



Invasive Species Early Detection Report, 2011–2020

Overview and Background

Invasive species are one of the leading threats to the biodiversity and integrity of ecosystems worldwide. Known ecological impacts of invasive species include displacement of threatened and endangered species, altered structure and composition of terrestrial and aquatic communities, and reduction in overall species diversity. National parks are not immune from the effects of invasive species. At Little River Canyon National Preserve (LIRI) there is a long history of human influence. Roads, trails, visitor use, and adjacent land use all affect the park and provide means of introducing and moving invasive species into and throughout the park. The Cumberland Piedmont Inventory and Monitoring Network (CUPN) assists Little River Canyon National Preserve with documenting invasive species through the implementation of an Invasive Species Early Detection (ISED) plan, detecting new invasive species populations in the park that are small and treatable, and disseminating the relevant information to the park's managers. If species are in the early stages of establishment, the costs of eradication are low and ecological damage can be minimized. When the ISED plan was implemented in 2014, a list of early detection species was created for the park and distributed to the park and CUPN staff. A field species identification guide was also created for the park at that time (Figure 1). From 2016–2019, the network annually updated the park's early detection list, utilizing presence and location information from various sources including EDDMapS (Early

Detection Distribution and Mapping Services, <https://www.eddmaps.org>), CUPN's forest vegetation monitoring (<https://www.nps.gov/im/cupn/forest-vegetation.htm>), and iNaturalist (<https://www.inaturalist.org>). See Table 1 for Little River Canyon National Preserve's 2019 invasive species early detection list.

Table 1. 2019 Invasive species early detection list for Little River Canyon National Preserve.

Scientific Name	Common Name
<i>Hemerocallis fulva</i>	Tawny daylily
<i>Solanum viarum</i>	Tropical soda apple
<i>Pyrus calleryana</i>	Callery/Bradford pear
<i>Lespedeza bicolor</i>	Shrubby lespedeza
<i>Elaeagnus umbellata</i>	Autumn olive
<i>Paulownia tomentosa</i>	Princesstree
<i>Wisteria sinensis</i>	Chinese wisteria
<i>Agilus planipennis</i>	Emerald ash borer

Partnership with iNaturalist

In April 2015, the NPS and the California Academy of Sciences entered into a cooperative agreement that allows the NPS to use iNaturalist as a valuable information collection tool. iNaturalist is a user-friendly mobile application that allows anyone to record, photograph, and share nature observations instantly online. It is a very useful tool for obtaining information on invasive species detections within the

EMERALD ASH BORER

[*Agilus planipennis* Fairmaire]




Fig. 1 UGA1241011 Fig. 2 UGA 5016058

Problem: A native of Asia,^{1,2,4} emerald ash borer (EAB) infests and kills North American ash species (*Fraxinus* sp.) including green, white, black and blue ash. Damage is caused by the larvae, which feed in the cambium between the bark and wood, producing galleries that eventually girdle and kill branches and entire trees.^{1,2}

Identification: Adults are roughly 7.5 to 13.5 mm long (¾ to 1 in)^{3,5} with metallic green wing covers (Fig. 1) and a coppery red or purple abdomen (Fig. 2).^{2,4} Larvae reach a length of 26 to 32 mm long (1 to 1 ¼ in),¹ are white to cream-colored and dorso-ventrally flattened.²

Signs and Symptoms: Irregular holes excavated by woodpeckers feeding on pre-pupal larvae (Fig. 3) may be the first sign of infestation.^{1,2} After at least one year of infestation, D-shaped exit holes (3-4 mm in diam., ~¼ in.) in the outer bark of the branches and trunk (Fig. 4) indicate adult emergence.^{1,2} Adults may be visible from late May through September,³ but are most common in June and July.^{2,3} Vertical bark fissures (Fig. 5), crown dieback (Fig. 6) and epicormic




Fig. 3 UGA 1372003 Fig. 4 UGA 1523072




Fig. 5 UGA 5016053 Fig. 6 UGA 1301042

sprouting and suckering are also prevalent.^{1,2} When the bark is removed from infested trees, distinct, larval tunnels or galleries that etch the outer sapwood and phloem are readily visible on the trunk and branches (Fig. 7).²

Similar Species: Adult EAB beetles are generally larger and a brighter green than native North American species' of *Agilus*,⁴ like the bronze birch borer.³ The six-spotted tiger beetle and caterpillar hunter are larger in size, are both predators of other insects, and are ground dwelling.³

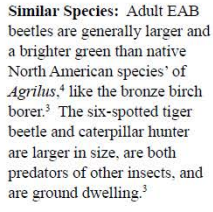



Fig. 7 UGA 5147090 Fig. 8 UGA 2133022

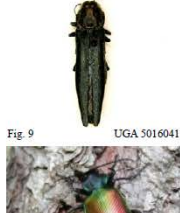



Fig. 9 UGA 5016041 Fig. 10 UGA 5022085

Above (Fig. 8): six-spotted tiger beetle *Cicindela sexguttata* Fabricius

Upper left (Fig. 9): bronze birch borer *Agilus anxius* Gory

Lower left (Fig. 10): caterpillar hunter *Calosoma scrutator* Fabricius

Figure 1. Field identification card for emerald ash borer (*Agilus planipennis*) at Little River Canyon National Preserve.

