Invasive species harm ecological systems, damage economies and threaten human well-being. The estimated damage from invasive species worldwide totals more than $1.4 trillion.
Management of non-natives (and problematic natives) requires some basic information

- Where did they originate from?
- When were they introduced?
- Life history characteristics?
- Where do they grow?
- How invasive?
- Can they persist and spread?
- Which pose the greatest threats to ecological systems and human activities?
Approximately 23% of the 2,223 species of vascular plants documented in Kansas are non-native.

Dicots represent 77% of non-native species.
Relationships between environmental barriers & invasiveness of non-natives
Relationships between environmental barriers & invasiveness of non-natives
Estimated invasiveness of over 500 non-native species documented in Kansas

1 = casual aliens; 2 = naturalized; 3 = invasive; 4 = transformers

Craig C. Freeman, Univ. of KS
Casual Alien Plants

- Have overcome geographic and environmental barriers
- May flourish or reproduce in an area; do not form self-replacing populations
- Often rely on repeated introductions for persistence
- May be persisting or non-persisting
- 168 species (33.3%) of KS non-natives
Casual alien (persisting and non-persisting)
Naturalized Plants

- Have overcome geographic, environmental, reproductive and, sometimes, dispersal barriers
- Reproduce consistently; sustain populations over many life cycles without direct intervention by humans
- Typically do not invade semi-natural or natural habitats
- Recruit offspring freely, often near adults

32.7% of KS non-natives

From Craig C. Freeman, Univ. of KS
Naturalized Plants

BARRIERS

geographic
environmental (local)
reproductive
dispersal

STATUS

aliens

naturalized

casual

naturalized plants
Naturalized Plants
Invasive Plants

• Have overcome geographic, environmental, reproductive and dispersal barriers
• Invade disturbed, semi-natural and, sometimes, natural habitats
• Produce offspring, often in large numbers, at large distances from site(s) of introduction

28.7% of KS non-natives

From Craig C. Freeman, Univ. of KS
Invasive Plants

St. John’s Wort

BARRIERS

geographic
environmental (local)
reproductive
dispersal
environmental (disturbed habitats)

invasives
Invasive Plants
Transformer Species

- Have overcome geographic, environmental, reproductive and dispersal barriers
- Able to invade and even dominate disturbed, semi-natural and natural habitats
- Can change the character, condition, form or nature of ecosystems over a substantial area relative to extent of ecosystem

5.3% of KS non-natives

From Craig C. Freeman, Univ. of KS
Transformer Species

STATUS

geographic
environmental (local)
reproductive
dispersal
environmental (disturbed habitats)
environmental (native habitats)

BARRIERS

transformers

Japanese honeysuckle
Transformer Species

Background information on the status and barriers for Transformer Species:

- Geographic
- Environmental (local)
- Reproductive
- Dispersal
- Environmental (disturbed habitats)
- Environmental (native habitats)

Sericea Lespedeza
Transformer Species

BARRIERS

geographic
environmental (local)
reproductive
dispersal
environmental (disturbed habitats)
environmental (native habitats)

STATUS

Old World Bluestems
Old World Bluestems (OWB):

Caucasian and yellow bluestems are warm-season perennial grasses that were brought to the United States in the early 1900s for use as forage and to control erosion.

These grasses are less palatable and nutritious to livestock than our native warm-season grasses, and once established are difficult to control.
OWBs produce biochemicals that give them a competitive advantage

Interstitial areas:
Soil Alterations

Native soil

Big bluestem

Intersttial

Little bluestem

Intersttial

Caucasian bluestem

Native soil

Interstitial

Native soil

Interstitial

Yellow bluestem
OWB Effects on Native Plant Diversity

- Native species diversity reduced with increasing OWB cover
- Native species cover reduced with increasing OWB cover
Strategies to deal with OWBs

• Early detection
• Map during dormant season
• Spot treat with appropriate herbicides/rates
• Monitor treatment
• Repeat treatment as needed
• Educate others about risk and treatment options
Mapping of Caucasian Bluestem at the Tallgrass Prairie National Preserve
Arsenal
(Imazapyr)
Sericea lespedeza (*Lespedeza cuneata*) is an introduced perennial legume native to eastern Asia. Sericea lespedeza can trace its roots in the United States back to 1896, when it was first planted by the North Carolina Agricultural Experiment Station.
Sericea lespedeza (*Lespedeza cuneata*) is an introduced perennial legume native to eastern Asia.

Sericea lespedeza can trace its roots in the United States back to 1896, when it was first planted by the North Carolina Agricultural Experiment Station.

USDA began work with sericea in 1924 for erosion control, hay production and wildlife cover and food. It was planted extensively into pastures in the southeast.
Sericea lespedeza (*Lespedeza cuneata*) is an introduced perennial legume native to eastern Asia. Was planted on strip mine locations during the 1930s in Kansas and Missouri. USDA began work with sericea in 1924 for erosion control, hay production and wildlife cover and food. It was planted extensively into pastures in the southeast.

Sericea lespedeza can trace its roots in the United States back to 1896, when it was first planted by the North Carolina Agricultural Experiment Station.
**Sericea lespedeza** (*Lespedeza cuneata*) is an introduced perennial legume native to eastern Asia.

Sericea lespedeza can trace its roots in the United States back to 1896, when it was first planted by the North Carolina Agricultural Experiment Station.

USDA began work with sericea in 1924 for erosion control, hay production and wildlife cover and food. It was planted extensively into pastures in the southeast.

More recent establishment is believed to have originated largely from contaminated native seed harvested for CRP (late 1980s). At the time it was not widely accepted as a serious threat.

