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MID-ATLANTIC REGION

DIVISION OF NATURAL SCIENCES

RESEARCH/RESOURCES MANAGEMENT REPORT

MAR-1

RARE AND ENDANGERED PLANT SPECIES WITHIN THE
NEW JERSEY PORTION OF THE DELAWARE WATER
GAP NATIONAL RECREATION AREA

U.S. DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE



MID-ATLANTIC REGIONAL OFFICE
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INTRODUCTION

This report was prepared to alert the National Park Service to 63 species of plants known to be extant or likely to be extant (based on past records) within the New Jersey portion of the Delaware Water Gap National Recreation Area (DWGNRA). The continued existence of these plants may be in serious jeopardy unless adequate measures are taken to plan for their protection. Within the past century, 4 of these species have been reported as extirpated in New Jersey (Snyder and Vivian 1981) because of the lack of recent confirmation of earlier reported stations. The proper use of the information in this report in park planning, management, operations, and interpretation will ensure that other species do not follow the same fate.

Of these 63 species, only Trollius laxus is threatened throughout its range in the United States and is therefore of national significance. Should, after the completion of the federal review process, Trollius laxus be declared a national threatened or endangered species, it would then receive the legal protection of the federal government.

The remaining 62 species are those which are generally found to be more common outside of New Jersey. As such, these species are of regional interest only and should be protected at the state level. At this time, New Jersey does not have an official state list of protected plant species or the laws necessary for their protection.

METHODS

Several sources were used to obtain information on the rare and endangered plant species of the DWGNRA. Records from the DWGNRA of the 186 species listed in the publication Rare and Endangered Vascular Plant Species in New Jersey (Snyder and Vivian 1981) as having occurrences in Sussex and Warren Counties were sought in the Chrysler Herbarium at Rutgers University and the herbarium of the Philadelphia Academy of Natural Sciences. Additional records were obtained by reviewing the pertinent literature, mainly Britton (1889) and Taylor (1915). Other records were gleaned from the personal records of Vincent Abraitys, Tom Halliwell, Richard Radis, and the writer. Although fieldwork was beyond the scope of this study, the results of several trips made by the writer in April, May, and June 1982 have been incorporated.

The species list in this report is arranged in phylogenetic order according to Gleason (1952). Nomenclature generally follows Fernald (1950), except for groups where more recent taxonomic revisions are available. Definitions and format of the annotated species list mainly follow those used by Snyder and Vivian (1981). The following terminology is used in this report to describe the status of species:

Extirpated--Those species of plants which are believed to no longer exist in New Jersey.

Endangered--An endangered species is one whose survival in New Jersey is in jeopardy. Its peril may result from destruction of habitat, over-exploitation by people, predation, adverse interspecific competition, disease, or because New Jersey is at the edge of its geographical range. An endangered species must receive protection or extinction will probably follow. (Fairbrothers and Hough 1973)

Rare--A rare species is not currently threatened with extinction, but it occurs in such small numbers in New Jersey that it may become endangered if its environment deteriorates further or other limiting factors are altered. Continued observation of its status is essential. (Fairbrothers and Hough 1973)

Undetermined--A species whose status is undetermined may be either rare, endangered, or extirpated in New Jersey, but currently

available information is inadequate to determine its status accurately. More information is needed to determine if the species now exists in dangerously low numbers in the state. (Fairbrothers and Hough 1973)

Included at the end of the "Comments" are the abbreviations of other states (enclosed in square brackets) in which the species being discussed is also in jeopardy.

ANNOTATED SPECIES LIST

Selaginella rupestris (L.) Spring

Rock Spike-moss

N.J. Status: Endangered (S&V*, p. 1)

Habitat: Dry, exposed rock ledges and ridgetops. Most frequently occurring on shale and trap rock, but occasionally found on gneiss.

Distribution in DWGNRA (last seen in 1982): Three extant stations are known; all are located on or in the immediate vicinity of Wallpack Ridge in Sussex County.

Comments: While once found with some frequency on the Watchung Mountains in Essex and Passaic Counties and on the Palisades in Bergen County, the species has now been virtually eliminated from the northeast section of the state by quarrying and the intense urbanization that has taken place in that region. Aside from the sites in Sussex County, only two other extant stations are currently known in the state. [DE, ME, MA]

Botrychium multifidum (Gmel.) Rupr.

Leathery Grape Fern

N.J. Status: Rare (S&V, p. 2; F&H[†], p. 10)

Habitat: A successional species found in old fields, thickets, and second growth woods.

Distribution in DWGNRA (last seen in 1963): The one known location is on the east slope of the Kittatinny Mountain in Warren County.

Comments: A northern species nearing the southern limit of its range. Whether the species is still present at this site is not known, as the station has not been searched in a number of years. Potential habitat exists throughout the DWGNRA, and new stations could likely be discovered.

*Snyder and Vivian (1981).

[†]Fairbrothers and Hough (1973).

Botrychium oneidense (Gilbert) House

Grape Fern

N.J. Status: Rare (S&V, p. 2)

Habitat: Open fields, thickets, and woodlands.

Distribution in DWGNRA (last seen in 1981): The two known stations are both located in fields in Sussex County.

Comments: While primarily a successional species, Botrychium oneidense appears to be more tolerant of shade and increased competition from other species than is B. multifidum.

Botrychium simplex Hitchc. var. simplex

Little Grape Fern

N.J. Status: Endangered (author)

Habitat: Grassy seepage slopes.

Distribution in DWGNRA (last seen in 1982): The single known station for this species in New Jersey is located along a road in Warren County.

