

ALL HOPE IS NOT LOST: INVASIVE PLANT TRENDS AND A STRATEGIC PLANNING TOOL

Stephanie Perles, Kate Miller, Ed Sharron





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WEBINAR OUTLINE

- Invasive plant trends in eastern parks
- Planning tool to make the most of limited resources
- Rethinking natural resource management

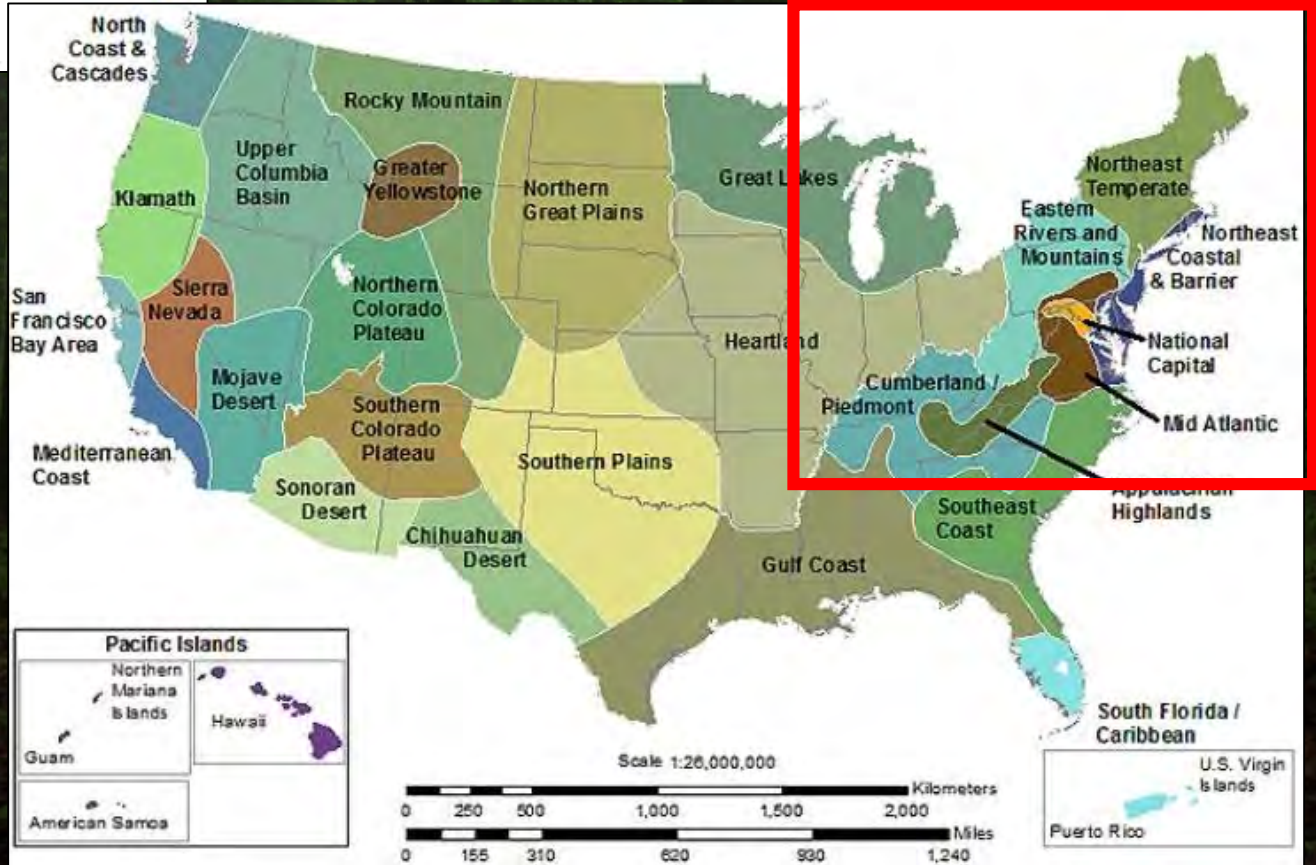
NPS Organic Act of 1916



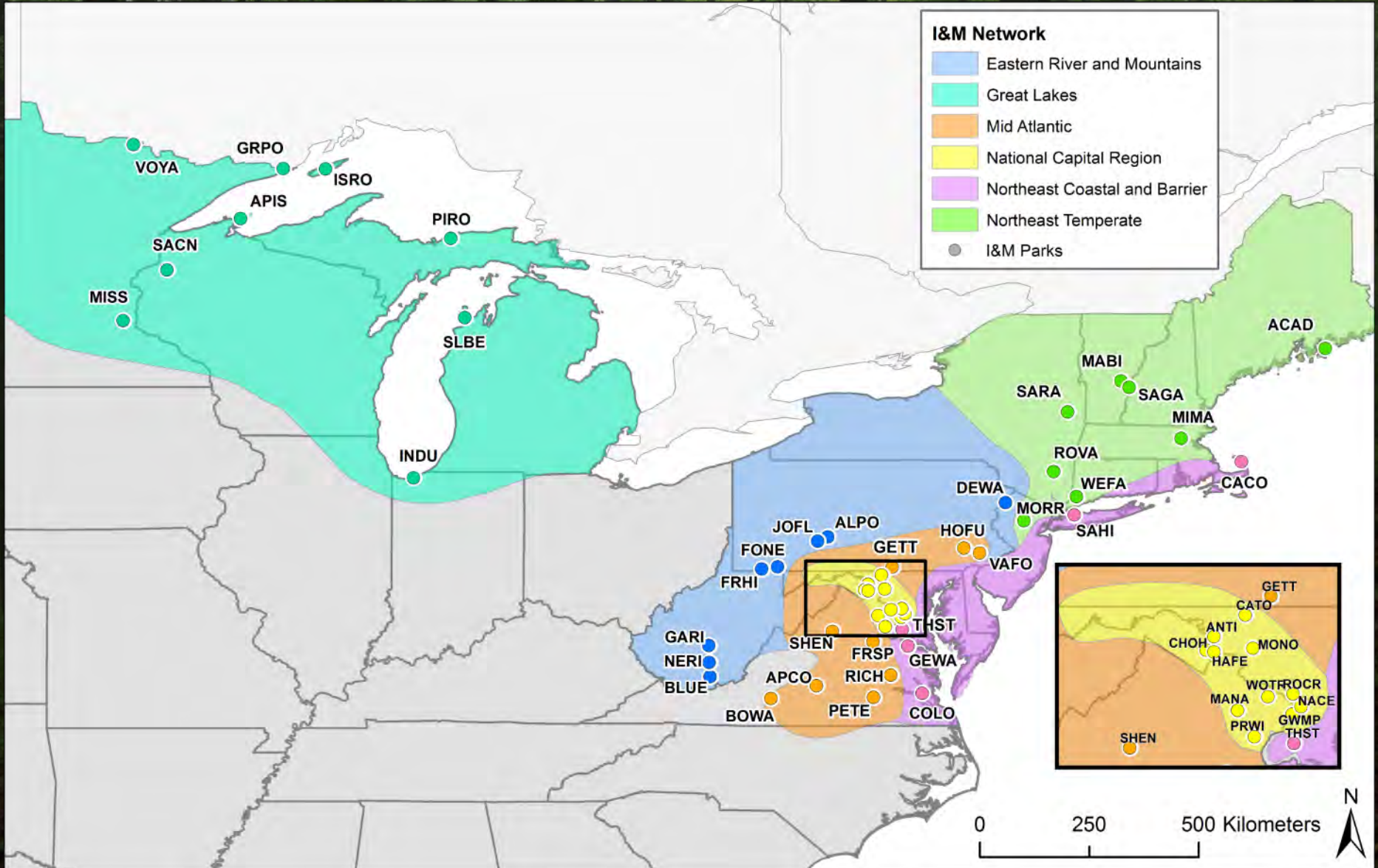
“...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”



NPS Inventory and Monitoring Division



Park vs. Surrounding Forest Comparisons





Park vs. Surrounding Forest Comparisons

- **Park forests are different from surrounding forests:**
 - Higher proportion of late successional forests
 - Higher live tree basal area
 - Higher density of large trees
 - Considerably higher CWD volume
 - Higher stand-level tree diversity

