Welcome to Botany 401 - Vascular Flora of Wisconsin

Brandon Corder, instructor



Today's agenda

1. Introduction to the course and instructors
2. Overview of the flora of Wisconsin
   - With sneak peeks of some of our future topics!

Our Course: Instructors



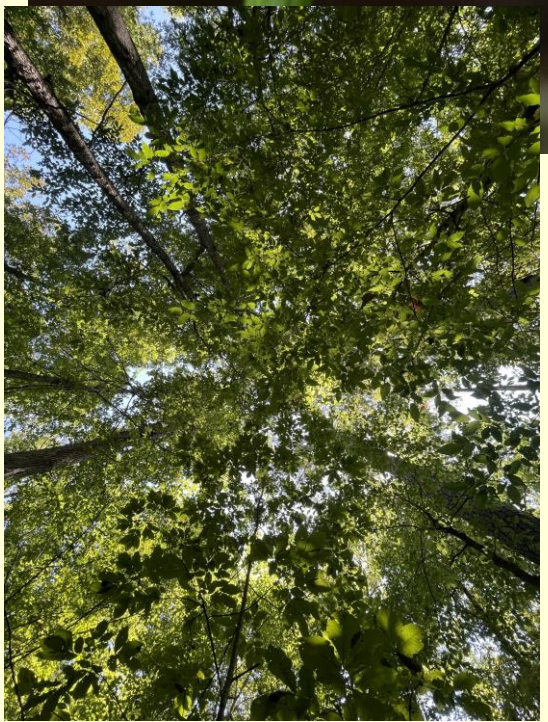
Brandon Corder (he/him)

6th year PhD candidate (Botany)
Originally from Florida
Study orchids in the Great Lakes
I love Wisconsin!

bcorder@wisc.edu











Our Course: Instructors



Patty Chan (she/her)

5th year PhD candidate (Botany)
Originally from New Jersey
Studies plants in Australia!

Our Course: Layout

- Daily lectures: 11:00-11:50am (recorded)
- T/R Labs (4 in person, 2 remote): 2:00-4:00pm
  - Some in **Birge 243**, others off-campus (see schedule)

Our Course: Grading

- 2 assignments (50 pts) – ways to get to know more about flora / communities in a self-led way
- 1 ongoing "project" (100 pts) – experience using iNaturalist app + with making labels for field-collected specimens
- 1 Field "exam" – identifying plants in the field
- Maintaining a field notebook

- Short questions following each lecture (on your own, up to 24 hours after) – **check after class under Assignments in Canvas!**

Our Course: Kemp Station Trip

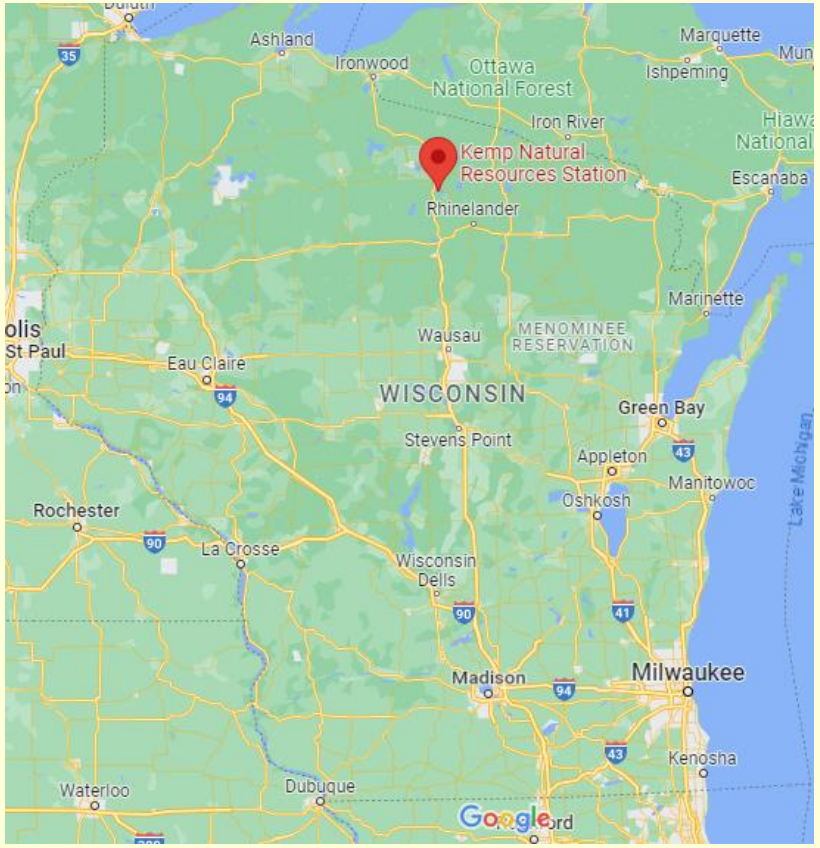
June 12-16: field trip to Kemp Natural Resources Station in Woodruff, WI

Field exam administered

Some mini-workshops!

Transportation / lodging costs covered – food cost split among us

More info to come soon



Our Course: Other Info

No required texts – **but, explore the resources on Canvas**

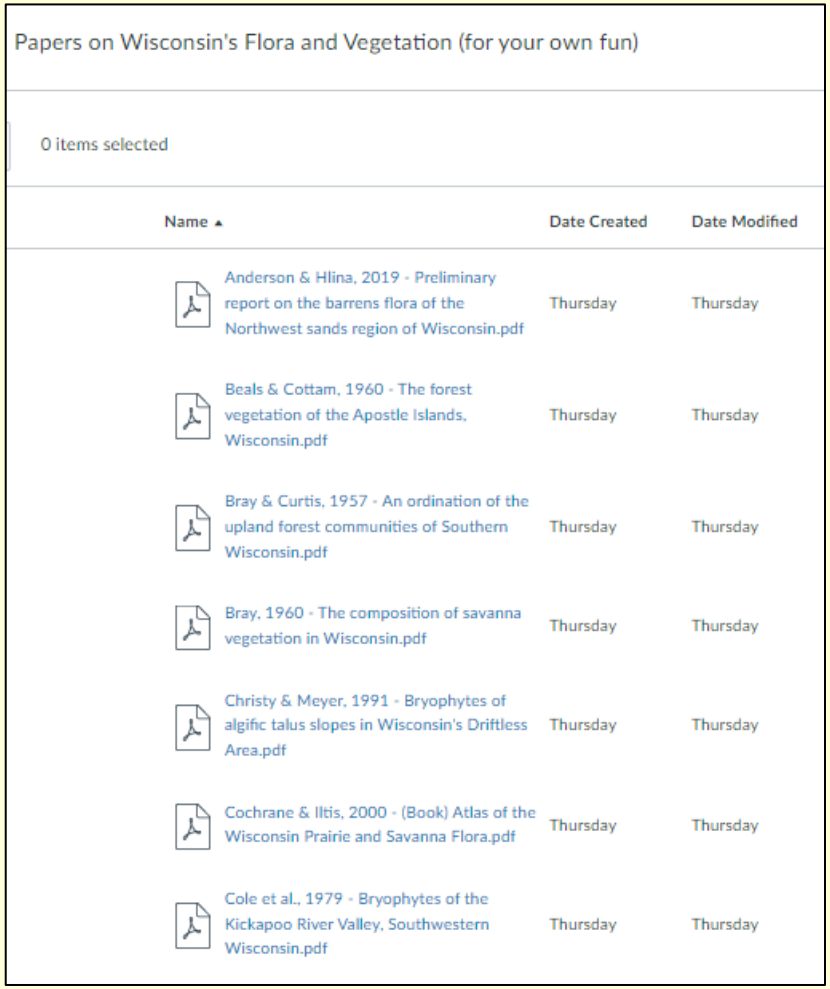
Short time span! Make sure late work gets in; coordinate with TA, Patty

Ask for help! We love to talk plants

On notetaking/exams for this class: point isn't to memorize everything on every slide, but to build familiarity with terms/concepts/patterns and then give the knowledge of how to start a life-long journey to familiarize yourself with any flora!



Corallorhiza striata, striped coralroot
Orchidaceae



Files on Canvas: some papers on Wisconsin flora for you to explore on your own!



Front page of Canvas: links to some resources we will use / you may use in the future

Botany 401
Vascular Flora of Wisconsin

Objectives for the course

1. Become familiar with a local flora: species diversity, biogeographical patterns, rarity, natural history, community types, etc.



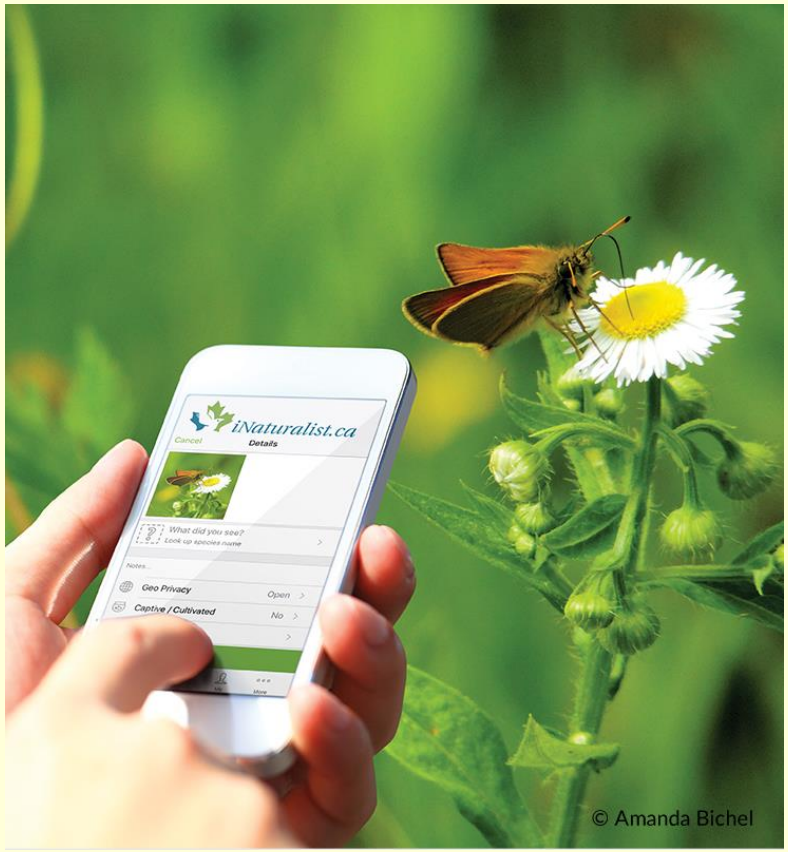
Iris lacustris, dwarf lake iris
Iridaceae

Botany 401
Vascular Flora of Wisconsin

Objectives for the course

2. Learn skills of identifying organisms, in the field or in the lab – includes use of technical keys, manuals, etc.

3. Utilize and contribute to community science platforms (e.g. iNaturalist) or natural history collections (e.g. herbarium collections)



Botany 401
Vascular Flora of Wisconsin

My goals for the class:

1. Have fun! Plants are beautiful and learning more about our natural world is fun
2. To learn more about Wisconsin and especially what makes our state unique
3. To learn skills that can be applied after the class: your next job, hobby, etc.
4. **To build a welcoming community in our classroom for folks of all different backgrounds / experience levels**





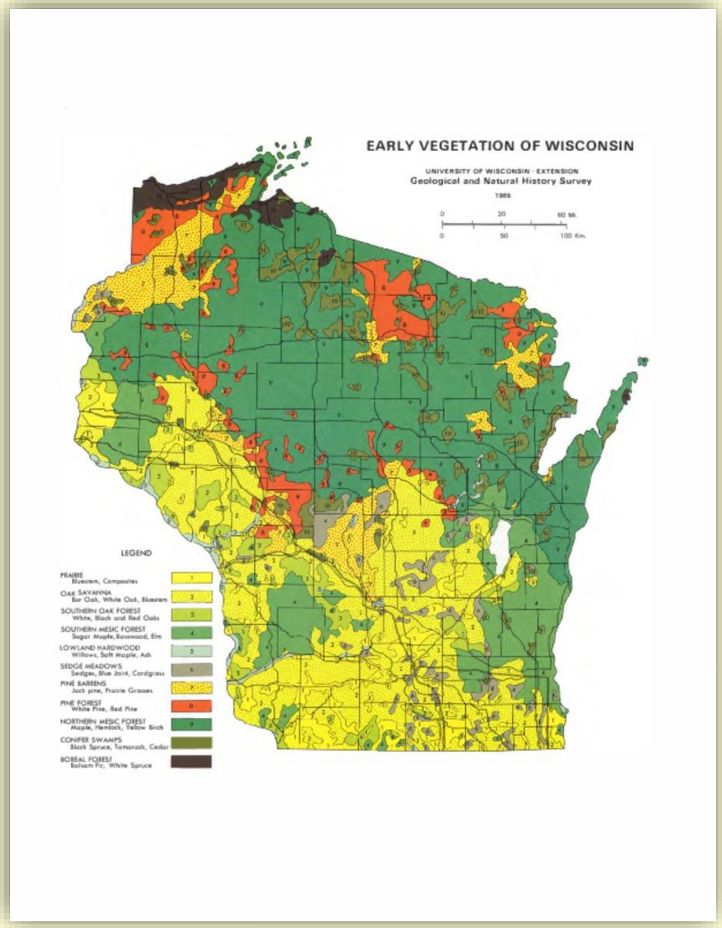


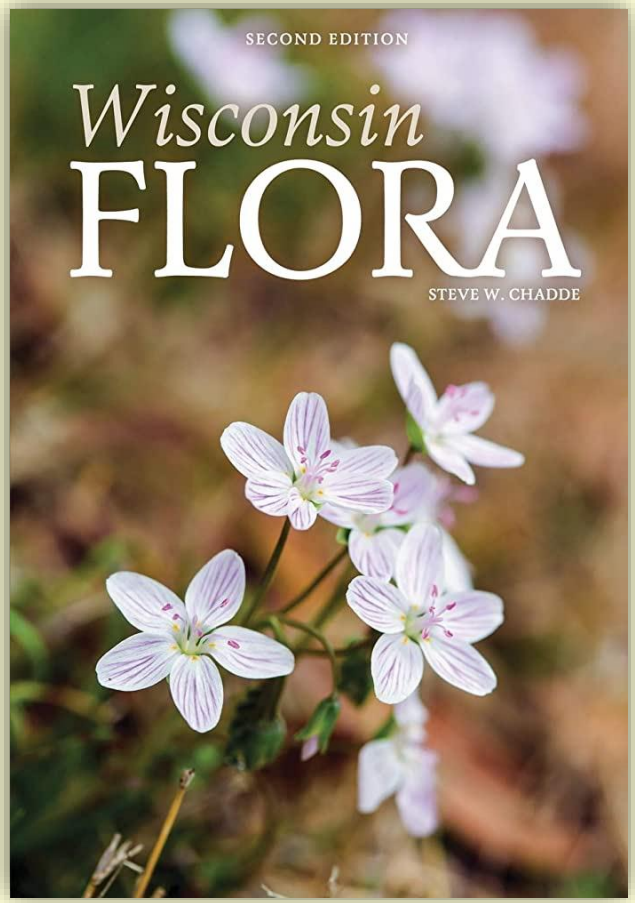



© Skillet Creek Medi



What is a Flora?





