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Monitoring of initial patterns and structures in an artificial catchment

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To combine process-oriented research on initial development of ecosystems with interactions and co-development of spatial patterns and structures the Transregional Collaborative Research Centre (SFB/TRR) 38 (www.tu-cottbus.de/sfb_trr) was established as an initiative of three universities (BTU Cottbus, TU Munich and ETH Zurich).
The objective of the SFB/TRR 38 is to enhance our understanding of structure genesis in ecosystems and of process dynamics as well as their interactions during the initial development phase. The aim is to integrate these feedback mechanisms in the analysis of water and element budgets at the catchment scale and to implement them into models.
To allow the clear definition of starting conditions at ´point zero´ and to be able to integrate spatially distributed processes and patterns to larger units, an artificial catchment was constructed in the mining area of Lusatia/Germany as the main research site (Gerwin et al. 2009a). With an area of about 6 ha, this catchment ´Chicken Creek´ is to our knowledge the largest artificial catchment worldwide. It was constructed as a 2-4 m layer of post-glacial sandy to loamy sediments overlying a 1-2 m layer of Tertiary clay that forms a shallow pan and seals the whole catchment at the base. No further measures of restoration like planting, amelioration or fertilization were carried out to allow natural succession and undisturbed development. Due to the artificial construction, boundary conditions of this site are clearly defined including well documented inner structures as compared to natural catchments. It is assumed that the interaction of patterns and processes during initial development will proceed from simpler to more complex states of the systems and that different stages along this phase can be identified at the catchment level.
Changes within the catchment are intensively monitored since 2005, when construction finished (Gerwin et al. 2009b), including intensive on-site measurements and micro-drone based aerial images. Starting from relatively homogenous site conditions the catchment rapidly developed new structures and patterns due to soil erosion, sediment transport, stream formation, vegetation cover and succession, groundwater table rise and surface crust formation resulting in an increasing differentiation of subareas and site characteristics. Some of these structures and patterns formed as a result of the interaction of abiotic and biotic processes during initial development, some were influenced by structures caused by the construction process itself, and others were affected by single accidental events, e.g. the occurrence of high intensity thunderstorms.

References

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