



# Knee Deep in Peatland Ecology



Plant community interactions among black spruce, tamarack, and labrador tea  
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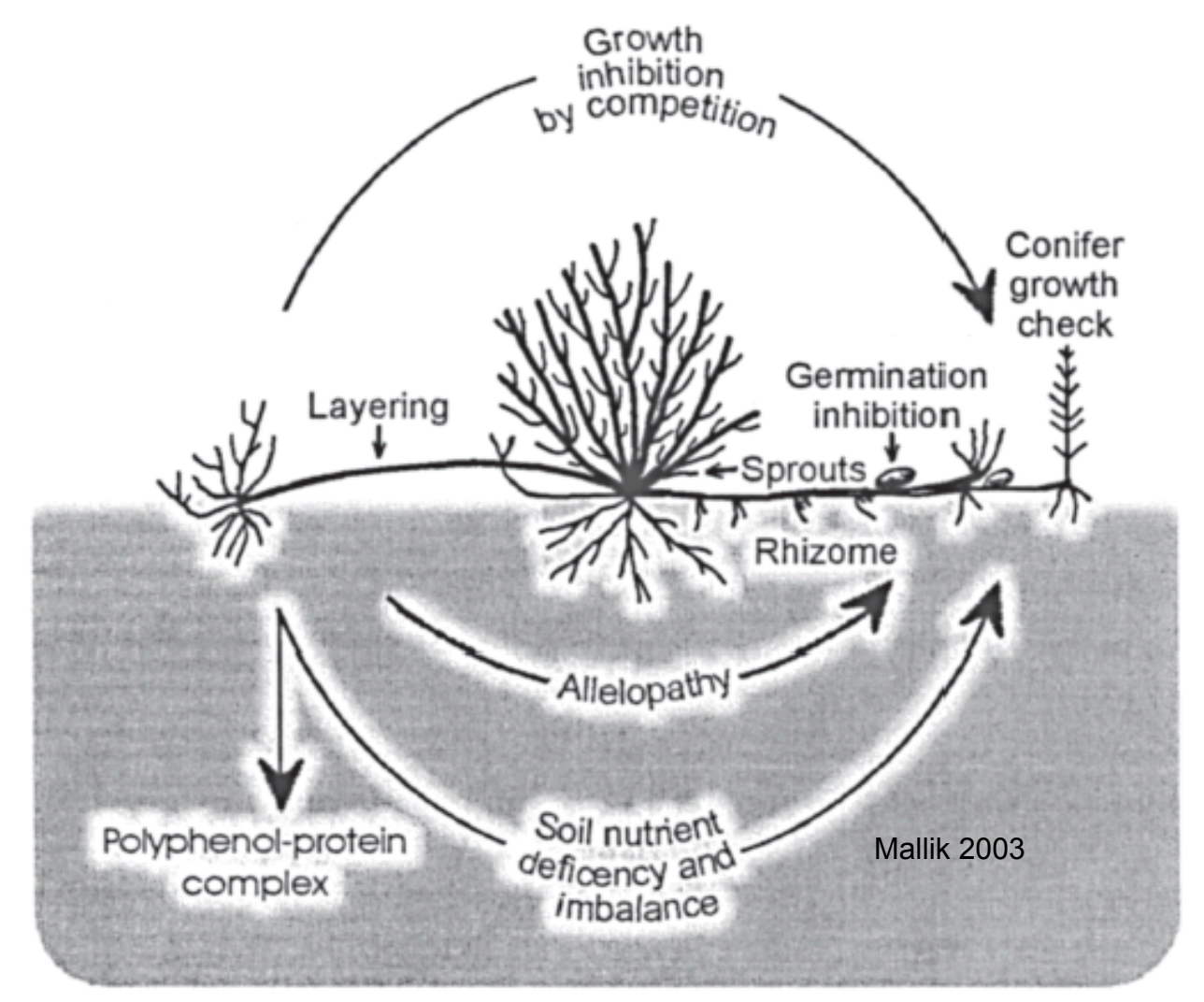
## Introduction

A peatland ecosystem provides habitat for wildlife, supports the timber industry and contains up to a third of the world's stored soil organic carbon (Gorham et al., 1991). The composition of peatland forests may change after perturbations such as wildfire or logging, with interactions between the understory shrubs and tree seedlings playing a significant role in their regeneration.

