schematic for native species restoration at Coal Mine Brook Park. The illustration shows the spatial arrangement of various native shrubs, grasses, and herbaceous plants within a 50-foot riparian buffer zone.



Looking at historical and recent flora data indicates a significant rise in nonnative plant species over the past 50–70 years. The number of invasive species documented in Massachusetts alone has increased to well above 700 out of 2,200 documented species, many of these invasive species arriving from East Asia. (Mass Audubon, 2025). The most problematic invasives tend to be those with long-distance dispersal mechanisms, such as bird-dispersed species like multiflora rose and bittersweet. (Sara Drake, et al, 2003) Our research confirms that invasive plants are more prevalent in areas with high land disturbance, such as residential zones, roadsides, and utility corridors, patterns consistent with findings from other studies (Wanting Dai, 2025). The spatial distribution and increasing numbers of invasives highlight the urgent need for targeted management.

Field observations and interviews reveal that Worcester’s invasive management efforts are hampered by limited funding, which restricts manpower and equipment needed for effective removal and disposal. The WNPI team explained that the lack of dedicated funding prevents comprehensive early detection, timely removal, and extensive public education, all of which are essential components of successful invasive management. These constraints mean that invasive species like phragmites and Japanese knotweed often go unchecked until they become widespread, complicating control efforts.



Japanese Knotweed Seed

Furthermore, our findings suggest that addressing invasive species in Worcester requires a proactive, multi step approach that combines immediate removal efforts with long-term prevention strategies. Implementing educational programs aimed at residents, landscapers, and local businesses can significantly reduce the unintentional introduction and spread of invasives through landscaping and horticultural practices. Additionally, establishing volunteer-based monitoring programs could enhance early detection, allowing management teams to respond more swiftly to emerging invasions before they become unmanageable. Building partnerships with community organizations, schools, and local government agencies will be essential in fostering a collective sense of ownership and responsibility for ecological health and invasive species management.

Looking ahead, it will be crucial for Worcester to prioritize securing dedicated funding streams, perhaps through grants or municipal budget allocations, to sustain and expand invasive management initiatives. Incorporating invasive species management into urban planning and land use policies can also help mitigate future invasions by reducing habitat disturbance and fragmentation. Moreover, investing in research to refine control methods—such as more effective herbicide use, native plant restoration techniques, and habitat modifications—can enhance the efficiency of ongoing efforts. Ultimately, a coordinated, well-funded, and community-supported strategy will be vital in safeguarding Worcester’s natural ecosystems, preserving biodiversity, and ensuring the resilience of its urban landscapes for generations to come.

# Inventory of Invasive Species

In order to accurately manage the problem of invasive species, it is crucial that one of our first steps is taking an inventory and identifying the plants and animals that we are seeking to address.



Due to factors like lack of funds and manpower, the city of Worcester has historically not been able to do much with regard to invasive species. We believe a key step the city must take in terms of starting to manage these species would be to take an initial inventory of the location of these problematic plants.

