Russian knapweed
Acroptilon repens (L.) de Candolle

Synonyms: *Acroptilon picris* (Pallas ex Willdenow) C.A. Meyer, *A. obtusifolium* Cass., *Centaurea picris* Pallas ex Willdenow *C. repens* L., *Rhaponticum repens* (L.) Hidalgo, *Serratula picris* (Pallas ex Willdenow) MB.
Other common names: creeping knapweed, hardheads, Turkestan thistle
Family: Asteraceae

Invasiveness Rank: **66** The invasiveness rank is calculated based on a species' ecological impacts, biological attributes, distribution, and response to control measures. The ranks are scaled from 0 to 100, with 0 representing a plant that poses no threat to native ecosystems and 100 representing a plant that poses a major threat to native ecosystems.

Description
Russian knapweed is a perennial plant that grows 20 to 100 cm tall from creeping roots with scaly adventitious buds. Stems are erect, and branched with soft-hairy pubescence. Leaves are sessile and alternate. Basal leaves and lower stem leaves are oblanceolate to oblong, irregularly pinnately lobed to entire, 3 to 15 cm long, and 1 to 2.5 cm wide. Upper stem leaves are linear to narrowly lanceolate, toothed or entire, and 1 to 7 cm long. Flower heads are borne singly at the ends of branches. Involucres are 9 to 17 mm long and greenish at the base with soft-hairy pubescence. Involucral bracts are arranged in several unequal rows and have widely papery tips. Florets are white, pink, blue, or purple and 11 to 16 mm long with tubular sections that are 6.5 to 7.5 mm long, throats that are 2 to 3.5 mm long, and lobes that are 3 to 3.5 mm long. Seeds are ovate, smooth or ribbed, and 2 to 4 mm long. Each seed has a deciduous pappus composed of bristles that are barbed below, feathery above, and 6 to 11 mm long (Watson 1980, Keil 2006, Kravchenko 2009, Klinkenberg 2010).

Flower heads and leaves of *Acroptilon repens* L. de Candolle. Photo by S. Shebs.

Similar species: Russian knapweed was previously classified within the *Centaurea* genus. It can be distinguished from *Centaurea* species by the presence of sub-basal rather than lateral attachment scars on its seeds and the absence of sterile outer florets (Watson 1980, Keil 2006).

Dense infestation of *Acroptilon repens* (L.) de Candolle on a dry substrate in Nevada. Photo by S. Shebs.

Ecological Impact
Impact on community composition, structure, and interactions: Russian knapweed is capable of dense growth and can significantly increase the density of vegetation in open areas. It can form stands with 100 to 300 shoots per square meter. Infestations can expand to 12 square meters within two years of establishment (Watson 1980). This species likely causes significant reductions in the density of lower herbaceous and graminoid layers. Once established, Russian knapweed can form extensive monocultures that displace other plant species. It suppresses the growth of surrounding vegetation through the production of allelopathic chemicals and competition for moisture and nutrients (Watson 1980, Carpenter and Murray 1999, Zouhar 2001). Russian knapweed is toxic to horses but not to cattle, sheep, or goats. Livestock avoid grazing this species because it has a bitter taste (Watson 1980,

Carpenter and Murray 1999, DiTomaso and Healy 2007, Kravchenko 2009). Large infestations reduce the quality of pastures (Carpenter and Murray 1999). Bighorn sheep graze on Russian knapweed in British Columbia. Birds and rodents eat the seeds (Zouhar 2001). Russian knapweed is insect pollinated (Zouhar 2001); therefore, the presence of this species may alter native plant-pollinator interactions.

Impact on ecosystem processes: Infestations of Russian knapweed increase the amount of bioavailable zinc in the soil (Morris et al. 2006). This species can be very aggressive, reducing the availability of soil moisture and nutrients (Watson 1980, Kravchenko 2009).

Biology and Invasive Potential

Reproductive potential: Russian knapweed reproduces sexually by seeds and vegetatively from buds on the creeping roots. Plants do not appear to reproduce extensively by seeds (Watson 1980, DiTomaso and Healy 2007). In British Columbia, Russian knapweed produced 100 to 292 viable seeds per plant (Watson 1980); in Colorado, it produced 50 to 500 seeds per shoot (Beck 2008). Seeds remain viable in the soil for two to three years (Watson 1980, DiTomaso and Healy 2007). Once a population has established, it spreads rapidly from root buds to form dense colonies. Populations are persistent; one population in Saskatchewan has survived for more than 75 years (Watson 1980).

