

Conservation genetics of the rare species  
*Delphinium exaltatum* (RANUNCULACEAE) of the  
Appalachian mountains and the Ozark highlands of  
Missouri



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# INTRODUCTION



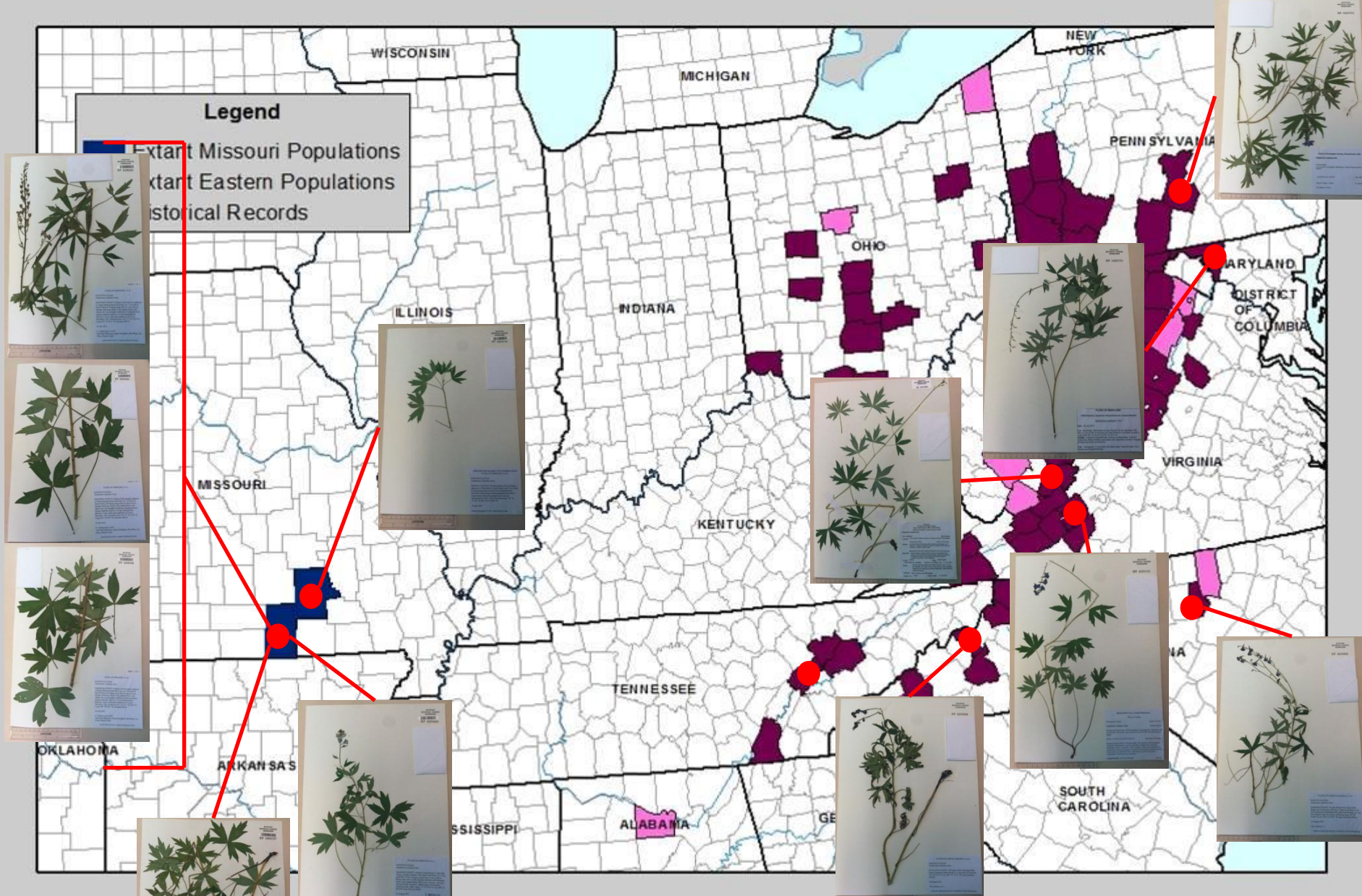
# objective

Examine the genetic variation and differentiation within and among populations of *D. exaltatum* from the Appalachian mountains and the Ozark highlands of Missouri to distinguish the effects of geographic isolation.



