PhD Congress ED413

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Macrophyte communities in man-made pond networks

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Illustration: Becca Thorne ©

Freshwater biodiversity decline

Freshwater biodiversity more at risk than **marine** and **terrestrial**

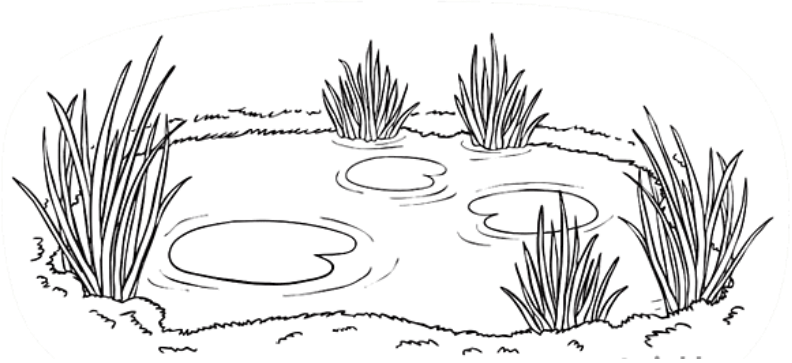
Of the 29,500 freshwater dependent species so far assessed for the IUCN Red List, **27% are threatened** with extinction (2019)

