Ranunculus fascicularis

Early Buttercup

Ranunculaceae

Ranunculus fascicularis courtesy Alan Cressler, Lady Bird Johnson Wildflower Center

***Ranunculus fascicularis* Rare Plant Profile**

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites
State Forest Fire Service & Forestry
Office of Natural Lands Management
New Jersey Natural Heritage Program

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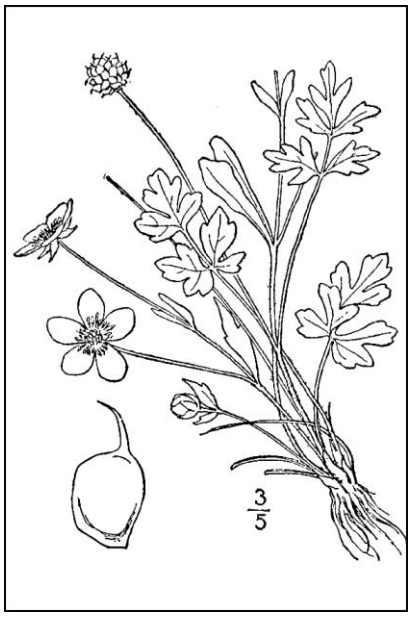
Life History

Early Buttercup (*Ranunculus fascicularis*) is a spring-blooming perennial in the Crowfoot family (Ranunculaceae). The plants grow erect, 10–30 cm tall, on pubescent stems. Filiform roots as well as thicker tuberous annual roots that are each about 5 cm long develop from the root crown (Gleason and Cronquist 1963; Vogelpohl 2021). The plants have a basal rosette of ovate to broadly ovate, 3–5 lobed leaves that remain over the winter; in the spring they sprout new compound basal leaves. There are 1–3 stem leaves that are sessile or nearly so, and less divided, either single or with 2–3 narrow lobes (Gleason and Cronquist 1963; Hilty 2020; Keener et al. 2021). Leaf surfaces of all leaves are densely short-hairy. Each stem bears 1–6 wide-spreading flowers, bright yellow and glossy, with a greenish tinge at the base of each petal. There are 5 sepals and usually 5 petals. The buds appear in mid-March (Vogelpohl 2021) and plants bloom in April and May (Gleason and Cronquist 1963), although blooming can occur as early as January depending on location (Whittemore 2020). After flowering, smooth, rotund, flat-sided, achenes are produced that have a relatively straight beak (See Seed Dispersal below) (Hilty 2020; Whittemore 2020).

The blooming period of the Hispid Buttercup (*Ranunculus hispidus var. hispidus*) often overlaps with that of the Early Buttercup. The presence of tuberous roots and the less sharply toothed leaves and longer more narrow leaves of the Early Buttercup can be used to differentiate these two species; also, Early Buttercup grows in drier habitats (Reznicek et al. 2011; Vogelpohl 2021; Whittemore 2020).



Left: Britton and Brown 1913, courtesy USDA NRCS 2022a. Right: Flowering plant, courtesy Alan Cressler, Lady Bird Johnson Wildflower Center, 2010.

Pollinator Dynamics

Early Buttercup is an insect-pollinated plant, visited by a diversity of early-spring pollinators that include: long-tongued bees such as Honey Bees (*Apis mellifera*), small carpenter bees (*Ceratina* spp.), mason bees (*Osmia* spp.), and cuckoo bees (*Nomada* spp.); short-tongued bees including sweat bees (Halictidae) and miner bees (Andrenidae); Syrphid flies, bee flies (Bombyliidae), and other fly species; and Lepidoptera such as Cabbage White butterflies (*Pieris rapae*) and Juvenal's Skipper (*Erynnis juvenalis*) (Eastman 2003; Hilty 2020; Robertson 1929). The Lady Bird Johnson Wildflower Center and The Xerces Society have recognized buttercups including *R. fascicularis* as having special value to native bees (LBJWC 2015).