Role of disturbance in establishment: Russian knapweed appears to germinate in and invade disturbed areas and unvegetated soil (Zouhar 2001). While it is able to persist and spread asexually in vegetated habitats, we did not find records of this species germinating in vegetated habitats. In Russia, it commonly grows in agricultural fields, gardens, vineyards, meadows, pastures, railroads, and roadsides (Kravchenko 2009). In North America, it grows in agricultural fields, roadsides, riverbanks, ditches, clearcuts, and disturbed areas (Watson 1980, Keil 2006). Russian knapweed establishes primarily in anthropogenically disturbed areas (Watson 1980, Carpenter and Murray 1999, Zouhar 2001), but it can also establish in naturally disturbed sites, such as areas disturbed by flooding or fire (Million pers. obs.). In pastures, animals preferentially graze more palatable plants, thereby allowing Russian knapweed to spread further (Keil 2006).

Potential for long-distance dispersal: Seedlings are uncommon. Most seeds land near the parent plant (DiTomaso and Healy 2007). Each seed has a pappus; however, the pappus is small relative to the seed and it is not persistent (Watson 1980). Russian knapweed lacks efficient seed dispersal mechanisms (Zouhar 2001).

Potential to be spread by human activity: Russian knapweed is transported to new locations with the movement of contaminated hay, alfalfa seed, or sugar beet seed (Watson 1980, Roché and Roché 1988). Seeds can be transported on vehicles and agricultural equipment (Zouhar 2001); however, this species does not spread extensively along roadsides and trails because it primarily reproduces vegetatively and pappi disarticulate from their seeds early (Roché and Roché 1988).

Germination requirements: Seeds germinate in late spring or summer. They can germinate in temperatures from 0.5°C to 35°C with optimal temperatures between 20°C and 30°C. Diurnal light and dark cycles and scarification of seed coats improve germination rates (Watson 1980, Carpenter and Murray 1999).

Growth requirements: Russian knapweed grows on a variety of soil types. It is most common in dry regions. A typical infestation in British Columbia occurs in an area that receives 25 cm of precipitation annually (Watson 1980).

Congeneric weeds: The *Acroptilon* genus is monotypic. However, Russian knapweed was previously included in the *Centaurea* genus as *Centaurea repens* (Watson 1980). Many *Centaurea* species are known to occur as non-native weeds in North America, and 12 *Centaurea* species are considered noxious weeds in one or more states of the U.S. or provinces of Canada (Invaders 2011, USDA 2011).

Legal Listings

- ☐ Has not been declared noxious
- ☒ Listed noxious in Alaska
- ☒ Listed noxious by other states (AZ, CA, CO, CT, HI, ID, IN, IA, KS, LA, MN, MT, NV, NM, NY, ND, OR, SD, TX, UT, WA, WY)
- ☐ Federal noxious weed
- ☒ Listed noxious in Canada or other countries (AB, BC, MB, SK)

Distribution and Abundance

Russian knapweed is associated with alfalfa fields in particular, but also with graminoid crops (Watson 1980, Kravchenko 2009). It appears to spread as a seed contaminant (Watson 1980). This species is also associated with pastures, where it reduces the quality of forage (Watson 1980, Kravchenko 2009), and it is able to invade riparian communities in the western U.S. (Carpenter and Murray 1999, Laufenberg et al. 2005).

Native and current distribution: Russian knapweed is native to Central Asia and Asia Minor (Watson 1980, Quintana et al. 2008). It was introduced to North America in the early 20th century as a contaminant in alfalfa seed from Turkestan (Watson 1980). It grows in 27 states in the western half of the U.S. and throughout much of Canada (USDA 2011). This species has also been introduced to Australia and Europe (Thorp and Wilson 1998, Bundesamt fuer Naturschutz 2009, Kravchenko 2009). It has not been documented from

arctic or subarctic regions; its northern limit of distribution in British Columbia is 54°N. Russian knapweed has been not been documented from Alaska.

Management

Many of the investigations of control measures for Russian knapweed are specific to agricultural infestations. The removal of aboveground portions encourages plants to produce new shoots from the root systems (Watson 1980, DiTomaso and Healy 2007). Plants can regenerate from root fragments as short as 2.5 cm (DiTomaso and Healy 2007, California Integrated Pest Control 2011). Hand pulling, cutting, and mowing three times per year cause roots to expend their nutrient reserves but fail to eliminate populations. The spread of populations can be controlled by isolating infestations to avoid spreading root fragments to other locations. Covering infestations in black plastic sheeting may effectively control this species (Zouhar 2001). Russian knapweed is tolerant of some herbicides, but 4-amino-3,5,6,-trichloropicolinic acid at 1 to 2.5 kg/ha and 3,6-dichloro-o-anisic acid at 2 to 20 kg/ha provide effective control of this species without damaging associated grasses (Watson 1980). Glyphosate herbicides have proven effective at destroying aboveground growth but do not prevent regrowth (Carpenter and Murray 1999). Many plant parasites native to Eurasia, some of which are monophagous, attack Russian knapweed and are prospective biological control agents (Watson 1980). *Subanguina picridis* (a gall-forming nematode) has been introduced in some localities in the Western U.S. and Canada but has not provided effective biological control (Zouhar 2001). *Aceria acroptiloni* (a gall-forming mite) is also approved by the USDA for use as a biological control agent. This mite stunts the growth of Russian knapweed, reduces seed production, and prevents the formation of new shoots (Carpenter and Murray 1999). Russian knapweed is most effectively controlled when multiple control methods are combined in a long term management plan (Carpenter and Murray 1999).

