

Eupatorium resinosum

Pine Barren Boneset

Asteraceae



Eupatorium resinosum by Chris Hoess, 2010

***Eupatorium resinosum* 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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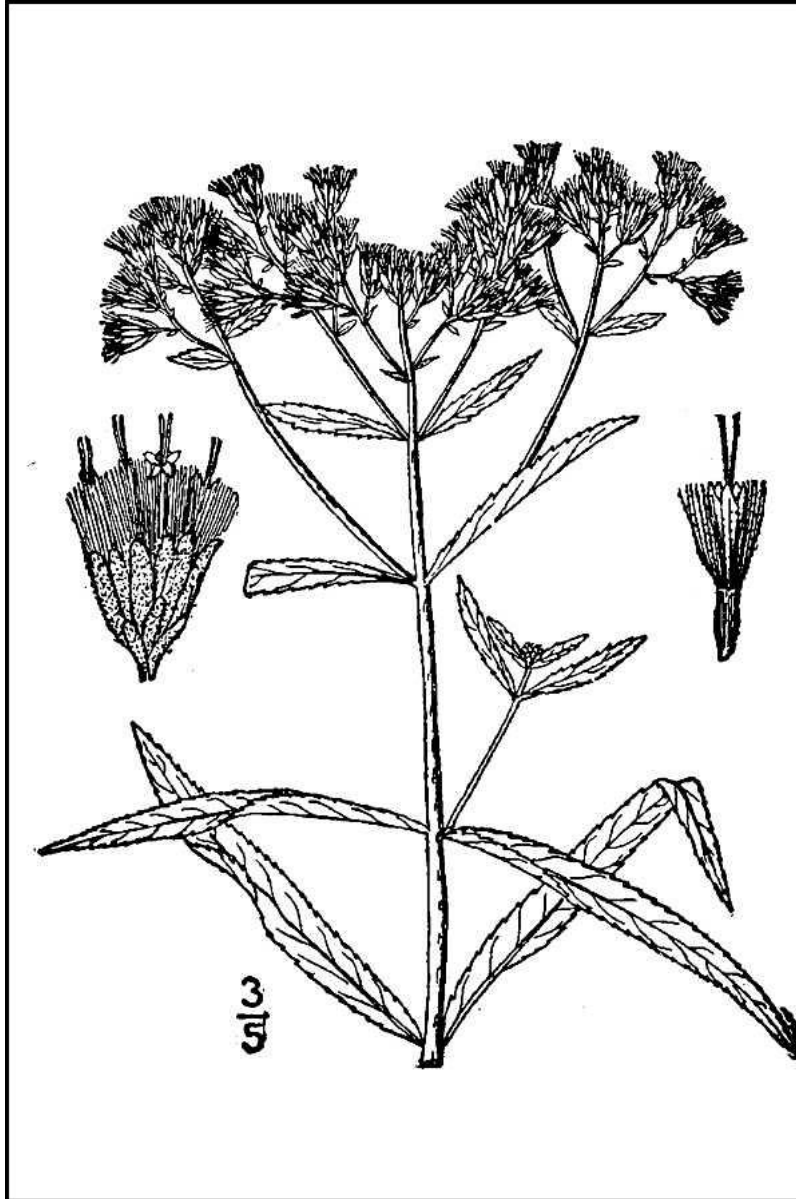
Life History

Pine Barrens Boneset (*Eupatorium resinsum*) is a perennial plant in the Aster family (Asteraceae). Its single stem grows erect about 0.5 to 1 meter tall from short underground rhizomes. The leaves are opposite, sessile, sharply toothed, and acuminate, 5–13 cm x 5–15 mm in size and both pubescent and resinous. The white flowers are borne in flat-topped inflorescences with 9–15 florets per head (Britton and Brown 1913; Gleason and Cronquist 1963). Depending on location, *E. resinsum* blooms July through October (Gleason and Cronquist 1963), though mostly August through September in New Jersey populations (Britton and Brown 1913; Siripun and Schilling 2020). The seeds are small, prismatic, 5-ribbed with 20–30 whitish bristles and are wind dispersed (Siripun and Schilling 2020).

