



Monitoring Problematic Plants in Wilson's Creek National Battlefield - 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 with impacts 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).

- We sought plant species on two watch lists: early detection and park-established.
- Observers used handheld GPS units to follow 200-m line transects, along which they observed target plants (Figure 1). See Young et al. (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 2009 and 2013, this maximum distance was capped at 12 m.
- Coarse 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.

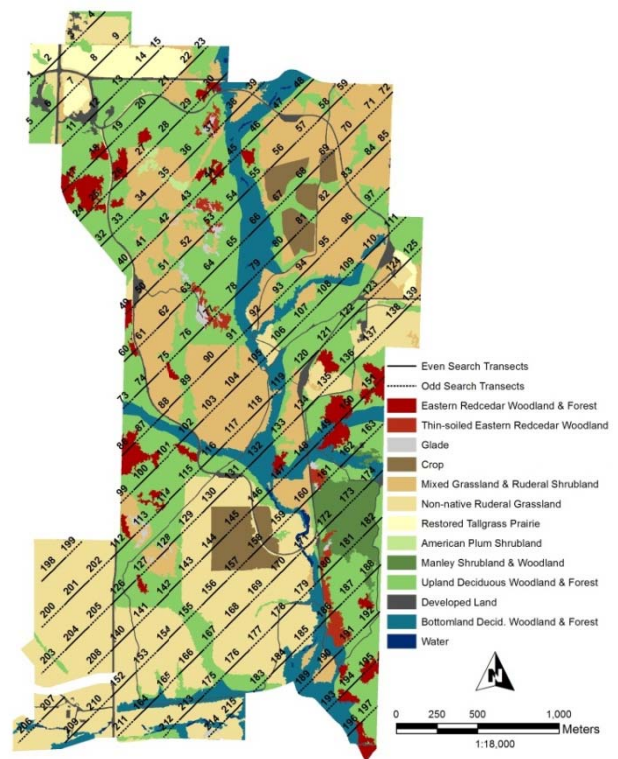


Figure 1. Vegetation cover (Diamond et al. 2012) and line transects for invasive plant monitoring at Wilson's Creek National Battlefield.

Summary of Findings:

Two tables summarize the results of this study. Table 1 summarizes frequency and abundance estimates during 2006, 2009, 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. 2012. Vegetation mapping and classification of Wilson's Creek National Battlefield. Natural Resource Report NPS/WICR/NRR—2013/650. 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. L. Haack, and H. J. Etheridge. 2007b. Invasive exotic plant monitoring at Wilson's Creek National Battlefield: Year 1 (2006). Natural Resource Technical Report NPS/HTLN/NRTR—2007/013 National Park Service, Fort Collins, Colorado.

Table 1. Overview of potentially problematic plants found in Wilson's Creek National Battlefield. The first 35 species include no obvious data quality deficiencies. Ecological impact and general management difficulty based on NatureServe I-Rank subbranks (Morse et al. 2004). Subbranks are given as high (H), medium (M), low (L), insignificant (I), unknown (U), a range of ranks (indicated by /), or not available (--).

