## Permafrost carbon pools in a larchdominated watershed in Siberia

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## 1600-1700 Pg C in permafrost region 7-11% projected C loss by 2100



### Research objective & questions:

Quantify C pools in a yedoma watershed in Siberia and ultimately place these C estimates in the context of landscape position and ecosystem characteristics.

- How much C currently stored in vegetation, active layer, permafrost?
- How spatially variable are these C pools?
- How do ecosystem characteristics affect permafrost C vulnerability?

## Study location



### Related presentations:

#### THE POLARIS PROJECT

- Terrestrial & aquatic C composition & lability
  - B33G-0557, Connolly
  - B33G-0558, Sather
  - B33G-0562, Han
  - B21D-0523, Vonk
- Vegetation controls on C, water, energy
  - B51D-0316, Squires
  - GC22D-05, Loranty
- Fire effects on:
  - Larch recruitment & thaw depth: B33E-0528, Alexander
  - Microbial dynamics: GC53B-1056, Ludwig
- C storage in lakes: C53A-0552, Berman
- Climate impacts on forest productivity: GC22D-02, Berner
- Organic matter processes in permafrost: GC22D-06, Spektor
- Heterogeneity of permafrost thaw: C43A-0663, Lebedev
- Aquatic CH<sub>4</sub> fluxes: B33K-0609, van Winden

## Low density larch forest

#### Canopy cover: 15% Larch: deciduous conifer

Understory cover: 50% shrub 23% moss 15% lichen 5% gram/forb



#### Organic layer depth: 11 ± 1 cm

#### Thaw depth (July): 28 ± 2 cm

## Underlain by yedoma





## Carbon pools

- Aboveground C:
  - Tree
  - Understory
  - Snags & woody debris
- Belowground C:
  - Organic layer
  - Thawed mineral
  - -~1m permafrost
  - 15m permafrost



## Field sites spanned stand densities







## But it is important in determining permafrost and C vulnerability



# High variation at both meter & kilometer spatial scales



## Landscape patterns that affect soil moisture important for soil C



## **Results Summary**

- 100-fold more C stored in belowground than in aboveground pools
- Vegetation is important for protection of permafrost C
- Positive relationship between soil moisture and %C due to plant inputs and/or microbial processing
- Landscape patterns key for refining C pool sizes

Assessing potential feedbacks from permafrost C to climate change requires refined estimates of both current C pool size and vulnerability to thaw.

Landscape and ecosystem characteristics affect soil C accumulation and storage, but they also play an important role in stabilizing permafrost C pools.



