Discovering Wisconsin's bur-reeds: diversity, specialization and conservation

Josh Sulman

bur-reeds (*Sparganium*)

- 14 spp. worldwide
  - 8 spp. in WI
- Growth form divergence
  - Tall, emergent
  - Limp, floating
- A difficult group
  - Morphological plasticity
  - Hybridization

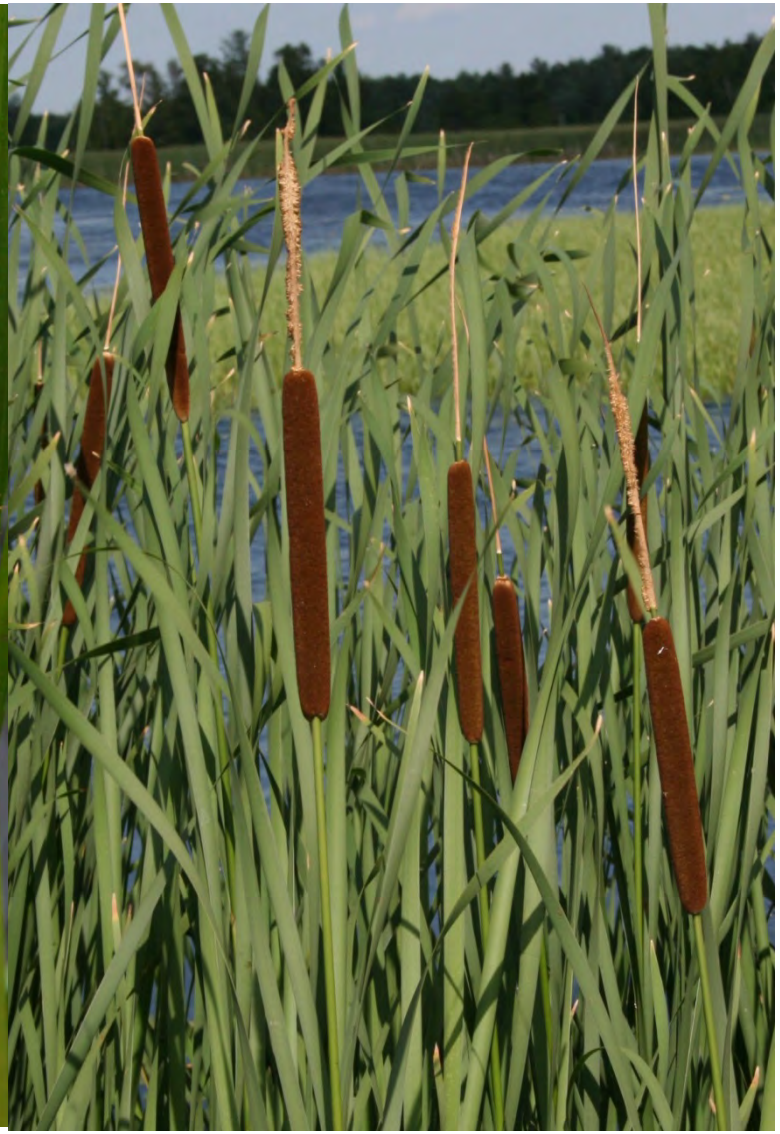
Yellowstone National Park, WY

Sparganium emersum Rehmann
(=*S. multipedunculatum*)

Phylogenetic context

- Monocots - Poales
- Closest relatives are cat-tails
- No previous studies on *Sparganium* species level relationships