Habitat decline important factor

Pond network creation for freshwater biodiversity

Refugia

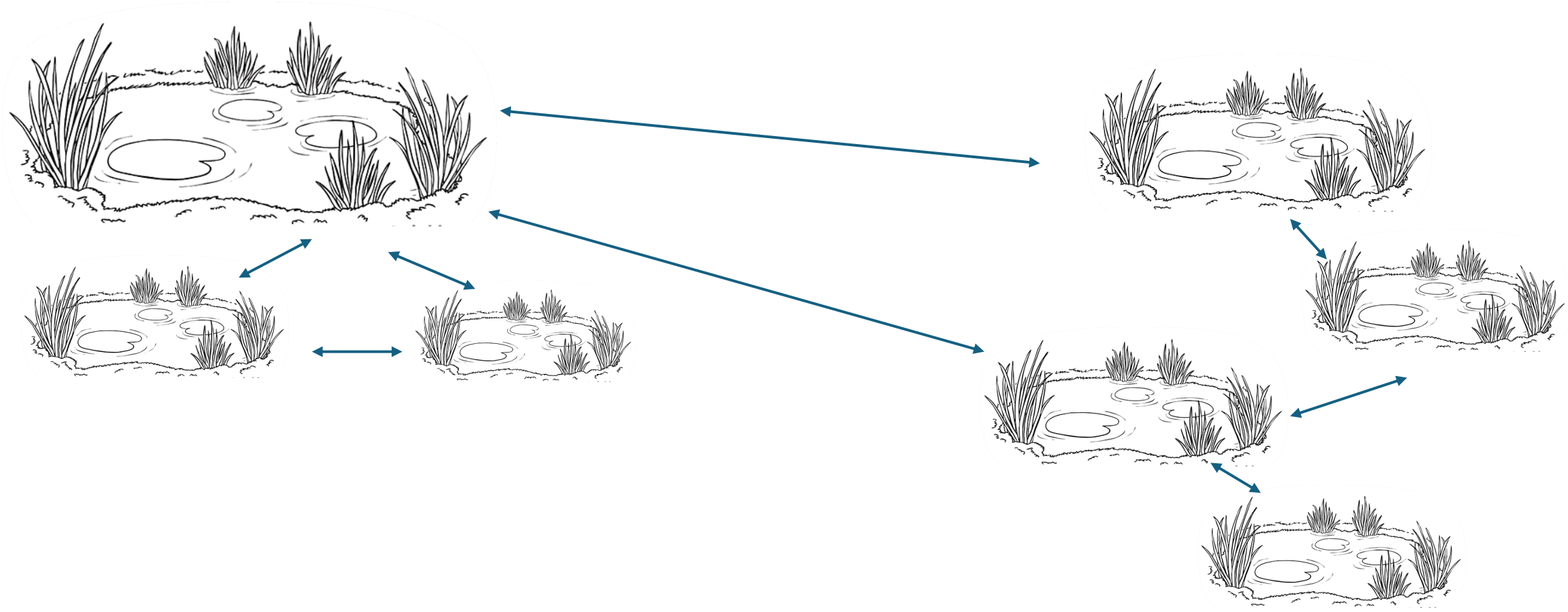
Species rich



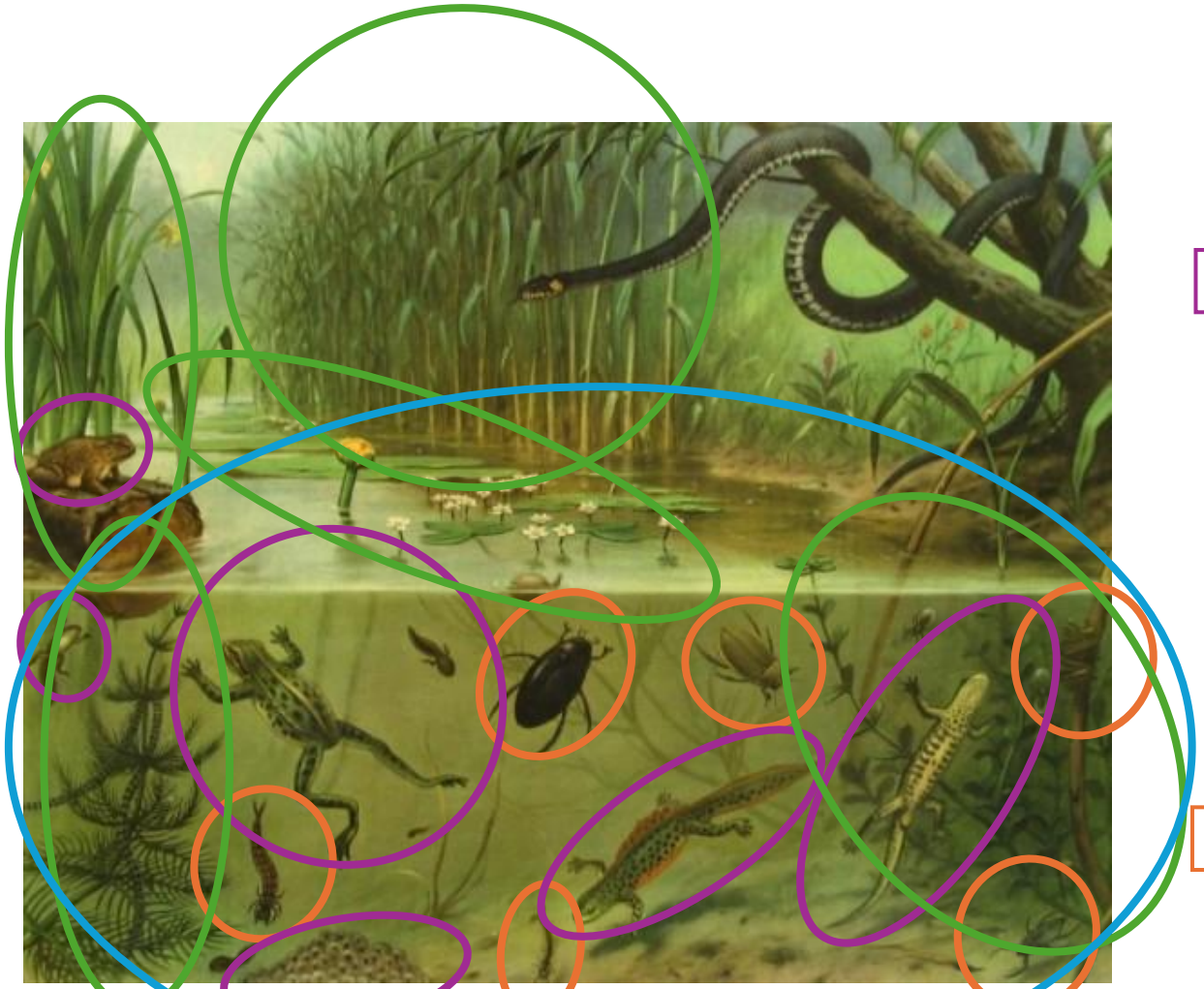
Stepping stone

