

# **DELAWARE**

## **Invasive and Potentially Invasive Plants**



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# TITLE 3

Agriculture

## Regulatory Provisions

### CHAPTER 29. Invasive and Potentially Invasive Plants

[83 Del. Laws, c. 8, § 1](#); [83 Del. Laws, c. 347, § 2](#);

**§ 2901. Purpose.**

The purpose of this chapter is to prohibit invasive plant species at their point of sale or delivery into this State.

[83 Del. Laws, c. 8, § 1](#);

**§ 2902. Definitions.**

As used in this chapter:

- (1) “Invasive plant” means any living part, cultivar, variety, species, or subspecies not native to Delaware identified by the Secretary as having the potential to do all of the following:
- a. Result in widespread dispersal and establishment.
  - b. Out-compete other species in the same area.
  - c. Exhibit rapid growth or high seed or propagule productions.
  - d. Become established in natural areas in the State.
- (2) “Secretary” means the Secretary of the Delaware Department of Agriculture.

[83 Del. Laws, c. 8, § 1](#);

**§ 2903. Restrictions on invasive and potentially invasive plants.**

- (a) No person may import, export, buy, sell, transport, distribute, or propagate any viable portion, including seeds, of a plant on the Invasive Plant List, unless the Secretary provides prior written approval under subsection (b) of this section.
- (b) The Secretary may provide written approval for a person to conduct an activity prohibited under subsection (a) of this section if the purpose of the activity is for any of the following:
- (1) Disposal.

- (2) Control.
- (3) Research or education.
- (4) Export for the purpose of disposal, control, research, or education.

(c) No person may import, export, buy, sell, transport, distribute, or propagate any viable portion, including seeds, of a plant on the Plant Watch List, unless the plant is identified with a tag, label, or sign published under § 2904 of this title.

[83 Del. Laws, c. 8, § 1](#); [83 Del. Laws, c. 347, § 2](#);

**§ 2904. Regulations; designation of plants.**

- (a) (1) The Secretary shall adopt regulations necessary to carry out the purposes of this chapter.
  - (2) The regulations adopted under paragraph (a)(1) of this section shall include all of the following:
    - a. Maintaining the Invasive Plant List.
    - b. Establishing and maintaining the Plant Watch List.
  - (3) The Secretary shall adopt regulations under paragraph (a)(2) of this section with the advice of the Delaware Native Species Commission, so long as the Delaware Native Species Commission exists.
- (b) The Invasive Plant List contains plants that are known to be invasive plants. Until revised under paragraph (a)(2)a. of this section, the Invasive Plant List is as follows:
- (1) Amur honeysuckle (*Lonicera maackii*).
  - (2) Autumn olive (*Elaeagnus umbellata*).
  - (3) Callery pear (*Pyrus calleryana*).
  - (4) Chinese wisteria (*Wisteria sinensis*).
  - (5) Creeping Jenny (*Lysimachia nummularia*).
  - (6) Creeping water primrose (*Ludwigia peploides* subsp. *glabrescens*).
  - (7) English ivy (*Hedera helix*).
  - (8) European privet (*Ligustrum vulgare*).
  - (9) European reed (*Phragmites australis* subsp. *australis*).
  - (10) European sweetflag (*Acorus calamus*).
  - (11) Garlic mustard (*Alliaria petiolata*).
  - (12) Hydrilla (*Hydrilla verticillata*).
  - (13) Japanese barberry (*Berberis thunbergia*).
  - (14) Japanese honeysuckle (*Lonicera japonica*).
  - (15) Japanese knotweed (*Fallopia japonica*).
  - (16) Japanese pachysandra (*Pachysandra terminalis*).
  - (17) Japanese stiltgrass (*Microstegium vimineum* ).
  - (18) Lesser celandine (*Ficaria verna*).
  - (19) Lesser periwinkle (*Vinca minor*).
  - (20) Marsh dewflower (*Murdannia keisak*).

- (21) Mile-a-minute weed (*Persicaria perfoliate*).
- (22) Morrow's honeysuckle (*Lonicera morrowii*).
- (23) Multiflora rose (*Rosa multiflora*).
- (24) Norway maple (*Acer platanoides*).
- (25) Orange daylily (*Hemerocallis fulva*).
- (26) Oriental bittersweet (*Celastrus orbiculatus*).
- (27) Parrot-feather (*Myriophyllum aquaticum*).
- (28) Porcelain berry (*Ampelopsis glandulosa*).
- (29) Purple loosestrife (*Lythrum salicaria*).
- (30) Spotted knapweed (*Centaurea stoebe* subsp. *micranthos*).
- (31) Tatarian honeysuckle (*Lonicera tatarica*).
- (32) Tree of heaven (*Ailanthus altissima*).
- (33) Water hyacinth (*Eichhornia crassipes*).
- (34) Wineberry (*Rubus phoenicolasius*).
- (35) Winged euonymus (*Euonymus alatus*).
- (36) Yam-leaved clematis (*Clematis terniflora*).
- (37) Yellow flag iris (*Iris pseudoacorus*).

- (c) (1) The Plant Watch List contains plants that have the potential to be invasive plants.
- (2) The Secretary shall create and publish a template for the tags, labels, and signs that must be used to identify a plant on the Plant Watch List as being potentially invasive.

[83 Del. Laws. c. 8, § 1](#); [83 Del. Laws. c. 283, § 3](#); [83 Del. Laws. c. 347, § 3](#);

**§ 2905. Acceptance of grants.**

The Department of Agriculture and the Department of Natural Resources and Environmental Control may accept, use, or expand a gift, grant, aid, or loan that may be available from any source, public or private, for the purposes of carrying out the provisions of this chapter.

[83 Del. Laws. c. 8, § 1](#);

**§ 2906. Violations.**

- (a) A person who violates this chapter is subject to a civil penalty of not less than \$50 and not more than \$500 for each proven occurrence.
- (b) Before imposing a penalty under subsection (a) of this section, the Secretary must offer the person advice on compliance with this chapter and an administrative hearing under § 2907 of this title.
- (c) The Secretary must send a person who violates this chapter a written notice of the violation. The written notice of a violation must contain information regarding the opportunity for an administrative hearing under § 2907 of this title.
- (d) (1) A person who violates this chapter may enter into a written agreement with the Secretary, specifying terms and conditions for compliance with this chapter.
- (2) A person who is in compliance with all of the terms and conditions of a written agreement under paragraph (d)(1)



of this section is not in violation of this chapter.

(e) All civil penalties collected under this section are payable to the Delaware Department of Agriculture and must be used for enforcement of this chapter.

[83 Del. Laws, c. 8, § 1;](#)

**§ 2907. Hearing procedure; appeals.**

- (a) The Secretary, or the Secretary’s designee shall conduct all administrative proceedings under this chapter.
- (b) A person accused of violating this chapter has the right to appear personally, to be represented by counsel, and to submit evidence and witnesses in defense of the charges.
- (c) The Secretary or the Secretary’s designee shall make and preserve a full record of the proceeding. A transcript of the record may be purchased upon payment to the Department of Agriculture of the cost of preparing such a transcript.
- (d) The Secretary or the Secretary’s designee shall issue a decision in writing to the person accused of violating this chapter within 30 days of the conclusion of the hearing.
- (e) The decision by the Secretary or the Secretary’s designee is appealable to the Superior Court within 30 days of the date the decision is mailed.
- (f) Written notice of an appeal under subsection (e) of this section, must state the grounds for the appeal and be served on the Secretary.

[83 Del. Laws, c. 8, § 1;](#)

The first Delaware Invasive Species Council (DISC) assessment of invasive plants was conducted in 2003, and followed protocol developed by NatureServe. A second assessment was done in 2006, following the same protocol. After the 2006 assessment, DISC developed three invasive categories – widespread and invasive, restricted and invasive, and restricted and potentially invasive. In 2019, DISC recognized that a revision of the 2006 list of invasive plants was needed, and that the NatureServe protocol should be modified to make it more relative to the state of Delaware. This current assessment is based on this modified protocol. Experts in the field of botany were contacted in June of 2019 and asked to complete the assessment in an online form. They were provided a list of species to review, and were asked to assess those species they were most familiar with. It should be noted, some individuals appeared on multiple subject matter expert lists (denoted by an asterisk). Experts were given five months to review and complete the assessment. Those who completed assessments for at least one species are indicated in the table below.

Plants List	
Expert Names	
Lori Athey	Ashley Kroon
Susan Barton	Eric Ludwig*
Chris Bennett	Bill McAvoy
Erich Burkentine	Brenna Ness
Darin Callaway	Dave Pro
Bob Collins	Alison Rogerson
Stephen Cottrell	Matt Sarver
Jim Dobson	George Schurter
Jack Ebert	Joe Sebastiani
Rob Gano*	Nate Shampine
Kate Hackett	Elaine Scherling
Jack Holt	Doug Tallamy*
Rick Johnstone	Mark VanGessel
Bill Jones*	Natasha Whetzel
	Jim White

*\* found on more than one expert list*

Based on the expert assessments, an I-Rank, or invasive rank was determined based on expert responses denoting the level at which a species is invasive in the identified geographic area, in this case, the state of Delaware. These ranks are categorized by high, medium, low, and insignificant. If a species was ranked as high, medium, or low, they are deemed invasive to some degree by the experts and; therefore, are included in the current iteration of the DISC list of Invasive Plant Species. Species ranked as insignificant, were added to the DISC Watch List and will be reevaluated in two years when the list will again be revised. Additionally, for future revisions to the list, selected species thought to be invasive in Delaware will also be evaluated. In contrast to the 2006 DISC list of invasive plants, the new list includes only two categories – invasive and watch list. Below are the results.

Scientific and common names are based on: McAvoy, W.A. 2020. The Flora of Delaware Database. Delaware Division of Fish and Wildlife, Species Conservation and Research Program, Smyrna, Delaware.

