United States Department of Agriculture
Natural Resources Conservation Service

National Resources Inventory
Rangeland Resource Assessment

Non-Native Plant Species

October 2010

About the Data

Estimates presented here are based upon rangeland data collected on-site as part of the National Resources Inventory (NRI). Rangeland is defined by the NRI as a *Land cover/use* category on which the climax or potential plant cover is composed principally of native grasses, grasslike plants, forbs, or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland. This includes areas where introduced hardy and persistent grasses, such as crested wheatgrass, are planted and such practices as deferred grazing, burning, chaining, and rotational grazing are used, with little or no chemicals or fertilizer being applied. Grasslands, savannas, many

The National Resources Inventory (NRI) is a statistical survey of natural resource conditions and trends on non-Federal land in the United States. Non-Federal land includes privately owned lands, tribal and trust lands, and lands controlled by state and local governments.

The NRI rangeland results presented here address current conditions. In the future, the NRI rangeland survey sample will include revisited sites. These data will allow estimates for change in rangeland resource conditions to be made.

The NRI findings presented here provide information about non-native herbaceous and woody plant species growing on non-Federal rangeland. The term non-native refers to plants that have been introduced from other regions or countries. Plants included in the summaries are those identified as non-native species by the USDA Plants Database.

Most non-native plant species are not a problem and some are considered beneficial. Crested wheatgrass (*Agropyron cristatum (L.)* Gaertn), for example, is an introduced species that is relatively easy to establish and commonly recommended for forage production and for soil stabilization in arid regions. Other non-native species such as cheatgrass (*Bromus tectorum L.*) have become severe weeds that often out-compete native grasses and forbs. Non-native species are of interest because under some conditions, some non-native species have become invasive. Where these species replace significant proportions of native plant communities, they may modify vegetation structure, the fire regime, hydrology, soil erosion rates, and forage production. These changes in turn can have significant effects on wildlife populations.

Additional findings are presented here for five groups of

wetlands, some deserts, and tundra are considered to be rangeland. Certain communities of low forbs and shrubs, such as mesquite, chaparral, mountain shrub, and pinyon-juniper, are also included as rangeland.

These results are based upon NRI rangeland data collected in the field on rangeland during the period 2003 to 2006. Current estimates cover non-Federal rangeland in 17 western states (extending from North Dakota south to Texas and west) and to a limited extent in Florida and Louisiana.

Findings are presented here for non-Federal rangeland where non-native plant species (as defined by the NRCS Plants Database, http://plants.usda.gov/index.html, accessed February 2009) are present and where at least 50 percent of the plant cover is composed of non-native species. Additional information is provided for five non-native invasive herbaceous species selected because of their ubiquitous nature in rangeland plant communities. Plant species in these groups were introduced from other countries and once established, have been very difficult to eradicate. The five non-native invasive herbaceous species groups include:

Medusahead (*Taeniatherum spp.*) typically invades rangeland communities, displacing the desirable vegetation. Medusahead has a high silica content making it generally unpalatable to livestock and wildlife. Its seeds are avoided by most seed eating birds. Dense communities present risk of wildfire.

Annual Bromes (*Bromus spp.*) **–** Annual bromes included in this group are highly invasive in shrub communities including sagebrush, pinyon-juniper, and mountain brush and often out-competes native grasses and forbs. Communities of annual bromes can be highly flammable after they mature and become dormant.

Centaurea spp. - The roots of species in this group produce toxins that stunt the growth of many native plant species. *Centaurea* species can be poisonous to some types of livestock.

Cirsium spp. – Canada thistle is a rhizominous, perennial thistle that can spread rapidly. Bull thistle is a biennial, tap-rooted species that grows in recent disturbed areas and decreases naturally over time.

Leafy spurge (*Euphorbia esula* L.) is a deep-rooted, invasive plant that is highly competitive with native species causing degradation of grazing land and wildlife habitat. The plant produces milky latex that causes irritation to the skin and is poisonous to some animals.

(Please see Table 1 for the list of species in each group.)

non-native invasive herbaceous species groups:

- Medusahead
- Annual bromes
- Centaurea
- Cirsium
- Leafy Spurge.