# METHODS


**study sites**



# Range of Tall Larkspur (*Delphinium exaltatum* Ait.)

Range distribution data based on input from various state botanists.

Map by Christine Steinwand, May 2013

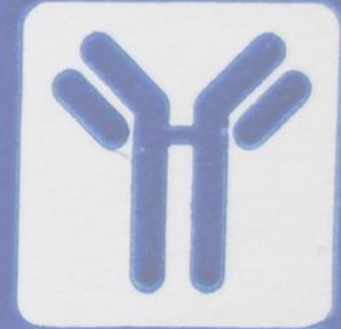


## life cycle

- **April-July: Vegetative**
- **July-September: Flowering**
- **August-October: Fruit**
- **Mid to late November-March: Dormant**

**extractions**

**MPD**

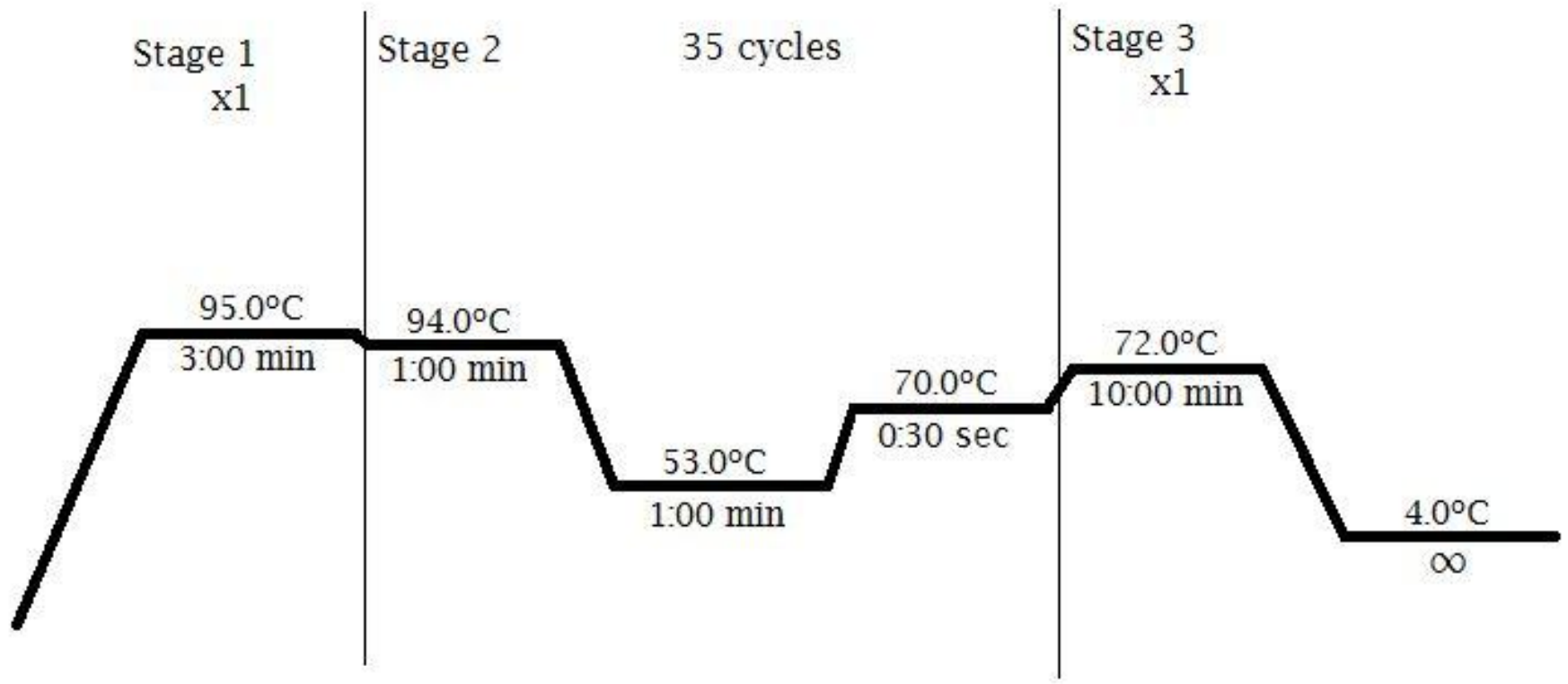