Species	Common Name	Status
<i>Acer palmatum</i>	Japanese maple	Invasive Species
<i>Acer platanoides</i>	Norway maple	
<i>Acorus calamus</i>	European Sweetflag	
<i>Ailanthus altissima</i>	Tree of heaven	
<i>Alliaria petiolata</i>	Garlic mustard	
<i>Ampelopsis glandulosa</i>	Porcelain berry	
<i>Berberis thunbergii</i>	Japanese barberry	
<i>Celastrus orbiculatus</i>	Oriental bittersweet	
<i>Centaurea stoebe</i> subsp. <i>micranthos</i>	Spotted knapweed	
<i>Clematis terniflora</i>	Japanese Clematis	
<i>Elaeagnus umbellata</i>	Autumn olive	
<i>Eragrostis curvula</i>	Weeping lovegrass	
<i>Euonymus alatus</i>	Winged euonymus	
<i>Euonymus fortunei</i>	Wintercreeper	
<i>Fallopia japonica</i>	Japanese knotweed	
<i>Ficaria verna</i>	Lesser celandine	
<i>Hedrix helix</i>	English ivy	
<i>Hemerocallis fulva</i>	Orange daylily	
<i>Hydrilla verticillata</i>	Hydrilla	
<i>Iris pseudacorus</i>	Yellow flag iris, Water flag	
<i>Koelreuteria paniculata</i>	Golden raintree	
<i>Leucojum aestivum</i>	Summer snowflake	
<i>Ligustrum vulgare</i>	European privet	
<i>Lonicera japonica</i>	Japanese honeysuckle	
<i>Lonicera maackii</i>	Amur honeysuckle	
<i>Lonicera morrowii</i>	Morrow's honeysuckle	
<i>Lonicera tatarica</i>	Tartarian honeysuckle	
<i>Lysimachia nummularia</i>	Creeping Jenny	
<i>Lythrum salicaria</i>	Purple loosestrife	
<i>Microstegium vimineum</i>	Japanese stilt grass	
<i>Miscanthus sinensis</i>	Chinese silvergrass	
<i>Murdannia keisak</i>	Marsh Dewflower	
<i>Pachysandra terminalis</i>	Japanese pachysandra	
<i>Persicaria perfoliata</i>	Mile-a-minute	
<i>Phalaris arundinacea</i>	Reed canarygrass	

Species	Common Name	Status
<i>Phragmites australis</i> subsp. <i>australis</i>	European reed	
<i>Pinus thunbergiana</i>	Japanese black pine	
<i>Pyrus calleryana</i>	Callery pear	
<i>Rosa multiflora</i>	Multiflora rose	
<i>Rubus phoenicolasius</i>	Wineberry	
<i>Viburnum dilatatum</i>	Linden arrowwood	
<i>Viburnum sieboldii</i>	Siebold’s viburnum	
<i>Vinca minor</i>	Lesser periwinkle	
<i>Wisteria sinensis</i>	Chinese wisteria	
<i>Buddleja davidii</i>	Butterflybush	Invasive Species Watch List
<i>Ilex crenata</i>	Japanese holly	
<i>Lespedeza thunbergii</i>	Thunberg’s bushcover	
<i>Lilium lancifolium</i>	Tiger lily	
<i>Lotus corniculatus</i>	Bird’s foot trefoil	
<i>Mahonia bealei</i>	Leatherleaf mahonia	
<i>Quercus acutissima</i>	Sawtooth oak	
<i>Spirea japonica</i>	Japanese spirea	
<i>Viburnum plicatum</i>	Japanese snowball	
<i>Viburnum setigerum</i>	Tea viburnum	

# **Plant Species Assessment Protocol**

## **Executive Summary**

NatureServe, in cooperation with The Nature Conservancy and the U.S. National Park Service, developed this Invasive Species Assessment Protocol as a tool for assessing, categorizing, and listing non-native invasive vascular plants according to their impact on native species and natural biodiversity in a large geographical area such as a nation, state, province, or ecological region. This protocol is designed to make the process of assessing and listing invasive plants objective and systematic, and to incorporate scientific documentation of the information used to determine each species' rank. This protocol was adopted and modified by Delaware Invasive Species Committee (DISC) for the purpose of updating the state's list of invasive plant and animal species. NatureServe's methodology has previously included assessments of the conservation significance of native plant species; this protocol extends that scope to include animals and non-native species as well. The protocol is used to assess species (or infraspecific taxa, as appropriate) individually for a specified "region of interest" and to assign each species an Invasive Species Impact Rank (I-Rank) of High, Medium, Low, or Insignificant to categorize its negative impact on natural biodiversity within that region. For Delaware's purposes, the "region of interest" has been designated as the entire state. The protocol includes 16 questions, each with four scaled responses (A-D, plus U = unknown). The original NatureServe survey included 20 questions, but was modified to remove 4 unnecessary questions due to Delaware's limited size. The 16 questions are grouped into four sections: Ecological Impact, Current Distribution and Abundance, Trend in Distribution and Abundance, and Management Difficulty. Each species is assessed by considering these questions, with the answers used to calculate a subrank for each of the four sections. An overall I-Rank is then calculated from the subranks. Text comments and citations to information sources are provided as documentation for each answer selected, along with a concise text summary of the major considerations leading to the overall rank. NatureServe is now using this protocol to assess the biodiversity impact of the approximately 3,500 non-native vascular plant species established outside cultivation in the United States.

## Introduction and Background

NatureServe, in cooperation with The Nature Conservancy and the U.S. National Park Service, developed this Invasive Species Assessment Protocol as a tool for assessing, categorizing, and listing non-native invasive vascular plants according to their impact on biodiversity in a large area such as a nation, state or province, or ecological region. This protocol is designed to make the process of assessing and listing invasive plants and animals objective and systematic by using a specified set of questions and requiring documentation of the scientific information used to determine each species' rank. Species (or infraspecific taxa, as appropriate) are assessed one at a time for a specified "region of interest" to determine an Invasive Species Impact Rank (I-Rank) categorizing the species' negative impact on natural biodiversity within that region as high, medium, low, or insignificant.

The protocol is designed for assessing the biodiversity impact of those species considered non-native in a specified region of interest, in this instance Delaware, or at least non-native in a portion of the region different from their native range.

- Native Species are those present in part or all of a specified region without direct or indirect human intervention, growing within their native range and natural dispersal potential. Other terms for native species include indigenous and aboriginal.
- Non-native, invasive species are not native to North America (north of Mexico) and are thought to have been introduced by humans and have the ability to cause environmental harm. Non-native, invasive species have the potential for widespread dispersal and establishment, are able to out-compete and displace native flora and fauna, have the potential for rapid growth and high reproductive output, and are capable of becoming established in natural areas.

Note that a species is considered native to a region if it is (or historically was) present as a native in at least one place within that region, even if the species is present as a non-native in a different portion of the same region.

Some but not all of the non-native species present in a given region of interest actually threaten biological diversity. The protocol can be used to rank and list the non-native invasive plant and animal species that threaten biological diversity, which we define as those species that:

1. are present but not native in the region of interest,
2. maintain themselves or recurrently appear in conservation areas or other native species habitats, and
3. negatively affect the native species and other natural biodiversity within the region of interest, generally by outcompeting or hybridizing with native species, or by altering ecological communities or ecosystem processes.

Similar terms include harmful invasive plants and animals.

Assessing the biodiversity impact of the non-native species in a region of interest requires an understanding of the various native plant, animal, fungal, and other species there, as well as the

region's ecological communities and important ecosystems processes, and the conservation importance of various lands and waters within the region of interest. Biodiversity (or biological diversity) has been defined as the variety of life on earth (Wilson, 1988), but is often considered as the variety of naturally occurring life in a specified area. Biodiversity can be assessed at any geographic scale (e.g., county-wide, eco-regional, state/provincial, national, continental, or global) and includes:

- Genetic diversity, or variations in genetic structure among individuals of a species or populations;
- Species diversity, or the variety of species (and infraspecific taxa);
- Higher taxonomic diversity, or the variety of higher taxonomic groups (e.g., families or orders);
- Community diversity, or the variety of identifiable groups of species that occupy and interact in the same habitats;
- Ecosystem diversity, or the variety of ecological units composed of biological communities interacting with the physical environment.

See Wilson (1992) for further discussion.

The Invasive Species Assessment Protocol consists of two yes-no screening questions and 20 weighted multiple-choice assessment questions grouped into four sections which address four major aspects of an invasive species' total impact (Table 1):

- I. Ecological Impact (5 questions)
- II. Current Distribution and Abundance (2 questions)
- III. Trend in Distribution and Abundance (6 questions)
- IV. Management Difficulty (3 questions)

*Table 1. Summary of Natureserve's Invasive Species Protocol*

<b>I. Ecological Impact</b> (5 questions; 50% of I-Rank Score)
1. Impact on Ecosystem Processes (33 points)
2. Impact on Ecological Community Structure (18 points)
3. Impact on Ecological Community Composition (18 points)
4. Impact on Individual Native Plant or Animal Species (9 points)
5. Conservation Significance of the Communities and Native Species Threatened (24 points)
<b>II. Current Distribution and Abundance</b> (2 questions; 25% of I-Rank Score)
6. Current Known Range in Delaware (15 points)
7. Diversity of Habitats or Ecological Systems Invaded in Delaware (3 points)
<b>III. Trend in Distribution and Abundance</b> (6 questions; 15% of I-Rank Score)
8. Current Trend in Total Range Within Delaware (18 points)
9. Long-Distance Dispersal Potential Within Delaware (9 points)
10. Local Range Expansion or Change in Abundance (18 points)
11. Inherent Ability to Invade Conservation Areas and Other Native Species Habitats (6 points)
12. Similar Habitats Invaded Elsewhere (9 points)
13. Reproductive Characteristics (9 points)
<b>IV. Management Difficulty</b> (3 questions; 10% of I-Rank Score)
14. General Management Difficulty (33 points)
15. Impacts of Management on Native Species (15 points)
16. Accessibility of Invaded Areas (3 points)

For each question, assessors may select one of four defined answers (A-D) or specify Unknown (U).



## Protocol

Consider the two screening questions (below) before investing substantial effort in assessing a species.