Miller et al. 2016. Ecosphere 7(7): e01404. IRMA: 2230636

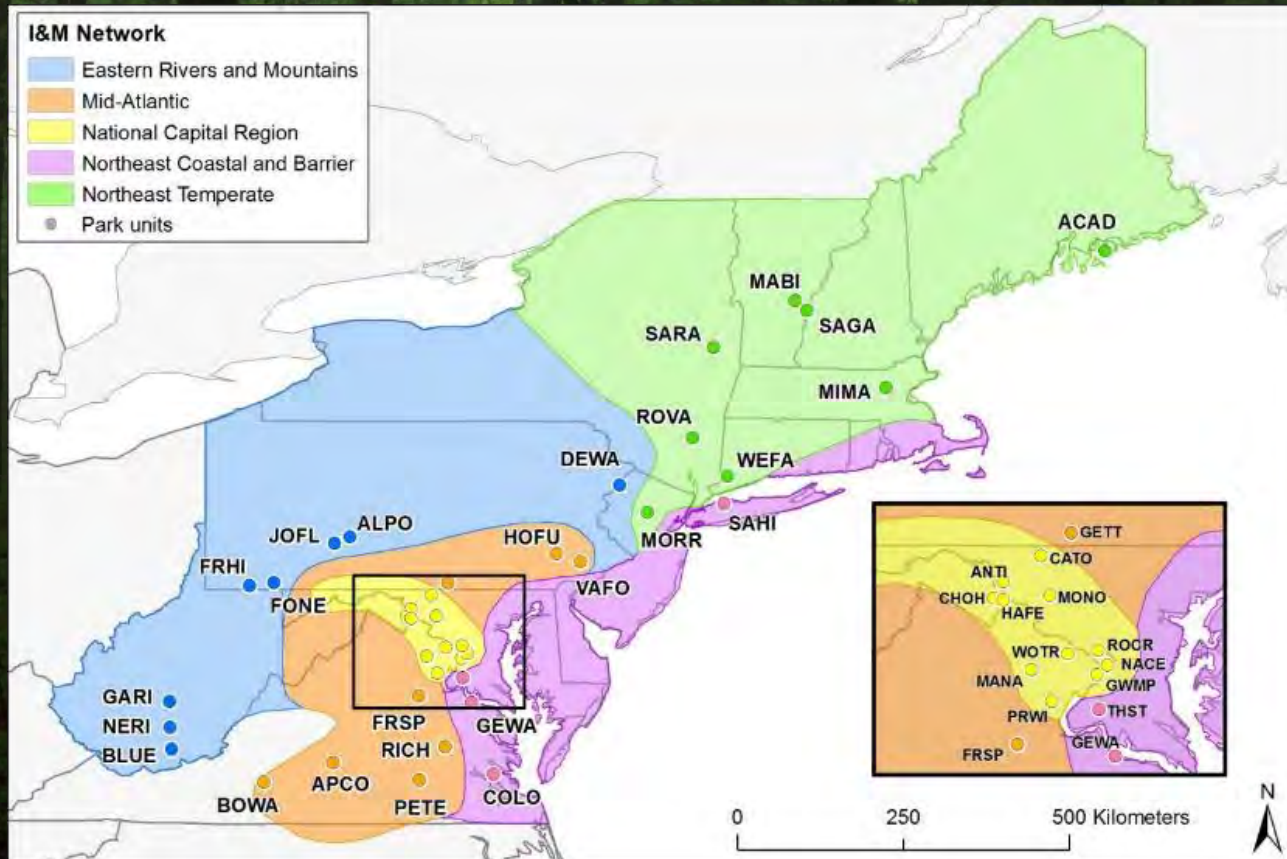
Miller et al. 2018. Forest Ecology and Management 414: 74-84. IRMA: 2251773



Invasive Plant Trend Analysis

By the numbers:

- 5 networks
- 39 parks
- 3 cycles over 12 years
- 1,470 forest plots



Invasive Trend Analysis Overview



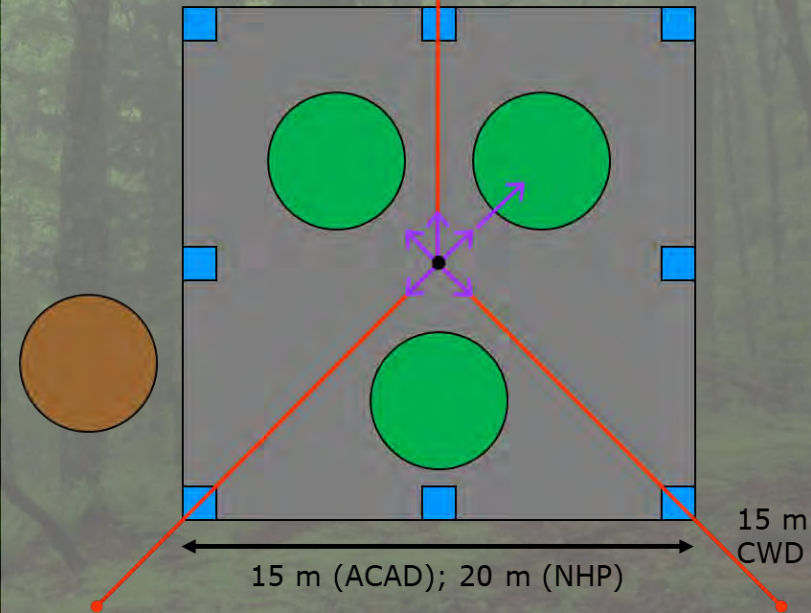
Metrics:

- Plot % Frequency
- Quadrat % Frequency
- Average Quadrat % Cover

Grouping Levels:

- Total invasives
- By guild: trees, shrubs/vines, graminoids, herbaceous
- By species

NETN Forest Plot



Invasive Ranking by Park



Rank	Network	Park	Avg. % Cover	Quad. % Freq.	Plot % Freq.
1	NCRN	MONO	40.4	91.7	100.0
2	NCRN	ANTI	39.6	97.6	100.0
3	ERMN	FRHI	35.3	85.0	100.0
4	NETN	MORR	35.1	75.0	100.0
5	NCRN	CHOH	33.9	74.3	91.9
6	MIDN	HOFU	29.1	71.4	93.8
7	MIDN	VAFO	27.2	69.4	89.3
8	NCRN	GWMP	22.3	54.2	80.0
9	NCRN	MANA	21.2	64.7	88.2
10	MIDN	GETT	21.0	92.9	100.0
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30	NETN	ROVA	3.2	49.4	95.0
31	NCBN	SAHI	2.1	83.3	100.0
32	ERMN	NERI	1.8	13.3	45.1
33	MIDN	BOWA	1.8	66.7	87.5
34	ERMN	GARI	1.6	13.6	58.1
35	NETN	SAGA	1.1	9.5	52.4
36	NCRN	PRWI	0.6	5.1	17.9
37	MIDN	FRSP	0.3	8.7	35.6
38	NETN	MABI	<0.1	8.9	87.5
39	NETN	ACAD	<0.1	0.2	4.6

