

Mecardonia acuminata var. *acuminata*

Axil-flower

Plantaginaceae



Mecardonia acuminata var. *acuminata* by Nate Harley, 2018

Mecardonia acuminata var. *acuminata* Rare Plant Profile

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

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July, 2024

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This report should be cited as follows: Dodds, Jill S. 2024. *Mecardonia acuminata* var. *acuminata* Rare Plant Profile. New Jersey Department of Environmental Protection, State Parks, Forests & Historic Sites, Forests & Natural Lands, Office of Natural Lands Management, New Jersey Natural Heritage Program, Trenton, NJ. 15 pp.

Life History

Mecardonia acuminata var. *acuminata* (Axil-flower) is a perennial herb in the plantain family. After genetic analyses resulted in fragmentation of the Scrophulariaceae numerous genera—including *Mecardonia*—were transferred to the Plantaginaceae, making that family very large and diverse (Olmstead et al. 2001, Oxelman et al. 2005). The plantain family was subsequently divided into twelve tribes and *Mecardonia* was placed in the Gratioleae (Albach et al. 2005). *M. acuminata* var. *acuminata* is the only member of the genus that has been documented in New Jersey.

The four-sided stems of *Mecardonia acuminata* var. *acuminata* are up to 6 dm in height and they branch near the top. The oblanceolate leaves are opposite, 1–3 cm long, and toothed beyond the middle. The widely spreading floral pedicels have a pair of narrow bracts at the base, and the pedicels are 1.7–3.5 cm in length which is 1–2 times as long as the bracts. The flowers have five sepals that are unequal in width, a tubular white corolla with flaring lobes and purple veins in the throat, four stamens, and a two-lobed stigma. The upper two lobes of the corolla are fused for half or more of their length. The fruits of *M. acuminata* var. *acuminata* are many-seeded capsules that are 6–7 mm long. (See Small 1903, Britton and Brown 1913, Pennell 1919 & 1935, Fernald 1950, Gleason and Cronquist 1991, Ahedor 2020).

Axil-flower can bloom and fruit throughout much of the summer and fall, typically doing so between July and October (Small 1903, Ahedor 2020, Weakley et al. 2024). Pennell (1919) observed that the fruits ripen quickly. Both flowers and fruits have been observed on *Mecardonia acuminata* plants in New Jersey during August. *Mecardonia* plants tend to turn black as they dry out but green basal rosettes have been observed beneath the darkened stems during December and January (NJNHP 2024).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Center: Larry Allain, courtesy Plants of Louisiana. Right: Matt Reala, February 2023.

Lewis et al. (1962) reported the chromosome number of *Mecardonia acuminata* as $2n = 42 \pm 2$ and Ahedor (2007) identified the base chromosome number for the genus as $n = 11$. Genetic and morphological studies of the *M. acuminata* complex suggest that the three varieties may be

converging (Ahedor and Elisens 2015a). Ahedor (2007) observed that some populations may include a mixture of two or more varieties, and many of the sources utilized for this profile did not recognize any subtaxa.

Pollinator Dynamics

Mecardonia acuminata is cross-fertilized by insects. Halbritter et al. (2015) indicated that the presence of *M. acuminata* blooms might influence the foraging behavior of butterflies but they are not known to obtain nectar from the flowers. Bees appear to be the primary pollinators (Ahedor 2007). The purple lines on the inside the floral tube act as pollinator guides, and they are interspersed with hairs. Bees enter the flowers upside-down while clinging to the hairs and brush against the and stigma as they pass (Pennell 1935, Rogers 2018).

It is not clear whether *Mecardonia acuminata* var. *acuminata* can also produce fruit via self-pollination. Self-compatibility has been demonstrated in another North American species (*M. procumbens*) and the structure of *Mecardonia* flowers may permit self-pollination as the buds unfold (Kaul 1969). Ahedor (2007) noted the possibility of gene flow between different varieties of *M. acuminata*, which also supports the premise of self-compatibility.

Seed Dispersal and Establishment

The capsules of *Mecardonia acuminata* contain 40–60 seeds (Ahedor 2020). *Mecardonia* seeds are narrow, less than a millimeter long, and have a reticulate surface. Images are available in Ahedor and Elisens (2015b). Ahedor (2007) observed that the diminutive seeds were easily transported by wind and water. Despite the small size of the propagules, germination studies have demonstrated that *M. acuminata* maintains a seed bank (Boyd and Moffett 2003, Martin and Kirkman 2009).

