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Selected Rare and Historical Vascular Plants of Delaware

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Botanists and zoologists with the Delaware Natural Heritage Inventory (DNHI) are responsible for surveying the entire state for rare species and significant natural communities. A major challenge of this work is to assess the rare flora and fauna, a task made even more difficult by the dynamic nature of the biota. A formerly common species may become rare due to habitat destruction, and conversely, as more field work is undertaken, a species previously believed rare may be found to be more common.

DNHI has developed a list of rare native plants (McAvoy 1993). The list, which is updated annually, depends on input from many sources: experts in the field, literature, herbarium collections, and field surveys. Tatnall (1946) provided substantial, and important, historical information on the Delaware flora including species he considered rare or no longer extant. Phillips (1978) was unable to relocate 338 species reported by Tatnall. Tucker et al. (1979) designated 450 taxa as rare, endangered, possibly extirpated, or status uncertain, and recognized the need for more thorough field work.

Over the past five years, intensive botanical field work has resulted in new information on the distribution and abundance of many species. These data are used to assess status. Although information from literature sources and herbarium collections form the framework, the development of the list is driven by intensive field surveys.

When a rare species is discovered, detailed information is gathered on population ecology, areal extent, co-occurring species, habitat description, etc. Locations are mapped on USGS topographic maps, and the record of the species is entered into the DNHI database (DNHI 1993). Herbarium voucher collections are made with prudence (i.e. collecting is avoided if population is small, or species is known from only a few populations).

Of the 2259 taxa listed by Tatnall (1946) as native, naturalized, or otherwise occurring on the Delmarva Peninsula; nearly 93% were present in Delaware (Tucker et al. 1979). Inventory work undertaken since Tatnall's publication, and particularly during the past five to ten years, has shown that many of the remaining 7% are also present in the state (e.g. *Alopecurus aequalis, Hypericum drummondii, Juncus torreyi, Mecardonia acuminata, Passiflora incarnata*). In addition, many other species which have been found in Delaware since 1946, are also new to the flora of the Delmarva Peninsula (e.g. *Carex projecta, Isotria medeoloides, Listera australis, Panicum hirstii, Pellaea atropurpurea, Sanicula trifoliata, Schizaea pusilla*).

The information presented in this paper has been updated since the 1991 symposium to reflect new data from 1991 and 1992 field surveys. Nomenclature generally follows Gleason and Cronquist (1991).

RARE SPECIES

On-going botanical field surveys in potentially suitable habitats and at historical sites throughout the state suggest that the following species are rare in Delaware. All those discussed below are ranked S1 (extremely rare; 5 or fewer known occurrences in the state)

by DNHI. A total of 296 species are currently included in this category; an effort was made to select for inclusion here, species for which rarity could be well substantiated.

Federal status designations are included (US Fish and Wildlife Service 1991a, 1991b, 1992a, 1992b, 1992c): LE = Listed Endangered; LT = Listed Threatened; PT = Proposed Threatened; C1 = Candidate, Category 1; C1* = Taxa which are believed to be extinct but persuasive documentation has not been made; C2 = Candidate, Category 2.

Actaea alba (L.) Miller (= *A. pachypoda* Ell.), white baneberry. Tatnall (1946) considered this species to be "rare, in rocky woods along Brandywine Creek," and cited several collections: (1) Wills Rock, Wilmington, 1866 and 1893 (A. Commons s.n., PH), 13 May 1899 (W. M. Canby s.n., DOV), and along the railroad at Wills Rock, 13 May 1944 (R. R. Tatnall 5085, DOV); and (2) Rockford Woods, 14 May 1897 (E. Tatnall, DOV). It is currently known from two sites in the Brandywine drainage of the Piedmont Province: (1) Rockland Park, Wilmington, several dozen plants were observed on steep slopes above the Brandywine Creek in 1988 (Ebert et al. 1990), this may be a relocation of E. Tatnall's 1897 Rockford Woods site; and (2) near Hoopes Reservoir, one plant was observed in a mature hardwood forest in 1991 by J. Ebert & J. Holt.

Amianthium muscaetoxicum (Walt.) Gray, fly-poison. Tatnall (1946) considered this plant to be "infrequent." Historical collections include the following: (1) along Penrose Branch, 5.5 miles west of Dover, 24 Jun 1930 (H. H. Hanson s.n., DOV); (2) near Greenbank, low ground, Work horse farm, 8 Jun 1922 (J. P. Otis s.n., PH); (3) between woods and Greenbank farm, low meadow, 2 Jul 1923 (J. P. Otis s.n., PH); (4) Mt. Cuba, dry woods, 8 Jul 1875, (A. Commons s.n., PH), 19 Jul 1891, (J. B. Brinton s.n., PH) and 24 Jun 1906, (S. S. VanPelt s.n., PH). It is currently known from five New Castle Co. sites, all in the Red Clay Creek drainage: (1) near Mt. Cuba, over 80 individuals were observed in a dry oak-beech woods, discovered in 1989 (Ebert et al. 1990); (2) near Wooddale, a small population of several plants was observed in a wooded ravine of mixed hardwoods in 1991 by J. Ebert & J. Holt; (3) near Wooddale three plants were observed in a mature mesic forest dominated by *Fagus grandifolia* in 1991 by J. Ebert & J. Holt; (4) near Ashland, along small tributary, four plants were observed in a mature woods of *Fagus grandifolia, Quercus rubra, Hamaemelis virginiana,* and *Viburnum acerifolium* in 1991 by J. Ebert & J. Holt; and (5) within 0.25 mile of previous site, more than 30 individuals were noted growing within 10 meters of a small tributary of the Red Clay Creek in 1991 by J. Ebert & J. Holt.

