Our New Great Lakes Flora
...weeds, aliens, invasives...

Weeds: the New Flora of Wisconsin

Information source: Wisconsin State Herbarium
wisflora.herbarium.wisc.edu

- **Native species**: 1889
- **Introduced species**: 681

**Species Summary**

- **Total species**: 2570
- **Families**: 158
- **Genera**: 758

- **Wisconsin total species**: 2570
- **Michigan**: 2717

Why are we (government, public, scientists, etc.) worried?

Why did the DNR force the Botany Dept in 2010 to dig up the Botany Garden pond that had *Nymphoides*?

Wisconsin State Journal, April 11, 2008
Weeds: the New Flora of Wisconsin

Weed: A plant species (or any organism) not in its normal geographic distribution, spread by human activities, and usually with some negative impact to humans and/or "native" flora/vegetation/fauna.

What is a weed?
- introduction
- non-native
- naturalized
- alien
- invasive

Centaurea maculosa
Spotted knapweed

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What is not a weed!

Eutrochium maculatum
Joe-pye weed

Although the Wisconsin Cranberry Association has labeled Eutrochium maculatum a weed as it decreases their profits!

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What is not a weed!

Cirsium pitcheri
Dune thistle

Weeds: the New Flora of Wisconsin

Wisconsin Legislated "Noxious" Weeds

- Cirsium arvense  Canada thistle
- Convolvulus arvensis  field bindweed
- Euphorbia virgata  leafy spurge
- Lythrum salicaria  purple loosestrife
- Rosa multiflora  multiflora rose

“Every person shall destroy all noxious weeds on all lands which he shall own, occupy or control. The term 'destroy' means the complete killing of weeds or the killing of weed plants above the surface of the ground by the use of chemicals, cutting, tillage, cropping system, pasturing livestock, or any or all of these in effective combination, at such time and in such manner as will effectually prevent such plants from maturing to the bloom or flower stage.”
**Wisconsin Legislated "Noxious" Weeds**

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Cirsium arvense</em></td>
<td>Canada thistle</td>
</tr>
<tr>
<td><em>Convolvulus arvensis</em></td>
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</table>
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Weeds can be ecological disruptive
- invasive cattail forming monospecific stands in Wisconsin

Invasive cattail spread from 1960s to 2000 (red contour) in two sites (Walworth County)
• (R) without normal water draw down
• (L) with normal water fluctuation

Weeds hybridize with native species - *Typha X glauca* cattail

- Broad leaf cattail *Typha latifolia*
- Hybrid cattail *Typha X glauca*
- Narrow leaf cattail *Typha angustifolia*
Has purple loosestrife hybridized with closely related but native winged loosestrife (*Lythrum alatum*)?

Is this part of the recent (delayed) invasive nature of the weed?

How do you tell a weed?

1. Fossil evidence or its lack
2. Historical evidence of introductions
3. Probable means of introduction
4. Typical reproductive patterns
5. Disturbed habitats
6. Geographical distribution patterns
7. Genetic diversity

• are any of the cattails native to North America?
  - Green River Eocene deposits of Colorado
  - Holocene fossil pollen tetrads
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*Reseda lutea* (mignonette) from Mediterranean found "natively" in pristine Thomson Prairie west of Madison

Rock garden ornamental - via shoes?

Weeds: the New Flora of Wisconsin

Sources of weeds — "rogues gallery of exotica"

1. Direct introduction
2. Agriculture
3. Ballast
4. Roads & pickles (salt)

*Pueraria lobata* - Kudzu

Kudzu introduced from Japan into SE U.S. for soil erosion control

*Gypsophila* introduced into Great Lakes (now invasive on dunes) as "baby-breath" ornamental
Heracleum mantegazzianum (hogweed) introduced from southwest Asia (Caucasus) by gardeners.

Hogweed: over 9 ft and looks like cow’s parsnip but bigger and with purple stem splatches; phototoxic!

