Hieracium caespitosum

INTRODUCTORY

Photo by Richard Old, XID Services Inc., Bugwood.org

AUTHORSHIP AND CITATION:
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FEIS ABBREVIATION:
HIECAE

NRCS PLANT CODE [106]:
HICA10

COMMON NAMES:
meadow hawkweed
field hawkweed

yellow king-devil
yellow hawkweed

TAXONOMY:
The scientific name of meadow hawkweed is *Hieracium caespitosum* Dumort. (Asteraceae) [28,31,47,63,91,112,120].

Meadow hawkweed may hybridize with other hawkweeds in the subgenus *Pilosella* (e.g., European hawkweed (*H. lactucella*) and mouseear hawkweed (*H. pilosella*)) [50]. Manyflower hawkweed (*H. floribundum* Wimmer & Grab) is apparently a cross between meadow hawkweed and European hawkweed [28,47].

SYNONYMS:
Hieracium pratense Tausch [83,98]

LIFE FORM:
Forb

DISTRIBUTION AND OCCURRENCE

SPECIES: Hieracium caespitosum

GENERAL DISTRIBUTION:
Meadow hawkweed is native to northern, central, and eastern Europe [77,117]. It was likely introduced to the United States in 1828 [117] as an ornamental [77]. As of this writing (2010), meadow hawkweed occurred in 2 areas: from Georgia north through New England to Quebec and west to Manitoba, and from Montana and Wyoming west to Oregon and north to British Columbia. Plants Database provides a distributional map of meadow hawkweed.

HABITAT TYPES AND PLANT COMMUNITIES:
In North America, meadow hawkweed occurs in a variety of plant communities, ranging from old fields to forests. A management guide suggests that the sites most vulnerable to invasive hawkweeds in the Pacific Northwest are disturbed areas, including roadsides, pastures, hay fields, abandoned farmland, mountain meadows, logged areas, and forest clearings [119].

Fields and meadows: Meadow hawkweed occurs in old fields in New Jersey [1,5,16,37,79], Pennsylvania [79], New York [6,70], Ontario [9], Ohio [110], Michigan [84], and Wisconsin [107]. In New Jersey, meadow hawkweed often dominates fields at various stages of successional development. In 6-year-old fields, it was a dominant species (48% cover in June; 55% cover in September) along with Virginia strawberry (*Fragaria virginiana*), rice button aster (*Symphyotrichum dumosum* var. *dumosum*), and hairy white oldfield aster (*S. pilosum* var. *pilosum*). Meadow hawkweed had lower cover (8% in both June and September) in 6-year-old fields dominated by narrowleaf plantain (*Plantago lanceolata*) and common cinquefoil (*Potentilla simplex*) [1]. Meadow hawkweed, Virginia strawberry, and sheep sorrel (*Rumex acetosella*) dominated the herbaceous subcanopy of 8-year-old fields in New Jersey. Canopy dominants included Canada goldenrod (*Solidago canadensis*) and hairy white oldfield aster [16]. Meadow hawkweed was a dominant species (30% frequency) in 10-year-old fields. Other dominant species included Canada bluegrass (*Poa compressa*) and Kentucky bluegrass (*P. pratensis*) [5]. On the coastal plain of New Jersey, meadow hawkweed, early goldenrod (*S. juncea*), and broomsedge bluestem (*Andropogon virginicus*) dominated 10- to 15-year-old fields [37].

Meadow hawkweed occurs in old fields in other areas of the Northeast and Great Lakes region. It was abundant in old fields at Delaware Water Gap National Recreation Area, New Jersey and Pennsylvania. Old fields were classified as orchard grass-timothy-fescue-goldenrod (*Dactylis glomerata-Phleum pratense-Festuca* spp.-*Solidago* spp.) plant

communities. Wrinkleleaf goldenrod (*S. rugosa*) and sweet vernalgrass (*Anthoxanthum odoratum*) dominated the understory [79]. In an old field in southeastern Ontario, meadow hawkweed was one of the most common species (88% frequency) behind Kentucky bluegrass. Wild basil (*Clinopodium vulgare*) and Canada goldenrod were also common [9]. In Michigan, meadow hawkweed was a dominant species in annually mowed old fields. Other dominants included Canada bluegrass, smooth brome (*Bromus inermis*), western yarrow (*Achillea millefolium*), Queen Anne's lace (*Daucus carota*), sulfur cinquefoil (*Potentilla recta*), and narrowleaf plantain [84].

Meadow hawkweed occurs in other open plant communities lacking a tree canopy. In North Carolina, meadow hawkweed occurred in a timothy-hairy woodland brome-common sneezeweed (*B. pubescens-Helenium autumnale*) montane grassland [76]. In Idaho, meadow hawkweed was reported from the Palouse prairie region [8] as well as forest [15,94] and mountain [55] meadows. In one forest meadow in Idaho, meadow hawkweed comprised 80% of the plant community. Other species included cheatgrass (*B. tectorum*), annual bluegrass (*Poa annua*), soft chess (*B. hordeaceus*), Japanese brome (*B. japonicus*), and creeping bentgrass (*Agrostis stolonifera*) [94].

Wetlands, riparian areas, and lakeshores: Meadow hawkweed may establish in wetlands or riparian areas, or along lakeshores. On Assateague Island, Maryland, it occurred in one location on disturbed sands in a fresh marsh plant community. The plant community was characterized by rushes (*Juncus*), sedges (*Carex*), rose gentian (*Sabatia*), and loosestrife (*Lythrum*) [40]. Meadow hawkweed occurred in constructed wetlands along the Delaware River in New Jersey [58]. It was sparse in wetlands in southeastern Ontario [21]. In southern New Hampshire, meadow hawkweed occurred with sweetfern (*Comptonia peregrina*), little bluestem, polytrichum moss (*Polytrichum* sp., and various goldenrods (*Solidago* spp.) on sand pits used as wood turtle nesting areas near a small stream [103]. Distribution records from Oregon document meadow hawkweed in riparian areas [88]. On a barrier island along the southern shore of Long Island, New York, meadow hawkweed was rare on dry, ruderal sands [20]. On an island in Lake Winnipesaukee, New Hampshire, meadow hawkweed was infrequent on rocky ledges and clearings near shoreline. It occurred at low cover (2%) on a ruderal site dominated by red fescue (*Festuca rubra*) and common woodrush (*Luzula multiflora*) [10]. Meadow hawkweed occurred frequently but with low cover (<6%) on sand dunes along the shores of Lake Superior, Michigan. Dune plant communities were largely herbaceous but contained patches of jack pine (*P. banksiana*) and northern hardwood forests [64]. Distribution records from Washington document meadow hawkweed occurring along a lakeshore [88].