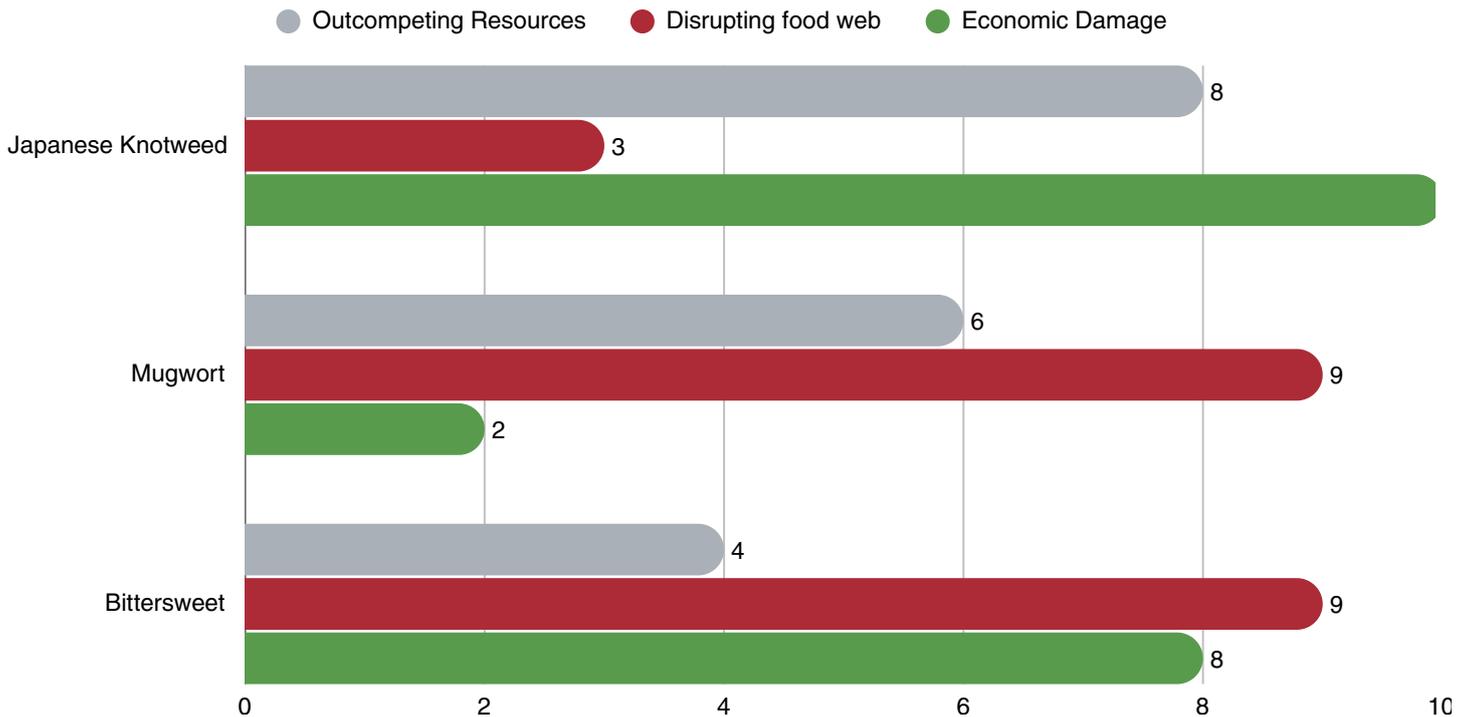
## Why taking inventory is important

- 1 Effective management of invasive species requires a clear understanding of where these plants are located. Identifying areas with dense concentrations of invasives allows management efforts to be strategically focused, enabling meaningful ecological improvements with limited time and resources. Given that invasive species management initiatives in Worcester are likely constrained by funding and manpower, efficient allocation of these resources is essential.
- 2 Appropriate management techniques depend heavily on site-specific conditions. For example, when invasive species are located near or within areas of dense native vegetation, chemical control methods such as herbicide use may pose risks to non-target species, making alternative approaches more suitable.
- 3 Taking an inventory establishes a baseline for monitoring invasive species in the city over time. By documenting the initial distribution and density of invasive plants, the city can evaluate the effectiveness of management efforts, identify areas where invasives are re-establishing, and adjust strategies as needed. Long-term tracking is critical for adapting management plans, as it allows decision-makers to assess which control methods are successful and ensures that resources are directed to the correct areas.

# Risk Identification

Through our own research and analysis, we have identified which of Worcester’s most populous invasive terrestrial species are the most risk to the native environment through 3 categories: outcompeting natives for resources, disrupting food webs by replacing vital food sources, and causing economic damage by degrading habitats, clogging waterways, and degrading buildings and public infrastructure.

## Invasive Risk Analysis



Our analysis identified Worcester’s most common invasive species, Japanese knotweed, Mugwort, and bittersweet, based on their risks to native ecosystems across three categories. Japanese knotweed poses the greatest threat economically, with a score of 10, due to habitat degradation, clogging waterways, and damaging infrastructure. It also ranks high in outcompeting native plants (8) and has a moderate impact on disrupting food webs (3). Mugwort presents a significant threat to food webs, scoring 9, and a moderate risk of outcompeting natives with a score of 6, but it has minimal infrastructure damage (2). Bittersweet scores highly in disrupting food webs (9) and causing economic damage (8), primarily through habitat degradation, but poses a lower risk for resource competition (4).

