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# Weed Identification and Management at the Morris Arboretum

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An independent study project report by The Alice and J. Liddon Pennock, Jr. Endowed Horticulture Intern (2013-2014)

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# Weed Identification and Management at the Morris Arboretum

## **Abstract**

There are a number of unwanted, invasive, non-native plants in the Morris Arboretum. The horticultural staff and volunteers are constantly battling these weeds in every section of the property. Correct identification poses a challenge, as well as choosing the most effective control techniques for each plant. Weed control requires a considerable allocation of time and money during the growing season. Efficient identification and eradication are of utmost importance. The purpose of this project was to create a weed identification and management guidebook specific to Morris Arboretum. Only the most common and problematic weeds on the property were covered. Emphasis was placed upon photographing and explaining all significant identification features, reproductive methods, problems caused, and management techniques. The reference guide is intended as a resource for interns, seasonal staff, volunteers, and interested members of the public.

## **Disciplines**

Horticulture | Weed Science

## **Comments**

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**Title:** Weed Identification and Management at the Morris Arboretum

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**Date:** March 2014

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There are a number of unwanted, invasive, non-native plants in the Morris Arboretum. The horticultural staff and volunteers are constantly battling these weeds in every section of the property. Correct identification poses a challenge, as well as choosing the most effective control techniques for each plant. Weed control requires a considerable allocation of time and money during the growing season. Efficient identification and eradication are of utmost importance. The purpose of this project was to create a weed identification and management guidebook specific to Morris Arboretum. Only the most common and problematic weeds on the property were covered. Emphasis was placed upon photographing and explaining all significant identification features, reproductive methods, problems caused, and management techniques. The reference guide is intended as a resource for interns, seasonal staff, volunteers, and interested members of the public.

**TABLE OF CONTENTS**

INTRODUCTION.....2

METHODS.....2

MANAGEMENT.....3

    Wildlife Considerations.....4

CONCLUSION.....5

REFERENCES.....6

APPENDIX.....8

## INTRODUCTION

One of the most considerable elements of gardening is weeding. Weeds are a constant pressure in the managed landscape. Before the act of weeding, the gardener must decide what is, in fact, a “weed”. Merriam-Webster defines a weed as “a plant that is not valued where it is growing and is usually of vigorous growth.” This definition expresses that the term “weed” is ambiguous. Plants considered weeds in a formal garden may not have the same designation in the natural landscape. Deciding what is or is not a weed is a human or personal classification. Fortunately, most plants considered weeds are agreed upon across the board by professional horticulturists. Plants that consistently overgrow or choke out more desirable plants are almost always regarded as weeds.

The ability to identify weeds in the landscape is an essential skill for all gardeners. It is also one of the most challenging aspects of the trade. For those new to horticulture, weeding can be an intimidating prospect. Differentiating between weeds and desired plants is difficult until a gardener gains confidence through experience. There are a large number of unwanted and invasive plants present at the Morris Arboretum of the University of Pennsylvania. The horticultural staff and volunteers are constantly battling these weeds in every section of the property. Correct identification poses a challenge, as well as choosing the most effective control techniques for each plant. Weed control requires a considerable allocation of time and money during the growing season. Efficient identification and eradication are of utmost importance.

Although the full-time horticulture staff is very comfortable with weed identification, a vast amount of labor in the Arboretum comes from seasonal staff, interns, and volunteers, many of whom are new to gardening. The aim of this project was to create a weed identification and management guidebook specific to the Morris Arboretum. Many other weed guides are available, but all of these contain information about numerous weed species that are not found in the Arboretum. These guides can lead to confusion and misidentification. The guide produced by this project includes only the most important weed pests at the Morris Arboretum. This guide will streamline the identification process for those that are unfamiliar with weeding. It is meant as a quick and easily accessible reference.

## METHODS

The main goal of this project was to create a weed identification reference for volunteers and staff. The first step was to establish which weeds to include. All horticulture section leaders were asked to identify the top 5-10 problematic weeds in their area of the property. This garnered a list of 20 weed species. An additional 10 weeds were selected based on suggestions from horticulture volunteers and personal observations by the author. In some cases, there are multiple related species belonging to the same genus. Since the differences between these species are minor in regard to identification and management, they are simply listed by their genus followed by spp. (i.e. *Oxalis corniculata* and *O. stricta* are listed as *Oxalis* spp.) The following is a total list of the selected weed species.