Rare species

Pond networks



Pond ecosystems



Importance of macrophytes

Functioning

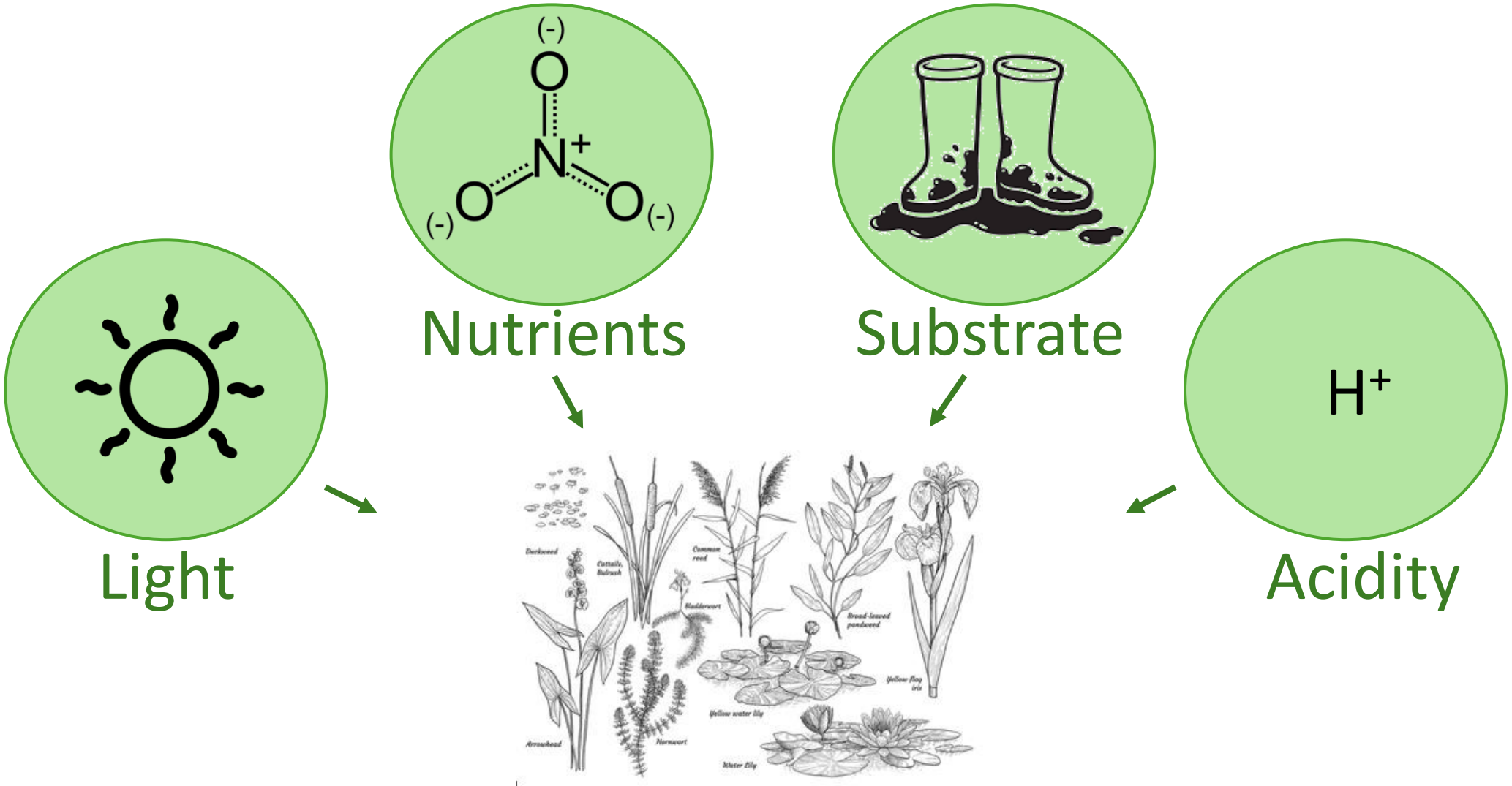
- Keep water clear
  - Competition with phytoplankton
  - Reduce resuspension sediment by wind
