Chondrilla juncea L.: Post-Fire Invasiveness in *Artemisia tridentata* Communities of Western North America

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Introduction *Chondrilla juncea* L. (Asteraceae), an invasive Eurasian apomictic perennial weed that increases vegetatively and from seed, has spread from the Pacific Northwest, USA into *Artemisia tridentata* communities of the northern Great Basin. Over the last 150 years this region has been heavily impacted by excessive livestock grazing, the invasion of exotic annual grasses, primarily *Bromus tectorum*, and an increase in wildfire size and frequency. We examined the distribution, fire response and seed biology of *C. juncea* to evaluate its ability to spread in burned or degraded *Artemisia tridentata* communities and to expand its range within the Great Basin.

Methods *C. juncea* invasion was surveyed at 33 sites in the northern Great Basin. Recovery and spread of *C. juncea* following wildfire were evaluated on paired burned and nonburned plots established in stands straddling 2003 firelines at 10 locations. All sites formerly supported *A. tridentata*/bunchgrass communities, but were dominated by invasive annual grasses or seeded wheatgrasses (e.g. *Agropyron desertorum*, *Thinopyrum intermedium*) prior to the burn. We evaluated recruitment from root sprouts, the soil seedbank, and seed planted in small plots at these locations from autumn 2003 through summer 2005. Seeds buried in mesh bags in autumn 2003 were recovered over time to monitor germination and seed longevity in response to wildfire and environmental conditions. Germination of *C. juncea* seeds collected over the growing season was examined in the laboratory in 2003.

Results and discussion Invasions were found on abandoned cropland, roadsides, heavily grazed sites, degraded wheatgrass (*Agropyron* spp.) seedings, seasonally dry drainages, burned sites vegetated with *B. tectorum* or other invasives and disturbed sites dominated by early successional vegetation. Although it is generally associated with coarse-textured soils, *C. juncea* infestations were also common on finer soils. Populations occurred on all slopes and aspects, but were least abundant on north facing slopes. Native *Artemisia tridentata*/bunchgrass communities were not immune to invasion. Isolated plants and small satellite populations, likely establishing from seed carried by wind or other vectors, were found on micro-disturbances such as animal burrows located within relatively intact native communities.

On both burned and nonburned sites, root sprouts were the main source of new plants (basal rosettes) in autumn 2003 and spring 2004. Root sprout numbers were similar on burned and unburned plots during the second year post-fire, in part due to drought and herbivory. Seeds sown in October 2003 germinated earlier on burned than on unburned sites, but total germination was similar and mostly complete by mid January. Natural emergence from seed on burned and nonburned plots was low (0.3% of rosettes present) during the dry spring of 2004; similarly, only 0.1% of sown seeds emerged during this period. Following a dry fall in 2004 and a wet spring in 2005, 27% of new rosettes were from seed, indicating considerable variability in response to annual fluctuations in weather conditions. Laboratory emergence was similar from seedbanks of burned and unburned soils. Greater emergence of seed added to recently burned compared to nonburned soil as well as from sterilized versus nonsterilized field soils suggested that native soil biota may negatively impact emergence of this exotic species.

Rush skeletonweed flowering is indeterminant with flowers and seeds produced from early summer until first frost. In a single season, mature plants produce numerous tiny seeds that are readily and widely dispersed by wind and animal vectors. Viability of seeds produced early in the 2003 season (mid-July) was low, but increased through mid-September before declining until seed production ceased in October. Harvested seed germinated rapidly over a wide temperature range of 6 to 30°C.

Because of prolific *C. juncea* seed production and dispersal over considerable distances, even very low seedling success can result in widespread invasion. We anticipate that isolated seedlings can develop into *C. juncea* dominance on new sites as its density increases via root sprouts. Increased wildfire size and frequency associated with exotic annual spread enhances the Great Basin range expansion of *C. juncea*. Managers should focus on controlling initial invasion sites.

Reference

Kinter, C. L., Mealor, B. A., Shaw, N. L., Hild, A. L. 2007. Post-fire invasion potential of rush skeletonweed (*Chondrilla juncea*). *Rangeland Ecology and Management* 60: 386-394.