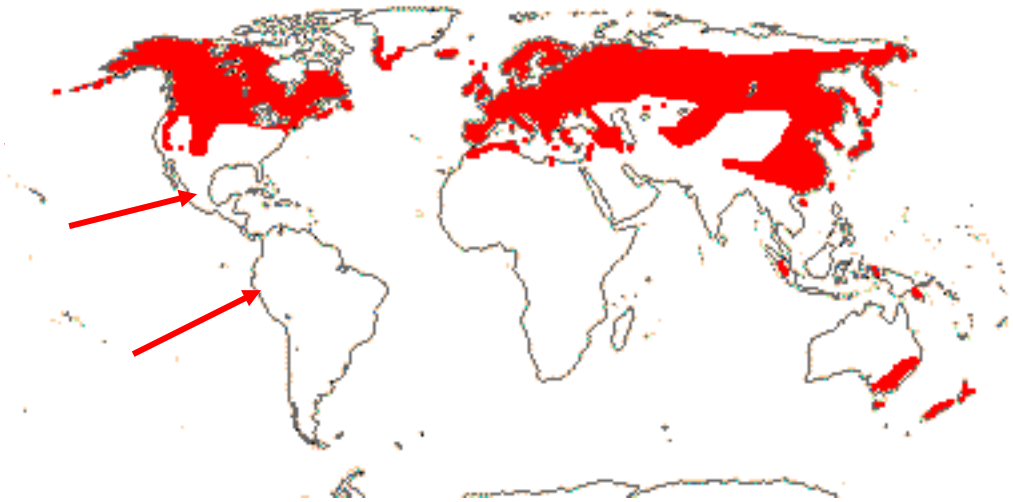
Sparganium androcladum



Typha latifolia

World distribution

- Arctic to Temperate
- every continent except Antarctica
- Wide distribution and LDD



APG, 2009

Fruit dispersal

hydrochory

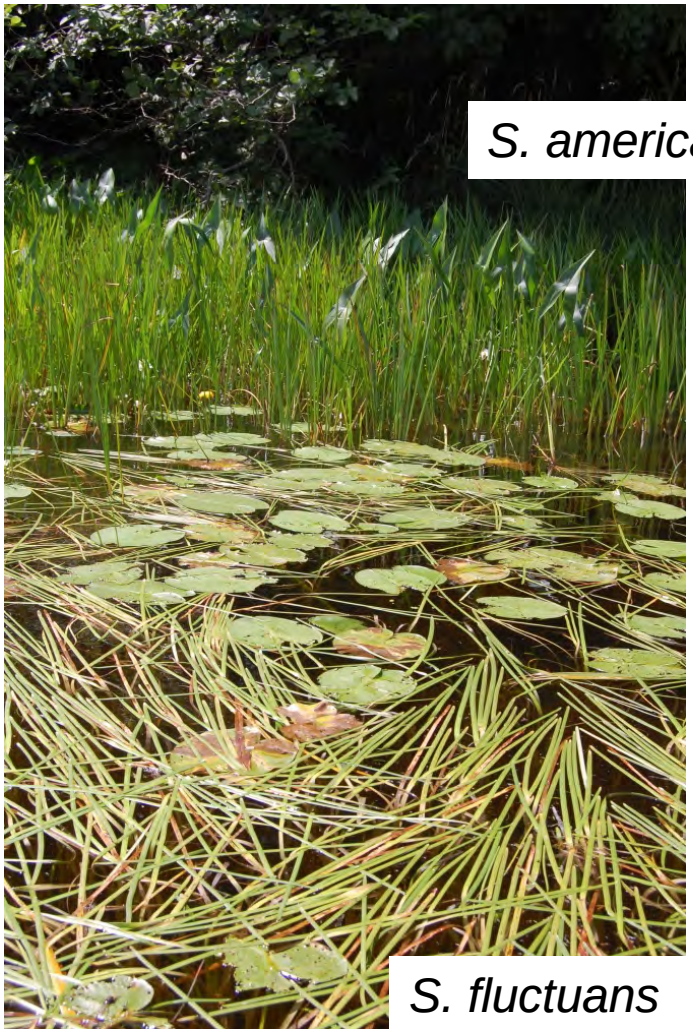
- Fruits float
- Probably important at watershed-level scales