**TM**



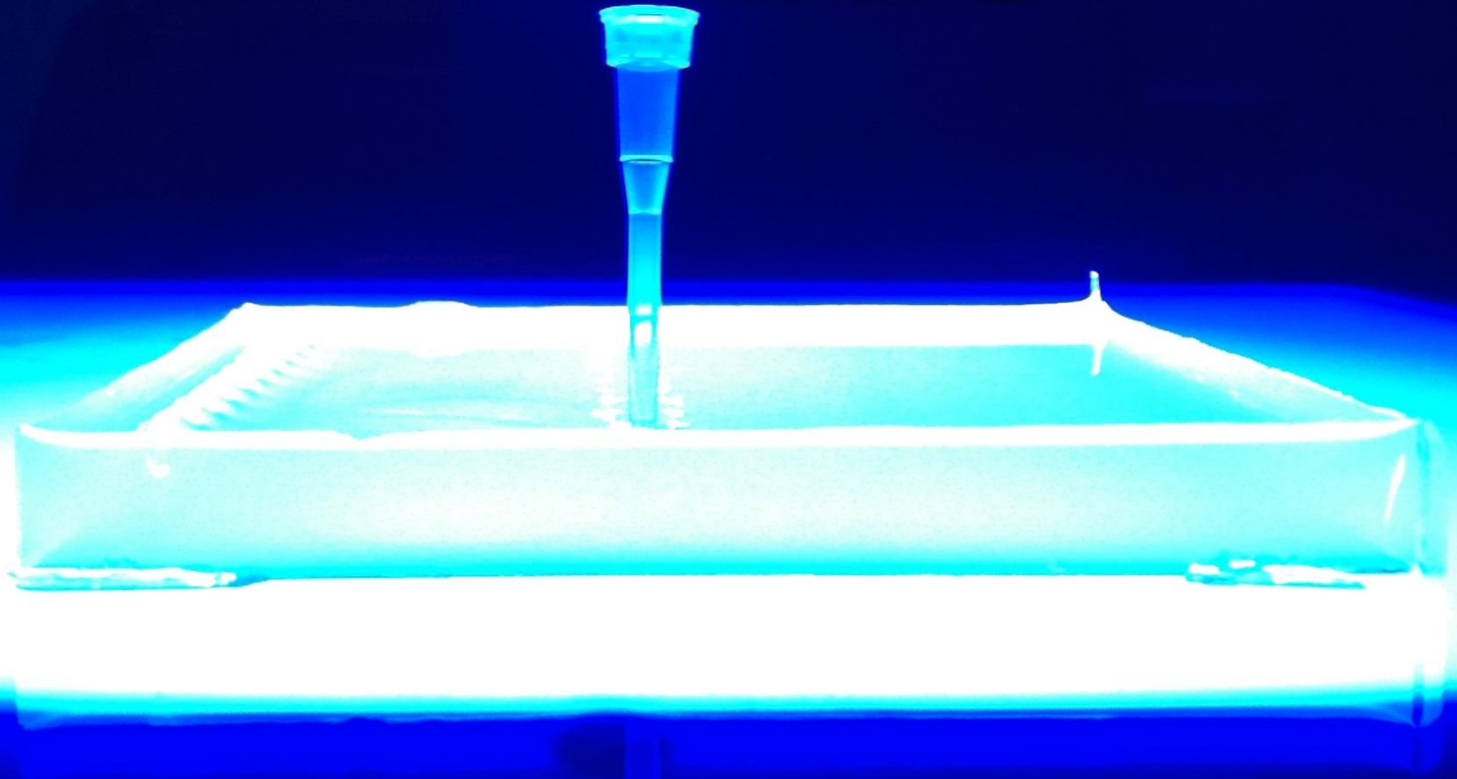
**amplification**

# 1st PCR cycle

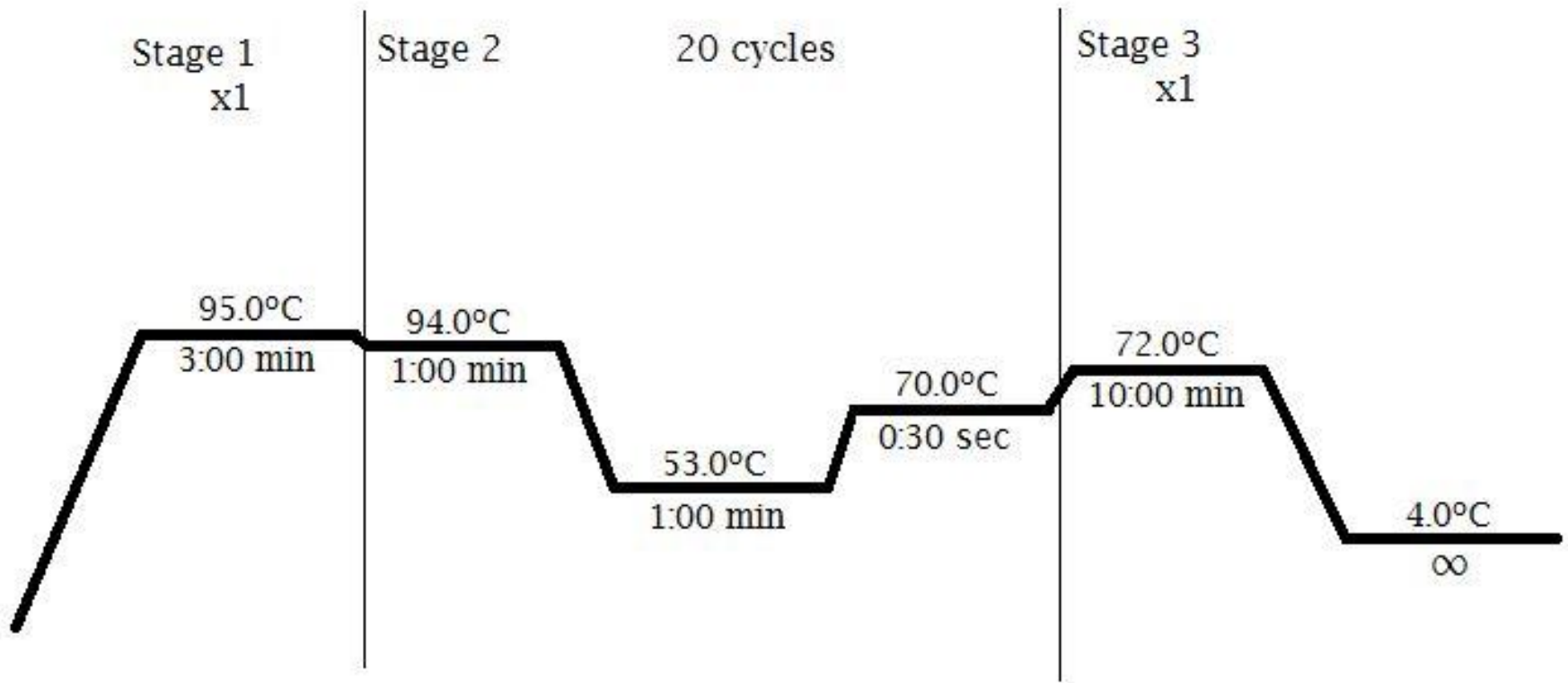




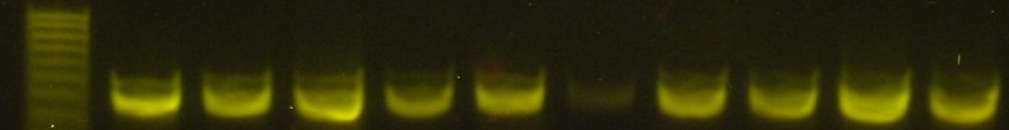
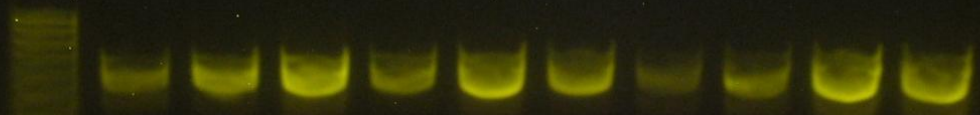
# gel-stab technique