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>Lespedeza cuneata</i>	Sericea lespedeza	Park Established	95.2-1670.4	10.4-165.5	44.7	39.1 (-5.6)	ML	ML
<i>Bromus racemosus</i>	Bald brome	Park Established	38.3-747.5	49.0-646.4	34.0	66.0 (32.0)	-	-
<i>Maclura pomifera</i>	Osage orange	Park Established	33.1-580.3	15.0-209.8	32.5	34.5 (2.0)	ML	L
<i>Lonicera japonica</i>	Japanese honeysuckle	Park Established	10.5-150.5	9.0-134.5	37.6	52.3 (14.7)	M	HM
<i>Bromus inermis</i>	Smooth brome	Park Established	8.9-170.0	15.7-282.9	4.1	14.2 (10.1)	M	ML
<i>Rosa multiflora</i>	Multiflora rose	Park Established	5.3-65.8	25.4-409.5	48.2	56.9 (8.7)	L	L
<i>Lonicera maackii</i>	Amur honeysuckle	Park Established	4.1-82.5	0.1-2.2	1.0	4.1 (3.1)	HM	M
<i>Rhus glabra</i>	Smooth sumac	Park Established	1.6-23.3	5.5-52.2	22.8	16.8 (-6.0)	-	-
<i>Carduus nutans</i>	Nodding plumeless thistle	Park Established	0.2-1.7	0.7-16.1	2.0	27.9 (25.9)	MI	HM
<i>Sorghum halepense</i>	Johnsongrass	Park Established	0.1-3.3	0.5-11.7	5.1	9.1 (4.0)	ML	HM
<i>Bromus sterilis</i>	Poverty brome	Park Established	0.1-4.0	23.1-392.3	11.2	39.6 (28.4)	ML	U
<i>Elaeagnus umbellata</i>	Autumn olive	Park Established	0.1-2.5	0.1-2.3	3.6	3.6 (0)	H	L
<i>Verbascum thapsus</i>	Common mullein	Park Established	0.06-2.7	0.2-5.8	15.7	20.8 (5.1)	ML	L
<i>Morus alba</i>	White mulberry	Park Established	0.06-1.5	0.0-0.0	4.6	0.0 (-4.6)	ML	ML
<i>Securigera varia</i>	Crownvetch	Park Established	0.05-1.3	4.3-87.3	2.0	6.1 (4.1)	H	L
<i>Ailanthus altissima</i>	Tree-of-heaven	Park Established	0.05-1.2	0.04-0.8	2.0	0.5 (-1.5)	ML	ML
<i>Melilotus officinalis</i>	Sweetclover	Park Established	0.04-1.7	0.05-1.2	9.1	3.6 (-5.5)	M	M
<i>Euonymus alatus</i>	Burningbush	Park Established	0.02-0.7	0.0-0.0	3.6	0 (-3.6)	LI	L
<i>Euonymus fortunei</i>	Winter creeper	Park Established	0.02-0.6	0.08-2.5	6.6	7.1 (0.5)	M	LI
<i>Celastrus orbiculatus</i>	Oriental bittersweet	Park Established	0.2-0.7	0.4-5.6	2.0	5.1 (3.1)	ML	M
<i>Cirsium vulgare</i>	Bull thistle	Park Established	0.01-0.5	0	1.5	0.0 (-1.5)	ML	ML
<i>Humulus japonicus</i>	Japanese hop	Park Established	0.009-0.3	0.05-1.1	1.5	1.5 (0)	-	-
<i>Ligustrum vulgare</i>	Common privet	Park Established	0.009-0.34	0	1.5	0 (-1.5)	HL	HM
<i>Vinca minor</i>	Common periwinkle	Park Established	0.009-0.3	0.2-1.6	1.0	0.5 (-0.5)	I	U
<i>Bromus tectorum</i>	Cheatgrass	Park Established	0.005-0.2	0.8-14.3	1.0	6.6 (5.6)	H	HM

Table 1 (cont.). Overview of potentially problematic plants found in Wilson's Creek National Battlefield. The first 35 species include 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 /), or not available (-).