These scores highlight that Japanese knotweed’s high economic impact makes it a top priority for management, while mugwort and bittersweet threaten native biodiversity through food web disruption. Understanding these risks allows for targeted control efforts, helping allocate resources effectively to species that pose the greatest threat to Worcester’s ecosystems and infrastructure.

These ratings were created based on our extensive research and analysis of each species’ behavior, spread, and ecological impacts within Worcester. By reviewing scientific literature, field observations, and expert insights, we assessed each species’ potential to outcompete native plants, disrupt food webs, and cause economic damage, resulting in the scores used in our chart.

# Control and Management Options

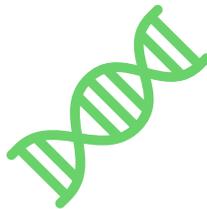
Effective control of invasive plant species relies on combining methods that address both immediate growth and long-term prevention. Mechanical techniques like pulling, digging, cutting, and mowing reduce plant biomass, while suffocation methods limit regrowth by blocking light. Chemical treatments and select biological controls offer targeted suppression when used carefully, and cultural practices help create conditions less favorable to invasives.

## Pulling and Digging



Pulling and digging is a method of control that involves removing a plant and as much of its root as possible by hand or using small tools.

## Biological



Biological control methods use insect predators and plant diseases from an invasive species' native habitat in order to combat their population growth and effects.

## Chemical



Chemical control is one of the most effective and efficient ways to deal with invasive species. In chemical control, herbicides such as glyphosate and triclopyr are used to control and eliminate invasive species in a given environment.

## Suffocation



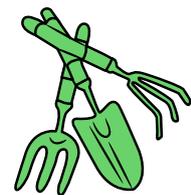
To suffocate small seedlings and herbaceous plants, cover the area with 2-3 layers of UV-stabilized plastic sheeting, secured with stakes or weights, extending five feet beyond the edge. Leave for at least two years, then plant a cover crop to prevent regrowth.

## Cutting and Mowing



Cutting and mowing is a method of control where you cut and mow away the green parts of plants to stop the process of photosynthesis. You must be able to visit the site of the plants three to five times a year to trim back new growth.

## Cultural



Cultural control is a method of control where you must change human behavior to help prevent spread and further growth of invasive plants. An example of this is educating homeowners on what garden plants are native versus non-native.

## **Integrated Pest Management**

Integrated pest management is the practice of using a combination of strategies and control techniques in order to deal with invasive species in a given area. Rather than relying on a single control method, IPM integrates multiple strategies selected based on site-specific conditions and species characteristics. This approach prioritizes prevention and the least invasive control methods first, using chemical controls only when necessary and in a targeted manner. By integrating multiple control methods together, IPM allows municipalities to adapt to shifting conditions, reduce unintended harm to native species, and make more efficient use of resources.

## **Disposal**

Disposal of invasive species is difficult due to the fact invasive species spread extremely quickly. Furthermore, if waste is not handled correctly, the species may spread even more. Composting reduces waste and creates resources for native plants, but may spread seeds if not done properly and can be slow. Incineration quickly reduces waste volume and kills pathogens. However, it emits pollutants and carries notable operation expenses. Another disposal method is the usage of burn piles, which is simple and effective for small amounts of waste. Unfortunately, it can cause air pollution and safety risks, and seeds may not always burn completely.

# Control and Management Options

## Species Specific Mitigation Plans



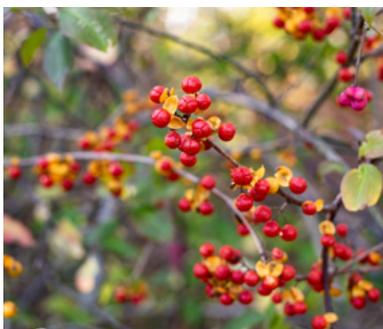
### Japanese Knotweed

We recommend a combination of mechanical control alongside chemical treatment, or alternatively, suffocation techniques to effectively manage this invasive species. If opting for the integrated approach, the process begins with initial cutting or removal of the plant's above-ground biomass, followed by regular maintenance—ideally every 2-3 days—to trim new growth. After each trimming, herbicides should be carefully applied to the cut stems to prevent regrowth. This method requires a significant time commitment and consistent effort. If the necessary dedication cannot be maintained, then suffocation methods—such as covering the area with heavy plastic or mulch—are advisable as a more passive, long-term control strategy.