- Provide substrate, refuge from predators, spawning grounds
  - Invertebrates
  - Fish
  - Amphibians
- Provide food
- Produce oxygen

Biodiversity

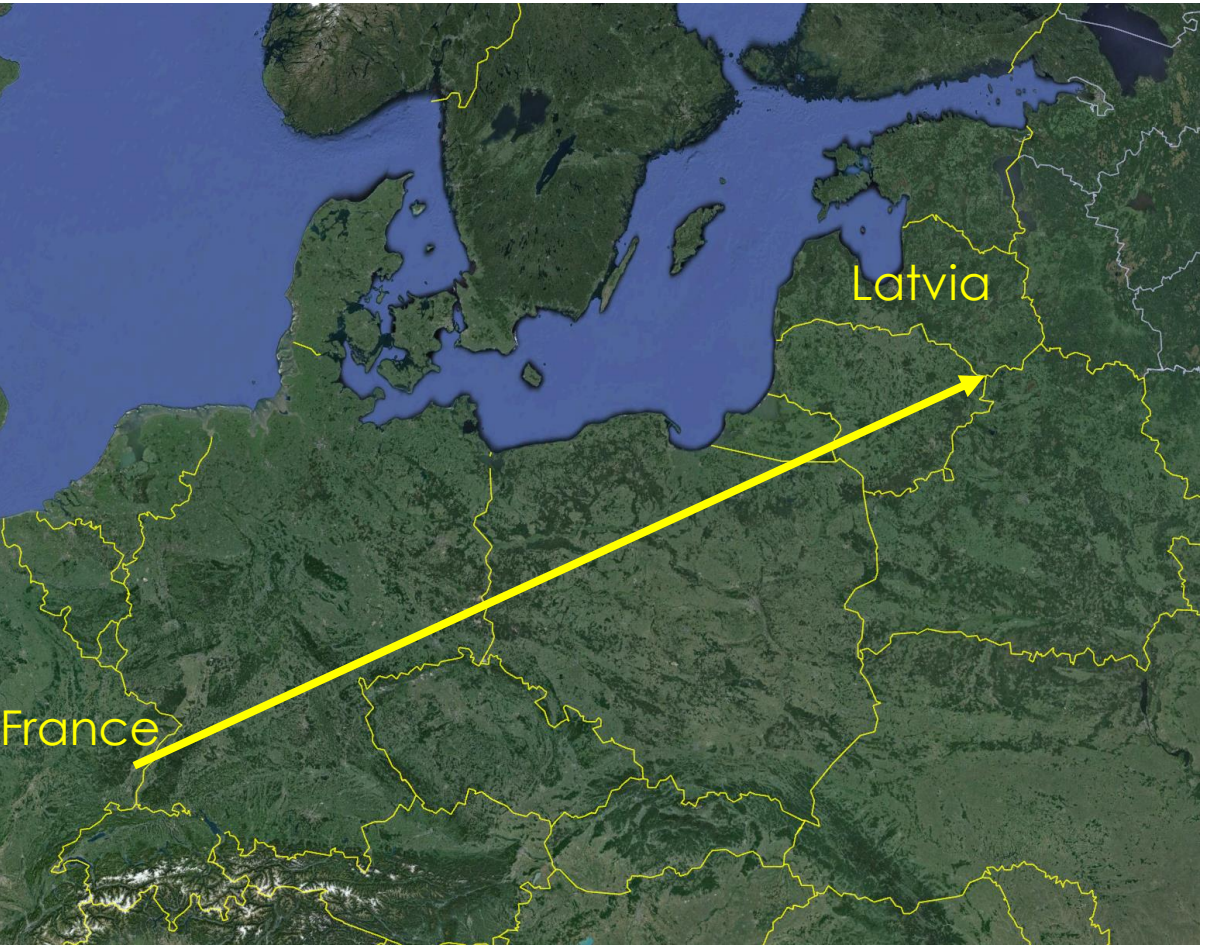
Labat (2021)