Arenaria caroliniana Walter, pine barren sandwort. According to Tatnall (1946) this plant was known from "a single collection: near Little Hill Church, 0.5 mile ne of Pepperbox, in dry pine barrens," (Commons, 5 Aug 1874, PH). The pine barren sandwort had been ranked SH by DNHI until several hundred plants were found in the dunes at Cape Henlopen State Park by F. Hirst & R. Wilson in 1992.

Asclepias lanceolata Walt., few-flowered milkweed. Tatnall (1946) considered this milkweed to be "frequent on beaches and in salt marshes" of Kent and Sussex counties. Recent field surveys conducted by DNHI botanists have resulted in its discovery at four Sussex Co. sites: (1) near Bethany Beach, a small population was observed in 1989 in an interdunal swale with several other state-wide rare species, *Eupatorium leucolepis, Fuirena squarrosa,* and *Vaccinium macrocarpon* by F. Hirst. In addition three distinct populations were located in the Assawoman Bay Wildlife Area; one in a coastal plain pond, one at the edge of a pond and along a woods road, both discovered by F. Hirst in 1989 and 1991; and the third at the edge of a brackish high-marsh within the general area of other rare species (*Agalinis maritima, Centella erecta,* and *Juncus roemerianus*), discovered in 1992 by W. McAvoy. All populations consisted of less than 10 individuals.

Asclepias rubra L., red milkweed. Tatnall (1946) reported this species to be "infrequent, in all three counties of Delaware." There are two known extant populations on the Coastal Plain: (1) near Dagsboro, less than 10 individuals were observed, with other state rare species (*Paspalum dissectum, Platanthera blephariglottis, P. lacera, Rhynchospora gracilenta, R. microcephala*) along an approximately 0.5 mile long swale in a powerline right-of-way in 1984 by F. Hirst: and (2) south of Woodland Ferry, a population of about 50 plants was observed along the roadside adjacent to a tidal red maple swamp in 1989 by R. Radis.

Asplenium trichomanes L., maidenhair spleenwort. Tatnall (1946) stated that this fern was "rare, in moist rock-crevices along the Brandywine and Red Clay Creeks. . . . Not collected since 1893." Tucker et al. (1979) considered it extirpated, and at a December 1990 meeting of DNHI botanists it was decided to rerank this species from SH to SX. However, that decision was premature, as J. Holt & J. Ebert located three small populations of this fern growing on rocks above the Brandywine Creek near the Hagley Museum in April 1991. This site is a relocation of the Soda House Woods site discussed by Fleming (1978).

Bidens bidentoides (Nutt.) Britton var. *bidentoides,* bur-marigold, C2. This plant has rather narrow habitat requirements, i.e. fresh to slightly brackish tidal mud flats (Ferren and Schuyler 1980). Tatnall (1946) stated that it was "infrequent" on the Delmarva. It is known from four extant sites, although population viability is tenuous, and several historical sites. It is found growing in tidal mud amid rocks and concrete blocks from near Delaware City to just below the PA state line, with the majority of plants having been observed in and near New Castle. Historically, it has been collected on several occasions along the Delaware River, the Brandywine Creek, and possibly along the Appoquinimink River (W. M. Canby, undated PENN; W. M. Canby Oct. 1865, PENN; ex Herb. E. Tatnall 1865, GH; Ferren 1159 and 1107, PH; R. Tatnall s.n., PENN). Population numbers in 1989 and 1990 ranged from a few individuals to less than twenty per site. Surveys in the summer and fall of 1991 located only one individual, a seedling (K. Clancy, B. McAvoy, A. E. Schuyler pers. observs.). This species is threatened throughout its range by dredging, filling, bulkheading, salinity increases, and pollution. A recent oil spill on the Delaware River (Presidente Rivera oil spill of 1989) resulted in many individuals of *Bidens* being covered in oil (R. Radis pers. comm.) and during surveys in September, 1991 a thick layer of oil-soaked mud was discovered at a site near Claymont (K. Clancy and B. McAvoy pers. obs.).

Botrychium matricariaefolium A. Br., chamomile grape-fern. This species was not reported to occur on the Delmarva by Tatnall (1946). It is now known from four Delaware sites: (1) Pike Creek Valley near Rte 2, in 1989 eight individuals were counted in a young tulip poplar woods (Ebert et al. 1990), this population may already have been destroyed by a housing development (B. McAvoy pers. comm.); (2) White Clay Creek Preserve, several dozen plants were observed in a young red maple woods in 1988 (Ebert et al. 1990); (3) Brandywine Creek Valley near Rockland, only one sporophyte was observed at the interface between mature hardwood forest and young maple woods in 1989 (Ebert et al. 1990); and (4) adjacent to the Christiana River near Newark, three sporophytes were observed, growing with *B. virginianum,* in a mature beech-tulip woods in 1991 by J. Ebert & J. Holt.