Pine Barren Boneset can be distinguished from the more common *E. perfoliatum* by the leaves. In *E. perfoliatum*, the leaves are fused around the stem and are wider than those of Pine Barren Boneset (CU Maurice River 2022). Stone (1911) wrote that the only other *Eupatorium* likely to occur in the same habitat in New Jersey “in the heart of the region [=Pine Barren]”, is *E. leucolepsis*. These two species can be distinguished from each other by the fact that *E. leucolepsis* has white-haired bracts beneath the flower heads and *E. resinsum* has leaves that are narrow and sticky-hairy. Also, *E. leucolepsis* has 5 flowers per head while *E. resinsum* has 9–14 flowers per head. (Note, however, that at some New Jersey *E. resinsum* occurrences other *Eupatoriums* [e.g., *E. album*, *E. hyssopifolium*, *E. rotundifolium*, and *E. pilosum*] were also found, so care should be taken with identification (NJNHP 2022).



Left: Plant stem and leaves, photo courtesy Alan Weakley, 2021. Center: Flower head, photo courtesy Chris Hoess, 2010. Right: Leaf close-up, photo courtesy Alan Weakley, 2021.



Britton and Brown 1913, courtesy USDA NRCS 2022a.

Pollinator Dynamics

A variety of insects, in particular Honey Bees (*Apis mellifera*), sweat bees (Halictidae), Carpenter Bees (*Xylocopa virginica*), small carpenter bees (*Ceratina* spp.), leaf cutter bees (*Megachile* spp.), mining bees (Andrenidae), plasterer bees (Colletidae), and bumble bees (*Bombus* spp.) are the primary agents of pollination for *Eupatoriums* such as Common Boneset (*Eupatorium perfoliatum*). Common Boneset is also visited by many species of wasps, flies, moths and butterflies, and beetles (Hilty 2020; Michigan State University 2022). Similar pollinators and herbivorous insects likely visit Pine Barren Boneset. Pine Barren Boneset is self-incompatible, meaning that individual plants can only be pollinated by pollen from a different plant making pollination by visiting insects extremely important.

Research reported by Byers (1995) found that in smaller New Jersey populations of *E. resinosum*, average seed set was 2.1 seeds/head ranging to 9.0 seeds/head in larger populations. Incomplete seed set was more common in smaller populations and may be due both to reduced pollen availability and to pollen incompatibility. Because Pine Barren Boneset flowers are relatively small and do not bloom quite as long as other *Eupatoriums*, they may be less visible or attractive to pollinators (Byers 1995). With fewer pollinators visiting, seed set would be reduced. Additionally, because Pine Barren Boneset is self-incompatible, its own pollen may clog access to compatible pollen grains carried to the flower by visiting insects, reducing cross-pollination. Not only can limited suitable pollen quantity affect seed set, it can also reduce the quality of seed produced (Byers 1995). Lastly, Byers and Meagher (1997) suggest that the nutrient-poor, acidic Pine Barrens soils contribute to a smaller growth rate with fewer plants growing large enough to flower, another factor that may result in reduced seed production in *Eupatorium resinosum* populations.

Seed Dispersal

Eupatorium resinosum seeds are 2–3 mm long, brownish to blackish, 5-ribbed, and usually glabrous. Wind dispersed, the seeds have 20–30 short tufts of hair that help carry them away from the parent plant (Siripun and Schilling 2022). There is little to no information about long-term seed viability or dispersal distance in *E. resinosum* or in *Eupatorium* generally.

While it may be possible for Pine Barren Boneset populations to vegetatively persist in suitable habitat for years (Byers and Meagher 1997), if habitat suitability is reduced by increased shading, for example, and plants begin to die out, sexual reproduction (i.e., seed production) would be needed for new populations to become established. According to Byers (1995) large numbers of seeds would be necessary to establish any new Pine Barren Boneset populations due to poor seedling survival of *Eupatorium resinosum* and to the patchiness of suitable habitat in the New Jersey populations she studied.