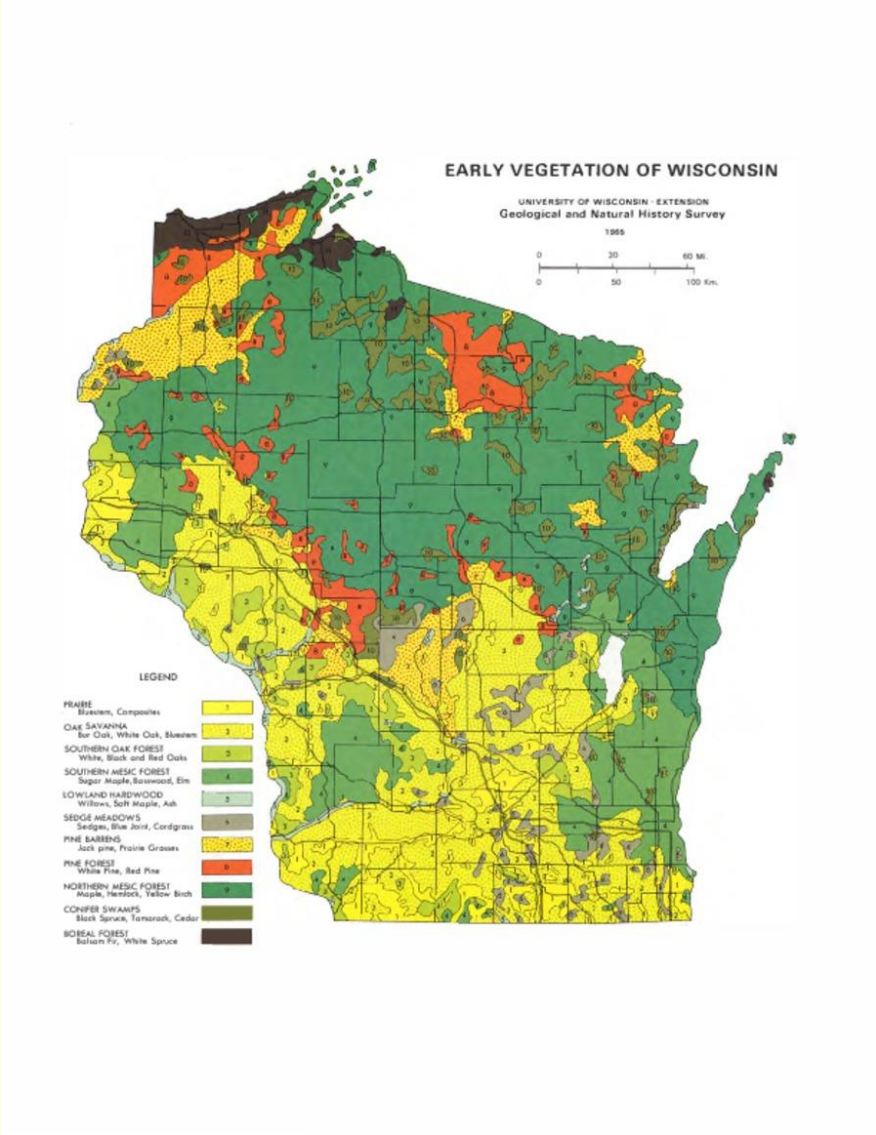
FLORA:

(1) The plants of a particular region, habitat, or time period

(2) A work that lists all the plants of a particular region, period, etc.

Floras include:

- Plants that occur naturally (**native**) in that region
- Plants that are non-native (**introduced**, or **invasive**) that are found wild in a region
- May include plants that occur naturally but ephemerally (**waifs**) or are otherwise not established, or recently extinct (**extirpated**) plants

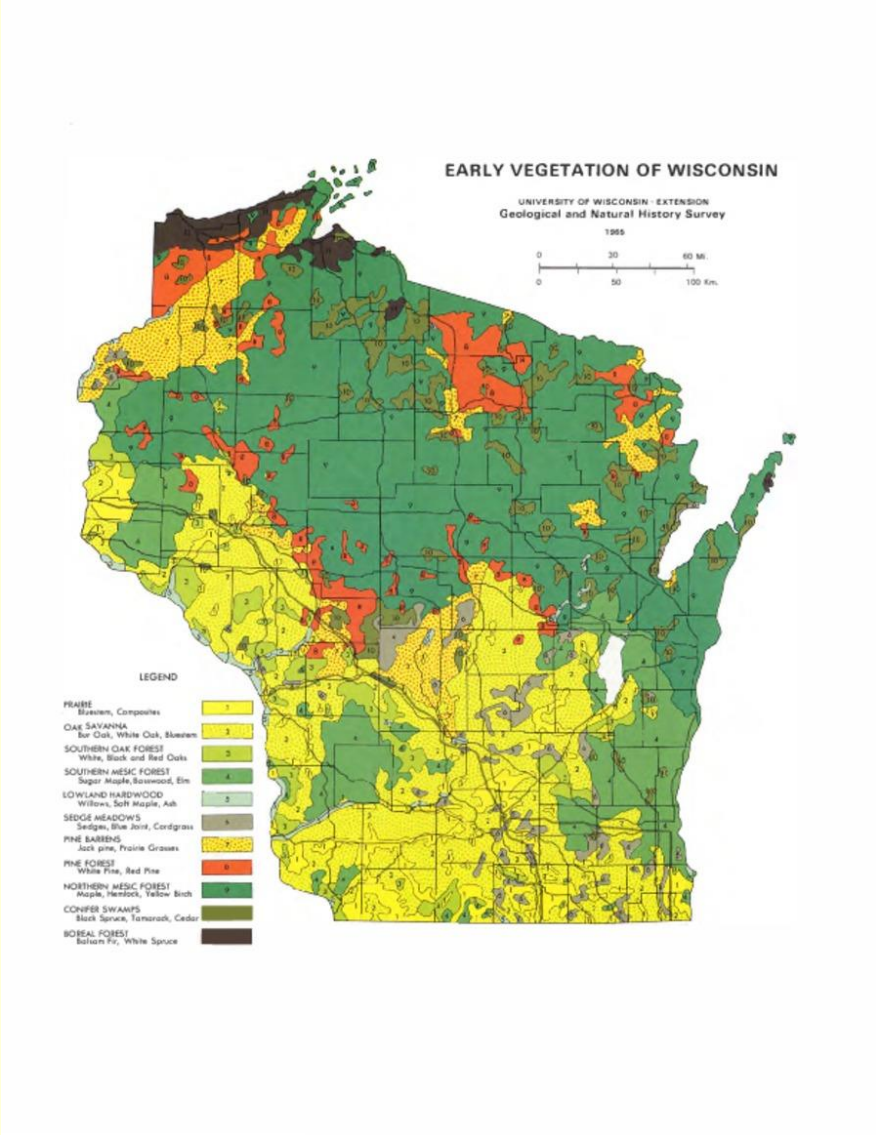


Floras often do not include:

- Plants only found in cultivation (e.g., **agricultural plants**, **ornamental plants**), unless they escape cultivation
- Unsubstantiated claims, depending on its evidence / veracity

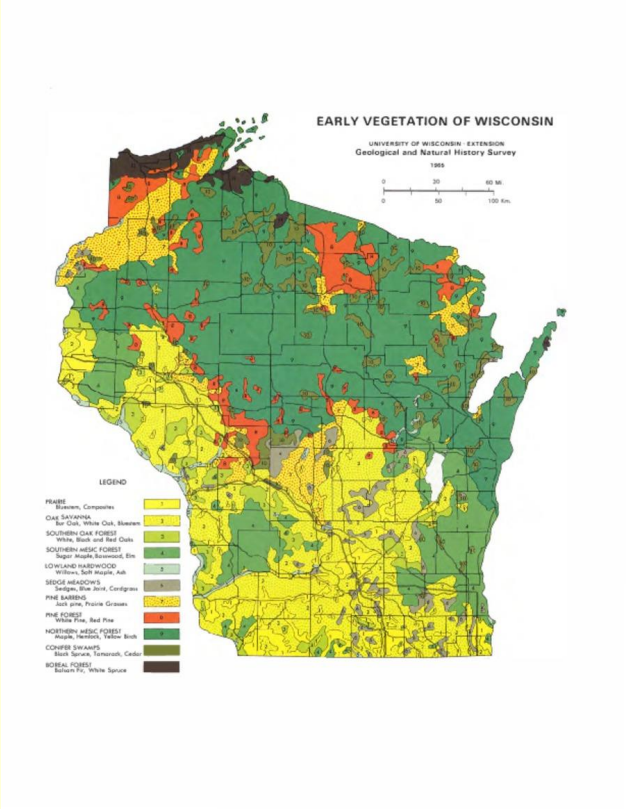
Context is important!

All can be more complicated to discern than you might think



Revisiting our list from a few slides ago:

- Plants that occur naturally (**native**) in that region
  - Is it truly native?
  - How long has it been here?
- Plants that are non-native (**introduced**, or **invasive**) that are found wild in a region
  - Is it an ancient or a recent introduction?
  - Was it introduced by humans or by natural means?
- May include plants that occur naturally but ephemerally (**waifs**) or are otherwise not established, or recently extinct (**extirpated**) plants
  - Is it truly extirpated? How long must pass before it isn't included in a flora?
  - What is a waif?

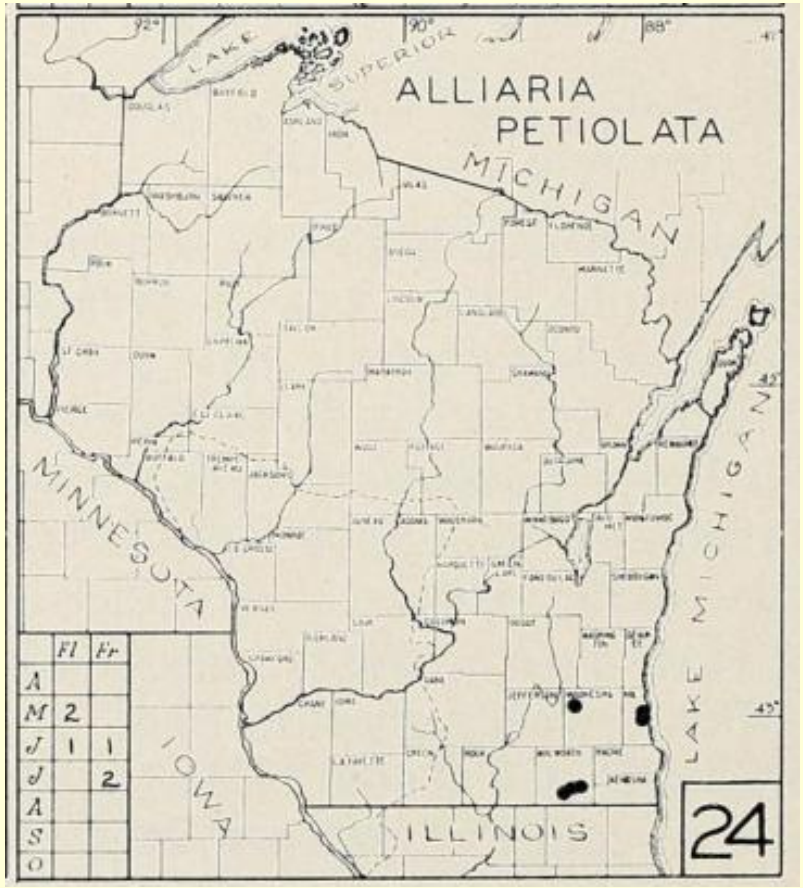


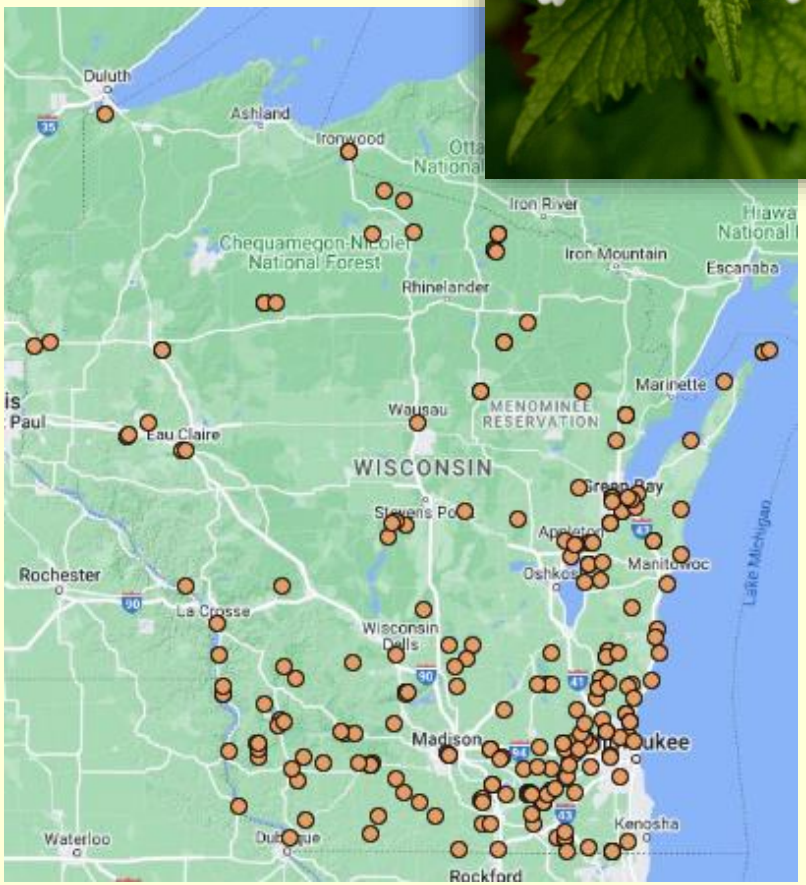
Feral hemp (*Cannabis sativa*), cultivated in Wisconsin but occurring in a natural (weedy) context – **Yes** in a Flora



