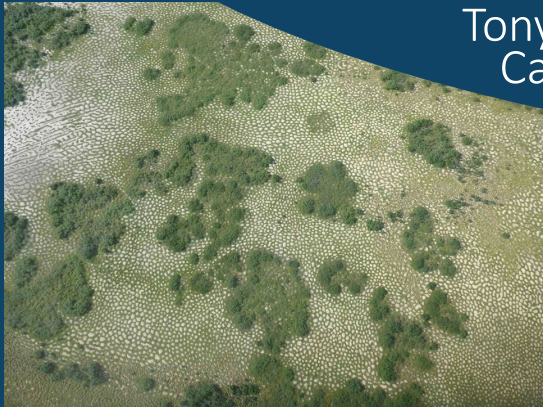


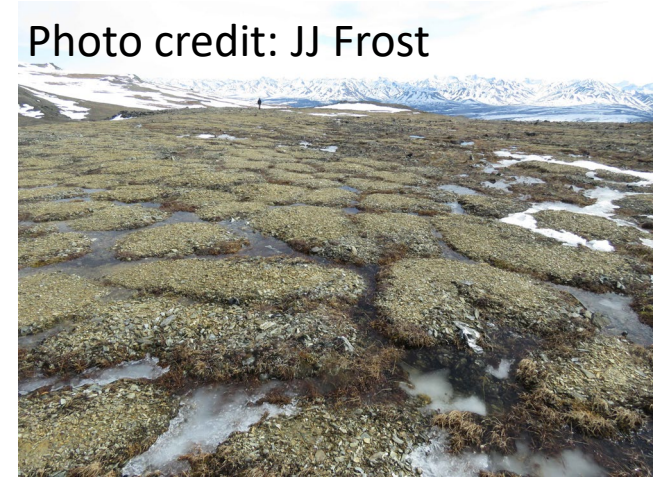


# Multi-Disturbance Synthesis Working Group Updates

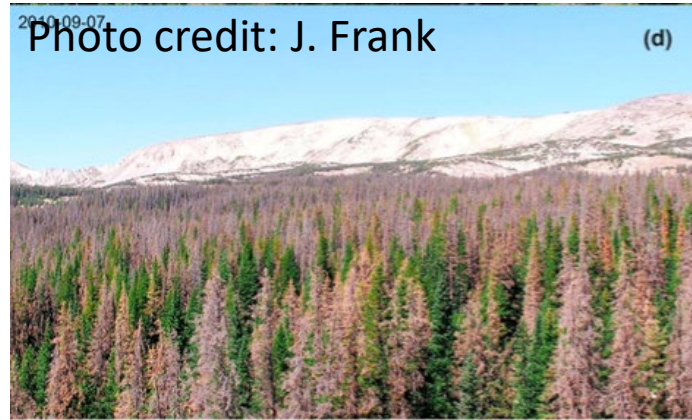
Adrianna Foster, Jon Wang, Brendan Rogers, Howie Epstein, JJ Frost, Arden Burrell, Elizabeth Campbell, Guillermo Castilla, Laura Bourgeau-Chavez, Dong Tony Chen, Jinyang Du, Angela Erb, Elizabeth Hoy, Randi Jandt, Richard Massey, Caleb Pan, Chris Potter, Tatiana Shestakova, Oliver Sonnentag, Kevin Turner, Carolina Voigt, et al.



ABOVE Science Team Meeting 6  
June 1-4, 2020



**Disturbances are dominant driver of  
vegetation dynamics in boreal & arctic  
systems**



# Some disturbances are well-studied

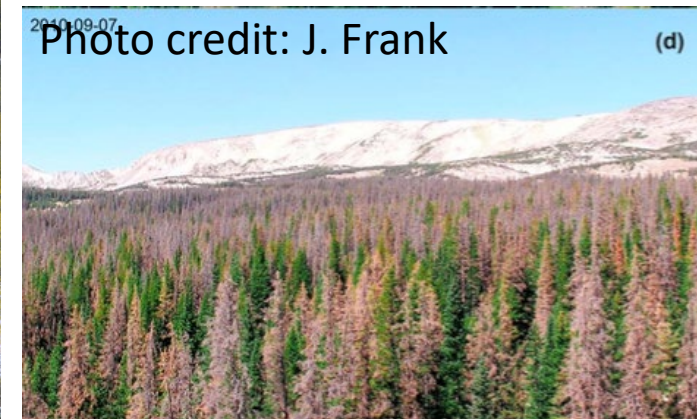
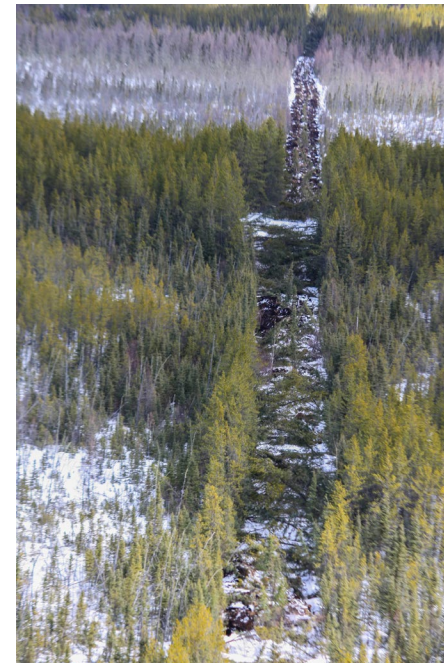
## Within ABoVE:

