birdsfoot trefoil
Lotus corniculatus L.

Synonyms: *Lotus corniculatus* var. *arvensis* (Schkuhr) Ser. ex DC., *L. rechingeri* Chrtkova-Zertova
Other common names: birdfoot deervetch, bloomfell, cat's clover, crowtoes, eggs-and-bacon, ground honeysuckle
Family: Fabaceae

Invasiveness Rank: **65** 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
Birdsfoot trefoil is a perennial plant that grows from a deep taproot. Stems are erect to trailing, branched, glabrous to sparsely hairy, and 10 to 80 cm long. Leaves are alternate and pinnately compound with five leaflets each, resembling the foot of a bird. Leaf axes are 2 to 5 mm long. Leaflets are asymmetrical, elliptic to obovate, 5 to 20 mm long, and 4 to 10 mm wide with pointed tips and minutely toothed margins. The lowest pair of leaflets are basal and somewhat reduced in size. The three terminal leaflets arise from the tip of the main axis. Flowers are arranged in axillary umbels in groups of two to eight. Peduncles are stout and 3 to 10 cm long. Flowers are 10 to 18 mm long. Calyxes are glabrous or sparsely hairy with linear to lanceolate teeth that roughly equal the length of the tube. Corollas are yellow, sometimes red-tinged, and 8 to 15 mm long. Corollas consist of five petals each; however, the lower two petals are united to form a keel. Pods are narrowly cylindrical and 2 to 5 cm long with 10 to 25 seeds each. Seeds are green-yellow to dark brown, ovoid, and 1 to 1.7 mm long (eFloras 2008, Dzyubenko and Dzyubenko 2009, Klinkenberg 2010, NatureGate 2011).

Leaf of *Lotus corniculatus* L. with two basal leaflets and three apical leaflets.

Similar species: Birdsfoot trefoil can be confused with yellow sweetclover (*Melilotus officinalis*), which is an introduced legume. Yellow sweetclover can be distinguished from birdsfoot trefoil by the presence of trifoliate leaves, flowers that are arranged in many-flowered terminal and axillary racemes, and corollas that are 4 to 7 mm long (DiTomaso and Healy 2007, Klinkenberg 2010).

Flowers of *Lotus corniculatus* L.

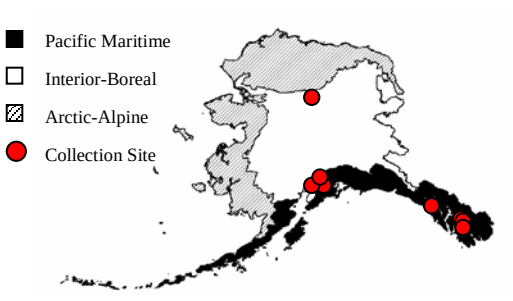
Ecological Impact
Impact on community composition, structure, and interactions: Birdsfoot trefoil can form dense mats (Turkington and Franko 1980) that outshade surrounding vegetation (Winter and Yalch 1996) and likely increase the density of vegetation in disturbed areas. In Alaska, 25% of infestations have occurred at or above 20% ground cover (AKEPIC 2011). It is a highly nutritious forage that, unlike many legumes, does not cause bloating (Turkington and Franko 1980). This species sometimes produces cyanogenic glucosides that discourage herbivory by mollusks and insects but rarely cause symptoms in livestock (Turkington and Franko

1980, Jones and Turkington 1986, DiTomaso and Healy 2007). Flowers are pollinated by bees (Turkington and Franko 1980); therefore, the presence of birdsfoot trefoil may alter native plant-pollinator interactions.
Impact on ecosystem processes: The roots of birdsfoot trefoil are associated with bacteria that fix atmospheric nitrogen; thus, populations increase the availability of nitrogen in the soil. This species often forms dense, fibrous root networks (Jones and Turkington 1986) that reduce soil erosion (DiTomaso and Healy 2007).

