Adapting the Process-Based Model *iLand* to Simulate Subalpine Forest Dynamics in Greater Yellowstone

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Why process-based and why *iLand*?

- Climate and disturbance regimes are changing in the Greater Yellowstone Ecosystem (GYE) (Westerling et al. 2011)
  - Models based on past empirical relationships may not predict future behavior
- Process-based models are needed to simulate ecosystem responses to novel environmental drivers (Gustafson 2013)
- **iLand** (Seidl et al. 2012) is an individual-tree, process-based model of forest dynamics
  - Tree dispersal, establishment, growth, death
  - Competition for light, water, nutrients
  - Disturbance regimes, climate, forest management
  - iLand Wiki: http://iland.boku.ac.at/iLand

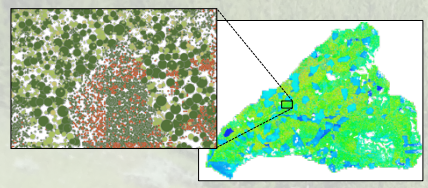

Figure 1: iLand scales from tree to stand to region

Objectives

- Adapt iLand for lodgepole pine (*Pinus contorta* var. *latifolia*) in the GYE
- Evaluate performance of iLand against field data
- Compare/contrast stand structure simulated by iLand and the Forest Vegetation Simulator (FVS-Teton Variant; Keyser and Dixon 2015)

Methods

- Parameterized iLand for lodgepole pine in GYE
- Initialized iLand and FVS with field data from 70 stands that regenerated from the 1988 fires (Turner et al. 2016)
- Simulated stand development for 300 years
- Assessed performance of iLand against field observations from multiple sources (see Kashian et al. 2013, Simard et al. 2011, Griffin et al. 2013)
- Compared stand development simulated in iLand and FVS

Simulated stand structure in iLand fell within observed ranges of field data

- Extreme values for stand basal areas were underestimated

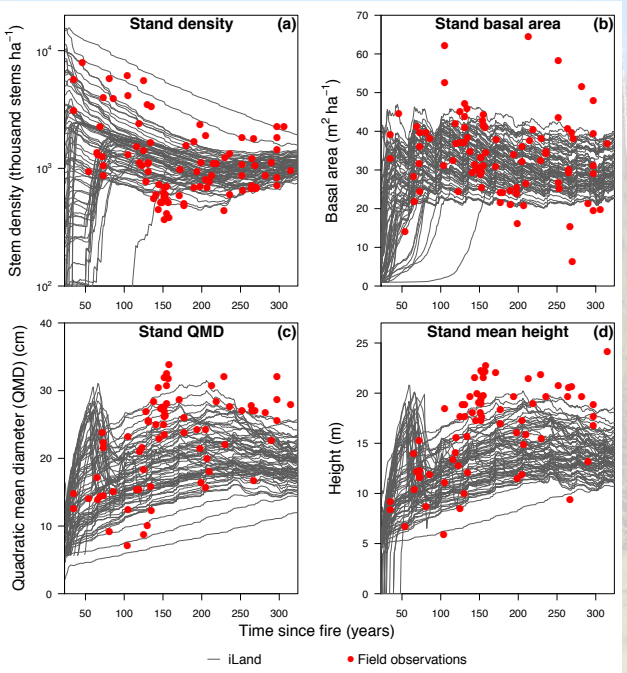

Figure 2: Stand development simulated in iLand initialized with data from 70 stands that regenerated from the 1988 fires and observed field data.

Literature cited

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iLand and FVS simulations diverged with increasing stand age

- At 50-100 yrs since fire, iLand and FVS both agreed with observed data
- At 120-170 years since fire, iLand simulations matched field data and FVS generally overpredicted basal areas

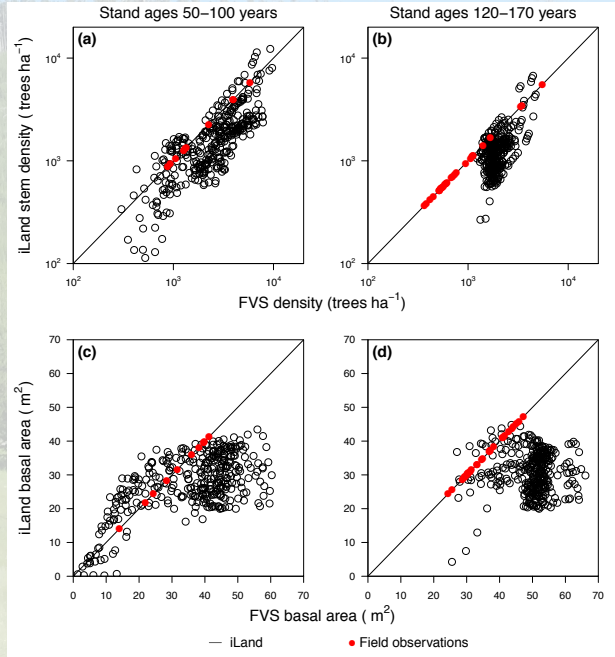

Figure 3: Stand development at two time-since-fire ranges simulated in iLand and FVS. Simulations were initialized with data from 70 stands that regenerated from the 1988 fires. Field observations for those stand age ranges are plotted on a 1:1 line.

Summary

- iLand performs well for lodgepole pine in the GYE
- iLand offers tremendous potential for exploring future forest dynamics under changing climate and disturbance regimes

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