- 48 projects that specifically mention fire in project description



## Others are less well-studied

- Insects, human-related activities, drought, permafrost degradation and collapse
- Few studies look at interactions between disturbances





# Focus of working group

## **Synthesis of main disturbances (natural and anthropogenic) within the North American arctic and boreal regions**

### **Specifically**

- Summary of each disturbance/disturbance type, focusing on temporal dynamics of vegetation loss and recovery
- Case studies for each topic/type

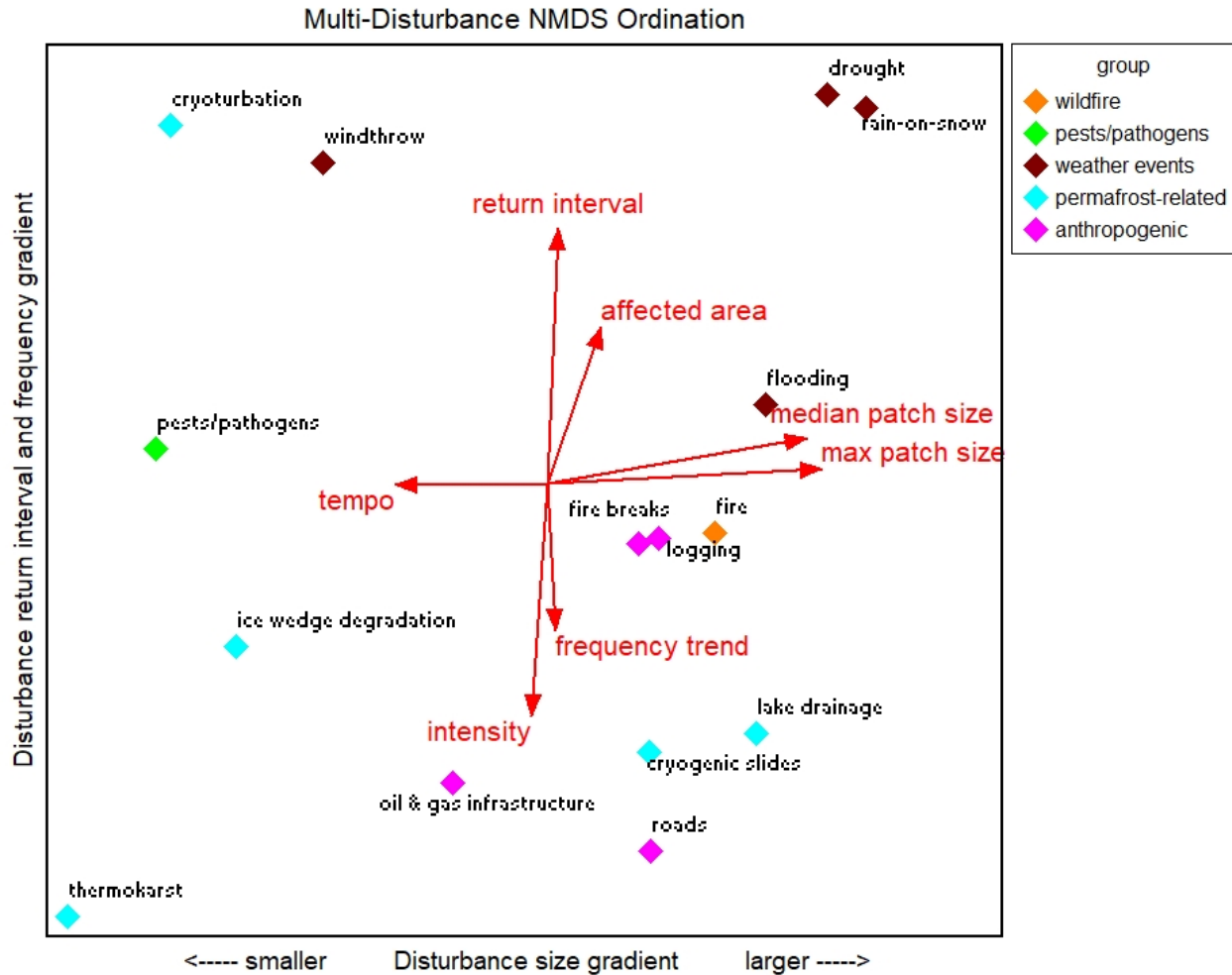
### **Additionally**

- Disturbance interactions and their impacts
- Future needs (data, studies, tools)