Was planted on strip mine locations during the 1930s in Kansas and Missouri.
Mature Sericea plants have been known to produce over 1,000 viable seeds per year per stem. These seeds can remain dormant for many years making control a long, drawn out process.
Cattle avoid sericea lespedeza because of high tannin levels, which gives sericea a competitive advantage in native prairie.
Spot spraying sericea is a proven and cost effective way to deal with sericea, provided the infestation is light to moderate. Spot spraying also reduces the impact to beneficial non-target, broadleaf plants.
Table 3. Cost analysis of spot spraying (using a contractor @ $40/hr.) to control sericea lespedeza in native rangeland using metribuzin, triclopyr and PastureGard®. Actual application rates may vary depending on the level of infestation. See Table 1 for proper mixing rates. Cost estimates are based on local dealer prices of non-generic herbicides; be sure to contact your countyxious weed director to find out if any herbicide cost share programs are available in your county.

<table>
<thead>
<tr>
<th>Level of Infestation</th>
<th>Area per hr</th>
<th>Solution</th>
<th>Escort XP® metribuzin</th>
<th>Remedy Ultra® triclopyr</th>
<th>PastureGard®</th>
<th>Remedy Ultra® Dye</th>
<th>Total cost per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sparse</td>
<td>20 ac.</td>
<td>1 qt.</td>
<td>4/ac.</td>
<td>14/ac.</td>
<td>14/ac.</td>
<td>6/ac.</td>
<td>$2.08</td>
</tr>
<tr>
<td>Scattered</td>
<td>15 ac.</td>
<td>1 gal.</td>
<td>5/ac.</td>
<td>55/ac.</td>
<td>4/ac.</td>
<td>11/ac.</td>
<td>$2.96</td>
</tr>
<tr>
<td>Light</td>
<td>10 ac.</td>
<td>2.3 gal.</td>
<td>36/ac.</td>
<td>1.38/ac.</td>
<td>1/ac.</td>
<td>28/ac.</td>
<td>$4.74</td>
</tr>
<tr>
<td>Moderate</td>
<td>5 ac.</td>
<td>5 gal.</td>
<td>72/ac.</td>
<td>2.75/ac.</td>
<td>2/ac.</td>
<td>20/ac.</td>
<td>$9.47</td>
</tr>
<tr>
<td>Heavy</td>
<td>2.5 ac.</td>
<td>7.5 gal.</td>
<td>116/ac.</td>
<td>5/ac.</td>
<td>36/ac.</td>
<td>83/ac.</td>
<td>$18.20</td>
</tr>
</tbody>
</table>

- Escort XP® @ $12.50/lb (48¢/oz); Remedy Ultra® @ $111.80/gal (82¢/gal); PastureGard® @ $57.00/gal (53¢/oz); Activator® 60® (non-ionic surfactant) @ $17.40/gal (11¢/gal). Dye @ $5.00/gal (32¢/oz). County subsidised and/or generic herbicide products will significantly reduce the cost per acre.

- Based on an hourly rate of $40.

- NIS = non-ionic surfactant is required for metribuzin; optional for triclopyr and PastureGard®.

- It may not be practical to spot spray sericea lespedeza when the level of infestation is severe.

Spot spraying Sericea Lespedeza
A cost effective control

A publication of the Tallgrass Legacy Alliance

The control of sericea will require a long term effort by land managers. Sericea lespedeza seed can remain viable for many years, and can be spread by water, wildlife, and livestock, making the eradication of sericea lespedeza next to impossible. Therefore, it is important that land managers learn how to manage this plant to prevent bankrupting themselves or the biodiversity of the prairie. It is imperative to begin control measures as soon as the first sericea lespedeza plants are detected. Sericea can be controlled at a minimal cost if detected early and promptly treated by spot spraying. However, yearly inspections and treatments will be required to maintain control of sericea.

Cost analysis of aerial spraying:

<table>
<thead>
<tr>
<th></th>
<th>Escort XP® metribuzin</th>
<th>Remedy Ultra® triclopyr</th>
<th>PastureGard®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground</td>
<td>$119.96</td>
<td>$247.00</td>
<td>$31.25</td>
</tr>
<tr>
<td>Aerial</td>
<td>$14.46</td>
<td>$274.00</td>
<td>$33.75</td>
</tr>
</tbody>
</table>

- Cost estimates are based on $5.00/ac. for ground applications and $7.50/ac. to spray aerially. See Table 2 for chemical application rates, and Table 3 (footnote) for estimated herbicide and surfactant costs.

For additional information, refer to these publications:

- Ecology and management of Sericea Lespedeza, F-2574 (Oklahoma Cooperative Extension Service)
- Sericea Lespedeza, history, characteristics, and identification, MF-2022 (Kansas State Cooperative Extension Service)
- [Other references]

No endorsement is intended for chemical product names, and criticism is not implied for chemical products not mentioned.
Strategies to deal with OWBs sericea

- Early detection
- Map later during dormant the growing season
- Spot treat with appropriate herbicides/rates
- Consider summer or fall burns, corn steep liquor, and possibly even sheep or goats
- Monitor treatment
- Repeat treatment as needed
- Educate others about risk and treatment options
Are certain species (both native & nonnative) becoming more invasive?

During the past 50 years there has been a significant increase of trees into global savannas and grasslands. The increasing dominance of trees in grasslands is attributed to modified land use, fire regimes, altered temperatures and precipitation, as well as increasing CO2 concentrations.
Are certain species becoming more invasive?

**C3 Plants:** Carbon fixation and photosynthesis occurs in mesophyll cells on the surface of leaf

**C4 Plants:** Carbon fixation and photosynthesis is split between mesophyll cells and bundle sheath cells
Are certain species becoming more invasive?

28% increase
Since 1971, tree density at Konza has increased by two- to 10-fold, except in watersheds burned annually.
"We never should have waited this long ... Now the weeds have completely taken over."