# 2nd PCR cycle

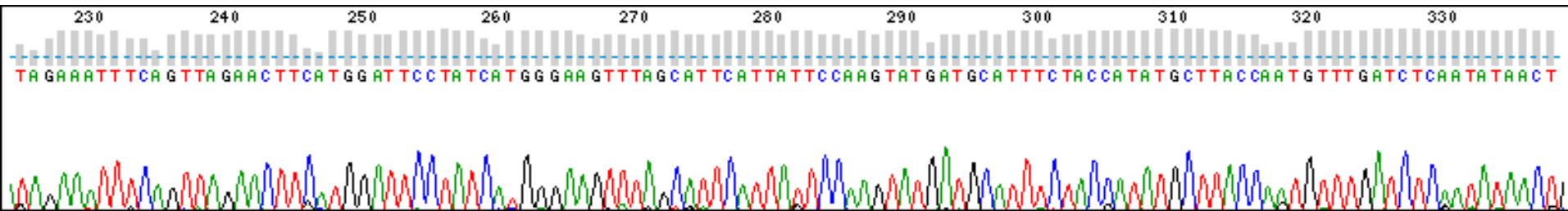


1 2 3 4 5 6 7 8 9 10



# sequencing

- Yale University – DNA Analysis Facility
- Sanger sequencing



Missouri, Howell County  
sample 11 - large band, forward sequence



**RESULTS**



Table 1. Patterns of deletion from significant regions of sequenced data. The data was analyzed from 26 sequenced samples from around 450 bp.

	G	A	A	A	G	C	G
<b>Maryland-W #1</b>	.	.	.	.	.	.	.
Maryland-W #2	C	G	G	T	A	T	C
Missouri-AF #15	C	.	.	.	.	T	.
<b>Missouri-AF #21</b>	.	.	.	.	.	.	.
<b>Missouri-AF #7</b>	.	.	.	.	.	.	.
Missouri-BC #15	.	G	G	T	A	T	C
Missouri-BC #19	.	G	G	T	A	T	C
Missouri-BC #23	C	.	.	T	.	T	C
Missouri-BC #34	C	G	G	T	A	T	C
<b>Missouri-H #1</b>	.	.	.	.	.	.	.
<b>Missouri-H #11</b>	.	.	.	.	.	.	.
<b>Missouri-H #14</b>	.	.	.	.	.	.	.
<b>Missouri-H #7</b>	.	.	.	.	.	.	.
Missouri-PB #8	C	G	G	T	A	T	C
Missouri-RS #21	C	G	G	T	A	T	C
Missouri-RS #33	.	.	.	T	.	T	C
North Carolina-D #1	C	G	G	T	A	T	C
North Carolina-D #21	C	G	G	T	A	T	C
North Carolina-W #17	C	G	G	T	A	T	C
North Carolina-W #5	.	.	.	T	.	T	C
Tennessee-OR #1	.	G	G	T	A	.	C
Tennessee-OR #29	.	G	G	T	A	T	C
Virginia-M #11	.	G	G	T	A	T	C
Virginia-M #22	.	.	.	.	.	.	C
West Virginia-M #14	C	G	G	T	A	T	C
West Virginia-M #26	.	G	G	T	A	T	C



Figure 1. Likelihood analysis. Missouri populations are shown in green.

A photograph of a pond with green reeds and spider webs. The reeds are tall and green, with some brown tips. The water is dark green and reflects the sky. Several spider webs are visible, some on the reeds and some in the air. The word "DISCUSSION" is written in large, bold, black letters on a white background in the upper right corner.

# DISCUSSION

# ACKNOWLEDGEMENTS

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  - **Dr. Rosa Ortiz-Gentry**
  - **Missouri Botanical Garden Staff**
- **REU Students**



**Questions?!**