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>Dipsacus fullonum</i>	Fuller's teasel	Park Established	0.005-0.18	0	1.0	0 (-1.0)	L	ML
<i>Arctium minus</i>	Lesser burdock	Park Established	0.0004-0.01	0.0004-0.01	0.5	0.5 (0)	LI	MI
<i>Dioscorea oppositifolia</i>	Chinese yam	Park Established	0.0004-0.01	0	0.5	0 (-0.5)	ML	MI
<i>Miscanthus sinensis</i>	Chinese silvergrass	Park Established	0.0004-0.01	0	0.5	0 (-0.5)	ML	HL
<i>Potentilla recta</i>	Sulphur cinquefoil	Park Established	0.0004-0.01	0	0.5	0 (-0.5)	HL	ML
<i>Alliaria petiolata</i>	Garlic mustard	Early Detection	0	0.004-0.2	0	0.5 (0.5)	ML	M
<i>Dipsacus laciniatus</i>	Cut-leaf teasel	Early Detection	0	0.005-0.2	0	1.5 (1.5)	L	ML
<i>Hesperis matronalis</i>	Dame's rocket	Park Established	0	0.004-0.2	0	0.5 (0.5)	MI	HL
<i>Ligustrum sinense</i>	Chinese privet	Early Detection	0	0.05-1.1	0	1.5 (1.5)	M	L
<i>Phalaris arundinacea</i>	Reed canarygrass	Park Established	0	0.005-0.2	0	1.0 (1.0)	H	HM
<i>Ulmus pumila</i>	Siberian elm	Park Established	0	0.06-1.5	0	2.5 (2.5)	ML	ML
<u>Species affected by taxonomic and detection issues</u>								
<i>Bromus sterilis</i>	Poverty brome	Park Established	0.1-4.0	23.1-392.3	11.2	39.6 (28.4)	ML	U
<i>Torilis japonica</i>	Japanese hedgeparsley	Park Established	0.6-9.2	0.008-0.3	22.3	1.0 (-21.3)	-	-
<i>Torilis arvensis</i>	Spreading hedgeparsley	Park Established	0	6.2-117.3	0	47.4 (47.4)	-	-
<i>Lolium spp.</i>	Fescue	Park Established	9.0-96.3	0	20.8	0 (-20.8)	-	-
<i>Schedonorus phoenix</i>	Tall fescue	Park Established	0	44.0-785.7	0	44.7 (44.7)	M	HM
<i>Poa spp</i>	Bluegrass	Park Established	0.1-3.1	0	4.1	0 (-4.1)	-	-
<i>Poa pratensis</i>	Kentucky bluegrass	Park Established	0	10.6-172.9	0	22.3 (22.3)	M	ML
<i>Poa compressa</i>	Canada bluegrass	Park Established	0.009-0.3	0	1.0	0 (-1.0)	ML	HL
<u>Species included only in 2013 watch lists</u>								
<i>Juniperus virginiana</i>	Eastern redcedar	Native	0	34.5-543.4	0	48.2 (-)	[Native]	[Native]
<i>Rhus copallinum</i>	Winged sumac	Native	0	15.3-199.4	0	31.5 (-)	[Native]	[Native]
<i>Daucus carota</i>	Queen Anne's lace	Park Established	0	2.8-30.5	0	18.3 (-)	I	I
<i>Sonchus arvensis</i>	Field sowthistle	Early Detection	0	0.01-0.4	0	2.5 (-)	LI	HL
<i>Hypericum perforatum</i>	Common St. Johnswort	Park Established	0	0.004-0.01	0	0.5	ML	M

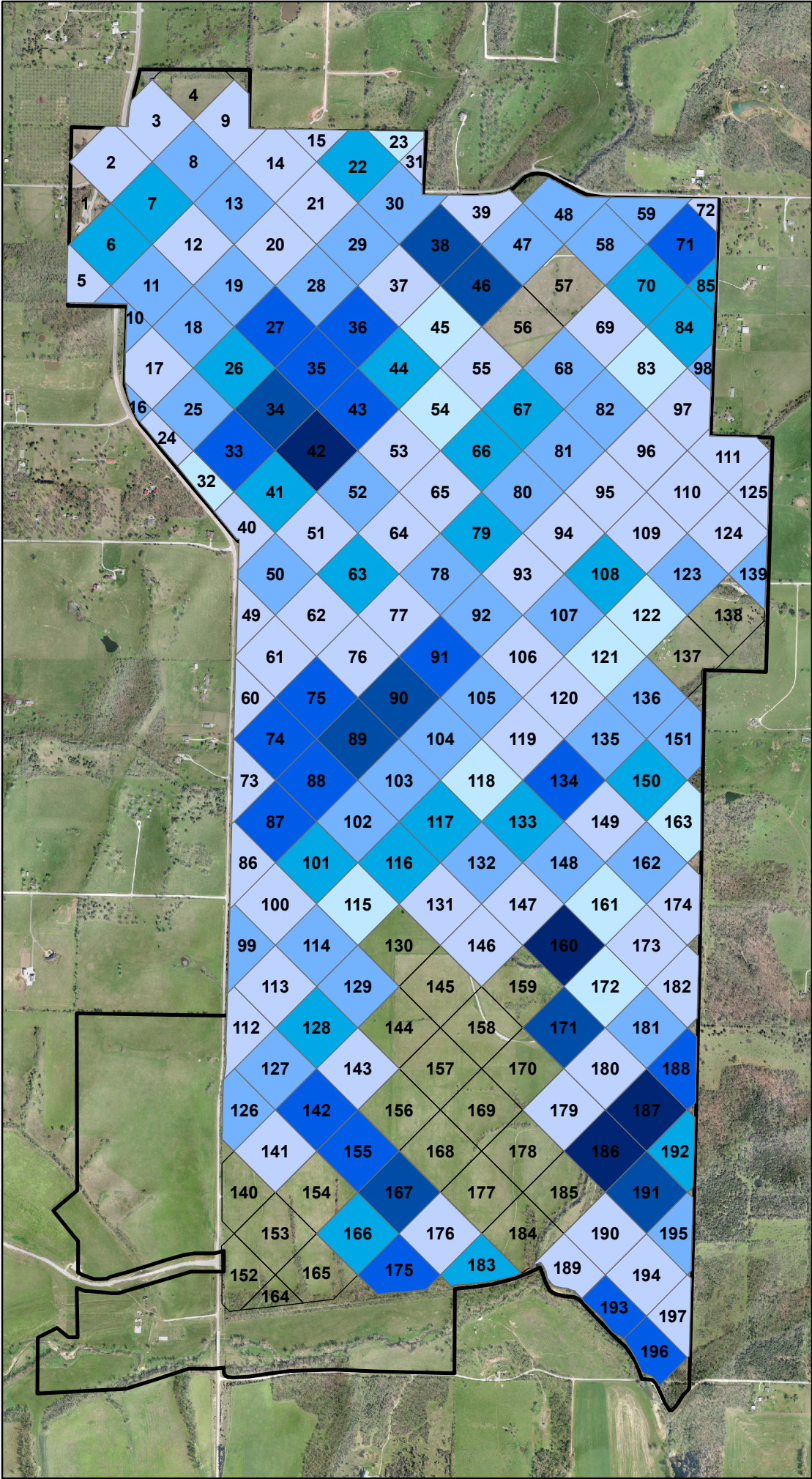
Table 2. Overview of potentially problematic plants found in Wilson's Creek National Battlefield and organized as to the action that is currently occurring or needed to manage these species. Ecological impact and general management difficulty based on NatureServe I-Rank subranks (Morse et al. 2004).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