Cacalia atriplicifolia L., pale Indian plantain. Tatnall (1946) reported this species to be "infrequent in pastures, thickets and open woods of the Piedmont Province; rare on the Coastal Plain. . . ." It is known from several historical collections from New Castle Co.: (1) field near Thompson Station, 6 Aug 1932, (R. R. Tatnall s.n., PH); (2) Kiamensi, 9 Sep

1901, (A. Commons s.n., PH); and (3) Greenbank, in woods, 13 Sep 1884, (A. Commons s.n., PH). The latter two sites occur near each other in the Red Clay Creek drainage. Since 1988 this rare composite has been discovered by J. Ebert & J. Holt at three localities in the state: (1) along the Red Clay Creek north of Wooddale, eight plants were observed growing in an old field; (2) Brandywine Creek, several dozen plants were observed along the floodplain near Ramsey Run; and (3) Sandy Branch east of MD line, nearly 100 plants were observed on slope above the creek.

Chamaelirium luteum (L.) A. Gray, devil's-bit, blazing star. This species was considered "infrequent, in rich woods and thickets of the Piedmont province" by Tatnall (1946), and was listed by Tucker et al. (1979) as "possibly extirpated. . . ." Historical collections include: (1) Wilmington, thickets, 25 May and Sep 1896, (A. Commons s.n., PH); (2) Brandywine, rocky woods, May 1843 (Rev. J. H. B. s.n., PH); (3) Mt. Cuba, 3 Jun 1894 (A. John s.n., PH). According to Tucker et al. (1979) the species was last collected in Delaware in 1938, however, during the 1992 field season, three plants were observed in disturbed habitat along a road bank in northern New Castle Co. by J. Ebert & J. Holt.

Coreopsis rosea Nutt., pink tickseed. This species was reported by Tatnall (1946) to be "frequent . . . from New Castle to Sussex . . . counties." Phillips (1978) stated that it was not found on the Delmarva, and Tucker et al. (1979) concluded that the species needed further field work to determine its true status in Delaware. According to Tucker et al. (1979) there were seven historical populations, the most recent from 1938, distributed in New Castle, Kent, and Sussex counties. At one time, Ellendale wet meadow was home to the pink tickseed (Dill and Tucker 1982), but searches at the site since 1984 have proved unsuccessful. Recent field surveys have resulted in its discovery at three Sussex Co. locations: (1) near Lewes, two populations were found in separate coastal plain ponds (Delmarva Bays), by D. Boone & F. Hirst in 1982, and F. Hirst in 1988; and (2) near Milton, an exceptionally vigorous population, estimated at >10,000 in 1990, was discovered in 1982 by D. Boone and F. Hirst in a pristine coastal plain pond.

Corydalis flavula (Raf.) DC., yellow corydalis. Tatnall (1946) considered the species to be "locally abundant in rocky woods . . . rare in northeastern New Castle Co." and cited one historical collection: Naamans Creek, below Harvey (Arden) Station, (Commons and Tatnall, 27 April 1894, PH). Although Tucker et al. (1979) mentioned two populations seen in 1971, they believed the plant to be extirpated in the state. There is one known population: near White Clay Creek, north of Newark, thousands of individuals were observed along a nearly 1.0 mile length of terrain, growing with a number of alien species (*Cerastium vulgatum, Stellaria media, Valerianella locusta*) in 1992 by J. Ebert & J. Holt.

Desmodium strictum (Pursh) DC., pine-barren tick-trefoil. Tatnall (1946) considered this species to be "infrequent, . . . from Caroline Co. to Worcester Co.," and did not include Delaware in the species' range. Nevertheless, since 1988, four populations have been discovered: (1) Nanticoke Wildlife Area, three populations of one, two, and over 200 individuals, respectively were discovered in xeric, sandy pine woods by C. Ludwig in 1988; and (2) near Nanticoke Wildlife Area north of Broad Creek, several dozen fruiting individuals were observed in dry sandy pine woods by F. Hirst in 1989.

Diervilla lonicera Miller, bush-honeysuckle. This species was reported by Tatnall (1946) to be "rare, in rocky woods of New Castle Co." Historical collections include: (1) Rattlesnake Run, Wilmington, 1 Jun 1844 ("G. W. T." s.n., DOV); (2) Mt. Cuba, 1873 and 1896 (A. Commons s.n., PH) and 29 Jun 1893 (E. Tatnall s.n., DOV); (3) Point Lookout, 0.5 mile nw of Granogue, 20 Jun 1937 and earlier collections (R. R. Tatnall 3425, DOV, G, PENN, PH); and (4) above Rockland, rocky woods along Brandywine, 8 May 1897 (A.

