

A Survey of Non-Native Plants Along Roadways in the Central and Western States

Kathryn A. Yurkonis^{1,2*}, Janice M. Coons^{1,3}, Scott J. Meiners¹ and Susan E. Lewis².

¹Department of Biological Sciences, Eastern Illinois University, Charleston 61920; ²Department of Biological Sciences, Carroll College, Waukesha, WI 53186; ³Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign, Urbana 61801.

Abstract

Roadways serve as a dispersal corridor for non-native species. This study identified common non-native species along 100 mile interstate transects and 10 mile two-lane roadway transects in national protected areas throughout the north central and western states. For each transect, species frequency was calculated and analyzed using a Principle Components Analysis (PCA). Comparisons of non-native species for transects pooled across ecoregions indicated roadway type as a determinant of roadway vegetation. In grasslands, however, there were no significant differences in vegetation between roadway types, suggesting that interstate and two-lane roadways have similar vegetation impacts on a regional scale.

Introduction

Roadway Corridors:

- Over 3.6 million km of roadways cover 8.1 million hectares (Forman, 1995)
- Vehicles are a seed dispersal mechanism

Roadway Vegetation:

- Typically edge and generalist species (Forman, 1995)
- Roadways contribute to spread of non-native plants (Trombulak & Frissell, 2000)
- Intensity of corridor use is associated non-native species richness (Tyser & Worley, 1992; Parendes & Jones, 2000)

Objectives

- (1) What are common non-native roadside plant species?
- (2) Does roadside vegetation composition vary with roadway type across all ecoregions? Within ecoregions?

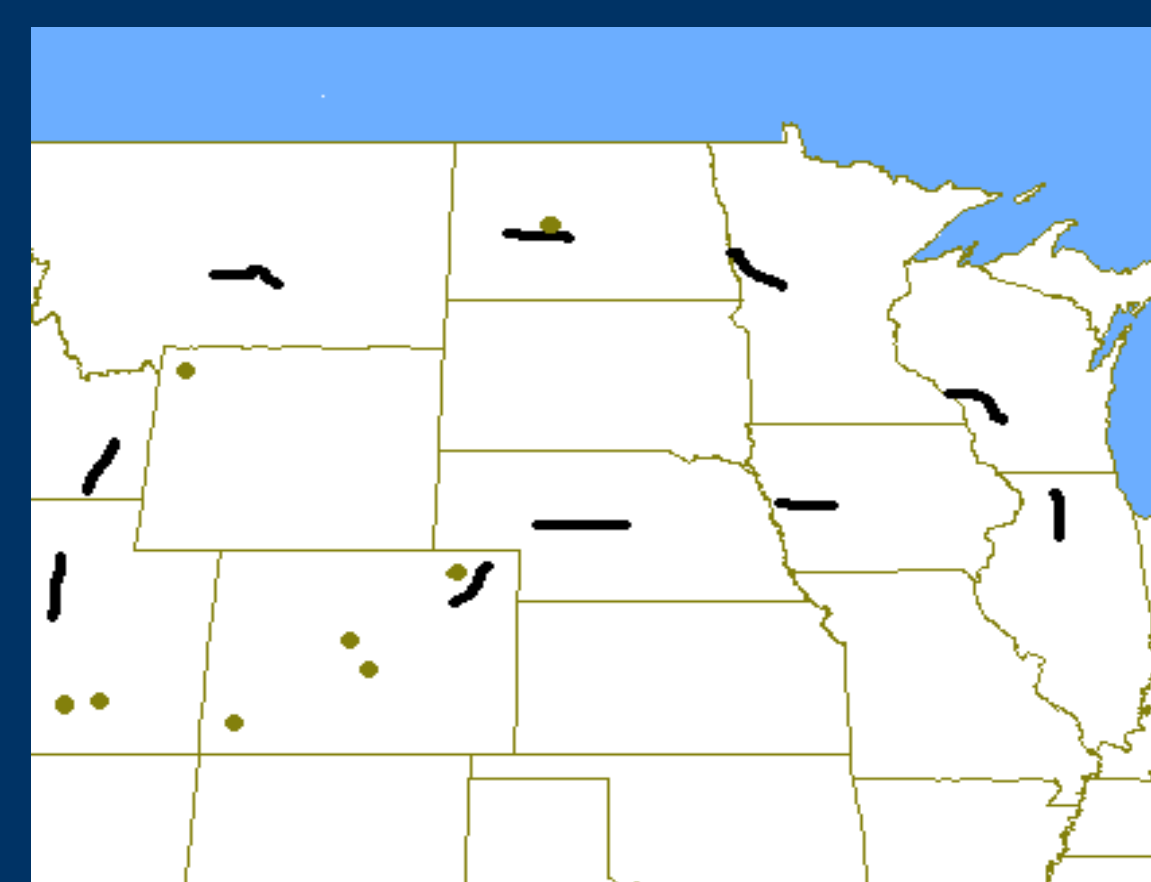


Figure 1: Transect locations. Blue lines = 100-mile interstate transects & green dots = 10 mile two-lane roadway transects in national protected areas.

