Endangered and Threatened Species of the Great Lakes Region

1. The value of Biodiversity
2. The Endangered Species Act
3. Endangered Wisconsin flora
4. How do species become endangered?
5. What can or should be done?

The term "BioDiversity" was born during the National Forum on BioDiversity, held in Washington D.C. in September 1986.

Biodiversity = variation at all levels
- the genes within a single local population or species
- the species composing all or part of a local community,
- communities composing the ecosystems of the world.

By the summer of 1992, biodiversity had moved to center stage as one of the central issues of scientific and political concern world-wide.

What is the value of the biological diversity of the planet?

Congress answered these questions in the preamble to the Endangered Species Act of 1973, recognizing that endangered and threatened species of wildlife and plants "are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people."
What is the value of the biological diversity of the planet?

View 1: The answer we give to this is often anthropocentric – we ask "What has biological diversity done for me lately?" — economic value

- This kind of argumentation for the value of biodiversity, although necessary, fundamentally breaks down to economics.

- Two issues with this approach:
  1. We have to acknowledge that we will never be able to demonstrate an immediate, utilitarian reason for preserving every species on Earth. But who will tell us which species are unimportant?

  Lake Huron Tansy
  Endangered in Wisconsin

View 2: Ecological value

- One of the key tasks facing both scientists and governments is to identify and protect the species whose ecological functions are especially important to their ecosystems or to human societies - keystone species.

  Kirtland’s Warbler
  Pinus banksiana - jack pine [keystone species]

What is the value of the biological diversity of the planet?

View 1: The answer we give to this is often anthropocentric – we ask "What has biological diversity done for me lately?" — economic value

- This kind of argumentation for the value of biodiversity, although necessary, fundamentally breaks down to economics.

- Two issues with this approach:
  2. If you want to protect a critical area of shoreline or a nearly old growth forest, be prepared to talk about the economic value of lakefront property, income from logging, and cost-benefit analysis.

  Lake Michigan beach scene
  with Lake Huron Tansy

View 2: Ecological value

- However, it is not clear if there have been significant repercussions in the eastern North American forests with the near extinction of one of its most dominant trees almost 100 years ago - the American Chestnut.

  Castanea dentata
  American chestnut
What is the value of the biological diversity of the planet?

View 2: Ecological value
- We know little about ecological impacts of the removal of even dominant species.

"In the meantime, prudence dictates giving existing organisms as much benefit of the doubt as possible" [Erik Eckholm]

What is the value of the biological diversity of the planet?

View 3: Evolutionary value
- Isolated phylogenetic lineages or clades are inherently worthy of protection – they have more value
- Biodiversity hotspots to be protected should be assessed not only on species diversity

What is the value of the biological diversity of the planet?

View 4: Species have intrinsic value – ethical role
- "It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course mean something far broader than mere economic value; I mean value in the philosophical sense." Aldo Leopold, 1949
What is the value of the biological diversity of the planet?

View 4: Species have intrinsic value – ethical role

- "It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, I of course mean something far broader than mere economic value; I mean value in the philosophical sense." Aldo Leopold, 1949

- The Judeo-Christian Stewardship Environmental Ethic argues we are accountable to God for conserving biodiversity:

  "Diversity is God’s property, and we, who bear the relationship to it of strangers and sojourners, have no right to destroy it." D.W. Ehrenfeld, 1988

Endangered Species Act

- The Endangered Species Act, Public Law 93-205, became effective on December 28, 1973, and is the most far-reaching wildlife statute ever adopted by any nation

- The stated purpose of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, and to provide a program for the conservation of such endangered species and threatened species".

- The ESA is literally "The Statutory Ark"
Endangered Species Act

- A species is considered to be **endangered** if it is "in danger of extinction throughout all or a significant portion of its range."

- A **threatened** species is one that "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

- Importantly, both of these terms recognize by Federal law that the species is the functional unit of concern, and that extinction is the threat to be avoided.

- The ESA includes provisions to conserve "the ecosystems upon which endangered species and threatened species depend" by designating and listing **critical habitat** when a species is listed.

- Critical habitat is defined as specific areas within the species’ range with physical or biological features either (1) essential to conservation of the species, or (2) which may require special management considerations or protection.

- However, species protection carries with it a degree of legislated habitat protection.

- Destroying the habitat of an endangered species is legally equivalent to destroying the species itself.

- The ESA thus is ecosystem-orientated in its motivation, but the particular ecosystems protected are determined by which species are deemed to be in danger of extinction. That, in turn, depends in part on how "species" is legally defined.
Endangered Species Act

**Biological Species Definitions**

Species represent groups of populations reproductively & potentially reproductively isolated from other such groups

**Phylogenetic Species Definitions**

Species represent monophyletic clades of populations distinguished from other such clades by shared derived features

• According to the ESA, "species" is defined to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature".