Baskin et al. (1995) characterized *Mecardonia acuminata* as a polycarpic perennial herb. Baskin and Baskin (1988) studied the germination phenology of hundreds of herbaceous plants and determined that the seeds of polycarpic perennials are usually dormant at maturity, requiring low winter temperatures to complete their development and germinating at high temperatures during the spring or summer. *Gratiola ramosa*, a related polycarpic perennial that was included in their research, primarily germinated during the first spring after dispersal but a small number of its seeds did not sprout until the following autumn or the second spring.

In 1976, *Mecardonia acuminata* was one of seven plant species that germinated in bags of moist Florida peat which had been stored in the parking lot of a discount store in Georgia (Bostick 1977). Thus it would seem that the germination requirements of *M. acuminata* are not particularly narrow, and that humans may inadvertently play a role in its long distance dispersal.

Habitat

Mecardonia acuminata var. *acuminata* can be found in an assortment of wet or moist habitats at elevations up to 900 meters above sea level. It is often associated with sandy or loamy substrate. Natural habitats include meadows, streamsides, wet pinelands, or deciduous bottomland forests (Small 1903, Pennell 1919, Fernald 1935, Lelong 1977, Plunkett and Hall 1995, Ahedor 2020, Weakley et al. 2024). *Mecardonia acuminata* has been reported in calcareous seepage fens (Boyd and Moffett 2003) and mountain outcrop communities that were inundated for extended periods of time (Houle 1987) and it is a characteristic species of limestone glades (Baskin et al. 1995, Allison and Stevens 2001, Baskin and Baskin 2003, Taylor and Estes 2012). Axil-flower also frequents wet disturbed areas. *M. acuminata* has often been documented in anthropogenic habitats such as roadsides, ditches, or wet fields and meadows that were maintained by mowing (Vascott 1985, Plunkett and Hall 1995, Steury and Davis 2003, Taggart 2010, Halbritter et al. 2015, Ahedor 2020, Weakley et al. 2024).

Mecardonia acuminata is tolerant of shade or partial shade but has a strong preference for open habitats (Szakacs et al. 2022, Weakley et al. 2024). When hardwood dominated depression wetlands in Georgia were experimentally cleared and managed to promote the development of fire-maintained communities, *M. acuminata* was one of the species that benefitted from the treatment (Martin and Kirkman 2009).

Wetland Indicator Status

The U. S. Army Corps of Engineers 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). *Mecardonia acuminata* has more than one wetland indicator status within the state. In the Eastern Mountain and Piedmont region, *M. acuminata* is an obligate wetland species, meaning that it almost always occurs in wetlands. In the Atlantic and Gulf Coastal Plain region Axil-flower is a facultative wetland species, meaning that it usually occurs in wetlands but may occur in nonwetlands. The species has not been ranked in the Northcentral and Northeast region (U. S. Army Corps of Engineers 2020).