endozoochory

- Fruits eaten by ducks
  - (and fish!)
- Probably important at large scales

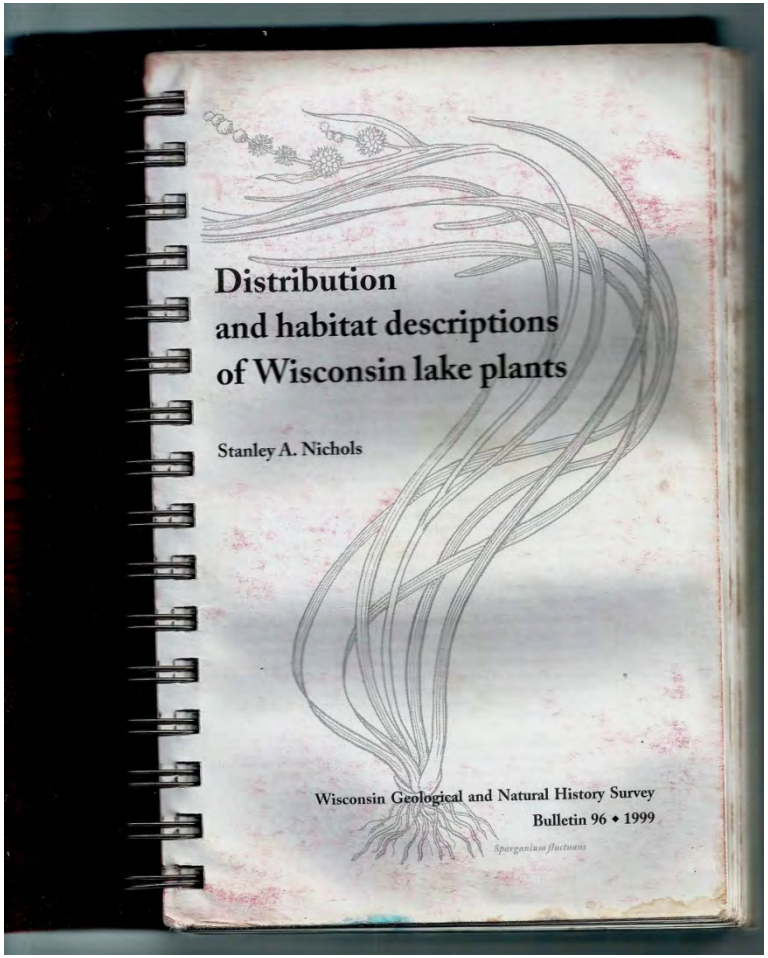
Growth form divergence

- Emergent
  - tall, self-supporting
  - Like cat-tails
- Floating
  - No rigid support structure
  - Like pondweeds



Shearer Lake, Taylor Co., WI

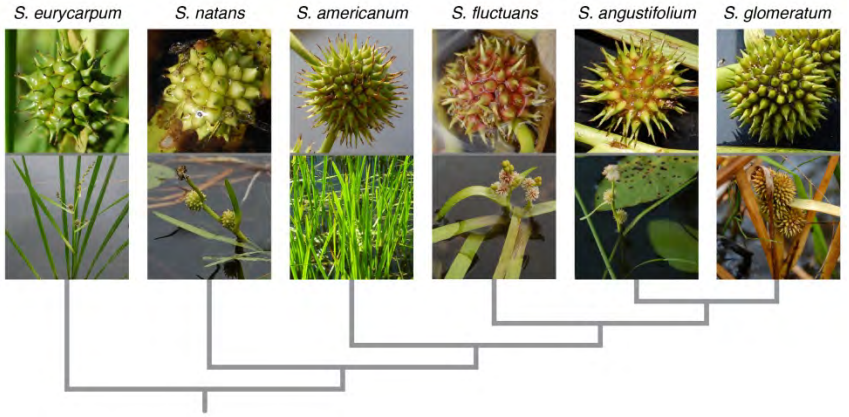
Species Distributions – water chemistry



- Nichols (1999)
- aquatic plant species are distributed unequally across water chemistry gradients
- Electrical conductivity is useful, easy to measure

Research Questions

- How are species related?
- How are species distributed?
- How are growth forms distributed?
- Why is there growth form divergence?

