

# LAND MANAGEMENT PLAN

## Cleveland Lakefront Nature Preserve

88 Acres, Cleveland,  
Cuyahoga County, Ohio

September 2015

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## EXECUTIVE SUMMARY

The Cleveland Lakefront Nature Preserve (CLNP) is an 88-acre site located on the Lake Erie shore, just east of the Burke Lakefront Airport and downtown Cleveland. The site is near Bratenahl in Cuyahoga County, Ohio and is managed by the Cleveland-Cuyahoga County Port Authority. Home to a variety of plant and wildlife species, CLNP (formerly known as Dike 14) is accessible through public trails.

Left to naturalize on its own since filling operations at the former confined disposal facility ceased in 1999, CLNP has flourished, with large areas of the peninsula dominated by tree and shrub cover that have naturally established. While much of the vegetation at CLNP is healthy, native naturalized growth, the nature of the site and the dredge materials used to form it have also allowed for growth of many non-native, invasive plant species.

As part of an ongoing commitment to provide the public with improved lakefront access and support environmental initiatives, the Cleveland-Cuyahoga County Port Authority assembled a committee of experts from local parks, conservation districts, and surrounding community organizations to collaborate and

develop a long-term land management plan that aligns with the vision and goals for the preserve. The committee members and their affiliations are listed in Table 1 below.

This management plan has been developed to provide guidance and an overall vision for CLNP. The goal of the Port Authority is to enhance CLNP, create a wildlife sanctuary that local residents and visitors of the Cleveland area can enjoy, and protect the area from loss of wildlife and plant diversity by actively managing the preserve for healthy native habitat.

In order to develop this plan, a field-based vegetation survey was performed by Davey Resource Group biologists. In this survey, approximately 50 acres were noted as having some level of infestation of non-native, invasive vegetation. The study area contains upland open fields, shrub thickets, and successional woods. Maps showing the location and size of the primary invasive vegetation populations and their associated percent cover can be found in Appendices A and B.

TABLE 1

Cleveland Lakefront Preserve  
Advisory Committee Members

MEMBER NAME	MEMBER AFFILIATION
Jim Bissell	Cleveland Museum of Natural History
Renee Boronka	Cleveland Museum of Natural History
Sarah Cech	Nature Center at Shaker Lakes
Claudia Fulton	Garden Club of Cleveland
Susan Gallager	The Ohio Lepidopterists Society
David Goerig	Davey Resource Group
Tim Krynak	Cleveland Metroparks
Corine Peugh	Davey Resource Group
Renata Brown	Cleveland Botanical Garden
Jan Rybka	Cuyahoga Soil and Water Conservation District
Linda Sternheimer	Cleveland-Cuyahoga County Port Authority
Harvey Webster	Cleveland Museum of Natural History



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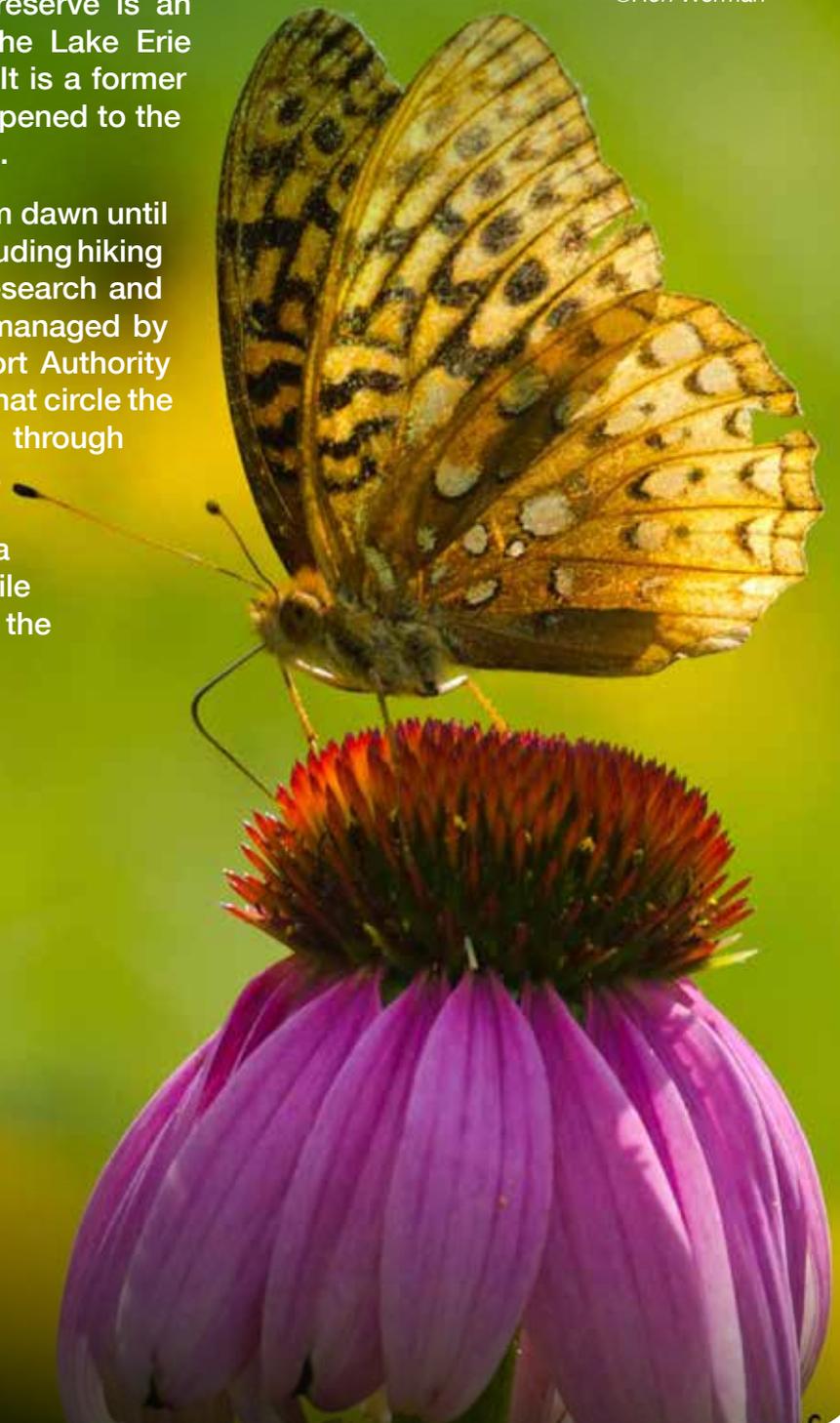
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## INTRODUCTION

The Cleveland Lakefront Nature Preserve is an 88-acre man-made peninsula on the Lake Erie shoreline in the heart of Cleveland. It is a former confined disposal facility that was opened to the public for passive recreation in 2012.