Plant distributions change drastically over time, like in spread of non-native plants, (garlic mustard, *Alliaria petiolata*)







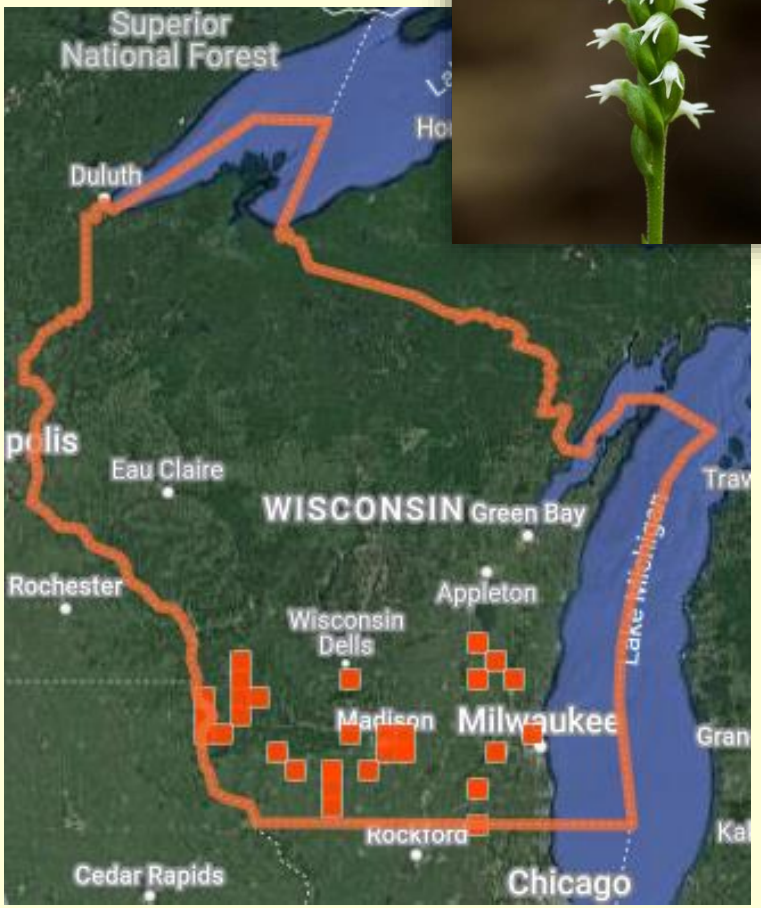
Alliaria petiolata in Patman & Iltis, 1960 - Preliminary reports on the flora of Wisconsin

Alliaria petiolata in WisFlora database (accessed May 2023)

Various factors also affect the distributions of plants considered native to a region: Northward spread of autumn lady's tresses, *Spiranthes ovalis* var. *erostellata*



Spiranthes ovalis var. *erostellata* in WisFlora database (accessed May 2023) – considered native



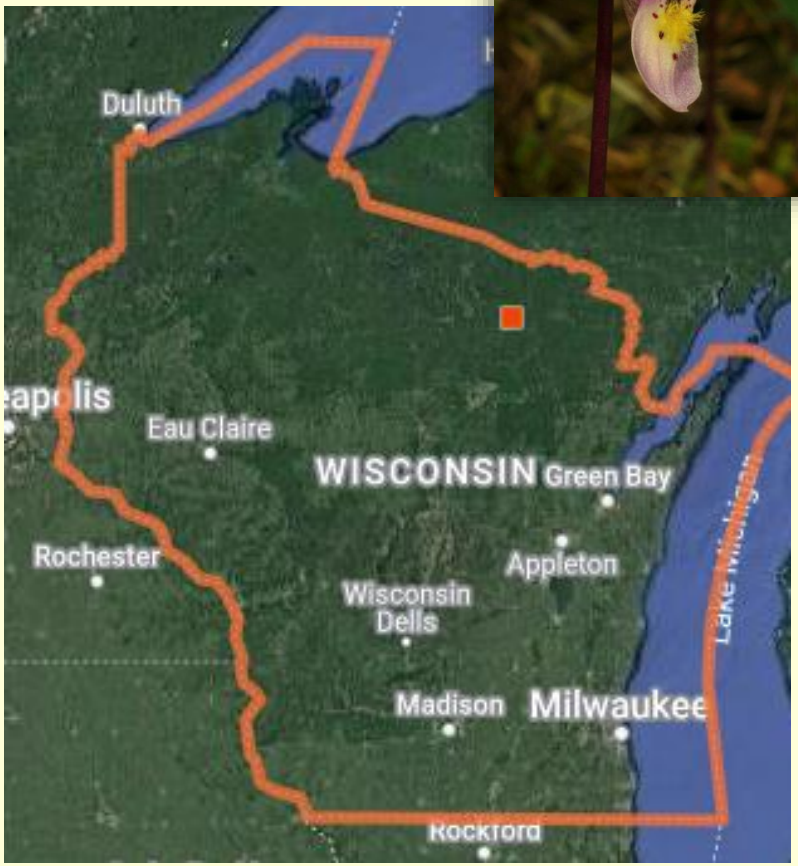
Spiranthes ovalis var. *erostellata* observations on iNaturalist (accessed May 2023)



Various factors also affect the distributions of plants considered native to a region: Decline of Eastern fairy slipper, *Calypso bulbosa* var. *americana*







Calypso bulbosa var. *americana* in WisFlora database (accessed May 2023) – 1897-1996

Calypso bulbosa var. *americana* observations on iNaturalist (accessed May 2023) – 1 obs post 1996

The importance of a Flora:

- Baseline for understanding our plant distributions and status over time
  - Where do they occur? Are they increasing or decreasing in number?
  - Crucial for conservation, mitigating future climate change scenarios, identifying land for conservation
- Understanding the taxonomy and diversity of plants in a region
  - Identification of regionally unique taxa, species new to science, etc.
- Practical identification of plants in a consistent, reliable way (for land managers, scientists, enthusiasts, interested folks in the public)
- Sparking all sorts of other scientific or public inquiry!

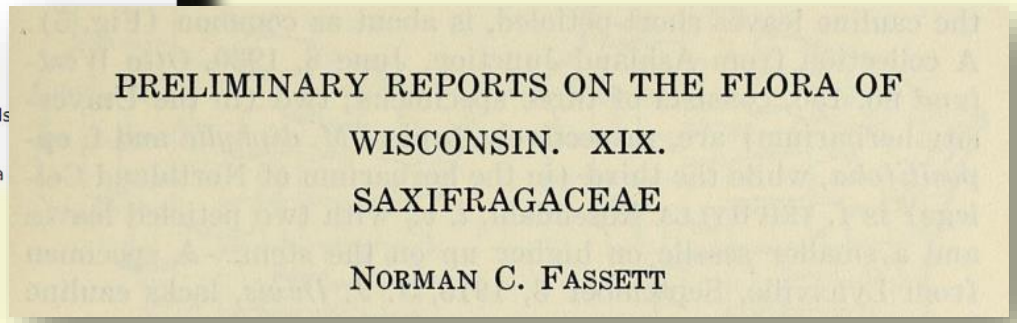
Does Wisconsin have a published “Flora”?

Not exactly – but it is in the works!

Various field guides also cover Wisconsin’s plants






PRELIMINARY REPORTS ON THE FLORA OF WISCONSIN. XIX.
SAXIFRAGACEAE

NORMAN C. FASSETT

26

Hydrocotyle L. Marsh- or Water-pennywort

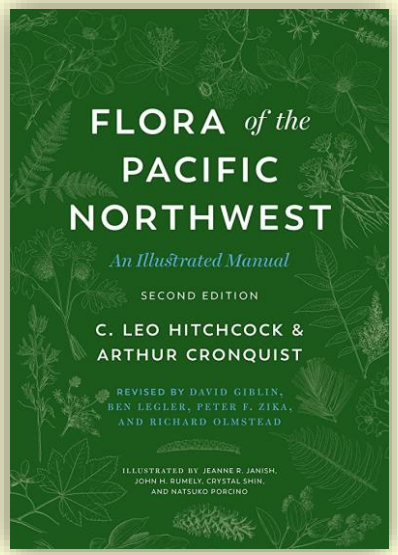
Infl gen a simple umbel, sometimes proliferous, peds ascending to reflexed; fls white, greenish, or yellow; fr orbicular or ellipsoid, ± flattened laterally, dorsal surface rounded or acute, with narrow, acute ribs, or the ribs absent; low, ann or per (ours) herbs, glab (ours) or hairy, with creeping or floating sts and petiolate, often peltate lvs. (Gr *hydro*, water, and *kotyle*, flat cup, referring to the peltate lvs). *H. umbellata* L., with peltate lvs and long-ped fls, occurs in s OR but is not known to reach our area.



1a Lvs not peltate, bls rotund-reniform, gen cordate, 1–6 cm wide, margins 5–6-lobed nearly to middle, petioles weak, mostly 0.5–3.5 dm; peduncles much < petiole, axillary, 1–5 cm; umbel 5–10-fld; fr suborbicular, 1–3 mm, ribs absent; pls ± aquatic, marshes, lakeshores, and wet ground; w Cas, WA to CA and AZ, e in s US to c and e N Am; widely intro elsewhere 1 **H. ranunculoides** L. f.

1b Lvs peltate, bls ± orbiculate, never cordate, gen 1–6 cm wide, margins coarsely and weakly crenate to shallowly 8–14-lobed, petioles mostly 0.3–1 dm; peduncles gen = petioles, axillary, 1.5–20 cm; umbel to 15-fld; fr elliptic, 1–3 mm, ribs prominent; pls ± terrestrial, wet areas; historic (1943) in Benton Co, OR, otherwise Coos Co, OR to CA, e across s US to Atl; cosmopolitan 2 **H. verticillata** Thunb.

Oplopanax (Torr. & A. Gray) Miq.



Hydrocotyle Linnaeus 1753 (WATER-PENNYWORT)

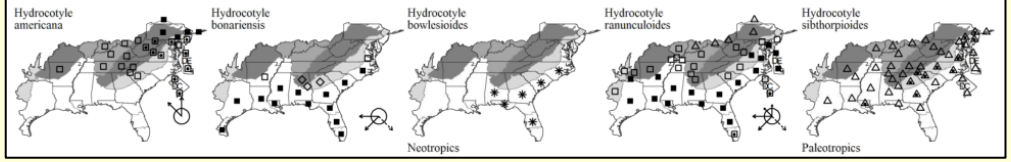
A genus of about 180 species, perennial and annual herbs, cosmopolitan (especially Australia) (Plunkett et al. 2018b). Molecular analyses have clarified that the affinities of *Hydrocotyle* lie with the Araliaceae rather than the Apiaceae (Downie et al. 1998; Chandler & Plunkett 2004).
References: MC; Plunkett et al (2018b) in Kadereit & Bittrich (2018).

1 Leaves peltate, lacking a sinus extending to the attachment of the petiole.
  2 Inflorescence umbellate; leaves 1-4 (-7) cm wide ..... ***Hydrocotyle umbellata***
  2 Inflorescence verticillate or umbellate-verticillate (when first developing sometimes appearing merely umbellate); leaves 1-15 cm wide.
    3 Inflorescence compound, the main inflorescence axis with nodes which produce verticils or umbels of pedicellate flowers, the inflorescence nodes also producing branches which themselves produce verticils or umbels of flowers; leaves (1-) 4-15 cm wide ..... ***Hydrocotyle bonariensis***
    3 Inflorescence verticillate, all the flowers borne sessile or on pedicels on the unbranched inflorescence axis; leaves 1-6 cm wide.
      4 Flowers and fruits pedicellate, the pedicels 1-10 mm long ..... ***Hydrocotyle tribotrys***
      4 Flowers and fruits sessile or subsessile ..... ***Hydrocotyle verticillata***
1 Leaves not peltate, a sinus extending to the attachment of the petiole.
  5 Central leaf lobe notably more distinct than the other lobes (the sinuses on either side extending 1/3 to 3/4 of the way to the petiolar attachment); stems and petioles fleshy ..... ***Hydrocotyle ranunculoides***
  5 Central leaf lobe not more distinct than the other lobes (the sinuses on either side extending 1/10 to 1/4 the way to the petiolar attachment); stems and petioles filiform.
    6 Fruiting umbels on peduncles 1-3 mm long;
    6 Fruiting umbels on peduncles 9-24 mm long
      7 Leaves 5-lobed, 15-30 mm wide.....
      7 Leaves 7-lobed, 5-13 mm wide.....

* ***Hydrocotyle bowlesioides*** Mathias & Constance. **Hab:** Lawns. **Dist:** Native of Costa Rica and Panama (naturalized in South America, se. United States, and New Zealand). See Anderson (1983) for discussion of the species' occurrence in Thomasville, Thomas Co. GA. See Krings, Newton, & Liles (2017) for the first report for NC (Scotland County). **Comm:** Reported for Panhandle FL (Wunderlin & Hansen 2011). **Syn:** = Fl7, K1, K3, K4, MC, Meso4.1, WH3. NatureServe GNR (Not Yet Ranked).

Hydrocotyle ranunculoides Linnaeus f. SWAMP WATER-PENNYWORT. **Hab:** Stagnant to (less commonly) swiftly flowing waters of swamps pools, backwaters, blackwater streams, sometimes forming floating mats. **Dist:** NY, IL, MO, and KS south to s. FL and se. TX; BC south to CA, AZ, Mexico, central America, and South America. **Phen:** Apr-Jul. **Syn:** = Ar, C, F, Fl7, G, GrPl, GW2, Il, K1, K3, K4, MC, Meso4.1, Mo2, NcTx, Pa, RAB, S, Tn, Tx, Va, W, WH3, WV. NatureServe G5 (Secure).

* ***Hydrocotyle sibthorpioides*** Lamarck. LAWN WATER-PENNYWORT. **Hab:** Lawns, pond margins, cracks between paving stones. **Dist:** Native of Asia and Africa. **Phen:** Mar-Sep. **Comm:** Greatly increasing as a lawn and garden weed. **Syn:** = Ar, C, F, Fl7, G, K1, K3, K4, MC, Pa, RAB, Tn, Va, WH3, WV. NatureServe GNR (Not Yet Ranked).