Overview and Background Continued

park. iNaturalist can also assist with species identification through an algorithm based on images and location information, as well as allowing users with relevant expertise to identify species.

In 2018 the network began utilizing iNaturalist to collect data on non-native plant and animal observations by the public within all CUPN parks. A “project” containing observations for the network was created and can be found at <https://www.inaturalist.org/projects/nps-cumberland-piedmont-network-invasive-species> (Figure 2). Each species observation includes observation date, location, image(s), and other relevant information useful to park managers. Through this project, the network can download and manage non-native species observation data for all network parks and review, verify, and report observations new-to-park species and treatable populations of established invasive species for each park on an ongoing basis.

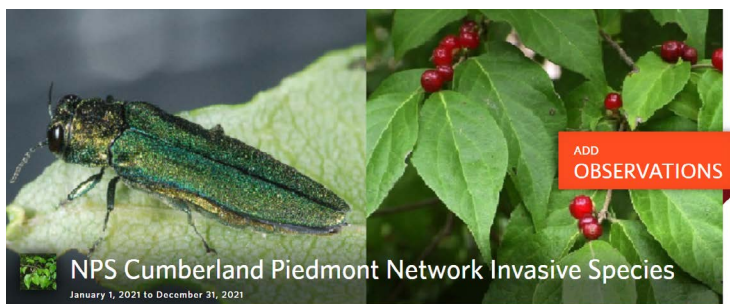


Figure 2. Banner for NPS Cumberland Piedmont Network Invasive Species iNaturalist project.

Results

New-to-Park Species Found through 2020

Figure 3 lists the number of new non-native species detections through 2020 at each CUPN park. At Little River Canyon National Preserve, 26 non-native species have been found through 2020 that are new to the park’s list, tying with Ninety Six National Historic Site for the most. The park maintains the most comprehensive invasive species treatments dataset of all CUPN parks, with data to 2002. Most species are common in the park but not on the park’s list in NPSpecies. Several species are ranked by CUPN as high-priority invasive. They are highly invasive in CUPN parks, common across CUPN forest vegetation monitoring plots, and should be targeted for removal if found in an early detection setting. Several are ranked on Alabama’s 2012 invasive plants list (<https://www.se-eppc.org/alabama/2012-updatedALIPCinvasiveplantlist.pdf>). Many were documented on iNaturalist.

1. Musk thistle (*Carduus nutans*) was first found in 2002 (see <https://www.inaturalist.org/observations/12608944> for a 2018 observation). It is invasive primarily in open disturbed areas and ranked as a category 2 plant in Alabama.
2. Spotted knapweed (*Centaurea stoebe*) was first found in 2002 (see www.inaturalist.org/observations/5881949 for a 2017 observation). It is not a CUPN high-priority species and is not listed in Alabama, but is invasive in open and disturbed areas and

New Non-Native Species Detections through 2020 at each CUPN Park

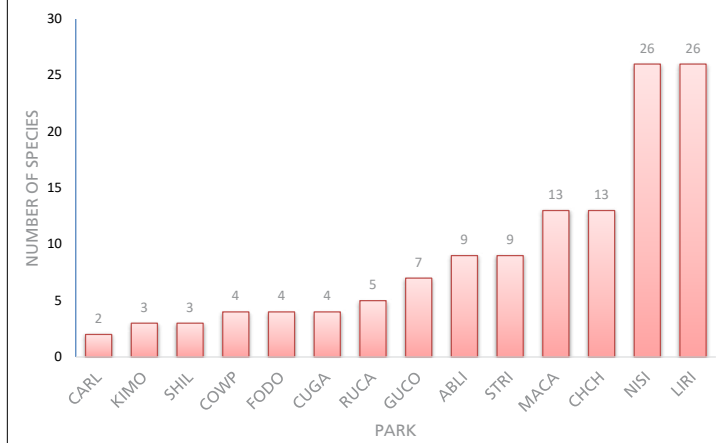


Figure 3. Number of new non-native species detections through 2020 at each CUPN park.

common across most of the northern and eastern United States.