Open plant communities with interspersed canopy cover: In some areas, meadow hawkweed occurs in open plant communities with interspersed tree or shrub cover. In North Carolina, meadow hawkweed occurred in a mountain oatgrass-shrubby fivefingers (*Danthonia compressa-Sibbaldiopsis tridentata*) plant association. This plant community was dominated by graminoids, contained scattered or patchy shrubs (e.g., flame azalea (*Rhododendron calendulaceum*), Catawba rosebay (*Rhododendron catawbiense*), minniebus (*Menziesia pilosa*), highbush blueberry (*Vaccinium corymbosu*m), and thornless blackberry (*Rubus canadensis*)), and was surrounded by dwarfed forests of American beech (*Fagus grandifolia*) or northern red oak (*Quercus rubra*) [76]. In southern West Virginia, meadow hawkweed occurred in an open-canopied Virginia pine-eastern redcedar-post oak (*P. virginiana-Juniperus virginiana-Q. stellata*) woodland [100]. It was abundant in wooded successional old fields at Delaware Water Gap National Recreation Area. Wooded successional old fields were classified as red maple-oak (*Acer rubrum-Quercus* spp.)-eastern redcedar-goldenrod woodlands. Wrinkleleaf goldenrod and sweet vernalgrass dominated the understory [79]. Meadow hawkweed occurred in successional woodlands in southeastern Pennsylvania. Successional woodlands were characterized by thickets of nonnative forbs, shrubs, and vines and typically had <60% canopy cover. Eastern redcedar was the most frequent native tree [48]. In central Pennsylvania, meadow hawkweed occurred in limestone prairies dominated by sideoats grama (*Bouteloua curtipendula*) and in transition areas between limestone prairies and mixed-hardwood forests. Transition areas were dominated by autumn-olive (*Elaeagnus umbellata*), Morrow's honeysuckle (*Lonicera morrowii*), and hawthorn (*Crataegu*s spp.). Surrounding mixed-hardwood forests were dominated by black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), eastern white pine (*Pinus strobus*), and hawthorn [56]. In central New York, meadow hawkweed occurred at a frequency of 3.5% in an old field in secondary succession. Dominant herbaceous species included Canada goldenrod, timothy, quackgrass (*Elymus repens*), and Canada bluegrass. Gray dogwood (*Cornus racemosa*) was established throughout the field [70]. In southwestern Ohio, meadow hawkweed occurred in a 50-year-old field with 30% woody overstory cover. The field was dominated by Canada goldenrod with white ash (*Fraxinus americana*) and black cherry in the overstory [110]. In south-central Michigan, meadow hawkweed occurred in prairie remnants interspersed with patches of second-growth deciduous

forest and oak (*Quercus*) savanna. Dominant native species in prairie remnants included goldenrod (*Solidago* spp.), poverty oatgrass (*Danthonia spicata*), and little bluestem (*Schizachyrium scoparium*). Dominant nonnative species included spotted knapweed (*Centaurea maculosa*), meadow hawkweed, sheep sorrel, and Kentucky bluegrass [26,99]. In southwestern Michigan, meadow hawkweed dominated the understory of a fire-maintained oak savanna. Other dominant understory species included yellow sedge (*Carex pensylvanica*), sheep sorrel, wild lupine (*Lupinus perennis*), and Carolina puccoon (*Lithospermum caroliniense* var. *croceum*) [29]. In northern Idaho, meadow hawkweed occurred in Douglas hawthorn (*Crataegus douglasii*) shrublands [55].

Rocky outcrops: In the eastern United States, meadow hawkweed occurs in several open, rocky outcrop plant communities. It was rare in upper gorge slope plant communities in Tennessee. The area was a mixture of xeric sandstone outcrops and bluffs and mixed-oak forests dominated by white oak (*Q. alba*), chestnut oak (*Q. prinus*), northern red oak, pignut hickory (*Carya glabra*), mockernut hickory (*C. tomentosa*), shortleaf pine (*P. echinata*), Virginia pine, and sourwood (*Oxydendrum arboreum*) [44]. In northwestern North Carolina, meadow hawkweed was frequent on high-elevation (approximately 4,600 feet (1,400 m)) rocky summits. Abundant species included little bluestem and greater tickseed (*Coreopsis major* var. *rigida*). Also present were high-elevation species like shrubby fivefingers, Michaux's saxifrage (*Saxifraga michauxii*), filmy angelica (*Angelica triquinata*), and American mountain-ash (*Sorbus americana*). High-elevation rocky summits were often surrounded by heath (*Ericaceae*) balds and stunted oaks (*Quercus* spp.) [81]. In western Virginia, meadow hawkweed occurred on sandstone ledges and in mountain shrublands [18]. In Maryland, it occurred in shale barren plant communities. The shale barrens were openings in a sparse mixed forest dominated by eastern white pine, Virginia pine, downy serviceberry (*Amelanchier arborea*), and Allegheny plum (*Prunus alleghaniensis*) [46]. A small colony of meadow hawkweed was found at the highest point in West Virginia, Spruce Knob, a mountain summit at 4,860 feet (1,480 m). Common trees included red spruce (*Picea rubens*) and American mountain-ash, while shrubby areas were dominated by minniebush and southern mountain cranberry (*Vaccinium erythrocarpum*) [89]. Meadow hawkweed occurred on serpentine and granitic outcrop plant communities in coastal Maine [82].