### Mugwort

Controlling mugwort involves a combination of manual removal and chemical treatment. The initial step is to pull or dig out the plant, ensuring as much of the root system is removed as possible to prevent regrowth. Following removal, the site should be treated with herbicides and monitored over several months to address any remaining or resprouting plants. Repeated applications of herbicide are essential to effectively suppress this resilient invasive. Consistent management over time is crucial for successful eradication.



### Oriental Bittersweet

For oriental bittersweet, we recommend a combination of mechanical and chemical control methods. Begin by trimming the vine as close to the ground as possible, ensuring minimal damage to the host tree if present. Carefully extract the plant from the tree's trunk or branches without causing harm. Once cut, apply a targeted herbicide to the freshly cut stump—using a small brush or applicator—to prevent resprouting. Continue this process until the plant is entirely dead, repeating as necessary.

# Education

One of the most effective ways to manage invasive species is by teaching citizens how to recognize invasive species and educating them on what they can do about the problem.

## Strategy 1



Mass EE Curriculum

## Environmental Education in Schools

Incorporate invasive species topics into school curricula, especially in science classes, through activities like native planting and invasive removal projects. This early education fosters awareness and stewardship among young students, helping to build a generation committed to protecting local ecosystems. Schools could have Green Clubs which go out into public land and remove invasive species under the guidance of a faculty member.

## Strategy 2



Worcester Native Plant Initiative

## Community Workshops

Hold workshops to teach residents how to identify, remove, and prevent invasive species. These hands-on sessions empower community members with practical skills and knowledge, encouraging active participation in conservation efforts.

## Strategy 3



State of Florida EE

## Signage and Informational Flyers

Install signs in parks and green spaces that explain the differences between invasive and native plants, along with their ecological impacts. Distribute flyers and brochures to visitors to promote responsible behavior and ongoing awareness.

Community organizations or schools could host yearly poster competitions, where students compete to design a poster that informs people on invasive species.

## Public Awareness Campaigns



Don't Move Firewood Campaign

Use local media, social media, and community events to spread messages about invasive species. Posters, videos, and success stories can motivate residents to report invasives, participate in removal efforts, and foster a culture of ecological responsibility.

A very common example of this is the Buy Where You Burn campaign. Although it is mostly focused on invasive insects, it is a public campaign encouraging people to not burn firewood bought from a distance away as it can spread invasive insects into native woods.

