Fire-induced forest transformations in the Zabaikalye region, southern Siberia

*Elena Kukavskaya[1], Ludmila Buryak[2], Eugene Shvetsov[1], Olga Kalenskaya[2], Susan Conard[3], Kirsten Barrett[4], Sergey Zhila[1]

1.V.N. Sukachev Institute of Forest, Siberian Branch of the Russian Academy of Sciences, Krasnoyarsk, Russia, 2.Siberian State Technological University, Krasnoyarsk, Russia, 3.US Forest Service, Rocky Mountain Research Station, Missoula, Montana, USA, 4.University of Leicester, Leicester, UK

Wildfires are one of the main disturbances in Siberia impacting on structure, sustainability, and carbon budget of boreal forests as well as on people' infrastructure and safety. The Zabaikalye region located in the south of Siberia is characterized by one of the highest fire activity in Russia. We have estimated fire disturbances in the Zabaikalye region with a use of Institute of Forest satellite fire dataset and official fire statistic data. Both datasets show trend in significant growth of fire activity in the region. The highest fire activity is observed in the central and southern parts of the Zabaikalye region. Repeatedly burned forest area accounted 20% (6.86 million ha) of the total forest area in the Zabaikalye region with many sites burned 3-6 times over the last 15 years. We have evaluated *in situ* fire impact on tree stands, regeneration, fuel loads, and carbon emissions on a number of sites in light-coniferous (Scots pine and larch) forests of the region. Tree mortality depended significantly on fire type and severity as well as forest conditions. Carbon emissions on repeatedly burned areas were no more than 15-40% of carbon released in the sites previously undisturbed. Regeneration amount depended on the site conditions and fire characteristics. While in the larch forests grown on mesic and wet soils fires result in the increase of tree seedlings, insufficient number of regeneration was registered in the Scots pine stands of the dry poor soils as well as in the repeatedly disturbed sites. Soil erosion was observed at many sites burned by high severity fires and in the repeatedly burned areas. The transformation of forests to steppe ecosystems occurs in many areas of the repeatedly disturbed sites of the Zabaikalye region. We combined field observations with remotely sensed data to develop methods for detecting disturbance level and tracking ecosystem recovery remotely. Climate warming along with antropogenic factors (e.g., agricultural burning, illegal logging, etc.) change drastically fire regimes in the Zabaikalye region. 2015 was characterized by one of the severest fire seasons in the region for the last several decades with more than 500 houses burned and 11 people died. There is an urgent need for planning complex forestry and fire management activities designed specifically for the region that take into account trends in climate conditions and local anthropogenic and natural features of the area. This research was supported by the Russian Foundation for Basic Research (grant # 15-04-06567), Grant of the President of the Russian Federation (# MK- 4646.2015.5), and NASA Land Cover and Land Use Change Program.

Keywords: light-coniferous forests, area burned, fire consequences, carbon emissions, regeneration, steppification