Flora of the Southeastern United States

Edition of April 13, 2022



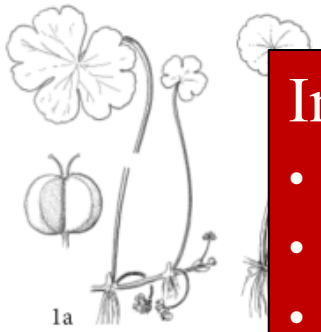
by
Alan S. Weakley and the Southeastern Flora Team*
University of North Carolina at Chapel Hill Herbarium (NCU)
North Carolina Botanical Garden
University of North Carolina at Chapel Hill
Campus Box 3280
Chapel Hill NC 27599-3280

Produced from the FloraManager database system by Michael T. Lee

26

Hydrocotyle L. Marsh- or Water-pennywort

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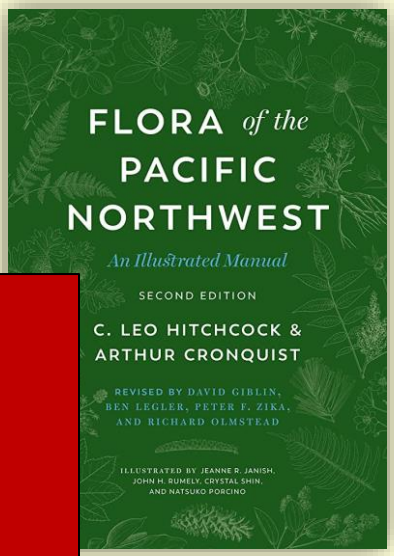
1a

1a Lvs not peltate, bls rotund-reniform, gen cordate, 1–6 cm wide, margins 5–6-lobed

Information that useful floras have

- Plant distributions / maps
- Technical keys and details for identification
- Biogeographical or historical notes
- Synonyms or notes on nomenclature/taxonomy
- Illustrations

Takes a LOT of work by many people!



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References: MC; Plunkett et al (2018b) in Kadereit &

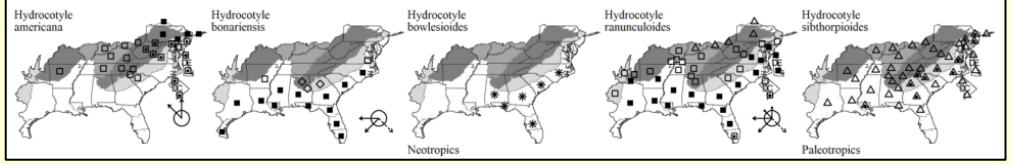
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1756

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by

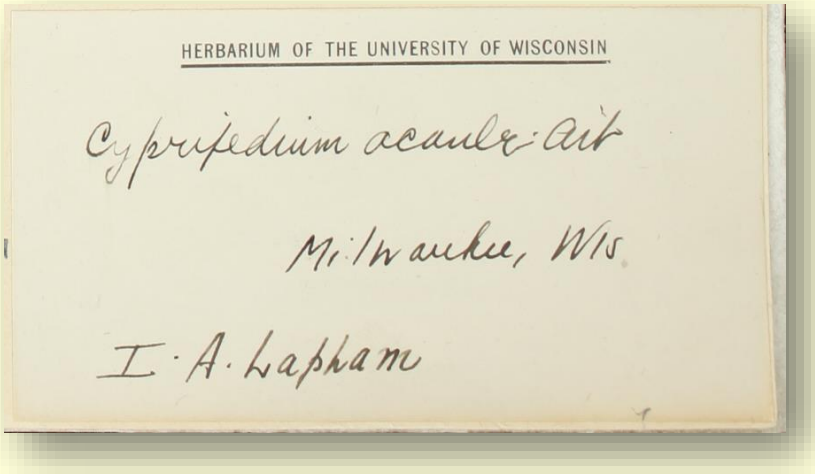
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Chapel Hill NC 27599-3280

Produced from the FloraManager database system by Michael T. Lee

How do we know what plants are in our state?

- First: someone must observe something! (some **collection bias** in where this happens based on population, proximity to a university, time of year, how "cool" a place is)
- Next, a collection or collections are made with important "**metadata**": who, what, when, where, etc.
- Specimen is identified using existing resources in the field or in the **herbarium**
- Many herbarium specimens aggregated together to "**map**" the flora




HERBARIUM OF THE UNIVERSITY OF WISCONSIN

Cypripedium acaule Ait

Milwaukee, Wis

I. A. Lapham

Orchidaceae Pink lady's-slipper

Cypripedium acaule Ait. WIS

Door County. Town of **Sturgeon Bay**. Ridge/swale community south of Lake Lane. N44.790371 W87.323485. Elev. 619 ft.

Uncommon pink-flowered slipper orchid growing on an old sandy beach ridge beneath large eastern hemlocks, white pines, and northern white cedar. Other plant associates include *Lysimachia borealis, Polygola paucifolia,* and *Lycopodium* spp. Digital photos taken.

Kevin A. Swagel #681 12 June 2011

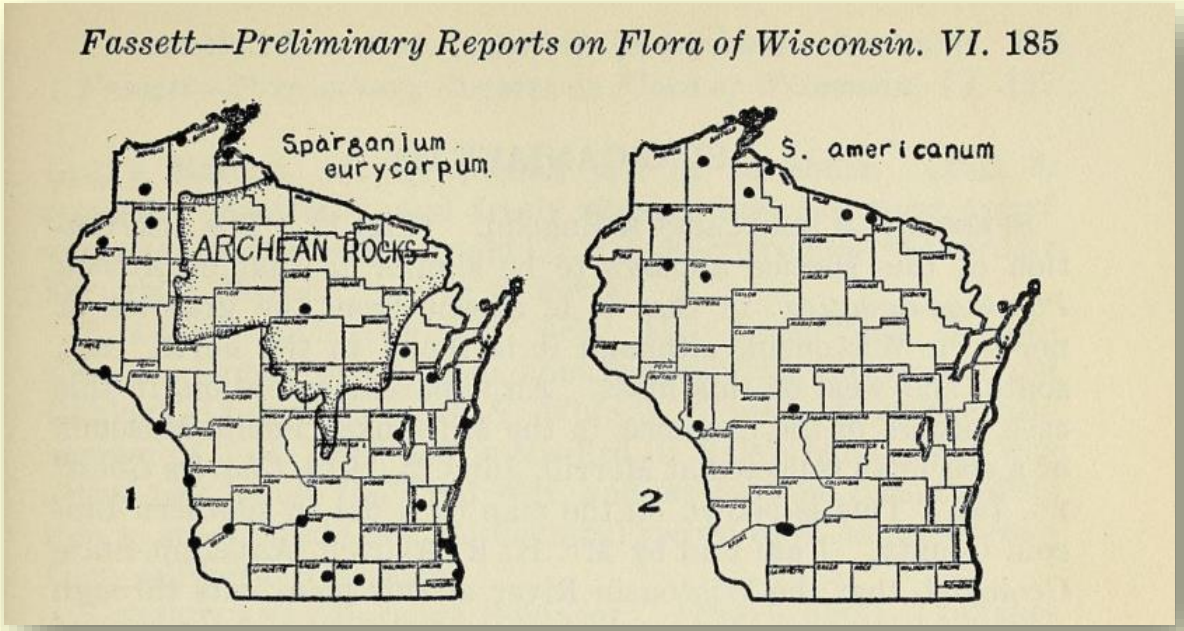
Historical labels:

- Scientific name & author
- Vague location
- Collector
- Date (sometimes)

We will get experience making good labels later this semester!

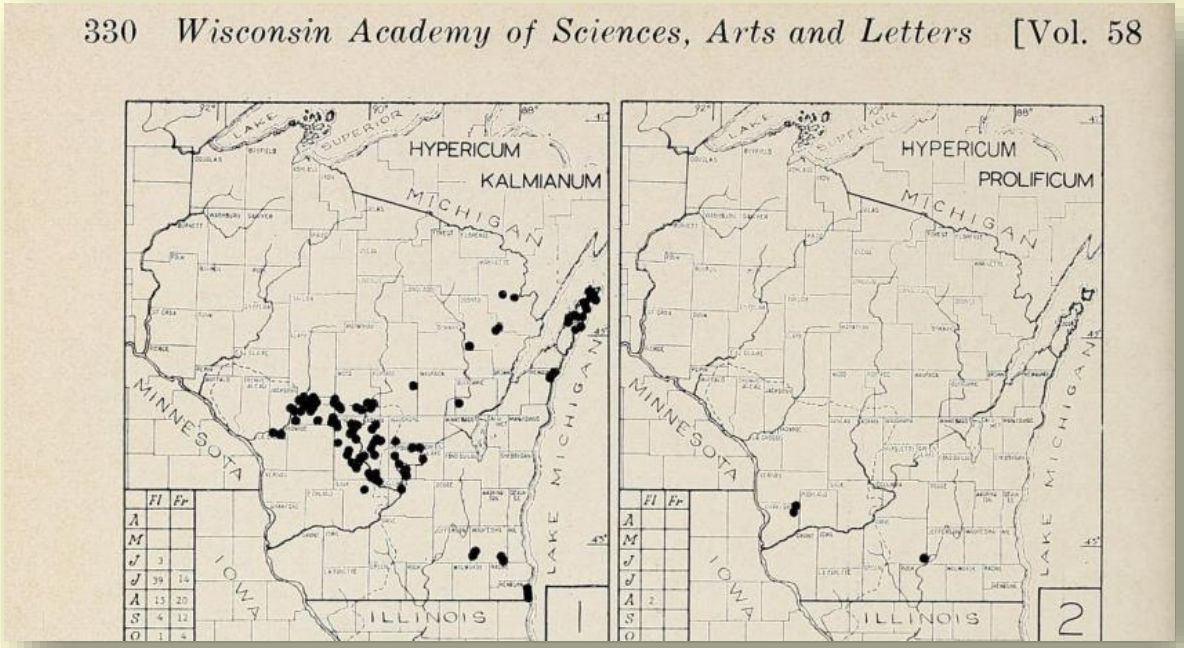
(Good) modern labels:

- Scientific name & author
- Locality and coordinates, elevation
- Habitat characteristics and associated species
- Date
- Collector and who "determined" the collection
- Plant characteristics: rarity, color, growth notes, etc.



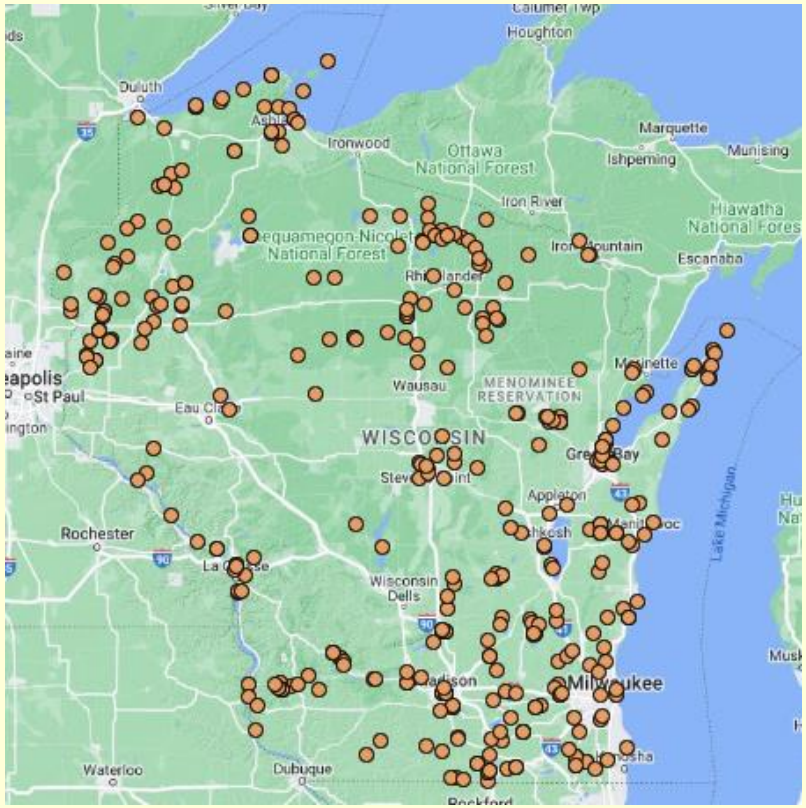
1929

Using herbarium records to map plants by hand…

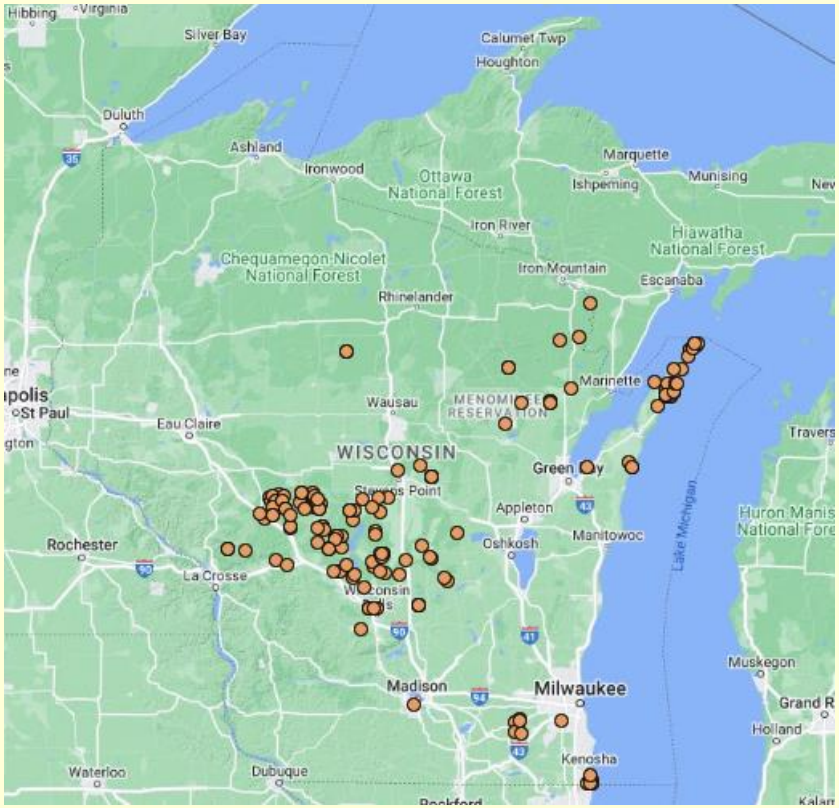


1970

… or by
computer in the
modern times



Sparganium eurycarpum
Typhaceae



Hypericum kalmianum
Hypericaceae

A flora isn't static!