### S-1. Establishment in Delaware

Is this species currently established as a non-native (i.e., as a direct or indirect result of human activity) somewhere within natural areas in Delaware?

- **YES.** Proceed to screening question S-2, below.
- **NO.** STOP. The Invasive Species Assessment Protocol is not applicable to this species. Enter 'Not Applicable' as the Invasive Species Impact Rank (I-Rank), summarize reasons in the I-Rank Reasons Summary, and cite at least one information source.

Note: If this question is not readily answered, assessment of the species may either be deferred or as an interim measure, further information on the species' status in Delaware can be sought.

### S-2. Occurrence in Native Species Habitat in Delaware

Is this species known or suspected to be present in conservation areas or other native species habitats somewhere within Delaware?

- **YES.** Proceed to the assessment (16 questions), below.
- **NO.** STOP. This species is an insignificant threat to natural biodiversity in Delaware. Enter 'Insignificant' as the Invasive Species Impact Rank (I-Rank), summarize reasons in the I-Rank Reasons Summary, and cite at least one information source.

Note: If this question is not readily answered, assessment of the species may be deferred or as an interim measure, further information on the species' presence in native species habitats can be sought. Until this point is verified, the I-Rank should either be 'Insignificant,' or be 'Unknown.'

## Assessment Questions

The following 16 questions are grouped into four sections, for which separate subranks are determined. The Invasive Species Impact Rank (I-Rank) is then determined from the four subranks. The "Other Considerations" data field may be used to present and document significant information not readily accommodated under any of the 16 assessment questions.

### Section I. Ecological Impact

Assess the current impact of the species on ecosystem processes, ecological communities, and native species within Delaware, to the extent it is known. Where appropriate, give greatest attention to the cumulative impact (e.g., over a period of several decades) of the species on conservation areas and other native species habitats where it is abundant or well established in Delaware, recognizing that impacts may be less severe in places where the species is less well established. Impacts on areas that are recovering from disturbance or being restored to native species habitats may be included. However, do not consider impacts restricted to areas such as croplands, orchards, roadsides, industrial sites, and other developed areas that are not native species habitats, even if such places are included within the boundaries of parks, preserves, or other lands managed for conservation purposes.

## 1. Impact on Ecosystem Processes

Some non-native species can alter the natural range and variation of abiotic ecosystem processes in ways that significantly diminish the ability of the native species to survive and reproduce. Alterations in ecosystem processes that determine the types of communities that exist in a given area are of greatest concern.

Examples of abiotic ecosystem processes include:

- Fire occurrence, frequency, and intensity
- Geomorphological changes (e.g., erosion and sedimentation rates)
- Hydrological regimes (including soil water table)
- Nutrient and mineral dynamics
- Reductions in light availability (e.g., an aquatic invader covering an entire water body which would otherwise be open)
- Changes in salinity, alkalinity, or pH

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

A. **Significant.** Major, possibly irreversible, alteration or disruption of abiotic ecosystem processes, such as:

- The species promotes fire in habitats that otherwise rarely support fires;
- The species drains water from open water or wetland systems through rapid transpiration, making these unable to support native wetland plant and animal species; or
- The species is a nitrogen fixer and invades systems with few or no known native nitrogen fixers, and consequently causes soil nitrogen availability to increase to levels that favor other non-native invaders at the expense of native species

B. **Moderate.** Substantial alteration in abiotic ecosystem processes (e.g., increases sedimentation rates along coastlines, reducing open water areas that are important for waterfowl)

C. **Low.** Influences abiotic ecosystem processes (e.g., has perceivable but mild influence on soil nutrient availability)

D. **Insignificant.** No perceivable impact on abiotic ecosystem processes

U. **Unknown.**

## 2. Impact on Ecological Community Structure

Some non-native species alter the physical structure (at least at some sites), thereby affecting many native species.

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Major alteration of ecological community structure (e.g., covers canopy or creates new canopy, changing or eliminating most or all layers of vegetation below)
- B. **Moderate.** Changes number of layers below canopy, or significantly alters structure of at least one layer of the vegetation (e.g., creation of a new layer, elimination of an existing layer, substantial change in density or total cover of an existing layer)
- C. **Low.** Influences structure of at least one layer (e.g., moderately changes density or total cover of a layer)
- D. **Insignificant.** No impact; establishes within existing layers without influencing their structure
- U. **Unknown.**

### 3. Impact on Ecological Community Composition

Some non-native species alter the composition of ecological communities (whether or not they also alter their structure), changing the relative abundance of native species or altering successional patterns.

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Causes major alteration in ecological community composition. For example, results in:
  - The extirpation or sharp reduction in abundance of several locally common native plant or animal species
  - Significant increases in the proportion of other non-native species in the community
  - Suppression of seedlings of native successional or climax species, leading to altered community composition over time
- B. **Moderate.** Significantly alters ecological community composition (e.g., produces a significant reduction in the population size of one or more locally common native species in an ecological community)
- C. **Low.** Influences ecological community composition (e.g., reduces recruitment of one or more locally common native species which will likely result in significant reduction in the long-term abundance of these species)
- D. **Insignificant.** No impact; causes no perceivable change in locally common native species populations
- U. **Unknown.**

### 4. Impact on Individual Native Plant Species

Non-native species often impact the native species of an area. Examples of such impacts on native species include:

- Strongly outcompetes a particular native species
- Hybridizes with a particular native species
- Hosts a non-native disease which damages a particular native species
- Distracts pollinators from a particular native species

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Major impacts on particular native species (e.g., in places they co-occur, has negative impacts on more than 50% of the individuals of one or more native species)
- B. **Moderate.** Significant impact on particular native species (e.g., has negative impacts on 20 to 50% of the individuals of one or more native species)
- C. **Low.** Occasional impact on particular native species (e.g., has negative impacts on 5 to 20% of the individuals of one or more native species)
- D. **Insignificant.** Little or no impact on particular native species (e.g., no known reports of competitive suppression, hybridization, or other particular disproportionate negative impacts)
- U. **Unknown.**

### 5. Conservation Significance of the Communities and Native Species Threatened

Many non-native species usually occur in disturbed, low quality habitats that are dominated by common, widespread native species and other non-native species. Non-native species have a greater impact if they:

- Directly or indirectly threaten native species or ecological communities that are considered rare or vulnerable (e.g., legally protected in the region, such as those federally listed in the U.S.; or considered globally rare)
- Threaten outstanding, high quality occurrences of common ecological communities (e.g., those with NatureServe Element Occurrence Ranks A or B).

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** For example, often threatens one or more rare or vulnerable native species or ecological communities, and/or high-quality occurrences of more common ecological communities
- B. **Moderate.** For example, may occasionally threaten one or more rare or vulnerable native species or ecological communities, and/or high-quality occurrences of more common ecological communities
- C. **Low.** For example, usually inhabits common, unthreatened habitats and rarely threatens rare or vulnerable native species or ecological communities, and/or high-quality occurrences of more common ecological communities
- D. **Insignificant.** For example, found primarily or only in human-disturbed habitats and not known to threaten any rare or vulnerable native species or ecological communities, and/or any high-quality occurrences of more common ecological communities
- U. **Unknown.**

## Section II. Current Distribution and Abundance

Assess the current distribution and abundance of the species within Delaware.

### 6. Current Known Range in Delaware

The range or distribution is the entire area where the species is present in natural areas within Delaware as a non-native (outside of cultivation if a species of plant) as you currently understand it, not just the range where it has its greatest impacts. The area of distribution is usually much greater than actual acreage infested.

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Widespread in state (e.g., >30% of state).
- B. **Moderate.** Substantial part of state (e.g., 10-30% state).
- C. **Low.** Small part of state (e.g., 0.1-10% state).
- D. **Insignificant.** Isolated or spotty range in state (e.g., <0.1% of state).
- U. **Unknown.**

### 7. Diversity of Habitats or Ecological Systems Invaded in Delaware

This question seeks to identify how many different habitat types or ecological systems have been invaded by a species. Examples of habitats or ecological systems include:

- Early successional grasslands, shrub-lands and forests
- Forested wetlands
- Forested Uplands
- Tidal and non-tidal wetlands
- Rivers and streams

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Many (6 or more) distinct habitats or ecological systems invaded
- B. **Moderate.** Moderate number (4-5) of distinct habitats or ecological systems invaded
- C. **Low.** Small number (2-3) of habitats or ecological systems invaded, or moderate number (4-5) of similar habitats
- D. **Insignificant.** Only a single habitat or ecological system invaded
- U. **Unknown.**

### Section III. Trends in Distribution and Abundance

Assess various trends in the species' distribution and abundance here, as well as its reproductive characteristics and its ability to invade natural habitats.

#### 8. Current Trend in Total Range within Delaware

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Range expanding in most or all directions, and/or spreading into new portions of the state
- B. **Moderate.** Range increasing in some directions but not most or all
- C. **Low.** Range stable, or areas of range contraction balancing areas of expansion
- D. **Insignificant.** Range decreasing
- U. **Unknown.**

#### 9. Long-Distance Dispersal Potential within Delaware

What is this species' potential for long-distance dispersal by humans (intentionally or unintentionally), by other animals, or by abiotic factors (e.g., wind, rivers, or floods)?

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Long-distance dispersal frequent (e.g., seed or other propagules frequently carried long distances by humans, wide-ranging birds or mammals, wind [especially spores or tiny seeds], and/or river currents; or species sold and/or transported substantial distances)
- B. **Moderate.** Long-distance dispersal infrequent (e.g., seeds carried occasionally by unusually strong winds, more localized birds or mammals, or periodic floods, or species occasionally transported by human actions)
- C. **Low.** Long-distance dispersal rare but known (e.g., major floods, hurricanes, or other unusual weather events)
- D. **Insignificant.** Long-distance dispersal seldom or never
- U. **Unknown.**

#### 10. Local Range Expansion or Change in Abundance

Is the species increasing in abundance (cover, density, frequency, etc.) within its current non-native range in Delaware and/or locally expanding within or at the edges of this range?