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>Lespedeza cuneata</i>	Sericea lespedeza	Park Established	95.2-1670.4	10.4-165.5	44.7	39.1 (	ML	ML
<i>Rhus glabra</i>	Smooth sumac	Park Established	1.6-23.3	5.5-52.2	22.8	16.8	-	-
<i>Carduus nutans</i>	Nodding plumeless thistle	Park Established	0.2-1.7	0.7-16.1	2.0	27.9	MI	HM
<i>Sorghum halepense</i>	Johnsongrass	Park Established	0.1-3.3	0.5-11.7	5.1	9.1	ML	HM
<i>Ailanthus altissima</i>	Tree-of-heaven	Park Established	0.05-1.2	0.04-0.8	2.0	0.5	ML	ML
<i>Securigera varia</i>	Crownvetch	Park Established	0.05-1.3	4.3-87.3	2.0	6.1	H	L
<i>Melilotus officinalis</i>	Sweetclover	Park Established	0.04-1.7	0.05-1.2	9.1	3.6	M	M
<i>Cirsium vulgare</i>	Bull thistle	Park Established	0.01-0.5	0	1.5	0.0	ML	ML
<i>Juniperus virginiana</i>	Eastern redcedar	Native	0	34.5-543.4	0	48.2	[Native]	[Native]
<i>Rhus copallinum</i>	Winged sumac	Native	0	15.3-199.4	0	31.5	[Native]	[Native]
<u>Species warranting further management consideration based on invasive potential</u>								
<i>Lonicera maackii</i>	Amur honeysuckle	Park Established	4.1-82.5	0.1-2.2	1.0	4.1	HM	M
<i>Elaeagnus umbellata</i>	Autumn olive	Park Established	0.1-2.5	0.1-2.3	3.6	3.6	H	L
<i>Ligustrum vulgare</i>	Common privet	Park Established	0.009-0.34	0	1.5	0	HL	HM
<i>Alliaria petiolata</i>	Garlic mustard	Early Detection	0	0.004-0.2	0	0.5	ML	M
<i>Phalaris arundinacea</i>	Reed canarygrass	Park Established	0	0.005-0.2	0	1.0	H	HM
<i>Ligustrum sinense</i>	Chinese privet	Early Detection	0	0.05-1.1	0	1.5	M	L
<u>Cool-season grasses requiring further evaluation of control options</u>								
<i>Bromus racemosus</i>	Bald brome	Park Established	38.3-747.5	49.0-646.4	34.0	66.0	-	-
<i>Lolium spp.</i>	Fescue	Park Established	9.0-96.3	0	20.8	0	-	-
<i>Bromus inermis</i>	Smooth brome	Park Established	8.9-170.0	15.7-282.9	4.1	14.2	M	ML
<i>Bromus sterilis</i>	Poverty brome	Park Established	0.1-4.0	23.1-392.3	11.2	39.6	ML	U
<i>Poa spp</i>	Bluegrass	Park Established	0.1-3.1	0	4.1	0	-	-
<i>Bromus tectorum</i>	Cheatgrass	Park Established	0.005-0.2	0.8-14.3	1.0	6.6	H	HM
<i>Poa compressa</i>	Canada bluegrass	Park Established	0.009-0.3	0	1.0	0	ML	HL