# Synthesis Groups

Group	Disturbance
Fire	Fire
Pests and Pathogens	Pests/Pathogens
Windthrow	Windthrow
Permafrost-related/hydrology	Thermokarst
	Landslides/active layer detachments
	Cryoturbation
	Permafrost degradation
	Lake drainage
Anthropogenic Impacts	Roads
	Fire breaks
	Survey/Power lines
	Oil & gas exploration/seismic lines
	Logging
Drought	Drought
	Freezing Drought

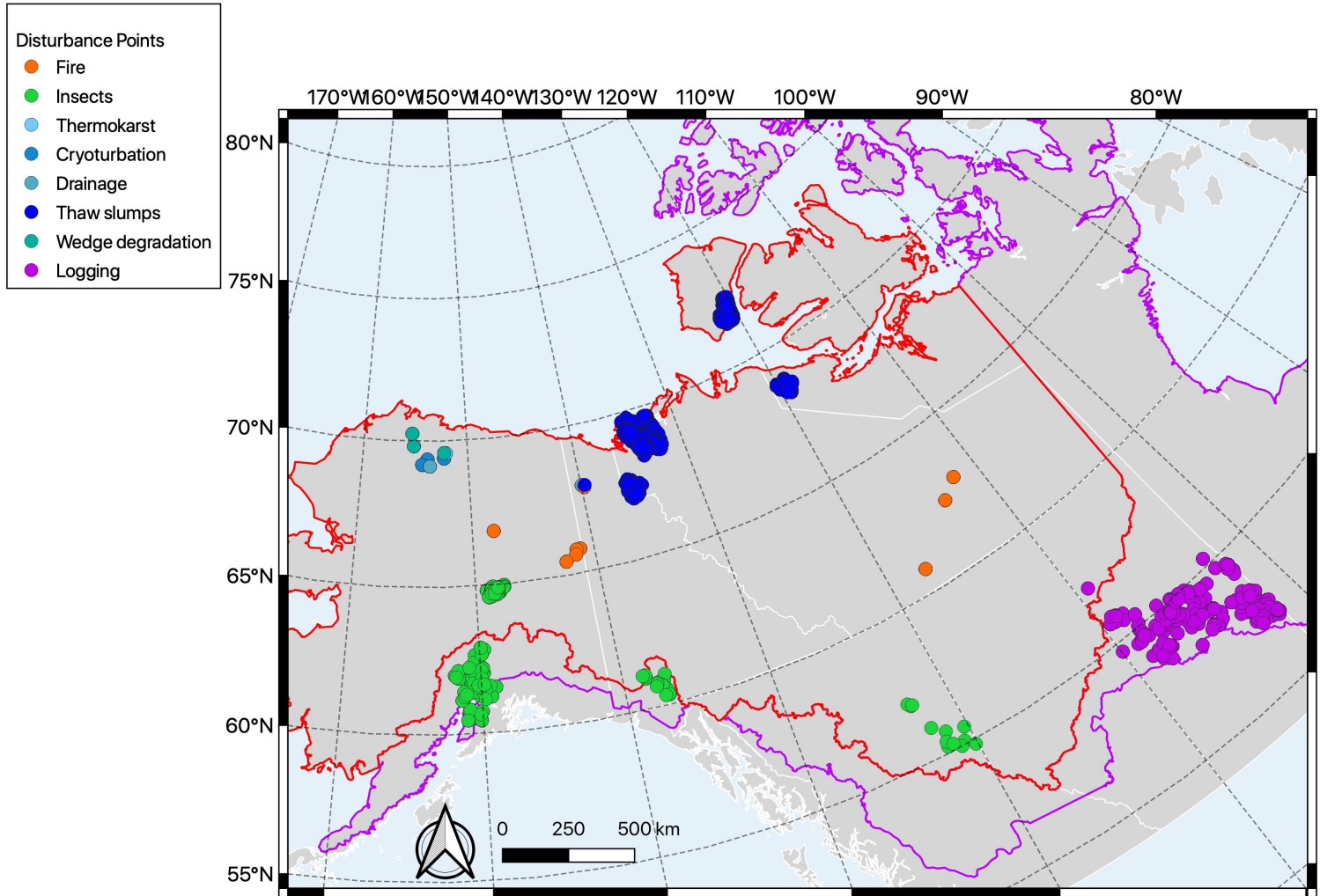
# NMDS Ordination



## Disturbance Characteristics

- Maximum & median size of an individual disturbance