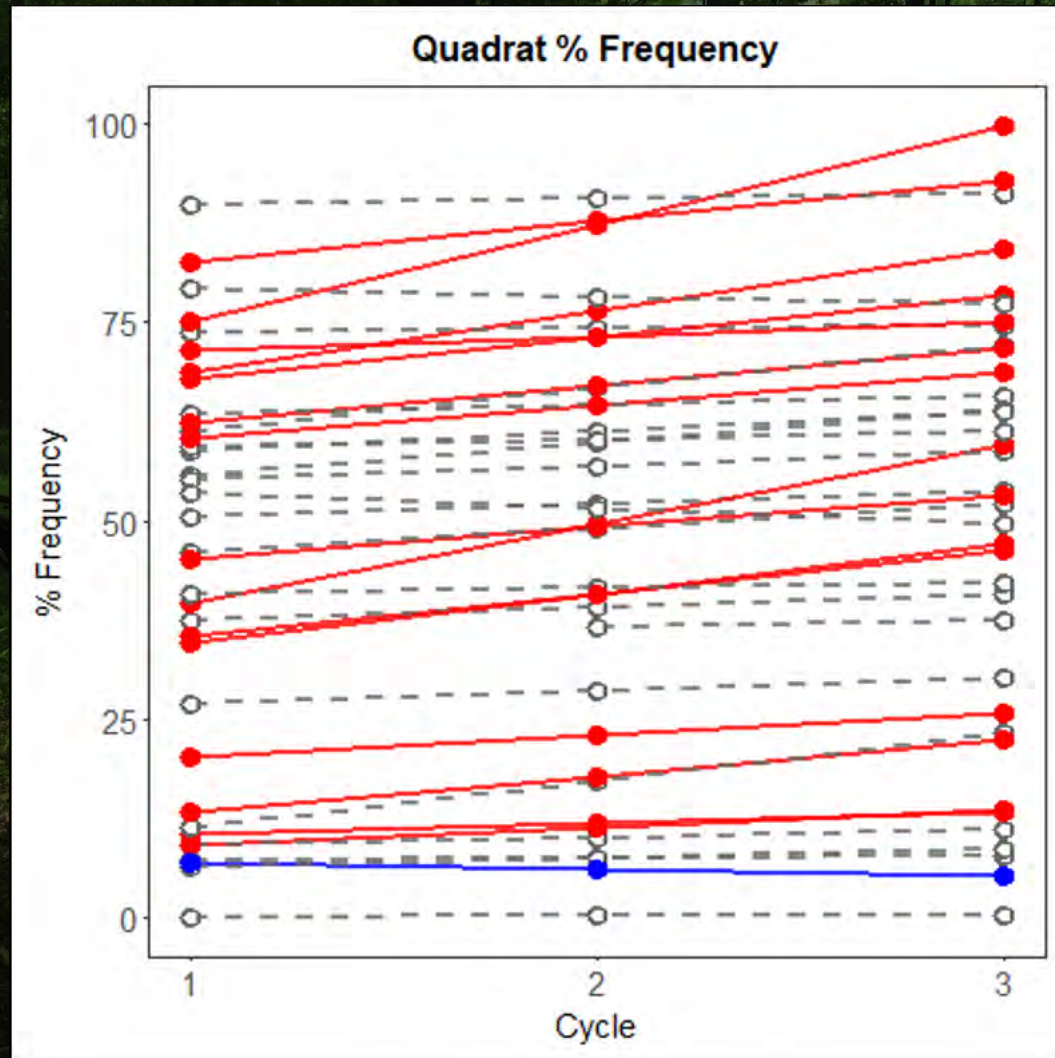
Years: 2015 – 2018

Invasive Ranking by Species



Rank	Latin Name	Common	Guild	% of Plots	% of Parks
1	<i>Microstegium vimineum</i>	Japanese stiltgrass	Graminoid	33.9	84.6
2	<i>Rosa multiflora</i>	multiflora rose	Shrub/Vine	28.2	89.7
3	<i>Lonicera japonica</i>	Japanese honeysuckle	Shrub/Vine	25.6	82.1
4	<i>Alliaria petiolata</i>	garlic mustard	Herbaceous	20.3	64.1
5	<i>Berberis thunbergii</i>	Japanese barberry	Shrub/Vine	19.6	76.9
6	<i>Celastrus orbiculatus</i>	Asian bittersweet	Shrub/Vine	16.9	84.6
7	<i>Lonicera</i> spp. (Exotic)	exotic bush honeysuckle	Shrub/Vine	15.4	66.7
8	<i>Persicaria longiseta</i>	oriental lady's thumb	Herbaceous	14.9	79.5
9	<i>Rubus phoenicolasius</i>	wineberry	Shrub/Vine	12.7	59.0
10	<i>Ligustrum</i> spp.	privet	Shrub/Vine	9.2	66.7
11	<i>Ailanthus altissima</i>	tree-of-heaven	Tree	8.9	66.7
12	<i>Elaeagnus</i> spp.	Oleaster/ olive	Shrub/Vine	6.9	51.3
13	<i>Euonymus alatus</i>	winged burningbush	Shrub/Vine	6.7	51.3
14	<i>Glechoma hederacea</i>	creeping charlie	Herbaceous	5.3	43.6
15	<i>Acer platanoides</i>	Norway maple	Tree	4.5	41.0

Total Invasive Trends: Quadrat Frequency



—●— Sign. Increase —●— Sign. Decline —○— No Sign. Trend

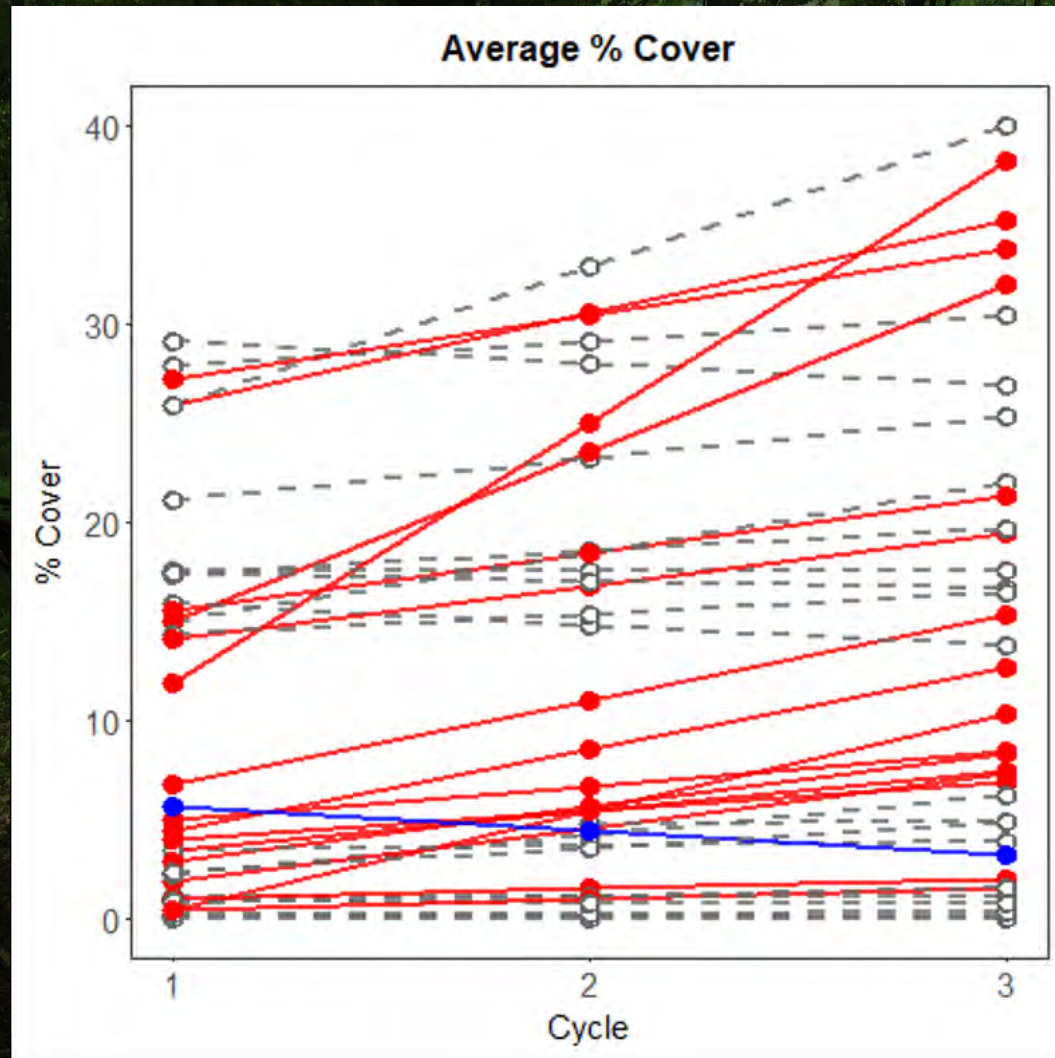
Cycles:

1= 2007 – 2010

2= 2011 – 2014

3= 2015 – 2018

Total Invasive Trends: Average Cover



—●— Sign. Increase —●— Sign. Decline —○— No Sign. Trend

Cycles:

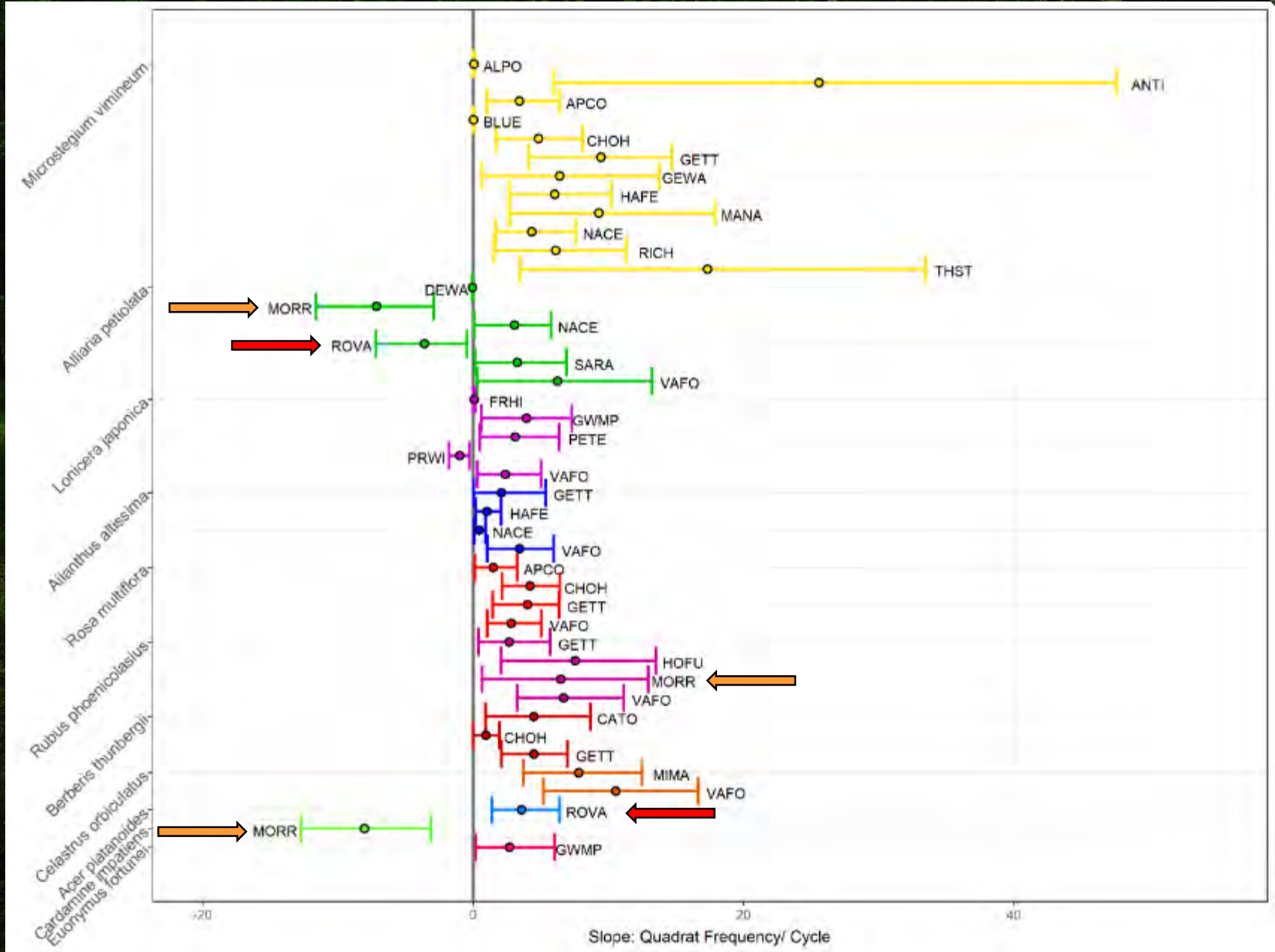
1= 2007 – 2010

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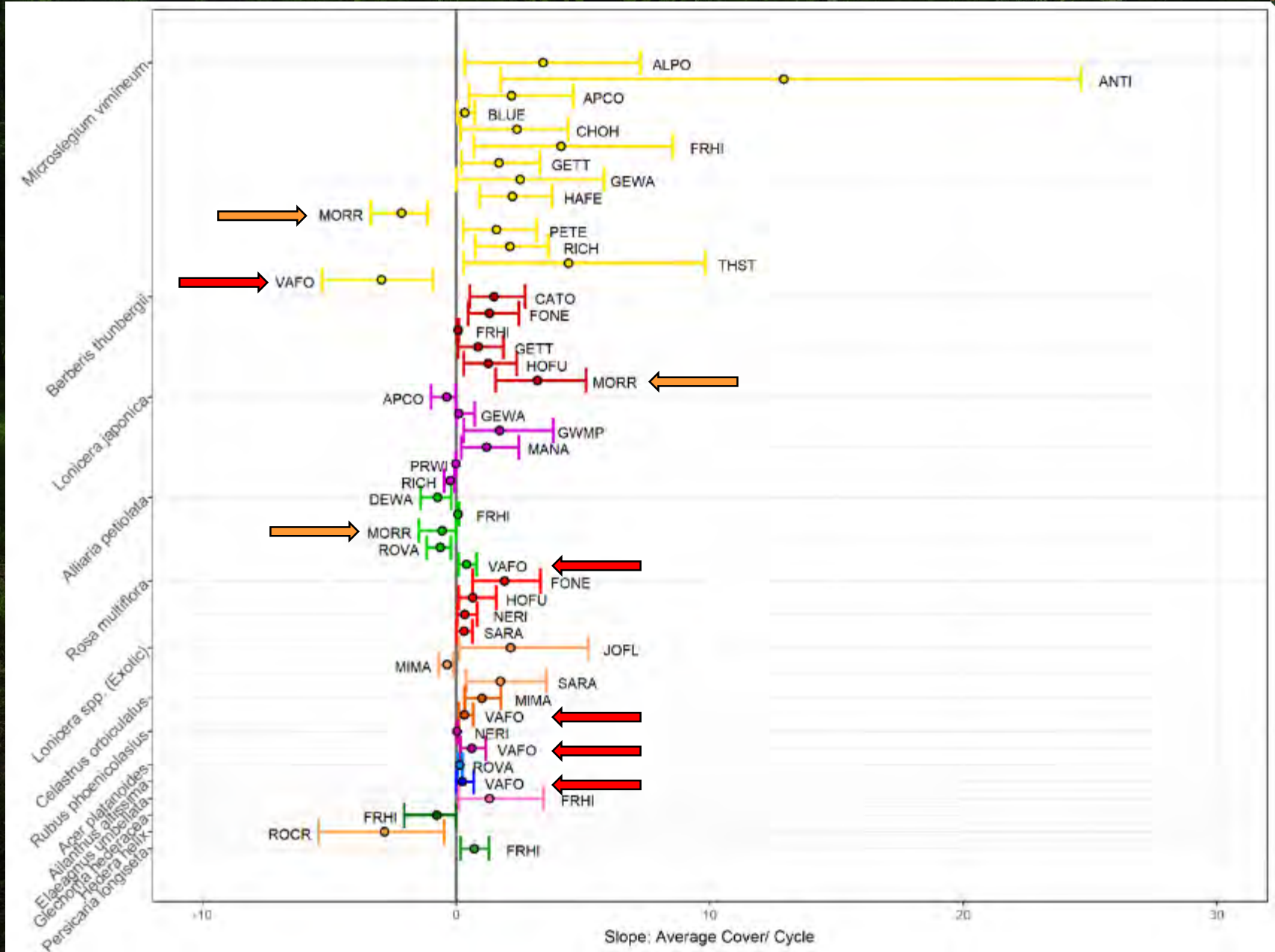


Species-level Trends: Quadrat Frequency





Species-level Trends: Average Cover



A photograph of a forest scene. In the lower-left foreground, a white wooden cross-shaped marker stands in the grass. A small white rectangular sign is attached to the horizontal bar of the cross. The sign contains the text "MORR-021" and "5/27/2009" in black. The background is a dense forest with many tall, thin trees and a thick layer of green undergrowth. The ground is covered with dry leaves and twigs.

MORR-021
5/27/2009

A white wooden cross-shaped marker is planted in the ground. A rectangular sign is attached to the horizontal arm of the cross. The sign contains the text 'MORR-021' and '5/29/2013'. The marker is located in a forest with many trees and dense green undergrowth.

MORR-021
5/29/2013

A white cross-shaped marker is positioned in the lower-left foreground of a dense forest. The marker has a vertical post and a horizontal crossbar. A white rectangular sign is attached to the crossbar with two small metal rings. The sign contains the text 'MORR-021' and '5/23/2017' in black, sans-serif font. The forest is filled with tall, thin trees and thick green undergrowth. The lighting is soft and even, suggesting an overcast day.

MORR-021
5/23/2017

A white cross-shaped marker is positioned in the lower-left foreground of a dense forest. A white rectangular tag is hanging from the horizontal arm of the cross. The tag contains the text "VAFO-042" and "07/24/2007". The forest floor is covered in thick green vegetation, and several fallen tree branches are scattered across the scene. In the background, numerous standing trees with green foliage are visible.

VAFO-042
07/24/2007



VAFO-042
07/26/2011



VAFO-042
07/22/2015

A white T-shaped marker is positioned in a dense, sunlit forest. The marker has a vertical post and a horizontal crossbar. A white rectangular label is attached to the crossbar with two small black rings. The label contains the text "VAFO-042" and "07/16/2019" in black. The background is a thick wall of green foliage, including many ferns and other leafy plants, with sunlight filtering through the canopy.

VAFO-042
07/16/2019



Invasive Trend Summary

Invasive species are widespread and consistently increasing in abundance across eastern parks

- 35/39 parks had invasives in at least half of their plots
- 30 parks had at least one significant increase in invasive abundance
- Only 2 parks showed overall declines: PRWI and MABI
- 2 parks kept low invasive levels: ACAD and SAGA





Invasive Trend Summary (Cont.)