Table 2 (cont.). Overview of potentially problematic plants found in Wilson's Creek National Battlefield 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 /), or not available (--).

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>Schedonorus phoenix</i>	Tall fescue	Park Established	0	44.0-785.7	0	44.7	M	HM
<i>Poa pratensis</i>	Kentucky bluegrass	Park Established	0	10.6-172.9	0	22.3	M	ML
<u>Woodland species requiring further evaluation of control options</u>								
<i>Maclura pomifera</i>	Osage orange	Park Established	33.1-580.3	15.0-209.8	32.5	34.5	ML	L
<i>Lonicera japonica</i>	Japanese honeysuckle	Park Established	10.5-150.5	9.0-134.5	37.6	52.3	M	HM
<i>Rosa multiflora</i>	Multiflora rose	Park Established	5.3-65.8	25.4-409.5	48.2	56.9	L	L
<i>Dioscorea oppositifolia</i>	Chinese yam	Park Established	0.0004-0.01	0	0.5	0	ML	MI
<u>Grassland and edge species requiring further evaluation of control options</u>								
<i>Torilis japonica</i>	Japanese hedgeparsley	Park Established	0.6-9.2	0.008-0.3	22.3	1.0	-	-
<i>Dipsacus fullonum</i>	Fuller's teasel	Park Established	0.005-0.18	0	1.0	0	L	ML
<i>Potentilla recta</i>	Sulphur cinquefoil	Park Established	0.0004-0.01	0	0.5	0	HL	ML
<i>Miscanthus sinensis</i>	Chinese silvergrass	Park Established	0.0004-0.01	0	0.5	0	ML	HL
<i>Dipsacus laciniatus</i>	Cut-leaf teasel	Early Detection	0	0.005-0.2	0	1.5	L	ML
<i>Hesperis matronalis</i>	Dame's rocket	Park Established	0	0.004-0.2	0	0.5	MI	HL
<i>Torilis arvensis</i>	Spreading hedgeparsley	Park Established	0	6.2-117.3	0	47.4	-	-
<u>Species not requiring management attention</u>								
<i>Celastrus orbiculatus</i>	Oriental bittersweet	Park Established	0.2-0.7	0.4-5.6	2.0	5.1	ML	M
<i>Verbascum thapsus</i>	Common mullein	Park Established	0.06-2.7	0.2-5.8	15.7	20.8	ML	L
<i>Morus alba</i>	White mulberry	Park Established	0.06-1.5	0.0-0.0	4.6	0.0	ML	ML
<i>Euonymus alatus</i>	Burningbush	Park Established	0.02-0.7	0.0-0.0	3.6	0	LI	L
<i>Euonymus fortunei</i>	Winter creeper	Park Established	0.02-0.6	0.08-2.5	6.6	7.1	M	LI
<i>Vinca minor</i>	Common periwinkle	Park Established	0.009-0.3	0.2-1.6	1.0	0.5	I	U
<i>Arctium minus</i>	Lesser burdock	Park Established	0.0004-0.01	0.0004-0.01	0.5	0.5	LI	MI
<i>Ulmus pumila</i>	Siberian elm	Park Established	0	0.06-1.5	0	2.5	ML	ML
<i>Daucus carota</i>	Queen Anne's lace	Park Established	0	2.8-30.5	0	18.3	I	I
<i>Sonchus arvensis</i>	Field sowthistle	Early Detection	0	0.01-0.4	0	2.5	LI	HL
<i>Hypericum perforatum</i>	Common St. Johnswort	Park Established	0	0.004-0.01	0	0.5	ML	M

Wilson's Creek NB Problematic Plant Monitoring



CoverClass