Quality assurance and statistical procedures are designed/developed to ensure data are scientifically legitimate. Irrespective of the scale of analysis, margins of error must be considered. Margins of error (at the 95 percent confidence level) are presented for all NRI estimates.

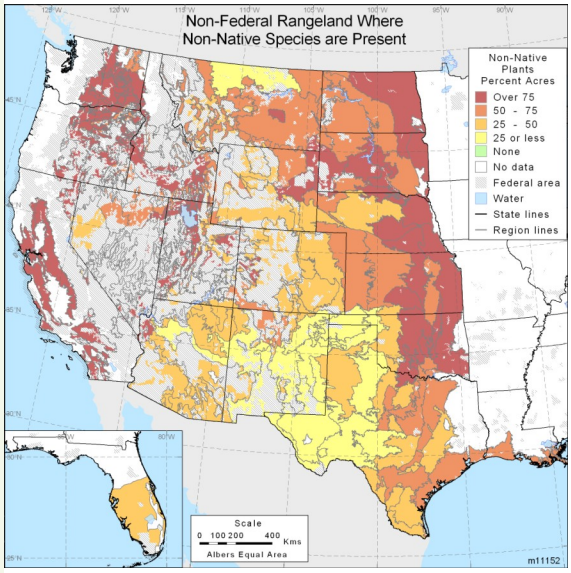
About the Line Point Intercept Protocol

Line point intercept data are utilized in summaries of non-native plant species, non-native invasive herbaceous species, native invasive woody species, and bare ground. Line point intercept data are collected along two intersecting 150-foot transects centered on each sample location.

Key Findings

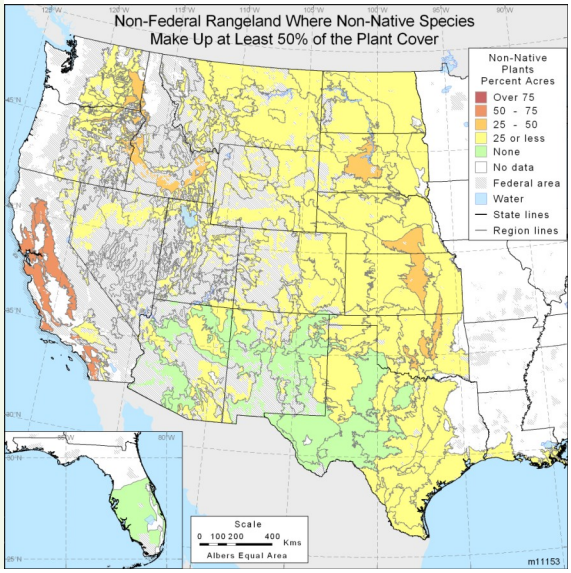
- Non-native species are present on nearly half (49.9%) of the Nation's non-Federal rangeland (Figure 1, Table 2).

Figure 1. Non-Federal Rangeland Where Non-Native Species Are Present



- Nationally, non-native species comprise at least 50 percent of the plant cover in 6.6 percent of non-Federal rangeland (Figure 2, Table 2).

Figure 2. Non-Federal Rangeland Where Non-Native Species Make Up at Least 50% of the Plant Cover



Data collectors record plant species, litter, lichen, moss, rock fragment, bedrock, and/or bare soil present at each 3-foot interval.

About the Non-Native Species Maps

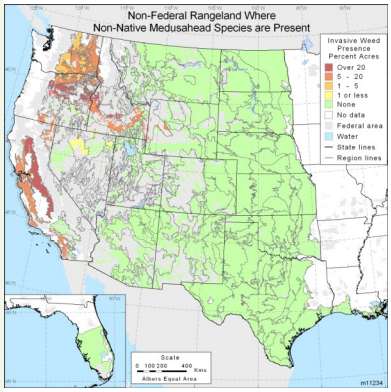
The maps are constructed with NRI rangeland data collected in the field on rangeland during the period 2003 to 2006. The regions are based on Common Resource Area (CRA) boundaries; in some cases CRAs were combined to increase the number of sample sites for which the data are summarized. Regions without non-Federal rangeland are described as "No data". Areas of Federal land are depicted with cross-hatching.

