Shaw Nature Reserve

Preserving and documenting diversity

By Garrett Billings

History of Shaw Nature Reserve

- Burned frequently
  - Native Americans
  - Natural fire regimes
- Used almost exclusively as agriculture
  - Encouraged red cedar
  - Greatly impacted soil stability

History of Shaw Nature Reserve

- Land purchased in 1925 due to coal-soot pollution in St. Louis
- 1932 named The Missouri Botanical Garden Arboretum
- Orchid collection
  - By 1943 over 20,000 plants were housed in green houses. (mostly orchids)
- 1934 E. Anderson establishes native plant collection

1937 Louis Brenner lays out wildflower trails

2000 renamed Shaw Nature Reserve

E. Anderson

- Introgressive hybridization
- Plants, Man and life
- Keen interest in cultivated and economically useful plants
- Studied corn crops, and corn hybridization

E. Anderson

- Established 40 species of wildflowers

- Curator

1954-1957

- Darwin-Wallace medal of Linnaean Society

Shaw Nature Reserve

- Located on the boundary line of the historic glaciated northern prairies and southern Ozark Plateau
- Meramec river front

- Bedrock primarily dolomite and limestone.

- Clay loam, sand loam and black river bottom soil along limestone bluffs.


Brooks
Range
Glacier
Sea Ice
Berengia
Greenland
Ice Sheet
Cordilleran
Ice Sheet
Laurentide
Ice Sheet
Glacial Maximum
Exposed
Continential
Shelf