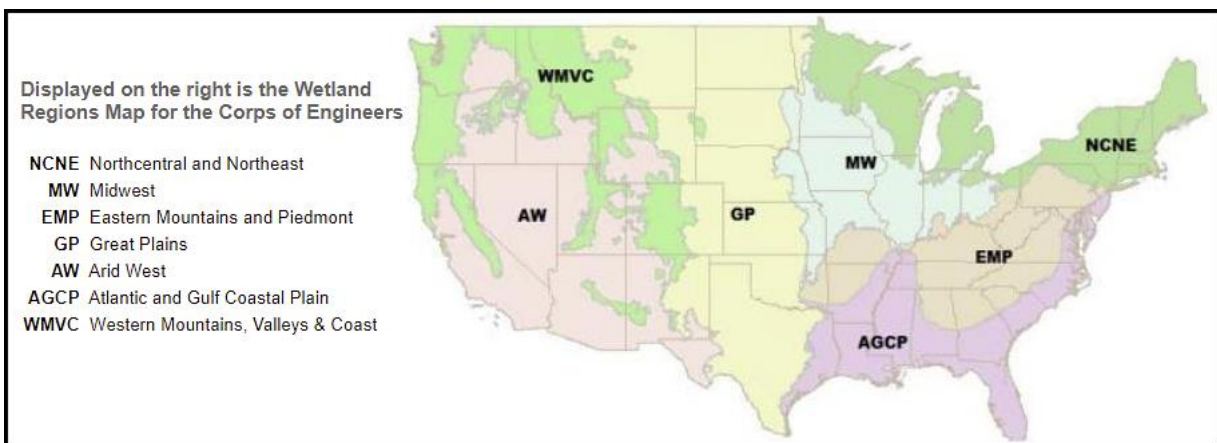


Figure 1. Mainland U. S. wetland regions, adapted from U. S. Army Corps of Engineers (2020).

USDA Plants Code (USDA, NRCS 2024b)

MEACA

Coefficient of Conservancy (Walz et al. 2020)

CoC = 5. Criteria for a value of 3 to 5: Native with an intermediate range of ecological tolerances and may typify a stable native community, but may also persist under some anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

Mecardonia acuminata var. *acuminata* is native to the southeastern and south central United States (POWO 2024). The map in Figure 2 depicts the extent of the variety in North America.

