



Environment and Natural Resources Trust Fund

Final Subproject Abstract

Project Information

ID Number: 2020-043

Project Title: Minnesota Invasive Terrestrial Plants and Pests Center, Phase 5

Project Manager: Robert Venette

Organization: U of MN

Funding Source: Environment and Natural Resources Trust Fund (ENRTF)

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 06a

Appropriation Amount: \$5,000,000

Appropriation Language: \$5,000,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to support the Minnesota Invasive Terrestrial Plants and Pests Center to fund approximately 15 new, high-priority research projects that will lead to better management of invasive plants, pathogens, and pests on Minnesota's natural and agricultural lands. This appropriation is subject to Minnesota Statutes, section 116P.10. This appropriation is available until June 30, 2026, by which time the project must be completed and final products delivered.

Appropriation End Date: June 30, 2026

M.L. 2021 Subproject Abstract

Subproject Title: Sub-project #9: Competitiveness and adaptability of Palmer amaranth in changing Minnesota climate

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Subproject Budget: \$157,821

Amount Spent: \$138,181

Amount Remaining: \$19,640

Amount Returned to Reserve: \$0

Subproject Completion Date: April 30, 2025

Final Subproject Abstract Submitted: January 13, 2026

Sound bite of Subproject Outcomes and Results

This study reveals that Palmer amaranth thrives in both dry and wet soils, outperforming waterhemp—a known major weed in Minnesota. Findings underscore that Minnesota is highly vulnerable to Palmer amaranth and management will be needed to prevent widespread infestation, protect ecosystems, and avoid escalating herbicide use and environmental risks.

Subproject Outcome and Results

Palmer amaranth can reduce yields of corn and soybean by more than 70%, so the weed must be eradicated whenever it is found in Minnesota. But, loss estimates come from drier states than Minnesota, and soil moisture might affect the damage Palmer amaranth can cause.

This team conducted greenhouse experiments to measure effects of soil moisture levels, ranging from flooded to drought, on the emergence and growth of Palmer amaranth and waterhemp, a weed that is related to Palmer amaranth and is problematic in Minnesota. Palmer amaranth seeds were from Arizona and North Dakota, and waterhemp seeds were from Minnesota. Seeds of each Palmer amaranth and waterhemp population were planted in large pots filled with sterile soil. Soil moisture levels were adjusted relative to the maximum amount of water that the soil could hold (known as 'field capacity'). Soils were completely flooded, flash flooded (specifically, 2 days of flooding followed by 12 days at 60% field capacity), or maintained at a constant 60%, 40%, or 20% field capacity. Soil moisture levels were monitored constantly with electronic sensors. Above-ground biomass was measured after two months. The study was conducted twice.

Palmer amaranth generally emerged better and grew faster than waterhemp under most moisture conditions. Neither Palmer amaranth nor waterhemp survived under complete flooding. Palmer amaranth emergence was 3 to 4 times greater than waterhemp under flash flooding. More Palmer amaranth seeds emerged than waterhemp at each of the other moisture levels that were studied. Similarly, Palmer amaranth grew more than waterhemp at each moisture level. These results indicate that Palmer amaranth is more likely to thrive in water-stressed environments (both wet and dry) than waterhemp, a weed that is already problematic in Minnesota. This study highlights the potential for Palmer amaranth to spread under current and future moisture conditions in Minnesota.

Subproject Results Use and Dissemination

Results of this research were presented at the Upper Midwest Invasive Species Conference in November 2024 and at the national meeting of the Weed Science Society of America in February 2025. Project findings were summarized in a [MITPPC blog post](#) for a general audience. Results from the study are already being used in statewide Extension programming and in outreach efforts by the Minnesota Department of Agriculture's Palmer Task Force to help ag professionals identify and manage Palmer amaranth before it spreads and becomes a problem across Minnesota. A manuscript is being written for a peer-reviewed publication.

For LCCMR Staff Use Only:

Final Subproject Abstract Approved: January 14, 2026