  - 1s, 10s, 100s, etc. of square meters
- Typical patch size of affected area
  - 10s, 100s, 1000s, etc. of square meters
- Typical return interval
  - Multi-centennial, centennial, decadal, annual
- Typical intensity of disturbance
  - Stress, partial mortality, total mortality
- Time scale of disturbance
  - Days, weeks, months, years, multi-years
- Projected trend in frequency
  - e.g., increasing for fire, decreasing for cryoturbation

# Preliminary Findings

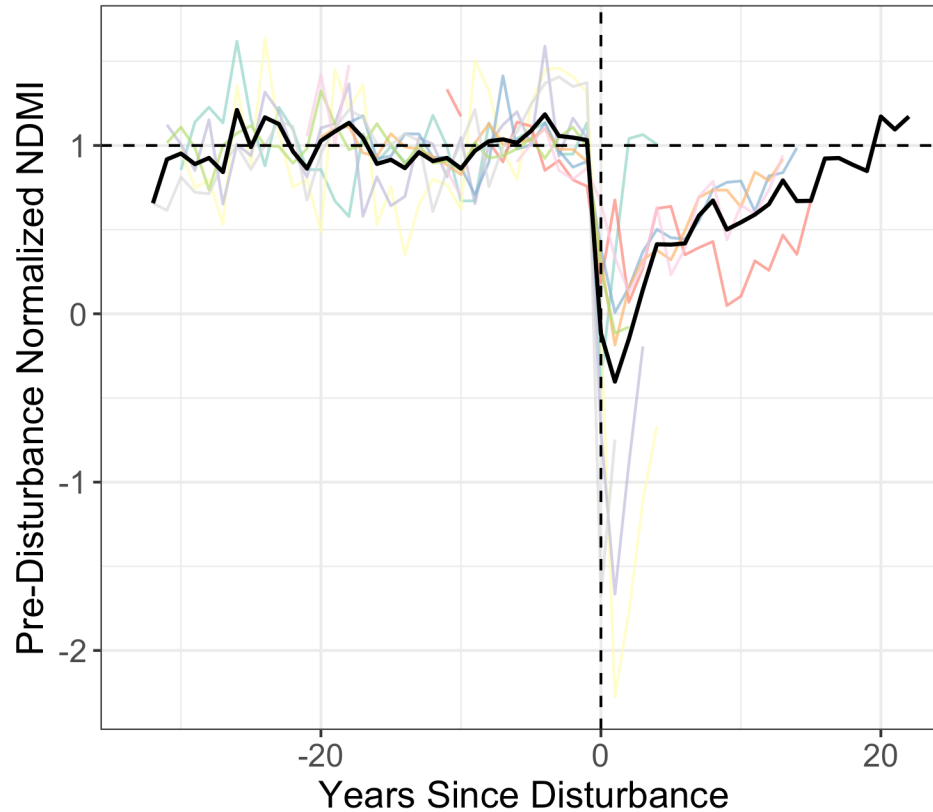
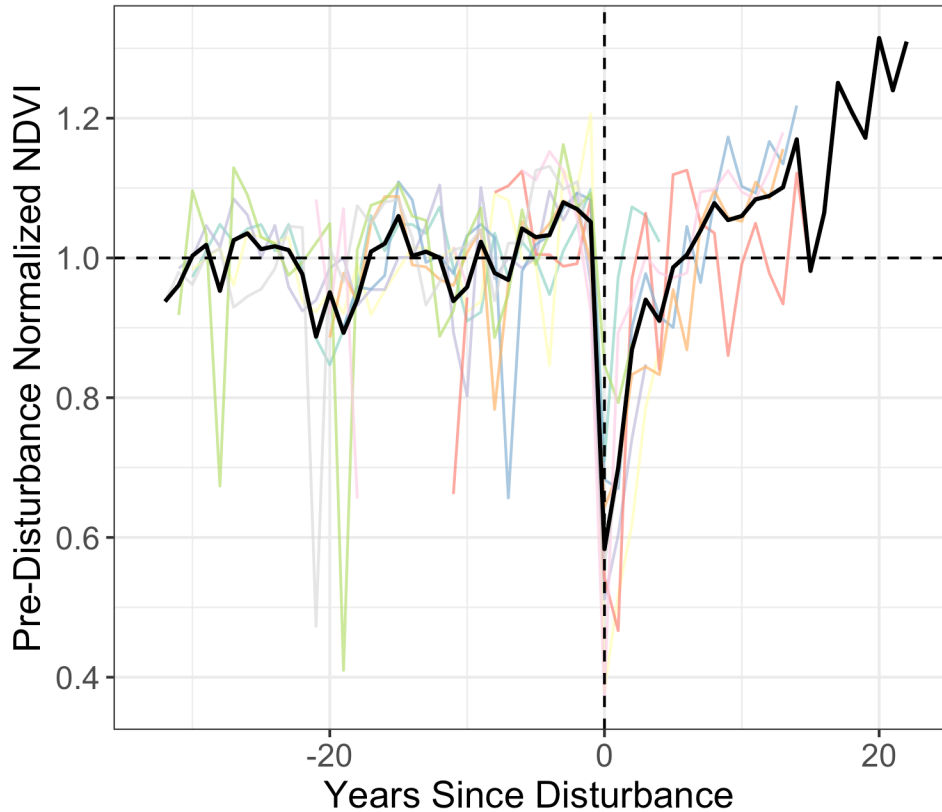