Commons s.n., PH). Since 1988 it has been discovered at two sites on the Piedmont: (1) along the Brandywine Creek west of Talleyville, a small population was noted in a rocky, steep-sloped *Liriodendron tulipifera* woods, discovered in 1988; and (2) northwest of Mt. Cuba, two plants were observed in a rocky mature oak-beech woods, discovered in 1989 (Ebert et al. 1990).

Dirca palustris L., leatherwood. Tatnall (1946) considered this plant to be "rare, in rich, rocky woods along Brandywine and Red Clay Creeks, New Castle Co." Historical collections include the following: (1) Mt. Cuba, 3 Jun 1864 (A. Commons s.n., PH) and at least seven other collections; and (2) west bank of Brandywine Creek, 0.25 mile below Henry Clay bridge, 10 Apr 1888 (R. R. Tatnall 1369, PH), and several additional collections made from, or near, this site. Intensive surveys during the past five years resulted in the 1989 discovery of a site near Mt. Cuba, one fruiting shrub was observed in 1992 in a mature mixed hardwood forest; this may be a relocation of Commons' 1864 site (Ebert et al. 1990).

Eleocharis rostellata (Torr.) Torr., small-beaked spikerush. This plant was considered to be "rare" by Tatnall (1946), who cited several historical collections: (1) Collins Beach, 20 Jun 1866 (A. Commons s.n., PH); and (2) Love Creek, near Rehoboth, 20 Jun 1926 (True s.n., PENN). This rare sedge is known from four extant sites: (1) Love Creek near Rte 24, a small population, surrounded on three sides by *Phragmites australis,* was observed in tidal brackish marsh in 1992 by C. Ludwig & B. McAvoy; (2) Angola Neck near Bookhammer Landing, an abundant and dominant species in more than 4 acres of a slightly brackish to freshwater bog-like habitat discovered in 1992 by C. Ludwig; (3) Assawoman Bay Wildlife Area, several thousand stems were observed covering approximately 6 acres of high tidal marsh by B. McAvoy in 1992; and (4) Angola Neck near Bookhammer Landing, more than 1000 stems was observed at edge of salt marsh by F. Hirst & R. Wilson in 1992. The Love Creek site may represent a rediscovery of True's historical site.

Equisetum fluviatile L., water horsetail. Tatnall (1946) considered this species to be "infrequent to rare" on the Delmarva and cited the following collections: (1) Bellevue, near Station, Jun 1868 (Commons s.n., PH); (2) Port Penn, 28 Jul 1884 (J. Carter s.n., PH); (3) south bank of Drawyers Creek, above DuPont Highway 1 mile north of Odessa, 4 Jul 1929 (R. R. Tatnall s.n., DOV); (4) streamlet west side of DuPont Highway, 1 mile north of Fieldsboro, 3 Jun 1939 (R. R. Tatnall 4188, DOV, PH). The last site is still extant. I followed Tatnall's directions precisely, and discovered this horsetail at the exact location specified. More than 100 stems were observed in a narrow mixed hardwood swamp forest adjacent to an emergent freshtidal marsh (K. Clancy 2617, 2625, DNHI Reference Herbarium).

Eriophorum virginicum L., tawny cotton-grass. Tatnall (1946) considered this species to be "infrequent," and intensive searches by DNHI botanists over the past few years would support that characterization. Since 1986, two sites have been discovered in Sussex Co.: (1) Angola Neck near Bookhammer Landing, a small population was observed in a narrow *Alnus maritima* dominated scrub-shrub wetland at the interface between a mixed forest and an emergent freshwater bog-like community by C. Ludwig in 1992; and (2) west of Frankford, in moist sandy soil, where it was observed associated with *Bartonia virginica, Eupatorium leucolepis, Rhynchospora microcephala, R. capitellata, Polygala lutea,* and *Juncus canadensis* (Naczi et al. 1986).

Eryngium aquaticum L., button snakeroot. This species was reported by Tatnall (1946) to be "frequent; ditches, rivers, beaches, dune hollows and swamps of the coastal plain, in fresh or brackish habitats." Recent intensive floristic surveys have resulted in its discovery

at three (possibly four) Sussex Co. sites: (1) along Love Creek, near Rt 24, a large population covering approximately five acres occurs in fresh tidal marsh, discovered in 1992 by C. Ludwig & B. McAvoy; (2) along Burton Prong, near Burton Millpond, ca. 50 plants in bud and flower were observed at the edge of a brackish marsh, co-occurring with such species as *Baccharis halamifolia, Hydrocotyle verticillata* var. *verticillata, Phragmites australis, Rumex verticillatus,* and *Sabatia dodecandra* in 1992 by F. Hirst; and (3) Miller Neck, adjacent to Dirickson Creek, several dozen plants were observed in an open, freshwater bog-like habitat above salt marsh in 1992 by B. McAvoy. Associated species include: *Centella erecta, Cladium mariscoides, Eleocharis palustris, Carex crinita,* and *Sphagnum* sp. A possible fourth site is in the Assawoman Bay Wildlife Area north of Miller Creek, several plants were observed in relatively dry habitat (K. Clancy 2046, DNHI Reference Herbarium). Identification is tentative as these plants appear to be intermediate between *E. aquaticum* and *E. yuccifolium.*