Forests: Meadow hawkweed occurs in deciduous forests in eastern North America. It was uncommon in mesic floodplain and lowland forests in Maryland. Canopy trees in floodplain forests included swamp white oak (*Q. bicolor*), willow oak (*Q. phellos*), pin oak (*Q. palustris*), Shumard oak (*Q. shumardii*), sweetgum (*Liquidambar styraciflua*), and red maple. Lowland forests contained chestnut oak, white oak, American beech, and yellow-poplar (*Liriodendron tulipifera*) [96]. In southeastern New York, meadow hawkweed was common in three upland forest types: chestnut oak-red oak (7.1% frequency); black oak (*Q. velutina*)-red maple (19.0% frequency); and red maple (30.8% frequency) [32]. In east-central New York, meadow hawkweed occurred in upland mixed-deciduous forest containing sugar maple, American beech, white ash, northern red oak, and eastern hophornbeam (*Ostrya virginiana*) [33]. In the same region, meadow hawkweed occurred in the edges of sugar maple (*A. saccharum*) forests adjacent to residential areas [72]. In east-central New York, it occurred in upland sugar maple-American beech forests [6,7] and 150-year-old floodplain forests dominated by sugar maple [6]. In Connecticut, meadow hawkweed occurred in a hardwood forest dominated by American beech. Red maple and sweet birch (*B. lenta*) were also abundant [73]. Meadow hawkweed germinated from soil samples taken from lowland floodplain forests in Vermont. Overstory trees included silver maple (*A. saccharinum*), swamp white oak, and green ash (*F. pennsylvanica*) [43]. Meadow hawkweed occurred in oak (*Quercus*) openings in northwestern Ohio [24].

Meadow hawkweed establishes in coniferous forests in both eastern and western North America. In east-central New York, it occurred at 11% cover in 50-year-old red pine (*Pinus resinosa*) and red spruce plantations [6]. In southeastern New Brunswick, meadow hawkweed was detected in 3- to 8-year-old black spruce (*Picea mariana*) plantations (50% frequency) and 3- to 21-year-old black spruce plantations (20% frequency) but was not found in adjacent mixed coniferous-deciduous forest [111]. In northeastern Ontario, meadow hawkweed was associated with disturbed areas in logged wetland black spruce stands [13]. In northern Idaho, it occurred in lodgepole pine (*Pinus contorta*) and ponderosa pine (*P. ponderosa*) forests [55]. Distribution records from Washington document meadow hawkweed occurring along roadsides with mountain hemlock (*Tsuga mertensiana*), Douglas-fir (*Pseudotsuga menziesii*), subalpine fir (*Abies lasiocarpa*), Pacific silver fir (*A. amabilis*), red alder (*Alnus rubra*), salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), and western sword fern (*Polystichum munitum*). It also occurred along roadsides with Douglas-fir, salal, and trefoil (*Lotus*) [88].

BOTANICAL AND ECOLOGICAL CHARACTERISTICS

SPECIES: Hieracium caespitosum

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., [31,63,83,92,98,112,120]).

Meadow hawkweed is a rhizomatous [49,108] and/or stoloniferous perennial herb [49,108,115] that exudes a milky sap when damaged. Leaves, stems, and stolons are conspicuously hairy [108]. A flora describes meadow hawkweed stolons as long and leafy [49]. Plants have a basal rosette and 10 to 30 flower stems that are 10 to 36 inches (25-91 cm) in height. A stem produces 5 to 30 yellow flowers arranged in a flat-topped cluster [77]. Meadow hawkweed seeds are small achenes that are 1.5 to 2 mm long [108] and weigh approximately 0.09 mg [87]. Seeds have a tawny tuft of bristles at one end [117].

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Meadow hawkweed has a shallow [113,117], fibrous root system [77,113,117]. One flora describes meadow hawkweed rhizomes as short and stout [49], while another describes them as short or, more often, elongated [31].

Density of meadow hawkweed populations is variable. It may establish at low cover (e.g., tussock grasslands in New Zealand [90]), at dense cover (e.g., upland pastures in Idaho [15]), or in patches (e.g., old fields in New Jersey [1]).

A fact sheet suggests that meadow hawkweed may be allelopathic [77]. Laboratory studies showed that meadow hawkweed pollen could potentially limit the sexual reproduction of other plants by inhibiting pollination, seed germination, and/or seedling growth [74].

Raunkiaer [86] life form:
Hemicryptophyte
Geophyte

SEASONAL DEVELOPMENT:

A fact sheet reports that meadow hawkweed seeds germinate in both spring and fall, but seedlings typically have a higher survival rate in the spring. Stolons elongate throughout the summer and give rise to new rosettes. Plants commonly flower by late June or July [77], though there is some variability in flowering dates in different parts of meadow hawkweed's North American range.

Month of flowering for meadow hawkweed in different parts of its North American range	
Location	Month
Georgia	May [23]
Maryland	May and June [40]
New Jersey	May and June [1,78]
New York	June [20]
North and South Carolina	May through July [83]
West Virginia	June through August [98]
New England and adjacent Canada	May to September [31]

Seeds mature and disperse shortly after flowering [77].

REGENERATION PROCESSES:

- **Pollination and breeding system**
- **Flower and seed production**
- **Seed dispersal**
- **Seed banking**
- **Germination**
- **Seedling establishment and plant growth**
- **Vegetative regeneration**

Meadow hawkweed reproduces by seed and spreads vegetatively via adventitious root buds, stolons [115], and/or rhizomes [49,108].

Pollination and breeding system: Meadow hawkweed is described as either an apomict [115] or facultative apomict [60]. Flowers were visited by bees (Apidea: Apiforma) in Maryland shale barrens [46].

Flower and seed production: A fact sheet reports that a single meadow hawkweed flower head produces between 12 and 50 seeds [77].

One study found that light increased the potential for meadow hawkweed sexual reproduction. In old fields in west-central New York, flowering of meadow hawkweed was positively correlated with light availability (r^2=0.42, P<0.0001). It had 10 times as many flowering stalks/m² in areas where the Canada goldenrod canopy was reduced by insect herbivory. Tying back canopy vegetation above meadow hawkweed plants and allowing light to reach the understory resulted in increased production of flowering shoots. Shade experiments showed a similar pattern, where production of flowering shoots by potted meadow hawkweed increased with light availability (r^2=0.92; P<0.0001) [17].

Seed dispersal: Meadow hawkweed seeds are dispersed by wind [90,115], animals, and humans [115].

