



Challenges of reforestation in a water limited world under climate change

Csaba Mátyás (1) and Ge Sun (2)

(1) Nyugat-magyarországi Egyetem, Sopron, Hungary (cm@emk.nyme.hu), (2) Eastern Forest Environment Threat Assessment Center, Raleigh, NC, USA (gesun@ncsu.edu)

Challenges of reforestation in a water limited world under climate change

Csaba Mátyás¹ and Ge Sun²

¹Institute of Environment and Earth Sciences, NEESPI Focus Research Center for Nonboreal Eastern Europe
University of West Hungary, Sopron, 9401 Hungary
E-mail: cm@emk.nyme.hu

²Eastern Forest Environmental Threat Assessment Center
USDA Forest Service, Raleigh, NC 27606, USA

The debate on the ecological benefits of planted forests at the sensitive lower edge of the closed forest belt (at the “xeric limits”) is still unresolved. Forests sequester atmospheric carbon dioxide, control water erosion and dust storms, reduce river sedimentation, and mitigate small floods. However, planting trees in areas previously predominantly occupied by grassland or agriculture can dramatically alter the energy and water balance at multiple scales. The forest/grassland transition zone is especially vulnerable to projected drastic temperature and precipitation shifts under future climate change and variability due to its high ecohydrological sensitivity. The study investigates some of the relevant aspects of the ecological and climatic role of plantation forests and potential impacts at the dryland edges of the temperate zone, using case studies from three countries/regions on three continents. We found that, contrary to popular expectations, the effect of forest cover on regional climate might be limited and the influence of reforestation on water resources might turn into negative. Planted forests generally reduce stream flow and lower groundwater table level because of higher water use than previous land cover types. Increased evaporation potential due to global warming and/or extreme drought events likely reduce areas that are appropriate for tree growth and forest establishment. Ecologically conscious forest policy on management, silviculture and reforestation planning requires the consideration of local hydrologic conditions, future climatic conditions, and also of non-forest alternatives of land use.

Keywords: drylands, xeric limits, trailing limits, ecohydrology, climate forcing, land use change, forest policy