CLNP is open to the public daily from dawn until dusk for passive recreational use including hiking and bird watching, as well as for research and educational uses. The preserve is managed by the Cleveland-Cuyahoga County Port Authority and includes over 2.5 miles of trails that circle the perimeter of the preserve and pass through the wooded and wildflower habitats. The primitive walking trails include a 1.75-mile Perimeter Loop Trails, a 0.25-mile Monarch Trail, and a 0.5-mile Northern Harrier Trail that bisects the preserve.

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## INTRODUCTION CONTINUED

contains various habitat types including upland open fields, successional woodlands, and a few areas with shrub thickets and seasonally hydric soils.

CLNP, located on the Lake Erie shoreline, is a significant attraction for birds as well as for people who enjoy observing and studying them. This site is a valuable migratory bird stopover due to its size, strategic coastal location, and diverse wildlife habitats. CLNP is identified as a high performance migratory site because of the significant number and diversity of birds that occupy it, and because it is located at the intersection of four major migratory bird routes. Audubon Ohio has designated CLNP as an Important Bird Area (IBA), providing essential habitat for breeding, resting, or overwintering birds during their long migrations.

A large portion of CLNP contains healthy, native, naturalized vegetation, but the materials collected from the Cuyahoga River and used to form the preserve also contained many seeds and rhizomes from non-native, invasive plant species. These species are readily able to establish in disturbed areas with no natural vegetative cover.

Without active management, many of the native areas will experience continued reductions in overall species diversity, which will eventually lead to reduced wildlife and bird populations.

Because CLNP is such a valuable and popular natural area among the local community, the Port Authority assembled an experienced, volunteer land management advisory committee to make sound, science-based management recommendations for CLNP. The input and expertise of this committee was used to develop this document. The committee holds regular meetings to discuss the goals of this land management plan and chart a course of direction for the potential use of this unique natural site.

Davey Resource Group, a division of The Davey Tree Expert Company, was contracted by the Cleveland-Cuyahoga County Port Authority to work with the advisory committee to determine what management practices should be established to control the invasive vegetation and determine what habitat types should be implemented or managed and preserved. The consensus of the committee is that a plan should be implemented to control the invasive vegetation populations within the preserve, with a focus on high impact wildlife and visitor areas. These areas should be enhanced to build on the existing surrounding habitats, such as the woodlands and prairie meadow.

In order to better educate the public on the importance and challenges of managing for invasive vegetation, the committee set goals to conduct community outreach for this restoration project.

This included the development and installation of an educational interpretive sign outlining the vegetation management process and the benefits to visitors and wildlife. Additionally, on July 29, 2015, a public information session was held to address any questions or concerns prior to the implementation of the vegetation treatments. The committee also established a project timeframe of 10 years to achieve significant control of invasive vegetation in open habitats, and to revisit the management plan and implement additional strategies and goals for the woodland habitats towards the end of this timeframe.

In August 2015, Davey Resource Group completed selective invasive vegetation treatments within the 5-acre wildflower area and an additional 6 acres along the southwest section of the Perimeter Loop Trail, as shown on the map in Appendix A. The Port Authority will oversee the project and continue to collaborate with the committee to determine which areas are the highest priorities. Additional treatments will be completed as funding for the project is available.

## PROPERTY HISTORY AND DESCRIPTION



**FIGURE 1**

A photo of CLNP (formerly Dike 14) in 1975. (Photo Credit: <http://coolcleveland.com/blog/2011/09/nature-in-the-neighborhood-cleveland-lakefront-nature-preserve/>)

The Cleveland Lakefront Nature Preserve is a man-made peninsula located on the Lake Erie shore, near the City of Bratenahl. The preserve is surrounded by water on all but the southern edge of the property where it lies adjacent to Gordon Park, a 122-acre park managed by Cleveland Metroparks, and Intercity Yacht Club.

Prior to being converted into a nature preserve, portions were used as a landfill and later as a confined disposal facility (CDF) for dredge spoils removed from the Cuyahoga River. In 1962, two, 500-foot-long freighters from the U.S. Steel fleet were sunk offshore to act as a breakwall for the beachfront. From the early 1960s until 1976, the site was used as a dumping site for scrapped cars and other refuse.



**FIGURE 2**

A photo of CLNP in 1987.  
(Photo Credit: U.S. Army Corps of Engineers)



**FIGURE 3**

The Overlook, featuring three benches and a decorative railing designed by Brinsley Tyrrell, was donated by the Garden Club of Cleveland in 2013.

In 1975, U.S. Army Corps of Engineers (USACE) drafted a plan to further expand the existing 8-acre landfill into Lake Erie using additional retaining walls in an effort to create a safe, contained area for dumping dredged materials from the river. In 1979, the site became Dike 14, a CDF accumulating approximately 5.7 million cubic yards of dredged materials over the next 20 years.

After the final fill was placed in 1999, USACE discontinued use of the site, which quickly became naturalized with vegetation and wildlife.

In 2001, Cleveland-Cuyahoga County Port Authority began managing the site, which was open to the public only a few days each year for special events.

The site was also used for environmental education and stewardship opportunities by Dike 14 Environmental Education Collaborative, which formed in 2003 to educate the public on environmental issues and the importance of the site to migratory bird populations.

In 2006, U.S. Environmental Protection Agency awarded a \$200,000 grant to the Cuyahoga Soil and Water Conservation District to conduct an environmental assessment of Dike 14. This assessment, completed in 2007, evaluated the soils and other environmental conditions to determine whether the site was safe to be opened to the public for passive recreational use. Results from the study ultimately supported opening the site to the public. In early 2012, the Port Authority officially introduced and opened the site to the public as Cleveland Lakefront Nature Preserve. In 2013, The Garden Club of Cleveland (GCC) donated resources to complete a new public overlook plaza at the westernmost point of CLNP, which offers unobstructed views of Lake Erie and the Cleveland city skyline.

Today, Cleveland Lakefront Nature Preserve is thriving, with diverse wildlife inhabiting the preserve and other wildlife using it as a migratory stopover. A little more than half of CLNP is forested habitat. The remaining areas consist of open grassland and wildflower habitats scattered throughout the site. The forested areas are dominated by early successional species common to the Cuyahoga River Valley, including tree species such as *Acer negundo* (box elder), *Acer saccharinum* (silver maple) and *Populus deltoides* (eastern cottonwood). The understory vegetation consists primarily of species that benefit from disturbed sites such as *Alliaria petiolata* (garlic mustard), *Hesperis matronalis* (dame's rocket), as well as some native species such as *Impatiens capensis* (jewelweed), *Parthenocissus quinquefolia* (Virginia creeper), and *Viola* spp. (violet).

The open areas exist primarily around the perimeter of the peninsula, along the trails, and in the center of the preserve where a wildflower habitat was created in 2013.



**FIGURE 4**

Today the Cleveland Lakefront Nature Preserve is home to a variety of plant and wildlife species.

This 5-acre area was established as part of an effort to mitigate some residual pollutants found in the dredging materials placed at the preserve. This area was planted with native warm-season grasses and forbs, creating valuable native habitat for butterflies and other pollinators, as well as native and migrating bird species.