Seed banking: Meadow hawkweed does not seem to form a persistent seed bank. A weed management guide reports

that meadow hawkweed seeds are viable in the soil for up to 7 years [117], but this assertion is based on a reference [78] that actually states the opposite. In field experiments in New Jersey, researchers found a large number of empty meadow hawkweed seed coats in the soil, leading the authors to hypothesize that seeds may not be viable in the soil for long periods of time [78].

The few seed bank studies in which meadow hawkweed was found suggest that it is infrequent in the soil seed bank. In a study examining the soil seed bank in several plant communities in east-central New York, meadow hawkweed germinated from soil samples from only 2 of 5 sampled plant communities, despite its pervasive presence in the extant vegetation [6].

Meadow hawkweed prevalence in the soil seed bank and in the extant vegetation of 5 plant communities in east-central New York [6]

Plant community	Density (seeds/m^2)	Cover in extant vegetation (%)
Floodplain forest	5	1
Conifer plantation	1	11
Upland forest mounds	0	45
Old field	0	38
Upland forest pits	0	2

In central Pennsylvania, meadow hawkweed was detected in the extant vegetation of limestone prairies and shrubby transition areas between prairies and mixed-hardwood forest but was not detected in the soil seed bank of either plant community [56]. In successional old fields in central New Jersey, meadow hawkweed occurred at high frequency in the extant vegetation but was rare in the soil seed bank [57].

Germination: Meadow hawkweed seeds lack specific dormancy requirements [108] and may germinate as soon as they are released from the plant [77,117].

Meadow hawkweed germination may be limited by the presence of litter or other ground cover. In mature, upland deciduous forests in central New York, meadow hawkweed established on treefall mounds but not in treefall pits. To test the hypothesis that accumulations of litter prevented meadow hawkweed seeds from germinating, litter was removed from treefall pits. Meadow hawkweed seedlings established the first year after litter removal, but they did not significantly increase in importance until 3 years after removal, when the seedlings began increasing in size ($P<0.01$). The authors suggested that litter removal may create conditions more conducive to germination, including drier and warmer soil conditions or lack of physical cover [7]. In field seedling emergence experiments in Ontario, significantly more meadow hawkweed seedlings emerged when other forbs and grasses were removed ($P<0.05$). In planting trials, meadow hawkweed seedling emergence was >50% in areas where ground cover was removed compared to approximately 4% where ground cover remained intact. The addition of cages to prevent seed predation did not impact seedling emergence [87].

Meadow hawkweed germination may be enhanced by moisture. In laboratory experiments with fresh-collected meadow hawkweed seeds from New Jersey, low water potential inhibited meadow hawkweed germination, leading the authors to hypothesize that a lack of moisture may inhibit germination in the field [78]. Five meadow hawkweed seedlings germinated from saturated soil samples taken from within 16 feet (5 m) of a streambank in floodplain forests in Vermont, whereas meadow hawkweed did not germinate from samples that were well-drained [43].

Temperature and light may affect meadow hawkweed seed germination. In laboratory experiments with fresh-collected meadow hawkweed seeds from New Jersey, germination rates increased with increasing temperature in the light, reaching 50% at 70 to 90 °F (20-30 °C). At low temperatures (40-60 °F (5-15 °C)), seeds that had been stratified were more likely to germinate than dry stored seeds. Germination in the dark was near zero at all temperatures. In field experiments, seeds failed to germinate from depths greater than 1 inch (2 cm) [78].

Seedling establishment and plant growth: A weed management guide reports that most new populations of invasive hawkweeds establish via seed and then expand vegetatively [117].

As of this writing (2010), there was little information available regarding the establishment of meadow hawkweed seedlings. The available literature suggested that meadow hawkweed may establish on a variety of substrates, but seedling densities may vary. In New Zealand, meadow hawkweed seedlings established on all available substrates, including vascular vegetation, lichens, bryophytes, litter, rock, and bare soil. More than 60% of seedlings established in areas with either vegetation or litter, though establishment was also frequent on bare ground. Where meadow hawkweed established on a litter substrate, litter depth was shallower (<1 inch (3 cm)) than what was generally available (P<0.01). The authors hypothesized that, though seedlings may avoid competition by establishing in bare ground, in mountain environments they are more prone to frost heave or drought, making their establishment more likely where there is some vegetation or litter. Mean seedling density was 55.5 seedlings/100 m² in tall-tussock grasslands and 7.5 seedlings/100 m² in short-tussock grasslands; the authors suggested that this difference may have resulted from closer established populations and consequent seed rain in tall-tussock grasslands [90].

Moisture may enhance meadow hawkweed growth. In 8-year-old fields in New Jersey, 2 years of experiments were conducted to test the effect of increasing water, nutrients, light, and disturbance on old field plant communities. The variable most strongly related to meadow hawkweed cover was soil moisture, with significantly higher meadow hawkweed cover in watered areas compared to unwatered areas, particularly early in the growing season (June and July) (P<0.01). Changes in soil disturbance, light, and nutrients had no consistent impact on meadow hawkweed cover [16].

Vegetative regeneration: Meadow hawkweed spreads vegetatively via stolons [19,31,77,98,115,117] and rhizomes [19,31,77,98,117] that originate from axillary buds at the base of rosette leaves [117]. Meadow hawkweed also sprouts from adventitious root buds located on fibrous roots [115,117], producing satellite plants. Authors of a study examining old field succession in central New Jersey reported that meadow hawkweed sprouts grew from root fragments collected in seed bank samples [57]. Meadow hawkweed sprouted after hand-pulling in a field in New Jersey [1].

The number of stolons, daughter rosettes, and sprouts from adventitious root buds varies. In field experiments in Idaho, meadow hawkweed plants averaged 34 stolons/plant, and more than half of stolons produced daughter rosettes. Stolon production and length were not affected by clipping treatments. More than half of plants produced satellite plants from adventitious root buds, though the author noted that satellite plants were "produced sporadically". Satellite plant production showed no relationship to clipping treatments [115].

Vegetative reproduction potential of meadow hawkweed plants in field experiments in Idaho [115]

	Mean	Range
Stolons/plant	34	13-130
Stolon length (cm)	7	1-19
Satellite plants/plant	5.3	2-15
Distance from parent plant to satellite plant (cm)	10	5-50

See Physical or mechanical control for more information on this study.