Fimbristylis perpusilla Harper, Harper's fimbristylis, C2. This species was not reported for the Delmarva by Tatnall (1946). Until very recently this sedge was only known from Georgia (Kral 1983), however, field work in the last twelve years has resulted in discoveries in several southeastern states (Leonard 1981, Hirst 1983, Leonard 1987, Wofford and Jones 1988, Harvill et al. 1992). This species is sporadic and appears irregularly over the years; at one locale in Georgia it went nine years between appearances (Kral 1983). Populations in Delaware exhibit similar erratic fluctuations (F. Hirst pers. comm.). It is known from three Coastal Plain ponds: (1) west of Hartly, a small population was observed in a woodland pond in 1984 by F. Hirst, this population has not been seen here since its discovery; (2) in a pond east of Delaneys Corner, a small population restricted to the center of the pond was first discovered by F. Hirst in 1983 and subsequently observed in 1991 and 1992 (K. Clancy 2373, DNHI Reference Herbarium); and (3) west of Delaneys Corner, a small population was observed in a woodland pond in 1991 by B. McAvoy, no plants were observed in 1992, although the pond was flooded into October.

Hudsonia ericoides L., golden heather. Tatnall (1946) described this species as "rare, in dry sandy soil of the seacoast," and cited several collections: (1) Cape Henlopen, in 1895 and 1898, (A. Commons s.n., PH); and (2) along the railroad, 3 mile nw of Rehoboth, 30 May 1935, (R. R. Tatnall 2578, DOV, PH), and 16 May 1938, (R. R. Tatnall 3695, DOV). There are currently three known extant sites, all within the confines of Cape Henlopen State Park: (1) in dunes, several hundred plants were observed by F. Hirst in 1988; (2) in xeric sand dunes near the US Naval Reservation, only a few clumps were seen growing alongside *H. tomentosa, Lechea* sp., and *Panicum commonsianum* in 1992 by F. Hirst & R. Wilson; and (3) in maritime pine forest, a few plants were seen in 1992 by F. Hirst & R. Wilson.

Isoetes riparia Engelm., riverbank quillwort. This species was reported by Tatnall (1946) to have been "collected in tidal mud of Delaware River, at and north of Wilmington, by Commons, Canby and E. Tatnall, between 1862 and 1896; not seen since." Today, there are three known localities: (1) Delaware River near Delaware City, New Castle Co., between 50–100 plants were observed in mud of a brackish tidal marsh in 1988 by R. Radis, searches at this site in 1992 were unsuccessful; (2) along the Nanticoke River, near Middleford, Sussex Co., two distinct populations of ca. 20 plants, and between 50–100 individuals, respectively, were observed in the freshwater intertidal zone by F. Hirst in 1992. There appears to be ample habitat for this species, especially in light of its discovery along the Nanticoke River.

(Pursh) Raf, small-whorled pogonia, LE. In Delaware this rare

orchid is known from a single population near Blackbird State Forest, New Castle Co. where a few plants were observed in a young mesic oak-beech-hickory forest by M. McLaughlin in 1985. Since 1985, population numbers at this site have varied from 0–11 stems, no plants were observed in 1992.

Lachnanthes caroliniana (Lam.) Dandy, Carolina redroot. Tatnall (1946) stated that this species was "frequent in bogs and sandy swamps, Kent and Sussex counties." However, intensive surveys over the past five years indicate that it has suffered a decline since Tatnall's time. The species is now known from five Sussex Co. sites: (1) near Lewes, several hundred plants were observed in a coastal plain pond (Delmarva Bay) by F. Hirst in 1988; (2) near Milton, a large population of several thousand plants was observed in a pristine coastal plain pond by F. Hirst & D. Boone in 1982 and still extant in 1992; (3) near Robbins, 50–100 plants were observed in a wet clearing of a re-planted pine plantation by F. Hirst in 1989; (4) north of Georgetown, two distinct populations, located more than 1.0 mile apart in openings in wet pine woods, one with less than 10 plants, the other with several hundred plants, were discovered by F. Hirst & R. Wilson in 1990 and 1992.

Listera australis Lindl., southern twayblade. Tatnall (1946) did not list this species for the Delmarva. There are currently three known sites in Delaware, all in Sussex Co.: (1) Nanticoke Wildlife Area, hundreds of plants were observed in 1992 growing on hummocks in a white cedar-red maple-black gum swamp, discovered in 1990 by F. Hirst; (2) Great Cypress Swamp, hundreds of plants were observed growing in a poorly drained loblolly pine woods by B. McAvoy in 1992; and (3) Nanticoke River near Middleford, a small population of approximately 30 plants was observed growing on hummocks in an Atlantic white cedar-red maple swamp by K. Clancy & B. McAvoy in 1992.

