

Erratum (3/5/2019): Pea Ridge Invasive Plant Monitoring Error in 2006 Data

Based on strong circumstantial evidence, the invasive plant data collected in 2006 at Pea Ridge National Military Park appear to contain a systematic error. Namely, beginning on transect 70, the Location ID used during field data collection from 2006 year appears to be +1 greater than the Location ID used in 2013 and 2018. As a result, maps locations for 2006 are inaccurately represented for transects 71-123.



Monitoring Problematic Plants in Pea Ridge National Military Park - 2013

The National Park Service's management policies distinguish between native and exotic (i.e., non-native) plant species (NPS 2006). Exotic plant species are typically characterized by their introduction due to human actions, whether intentional or not. Invasive plants, following the definition used in Executive Order 13112, are those plants that are exotic and cause ecological or economic harm. Finally, pest plants are defined less by their biology and more by their context in the same way that the term "weed" is defined (NPS 2006). Pest plants, which include native species, interfere with a specific management objective, including protecting human health. We refer to the collection of exotic, invasive, and pest plants as "potentially problematic".

Park managers, however, are only required to control any problematic plant that leads to "resource impairment". For plant populations causing effects that fall short of the impairment threshold, park managers wield a high level of discretion in judging whether the population should be controlled or not. The standard for making this decision rests on five criteria: the origin of the species, prudence, feasibility, the harm (i.e., impact) that the plant causes to park resources, and the harm that removal causes (NPS 2006). As with impairment determinations, these decisions are based on professional judgment, environmental assessment, consultation with regulating agencies, evidence-based scholarship, subject matter expertise, and civic engagement with the public (NPS 2006).

Methods:

For details on the survey, see Young et al. (2007a,b).

- In 2006 and 2013, we sought plant species on two watch lists: early detection and park-established.
- Observers used handheld GPS units to follow 400 m line transects along which they observed target plants (Figure 1). See Young 2007a,b for excluded areas.
- Along each transect, observers estimated plant cover in a belt at least 3-m wide, but used a larger belt width if conditions allowed. In 2006, the widest belt possible was observed. In 2013, this maximum distance was capped at 12 m.
- Cover values ($0=0$, $1=0.1-0.9$ m², $2=1-9.9$ m², $3=10-49.9$ m², $4=50-99.9$ m², $5=100-499.9$ m², $6=500-999.9$ m², $7=1,000-4,999$ m²) were attributed to each species per search unit.
- To calculate the minimum end of the estimated cover range for each species, the lower endpoints associated with the assigned cover class values for that species were summed and then divided by the reference frame fraction observed assuming the widest possible survey belt (i.e., maximum fraction observed).

- Maximum cover for each species was calculated similarly, using the upper endpoints of the cover values in each occupied search unit and assuming that a 3 m belt was surveyed (i.e., minimum fraction of area observed).

To provide additional information on the ecological impact and feasibility of control, the ecological impact and general management difficulty sub-ranks that constitute the invasiveness rank (I-rank) (Morse et al. 2004) were listed when available.

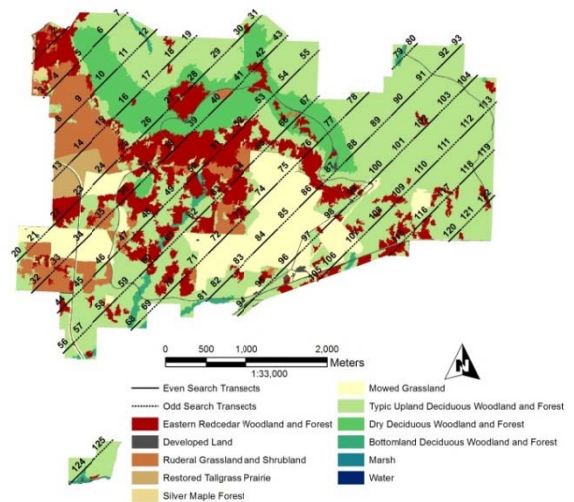


Figure 1. Invasive exotic plant line transects on vegetation map (Diamond et al. 2013) of Pea Ridge National Military Park.