New records/additions from 2019+

NOTEWORTHY COLLECTION

WESTWARD RANGE EXTENSION OF *DENDROLYCOPODIUM OBSCURUM* (L.) A. HAINES (LYCOPODIACEAE), INCLUDING NEW STATE RECORDS FOR MINNESOTA, U.S.A.

Derek S. Anderson[1], Richard W. Haug, and Welby R. Smith
Minnesota Department of Natural Resources
Minnesota Biological Survey
500 Lafayette Road, Box 25
St. Paul, MN 55155

NOTEWORTHY COLLECTIONS

NEW RECORDS FOR SOME OLD GRASSES IN WISCONSIN

John G. Zaborsky
Wisconsin State Herbarium
Department of Botany
University of Wisconsin–Madison
Madison, Wisconsin 53706
jzaborsky@wisc.edu

NOTEWORTHY COLLECTION

THE DISCOVERY OF *ERIOPHORUM RUSSEOLUM* FR. SUBSP. *LEIOCARPUM* NOVOSELOVA (CYPERACEAE), WHITE-BRISTLED RUSSET COTTONGRASS, IN MICHIGAN.

Rob Routledge
School of Natural Environment, Sault College
443 Northern Ave., Sault Ste. Marie, Ontario, P6B 4J3
robert.routledge@saultcollege.ca

Alex Graeff
555 Rosewood Ave, East Grand Rapids, Michigan 49506
alex.graeff@gmail.com

Janet Marr
23180 Highway Rd., Calumet, Michigan 49913
jkmarr@mtu.edu

NOTEWORTHY COLLECTION

DISCOVERY OF A POPULATION OF STATE ENDANGERED *TRILLIUM ERECTUM* L. (MELANTHIACEAE) IN WEST CENTRAL ILLINOIS

D. James Mountjoy[1]
Department of Biology
Knox College
2 East South Street, Galesburg, IL 61401

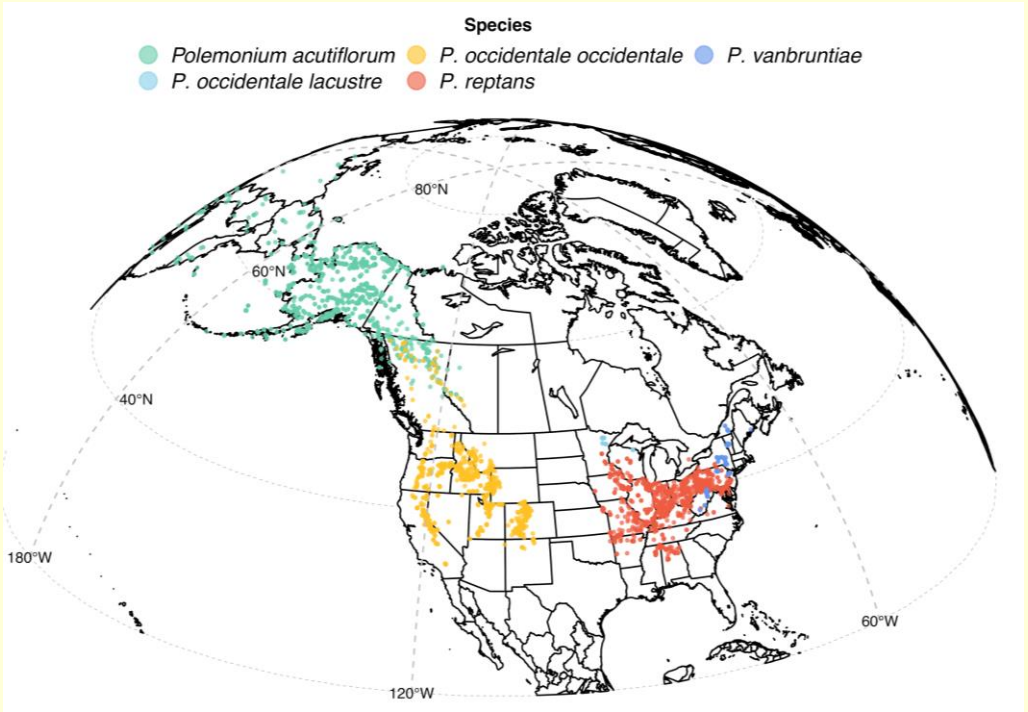
P. Anthony Gant
Department of Art
Knox College
2 East South Street, Galesburg, IL 61401

A flora isn't static!

New species recognized / species concepts may change

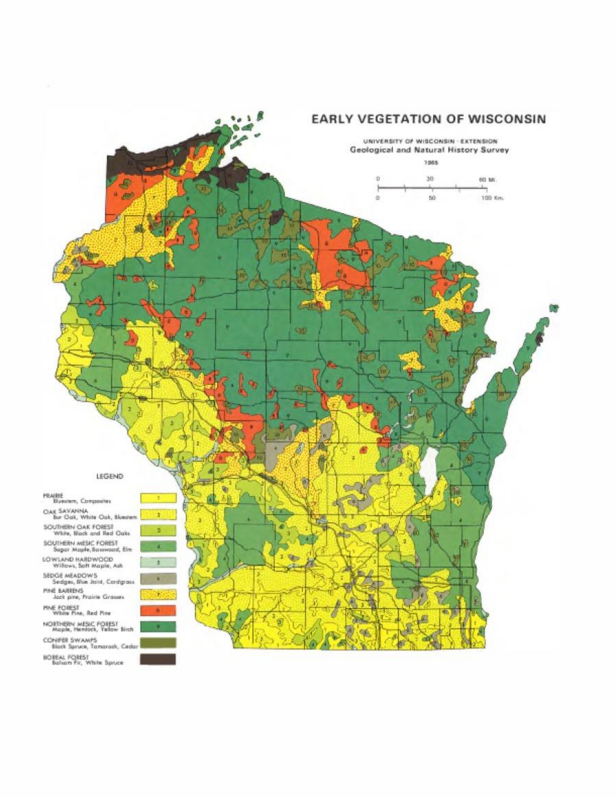
Our newest species! – Jan 2023
lake Jacob's ladder





Polemonium lacustre (Wherry) J. P. Rose & Sytsma

What is the Wisconsin flora?



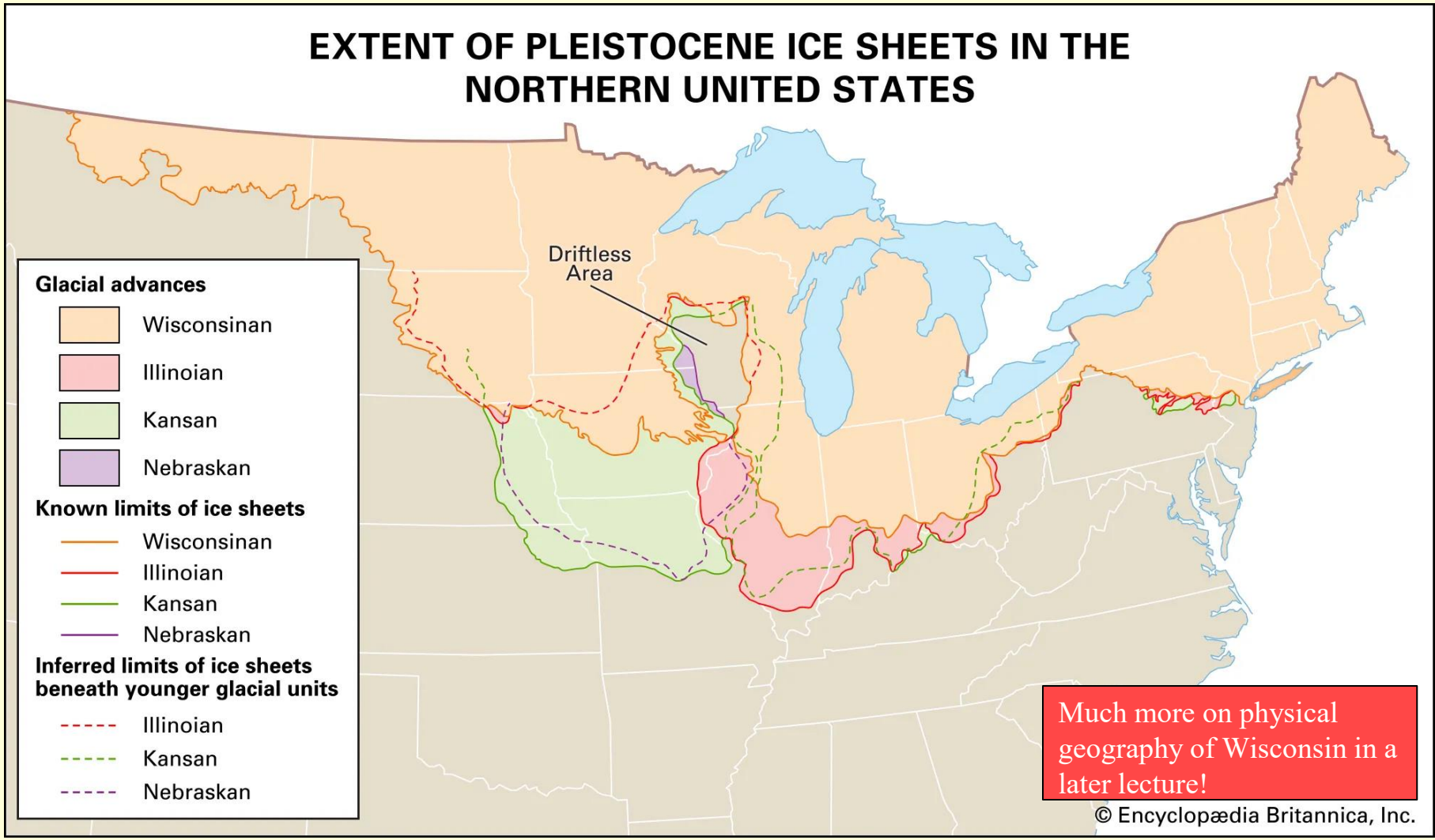




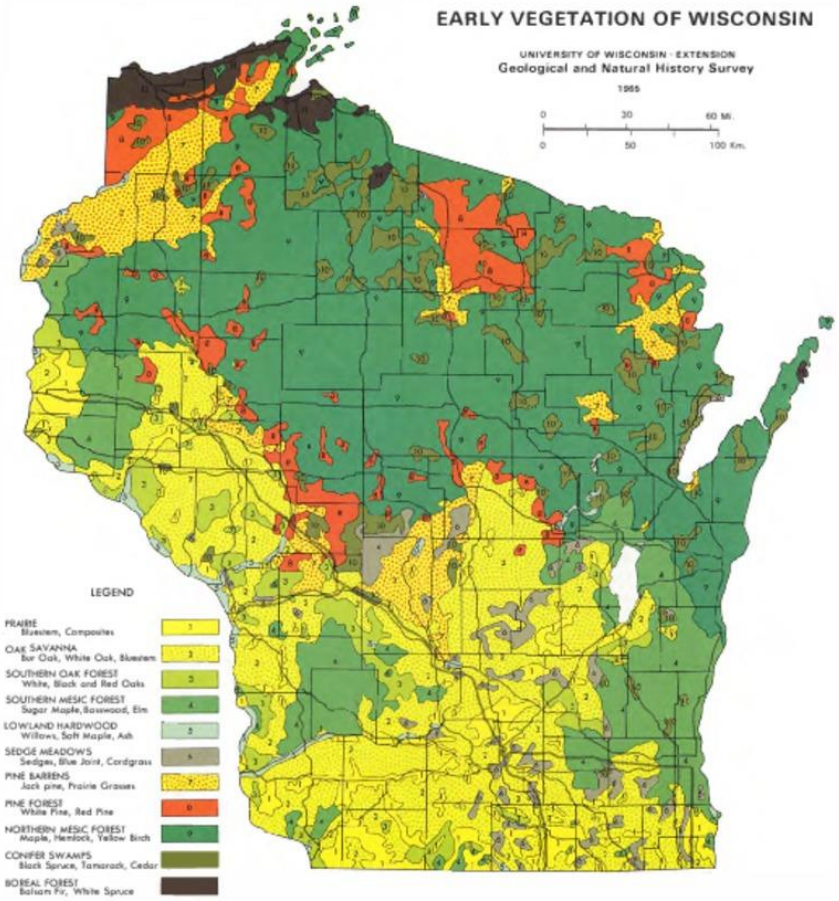
Wisconsin at a glance

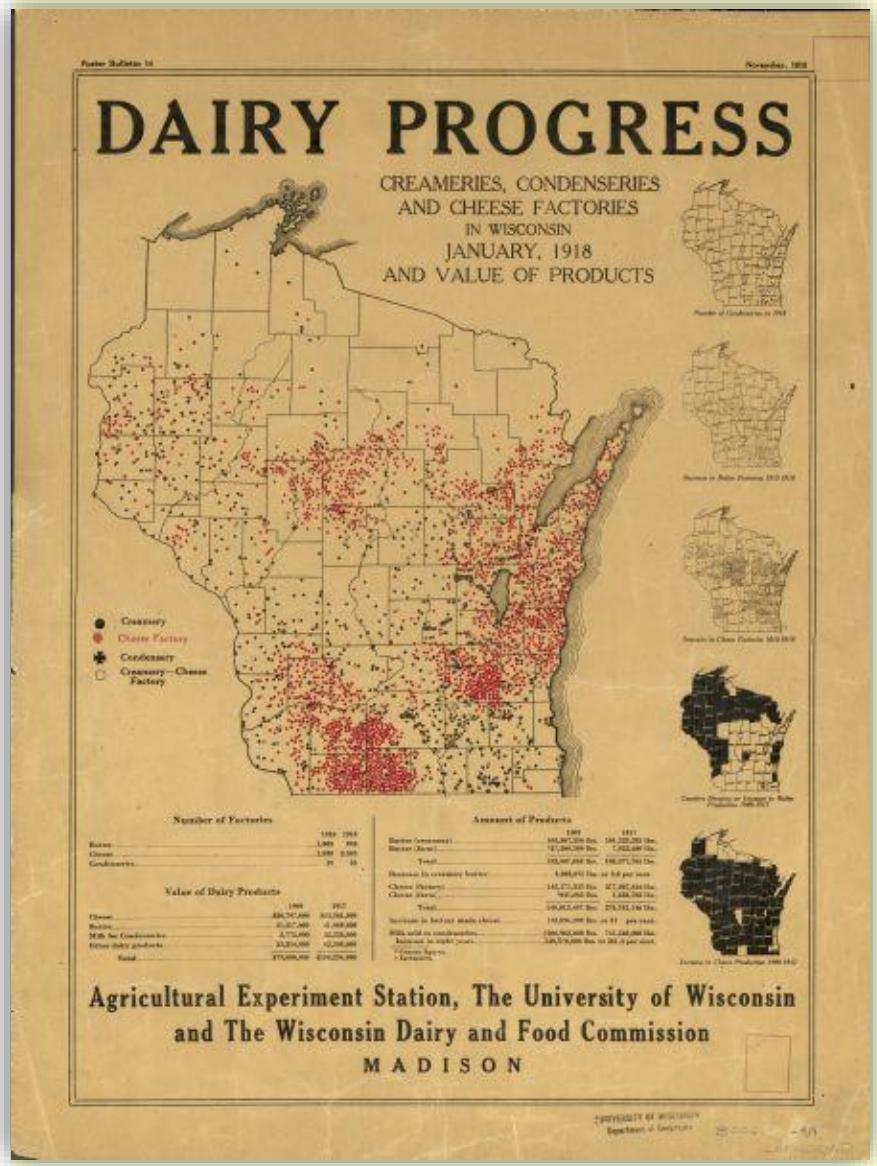


- Region: Midwest, Upper Great Lakes
- 65,000+ sq miles area
- Approx 5.9 million people (20th)
- Climate: mostly warm-summer humid continental (*Dfb*)
- Historical homeland of the Ojibwa, Sauk, Fox, Kickapoo, and Potawatomie



Wisconsin's flora and plant communities heavily influenced by glaciation history…





… and by humans!