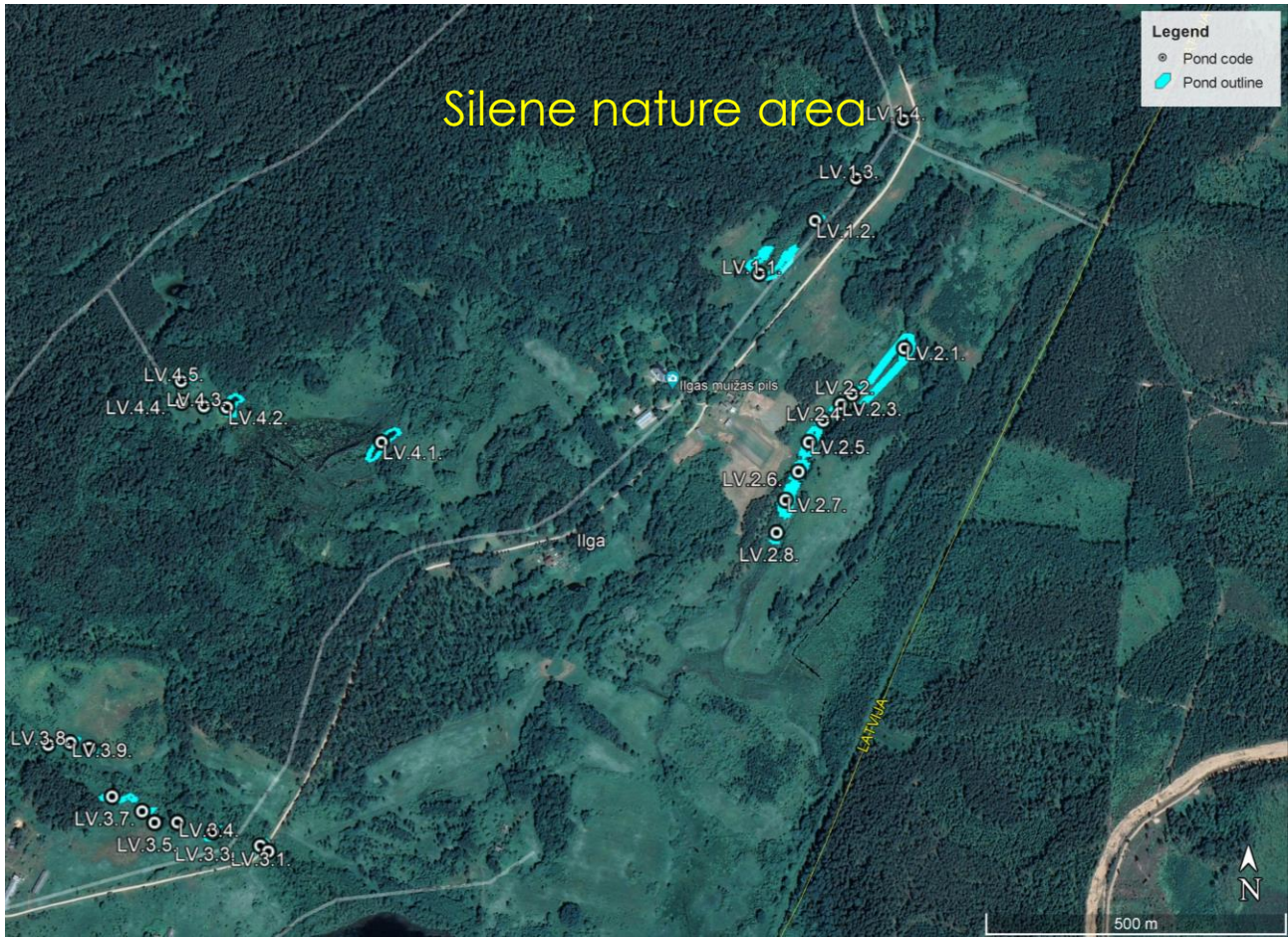
www.i-flora.com

Main variables influencing macrophyte communities



Study site


Latvia
France


Silene nature area
Legend
Pond code
Pond outline
LV.1.4.
LV.1.3.
LV.1.2.
LV.1.1.
LV.2.1.
Ilgas muižas pils
LV.2.2.
LV.2.4.
LV.2.3.
LV.2.5.
LV.2.6.
LV.2.7.
LV.2.8.
Ilga
LV.4.5.
LV.4.4.
LV.4.3.
LV.4.2.
LV.4.1.
LV.3.8.
LV.3.9.
LV.3.7.
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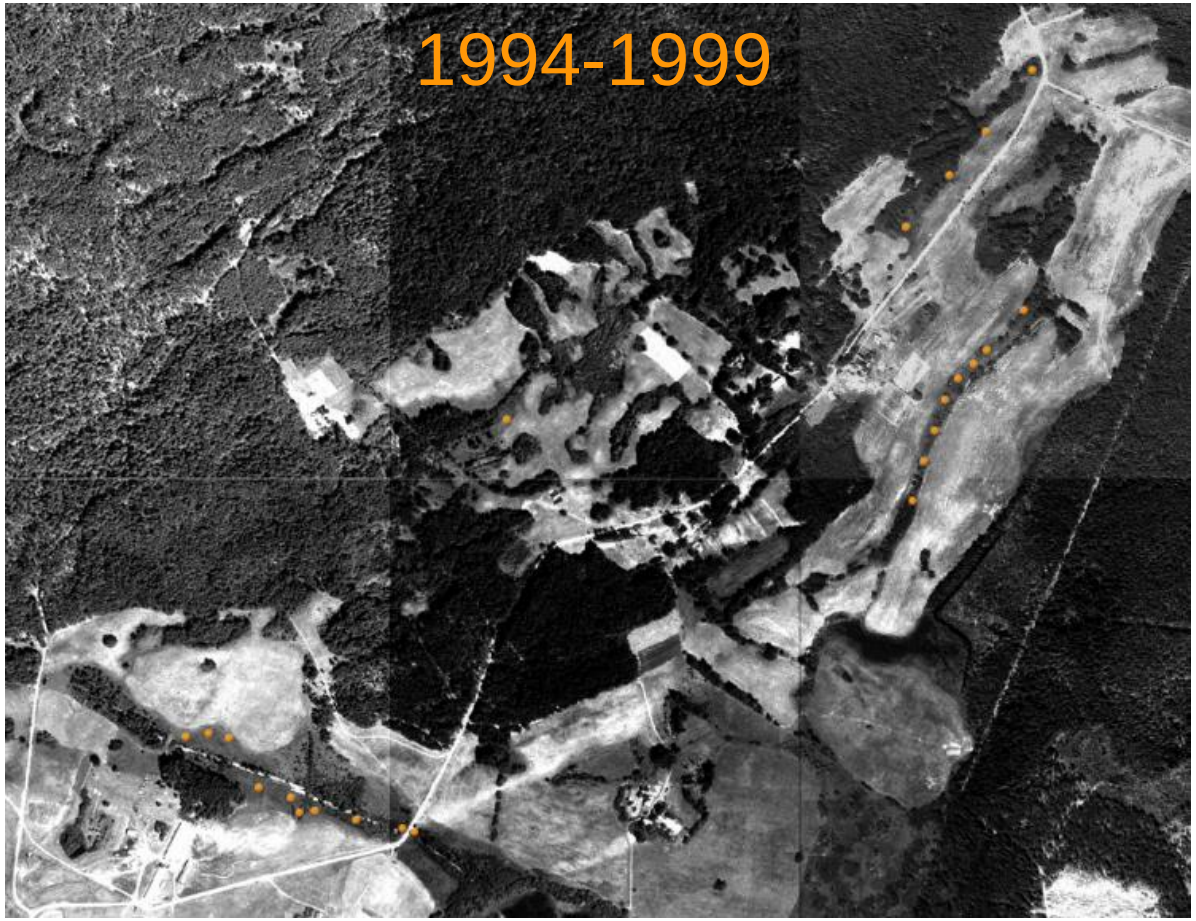
LV.3.4.
LV.3.3.
LV.3.1.
LATVIJA
N
500 m