CLNP has largely been left to nature to reclaim since filling operations ceased in 1999. While CLNP has flourished without active management and become an important piece of natural habitat in an ever-expanding urban environment, it is not without issues. Because CLNP was man-made

and created using fill from the Cuyahoga River, the preserve contains seed from many species of non-native and invasive vegetation that are particularly well adapted to such disturbed sites. Species such as *Artemisia vulgaris* (mugwort), *Phalaris arundinacea* (reed canarygrass), and *Phragmites australis* (common reed) dominate many of the open habitats on the peninsula and reduce the overall species diversity of the site. Without ongoing management, many of these species will eventually move into the remaining natural areas of the preserve, further limiting the native species diversity.

## SITE MAPPING AND METHODOLOGY

In order to gauge the current site conditions and distribution of vegetation communities at CLNP, Davey Resource Group biologists Todd Crandall and Jeff Pettit conducted a field-based survey of the property's current vegetative cover on April 9, 2015. The open habitats were intensively surveyed, and non-native, invasive vegetation was identified and mapped with a GeoXH™ Trimble® GeoExplorer® 6000. The approximate percent cover of these species was also noted for each population. These data were compiled and used to develop vegetation and treatment maps for Cleveland-Cuyahoga County Port Authority. Woodland areas were not included as part of the mapping survey, but will instead be added as part of the management plan in the future, once the high-priority open habitats are managed for non-native vegetation and enter a maintenance stage.

In total, 49.95 total acres of the preserve were found to have some level of infestation of non-native, invasive vegetation. The primary species found were *Artemisia vulgaris* (mugwort), *Conium maculatum* (poison hemlock), *Phalaris arundinacea* (reed canarygrass), and *Phragmites australis* (common reed). Additional species were noted in smaller, scattered populations throughout the peninsula, including *Dipsacus fullonum* (common teasel), *Melilotus alba* (white sweet clover), and *Securigera varia* (crown vetch), which occur mainly within the wildflower area, and *Alliaria petiolata* (garlic mustard), which was primarily noted in the understory of woodland habitats.

The most prevalent species was common reed, with 36.58 acres of dense populations along the existing trails and open canopy areas in the forested areas. Species density ranges from 75% to 100% cover.

TABLE 2

Non-Native, Invasive Vegetation Species by Percent Cover Range and Acreage of Project Area

SPECIES	COMMON NAME	TOTAL ACRES	% COVER RANGE
<i>Phragmites australis</i>	common reed	36.58	75-100%
<i>Phalaris arundinacea</i>	reed canarygrass	3.90	50-75%
<i>Artemisia vulgaris</i>	mugwort	4.71	75-90%
<i>Conium maculatum</i>	poison hemlock	4.76	50-75%
<b>TOTAL</b>		<b>49.95</b>	

## MANAGEMENT OBJECTIVES

The Cleveland Lakefront Nature Preserve is comprised of three main habitat types: open fields and trail rights-of-way, successional woodlands, and a man-made wildflower prairie. There are also a few areas within the preserve that are seasonally wet and able to support more

hydric species such as *Phalaris arundinacea* (reed canarygrass). Each of these habitat areas has a different management objective and requires individually tailored management techniques. The objectives for each habitat type are outlined below.

### WILDFLOWER PRARIE

The wildflower prairie habitat is located at the center of the preserve. This 5-acre, warm-season grass prairie was established in 2013 using 4

native warm-season perennial grass species, 2 cool-season grass species, and 12 herbaceous forb species (Table 3).

**TABLE 3**

Native Wildflower Prairie Seed Mix  
Used for the 5-Acre Meadow

SPECIES	COMMON NAME
<i>Andropogon gerardii</i>	big bluestem
<i>Asclepias tuberosa</i>	butterflyweed
<i>Aster novae-angliae</i>	New England aster
<i>Chamaecrista fasciculata</i>	partridge pea
<i>Echinacea purpurea</i>	purple coneflower
<i>Elymus canadensis</i>	nodding wild rye
<i>Festuca rubra</i>	creeping red fescue
<i>Heliopsis helianthoides</i>	oxeye sunflower
<i>Liatris spicata</i>	dense blazingstar
<i>Monarda fistulosa</i>	wild bergamot
<i>Panicum virgatum</i>	switchgrass
<i>Ratibida pinnata</i>	grey-headed coneflower
<i>Rudbeckia hirta</i>	black-eyed Susan
<i>Rudbeckia triloba</i>	brown-eyed Susan
<i>Schizachyrium scoparium</i>	little bluestem
<i>Solidago rigida</i>	stiff goldenrod
<i>Sorghastrum nutans</i>	Indiangrass
<i>Trifolium pratense</i>	red clover



**FIGURE 5**

Light to moderate populations of common reed and white sweet clover are scattered throughout the 5-acre wildflower area.

These native species are highly beneficial to wildlife as well as the overall health of the site. Pollinators, such as butterflies and bees, require flowering plants to maintain their populations. Grassland birds, such as the eastern meadowlark, prefer to nest in these open grassland habitats. Native prairie vegetation also improves soil conditions, sequesters carbon, and absorbs excess water and pollutants from the environment. Once established, native areas require very little maintenance outside of annual mowing for weed control.

Because this habitat is so beneficial to wildlife, and extensive resources have already been invested in its establishment, the wildflower prairie area is considered the highest priority for habitat restoration.

After only two years since its installation, this habitat is very well established with light to moderate encroachment by non-native vegetation. The primary species noted in this area during the vegetation survey were *Artemisia vulgaris* (mugwort), *Cirsium arvense* (Canada

thistle), *Dipsacus fullonum* (common teasel), *Melilotus alba* (white sweet clover), *Phragmites australis* (common reed), *Securigera varia* (crown vetch). These species occurred in scattered populations throughout the 5-acre area in light to moderate densities.

The management goals for this area are geared toward enhancing and expanding the existing wildflower habitat in order to better support bird and pollinator populations by increasing native plant diversity.

**TABLE 4**

Wildflower Prairie Habitat by Percent Cover Range and Acreage of Project Area

SPECIES	COMMON NAME	TOTAL ACRES	% COVER RANGE
<i>Cirsium arvense</i>	Canada thistle	≤0.5	1-5%
<i>Dipsacus fullonum</i>	common teasel	≤0.5	1-5%
<i>Artemisia vulgaris</i>	mugwort	≤1.0	10-25%
<i>Securigera varia</i>	crown vetch	≤1.0	10-25%
<i>Phragmites australis</i>	common reed	≤1.0	10-25%
<i>Melilotus alba</i>	sweet white clover	1.0-1.5	20-30%
<b>TOTAL</b>		<b>≤5.5</b>	

**1 MANAGEMENT GOAL 1**  
 ENHANCE THE EXISTING WILDFLOWER AREA AND GAIN SIGNIFICANT CONTROL OF NON-NATIVE, INVASIVE VEGETATION WITHIN TWO YEARS.

**2 MANAGEMENT GOAL 2**  
 MAINTAIN AND MANAGE THE WILDFLOWER AREA FOR WILDLIFE AND VEGETATION DIVERSITY OVER THE LONG TERM.

