LCLUC Abstract

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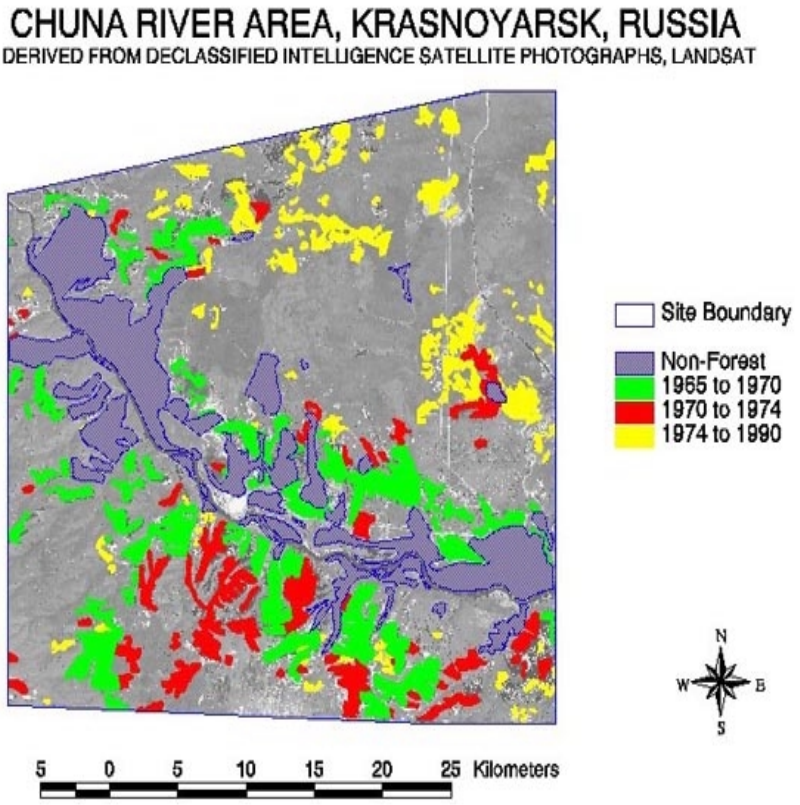

The region encompassed by the boreal forest contains over one-third of the carbon stored in all terrestrial ecosystems, making it one of the largest pools. Since three-quarters of the world's boreal forests are located in Russia, understanding the consequences of human activities on patterns of forest growth in this region is a critical to more accurately quantifying human impacts on the global carbon budget. As a regional case study of boreal forest carbon dynamics, this project will to focus on a large area of the boreal forest which has undergone significant development over the past 40 years. In 1974, the Russian Government initiated the completion of the building of the Baikal-Amur Mainline Railroad (BAMRR), which runs between the northern tip of Lake Baikal and the port of Vanino on the east coast of Russia. Completed in 1980, The BAMRR spans a distance of 2500 km through the southern Siberian boreal forest, and opened this region to large-scale forestry activities. In addition, the railroad construction and increased human settlements reportedly resulted in an increase in the frequency of large-scale wildfires occurring in these regions. The overall goal of this research project is to quantify how the building of the Baikal-Amur Mainline Railroad (BAMRR) has altered the patterns of forest cover and carbon source/sink relationships in the southern Siberian boreal forest. More specifically, the

research will use archived satellite remote sensing data, ground-based data sets, and forest process models to quantify patterns of forest change and carbon source sink/relationships in the study area. The first step of the analysis will use Landsat imagery, recently declassified reconnaissance imagery, and AVHRR imagery to map patterns of deforestation and fire disturbances along the BAMRR. We will evaluate the utility of Landsat data to monitor patterns of forest regrowth after disturbance as well as using other systems (ERS, Radarsat, and ATSR) to estimate other surface characteristics (soil moisture and temperature and patterns of burn severity) important in predicting forest succession. The ground-based data bases and theoretical models needed to estimate patterns of forest succession and carbon flux associated with human and natural disturbance of forests along the BAMRR will be developed. A comparison will be made between the Landsat-observed patterns of regrowth with those predicted by forest successional models. An evaluation of the information derived from satellite data on soil temperature and moisture and fire severity to improve the performance of forest succession models in the test regions will be performed. Finally, we will develop and exercise landscape-scale models which utilize remote sensing observations in combination with ground-based data sets and theoretical models to estimate the effects of land cover change and fire along the BAMRR on carbon fluxes in the Southern Siberian boreal forests. The research project addresses three of the priority topical issues identified in NASA's Land Use/Land Change program area. First, the results will develop a clearer understanding of how two of the primary ecological drivers responsible for land cover change in boreal forests (fire and forest succession) interact with anthropogenic deforestation to influence the carbon balance in this important terrestrial biome. Second, the proposed research will develop new approaches to use information derived from satellite remote sensing systems to parameterize and evaluate models that couple biogeochemical dynamics in terrestrial biomes with the atmosphere. Finally, this research project will develop and evaluate new algorithms to analyze temporal sequences of spaceborne multispectral scanner data. These algorithms not only can be applied to current or existing systems (e.g., Landsat MSS and TM, AVHRR, ADEOS, ATSR, etc.), but also to future EOS era systems (Landsat 7, MODIS, etc.). Finally, the proposed research project focuses on one of the priority case study area: understanding the effects of fire and logging in Russia.