

Tussilago farfara

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INTRODUCTORY

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Photo courtesy of Robert Videki, Doronicum Kft., Bugwood.org

AUTHORSHIP AND CITATION:

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FEIS ABBREVIATION:

TUSFAR

NRCS PLANT CODE [[103](#)]:

TUFA

COMMON NAMES:

coltsfoot
colt's foot

TAXONOMY:

The scientific name of coltsfoot is *Tussilago farfara* L. (Asteraceae) [[36,43,57,84](#)].

SYNONYMS:

None

LIFE FORM:

Forb

DISTRIBUTION AND OCCURRENCE

SPECIES: *Tussilago farfara*

- [GENERAL DISTRIBUTION](#)
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GENERAL DISTRIBUTION:

Coltsfoot is nonnative in North America. It is most widespread in the eastern United States from Minnesota south to Tennessee, east to North Carolina, and north to Maine [[36,43,57,95,106](#)]. It occurs throughout southern Ontario, southern Quebec, and the Canadian Maritime provinces. It is also found in southwestern British Columbia and Vancouver Island [[83](#)] and occasionally west of the Cascade Range in the Pacific Northwest [[43](#)]. [Plants Database](#) provides a distributional map of coltsfoot.

Coltsfoot is native to Europe, western Asia, and northwestern Africa ([[33,36,43](#)], Hulten and Fries 1986 cited in [[48](#)]). Coltsfoot's native geographical distribution extends from the British Isles east to Siberia, north to the Arctic Circle, and south to the Himalayas [[62](#)]. Coltsfoot was probably introduced from its native range to the United States by early European settlers for its medicinal properties (see [Other Uses](#)) [[95](#)]. It was present in the United States as early as 1840 [[105](#)] and present in Canada in the 1920s [[109](#)]. Coltsfoot has escaped from cultivation and has spread extensively (see [Impacts](#)) [[48](#)].

HABITAT TYPES AND PLANT COMMUNITIES:

Plant community associations of nonnative species are often difficult to describe accurately because detailed survey information is lacking, there are gaps in understanding of nonnative species' ecological characteristics, and nonnative species may still be expanding their North American range. Therefore, coltsfoot may occur in plant communities other than those discussed here and listed in the [Fire Regime Table](#).

Coltsfoot occurs in a variety of habitats and plant communities throughout the United States and Canada that are similar to those of its native range (see [Site Characteristics](#)). It occurs in upland and floodplain forests and woodlands; in wetlands and along riverbanks and shorelines of lakes and ponds; and in grasslands. It also occurs in anthropogenically disturbed areas such as cultivated, fallow, and successional fields, railroad rights-of-way, roadsides, and ditches (e.g., [[21,22,29,31,41,57,59,88,90,93](#)]).

Wetlands and shoreline communities: Coltsfoot commonly occurs in and on the edge of rivers, lakes, ponds, swamps, marshes, and [fens](#). In Gros Morne National Park, Newfoundland, coltsfoot occasionally dominated highly disturbed gravel riverbanks [[80](#)]. Near Quebec City, Quebec, it was the most abundant species in ditches in lowland

boreal peatlands [23]. It occurred on a sand dune dominated by switchgrass (*Panicum virgatum*) and Great Lakes wheatgrass (*Elymus lanceolatus* spp. *psammophilus*) on the northern shore of Lake Erie, Ontario [113]. On Timber Island in Lake Winnepesaukee, New Hampshire, coltsfoot was infrequent in moist and wet crevices along the shoreline [14]. In Strouds Run State Park, south-central Ohio, it occurred in marshes and on lake edges [41]. In the Delaware Water Gap National Recreation Area, coltsfoot occurred in the northern bayberry-shrubby cinquefoil/dioecious sedge-yellow sedge (*Morella pensylvanica*-*Dasiphora fruticosa* spp. *floribunda*/*Carex sterilis*-*Carex flava*) marl fen association [72]. Along the New River Gorge National River in West Virginia, coltsfoot occurred in an American eelgrass-pondweed (*Vallisneria americana*-*Potamogeton* spp.) wetland [93]. In Kentucky, coltsfoot occurred in mud flats along Cave Run Lake [54]. In King George County, Virginia, it occurred along steeply sloped river bluffs and on beach berms located at the bases of these bluffs [88]. In Washington, it occurred in a larch (*Larix* spp.) swamp [31].

Riparian floodplain and bottomland communities: In the northeastern United States and southeastern Canada, coltsfoot commonly occurs in mixed-hardwood riparian floodplain and bottomland communities. In Gros Morne National Park, Newfoundland, coltsfoot was one of the most common nonnative herbaceous species within canopy gaps in lowland balsam fir-white spruce-paper birch (*Abies balsamifera*-*Picea alba*-*Betula papyrifera*) forest [46]. In the Delaware Water Gap National Recreation Area, it occurred on low riverbanks in the black willow/reed canarygrass-Indianhemp (*Salix nigra*/*Phalaris arundinacea*-*Apocynum cannabinum*) temporarily flooded shrubland association [72]. In Prince Georges and Charles counties, Maryland, it was rare in oak-sweetgum-red maple (*Quercus* spp.-*Liquidambar styraciflua*-*Acer rubrum*) woodlands in the Piscataway Creek floodplain [91]. Along the New River Gorge National River in West Virginia, coltsfoot occurred in yellow-poplar-white oak-northern red oak-sugar maple (*Liriodendron tulipifera*-*Quercus alba*-*Q. rubra*-*Acer saccharum*) forest on bottomlands and slopes that ranged from rarely flooded to frequently flooded and in sycamore-river birch forest that was often flooded during high water [93].

Upland forest communities: Near Montreal, Quebec, coltsfoot occurred in an old-growth sugar maple-American beech (*Fagus grandifolia*)-northern red oak forest 5 years after an ice storm [35]. At the Waterloo Wildlife Research Station in Athens County, Ohio, it occurred in 7- to 9-year-old clearcuts dominated by pin oak (*Quercus palustris*), red maple, yellow-poplar, and bigtooth aspen (*Populus grandidentata*) with an understory of sassafras (*Sassafras albidum*), common greenbriar (*Smilax rotundifolia*), and blackberry (*Rubus* spp.) [89]. In south-central Pennsylvania, it occurred in white oak-white ash (*Fraxinus americana*)-northern red oak forests [110]. In Great Falls Park, Fairfax County, Virginia, it was rare in white oak-northern red oak-mockernut hickory/flowering dogwood/deerberry-nakedflower ticktrefoil (*Carya alba*/*Cornus florida*/*Vaccinium stamineum*-*Desmodium nudiflorum*) forest on dry middle or upper slopes and ridges [90].

BOTANICAL AND ECOLOGICAL CHARACTERISTICS

SPECIES: *Tussilago farfara*

- [GENERAL BOTANICAL CHARACTERISTICS](#)
- [SEASONAL DEVELOPMENT](#)
- [REGENERATION PROCESSES](#)
- [SITE CHARACTERISTICS](#)
- [SUCCESSIONAL STATUS](#)

GENERAL BOTANICAL CHARACTERISTICS:

- [Botanical description](#)
- [Raunkiaer life form](#)

Botanical description: This description covers characteristics that may be relevant to fire ecology and is not meant for identification. Keys for identification are available (e.g., [36,43,57,79,84]).