One study found that light increased the potential for rhizome production. In old fields in west-central New York, meadow hawkweed rhizome production was low (approximately 2 rhizomes/rosette) at very low light levels (5% of ambient). Rhizome production increased rapidly at slightly higher light levels (15% of ambient) and continued to increase until leveling off (approximately 8 rhizomes/rosette) at high light levels (75% of ambient). Though increased light improved rhizome production, the authors thought it likely that meadow hawkweed plants produced new rosettes via rhizomes even under the densest overstory canopy [17].

SITE CHARACTERISTICS:
Meadow hawkweed tolerates a range of site characteristics. It appears to have some climatic preferences.

A summary of invasive hawkweeds reports that sites in the Pacific Northwest most vulnerable to their establishment are disturbed areas, including roadsides, mountain meadows, clearings in forest zones, cleared timber units, permanent pastures, hayfields, and abandoned farmland at elevations of 2,100 to 5,400 feet (600-1,600 m) [22]. Floras report meadow hawkweed in disturbed areas [28] including fields [31,63,83,98,112,120], meadows [112], pastures [31,83,92], clearings [92,112], roadsides [31,63,83,98,112,120] and "waste" places [63,98,112]. Floras also report meadow hawkweed establishing in dry woods [31,112], dry woodland edges [39], "thin woodlands" [83], and streamsides [28]. See Habitat Types and Plant Communities for detailed descriptions of native plant communities where meadow hawkweed occurs.

Elevation: Meadow hawkweed occurs at a wide range of elevations in North America.

Elevation of sites with meadow hawkweed within its North American distribution	
Location	Elevation (feet)
Connecticut	550 [65]
Georgia	3,000 [23]
Idaho	2,750 [30]; 3,280 [115]
Montana	3,200 to 5,100 [88]
New York	1,380 [68]
North Carolina	4,600 [81]
Oregon	3,580 [88]
Washington	2,700 to 5,000 [88]
New Brunswick	500 [36]

Soil: A fact sheet [77] and a review of invasive hawkweeds [22] report that meadow hawkweed prefers soils that are well drained, coarse-textured, and moderately low in organic matter. Meadow hawkweed occurred on well-drained soil in North Carolina [25], Pennsylvania [56], New Jersey [17], New York [33,68], Idaho [115], and Washington [88]. Floras from Maryland [40] and Illinois [71] report that meadow hawkweed establishes on disturbed soils. Soil disturbance did not affect established meadow hawkweed cover in old fields in New Jersey [16].

An invasive plant guide for the Upper Midwest reports that invasive hawkweeds prefer sandy or gravelly soil [19], though the available literature documents a variety of soil textures at sites with meadow hawkweed. It occurred in silt loam in Idaho [15,94,115], New York [68,70], Ohio [110], and New Brunswick [36] and in loam in New Jersey [1,17] and New York [33]. It occurred on sites with sandy soil in North Carolina [25], West Virginia [100], Maryland [40], New York [20], and Michigan [26]. Meadow hawkweed occurred on gravelly silt loam with larger fragments of shale in New Brunswick [36], shallow rocky soil in Wisconsin [107], and compacted gravelly soil in Montana [88].

Meadow hawkweed may show some preferences for soil characteristics such as moisture, fertility, and pH. Moist soil conditions may improve meadow hawkweed germination [43,78] and growth [17]. It has been documented in some wetland and riparian plant communities (see Habitat Types and Plant Communities) but was also reported in dry, sandy areas on a barrier island near Long Island [20] and in Wisconsin [107]. A weed management guide reports that invasive hawkweeds tolerate low-productivity soils [117]. A field guide to weeds of the Northeast states that meadow hawkweed is often found on low-fertility sites [108]. Invasive plant guides from the Northeast [108] and the Upper Midwest [19] suggest that meadow hawkweed may prefer acidic soils.

Climate: Meadow hawkweed may be limited by climatic preferences. A literature review reports that meadow

hawkweed prefers mesic, humid habitats like those found in northern Europe [115]. In eastern North America, meadow hawkweed occurs in humid, continental climates like that of New York [17,72] and New Hampshire [10], and in humid subcontinental climates like that of New Jersey [17] and North Carolina [25]. Meadow hawkweed is not reported from sites in North America with low annual precipitation.

Average annual precipitation of sites with meadow hawkweed within its North American distribution	
Location	Precipitation (mm)
Connecticut	1,250 [65]
Idaho	890 [113]
Maryland	1,144 [96]
Michigan	860 to 910 [26]
New Hampshire	1,132 [10]
New Jersey	1,100 [37]; 1,150 [1,17]
New York	940 [72]; 960 [17]
North Carolina	1,237 [81]
Vermont	850 [43]
West Virginia	1,042 [100]
Ontario	790 [13]

Average monthly temperature in January and July of sites with meadow hawkweed within its North American distribution		
	January (°F)	July (°F)
New Hampshire	15.9	66.8 [10]
New York	24.4	72.3 [32]
North Carolina	32.4	69.6 [81]

SUCCESSIONAL STATUS:

A weed management guide reports that in its native range, meadow hawkweed achieves highest densities in disturbed areas and does not persist beyond early succession [117]. In North America, meadow hawkweed often establishes in early succession and appears to persist through multiple years of succession. However, most of the studies on this topic are from old fields and may not represent successional trends in other plant communities.

Several studies from New Jersey suggest that meadow hawkweed does best in old fields in midsuccession. In one study, meadow hawkweed established approximately 4 years after field abandonment. Ten years after field abandonment, it was a dominant species (30% frequency), but its frequency dropped to approximately 10% 12 years after abandonment [5]. In observations of 10 old fields through 22 years of succession, meadow hawkweed dominated midsuccessional sites (years 8-13), but it was not a dominant in early (years 0-8) or later (years 14-22) successional stages [75]. In other old fields, meadow hawkweed reached peak cover (47%) 10 years after plowing and agricultural abandonment. Cover declined to <5% 20 years after abandonment [80]. On New Jersey's coastal plain, meadow hawkweed was detected in 10- to 15-year-old fields but not in 1- to 2-year-old fields, 25- to 40-year-old fields, or adjacent forests [37].

