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**“AND
JUSTICE
FOR ALL”**



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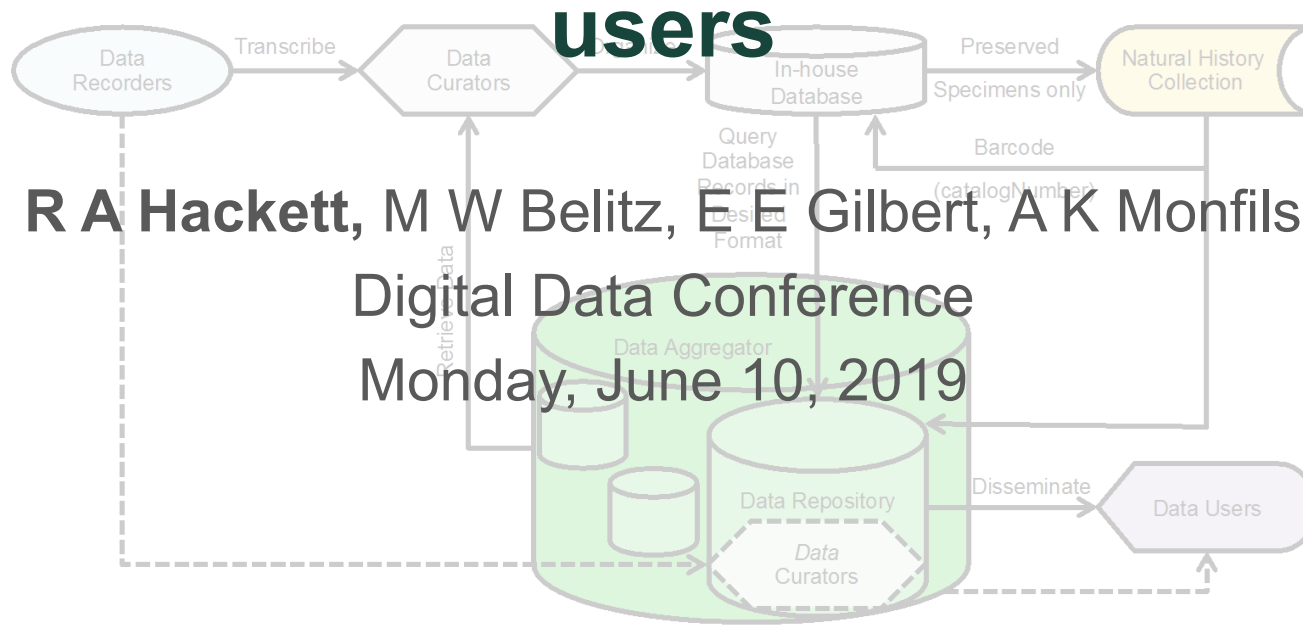
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A data management workflow of biodiversity data from the field to data users



R A Hackett, M W Belitz, E E Gilbert, A K Monfils
 Digital Data Conference
 Monday, June 10, 2019

Prairie fens are highly diverse communities

Rachel Hackett

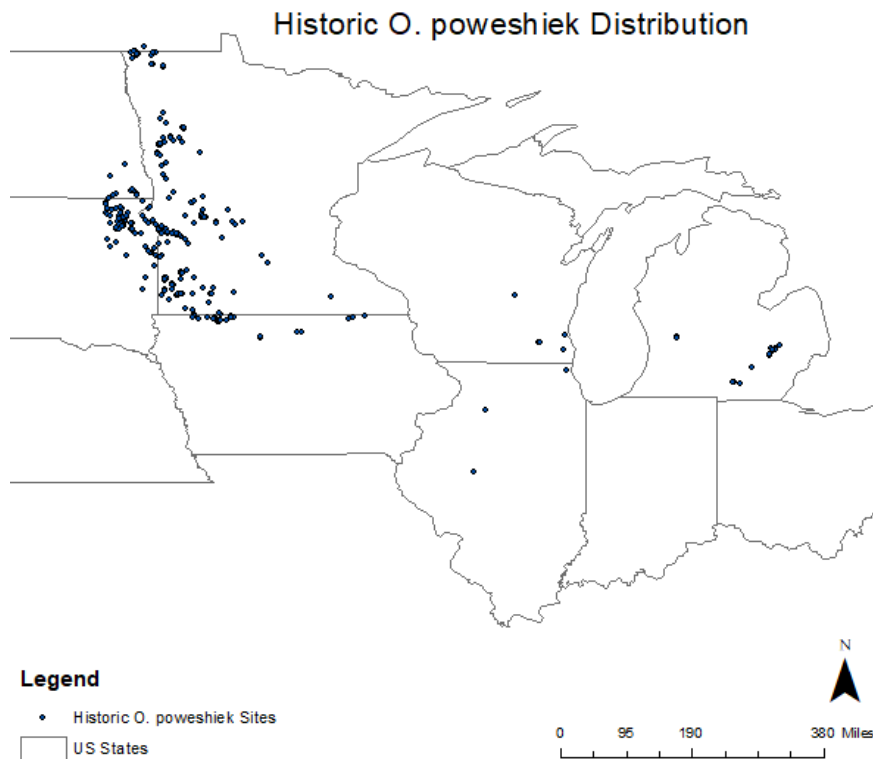
Park Lyndon, Washtenaw County, Michigan

Plant Community Survey Data

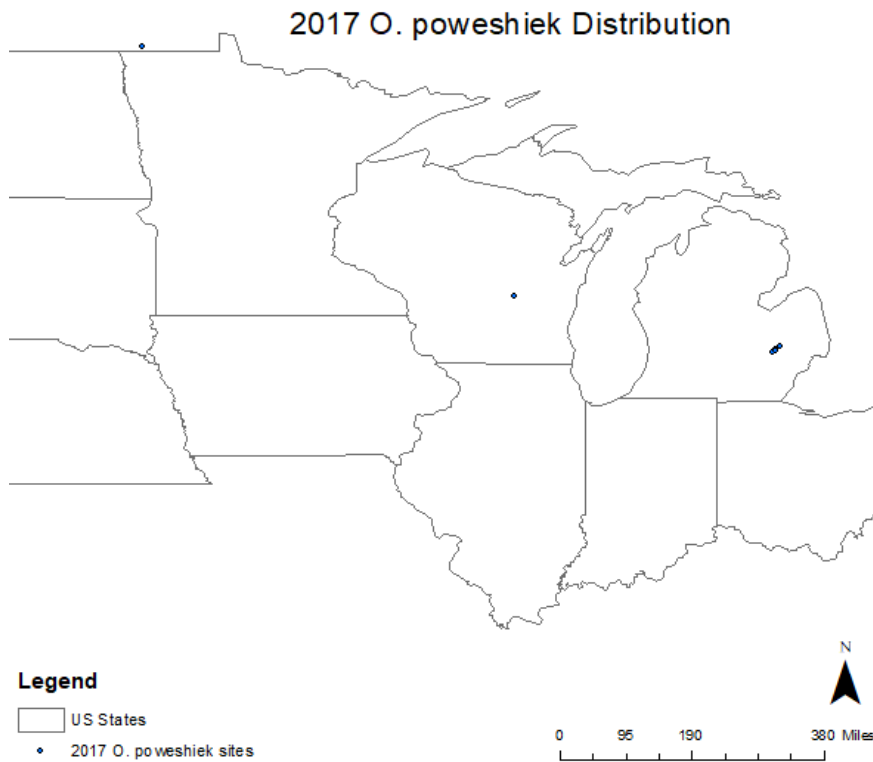
- Location-level
 - Geometry
 - Connectivity
 - Surrounding land cover
- Event-level
 - Pore water quality
 - Soil chemistry
 - Photographs
- Occurrence-level
 - Percent cover