The thick waterlogged organic soils of these forests host many ericaceous shrubs like labrador tea and coniferous trees such as tamarack and black spruce. Ultimately, the objective of this study to understand the succession of peatland forests through a greenhouse experiment which will test the interactions among tamarack, labrador tea and black spruce at different stages of growth.

Ericaceous shrubs like labrador tea inhibit the growth of spruce; however, the mechanisms that may inhibit conifer establishment are not clear (Mallik 2003). Secreted allelochemicals, competition for nutrients, and light are all potential mechanisms that inhibit the recruitment of black spruce. The objective of the specific greenhouse experiment is to elucidate where inhibition takes place, whether it is apparent at primary stages of growth (i.e. seedling germination), and what extent tamarack may mediate this effect.

## Current Model



Black Spruce  
[http://upload.wikimedia.org/wikipedia/commons/1/17/Picea\\_mariana\\_\(Spruce\\_black\).jpg](http://upload.wikimedia.org/wikipedia/commons/1/17/Picea_mariana_(Spruce_black).jpg)

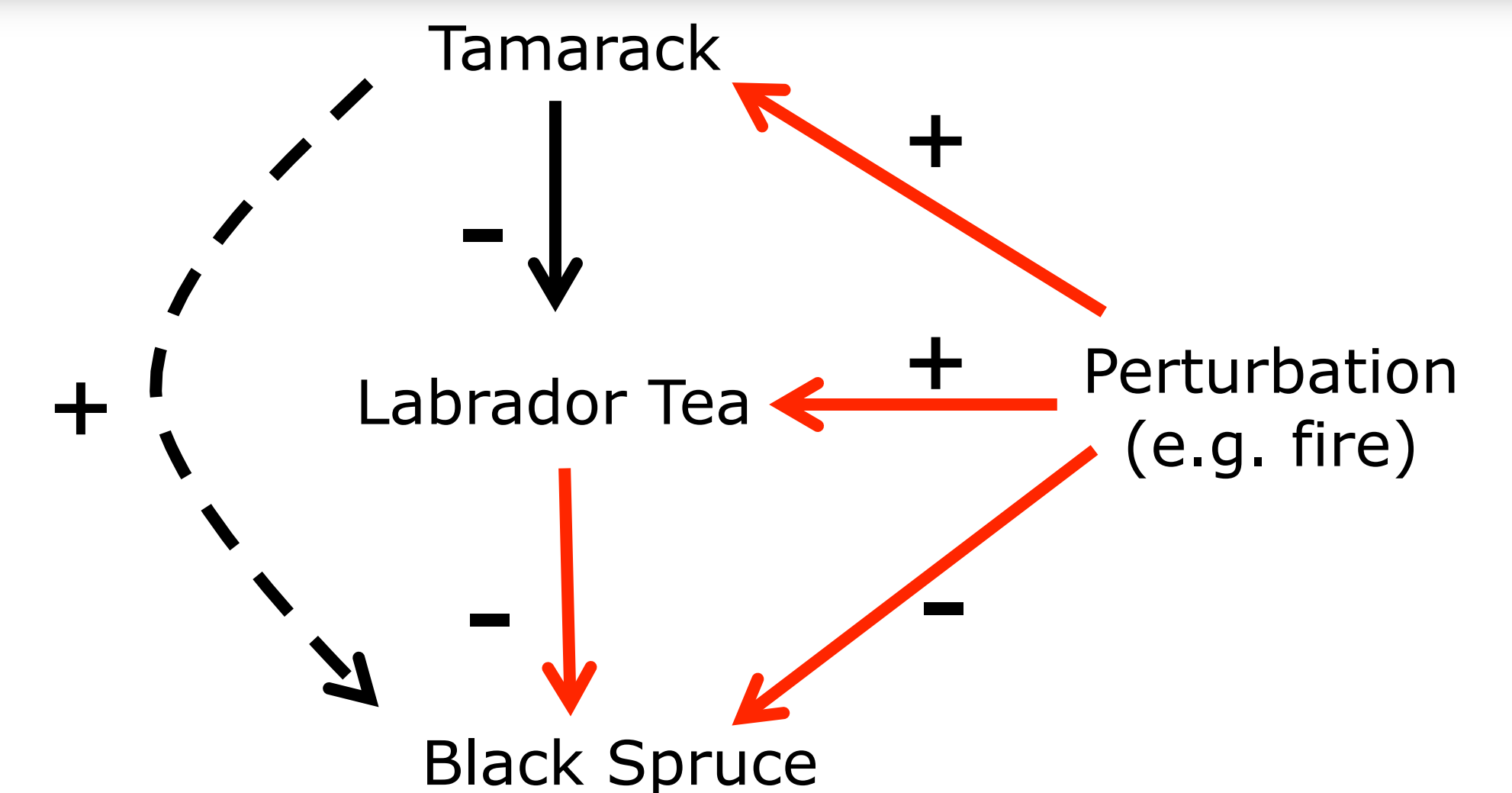


Tamarack  
<http://media-2.web.britannica.com/65-media/66/1966-004-44359187.jpg>



Labrador Tea (Ericaceous Shrub)  
[http://www.schumannia.com/pics/141\\_4131.jpg](http://www.schumannia.com/pics/141_4131.jpg)

## Proposed Model



## Methods

	Control	LT Soil	LT Plant
Spruce Alone	(A)	(A)	(A)
Tamarack Alone	(A)	(A)	(A)
Spruce with Neighbor	(P)	(P)	(P)
Tamarack with Neighbor	(P)	(P)	(P)



### Explanatory Variables:

- 3 Soil Potting Conditions - Control, LT Soil, LT Plant
  - 2 Species of Seedlings - Black Spruce and Tamarack
  - 2 Neighbor Conditions - Present or Absent
- n = 6 and N = 72