While insect pollinated, Early Buttercup is also self-compatible—able to be pollinated by its own pollen. However, individual flowers are protogynous, where the female flower parts mature before the male flower parts, hindering self-pollination to promote cross-pollination. This breeding system tends to occur when or where the presence of pollinators is not reliable (Cruden 1977), for example, early in the season when pollinators may be less abundant or where plant distribution is spotty.

Most Ranunculus flower petals, including those of the Early Buttercup, are quite glossy. This shininess is caused by the flat reflective nature of each petal's epidermal cells enhanced by the presence of an air layer within the petals that further increases reflectance. Pollinators flying past a buttercup perceive a bright yellow flash of color, which attracts their attention (van der Kooi et al. 2017).

The flowers of some buttercup species (e.g., Alpine Snow Buttercup—*Ranunculus adoneus*) are heliotropic, tracking the movement of the sun on cooler days, and this characteristic may also aid pollination. With the petals acting together as a solar collector, sunlight is directed toward the reproductive organs at the center of the flower, increasing the flower temperature to warm any visiting pollinators early in the season or in cooler climes while at the same time enhancing seed and pollen maturation (van der Kooi et al. 2017). It is not known whether Early Buttercup also tracks the sun in a similar manner.

Seed Dispersal

Early Buttercup seeds develop into a globose seed head, with individual dried seed capsules (achenes) rotund in shape. Each achene is 2.0–3.5 mm long and 1.8–2.2 mm wide with a long, slender beak that is "straight or nearly so" (Authentic Wisconsin 2022; Britton and Brown 1913; Gleason and Cronquist 1963; Hilty 2020; Whittemore 2020).

Seed dispersal occurs in a variety of ways. Most seeds simply drop to the ground near the parent plant. Others may be blown or washed away by surface water. Still others are eaten by upland game birds such as Wild Turkey (*Meleagris gallopavo*), small mammals, or deer (Martin et al. 1951), which may result in dispersal at some distance from the plant. Seeds may occasionally become entangled in the fur of small mammals and transported to new areas in that manner (Vogelpohl 2021). The seeds of the closely related Creeping Buttercup (*R. repens*) are dispersed

by human activity, in clothing and on tires (ACCS 2018) and it is quite possible that this could occur with Early Buttercup, depending on the population location and its proximity to human habitation or activity.

The seeds of the related Tall Buttercup (*R. acris*) are viable for less than two years if deposited within the top inch of soil but can last longer in the seed bank when buried more deeply (Strevey et al. 2015). However, information about seed viability and the longevity of the seed bank for Early Buttercup was not readily available.

Some *Ranunculus* species spread by long branching stolons that root at the nodes (e.g., Creeping Buttercup) (ACCS 2018) or when larger rhizomes split to form new plants (e.g., Tall Buttercup) (Strevey et al. 2018), but there is no mention in the literature that Early Buttercup grows clonally; it does not root at the nodes or have bulbils (MinnesotaSeasons.com 2022; Whittemore 2020).

Habitat

Early Buttercup favors dry grassy openings and prairies or pastures; rock outcrops, ledges, and balds (including on limestone pavement and over mafic or ultramafic rocks); sandy oak savannas; and open upland woodlands. It has been reported from lawns, railroads, and roadsides, and is found in full to partial shade in nutrient-poor rocky, sandy, or calcareous soil where vegetation is sparse (Hilty 2020; Keener et al. 2022; Reznicek et al. 2011; Vogelpohl 2021; Weakley 2015).

New Jersey populations have been found on a variety of substrates; a dry ridgetop at the top of slope with greatest numbers of plants at the highest elevation, in small clearings on dry wooded slopes with thin soils, and in cracks in rocks. Some populations were found on limestone; one historical occurrence was on traprock. A new population was discovered in Warren County in 2020 in open dry woodlands with exposed rock on a southeast-facing slope. The associated overstory species at that site included *Carya ovata*, *Juniperus virginiana*, and *Amelanchier* spp. and herb layer associates included *Cerastium arvense*, *Polygonatum* spp., *Potentilla* spp., *Oxalis purpurascens*, *Vaccinium* spp., and *Saxifraga virginiensis* (NJNHP 2022).

