

Dicentra canadensis

Squirrel Corn
Fumariaceae



Fritz Flohr Reynolds (2014)

***Dicentra canadensis* Rare Plant Profile**

New Jersey Department of Environmental Protection
Division of Parks and Forestry
New Jersey Forest Service
Office of Natural Lands Management
New Jersey Natural Heritage Program

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Life History

Dicentra canadensis, otherwise known as squirrel corn, is an herbaceous perennial in the Fumitory family (Fumariaceae). The species develops 1 to 2 basal leaves per flowering stem that are glaucous beneath and green-gray to brown in color. Its compound foliage is fern-like in appearance, with each leaf blade dividing into 1 terminal and 2 lateral pinnate-pinnatifid leaflets. Its inflorescence consists of 3 to 10 bilaterally symmetrical flowers borne in racemes, heart-shaped and about $\frac{3}{4}$ inch long and $\frac{1}{2}$ inch wide. Its fragrant flowers have been described as greenish-white tinged with yellow (Hilty 2020a) or pinkish-white tinged with lavender (Lady Bird Johnson Wildflower Center 2013). The petals enclose the ovary and 6 stamens, requiring pollinators to force apart the petal tips during pollination (Schemske et al. 1978). This tuberous spring ephemeral emerges aboveground shortly after snowmelt and consists of a primary tuber produced from the previous year, shallow roots, and a single photosynthetic leaf. The plant grows quickly and accumulates biomass at the base of the leaf stalk in order to form a new tuber as an energy reserve for the following year (Lin et al. 2016). The species flowers for an average of 12 days (Schemske et al. 1978) and reproduces either sexually or clonally before the deciduous trees leaf out fully. The plants fruit in early summer and become dormant until fall, when there is a brief period of subterranean vegetative activity, then become dormant again until the following spring (Stern 1961).

Similar Species

Plants of the subgenus *Dicentra* are acaulescent, and in all species either rhizomes, bulblets, tubers or a combination of bulblets and tubers are present. One species that occurs sympatrically with *Dicentra canadensis* is *Dicentra cucullaria*. The basal foliage of both species are nearly identical in appearance, so the most effective way to distinguish between the two species would be to look at their inflorescences. *D. cucullaria* has basally pointed outer petal spurs somewhat pointed at the apex, lacks fragrance, and flowers approximately 7 to 10 days before *D. canadensis*. Both species contain the toxic alkaloid cucullarine, known to cause narcosis, convulsions, and death in cattle (Stern 1961). Pollination dynamics and methods of seed dispersal are also identical in both species.



Figure 1. Flowers of *Dicentra cucullaria* (Pasqualina Rivetti 2020)

Pollination Dynamics

The flower morphology of *D. canadensis* attracts long-tongued insects, particularly butterflies such as *Celastrina ladon* and bees such as *Bombus griseocollis* (Hilty 2020b). Pollinators insert their maxillae and tongue between the tips of the outer petals and the tips of the inner ones and extend their tongues toward the nectar. Pollen is then removed and deposited by the pollinators head once it has contacted the essential flower parts (Macior 1978). One study identified flies in the family Syrphidae, and small halictid and anthophorid bees as occasional flower visitors. This particular study further indicated that *B. griseocollis* often selected *D. canadensis* over the sympatric *D. cucullaria* (Schemske et al. 1978). Lin et al. (2016) found that sexual reproduction occurred more frequently in populations located in continuous forests than in forest fragments – likely due to pollinator abundance in these habitats and how microhabitat conditions affect seed set and seedling survival.

Although *Dicentra canadensis* and *Dicentra cucullaria* are pollinated identically, a study on artificial pollination of *Dicentra* species by Macior (1978) showed that in the populations studied, nectar of both *D. canadensis* and *D. cucullaria* contained fructose and sucrose, but only the nectar of *D. canadensis* contained glucose. The study also revealed that pollen from *D. cucullaria* was somewhat fertile on *D. canadensis*, but pollen of *D. canadensis* was not fertile on *D. cucullaria* stigmas. Furthermore, the strong fragrance and high ultraviolet reflectivity of *D. canadensis* provided an advantage in the attraction of pollinators compared to that of *D. cucullaria*.