Prairie Fens: Home of Endangered *Poweshiek skipperling*



Prairie Fens: Home of Endangered *Poweshiek skipperling*

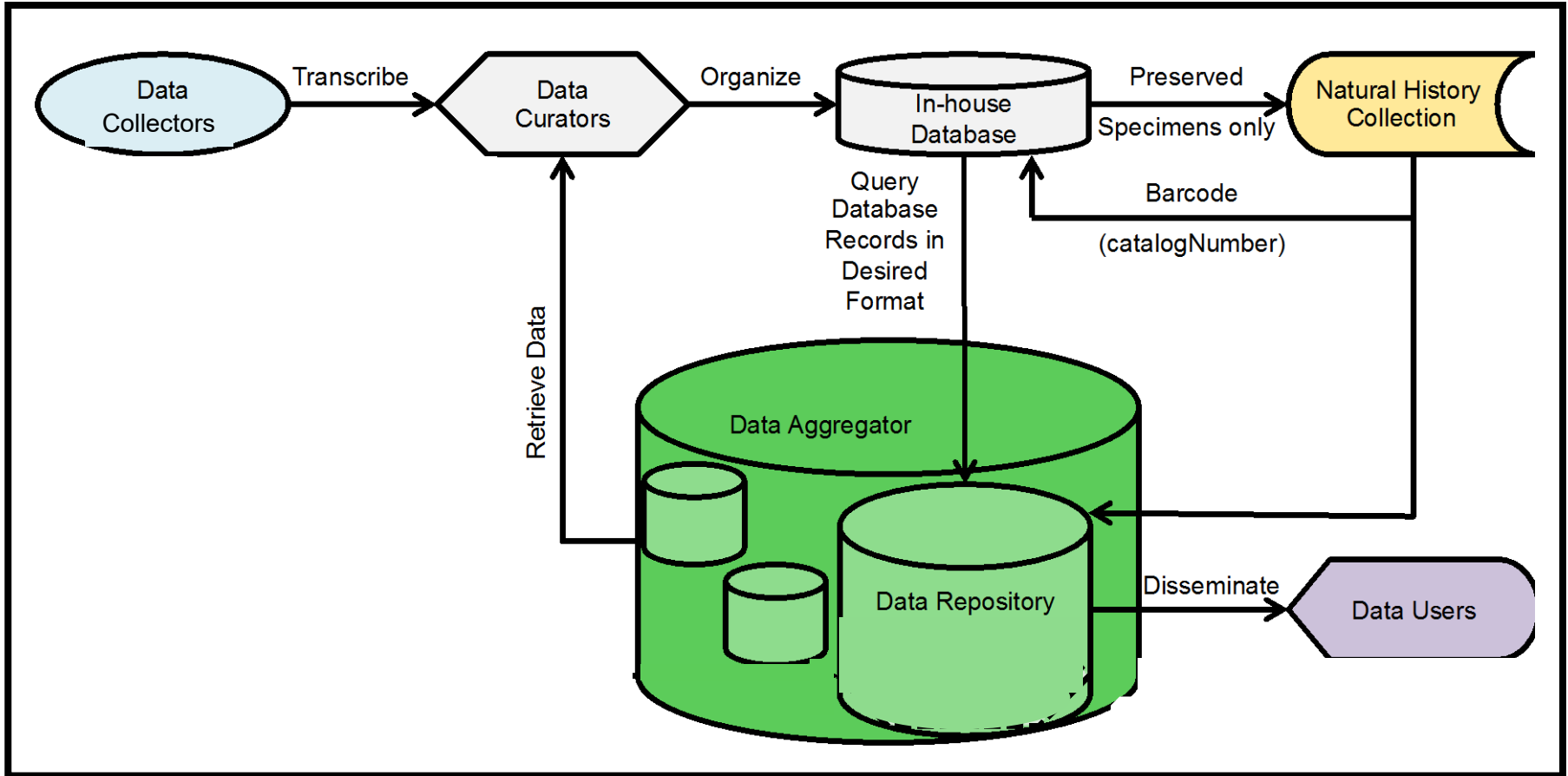


Poweshiek Skipperling Survey Data

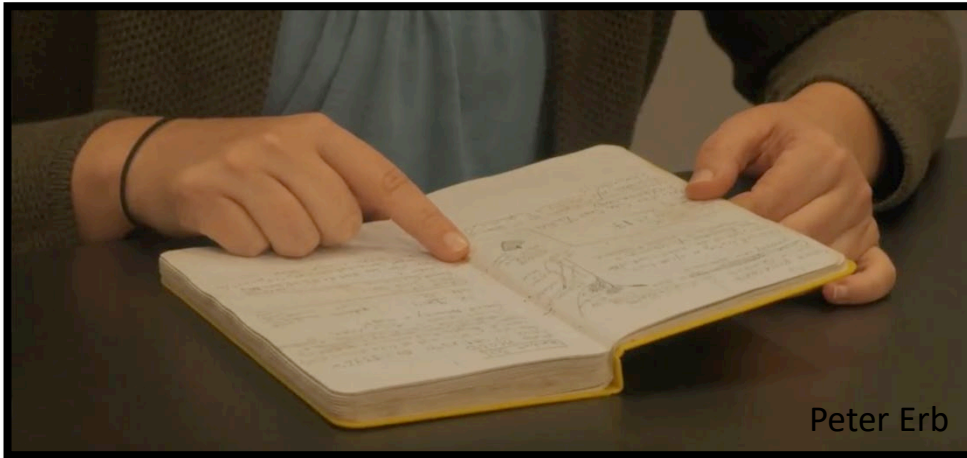
- Location-level
 - Area
 - Perimeter
- Event-level
 - Weather conditions
 - Nectar sources
- Occurrence-level
 - Distance
 - Wing wear
 - Behavior



Biodiversity Data Workflow



Data Collection Tools



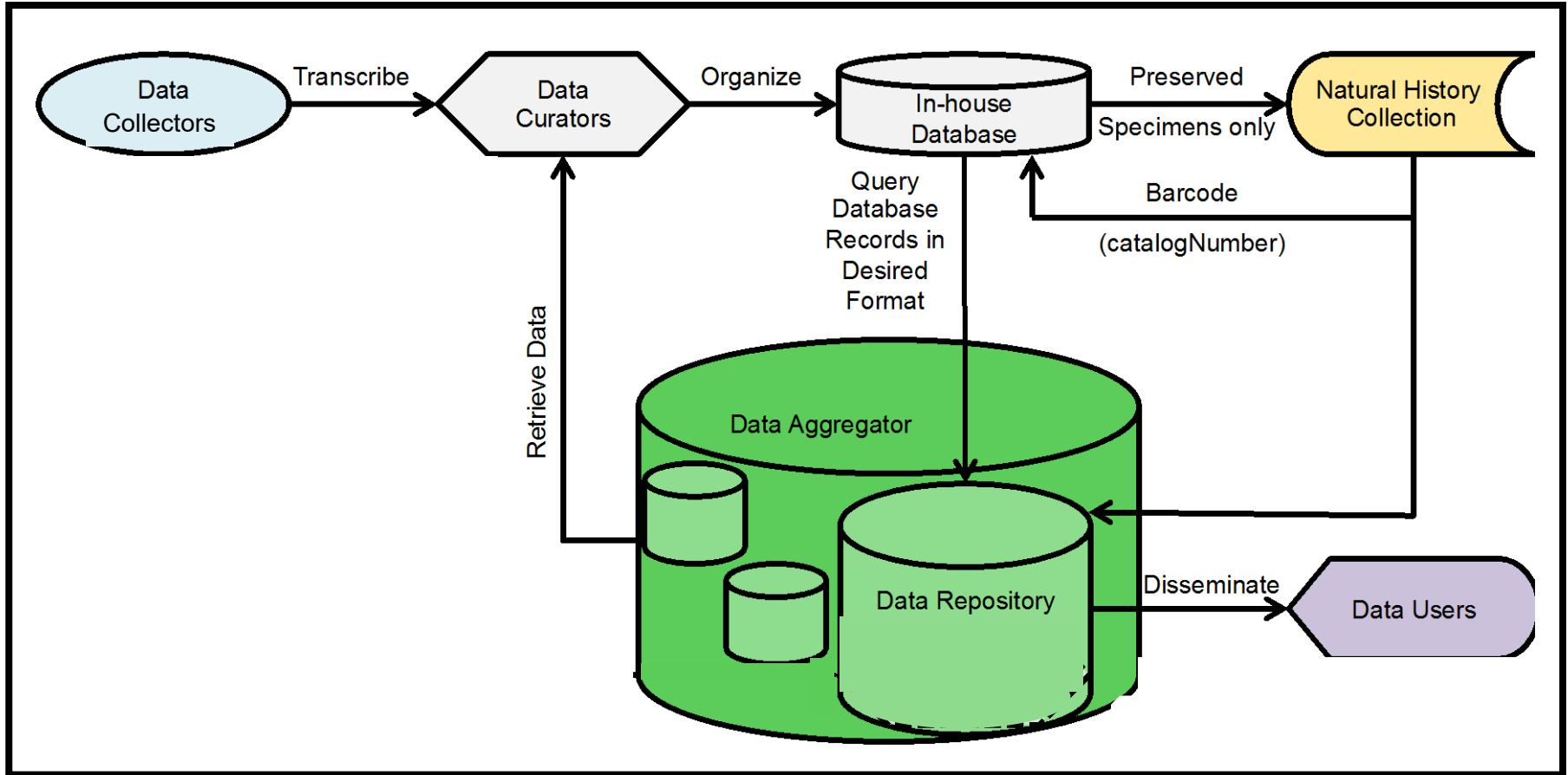
Peter Erb



Jacob Pollock



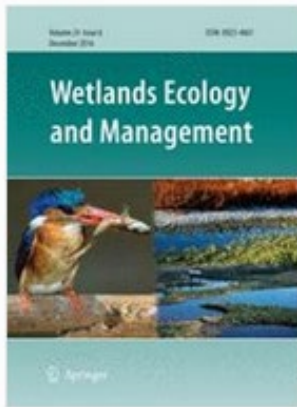
Biodiversity Data Workflow



DwC MeasurementOrFact Tables

MeasurementOrFact
measurementID
measurementType
measurementValue
measurementAccuracy
measurementUnit
measurementDeterminedBy
measurementDeterminedDate
measurementMethod
measurementRemarks