Form and architecture: Coltsfoot is a [rhizomatous](#) perennial forb [[36,43,57](#)] that is 2 to 20 inches (5-50 cm) tall [[36,43](#)].

Reproductive structures: Coltsfoot flowers resemble that of common dandelion (*Taraxacum officinale*) but are smaller and have disc florets and numerous, radiate, yellow ray florets [[19,36,57,79](#)]. Disc florets are sterile, whereas ray florets are fertile [[36,57,84](#)]. In a flower head, 3 to 80 disc florets are surrounded by 150 to 500 ray florets in several rows (Bakker 1952 cited in [[4](#)]). Flower heads are 1.00 to 1.25 inches (2.54-3.18 cm) wide and occur singly at the top of flowering stems [[19,36,57](#)].

Flowering stems are covered with wooly hairs and scaly bracts and emerge in early spring prior to the leaves [[19,36,43,57,79](#)]. Several flowering stems arise from one root crown. Flowering stems are 2 to 6 inches (5-15 cm) tall when flowering begins and may reach 12 to 20 inches (30-51 cm) tall by the time flowers mature [[19,57](#)].

Coltsfoot seeds are achenes with a small pappus, resembling that of the common dandelion [[62,64,95](#)]. The seeds are small nutlets about 0.1 to 0.2 inch (0.3-0.4 cm) long [[30,33,64](#)] and weigh approximately 0.3 mg each [[10,11,33](#)].



Photo courtesy of Ohio State University, Ohio Agricultural Research and Development Center, Bugwood.org

Leaves: Coltsfoot leaves emerge after flowers mature [[19,57](#)]. Leaves grow in the form of a basal rosette. They are long-petioled, heart-shaped [[19,36,43,57](#)], and 2 to 8 inches (5-20 cm) long [[19,36](#)]. They are deciduous [[11](#)].

Underground structures: Upon germination, coltsfoot has a branched primary tap root that may grow 2 to 4 inches (5-10 cm) deep before leaves emerge [[4,62,69](#)]. The primary root dies 3 to 4 months after germination. In the meantime, adventitious roots develop from the first nodes of the stem. Adventitious roots may grow up to 5 feet (1.5 m) deep.

Coltsfoot has a deep, extensive rhizome system [[19,39](#)]. As early as 2 to 4 months after germination, rhizomes grow out from the basal leaf axils. Rhizomes may produce aerial vegetative shoots in their first year [[4](#)]. Rhizomes may grow >3 feet (1 m) between the time of initiation and the formation of aerial shoots [[69](#)] and may grow up to 18 feet (5.5 m) long [[67](#)]. According to fact sheets, rhizomes may grow up to 10 feet (3 m) deep [[19](#)], but most grow between 2 and 8 inches (5-20 cm) deep [[109](#)]. Rhizomes are brittle, and fragmentation of plants by breaking and rotting of rhizomes leads to development of independent ramets that are genetically identical to their parent [[13,73](#)]. Generally, a rhizome initiated in one year produces aerial shoots the succeeding year, and these shoots produce flowers in the third year. After this the rhizome usually dies, leading to fragmentation of the rhizome system [[13,62,69](#)]. In hydric soils in the Netherlands, the central parts of some coltsfoot clones died in the second year after establishment, while the outer parts survived [[4](#)]. Thus, new growth may occur at points distant from that of the previous year [[62](#)].

Physiology: Coltsfoot is apparently salt tolerant. In New York, coltsfoot occurred along the southwestern shore of Onondaga Lake near Syracuse, New York, where saline industrial residues (finely ground limestone rich in salts) were dumped 34 years prior to the study [[111](#)]. In East Bohemia, Czech Republic, coltsfoot persisted on a road bank that was exposed to winter salt spray through a 7-year study [[51](#)]. Coltsfoot also appears to be tolerant of intermittent

flooding (e.g., [47,72,93]). For more information on coltsfoot's soil moisture tolerance, see [Site Characteristics](#).

Raunkiaer [78] life form:

[Hemicryptophyte](#)

[Geophyte](#)

SEASONAL DEVELOPMENT:

Coltsfoot seeds germinate in late spring and early summer shortly after they are shed (see [Germination](#)). Shortly after germination, a tap root develops. During the first summer, adventitious roots develop on the lowest nodes of the stem, followed by rhizomes that are initiated in the same region (see [Underground structures](#)). By fall, several leaves are typically present, rhizomes are well developed, and flower buds have usually formed. In favorable environments, vegetative reproduction may occur before winter, with the tips of some rhizomes growing upwards to produce new plants. During winter, leaves die so all that is visible at the soil surface is a cluster of flower buds on the root crown. Flower buds continue to develop during winter, and early the following spring new vegetative shoots develop, flowering stems elongate, and flowers open. After flowers mature, seeds are dispersed, and vegetative shoots grow. Leaves grow from vegetative shoots in early summer after flowering stems die. During summer, rhizomes grow and develop aerial shoots, and the cycle recommences the following spring [4,62,69,109].

In North America, coltsfoot generally flowers from March through June:

General flowering dates reported for coltsfoot in parts of its North American range	
Location	Dates
New England	April-June [36]
New England	19 April-11 June [84]
New England and New York	April-June [57]
Ohio	March (fact sheet by [19])
Maryland	March-May [30]
southern Ontario	April-early May (fact sheet by [109])
Nova Scotia	late April-early May [79]

In the European range of coltsfoot, temperature appears to affect timing of flowering, with plants at higher elevation and more northerly latitudes flowering later in the season. For example, flowering generally occurs from June to July in Fennoscandia, but from March to April in southern Great Britain [62]. For more information on this topic, see [Climate](#).

REGENERATION PROCESSES:

- [Pollination and breeding system](#)
- [Seed production](#)
- [Seed dispersal](#)
- [Seed banking](#)
- [Germination](#)
- [Seedling establishment and plant growth](#)
- [Vegetative regeneration](#)

Coltsfoot is a rapidly growing, herbaceous perennial that reproduces vegetatively by rhizomes and by seed [4,11,63,69,109]. Fact sheets state that coltsfoot reproduces primarily by rhizomes [19,48]. However, the balance between vegetative reproduction and reproduction by seed in coltsfoot may be influenced by plant density, where low-density populations have greater vegetative reproduction and reduced seed production [69].

Pollination and breeding system: Coltsfoot may self-pollinate, but it is principally cross-pollinated [4,34,62] by insects [11,33,62]. Self-pollination "does not...appear to be very successful as may be seen from the numerous shriveled empty fruits...found in most heads if insects are excluded" [62]. In its native range, coltsfoot is pollinated by bees (Hymenoptera) [71,73], hoverflies (Syrphidae), flies (Diptera), beetles (Coleoptera), and possibly ants (Formicidae) [73].