Summary of Findings:

Two tables summarize the results of this study. Table 1 summarizes frequency and abundance estimates during 2006 and 2013. Observations are summarized with respect to data quality. In Table 2, we group our observations according to current or recommended management actions. These management recommendations are judgments based on our experience controlling problematic plants and are not binding on park staff.

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Supporting Literature:

- Diamond, D. D., L. F. Elliott, M. D. DeBacker, K. M. James, D. L. Pursell, and A. Struckhoff. 2013. Vegetation mapping and classification of Pea Ridge National Military Park. Natural Resource Report NPS/PERI/NRR—2013/649. National Park Service, Fort Collins, Colorado.
- Morse, L. E., J. M. Randall, N. Benton, R. D. Hiebert, and S. Lu. 2004. An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity. Version 1. Document. Online. <<http://www.natureserve.org/getData/plantData.jsp#InvasivesProtocol>>. Accessed 22 January 2014.
- National Park Service. 2006. Management Policies. Unpublished document. Online. <<http://www.nps.gov/policy/mp2006.pdf>>. Accessed 22 January 2014.
- Young, C. C., J. L. Haack, L.W. Morrison, and M. D. DeBacker. 2007a. Invasive exotic plant monitoring protocol for the Heartland Inventory and Monitoring Program. Natural Resource Report NPS/HTLN/NRR-2007/018. National Park Service, Fort Collins, Colorado.
- Young, C. C., J. T. Cribbs, J. L. Haack, and H. J. Etheridge. 2007b. Invasive exotic plant monitoring at Pea Ridge National Military Park: Year 1 (2006). Natural Resource Technical Report NPS/HTLN/NRTR—2007/019. National Park Service, Fort Collins, Colorado.

Table 1. Overview of potentially problematic plants in Pea Ridge National Military Park. The first 20 species in the list constitute the species with no obvious data quality deficiencies. Ecological impact and general management difficulty based on NatureServe I-Rank subranks (Morse et al. 2004). Subranks are given as high (H), medium (M), low (L), insignificant (I), unknown (U), a range of ranks (indicated by /), not available (--), or native.