References:

Beck, K. 2008. Natural Resources Series, Range. Russian Knapweed No. 3.111. Colorado State University Extension. [16 January 2011] http://www.ext.colostate.edu/pubs/natres/03111.pdf

Bundesamt fuer Naturschutz. 2009. Accessed through GBIF (Global Biodiversity Information Facility) data portal (http://data.gbif.org/datasets/resource/1098, 2011-01-16). In Anerkennung der Leistungen der ehrenamtlichen Kartierer der Flora Deutschlands. Netzwerk Phytodiversitaet Deutschland. Bonn, Germany.

California Integrated Pest Control. 2011. Russian knapweed (*Acroptilon repens* (L.) DC.). California Department of Food and Agriculture. [16 January 2011] http://www.cdfa.ca.gov/phpps/ipc/weedinfo/acroptilon.htm

Carpenter, A., and T. Murray. 1999. Element Stewardship Abstract for *Acroptilon repens* (L.) de Candolle (*Centaurea repens* L.). Land Stewardship Consulting, The Nature Conservancy. [16 January 2011] Available: http://www.imapinvasives.org/GIST/ESA/esapages/documnts/acrorep.pdf

DiTomaso, J., and E. Healy. 2007. Weeds of California and Other Western States. Vol. 1. University of California Agriculture and Natural Resources Communication Services, Oakland, CA. 834 p.

Invaders Database System. 2011. University of Montana. Missoula, MT. http://invader.dbs.umt.edu/

Keil, D. 2006. *Acroptilon repens* (Linnaeus) de Candolle. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 19, p. 172.

Klinkenberg, B. (Editor) 2010. E-Flora BC: Electronic Atlas of the Plants of British Columbia. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia. Vancouver, BC. Available: http://www.geog.ubc.ca/biodiversity/eflora/index.shtml [January 2011]

Kravchenko, O. 2009. Weeds, *Acroptilon repens* DC. – Russian knapweed. AgroAtlas. Interactive agricultural ecological atlas of Russia and neighboring countries: Economic plants and their diseases, pests, and weeds. [16 January 2011] http://www.agroatlas.ru/en/content/weeds/Acroptilon_repens/

Laufenberg, S., R. Sheley, J. Jacobs, and J. Borkowski. 2005. Herbicide Effects on Density and Biomass of Russian Knapweed (*Acroptilon repens*) and Associated Plant Species. Weed Technology. 19(1). 62-72 p.

Million, B., Alaska Exotic Plant Management Team Liaison, Alaska Regional Office, National Park Service, U.S. Department of the Interior, 240 West 5th Avenue, Anchorage, Alaska, 99501. Tel: (907) 644-3452 – pers. obs.

Morris, C., C. Call, T. Monaco, P. Grossl, and S. Dewey. 2006. Evaluation of elemental allelopathy in *Acroptilon repens* (L.) DC. (Russian Knapweed). Plant and Soil. 289(2). 279-288 p.

Quintana, N., T. Weir, J. Du, C. Broeckling, J. Rieder, F. Stermitz, M. Paschke, and J. Vivanco. 2008.

Phytotoxic polyacetylenes from roots of Russian knapweed (*Acroptilon repens* (L.) DC.). Phytochemistry. 69(14). 2572-2578 p.

Roché, C., and B. Roché. 1988. Distribution and Amount of Four Knapweed (*Centaurea* L.) Species in Eastern Washington. Northwest Science. 62(8). 242-253 p.

Thorp, J., and M. Wilson. 1998. Weeds Australia. Australian Weeds Committee. www.weeds.org.au

USDA. 2011. The PLANTS Database. National Plant Data Center, Natural Resources Conservation Service, United States Department of Agriculture. Baton Rouge, LA. http://plants.usda.gov

Watson, A. 1980. The Biology of Canadian Weeds. 43. *Acroptilon* (*Centaurea*) *repens* (L.) DC. Canadian Journal of Plant Science. 60(3). 993-1004 p.

Zouhar, K. 2001. *Acroptilon repens*. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. [16 January 2011] Available: http://www.fs.fed.us/database/feis/