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Local range and/or species abundance increasing rapidly (e.g., area occupied likely to double within 10 years in most areas where it doesn't already fully occupy its potential habitat), and/or abundance increasing significantly (by >25% of current values) in >75% of the area that it has already invaded
- B. **Moderate.** Local range expanding at a moderate rate (e.g., area occupied likely to increase by 50% in 10 years or to double within 50 years) and/or species abundance increasing significantly (by >25% of current values) in 25%-75% of the area that it has already invaded
- C. **Low.** Local range expanding slowly and/or abundance increasing significantly (by >25% of current values) in only a small portion (<25%) of the area that it has already invaded
- D. **Insignificant.** Species abundance and local range stable or decreasing across the entire area it has already invaded within the region
- U. **Unknown.**

### 11. Inherent Ability to Invade Native Species Habitats

Consider information indicating the extent to which this species invades well-established habitats with high ecological value, which helps predict whether it will do so in other places.

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Regularly establishes in undisturbed portions of intact high quality habitat
- B. **Moderate.** Regularly establishes in moderate quality habitat, but may establish in high quality habitat following minor one-time or recurrent disturbances (e.g., tree falls, hiking trails, streambank erosion); however, rarely if ever establishing in undisturbed portions of intact high quality habitat
- C. **Low.** Often establishes in areas where major natural or human-caused disturbance has occurred in the previous 20 years (e.g., post-hurricane sites, landslides, highway corridors), but seldom if ever in undisturbed areas or areas with only minor disturbance
- D. **Insignificant.** Not known to spread significantly into native species habitats on its own (e.g., species may be present only along edges, or may persist from former cultivation)
- U. **Unknown.**

### 12. Similar Habitats Invaded Elsewhere

Is this species established outside its native range in states outside of Delaware, such as Pennsylvania, New Jersey, Maryland and Virginia? If so, has this species escaped in habitats/ecosystem types that are comparable to habitats/ecosystem types that exist in Delaware, but which it has not yet invaded?

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Escaped in 3 or more habitats or ecosystem types in surrounding states, which it has not yet invaded in Delaware, but which exists in Delaware

- B. **Moderate.** Escaped in 1-2 habitats or ecosystem types in surrounding states, which it has not yet invaded in Delaware
- C. **Low.** Escaped elsewhere but only in habitat types comparable to those it has already invaded in Delaware
- D. **Insignificant.** Not known as an escape except in Delaware
- U. **Unknown.**

### 13. Reproductive Characteristics

The following are some reproductive characteristics typical of invasive plant species; consider which of these characterize this species.

- Produces over 1,000 seeds or spores per plant annually
- Reproduces more than once per year
- Grows more rapidly to reproductive maturity than most species of its lifeform
- Reproduces readily both vegetatively and by seed or spores
- Has seeds (or spores) that remain viable in soil for three or more years
- Has quickly spreading rhizomes or stolons that may root at nodes
- Resprouts readily when broken, cut, grazed, or burned
- Fragments easily, with fragments capable of dispersing and subsequently becoming established
- Has other comparable reproductive factors suggesting potential aggressiveness  
(Explain in comments)

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Extremely aggressive (e.g., strongly exhibits three or more of the above characteristics)
- B. **Moderate.** Moderately aggressive (e.g., strongly exhibits two of the above characteristics)
- C. **Low.** Somewhat aggressive (e.g., strongly exhibits one of the above characteristics, or more weakly exhibits a few)
- D. **Insignificant.** Not aggressive (e.g., has none of the above characteristics or weakly exhibits only one)
- U. **Unknown.**

## Section IV. Management Difficulty

In addressing the questions in this section, consider particularly known control methods for this species that are feasible and appropriate for use in natural areas and other native species habitats.

### 14. General Management Difficulty

Given the current state of knowledge regarding management methods, how difficult is it to control established populations of this species? Consider both the difficulty of control and the extent of existing knowledge regarding the management of this species. Also consider the minimum time commitment needed to control this species (e.g., reduction to acceptable levels



which can be maintained with little effort) at a site in which it is abundant or well established, including follow-up surveys and monitoring.

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Managing this species normally requires a major, long-term investment of human and/or financial resources and time commitment or is not possible with available technology
- B. **Moderate.** Management requires a minor short-term investment of human and financial resources, or a moderate long-term investment
- C. **Low.** Managing this species is relatively easy and inexpensive
- D. **Insignificant.** Management requires a minor investment in human and financial resources.
- U. **Unknown.**

### 15. Impacts of Management on Native Species

Do the effective methods for managing this species normally cause significant and persistent reductions in the abundance of native species (sometimes referred to as collateral or non-target damage)?

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Management impacts often severe, with the only effective methods for managing this species normally causing significant and persistent reductions in the abundance of native species (>75% of the time)
- B. **Moderate.** Management impacts moderate, with the only effective methods for managing this species reducing native species abundance or causing other unacceptable damage 25-75% of the time
- C. **Low.** Management impacts minor, with the only effective methods causing significant persistent reductions in native species abundance <25% of the time
- D. **Insignificant.** Management impacts insignificant or rare, with effective control methods rarely or never causing significant reductions in native species abundance, or causing only ephemeral reductions (lasting <2 years)
- U. **Unknown.**

### 16. Accessibility of Invaded Areas

The accessibility of infestations within areas that can't be accessed without specific permissions is considered here, because species found in inaccessible areas are more difficult to control. Consideration should also be given here to accessibility of adjacent areas that are sources of recurrent reintroduction, but not infestations remote from native species habitats.

**Select** the single-letter answer (A, B, C, or D) that best characterizes the species, or the single-letter U if unknown. However, if you have not substantially considered the question, leave the answer null.

- A. **Significant.** Accessibility problems high, with many invaded areas (>30% of area it infests) not accessible for treatment
- B. **Moderate.** Accessibility problems medium, with a substantial percentage of the area invaded by this species inaccessible (5-30% of the area it infests)
- C. **Low.** Accessibility problems low, with a significant but relatively small percentage of the area invaded by this species inaccessible (<5% of area it infests)
- D. **Insignificant.** Accessibility problems insignificant or rare, with little or none of the area infested by this species inaccessible
- U. **Unknown.**

## Plants

Common Name(s)	Scientific Name
Red emperor maple, Japanese maple	<i>Acer palmatum</i>
Weeping lovegrass	<i>Eragrostis curvula</i>
Wintercreeper	<i>Euonymus fortunei</i>
English ivy	<i>Hedrix helix</i>
Orange daylily, Tawny daylily	<i>Hemerocallis fulva</i>
Japanese holly, Boxleafed holly	<i>Ilex crenata</i>
Yellow flag iris, Water flag	<i>Iris pseudoacorus</i>
Golden raintree	<i>Koelreuteria paniculata</i>
Thunberg's bushcover, Creeping lespedeza	<i>Lespedeza thunbergii</i>
Summer snowflake, Giant snowdrops	<i>Leucojum aestivum</i>
Splendens tiger lily	<i>Lilium lancifolium</i>
Bird's-foot trefoil	<i>Lotus corniculatus</i>
Moneywort, Creeping Jenny	<i>Lysimachia nummularia</i>
Leatherleaf mahonia	<i>Mahonia bealei</i>
Chinese silvergrass	<i>Miscanthus sinensis</i>
Japanese pachysandra	<i>Pachysandra terminalis</i>
Japanese black pine	<i>Pinus thunbergii</i>
Sawtooth oak	<i>Quercus acutissima</i>
Japanese spirea	<i>Spirea japonica</i>
Linden arrowwood, Linden viburnum	<i>Viburnum dilatatum</i>
Japanese snowball	<i>Viburnum plicatum</i>
Tea viburnum	<i>Viburnum setigerum</i>
Siebold's viburnum	<i>Virbirnum sieboldii</i>
Chinese wisteria	<i>Wisteria sinensis</i>



# TREE-OF-HEAVEN

Tree-of-heaven (*Ailanthus altissima*) is by no means a new invader. Native to China, TOH was introduced to North America as a fast-growing ornamental and street tree in the late 1700s when invasive species were of little concern. TOH quickly escaped cultivation and has since become naturalized throughout most of the continental US

This exotic invader spreads so quickly thanks to huge numbers of winged seeds that can be blown in the wind for hundreds of feet. Another way TOH reproduces is by cloning itself! New stems can shoot up from roots of older trees up to 90 feet away, and a cut stump will quickly recover by producing dozens of new sprouts that can grow a 12 feet in a single year. This weedy tree also leaches toxic compounds into the ground from their root system, seeds, and fallen leaves, which inhibit the growth of nearby plants and allows TOH to out-compete native species.

TOH prefers to grow in sunny locations, but can tolerate a wide range of soil and environmental conditions and thrives in disturbed urban environments such as along roads and highways, field edges, and can even germinate in the cracks of sidewalks! You can identify TOH by smooth, light grey bark and long, pinnately-compound leaves which produce a foul odor when crushed, like burnt peanut butter (yuck!)



While the TOH has few natural pests or diseases to worry about in America, the spotted lanternfly, an invasive insect also from China, loves to feed on it. Some research suggests that the insect relies on the toxins this tree produces to make itself unappetizing or even poisonous for predators! Spotted Lanternfly not only feeds on TOH, though, and it is a major pest of fruits like grape vines, apple, and peach trees.

This is proof that letting even one invasive species take over an environment can cause unforeseen consequences in the future; without the introduction of TOH, the spotted lanternfly would not have been able to invade! Management and control efforts are important to limit the damage of this species.

## QUICK FACTS

- Native to China
- Brought to North America as an ornamental in the late 1700s
- Light gray bark
- Long, pinnately-compound leaves
- Leaves smell like burnt peanut butter when crushed
- Thrives in disturbed environments
- Can leach toxic compounds into the soil that inhibit the growth of nearby plants







Photo by: Kate O'Hanlon

# JAPANESE BARBERRY

Japanese barberry, *Berberis thunbergii*, was originally imported to the US in 1875 as an ornamental shrub to replace our native species of barberry (*Berberis canadensis*) in the landscape, and continues to be used in modern-day landscaping. Native to Japan and eastern Asia, its ornamental bright red berries are frequently eaten by birds who spread the seeds to neighboring areas.