Documented Methods and Meta-Data



[Wetlands Ecology and Management](#)

December 2016, Volume 24, [Issue 6](#), pp 609–622 | [Cite as](#)

Evaluating a sampling protocol for assessing plant diversity in prairie fens

Authors [Authors and affiliations](#)

Rachel A. Hackett , Michael J. Monfils, Anna K. Monfils



Habitat Suitability Modeling of the Federally Endangered Poweshiek Skipperling in Michigan

Clint D. Pogue*, Michael J. Monfils, David L. Cuthrell, Benjamin W. Heumann, Anna K. Monfils

Integrating Media Files



CMC

Central Michigan University

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Catalog #: CMC00018968

Occurrence ID (GUID): 52965e2b-0f40-4a3c-908c-cc397b2ee17a

Taxon: *Dryopteris cristata* (L.) Gray

Family: Dryopteridaceae

Collector: Rachel Hackett & Hillary Karbowski RHHK397

Date: 2012-06-21

Locality: United States, Michigan, Jackson, Mt Hope Road Fen
42.3085 -84.2026

Elevation: 251 meters (823ft)

Habitat: Prairie fen dominated by *Carex*, Asteraceae, and grasses but encroachment by shrubs (*Rubus*, *Cornus*, *Betula*, *Toxicodendron vernix*). A few pockets and walls of shrub-carr and wooded fen. Evidence of some management. Hummocky in areas from *Carex stricta*, other areas dominated by other *Carex* and *Dasiphora fruticosa*. In eastern most part of fen, 30m from wooded border, 100m from wooded fen clump. On edge of open *Carex* meadow in more *Betula* thicket. Dominant species are *Carex stricta*, *Thelypteris palustris*, *Eutrochium* with a shrub layer of *Cornus* and *Betula*. Ground moist but no puddling. Stream (less than 1m across) nearby.

Description: Sori - round, cup, not ripe, in lines, 2 lines per segment. Population - clumped near *Thelypteris palustris* on hummock.

Specimen Images



Open Medium Image
Open Large Image



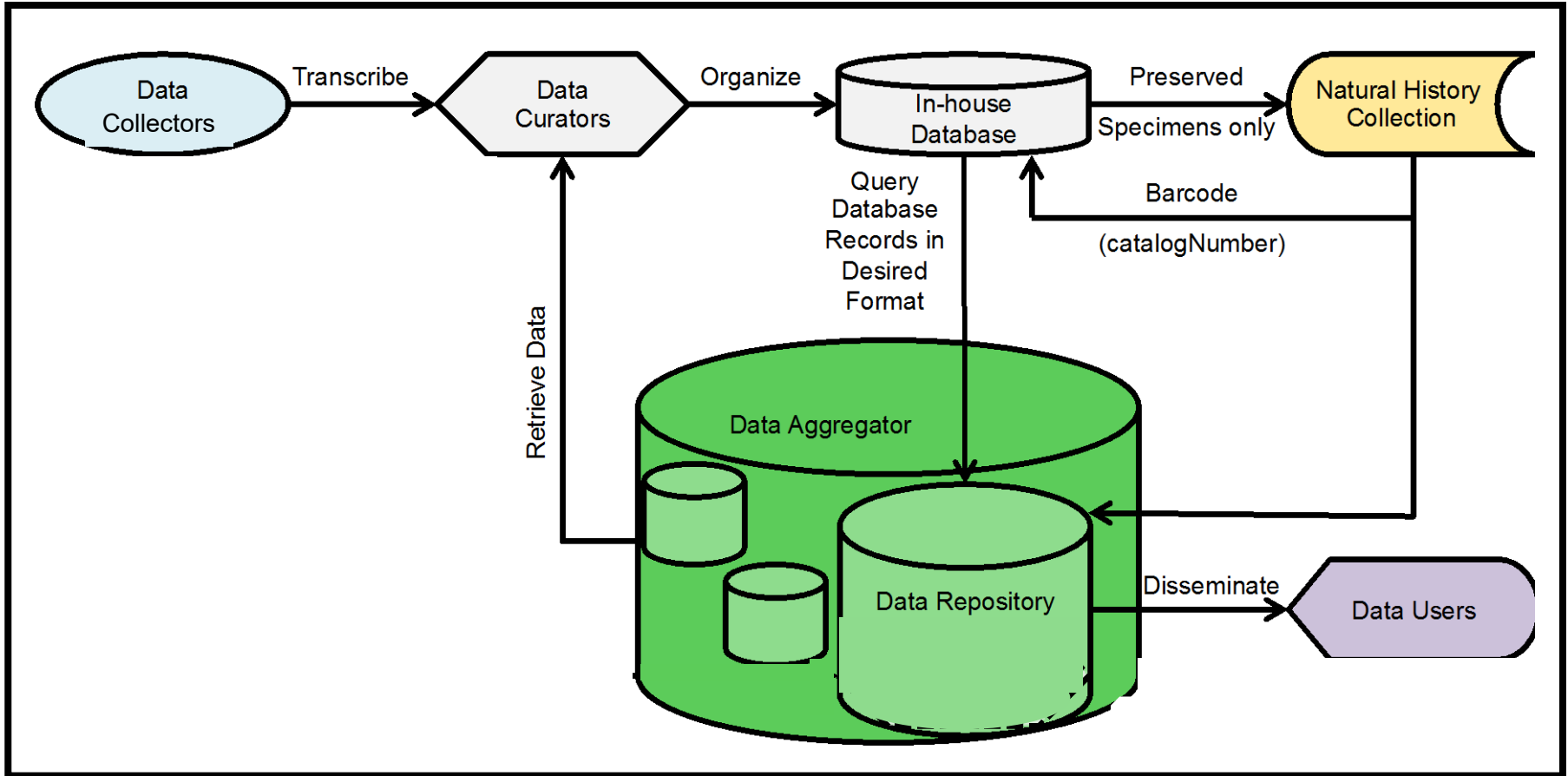
Open Medium Image
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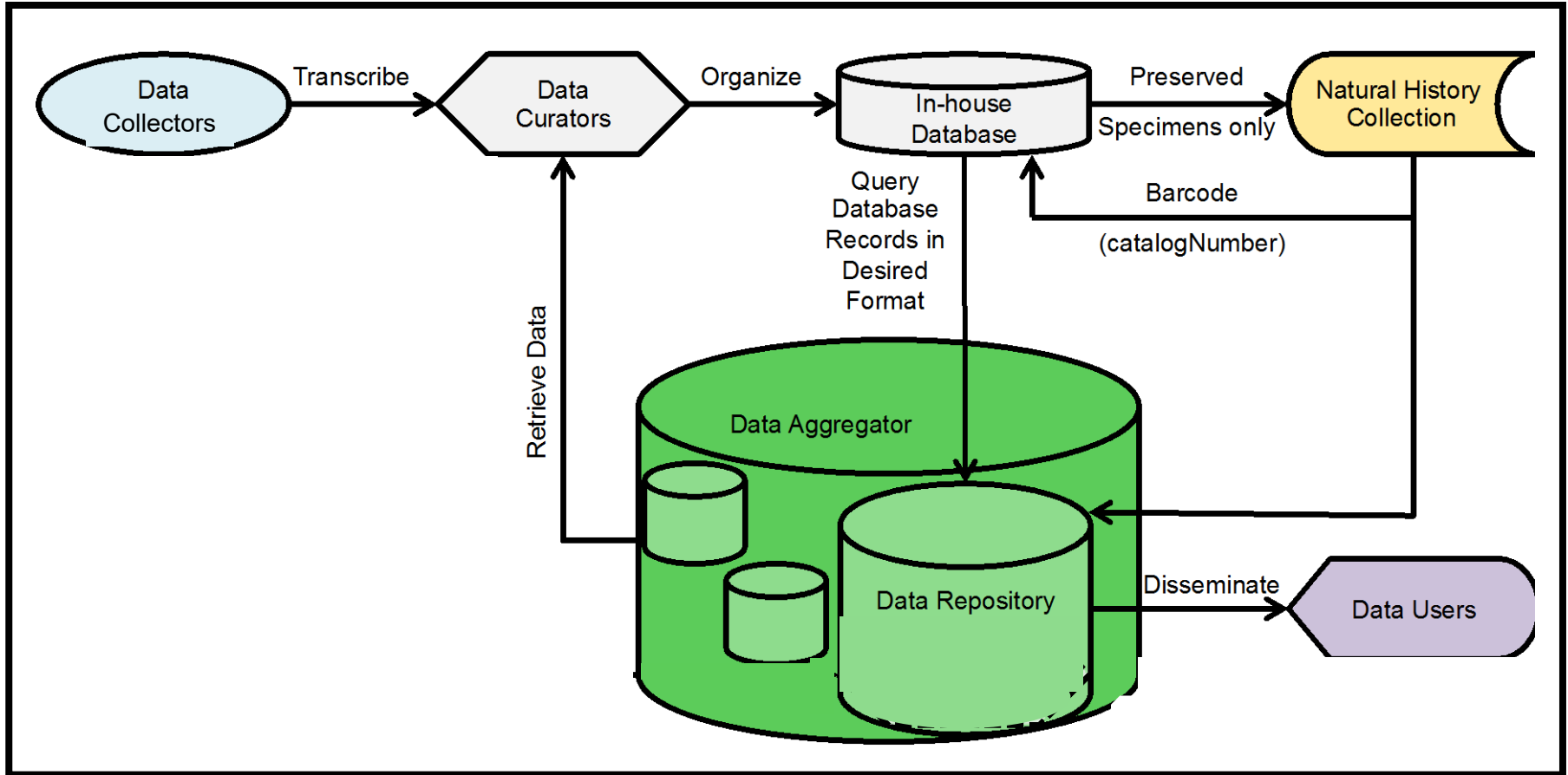
Open Medium Image
Open Large Image