Comments: Except for a disjunct population in Virginia, the species reaches the southern limit of its range in northern New Jersey and adjacent Pennsylvania. Until the discovery of the species in Warren County by the writer in 1981, its occurrence in New Jersey was unconfirmed. Earlier reports of this species in New Jersey were apparently incorrect (Chrysler and Edwards 1947). The habitat for this species in the park is extremely fragile, and excessive foot traffic in the area should be discouraged.
[VA]

Cheilanthes lanosa (Michx.) D.C. Eaton

Hairy Lip-fern

N.J. Status: Rare (S&V, p. 3; F&H, p. 10)

Habitat: Dry rock ledges, gravelly slopes, and on cliff faces.

Distribution in DWGNRA (last seen in 1982): The known stations for this species are on rocky ledges near the summit of Mt. Tammany, Warren County, and on a hilltop near Wallpack Center, Sussex County.

Comments: Like Selaginella rupestris, most stations for this species located in the northeast section of the state have reportedly been destroyed. Most modern records for the species are from sites along the Delaware River in Hunterdon and Warren Counties. [DE, NY]

Asplenium bradleyi D.C. Eaton

Bradley's Spleenwort

N.J. Status: Endangered (S&V, p. 4; F&H, p. 9)

Habitat: Rock ledges and in crevices of high cliffs of the Kittatinny Mountain.

Distribution in DWGNRA (last seen in 1980): A single station is known from the cliffs of the Kittatinny Mountain in Warren County.

Comments: A southern species nearing the northern limit of its range. It was feared that this colony of Asplenium bradleyi was destroyed by a recent construction project, but several plants have been sighted within the last few years. The only other known station for this species in New Jersey is located in Morris County. [MD]

Asplenium pinnatifidum Nutt.

Lobed Spleenwort

N.J. Status: Endangered (S&V, p. 4; F&H, p. 9)

Habitat: Cracks and crevices of cliffs.

Distribution in DWGNRA (last seen in 1939): A single station was located on cliffs on the southeast face of the Kittatinny Mountain in Stillwater Township, Sussex County.

Comments: This station is the northern-most one known for the species in the United States. While this station has not been relocated in recent years, much potential habitat exists within the DWGNRA, and perhaps new stations could be discovered.

Picea rubens Sarg.

Red Spruce

N.J. Status: Endangered (S&V, p. 5; F&H, p. 11)

Habitat: Rocky slopes and swamp margins.

Distribution in DWGNRA (last seen in 1981): Known to occur in two swamp margin sites, one in Warren County and one in Sussex County.

Comments: More common north of New Jersey. Easily confused with black spruce (Picea mariana) when cones are not present. [CT]

Poa languida Hitchc.

Weak Spear-grass

N.J. Status: Endangered (S&V, p. 12; F&H, p. 24)

Habitat: Grows in moist, sandy or rocky soil along streams and swamp margins.

Distribution in DWGNRA (last seen in 1914): Only one collection is known from moist woods at the Delaware Water Gap in Warren County.

Comments: This station has not been checked in recent years, but it is probably still extant. [VA]

Carex crawei Dew.

Crawe's Sedge

N.J. Status: Endangered (S&V, p. 14)

Habitat: Calcareous shores of the Delaware River.

Distribution in DWGNRA (last seen in 1982): The only modern record for this species in New Jersey is from a station along the banks of the Delaware River in Sussex County.

Comments: A northern species approaching the southern limit of its range. [CT, ME, NY, PA]

Carex viridula Michx.

Green Sedge

N.J. Status: Rare (S&V, p. 16)

Habitat: Calcareous shores of the Delaware River.

Distribution in DWGNRA (last seen in 1982): Known to occur along the Delaware River in Sussex County.

Comments: Reaches the southeastern limit of its range in northern New Jersey. Perhaps overlooked elsewhere along the Delaware. [CT, PA]

Eleocharis compressa Sulliv.

Compressed Spike-rush

N.J. Status: Rare (S&V, p. 17)

Habitat: Wet calcareous banks of the Delaware River.

Distribution in DWGNRA (last seen in 1982): The only two current stations reported for New Jersey are from the banks of the Delaware River in Sussex County..

Comments: The species is small and inconspicuous and may be discovered at other sites along the Delaware River. [NY, PA]

Scirpus pedicellatus Fern.

Pedicelled Bulrush

N.J. Status: Extirpated (S&V, p. 21)

Habitat: Rich, marshy alluvial woods along the Delaware River.

Distribution in DWGNRA (last seen in 1918): The only location ever reported for this species in New Jersey was in Sussex County.

Comments: The species reaches the southern limit of its range in northern New Jersey. Although the station for this species has been searched in recent years, the plant has not been rediscovered. Potential habitat still exists along the Delaware River, so persistent searching may discover new stations.

Lilium philadelphicum L.

Wood Lily

N.J. Status: Rare (S&V, p. 26)

Habitat: Moist fields, thickets, and open woods.

Distribution in DWGNRA (last seen in 1932): Along the Flat Brook in Sussex County.

Comments: The species seems to be declining in New Jersey, perhaps due to succession of its habitat or from overcollecting by wild-flower enthusiasts. [DE, RI]

Smilacina trifolia (L.) Desf.

Three-leaved Solomon's Seal

N.J. Status: Rare (S&V, p. 27)

Habitat: Grows in sphagnum of cold bogs, usually under black spruce.

Distribution in DWGNRA (last seen in 1980): This northern plant occurs in a number of bogs on the Kittatinny Mountain in Sussex County.

Comments: Most abundant in bogs on the Kittatinny Mountain, with a very few sites known also in Morris and Passaic Counties. Does not flower regularly in New Jersey.

Streptopus amplexifolius (L.) DC.
var. americanus Schultes

White Mandarin

N.J. Status: Endangered (S&V, p. 27; F&H, p. 27)

Habitat: Grows in moist soil along streams in hemlock ravines.

Distribution in DWGNRA (last seen in 1982): Only two stations for this species have been reported for New Jersey, both of which are located in the DWGNRA. One site is in Sussex County, and the second is in Warren County.

