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Assessing invasiveness of non-indigenous plant populations: a post-establishment, empirically-based methodology.

Invasiveness of non-indigenous plant species (NIS) is characterized by two basic attributes: the rate of growth (number of individuals) of a population and the rate of spread of a population. The amount and distribution of suitable habitat and specific traits associated with demographics and dispersal will determine the population and metapopulation growth rates, and these determinants will vary across different environments. In this research, we used a post-establishment empirical approach to quantify whether invasiveness varied between populations of spotted knapweed (*Centaurea maculosa*) found in different environments. Spotted knapweed has been recorded in Montana for more than 80 years and is present in a variety of habitat types throughout the state. We defined invasiveness as the change in density and/or the change in spatial extent of populations over time. At each of four sites, three populations of spotted knapweed were monitored for three years. The annual change in per plot (0.25m²) density, the change in plot occupancy, and the change in spatial extent were recorded. Across the four sites, some spotted knapweed populations were more invasive than others. For example, the change in population density (N_t/N_{t-1}) ranged from 0.57 to 5.1, and the change in spatial extent (m^2_t/m^2_{t-1}) ranged from 0.77 to 171 m² across sites. When such comparisons were made with different combinations of metrics differences in invasiveness were apparent. In a management context, the extent of infestation and limited budgets preclude the management of all NIS populations. These methods could facilitate land managers' prioritization of NIS.