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**Endangered Species Act**

• The ESA has largely followed the Biological Species Concept despite protest

**Endangered Species Act Status Codes**

- **E** -- Endangered
- **T** -- Threatened
- **EmL** -- Emergency Listing, Endangered
- **EmT** -- Emergency Listing Threatened
- **SAE, S(A)S** -- Similarity of Appearance to an Endangered Taxon
- **SAT, T(A)S** -- Similarity of Appearance to a Threatened Taxon
- **PE** -- Proposed Endangered
- **PT** -- Proposed Threatened
- **C** -- Candidate Taxon, Ready for Proposal
- **D3A** -- Delisted Taxon, Evidently Extinct
- **D3B** -- Delisted Taxon, Invalid Name in Current Scientific Opinion
- **D3C** -- Delisted Taxon, Recovered
- **DA** -- Delisted Taxon, Amendment of the Act
- **DM** -- Delisted Taxon, Recovered, Being Monitored First Five Years
- **DO** -- Delisted Taxon, Original Commercial Data Erroneous
- **DP** -- Delisted Taxon, Discovered Previously Unknown Additional Populations and/or Habitat
- **DR** -- Delisted Taxon, Taxonomic Revision (Improved Understanding)
- **AD** -- Proposed Delisting
- **AE** -- Proposed Reclassification to Endangered
- **AT** -- Proposed Reclassification to Threatened

**Summary of Listed Species – February 22, 2016**

<table>
<thead>
<tr>
<th></th>
<th>U.S. Endangered</th>
<th>Foreign Endangered</th>
<th>U.S. Threatened</th>
<th>Foreign Threatened</th>
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<tr>
<td><strong>Animals</strong></td>
<td>493</td>
<td>575</td>
<td>199</td>
<td>79</td>
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<tr>
<td><strong>Plants</strong></td>
<td>732</td>
<td>1</td>
<td>165</td>
<td>2</td>
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<tr>
<td><strong>Total</strong></td>
<td>1225</td>
<td>576</td>
<td>364</td>
<td>81</td>
</tr>
</tbody>
</table>

• 1144 approved "Recovery Plans"

• The success of the ESA is indicated by "Delisting" of a number of the original "Listed" species - peregrine falcon, bald eagle, American alligator, brown pelican; although some have been delisted because they went extinct - blue pike, dusky seaside sparrow, southern penquynal
Endangered Species Act

Summary of Listed Species – February 22, 2016
U.S. Fish & Wildlife website

Jatropha costaricensis

Abies guatemalensis

Fitzroya cupressoides

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~2,450 species of vascular plants known from Wisconsin
7 Federally Threatened, 72 State Endangered, 58 State Threatened, and ~200 Special Concern taxa

http://dnr.wi.gov/topic/NHI/WList.html

Endangered Wisconsin Flora

7 species Federally listed as ‘Threatened’
Some are State listed as ‘Endangered’, some as ‘Threatened’, one as ‘Extirpated’

Wisconsin’s Federally Listed Species

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Global Rank</th>
<th>State Rank</th>
<th>USESA STATUS</th>
<th>WI STATUS</th>
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<tbody>
<tr>
<td>Cirsium pitcheri</td>
<td>dune thistle</td>
<td>G3</td>
<td>S2</td>
<td>LT</td>
<td>THR</td>
</tr>
<tr>
<td>Lespedeza leptocephala</td>
<td>prairie bush-clover</td>
<td>G3</td>
<td>S2</td>
<td>LT</td>
<td>END</td>
</tr>
<tr>
<td>Ophrygone campbelli var. chartacea</td>
<td>Fauler’s heathcup</td>
<td>GST1</td>
<td>S1</td>
<td>LT</td>
<td>END</td>
</tr>
<tr>
<td>Asterum roseoalbus</td>
<td>northern wild monkshood</td>
<td>G3</td>
<td>S2</td>
<td>LT</td>
<td>THR</td>
</tr>
<tr>
<td>Iris lacustris</td>
<td>dwarf lake iris</td>
<td>G3</td>
<td>S3</td>
<td>LT</td>
<td>THR</td>
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<tr>
<td>Platanthera leucophaea</td>
<td>prairie white-fringed orchid</td>
<td>G2</td>
<td>S3</td>
<td>LT</td>
<td>END</td>
</tr>
<tr>
<td>Asclepias meadii</td>
<td>Mead’s milkweed</td>
<td>G3</td>
<td>EXT</td>
<td>LT</td>
<td>EXT</td>
</tr>
</tbody>
</table>

7 species Federally listed as ‘Threatened’
Some are State listed as ‘Endangered’, some as ‘Threatened’, one as ‘Extirpated’

Endangered Wisconsin Flora

Platanthera leucophaea
Prairie fringed orchid

State endangered, Federally threatened
Endangered Wisconsin Flora

**Lespedeza leptostachya**
prairie bush-clover

State endangered, Federally threatened

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**Oxytropis campestris var. chartacea**

Cold Mountain crazyweed, Fassett’s locoweed, northern yellow locoweed

State endangered, Federally threatened

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**Aconitum 'noveboracense'** - monk’s hood