Vascular Flora of Wisconsin



Wisconsin:
approx. 2600 species

Comparison:
Michigan: approx. 2900
Florida: approx. 4300

What is a “vascular flora”?

- Marchantiophyta – liverworts
- Bryophyta – mosses
- Anthoceratophyta - hornworts
- Lycopodiophyta - spike & club mosses
- Polypodiophyta – ferns & horsetails
- Pinophyta - gymnosperms
- Magnoliophyta - angiosperms, flowering plants

non-vascular

vascular

More on the classification and evolution of plants in our next lecture!

We will still find time to include the non-vascular plants any, when possible!

Vascular Flora of Wisconsin

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



Arethusa bulbosa
Dragon's mouth orchid

Native species = 1,659

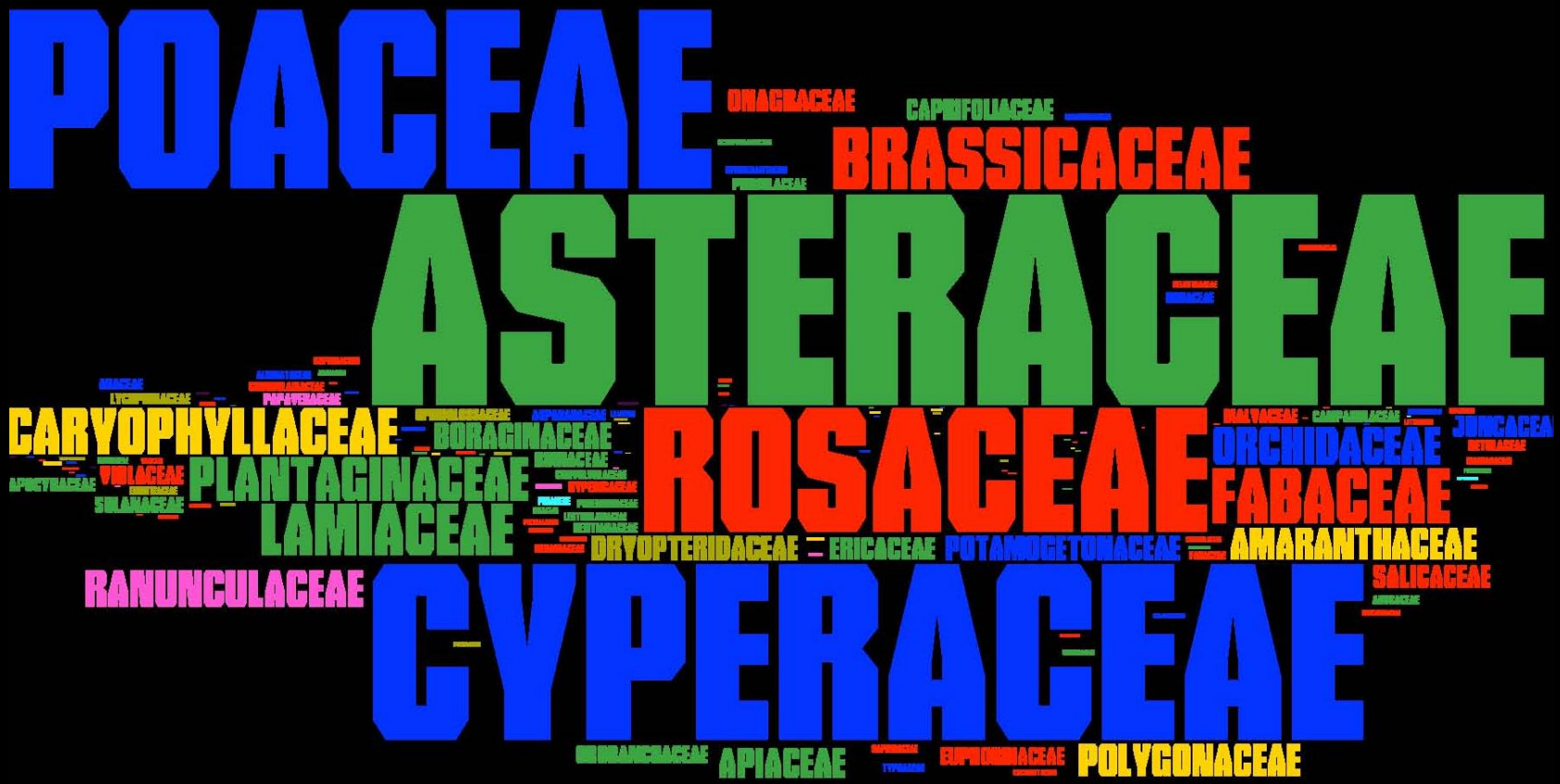


Alliaria petiolata
Garlic mustard

Introduced species = 791

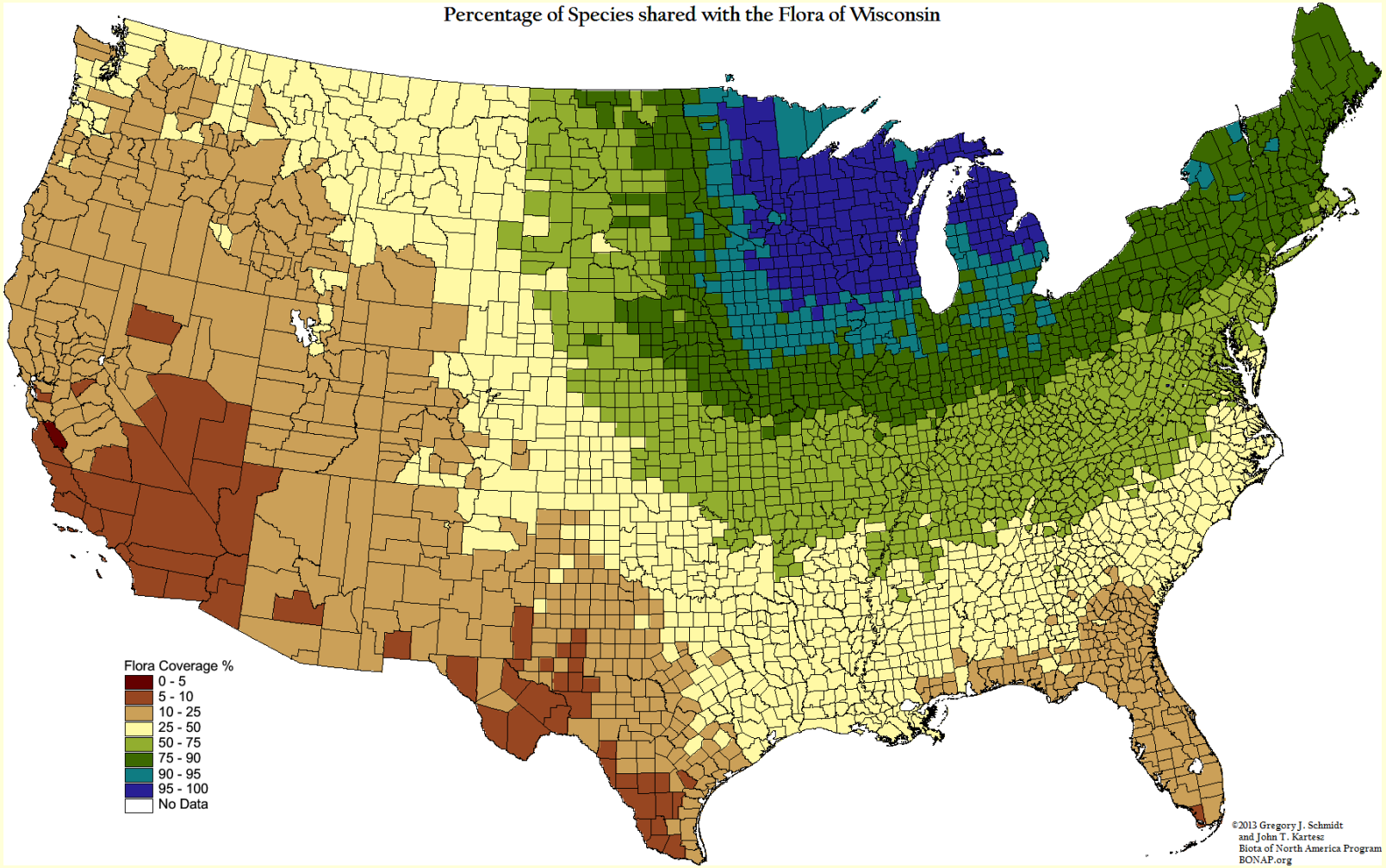
164 families **787 genera** **2,450 species**

Not all plant families in Wisconsin are equally represented!



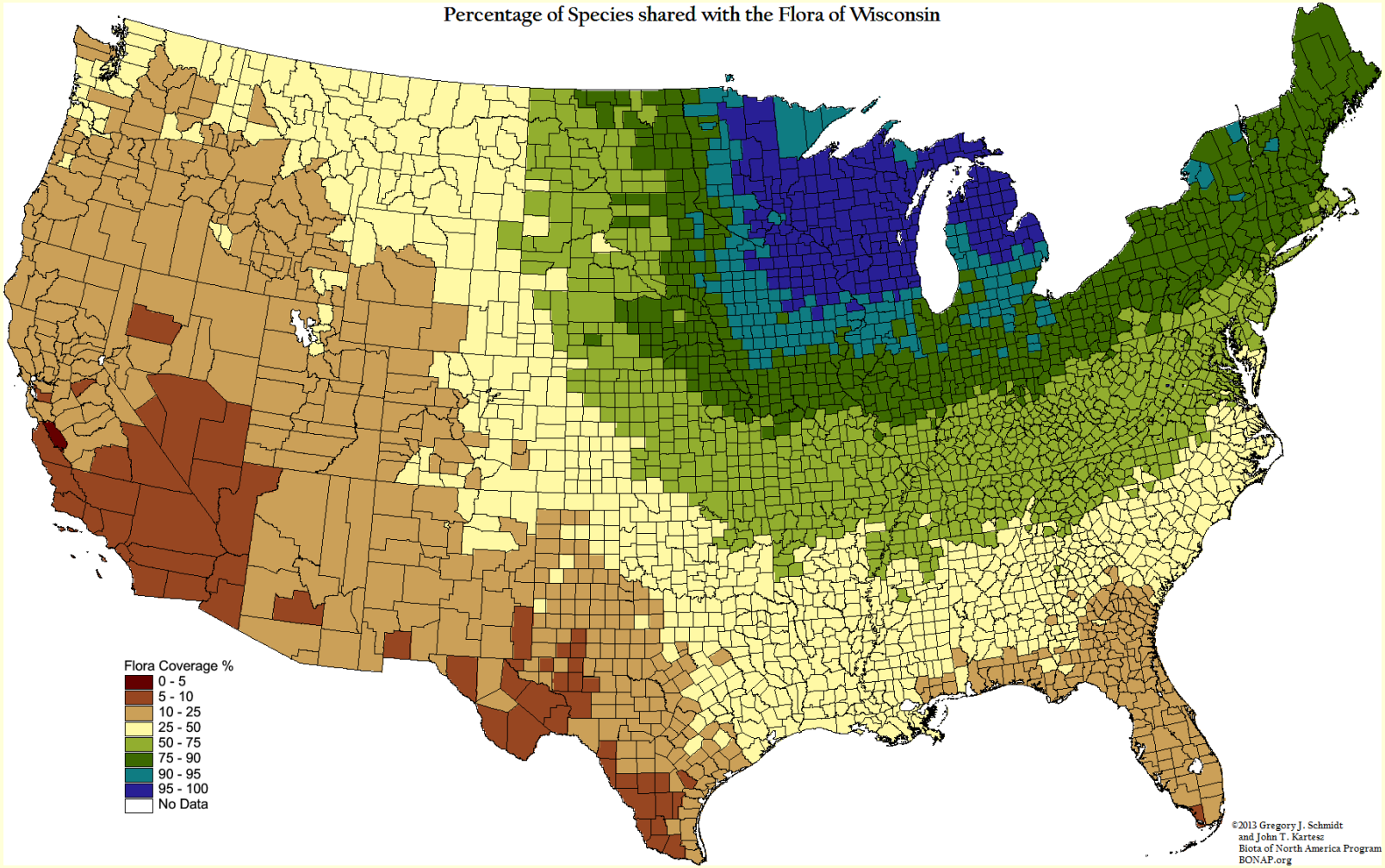
Floristic elements and provinces

The flora of WI can be divided into a number of **elements**, each of which shares a common type of past and/or current geographical range.