## OPEN FIELDS AND TRAIL RIGHTS-OF-WAY



**FIGURE 6**

The trails and other open, non-forested areas are being encroached upon by non-native vegetation.

The open field habitats throughout the preserve, found primarily along the trail rights-of-way, are dominated by *Artemisia vulgaris* (mugwort), *Conium maculatum* (poison hemlock), and *Phragmites australis* (common reed). These areas lack significant

canopy cover and provide ideal growing conditions for non-native, invasive vegetation. The trails are currently mow-managed to keep paths clear of vegetation, but they are densely populated with undesirable vegetation. Because of their high visibility, visitor use, and access, these open areas are considered a high priority for completion.

Management goals for these areas are geared toward enhancing the open habitats so as to better support bird and pollinator populations, while increasing native plant diversity, as well as maintaining trail pathways for visitors.

### 1 MANAGEMENT GOAL 1

GAIN SIGNIFICANT CONTROL OF NON-NATIVE, INVASIVE VEGETATION OVER A PERIOD OF 10 YEARS, WITH AN 80% OR GREATER REDUCTION IN COVER.

### 2 MANAGEMENT GOAL 2

IMPROVE OVERALL NATIVE VEGETATION DIVERSITY BY ESTABLISHING 22.5 ACRES OF ADDITIONAL OPEN GRASSLAND AND WILDFLOWER PRAIRIE HABITAT ALONG THE TRAIL RIGHTS-OF-WAY AND NON-FORESTED AREAS.

### 3 MANAGEMENT GOAL 3

IMPROVE OVERALL NATIVE VEGETATION DIVERSITY BY ESTABLISHING 23 ACRES OF ADDITIONAL SUCCESSIONAL WOODLAND HABITAT AND SHRUB/SCRUB HABITAT WITHIN THE REMAINING OPEN GRASSLAND HABITATS.

### 4 MANAGEMENT GOAL 4

MAINTAIN AND MANAGE THE RESTORED AREAS FOR WILDLIFE DIVERSITY OVER THE LONG-TERM.

## SUCCESSIONAL WOODLANDS

The forested habitats are dominated by early successional species common to the Cuyahoga Valley. Canopy species include *Acer negundo* (box elder), *Acer saccharinum* (silver maple),

and *Populus deltoides* (eastern cottonwood). The understory vegetation consists of native species such as *Impatiens capensis* (jewelweed), *Parthenocissus quinquefolia* (Virginia creeper), and *Viola* spp. (violets), as well as non-native species such as *Alliaria petiolata* (garlic mustard) and *Hesperis matronalis* (dame's rocket). While the forested areas are as important as the open areas and trails, they require less immediate attention than the other habitat areas. The long-term management goals for these areas will be incorporated into the management plan following significant improvements in other high-impact wildlife and visitor areas. In the interim, this area will be maintained using volunteer groups to manage the existing invasive vegetation populations and prevent further spread of these species.



**FIGURE 6**

The forested areas contain populations of *Alliaria petiolata* (garlic mustard) as well as other non-native vegetation.

### MAINTENANCE PLAN

**REDUCE OR MAINTAIN GARLIC MUSTARD AND OTHER NON-NATIVE VEGETATION POPULATIONS IN THE WOODLANDS THROUGH PULL EVENTS WITH VOLUNTEER GROUPS AND OTHER ORGANIZATIONS.**

## MANAGEMENT SUMMARY

With different management goals for each of these separate habitat areas, individual management recommendations have been developed to best achieve these goals and create the highest quality habitats. These recommendations have been outlined for each habitat type, along with general guidelines to herbicide applications.

Areas with greater than 65% invasive cover should be treated with high-volume herbicide applications. This approach is non-selective and will create large areas with little vegetative growth; these areas will, therefore, need to be replanted and/or reseeded following treatments to encourage native growth.

Areas with less than 65% but greater than 35% invasive cover should be treated using backpack sprayers and a more selective application process. Some native, desirable vegetation will be lost in the areas immediately surrounding non-native vegetation populations. These areas will need to be replanted and/or reseeded as well.

Areas with less than 35% invasive cover should be treated using highly targeted herbicide application methods, such as hand-wicking. This is a very time-intensive process, but areas treated in this manner will lose very little native cover and will require only minor overseeding or planting to discourage further growth of invasive vegetation.

The recommendations for each habitat type are provide in the following sections.

## WILDFLOWER PRAIRIE

The wildflower prairie habitat is one of the focal points of CLNP and receives many visitors throughout the season. As a high-traffic area with relatively moderate non-native vegetative cover, the wildflower prairie habitat is an ideal area to begin the process of managing undesirable vegetation. Some of the undesirable species noted in this area during the vegetation survey included *Artemisia vulgaris* (mugwort), *Cirsium arvense* (Canada thistle), *Daucus carota* (Queen Anne's lace), *Dipsacus fullonum* (common teasel), *Melilotus albus* (white sweet clover), *Phalaris arundinacea* (reed canary grass), and *Phragmites australis* (common reed).

As part of a healthy maintenance regime, the wildflower meadow should be mowed annually each spring or burned once every two to three years in the spring to help control undesirable vegetation. This process helps to remove thatch and other vegetation, which opens up and warms the soils. Warmer soils in early spring encourage growth of native warm-season species, allowing them to achieve significant growth before the weedy species begin to emerge. When mowed

at the correct time of year, this process also helps to slow the growth of undesirable species, as they tend to emerge first in the spring and can be set back by mowing or burning activities. Mowing or burning in the spring will encourage growth of warm-season grasses, while mowing or burning in the summer or early fall will encourage more forbs.

Davey Resource Group recommends that any existing undesirable vegetation should first be controlled with a selective herbicide application at the appropriate time of year for each species (Table 5). Areas with a moderate density (35-65% cover) of non-native vegetation should be treated using low-volume backpack sprayers and a 2% solution of glyphosate with a surfactant. Because the preserve is on the Lake Erie shore, an aquatic-use approved formulation of glyphosate should be used in the treatments. This product is non-selective and can impact native growth. However, using targeted application methods to preserve surrounding native vegetation, glyphosate is the most effective treatment.

TABLE 5

Non-Native, Invasive Vegetation  
Treatment Windows

SPECIES	COMMON NAME	TREATMENT MONTHS
<i>Artemisia vulgaris</i>	mugwort	April-September
<i>Conium maculatum</i>	poison hemlock	April-July
<i>Daucus carota</i>	Queen Anne's lace	April-September
<i>Phalaris arundinacea</i>	reed canarygrass	April-May
<i>Phragmites australis</i>	common reed	August-September

Areas with sensitive vegetation or very few weedy species should be treated using hand-wicking equipment and a 2% glyphosate solution. This method keeps desirable species intact and allows for an extremely targeted herbicide application to only the plants that are to be removed.

In addition to treatments, the wildflower area should be assessed for native species diversity. This will help determine what species from the original seed mix have more readily established, and if the species are in a healthy balance.