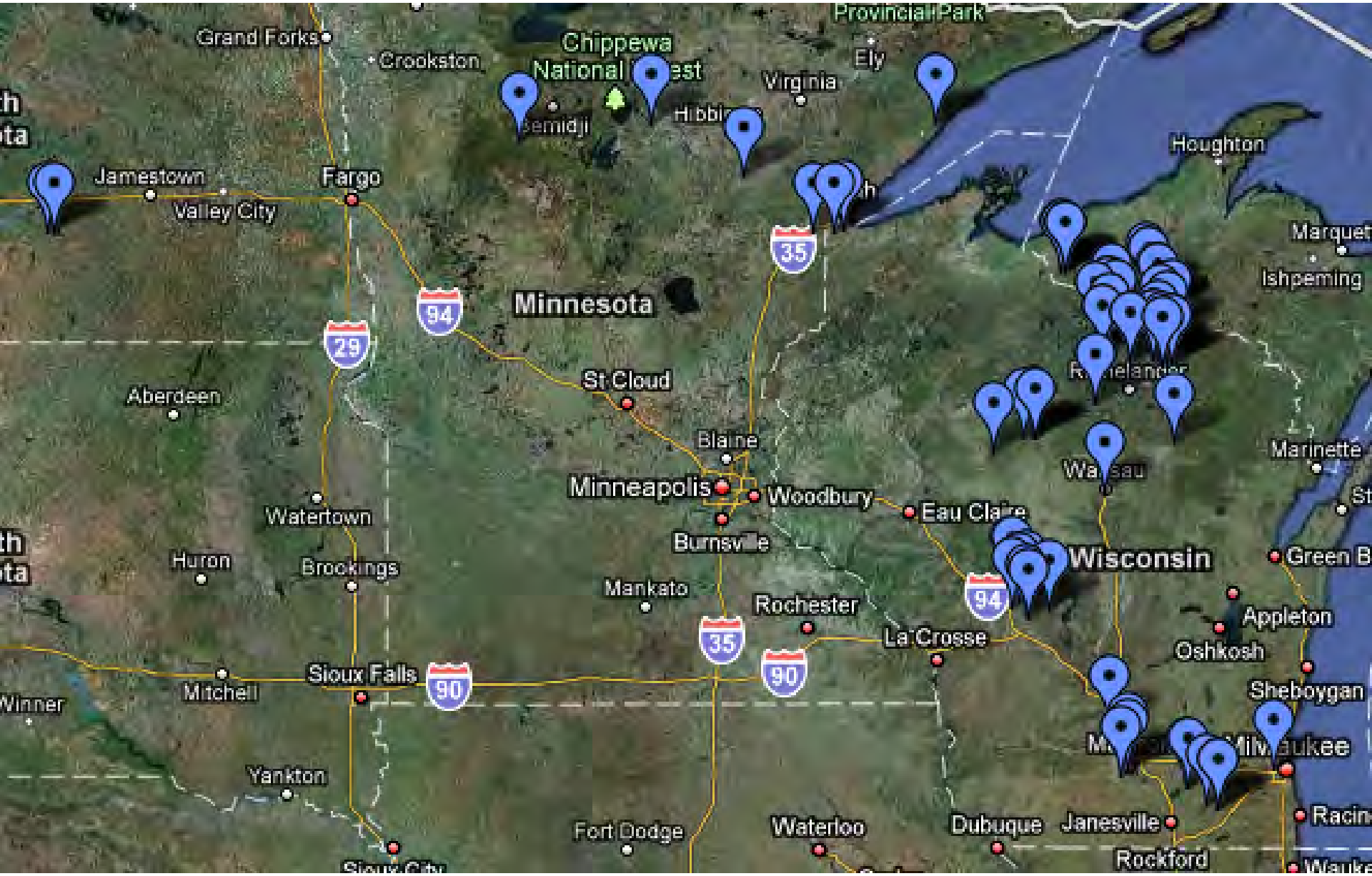


Field work, 2008-2009

- 76 field sites
- 6 states

Little Duck Lake, UP

Sites in Midwest



Prairie pothole, North Dakota

- Evaporation leads to high levels of solutes, sometimes approaching saline conditions. *S. eurycarpum* only

Northern Wisconsin

- **highest diversity of *Sparganium:* often 3 species in one lake**
- **Lowest conductivity and nutrient levels**

Results

- **Sulman JD, BT Drew, C Drummond, E Hayasaka and KJ Sytsma. 2013. Systematics, biogeography, and character evolution of *Sparganium* (Typhaceae): Diversification of a widespread, aquatic lineage. *American Journal of Botany* 100:10**