Disturbance Type	Number of Locations
Fire	9
Insects	152
Thermokarst	1
Cryoturbation	15
Drainage	5
Thaw Slumps	2996
Wedge Degradation	3
Logging	173

# Preliminary Findings

## Fire Case Study Points

- Mean
- 2014ZF-014 (NWT, 2014)
- Kandik River (1996)
- Kandik River (2005)
- Nelson Mountain (2005)
- 2014SS-003 (NWT, 2014)
- 2015ZF-014 (NWT, 2015)
- Kandik River (2004)
- Kandik River (2016)
- Yukon Territory (2017)



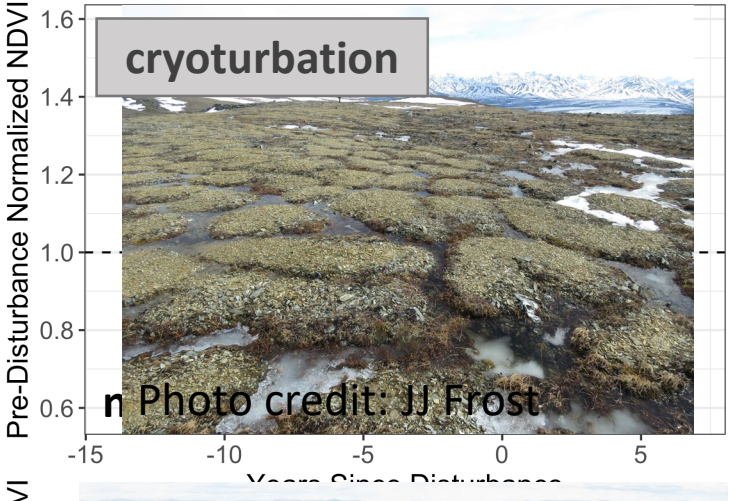
**n = 9**



# Preliminary Findings

## Permafrost/Hydrology Case Study Points

NDVI



— Yukon — AK 1 — AK 2 — AK 3 — AK 4

— thaw slump — thermokarst

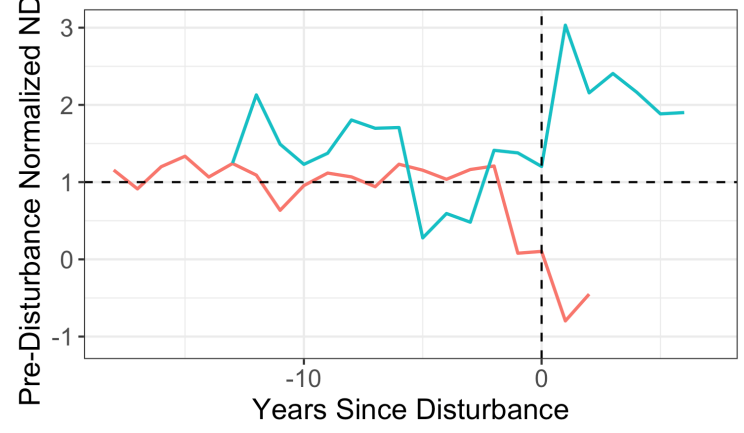
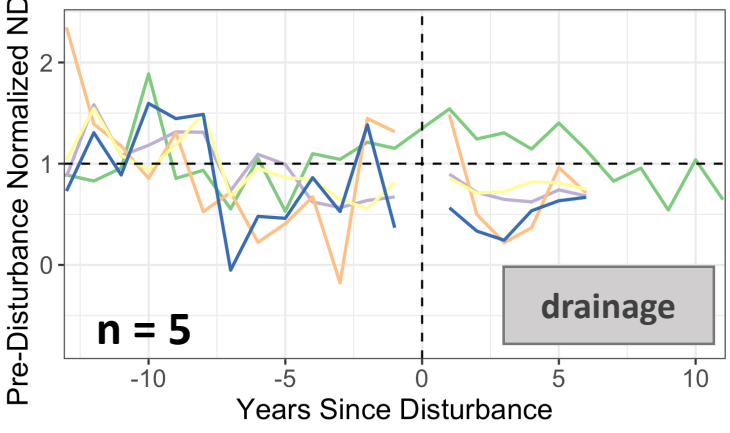
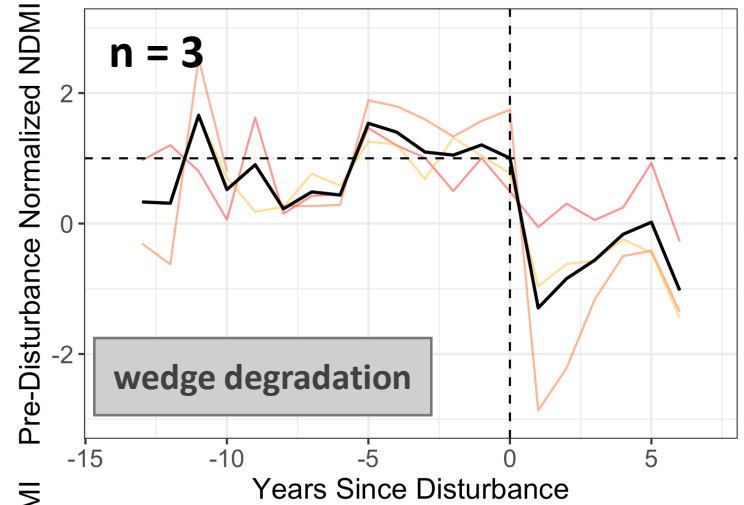
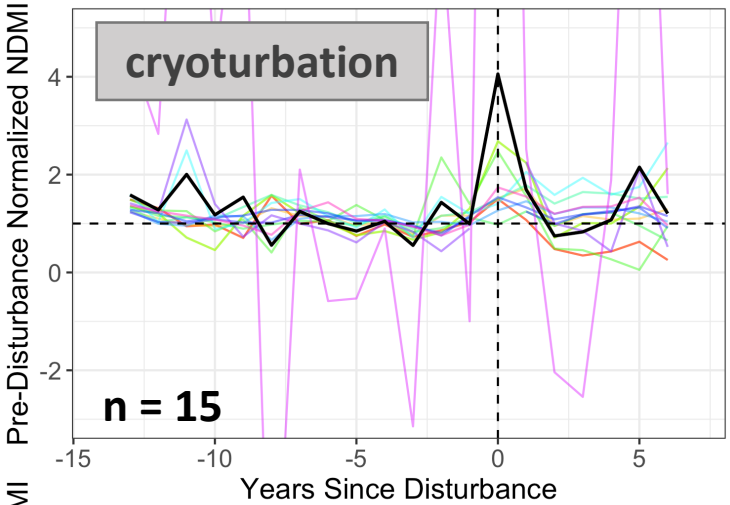
thaw slump  
 thermokarst

