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Development of a spatially explicit ecohydrological modelling approach to simulate semi-arid vegetation transition dynamics

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An ecohydrological model must be spatially explicit to facilitate the redistribution of resources (water, nutrients and sediment) and seeds over the landscape, incorporate key biogeochemical cycling processes (N and C cycling), simulate key vegetation processes (plant growth, recruitment and mortality), simulate over a spatial scale fine enough so that variations in patch dynamics can be modelled and have a temporal resolution that will facilitate simulation of the hydrological response to individual rainfall events and the vegetation response to pulses of water. An ecohydrological model is being developed according to the aforementioned criteria, which couples a hydrological model with an ecological model to yield a fully-integrated, spatially explicit ecohydrological model. To parameterise and test the model a field-based study has been carried out over a grass-shrub transition zone within the Sevilleta Long Term Ecological Research site, at the northern margin of the Chihuahuan Desert in the south-western United States. The ecohydrological model will be used to investigate the dynamics of grass-shrub transitions and will enable the role of disturbance regimes, including grazing by livestock, fire and changing climatic conditions to be investigated.