Seed production: Coltsfoot is sexually mature in its second year (see [Seasonal Development](#)) [7]. A fact sheet states that each coltsfoot plant produces about 3,500 seeds [109]. In Manchester, England, coltsfoot plants grown in pots outside produced 4,600 seeds/plant on average [11]. According to a flora, a single flower head may produce 100 to 1,000 seeds, although typically no more than 300 [33]. In England, one wild population of coltsfoot produced an average of 157 seeds/flower head [13], and another produced 178 seeds/flower head [11]:

Reproductive characteristics of a wild coltsfoot population in Manchester, England [11]	
Seeds/flower head	178.1
Loss of seeds to predation (%)	21.0
Flower heads/ rootstock	7.7
Flower heads/rootstock of the largest plant	100
Seeds/rootstock, including loss of seeds to predation	1,080

Coltsfoot seed production may be variable among populations and years. In its native range in Poland, a coltsfoot population along a riverbank produced 23,308 seeds/m² one year and <500 seeds/m² the previous year. The author attributed the difference in part to weather. In the same study, coltsfoot seed production decreased 51-fold in an old field and 22-fold in a grassland over 4 years. The author attributed the decline to succession of sod-forming grasses [64]. In the Netherlands, coltsfoot planted on bare, unvegetated soil produced 226,715 seeds/m², whereas coltsfoot planted in a young forest produced 16,511 seeds/m² [4]:

Reproductive characteristics of coltsfoot planted in 2 habitats in the Netherlands [4]		
Variable	Unshaded site*	Shaded site**
Flowering stems/m ²	33	7
Flower heads/flowering stem	37	16
Seeds/flower head	211	162
Mean percent seed germination	88	91
Number of viable seeds/m ²	226,715	16,511

*A bare, unvegetated site. Soils were moderately moist clay loam, aerated to a depth of 30-40 cm.
 ** A young forest (3-4 m tall), without groundlayer vegetation. Light intensity in July was 35-45% of full daylight. Soils were moderately moist clay loam, aerated to a depth of 50 cm.

In its native range in Denmark, coltsfoot did not produce seeds every year [1]. Coltsfoot seed production may be influenced by plant density. For more information on this topic, see [Vegetative regeneration](#).

Seed dispersal: Coltsfoot seeds are dispersed by wind [1,4] and secondarily by water [4]. According to a fact sheet, seeds are dispersed by wind as far as 8 miles (13 km) [19]. In the Netherlands, wind dispersed some coltsfoot seeds up to 4 miles (6 km), although most seeds apparently landed within 300 feet (100 m) of their source population [4]. Seed dispersal is likely greatest in open habitats [10,86].

Seed banking: Coltsfoot seeds show no dormancy, and most seeds germinate shortly after dispersal. Seeds >5 months old typically do not germinate (see [Germination](#)). This suggests that coltsfoot has a transient seed bank. A flora

stated that coltsfoot seed bank longevity was <3 months [33]. According to a review, studies in northwestern Europe reported coltsfoot seed densities in the seed bank ranging from 53 to 60 seeds/m² [96]. In "microcatchments" in the badlands area of southeastern Spain near Vallcebre, where coltsfoot plants were abundant in the standing vegetation, 77.9 coltsfoot seeds/m² were found in samples taken from the upper 4 inches (10 cm) of soil in October; no germination tests were conducted and seed viability was not determined [38].

Germination: Coltsfoot seeds do not show dormancy. Secondary dormancy does not occur in coltsfoot. Seeds usually germinate the season they are produced [10]. Under laboratory and natural conditions, seed viability decreases rapidly over time. Most seeds >5 months old do not germinate [4,10,64]. Under laboratory conditions in the Netherlands, mean percent germination of coltsfoot seeds decreased from 94% immediately after harvest to 3% 4 months later [4]:

Mean percent germination of coltsfoot seeds immediately after harvest and after storage under varied conditions [4]				
Storage conditions	Storage time			
	Immediately after harvest	1 month	2 months	4 months
Indoors, 18-23 °C	94	57	41	3
Outdoors, 40 cm below the soil surface	94	21	3	0
Outdoors, 50 cm below the water surface	94	37	0	0

Coltsfoot seeds collected in May from wild populations in Poland and sown on filter paper in May and June reached 100% germination within 24 hours. Seeds sown in July reached 92% germination within 3 days; those sown in September reached 4.7% germination in 6 days; none of those sown in October germinated [64]. All coltsfoot seeds collected in April and May from wild populations in England and planted immediately after harvesting germinated in the laboratory. All seeds stored for 8 weeks at 37 °F (3 °C) also germinated in the laboratory, suggesting no loss of viability during 8 weeks of storage. However, all seeds stored at 37 °F for 6 months, then stored for an additional 6 months either at 81 °F (27 °C) in the laboratory or buried in mesh bags in potting soil outside, failed to germinate [10].

Viability and germination of coltsfoot seeds in the laboratory are high [4,10,64] but may not reflect germination rates in wild populations [64]. In laboratory experiments, viability reported for coltsfoot seeds from wild populations ranged from about 52% [11] to 76% [10]. However, seed germination in the field may be much lower than that in the laboratory. Namura-Ochalska [64] reported that even in years of high seed production, "no more than a few seedlings emerged", with as few as 0.5% of seeds germinating.

Coltsfoot seeds germinate in a range of light, temperature, soil moisture, and soil pH conditions, but cold temperatures and dry or extremely acid soils inhibit germination. Coltsfoot seeds germinate equally well in light and in dark [4,10,64]. Fresh coltsfoot seeds germinate at constant temperatures ranging from 41 to 86 °F (5-30 °C) [10], but >50 to 77 °F (10-25 °C) is optimum [4,6,10]. Coltsfoot seeds germinate well on substrates with a range of water availability, although they germinate best on moist substrates [10,64]. In the laboratory in Poland, seedling emergence tests indicated that coltsfoot seeds tolerated excess water, including submergence, but were very susceptible to water shortage [64]. In a culture solution, coltsfoot seeds germinated at a pH ranging from 4.5 to 6.5; germination was "slow" at pH 4; and no seeds germinated at pH <3.5 [62].

Seedling emergence tests indicate that coltsfoot seeds germinate best when on the soil surface, and seeds buried deeper than 0.2 inch (0.5 cm) [4] to 0.8 inch (2 cm) [64] do not germinate. In the laboratory in Poland, 100% of seeds planted on the soil surface germinated within 2 days; 50% germinated within 9 days when planted 0.4 inch (1 cm) deep; and 12% germinated within 12 days when planted 0.8 inch (2 cm) deep. Seeds sown deeper did not germinate [64].

Seedling establishment and plant growth: Coltsfoot plants grow best in moist soils in full sun in areas with

low vegetation abundance.

Although coltsfoot seeds can germinate equally well in light and in dark [4,10,64], coltsfoot seedling establishment and growth are optimum under full light, and shading delays growth. In field experiments in the Netherlands, coltsfoot seedling growth was best at 100% full light; seedling growth was delayed at 60% to 70% full light; and seedlings died at light intensities <20% full light [4]. In a greenhouse experiment in England, coltsfoot plants grown under 10% daylight had a mean dry weight of 7 mg, whereas plants grown at 70% daylight had a mean dry weight of 8,770 mg [63]. In southeastern Ohio, coltsfoot stem number tended to decrease with increased canopy closure, indicating increased coltsfoot recruitment under an open canopy [21].