*Aconitum columbianum* Nutt. subsp. columbianum

State threatened, Federally threatened

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**Cirsium pitcheri**
Dune thistle

State threatened, Federally threatened
**Endangered Wisconsin Flora**

*Iris lacustris*
Dwarf lake iris

State threatened, Federally threatened

**Endangered Wisconsin Flora**

*Asclepias meadii*
Mead’s milkweed

State extirpated, Federally threatened

**Diversity**

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**Endangered Wisconsin Flora**

*Rhododendron lapponicum* - lapland rosebay
Endangered in Wisconsin

Circumboreal species found in Great Lakes region only in the Driftless Area and on cliffs along the Wisconsin and Kickapoo River gorges

**How Species Become Endangered**

*Rarity can be simply a way of life for some species with specialized habitats or restricted biogeographic distributions.*

*Rhododendron lapponicum* - lapland rosebay
Endangered in Wisconsin

Circumboreal species found in Great Lakes region only in the Driftless Area and on cliffs along the Wisconsin and Kickapoo River gorges
Rarity can be simply a way of life for some species with specialized habitats or restricted biogeographic distributions.

Isle Royale, Michigan

A large group of the threatened and endangered plants of the Great Lakes Region are only found in Isle Royale.

Optopanax horridus - devil’s club

Isle Royale, Michigan

Members of arctic or boreal lineages

Saxifraga tricuspidata - prickly saxifrage

Members of western montane lineages

Pre-settlement forest types based on 19th century surveyors' records

In the Great Lakes region, the single most important reason for endangered species is the drastic and rapid change of pre-settlement community types.
How Species Become Endangered

Deforestation and oak savanna/prairie use for agriculture have largely made many ecosystems simply experiments in "island biogeography".

The endangered Karner Blue is restricted to disappearing oak savanna habitat in the Great Lakes region with its larval stages dependent on a single species of plant - *Lupinus perennis*.

As predicted by the theory of island biogeography, prairie patches inventoried in southern Wisconsin in 1950 and again in 2000 showed significant loss of species diversity during the 50 year interval (Leach and Givnish, 2001). As expected, moth-pollinated species such as the prairie fringed orchid were one of the first to disappear.

Three of our greatest plant threats in the Great Lakes region are now actively spreading and decimating our forests and wetlands.

- *Rhamnus cathartica* - European buckthorn
- *Alliaria petiolata* - Garlic mustard
- *Lythrum salicaria* - Purple loosestrife

Invasion of the aliens
How Species Become Endangered

- Cumulative effect is degradation of genetic diversity or severe genetic bottlenecks

**Agalinus skinneriana**
Purple false foxglove

Threatened (4 states) in Great Lakes region - restricted to south facing dry prairies

How Species Become Endangered

- Cumulative effect is degradation of genetic diversity or severe genetic bottlenecks

Variation in floral coloration and pattern exists and is correlated with geographical location.

DNA fingerprinting, however, reveals practically no genetic variation.

Kercher & Sytsma (2000) in Natural Areas Journal

How Species Become Endangered

- Cumulative effect is degradation of genetic diversity or severe genetic bottlenecks

Many of our critical habitats and their endangered species - like the Great Lake dunes and the Piping Plover and Dune Thistle - are impacted by multiple threats simultaneously.
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What can or should be done?
• We need more systematists and ecologists!

What can or should be done?
• We need basic systematic knowledge of our endangered biota: to what are they related?

Example of northern monk’s-hood

Western monk’s-hood Northern monk’s-hood
Wisconsin Dells

“We have certainly not given much evidence so far of our commitment; having given names to only 1.4 million of them, we don’t know whether the total number may be 10 or 100 million.”

“For better or worse, we find ourselves charged with responsibility for a gigantic, dispersed Noah’s ark; what we do next will determine what can be saved. Will we act as responsible stewards of the many organisms that share the Earth with us?”

P.H. Raven and G. Prance in Save the Earth
What can or should be done?

- We need basic demographic knowledge of our endangered biota: how stable are they?

Long term demographic studies of endangered and threatened species - such as

Cirsium pitcheri
Dune thistle

Tanacetum huronense
Lake Huron tansy

What can or should be done?

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Transition matrix projecting Pitcher Thistle population growth

- Wisconsin has a number of state mandated programs for protecting species and natural areas in which they occur in association with private landowners

Endangered and Nongame Species: protecting and managing endangered species; working with private landowners to increase awareness and protection of endangered resources.

Natural Heritage Inventory: surveying the state for endangered resources; maintaining the Natural Heritage Inventory database; providing information to natural resource managers, land-use planners and developers.

State Natural Areas: protecting and managing state natural communities; providing educational and research opportunities; coordinating the DNR/DOT Native Plant Seed program.
What can or should be done?

- The Antrim Creek Natural Area is a good example where a combination of the local public, county government, conservancy groups, and basic science permitted the preservation of a 1 mile stretch of Lake Michigan shoreline valued in the millions of dollars.