Seed Dispersal

Dicentra canadensis fruits in early summer around May. Fruit are ovoid capsules, tapering at both ends, 5 to 17 mm in length and 3 to 6 mm wide. Seeds are kidney-shaped, black and lustrous (Stern 1961). As with many ephemerals, *D. canadensis* relies on ants to aid in seed dispersal. *D. canadensis* seeds have fleshy structures, elaiosomes, that are rich in lipids and proteins. Attracted to the nutrient-rich elaiosome, ants will carry seeds to their nest, consume the elaiosome, and then discard the seed – effectively planting it.

Lin et al. (2016) studied the effects of natural and supplemental pollination treatments on seed production of *D. canadensis*. Plants produced no seed when pollinators were excluded, confirming that pollinator visits were required for the plant to produce seed. Additionally, the authors found that seed production varied greatly across sites and years, attributing this variation to highly variable pollinator activities in early spring. It should also be noted that they found significant variation in seed set when flowers were supplemented with outcross pollen, suggesting a strong influence of non-pollinator factors on sexual reproduction. Limited sexual reproduction and variations in seed sets, however, did not have a significant impact on population growth rates, emphasizing the importance of clonal reproduction.

As with many other seedlings which germinate under cool, moist conditions, those of *Dicentra* are subject to damping off disease. *Cerotelium dicentrae* is a rust fungus with brightly colored

specialized reproductive structures (aecia) that develop on the leaves of both *D. canadensis* and *D. cucullaria* after their seed capsules have matured (Stern 1961).

Habitat

Dicentra canadensis is found in rich, old-growth, mesic, deciduous forests throughout temperate eastern North America. Because of its specific habitat associations, it is considered unlikely to establish populations in secondary forests (Lin et al. 2016). Typical habitats include wooded bluffs, wooded slopes, ravines, shaded stream banks, the base of north facing slopes, and forested bottomlands of narrow valleys (Minnesota Department of Natural Resources 2005).

In New Jersey, the species has been documented growing in rich moist soil at the base of a limestone cliff in mixed deciduous woods; the edge of a thin oak-hickory-cherry woods in well-draining soil with a gneiss substrate; a ravine in a mixed conifer and hardwood forest; alluvial woods along small streams and wooded slopes; and a rich stream corridor on Triassic shale. Associated species in New Jersey include *Dicentra cucullaria*, *Thalictrum thalictroides*, *Allium tricoccum*, *Tsuga canadensis*, *Aquilegia canadensis*, *Polygonatum biflorum*, *Staphylea trifolia*, *Carex pennsylvanica*, *Schizachyrium scoparium*, *Danthonia spicata*, *Dryopteris marginalis*, *Carya ovata*, and *Quercus spp.* (New Jersey Natural Heritage Program. 2020. Biotics 5 database. Trenton, NJ).

Wetland Indicator Status

There is no wetland indicator status symbol associated with *Dicentra canadensis*; According to the US Army Corps of Engineers, any species not on the National Wetland Plant List is considered to be obligate upland (UPL) and almost never occurs in wetlands (NWPL 2018).

USDA Plants Code

DICA; USDA Plant Code for *Dicentra canadensis*
BICA4; *Bicuculla canadensis* (Goldie) Millsp.

Coefficient of Conservatism

CoC = 9, Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance (Walz et al. 2020).