Coltsfoot seedling establishment and growth appear to be optimum in moist but not saturated soils. In the Netherlands, coltsfoot seedlings were "hardly affected" by very moist and "badly aerated" soils. Conversely, many coltsfoot seedlings did not survive the first growing season in areas with low water availability in the upper soil surface in June [4].

Dense vegetation decreases coltsfoot seedling growth and establishment, probably due in part to competition with other plants for light and moisture. In field experiments in the Netherlands, coltsfoot did not grow well from germination to the reproductive stage when grown among dense agricultural crops, a result attributed in part to low light under these crops [4]. In a greenhouse in Poland, coltsfoot seedling survival decreased with increased sowing density; survival was 92% when 20 seeds were sown per tray and 19% when 500 seeds were sown per tray [66]. In field experiments in the Netherlands, coltsfoot seeds were planted at different densities in full sun in May. Sites with the lowest density showed the highest total vegetative production, and those with the highest density showed the highest mortality at the end of the first growing season. Most mortality occurred during drought at the end of June. Soil erosion and pathogens may have also caused some mortality [4]:

Survival of coltsfoot seedlings to reproductive stage from seeds planted at 4 densities in 2 experiments [4]	
Mean number of seedlings/dm ² shortly after emergence	Mean number of plants/dm ² in the reproductive stage before the end of the first growing season
28-36	0-1
11-18	3-4
8	4
2-3	1-2

Coltsfoot seedlings are apparently most vulnerable to mortality prior to development of rhizomes, when seedlings are not capable of vegetative reproduction [4]. Two and 3 years after complete removal of aboveground vegetation along a river in Poland, a large number of coltsfoot seedlings germinated in May. However, about 90% of seedlings had died by the end of the growing season [67].

Vegetative regeneration: Coltsfoot reproduces vegetatively via rhizomes. Rhizomes may grow out from the basal leaf-axils and produce aerial shoots as early as 2 to 4 months after germination.

Coltsfoot is capable of rapid vegetative growth. Rhizomes may grow >3 feet (1 m) long between initiation and the formation of aerial shoots [4,69]. Two years after sowing and transplant experiments in the Netherlands, some coltsfoot plants on bare, moist, aerated soils grew into patches 8.2 to 11.5 feet (2.5-3.5 m) long [4]. In southeastern Ohio, a 4-year-old coltsfoot patch along a road was 16 to 20 feet (5-6 m) long [21].

Vegetative reproduction in coltsfoot may be decreased by shading and overcrowding. In the Netherlands, mean density of rhizomes in unshaded sites (206-228 rhizomes/m²) was substantially higher than mean density of rhizomes in shaded sites (0-38 rhizomes/m²) [4]:

Coltsfoot vegetative reproduction 2 years after planting at 4 sites [4]

Site characteristics	Mean number of rhizomes/m ²
Unshaded, moderately moist, and aerated to 30-40 cm deep*	228
Shaded, moderately moist, and aerated to 50 cm deep**	38
Unshaded, very moist, and aerated to 0-5 cm deep*	206
Shaded, very moist, and aerated to 0-5 cm deep***	0

*Bare, unvegetated soil.
 **Young forests (3-4 m tall) without other groundlayer vegetation. Light intensity on the soil surface in July was 35-45% of full daylight.
 ***A stand of common reed (*Phragmites communis*). Light intensity on the soil surface in July was 60-70% of full daylight the first year and 5-10% the 2nd year.

In a common garden in Poland, coltsfoot individuals growing under the least crowded conditions had the most vegetative shoots [66]. In a common garden in Wales, coltsfoot allocated proportionally more biomass to vegetative reproduction than to seed production at low densities; at high densities, many plants failed to produce a rhizome [69]. In a greenhouse experiment in England, the greatest increases in density as a result of vegetative spread occurred when coltsfoot plants were at low density. At the highest densities, many individuals produced no rhizomes [63]. Along a river in Poland, complete removal of aboveground vegetation resulted in a decrease in grass density and an increase in coltsfoot density the year after the disturbance. Coltsfoot vegetative stem density doubled compared to the year prior to the disturbance. Vegetative stem density peaked in postdisturbance year 2, when coltsfoot cover was up to 70%. During postdisturbance year 3, coltsfoot vegetative stem density declined to predisturbance levels and grass cover and "sodding" increased. When 50% of the aboveground vegetation was removed along the river, coltsfoot vegetative stem density increased but was markedly lower than when 100% of aboveground vegetation was removed [67].

Vegetative reproduction in coltsfoot may decrease in harsh environments. In a seedling transplant experiment in England, coltsfoot plants in harsh environments (low soil fertility; soil pH: 4.6; mean daily temperature in summer: 51.1 °F (10.6 °C)) allocated proportionally less biomass to seed production and more to vegetative reproduction than did those in milder environments (high soil fertility; soil pH: 7.9; mean daily temperature in summer: 58.1 °F (14.5 °C)) [13]. In a common garden in Wales, total rhizome production was greater in fertile soils than in nutrient-poor soils [69].

SITE CHARACTERISTICS:

Coltsfoot establishes on lowland and upland sites with a range of soil and climatic conditions, but is most common on moist soils in cool climates. According to fact sheets, coltsfoot grows best in low-lying mesic areas including streambanks and moist grasslands and in disturbed areas such as roadsides, although it also grows in dry sites [95]. It prefers full sun (see [Seedling establishment and plant growth](#)). It primarily establishes on open, disturbed sites, though it may occasionally occur in intact native plant communities including wetlands and forests. See [Habitat Types and Plant Communities](#) for descriptions of plant communities where coltsfoot occurs.

- [Soils](#)
- [Climate](#)
- [Elevation](#)
- [Topography](#)

Soils: According to a fact sheet from Ohio, coltsfoot prefers moist, clay soils in cool climates [19].



Photo courtesy of Chris Evans, River to River CWMA, Bugwood.org

Texture: Coltsfoot occurs in clays [9], silts [99], loams [28], silt loams [82,99], silty clay loams [90,99], sandy loams [2,99], and sands [25,64]. Coltsfoot occurs in peatlands in its native [81] and North American [23] ranges. In the Cayuga Lake Basin in New York, Turner [99] concluded that the "optimum" soil textures for coltsfoot were silt loam and silty clay loam.

pH: Coltsfoot occurs in soils with pH ranging from 4.6 to 10 [2,2,13,23,62,64,99,112]. It occurs primarily on neutral to very strongly alkaline soils [2,13,62]. In the Cayuga Lake Basin in New York, coltsfoot did not occur in soils with pH <6.9; 20% of plants occurred in neutral (7.0 pH) soils; and most plants (45%) occurred in soils with pH >7.1 [99].

Soil fertility: Coltsfoot can occur in infertile (e.g., [82,90]) to very fertile (e.g., [28]) soils. Coltsfoot's tolerance of extremely infertile soils caused Myerscough and Whitehead [62] to suggest that coltsfoot "appears to have a competitive advantage in that germination can occur at lower levels of nutrient concentration than in other species". Coltsfoot is mycorrhizal, and symbiotic vesicular-arbuscular mycorrhizae were found on coltsfoot roots in Pennsylvania [60].