Scientific Name	Common Name	Watch List	2006 Park-wide acres	2013 Park- wide acres	2006 Frequency	2013 Frequency (Difference 2006-2013)	Ecological Impact	Management Difficulty
<i>Juniperus virginiana</i>	Eastern redcedar	[Native]	128.2 – 2135.7	74.2 – 893.9	59.2	71.2 (12)	Native	Native
<i>Lespedeza cuneata</i>	sericea lespedeza	Park Established	6.8 – 79.7	16.0 – 169.3	26.4	32.8 (6.4)	ML	ML
<i>Lonicera japonica</i>	Japanese honeysuckle	Park Established	2.9 – 55.8	18.7 – 167.6	25.6	14.4 (-11.2)	M	HM
<i>Rosa multiflora</i>	multiflora rose	Park Established	2.2 – 36.6	6.6 – 66.5	26.4	25.6 (-0.8)	L	L
<i>Microstegium vimineum</i>	Nepalese browntop	Park Established	0.3 – 8.5	1.2 – 19.8	11.2	17.6 (6.4)	M	HM
<i>Robinia pseudoacacia</i>	black locust	Park Established	0.3 – 6.4	7.3 – 82.1	8.8	12 (3.2)	HM	M
<i>Sorghum halepense</i>	Johnsongrass	Park Established	0.2 – 4.6	0.6 – 7.6	4.8	10.4 (5.6)	ML	HM
<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed	Park Established	0.1 – 2.9	0.02 – 0.7	4	2.4 (-1.6)	M	HL
<i>Verbascum thapsus</i>	common mullein	Park Established	0.01 – 0.4	0.02 – 0.8	3.2	4.8 (1.6)	ML	L
<i>Ligustrum</i> spp.	privet	Park Established	0.003 – 0.09	0	2.4	0 (-2.4)	--	--
<i>Bromus inermis</i>	smooth brome	Park Established	0.0008 – 0.03	0.008 – 0.3	0.8	0.8 (0)	M	ML
<i>Albizia julibrissin</i>	silktree	Park Established	0	0.02 – 0.7	0	1.6 (1.6)	ML	ML
<i>Arctium minus</i>	lesser burdock	Early Detection	0	0.009 – 0.4	0	1.6 (1.6)	LI	MI
<i>Carduus nutans</i>	nodding plumeless thistle	Early Detection	0	0.0008 – 0.03	0	0.8 (0.8)	MI	HM
<i>Euonymus fortunei</i>	winter creeper	Park Established	0	4.8 – 41.9	0	7.2 (7.2)	M	LI
<i>Glechoma hederacea</i>	ground ivy	Park Established	0	0.0008 – 0.03	0	0.8 (0.8)	MI	U
<i>Melilotus officinalis</i>	sweetclover	Park Established	0	0.02 – 0.7	0	2.4 (2.4)	M	M
<i>Rhus copallinum</i>	winged sumac	[Native]	0	2.4 – 38.2	0	13.6 (13.6)	Native	Native
<i>Rhus glabra</i>	smooth sumac	[Native]	0	0.03 – 1.3	0	4 (4)	Native	Native
<i>Vinca major</i>	bigleaf periwinkle	Park Established	0	0.08 – 1.6	0	0.8 (0.8)	ML	M
<u>Species affected by taxonomic and detection issues</u>								
<i>Schedonorus phoenix</i>	tall fescue	Early Detection	0	10.7 – 202.5	0	29.6 (29.6)	M	HM
<i>Lolium</i> sp.	Ryegrass/fescue	Early Detection	0.8 – 10.9	0	7.2	0 (-7.2)	--	--
<i>Poa pratensis</i>	Kentucky bluegrass	Park Established	0	0.5 – 11.5	0	12 (12)	M	ML
<i>Poa compressa</i>	Canada bluegrass	Park Established	0.0008 – 0.03	0	0.8	0 (-0.8)	ML	HL
<i>Bromus racemosus</i>	bald brome	Park Established	0.0008 – 0.03	1.0 – 21.9	0.8	18.4 (17.6)	--	--
<i>Bromus sterilis</i>	poverty brome	Early Detection	0	0.2 – 4.9	0	5.6 (5.6)	ML	U
<u>Species included only in 2013 watch lists</u>								
<i>Daucus carota</i>	Queen Anne's lace	Park Established	0	0.1 – 2.9	0	10.4 (10.4)	I	I
<i>Rumex crispus</i>	curly dock	Park Established	0	0.002 – 0.06	0	1.6 (1.6)	--	--
<i>Hypericum perforatum</i>	common St. Johnswort	Park Established	0	0.0008 – 0.03	0	0.8 (0.8)	ML	M