Wetland Indicator Status

The U. S. Army Corps of Engineers (2020) divided the country into a number of regions for use with the National Wetlands Plant List and portions of New Jersey fall into three different regions (Figure 1). *Ranunculus fascicularis* has more than one wetland indicator status within the state. In the Atlantic and Gulf Coastal Plain region, Early Buttercup is a facultative species, meaning that it occurs in both wetlands and nonwetlands, and in other regions of the state it is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands (U. S. Army Corps of Engineers 2020).

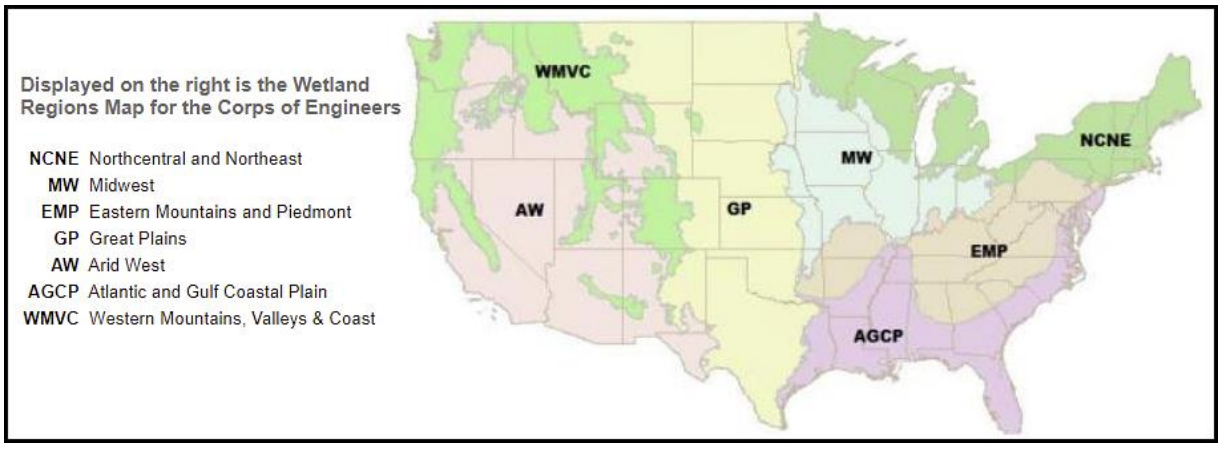


Figure 1. Mainland U. S. wetland regions, adapted from U. S. Army Corps of Engineers (2020).

USDA Plants Code (USDA, NRCS 2022b)

RAFA

Coefficient of Conservatism (Walz et al. 2018)

CoC = 7. Criteria for a value of 6 to 8: Native with a narrow range of ecological tolerances and typically associated with a stable community (Faber-Langendoen 2018).

Distribution and Range

The global range of *Ranunculus fascicularis* is restricted to the United States and Canada (POWO 2022). The map in Figure 2 depicts the continental extent of *R. fascicularis*.