*Aegopodium podagraria*, Goutweed  
*Alliaria petiolata*, Garlic mustard  
*Allium vineale*, Field garlic  
*Ampelopsis brevipedunculata*, Porcelain berry  
*Artemisia vulgaris*, Mugwort  
*Calystegia sepium*, Hedge bindweed  
*Cardamine hirsuta*, Hairy bittercress  
*Celastrus orbiculatus*, Oriental bittersweet  
*Cirsium arvense*, Canada thistle  
*Cyperus esculentus*, Yellow nutsedge  
*Euphorbia maculata*, Spotted spurge  
*Fallopia japonica*, Japanese knotweed  
*Fatoua villosa*, Mulberry weed  
*Glechoma hederaceae*, Ground ivy  
*Humulus japonicus*, Japanese hop

*Lonicera japonica*, Japanese honeysuckle  
*Lonicera* spp., Shrub honeysuckles  
*Microstegium vimineum*, Japanese stilt grass  
*Oxalis* spp., Wood sorrel  
*Persicaria perfoliata*, Mile-a-minute  
*Persicaria* spp., Smartweed  
*Phalaris arundinaceae*, Reed canary grass  
*Phragmites australis*, Common reed  
*Phytolacca americana*, Common pokeweed  
*Pilea pumila*, Clearweed  
*Pinellia ternata*, Crow-dipper  
*Ranunculus ficaria*, Lesser celandine  
*Rosa multiflora*, Multiflora rose  
*Toxicodendron radicans*, Poison ivy  
*Urtica dioica*, Stinging nettle

After determining the list of the most common and problematic weeds, those plants were scouted and identified in the field. All weeds were photographed with a point and shoot camera on site. A majority of the photographs were taken within the Morris Arboretum property. However, in order to photograph some plants and their important life-stages, pictures were taken at other locations, including: Wissahickon Valley Park, Awbury Arboretum, and Mount Tammany (Delaware Water Gap). A minimum of twelve pictures were taken of each weed species. Image quality was assessed based on focus, contrast, lighting, and content. Effort was made to only include the highest quality pictures depicting important stages. The reference guide was intended to be concise. Each weed was given one page on which to fit all of the information and photographs. A maximum of three photographs were selected to represent each species in the guide. Color images are the most important part of the reference guide. Even though written descriptions were included, the photographs provide a higher level of clarity.

The next step was to decide what information to include in the guide. The categories decided upon were: botanical family, identification, propagation, origin and habitat, problem caused, and management. These categories generally coincide with topics covered in published weed guides. The identification category was broken into seven sub-categories: growth habit, size, leaves, stem, roots and underground structures, flowers, and fruit. Effort was made to keep the information in each category as clear and concise as possible. Thus, information for each weed species was kept on a single page.

## MANAGEMENT

Effective weed management requires specific goals. Early weed detection and rapid response are manageable goals for the Arboretum. With the help of this management guide, volunteers, seasonal workers, and interns should be able to monitor all areas of the Arboretum for new weed infestations and respond quickly with control efforts. Although it will be impossible to eliminate all weeds from the property, at least this new guide will help workers

become better scouts. Early detection and rapid response are the best ways to reduce weed populations at Morris Arboretum.

There are two “types” of weeds included in this reference guide: aesthetic weeds and those that pose a threat to the maintenance of broad-scale biodiversity. Most of the aesthetic weeds only affect the formal plantings of the Arboretum including mulch rings around trees and perennial borders. Aesthetic weeds include: *Cardamine hirsuta*, *Euphorbia maculata*, *Pilea pumila*, and *Oxalis* spp. These species do not pose a threat to overall biodiversity, but rather represent an annoyance to the gardener. They reproduce quickly and make plantings look unkempt if left uncontrolled. Other weeds, particularly those that inhabit the natural areas of the Arboretum, are a threat to overall biodiversity (i.e. *Alliaria petiolata*, *Fallopia japonica*, and *Microstegium vimineum*). These plants are almost all non-native and invasive. They disperse readily and grow aggressively. Invasive plants have few natural controls in the environment. There are not many forces that keep the growth of these plants in check. Thus, invasive species out-compete native plants which have evolved to a very specific niche. Most native plants have a whole host of natural predators and diseases that keep them in balance in the ecosystem.

No single management technique is inherently better than another, nor will a single management technique be adequate for all situations in a management program. Each site needs to be evaluated and weed management goals established based on the level of control desired, keeping in mind environmental and budgetary restrictions. In most cases, it is more cost effective to remove small infestations by hand. Large weed populations are often more efficiently controlled with herbicides. Many weed guides include both chemical and organic control methods. However, this new Morris Arboretum reference guide only includes organic methods of control. This approach was taken in order to protect the health of workers. Chemical control is not inherently bad, but herbicide exposure raises human health and environmental concerns. Safely handled chemicals can be of great use to the gardener, but many mechanical and cultural management techniques can be just as effective given enough time. Morris Arboretum volunteers and employees can achieve weed control with organic methods that pose fewer risks.

Mechanical and cultural weed control techniques were included in the reference guide. Mechanical techniques are those that act directly on plants. Mowing is a good example of a mechanical control technique. Mulching is a mechanical control technique that works by shading out light-sensitive seeds and seedlings. Cultural control involves manipulating the environment of a plant, which, in turn, acts upon the plant. For example, densely planting a garden bed limits the amount of bare soil for weeds to colonize. Every weed in the reference guide has at least one organic control method that will help curb its population.