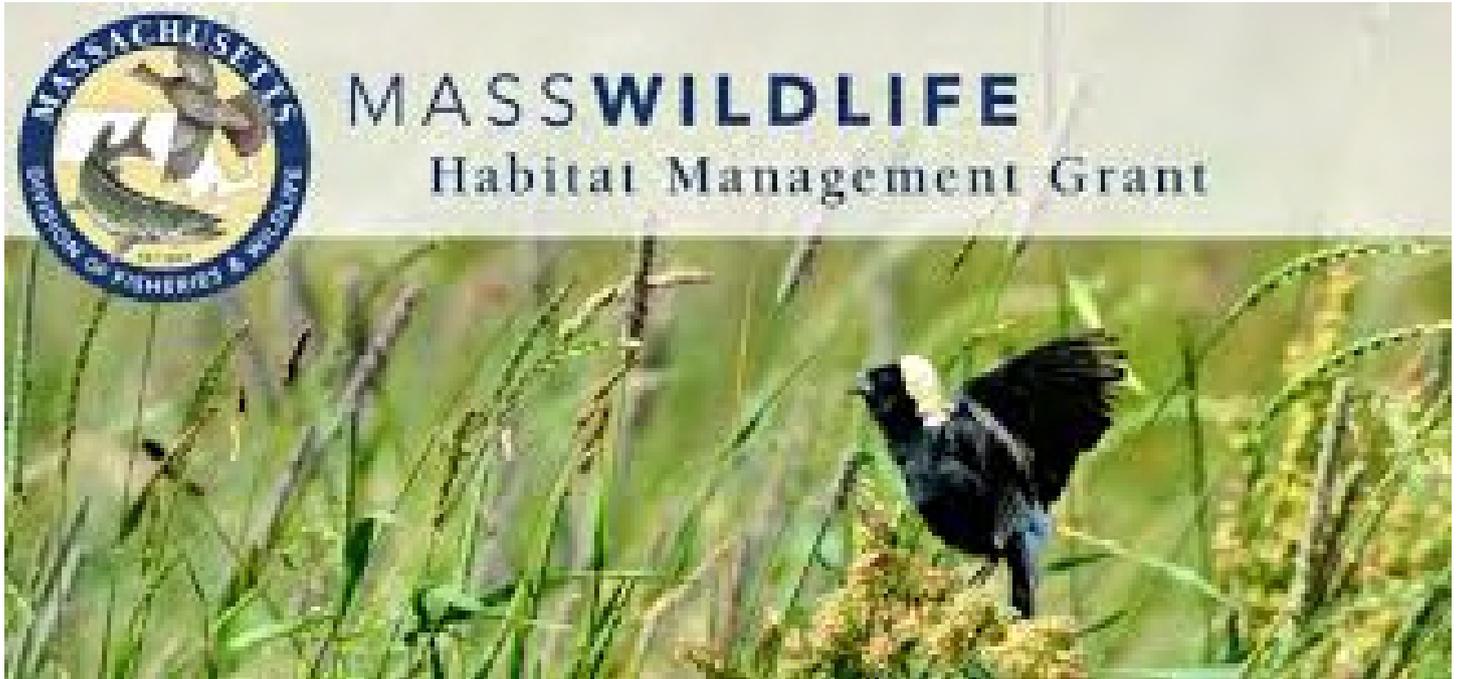
Public education is a crucial element in invasive species management because an informed community is more capable of recognizing, preventing, and controlling invasive threats before they become unmanageable. By integrating topics about invasive species into school environmental curriculum, young students gain foundational knowledge about ecosystem health, native plants, and the risks posed by invasives. Hands-on activities such as native planting projects and invasive removal exercises not only teach practical skills but also foster a sense of environmental responsibility from an early age. Cultivating awareness among youth ensures that future generations are better equipped to contribute to ongoing conservation efforts.

Community workshops further reinforce this knowledge by providing residents with the opportunity to learn identification techniques, effective removal methods, and prevention strategies in a hands-on setting. These workshops serve as a bridge between theoretical understanding and practical action, empowering community members to take immediate steps within their neighborhoods and private properties. When residents actively participate in invasive plant removal and native planting, they develop a sense of ownership and responsibility, which can lead to sustained efforts over time. Additionally, increasing signage and distributing informational flyers in parks, public green spaces, and recreational areas serve as constant visual reminders, educating visitors about invasive species, their ecological impacts, and ways to prevent their spread. This ongoing visual education ensures that even casual park-goers and passersby remain aware and engaged.

Combining these educational strategies creates a in depth and long lasting approach that fosters a community-wide culture of ecological responsibility. When residents understand the differences between invasive and native species, recognize the ecological and economic impacts, and are equipped with practical removal techniques, they become active participants in conservation efforts. This collective awareness and engagement can significantly reduce the spread of invasive plants, protect native ecosystems, and promote healthier, more resilient habitats. Ultimately, a well-informed community is one of the most effective tools in preventing invasives from establishing and spreading, ensuring long-term ecological sustainability and the preservation of Worcester's natural environment.

## Grants and Funding

### MassWildlife Habitat Management Grant Program



The MassWildlife Habitat Management Grant Program (MHMGP) is a vital funding opportunity designed to support habitat restoration and management projects across Massachusetts, including in Worcester. While the program traditionally supports private landowners, it also offers significant benefits for municipal agencies, non-profit organizations, and conservation groups working within Worcester's boundaries. The primary goal of the program is to enhance habitats that are critical for the survival of Species of Greatest Conservation Need, improve biodiversity, and foster public access to natural areas for outdoor recreation such as hiking, birding, and nature observation.