Moisture: Coltsfoot occurs in dry and moist soils but is most common in moist soils. Coltsfoots was listed as a facultative upland species in Ohio. Facultative upland species were those that usually occurred in nonwetland habitats (67-99% of the time) but occasionally occurred in wetlands (Sabine 1993 cited in [107]).

Coltsfoot commonly occurs in poorly drained and intermittently flooded areas. In the Cayuga Lake Basin in New York, coltsfoot was "fairly abundant" in poorly drained silt loam, abundant in moderately well-drained silty clay loam, fairly abundant in well-drained fine sandy loam, and scarce in marly silt of marshy basins and outlets of marl springs [99]. In the Delaware Water Gap National Recreation Area, coltsfoot occurred on low river banks in the black willow/reed canarygrass-Indianhemp association that was intermittently flooded [72]. In the Pra River floodplain in Russia, coltsfoot occurred in burned peatlands that were flooded for 1 to 2 months in spring and had a high groundwater table (16-20 inches (40-50 cm) deep) in summer [112]. In Germany, coltsfoot occurred in wet, shaded oak-alder (*Quercus* spp.-*Alnus* spp.) stands along a river bank [73]. In Scotland, coltsfoot occurred in very open gravel-flushes and springs within woodlands where cover was patchy; it appeared to be tolerant of rapid water flow and periodic submergence [47]. In the British Isles, coltsfoot occurred in calcareous seepage fens (Clapman 1953 cited in [62]).

Two years after forest restoration efforts on a surface mine in eastern Kentucky, coltsfoot established on brown, weathered sandstone ("brown spoils") and had the highest cover of any plant species (51% cover). Coltsfoot did not occur on gray, weathered sandstone ("gray spoils") or mixed weathered and unweathered sandstones and shale ("mixed soils"). Total vegetation cover was 66%, 6%, and 2% on brown, gray, and mixed spoils, respectively. Three years after restoration efforts, coltsfoot remained dominant in brown spoils and became dominant in gray and mixed spoils.

Coltsfoot cover was 30%, 41%, and 30% on brown, gray and mixed spoils, respectively. Differences in coltsfoot cover on the 3 spoils was explained in part by soil moisture and pH. Brown spoils had the highest soil moisture and gray spoils the least. Brown spoils were moderately acidic to neutral (pH 6.0-6.6), whereas mixed and gray spoils were moderately to strongly alkaline (pH 8.1-8.6) [2].

Coltsfoot infrequently occurs in dry soils. In Great Falls Park, Virginia, coltsfoot was rare in white oak-red oak-mockernut hickory forest on dry middle or upper slopes and ridges with high solar exposure [90]. In Germany, coltsfoot occurred in a sunny, dry gravel pit [73].

Climate: Coltsfoot appears to prefer cool, moist climates [106]. Cold temperatures in winter are apparently required for breaking bud dormancy in early spring [61]. According to Ogden [69], coltsfoot seems well-adapted to places in which the growing season is short and the winter severe.

Mean maximum and minimum temperatures and mean annual precipitation of some sites with coltsfoot in North America			
Location	Mean annual temperature (°C)		Mean annual precipitation (mm)
	Minimum	Maximum	
King George County, Pennsylvania	7.7	31.7	1,019 [88]
Prince Georges and Charles counties, Maryland	5.9	19.6	1,144 [91]
Quebec City, Quebec	-12	18	924 [23]

In Europe, coltsfoot occurred on sites where mean annual temperature ranged from 47 to 49 °F (8.5-9.2 °C) and mean annual precipitation ranged from 19 to 33 inches (480-850 mm) [28,38,68].

Fruiting timing is affected by elevation and temperature. During one year near Bath, England, coltsfoot plants in the valley (elevation 65 feet (20 m)) bloomed 36 days earlier than plants on the plateau (elevation 720 feet (220 m)) [5]. An analysis of 36 years of first flowering dates in central England found that coltsfoot flowered earlier following warm winters, whereas warm temperatures in fall resulted in later flowering the following spring [32].

The relationship between temperature and coltsfoot flowering has been used to study potential effects from climatic warming. In central England, models based on 36 years of first flowering dates suggested that an increase in monthly mean temperature by 1.8 °F (1.0 °C) may advance coltsfoot flowering by 20 days [32]. Timing of flowering by coltsfoot may be affected by the North Atlantic Oscillation (NAO), which accounts for much of the interannual variation in wintertime temperature and precipitation in the northern hemisphere and exhibits phases of increase and decrease that persist over decades. Analysis of 34 to 50 years of flowering data from Norway found that coltsfoot flowering was negatively related to the NAO index of the preceding winter at 20 out of 23 sites ($P \leq 0.05$ for all tests); coltsfoot plants bloomed earlier following warm, wet winters. Following increasingly warm, wet winters, the flowering season was prolonged by an average of 18.5 days [74].

Elevation: As of this writing (2011), few authors reported elevation data for sites with coltsfoot in North America. In coltsfoot's native range in the British Isles, it occurs from sea level to 3,497 feet (1,066 m) [33]. In Europe, coltsfoot occurs from sea level to 7,500 feet (2,300 m) in the Alps Range [38,51,68,70,73,74,97]. Coltsfoot occurs from 7,580 to 10,100 feet (2,310-3,080 m) in the Himalayas in Pakistan [27].

Topography: Coltsfoot occurs on level to gently sloping topography (e.g., [25,46]) and on steep, erosional slopes, especially road cuts (e.g., [38,88,94]).

SUCCESSIONAL STATUS:

Coltsfoot generally achieves its highest densities in disturbed areas and does not persist past early succession. In its North American range, coltsfoot is frequently documented in early-successional plant communities or disturbed areas.

Near Quebec City, Quebec, coltsfoot was the most abundant species (2.7% cover) in a boreal peatland 1 year after restoration efforts. Coltsfoot was present in ditches prior to restoration efforts, and rhizomes were left in the ground after a grader disturbed the plants. In postdisturbance year 2, coltsfoot cover had increased, and coltsfoot was the third most abundant (4.9% cover) species; field horsetail (*Equisetum arvense*) and winter bentgrass (*Agrostis hyemalis*) were the most abundant [23]. Five years after an ice storm near Montreal, Quebec, mean coltsfoot cover was 0.2% in an old-growth sugar maple-American beech-red oak forest [35]. In Athens County, Ohio, coltsfoot occurred in 7- to 9-year old clearcuts [89]. Coltsfoot dominated some highly disturbed gravel riverbanks in boreal forest in Gros Morne National Park, Newfoundland [80].

Coltsfoot also occurs in early-successional plant communities or disturbed areas in its native range. In England, coltsfoot colonized the "less advanced stages" of fine-structured talus slopes and spoil banks in an abandoned chalk quarry [94]. In the British Isles, coltsfoot occurred on sand dunes where there was abundant bare ground and the soil was too unstable for moss colonization [42]. In Sweden, coltsfoot occurred in young (<10 years old) and old (up to 100 years old) abandoned gravel pits but was most common in young pits with high clay content [9]. In northwestern Czech Republic, coltsfoot often dominated 4- to 10-year-old abandoned basalt quarries where spoils with a high proportion of fine-structured subsoil were dumped [68]. In Hungary, coltsfoot dominated brown coal spoils within 3 years after abandonment [75].