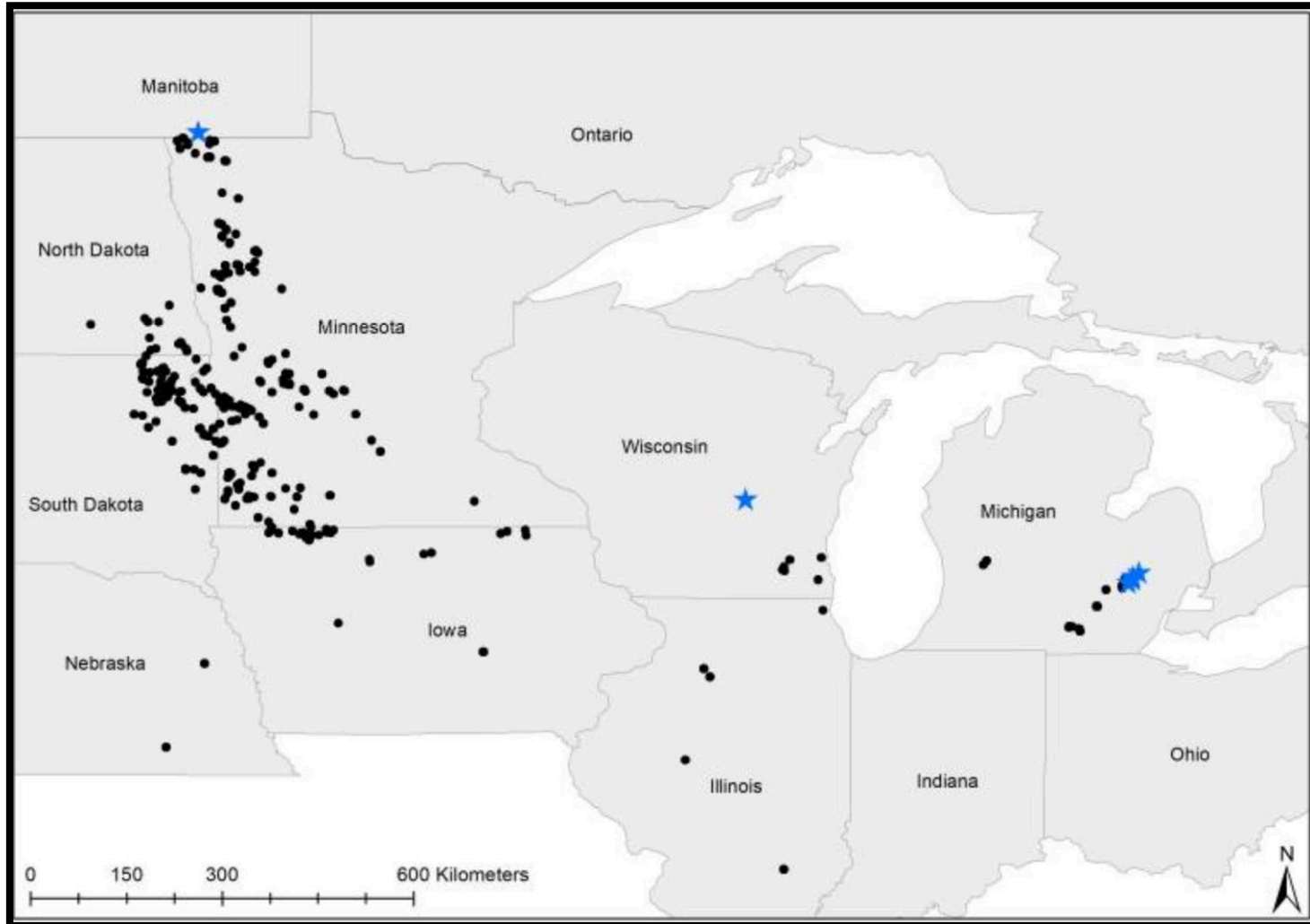
Biodiversity Data Workflow



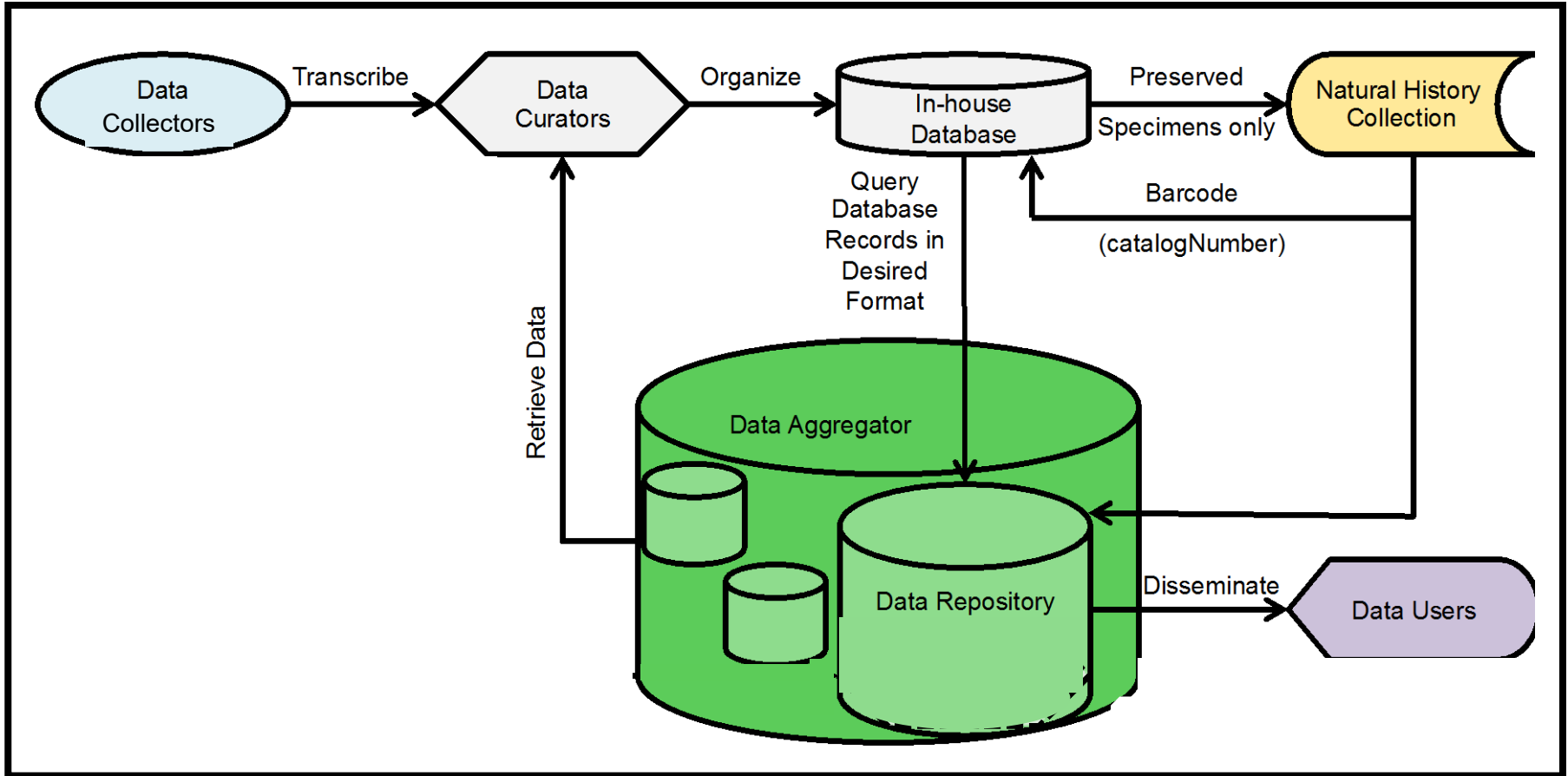
Biodiversity Data Workflow



Aggregating Poweshiek Skipperling



Biodiversity Data Workflow



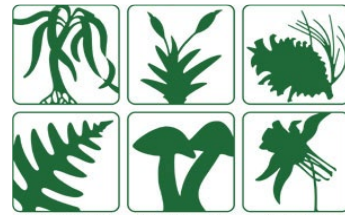
Reaching Our Partners and Data



Hanes Trust Foundation



SEINet

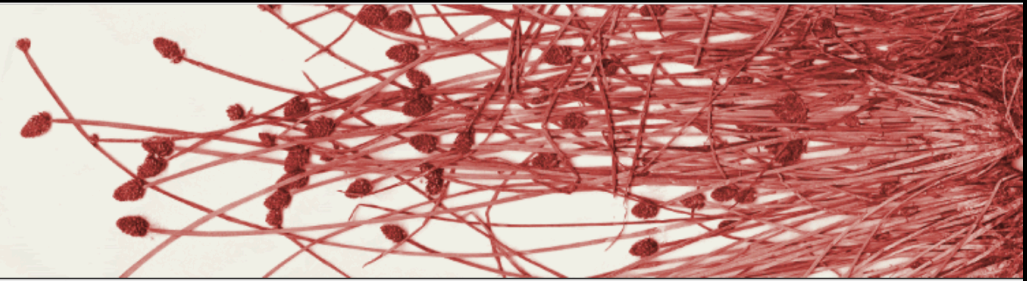


Small Collections Network



For Land Owners and Managers

Consortium of Midwest Herbaria



Home
Specimen Search
Images
Flora Projects
Interactive Tools
Crowdsource
Log In
New Account
Sitemap

Welcome to the Consortium of Midwest Herbaria


While focused around the Great Lakes drainage basin, the region includes the six states that border the western Great Lakes: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. 132 herbaria are listed in [Index Herbariorum](#) (Thiers, B. [continuously updated]) from this region; we hope to eventually make data available from a majority of those collections.

The Great Lakes basin includes 84% of North American surface fresh water and includes a mixture of habitat types amidst a landscape that has been highly modified by agricultural and industrial uses and is home to 16% of the US population (US Census Bureau, 2014 estimates). Areas to the south and west of the lakes include lands which form portions of the Mississippi and Ohio River basins; much of this land escaped major glaciation. Plants and communities in the region are diverse, ranging from boreal forest to southern hardwoods, prairies, bogs and fens.