Floristic elements and provinces

Floristic **elements** give some idea to us about how the flora of Wisconsin was assembled biologically over time



Floristic elements and provinces

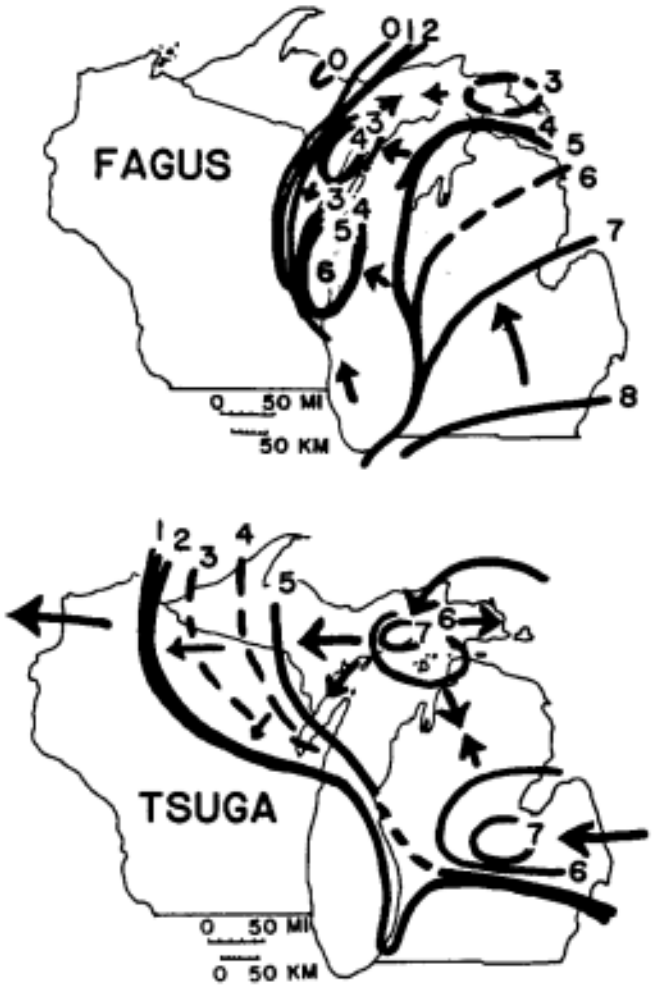


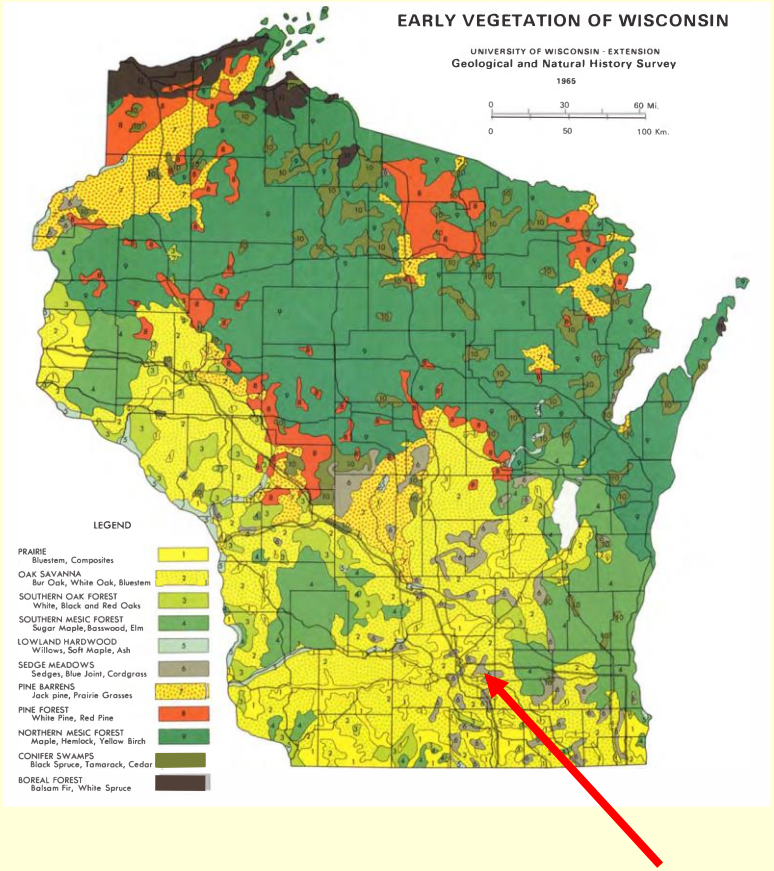
Fig. 5. Simplified reconstruction of the expansion of *Fagus* and *Tsuga* into the Upper Great Lakes Region. Lines show the position of the species limit at 1000-yr intervals.

Palynological (pollen) data gives us more evidence, showing roughly the route some plants took to colonize Wisconsin following glacial retreat

L: Davis et al., 1986

Floristic elements and provinces

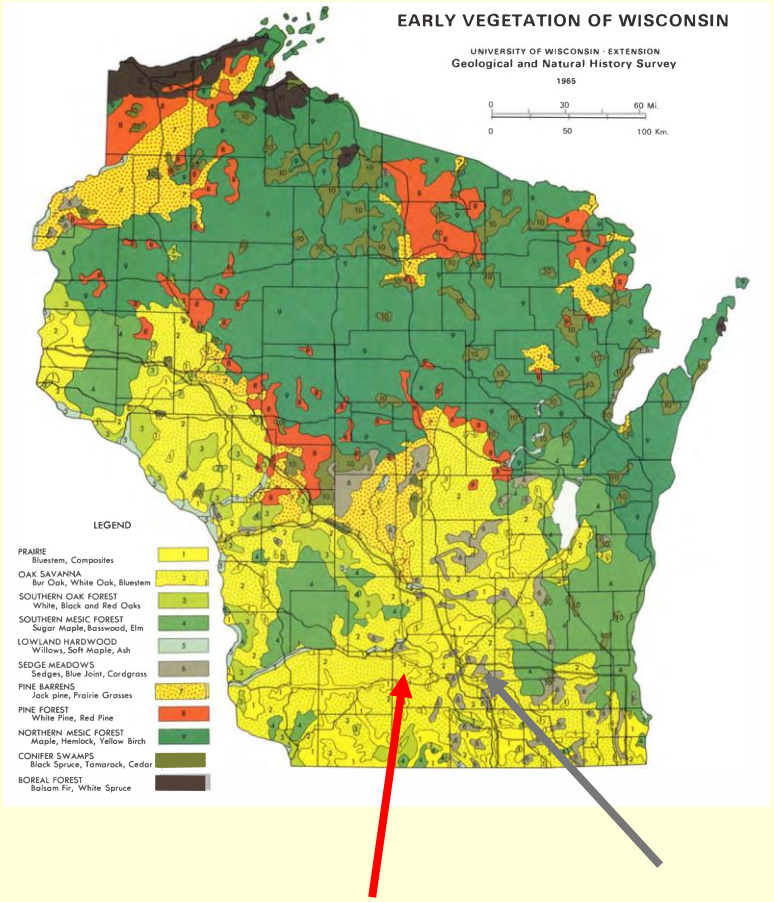
The flora of WI can be divided into a number of **elements**, each of which shares a common type of past and/or current geographical range. The 4 most important are:



1. Alleghenian: group of species with ranges centered from Cumberland, Appalachians/Great Smoky mountains; dominant in deciduous forests; e.g., white pine, hemlock and basswood; ancient element extending back to the Tertiary

Floristic elements and provinces

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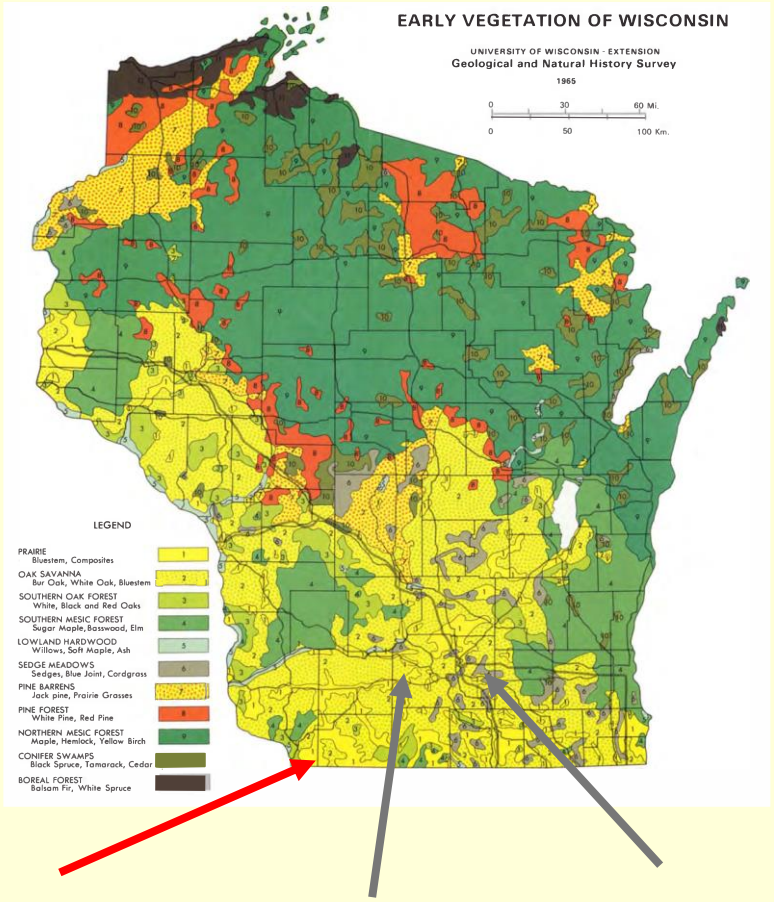


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2. Ozarkian: species grouped around the Ozark Mts. of Arkansas and Missouri; more adapted to xeric or dry conditions, but similar to Alleghenian (many genera, but not species overlapping between the two elements); e.g., bur oak and black oak, hickory

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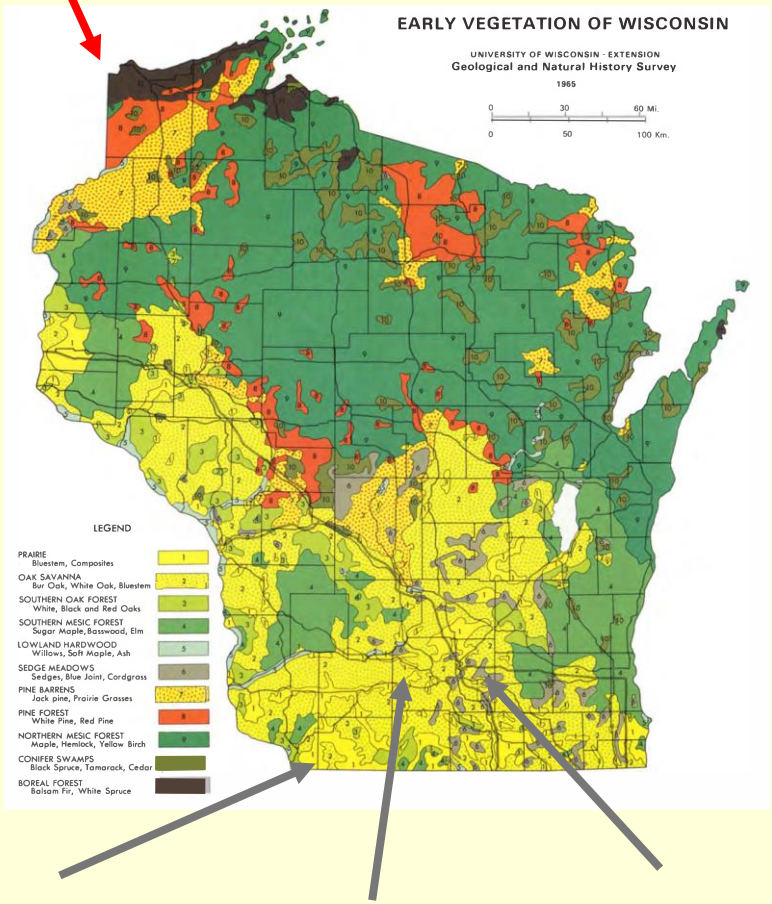
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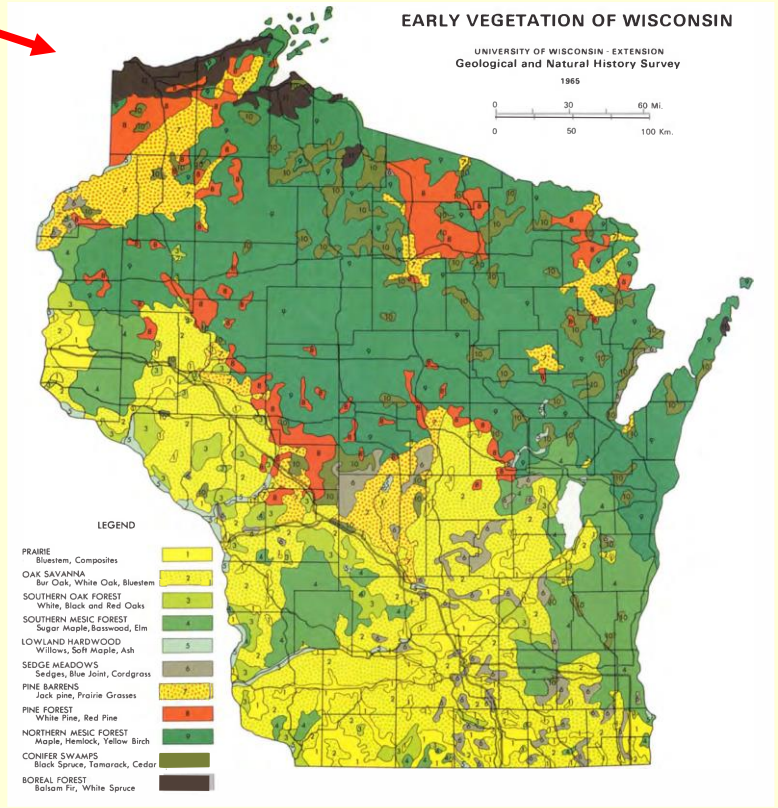
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3. Prairie: species whose ranges includes all or part of existing prairies e.g. needle grass, side oats

4. Boreal: species w/ranges from Alaska to Upper Great Lakes, many species circumboreal (with ranges in Eurasia) e.g., tamarack, white spruce, and balsam fir

Floristic elements and provinces

The flora of WI can be divided into a number of **elements**, each of which shares a common type of past and/or current geographical range. The 4 most important are:



Other smaller elements too!