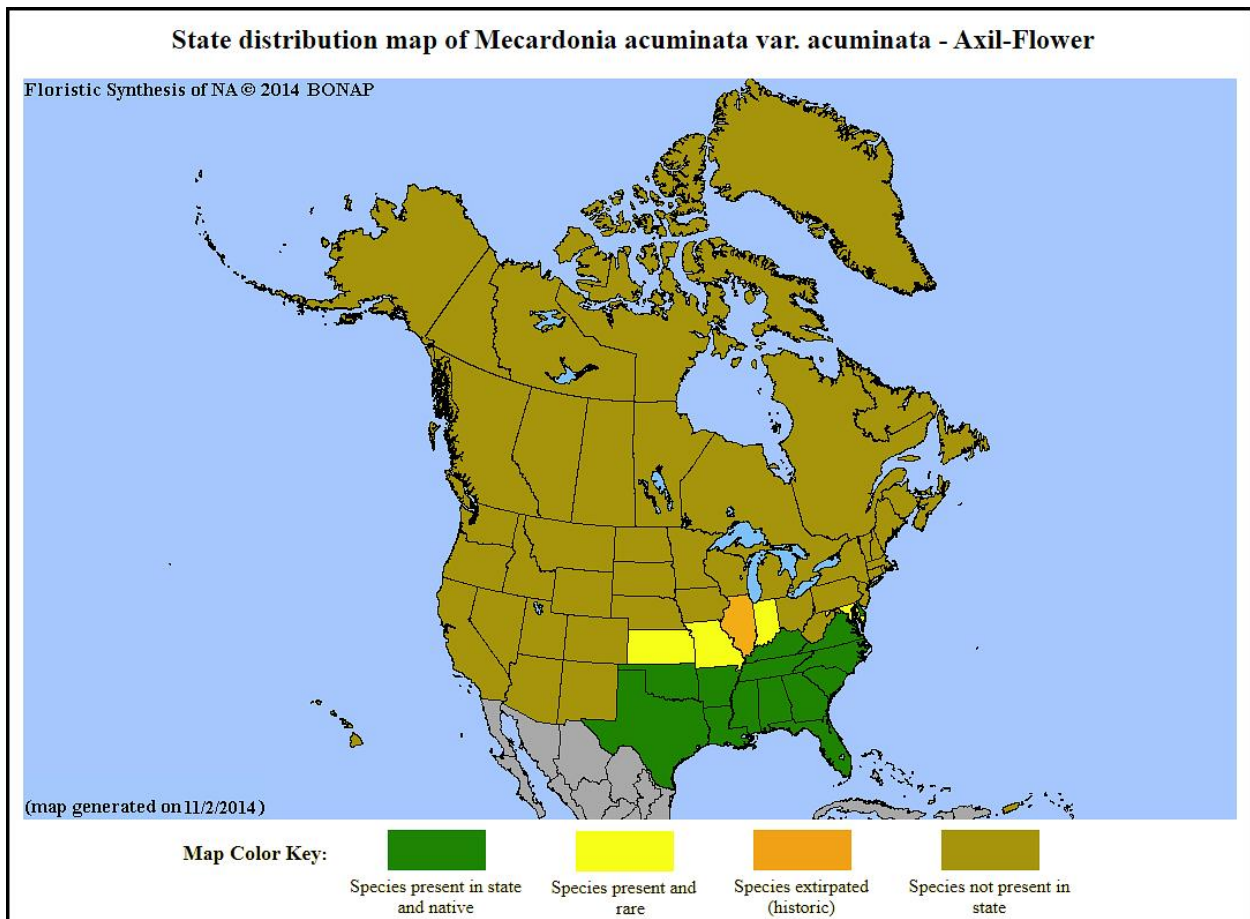


Figure 2. Distribution of *M. acuminata* var. *acuminata* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2024) does not yet show a record for *Mecardonia acuminata* var. *acuminata* in New Jersey. The species was only recently discovered in the state and it is only known from Burlington County at this time (NJNHP 2024).

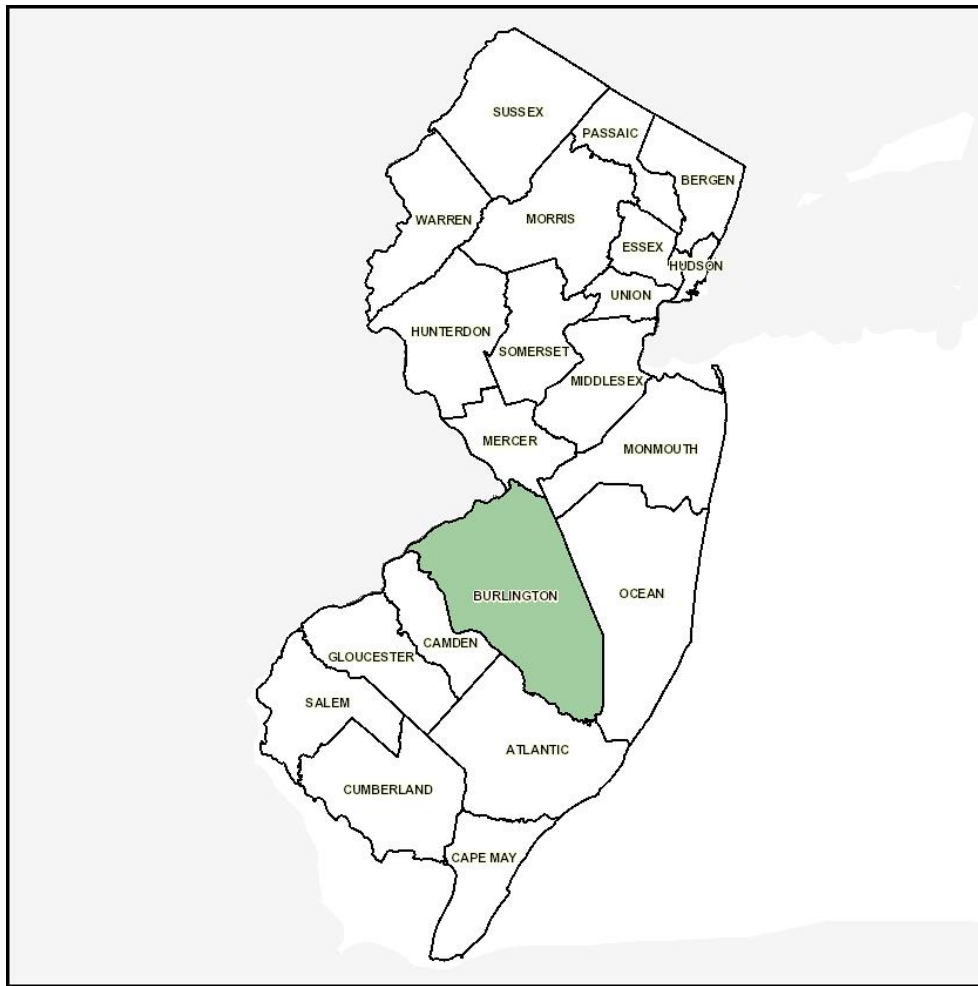


Figure 3. County records of *M. acuminata* var. *acuminata* in New Jersey.