Habitat

Eupatorium resinosum prefers open, early successional habitats with acidic, sandy or peaty saturated soils such as seepage or shrub bogs, frequently burned streamhead pocosins, beaver ponds, or along streambanks (NatureServe 2022; Weakley 2015). In New Jersey, populations have been found most abundantly in abandoned cranberry bogs with peaty soil, along sphagnum streambanks, as well as in open or cutover bogs adjacent to or associated with Atlantic White Cedar (*Chamaecyparis thyoides*) wetlands, and in natural oxbow bog savannas. Populations have also been found in ditches or edges of flooded areas along railroad tracks, at the edges of manmade ponds or in drained millponds, along channelized streams, and in open wet areas along powerline rights-of-ways (NatureServe 2022; NJNHP 2022). Typical habitat is found at 20–100+ meters elevation (Siripun and Schilling 2020). Periodic habitat disturbance seems to be the most important factor in the establishment and persistence of *E. resinosum* populations, whether natural disturbances like fire or flooding along stream banks, or anthropogenic disturbances such as cranberry bog creation and subsequent abandonment or ROW maintenance (Byers and Meagher 1997).

Although each of New Jersey's 93 occurrences is unique, typical associated species may include sphagnum mosses; grasses, sedges and rushes (e.g., *Carex atlantica*, *C. bullata*, *C. stricta*, *Dulichium arundinaceum*, *Eleocharis flavescens*, *Juncus canadensis*, *J. caesariensis*, *Leersia oryzoides*, *Panicum verrucosum*, *Rhynchospora capitellata*, *Scirpus cyperinus*); and other herbaceous vegetation (e.g., *Bidens frondosa*, *Hypericum densiflorum*, *Osmunda regalis*, *Peltandra virginica*, *Polygonum sagittatum*, *Rhexia virginica*, *Sagittaria engelmanniana*, *Symphotrichum novae-angliae*, *Thelypteris simulata*, *Triadenum virginicum*, *Typha latifolia*, *Woodwardia areolata* and *Woodwardia virginica*). Shrubs and trees that are often found include *Cephalanthus occidentalis*, *Clethra alnifolia*, *Spiraea tomentosa* and *Vaccinium corymbosum* with *Acer rubrum*, *Chamaecyparis thyoides*, and scattered *Liquidambar styraciflua*, *Magnolia virginiana* and *Nyssa sylvatica* in adjacent woods (NJNHP 2022).

Information about mycorrhizal relationships for *Eupatorium resinosum* is not readily available; however, Wang and Qiu (2006) did look at six *Eupatorium* species including *E. perfoliatum* and found that arbuscular mycorrhizae were associated with those species. Arbuscular mycorrhizae (endomycorrhizae) are a type of mycorrhizae where the fungal/plant connection occurs inside the plant's root cells. This relationship helps the plant to obtain nutrients from the soil. It is likely that *E. resinosum* also has a symbiotic relationship with arbuscular mycorrhizae.

Wetland Indicator Status

Eupatorium resinosum is an obligate wetland species, meaning that it almost always occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2022b)

EURE8

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 worldwide range of *Eupatorium resinosum* is restricted to the eastern United States. The map in Figure 1 depicts the global extent of Pine Barren Boneset.

