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Restoring ecosystem functions and services by overcoming soil threats - The case of Mt. Hekla area in Iceland

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Soils are one of the main fundamental bodies of terrestrial ecosystems. Soil functions contribute substantially to the ecosystem services humans and all other living beings depend on. Current soil threats are in most cases related to anthropogenic impacts and derived environmental pressures. For instance, overexploitation has in many cases damaged ecosystem resilience, affected current equilibrium and caused severe soil degradation. The resulting dysfunctional ecosystems are incapable of providing necessary ecosystem services. In such cases ecosystem restoration is necessary to restore ecosystem functions and ecological succession.
The Mt. Hekla area in Iceland is an example of land suffering from accelerated erosion amplified by anthropogenic impacts. The area is 900 km2 located in South Iceland in the vicinity of the volcano Mt. Hekla. Today over 40% of the area is classified as eroded but historical documents indicate that vast part of the area were fertile and vegetated at the time of settlement, 1100 years ago; hence was able to withstand the geological disturbances occurring prior to the arrival of man as is obvious from the pristine woody patches still remaining.
Severe soil degradation followed the large-scale deforestation and overgrazing that took place within the area. The initial land degradation event is considered to have occurred in the 11th century, but has been ongoing since then in several episodes. The Þjórsá glacial river flows through the area and carries enormous amounts of sediments every year. After the deforestation, the ecosystem resilience was damaged and the land left exposed to the elements. Eventually large scale wind erosion started, followed with water erosion and increased impact of freeze-thaw processes.
The Soil Conservation Service of Iceland started working in the area in the early 20th century and land reclamation operations have been ongoing until this day. Considerable successes have been made as is manifested in the fact that sandstorms, once frequent, do not occur any more in the area. A governmental project (the “Mt. Hekla Forest”) has been ongoing since 2007 focusing explicitly on this area. The project′s main aim is to restore ecosystem services and increase the system resilience towards volcanic eruptions and other potential natural hazards. In this presentation we will discuss the causes for the ecosystem collapse in the Hekla area in further details and the social-ecological context of the restoration activities implemented.