Comments: A northern species nearing southern limits. The species was only recently discovered in New Jersey by Vincent Abraitys in 1963. One of New Jersey's rarest plants. [CT, MA]

Corallorhiza trifida Chat.

Early Coral-root

N.J. Status: Rare (S&V, p. 29; F&H, p. 33)

Habitat: Grows in sphagnum of bogs, swamps, and wet woods; usually under hemlock or spruce.

Distribution in DWGNRA (last seen in 1952): The one recorded station is in a bog in Sussex County.

Comments: Extant stations are currently known only from the bogs and swamps of the Kittatinny Mountain in Sussex County. Small and inconspicuous, the species appears erratically and therefore is easily overlooked in some seasons. The species is more common north of New Jersey. [CT, RI, VA, WV]

Listera cordata (L.) R. Br.

Heart-leaved Twayblade

N.J. Status: Rare (S&V, p. 31; F&H, p. 36)

Habitat: Cold sphagnum bogs and swamp margins, often under conifers.

Distribution in DWGNRA (last seen in 1964): The two reported sites are in spruce bogs in Sussex County.

Comments: Except for one old report from Hudson County, all reports for this northern species have been confined to the bogs and swamps on the Kittatinny Mountain in Sussex County. The report of the species from Mercer County given by Britton (1889) is unverified and seems unlikely. [MA, NH, VA, WV]

Malaxis unifolia Michx.

Adder's Mouth

N.J. Status: Rare (S&V, p. 32; F&H, supplement)

Habitat: Sphagnum bogs and swamp margins.

Distribution in DWGNRA (last seen in 1965): The one known record is from a spruce bog in Sussex County.

Comments: This population, which numbered well over 100 individuals, may have been destroyed when its habitat was flooded due to dam construction by beavers. The area was searched in 1980, but no plants were observed. It is not unusual for this species to disappear unpredictably for several successive years, so it will be necessary to monitor this station carefully in the years that follow to determine whether or not the species has truly succumbed to flooding. [CT, DE]

Platanthera ciliaris (L.) Lindl.

Yellow Fringed Orchid

N. J. Status: Endangered (S&V, p. 33; F&H, p. 33)

Habitat: Moist thickets at edge of pond.

Distribution in DWGNRA (last seen in 1939): Collected only once within the DWGNRA from the shore of a pond in Warren County.

Comments: Primarily a southern species that becomes common south of New Jersey. This is the only recorded occurrence of the species from the Ridge and Valley Province in New Jersey, all other sightings having been made from the Piedmont and Coastal Plain section of the state. The species is protected by federal law in the New Jersey Pinelands. [CT, MA, NH, RI]

Platanthera flava (L.) Lindl.
var. herbiola (R. Br.) Luer

Pale Green Orchid

N.J. Status: Rare (S&V, p. 34)

Habitat: Grows in moist soil of open woods and thickets.

Distribution in DWGNRA (last seen in 1932): The only known collection is from Sussex County.

Comments: For reasons yet unknown, the species appears to be seriously declining in the state, with only one extant population known at present. Platanthera flava (L.) Lindl. var. flava was formerly under federal review. [DE, ME, MD, NH, PA, RI, VT, VA]

Spiranthes lucida (H.H. Eaton) Ames

Wide-leaved Ladies'-tresses

N.J. Status: Rare (S&V, p. 36; F&H, p. 36)

Habitat: Mossy seeps and other wet places on calcareous rocks of the Delaware River's shore.

Distribution in DWGNRA (last seen in 1982): Recent stations are known from the Delaware River's shore in Sussex County.

Comments: The habitat is fragile and is easily destroyed by being walked on. [DE, ME, NH, VA]

Spiranthes ochroleuca (Rydb.) Rydb.

Ladies'-tresses

N.J. Status: Undetermined (S&V, p. 36)

Habitat: Dryish roadside banks.

Distribution in DWGNRA (last seen in 1981): At present, the only extant population known for this species in New Jersey is located roadside in Warren County.

Comments: Difficult to separate from Spiranthes cernua (L.) Rich. and therefore perhaps more frequent than now believed.

Betula papyrifera Marsh.

Paper Birch

N.J. Status: Rare (S&V, p. 39)

Habitat: Grows at high elevations on dry ridgetops and rocky slopes.

Distribution in DWGNRA (last seen in 1981): Reported from within park boundaries at two areas of the Kittatinny Mountain. One station is along the Appalachian Trail in Warren County, and the other is located at the base of the Kittatinny Mountain in Sussex County.

Comments: Except for a disjunct population found in the mountains of West Virginia, this species reaches the southern limit of its range in northern New Jersey. [WV]

Arceuthobium pusillum Peck

Dwarf Mistletoe

N.J. Status: Endangered (S&V, p. 41; F&H, p. 30)

Habitat: Parasitic on black spruce.

Distribution in DWGNRA (last seen in 1937): The only reported location is from a black spruce bog/swamp along the Appalachian Trail in Warren County.

Comments: This northern species reaches the southern limit of its range in northern New Jersey. Although no plants were observed at this site during a search made in 1981, the species is probably still present, as its tiny size makes it decidedly difficult to spot. [CT, MA]

Polygonum cilinode Michx.

Fringed Bindweed

N.J. Status: Rare (S&V, p. 42)

Habitat: Shaded stream banks, moist or dry woods, and rocky slopes.

Distribution in DWGNRA (last seen in 1981): Has been collected from the banks of the Delaware River in Sussex County and from the Delaware Water Gap in Warren County.

Comments: Easily overlooked and probably more frequent than now supposed.

Silene nivea (Nutt.) Otth

Snowy Champion

N.J. Status: Rare (author)

Habitat: Alluvial stream banks of the Delaware River.