Lobelia elongata Small, elongated lobelia. Tatnall (1946), who cited collections by Commons (1877, 1880) from "ponds, Millsboro," and a 1907 record from Brown collected along "Indian River, Millsboro," considered this species to be "rare, in wet places of the Coastal Plain." Tucker et al. (1979) reported that it was last seen in Delaware in 1907. Today this *Lobelia* is known from two extant Sussex Co. sites: (1) along Guinea Creek, less than 10 plants were observed above brackish marsh in a freshwater seepage habitat by C. Ludwig & B. McAvoy in 1992; and (2) Upper Love Creek near Rt 24, an abundant flowering and fruiting population was observed in fresh-tidal marsh on both sides of the creek by C. Ludwig & B. McAvoy in 1992. The latter population co-occurs with other rarities including: *Bidens coronata, Eryngium aquaticum, Sabatia dodecandra,* and *Sacciolepis striata.*

Lupinus perennis L., wild lupine. This species was reported by Tatnall (1946) to be "infrequent in sandy soil . . . southern New Castle Co. southward. . . ." However, extensive inventories indicate that this species is much rarer than Tatnall reported. It is currently known from three locations: (1) near Killens Pond State Park, Kent Co., a vigorous flowering population of several hundred stems was observed in sandy soil along a roadside in 1991 (K. Clancy 2210, DNHI Reference Herbarium); and (2) southwestern Sussex Co., in the Nanticoke Wildlife Area, two populations of less than 50 stems and ca. 200 stems, respectively, were observed along roadsides (several miles apart) in dry, sandy pine-oak woods in 1988 by C. Ludwig, and 1989 by F. Hirst.

Malaxis unifolia Michx., green adder's-mouth orchid. Tatnall (1946) listed this species as "infrequent but widespread in both Piedmont and Coastal Plain provinces," while Phillips (1978) stated that it was "infrequent throughout." Currently it is known from three locations: (1) near Sandhill, Sussex Co., less than ten plants were observed in roadside woods by F. Hirst in 1984; (2) south of Ellendale, Sussex Co., one fruiting individual was

observed in a rich, mesic woods by F. Hirst in 1989; and (3) near the Cedar Swamp, New Castle Co., about 30 individuals were observed in a wet sweetgum woods in 1992 by J. Ebert & J. Holt.

Matelea carolinensis (Jacq.) Woodson, Carolina angelpod. Tatnall (1946) reported that this species was "infrequent, in thickets, or climbing on fences, in southern New Castle, . . . Kent . . . counties." Brown and Brown (1972) stated that this species was "infrequent in Cecil, Kent, and Queen Anne counties" on Maryland's Eastern Shore. Harvill et al. (1992) did not list it for Virginia's portion of the Delmarva. This plant is known from one location: along the MD-DE state line, about 40 plants were observed at the edge of road and scattered in woods by J. Ebert & J. Holt in 1992. The habitat suggests that it may be more common than currently believed.

Nelumbo lutea (Willd.) Pers., American or yellow lotus. This plant was reported to be "rare" by Tatnall (1946) who cited one locality: St Jones Creek, 2.5 miles below Dover, 1863 (A. Commons s.n., PH), 3 August 1930 (R. R. Tatnall 965, DOV, GH, PH). In addition, several undocumented records were also mentioned by Tatnall; Drawyers Creek below Shallcross Lake; Moore's (Wiggins) Pond, 1 mile nw of Townsend; and the sw end of McGinnis Pond, 2 mile e of Canterbury. Tucker et al. (1979) suggested that it was "probably extirpated." There is currently one known extant site: in Dover south of the Hwy 13 bridge, in tidal marsh along the St. Jones River. This population was brought to the attention of DNHI in December 1990 and a small population was observed in July 1991 (K. Clancy pers. obs.); it may represent what remains of the historical St. Jones' population.

Nymphoides cordata (Ell.) Fern., little floating heart. This species was reported by Tatnall (1946) to be "infrequent, on ponds, from central Kent." It is known from one site: west of Lewes, where less than 100 individuals occur with 13 other state rare species, in a coastal plain pond discovered by F. Hirst in 1988. More field work is needed to accurately assess this species' status in Delaware, as it could easily be confused with the often sympatric, and more common *N. aquatica.*

Panicum hirstii Swallen, Hirst's panic grass, C2. One of the rarest grasses known, this plant occurs in wet meadows or temporary ponds in NJ, DE, NC, and GA (A. Weakley pers. comm., Kral 1983). *P. hirstii* is known from one Sussex Co. location: Assawoman Bay Wildlife Area, a small population, varying from 10 to several hundred culms, occurs in a coastal plain pond (Delmarva Bay) within a pine-hardwood forest, discovered by F. Hirst in 1984.

Passiflora lutea L., yellow passion-flower. Tatnall (1946) stated that *P. lutea* was "local . . ." and cited collections from only the Maryland and Virginia portions of the Delmarva. However, a check of herbaria uncovered two historical collections: (1) "Delaware" 1824? (Nuttall?, GH); and (2) "Delaware" 1833 (H. C. Beyrich, MO). There are currently two known populations (Clancy 1993): (1) near Dover and the St. Jones River, Kent Co., several flowering vines at the edge and several dozen seedlings just inside a narrow second-growth mixed deciduous forest, discovered in 1991 (K. Clancy 2315, DNHI Reference Herbarium, PH); and (2) near Lewes, Sussex Co., an extensive flowering and fruiting population was observed in a clearing of a mixed oak-pine forest in 1991 (K. Clancy 2381, DNHI Reference Herbarium, PH).