Distribution and Range

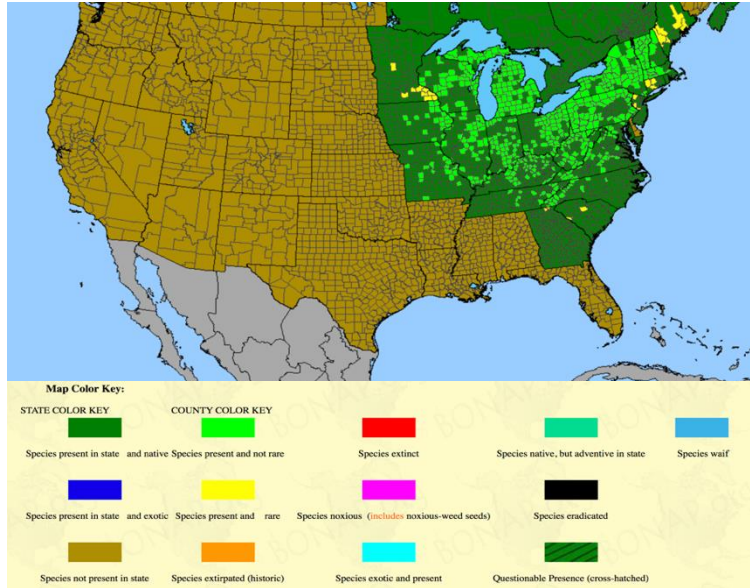


Figure 2. Distribution of *Dicentra canadensis* in North America (Kartesz 2015).

Figure 2 illustrates the distribution of *D. canadensis* in the northeastern United States. The dark green shaded regions indicate states in which the species is present and native, light green shaded regions indicate counties where the species is present and not rare, and yellow shaded regions indicate counties where the species is present and rare (Kartesz 2015).

Figure 3 provides county distribution of *D. canadensis* specifically in New Jersey. The species is shown to be found in Sussex, Hunterdon, Somerset and Mercer counties (USDA 2020), however there are no records for Somerset County in the NJNHP Biotics database (New Jersey Natural Heritage Program. 2020. Biotics 5 database. Trenton, NJ).

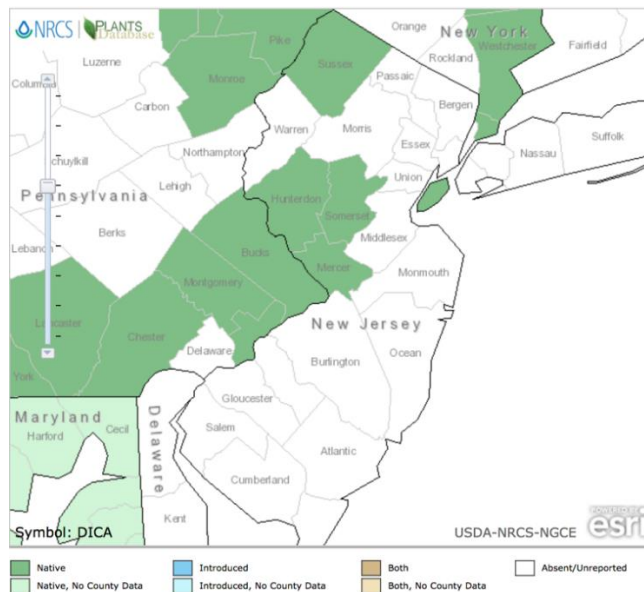


Figure 3. Distribution of *Dicentra canadensis* in New Jersey (USDA 2020)

Conservation Status

Dicentra canadensis is globally secure (G5) although it is rare in some parts of its range. In New Jersey, the species is listed as critically imperiled (S1) and is vulnerable to extirpation, with fewer than 5 remaining occurrences (New Jersey Natural Heritage Program 2020). Historic populations have been reduced by habitat destruction and invasive species.