Meadow hawkweed often declines through succession. In southwestern Virginia, meadow hawkweed occurred at low levels on reclaimed surface mine sites at different stages of succession. It was detected at sites <5 years to 20 years old but not in sites that were 25 to 30 years old or in adjacent mixed-hardwood forests [42]. Meadow hawkweed frequency declined over 4 decades of succession in an old field in southeastern Connecticut. Its frequency was 38% 3 years after abandonment from grazing, 30% 9 years after abandonment, 8% 22 years after abandonment, and it was not detected

32 and 40 years after abandonment [27].

Meadow hawkweed may be favored by disturbance (see Site Characteristics), though it is not clear what characteristics of disturbed areas promote meadow hawkweed establishment and persistence. It is reported from sites disturbed by logging [13,88,111], clipping [3], mowing [79], and mining [42]. Distribution records from Oregon report meadow hawkweed in pastures, along logging roads, and in riparian areas but not in undisturbed forests [88]. On northern Cape Breton Island, Nova Scotia, meadow hawkweed was considered unlikely to spread into native plant communities from the disturbed places where it established [95].

High-light conditions may favor meadow hawkweed but are not required for establishment and growth. Light increases the potential for meadow hawkweed seed germination [78], sexual reproduction, and vegetative regeneration [17], though meadow hawkweed cover did not increase as light increased in old fields in New Jersey [16]. In central Pennsylvania, meadow hawkweed was detected in the extant vegetation of limestone prairies and shrubby transition areas between prairies and mixed-hardwood forest, but it was not found in the interior of mixed-hardwood forests [56]. In east-central New York, meadow hawkweed occurred more frequently in treefall gaps than in closed-canopy areas of upland mixed-deciduous forests ($P<0.05$) [33]. In a study from New Jersey examining patterns of plant establishment along a gradient from open field to hardwood forest interior, meadow hawkweed was found only in open fields. The authors hypothesized that along the forest edge, meadow hawkweed was limited by shading from multiflora rose (*Rosa multiflora*) [67]. Distribution records from Washington [88] and herbarium records from Wisconsin document meadow hawkweed occurring on sites with full sun [107], though it also occurs in plant communities with an overstory (see Habitat Types and Plant Communities).

It is not clear whether meadow hawkweed would influence the successional trajectories of native plant communities where it establishes. This topic had not been addressed in the literature as of this writing (2010).

FIRE EFFECTS AND MANAGEMENT

SPECIES: Hieracium caespitosum

FIRE EFFECTS:

Immediate fire effect on plant: As of this writing (2010), there was no published information on the immediate effects of fire on meadow hawkweed. Meadow hawkweed plants and stolons are likely top-killed by fire; belowground rhizomes and adventitious root buds may survive. As of 2010, no information was available regarding fire effects on or heat tolerance of meadow hawkweed seeds.

Postfire regeneration strategy [97]:
Surface rhizome and/or a chamaephytic root crown in organic soil or on soil surface
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
- Plant response to fire

Fire adaptations: Meadow hawkweed exhibits some characteristics that make it likely to survive and/or establish after fire. Belowground rhizomes and adventitious root buds likely survive fire. Rhizomes, adventitious root buds, and stolons reportedly sprout after physical disturbance [77,117], suggesting that postfire sprouting is possible. Meadow hawkweed seeds have the potential for long-distance dispersal, though seeds do not seem to persist in the soil seed bank. High-light conditions may favor meadow hawkweed sexual reproduction and vegetative regeneration [17]. Meadow hawkweed may be favored by disturbance (see Successional Status).

Plant response to fire: As of this writing (2010), little information was available regarding meadow hawkweed's response to fire. Meadow hawkweed has been documented in burned areas following both wildfire [2] and prescribed fire [36,66,70]. The scarcity of studies and lack of details about fire characteristics, pre- and postfire vegetation, and meadow hawkweed response limit the inferences that can be made on fire effects on meadow hawkweed.

In Alaska, meadow hawkweed was listed as a nonnative plant species occurring within or adjacent to areas burned during the 2004 fire season [2]. In central New York, meadow hawkweed was infrequent (3.5% frequency) in an old field that had been burned by spring prescribed fire 3 and 5 years prior to sampling [70].

The results of one study suggest that meadow hawkweed may establish on burned sites soon after fire via wind-dispersed seed, though in this case, it did not persist through a subsequent fire. In New Brunswick, a deciduous-coniferous woodlot was clearcut, left untreated for a year, then burned in April for 2 consecutive years to encourage low sweet blueberry (*Vaccinium angustifolium*) and velvetleaf blueberry (*V. myrtilloides*) production. June vegetation surveys showed that meadow hawkweed was not present prior to treatments or in the year between clearcutting and burning, but 7 stems were detected 2 months after the 1st fire. The author suggested that meadow hawkweed established via wind-dispersed seed. It was not detected after the 2nd fire [36].

In western Pennsylvania, prescribed fire favored meadow hawkweed growth more than other disturbances. Field experiments were conducted to examine the impact of different disturbances on a 7-year-old goldenrod-serpentine aster (*Solidago-Symphyotrichum depauperatum*) plant community. Disturbances included prescribed fire, topsoil removal, and combinations of plowing, planting, and fertilizer or herbicide application. Disturbances occurred in April and vegetation was measured 6 months and 2.5 years after the initial disturbances. Initial vegetation conditions were not reported. Compared to other disturbances, meadow hawkweed cover was highest following prescribed fire. In burned areas, meadow hawkweed cover was >10% 6 months and 2.5 years after fire. In areas where the top 6 inches (15 cm) of topsoil was removed, meadow hawkweed cover was <10% 6 months after treatment, and it was not present 2.5 years after treatment. In areas that had been plowed in the spring, disked, and then planted to corn (*Zea mays*), meadow hawkweed was not detected 6 months after treatment, and cover was <10% 2.5 years after treatment. It was not detected in areas that had been plowed, disked, and exposed to either fertilizer or herbicides [66].

FUELS AND FIRE REGIMES:

- **Fuels**
- **Fire regimes**

Fuels: As of this writing (2010) there was no information available regarding the fuels characteristics of meadow hawkweed.

Fire regimes: It is not known what fire regime meadow hawkweed is best adapted to. In North America, meadow hawkweed occurs in a wide variety of plant communities, and consequently, a range of fire regimes. See the Fire

Regime Table for further information on fire regimes of vegetation communities in which meadow hawkweed may occur.