Habitats

Prairies

Schizacrium scoparium

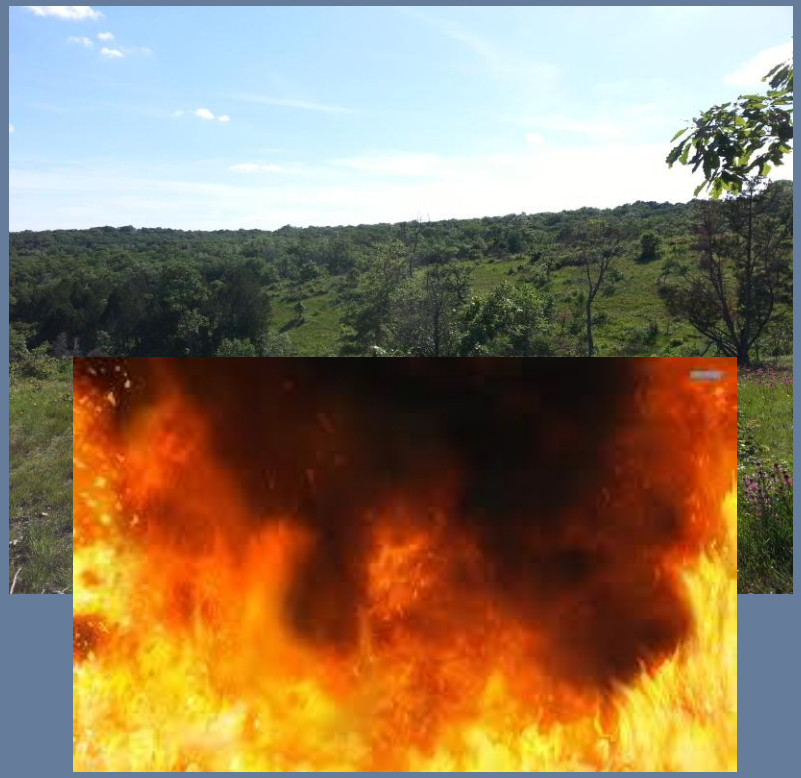
Andropogon gerardii

Glades

Echinacea

Dalea

Oenethera macrocarpa



Woodlands

Wetland

-Biodiversity hotspots

- Pollutant filters

- Soil erosion control

-Flood control

- Water reservoir

John Behrer began the construction in 1991

32 acres of wetland

Considered by the Corp of Engineers as a natural wetland equivalent

Wetland

Carex brevior

Taxodium distichum

Nyssa aquatica

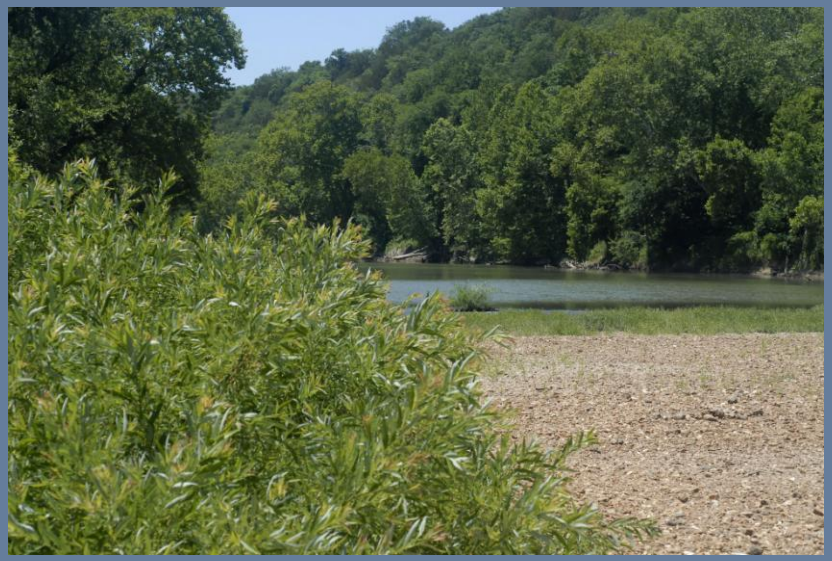
Uercus phellos

Carex spp.

Juncus spp.

Scirpus spp.

Other riparian communities

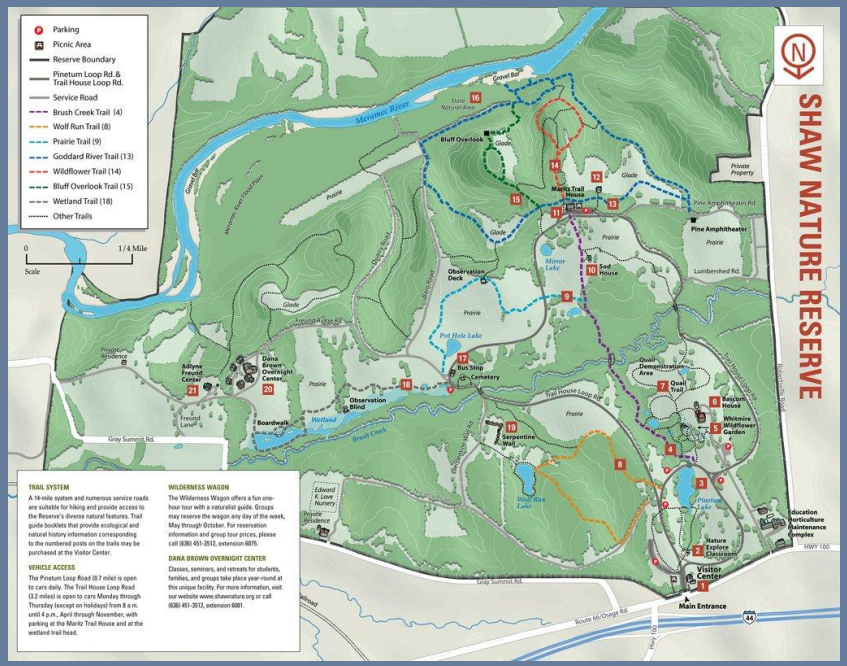


Meramec river

Pinetum Lake

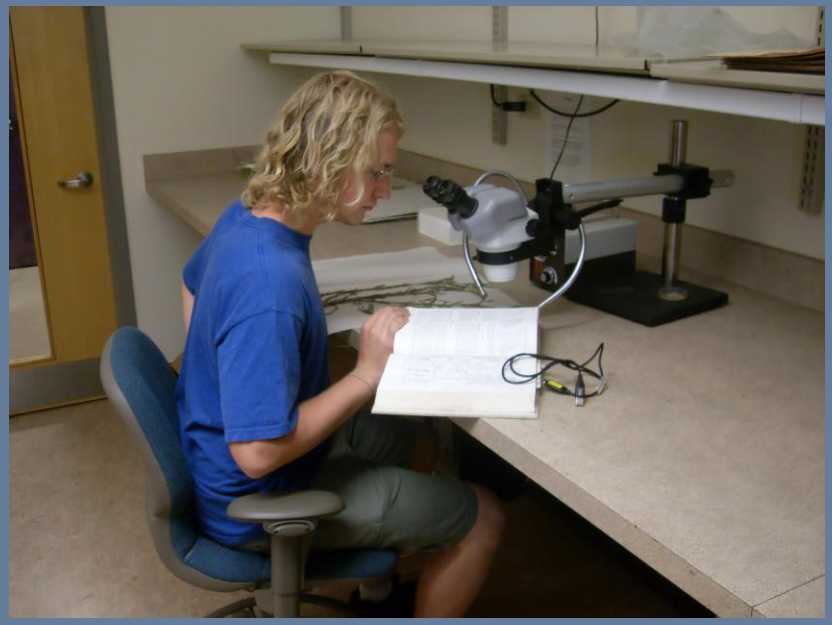
Collecting Shaw

- Plants were collected, pressed and placed in a dryer.
- Young leaf tissue was collected in coffee filters and later stored in silica gel
- 65 species were collected



Checklist

- 1605 specimens



DNA barcoding

- DNA barcoding is a short gene sequence from a standardized region of the genome used to distinguish and characterize species.