Worcester, with its diverse ecosystems ranging from wetlands and forests to grasslands, faces ongoing challenges from invasive species, habitat fragmentation, and climate change. Active habitat management is essential to preserving native biodiversity and ensuring resilient ecosystems. This grant offers Worcester an opportunity to implement targeted projects that address these issues directly. For example, funds could be used to control invasive plants threatening areas of high concern, such as local wetlands and waterways that are vital for overall ecosystem health. Additionally, the grant can support efforts to improve public access to natural areas, encouraging community engagement and environmental education, such as to fund public education, increased signage, etc.

The grant provides between \$5,000 and \$75,000 to support projects that involve practical habitat management activities. These include invasive species removal, prescribed burns, native planting, habitat enhancement, and stream or shoreline restoration. Projects must be completed by June 30 of the grant year, with all expenses supported by proper documentation. The funds can be used to

cover staff time, contracted management services, equipment rentals, and necessary supplies, such as native plants or signage, aimed at achieving measurable ecological improvements.

For Worcester's sake, agencies and organizations interested in applying would need to do so by September of the application year, as applications close in October. Applications must detail specific project goals, management practices, and expected outcomes. Once awarded, projects must be completed within the designated timeframe, with final reports and expense documentation submitted for reimbursement. The program emphasizes projects that deliver tangible habitat improvements aligned with conservation priorities, such as those outlined in the Massachusetts State Wildlife Action Plan.



Mass.gov 2017 Cape Burn

The MassWildlife Habitat Management Grant can significantly enhance Worcester's local ecosystems by funding targeted habitat restoration projects. For example, the city could utilize funds for invasive species removal in critical areas such as wetlands and forests, helping to restore native plant communities and improve habitat connectivity. The grant can also support prescribed burns to maintain open grasslands and prevent woody succession, which benefits pollinators and rare species.



Mass.gov 2017 Cape Burn

The grant covers staff time for on-the-ground management activities, such as invasive species removal, habitat planting, and prescribed burns. It can also fund contracted services, equipment rentals, and necessary supplies. This ensures that trained personnel execute projects efficiently, saving the city money and ensuring best practices. The funding allows Worcester to leverage additional resources, such as volunteer programs and community outreach, to promote sustainable habitat management.

Investing in habitat management through this grant will improve biodiversity, water quality, and resilience to climate change. Projects could include restoring pine barrens, managing wetlands, or creating wildlife corridors, all of which support native species and improve recreational opportunities for residents. Ultimately, this funding helps Worcester meet conservation goals and enhances its natural beauty and ecological health.

Many towns and organizations across Massachusetts have successfully utilized the MassWildlife Habitat Management Grant to achieve tangible conservation outcomes. For instance, the Town of Falmouth received funding to remove invasive vines and woody plants from sandplain grasslands, improving habitat connectivity for rare species. The Berkshire Natural Resources Council used their grant to control invasive plants along floodplain forests, fostering healthier ecosystems.

Recipient organizations employed the grants for a variety of activities, including prescribed burns, invasive species control, habitat planting, and stream restoration. These projects often involved collaboration with volunteers, local agencies, and conservation partners, maximizing impact. The

funds were also used to purchase necessary equipment, hire seasonal staff, and develop educational signage, broadening community awareness and engagement.

These projects have resulted in healthier habitats, increased native plant populations, and improved access for outdoor recreation. The success stories demonstrate that strategic use of the grant can lead to meaningful ecological restoration and community benefits. Worcester can adopt similar approaches, tailoring projects to local needs and leveraging the program's resources to achieve its conservation objectives.



Linda Loring Nature Foundations - 2017 recipient of \$75,000

## Reccomendations Overview

### Secure Funding and Develop Grant Opportunities

To effectively manage invasive species in Worcester, securing dedicated funding through state and federal grants should be a top priority. These financial resources are essential for hiring specialized staff, supporting labor-intensive removal efforts, and implementing effective disposal methods for invasive plant material. Increased funding will also enable Worcester to develop and deploy early detection systems, conduct frequent monitoring, and sustain long-term management efforts, crucial components for controlling rapidly spreading invasives.