Distribution in DWGNRA (last seen in 1980): In New Jersey, this species has been found only in two areas of northern Sussex County.

Comments: This species has been only recently discovered in New Jersey (1980). Continued searching could reveal new colonies.
[WV]

Stellaria calycantha (Ledeb.) Bong.

Mountain Starwort

N.J. Status: Rare (S&V, p. 43; F&H, p. 39)

Habitat: Boggy areas along streams and at edges of swamps.

Distribution in DWGNRA (last seen in 1884): Collected from the Kittatinny Mountain in Sussex County.

Comments: A northern species. It is not known whether the species is still present at this site, as no efforts to relocate the station are known to have been made in recent years. [WV]

Nuphar microphyllum (Pers.) Fern.

Small Yellow Water-lily

N.J. Status: Undetermined (S&V, p. 44)

Habitat: Grows in quiet waters of ponds, lakes, and streams.

Distribution in DWGNRA (last seen in 1958): The species is known from a pond site and from a site in the Delaware River, both in Warren County.

Comments: A northern species which reaches its southern limit in New Jersey. Although not checked in recent years, these stations may still be extant. [ME, PA]

Anemone riparia Fern.

River Bank Thimbleweed

N.J. Status: Rare (S&V, p. 45)

Habitat: Rocky banks along the Delaware River.

Distribution in DWGNRA (last seen in 1982): Occurs along the banks of the Delaware River in Sussex County.

Comments: A northern species approaching the southern limit of its range. The only other extant station reported for the state is in Hunterdon County. Sometimes confused with A. virginiana L. and may be more frequent than now believed. [MD, PA]

Clematis verticillaris, DC.

Mountain Clematis

N.J. Status: Rare (S&V, p. 45; F&H, p. 15)

Habitat: Rocky, wooded hillsides and talus slopes.

Distribution in DWGNRA (last seen in mid-1960's): Recorded as occurring on the Water Gap by Britton (1889). Fairly recently seen at the base of Kittatinny Mountain in Sussex County.

Comments: Undoubtedly occurs elsewhere in the park, as potential habitat for the species is extensive. [DE, ME, MD, RI, WV]

Ranunculus fascicularis Muhl.

Early Buttercup

N.J. Status: Rare (S&V, p. 46)

Habitat: Dry soil of thinly wooded slopes and ridgetops.

Distribution in DWGNRA (last seen in 1981): The only extant station reported for New Jersey is located on a dry ridgetop in Sussex County.

Comments: The species is often confused with R. hispidus and unvouchered reports of R. fascicularis that are complete enough to identify at the Chrysler Herbarium, Rutgers University, proved to be R. hispidus. The only authentic sighting for this species in New Jersey is the one discovered by Vincent Abraitys in Sussex County.

Ranunculus longirostris Godr.

White Water Crowfoot

N.J. Status: Rare (S&V, p. 46; F&H, p. 16)

Habitat: Slow waters (often calcareous) of ponds, lakes, and streams.

Distribution in DWGNRA (last seen in 1980): The one population for this species found within the park is in the Flat Brook in Sussex County.

Comments: Appears to be increasing in numbers in recent years. [CT, DE, MA, NH, VA]

Ranunculus reptans L. var.
ovalis (Bigel.) T. & G.

Creeping Spearwort

N.J. Status: Extirpated (S&V, p. 47)

Habitat: Muddy shore of the Delaware River.

Distribution in DWGNRA (last seen in 1884): Occurred formerly on the shore of the Delaware River in Warren County.

Comments: At the southeast limit of its range. Very rare in New Jersey, having been collected at only two other additional locations in the state, both prior to 1900. A tiny, inconspicuous plant that is easily overlooked. Continued, careful searching is recommended.

Ranunculus trichophyllus Chaix.

White Water Crowfoot

N.J. Status: Rare (S&V, p. 47)

Habitat: In water of lakes, ponds, and streams.

Distribution in DWGNRA (last seen in 1973): Known from two stations in Sussex County, one of which is along the Delaware River.

Comments: This formerly widespread species was once known from 11 counties in New Jersey. Today, the species is known only from the Delaware River site listed above and from a few sites in the Musconetcong River in Morris County. Unless in flower, the species is easily overlooked. Approaching the northern limit of its range. [VA]

Trollius laxus Salisb.

Spreading Globe Flower

Federal Status: Under review as a threatened or endangered species (Federal Register, Vol. 45, No. 242, December 1980)

N.J. Status: Rare (S&V, p. 47; F&H, p. 16)

Habitat: Prefers calcareous soils of wet pastures, meadows, and swamp margins.

Distribution in DWGNRA (last seen in 1928): The only known record is from a meadow along the Flat Brook in Sussex County.

Comments: Reaches the southeast limit of its range in northern New Jersey. This station for Trollius laxus is a relict of a time when the species was more frequent and widespread in northern New Jersey. Today, although locally abundant at some sites, the species is restricted to a relatively narrow belt of limestone running through Sussex and Warren Counties. Modern records of Trollius laxus stations found outside of this area are rare and few in number. A brief search of the DWGNRA site made in May 1982 by the writer failed to produce any plants of Trollius laxus. However, the habitat appears to be undisturbed and a more thorough survey should be made. [CT, NY, PA]

Dicentra canadensis (Goldie) Walp.

Squirrel Corn

N.J. Status: Endangered (S&V, p. 48; F&H, p. 14)

Habitat: Rich, moist woods.

Distribution in DWGNRA (last seen in 1982): The one known station is located along a road in Sussex County.

Comments: The only other known station for this species is in Hunterdon County. Both stations could be eliminated by road widening.

Dicentra exima (Ker.) Torr.

Wild Bleeding Heart

N.J. Status: Undetermined (S&V, p. 48; F&H, p. 15)

Habitat: In cracks and on ledges of high cliffs.