This site is brought to you in collaboration with the [SEINet Network](#). Please send questions or comments to seinetAdmin@asu.edu.

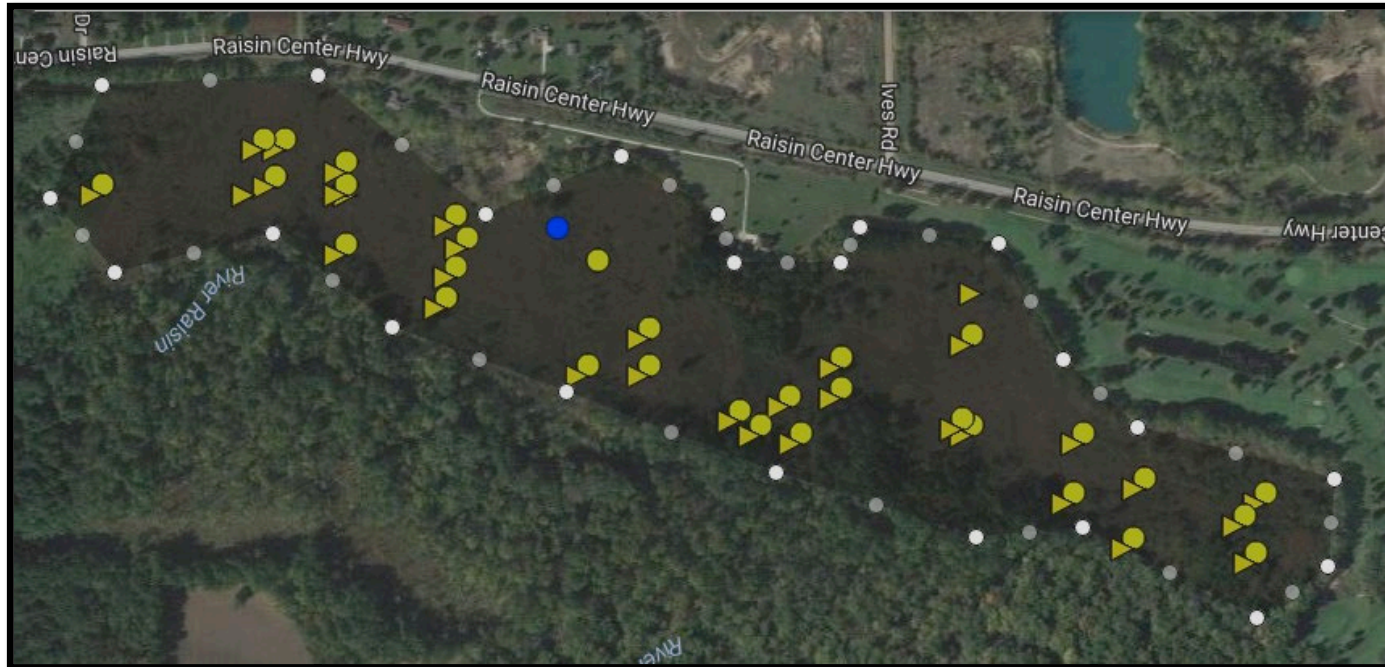
Search Taxon

Plant of the Day



What is this plant?
[Click here to test your knowledge](#)

For Land Owners and Managers



Collections Records Taxa List

○ = Collection Reset Symbology

△ = General Observation Auto Color

■ = Central Michigan University

■ = Prairie Fen Biodiversity Project

■ = University of Michigan Herbarium

For Government and Natural Heritage Agencies



[<http://wisconsinbutterflies.com>]

Poweshiek skipperling (*Oarisma poweshiek*)



Rachel Hackett

Mat-muhly (*Muhlenbergia richardsonis*)

Furthering data workflow skills



Michigan Natural
Features Inventory



Questions

Rachel Hackett

Park Lyndon, Washtenaw County, Michigan

Prairie fens are highly diverse communities

Rachel Hackett

Park Lyndon, Washtenaw County, Michigan

Prairie fens provide habitat to listed species



[<http://wisconsinbutterflies.com>]

Poweshiek skipperling (*Oarisma poweshiek*)



Rachel Hackett

Mat-muhly (*Muhlenbergia richardsonis*)



Joseph Sage [<http://mnfi.anr.msu.edu/>]

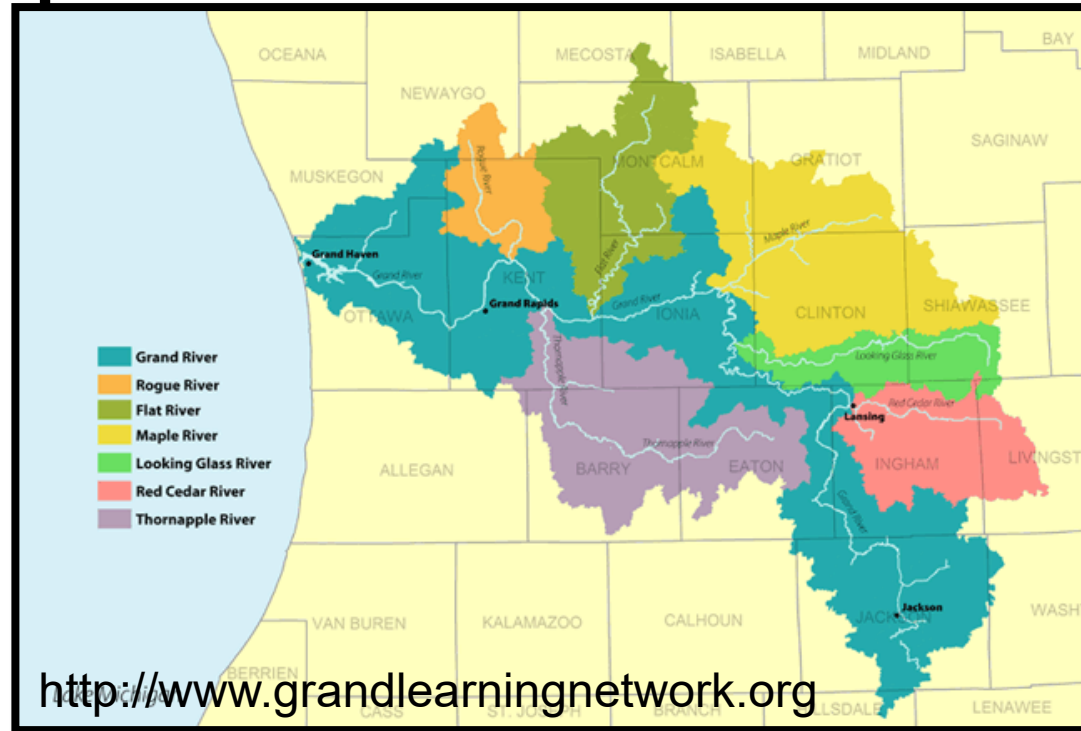
Eastern massasauga (*Sistrurus catenatus catenatus*)