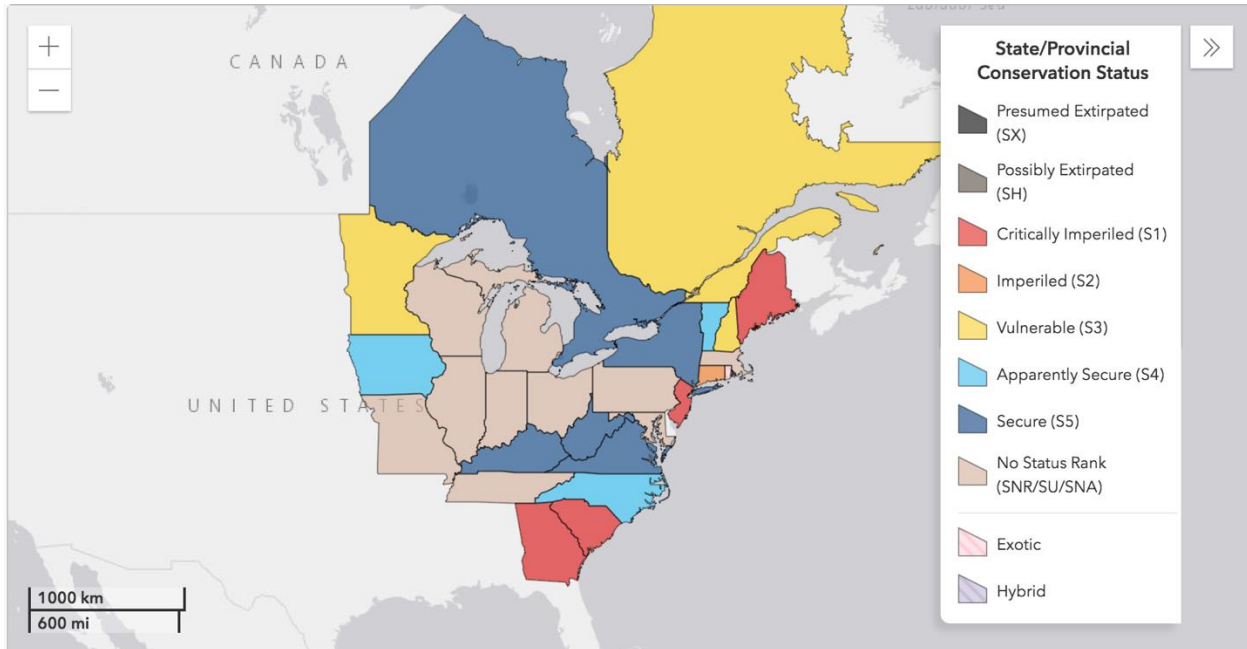


Figure 4. Conservation Status of *Dicentra canadensis* (NatureServe 2019).

The map in Figure 4 provides combined data on the conservation status of *D. canadensis* synthesized by the reports of individual heritage programs for each state. Throughout its range, the species is anywhere from secure (S5) to critically imperiled (S1).

The New Jersey List of Endangered Plant Species and Plant Species of Concern also indicates that *D. canadensis* is listed as State Endangered (E).

Threats

The most imminent threats to *Dicentra canadensis* are habitat destruction and invasion of non-native species. The species relies on late successional or climax communities and is unlikely to establish populations in secondary forests (Lin et al. 2016), consequently, habitat conversion has been a major cause for the decline in populations throughout the years and remaining habitat fragments are vulnerable to degradation. In recent years, a growing concern has become the aggressive spread of invasive plant species such as *Alliaria petiolata*, *Lonicera maackii*, and *Rhamnus cathartica* (Minnesota Department of Natural Resources 2005). In New Jersey, some populations have been overrun by *Alliaria petiolata*, *Lonicera japonica*, *Rubus phoenicolasius*, *Berberis thunbergii* and *Lonicera tatarica* (New Jersey Natural Heritage Program. 2020. Biotics 5 database. Trenton, NJ).

Management Summary and Recommendations

Because *Dicentra canadensis* relies on old-growth, undisturbed habitats, one goal for this species moving forward would be to maintain and protect the extant populations by preserving those habitats. In forest fragments where invasive species threaten to destroy the biotic community, an action-oriented approach may be necessary to physically remove those aggressive species.

Synonyms

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| Botanical Name | <i>Dicentra canadensis</i> |
| Botanical Synonym(s) | <i>Bicuculla canadensis</i> (Goldie) Millsp. <i>Capnorchis canadensis</i> (Goldie) Kuntze <i>Corydalis canadensis</i> Goldie <i>Diclytra canadensis</i> |
| Common Name(s) | Squirrel corn |

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