Effect On Grassland Invasability Of Vegetation Type, Weakening Disturbance, And Destructive Disturbance[MAS]

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We expect invasability of steppe vegetation to differ among vegetation types and to be facilitated by disturbance, which weakens the community fabric (e.g. fire or grazing) or locally destroys it (cultivation, machine, or animal). Three experiments examine aspects of this hypothesis. We expect a colonizer to perform differently in environments with different physical or biotic stresses. Thus, invaders should perform differently on topographic gradients from moist tall-grass through mixed-grass to dry short-grass prairie. And, in a mixed-grass environment, invaders might perform differently in the native grass type or in clones of invading *Bromus inermis* (exotic grass) or *Symporicarpos occidentalis* (native shrub). On either gradient, a recently burned site might be more invasible than a healed site. Surrogate weeds both well adapted to the environment and having large seeds (*Hordeum vulgare*, grass, and *Helianthus annus*, forb) were planted into disturbances (7 cm dia) in five such great plains vegetation types, each with examples of recent burning. Survival to flowering was ~30-50 percent and equal in all the communities. Height (9-22 cm) and weight (0.2-0.7 gm/ plant) growth were poor and roughly equal throughout. One might conclude that, regardless of vegetation type, most of the limiting resource is used by the established community and unavailable to any invader. We expect colonizing success to increase linearly with the area of a denuding disturbance. This hypothesis was rejected when seeds planted in 1-, 10-, 10-, and 1000-cm^2 holes grew similarly and poorly while plants growing in >10,000-cm2 holes grew well. We speculate that, while disturbance released resources to invading plants in large disturbances, resources also released in smaller holes were pre-empted by roots invading from adjacent undisturbed vegetation. The experiment was conducted in two rangelands (dry *Bouteloua gracilis* and moister *Festuca idahoensis*) and replicated in five blocks and two years. The plants studied included, in order of seed size, grasses (*Zea mays*, *Triticum aestivum*, and *Bromus tectorum*) and forbs (*Helianthus annus*, *Melilotus officinalis*, and *Centaurea maculosa*). The forbs in 1000-cm^2 holes performed slightly better than the grasses, perhaps because forb taproots reached below densely rooted surface horizons. Some hypothesize that fire weakens native vegetation to facilitate weed invasion. A corollary is, that if invaders are perennial and fire resistant, successive fires will allow increase of the weed both by providing damaged sites for new infections and reducing resistance to lateral spread of established colonies. We tested this hypothesis by comparing ubiquity (percent of m^2 plots infected) and dominance (percent cover in infected plots) in management units protected from fire 1935-1972 and burned 0, 1, 2, 3, 4, 5, or 6 times since 1972. Vegetation of moist bottoms, mixed grass slope sites, and short-grass hilltop sub-sites was separately examined. Preliminary analyses show no fire-related difference in either establishment (ubiquity) or expansion (cover at occupied sites) for major weeds including *Bromus inermis* and *Poa pratens*is (exotic grasses) or *Symphoricarapos occidentalis* (native brush).