Distribution in DWGNRA (last seen in 1963): The only known native station in New Jersey is from the cliffs of the Delaware Water Gap, Warren County.

Comments: Approaching the northern limit of its range. A single plant was observed at this site in 1963. The precipitous habitat preference of this species makes field verification extremely challenging. [MD]

Cardamine rotundifolia Michx.

Mountain Water Cress

N.J. Status: Endangered (S&V, p. 49; F&H, p. 31)

Habitat: Grows on wet, dripping rocks, in seeps, and in springy ground along brooks.

Distribution in DWGNRA (last seen in 1982): The three known occurrences for this species in New Jersey are confined to the western base of Kittatinny Mountain in Warren County: an old collection, a known wet, swampy area, and a third station, located near the Water Gap, reported to have been destroyed by the construction of I-80.

Comments: Reaches the northern limit of its distribution in New York State. The species is not obvious, even when in flower, amongst the tangle of other low herbs in which the species often grows. A careful search for this species in likely habitats could be productive. [NY]

Dentaria diphylla Michx.

Two-leaved Toothwort

N.J. Status: Rare (S&V, p. 49)

Habitat: Grows in rich woods along streams and in ravines.

Distribution in DWGNRA (last seen in 1982): Known from a ravine site in Warren County; also along a stream and from a ravine in Sussex County.

Comments: Most modern records for this species are from extreme northwest Sussex and Warren Counties. More common north of New Jersey.

Ribes glandulosum Grauer

Skunk Currant

N.J. Status: Endangered (S&V, p. 50; F&H, p. 41)

Habitat: Cold, shaded gulley at base of talus slope.

Distribution in DWGNRA (last seen in 1981): Known from only one station in New Jersey, the base of Kittatinny Mountain in Sussex County.

Comments: The report in Britton (1889) of the species' occurrence in Bergen County is unverified and seems unlikely. [CT, VA]

Ribes hirtellum Michx.

Smooth Gooseberry

N.J. Status: Rare (S&V, p. 50)

Habitat: Rocky or swampy woods; often calcareous.

Distribution in DWGNRA (last seen in 1884): The two known reports are from the Delaware Water Gap, Warren County, and from Montague Township, Sussex County.

Comments: No recent sightings in the DWGNRA are known.

Spiraea alba Du Roi

Meadow Sweet

N.J. Status: Rare (S&V, p. 52)

Habitat: Rocky banks along the Delaware River.

Distribution in DWGNRA (last seen in 1982): The only known occurrence of the species is from the banks of the Delaware River in Montague Township, Sussex County.

Comments: Possibly overlooked and may be more common than now believed.
[DE]

Waldsteinia fragarioides (Michx.) Tratt.

Barren Strawberry

N.J. Status: Rare (S&V, p. 52; F&H, p. 40)

Habitat: Moist woods and stream banks.

Distribution in DWGNRA (last seen in 1980): The only known station is from a spruce bog in Sussex County.

Comments: In New Jersey, the species is apparently restricted to limestone soils in a relatively small area of Sussex and Warren Counties. [CT, ME, MA, NH]

Vicia americana Muhl.

Purple Vetch

N.J. Status: Rare (S&V, p. 55)

Habitat: Dry, rocky banks or wooded bluffs along the Delaware River.

Distribution in DWGNRA (last seen in 1982): Three stations are known, two in Sussex County and one in Warren County.

Comments: Both Sussex County stations are known to be extant.

Ilex montana (T. & G.) Gray

Mountain Holly

N.J. Status: Rare (S&V, p. 57; F&H, p. 26)

Habitat: Rich, moist woods.

Distribution in DWGNRA (last seen in 1967): The one known station is from woods surrounding a spruce bog in Sussex County.

Comments: Easily overlooked if not in flower or fruit. The species is more common to the west of New Jersey. [MA]

Panax quinquefolius L.

Ginseng

N.J. Status: Rare (S&V, p. 63; F&H, p. 22)

Habitat: Grows under hemlocks in moist soil of a steep, rocky slope.

Distribution in DWGNRA (last seen in 1981): The one record for this species in DWGNRA is from woods at the Delaware Water Gap, Warren County.

Comments: Recently dropped from federal review (Federal Register, Vol. 45, No. 242, December 1980) as a threatened or endangered species. The species is vulnerable to overcollection for commercial exploitation. [CT, DE, ME, MD, MA, NH, NY, PA, VT, VA]

Cornus canadensis L.

Bunchberry

N.J. Status: Rare (S&V, p. 64)

Habitat: Cold, wet woods, bog, and swamp margins.

Distribution in DWGNRA (last seen in 1981): Occurs rather frequently along the Appalachian Trail in Warren County. Has also been collected from a spruce bog in Sussex County.

Comments: A northern species nearing the southern limit of its range. [MD, VA]

Kalmia polifolia Wang.

Pale Laurel

N.J. Status: Endangered (S&V, p. 65; F&H, p. 25)

Habitat: Grows in sphagnum of cold spruce bogs, in sun or shade.

Distribution in DWGNRA (last seen in 1962): The only known locations are from a spruce bog in Sussex County and from a swamp in Warren County.

Comments: Reaches the southern limit of its range in northern New Jersey.

Rhododendron canadense (L.) Torr.

Rhodora

N.J. Status: Endangered (S&V, p. 66; F&H, p. 26)

Habitat: In New Jersey, the species is found in wet to dryish thickets, or sometimes in sphagnous bogs.

Distribution in DWGNRA (last seen in 1959): A few plants have been reported from along the Appalachian Trail in Warren County.

Comments: The species reaches the southern limit of its range in New Jersey. Although searched for in recent years, no extant stations are known for the state. [CT]

Vaccinium oxycoccus L.