Non-native plant species maps are displayed by classes (none, 25% or less, 25-50%, 50-75%, over 75%) of non-Federal rangeland where non-native plant species are present (Figure 1) or where they compose at least 50 percent of the plant cover (Figure 2).

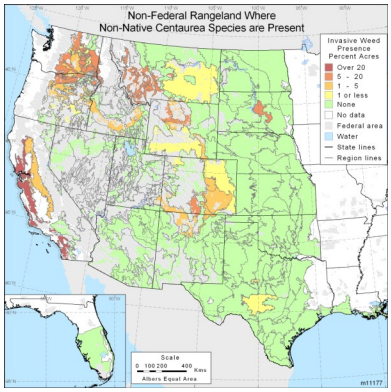
- Non-native invasive medusahead, *Centaurea*, *Cirsium*, and leafy spurge species groups (Figures 3-6, Table 3) are present on a very small proportion of the Nation's non-Federal rangeland (1.2%, 1.1%, 1.0%, and 0.4%, respectively).

Figures 3-6. Non-Federal Rangeland Where Non-Native Invasive Medusahead, *Centaurea*, *Cirsium*, and Leafy Spurge Species Groups Are Present.

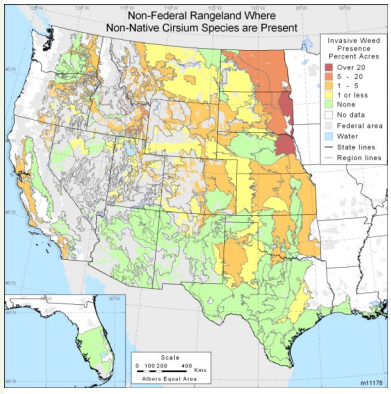
3. Medusahead



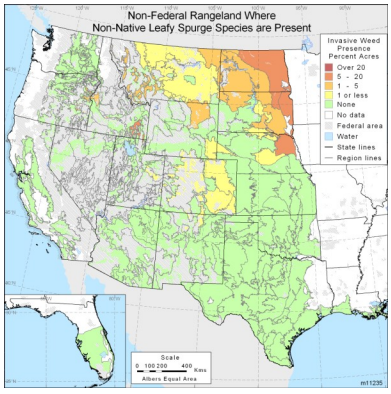
4. *Centaurea*



5. *Cirsium*



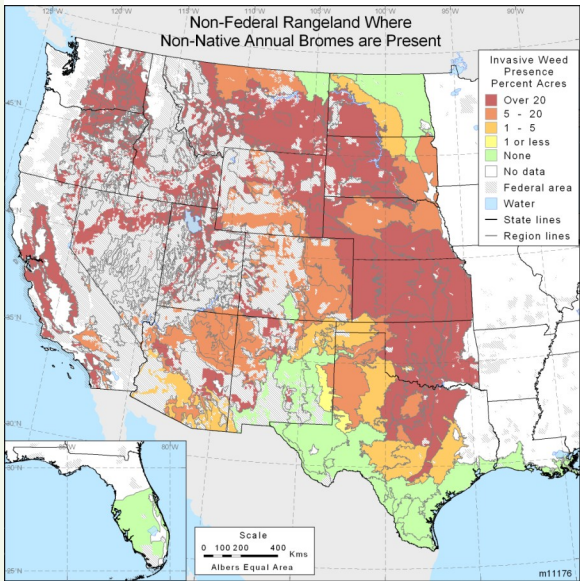
6. Leafy Spurge



Additional maps for non-native invasive herbaceous species groups are displayed by classes (none, 1% or less, 1-5%, 5-20%, over 20%) of non-Federal rangeland where these non-native invasive species groups are present (Figures 3-7).

- Annual bromes are more widespread (Figure 7, Table 3). Species in this group are present on 28.4 percent of the Nation's non-Federal rangeland.

Figure 7. Non-Federal Rangeland Where Non-Native Annual Bromes Are Present



Significance of Findings

Invasive exotic plants negatively impact rangeland throughout the western United States by displacing desirable species, altering ecological and hydrological processes, reducing wildlife habitat, degrading systems, altering fire regimes, and decreasing productivity (Sheley 2010 in press). Of the approximately 300 species added to the Biota of North America (University of North Carolina, Chapel Hill) only 10% of new accessions are native plants. The extent and spread of invasive exotic plants is poorly documented and understood. Without these facts, policymakers lack critical information to make decisions and to sustain public support relating to invasive species management (Mack 2000).