Benefits of DNA barcoding

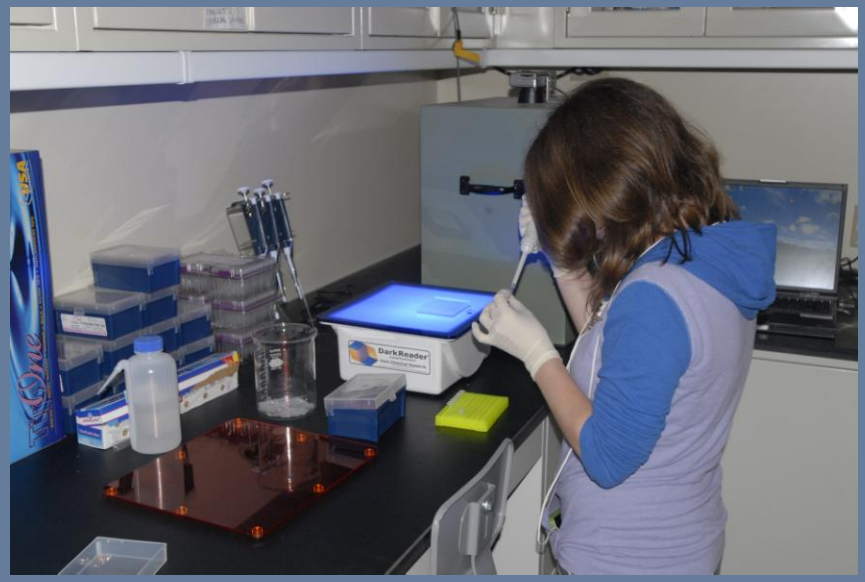
- Forensic analysis
  - Herbal medicines
  - Protection of endangered species
  - Species identification

Development of DNA barcoding

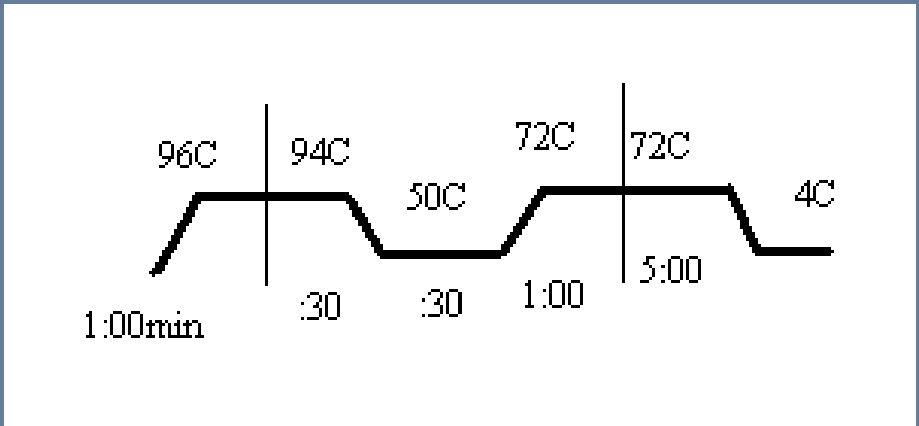
- Needs to be universally effective
  - Standardization
  - Minimalism
  - Scalability

A universal primer is needed

- (i) universality (ease of amplification and sequencing)
- (ii) sequence quality
- (iii) discrimatory power



- Extraction
- Amplification



- Sequencing

Consortium for the barcode of life

- COBL Proposed primers matK and rbcL as potential universal barcodes

Orchid case study:
matK
Lahaye et al found:
Tested 1,036 species of orchids
Resulted in >90% correct species identification.

Corallorhiza

	rbcL	matK
Positive	High amplifications and sequencing success	High rate of species discrimination success
Negative	Low rate of discrimination success	Low amplification and sequence success in many plant groups

	matK	rbcL
Genbank Presence	54% (561/1031)	53% (541/1031)
Species amplified	56% (17/30)	58% (18/31)
Species with > 80% sequence accuracy	5% (1/17)	88% (15/17)
Species with < 80% sequence accuracy	94% (16/17)	12% (2/17)
Species correctly identified to family	52% (9/17)	88% (15/17)
Species correctly identified to genus	35% (6/17)	76% (13/17)

DNA barcoding databases

Genbank presence

- matK- 54%
- rbcL-53%

Vouchers?

Take home message

- Currently there is no “universal” barcode that will work for all groups of flowering plants
- Standard primers like matK and rbcL on average tend to identify 70% of taxa, but if correct gene region is chosen for a particular group than >90% can be sequenced species specific
- **Different gene regions code better for different plant groups. (imagine that)**
- Great strides must be made if a universal barcode will ever be adopted for plants

Acknowledgements

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Sources

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Info-

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