### Response Variable:

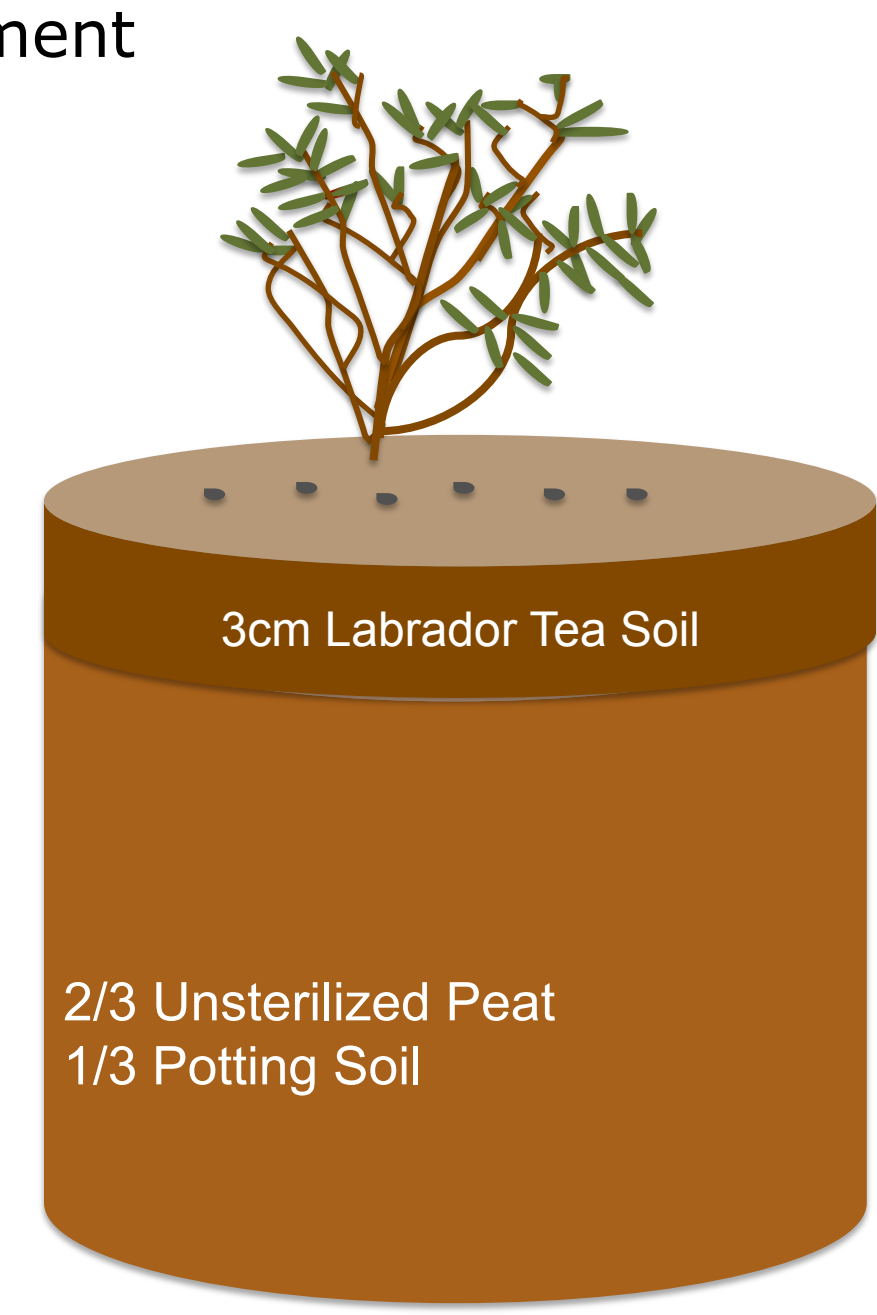
- Seed Germination (proportion)
- The number of established seedlings that survived over 6 weeks out of total seeds sowed per treatment