Small Cranberry

N.J. Status: Rare (S&V, p. 66; F&H, p. 26)

Habitat: Cold sphagnous bogs.

Distribution in DWGNRA (last seen in 1981): The one station known for the DWGNRA is from a swamp area in Warren County.

Comments: Near the southern limit of its range. Small and easily overlooked and possibly more common than records now indicate.

Apocynum sibiricum Jacq.

Clasping-leaved Dogbane

N.J. Status: Rare (S&V, p. 69)

Habitat: Rocky or gravelly banks of the Delaware River.

Distribution in DWGNRA (last seen in 1982): In New Jersey, the species is confined to the upper Delaware River shores in Sussex and Warren Counties.

Comments: Perhaps more frequent than collections now indicate. [DE]

Asclepias variegata L.

White Milkweed

N.J. Status: Endangered (S&V, p. 70; F&H, p. 29)

Habitat: Open woods in sandy soil.

Distribution in DWGNRA (last seen in 1884): Known from a single collection from woods near the Delaware River in Sussex County.

Comments: In New Jersey, this is the only record of occurrence for the species north of the Piedmont. Primarily a southern species. [CT, PA]

Asclepias verticillata L.

Whorled Milkweed

N.J. Status: Rare (S&V, p. 71)

Habitat: Dry, rocky ledges.

Distribution in DWGNRA (last seen in 1979): The one known station for this species is at the Delaware Water Gap, Warren County.

Comments: Much potential habitat exists in the DWGNRA, and new stations may be found if searched for.

Monarda didyma L.

Oswego Tea

N.J. Status: Endangered (S&V, p. 74; F&H, p. 30)

Habitat: Open, alluvial woods and stream banks.

Distribution in DWGNRA (last seen in 1980): Native populations are known from woods along the Delaware River and from roadside woods in Sussex County. In Warren County, the species has been collected from along a stream.

Comments: The species is frequently planted in gardens and often escapes from cultivation. In New Jersey, the species is believed to be native only in the upper Delaware Valley.

Castilleja coccinea (L.) Spreng.

Indian Paint Brush

N.J. Status: Endangered (S&V, p. 74; F&H, p. 46)

Habitat: Moist to wet soil in fields and meadows.

Distribution in DWGNRA (last seen in 1928): Known from a single collection made from a meadow along the Flat Brook in Sussex County.

Comments: A difficult species to monitor--in one season it may be very abundant at a site, becoming rare in succeeding years, and perhaps disappearing completely. The DWGNRA station has not been searched for in a number of years and its status there is not known. [DE, NH, RI]

Justicia americana (L.) Vahl.

Water Willow

N.J. Status: Rare (S&V, p. 78)

Habitat: In shallow water or on muddy or rocky shores of the Delaware River.

Distribution in DWGNRA (last seen in 1980): The two known stations for this species in the DWGNRA are both in Sussex County along the Delaware River.

Comments: Until its discovery in the DWGNRA in 1980, this species was not known to occur in the state north of Hunterdon County. Except for one old collection from the Raritan River, all known stations for the species are from the Delaware River. [DE, VT]

Campanula americana L.

Tall Bellwort

N.J. Status: Extirpated (S&V, p. 81)

Habitat: Moist woods and stream banks.

Distribution in DWGNRA (last seen in the 1800's): Listed in Britton (1889) as occurring at the Delaware Water Gap in Warren County.

Comments: While no extant herbarium species are known to verify the occurrence of this species in New Jersey, the frequency in which it occurs across the river in adjacent Pennsylvania would seem to lend credence to these early reports.

Lobelia dortmanna L.

Water Lobelia

N.J. Status: Extirpated (S&V, p. 82; F&H, p. 28)

Habitat: Grows on sandy shores or in shallow water of high-altitude ponds and lakes.

Distribution in DWGNRA (last seen in 1936): Two stations are known, one in Warren County and one in Sussex county.

Comments: Reaches the southern limit of its range in the mountains of northern New Jersey. Unless in flower, the species is not easy to spot amongst the tall shore-line vegetation in which it often grows. No extant stations are presently known for the species in New Jersey. Possibly still extant at the Warren County site and should be searched for.

Aster ericoides L.

Heath Aster

N.J. Status: Rare (S&V, p. 83)

Habitat: Dry, rocky banks of the Delaware River.

Distribution in DWGNRA (last seen in 1982): Known to be present on the Delaware River shore in Warren County and in Sussex County.

Comments: The species is more common west of New Jersey. Often confused with Aster pilosus and its many varieties. [DE, PA]

Aster infirmus Michx.

Cornel-leaved Aster

N.J. Status: Undetermined (S&V, p. 83)

Habitat: Rocky banks of moist or dry woods.

Distribution in DWGNRA (last seen in 1887): The one record for the DWGNRA is from woods at the Delaware Water Gap, Warren County.

Comments: For reasons yet unknown, the species seems to be declining in New Jersey. [MA]

Aster prenanthoides Muhl.

Crooked-stemmed Aster

N.J. Status: Endangered (S&V, p. 84)

Habitat: Grows on either alluvial or rocky banks of the Delaware River.

Distribution in DWGNRA (last seen in 1981): Only three extant stations are known for this species in New Jersey, all from the DWGNRA.

Comments: Approaching the southern limit of its range. In New Jersey, the species is confined to the shores of the Delaware River in Hunterdon, Sussex, and Warren Counties. [CT, MA]

Polymnia uvedalia L.

Bearsfoot

N.J. Status: Endangered (S&V, p. 88; F&H, p. 19)

Habitat: Open woods and pastures.

Distribution in DWGNRA (last seen in 1981): The only known extant station for this species in New Jersey is located in Sussex County.