Prairie fens are ecologically important



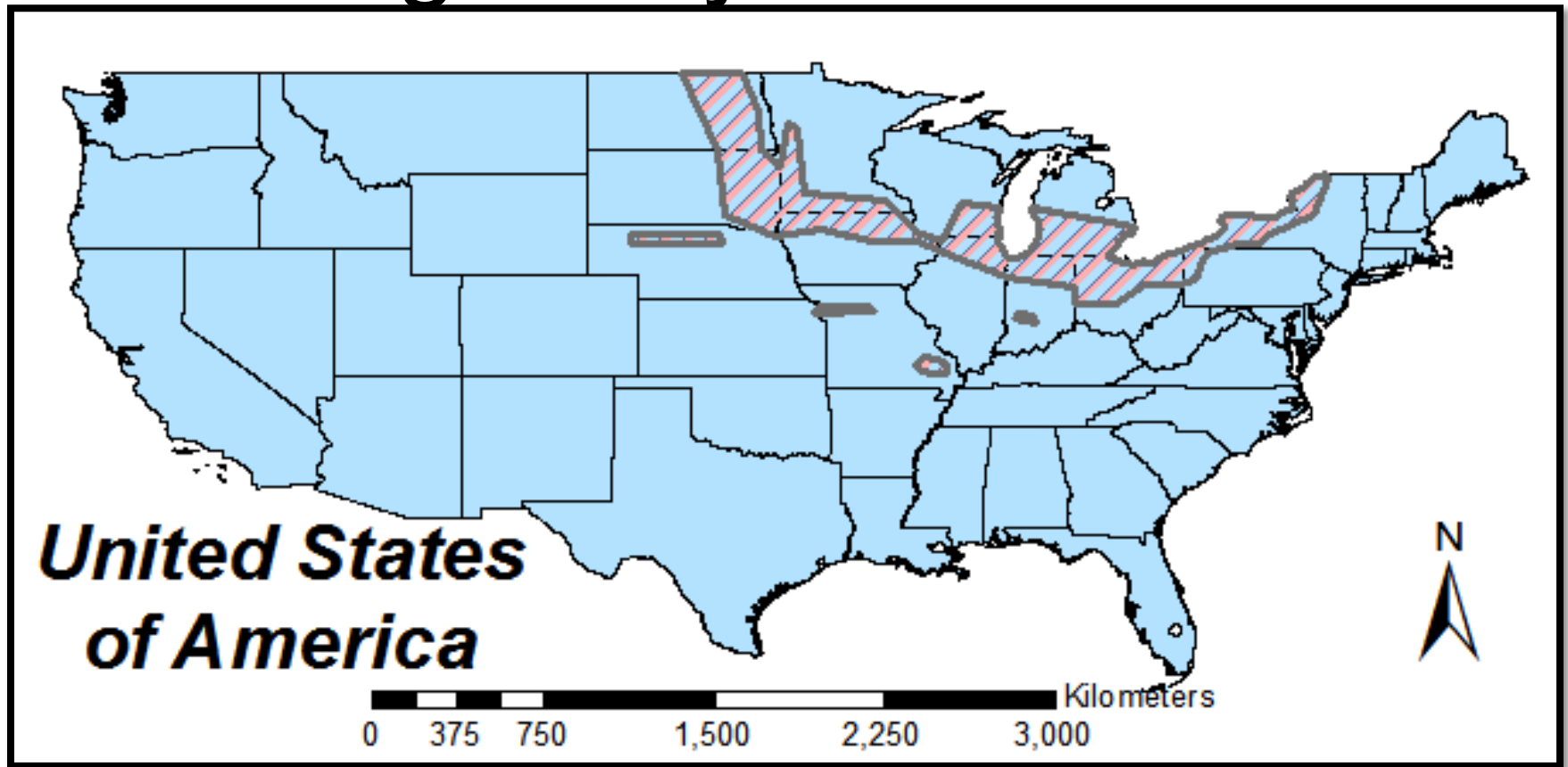
Molly Gorman

Grand River in Liberty Fen (North), Jackson County, Michigan

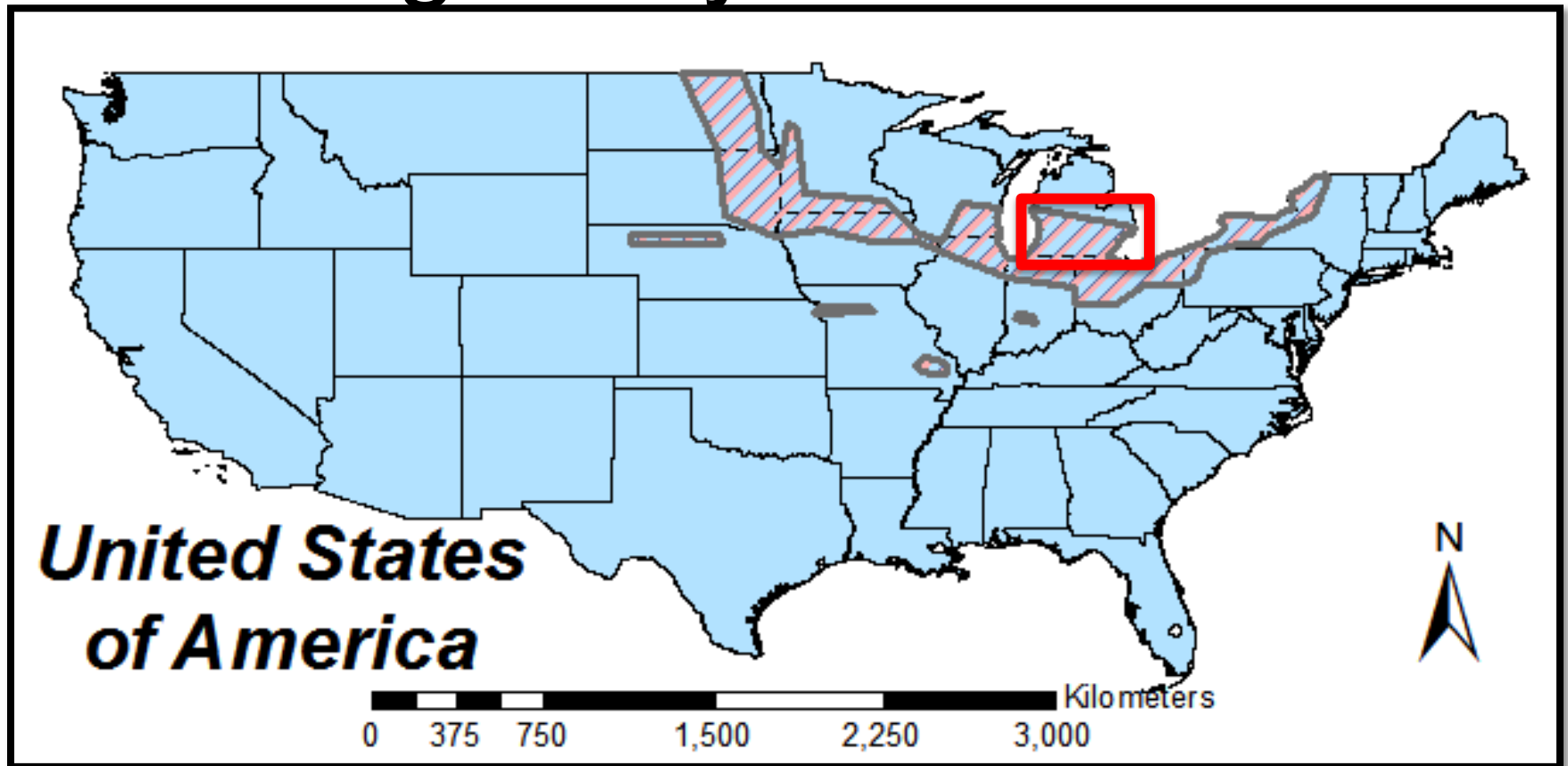