In its native range, coltsfoot generally does not persist past early succession. In an abandoned wheat (*Triticum* spp.) field in Great Britain, coltsfoot was abundant 4 and 13 years after abandonment but scarce or occasional 21 and 31 years after abandonment. The author noted that coltsfoot looked like it would be "eliminated within the next few years" [15]. On nutrient-poor (low organic carbon and nitrogen) "protosoil" in central Germany, coltsfoot had the third highest cover (approximately 15%) during postdisturbance year 1. Coltsfoot cover subsequently declined, and at the end of the study in postdisturbance year 14, its cover was approximately 2% [82]. Coltsfoot colonized gravel areas in a moraine following a receding glacier in Obergurgl, Austria. It was found within 1,300 feet (400 m) of the glacial snout within 4 years of the start of colonization but was absent by the 19th year [70].

Coltsfoot is considered a "weak competitor" [64]. Coltsfoot cover apparently declines over time with increased vegetation density and cover. After a stand-replacing wildfire on drained peat soils in forested lowlands in the Pra River floodplain, Russia, coltsfoot occurred in mucky depressions where a thick peat layer (>39 inches (100 cm)) had burned to mineral soil and created a 4- to 6-inch (10-15 cm) deep ash horizon. Coltsfoot was present in postfire years 1 to 4 but absent in postfire year 5. Starting in postfire year 4, a continuous plant cover dominated by chee reedgrass (*Calamagrostis epigeios*) developed, and a humus horizon had formed in the upper soil layer [112], apparently reducing coltsfoot cover. In northwestern Czech Republic, coltsfoot cover decreased on reclaimed spoil heaps as woody vegetation increased during 35 years. Coltsfoot was not present the first 5 years but was abundant at 5 to 8 years when herbaceous perennials started to dominate. Coltsfoot cover declined as cover of other perennial herbs increased, and 15 years after abandonment, cover of other perennial herbs was dense. In subsequent years, coltsfoot and other perennial herbs declined as woody species cover increased [45]:

Percent coltsfoot cover on spoil heaps in a reclaimed coal mine in northwestern Czech Republic [45]		
Years since reclamation	Mean percent coltsfoot cover	Mean woody species cover
1-5 years	not present	present with negligible cover
6-10 years	20.5	1.0
11-15 years	4.9	6.4
16-25 years	2.6	9.0
26-35 years	0.3	15.0
35-45 years	3.1	10.0

In an abandoned fly ash waste dump in the Lee Valley, southern England, coltsfoot was abundant during early succession. Coltsfoot cover in 7-year-old and 10-year old dumps was 50% and 30%, respectively. After about 10

years, coltsfoot began to be shaded out by willow (*Salix* spp.) and birch (*Betula* spp.). Coltsfoot cover in 12- to 14-year-old ash dumps was 1% to 20%. After about 25 years, dumps succeeded to willow-birch woodlands. Coltsfoot was absent from a 24-year-old dump [85]. In central Finland, coltsfoot cover was about 2% in young peat fields (1-2 years after abandonment), but coltsfoot was absent from old peat fields (5-8 years after abandonment). Six to 8 years after abandonment, the ground was totally covered by mosses (*Polytrichum* spp.), and willow and birch dominated the shrub layer [81]. Coltsfoot and quackgrass (*Elymus repens*) dominated a 1-year-old abandoned agricultural field in Poland. Coltsfoot cover declined each succeeding year until postdisturbance year 4, when the site was dominated by orchardgrass (*Dactylis glomerata*) and quackgrass, and only trace coltsfoot cover was present. The authors suggested that coltsfoot rhizomes were apparently not able to grow through the thick, dense layer of rhizomes and roots of the dominant grasses [65].

Coltsfoot prefers full sun and may be favored by high-light conditions following disturbance. Coltsfoot dominated some highly disturbed gravel riverbanks in boreal forest in Gros Morne National Park, Newfoundland. The author surmised that bare soil and high light intensities created by regular disturbance along the riverbank favored coltsfoot establishment [80]. Several North American studies indicate that coltsfoot is often found in edge habitats but absent in interior forest habitats [21,56,59].

FIRE EFFECTS AND MANAGEMENT

SPECIES: *Tussilago farfara*

- [FIRE EFFECTS](#)
- [FUELS AND FIRE REGIMES](#)
- [FIRE MANAGEMENT CONSIDERATIONS](#)

FIRE EFFECTS:

Immediate fire effect on plant: As of this writing (2011), no information was available in the published literature regarding the immediate effects of fire on coltsfoot plants or seeds. Coltsfoot is likely top-killed by fire; belowground reproductive structures may survive.

Postfire regeneration strategy [92]:

Rhizomatous herb, [rhizome](#) in soil

[Geophyte](#), growing points deep in soil

[Ground residual colonizer](#) (on site, initial community)

[Initial off-site colonizer](#) (off site, initial community)

[Secondary colonizer](#) (on- or off-site seed sources)

Fire adaptations and plant response to fire:

Fire adaptations: Coltsfoot exhibits some characteristics that may allow it to survive or establish after fire. It sprouts from rhizomes after mechanical disturbance (see [Vegetative regeneration](#)) [4], so it seems likely that rhizomes below the soil can sprout after fire. Coltsfoot seeds have potential for long-distance [dispersal](#) via wind and water. Seeds may persist in the [seed bank](#) for up 4 months, suggesting the potential for coltsfoot establishment from the seed bank if fire occurs soon after seed dispersal in late spring and early summer. However, it is unclear whether coltsfoot seed would survive fire. Coltsfoot can establish or persist following disturbances such as fire and flooding, which expose mineral soil and open the canopy (see [Successional Status](#)).

Plant response to fire: Several studies document coltsfoot occurring in areas burned by wildfire [24,25,85,97,112], but to date (2011), a lack of details about fire characteristics, pre- and postfire vegetation, and coltsfoot response limit inferences that can be made from these studies. The limited information available suggests that fire may facilitate

coltsfoot establishment and spread.

It is not clear whether coltsfoot abundance increases after fire. In a mature black spruce (*Picea mariana*) forest near Ignace, Ontario, coltsfoot was abundant 5 years after a 52,400-acre (21,200 ha) wildfire in May. It also occurred with low abundance 5 years after fire in 15-year-old pine (*Pinus* spp.) plantations [25]. In southwestern Bulgaria, coltsfoot occurred in an Austrian pine (*Pinus nigra*) forest 2 years after a July wildfire [97]. In southern England, coltsfoot cover was 7% 2 years after fire in a 24-year-old willow scrubland [85]. However, coltsfoot abundance prior to these fires was not reported.

Some studies have documented coltsfoot establishing after fire on sites where it did not occur previously. In Dublin, Ireland, coltsfoot had high frequency 18 months after a stand-replacing wildfire in a gorse (*Ulex* spp.) stand in July. The author concluded that coltsfoot dispersed to the area from adjacent unburned areas [24].