Most aggressive invaders

- Japanese stiltgrass (*Microstegium vimineum*)
- Shrubs and woody vines

Likely drivers

- Overabundant deer
- Forest pests
- Canopy disturbances
- Exotic earthworms
- Fragmentation
- Land use history



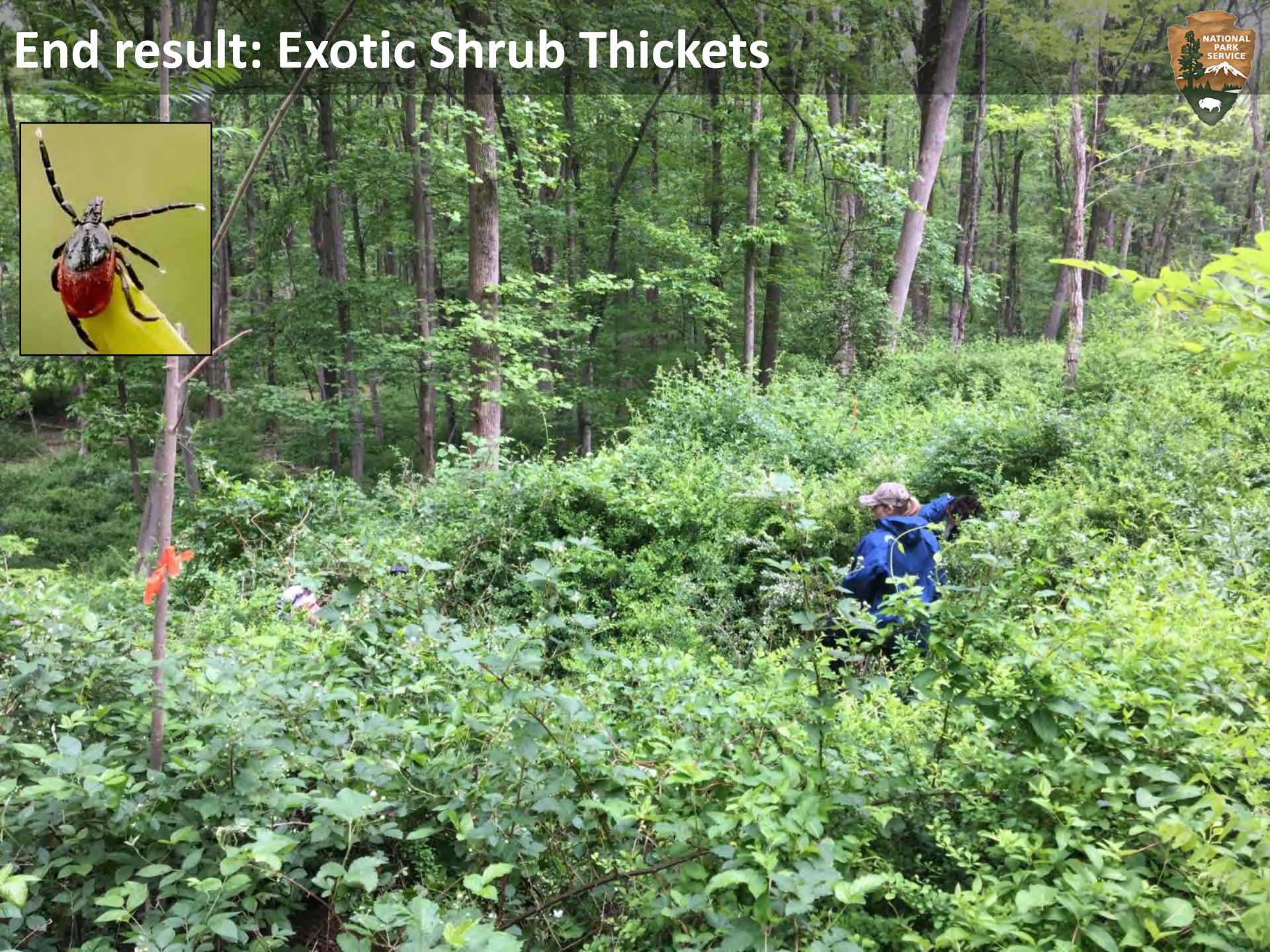
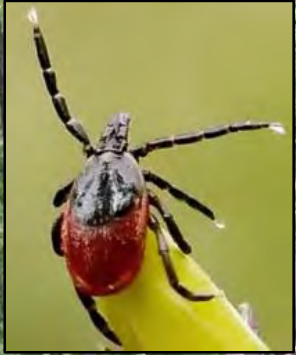


Impacts of Deer Overabundance

Impacts of Forest Pests and Intense Storms

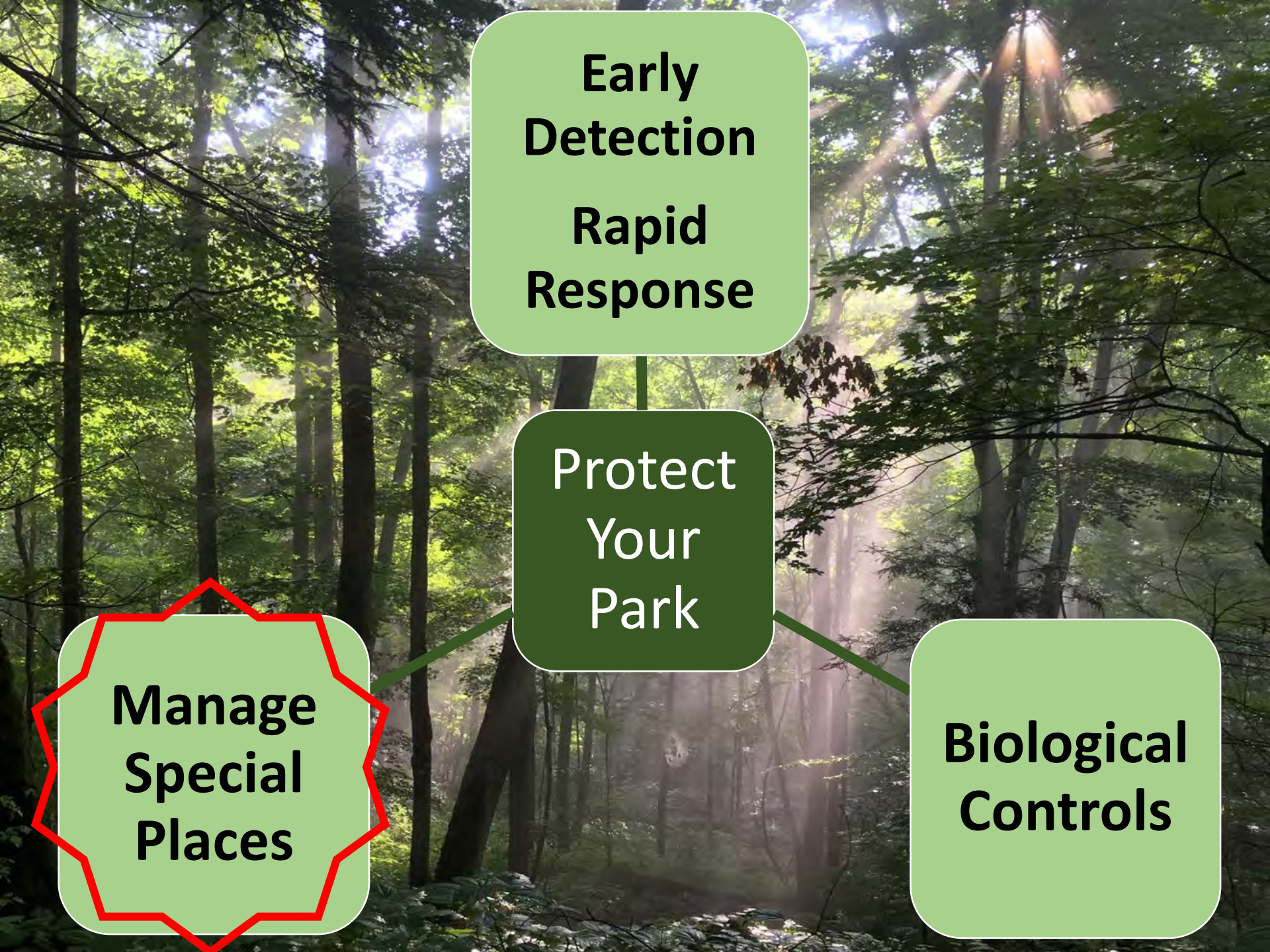


End result: Exotic Shrub Thickets



Invasive Species : What to do???



A lush green forest with tall trees and sunlight filtering through the canopy. A central diagram consists of a dark green rounded rectangle labeled 'Protect Your Park' connected by green lines to three light green rounded rectangles: 'Early Detection Rapid Response' (top), 'Manage Special Places' (bottom-left, with a red jagged border), and 'Biological Controls' (bottom-right).