Study site



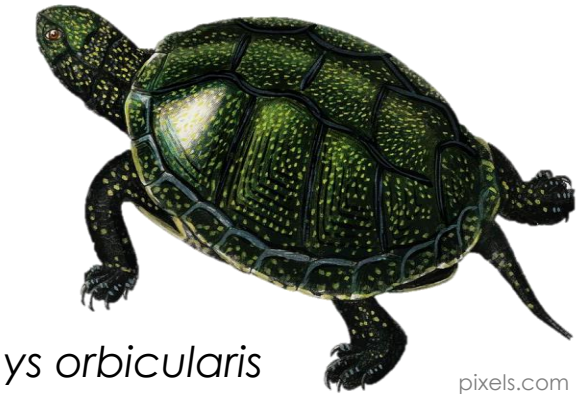
2006
3 ponds created

www.fritsahlefeldt.com

Bombina bombina

2013
16 ponds created

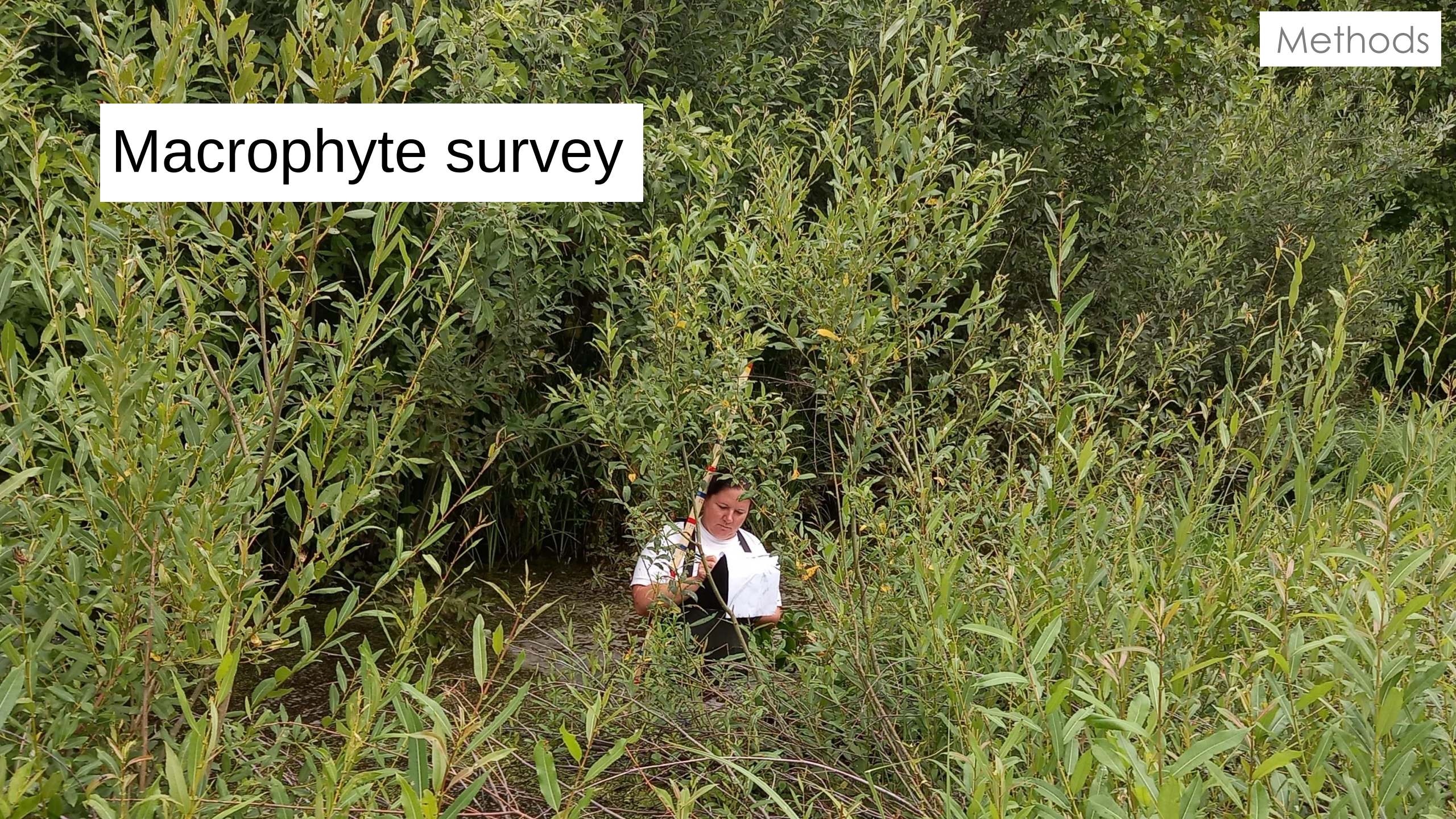
2018
3 ponds created



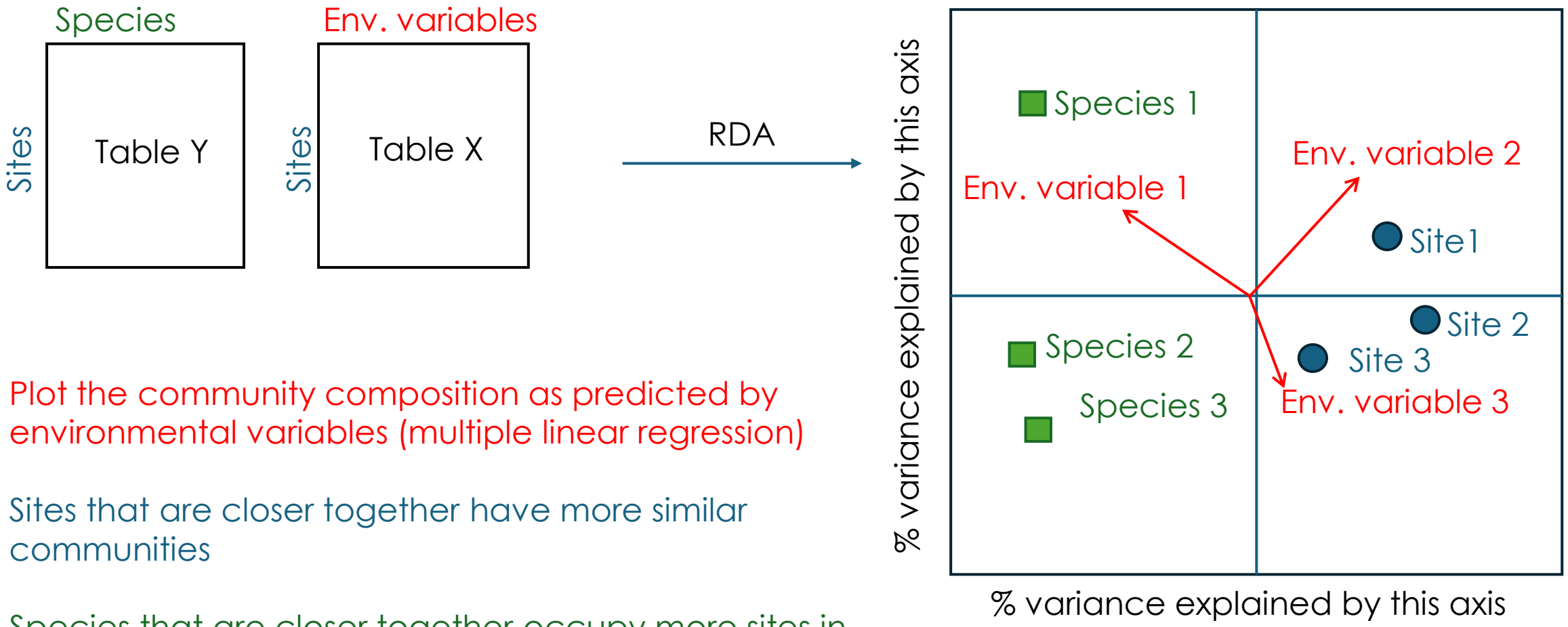
Emys orbicularis

pixels.com

Macrophyte survey



Redundancy analysis RDA



Plot the community composition as predicted by environmental variables (multiple linear regression)