Pellaea atropurpurea (L.) Link, purple cliff-brake. This fern was not reported by Tatnall (1946) for the Delmarva. It is currently known from two locations on the Piedmont: (1) near Rockland, about 100 plants were observed growing on a stone wall above the Brandywine Creek, (Ebert et al. 1990); and, (2) along Rockland Road, approximately 100 plants were observed, also growing on a stone wall, discovered in 1990 by J. Ebert & J.

Holt. These are the first known sites for this species in Delaware, and perhaps in the Delmarva.

Platanthera peramoena (Gray) Gray, purple fringeless orchid. Tatnall (1946) reported this species to be "rare and local . . ." and cited several historical collections from New Castle Co.: (1) moist meadows above Rockland along Brandywine Creek, 8 Aug 1864 (A. Commons s.n., PH); (2) Granogue, (Canby, no date); (3) meadow along White Clay Creek, "rather abundant at this station," ca. 1 mile north of Newark, 4 Aug 1944 (G. R. Proctor 1113 pers. herb.) and 28 Jul 1945 (R. R. Tatnall 5222, DOV, PH). There is currently one known extant population, which may be a relocation of the 1944 Proctor and/or the 1945 Tatnall sites: White Clay Creek drainage near Newark, between 1988–91, a small population, ranging from 1–6 individuals, was observed in an open wet meadow at the edge of floodplain woods, no plants were observed in 1992, this population was discovered by C. Pattison (see Ebert et al. 1990).

Polypodium polypodioides (L.) Watt, resurrection fern. Tatnall (1946) reported this species to be "infrequent . . . from Sussex Co. to . . . Accomac Co." It is currently known from one site: near Laurel, a small population of a few vigorous, spore-producing individuals, was observed on a tree in 1979 (R. Radis pers. comm.). Field surveys are needed to determine the current status of this species.

Rhexia aristosa Britt., awned-meadowbeauty, C2. Tatnall (1946) considered this plant to be "rare and local . . .," and cited several historical collections: (1) Ellendale, 24 Jul 1893 (Canby s.n., DOV), and several later collections; and (2) at Wilmington, "south side of Christina Creek," 21 Sep 1896 (Commons, s.n., PH). *R. aristosa* is currently known to be extant from six Sussex Co. sites: (1) Ellendale wet meadow, less than 50 plants were observed growing in a ditch, it has been monitored at this locality since 1984; (2) Assawoman Bay Wildlife Area, in a woodland pond (Delmarva Bay) with other rare species (*Coelorachis rugosa, Panicum hirstii,* and *Sclerolepis uniflora*), population numbers have fluctuated dramatically over the years (1984–1992), discovered by F. Hirst in 1984; (3) south of Ellendale, between 1988 and 1992 four separate populations have been located, in ditches in sandy, open pine plantation, ca. 5000 plants were observed in 1991, but fewer than 100 in 1992; in a clear-cut, ca. 3000 plants in 1991 and 1992; at the edge of an excavated pond, three plants in flower; and in a ditch, five flowering individuals, discovered by F. Hirst, R. Wilson, and B. McAvoy. The latter four sites, contain an assemblage of state rare species (*Amphicarpum purshii, Boltonia asteroides, Eleocharis robbinsii, Fuirena pumila, F. squarrosa, Hypericum adpressum, H. denticulatum, Lobelia canbyi, Rhynchopsora fusca, R. gracilenta, R. torreyena, Scleria reticularis.*) Since all but one of the sites occur in degraded habitats and because the awned-meadow beauty is a candidate for federal listing, the species has been ranked S1.

Sagittaria calycina Engelm., Mississippi arrow-head. Tatnall (1946) reported that this species "infrequent in ditches, and tidal mud of Delaware River, in New Castle Co., where not recently collected. . . ." There are currently four known extant sites: (1) Along the Delaware River near the Delaware Memorial Bridge, more than 100 plants were observed at the upper-edge of the inter-tidal zone in 1990 by A. E. Schuyler; (2) near New Castle, along the Delaware River, more than one hundred seedlings were observed in tidal mud growing with typical marsh species such as *Amaranthus cannabinus, Bidens laevis, Echinochloa walteri, Impatiens capensis, Scirpus pungens, S. tabernaemontanii,* and *Spartina alterniflora* in 1992 (K. Clancy 2551, with A. E. Schuyler, DNHI Reference Herbarium); (3) Blackbird Creek, near Blackbird Landing, numerous plants were observed in mud at edge of freshtidal marsh in 1990 by F. Hirst & R. Wilson; and (4) Drawyers Creek, near DuPont

Hwy, abundant in exposed mud of brackish tidal marsh (K. Clancy 2661, DNHI Reference Herbarium).

Sagittaria teres Wats., slender arrowhead. This species was reported by Tatnall (1946) as "rare." One Delaware collection was cited by Tatnall and later by Tucker et al. (1979): "Millpond at Milton, (Commons, 17 Aug 1899, PH)." The site of Common's collection was likely Wagamons Millpond, where *S. teres* has been unsuccessfully searched for during the past 10 years. Presently there is one known site: Reynolds Millpond, north of Milton, where one plant was noted in 1988 by C. Ludwig. Subsequent searches in 1990 and 1992 failed to relocate this plant (B. McAvoy pers. comm.).