Conservation Status

Mecardonia acuminata var. *acuminata* is considered globally secure. The G5T5 rank means the variety 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 2024). The map below (Figure 4) illustrates the conservation status of *M. acuminata* var. *acuminata* throughout its range. *M. acuminata* var. *acuminata* is secure, apparently secure, or unranked in most of the southern states where it occurs. It is depicted as critically imperiled (very high risk of extinction) in New Jersey, possibly extirpated in Kansas, and likely extirpated in Illinois. There are several other states where *M. acuminata* is rare but they do not appear on the map because they listed the plant at the species level rather than the varietal level. *Mecardonia acuminata* is critically imperiled in Indiana and Missouri, imperiled (high risk of extinction) in Maryland, and vulnerable (moderate risk of extinction) in Delaware (NatureServe 2024).

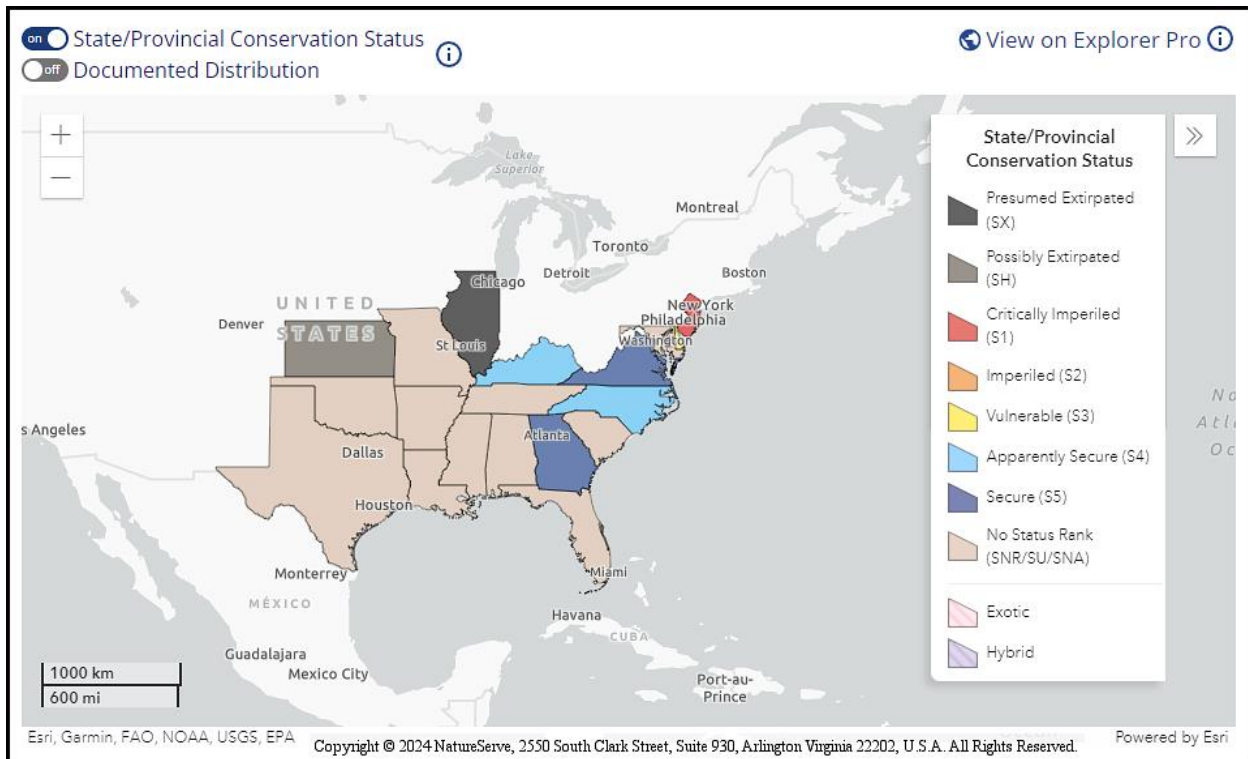


Figure 4. Conservation status of *M. acuminata* var. *acuminata* in North America (NatureServe 2024).

Mecardonia acuminata var. *acuminata* is ranked S1.1 in New Jersey (NJNHP 2024), meaning that it is critically imperiled due to extreme rarity. A species with an S1.1 rank has only ever been documented at a single location in the state. *M. acuminata* var. *acuminata* has also been assigned a regional status code of HL, signifying that the species is eligible for protection under the jurisdiction of the Highlands Preservation Area (NJNHP 2010). Axil-flower was first recorded in New Jersey during 2019 (NJNHP 2024).