- https://bsapubs.onlinelibrary.wiley.com/doi/10.3732/ajb.1300048

S. eurycarpum

S. androcladum

S. americanum

S. chlorocarpum

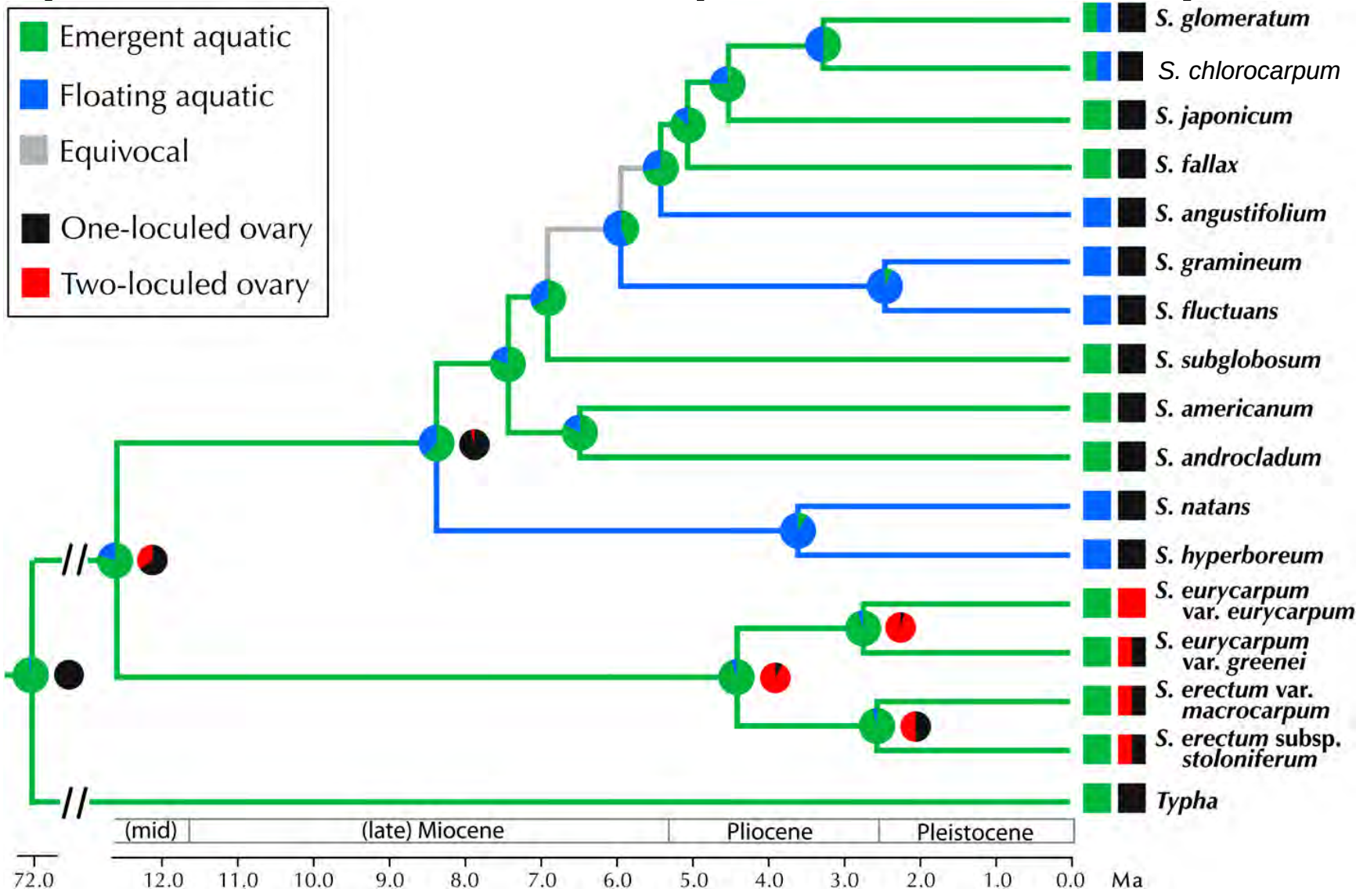
S. glomeratum

S. angustifolium

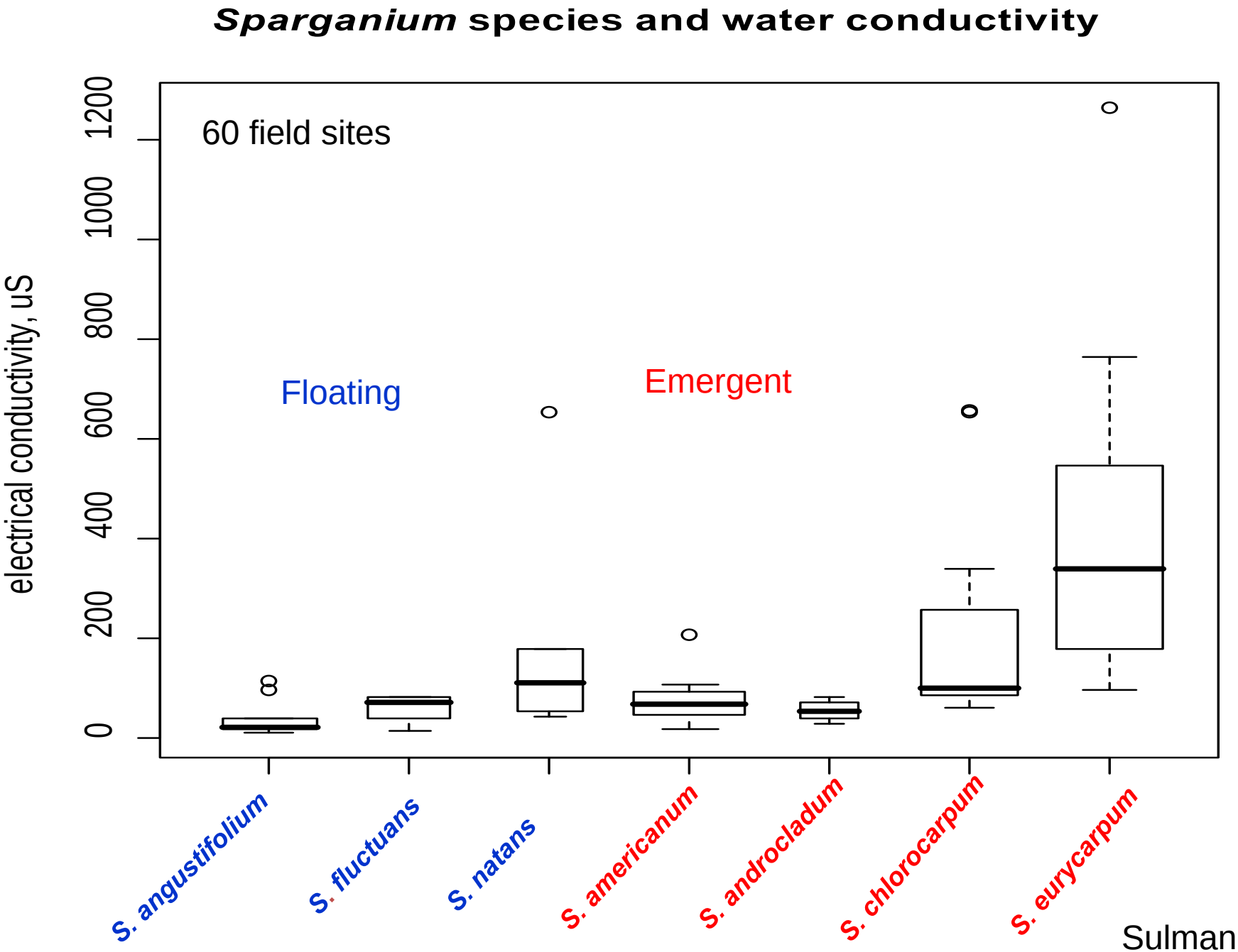
S. fluctuans

S. natans

Species relationships and history



Sulman, et al. (2013)


Sparganium species and water conductivity
60 field sites
Floating
Emergent
electrical conductivity, uS
0
200
400
600
800
1000
1200
S. angustifolium
S. fluctuans
S. natans
S. americanum
S. androcladum
S. chlorocarpum
S. eurycarpum

Sulman, 2010

Growth form distributions

Floating growth form

- deep water
- short growing season
- nutrient-poor environments

- Evolved 2 (or 3) times in *Sparganium*
- Boreal to Arctic

- Global cooling (Pliocene)