Biology and Invasive Potential
Reproductive potential: Birdsfoot trefoil reproduces sexually by seeds and vegetatively under certain conditions. Most cultivars do not produce rhizomes; however, rhizomatous cultivars have been developed (Beuselinck et al. 2005). Roots can produce new shoots in spring, when the crown is damaged, or when roots are fragmented (DiTomaso and Healy 2007, Dzyubenko and Dzyubenko 2009). Older, prostrate stems can sometimes root in bare soil (Turkington and Franko 1980), and some varieties have stoloniferous growth habits (Jones and Turkington 1986). This species can produce over 18,000 seeds per plant (Jones and Turkington 1986). Many seeds have hard seed coats, and some seeds can remain viable for 11 years (Turkington and Franko 1980).
Role of disturbance in establishment: Seedlings are not likely to survive when shaded (Turkington and Franko 1980, Jones and Turkington 1986); few plants established when birdsfoot trefoil was sown in an undisturbed, tall grass community in Argentina. Soil disturbance, removal of vegetation, and burning favor the establishment of this species (Petryna et al. 2002). All infestations recorded in Alaska are associated with anthropogenically disturbed areas (AKEPIC 2011, UAM 2011). However, birdsfoot trefoil is known to grow in natural areas in lowlands immediately inland from coastal dunes in California (DiTomaso and Healy 2007) and on glacial moraines in Europe (Jones and Turkington 1986). Populations in Alaska have expanded under alder canopies (DeVelice pers. obs.).
Potential for long-distance dispersal: The pods open forcefully and can launch seeds up to 1.75 m from the parent plant (Jones and Turkington 1986). Seeds remain viable after being ingested and can be dispersed by birds and deer (Turkington and Franko 1980, Jones and Turkington 1986, Williams and Ward 2006).
Potential to be spread by human activity: Birdsfoot trefoil is grown for forage, hay, and silage, and it escapes from pastures and fields (Turkington and Franko 1980, Dzyubenko and Dzyubenko 2009). It is a contaminant in low-grade grass seed. Seeds remain viable after being ingested and can be dispersed by cattle and sheep (Turkington and Franko 1980).
Germination requirements: Some seeds can germinate immediately following maturation, but most seeds germinate in subsequent years. Seeds with hard seed coats can overwinter but require scarification to germinate. Seeds germinate most readily when buried 0.5 to 1 cm deep in firm soil. Germination rates are reduced when temperatures are below 15°C or above 30°C (Jones and Turkington 1986).
Growth requirements: Flowering is sparse where the plant receives less than 14 hours of light per day. Plants overwinter with a short crown of aboveground shoots or without any aboveground vegetation. Birdsfoot trefoil is intolerant of shade and severe drought. It can grow well in a variety of soil textures, including clay, sand, rocky slopes, and glacial moraines. It can grow in soils with pH from 4 to 8 but grows best on moist soil with pH near 6.5. This species benefits from grazing (Jones and Turkington 1986). It is highly competitive on infertile, acidic, calcareous, dry, and water-logged soils (Turkington and Franko 1980).
Congeneric weeds: Big trefoil (*Lotus pedunculatus*) is known to occur as a non-native weed in California (DiTomaso and Healy 2007).

Legal Listings
☒Has not been declared noxious
☐Listed noxious in Alaska
☐Listed noxious by other states
☐Federal noxious weed
☐Listed noxious in Canada or other countries

Distribution and Abundance
Birdsfoot trefoil is grown for forage in pastures and as a hay and silage crop (Turkington and Franko 1980, Dzyubenko and Dzyubenko 2009). It has been planted along roadsides in the U.S. and Canada for erosion control (Winter and Yalch 1996). It occasionally grows as an agricultural weed (eFloras 2008). This species invades wetland and riparian communities in California (DiTomaso and Healy 2007).
Native and current distribution: Birdsfoot trefoil is native to Eurasia and North Africa (Jones and Turkington 1986, DiTomaso and Healy 2007). It has been introduced to North America, South America, Australia, and New Zealand (Johnston and Pickering 2001, eFloras 2008). It grows in 44 states of the U.S. and most of Canada (USDA 2011). This species is known to grow in Norway as far north as 70°N (Norwegian Species Observation Service 2011). Birdsfoot trefoil has been documented from the Pacific Maritime and Interior-Boreal ecogeographic regions of Alaska (AKEPIC 2011, UAM 2011).



Distribution of birdsfoot trefoil in Alaska

Management

Birdsfoot trefoil can resprout from the roots after the removal of the aboveground growth (DiTomaso and Healy 2007). Stem fragments from prostrate stems sometimes root (Jones and Turkington 1986). However, hand pulling and digging small populations of birdsfoot trefoil appear to be effective, as plants that were removed by digging in 2006 along the Dalton highway were not found again in 2007 (Cortés-Burns et al. 2008). Removing plants manually can be difficult because of the stout roots. Digging of larger populations may need to be repeated for several years to provide effective control (DeVelice pers. obs.). Some varieties have developed resistance to certain herbicides (Turkington and Franko 1980). Foliar applications of MCPA and clopyralid can effectively control this species (Winter and Yalch 1996).

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