

BACKGROUND

The forest-steppe in Mongolia is a sensitive ecotone at the edge between Siberian Taiga and Gobi Desert. Various factors influence the distribution of forest patches:

climate (DULAMSUREN et al. 2011),

forest fires (HESSL et al. 2016),

human impact (LKHAGVADORJ et al. 2013),

relief and **sediment** (KLINGE et al. 2015).

In previous studies, we observed that some forest patches recover after disturbance (e.g. fire), whereas some don't.

OBJECTIVES

- Identify differences in soil properties between forest patches with regrowth of trees and patches without / with reduced regrowth of trees after disturbance.

- Evaluate the role of soil-hydrological properties for tree regrowth.

→ **Hypothesis:** Water is a key factor in this environment.

METHODS

- 54 soil profiles in several sites including 23 profiles in different forest patches disturbed by fire, logging and pastoral pressure,

- grain size distribution (sieving and sedigraph),

- saturated hydraulic conductivity (Kf): *in-situ* Kf determination by borehole infiltration tests using a constant head permeameter, complemented by laboratory measurements,

- field capacity measurements.

STUDY AREA

- Location: Northern Khangai Mountains, central Mongolia.

- Climate: Continental with mean annual precipitation of 250-300 mm, growing season from May to September.

- Vegetation: Predominant tree species is *Larix sibirica* Ledeb. (only on northern slopes), plains and southern slopes are covered by steppe (DULAMSUREN 2004).

- Geology: Permian acidic plutonic and metamorphosed sedimentary rock.

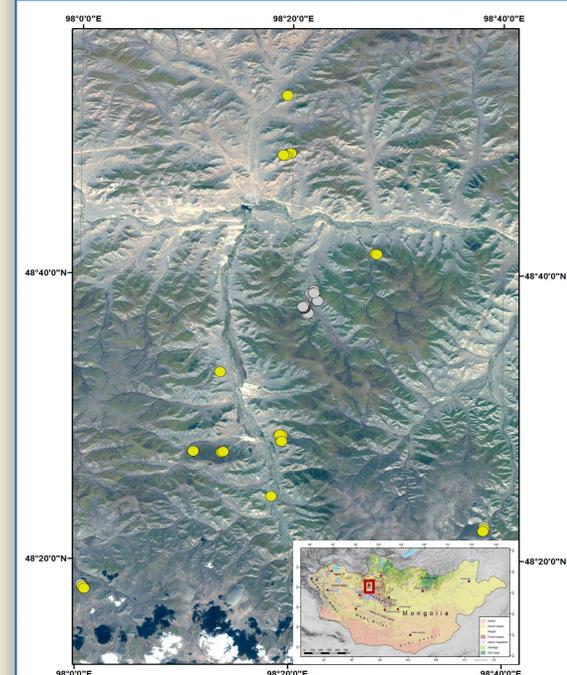


Fig. 1: Study area. Yellow dots represent the soil profiles.

RESULTS AND DISCUSSION

Hydraulic conductivity

- Soils with tree regrowth have higher hydraulic conductivity in the upper soil horizons and lower conductivity below.

- Soils without forest regrowth show lower values and partly reverse depth pattern of hydraulic conductivity.

- Preliminary conclusion: Quick drainage through upper horizons supports forest regrowth, as it reduces evaporation loss and competition for water with grasses and herbs.



Fig. 2: Landscape at profile 37 with regrowth of trees.



Fig. 3: Landscape at profile 40 without regrowth of trees.

Field capacity

- Soils with tree regrowth have higher plant-available field capacity.

- Field capacity and soil texture confirm the difference between the groups.

- Preliminary conclusion: Under the given climatic conditions, storage of plant-available water is a key factor for regrowth / no regrowth of forest after disturbance.

