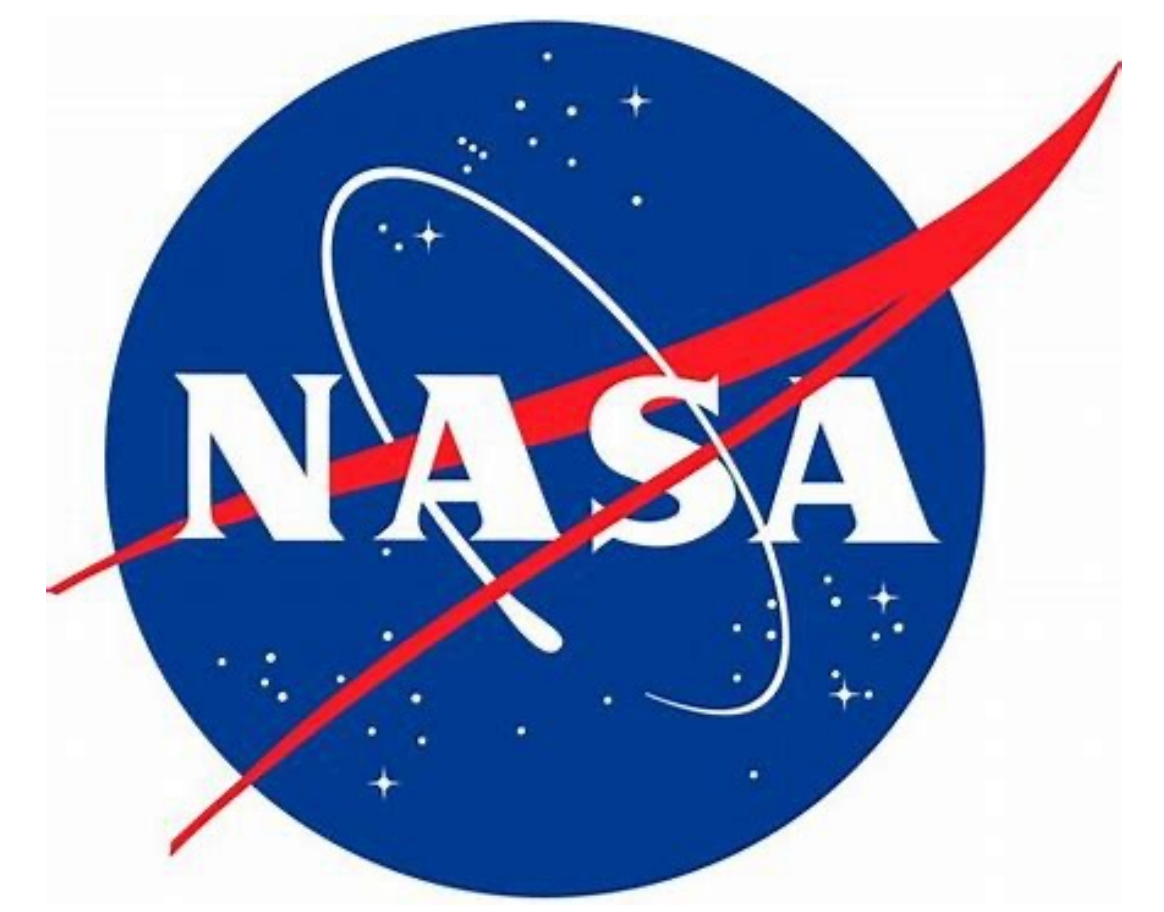


Genetic Diversity of *Myriophyllum alterniflorum* in Alamoosook Lake, Maine

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Background

- Alternate-flowered watermilfoil, *M. alterniflorum*, is native to and present in all New England states but is most common in Maine and is located in still or slow-moving water of lakes and rivers (New York Natural Heritage Program).
- Distinguishable from other watermilfoil species by its slenderness, leaves less than one centimeter long, and a terminal spike with mostly alternately arranged flowers and bracts (Gleason and Cronquist, 1991).
- Watermilfoil can sexually and asexually propagate. Asexual propagation can occur through fragmentation which produces clonal offspring.

Objective

Determine how many clones there are of *M. alterniflorum* in Alamoosook Lake, Maine. I hypothesize that there will be low genetic diversity of *M. alterniflorum* in Alamoosook Lake because the watermilfoil asexually propagated through fragmentation. The watermilfoil sampled in Alamoosook Lake had no flowering which likely means the watermilfoil spread throughout the lake by asexual propagation.

Methods

- Maine DEP provided nineteen watermilfoil specimens, sampled from Alamoosook Lake during the 2023 growing season.
- Samples were characterized using a library of five microsatellite markers during the polymerase chain reaction (PCR) amplification.
- Samples AL1, AL3, AL21, AL27, and AL29 were additionally tested with internal transcribed spacer (ITS) region sequencing and compared to GenBank and other sequenced controls (Bernacki, unpublished).