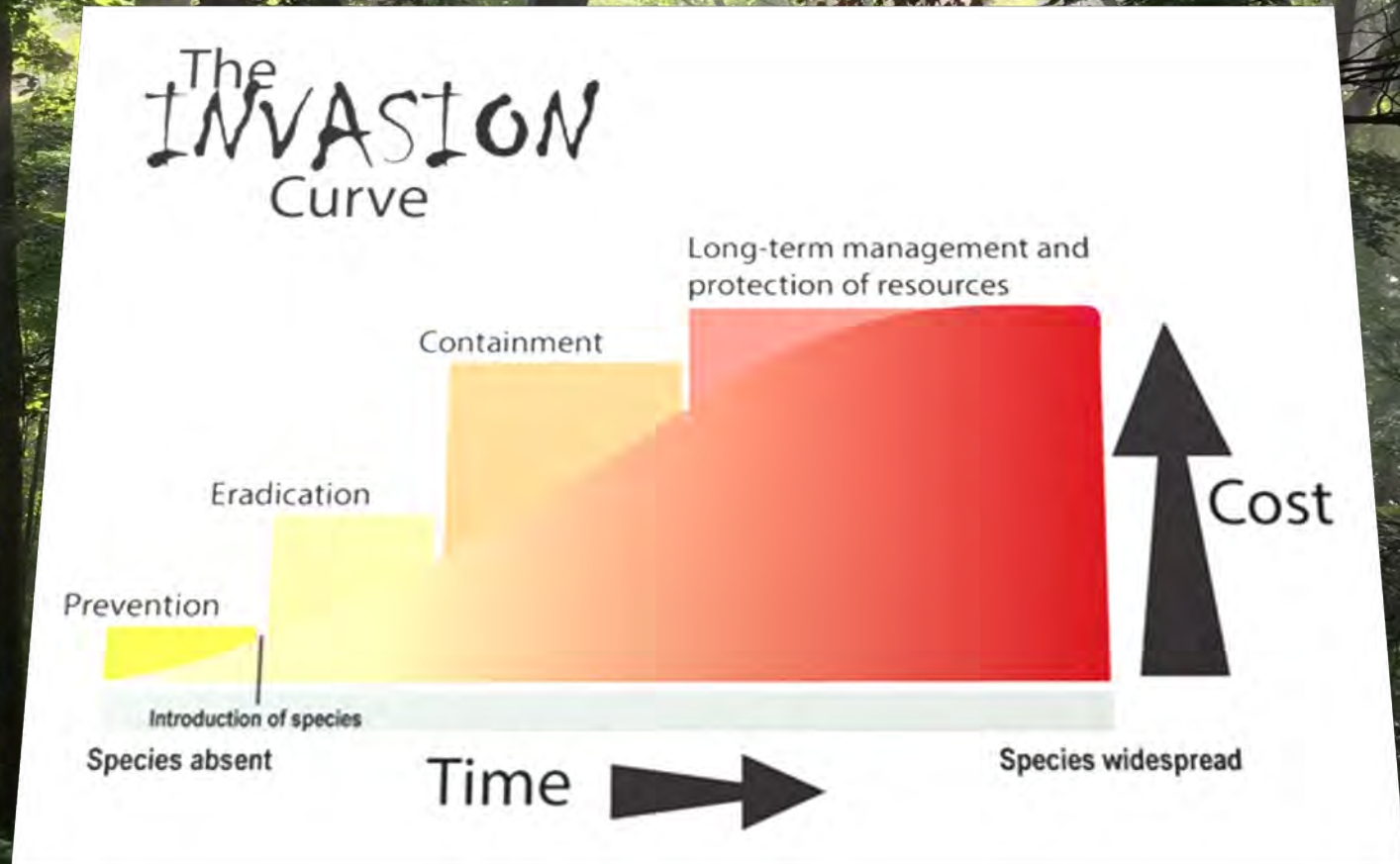
**Early
Detection
Rapid
Response**

**Protect
Your
Park**

**Manage
Special
Places**

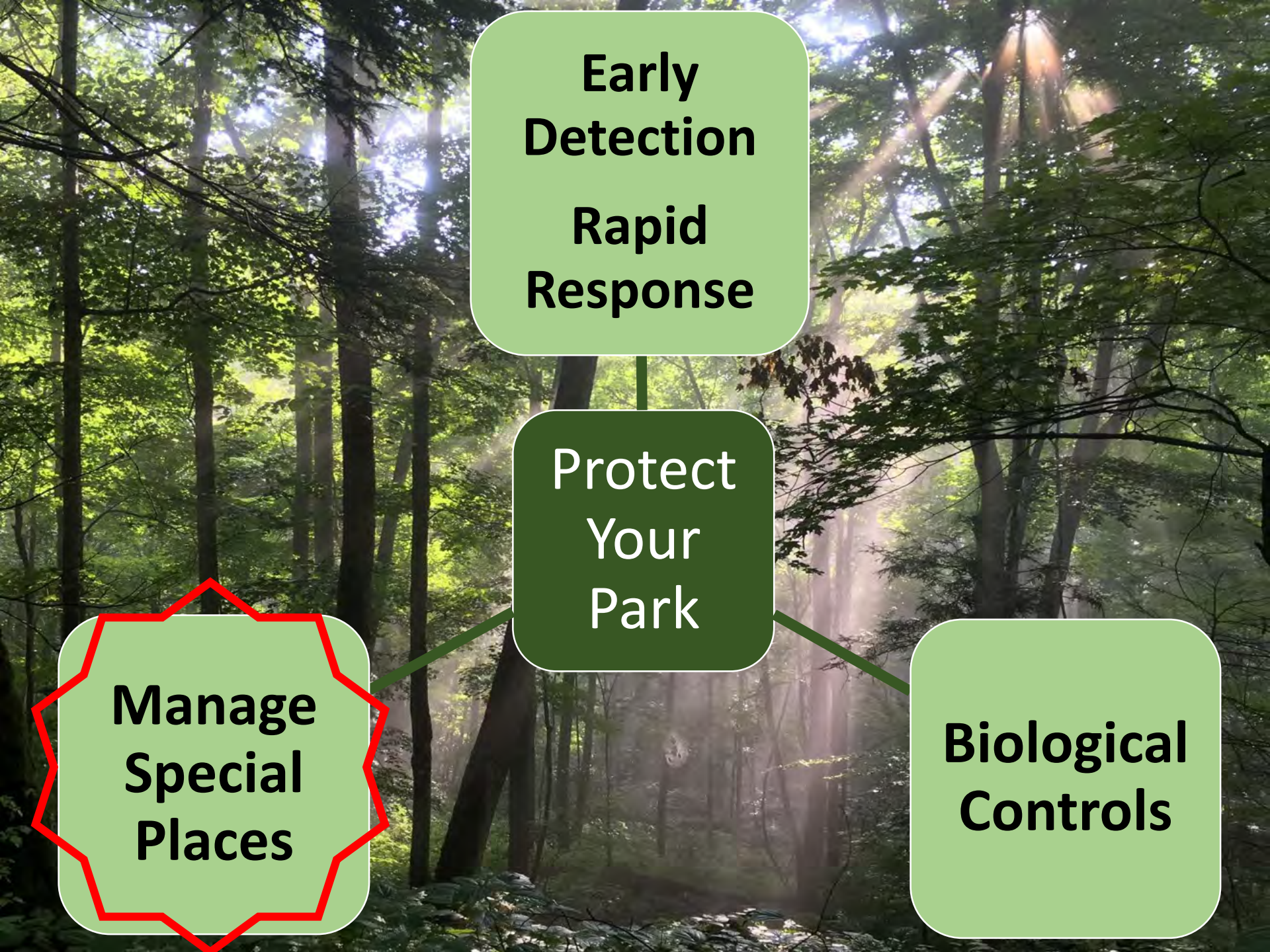
**Biological
Controls**

Early Detection Rapid Response





Biological Controls

A lush green forest with tall trees and sunlight filtering through the canopy. A central diagram consists of a dark green rounded rectangle labeled 'Protect Your Park' connected by green lines to three light green rounded rectangles: 'Early Detection Rapid Response' (top), 'Manage Special Places' (bottom-left, with a red jagged border), and 'Biological Controls' (bottom-right).

**Early
Detection
Rapid
Response**

**Protect
Your
Park**

**Manage
Special
Places**

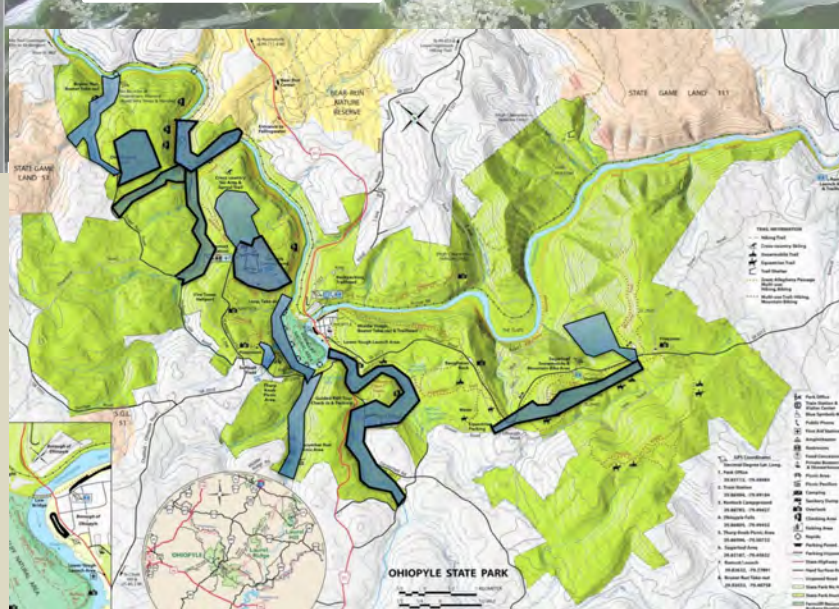
**Biological
Controls**

So Many Weeds, So Little Time: Prioritizing Invasive Plant Species Management



Art Gover

**Wildland Weed Management Program
Pennsylvania State University**



So Many Weeds, So Little Time: Prioritizing Invasive Plant Species Management



Art Gover

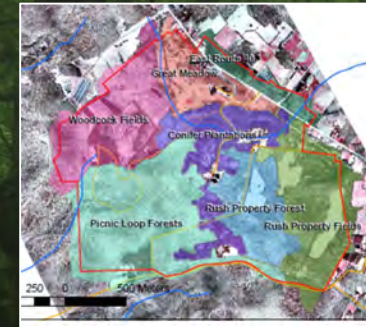
- Parks have finite resources.
- Use park-specific data to plan strategic management.
- Focus on protecting the best sites within a park.
- Inaction is more harmful than action.