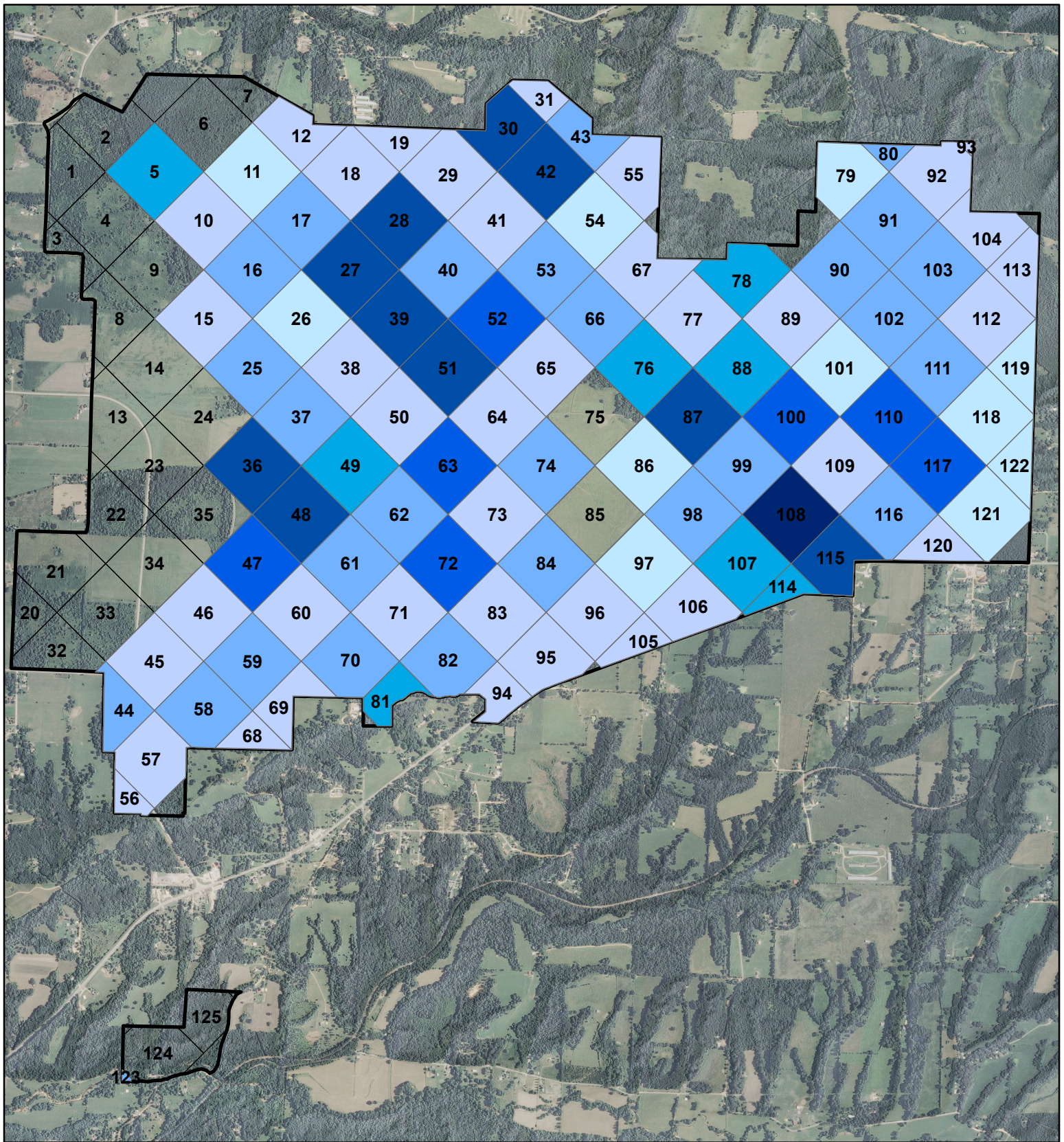
Table 2. Categorization of potentially problematic plants found in Pea Ridge National Military Park and organized as to the action that is currently occurring or needed to manage these species. Ecological impact and general management difficulty based on NatureServe I-Rank subranks (Morse et al. 2004). Subranks are given as high (H), medium (M), low (L), insignificant (I), unknown (U), a range of ranks (indicated by /), not available (--), or native.