NRI Rangeland on-site data collected by means of unbiased sample sites on over 10,000 locations, as part of a multi-stage sample survey design, presents a unique resource for addressing the paucity in information on invasive species. The findings here are an initial attempt at providing science-based quantitative data that is deemed critical for management and policymakers. NRI uses a "unified sample design across natural resources and through space and time…a

cornerstone to investigating the dynamics of change in an ecological system" (Nusser et al. 1998).

The lack of regional scale maps of invasive plant distribution and abundance inhibits monitoring, management and research (Marvin et al. 2009). While the need for a "national system to detect, assess, and respond to invasive species infestations in their early stages of establishment" led to conceptual plans by the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW 2003), these new NRI data exhibit our ability to develop current maps to describe presence, extent, and relative dominance of invasive plants.

Importance to the Nation

Certain non-native plant species have the potential to outcompete native species. Loss of native species negatively impacts quality of forage for grazing livestock and can lead to fire risks, land degradation and erosion. Land managers and policymakers need this information to support strategic decisions and to identify areas of risk and implement strategies to eradicate and control the spread of invasive species.

Tables and Results

Estimates presented here are based upon rangeland data collected on-site as part of the National Resources Inventory (NRI), a sample survey based upon scientific statistical principles and procedures. These results are based upon NRI rangeland data collected in the field on rangeland during the period 2003 to 2006 and address current conditions. These estimates cover non-Federal rangeland in 17 western states (extending from North Dakota south to Texas and west) and to a limited extent in Florida and Louisiana.

Margins of error are reported for each NRI estimate and must be considered at all scales of analysis. The margin of error is used to construct the 95 percent confidence interval for the estimate. The lower bound of the interval is obtained by subtracting the margin of error from the estimate; the upper bound is obtained by adding the margin of error to the estimate. A 95 percent confidence interval means that in repeated samples from the same population, 95 percent of the time the true underlying population parameter will be contained within the lower and upper bounds of the interval. In the following tables, if there are instances where the margin of error is greater than or equal to the estimate, the confidence interval includes zero and the estimate should not be used. In those cases, the estimate in the table is replaced by the word "Trace."

Table 1. Non-Native Invasive Herbaceous Species Groups (source: USDA PLANTS database (http://plants.usda.gov/index.html) accessed November 2009)

Medusahead

TACA8 - *Taeniatherum caput-medusae (L.) Nevski*, medusahead

TAENI2 - *Taeniatherum Nevski*, medusahead

Annual Bromes

BRTE - *Bromus tectorum L.,* cheatgrass

BRJA - *Bromus japonicus Thunb. ex Murr*., Bromus arvensis

BRST2 - *Bromus sterilis L.,* poverty brome

BRRU2 - *Bromus rubens*, red brome

BRDI3 - *Bromus diandrus ssp. diandrus*, ripgut brome

BRDID2 - *Bromus diandrus ssp. diandrus*, ripgut brome

BRDIR - *Bromus diandrus ssp. rigidus,* ripgut brome

BRHO2 - *Bromus hordeaceus,* soft brome

BRHOH - *Bromus hordeaceus ssp. hordeaceus,* soft brome

BRHOD - *Bromus hordeaceus ssp. divaricatus,* soft brome

BRSE - *Bromus secalius,* rye brome

Centaurea

CENTA - *Centaurea L.*, knapweed*s

CESO3 - *Centaurea solstitialis L*., yellow star-thistle

CEDI3 - *Centaurea diffusa Lam*., diffuse knapweed

CEME2 - *Centaurea melitensis L*., Maltese star-thistle

ACRE3 - *Acroptilon repens* (L.) DC., hardheads

CEBI2 - *Centaurea biebersteinii* DC., spotted knapweed

* CENTA not included from AZ, KS, NM, OK, TX since in those states the genus Centaurea may include both native and introduced species.