Japanese Barberry has become problematic in natural areas because of its high shade tolerance and tendency to form dense thickets, crowding out many of our more delicate native species. Research has shown that these thickets tend to have higher densities of ticks, making them a potential health hazard to hikers. The leaf litter of this species is particularly detrimental to the ecosystem because it changes the surrounding soil chemistry, by raising soil pH and Nitrogen levels, making the habitat less suitable for native species.

Some identifying characteristics of Japanese Barberry are small oval-shaped clusters of leaves and very sharp needle-like spines. The notable bright red berries are most visible in the fall, and if branches are, cut the interior is bright yellow.

Japanese Barberry tends to have a tough but shallow root system, making it possible to hand pull or dig up smaller infestations. Herbicides labeled for broadleaf control can also be used either as a foliar spray or on the cut stumps.



Photo: Kate O'Hanlon

## QUICK FACTS

- Ornamental shrub native to Japan and eastern Asia
- Small, oval shaped leaves
- Sharp, needle-like spines
- Bright red fruits
- Yellow heartwood
- Can spread to natural areas by birds
- Thickets harbor high densities of ticks
- Leaf litter can increase soil pH and Nitrogen







# LESSER CELANDINE

Lesser celandine, *Ficaria verna* (formerly *Ranunculus ficaria*), is a small perennial member of the buttercup family, Ranunculaceae. Lesser celandine is native to Europe and Asia and was likely introduced as an ornamental plant. Flowers range from white to yellow with 7-12 petals. Lesser celandine reproduces through seeds, bulblets located on the stems, and root tubers. Bulblets and tubers break off existing plants to become new plants.

Lesser celandine emerges early in the spring and actively grows for a short time before going dormant. The plant prefers moist conditions and is often found in riverine floodplains and wet woodlands. Lesser celandine forms dense carpets and out competes native spring ephemerals such as spring beauty, trout lily, and blood root. The native plant marsh-marigold (*Caltha palustris*) looks very similar to lesser celandine. Marsh-marigold lacks bulblets on stems and tubers on roots.

Lesser celandine is difficult to control because it grows in vast numbers during a short time frame in early spring. When the above-ground leaves and stems die back in late spring the plant is difficult to find and identify. Digging the plant out from the soil, taking care to remove the tubers, is an effective control. This is a good control method to use in situations where lesser celandine is mixed with desirable native plants. The time and effort digging requires may not be practical on a large scale. Large populations of lesser celandine may be better managed using an herbicide. A foliar application of glyphosate is an effective treatment that can kill lesser celandine. All herbicide labels must be read carefully prior to use, especially when working in wet soil conditions or near water.

Long term management of lesser celandine often involves a combination of control methods and repeated effort over many years. Management of lesser celandine may be especially difficult in situations where seeds, bulblets, and tubers wash into an area from large populations upstream during flood events.

## QUICK FACTS

- Small plant with shiny dark green leaves and yellow flowers
- Grows for a short time in spring
- Reproduces through stem bulblets and root tubers
- Forms dense populations that out-compete native spring ephemerals
- Grows in moist soils and thrives along river banks
- Digging and herbicide are effective controls







Photo: James H. Miller, USDA Forest Service, Bugwood.org/od.org

# ENGLISH IVY

English ivy, *Hedrix helix*, is a shade tolerant, evergreen vine introduced from Eurasia to the U.S. by early European settlers. By mid-20th century it was reported as naturalized in Delaware. It grows vigorously along the ground and also climbs vertically. It spreads so aggressively that it can cover entire forest floors and displace native vegetation that are important for maintaining the health and stability of forest ecosystems. It can potentially kill trees by climbing up into their canopies and completely covering them (bottom left). English ivy is also known to transmit tree diseases, such as Bacterial Leaf Scorch.

Only mature vines - at least 16 years old – flower and produce dark purplish-black fruit (bottom right). Mature ivy leaves look different than those on the standard younger, non-flowering vines: they are heart-shaped, typically not lobed and lack strong venation and marbling. The fruit matures from late summer to winter, and birds eat them and disperse their seed. Homeowners also will often dispose of English ivy yard waste in adjacent or nearby forests. The roots from discarded vines may take hold and become established then begin to spread throughout the forest floor.

Some of our native vines, such as Virginia creeper and poison ivy vines, will also climb tree trunks, but they are not evergreen like English ivy. Winter can be a great time to target the English Ivy but be careful to avoid the red hairy vines of poison ivy.

Members of the public are encouraged to hand-pull English Ivy that they find encroaching into natural areas. A combination of manual, mechanical, and chemical control methods may be necessary to control infestations. Vines that are climbing tree trunks should be cut at the base and the cut stem can be treated with an herbicide. In addition, hand-pull the roots from cut vines around base of the tree and try to minimize soil disturbance. Monitor for regrowth and follow up yearly.



## QUICK FACTS

- Evergreen vine native to Eurasia
- Spreads to forests where it can outcompete and displace native vegetation
- Climbs trees and smothers their canopies
- Can transmit tree diseases
- Only mature vines produce fruit
- Birds eat and spread its black berries in the fall and winter
- July 1, 2022 it will be illegal to sell in Delaware







# HYDRILLA

*Hydrilla verticillata* is a rooted, submersed aquatic plant that is native to the Indian Continent. Introduced in the U.S. through the aquarium trade in the 1950s, it has spread to 32 states, Guam, Puerto Rico, and the District of Columbia. It was first documented in Delaware's state-owned public ponds in the 1970s and quickly spread and established in other water bodies throughout the state. Hydrilla is designated as a federal noxious weed, which prohibits interstate transport and importing it into the U.S. without a permit. It is included in the Delaware Invasive Species Council list of invasive species.

The small (<1" long) green leaves are pointed with serrated (toothed) margins. The leaves grow in whorls around the stem - 5 leaves per whorl is the most common. Rooted in the substrate, the stems can grow over 25ft in length and branch horizontally at the surface creating a dense mat. The flowers have 3 translucent petals that may have a few red streaks. It can reproduce by fragmentation, turions (stem tubers) and tubers. The white to yellowish tubers are small (<0.5") and occur at the end of stems that grow into the sediment.

Hydrilla thrives in the calm waters of freshwater ponds and lakes as well as tidal rivers and streams. It grows fast, quickly outcompeting native plants by spreading into shallower areas and blocking sunlight. Hydrilla can impact water quality by depleting oxygen levels and disrupting water flow. Although aquatic plants are an important component of the aquatic food web, dense stands of hydrilla can make foraging and spawning difficult for important game fish species. It can become so dense that it restricts boating, fishing and water-based recreation. It is especially important that boaters and anglers clean their boats and equipment to prevent Hydrilla from 'hitch hiking' and spreading to other water bodies.



## QUICK FACTS

- Grows nearly 1" a day!
- Considered world's worst aquatic invasive plant
- A new plant can grow from a tiny stem fragment
- Tubers can survive freezing, desiccation, and the digestive tracts of wildlife
- Some states spend millions of dollars annually on hydrilla management





# Tried and True Native Plants To Replace Invasive Plants



Best Bets: Plants  
for Particular Uses  
in the Mid-Atlantic

## INVASIVE PLANTS:

### Golden Raintree (*Koelreuteria paniculata*)



This Asian native was introduced to North America in 1763 and has become a popular landscape tree with its colorful flowers and interesting fruit. Unfortunately, it escapes from cultivation and naturalizes in a variety of environmental conditions. It is especially troublesome in warmer climates and is considered as invasive in natural areas in both Arlington County and the City of Alexandria.

Problems	Golden Raintree & Red Buckeye	
Fast grower that crowds out desired native species in natural areas		
Tolerates drought and blooms with only 6 hours of sun		
Prolific production of seeds that germinate quickly within 6 to 8 days		
Produces numerous seedlings under parent tree		
Birds and water may contribute to spread		
Dried blossoms and seed pods create debris		
Brittle wood can result in storm damage		
Desired Characteristics		
Medium-size summer-blooming tree		
Native Alternatives		
(Summer-blooming replacements:)		
<a href="#"><i>Magnolia virginiana</i> (Sweetbay Magnolia)</a>		
<a href="#"><i>Oxydendum arboreum</i> (Sourwood)</a>		
(Spring-blooming replacements:)		
<a href="#"><i>Aesculus pavia</i> (Red Buckeye)</a>		
<a href="#"><i>Chionanthus virginicus</i> (Fringetree)</a>		
<a href="#"><i>Cornus alternifolia</i> (Pagoda Dogwood)</a>		
<a href="#"><i>Cornus florida</i> (Flowering Dogwood)</a>		
developed by Master Gardeners of Northern Virginia, serving Arlington and Alexandria		

Images by Elaine Mills, Daniel Stowe Garden, and Arlington





Photo:  
Chuck Barger  
University of GA  
Bugwood.org

# JAPANESE HONEYSUCKLE

Japanese honeysuckle, *Lonicera japonica*, is a twining vine native to East Asia, including Japan and Korea. The vine is best known for sweet-scented white or pink tubular flowers that fade to yellow over time and have sweet tasting nectar. These flowers bloom in late spring and produce a black fruit that birds feed on, spreading the seed to new locations. Japanese honeysuckle leaves are oval with smooth edges growing oppositely along the stem and may remain on the vine year-round during mild winters. Occasionally, young leaves will be lobed and look similar to white oak.

Introduced in 1806 in Long Island New York, Japanese honeysuckle was marketed as an ornamental vine that would benefit wildlife and erosion control. The vines are now prevalent on roadsides, field edges, floodplains, disturbed woods and forest openings throughout eastern USA. Although Japanese honeysuckle has some wildlife benefit, these invasive vines can overgrow and girdle small trees and shrubs. They have the ability to form a monoculture where established and reduce the variety of food and shelter available to native wildlife.