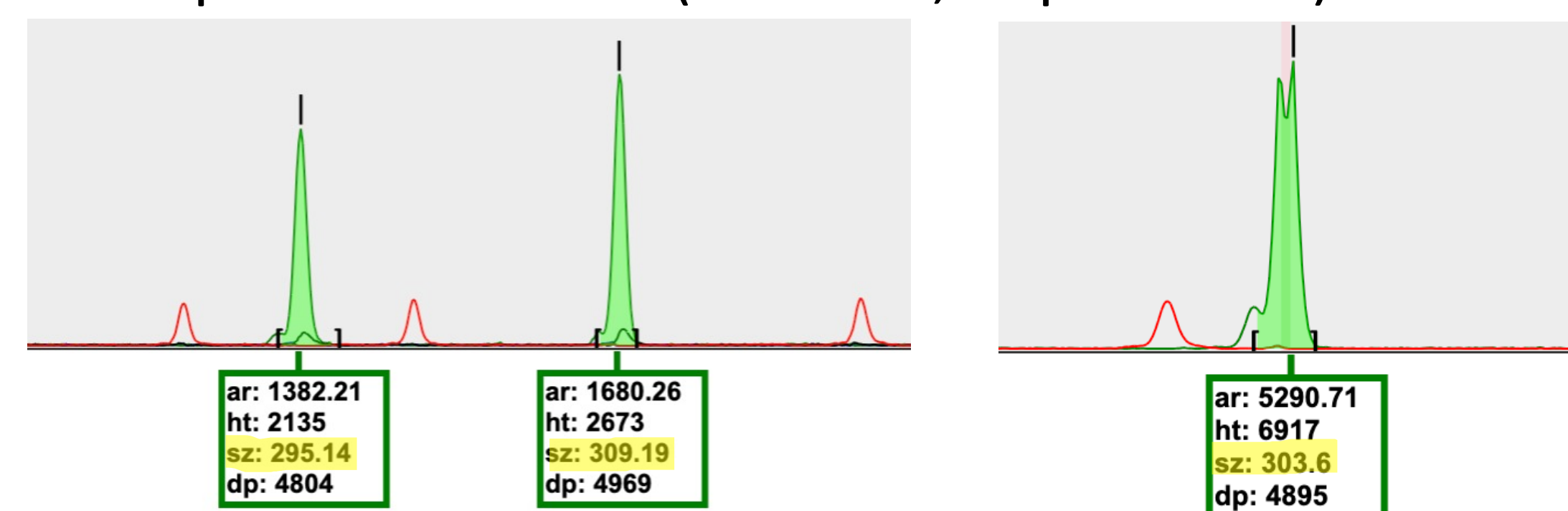


Fig. 1 (left): Fragment analysis sample of AL1, *M. humile*, with Mspi14 PCR product. Fig. 2 (right): Fragment analysis sample of AL27, *M. alterniflorum*, with Mspi14 PCR product. The y-axis is the height/relative absorbance (RFU), and the x-axis is base pair size/fragment length (highlighted).