Sites that are closer together have more similar communities

Species that are closer together occupy more sites in common

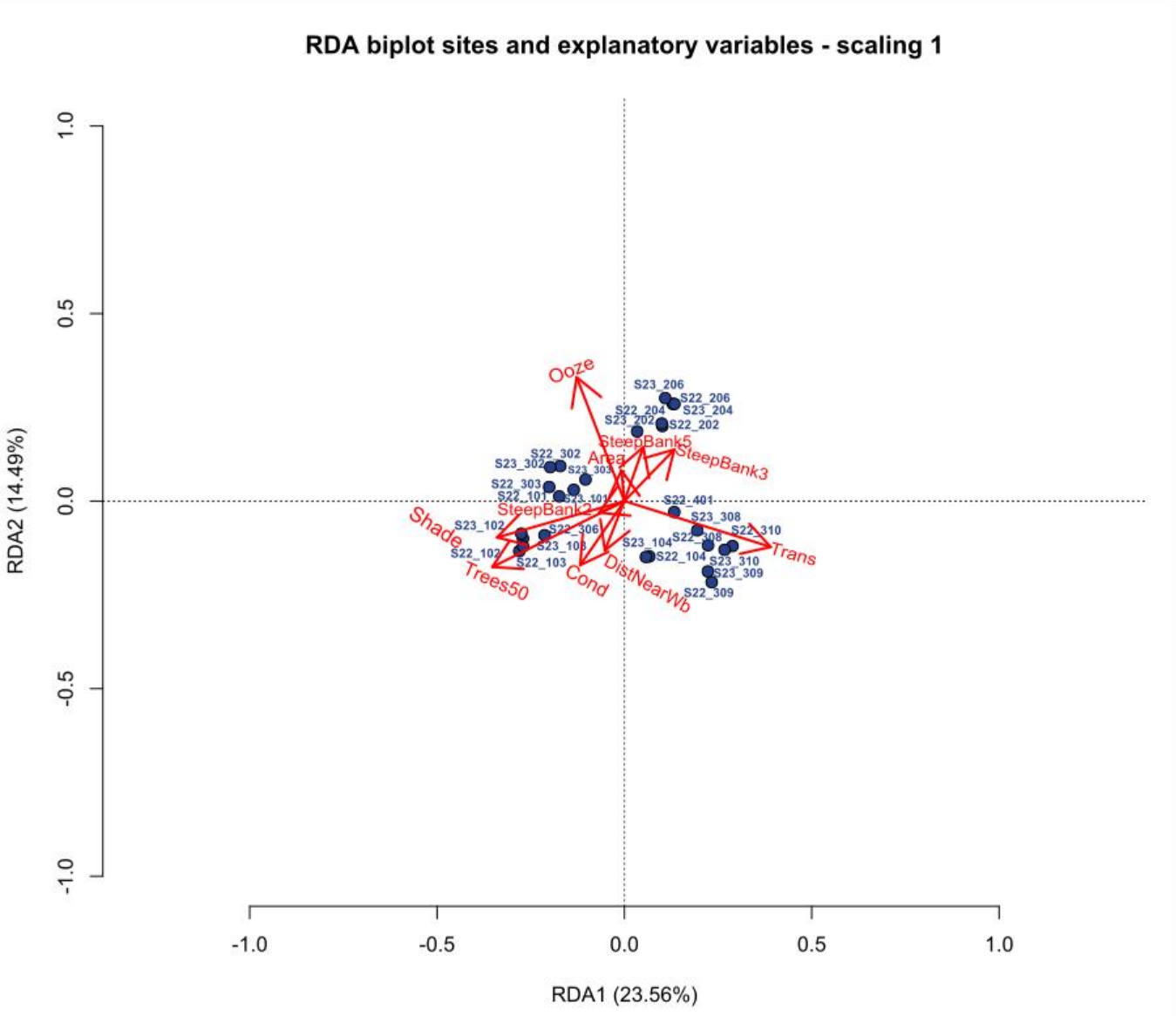
RDA

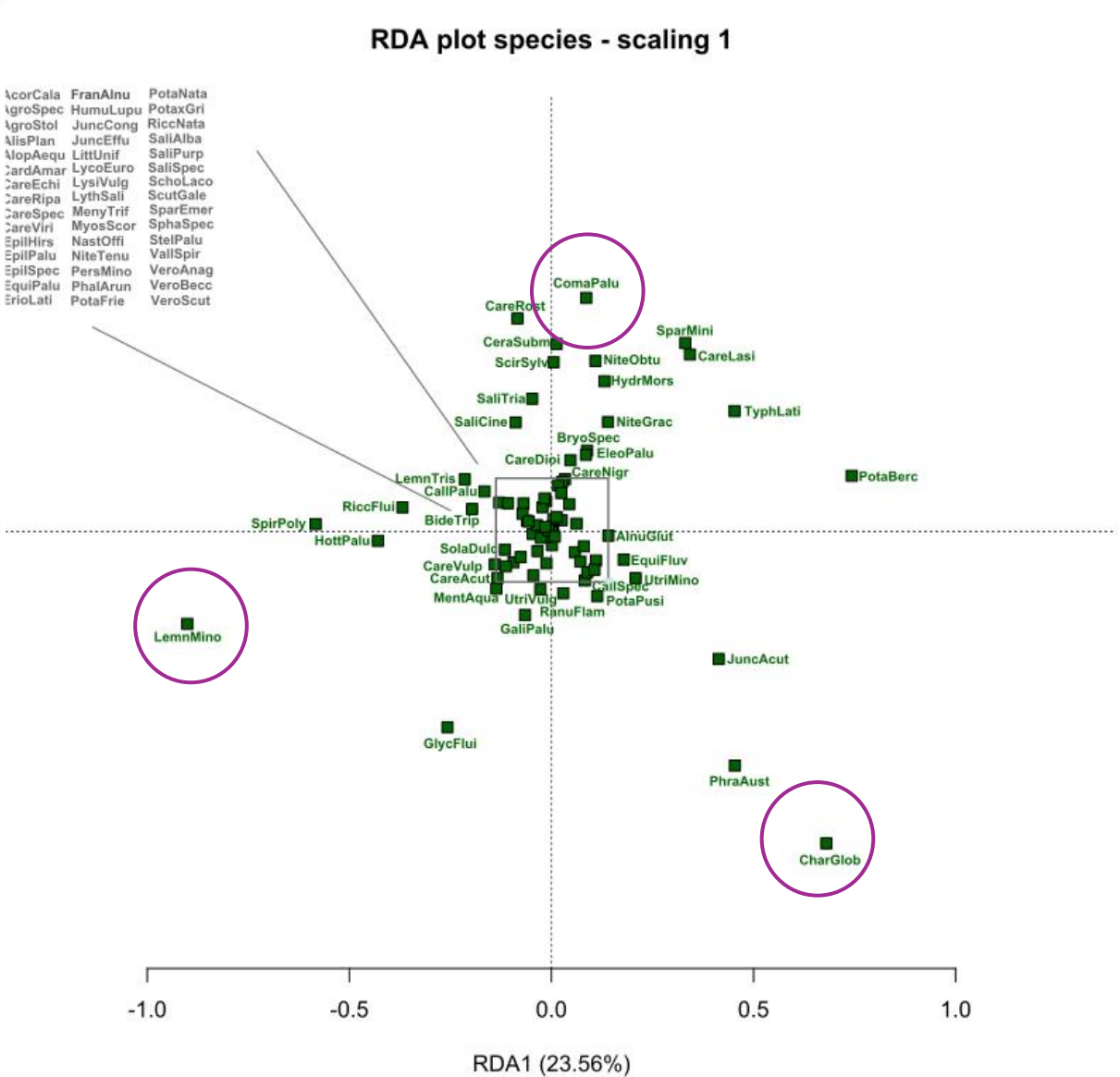
- Hellinger transformed log (x+1) percentage cover macrophyte data
- **Forward selection** of explantory variables. Started with Year, Area, Age, DistNearWb, Depth, Trans, TotalCov, SteepBank, InstTrampBank, Beaver, Fish, Shade, Trees50, Temp, Cond, TDS, DO%, pH, ORP, Chl, Ooze, CoarOrg, DecompLeavesTwig, SedimThick
- Remove correlated variables VIF> 20 (beaver presence, instable and trampled banks)
- Result is **Macrophytes ~ Trans + SteepBank + Trees50 + Cond + DistNearWb + Area + Ooze + Shade**

Results RDA

Partitioning of variance:

	Inertia	Proportion
Total	0.6067	1.0000
Constrained	0.4659	0.7679
Unconstrained	0.1408	0.2321





PhD outline

1. Introduction
2. Melina's paper on eDNA metabarcoding
3. Paper on pond eDNA metabarcoding
4. Paper on pond community ecology
5. Chapter on assessment of wetland restoration
6. Discussion