Species that are not found or are growing in very low densities (<5% cover) are likely not well suited to the site conditions and should not be included in future seed mixes. These species may also be sparse due to other species dominating the habitat. Species that are dominating the site, with greater than 60% total cover, should also be removed from future seed mixes in this area, or used in much lower quantities to increase overall species diversity.

All areas treated with herbicide within the wildflower prairie should be overseeded with an appropriate version of the original seed mix to

encourage native species to become established in place of the non-native vegetation that is removed. This will help prevent reinvasion by additional invasive species and increase the overall diversity of the prairie habitat.

The wildflower area will require some long-term management; however, this will be limited to annual mowing and spot treatments, which will decrease over time. The management goals established in the previous section can be achieved using the following recommendations.



- SUMMER/FALL YEAR 1** SELECTIVE TREATMENT OF THE 5-ACRE WILDFLOWER AREA USING TARGETED HERBICIDE APPLICATIONS AND OVERSEEDING TREATED AREAS WITH A NATIVE SEED MIX.
- SPRING YEAR 2** MOW THE WILDFLOWER AREA IN MARCH-APRIL TO A HEIGHT OF 6-8 INCHES BEFORE SIGNIFICANT GROWTH OF DESIRABLE SPECIES OCCURS.
- SUMMER/FALL YEARS 2-10** CONTINUE SELECTIVE TREATMENT OF RESIDUAL NON-NATIVE VEGETATION AS NEEDED USING TARGETED HERBICIDE APPLICATIONS AND OVERSEEDING.
- SPRING YEARS 3-10** CONTINUE MOW MANAGEMENT OF THE WILDFLOWER AREA EACH SPRING TO REDUCE UNDESIRABLE VEGETATION AND ENCOURAGE A HEALTHY NATIVE STAND.

## OPEN FIELDS AND TRAIL RIGHTS-OF-WAY

The open field habitats require more ongoing management since they do not currently have enough native vegetative diversity to naturally control undesirable plant species. Additionally, these areas will have to be continually maintained to preserve the trail system used by visitors. Open fields are also beneficial to migratory birds and other wildlife, offering nesting areas for birds and small mammals, as well as flight corridors for bats.

These habitats will require different management techniques depending on the desired outcome for each area, such as managing for new forested habitat or additional wildflower areas. Management recommendations for these areas are geared towards enhancing and maintaining portions of the open habitats to support wildlife populations, increasing native plant diversity, and maintaining trail pathways for visitors. For the purpose of wildlife use, other areas will be converted to woody shrub/scrub or forested habitats using native tree and shrub species from Tables 6 and 7.

**TABLE 6**  
Native Tree Species Planting List

SPECIES	COMMON NAME
<i>Acer rubrum</i>	red maple
<i>Acer saccharinum</i>	silver maple
<i>Carya ovata</i>	shagbark hickory
<i>Liriodendron tulipifera</i>	tulip tree
<i>Nyssa sylvatica</i>	black gum
<i>Populus deltoides</i>	eastern cottonwood
<i>Prunus serotina</i>	black cherry
<i>Quercus bicolor</i>	swamp white oak
<i>Quercus rubra</i>	red oak
<i>Quercus velutina</i>	black oak

**TABLE 7**  
Native Shrub Species Planting List

SPECIES	COMMON NAME
<i>Aronia melanocarpa</i>	black chokeberry
<i>Cephalanthus occidentalis</i>	buttonbush
<i>Cornus amomum</i>	silky dogwood
<i>Cornus sericea</i>	redosier dogwood
<i>Lindera benzoin</i>	spicebush
<i>Physocarpus opulifolius</i>	ninebark
<i>Salix nigra</i>	black willow
<i>Salix sericea</i>	silky willow

Since the trails are vital to the visitor experience, maintaining access along these paths is a high priority. During each treatment year, sections of the trail with high densities of common reed and other tall, non-native vegetation should be

treated with a high-volume spray on either side of the trails. Treatment should occur within a 10-foot path on each side to more easily allow for mowing activities along the trails.



**SUMMER/FALL  
YEAR 1**

TREATMENT OF LARGE STANDS OF COMMON REED, MUGWORT, AND POISON HEMLOCK ALONG THE TRAIL EDGES LEADING TO AND SURROUNDING THE OVERLOOK POINT. SEED WITH AN ANNUAL COVER CROP TO ESTABLISH VEGETATION UNTIL NON-NATIVE AND INVASIVE SPECIES ARE CONTROLLED.

**SPRING  
YEAR 2**

MOW THE TREATED AREAS TO ALLOW REGENERATION OF VEGETATION AND GERMINATION OF PLANTED SEED.



## **SUMMER/FALL YEARS 2-10**

CONTINUE SELECTIVE TREATMENTS OF RESIDUAL NON-NATIVE VEGETATION IN EACH AREA AS NEEDED AND TREAT AN ADDITIONAL AREA EACH YEAR (AS INDICATED ON THE TREATMENT MAP IN APPENDIX A) USING TARGETED HERBICIDE APPLICATIONS, FOLLOWED BY ADDITIONAL COVER CROP SEEDING. EMPHASIS SHOULD BE PLACED ON MAINTAINING TRAIL RIGHTS-OF-WAY IN EACH TREATMENT AREA.

## **SPRING YEARS 3-10**

CONTINUE MOW MANAGEMENT OF THE TREATED COMMON REED STANDS AS NEEDED UNTIL THATCH IS REMOVED.

## **SUMMER/FALL YEARS 3-10**

AREAS WITH SIGNIFICANT CONTROL OF NON-NATIVE, INVASIVE VEGETATION (>85% OVERALL REDUCTION IN COVER) SHOULD BE SEEDED WITH A NATIVE SEED MIX IN AREAS TO BE PRAIRIE OR GRASSLAND HABITAT. IN AREAS TO BE CONVERTED TO WOODLAND OR SHRUB/SCRUB, HABITATS SHOULD BE PLANTED WITH NATIVE TREES AND SHRUBS AT A RATE OF 200-400 STEMS PER ACRE AND SEEDED WITH LOW-GROWING GRASSES AND FORBS.

## **SUCCESSIONAL WOODLANDS**

The existing forested habitats at CLNP are naturally occurring, early successional woodlands with healthy native tree and shrub growth. These areas also contain significant populations of *Alliaria petiolata* (garlic mustard), *Phragmites australis* (common reed), and other non-native vegetation that thrive in understory and woodland edge habitats, thus limiting native understory growth. Because a little over half of CLNP is forested and many of the species are manageable with volunteers, these areas have been assigned the lowest priority at this time. As other areas are completed and evolve into a maintenance stage, the forested habitats will be revisited and management recommendations will be incorporated into this plan. Some management recommendations have been included as opportunities for volunteer groups and other organizations to participate in until these areas are revisited.

Garlic mustard can be effectively pulled by hand from April through May each spring. This should be done prior to flowering to prevent further spread of seed. All pulled weeds should be bagged and removed from the site. These can be dried and burned, or disposed of in a proper landfill that accepts this material. These materials should not be composted.