Results

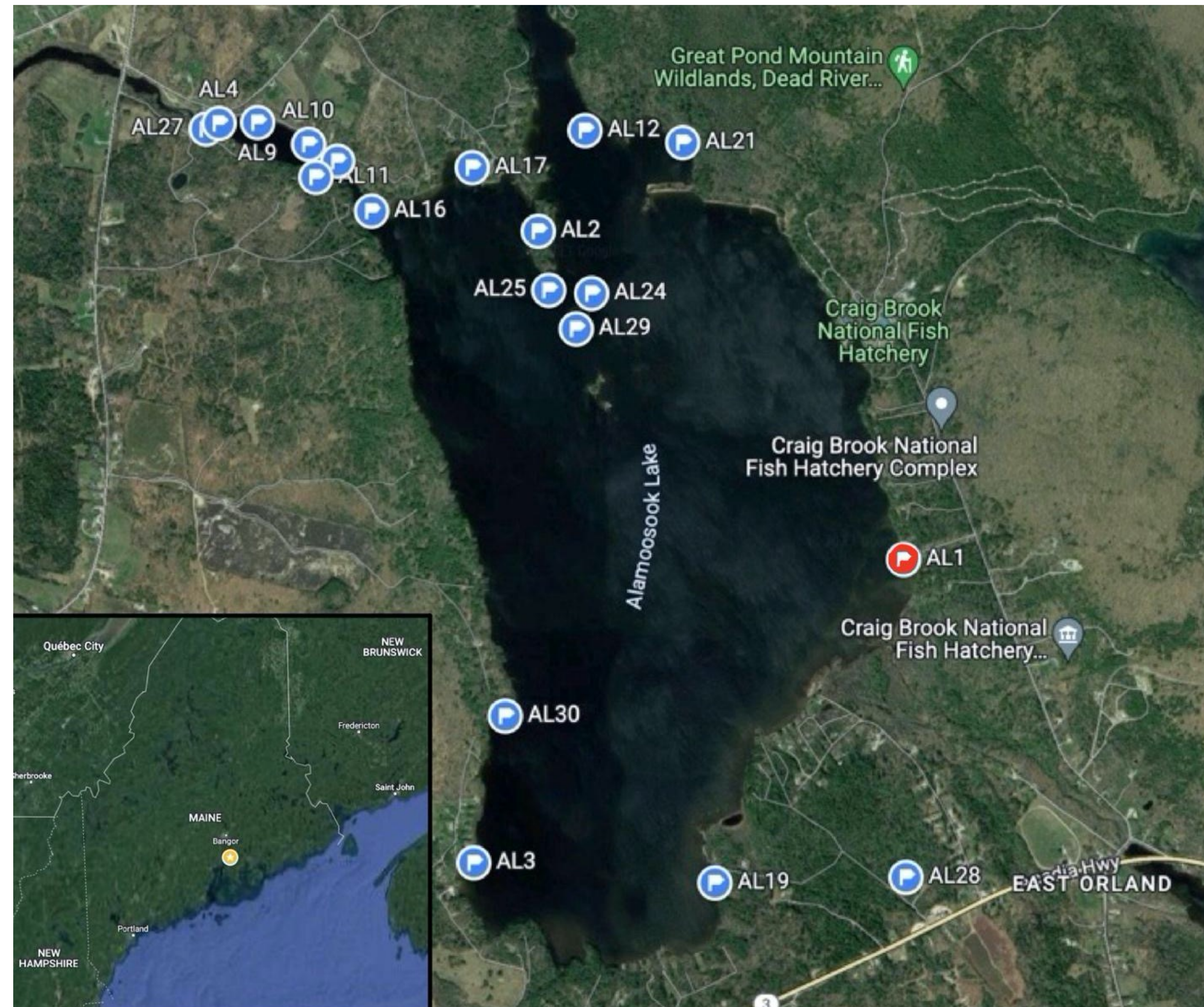


Fig. 3: Shows the lone sample of *M. humile*, AL1, in red and the single clone of *M. alterniflorum* samples in blue. There are nineteen total tissue samples and Table 1 contains the five-marker genotype used to characterize the clones.

- There was only **one genotype of *M. alterniflorum* in Alamoosook Lake** of the provided samples.
- Samples AL3, AL21, AL27, and AL29 had ITS region sequencing results that were consistent with *Myriophyllum alterniflorum*.
- AL1 had a multi-locus genotype that was significantly divergent from all of the other samples. The sequence for the **AL1 sample was 99-100% match to *M. humile*** ITS region sequences from GenBank.

Importance

Understanding native populations, like *M. alterniflorum*, is critical to their success and management. To properly manage populations, all possible information should be understood about them, like genetic diversity. Keeping the native populations healthy will help to limit the establishment of the environmentally and economically destructive invasive species of watermilfoil.

Results (continued)

Table 1: Five-marker genotype of the nineteen watermilfoil samples. There is only one genotype of the *M. alterniflorum* samples, AL1 was determined to be a sample of *M. humile*. Samples were named after the Alamoosook Lake and the Bouy number they were sampled by (AL#). The numbers in the table represent the DNA fragment size that was produced by the individual primer pairs during PCR. Mspi# represent the primer pairs used for the PCR amplification.

Code	Mspi6	Mspi8	Mspi14	Mspi15	Mspi16
AL1	160	274	295 309	253 254 266	186
AL2	153	281	304	265 266	345
AL3	153	281	304	265 266	345
AL4	153	281	304	265 266	345
AL7	153	281	304	265 266	345
AL9	153	281	304	265 266	345
AL10	153	281	304	265 266	345
AL11	153	281	304	265 266	345
AL12	153	281	304	265 266	345
AL16	153	281	304	265 266	345
AL17	153	281	304	265 266	345
AL19	153	281	304	265 266	345
AL21	153	281	304	265 266	345
AL24	153	281	304	265 266	345
AL25	153	281	304	265 266	345
AL27	153	281	304	265 266	345
AL28	153	281	304	265 266	345
AL29	153	281	304	265 266	345
AL30	153	281	304	265 266	345



Fig. 4 (left) and 5 (right): Photos by Don Cameron of alternate-flowered watermilfoil, *M. alterniflorum*. The pictures show how *M. alterniflorum* can be identified morphologically by its slenderness, leaves less than one centimeter long, and a terminal spike with mostly alternately arranged flowers and bracts.

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References

- Alternate-flowered Water Milfoil Guide. New York Natural Heritage Program. guidesnynhp.org. [accessed 2023 Nov 17].
- Bernacki, Lucas. Saint Joseph's College; Department of Sciences. Standish, Maine.- unpublished
- Gleason, Henry A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. The New York Botanical Garden, Bronx, New York. 1:910.