A good method for managing Japanese honeysuckle is to cut the vines off of trees or shrubs to prevent girdling. Small vines can be hand-pulled, but any root fragments left in the soil will regrow. As Japanese honeysuckle tends to retain its leaves year round, foliar herbicide can be used on larger infestations while native plants are dormant.

In the Eastern US, Trumpet honeysuckle, *Lonicera sempervirens*, a native honeysuckle, can be mistaken for Japanese honeysuckle. Trumpet honeysuckle, has similar twining vines and opposite leaves, but has bright red fruit and terminal red flowers. The native vine also has a pair of fused leaves just below the terminal flower or fruit clusters. It is a good native alternative for ornamental plantings when replacing Japanese honeysuckle.

## QUICK FACTS

- Native to East Asia
- Twining, woody vine
- Leaves opposite, oval, with simple margins
- Spring flowers white or pink and fading to yellow, sweet-smelling
- Birds eat and spread black berries
- Overgrows or girdles native species
- Has similarities to native Trumpet honeysuckle



Photo: Karan A. Rawlins, University of Georgia,  
Bugwood.org

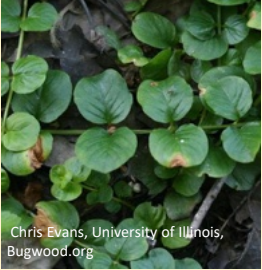


Photo: James H. Miller & Ted Bodner  
Southern Weed Science Society,  
Bugwood.org





# Creeping Jenny



5447868

## What Do We Know?

Creeping jenny (*Lysimachia nummularia*) is an herbaceous perennial with a low growing, spreading growth form. It is part of the Primrose Family (Primulaceae) family and also goes by the common name of moneywort.

Creeping jenny is native to Eurasia and was introduced to North America prior to 1900 as an ornamental plant. This species is still used as a landscape ground cover. The primary ecological damage caused by creeping jenny occurs when the dense mats out compete native plants for resources. Large populations of creeping jenny can block small drainage structures and springs.

It has smooth stems that can run along the ground for more than a foot before rooting in the ground at the stem nodes. Leaves are round, opposite, and close to the stem. Plants can be 2-4 inches tall and found in a variety of habitats. It thrives in wet areas such as swamps, stream banks, wet meadows, floodplains, ditches, and roadsides. Disturbed areas are especially vulnerable to invasion from this species.

Through much of the Mid-Atlantic, creeping jenny is green for most of the year. This species tolerates a broad-spectrum light exposure, from full sun to part shade. Small yellow cup-like flowers with five petals emerge in June and July. Creeping jenny reproduces vegetatively by rooting at stem nodes or from fragments. It also reproduces through seeds.

Because the plant is low growing, mowing is ineffective. The best form of mechanical control is hand pulling. As much of the plant should be removed, if possible, to prevent re-sprouting. Herbicides containing glyphosate are effective in controlling creeping jenny. Care should be taken to select aquatic safe herbicide formulations if plants are in or very close to water. There are currently no biological control options for this species. The public can help limit the spread of creeping jenny by not purchasing this species. It is important not to use it as an ornamental ground cover as it can quickly spread and overtake an area.

[www.delawareinvasives.net](http://www.delawareinvasives.net)  
Facebook: [DEInvasiveSC](https://www.facebook.com/DEInvasiveSC)

National Invasive Species Awareness Week - 2023

## Quick Facts

- Herbaceous perennial
- Creeping ground cover
- Semi-evergreen in the mid-Atlantic
- Grows in a broad range of light and moisture levels
- Especially abundant in wet areas
- Hand pulling or herbicide application most effective control methods





Photo by: Ashley Kroon

# CHINESE SILVER GRASS

Chinese silver grass (*Miscanthus sinensis*) was brought to the U.S. from Asia as an ornamental. It has now escaped from landscape plantings into natural areas across the eastern U.S. and in parts of Colorado and California. It continues to be a popular ornamental in many areas of the United States, as well as a barrier plant along roadsides and agricultural fields with many different varieties sold in the U.S. The grass is found escaping into disturbed and natural areas in all three counties in Delaware. Due to the large amount of dried biomass that remains during the fall and winter, it can be considered extremely flammable and a fire hazard. CSG spreads by underground roots or rhizomes and seed, though seed viability is variable depending on the cultivar.

CSG is a tall, densely bunched grass with upright to arching leaves. Its height can reach up to 12 feet and the leaves have a whitish midvein. Individual leaves taper to a point and the margins are sharp and slightly serrated. Mature plants have extensive perennial root systems and new growth emerges in mid-spring and rapidly replaces the previous year's dried erect leaves. Flowers on terminal panicles emerge in late August to early September and mature in early November. Initially a pale pink to reddish in color, the flowers gradually turn tan in the fall and last through winter.

CSG will grow on a variety of sites but prefers moist, well-drained soil to reach its maximum growth potential. It is intolerant of shade although it will persist in sparsely forested areas and small openings. In many natural areas, this grass is prevalent on abandoned home sites where it was used as an ornamental. It has been documented invading shores of reservoirs, roadsides, meadows and in forests and old fields following fires. Once established, CSG is difficult to remove.

Manual remove of the plants will likely result in re-sprouting if the entire root system is not removed. Chemical control is possible with readily available herbicides like glyphosate in late spring and/or fall. Follow-up will be required. When using herbicides, please read and adhere to the label.

Some native alternatives to CSG in Delaware are big bluestem (*Andropogon gerardii*), bushy bluestem (*Andropogon glomeratus*), Switch grass (*Panicum virgatum*) [coastal plain only], little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and bottlebrush grass (*Elymus hystrix*).



Photo: wikipedia

## QUICK FACTS

- Ornamental grass native to Asia
- Still a popular landscape plant in US
- Densely bunched with upright to arching leaves
- Leaves have whitish midvein
- Can reach 12 feet in height
- Spreads by underground roots or rhizomes, as well as seed
- Difficult to remove once established







# CHINESE FOUNTAIN GRASS

Chinese fountain grass, *Cenchrus purpurascens* (synonym: *Pennisetum alopecuroides*), is a non-native perennial grass native to Eastern Asia and Australia. This ornamental grass has escaped into natural areas, meadows and open woods, in all three counties in Delaware. There are several different cultivars of *Cenchrus purpurascens* sold commercially.

Chinese fountain grass forms dense clumps from 12"-48", which become more arching as they mature. The narrow, medium-to-deep green foliage can vary in length and width dependent upon the different cultivars. After the frost, the grass clumps will become a light tan. The inflorescence has a bottle brush appearance and the flowers can vary from a light pink to dark purple. Chinese fountain grass' inflorescences also turn tan as the seeds form and the spikes will persist into the late fall and early winter before shattering and spreading the seed.

Full sun and well-drained soil is the preferred habitat, but it will tolerate partial shade and poorer quality soils as evidenced by clumps of the fountain grass found in the more open forested areas of Thompson Island Nature Preserve in southern Delaware. It is documented in the mid-Atlantic and in several other states in the eastern half of the United States. Chinese fountain grass is not yet well established in Delaware, but it is on the watch list for some land managers.



## QUICK FACTS

- Native to Eastern Asia and Australia
- Perennial, ornamental commercially sold
- Escaped into natural areas in all three counties in Delaware
- Bottle brush appearance to showy inflorescences
- Dense, clumping foliage





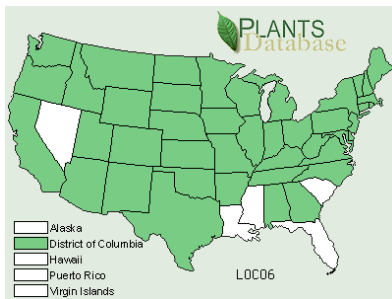


# Bird's-Foot Trefoil *Lotus corniculatus* L.

**Common Names:** birdfoot deervetch, bird's-foot trefoil, bloomfell, cat's clover, crowtoes, ground honeysuckle

**Native Origin:** Europe

**Description:** A perennial, fine-stemmed, leafy legume (pea family, *Fabaceae*) that grows 6-24 inches in height. Erect stems are nearly square, emerge from a single root crown and have many branches that can become tangled and matted. Clover-like leaves are pinnately compound, alternate, and consist of three oval leaflets and two smaller leaflet-like stipules that grow at the base of the leaf stalk. Flowers are bright yellow, sometimes streaked with red, ½ inch long, born in flat-topped clusters of three to six at the end of stems, and bloom from June to frost. Clusters of slender brown to black seed pods are cylindrical, resemble a bird's foot, and contain 10-20 seeds that eject when mature. The deep, branched root system has a 3-foot long taproot and secondary roots from rhizomes. It reproduces by seed, rhizomes and above ground runners that form fibrous mats.



**Habitat:** It is located in roadsides, waste areas, fields, prairies, wildlife openings, and open disturbed areas. It tolerates a variety of soil types including dry, moist, hardpan or droughty soils. It is a common lawn weed in western NY.

**Distribution:** This species is reported from states shaded on Plants Database map. It is reported invasive in CA, IL, MN, MO, OR, TN, VA, WA, and WI.

**Ecological Impacts:** Bird's-foot trefoil creates tangled mats of dense growth that can choke out other plants. It spreads to threaten the diversity of native plants.

### Control and Management:



- **Manual-** Dig up small infestations, remove all root fragments; frequent mowing at a height of 2" for several years helps control the plant, but can set back native plants. *Note:* Control burns are not recommended because they increase seed germination and promote seedling establishment
- **Chemical-** It can be effectively controlled using any of several readily available general use herbicides such as clopyralid, glyphosate, or triclopyr. Follow label and state requirements.
- **Natural enemies-** One fungal associate, *Erysiphe betae* and seven species of arthropods are reported to occur on *Lotus* including one bug and six lepidopterans.

