Herbaceous Plants of the Indiana Dunes National Lakeshore Projected to be Resilient to Climate Change

Elizabeth LaRue

Department of Biological Sciences

Purdue University

Joy Marburger

National Park Service

Indiana Dunes National Lakeshore

A Changing Climate

- Increased temperatures, drought, and extreme precipitation events already occurring → projected to continue
- Projections for Indiana by end of century
  - Summers like Oklahoma
  - Winters like Virginia

2012 Drought Midwest

Hurricane Katrina

IPCC (2013), Union of Concerned Scientists (2003)

Ecological Impacts of Climate Change

- Changing climate zones of suitable habitat
- Species extinction risk
- Need for restorations to alleviate extinction risks in our National Parks and natural areas

How Will Species' Respond to Climate Change?

Species responses to climate change

- Track climate through dispersal
- Adapt to new climate
- Phenotypic plasticity

How do we choose species for restoration?

What traits do we expect a favorable response from?

Project Objective

Identify native herbaceous plants projected to be resilient to climate change in three critical habitats at Indiana Dunes National Lakeshore at the end of the century

Critical Habitats at Indiana Dunes National Lakeshore

Coastal sand dunes

Mesic prairie

MNFI (2010)

Interdunal wetland

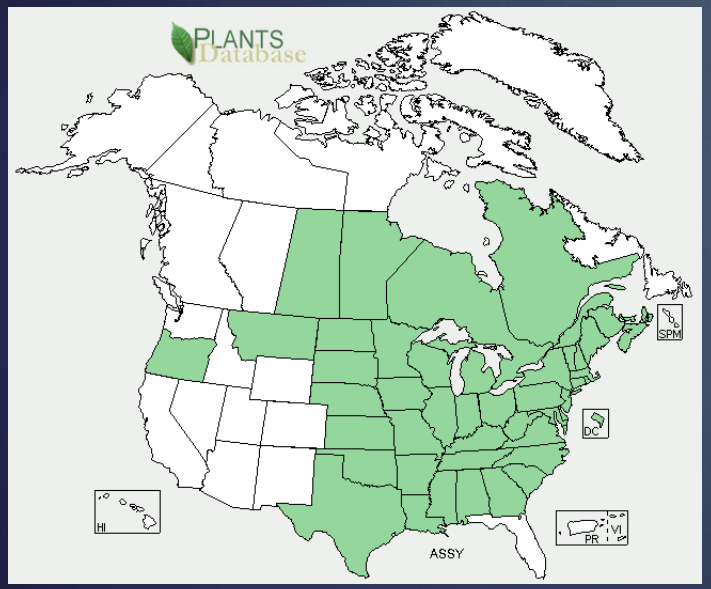
Traits Likely to Lead to Plant Resilience to Climate Change

- Track suitable climate zones
  - High dispersal ability
- Tolerant via phenotypic plasticity
  - Wide climatic and environmental tolerance
  - Drought tolerant
  - Medium phenotypic plasticity
- Evolve quickly
  - Common species
  - High genetic diversity
  - Short generation time
- Long seed bank duration
- No coevolved species necessary for survival

Gran Canaria Declaration II (2006), National Fish, Wildlife, and Plant Climate Adaptation Strategy (2012)

Coastal Sand Dunes

- *Asclepias syriaca* (common milkweed)
- Perennial
- High seed dispersal ability
- High drought tolerance