3. Autumn olive (*Elaeagnus umbellata*) was first found in 2002. It is a CUPN high-priority species and ranked as a category 2 plant in Alabama, found in scattered and localized infestations.
4. Winged burning bush (*Euonymus alatus*) was first found in 2018 (see <https://www.inaturalist.org/observations/17997410>). It is a CUPN high-priority species but not ranked in Alabama.
5. Tawny daylily (*Hemerocallis fulva*) was found in 2017 (see <https://www.inaturalist.org/observations/6529296>). It is invasive primarily along roadsides and ditches. It is not a CUPN high-priority species or ranked in Alabama.
6. Rose-of-Sharon (*Hibiscus syriacus*) was found in 2002. It is not a CUPN high-priority species and is not listed in Alabama.
7. Common cat’s-ear (*Hypochaeris radicata*) was found in 2019 (see <https://www.inaturalist.org/observations/25274123>). It is invasive primarily in open disturbed areas. It is not a CUPN high-priority species or listed in Alabama.
8. Cypress vine (*Ipomoea quamoclit*) was found in 2017 (see <https://www.inaturalist.org/observations/8373039>). It is a common landscape annual that cannot survive cold weather and will likely not survive. It is not a CUPN high-priority species or ranked in Alabama.
9. Shrubby lespedeza (*Lespedeza bicolor*) was first found in 2002. It is not a CUPN high-priority species but is ranked as a category 2 plant in Alabama.
10. Tall fescue (*Lolium arundinaceum*) was found in 2010. It is not a CUPN high-priority species and is not listed in Alabama.
11. Leatherleaf mahonia (*Mahonia bealei*) was first found in 2009 (see <https://www.inaturalist.org/observations/12648584> for a 2018 observation). It is a CUPN high-priority species and is ranked as a category 2 plant in Alabama.

Results Continued

12. Chinese silvergrass (*Miscanthus sinensis*; Figure 4) was found in 2017 in DeSoto State Park. It is ranked as a watch list B plant in Alabama, invasive in adjacent states and/or cultivated in Alabama. Invasiveness varies by variety. This population was of the ‘Zebrinus’ variety, blooming later in the year than most other varieties. It may not be as invasive.
13. Heavenly bamboo (*Nandina domestica*) was first found in 2008. It is a CUPN high-priority species and is ranked as a category 2 plant in Alabama.
14. Princess tree (*Paulownia tomentosa*) was first found in 2002 (see <https://www.inaturalist.org/observations/10794549> for a 2018 observation). It is a CUPN high-priority species and ranked as a category 2 plant in Alabama.
15. White poplar (*Populus alba*) was found in 2019 (see <https://www.inaturalist.org/observations/23089526>). It can be invasive but is not a CUPN high-priority species or listed in Alabama.
16. Callery pear (*Pyrus calleryana*) was first found in 2012 (see <https://www.inaturalist.org/observations/12615895> for a 2018 observation). It is a CUPN high-priority species and ranked as a category 2 plant in Alabama.
17. Sawtooth oak (*Quercus acutissima*) was found in 2017. It is not a CUPN high-priority species but is listed in Alabama as a watch list A plant, recently appearing in Alabama as free-living infestations.
18. Bladder campion (*Silene latifolia*) was first found in 2014. It is invasive primarily in disturbed and waste places but is not a CUPN high-priority species or listed in Alabama.
19. Bridal wreath spiraea (*Spiraea prunifolia*) was found in 2018 (see <https://www.inaturalist.org/observations/10140021>). It is invasive primarily in open areas with well-drained soils but is not a CUPN high-priority species or ranked in Alabama.
20. Chinese wisteria (*Wisteria sinensis*) was first found in 2003 (see <https://www.inaturalist.org/observations/13805947> for a 2018 observation). It is a CUPN high-priority species and ranked as a category 1 plant in Alabama, forming extensive and dense infestations throughout the state.
21. Oriental false hawksbeard (*Youngia japonica*) was found in 2018 at DeSoto State Park and an observation was made on iNaturalist (see <https://www.inaturalist.org/observations/12691663>). It is invasive primarily in disturbed habitats but is not a CUPN high-priority species or ranked in Alabama.
22. White mulberry (*Morus alba*) was found in 2019 by public citizens at two locations in DeSoto State Park (see <https://www.inaturalist.org/observations/25032581> and <https://www.inaturalist.org/observations/24787409>). Although invasive, it is not a CUPN high-priority species or listed in Alabama.
23. Chocolate vine (*Akebia quinata*) was found in 2019 and treated by



Figure 4. NPS IPMT member treating Chinese silvergrass (*Miscanthus sinensis*) at Little River Canyon National Preserve. NPS photo.

LIRI park staff. Although invasive, it is not a CUPN high-priority species or listed in Alabama.

