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Biological Soil Crusts Influence Hydrologic Function Differently in Various Deserts And Future Climate and Land Use will Affect These Relationships

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Biological soil crusts (biocrusts) can completely cover plant interspaces in dryland regions, and can constitute 70% or more of the living ground cover. In these areas, where precipitation is low and soils have low fertility, native plants often rely on intact biological soil crusts to provide water and nutrient flow to the broadly scattered vegetation. In cool desert systems, well-developed biocrusts (dominated by lichens and mosses) roughen the soil surface, increasing residence time of surface water flow. This results in increased and relatively homogenous infiltration of water into the soils. Filaments associated with cyanobacteria, fungi, mosses and lichens increase aggregate formation and stabilize soils, thus reducing sediment production, with well-developed biocrusts conferring much more stability on soils than less developed cyanobacterial dominated biocrusts. In hot and hyper-arid desert systems, biocrusts are generally less developed and dominated by cyanobacteria. These biocrusts generally increase runoff from plant interspaces to downslope vegetation. While reduced infiltration may seem to be negative, it can actually be advantageous to the downslope plants, as they may require small watersheds above them to provide the needed amount of water and nutrients required for their growth. Thus, infiltration and nutrient additions are more heterogenous than in cool desert systems. Soil surface disturbance and climate change have the potential to dramatically alter the species composition and thereby function of biological soil crusts in different deserts. Compressional disturbances results in reduced cover and a loss of lichen and moss species. Changes in climate regimes, such as an increase in temperature or a shift in the amount, timing, or intensity of rainfall, will influence the composition and physiological functioning of biological soil crusts, as various crust components have different photosynthetic and respiration responses to temperature and moisture. Changes in the flora will lead to changes in hydrologic functioning. This, in turn, can have regional, national, and global implications.