Methods

Study Sites:

- June 2002 recorded non-native species presence/absence on right roadway edge along:
- Ten 100 mile interstate transects (Figure 1) sampling every other mile to fencerow
 - Eight 10 mile two-lane roadway transects (Figure 1) in national protected areas sampling every other tenth mile to 10 m from the roadway edge

Species Identification:

- Selected species easily visible from the roadside (i.e. forbs and flowering species)
- Photo documentation and specimen collections (where applicable) were taken for unknown species

Data analysis:

- For pooled transects and grassland transects:
- Frequency of observed species/transect (0-50) was calculated for each sample location
 - Principle Components Analysis (PCA) identified common floristic components
 - Bivariate correlation identified species significantly correlated with PCA components
 - Mann-Whitney test compared positions of interstate and two-lane roadway transects along PCA components

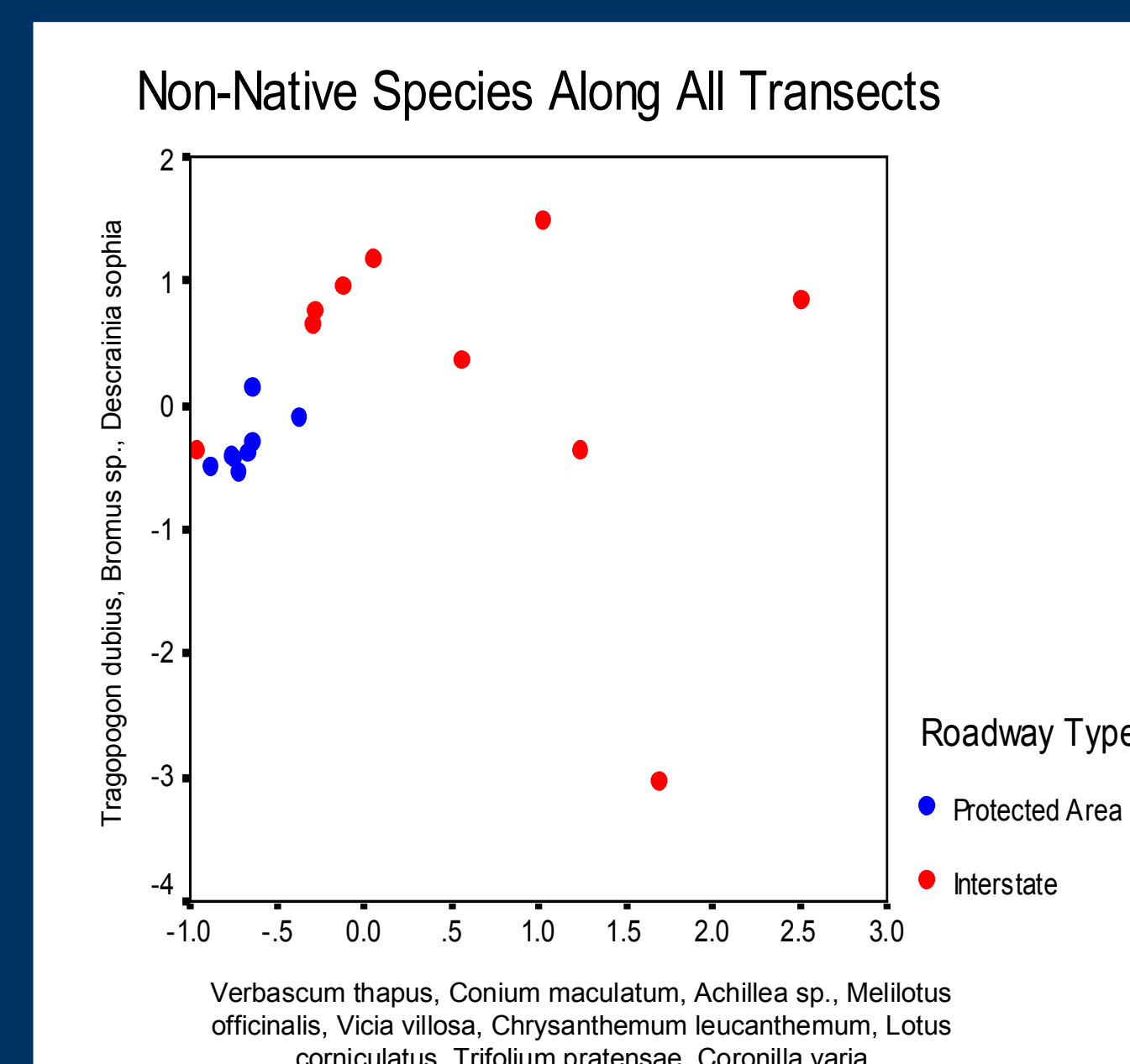


Figure 2: PCA of non-native species from each transect. Interstate (n=10) and two-lane roadway (n=8) transects in relation to the first and second PCA components. The first and second components explain 40% of the variation in the data. Significant differences (P=0.003) occur between interstate and protected area transects along the first axis.

Results

Non-native roadside vegetation:

- 26 non-native plants/genra were identified (Table 2)
- Most frequently observed species:
 - *Melilotus officinalis* (Yellow sweet clover)
 - *Trogopogon dubius* (Goatsbeard)
 - *Elaeagnus angustifolia* (Russian Olive)
 - *Bromus sp* (Japanese Brome, Smooth Brome, Cheatgrass)

Non-native roadside vegetation across ecoregions:

- Analysis included all roadway transects.
- Significant differences occur in non-native vegetation between interstates and two-lane roadways (P= 0.003) (Figure 2)

Non-native roadside vegetation in grasslands:

- Compared species frequency data along interstate (n=8) and national protected area (n=3) grassland transects
- No significant differences occurred in species distributions between interstate and national protected area transects (Figure 3).