Scientific Name	Common Name	Watch List	2006 Park-wide acres	2013 Park- wide acres	2006 Frequency	2013 Frequency (Difference 2006-2013)	Ecological Impact	Management Difficulty
<u>Species under management</u>								
<i>Juniperus virginiana</i>	Eastern redcedar	[Native]	128.2-2135.7	74.2-893.9	59.2	71.2 (12)	Native	Native
<i>Lespedeza cuneata</i>	sericea lespedeza	Park Established	6.8 – 79.7	16.0 – 169.3	26.4	32.8 (6.4)	ML	ML
<i>Robinia pseudoacacia</i>	black locust	Park Established	0.3 – 6.4	7.3 – 82.1	8.8	12 (3.2)	HM	M
<i>Sorghum halepense</i>	Johnsongrass	Park Established	0.2 – 4.6	0.6 – 7.6	4.8	10.4 (5.6)	ML	HM
<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed	Park Established	0.1 – 2.9	0.02 – 0.7	4	2.4 (-1.6)	M	HL
<u>Species that may require future management due to invasive potential</u>								
<i>Lonicera japonica</i>	Japanese honeysuckle	Park Established	2.9 – 55.8	18.7 – 167.6	25.6	14.4 (-11.2)	M	HM
<i>Microstegium vimineum</i>	Nepalese browntop	Park Established	0.3 – 8.5	1.2 – 19.8	11.2	17.6 (6.4)	M	HM
<i>Ligustrum</i> spp.	privet	Park Established	0.003 – 0.09	0	2.4	0 (-2.4)	--	--
<i>Carduus nutans</i>	nodding plumeless thistle	Early Detection	0	0.0008 – 0.03	0	0.8 (0.8)	MI	HM
<u>Woodland species to consider for future management</u>								
<i>Rosa multiflora</i>	multiflora rose	Park Established	2.2 – 36.6	6.6 – 66.5	26.4	25.6 (-0.8)	L	L
<i>Albizia julibrissin</i>	silktree	Park Established	0	0.02 – 0.7	0	1.6 (1.6)	ML	ML
<i>Euonymus fortunei</i>	winter creeper	Park Established	0	4.8 – 41.9	0	7.2 (7.2)	M	LI
<i>Vinca major</i>	bigleaf periwinkle	Park Established	0	0.08 – 1.6	0	0.8 (0.8)	ML	M
<u>Pasture and grassland species to consider for future management</u>								
<i>Melilotus officinalis</i>	sweetclover	Park Established	0	0.02 – 0.7	0	2.4 (2.4)	M	M
<i>Rhus copallinum</i>	winged sumac	[Native]	0	2.4 – 38.2	0	13.6 (13.6)	Native	Native
<i>Rhus glabra</i>	smooth sumac	[Native]	0	0.03 – 1.3	0	4 (4)	Native	Native
<u>Cool-season grasses requiring further evaluation of control options</u>								
<i>Schedonorus phoenix</i>	tall fescue	Early Detection	0	10.7 – 202.5	0	29.6 (29.6)	M	HM
<i>Lolium</i> sp.	ryegrass/fescue	Early Detection	0.8 – 10.9	0	7.2	0 (-7.2)	--	--
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<i>Bromus inermis</i>	smooth brome	Park Established	0.0008 – 0.03	0.008 – 0.3	0.8	0.8 (0)	M	ML
<i>Bromus racemosus</i>	bald brome	Park Established	0.0008 – 0.03	1.0 – 21.9	0.8	18.4 (17.6)	--	--
<i>Bromus sterilis</i>	poverty brome	Early Detection	0	0.2 – 4.9	0	5.6 (5.6)	ML	U
<u>Species not requiring management attention</u>								
<i>Arctium minus</i>	lesser burdock	Early Detection	0	0.009 – 0.4	0	1.6 (1.6)	LI	MI
<i>Glechoma hederacea</i>	ground ivy	Park Established	0	0.0008 – 0.03	0	0.8 (0.8)	MI	U

Table 2 (cont.). Categorization of potentially problematic plants found in Pea Ridge National Military Park and organized as to the action that is currently occurring or needed to manage these species. Ecological impact and general management difficulty based on NatureServe I-Rank subranks (Morse et al. 2004). Subranks are given as high (H), medium (M), low (L), insignificant (I), unknown (U), a range of ranks (indicated by /), not available (--), or native.

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<i>Hypericum perforatum</i>	common St. Johnswort	Park Established	0	0.0008 – 0.03	0	0.8 (0.8)	ML	M

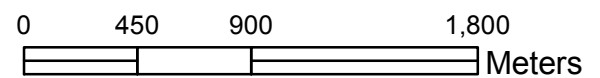
Pea Ridge NMP Problematic Plant Monitoring



Cover Class



Search Units Park Boundary



1:30,000