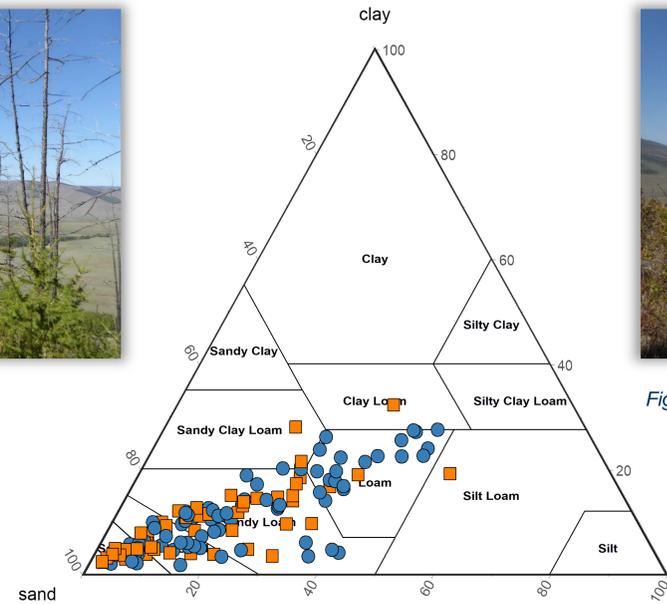


Fig. 5: Soil texture of profiles with regrowth (blue circle) and without regrowth (orange rectangle) of trees. Texture groups based on WRB.

Grain size distribution

- Dominant grain size: sand

- Soils with tree regrowth have slightly loamier texture than those without regrowth.

- Preliminary conclusion: Already slightly loamier texture may be important for water storage during dry periods and thus for forest regrowth.

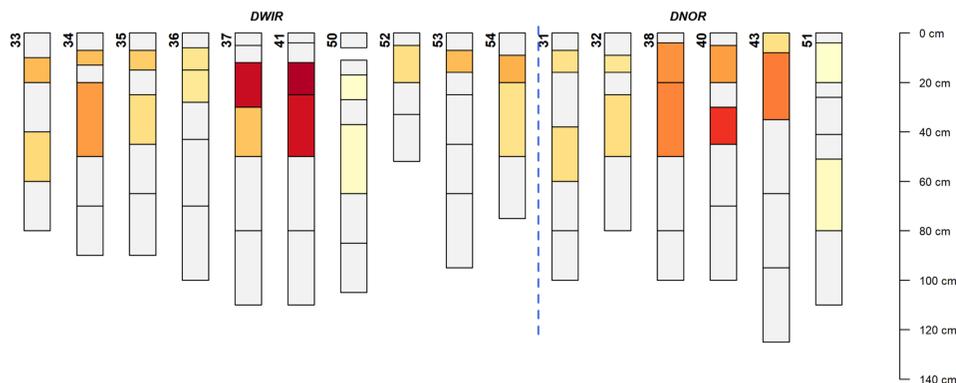
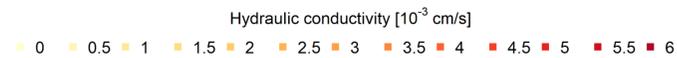


Fig. 4: Hydraulic conductivity of profiles with regrowth (DWIR) and without regrowth (DNOR) of trees.

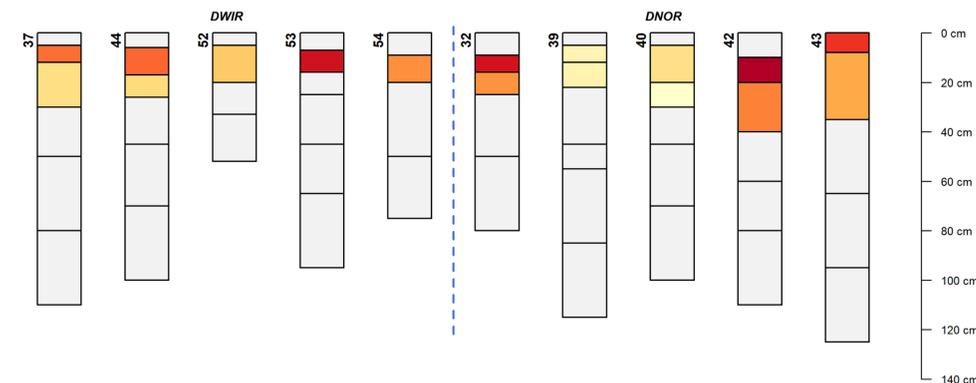


Fig. 6: Plant-available field capacity of profiles with regrowth (DWIR) and without regrowth (DNOR) of trees.

CONCLUSIONS

- In this **fragile** ecotone, **soil-hydrological** properties play a **major** role for the regrowth patterns of forest patches.

- Already minor increases of clay and silt in the overall sandy soils showed different recovery patterns. Due to the low precipitation, **small differences** in soil properties can be the **decisive factor** for regrowth / no regrowth of forest patches.

- Trees **benefit** from **higher hydraulic conductivity** in the upper soil horizons due to less evaporation loss and less competition with grasses and herbs for water.

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