Strategic Tool



1. Define Habitat Management Zones
2. Use park-specific data to prioritize zones and species for management.
3. Prescribe detailed treatments.



HMAZ Name	Woodstock Forest	Center Plantation	Rush Property Forest	Rush Property Fields	Picnic Loop Forests	Center Plantation	Woodstock Fields
Habitat Type	MF	MF	YF	WL	MF	MF	YF
Stewardship Index	1	0	0	2	2	0	1
Outreach Index	0	0	0	2	2	0	2
Exotic Index	0	0	0	0	0	0	0
Japanese stregress	0	0	0	0	0	0	0
bulb thistle	0	0	0	0	0	0	0
common beaked	0	0	0	0	0	0	0
garlic mustard	0	0	0	0	0	0	0
wild parakeet	0	0	0	0	0	0	0
Canada thistle	0	0	0	0	0	0	0
coronilla	0	0	0	0	0	0	0
exotic shrubs	0	0	0	0	0	0	0
autumn olive	0	0	0	0	0	0	0
empress tree	0	0	0	0	0	0	0
Japanese barberry	0	0	0	0	0	0	0
multiflora rose	0	0	0	0	0	0	0
privet	0	0	0	0	0	0	0
shrub honeysuckle	0	0	0	0	0	0	0
orange honeysuckle	0	0	0	0	0	0	0
tree-of-heaven	0	0	0	0	0	0	0
Japanese honeysuckle	0	0	0	0	0	0	0
Oriental bittersweet	0	0	0	0	0	0	0
Japanese knotweed	0	0	0	0	0	0	0



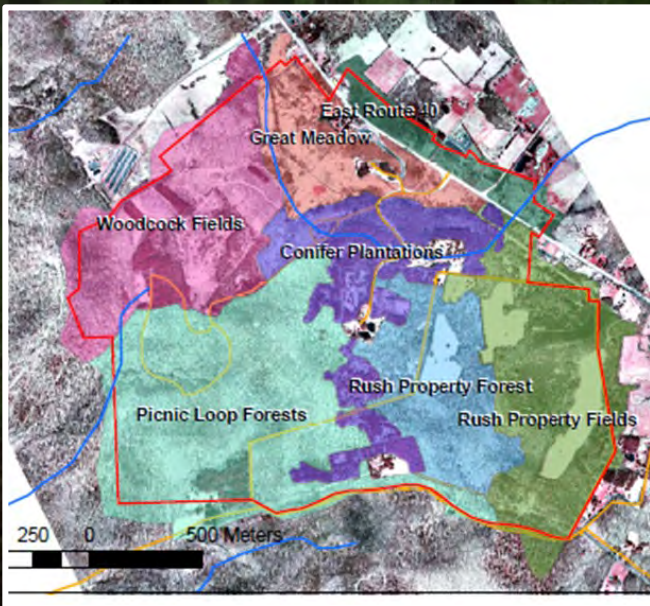
Define Habitat Management Zones



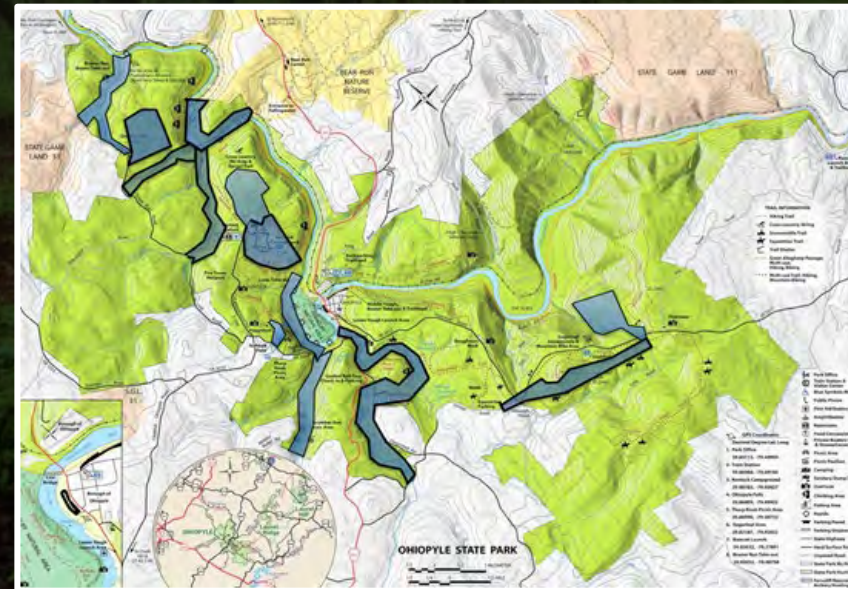
- Focus on the parks' special places
- Consider rare habitats and species
- Create zones that are operationally feasible
- Exclude areas that won't be managed



Pennsylvania Natural Heritage Program



*Works best for
parks
<2,000 ha
(<5,000 ac)
in size*



Strategic Invasive Species Management Tool



Habitat Management Zone

Stewardship
Value

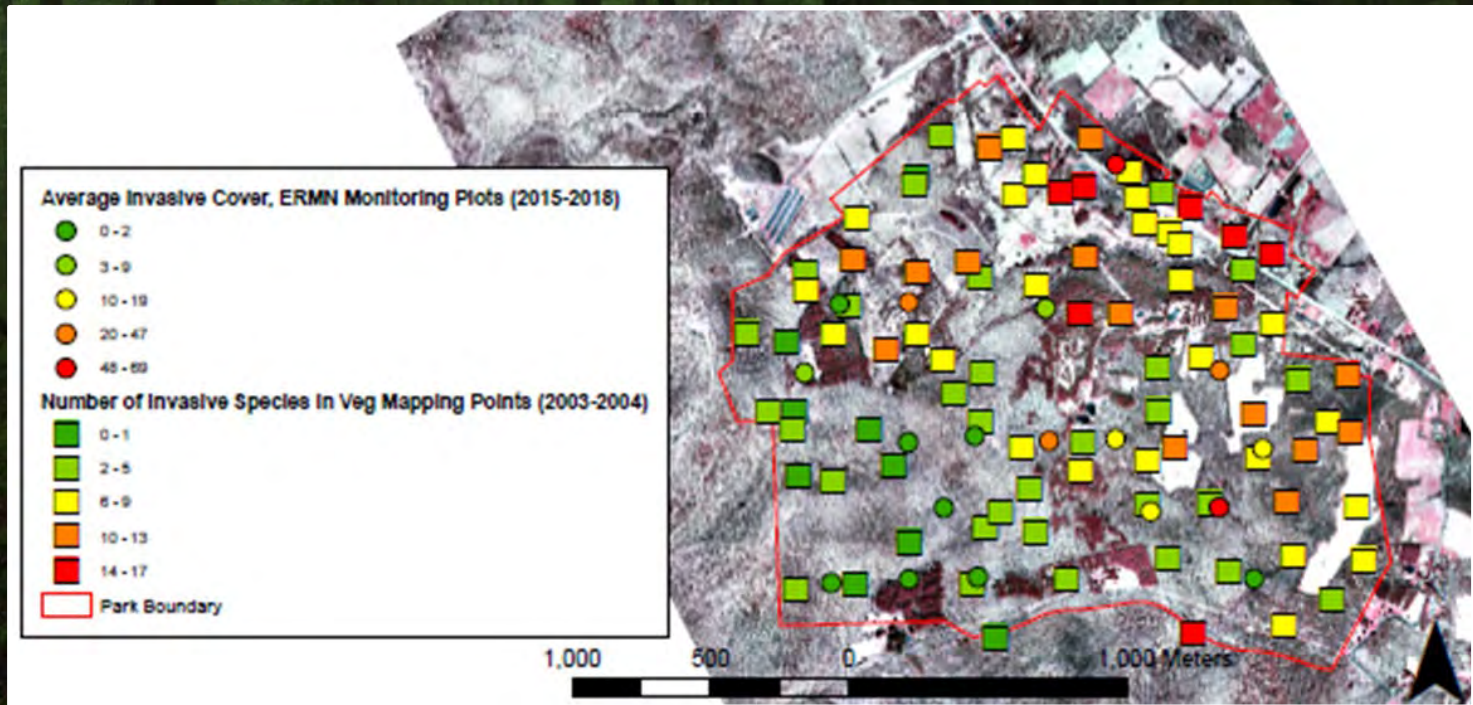
Outreach
Value



Protect
Your
Park

Use Park-Specific Data

- I&M Forest Health Monitoring
- Vegetation Inventory / Mapping
- Invasive Plant Management Team Treatments
- Park projects
- EDDMapS
- iNaturalist and iMapInvasives