# Preliminary Findings

## Permafrost/Hydrology Case Study Points

**NDMI**

thaw slump  
 thermokarst

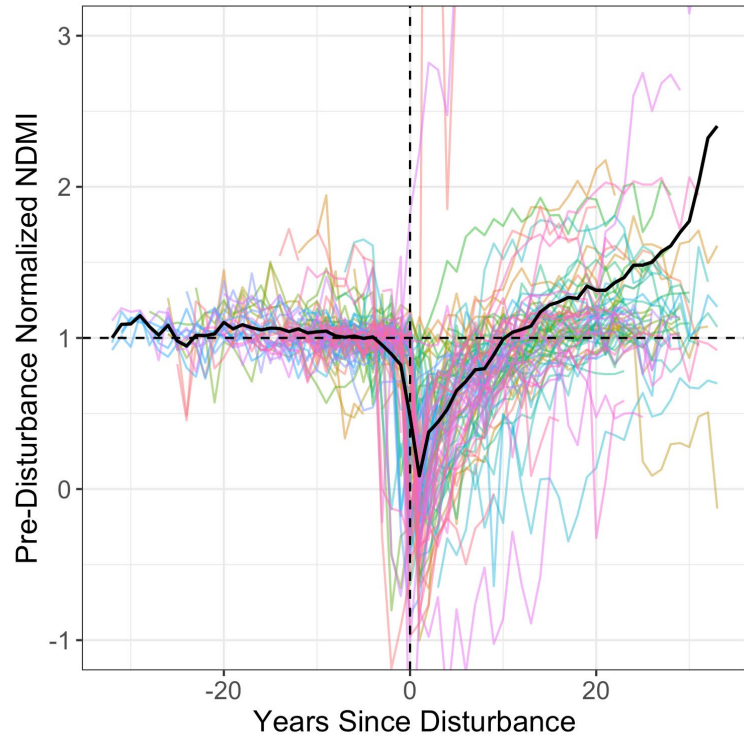
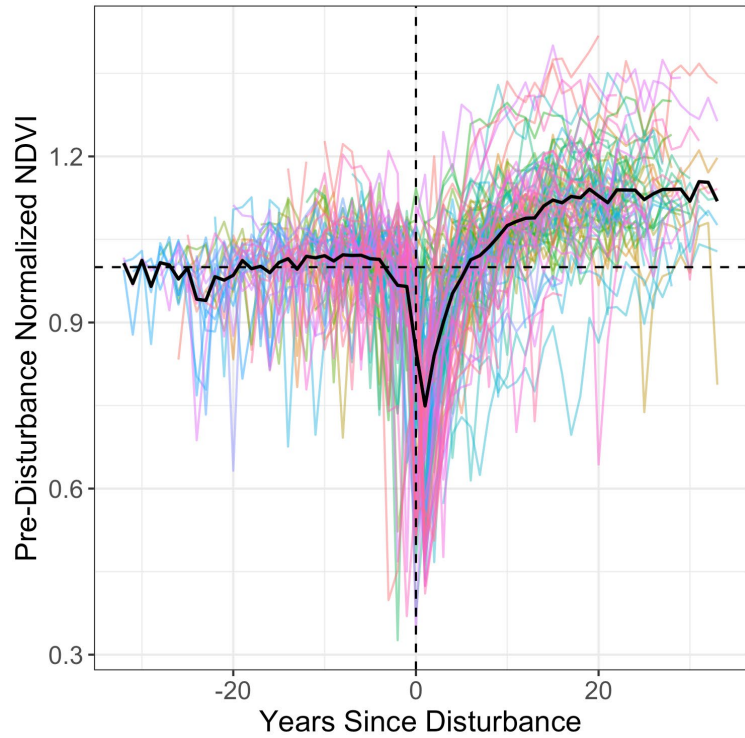


