

# Assessing distribution patterns and impacts of introduced plant species in the forests of the United States with Forest Inventory and Analysis (FIA) Phase 3 Vegetation Indicator Data

Beth Schulz, US Forest Service, PNW Research Station, FIA

## Background:

The U.S. Forest Service Forest Inventory and Analysis Program collects Vegetation Indicator data on Phase 3 plots. In contrast to monitoring efforts that focus on a list of invasive species, all vascular plants are recorded on plot. The proportion of introduced species in the forest community and their relative cover provides a measure of impact on the ecosystem.

Results reported include data collected from 2001 through 2004 in several regions in the country to demonstrate the value of the data for tracking distribution patterns of introduced and known invasive plant species. Of the 933 plots, 62% had at least one introduced species recorded. Of the 2980 unique plant symbols recorded, 2323 are native species, 279 are introduced or cultivated species, 345 are genus, and 33 are symbols for unknown plants.

## Methods:

Field guide:

<http://www.fia.fs.fed.us/library/field-guides-methods-proc/>

Maps of plots displayed over Ecological Provinces (Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2005. Ecological Subregions: Sections and Subsections for the conterminous United States. (A.M. Sloan, cartographer) Washington D.C.:U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored.

## Analysis:

**Average species richness (alpha)** is average number of species recorded per 1/24<sup>th</sup> acre subplot, including species that are recognized as unique species even though they cannot be identified to genus and species. Subplots that are not 100% accessible forest are not included in these summaries.

**Percent Introduced Species** is computed by dividing the number of introduced species by the total number of species recorded.

**Proportion cover by introduced species** is computed by summing cover of all introduced and cultivated species and dividing by the sum of all unique species recorded on plot (including native, introduced, and plants not identified to species).

**Constancy and frequency** are based on the ratio of sampled units and number of sample units where species was recorded.

## Results:

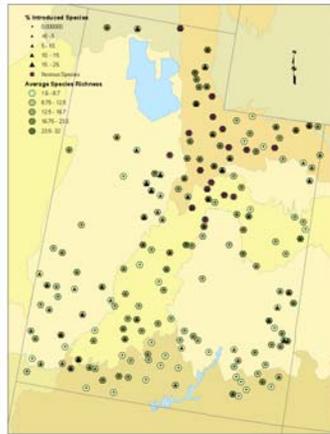


Figure 1. Percent introduced species and average subplot species richness in Utah. Inventories for invasive species are based on noxious species in this region. Only 3 of the 52 introduced species detected in P3 Vegetation data are on Utah's noxious plant species list.



Multiflora rose was planted with good intention in the 1940's-1960's. It has been a "very successful" colonizer.



Canada thistle is one of the noxious species detected in Utah.



Cheat grass is the most commonly encountered introduced species in Utah and the most frequently encountered grass species in the 2001-2004 data.



Garlic mustard is a shade-tolerant forb.



Japanese honeysuckle.

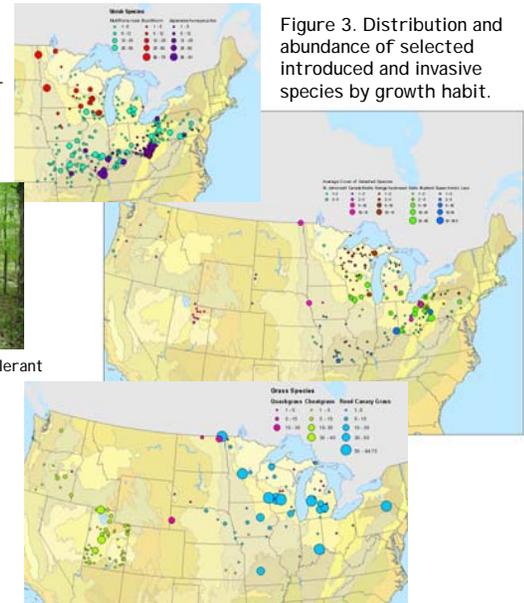


Figure 3. Distribution and abundance of selected introduced and invasive species by growth habit.

## Distribution of Select Species

Species	All Plots		Plots Where Present	
	Constancy	Average Cover	Subplot Frequency	Quadrat Frequency
Multiflora rose	23%	6.8%	0.67	0.15
Cheatgrass	8%	3.9%	0.81	0.28
Garlic Mustard	4%	8.9%	0.73	0.35

Constancy reflects the proportion of plots where species is recorded (in this case, over all 933 plots). Cover and frequency shown above describe the spatial distribution of species on plots where they occur. Multiflora rose is the most prevalent introduced species; cover is high, but its relatively low quadrat frequency reflects the clumpy nature of the shrub growth habit. Garlic mustard occurred on fewer plots, but it's high cover and high quadrat frequency reflects the invasive nature of this forb.

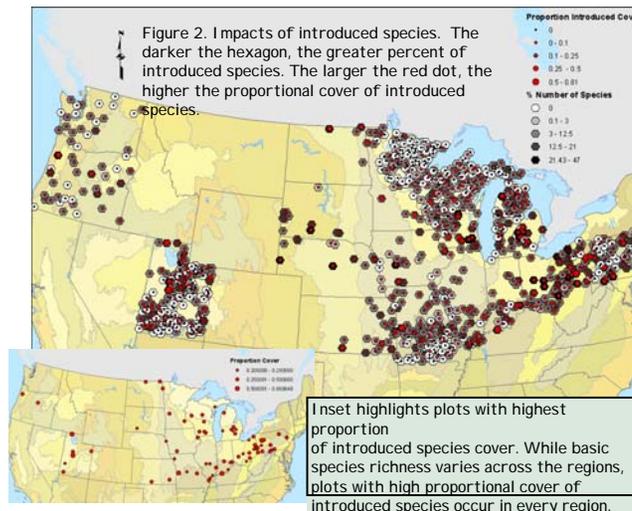


Figure 2. Impacts of introduced species. The darker the hexagon, the greater percent of introduced species. The larger the red dot, the higher the proportional cover of introduced species.

Inset highlights plots with highest proportion of introduced species cover. While basic species richness varies across the regions, plots with high proportional cover of introduced species occur in every region.



For more information, contact:  
Beth Schulz  
Indicator Advisor  
USDA Forest Service  
PNW Research Station  
Anchorage Forestry Sciences I  
3301 C Street, suite 200  
Anchorage AK 99503  
Phone: (907) 743-9424  
Email: [bschulz@fs.fed.us](mailto:bschulz@fs.fed.us)