Strategic Invasive Species Management Tool



Habitat Management Zone

Stewardship
Value

Outreach
Value

+

Prioritizing Species

Presence
in Zone

Extent

Growth
Form

Impact

Restoration Effort

Protect
Your
Park

Management Priorities



HMZ Name	Braddock Forest	Conifer Plantations	Route 40 East	Great Meadow	Jumonville Glen Forest	Picnic Loop Forests	Rush Property Fields	Rush Property Forest	Woodcock Fields
Habitat Type	MF	MF	YF	WL	MF	MF	YF	MF	YF
Stewardship Index	1	0	0	2	2	2	0	1	1
Outreach Index	0	0	0	2	0	1	0	0	2
Species									
Japanese stiltgrass	0	0	2	6	0	0	2	3	5
bull thistle	0	0	2	6	0	0	0	0	0
common teasel	0	0	2	7	0	0	2	0	5
garlic mustard	5	0	2	7	0	0	2	0	5
wild parsnip	0	0	2	6	0	0	0	0	0
Canada thistle	0	2	2	6	0	0	0	3	0
crownvetch	0	2	2	7	0	0	2	3	5
exotic shrubs	4	3	3	7	0	6	3	4	6
autumn olive	6	5	5	7	7	8	3	6	6
Japanese barberry	4	3	3	7	7	6	3	4	6
multiflora rose	4	3	3	7	0	6	3	4	6
privet	4	3	3	7	0	6	3	4	6
shrub honeysuckle	4	3	3	7	0	6	3	4	6
winged euonymus	4	3	3	7	0	0	3	4	6
empress tree	6	3	5	9	0	8	5	6	8
tree-of-heaven	0	3	3	7	0	0	3	4	6
Japanese honeysuckle	0	0	2	6	0	0	2	3	5
Oriental bittersweet	0	2	3	6	0	0	3	3	6
Japanese knotweed	0	0	0	7	7	0	0	0	0

**BUNDLE
MANAGEMENT**

Strategic Invasive Species Management Tool



Habitat Management Zone

Stewardship Value

Outreach Value

Prioritizing Species

Presence in Zone

Extent

Growth Form

Impact

Restoration Effort

Treatment Prescriptions

Who

How



Protect Your Park



Implementation Calendar

When

+

+



[illegible]



Management Priorities

FONE Invasive Species

Select Species to See Observations None

Select Observation Year None

Filtering Options

Management Zone:

- ☐ None
- ☒ Great Meadow

Select Month:

06-JUN

Select Priority

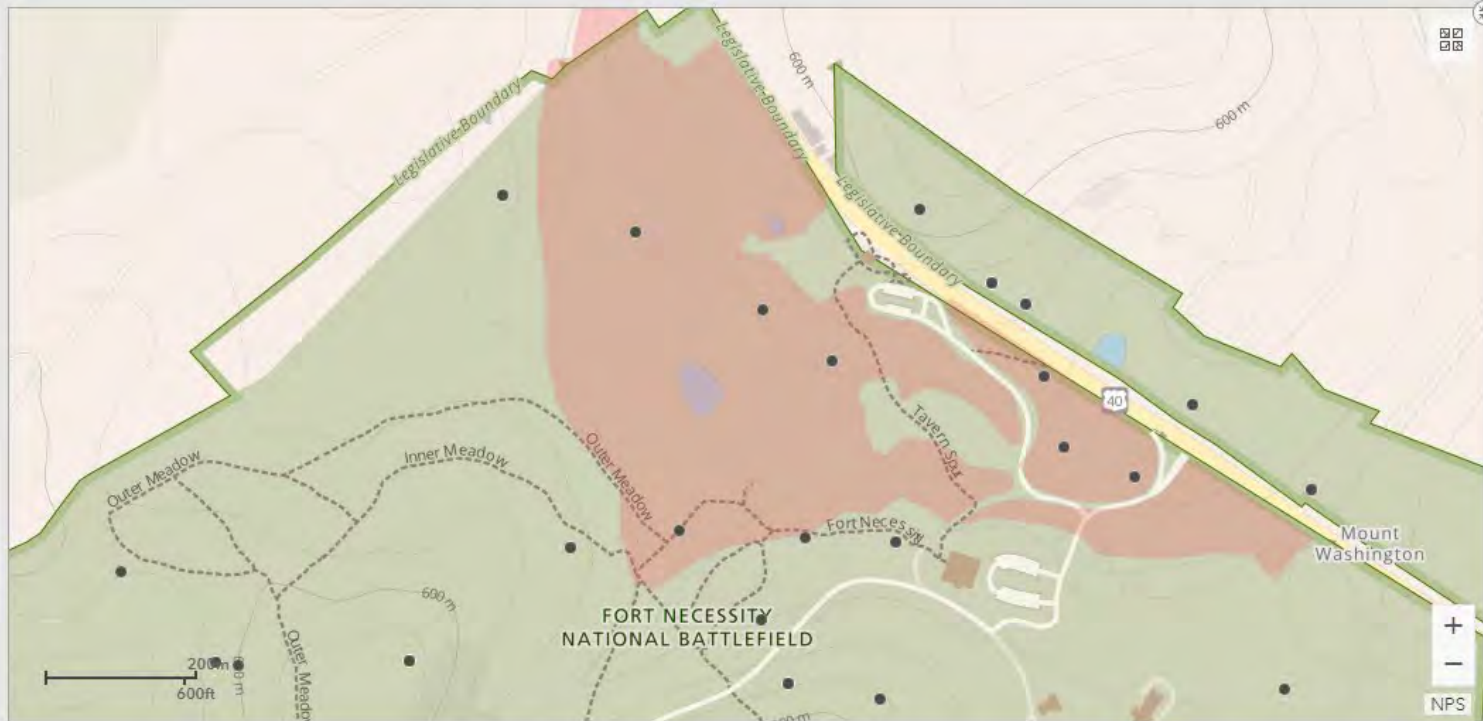
None 9 7 6

Select Method:

- ☒ None
- ☐ Cut then spray
- ☐ Foliar-AirStrike
- ☐ Foliar-Broadleaf
- ☐ Stem-basal

Select Species:

- ☒ None
- ☐ common teasel
- ☐ crownvetch
- ☐ empress tree > 5" diameter



COLLABORATION



Park Staff

**Protect
Your
Park**

**Inventory
and
Monitoring
Network**

**Invasive
Plant
Management
Team**

Cool Tool, but does it work?



Fort Necessity National Battlefield

Gauley River National Recreation Area





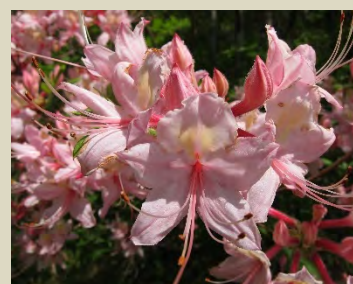
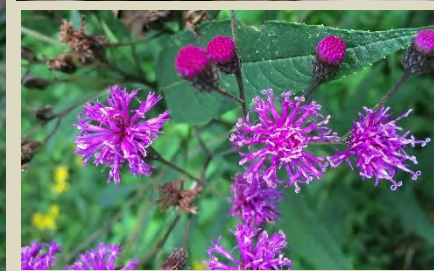
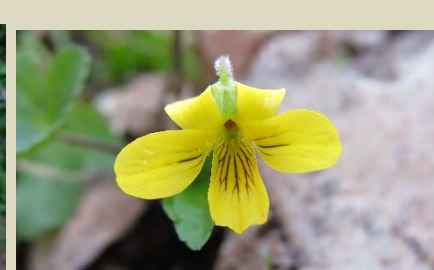
How to get Started



- Invasive Species in Eastern Forest Sharepoint Site
- Park Interest Form

Sign Me Up!





Strategic invasive species management protects parks' biodiversity.

The cost of inaction



Deferred Management Degrades Park Resources



Solutions to Deferred Management



- Chronic problems need long-term funding
- Permanent cyclic funding opportunities for deferred natural resource management
- Regional commitment to rebuild natural resource staff



More Information

[Invasive Species in Eastern National Parks SharePoint Site](#)

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National Park Service
U.S. Department of the Interior

EXPERIENCE YOUR AMERICA