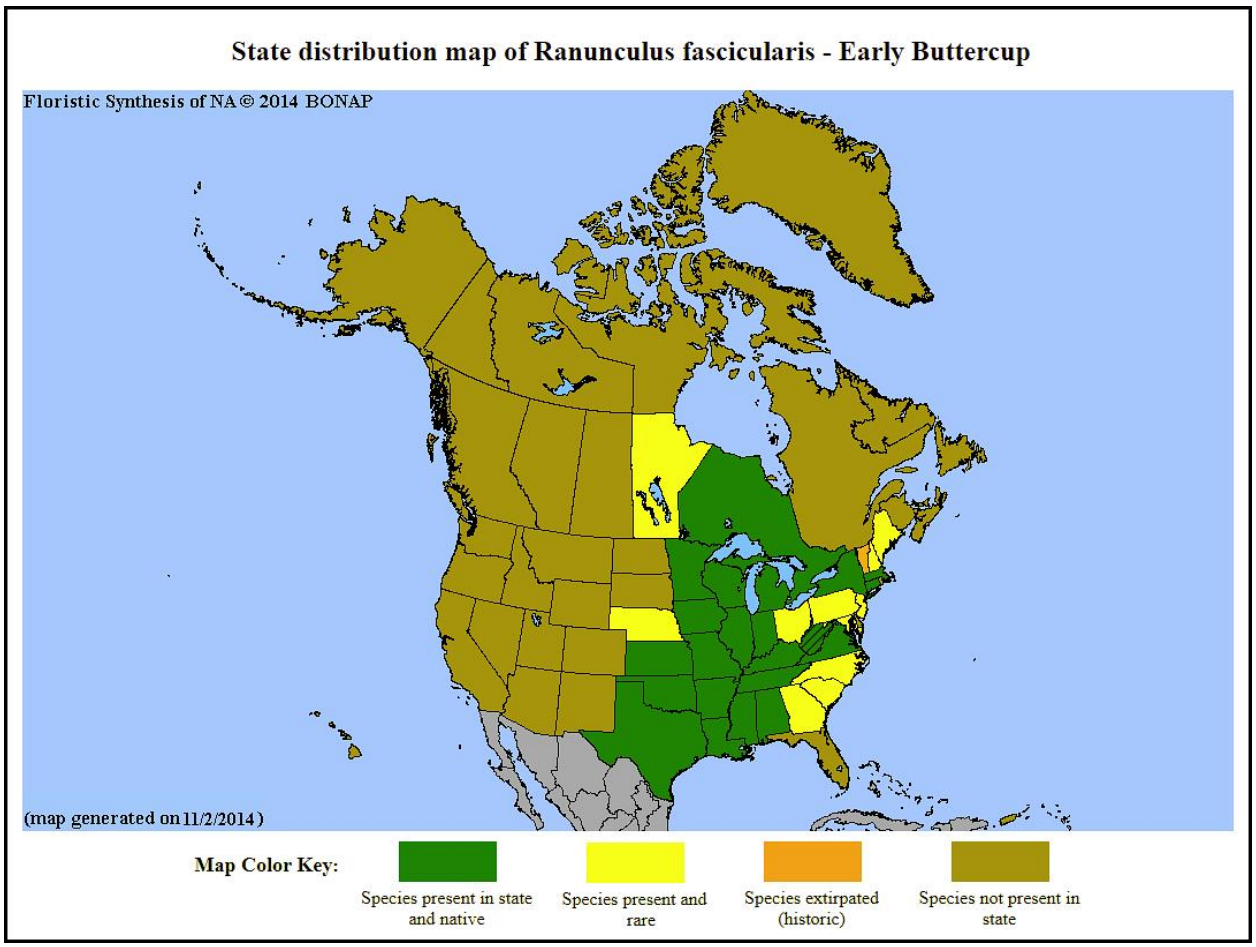


Figure 2. Distribution of R. fascicularis in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022b) shows records of *Ranunculus fascicularis* in four New Jersey counties: Hunterdon, Monmouth, Morris, and Sussex (Figure 3). The data include historic observations and do not reflect the current distribution of the species as there was a recent discovery of the Early Buttercup in Warren County, New Jersey (NJNHP 2022).