Cirsium

CIAR4 - *Cirsium arvense (L.) Scop., Canada thistle*

CIVU - *Cirsium vulgare (Savi) Ten*., bull thistle

Leafy spurge

EUES - *Euphorbia esula L*., leafy spurge

Table 2. Non-Federal Rangeland Where Non-Native Plant Species are Present, or Where They Make Up at Least 50 Percent of the Plant Cover, by State, with Margins of Error

State	Present *Percent*	At Least 50% of Plant Cover *Percent*
Arizona	34.0 ±6.5	Trace
California	97.5 ±2.5	34.4 ±11.7
Colorado	48.3 ±6.3	3.1 ±1.1
Florida	38.9 ±21.0	0 NA
Idaho	85.0 ±7.2	16.6 ±6.6
Kansas	78.8 ±3.6	14.2 ±3.4
Louisiana	78.8 ±18.9	31.6 ±23.2
Montana	54.0 ±6.3	3.2 ±1.8
Nebraska	43.7 ±5.0	4.0 ±1.6
Nevada	45.3 ±13.2	Trace
New Mexico	17.6 ±4.7	Trace
North Dakota	69.7 ±5.6	4.1 ±1.8
Oklahoma	60.5 ±5.7	10.0 ±2.6
Oregon	91.9 ±4.0	17.5 ±6.0
South Dakota	85.0 ±3.3	21.6 ±4.0
Texas	32.8 ±3.6	2.8 ±0.8
Utah	68.0 ±10.3	8.5 ±5.7
Washington	90.0 ±8.3	19.3 ±7.7
Wyoming	51.6 ±7.0	2.2 ±1.6
Nation	49.9 ±1.4	6.6 ±0.7

Note: Estimates where margins of error are at least as large as the estimates are denoted as “Trace.”

Table 3. Non-Federal Rangeland Where Native Invasive Herbaceous Species Groups Are Present, by State, with Margins of Error

State	Medusahead *Percent*	Annual Bromes *Percent*	Centaurea *Percent*	Cirsium *Percent*	Leafy Spurge *Percent*
Arizona	0 NA	13.4 ±4.9	Trace	0 NA	0 NA
California	13.9 ±5.0	65.5 ±13.9	Trace	Trace	0 NA
Colorado	0 NA	17.0 ±3.9	1.8 ±1.1	Trace	Trace
Florida	0 NA	0 NA	0 NA	0 NA	0 NA
Idaho	14.3 ±5.2	72.4 ±8.3	Trace	4.3 ±2.7	Trace
Kansas	0 NA	64.0 ±4.5	0 NA	1.3 ±1.1	0 NA
Louisiana	0 NA	0 NA	0 NA	0 NA	0 NA
Montana	0 NA	34.4 ±6.2	2.0 ±1.4	1.5 ±0.9	0.6 ±0.4
Nebraska	0 NA	33.0 ±4.6	0 NA	Trace	Trace
Nevada	0 NA	35.5 ±12.9	0 NA	Trace	0 NA
New Mexico	0 NA	2.6 ±1.5	Trace	Trace	0 NA
North Dakota	0 NA	8.5 ±3	0 NA	4.3 ±2.7	6.3 ±3.2
Oklahoma	0 NA	28.9 ±5.5	0 NA	Trace	0 NA
Oregon	14.3 ±5.9	77.9 ±7.2	Trace	Trace	0 NA
South Dakota	0 NA	61.2 ±4.3	Trace	5.1 ±1.7	Trace
Texas	0 NA	8.5 ±1.4	Trace	Trace	0 NA
Utah	0 NA	47.5 ±12.2	0 NA	Trace	0 NA
Washington	4.0 ±2.8	87.2 ±8.7	9.7 ±5.8	Trace	0 NA
Wyoming	0 NA	41.4 ±6.7	Trace	2.1 ±1.8	Trace
Nation	1.2 ±0.3	28.4 ±1.5	1.1 ±0.7	1.0 ±0.2	0.4 ±0.1

Note: Estimates where margins of error are at least as large as the estimates are denoted as “Trace.”

More Information

For more information about the NRI, visit http://www.nrcs.usda.gov/technical/NRI/.

More information about the USDA Plants Database may be found at http://plants.usda.gov/.

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