Threats

Although *Mecardonia acuminata* var. *acuminata* tends to be rare along its northern boundary it is secure throughout most of its range and no substantial threats have been reported. *M. acuminata* can tolerate partial shading but in the long term canopy closure might be a threat to some populations. The species was invigorated at a site that was managed with prescribed burns at two year intervals (Martin and Kirkman 2009). The New Jersey population is situated in a utility corridor that is mowed every four or five years—a strategy that is likely to favor the plant—and no threats to the occurrence have been identified although some drought stress was noted during 2022 (NJNHP 2024).

Many plant species in New Jersey, particularly those restricted to small populations, face a significant threat from deer browse. The overabundance of White-tailed Deer (*Odocoileus virginianus*) is well-documented in the state (NJDSR 2019), as is their detrimental effect on a wide array of native plants (Kelly 2019). Warren and Hurst (1981) ranked *Mecardonia*

acuminata as having low usage as deer forage but noted that it could be subjected to moderate amounts of grazing during the summer months, while Thill (1984) indicated that deer were most likely to browse on Axil-flower during the fall. Seasonal usage of *M. acuminata* may depend on the relative attractiveness of other plants in the community to herbivores.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Mecardonia acuminata* var. *acuminata* population to climate change. The species was assigned a rank from NatureServe's Climate Change Vulnerability Index using the associated tool (Version 3.02) to estimate its exposure, sensitivity, and adaptive capacity to changing climatic conditions in accordance with the guidelines described by Young et al. (2016) and the state climatic computations by Ring et al. (2013). Based on available data *M. acuminata* var. *acuminata* was assessed as Less Vulnerable, meaning that climate change is not expected to have a notable detrimental impact on its extent in New Jersey by 2050.

Shifting climatic conditions in New Jersey are resulting in higher temperatures, rising seas, more frequent and intense precipitation events, and increasing periods of drought (Hill et al. 2020). As a southern species, *M. acuminata* is not likely to be threatened by rising temperatures in New Jersey; in fact that might even facilitate its growth and northward spread. Delaware previously marked the northern end of the Axil-flower's range (Tatnall 1946) and its presence in that state was apparently somewhat tentative for decades (Clancy 1993). *M. acuminata* is now ranked S3 in Delaware, suggesting that it may have become somewhat more frequent there, and the New Jersey occurrence represents a recent northward range expansion for the species. The state's sole population is situated in a place that is not expected to be directly affected by sea level rise or increasing groundwater salinity in the next quarter century but does already experience some secondary effects such as inland flooding and storm surges (Pope and Gordon 1999, NJ Adapt 2023). The presence of *M. acuminata* on a barrier island in Florida (Herwitz and Wunderlin 1990) suggests that the species has some tolerance for periodic flooding. The most significant threat to local populations of this wetland plant from climate change is probably drought.

Management Summary and Recommendations

The habitat management strategies currently employed at the site of New Jersey's only *Mecardonia acuminata* var. *acuminata* occurrence appear to be beneficial to the species. Close monitoring of the newly established population could help to evaluate its progress and identify areas of potential concern. Searches of open, wet habitat in the vicinity or at other locations in the southern part of the state might turn up additional occurrences.

Cold tolerance does not seem to have been studied in the species and it would be useful to know whether temperature has played a role in determining the northern limits of its range. More definitive information regarding the pollinators of *Mecardonia acuminata* and its capacity for self-fertilization would also be helpful.

Synonyms

The accepted botanical name of the species is *Mecardonia acuminata* (Walter) Small var. *acuminata*. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b).

Botanical Synonyms

Common Names

Bacopa acuminata (Walter) B. L. Rob.
Bacopa acuminata var. *brevifolia* (Pennell) Standl.
Bacopa nigrescens (Benth.) Wettst.
Dasanthera cuneifolia Raf.
Gerardia cuneifolia Pursh
Herpestis nigrescens Benth.
Ilysanthes geniculata Raf.
Matourea nigrescens Benth.
Mecardonia acuminata var. *brevifolia* Pennell
Pagesia acuminata (Walter) Pennell
Pagesia leucantha Raf.

Axil-flower

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