Coltsfoot may establish soon after fire, but it is not likely to persist as [succession](#) proceeds. After a stand-replacing wildfire on drained peat soils in forested lowlands in the Pra River floodplain, Russia, coltsfoot occurred in mucky depressions where a deep peat layer (>39 inches (100 cm)) had burned to mineral soil and created a 4- to 6-inch (10-15 cm) deep ash horizon. Coltsfoot was present in postfire years 1 to 4 but absent in postfire year 5. Starting in postfire year 4, a continuous plant cover dominated by chee reedgrass developed and a humus horizon had formed in the upper soil layer [112].

FUELS AND FIRE REGIMES:

Fuels: As of this writing (2011), no information was available regarding the fuel characteristics of coltsfoot.

Fire regimes: It is not known what fire regime coltsfoot is best adapted to. In North America, coltsfoot occurs in a variety of plant communities with a range of presettlement fire regime characteristics. See the [Fire Regime Table](#) for further information on fire regimes of vegetation communities in which coltsfoot may occur.

FIRE MANAGEMENT CONSIDERATIONS:

Potential for postfire establishment and spread: Coltsfoot possesses traits that are likely to allow it to survive and establish after fire (see [Fire adaptations](#)). The available literature documents coltsfoot establishment in burned areas following wildfire [24,25,85,97,112]. In one study, coltsfoot established from seed from adjacent unburned areas [24] (see [Plant response to fire](#)).

Preventing postfire establishment and spread: Because of its potential for long-distance [seed dispersal](#), coltsfoot may establish on burned sites via wind-dispersed seed. Thus, monitoring burned areas in close proximity to known coltsfoot populations is advised. Because of coltsfoot's potential for seed dispersal via water, monitoring burned areas downstream of coltsfoot populations is also advised. Coltsfoot establishment may occur in the first several years after fire. For example, it established 1 year after wildfire in Ireland [24], 2 years after wildfire in Bulgaria [97], 2 years after wildfire in England [85], 1 to 4 years after wildfire in Russia [112], and 5 years after wildfire in Ontario [25].

Preventing invasive plants from establishing in weed-free burned areas is the most effective and least costly management method. This may be accomplished through early detection and eradication, careful monitoring and follow-up, and limiting dispersal of invasive plant propagules into burned areas. General recommendations for preventing postfire establishment and spread of invasive plants include:

- Incorporate cost of weed prevention and management into fire rehabilitation plans
- Acquire restoration funding
- Include weed prevention education in fire training
- Minimize soil disturbance and vegetation removal during fire suppression and rehabilitation activities
- Minimize the use of retardants that may alter soil nutrient availability, such as those containing nitrogen and phosphorus
- Avoid areas dominated by high priority invasive plants when locating firelines, monitoring camps, staging areas, and helibases

- Clean equipment and vehicles prior to entering burned areas
- Regulate or prevent human and livestock entry into burned areas until desirable site vegetation has recovered sufficiently to resist invasion by undesirable vegetation
- Monitor burned areas and areas of significant disturbance or traffic from management activity
- Detect weeds early and eradicate before vegetative spread and/or seed dispersal
- Eradicate small patches and contain or control large infestations within or adjacent to the burned area
- Reestablish vegetation on bare ground as soon as possible
- Avoid use of fertilizers in postfire rehabilitation and restoration
- Use only certified weed-free seed mixes when revegetation is necessary

For more detailed information on these topics, see the following publications: [[3,16,37,102](#)].

Use of prescribed fire as a control agent: Prescribed fire may not be an appropriate management tool where coltsfoot occurs, or prescribed fire may need to be used in combination with other management techniques. Though no studies have used prescribed fire specifically to control coltsfoot, its establishment following wildfire [[24,25,85,97,112](#)] suggests that prescribed fire may encourage coltsfoot establishment.

MANAGEMENT CONSIDERATIONS

SPECIES: *Tussilago farfara*

- [FEDERAL LEGAL STATUS](#)
- [OTHER STATUS](#)
- [IMPORTANCE TO WILDLIFE AND LIVESTOCK](#)
- [OTHER USES](#)
- [IMPACTS AND CONTROL](#)

FEDERAL LEGAL STATUS:

None

OTHER STATUS:

Information on state-level noxious weed status of plants in the United States is available at [Plants Database](#).

IMPORTANCE TO WILDLIFE AND LIVESTOCK:

As of this writing (2011), little information was available in the published literature regarding coltsfoot's use by wildlife or livestock. In Manchester, England, coltsfoot flower heads were harvested by birds [[11](#)].

Palatability and nutritional value: As of this writing (2011), little information was available in the published literature regarding coltsfoot's palatability or nutritional value to wildlife or livestock. In coltsfoot's native range, its flowers are visited by a variety of invertebrates, including bees (Hymenoptera), hoverflies (Syrphidae), flies (Diptera), and beetles (Coleoptera) [[71,73](#)]. On the British Isles, leaf-miner flies (Agromyzidae), aphids (Aphididae), gelechiid moths (Gelechiidae), plume moths (Pterophoridae) and tortix moths (Tortricidae) feed on the roots, stems, leaves, and flowers of coltsfoot [[33](#)].

Cover value: No information is available on this topic.

OTHER USES:

Coltsfoot may provide erosion control [[61](#)]. Coltsfoot traditionally served a number of medical uses. Leaves and roots were dried, ground, or boiled and used to make teas, candies, and tobaccos. Preparations from leaves have been used to treat coughs and bronchial congestion. However, coltsfoot leaves contain a liver toxin and they are no longer used for

this purpose ([30,57], fact sheets by [19,48]). Chemicals extracted from coltsfoot roots may be effective as a deterrent to larval eastern spruce budworm (*Choristoneura fumiferana*) [8].

IMPACTS AND CONTROL:

Impacts: Coltsfoot often forms dense stands, particularly along roadsides (e.g., [21,22,59]), and occasionally dominates disturbed native plant communities (e.g., [2,80]). Coltsfoot's ability to dominate disturbed areas is attributed to its high seed production, fast vegetative spread, and ability to tolerate a wide range of environmental conditions [66,77]. According to management guidelines from 2005, however, evidence was lacking that coltsfoot out-competes other vegetation in relatively undisturbed native habitats [58]. In 2004, a compilation of invasive species lists and expert opinion from throughout the northeastern and north-central United States indicated that coltsfoot was “not currently known to be especially invasive” [101]. Although coltsfoot was introduced in Canada in the 1920s, Wright [109] stated that by 1997 it had not spread extensively. Most fact sheets, government publications, and weed management guides indicated that coltsfoot had no more than a moderate impact on native vegetation [20,26,95,101]. In the Upper Midwest, coltsfoot appears most invasive in grasslands and wetlands [26]. In Massachusetts, coltsfoot appears most invasive in lime seeps and disturbed sites [58].