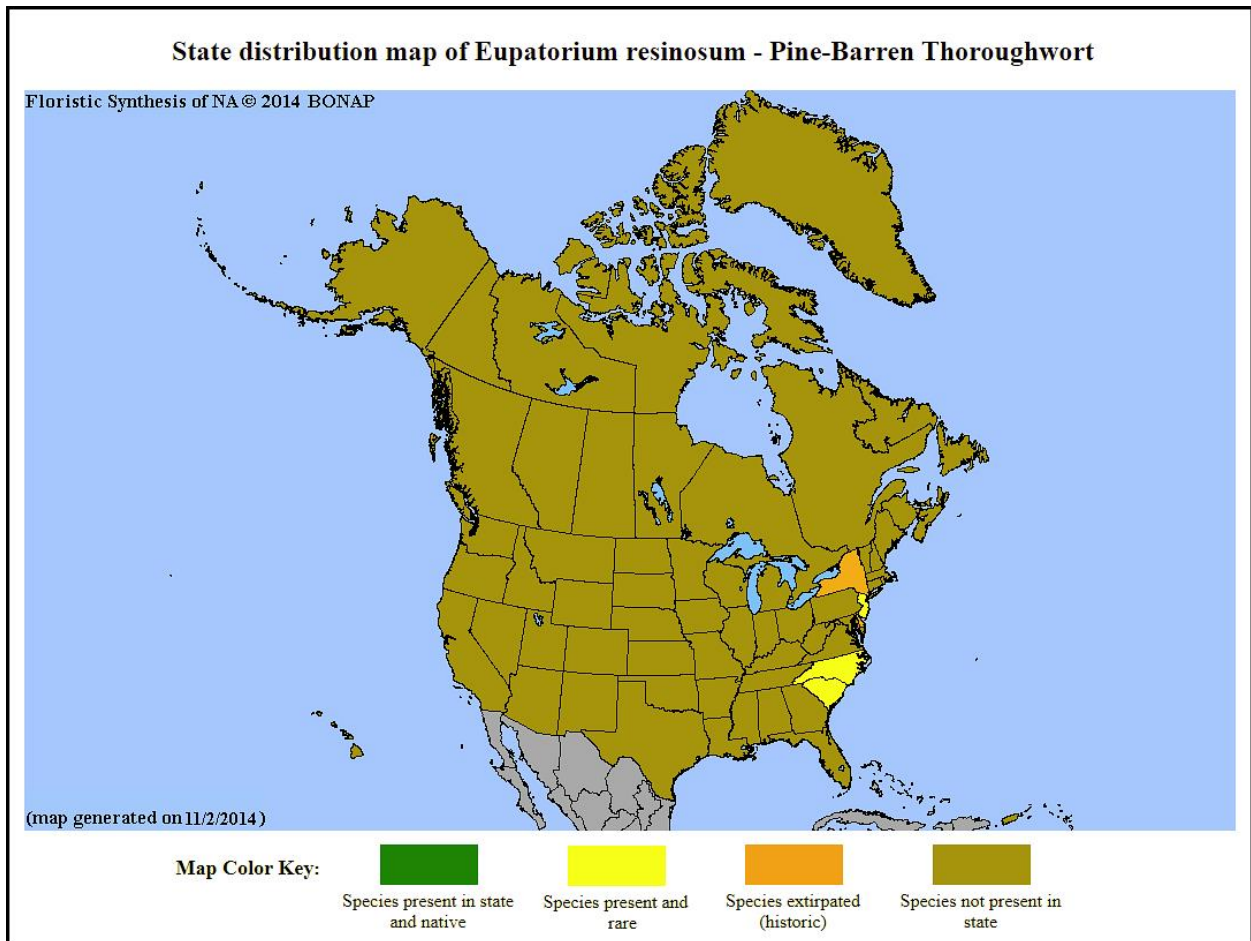


Figure 1. Distribution of *E. resinsum* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022b) shows records of *Eupatorium resinsum* in eight New Jersey counties: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Monmouth, and Ocean (Figure 2). The data include historic observations and do not reflect the current distribution of the species, which does not include Monmouth County (Edmonson and Gries 1997; NJNHP 2022).