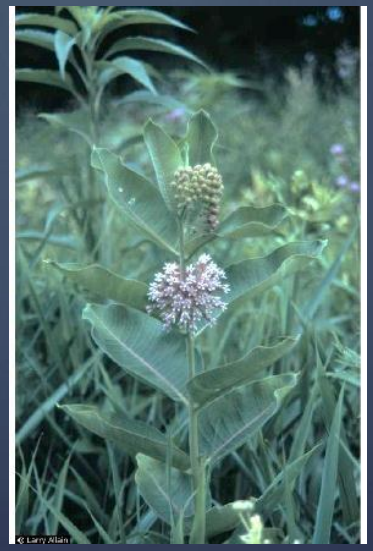
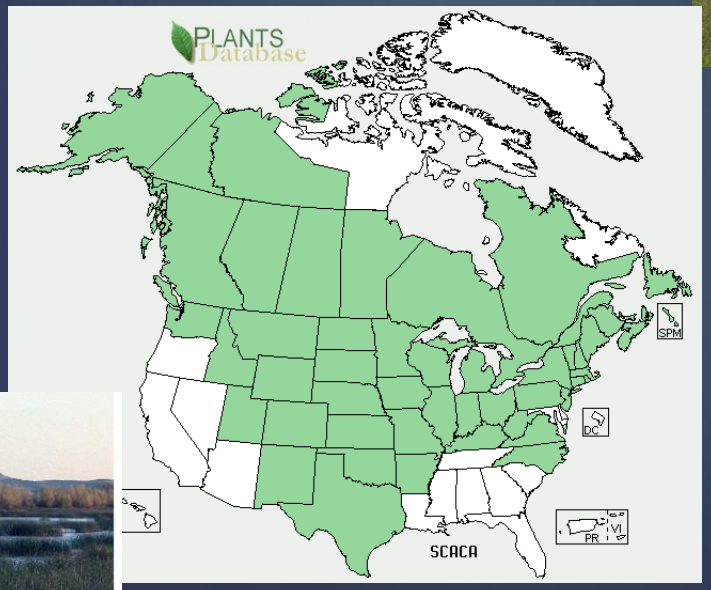


Photo by Larry Allain
@ USDA-NRCS
PLANTS Database

Ammophila breviligulata
Asclepias syriaca
Cyperus strigosus
Juncus canadensis
Monarda punctata
Oenothera biennis
Panicum capillare
Schizachyrium scoparium
Sphenopholis obtusata
Xanthium strumarium

Interdunal Wetlands

- *Schoenoplectus acutus* var. *acutus* (hardstem bulrush)
- Perennial
- Moderate seed/vegetative spread
- Medium drought tolerance



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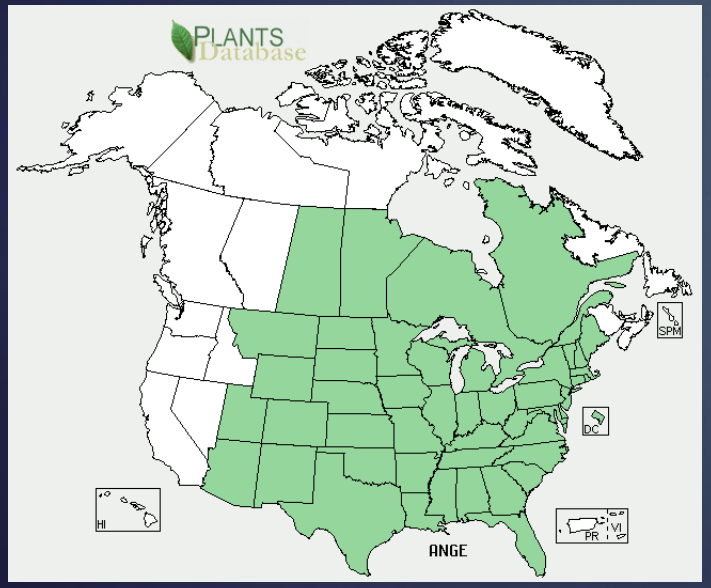
Agrostis hyemalis
Campanula aparinoides
Carex stricta
Cladium mariscoides
Euthamia graminifolia
Lycopus americanus
Lysimachia terrestris
Schoenoplectus acutus var. acutus
Schoenoplectus pungens
Schoenoplectus tabernamontani

Mesic Prairie

- *Andropogen gerardii* (big bluestem)
- Perennial
- Slow seed/vegetative spread
- High drought tolerance



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Andropogon gerardii
Euphorbia corollata
Lespedeza capitata
Liatris aspera
Lithospermum canescens
Phlox pilosa
Sorghastrum nutans
Symphyotrichum novae-angliae
Tradescantia ohiensis
Verbena stricta

Significance and Future Directions

- Significance
  - We care about successful restoration efforts – this approach could help achieve this
  - Allows for managers at INDU and other local natural areas to make more informed decisions
- Future directions
  - Use this approach at other National Parks and natural areas?
  - Restoration experiments and long-term monitoring is essential

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