Photo courtesy of Leslie J. Mehrhoff, University of Connecticut,
Bugwood.org

Control: Coltsfoot control is complicated by its abundant seed production and ability to sprout from rhizomes following disturbance [77,109]. Because coltsfoot often becomes established after disturbance, control efforts should focus on management of existing infestations and minimization of disturbance to forests, wetlands, and other natural communities. Control effectiveness may depend on a program that integrates multiple management procedures such as herbicides, seeding of desired species, and other techniques that decrease coltsfoot spread and favor desired species.

In all cases where invasive species are targeted for control, no matter what method is employed, the potential for other invasive species to fill their void must be considered [17]. Control of biotic invasions is most effective when it employs a long-term, ecosystem-wide strategy rather than a tactical approach focused on battling individual invaders [55].

Prevention: Coltsfoot's preference for disturbed sites (see [Successional Status](#)) suggests that its establishment may be prevented by minimizing soil disturbance. It is commonly argued that the most cost-efficient and effective method of managing invasive species is to prevent their establishment and spread by maintaining "healthy" natural communities [55,87] (e.g., avoid road building in wildlands [100]) and by monitoring several times each year [49]. Managing to maintain the integrity of the native plant community and mitigate the factors enhancing ecosystem invasibility is likely to be more effective than managing solely to control the invader [44].

Weed prevention and control can be incorporated into many types of management plans, including those for logging and site preparation, grazing allotments, recreation management, research projects, road building and maintenance, and fire management [102]. See the [Guide to noxious weed prevention practices](#) [102] for specific guidelines in preventing the spread of weed seeds and propagules under different management conditions.

Fire: For information on the use of prescribed fire to control this species, see [Fire Management Considerations](#).

Cultural control: Because increased vegetation density and cover may result in decreased coltsfoot cover (see [Successional Status](#)), it may be possible to control coltsfoot by establishing native vegetation. In a greenhouse in Poland, coltsfoot seedling survival decreased with increased seedling density, and increased seedling density also delayed coltsfoot seedling development [66]. In field experiments in the Netherlands, coltsfoot did not grow well from germination to the reproductive stage when grown among dense agricultural crops, due in part to low light intensities under these crops [4]. Other researchers reported that because coltsfoot was low-growing, vegetative reproduction was reduced by the abundance of other low-growing herbs such as clover (Fabaceae) and ryegrass (*Lolium* spp.) (review by [4]). In combination, these studies suggest that establishing native vegetation may slow coltsfoot establishment and spread. For more information on this topic, see [Seedling establishment and plant growth](#).

Physical or mechanical control: Coltsfoot has deep, brittle rhizomes, making it difficult to control by hand-pulling. Small coltsfoot infestations may be eradicated by carefully digging out plants [26,95]. It is critical that all underground portions of the plant are removed because even small fragments of rhizomes left in the soil are likely to give rise to new plants [66]. According to a fact sheet, coltsfoot roots can remain dormant underground for long periods [95] and presumably retain the potential to generate new plants. Coltsfoot seedlings hand-pulled after germination but prior to rhizome development are usually killed and not capable of vegetative reproduction (see [Vegetative regeneration](#)) [4]. Hand-pulling before the plant has set seed may reduce spread [95].

Biological control: No biological controls of coltsfoot are known as of this writing (2011). Biological control of invasive species has a long history that indicates many factors must be considered before using biological controls. Refer to these sources: [104,108] and the [Weed control methods handbook](#) [98] for background information and important considerations for developing and implementing biological control programs.

Chemical control: Herbicides may control coltsfoot. Fact sheets provide information on specific chemicals that may be used to control coltsfoot: [95,109]. However, little detailed information regarding the effectiveness of herbicides on coltsfoot was available as of this writing (2011). Herbicides are effective in gaining initial control of a new invasion or a severe infestation, but they are rarely a complete or long-term solution to weed management [18]. See the [Weed control methods handbook](#) [98] for considerations on the use of herbicides in natural areas and detailed information on specific chemicals.

Integrated management: Integrated management includes considerations of not only killing the target plant but also of establishing desirable species and maintaining weed-free systems over the long term. Integrated management techniques may be more effective than individual methods at controlling coltsfoot, but as of this writing (2011) no information was available.

APPENDIX: FIRE REGIME TABLE

SPECIES: *Tussilago farfara*

This Fire Regime Table summarizes characteristics of fire regimes for vegetation communities in which coltsfoot may occur based on descriptions in available literature. Follow the links in the table to documents that provide more detailed information on these fire regimes. This table does not include plant communities across the entire range of coltsfoot. For information on other plant communities in which coltsfoot may occur, see the complete [FEIS Fire Regime Table](#).

Fire regime information on vegetation communities in which coltsfoot may occur. This information is taken from the [LANDFIRE Rapid Assessment Vegetation Models \[53\]](#), which were developed by local experts using available literature, local data, and/or expert opinion. This table summarizes fire regime characteristics for each plant community listed. The PDF file linked from each plant community name describes the model and synthesizes the knowledge available on vegetation composition, structure, and dynamics in that community. Cells are blank where information is not available in the Rapid Assessment Vegetation Model.

[Great Lakes](#)

[Northeast](#)

[Southern Appalachians](#)

[Southeast](#)

Great Lakes

- [Great Lakes Forested](#)

Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)

Great Lakes Forested

Great Lakes floodplain forest	Mixed	7%	833		
	Surface or low	93%	61		
Maple-basswood mesic hardwood forest (Great Lakes)	Replacement	100%	>1,000	≥1,000	>1,000

Northeast

- [Northeast Grassland](#)
- [Northeast Forested](#)

Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)

Northeast Grassland

--	--	--	--	--	--

Northern coastal marsh	Replacement	97%	7	2	50
	Mixed	3%	265	20	
Northeast Forested					
Northern hardwoods (Northeast)	Replacement	39%	≥1,000		
	Mixed	61%	650		
Northeast spruce-fir forest	Replacement	100%	265	150	300
Southern Appalachians <ul style="list-style-type: none"> Southern Appalachians Forested 					
Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
Southern Appalachians Forested					
Bottomland hardwood forest	Replacement	25%	435	200	≥1,000
	Mixed	24%	455	150	500
	Surface or low	51%	210	50	250
Mixed mesophytic hardwood	Replacement	11%	665		
	Mixed	10%	715		
	Surface or low	79%	90		
Southeast <ul style="list-style-type: none"> Southeast Grassland Southeast Forested 					
Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)

Southeast Grassland					
Floodplain marsh	Replacement	100%	4	3	30
Southern tidal brackish to freshwater marsh	Replacement	100%	5		
Southeast Forested					
Maritime forest	Replacement	18%	40		500
	Mixed	2%	310	100	500
	Surface or low	80%	9	3	50
Southern floodplain	Replacement	7%	900		
	Surface or low	93%	63		
<p>*Fire Severities—</p> <p>Replacement: Any fire that causes greater than 75% top removal of a vegetation-fuel type, resulting in general replacement of existing vegetation; may or may not cause a lethal effect on the plants.</p> <p>Mixed: Any fire burning more than 5% of an area that does not qualify as a replacement, surface, or low-severity fire; includes mosaic and other fires that are intermediate in effects.</p> <p>Surface or low: Any fire that causes less than 25% upper layer replacement and/or removal in a vegetation-fuel class but burns 5% or more of the area [40,52].</p>					

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