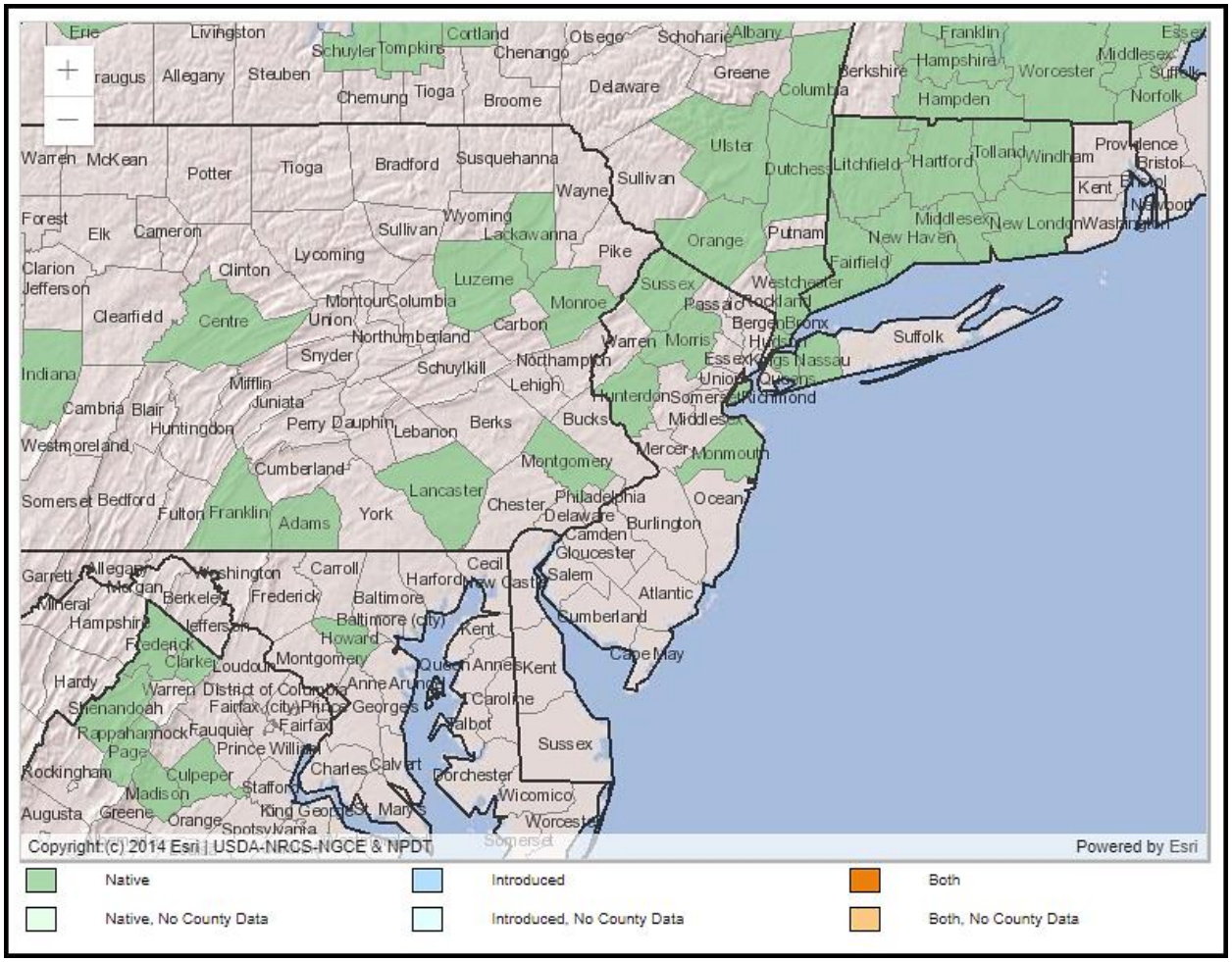


Figure 3. County records of R. fascicularis in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Ranunculus fascicularis is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2022). The map below (Figure 4) illustrates the conservation status of *R. fascicularis* throughout its range. The buttercup is critically imperiled (very high risk of extinction) in eight states and one province, imperiled (high risk of extinction) in two states, and possibly extirpated in Vermont. These imperiled sites are generally found in portions of the eastern and northwestern sections of its range.