FIRE MANAGEMENT CONSIDERATIONS:
Potential for postfire establishment and spread: Meadow hawkweed possesses several traits that make it likely to survive and/or establish after fire (see Fire adaptations). The suggestion that it established 2 months after prescribed fire in New Brunswick via wind-dispersed seed [36] and the potential for seed dispersal by animals and humans [115] suggest that meadow hawkweed has the potential to establish in burned areas, particularly if populations exist nearby.

Preventing postfire establishment and spread: 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: [4,11,34,105].

Use of prescribed fire as a control agent: The limited available literature suggests that prescribed fire is not an effective method for controlling meadow hawkweed (see Plant response to fire). However, this topic had not been well-studied as of this writing (2010).

MANAGEMENT CONSIDERATIONS

SPECIES: Hieracium caespitosum

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:
Meadow hawkweed appears to have minimal value to wildlife or livestock.

Palatability and/or nutritional value: A fact sheet reports that meadow hawkweed is moderately to highly nutritive [77]. In Idaho, meadow hawkweed's nutritional content was similar to that of native plant species. In the rosette stage, it had 13.4% crude protein content [30].

Some parts of meadow hawkweed may be consumed by wildlife and livestock. In feeding trials, meadow hawkweed was consumed by captive woodchucks more than expected by chance ($P<0.05$) [101]. In Ontario, meadow hawkweed seedling emergence was not impacted by the presence of cages to prevent seed predation [87], suggesting that seed predators did not feed on meadow hawkweed seed. In old fields in west-central New York, meadow hawkweed experienced little insect herbivory [17], though it was listed as a food plant for aphids (Aphididae) in New Jersey [59] and a host plant of plant bugs (Miridae) in West Virginia [114]. Bees in Maryland visited meadow hawkweed [46].

A fact sheet reports that meadow hawkweed is palatable to livestock, including domestic sheep and cattle [77]. The small, prostrate leaves may be more easily consumed by the small mouths of domestic sheep and domestic goats than cattle [30].

Cover value: In a riparian area in southern New Hampshire, hatchling wood turtles hid under the basal rosettes of meadow hawkweed growing on riparian sandpits [103].

OTHER USES:
Exudates from invasive hawkweed leaves or stems may cause congestive and respiratory conditions and skin rashes in sensitive people [22].

IMPACTS AND CONTROL:
Impacts: Meadow hawkweed has the potential to alter native plant communities. A fact sheet [77] and a weed management guide [117] report that individual plants may quickly develop into large, dense patches that displace other vegetation. In fields and pastures, meadow hawkweed may reduce forage quality [77,117]. It may also be problematic in lawns and gardens [77]. Meadow hawkweed may be allelopathic [74,77].

Control: Control of meadow hawkweed is complicated the presence of stolons, rhizomes, and adventitious root buds (see Vegetative regeneration), which may sprout following control treatments.

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 [12]. 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 [61].

Prevention: It is possible that meadow hawkweed establishment is facilitated by disturbance due to human activities. Distribution records from Montana documented meadow hawkweed establishing along a decommissioned road in an area burned by wildfire. It was not detected when the road was removed but was detected 6 years after road decommissioning [88]. Though dispersal mode was not identified, it is possible that meadow hawkweed could have been brought to the site via equipment related to road removal.

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 [61,93] (e.g., avoid road building in wildlands [104]) and by monitoring several times each year [45]. 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 [41].

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 [105]. See the Guide to noxious weed prevention practices [105] 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: A weed management guide suggests that cultural methods may be effective at controlling invasive hawkweeds in pastures and rangelands. Fertilizer application may enhance cultural methods by increasing nutrient availability to desired perennial grasses, legumes, or other preferred forbs [117]. In old fields in Michigan, 2 years of fertilization led to the expansion of Canada bluegrass and smooth brome and the elimination of meadow hawkweed [84]. In contrast, meadow hawkweed and other plants showed no clear response to fertilization treatments in an Idaho pasture [115]. The addition of fertilizer to herbicide treatments did not improve the level of meadow hawkweed control provided by herbicide treatment alone [113]. See Chemical control for more information on this study.

Physical or mechanical control: A fact sheet suggests that hand-pulling can be used on small infestations of meadow hawkweed if the entire root system is removed. Digging may control small infestations but may also stimulate the growth of new plants from rhizomes, stolons, and fragmented roots that are left behind [77]. A weed management guide also cautions that digging or other mechanical disturbances may prompt sprouting [117].

Mowing does not seem to be effective for controlling meadow hawkweed because it may encourage vegetative spread, and mower blades likely miss low-lying meadow hawkweed rosettes [77,117]. Meadow hawkweed occurred in frequently mowed fields in New Jersey, Pennsylvania [79], Michigan [84], and Wisconsin [107]. In field experiments in Idaho, sprouting from stolons and adventitious root buds and production of flowering stems were not limited by clipping. Plants recovered from clipping within a growing season. The production of daughter rosettes from the ends of stolons or satellite plants from adventitious root buds was also not affected by clipping. Flowering stem clipping reduced seed production by 23% and seed weight by 9% compared to unclipped plants [115]. A fact sheet [77] and weed management guide [117] suggest that mowing may reduce or prevent meadow hawkweed seed production.

A review of invasive plants reports that invasive hawkweeds do not persist with tillage, particularly where herbicide use and tillage are combined [22]. However, a fact sheet suggests that tilling may increase the spread of meadow hawkweed by redistributing fragmented roots, rhizomes, and stolons [77]. Physical disturbance by machinery may spread meadow hawkweed across fields. Local disturbances such as activity by livestock, wild ungulates, or rodents may also enhance its spread [117]. A fact sheet reports that careful grazing may suppress the growth and spread of meadow hawkweed, though overgrazing might increase its spread [77].

Biological control: Both insects [35,117] and fungi [117] were being evaluated for use in controlling meadow hawkweed and other invasive hawkweeds as of 2010. The presence of numerous native hawkweeds presents challenges to biocontrol programs. The stoloniferous character of invasive hawkweeds, a trait lacking in hawkweeds native to North America, suggests that biocontrol programs targeting stolons would be ideal. However, the inability of clipping experiments to reduce meadow hawkweed stolon and flowering stem production (see Physical or mechanical control) suggests that biocontrol agents targeting stolons may not be effective [115]. Meadow hawkweed plants experienced little insect herbivory in old fields in west-central New York, which the authors suggested could be due to the presence of hairs on the leaves [17].