These pull events are great opportunities for volunteer groups of all ages and groups of any size. Many groups often use an organized competition event to encourage participation, and depending on weather, multiple pulls can be organized each spring. Pulling these weeds is highly effective if done consistently over multiple years. Persistent populations can be later treated with herbicide as needed.

## WORK PLANS AND COSTS

The first stage in implementing this management plan will begin in late-summer 2015 and will continue over a period of at least 10 years, depending on funding availability (Table 8). During this time, the results of the treatments and habitat enhancements will be monitored and evaluated. Adjustments will be made to the treatment plans as needed in order to most effectively produce high-quality wildlife habitats that visitors can enjoy.

In addition to management recommendations, a work plan has been developed for each treatment year to guide the process of restoring and enhancing CLNP. This is illustrated both in map form in Appendices D and E, as well as in timeline form in Appendix G. In addition, estimated costs have been developed to help anticipate the annual costs for treatments and enhancements. These costs have been outlined in Tables 8 and 9.

**TABLE 8**

Estimated Costs for  
Invasive Vegetation Control  
Over a 10-Year Period<sup>†</sup>

TREATMENT AREA	ACRES	COST PER YEAR
1	10.99	\$3,750
2	11.14	\$9,844
3	3.25	\$3,077
4	3.50	\$3,314
5	6.83	\$6,499
6	2.64	\$2,512
7	3.50	\$3,347
8	3.34	\$3,194
9	7.66	\$7,362
10	4.82	\$4,654
<b>Total</b>	<b>57.03</b>	<b>\$47,553</b>

<sup>†</sup>Costs were developed in 2015 as an estimate for the purpose of management planning and budgeting, and are subject change based on changing site conditions and fluctuating material and labor costs.

**TABLE 9**  
 Recommendations and  
 Estimated Costs for Planting in  
 Each Treatment Area†

<b>TA1</b>	<p><b>10.99 acres - \$3,270</b></p> <ul style="list-style-type: none"> <li>Existing Wildflower Habitat, 5.0 acres. Overseed with original seed mix in treated areas.</li> <li>Install 240 native bare-root trees within a 0.6-acre area northeast of the Overlook.</li> <li>Install 1.5 additional acres of wildflower habitat along the trail leading to the Overlook.</li> </ul>	<p><b>2.64 acres - \$4,550</b></p> <ul style="list-style-type: none"> <li>Install 320 native bare-root trees within the 0.8-acre area of the northern portion of the unit.</li> <li>Install 2.0 acres of wildflower habitat along the trail bordering the eastern and western portions of the unit.</li> </ul>
<b>TA2</b>	<p><b>11.14 acres - \$14,250</b></p> <ul style="list-style-type: none"> <li>Install 800 native bare-root trees within the 2-acre area east of the Overlook.</li> <li>Install 2.5 acres of wildflower habitat along the trails bordering the western portion of the unit.</li> <li>Establish 4.2 acres of shrub-scrub habitat, installing 680 bare-root shrubs and 1,000 live-stakes in the two eastern units.</li> </ul>	<p><b>3.50 acres - \$6,800</b></p> <ul style="list-style-type: none"> <li>Install 1,000 native bare-root trees within the 2.5-acre area in the center of the unit.</li> <li>Install 1.6 acres of wildflower habitat along the trail bordering the western portions of the unit.</li> </ul>
<b>TA3</b>	<p><b>3.25 acres - \$5,350</b></p> <ul style="list-style-type: none"> <li>Install 1,080 native bare-root trees within the 2.7-acre area east of the unit.</li> <li>Install 0.5 acre of wildflower habitat along the trail bordering the northern portion of the unit.</li> </ul>	<p><b>3.34 acres - \$3,150</b></p> <ul style="list-style-type: none"> <li>Install 0.8 acre of wildflower habitat along the trail bordering the western portion of the unit.</li> <li>Establish 1.55 acres of grassland habitat west of the trail, within an isolated open habitat.</li> </ul>
<b>TA4</b>	<p><b>3.50 acres - \$6,600</b></p> <ul style="list-style-type: none"> <li>Install 1,000 native bare-root trees within the 2.5-acre area east of the trail, along the existing woodline.</li> <li>Install 1.5 acres of wildflower habitat along the trail bordering the the unit.</li> </ul>	<p><b>7.66 acres - \$9,450</b></p> <ul style="list-style-type: none"> <li>Install 800 native bare-root trees within the 3.8-acre area.</li> <li>Install 3.7 acres of grassland habitat within open habitats near the center and northeast portions of the unit</li> <li>Install 1.0 acre of wildflower habitat along the trail bordering the southern portion of the unit.</li> </ul>
<b>TA5</b>	<p><b>6.83 acres - \$8,500</b></p> <ul style="list-style-type: none"> <li>Install 920 native bare-root trees within the 2.3-acre area east of the unit.</li> <li>Install 1.2 acres of wildflower habitat along the trail bordering the southern side of the unit.</li> <li>Establish 2.3 acres of grassland habitat north of the trail, bordering the western edge of the shrub-scrub habitat.</li> </ul>	<p><b>4.82 acres - \$4,200.</b></p> <ul style="list-style-type: none"> <li>Install 400 native bare-root trees within the 1.0-acre area east of the unit.</li> <li>Establish 2.2 acres of grassland habitat within an isolated open habitat near the center of the unit.</li> </ul>

†Costs were developed in 2015 as an estimate for the purpose of management planning and budgeting, and are subject change based on changing site conditions and fluctuating material and labor costs.