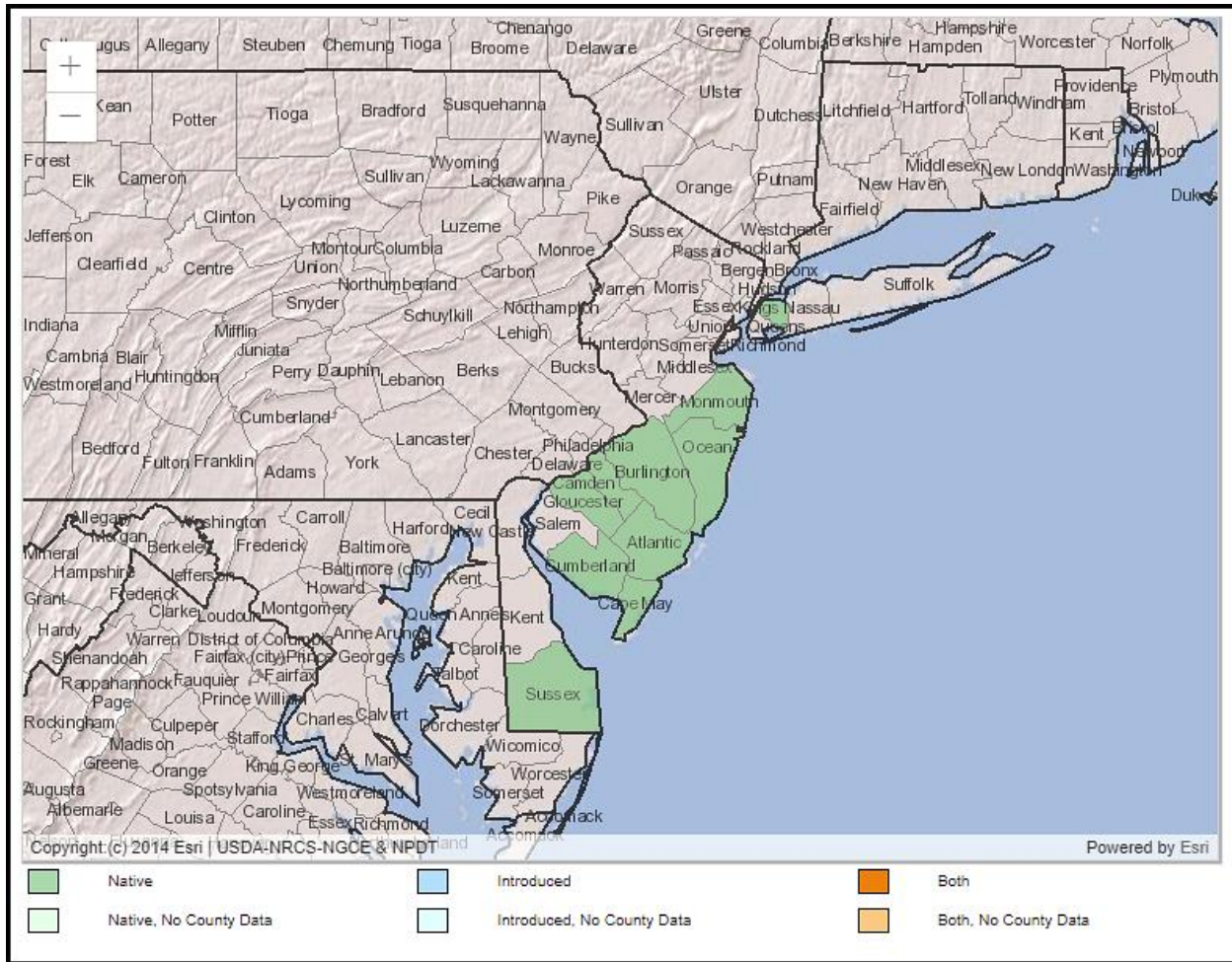


Figure 2. County records of *E. resinosum* in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Eupatorium resinosum is globally vulnerable. The G3 rank means the species has a moderate risk of extinction or collapse due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors (NatureServe 2022). The map in Figure 3 illustrates the conservation status of *E. resinosum* throughout its range. Pine Barren Boneset is presumed extirpated in New York and Delaware, critically imperiled (very high risk of extinction) in South Carolina, and vulnerable (moderate risk of extinction) in North Carolina. Sorrie and Weakley (2001) have described it as a “bimodal endemic” due to the presence of two disjunct population centers.