Comments: Approaching the northern limit of its range. In addition to the above location, the species has been collected at only two other sites in New Jersey, neither of which are known to be extant. [NY]

DISCUSSION

Sixty-one species of plants designated as being of extirpated, endangered, rare, or undetermined status in Snyder and Vivian (1981) were found to have records of occurrence in the DWGNRA. This number represents approximately 15 percent of the 388 species of rare and endangered New Jersey plants listed in that publication. Two species which do not appear on any known listing of New Jersey rare and endangered plants have been included in this survey. These species, Botrychium simplex Hitchc. var. simplex and Silene nivea (Nutt.) Otth, have both been only recently discovered (1981 and 1980, respectively) in the state and are considered by the author to be of significantly rare occurrence to warrant protection.

Of the 63 New Jersey rare and endangered plant species which have been found within the boundaries of the DWGNRA, only one, Trollius laxus Salisb., is of national importance. Trollius laxus, a spreading globe flower which is restricted to the five northeastern states of Connecticut, New Jersey, New York, Ohio, and Pennsylvania, is currently under federal review as being either threatened or endangered throughout its range in the United States (Federal Register, Vol. 45, No. 242, December 1980). The one known station for Trollius laxus within the DWGNRA is located along the Flat Brook in Sussex County, but its status there is not known, as it was last observed there in 1928. Eight extant stations for Trollius laxus are currently known for New Jersey but, of these, only one occurs on lands under state or federal jurisdiction.

The remaining 62 species are comprised of plants which are generally more common outside of New Jersey. The primary reason for their rarity in the state is that New Jersey is located at or very near the southern, northern, or eastern terminus of their geographic ranges in the United States. Thirty-four of these 62 species (approximately 54 percent) are of northern affinities, with New Jersey at or near the southern limit of their geographical distribution in the United States. This is not a high number when considering the fact that some of New Jersey's greatest elevations and subsequently coldest habitats are found within the DWGNRA. Nine species (about 14 percent) approach or are at the northern limit of their geographical ranges in the United States. Five of these, Cheilanthes lanosa, Asplenium bradleyi, A. pinnatifidum, Dicentra exima, and Cardamine rotundifolia, are montane species which find their greatest abundance in the southern Appalachian Mountains. Two, Platanthera ciliaris and Asclepias variegata, are southern coastal plain species and, as such, are exceptionally rare occurrences for the Ridge and Valley Province in New Jersey. Two species, Ilex montana and Aster ericoides (approximately 3 percent), are at the eastern limit of their ranges in the

United States. The 18 remaining species (29 percent) can be characterized as wide-ranging species, having large ranges which include most of the eastern United States.

Four of the 63 species have been designated as being extirpated in New Jersey, with 20 species considered as endangered, 35 as rare, and 4 species of undetermined status.

Forty-four species are considered to be extant in the DWGNRA, having been seen or collected within the last 15 years or so. Twenty-nine of these species have been observed in the DWGNRA within the last 2 years by the writer. Although the presence of the other 19 species has not been confirmed for more than 15 years, at least 13 of these are probably still present and could likely be relocated.

Species of Special Concern

While the 63 species of plants listed in this report are all considered to be quite rare in New Jersey, not all are in immediate danger of extinction. Many of these species either occur in sufficient numbers in the DWGNRA or additional stations are known from other areas of the state, some of which are on lands which are under state or federal jurisdiction, so that the continued survival of these species appears to be relatively secure at the present time.

The 23 species listed in Table 1 are recommended for special protection. These species represent some of New Jersey's rarest plants. The distribution of most of these species in New Jersey is restricted to the DWGNRA or its immediate vicinity. Unless special steps are taken to preserve these species, their extinction in New Jersey within the foreseeable future is a distinct possibility.

Habitat Protection

Given the large number of species (63) to be protected and the enormous acreage embraced by the DWGNRA, it would seem that the only practical approach to their preservation is the identification and protection of critical habitat. To protect individual species on a station-by-station basis would be both a logistic and management impossibility.

The following areas are believed to be the most significant and ecologically sensitive botanical sites located within the New Jersey portion of the DWGNRA:

Table 1. Rare and endangered plant species of the DWGNRA which should receive special protection.

<u>Botrychium simplex</u> var. <u>simplex</u>	<u>Ranunculus reptans</u>
<u>Asplenium bradleyi</u>	<u>Trollius laxus</u>
<u>Asplenium pinnatifidum</u>	<u>Dicentra canadensis</u>
<u>Picea rubens</u>	<u>Dicentra exima</u>
<u>Carex crawei</u>	<u>Cardamine rotundifolia</u>
<u>Eleocharis compressa</u>	<u>Ribes glandulosum</u>
<u>Scirpus pedicellatus</u>	<u>Kalmia polifolia</u>
<u>Streptopus amplexifolius</u>	<u>Rhododendron canadense</u>
<u>Platanthera ciliaris</u>	<u>Lobelia dortmanna</u>
<u>Arceuthobium pusillum</u>	<u>Aster prenanthoides</u>
<u>Silene nivea</u>	<u>Polymnia uvedalia</u>
<u>Ranunculus fascicularis</u>	

1. Delaware Water Gap/Dunnfield Creek
2. Tock's Swamp
3. Wallpack Ridge
4. Crater Lake
5. Sambo Island/Flatbrookville
6. Dingman's Ferry Bridge Crossing
7. Montague

Approximate and tentative boundaries for each critical area have been presented to the National Park Service for protection consideration. More complete field surveys are needed to accurately delineate the proposed sites. Three criteria were considered in the selection of these critical areas:

- a. The area had to contain a high number of rare and endangered plant species.
- b. The area had to contain habitat which is rare or restricted in New Jersey.
- c. The area had to be particularly fragile or sensitive to disturbance.