Biological control of invasive species has a long history that indicates many factors must be considered before using biological controls. Refer to these sources: [109,118] and the Weed control methods handbook [102] for background information and important considerations for developing and implementing biological control programs.

Chemical control: Herbicides may control meadow hawkweed [15,53,54,77,94,113,116], though not in all cases (e.g., [94]). Herbicide application may be most effective early in the growing season, when plants are in the rosette stage, because treatment prevents flowering and seed production [77]. In Idaho, application of foliar herbicides to meadow hawkweed in either the spring, summer, or fall all prevented seed production 1 and 2 months after treatment

[116].

In Idaho, one study investigated meadow hawkweed control using selective herbicides and a single fertilizer application across 3 levels of meadow hawkweed establishment (low (<25% cover), medium (40-60%), and high (>75%)) in cleared forestland converted to pasture. At all establishment levels, herbicide application resulted in almost complete control (<1% cover) of meadow hawkweed 3 months after treatment, with cover levels remaining at <1% 39 months after treatment. The addition of fertilizer to herbicide treatments did not appear to favor desired species at the expense of meadow hawkweed, and the combination of fertilizer and herbicide application did not increase perennial grass cover. The authors concluded that herbicide application alone was just as effective as the addition of fertilizers in the control of meadow hawkweed [113].

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 [14]. See the Weed control methods handbook [102] for considerations on the use of herbicides in natural areas and detailed information on specific chemicals. See the following sources for information specific to the chemical control of meadow hawkweed: [15,53,54,94,117].

Integrated management: No information is available on this topic.

APPENDIX: FIRE REGIME TABLE

SPECIES: Hieracium caespitosum

The following table summarizes characteristics of fire regimes for vegetation communities in which meadow hawkweed 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. If you are interested in fire regimes of plant communities not listed here, see the Expanded Fire Regime Table.

Fire regime information on vegetation communities in which meadow hawkweed may occur. This information is taken from the LANDFIRE Rapid Assessment Vegetation Models [52], 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.

Pacific Northwest | Northern and Central Rockies | Great Lakes | Northeast | Southern Appalachians

Pacific Northwest

- Northwest Grassland
- Northwest Forested

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

Bluebunch wheatgrass	Replacement	47%	18	5	20
	Mixed	53%	16	5	20
Idaho fescue grasslands	Replacement	76%	40		
	Mixed	24%	125		
Alpine and subalpine meadows and grasslands	Replacement	68%	350	200	500
	Mixed	32%	750	500	>1,000
Northwest Forested					
Douglas-fir-western hemlock (dry mesic)	Replacement	25%	300	250	500
	Mixed	75%	100	50	150
Mountain hemlock	Replacement	93%	750	500	>1,000
	Mixed	7%	>1,000		
Subalpine fir	Replacement	81%	185	150	300
	Mixed	19%	800	500	>1,000
Northern and Central Rockies • Northern and Central Rockies Grassland • Northern and Central Rockies Forested					
Vegetation Community (Potential Natural Vegetation Group)	Fire severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
Northern and Central Rockies Grassland					
Northern prairie grassland	Replacement	55%	22	2	40
	Mixed	45%	27	10	50
Mountain grassland	Replacement	60%	20	10	
	Mixed	40%	30		
Northern and Central Rockies Forested					
Ponderosa pine (Northern and Central Rockies)	Replacement	4%	300	100	≥1,000
	Mixed	19%	60	50	200
	Surface or low	77%	15	3	30
Ponderosa pine-Douglas-fir	Replacement	10%	250		≥1,000
	Mixed	51%	50	50	130
	Surface or low	39%	65	15	

Great Lakes

- Great Lakes Grassland
- Great Lakes Woodland
- 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 Grassland					
Mosaic of bluestem prairie and oak-hickory	Replacement	79%	5	1	8
	Mixed	2%	260		
	Surface or low	20%	2		33
Great Lakes Woodland					
Northern oak savanna	Replacement	4%	110	50	500
	Mixed	9%	50	15	150
	Surface or low	87%	5	1	20
Great Lakes Forested					
Great Lakes spruce-fir	Replacement	100%	85	50	200
Great Lakes pine forest, jack pine	Replacement	67%	50		
	Mixed	23%	143		
	Surface or low	10%	333		
Northern hardwood-eastern hemlock forest (Great Lakes)	Replacement	99%	>1,000		

Northeast

- Northeast Woodland
- 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 Woodland					
	Replacement	2%	200	100	300

Eastern woodland mosaic	Mixed	9%	40	20	60
	Surface or low	89%	4	1	7
Rocky outcrop pine (Northeast)	Replacement	16%	128		
	Mixed	32%	65		
	Surface or low	52%	40		
Oak-pine (eastern dry-xeric)	Replacement	4%	185		
	Mixed	7%	110		
	Surface or low	90%	8		
Northeast Forested					
Northern hardwoods (Northeast)	Replacement	39%	≥1,000		
	Mixed	61%	650		
Eastern white pine-northern hardwood	Replacement	72%	475		
	Surface or low	28%	>1,000		
Northern hardwoods-eastern hemlock	Replacement	50%	≥1,000		
	Surface or low	50%	≥1,000		
Appalachian oak forest (dry-mesic)	Replacement	2%	625	500	≥1,000
	Mixed	6%	250	200	500
	Surface or low	92%	15	7	26
Beech-maple	Replacement	100%	>1,000		
Northeast spruce-fir forest	Replacement	100%	265	150	300
Southeastern red spruce-Fraser fir	Replacement	100%	500	300	≥1,000
Southern Appalachians • 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					

Appalachian oak-hickory-pine	Replacement	3%	180	30	500
	Mixed	8%	65	15	150
	Surface or low	89%	6	3	10
Appalachian oak forest (dry-mesic)	Replacement	6%	220		
	Mixed	15%	90		
	Surface or low	79%	17		
Southern Appalachian high-elevation forest	Replacement	59%	525		
	Mixed	41%	770		

*Fire Severities—
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.
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.
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 [38,51].

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