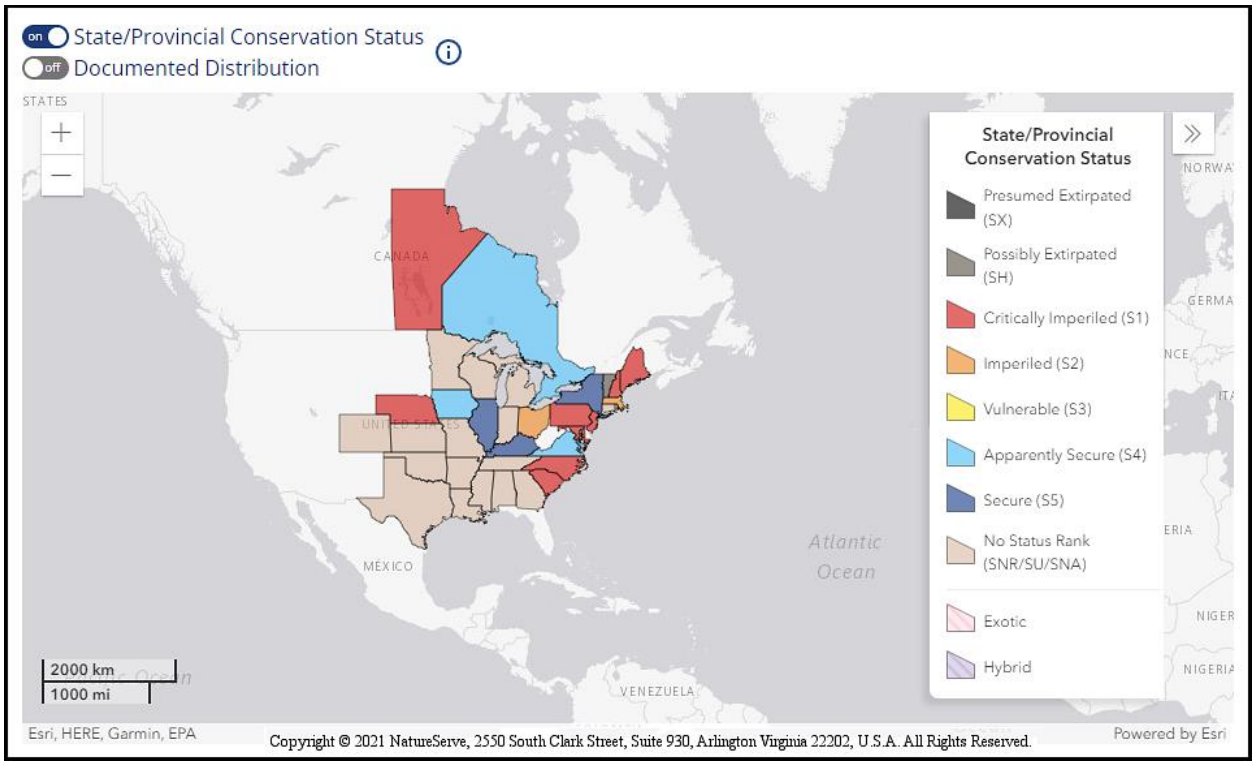


Figure 4. Conservation status of R. fascicularis in North America (NatureServe 2022).

New Jersey is one of the states where *Ranunculus fascicularis* is critically imperiled (NJNHP 2022). The S1 rank signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *R. fascicularis* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities such as wetlands or coastal habitats, being listed does not currently provide broad statewide protection for the plants. Additional regional status codes assigned to the plant signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

There are five extant and two historical populations in New Jersey. Of the five extant populations, two were not relocated during most recent surveys (in 2005 and 2014) and two have not been visited since 1988. The two historical populations were last observed in 1907 and 1936 (NJNHP 2022).

Threats

In the parts of the range where Early Buttercup is imperiled, the reasons cited include land-use conversion, habitat fragmentation, change in habitat (e.g., succession and increasing canopy cover), and forest management practices (Maine Natural Areas Program 2022; NatureServe 2022).

