

MODELING SIBERIAN BOREAL FOREST LAND-COVER CHANGE AND CARBON UNDER CHANGING ECONOMIC PARADIGMS

PI: Kathleen Bergen, School of Natural Resources and Environment
The University of Michigan

Co-PIs: Daniel G. Brown, School of Natural Resources and Environment
Hank H. Shugart, University of Virginia
Eric Kasischke, University of Maryland

ABSTRACT

While change in political and economic structures is occurring in a number of countries worldwide, nowhere else recently has this occurred at the scale of the break-up of the state-controlled Soviet Union and its transition to a market economy (Braguinsky and Yavlinsky 2000). This event stands out in the magnitude of the change; its rapid transition period, and the geographic extent and global impact of the potential effect, including its effect on the Russian boreal forest. 13.5 million km² or nearly 10% of the global landmass, 20% of the world's forest, and over 50% of the world's coniferous forest will be affected. We hypothesize that these two different economic paradigms – state controlled and market economy-will leave significantly different imprints on the land, and we propose to develop a model of the contrasting economic drivers and of their past, present, and potential future consequences for land-cover land-use change and carbon in Russia. **Goals and Objectives:** The goal of the proposed project is to develop a model of Russian boreal forest land cover land use change and carbon that is linked to changing economic paradigms, and that is informed by remote sensing-derived analyses of change. To achieve this goal we will address four objectives: 1) develop an economic model of the factors affecting forests in Russia over the past 70 years; 2) use time-series Landsat-derived datasets to develop land cover land use change matrices and transition probabilities, including their socio-economic spatial dependency; 3) add the carbon content to these land cover states through application of an ecosystems dynamics and carbon models; 4) combine these into an integrated model of land-cover land-use change in Siberia driven by rules associated with different economic paradigms. **Approach:** This project builds on previous work in remote sensing and modeling of Siberian forests specifically using time-series analyses and ecosystem models to begin to study change along the Baikal-Amur Mainline Railway. We will build on this by using a new Landsat-7 dataset for three test sites in three of the most important administrative units in the Siberian forest sector: Tomsk Oblast, Krasnoyarsk Krai, and Irkutsk Oblast. We will derive land cover transitions from time series remote sensing and link these to carbon content as well. We will develop models of the economic paradigms. Land-cover transition probabilities and associated carbon contents will be coded into a Markov-based simulation model and this model driven by different scenarios as based on the economic models. **Expected Results:** We will develop an economic model that expresses the institutionalized “rules” of the different paradigms that impact land-cover/use in Siberia. We will develop a time-series Landsat-7 datasets and different land-cover states at each time period. We will develop a matrix of transition states and probabilities that are spatially dependent and further couple these with carbon contents. We will integrate these model components into a new coupled model driven by the rules of the different economic paradigms. We will examine the model output in terms of land-cover land-use impacts of the different economic paradigms. This work will be useful for further understanding the relationships between land cover land use change and carbon and economic policy in Russia.