In North America, *E. resinosum* has also been identified as a plant species of highest conservation priority for the North Atlantic region, which includes four Canadian provinces and twelve U. S. states. The species has a regional rank of R2 (imperiled), signifying a high risk of extinction (Frances 2017).

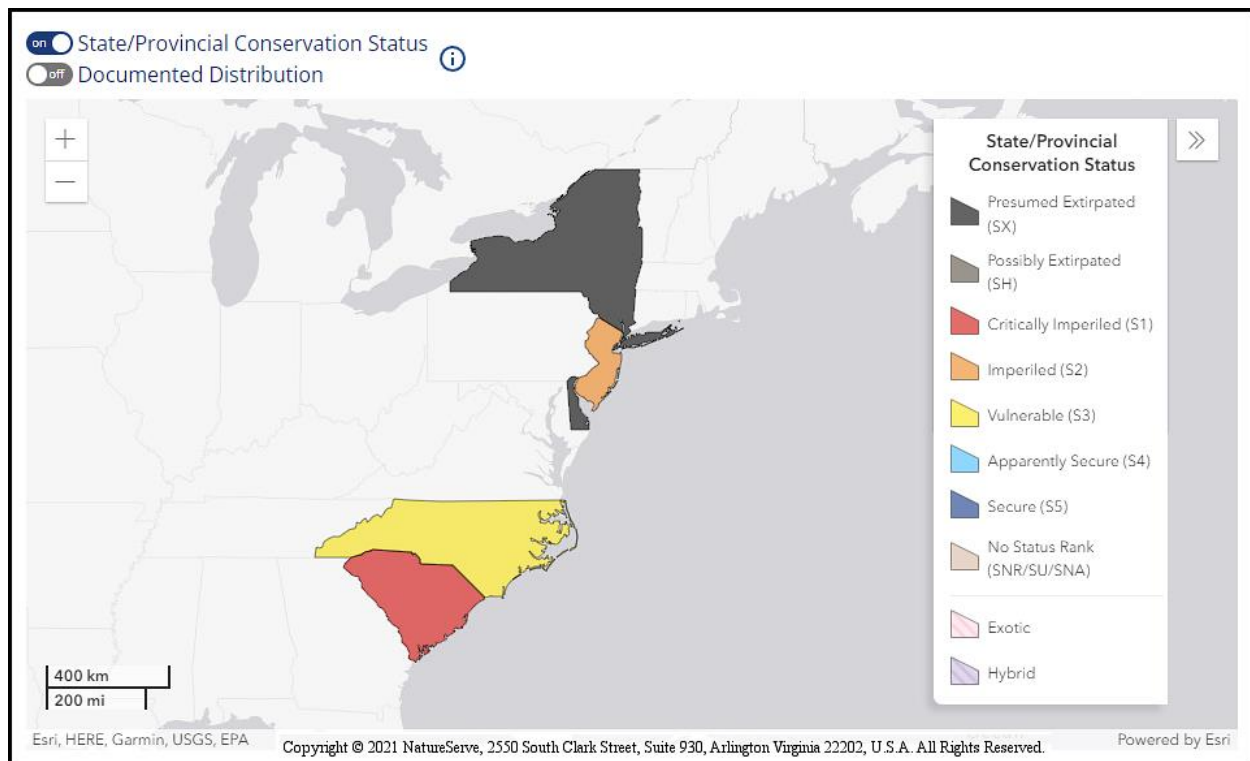


Figure 3. Conservation status of *E. resinosum* in North America (NatureServe 2022).

Eupatorium resinosum is imperiled (S2) in New Jersey (NJNHP 2022). The rank often indicates that a species is very rare in the state, with 6 to 20 occurrences. Species with an S2 rank may have once been more abundant in the state but now persist in only a few of their former locations. *E. resinosum* 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).