## **Wildlife Considerations**

The large white-tailed deer (*Odocoileus virginianus*) population on the Morris Arboretum property is likely exacerbating problems with invasive species. Historically, the land was able to support smaller deer populations. Now, with few natural predators, white-tailed deer populations have swollen to an unsustainable size. Human development has left very little natural land for deer to graze on. Small patches of undeveloped land are overrun with deer. White-tailed deer

preferentially feed on native plants. As deer browse native vegetation, they leave gaps in the landscape that are filled with non-native invasive species. Non-native plants are great at utilizing disturbed land and vacant niches. Many non-native plants are not palatable for deer and are avoided. High deer pressure complicates efforts to maintain healthy native plant communities.

Many fruit-eating bird species are considered the major dispersal agents of invasive plants. The Morris Arboretum hosts many frugivorous bird species including:

- Cedar waxwing, *Bombycilla cedrorum*
- Northern cardinal, *Cardinalis cardinalis*
- Gray catbird, *Dumetella carolinensis*
- Northern mockingbird, *Mimus polyglottos*
- Eastern bluebird, *Sialia sialis*
- European starling, *Stumus vulgaris*
- American robin, *Turdus migratorius*

Fleshy fruits are produced by a number of invasive plants such as: *Ampelopsis brevipedunculata*, *Celastrus orbiculatus*, *Rosa multiflora*, and *Lonicera* species. Fruit passes through birds' digestive tracts, and the seeds are subsequently deposited in new areas. The invasive species listed above are often dispersed by birds. Although these plants contribute to the diets of many frugivorous birds, they negatively impact the ecosystem in other ways. For example, non-native invasive plants are often unpalatable to native insects. Many birds depend on insects for the main part of their diet. Areas dominated by non-native plants will have less insect diversity than healthy, functioning ecosystems. Thus, bird territory sizes must be larger during nesting season in order to provide enough insects for breeding birds. Although invasive, fleshy-fruit bearing plants should be removed, consider the bird species that utilize their fruit. Planting native species with fleshy fruit will take the place of invasive non-natives. A few good options are winterberry (*Ilex verticillata*), silky dogwood (*Cornus amomum*), black tupelo (*Nyssa sylvatica*), and serviceberry (*Amelanchier canadensis*).

A few native plant species that have wildlife benefits are considered weeds in the garden. Poison ivy (*Toxicodendron radicans*) and common pokeweed (*Phytolacca americana*) both produce fruit that is a part of the diet of many songbirds and mammals. While these plants are considered nuisances in formal plantings, they are very valuable plants in the ecosystem. Pokeweed should be conserved in natural areas. Poison ivy should be left growing in areas where humans will not easily come in contact with it. Marginal natural areas are good places to let poison ivy grow and serve wildlife.

## CONCLUSION

Weeds will inevitably remain a part of the Morris Arboretum landscape. It is hoped that this new weed identification and management guide will help staff and volunteers recognize unwanted plants in the gardens, farm, and natural areas. The management techniques specified in the reference guide will give workers ideas on how best to control the plant.

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# Weed Identification AND Management

At the Morris Arboretum of the  
University of Pennsylvania



EMMA E. ERLER

# Mugwort

*Artemisia vulgaris*

**FAMILY:** Asteraceae (Aster Family)

## IDENTIFICATION

- ◇ **Growth Habit:** Herbaceous perennial
- ◇ **Size:** 2-5 feet tall
- ◇ **Leaves:** Simple, alternate, lobed, and pointed. Upper leaf surfaces are lightly hairy; bottoms densely covered with silvery-white hairs. Crushed leaves are fragrant.
- ◇ **Stem:** Upright and branched in the upper 1/3 of the stem. Older plants are woody. Stems are red, brown, or purplish.
- ◇ **Roots and Underground Structures:** Horizontal rhizomes are long and white/tan. Rhizomes creep outwards to form large colonies.
- ◇ **Flowers:** Composite flower heads are borne in clusters at the ends of stems. Flowers are greenish white or yellowish. June-October
- ◇ **Fruit:** Oblong achenes; rarely viable

## PROPAGATION

Mugwort primarily reproduces by spreading rhizomes. It is spread when rhizomes are fragmented in cultivation or transported in topsoil. Mugwort occasionally spreads by seed.

## ORIGIN AND HABITAT

Native to Eurasia. Mugwort is a weed of gardens, fields, roadsides, and turf grass. It is very tolerant of mowing and cultivation. Mugwort thrives in sunny areas with poor, well-drained soil.

## PROBLEM

Mugwort forms dense stands that outcompete native or desirable vegetation. Tough rhizomes make it hard to eliminate in perennial beds and turf.



## MANAGEMENT

Mugwort is easiest to remove in spring and early summer when it is still small. Use a soil knife to dig up as much of the root and rhizome system as possible. Rhizome fragments will resput, so revisit affected areas. Vigilant removal will eventually exhaust the rhizome system.

Large patches can be repeatedly mowed to the ground to stop the spread of the plant.