**References:** [www.forestimages.org](http://www.forestimages.org), <http://plants.usda.gov>, [www.nps.gov/plants/alien](http://www.nps.gov/plants/alien), Czarapata, Elizabeth J. Invasive Plants of the Upper Midwest, An Illustrated Guide to their Identification and Control, 2005 p. 64-65, [www.invasive.org/weeds/asian/lotus.pdf](http://www.invasive.org/weeds/asian/lotus.pdf), [www.npwrc.usgs.gov/resource/othrdata/plntguid/species/lotucorn.htm](http://www.npwrc.usgs.gov/resource/othrdata/plntguid/species/lotucorn.htm), [www.hort.purdue.edu/newcrop/Crops/Birdsfoot\\_trefoil.html](http://www.hort.purdue.edu/newcrop/Crops/Birdsfoot_trefoil.html)

# BRADFORD PEAR

NATIONAL INVASIVE SPECIES AWARENESS WEEK 2017



FEBRUARY 28, 2017



A native of Asia, *Pyrus calleryana* was first introduced to the U.S. in 1916 as rootstock for cultivated pears. Around 1950, interest from the horticultural trade began to grow and a non-spiny seedling was selected and named “Bradford” pear. The Bradford pear, also referred to as Callery pear, is a medium-sized deciduous tree well suited for urban planting. Its abundant spring flowers – borne on an attractive tear-dropped shape – combined with its ability to tolerate a wide range of soil conditions made the Bradford pear the second most popular

tree in America by the 1980’s. At the time, the Bradford pear was thought to have no impact on the natural environment because it was a hybrid that could only produce sterile fruit. Its popularity led to the development of several other cultivars such as the Aristocrat, Cleveland, Chanticleer, and Respire.

By the late 1990’s, it had become apparent that these new cultivars were able to cross-pollinate, as pear trees began popping-up along roads, rights-of-way and old fields. With birds and other wildlife readily dispersing the now viable fruit, the Bradford pear gained new attention as an aggressive invader. These “wild” pear trees are highly competitive, which allows them to invade natural areas. Once established, they form dense thickets which produce root sprouts that push out native plants intolerant of the deep shade. These new stands can subsequently interbreed, producing more viable seed and furthering expansion and dispersal of the wild stand of the species. A study conducted in 2005 on the spread and distribution of Bradford pear reported the species to have established stands outside of cultivation in over 152 counties in 25 US states. The consequences of Bradford pear invasions are numerous: displacing native plant communities; increased economic costs due to vegetation management problems; threats to structures, roads, and powerlines due to damaged or toppled trees.

In the landscape setting, the Bradford pear and its many cultivar cousins exhibit several problems. The growth habit of the tree’s crown is problematic because it lacks a central leader, resulting in many weak structural supports. Combined with its brittle wood, the main branches have a tendency to split during wind and ice storms, leaving ugly wounds or decimating the tree altogether. The Bradford pear is a short-lived tree with an average life span of only 20 years and requires aggressive pruning to combat its poor branch development. For these reasons and the impact on natural areas, Bradford pears have been placed on Delaware’s “Do Not Plant List.”

If you have pear trees planted in your landscaping, it is recommended that they be removed as they begin to deteriorate or become unhealthy and replaced with native trees or shrubs. Several native species, such as Allegheny Serviceberry (*Amelanchier laevis*) and White Fringe Tree (*Chionanthus virginicus*), offer beautiful spring time blooms.



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# LINDEN VIBURNUM

Linden viburnum, *Viburnum dilatatum*, is native to eastern Asia and was introduced as an ornamental landscape plant. The deciduous shrub has begun to escape into woodlands in the Piedmont region of Delaware, creating dense thickets which replace and suppress native species. Linden viburnum is not widespread in the mid-Atlantic region yet and is locally invasive. Like many other invasive plant species, it leafs out early in the spring, and holds onto its leaves later in the fall, giving the non-native viburnum a competitive advantage.

Linden viburnum is a multi-stemmed shrub, generally growing up to ten feet tall and spreading just as wide. Its dark green leaves are often hairy on both sides, oppositely arranged, and coarsely toothed. The stems of Linden viburnum are brown to brown-gray with prominent orange lenticels. Buds are slightly hairy and brown with a reddish tinge in the scales. Be mindful in control because Linden viburnum plants can reproduce by layering— vegetative propagation of a plant by branches touching the ground, forming roots and eventually, a new plant (clone).

Native Arrowwood, *Viburnum dentatum*, is one species commonly confused with invasive Linden viburnum. The native's leaves are smooth on the upper surface with some hairs underneath, while the hairs on both sides of the invasive can give the Linden viburnum leaves a sandpaper-like feel. The creamy white flower clusters in the late spring are similar with both species, but the fruits will differ.

Linden viburnum flowers give way to bright red drupes, while the native viburnums have dark blue to black drupes.



Photo Credit: Hamachidori, North Carolina Extension Gardener Plant Toolbox

## QUICK FACTS

- Ornamental landscape plant that escaped into natural areas
- Leaves emerge early in spring and drop later in the fall than surrounding native species
- Leaves are hairy on both sides
- Prominent orange lenticels on stems
- Fruits are red, while native viburnums in Delaware bear dark blue to black fruit





# Poison Hemlock



## What Do We Know?

Poison hemlock, (*Conium maculatum*), is a highly invasive and poisonous plant in the Carrot Family (Apiaceae). It can be mistaken for other species such as wild carrot (*Daucus carota*) and wild parsnip (*Pastinaca sativa*). Humans and livestock can be poisoned by eating small amounts of any part of the dried or green plants.

It was introduced from Europe in the 1800's and is widespread in Western US and is now being seen in Delaware. The species establishes in moist, disturbed, sunny areas such as ditches, roadsides, fence lines, and fields. It does not grow well in shady or frequently mowed areas.

The species is biennial, requiring two growing seasons to complete its life cycle. The first year's growth is strictly vegetative (photo 1), where a rosette develops with hairless finely-divided or lacy leaves. In spring of the plant's second year, it begins to grow stout, hollow and hairless stems. The stems can grow up to 10' in fertile soil -- much taller than wild carrots. The stems of poison hemlock are very different than the lookalike species, with green and distinctive mottled purple blotching (photo 2). The stems can have an unpleasant odor, and the compound leaves are arranged alternately along the branches. The long white taproot of poison hemlock can resemble wild carrot or wild parsnip.

In late spring, clusters of small white flowers at the end of stalks begin to bloom and persist into the summer (photo 4). Seed begins to mature soon after flowering (photo 3) and one plant can produce up to 40,000 seeds. After seed has set and is dispersing from the plant, the plant will then die.

It is advised to control this species by digging it up or treating with chemicals when it is entirely vegetative, before it flowers. If control is to be done when poison hemlock is in flower, remove and bag all flowers and seed heads, then remove or treat the entire plant. Cautiously cut seed heads to avoid dropping seeds. Seeds will still mature and remain viable even when the green foliage and stem are treated and appear dead. Mowed or cut plants will regrow. Plant material can remain poisonous for 3 years and seeds can be viable for up to 10 years. Burning plants can release toxins into the air, and toxins also persist in compost. Always wear gloves and protective clothing, including eye ware when handling this plant. Also be sure to thoroughly wash up and launder clothing.

[www.delawareinvasives.net](http://www.delawareinvasives.net)

Facebook: [DEInvasiveSC](https://www.facebook.com/DEInvasiveSC)

## Quick Facts

- Poisonous
- Resemble wild carrot and wild parsnip
- Biennial plant
- Can grow to 10' tall
- Flowers will go to seed even if green plant is killed with herbicide
- One plant can produce up to 40,000 seeds
- Seeds remain viable in soil up to 10 years
- Second year stalks are smooth with mottled purple blotching
- Lacks hairs on leaves

National Invasive Species Awareness Week - 2023



# WATERWHEEL

NATIONAL INVASIVE SPECIES AWARENESS WEEK 2017



MARCH 3, 2017



Waterwheel is a rootless, submersed aquatic plant that is carnivorous. Typically the stems are less than 20cm in length with 6-8 whorls of 7-11cm long leaves. The leaves have flattened petioles with clam-like 'traps' at the terminus. The traps have bristles which may serve to funnel prey towards the trap. Under ideal conditions lateral branches are produced at several locations along the stem. Flowering in temperature regions can be rare, but when it occurs it only lasts for a few hours. Small solitary white flowers occur above the water on short peduncles that arise from the leaf whorl axes. From a distance waterwheel resembles another invasive aquatic plant hydrilla, *Hydrilla verticillata*, which is common in Delaware. There is a potential for waterwheel to be overlooked in areas where hydrilla occurs, however, once the plant is in-hand it is fairly easy to identify.

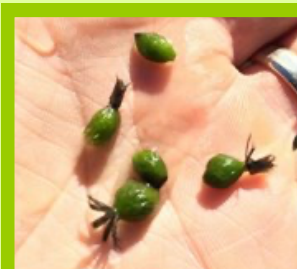


Waterwheel is native to Africa, Asia, Australia, Europe, Japan and Korea. It is the only extant species in the genus *Aldrovanda* and is listed as endangered or threatened in some parts of the world. In the mid-Atlantic region this species is considered invasive. Although not yet documented in Delaware, waterwheel has been confirmed in New Jersey, New York, and Virginia, thus early detection and a rapid response is especially important for preventing it from spreading.

The dense vegetative mats formed by this species can impede water based recreation such as boating and fishing. In optimal conditions the plant can grow rapidly, producing one or more new whorls per day. A high percentage of dense aquatic vegetation can result in unbalanced fish populations as predatory fish find it difficult to cull prey that is hiding in the vegetation. The carnivorous nature of this plant is also of concern because it not only traps and 'consumes' aquatic invertebrates, but also larval fish as seen in the photo to the right. The trigger hairs on the trap can activate it to close in as little as 0.01 seconds, making it one of the fastest moving plants! If you imagine the potential number of 'traps' in a dense mat of this plant, you can appreciate the potential impact it could have on the aquatic food web.