In New Jersey, of an original 93 known occurrences, there are currently 36 extant element occurrences in seven south Jersey counties (Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Ocean). A majority of those extant occurrences have not been visited for many years. Three have been classified as “failed to find”, one as “possibly extirpated”, and the remaining 53 are considered historical (NJNHP 2022).

Threats

Although many of New Jersey’s *E. resinosum* populations are historical with little to no information about why the populations did not persist, an overview of more recent population reductions and possible extirpations points to several key threats.

First among these threats is habitat succession. Given the species' self-incompatibility, and the patchiness of suitable habitat, once a local site becomes unsuitable through shading, for example, the existing population usually declines in size until extirpated. Succession by woody species (e.g., Red Maple and Atlantic White Cedar) that resulted in declines of *E. resinosum* has been noted at a few New Jersey locations (NJNHP 2022).

Another potential threat to population longevity is the fact that Pine Barren Boneset has structured populations. Because pollen grains are only moved by pollinators over a short distance, genetically different subpopulations often form within a larger population. Over time, some of these subpopulations may exhibit reduced fitness due to genetic inbreeding (See Byers [1998] for a description of possible contributing factors), which may lead to an overall decline in population size and survival (Byers 1998).

Deer herbivory has been observed at three New Jersey populations (NJNHP 2022) and Byers (1995) noted deer herbivory as a contributing factor to poor seed production in the New Jersey populations she studied. Deer readily browse on the flower heads and target the larger flowering individuals, decreasing seed production. Apart from deer browse, insect herbivory was observed at one occurrence in New Jersey (NJNHP 2022). Many larval Lepidoptera (e.g., Lined Ruby Tiger Moth (*Phragmatobia lineata*), Burdock Borer Moth (*Papaipema cataphracta*), Three-lined Flower Moth (*Schinia trifascia*), Blackberry Looper (*Chlorochlamys chloroleucaria*), Geometrid Moth (*Semiothisa continuata*) and Clymene Moth (*Haploa clymene*) (Hilty 2020) as well as Lygus bugs, leaf beetles, weevils, thrips, leafhoppers and aphids are known to feed on *E. perfoliatum*, and similar insect species may also feed on Pine Barren Boneset (Michigan State University 2022).

Phragmites australis, a non-native invasive species, is present at several New Jersey sites and in some of those locations is spreading and encroaching into *E. resinosum* populations. Dense overgrowth of *Phragmites* may shade out any Pine Barren Boneset plants; however, the improper use of herbicides to remove *Phragmites*, especially in populations along powerline ROWs could also contribute to loss of *E. resinosum* populations. Other non-native species were not mentioned in the literature or in site visit reports as direct threats at the time.

Human disturbances may provide habitat or remove habitat, depending on the type of activity. One population may have been destroyed by the burial of a sewer pipeline alongside a stream corridor that had previously supported Pine Barren Boneset; road widening, and culvert/bridge replacement were noted as possible contributing factors to declines in plant numbers at two other New Jersey locations (NJNHP 2022). In contrast, careful rights-of-way management that prevents woody succession has resulted in relatively stable *Eupatorium* populations along certain powerlines (NJNHP 2022).

Hydrologic alterations may also affect boneset populations. Flooding by beaver activity as observed at one New Jersey site and the localized heavy rains sustained from storms such as Hurricane Irene may reduce plant survival, depending on the length of inundation period; conversely, the draining of ponds and some ditching that result in the creation of open moist soil habitat may support *Eupatorium resinosum* populations (NJNHP 2022). However, stunting by

past drought conditions was mentioned as a concern at one New Jersey occurrence (NJNHP 2022).