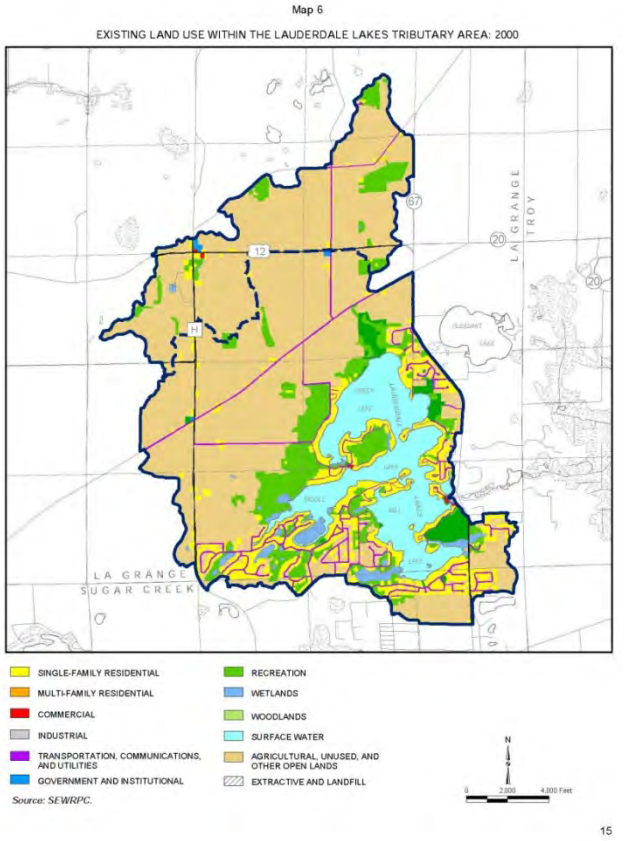
Emergent growth form

- shallow water
- Long growing season
- Nutrient-rich environments

- Ancestral form
- Warm-temperate to Boreal

- Global warming (Miocene)

Case study: Lauderdale Lakes



- SE Wis. Lake with rare *Sparganium*
- high quality wetland vegetation
- Surrounded by lake homes
- How can a healthy aquatic system exist on a heavily used lake in an agricultural watershed ?

- "a heavily used, recreational water resource" –SEWRPC, 2010
- "intense anthropogenic pressure" –DNR Sensitive Area Report

"exceptional [aquatic plant] diversity" – SEWRPC, 2010

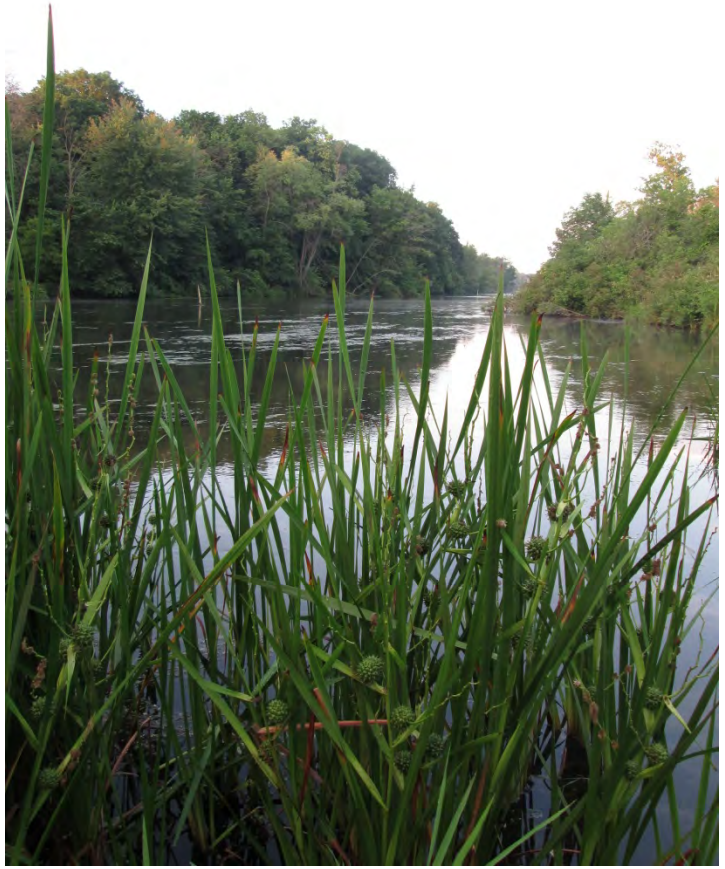
  - *Sparganium natans, S. androcladum, S. chlorocarpum*
  - *Zizania palustris, Schoenoplectus acutus, Sagittaria cuneata, Potamogeton* spp.
- 19 fish spp., including WI Special Concern lake chubsucker--DNR Sensitive Area Report

Community conservation

- Community concern:
  - “lake residents have become increasingly concerned about present and future impacts of development and increasing recreational use on the Lakes and their ecosystems” – SEWRPC, 2010
- Community organization:
  - Lauderdale Lakes Improvement Assoc. (LLIA), Kettle Moraine Land Trust (KMLT), Lauderdale Lake Management District (LLLMD)
- Research and Planning:
  - Southeastern Wisconsin Regional Planning Commission Report (2010)
  - DNR Sensitive Area Report (1990, 2004)
- Education
- Implementing best practices
- Self-policing, local authority

Bur reeds: why you should care

- Conservation
- Indicator species
- Restoration
- A great reason to explore Wisconsin Wetlands



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