Coastal plains (Gulf, Atlantic coast)

Western North America

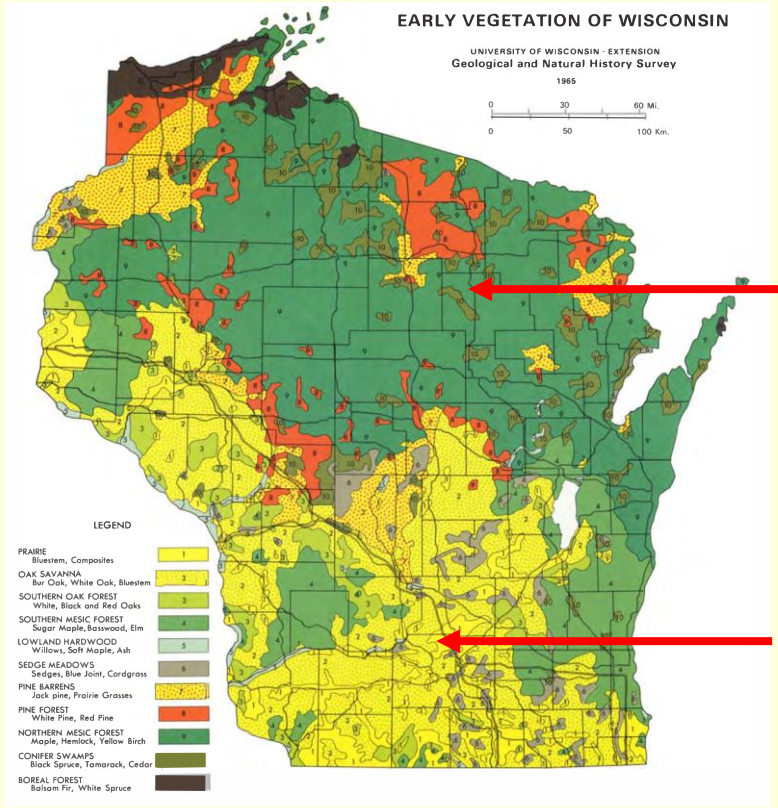
Eurasian weeds

Arctic

Driftless or Great Lakes endemics

Floristic elements and provinces

These floristic elements are not distributed uniformly throughout the state. There are 2 **floristic provinces**:



Northern Hardwoods - NE Wisconsin

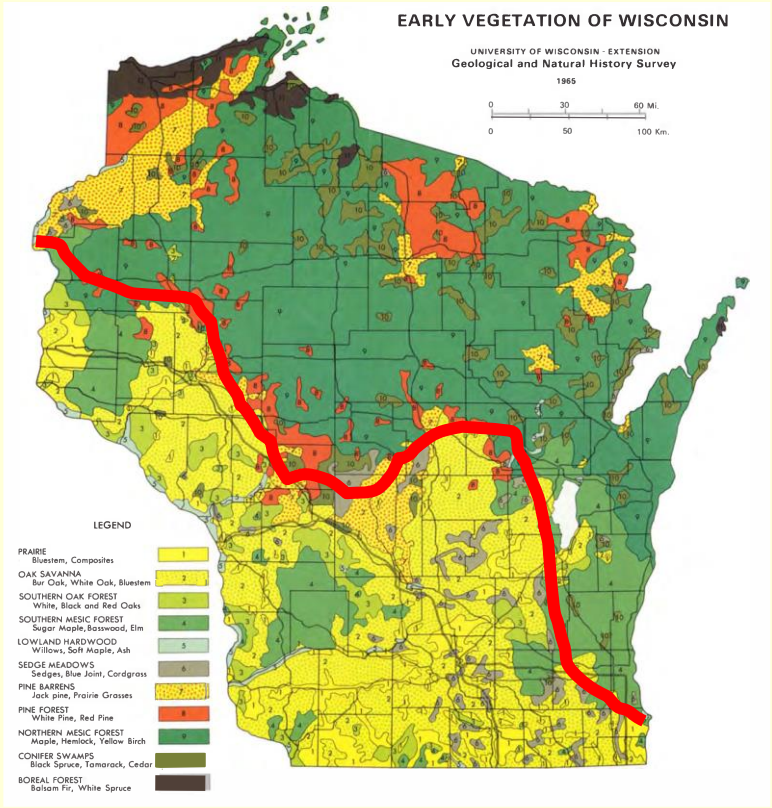
most Boreal elements, some Alleghenian elements

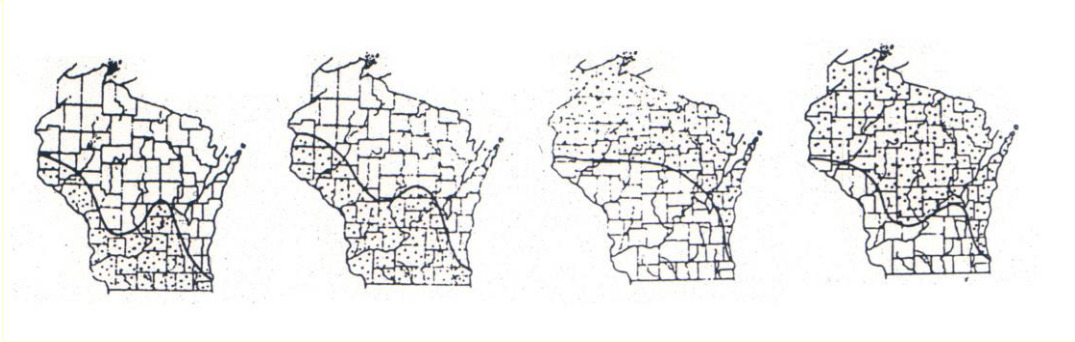
Prairie-Forest - SW Wisconsin

most Prairie & Ozarkian, some Alleghenian elements

Floristic elements and provinces

The 2 provinces are separated by a narrow band or zone: **tension zone** which is based on the upper and lower limits of the southwest and northeastern species, respectively.







Golden cassia



Wild indigo



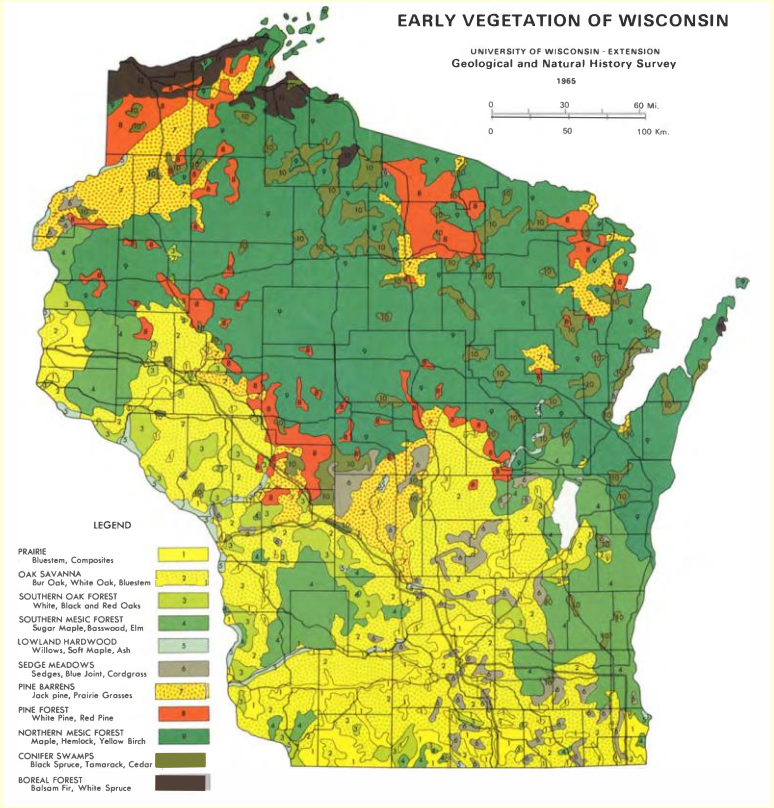
Ram's head ladyslipper



Stemless ladyslipper

Plant Communities

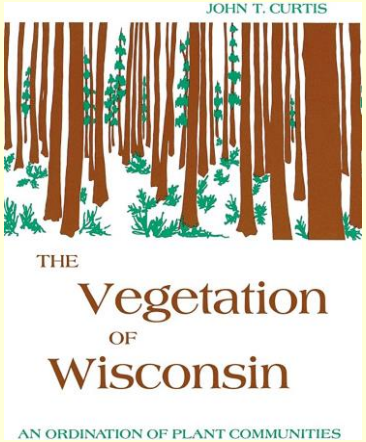
Within each province, there are ecological (not floristic) assemblages of species called **plant communities**. John Curtis in the *Vegetation of Wisconsin,* described about 35 communities



Some examples:

Southern dry, mesic, wet forests
Northern dry, mesic, wet forests
Oak savanna
Poor or rich fens, bogs, other wetlands
Dune
Talus slope, cliff
Oak and pine barrens
Dry, mesic, wet, or sand prairies

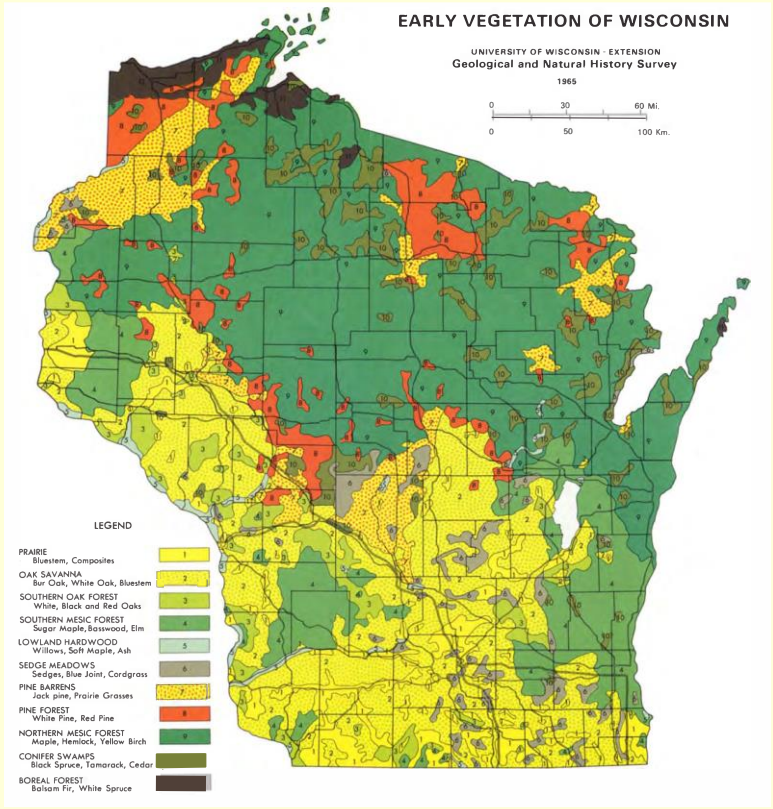
More on the plant communities in Wisconsin in a future lecture!



Where we go from here:

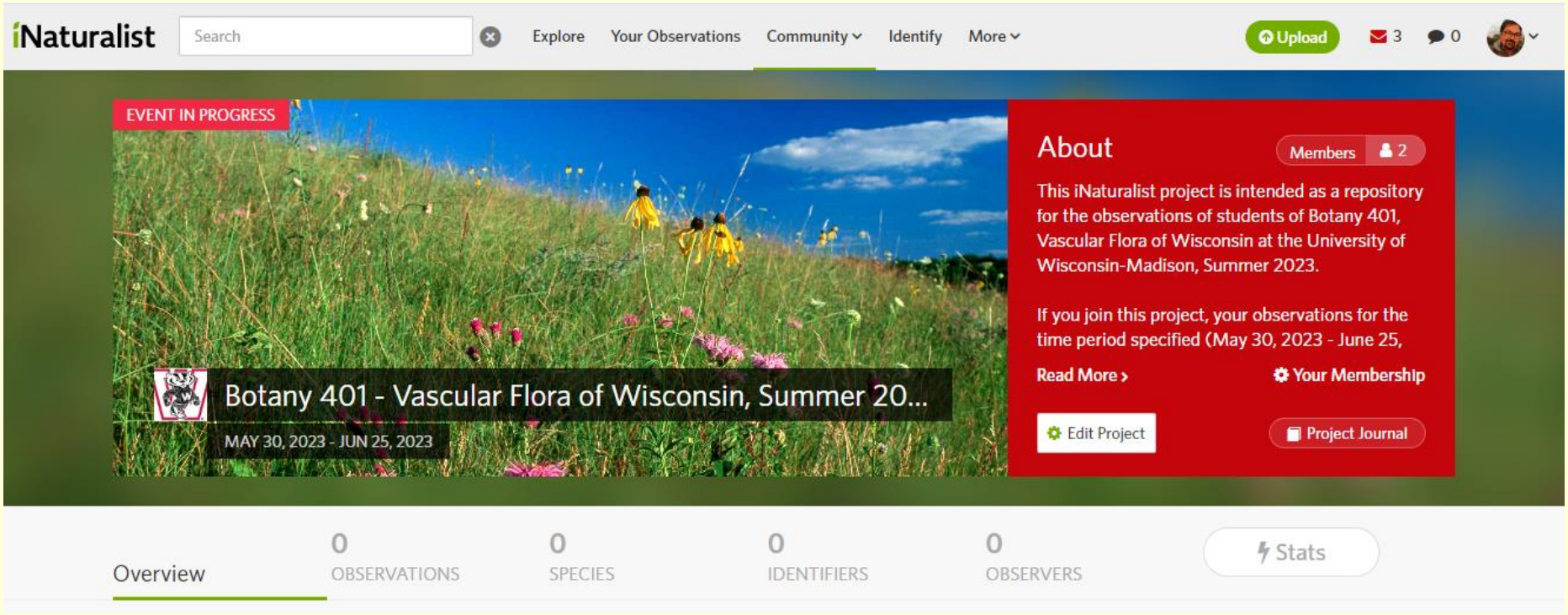
General lecture units:

1. Floristics, Wisconsin geography, natural communities
2. Practical plant identification skills: basic morphology and structure
3. Wisconsin plants: family and identification characteristics



Link in Canvas to our class page

Will use today in Lab (bring laptop and/or phone and a notebook)



Botany 401
Vascular Flora of Wisconsin

Enjoy!