Several municipalities in Massachusetts have successfully leveraged grant programs to advance their invasive species management initiatives. For example, the Town of Falmouth received \$70,000 from a state conservation fund to enhance the health of sandplain grasslands by removing invasive vines, woody shrubs, and trees. This project not only reduces invasive pressure but also improves habitat connectivity, expanding habitats for rare species at Coonamessett Reservation. Similarly, the Berkshire Natural Resources Council was awarded \$28,930 to treat invasive plants along the Housatonic River floodplain forest and at Rising Pond Conservation Area, helping restore natural floodplain dynamics and native biodiversity (Phillips 2024).

Other successful grants include the Town of Kingston's \$23,765 award to treat invasive aquatic species like variable-leaved milfoil at Smelt Pond, which outcompetes native aquatic plants and diminishes water quality. On Nantucket, the Nantucket Conservation Foundation received \$75,000 for the removal and safe disposal of southern pine beetle-infected pitch pine, protecting critical pitch pine barren habitats. Additionally, the Nantucket Island Land Bank was awarded nearly \$75,000 to restore pine barrens by thinning dense pitch pine to promote ecosystem resilience and support rare butterfly and moth species (Phillips 2024). Other examples include South Lee's \$17,990 grant to treat woody invasives along the Housatonic River and the Sheriff's Meadow Foundation's \$75,000 to manage southern pine beetle infestations in Phillips Preserve.

These programs demonstrate how targeted grants can fund specific, impactful projects that restore native habitats, prevent invasive spread, and protect ecological integrity. Worcester can adopt a similar approach by identifying and applying for grants that align with local priorities, such as controlling invasive plants along waterways, in urban parks, and in natural reserves. Pursuing these opportunities will not only bolster Worcester's capacity to combat invasives but also foster partnerships with conservation organizations and state agencies committed to ecological health. Mass Wildlife's Hazard Mitigation Grant is a great example of a pursuable grant that the city of Worcester could apply for and receive money to assist with the mitigation of invasive species.

# Implement a City-Wide Public Education and Community Engagement Program

Raising awareness is crucial for long-term control. Worcester should develop an educational strategy modeled after successful programs in cities like Brookline, MA, which distributed invasive species guides and organized community removal events (Brookline.gov, et al, 2024). Educational initiatives can include informational signage, workshops, and online resources aimed at helping residents identify invasives, understand their impacts, and learn proper disposal techniques.

A first step in this process would be to develop a series of informational graphics and posters about identifying the local invasive plant species and how to combat them. For example, a poster would consist of simple information about preventing or managing the spread of invasive plants. The poster could take inspiration from the Adirondack Park Invasive Plant Program's "Protect Your Forests Awareness Poster", where the imagery and information would be tailored towards Worcester. These posters should be placed in public locations such as parks, recreational spaces, and any government building as to inform as many people as possible. It would also be available online for the public to be able to download.



The next step towards educating the public on the invasive plants of Worcester would be creating a comprehensive guide. This guide would provide the reader with the knowledge to identify invasive plants such as Japanese knotweed, phragmites, mugwort, oriental bittersweet, and many others. This guide would also contain information on the harmful affects of those plants and how to remove, as well as safely dispose of them. This guide would also be placed in public locations such as parks, recreational spaces, and any government building, as well as being available online for the public to be able to download and view.

In order to create cultural awareness of invasive plants, an educational program about the local invasive plants should be implemented into schools. This educational program would teach students about local invasive plant species through a combination of classroom learning and hands on field experiences. Students would learn how invasive plants affect ecosystems, biodiversity, and local habitats, and then apply this knowledge by identifying species in their community, collecting data, and participating in removal or monitoring activities. The program integrates into the existing curriculum through content in core subjects such as science, geography, and language arts. This program would promote environmental stewardship and develop students practical skills in observation, critical thinking, and problem solving. It offers a meaningful way for students to connect what they learn in class to real environmental issues in their own community.