It is significant to note that 55 species, or 87 percent of all rare and endangered species listed for the DWGNRA in this report, have been documented as occurring in these seven relatively small areas (Table 2). In addition, 17 other species that can be classified as being highly infrequent or of special interest in New Jersey are also known to occur in these areas (Table 3).

Table 2. Rare and endangered plant species that have been recorded from the seven proposed critical areas.

<u>Selaginella rupestris</u>	<u>Ranunculus trichophyllus</u>
<u>Cheilanthes lanosa</u>	<u>Trollius laxus</u>
<u>Asplenium bradleyi</u>	<u>Dicentra canadensis</u>
<u>Asplenium pinnatifidum</u>	<u>Dicentra exima</u>
<u>Picea rubens</u>	<u>Dentaria diphylla</u>
<u>Poa languida</u>	<u>Ribes glandulosum</u>
<u>Carex crawei</u>	<u>Spiraea alba</u>
<u>Carex viridula</u>	<u>Waldsteinia fragarioides</u>
<u>Eleocharis compressa</u>	<u>Vicia americana</u>
<u>Scirpus pedicellatus</u>	<u>Ilex montana</u>
<u>Lilium philadelphicum</u>	<u>Panax quinquefolius</u>
<u>Smilacina trifolia</u>	<u>Cornus canadensis</u>
<u>Corallorhiza trifida</u>	<u>Kalmia polifolia</u>
<u>Listera cordata</u>	<u>Rhododendron canadense</u>
<u>Malaxis unifolia</u>	<u>Vaccinium oxycoccus</u>
<u>Platanthera flava</u> var. <u>herbiola</u>	<u>Apocynum sibiricum</u>
<u>Spiranthes lucida</u>	<u>Asclepias variegata</u>
<u>Spiranthes ochroleuca</u>	<u>Asclepias verticillata</u>
<u>Betula papyrifera</u>	<u>Monarda didyma</u>
<u>Arceuthobium pusillum</u>	<u>Castilleja coccinea</u>
<u>Polygonum cilinode</u>	<u>Justicia americana</u>
<u>Silene nivea</u>	<u>Campanula americana</u>
<u>Nuphar microphyllum</u>	<u>Lobelia dortmanna</u>
<u>Anemone riparia</u>	<u>Aster ericoides</u>
<u>Clematis verticillaris</u>	<u>Aster infirmus</u>
<u>Ranunculus fascicularis</u>	<u>Aster prenanthoides</u>
<u>Ranunculus longirostris</u>	<u>Polymnia uvedalia</u>
<u>Ranunculus reptans</u> var. <u>ovalis</u>	

Table 3. Species that are highly infrequent or of special interest in New Jersey and are known to be found in the seven proposed critical areas.

<u>Asplenium montanum</u>	<u>Podostemum ceratophyllum</u>
<u>Woodsia ilvensis</u>	<u>Hypericum pyramidatum</u>
<u>Carex hitchcockiana</u>	<u>Campanula rotundifolia</u>
<u>Aristolochia serpentaria</u>	<u>Gentiana crinita</u>
<u>Oxalis violacea</u>	<u>Galium boreale</u>
<u>Opuntia compressa</u>	<u>Hypericum ellipticum</u>
<u>Pinus virginiana</u>	<u>Potentilla arguta</u>
<u>Senecio pauperculus</u>	<u>Polygala paucifolia</u>
<u>Trillium erectum</u>	

Potential Rare and Endangered Plant Species in the DWGNRA

According to Snyder and Vivian (1981), approximately 250 of the 388 species they list as being rare or endangered have or have had occurrences in the counties of northern New Jersey. If only those species reported from Sussex and Warren Counties are considered the most likely to have possible occurrences in the DWGNRA, the number of potential species is 186, or nearly half the total number of rare and endangered plant species listed for New Jersey. While the probability is high that many of these species do occur in the DWGNRA, to speculate on what specific species might or might not be found would serve no useful purpose. The determination of any additional species which may occur in the DWGNRA should be made through actual field work and the "Annotated Species List" given in this report should be adjusted accordingly.

Of the 19 nationally significant species found in New Jersey,* only 4 are found in northern New Jersey. Isotria medeoloides is listed by the federal government as an endangered species; and Isoetes eatonii, Helonias bullata, and Trollius laxus are currently under federal review as being threatened or endangered species.

Helonias bullata L., a southern species which reaches its northern limit in New Jersey, is, except for a few disjunct populations in Morris County, restricted to the coastal plain in New Jersey. Its possible occurrence in the DWGNRA seems remote.

*See Snyder and Vivian (1981), Tables I and II, p. iv-v.

Isoetes eatonii Dodge, a small, inconspicuous aquatic plant, has been collected from only two lakes in northern Morris and Sussex Counties. Considering that the species generally grows in 2 to 3 feet of water and is often difficult to identify, it is not unlikely that additional stations for this species have been overlooked in the state. Careful searching of the natural lakes located within the DWGNRA may reveal new stations.

As discussed in a previous section, the one historic record for Trollius laxus Salisb. in the DWGNRA is from a limey meadow along the Flat Brook in Sussex County. The species shows a preference for wet, limestone-rich soils and any future field searches made for this species should target similar habitats.

While there are no known collections or reports of Isotria medeoloides (Pursh) Raf. for the New Jersey side of the DWGNRA, its occurrence there seems highly probable for several reasons. The type locality of the species is the Blue (Kittatinny) Mountains of New Jersey and Pennsylvania. The species has been collected from the Delaware Water Gap in Pennsylvania. The two most recent stations in New Jersey are both located at sites on the Kittatinny Mountain within a few miles of the boundaries of the DWGNRA. Since Isotria medeoloides prefers moist to dry acid soils of open deciduous woods, extensive potential habitat for the species exists in the DWGNRA. Considering the above information, it is not unreasonable to expect that, with persistent field work, new stations for this orchid could be discovered in the DWGNRA.

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