New Jersey populations of Pine Barren Boneset have been identified as moderately vulnerable to climate change (Ring and Spencer 2013), meaning that the “abundance and/or range extent within geographical area assessed is likely to decrease by 2050.” This vulnerability is due in part to potential effects of climate change on pollinators and the ability of the plant to disperse to new habitats under changing conditions. Additional risk factors that increase sensitivity to climate change for this species include a dependence on a particular hydrological niche and on disturbance to maintain habitat quality (Ring and Spencer 2013). Both flooding and drought can negatively affect Pine Barren Boneset populations, as previously mentioned. Current New Jersey climate change models predict an increase in heavier rain events that could cause extensive flooding and a greater likelihood of short-term drought conditions persisting during the summer months (NJDEP 2020). Other factors that influence the vulnerability of Pine Barren Boneset to climate change include potential exposure to sea level rise and the distribution of the species relative to natural barriers to migration, challenges that are predicted to significantly increase with a changing climate in New Jersey (Ring and Spencer 2013).

Pine Barren Boneset populations face additional threats rangewide. Many botanical sites that may have supported Pine Barren Boneset in Delaware were likely lost to residential, industrial, recreational, and agricultural development (Tucker and Dill 1993). In North and South Carolina populations, threats include habitat succession, agriculture, and the establishment of pine plantations. The largest populations are located on the Fort Bragg Military Reservation, North Carolina where it appears that active military training operations and a short fire-return interval of approximately two years helps keep the habitat open while also supporting the greatest diversity of rare plants, including *E. resinosum* (Edmonson and Gries 1997; Gray et al. 2003; Gray et al. 2016).

Management Summary and Recommendations

Additional field inventory is needed in New Jersey (NatureServe 2022). When possible, element occurrences should be resurveyed where the presence of expansive suitable habitat had been noted, even if the population numbers observed at the time were small. Many of these populations have not been visited in 10–15 or more years and warrant resurvey for a better assessment of population status, current management needs and subsequent prioritization of management action (NJNHP 2022). For example, while deer and some insect herbivory has been noted at a few New Jersey sites in the past, a resurvey and regular monitoring of *E. resinosum* populations as mentioned will help determine whether actions need to be taken to protect plants in certain populations from herbivory.

As many sites are on Powerline ROWs, it is important to work closely with site managers to reduce or better target the use of any pesticides during site management. Some Pine Barren Boneset populations have been negatively affected by the non-judicious use of herbicide treatments (NJNHP 2022) and the use of pesticides may harm the local pollinator community.

It is important to protect habitat and populations that are sufficiently large to maintain the necessary genetic diversity for optimal plant fitness. For smaller populations, consideration should be given to introducing new genotypes into those populations to address potential losses of genetic diversity (Byers 1998).

Active habitat management may be necessary in certain New Jersey locations. In areas where *Phragmites* is encroaching into Pine Barren Boneset populations, careful *Phragmites* treatment and removal should be considered. Shrub removal or tree thinning to open the canopy over or near Pine Barren Boneset plants are also options for management to set back succession. Although primarily a plant of moist soil and bogs, fire can play a role in maintaining habitat for this species (Byers and Meagher 1997; Coritz 1995), with southern streamhead pocosins that are frequently burned as one example (Weakley 2015). Studies of fire-return intervals and rare plant species diversity in canebrakes and longleaf pine-wiregrass ecosystems of the southern United States (of which *E. resinsum* is a component) found that shorter return intervals supported greater rare plant diversity, population persistence and colonization, although population size was also a contributing factor (Gray et al. 2003; Gray et al. 2016). It may be worthwhile to reassess the importance of fire in creating or maintaining certain open wetland habitat favored by this species in New Jersey.

Lastly, the management challenges posed by climate change will entail a broader assessment of Pine Barrens habitats and ecological processes overall, to determine how best to support population persistence and/or migration of this species in the coming years.

Synonyms

The accepted botanical name of the species is *Eupatorium resinsum* Torr. ex DC. Orthographic variants, synonyms, and common names are listed below (ITIS 2021; POWO 2022; USDA NRCS 2022b; Weakley 2015; Werier et al. 2022).

Botanical Synonyms

Eupatorium resinsum var. *kentuckiense* Fernald

Uncasia resinosa Greene

Eupatorium resinsum var. *resinosum*

Common Names

Pine Barren Boneset

Pine-Barren Thoroughwort

Resinous Thoroughwort

Pine Barren Eupatorium

Resinous Boneset

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