— Yukon — AK 1 — AK 2 — AK 3 — AK 4

— thaw slump — thermokarst

# Preliminary Findings

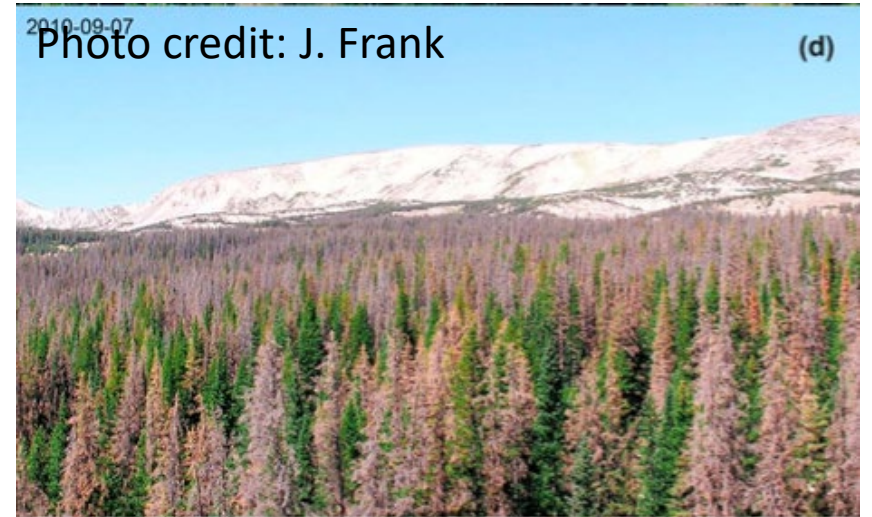
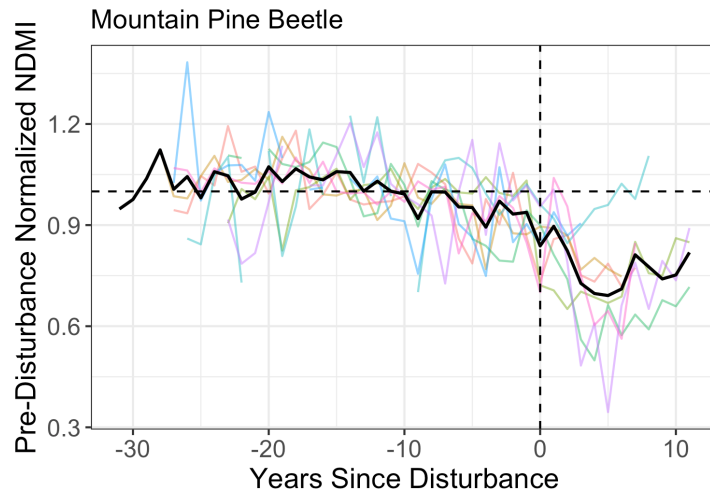
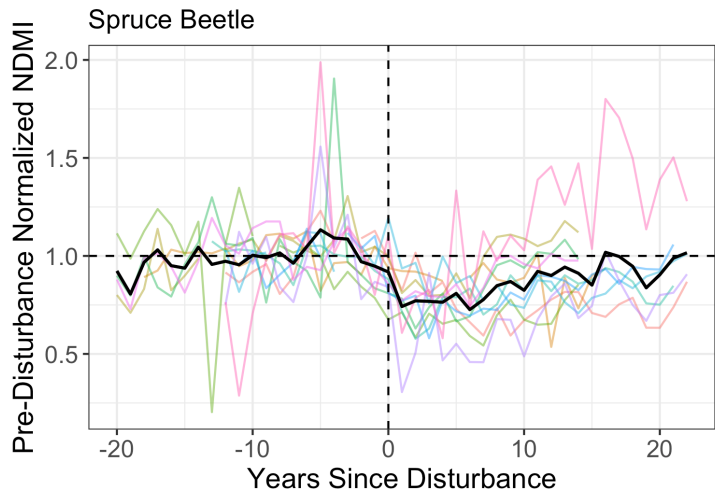
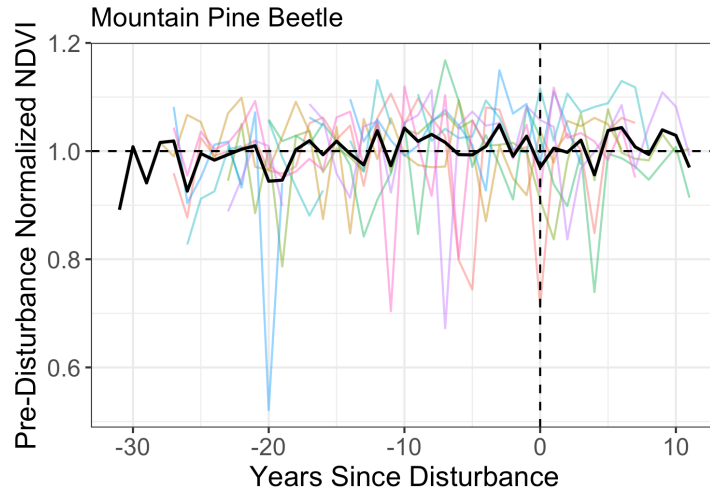
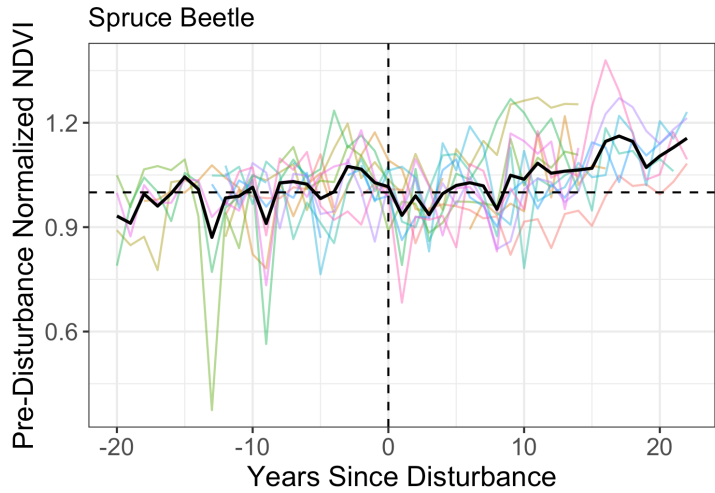
## Logging Case Study Points



**n = 95**

# Preliminary Findings

## Insect Case Study Points



**SB: n = 11**  
**MPB: n = 8**

# Future Directions

## Case Study Analyses

- Develop analysis framework for comparing across disturbance types
- Biomass & vegetation composition space-for-time substitution using gridded biomass data and spectral indices
- Compile potential sites for disturbance interactions and analyze

## Conceptual Framework

- Why recovery patterns & rates are similar or different across disturbance types

## Deliverables

- Unified database of ABoVE disturbances
- Large review paper outlining synthesis of disturbance types, case studies, future needs
- **Potential smaller papers:**
  - hydrology/permafrost-focused paper
  - disturbance interactions
  - biogeography/climate impacts on differences in post-disturbance recovery