The 2003 Guinness Book of Records recognizes Giant Hogweed as the largest weed in the world.

Sources of weeds — “rogues gallery of exotica”

1. Direct introduction
2. Agriculture
3. Ballast
4. Roads & pickles (salt)

Agriculture basically came from Eurasia to North America

Many of our weeds are agriculture based

Few North American weeds in Eurasia

American weeds in Europe – the empire strikes back

‘Neophytes’ in the upper Rhine valley near Heidelberg — first recorded after 1492

http://www.guenther-blaich.de/pflgs.php?par=kune&lan=e
1. Direct introduction
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Weeds: the New Flora of Wisconsin
Sources of weeds — "rogues gallery of exotica"

Ballast (water now; soil/gravel before) used to stabilize ships is a major source of aquatic organisms and seeds.

Canals allowed early spread of Lythrum salicaria by 1880.

Salt used on roads or as brine (pickle factories) has brought in halophytic (salt loving) weeds from the Great Plains and East Coast.

Myriophyllum

Centaurea maculosa

Spotted knapweed

Lythrum salicaria

Purple loosestrife

Muhlenbergia asperifolia

(alkali muhly) from Great Plains first seen on de-iced roads in late 1930s.
Weeds: the New Flora of Wisconsin

Sources of weeds — "rogues gallery of exotica"

1. Direct introduction
2. Agriculture
3. Ballast
4. Roads & pickles (salt)
   - Railway yards, disturbed areas around brine wells, and medians of salted expressways; introduced from the East Coast and first collected in St. Clair Co. in 1910.

*Spartina patens*: salt-meadow cordgrass

Sources of weeds — "rogues gallery of exotica"

1. Direct introduction
2. Agriculture
3. Ballast
4. Roads & pickles (salt)
   - Coastal U.S. halophyte; introduced into SE Michigan and Wisconsin and spreading along salted highways

*Symphyotrichum subulatum*: saltmarsh aster

Weeds often possess modified vegetative and sexual reproductive features as part of the "weed syndrome"
Historical herbarium specimens of *Veronica beccabunga* in North America.

How do you tell a weed?

Veronica beccabunga (water speedwell) present distribution in Wisconsin (plus other 1982 & 2000 collections in Door Co.)
**Weeds: the New Flora of Wisconsin**

How do you tell a weed?

**Alliaria petiolata** (garlic mustard) native to Europe

Garlic mustard distribution – 2006 (date for Wisflora maps)

Typical collection pattern of weeds

1. Fossil evidence or its lack
2. Historical evidence of introductions
3. Probable means of introduction
4. Typical reproductive patterns
5. Disturbed habitats
6. Geographical distribution patterns
7. Genetic diversity

**Phragmites australis** (common reed) native or invasive?
Both forms occur (and co-occur at this site) of the cosmopolitan common reed
Genotype network based on chloroplast DNA.

Native North American genotypes are closely related and they are unrelated to the invasive form from the Old World.

Genotyping of common reed from herbarium specimens prior to 1910 indicates the widespread presence of 11 native genotypes and 1 southern genotype also seen in South America and Asia.

A few populations scattered from Connecticut to Maryland prior to 1910 also exhibited the invasive genotype.
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Genotyping of common reed from modern populations (both herbarium specimens after 1960 and extant populations) indicates the same distributions of genotypes.

However, the invasive genotype has dramatically spread across North America since 1910.

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Phragmites australis native or invasive?

However, the invasive genotype has dramatically spread across North America since 1910.

& replacing native genotypes - what should be the state’s response?

Phragmites australis native or invasive?

• Previous studies found no evidence of hybridization, although experimental hybrids could rarely be made with natives as maternal line.

• 2000 mile survey in E North America using microsatellites showed strong evidence of hybridization – in either direction.
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A final thought:

Unlike some other threats such as logging or pollution, which in theory can be stopped and allowing native vegetation/flora to recover, alien invasions are self-sustaining once started and extremely difficult to reverse.