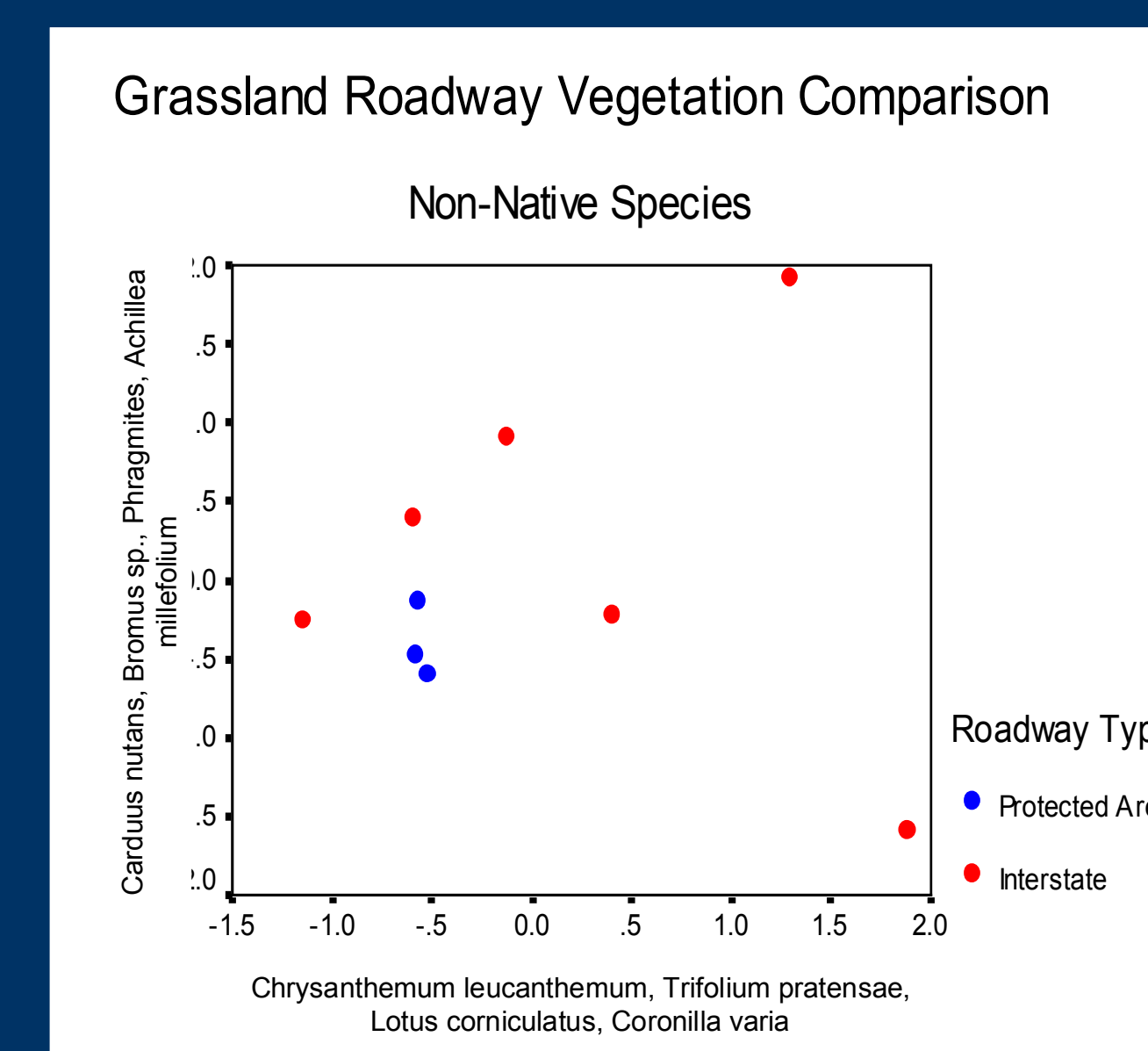


Figure 3: PCA of non-native species from grassland transects. Interstate (n=6) and two-lane roadway grassland (n=3) transects in relation to the first and second PCA components. The first and second components explain 51% of the variation in the data. No significant differences occur between interstates and protected area transects along either axis.

Discussion

Non-native roadside vegetation:

- 26 non-native species or species groups identified along interstate and two-lane roadways
- Results may vary by time as well as a result of seasonal conditions (i.e. western droughts)

Non-native roadside vegetation across ecoregions:

- Significant differences occur in roadside vegetation composition between roadway types
- Additional sampling needed for midwestern national protected area roadways
- Non-native species for which significant differences occur between roadway types typically planted along interstate roadways

Non-native roadside vegetation in grasslands:

- No significant differences between interstate and national protected roadway vegetation
- Non-native vegetation along roadways in the north central and western states related to ecoregion

Family	Scientific Name	Common Name
Apiaceae	<i>Conium maculatum</i>	Poison hemlock
Asteraceae	<i>Achillea millefolium</i>	Common yarrow
	<i>Carduus nutans</i>	Nodding plumeless thistle
	<i>Centaurea biebersteinii</i>	Spotted knapweed
	<i>Chrysanthemum leucanthemum</i>	Ox-eye daisy
	<i>Cichorium intybus</i>	Chicory
	<i>Cirsium arvense</i>	Canada thistle
	<i>Gnaphalium bonariense</i>	Hairy feebane
	<i>Taraxacum laevigatum</i>	Dandelion
	<i>T. officinale</i>	Dandelion
