LCLUC synthesis: Forested Land-Cover and Land-Use Change in the Far East of Northern Eurasia under the Combined Drivers of Climate and Socio-Economic Transformation

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SUMMARY: In response to the synthesis component of the 2010 solicitation for the Land Cover Land Use Change (LCLUC) program, we will focus on better understanding forest-cover dynamics over a broad region of the Northern Eurasian Far East over the past 35 years by combining previously developed knowledge and methodologies. Rationale: The Russian and Chinese portions of the study region present contrasting political systems operating on similar landscapes over very different eras in their recent histories. The abrupt changes in the economies of Russia and China over the past 30 years, and the region's importance as a locus of forest resources, carbon and biodiversity make this area a particularly critical hot-spot of change and conflicting economic interests. Located in Earth's largest forest, the region is also predicted to show some of the greatest change in climate over the near future. The critical issue—our driving research question for this synthesis project—is the following: How have human-driven disturbances related to use of forest resources, combined with natural disturbances (wildfires and insect outbreaks), created the landscapes of the region over the past 35 years? How might they change in the future? To answer, we must integrate human and natural drivers and their consequences. Therefore the overarching goal of this synthesis is to quantify and attribute changes in land-use and land-cover due to climatic variability and due to changing socio-economic drivers in this large region. We will build our specific objectives and approach to synthesize research previously funded by NASA LCLUC and other related programs, by (1) Synthesizing local and small-regional Landsat-based case studies previously funded by NASA, (2) Mapping change in the extent of the land cover and forest composition from the MODIS data applying the past disturbance reconstruction approach recently developed for the region, (3) Evaluating the impact of climatic change on forest composition and characteristics using the individual-based forest gap model (IBM) FAREAST to identify potential vegetation composition under different climate scenarios in combination with observed rates of natural and socio-economic disturbances, and (4) Attributing forest characteristics to changing forest policies and climate change in Russia and China over the past 35 years, using a systems dynamics model to integrate and illustrate the impact of these drivers. The results of these four objectives are three intermediate yet stand-alone synthesis outputs (Landsat case study sites and LCLUC records, region-wide MODIS-derived disturbance record, and multiple region-wide IBM-derived scenarios) and analyses derived from them; and one capstone modeling integration (systems dynamic model, scenarios and analyses). These will be interpreted and tested in order to answer our driving research question. The evolution of the institutional frameworks for the forest sectors in both countries provides an opportunity to evaluate, through multiple scenarios that are informed by modeling, remotely sensed data and available socio-economic statistics, the interactions between changing social and economic structures, climate change, and the state of the forests.