In New Jersey, successional changes were listed as a potential future threat at one population with invasive species and human activity identified as threats to other extant populations. For example, two non-native species (Garlic Mustard [*Alliaria petiolata*] and Autumn Olive [*Elaeagnus umbellata*]) were found encroaching into Early Buttercup populations. Human use was a concern for one New Jersey occurrence—specifically trampling by hikers at populations located along the Appalachian Trail (NJNHP 2022). The tendency of the plant to be found along ridgetops may make it vulnerable to hikers seeking mountain views along other ridges.

Deer herbivory has not been noted as a threat to the Early Buttercup. Most Ranunculaceae contain a glycocide, ranunculin, that breaks down into a toxic oil called protoanemonin when the plant is chewed. This oil gives the leaves a bitter taste and can cause blistering of mucus membranes (Colorado State University 2022). Other symptoms of poisoning are drooling, diarrhea, increased heart rate, behavior changes such as weakness and depression, bleeding, and convulsions (Nice et al. 2008). Although some *Ranunculus* species are more toxic than others, *Ranunculus* in general are considered toxic to livestock (Nice et al. 2008) and are not likely palatable to deer.

Although not mentioned in the literature, climate change may become a challenge for this early spring bloomer. Warming temperatures overall may shift the timing of blooming, which could result in a mismatch with the emergence of important pollinator species that respond to different environmental cues (Gérard et al. 2020), although Early Buttercup does have a diversity of pollinators and may self-pollinate, which could mitigate any impact. Summers in New Jersey are projected to become hotter and precipitation patterns may shift, with a greater likelihood of periods of short-term drought (NJDEP 2020). This may affect long-term survival of Early Buttercup in habitats that already tend to be drier, for example in open-canopied rocky ridges with thin soils.

Management Summary and Recommendations

A resurvey of all extant Early Buttercup populations in New Jersey is needed. Most occurrences have not been seen for eight years or longer and the most recent 2020 Warren County discovery lacks a detailed population viability assessment (NJNHP 2022).

Some New Jersey populations are located near the Appalachian Trail and have been trampled in the past by trail hikers. To prevent inadvertent harm by hikers, consideration should be given to rerouting the trail or establishing a natural barrier between the trail and the plant population. Non-native invasive plant species have also been found at New Jersey sites, as mentioned above. All Early Buttercup populations should be monitored for the presence of non-native species on a regular basis to enable early detection and/or control as needed.

Future forest successional changes could shade out some *R. fascicularis* populations in New Jersey. The plants seem to prefer dry open ridgetop habitats. With regular monitoring, a determination can be made as to whether canopy thinning, or other vegetation management would be warranted at individual sites. In New Hampshire, forest management that includes canopy removal recommends single tree removal only, to prevent encroachment of more

competitive plant species that may affect Early Buttercup (UNH Cooperative Extension 2022). The vulnerability of Early Buttercup to climate change has not been fully assessed, so it is difficult to determine appropriate future management needs for New Jersey populations.

Synonyms

The accepted botanical name of the species is *Ranunculus fascicularis* Muhl. ex Bigelow. Some authors recognize two varieties, var. *apricus* and var. *typicus* (based on differences in the shape of basal leaves); however, most authors treat the varieties as synonyms (MinnesotaSeasons.com 2022). Orthographic variants, synonyms, and common names are listed below (Britton and Brown 1913; ITIS 2021; Keener et al. 2022; POWO 2022; USDA NRCS 2022b).

Botanical Synonyms	Common Names
Ranunculus fascicularis var. *apricus* (Greene) Fernald	Early Buttercup
Ranunculus fascicularis var. *typicus* L.D. Benson	Prairie Buttercup
Ranunculus fascicularis var. *deforesti* K. C. Davis	Tufted Buttercup
Ranunculus apricus Greene	Prairie-tufted Buttercup
Ranunculus illinoensis Greene	Thick-root Buttercup
Ranunculus trifoliatus Muhl. ex Steud.	Early Crowfoot
	Bundle-rooted Buttercup
	Cowslip

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