	<i>Trogopogon dubius</i>	Western goatsbeard
Brassicaceae	<i>Oscularia sophia</i>	Flixweed
Chenopodiaceae	<i>Salsola kali</i>	Russian thistle
Convolvulaceae	<i>Convolvulus arvensis</i>	Field bindweed
Dipsacaceae	<i>Dipsacus sylvestris</i>	Common teasel
Elaeagnaceae	<i>Elaeagnus angustifolia</i>	Russian olive
Euphorbiaceae	<i>Euphorbia esula</i>	Leaky spurge
Fabaceae	<i>Coronilla varia</i>	Crain vetch
	<i>Lotus corniculatus</i>	Birdsfoot trefoil
	<i>Melilotus officinalis</i>	Yellow sweet clover
	<i>Trifolium pratense</i>	Red sweet clover
	<i>Vicia villosa</i>	Hairy vetch
Poaceae	<i>Bromus sp.</i>	Japanese/Smooth brome
	<i>Phragmites sp.</i>	Reed
Polygonaceae	<i>Rumex crispus</i>	Cutley dock
Scrophulariaceae	<i>Verbascum thapsus</i>	Common mullein
Tamaricaceae	<i>Tamarix ramosissima</i>	Saltcedar

Table 1: Observed Non-native species. Observed non-native species are grouped by family.

References

- Forman, Richard T. T. 1995. *Land Mosaics: The Ecology of Landscapes and Regions*. Cambridge University Press, New York.
- Tyser, Robin W. and Christopher A. Worley. 1992. Alien Flora in Grasslands Adjacent to Road and Trail Corridors in Glacier National Park, Montana (U.S.A.). *Conservation Biology*. 6: 253-262.
- Trombulak, Stephen C. and Christopher A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology*. 14: 18-30.

Acknowledgements

- Ann Claerbout, Shannon Beach and Eric Janssen
- National Science Foundation- Research Experience for Undergraduates program at Eastern Illinois University
- University of Illinois at Urbana-Champaign Natural Resources and Environmental Science Department and Special Undergraduate Research on the Environment program