

MICROCLIMATIC SITE PROFILE DESCRIPTIONS FOR EARLY PLANT ESTABLISHMENT¹

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Abstract: Microclimatic requirements for successful germination, emergence and seedling establishment are much more restrictive than are the set of conditions necessary for the persistence of mature plants. Seedbed microclimate is determined by the interaction of soils, vegetation and atmospheric parameters which exhibit high spatial and temporal variability. We cannot predict the system requirements for plant community establishment until we are able to characterize the spatial and temporal variability in microclimatic conditions in the field; both for vegetated and bare-soil conditions. Current seeding guides rely on gross approximations of species adaptation to mean annual precipitation and soil texture. This approach does not take into account the seasonal and yearly variability in macroclimatic variables or topographic and edaphic effects on seedbed microclimate. The USDA-ARS Northwest Watershed Research Center in Boise, Idaho is using a process-based soil heat and water flux model (Simultaneous Heat And Water model) to characterize the spatial and temporal variability in seedbed microclimate as it pertains to potential establishment success of native grass and shrub species in the Great Basin and Columbia Plateau region of the western United States. Three blocks of experimental plots, one in each of three soil types (loamy and sandy loam and silt loam) have been instrumented with meteorological recorders, TDR waveguides and thermocouple probes to monitor weather variables, soil water and soil temperature relations. This data is being used to validate the SHAW model for predicting the seasonal distribution of seedbed temperature and moisture. Historical weather records are then being used to develop a probabilistic description of site suitability for plant establishment. Microclimatic site profile descriptions for historical, short and longer term weather forecasts can be used to optimize planting scenarios for disturbed rangeland sites.

Additional Key Words: Seedbed, germination, models, variability

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