Mechanisms and reversibility of effects of invasive cattail on native wetlands

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Introduction
• Most invasive plants negatively affect the native communities they invade.
• However, invasives can affect natives via different mechanisms and distinguishing among them is essential for understanding the dynamics of invasions and for directing management strategies.
• Two common mechanisms of invasive plant effect:
  Direct competition
  Alteration of the environment
• If invasives alter the environment, not only do restoration efforts need to remove the invader, but also these underlying environmental changes may need to be addressed before the system is again suitable for natives.

Questions:
1. By what mechanisms does invasive cattail (Typha x glauca) affect the ecosystem and plant community?
2. Are these effects reversible?

Study System
Invasive hybrid cattail (Typha x glauca) in a Great Lakes coastal wetland
• T. x glauca produces monodominant stands with considerable litter accumulation

Hypothesis: T. x glauca litter alters the environment, and this alteration negatively affects native plants.

Methods
Addition experiment: Live T. x glauca and its litter were added in factorial design to an uninvaded part of the marsh.
Removal experiment: Live T. x glauca and its litter were removed in factorial design in the invaded part of the marsh.

Environmental properties and plant community measured over four years

Results
Addition Experiment: Does live T. x glauca or its litter affect the environment and plant community?
• Both live T. x glauca and its litter increased soil inorganic nitrogen pools
• Neither affected N mineralization in the long term
• Only litter decreased light
• Only litter reduced native plant diversity and abundance
• Marsh dominants (sedges and rushes) were negatively affected by litter addition, whereas grasses and forbs benefited from litter

Removal Experiment: Does removal of live T. x glauca or its litter restore the environment and plant community?
• Removal of T. x glauca litter caused a small decrease in soil inorganic nitrogen pools
• Neither affected N mineralization
• Removal of litter increased light
• Removal of litter increased native plant diversity and abundance
• However, it did not restore native marsh species, but rather recruited more terrestrial sedge meadow grasses and forbs

Conclusions
• T. x glauca affects native species through alteration of the environment (litter production), not direct competition.
  → This is probably due to light reduction by the litter.
• Most effects on the environment are also brought about by T. x glauca’s litter.
• Removal of live T. x glauca and its litter did not restore the native marsh community, but rather recruited more terrestrial sedge meadow grasses and forbs.
  → This is probably because the underlying environment was still altered, such as elevated nutrients and soil organic matter.
  → When restoring marshes invaded by cattail, removal of litter and soil may be necessary to promote recruitment by sedges and rushes.

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