Effects of the Development of the Baikal-Amur Mainline Railroad on Patterns of Boreal Forest Cover and Carbon Fluxes in Southern Siberia

Principal Investigator:
Eric Kasischke, University of Maryland, Dept. of Geography,USA

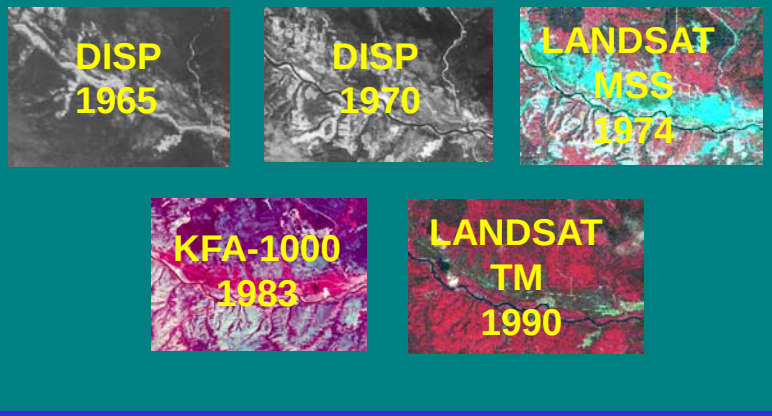
Co-Investigators:
Herman H. Shugart, University of Virginia, USA
Kathleen Bergen, ERIM International, USA
Slava Kharuk, Sukachev Forest Institute, Russia
Amber Hill, University of Virginia, USA
Donald Clark, University of Virginia, USA

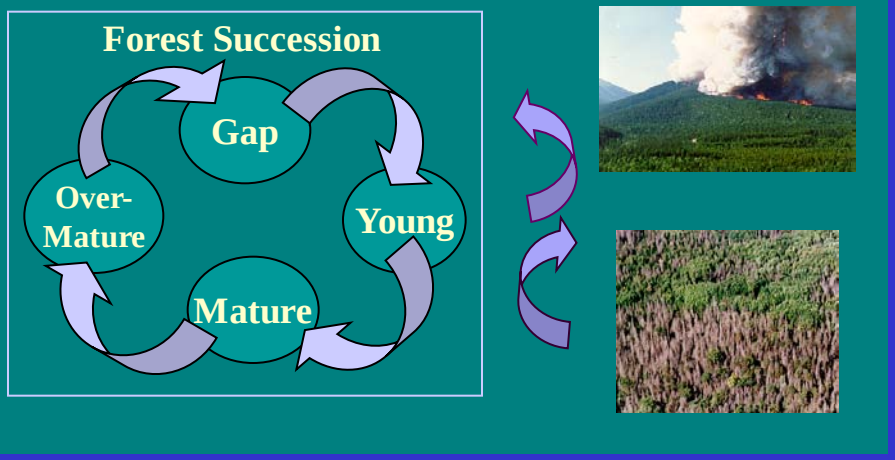
Introduction

Overall Goal: **Assess how the Baikal-Amur Mainline Railroad (BAMRR) has altered the patterns of forest cover and carbon source/sink relationships in the Southern Siberian boreal forest.**

Approach:

1. **Analyze archived satellite remote sensing data**
2. **Develop and validate forest succession and carbon models**
3. **Integrate satellite observations and models to assess carbon source/sink strengths**





Results

Most Significant Results

- Time-series, hybrid remote sensing datasets can be used to quantify rates and patterns of deforestation in Siberia (Fig. 1)
- Remote Sensing spectral-temporal trajectories can be used to identify and map patterns of regrowth (Fig. 2a)
- Models and remote sensing must be used together to:
  - quantify and map biomass and carbon
  - quantify and map forest succession/composition (Fig. 2b)
  - project the observed patterns on remote sensing imagery into the future

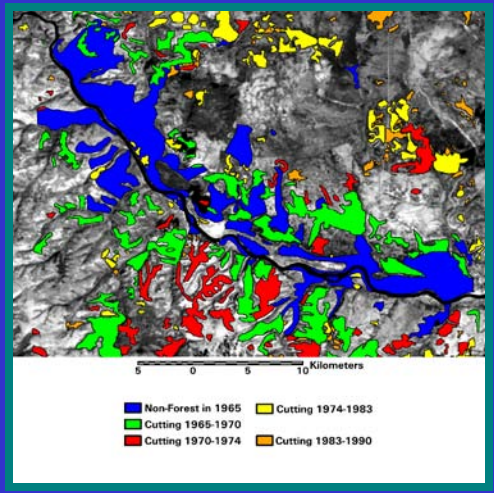


Figure 1. 38% of this area logged, greatest at time railroad was built

Future Steps

- Studies are ongoing (to be completed under a NASA MODAR project) to determine if BAMRR has resulted in increased disturbance from fire.
- A socio-economic model of the drivers of land-cover change along the trans-Siberian railroad is now just emerging
- Continued integration of remote sensing and models is key for mapping carbon and forest succession trends over the broader regions of Siberia

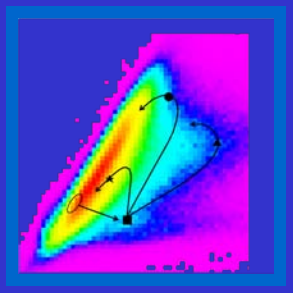
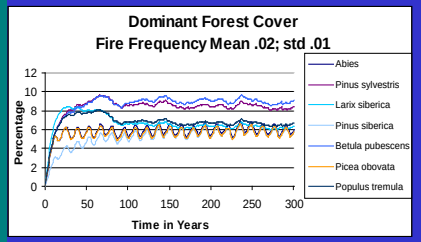


Figure 2a.

Figure 2b.



Conclusions

Conclusions:

•There is little doubt that creation of trans-Siberian railroads have increased human land clearing

•Landscape and Stand scale models can be coupled to simulate succession and disturbance, and to produce productivity, biomass, and carbon over time and space scales which are difficult to empirically investigate.

•Species composition in boreal regions is defined by disturbance regimes (logging, fire, and infestation) and change in these regimes has the capacity to alter productivity and the ability of forests to store carbon.

•Carbon stored in logged areas will not reach pre-disturbance levels for decades to centuries.

•The relative role of logging and fire disturbance in Siberia is complex and interrelated.

•Overall land use trends are clearly linked to socio-economic and political policies. We now understand the past scenarios and need to develop capabilities to interpret and model present and future.

Published:

E.S. Kasischke, K. Bergen, R. Fennimore, et al. "Mapping the Severe 1998 Forest Fires in the Russian Far East using NOAA AVHRR Imagery," *EOS*, 1999.**

In Preparation:

E. Kasischke, H. Shugart, K. Bergen, A. Hill, D. Clark . LCLUC book chapter

K. Bergen, E. Kasischke, N. Roller, N. Miller, N. French, "Observations of Boreal Forest Cover Change in Central Russia Using Multiple Satellite Imagery."

K. Bergen, A. Hill, D. Clark, E. Kasischke, H. Shugart, J. Colwell, N. Miller, "Forest Regrowth and Carbon in the Central Russian Boreal Forest: A Comparison of Remotely Sensed and Modeled pathways at a Site Along the Baikal-Amur Railway."