Grand River Watershed

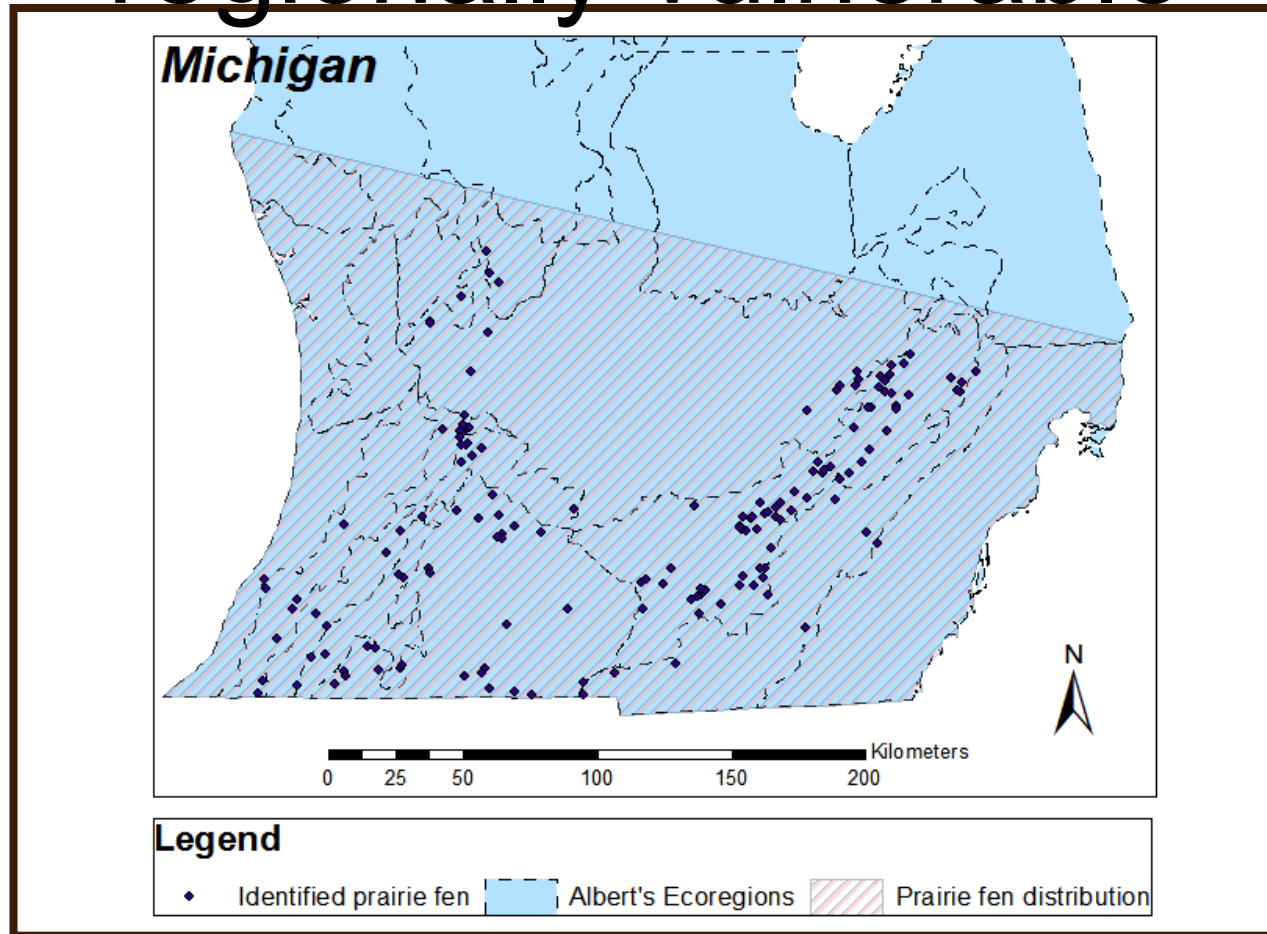
Prairie fens are globally and regionally vulnerable



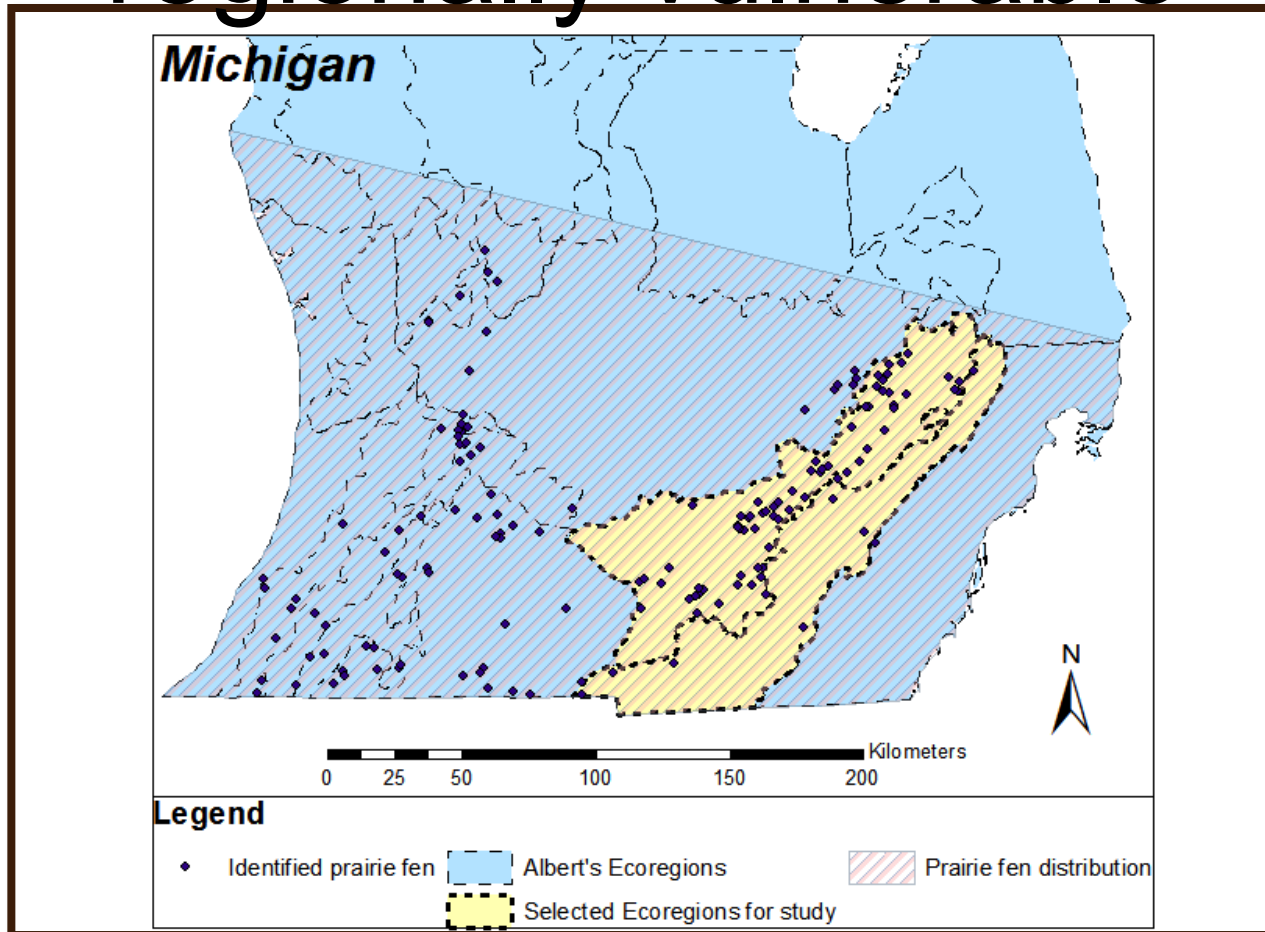
Prairie fens are globally and regionally vulnerable