LT Soil

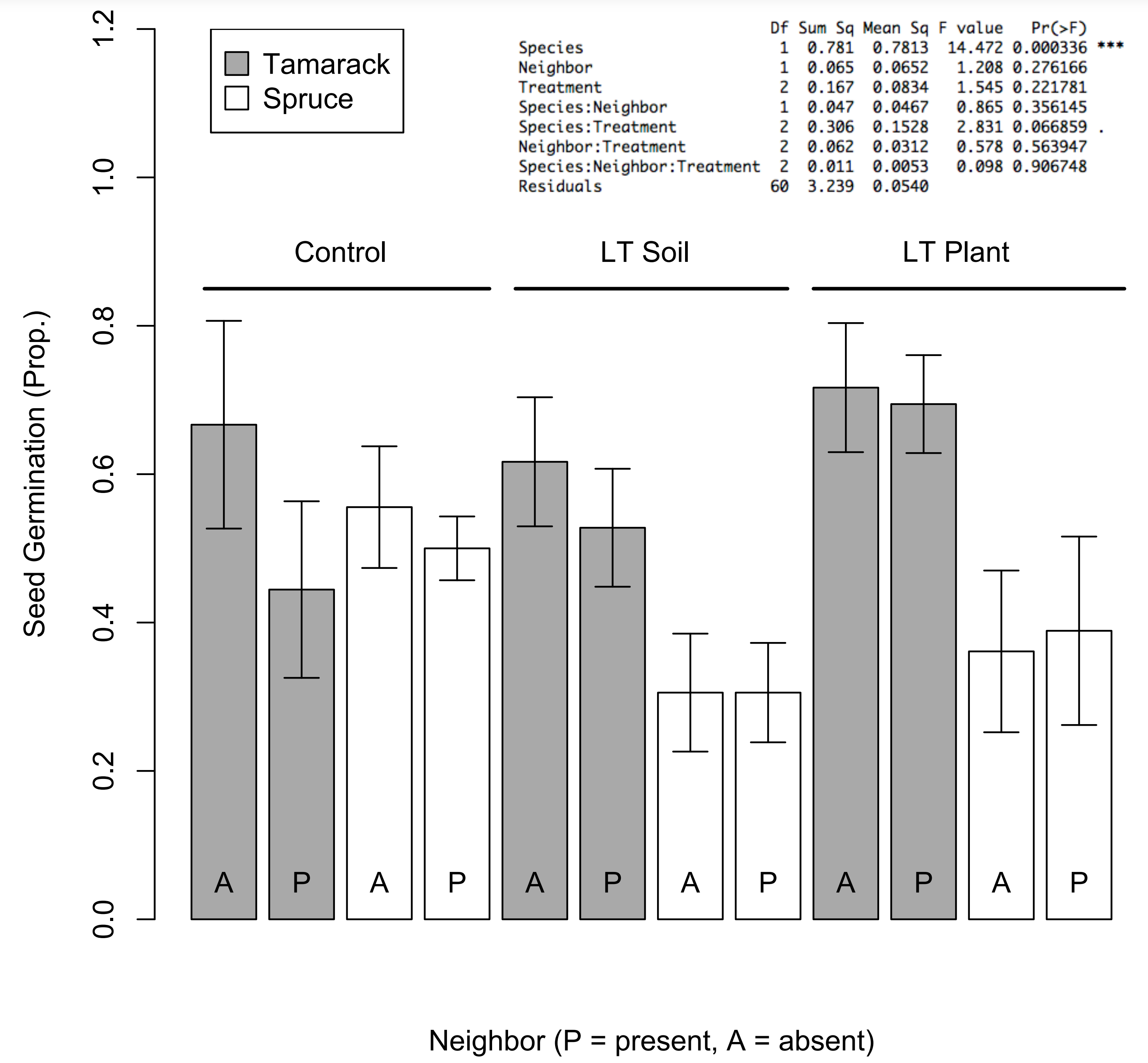


Control



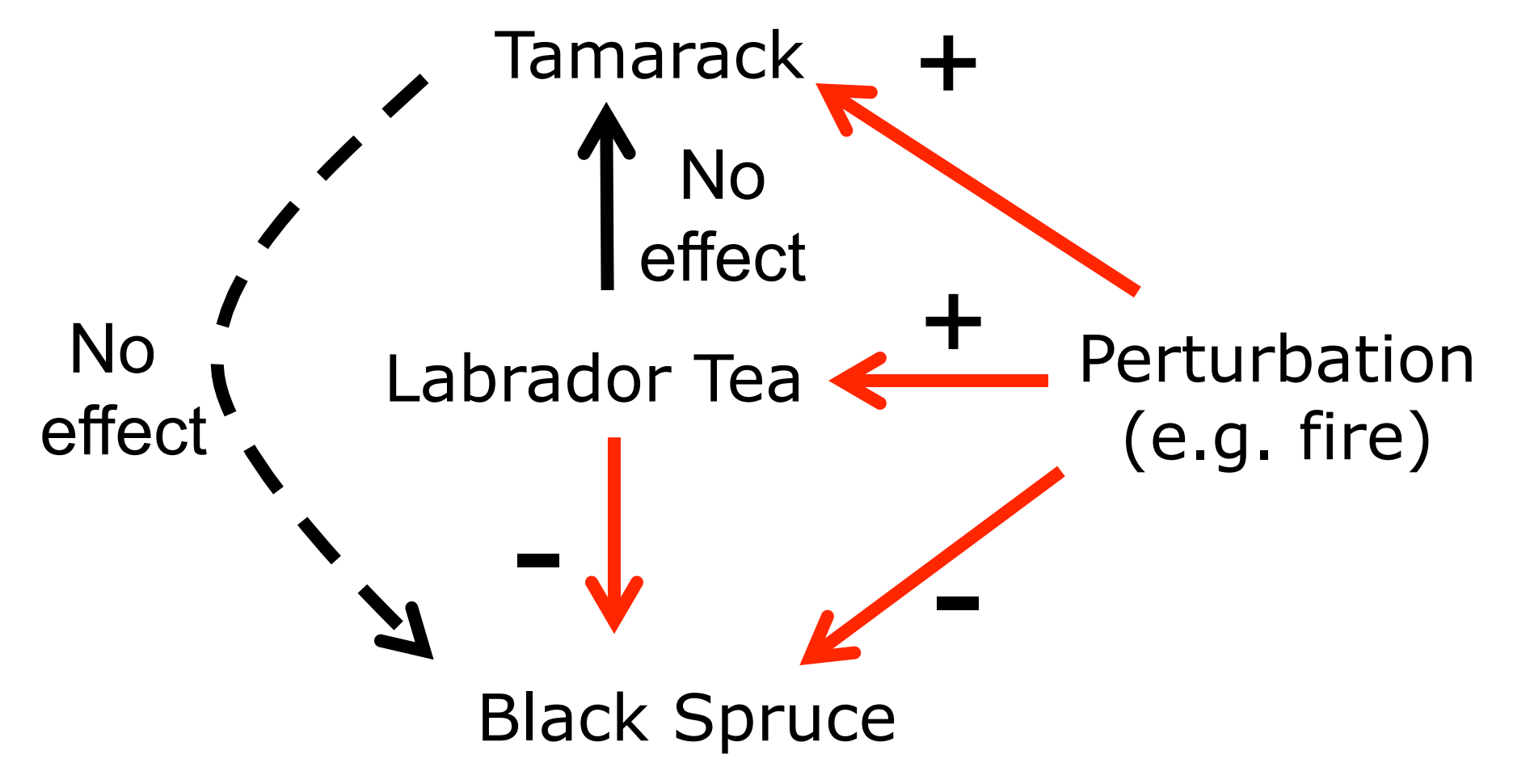
LT Plant

## Results



## Conclusions

- The presence of tamarack as a neighbor of black spruce has no effect on the seedling germination success of black spruce when paired with labrador tea
- Tamarack has a higher seed germination proportion than black spruce
- Labrador tea soil and labrador tea plant potting conditions tend to reduce the seed germination success of black spruce



## Future Directions

- Mature seedling greenhouse experiment

Our data indicate that tamarack does not influence the interaction between black spruce and ericaceous shrubs at the seed germination stage. It is possible, however, that positive effects of tamarack may be present at later stages of spruce growth. To address this, we will set-up a second greenhouse experiment looking at the growth of one-year-old black spruce seedlings in the presence and absence of one-year-old tamarack seedlings and the same labrador tea plants. Seedlings of both tree species will be grown for 18 months, after which height and biomass of all plants will be determined.

- Vegetation data from North Minnie fire

To assess the field relevance of our hypothesis about the nature of tree-shrub interactions of peatland forests in Minnesota, we will be collaborating with Erika Rowe, a master's student in the Department of Forest Resources. Erika has recently conducted a series of vegetation surveys in peatlands forest in northeastern Minnesota that experienced significant wildfire disturbance. We will assess the abundance and size of black spruce seedlings in plots with and without tamarack where ericaceous shrubs are also present.

## References

- Gorham, E. (1991). Northern peatlands: role in the carbon cycle and probable responses to climatic warming. *Ecol. Appl.*, 1, 182-195.
- Mallik, A. (2003). Conifer Regeneration Problems in Boreal and Temperate Forests with Ericaceous Understory: Role of Disturbance, Seedbed Limitation, and Keystone Species Change. *CRC. Crit. Rev. Plant Sci.*, 22, 341-366.

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