# APPENDIX A LOCATION STUDY AREA

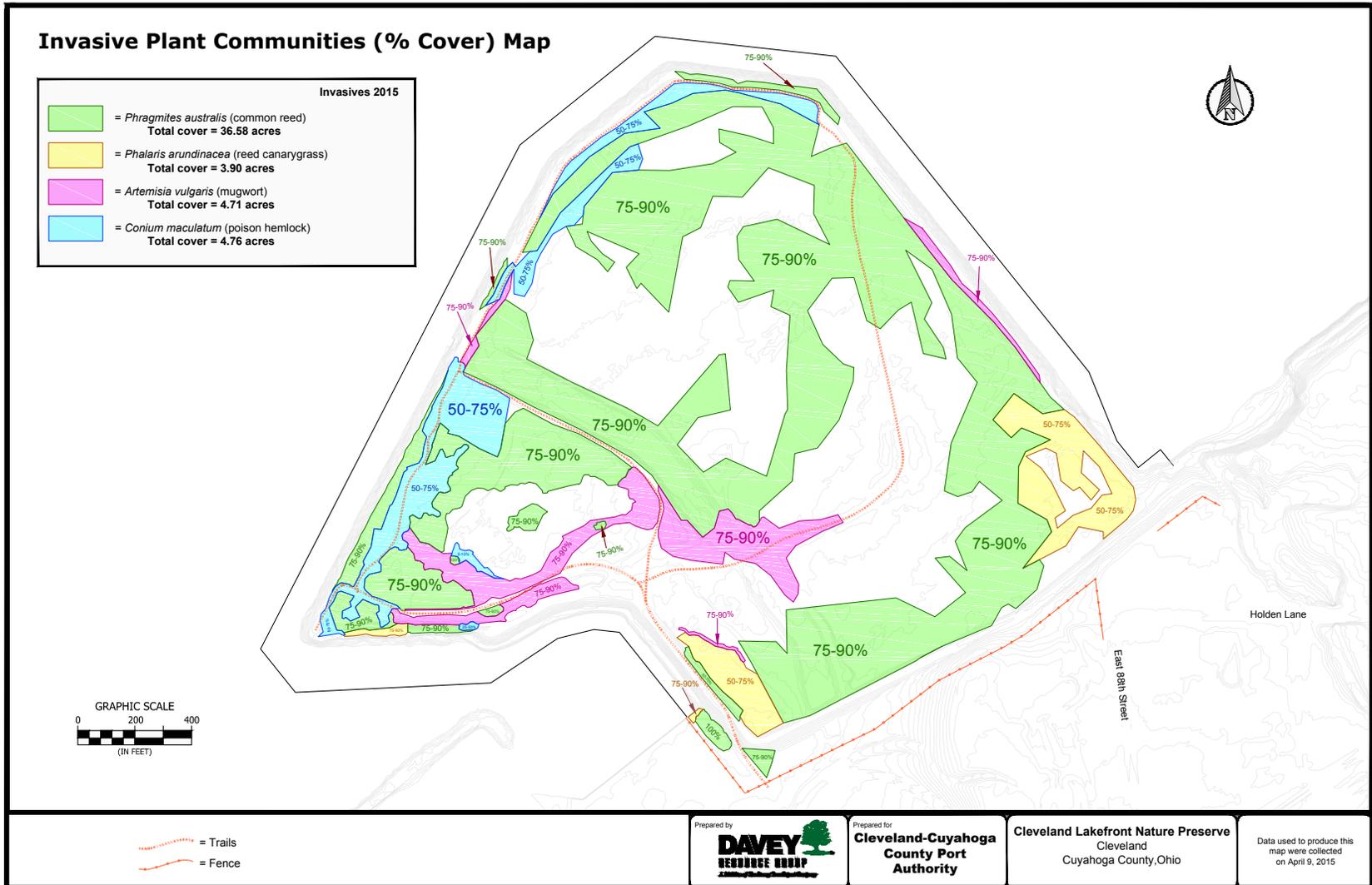
## LOCATION OF STUDY AREA ON HIGHWAY MAP



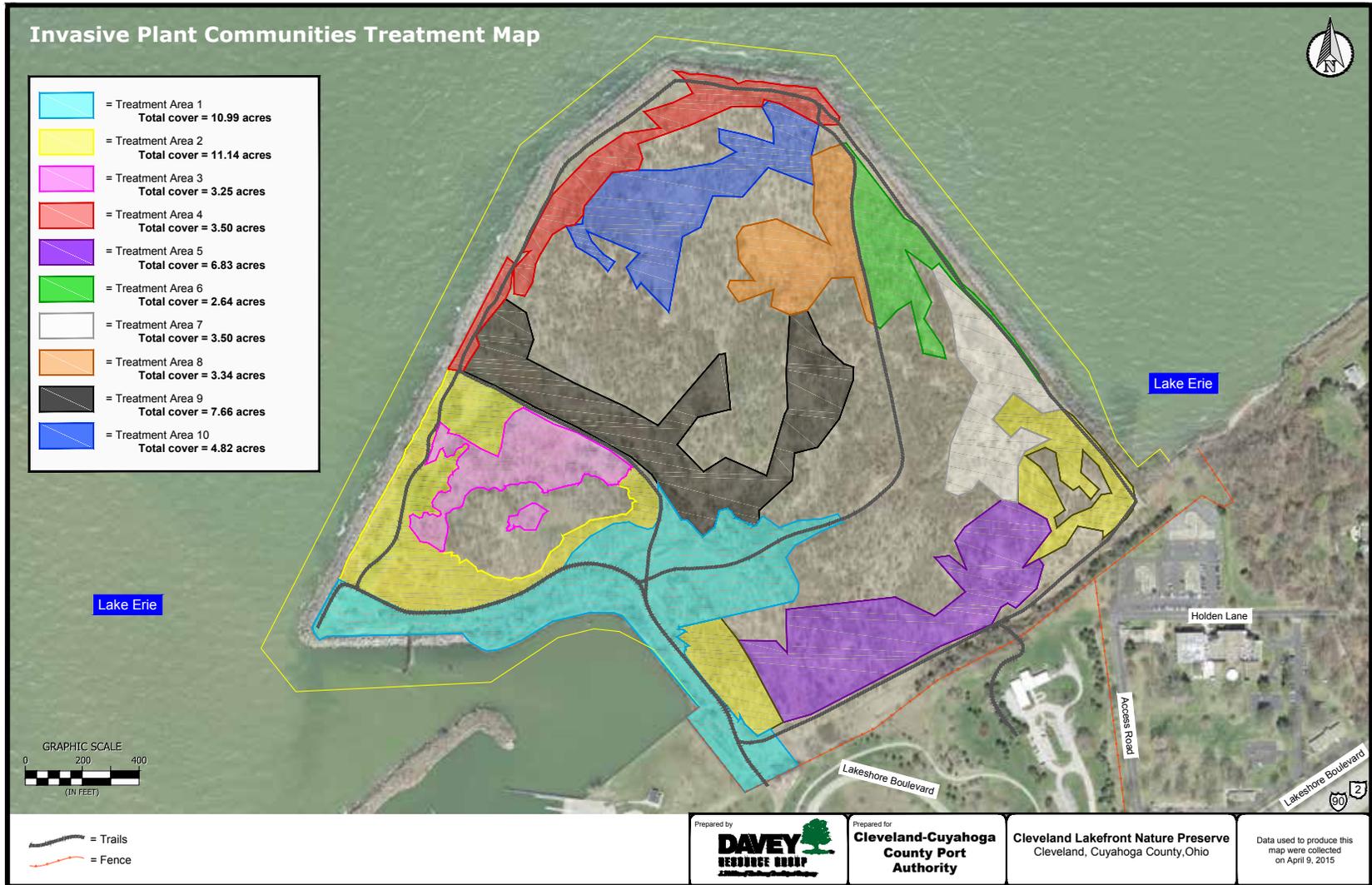
# APPENDIX B INVASIVE PLANT COMMUNITIES MAP