Prairie fens are globally and regionally vulnerable

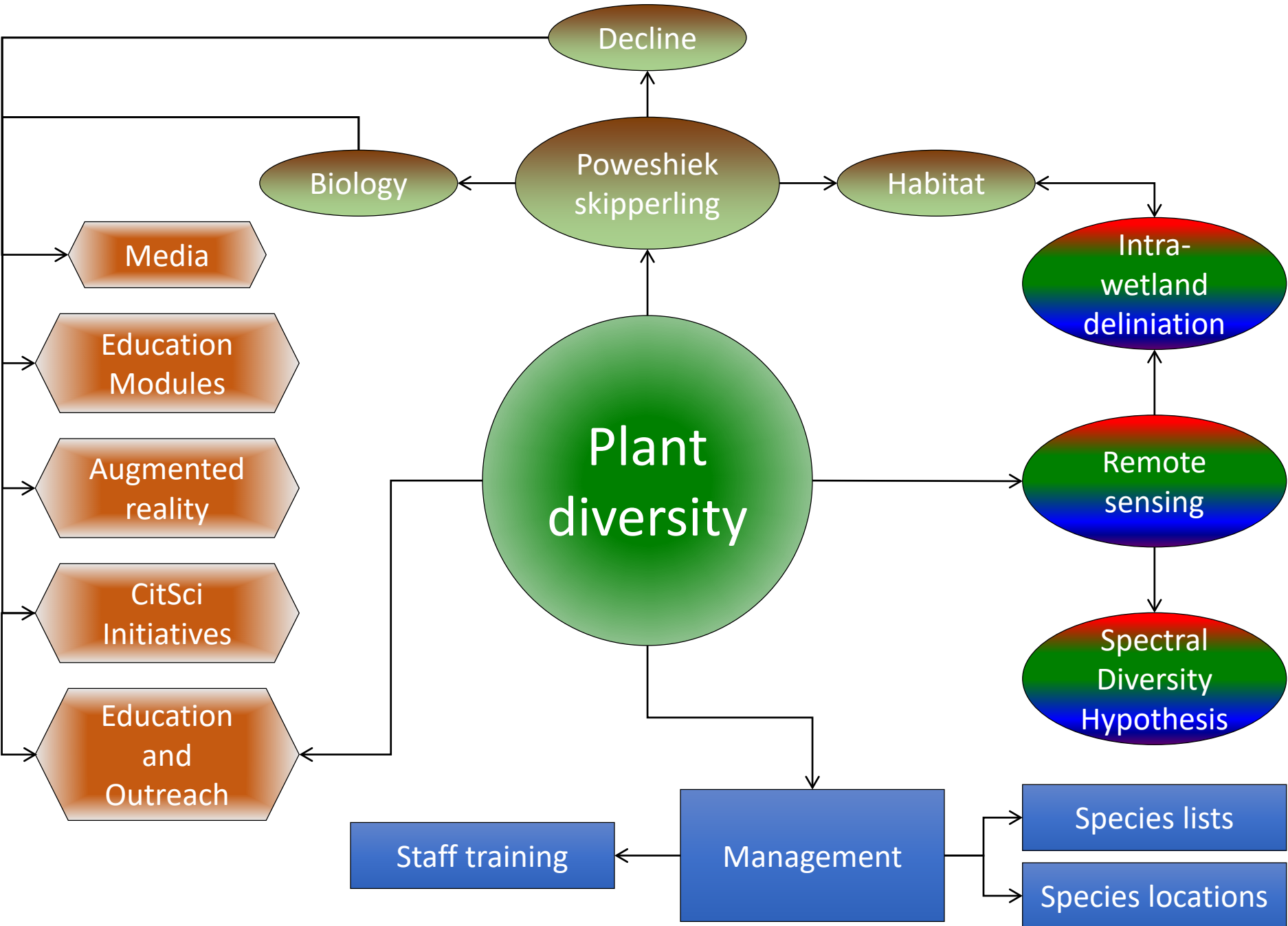


Prairie fens are globally and regionally vulnerable



Project Objectives

- Collect baseline data on prairie fen biodiversity
- Aggregate resources from other sources
- Address large scale research questions and inform conservation and management efforts
- Disseminate data to partners
- Make data available for future use



Natural History Collection



Disseminating Plant Community

Consortium of
Midwest
Herbaria



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Home >> Collection Search Page >> **Prairie Fen Biodiversity Project Details**

Prairie Fen Biodiversity Project (PFBP-Observations)

Since 2012, the Prairie Fen Biodiversity Project (PFBP) has collected baseline plant diversity data in prairie fens to investigate drivers of biodiversity in these diverse systems. Prairie fen wetlands are globally vulnerable wetlands that provide habitat for over 35 state (i.e., Michigan) and federally listed species and function at the headwaters for several major watersheds. These at risk habitats are of high conservation concern and are heavily managed at the local, state, and federal level.

The Prairie Fen Biodiversity Project began in 2012 as a part of the Master's thesis of Central Michigan University student Rachel A Hackett working with Professor Anna K Monfils. The project was continued and expanded by Clint D Pogue in 2014, and has since been a focus of the graduate students in Monfils' laboratory. The original project focused on plant diversity which has expanded to several listed species and pollinators of prairie fen wetlands.

This project has expanded into a Prairie Fen Research Collaborative (<https://www.researchgate.net/project/Prairie-Fen-Research-Collaborative>) that includes several Central Michigan University professors and studies and scientists at the Michigan Natural Features Inventory. The goal of the Prairie Fen Research Collaborative is to conduct research that addresses knowledge gaps hindering the conservation of prairie fen biodiversity and improve the efficacy of prairie fen research, monitoring, and management. By accruing knowledge and creating new tools, we help a variety of agencies and organizations working to conserve prairie fens for the benefit of unique species and people.

Plant species list can be found at <http://midwestherbaria.org/portal/projects/index.php?pid=113>.

Contact: Anna K Monfils (monfi1ak@cmich.edu)

Home Page: <https://www.researchgate.net/project/Prairie-Fen-Research-Collaborative>

Collection Type: Observations

Management: Live Data managed directly within data portal

Global Unique Identifier: 068ce307-4e84-4ab8-9c9e-159758a03546

Digital Metadata: EML File

Usage Rights: CC0 1.0 (Public-domain)

Access Rights: Contact Anna K Monfils (monfi1ak@cmich.edu)

Collection Statistics

Disseminating Plant Community Dataset

Consortium of
Midwest
Herbaria

Dataset



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Home >> Collection Search Page >> **Central Michigan University Details**

Central Michigan University (CMC)

The Central Michigan University Herbarium (CMC) strives to integrate research and education, providing centralized botanical resources, research facilities, and educational opportunities to the University and broader scientific community.

Contact: Anna Monfils, Director (monfi1ak@cmich.edu)

Home Page: <http://cmcherbarium.bio.cmich.edu/>

Collection Type: Preserved Specimens

Management: Live Data managed directly within data portal

Global Unique Identifier: 9798472c-c2da-40b9-a636-cec2c61d4589

DwC-Archive Publishing: <http://midwestherbaria.org/portal/collections/datasets/datapublisher.php>

Live Data Download: Login for access

Digital Metadata: EML File





Usage Rights: <http://creativecommons.org/licenses/by-nc/3.0/>

iDigBio Dataset page: <https://www.idigbio.org/portal/recordsets/c49bc91d-0a50-497b-8b17-d77808745cf9>

Collection Statistics

- 20,502 specimen records
- 4,102 (20%) georeferenced
- 20,502 (100%) with images
- 19,444 (95%) identified to species
- 176 families
- 743 genera
- 1,977 species
- 2,131 total taxa (including subsp. and var.)

Plant Community Dataset

<p>Taxon:</p> <p>All Species </p> <p>Display/Reset Species List</p> <hr/> <p>Display as: Scientific Name </p> <p>Plant habit</p> <p><input type="checkbox"/> herb</p> <p><input type="checkbox"/> shrub</p> <p><input checked="" type="checkbox"/> tree</p> <p>Leaves type </p> <p><input type="checkbox"/> simple</p> <p><input type="checkbox"/> compound</p> <p>Leaves arrangement </p> <p><input type="checkbox"/> alternate</p> <p><input type="checkbox"/> opposite</p>	<p>Waterloo Recreation Area - Mount Hope Road Fen</p> <p>Hackett, RA; Karbowski, HM; Peters, S; Monfils, AK;</p> <p>Species Count: 14</p> <p>Adoxaceae</p> <p><i>Viburnum dentatum</i></p> <p><i>Viburnum lentago</i></p> <p>Betulaceae</p> <p><i>Betula pumila</i></p> <p><i>Corylus americana</i></p> <p>Cornaceae</p> <p><i>Cornus amomum</i></p> <p><i>Cornus foemina</i></p> <p>Fabaceae</p> <p><i>Apios americana</i></p>
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Issues with Integrating Data

- Transcription time
- Data discoverability
- Compatibility among different data sources
- Integrating media
- Adaptiveness of disseminated data
- Longevity and access to meta-data

**“The stage is now set for a new generation of collecting, pre-serving, analyzing, and integrating biological samples—
a generation devoted to interdisciplinary research into complex biological interactions and processes.”**

- Schindel DE, Cook JA (2018) The next generation of natural history collections. *PLoS Biol* 16(7): e2006125