Waterwheel can be difficult to eradicate once it becomes established, and like hydrilla, can survive cold winters via bud like turions (shown at the right). The best defense is prevention such as implementing best management practices when leaving a water body—remove visible mud and plants from your boat or equipment before transporting; clean and dry anything that comes into contact with the water—go to [www.protectyourwaters.net](http://www.protectyourwaters.net) for more information. If you encounter this plant in Delaware, please report it to the Division of Fish and Wildlife at [Edna.Stetzar@state.de.us](mailto:Edna.Stetzar@state.de.us) or at (302) 735-8654.



VISIT OUR WEBSITE: [www.delawareinvasives.net](http://www.delawareinvasives.net)



Thursday, February 26, 2015

## Wavyleaf Basketgrass

### *Oplismenus hirtellus* spp. *undulatifolius*



Wavyleaf basketgrass is an aggressive, introduced subspecies of the native basketgrass *Oplismenus hirtellus*. Native to parts of Europe and Asia, it is thought to have arrived in the United States through discarded and contaminated hanging flower baskets. It was first discovered in Patapsco Valley State Park, Maryland in 1996. Currently, its distribution is limited to a handful of sites in Maryland and Virginia, including 80 acres in Shenandoah National Park.

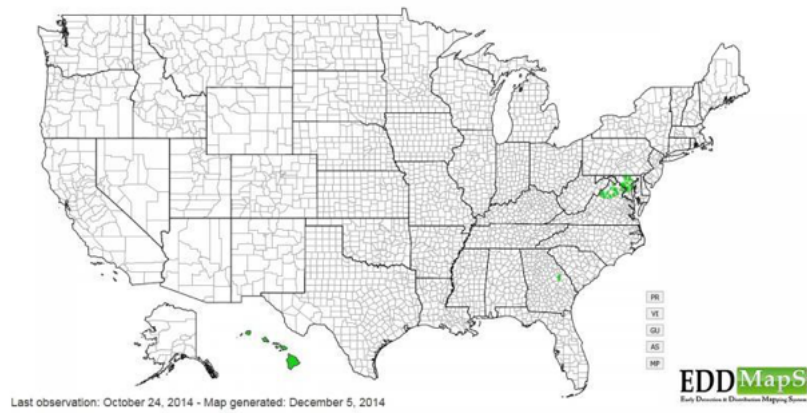
The leaves of Wavyleaf basketgrass are flat, dark green and have rippling waves across the blades. They are similar in appearance to invasive Japanese stiltgrass (*Microstegium vimineum*) leaves, but come to a sharper, more elongated tip and lack the silver mid-stripe of stiltgrass leaves. The leaf sheath and stem are hairy. In the autumn, Wavyleaf basketgrass forms sticky awns (seeds), which easily attach to clothing, animals and vehicles.

Wavyleaf basketgrass is a perennial, extremely shade tolerant, and can easily out-compete the native vegetation of deciduous forests to form a monoculture. This, combined with its ability to quickly spread by rhizomes and sticky seeds, could allow it to invade nearby areas. It is of little value to native wildlife. Although it is not currently present in Delaware, its seeds could make their way here on the clothing or vehicles of unsuspecting visitors. Early detection and rapid response will be essential in preventing this invasive from getting a foothold in our forests. Currently, groups in Maryland and Virginia are working to eliminate Wavyleaf basketgrass from known sites. Until these efforts are completely successful, the threat to Delaware remains real.

If you find an infestation of Wavyleaf basketgrass in Delaware, please carefully compare it to several lookalikes: invasive Japanese stiltgrass (*Microstegium vimineum*); non-native Small Carpetgrass (*Arthraxon hispidus*); and native Deertongue grass (*Dicanthelium clandestinum*). Suspected Wavyleaf basketgrass colonies should be reported to State of Delaware botanist (DNREC) Bill McAvoy: [william.mcavoy@state.de.us](mailto:william.mcavoy@state.de.us)



*Oplismenus hirtellus* ssp. *undulatifolius*



# Periwinkle

## *Vinca minor*



Pictures By (From top to bottom):  
K. Yatskievych, D. Tenaglia @  
[www.invasive.org](http://www.invasive.org) and D. Tenaglia  
@ [www.invasive.org](http://www.invasive.org).

### **Invasive Plants are a Threat to:**

- **Forests and wetlands**
- **Native plants**
- **Perennial gardens**
- **Wildlife**
- **Lakes and rivers**
- **Human health**
- **Farmland**

### **Description:**

*Vinca minor* is a perennial, evergreen herb that matures at about 6" tall and stems that continue to elongate each year to many yards in length. It exhibits a trailing mat, prostrate mat or mounding mat growth habit and has a medium growth rate. Its leaves are evergreen, elliptic and dark green above with a subtle white mid-vein. The flowers are predominantly blue-purple, originate from the leaf axils, composed of five fused pinwheel-like petals and a short tubular throat. They bloom in late March and April and sporadically throughout the growing season.

### **Distribution:**

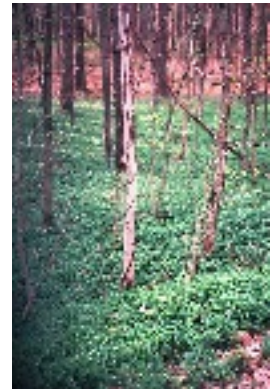
Periwinkle is frequently found in well-drained, open, disturbed ground of shaded woods, edges and roadsides. It is escaped throughout the eastern US, and can become a dominant and sometimes monotypic understory in the northeastern US. In Indiana, it has been found as an escaped species in all counties. It grows more aggressively in the south part of the state, covering hundreds of acres in southern Indiana forests.

### **Problem:**

Once established, *Vinca minor* forms a dense carpet to the exclusion of other plants. This creates a problem where it is competing with native flora. In ideal growth conditions, *Vinca minor* can spread with great rapidity by means of its arching stolons, which root at the tips. Dry or cold weather may temporarily set growth back, but it quickly resprouts and regains lost ground coverage. It grows most vigorously in moist soil with only partial sun, but it can grow in the deepest shade and even in poor soil.

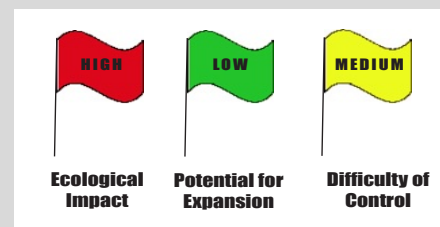
### **Origin:**

*Vinca minor* is a native from southern Switzerland southward around much of the Mediterranean basin, from Portugal to Turkey, and across much of north Africa. It has been introduced in the United States as a medicinal herb and as an ornamental ground cover.



Picture By: Ellen Jacquart

### **IPSAWG Ranking:**



### **IPSAWG Recommendation:**

- Plant periwinkle only next to concrete or lawns; do not plant next to natural areas.
- Help by eradicating any periwinkle adjacent to or in natural areas on your property.

This ranking illustrates the results of an assessment conducted by the **Invasive Plant Species Assessment Working Group (IPSAWG)**, which is made up of many organizations and agencies concerned about invasive plant species. IPSAWG's goal is to assess which plant species may threaten natural areas in Indiana and develop recommendations to reduce their use in the state.

For more information about IPSAWG and the assessment tool used to rank invasive species, visit their website:

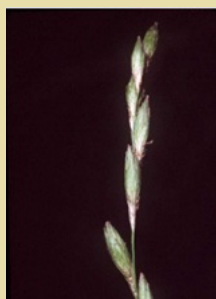
[www.invasivespecies.IN.gov](http://www.invasivespecies.IN.gov)



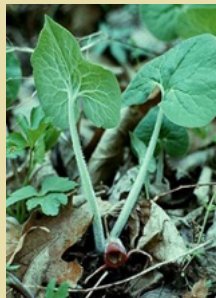
## ALTERNATIVES to Periwinkle:



Dwarf Crested Iris  
(*Iris cristata*)



Palm Sedge  
(*Carex muskingumensis*)



Wild Ginger  
(*Asarum canadense*)



Creeping Phlox  
(*Phlox subulata*)

Pictures By (Top to Bottom): Kay Yatskievych, R. H. Mohlenbrock @ USDA-NRCS Plants Database, Dennis W. Woodland and Thomas Barnes @ USDA-NRCS Plants Database.

## Control Methods:

Periwinkle can be pulled, raked, or dug up, though resprouting will occur. It can also be cut or mowed in spring during its rapid growth stage followed by a foliar application of glyphosate on the resprouts. Herbicide alone can be used as a control method. Thoroughly wet all leaves with triclopyr (Garlon 3A) or glyphosate (Roundup) mixed according to label directions at the highest allowed rate plus a non-ionic surfactant. This should be done between July to October for successive years.

In winter, herbicide treatments should be limited to days when the high temperature exceeds 50° F. No biological

controls are known.

**Always read and follow pesticide label directions.**



Picture By: J. Swearingen @ [www.invasive.org](http://www.invasive.org).

## Eight Easy Ways to Combat Invasive Plants

You can **help stop** the spread of **invasive plants** by following these **8 easy guidelines**:

1. Ask for only non-invasive species when you acquire plants. Request that nurseries and garden centers sell only non-invasive plants.
2. Seek information on invasive plants. Sources include botanical gardens, horticulturists, conservationists, and government agencies.
3. Scout your property for invasive species, and remove invasives before they become a problem. If plants can't be removed, at least prevent them from going to seed.
4. Clean your boots before and after visiting a natural area to prevent the spread of invasive plant seeds.
5. Don't release aquarium plants into the wild.
6. Volunteer at local parks and natural areas to assist ongoing efforts to diminish the threat of invasive plants.
7. Help educate your community through personal contacts and in such settings as garden clubs and civic groups.
8. Support public policies and programs to control invasive plants.

### For More Information:

On this assessment and IPSAWG:

**IPSAWG**  
**[www.invasivespecies.IN.gov](http://www.invasivespecies.IN.gov)**

On identification and control techniques:

**The Nature Conservancy's Wildland Weeds**  
**[www.tncweeds.ucdavis.edu](http://www.tncweeds.ucdavis.edu)**

On native plant alternatives and sources:

**Indiana Native Plant and Wildflower Society**  
**[www.inpaws.org](http://www.inpaws.org)**

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