Through combining public education, accessible identification tools, and school based learning, Worcester can build a community that is informed, engaged, and equipped to manage invasive plant species. Posters, guides, and hands-on educational programs not only increase awareness but shift the culture towards taking meaningful action in protecting local ecosystems. Implementing this strategy will strengthen long-term invasive plant control efforts and foster a culture of environmental stewardship throughout the city.

## **Development of Species-Specific Management Plans and Control Strategies**

Given Worcester's distinct invasive plant challenges, it is essential to develop tailored management plans for each high-priority invasive species. Different invasive plants, such as Japanese knotweed, phragmites, mugwort, and oriental bittersweet, each have unique biological characteristics and dispersal mechanisms that require specific control methods. For example, Japanese knotweed's aggressive traits require a combination of mechanical removal, such as cutting or digging, and targeted herbicide application during its active growth period (Adler, 2025). Timing herbicide treatments in late summer or early fall when the plant's vascular system is most active can significantly improve effectiveness. Proper disposal of removed plant material, through incineration, deep burial, or controlled composting, is critical to prevent reintroduction into the environment, as discussed in our poster.

Similarly, phragmites, which form dense stands in wetlands, require a combination of mechanical removal and herbicide treatment, often paired with ongoing monitoring to prevent regrowth. To

maximize success, interventions should be timed before seed production, typically in late summer, to reduce seed dispersal and reinvasion (Rohal, 2019). Mugwort and bittersweet, which spread via seeds and vegetative fragments, demand removal during dormancy or early growth stages to minimize dispersal. For each species, control efforts must be strategically scheduled to align with their growth cycles, ensuring that treatments are most effective and sustainable.

In addition to physical removal, native plant restoration is an integral component of species-specific management plans. After invasive removal, replanting native species, such as milkweed, goldenrod, or blue-eyed grass, can outcompete residual invasives, restore ecosystem functions, and promote biodiversity (Tartaglia, 2024). Restoration efforts should be carefully planned based on each species' optimal growth conditions and habitat needs, ensuring successful establishment. Developing detailed plans that incorporate these varied techniques, mechanical, chemical, and ecological, will enable Worcester to systematically address invasive species, improve management efficiency, and support the long-term resilience of its ecosystems.

## Conclusion

This project provided a comprehensive examination of the ecological and economic challenges posed by invasive plant species in Worcester, Massachusetts, and aimed to develop a practical, adaptable framework to guide future management efforts. Although initially faced with limited Worcester-specific data, our approach relied heavily on extensive research, field observations, and interviews with local conservation professionals. These efforts enabled us to identify the most problematic invasive species in the area, understand their primary pathways of spread, and evaluate the complex challenges associated with their control. By analyzing how other cities and towns have addressed similar invasive species issues, we were able to build upon existing models, best practices, and management strategies, and tailor them to fit Worcester's unique ecological landscape, land use patterns, and administrative context.

Building from this foundation, we developed a set of actionable recommendations that emphasize prevention, targeted removal, and long-term public engagement. Our plan advocates for promoting responsible behaviors to minimize new introductions, such as educating residents on proper disposal and planting native species, and implementing integrated pest management strategies that combine mechanical removal, herbicide application, and suffocation techniques. These methods, when used in a coordinated manner, can effectively manage active invasions while avoiding unnecessary environmental impacts. We also prioritized resource allocation toward controlling invasive populations that are already established, rather than focusing solely on disposal efforts. Our identification of three priority invasive species, based on field observations and expert insights, allowed us to outline tailored management strategies for each, promoting efficiency and effectiveness.

Beyond direct management techniques, we recognized the critical importance of securing sustainable funding through grants, increasing community awareness, and fostering active participation from local residents and organizations. By engaging the community in invasive species monitoring, removal, and native planting initiatives, Worcester can create a resilient, collaborative approach to ecological stewardship. These strategies, supported by research and local expertise, provide Worcester with a solid baseline plan that can be expanded, refined, and adapted over time. Implementing this comprehensive framework will help reduce the impacts of invasive species, protect native biodiversity, and promote a healthier, more resilient urban environment. Ultimately, our goal is to support Worcester's long-term ecological health and community well-being through informed, strategic, and inclusive invasive species management.



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