24. Erect cinquefoil (*Potentilla recta*) was found in 2020 and an observation was made on iNaturalist (see <https://www.inaturalist.org/observations/46029305>). It is naturalized in much of North America but is not a CUPN high-priority species or listed in Alabama.
25. Annual meadow-grass (*Poa annua*) was found in 2020, (see <https://www.inaturalist.org/observations/40565807>). It is a common species of lawns and disturbed areas but is not a CUPN high-priority species or listed in Alabama.
26. The red imported fire ant (*Solenopsis invicta*) was found in 2006 (see <https://www.inaturalist.org/observations/65559938>). It is native to South America but found throughout the southern United States, mostly in disturbed and altered habitats.

Invasive Species Treatments

Little River Canyon National Preserve utilizes the expertise of the NPS Invasive Plant Management Teams (IPMTs) as well as park natural resource staff and interns to treat invasive species populations. The IPMTs come to the park at least once per year and target invasive plants while park staff treat plants throughout the growing season. Based on available data from 2002–2019, the following species have been treated at the park by IPMTs and park staff:

1. ox-eye daisy (*Leucanthemum vulgare*)
2. Queen Anne’s lace (*Daucus carota*)
3. spotted knapweed (*Centaurea stoebe*)
4. Nepalese browntop (*Microstegium vimenium*)
5. common mullein (*Verbascum thapsus*)
6. tree of heaven (*Ailanthus altissima*)
7. kudzu (*Pueraria montana*)
8. Chinese wisteria (*Wisteria sinensis*)
9. silktree mimosa (*Albizia julibrissin*;))
10. beefsteak plant (*Perilla frutescens*)

Results Continued

11. princess tree (*Paulownia tomentosa*)
12. Autumn olive (*Elaeagnus umbellata*)
13. sericea lespedeza (*Lespedeza cuneata*)
14. Chinese privet (*Ligustrum sinense*)
15. multiflora rose (*Rosa multiflora*)
16. Callery pear (*Pyrus calleryana*)
17. heavenly bamboo (*Nandina domestica*)
18. Chinese silvergrass (*Miscanthus sinensis*; Figure 4)
19. sawtooth oak (*Quercus acutissima*)
20. bull thistle (*Cirsium vulgare*)
21. leatherleaf mahonia (*Mahonia bealei*)
22. Japanese honeysuckle (*Lonicera japonica*)
23. musk thistle (*Carduus nutans*)

24. Chinese yam (*Dioscorea polystachya*)
25. shrubby lespedeza (*Lespedeza bicolor*)
26. tall fescue (*Lolium arundinaceum*)
27. Johnsongrass (*Sorghum halepense*)
28. white clover (*Trifolium repens*)
29. Chocolate vine (*Akebia quinata*)

Next Steps

- Invasive Species Early Detection Plan update: the network will be substantially revising the ISED plan in FY2021, focusing on utilizing the project in iNaturalist as the main method of collecting ISED data.
- Data release: the network will provide the park with ISED data collected through 2020.
- Data monitoring: the network will ensure data from the iNaturalist project are routinely reviewed, verified, and provided to park managers as quickly as possible.

About the Cumberland Piedmont Network

In 1999, the National Park Service initiated a long-term ecological monitoring program, known as “Vital Signs Monitoring,” to provide the minimum infrastructure to allow more than 270 national park system units to identify and implement long-term monitoring of their highest-priority measurements of resource condition. The overarching purpose of natural resource monitoring in parks is to develop scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and to determine how well current management practices are sustaining those ecosystems.

- The NPS Vital Signs Monitoring Program addresses five goals for all parks with significant natural resources:
- Determine the status and trends in selected indicators of the condition of park ecosystem,
- Provide early warning of abnormal conditions,
- Provide data to better understand the dynamic nature and condition of park ecosystems,
- Provide data to meet certain legal and congressional mandates, and
- Provide a means of measuring progress towards performance goals.

The Cumberland Piedmont Inventory and Monitoring Program is comprised of 14 national park units with diverse cultural and natural resources distributed across eight states (Alabama, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia)

and six different physiographic regions.

The objectives for Cumberland Piedmont Network are centered around monitoring aquatic, cave, and terrestrial ecosystems at these parks. The network works closely with each park’s natural resource program to develop and implement long-term monitoring and provide sound scientific information to park managers.

About the NPS Inventory & Monitoring Division:

<https://www.nps.gov/im/index.htm>

Data Downloads via the Natural Resource Information Portal:

<http://irma.nps.gov>

CUPN Home Page:

<https://www.nps.gov/im/cupn/index.htm>

CUPN Reports & Publications:

<https://www.nps.gov/im/cupn/reports-publications.htm>

CUPN Invasive Species Early Detection (ISED) Page:

<https://www.nps.gov/im/cupn/invasive-species.htm>

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