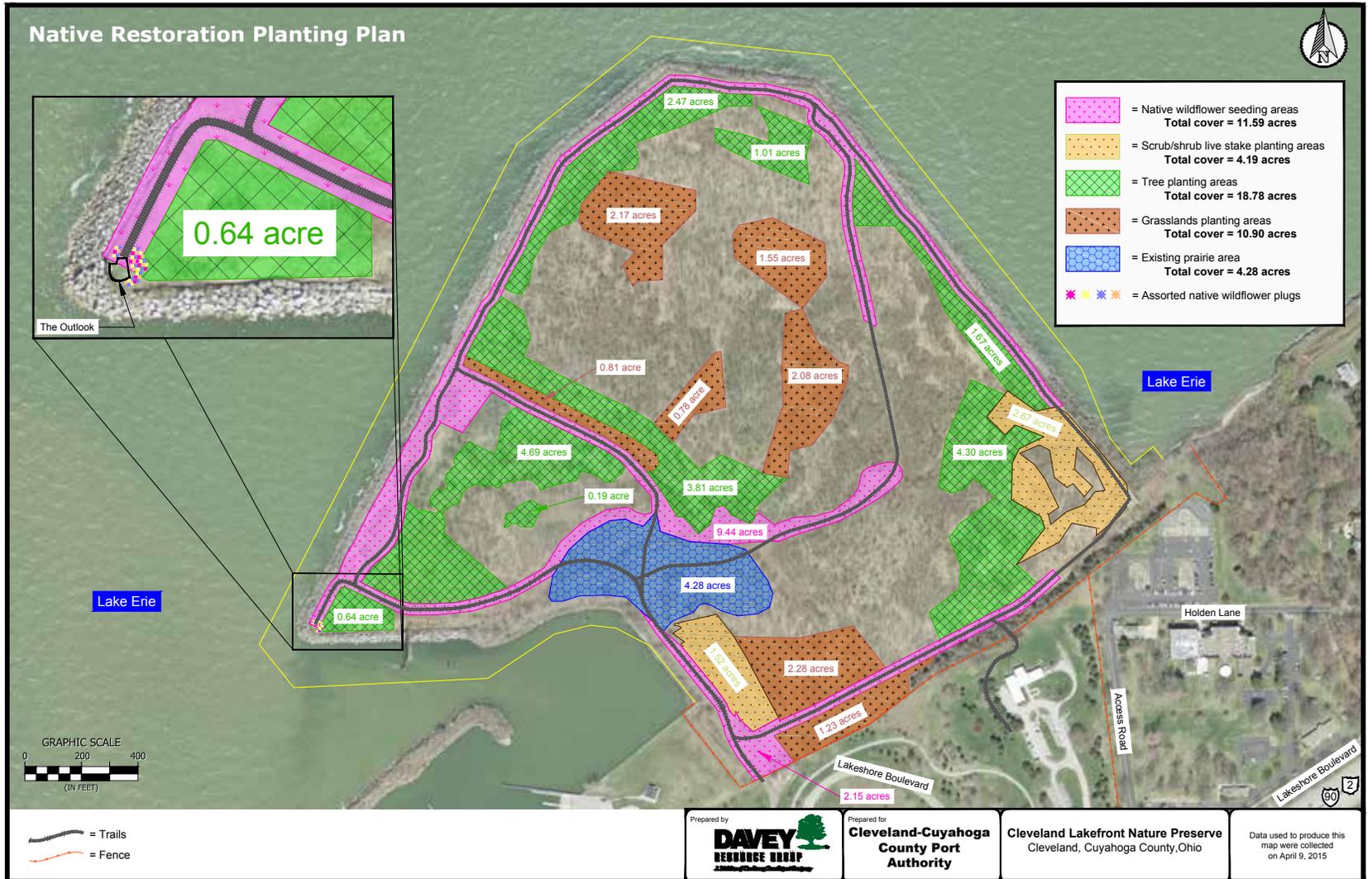
# APPENDIX C INVASIVE VEGETATION COVERAGE MAP



# APPENDIX D INVASIVE VEGETATION TREATMENT PLAN MAP



# APPENDIX E NATIVE HABITAT RESTORATION PLAN MAP



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## APPENDIX F MAINTENANCE COSTS

Below are estimated maintenance costs for each treatment area, following eradication of non-native invasive vegetation and establishment of native habitat (activities include mowing and

spot treatments of invasive vegetation). Costs will decrease over time for each area as habitats become established.†

AREA	ACRES	ANNUAL MAINTENANCE COST
1	10.99	\$1,175
2	11.14	\$1,650
3	3.25	\$950
4	3.50	\$1,050
5	6.83	\$1,350
6	2.64	\$700
7	3.50	\$750
8	3.34	\$750
9	7.66	\$1,200
10	4.82	\$980
<b>Total</b>	<b>57.03</b>	<b>\$10,555</b>

*†Costs were developed in 2015 as an estimate for the purpose of management planning and budgeting, and are subject change based on changing site conditions and fluctuating material and labor costs.*

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## **APPENDIX G YEAR 1 TREATMENT TIMELINE**

The table below is the estimated timeline for Year 1 treatment and planting activities.

<b>DELIVERABLE</b>	<b>ESTIMATED DATE OF COMPLETION</b>
Herbicide application	August 25, 2015
Mowing biomass	November, 2015
Seeding treated areas	November, 2015
Planting bare-root trees	April, 2016
Follow-up herbicide application	late-June, 2016

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## APPENDIX H PHOTOGRAPHS OF PROJECT SITE

### PHOTOGRAPH 1

(July 29, 2015) The 5-acre wildflower habitat contains scattered populations of *Phragmites australis* (common reed) that will be selectively treated using backpack sprayers and hand wicking equipment. These areas will be seeded using the native wildflower mix that was originally used.



### PHOTOGRAPH 2

(July 29, 2015) Areas on the perimeter of the 5-acre wildflower habitat contain larger stands of *Phragmites australis* (common reed) that will continue to spread and dominate a larger area over time if left untreated. These areas should be treated so that biomass is removed to establish native seed that will deter growth of additional non-native vegetation.



### PHOTOGRAPH 3

(July 29, 2015) The areas along the trail leading from the wildflower area to The Overlook, on the western side of the preserve, contain monotypic stands of *Artemisia vulgaris* (mugwort) and *Phragmites australis* (common reed). Very little native growth exists in these areas. Herbicide treatments will be completed in these areas. The vegetation will be replaced with native grasses and wildflowers to improve native species diversity.



### PHOTOGRAPH 4

(July 29, 2015) The trails on the western side of the preserve also contain large populations of *Conium maculatum* (poison hemlock), as well as *Artemisia vulgaris* (mugwort) and *Phragmites australis* (common reed). These species create dense stands with little native vegetation that easily overgrow and obstruct the trails. Removing these species will increase visibility, decrease maintenance and mowing costs, and improve the overall aesthetic of the preserve.



### PHOTOGRAPH 5

(July 29, 2015) The section of trail leading out to The Overlook is overgrown with invasive vegetation that is encroaching on the trail. This area will be treated and planted with wildflowers and trees to shade out the non-desirable species.



### PHOTOGRAPH 6

(July 29, 2015) The area directly east of the overlook plaza is a monoculture of *Phragmites australis* (common reed) with additional *Conium maculatum* (poison hemlock) growing along the perimeter. Once the vegetation is controlled, this will be an excellent area to create a volunteer garden and plant a memorial garden with large caliper trees donated by local organizations.