Sanicula marilandica L., black snakeroot. This species was described by Tatnall (1946) as "rare" on the Delmarva and was known from several historical collections: (1) near Wilmington, 1896, (W. M. Canby s.n., DOV); (2) near Centreville, 1878, 1898, (A. Commons s.n., PH); (3) Choptank Mills, 1904, (Stone s.n., PH); and (4) Arden, New Castle County, in open woods, 1945, (Morris & D. Berd 17514, NY). The latter collection was cited by Moldenke (1945). There is currently one known extant site: five plants were observed along Snuff Mill Road near the PA state line by J. Ebert & J. Holt in 1992.

Sanicula trifoliata Bickn., long-fruited snakeroot. This species was not reported by Tatnall (1946). Brown and Brown (1984) considered this species to be "scarce" and listed Harford Co. and Baltimore City for its distribution in MD. Harvill et al. (1992) do not list this species in the Virginia portion of the Delmarva. The one known locality occurs along a roadside, se of Hoopes Reservoir, where less than 50 mature fruiting plants were observed in 1989 (Ebert et al. 1990).

Schizaea pusilla Pursh, curly grass fern. This diminutive fern was recently discovered near Milton where a vigorous population was observed on hummocks and downed logs in an Atlantic white cedar swamp by F. Hirst & R. Wilson (Hirst 1990). Subsequent surveys have shown it to be more abundant at this site than previously reported (Hirst pers. comm.).

Scirpus etuberculatus (Steudel) Kuntze, Canby's bulrush. According to Tatnall (1946), Canby's bulrush was "rare . . . reaches the northern limit of its range in Sussex Co." It is known from two historical sites: (1) ". . . ponds, rare," 5 Aug 1874, (A. Commons s.n., PH); and (2) Ellis pond, 4.75 mile s of Laurel, 9 Aug 1961 (F. Hirst 59, PH). Surveys between 1989 and 1992 failed to relocate this population, Ellis Pond is in the latter stages of succession to a shrub swamp and very little open water remains. Canby's bulrush may have last been seen at the site in 1972 (A. E. Schuyler pers. comm.). There is currently one known extant population: Raccoon Pond, several thousand plants were observed growing in shallow water by C. Ludwig in 1988; surveys in 1990 revealed the presence of only a few, scattered clumps.

Sclerolepis uniflora (Walter) BSP, pink bog-button. Tatnall (1946) cited one New Castle Co. location for this species: "Sassafras Crossroads" (=Green Springs Station), 1866, (A. Commons s.n., DOV, PH)." In Delaware, it usually co-occurs with *Boltonia asteroides* and *Coreopsis rosea*. Recent surveys by Natural Heritage botanists have resulted in its discovery at five Sussex Co. sites: (1) Assawoman Bay Wildlife Area, two populations occur in woodland ponds (Delmarva Bays), one has remained relatively stable between 1984 and 1992 forming dense patches, while the other has declined; (2) between Ellendale and Robbins, less than 100 mature plants were observed in wet spots of a recently re-planted pine plantation in 1988 by F. Hirst; (3) Ellendale Wet Meadow, a small population of ca. 50 plants was observed in 1991 after being re-discovered by F. Hirst in 1984; and (4) near Georgetown, several hundred plants were observed in wet deciduous woods by F. Hirst &

R. Wilson in 1992. In addition to the presence of *Sclerolepis,* site 4 is also home to the rare *Coelorachis rugosa, Eupatorium leucolepis, Hypericum dentatum, Lobelia canbyi, Polygala cruciata, Rhynchospora fusca,* and *Scleria reticularis,* to name a few.

Senecio anonymus A. Wood, Small's ragwort. This species was considered by Tatnall (1946) to be "infrequent" on the Delmarva. Currently it is known from one site: northeast of Mt Cuba, near Owls Nest Road, a relatively large population (more than 100 individuals) growing in a mowed lawn underlain by serpentinite was discovered in 1992 by J. Ebert, J. Holt, & B. McAvoy.

Historical Species

Selected SH or SX ranked species are discussed below. These species have not been seen or collected in Delaware for at least 15 years. Taxa classified SX have been searched for repeatedly at all known historical sites and in all potential habitats. In contrast, although taxa ranked SH have not been seen or collected for many years, there appears to be potential habitat yet to survey. In many cases, these species were also believed to be historical, or extirpated, by Tatnall (1946) and Tucker et al. (1979).

Adlumia fungosa (Ait.) Green ex BSP., climbing fumitory, SX. Tatnall (1946) stated that this species was "infrequent" in Delaware, while Tucker et al. (1979) thought that it was "probably extirpated. . . ." Apparently it was never abundant in the state and was restricted to the rocky banks of the Brandywine Creek: (1) opposite Bancroft's Factory, 15 Jun 1869 (A. Commons, s.n., PH); and (2) rocky woods at Wills Rocks, below the High Bridge, 8 Jul 1865, 11 Aug 1897 (A. Commons, s.n., PH).

Aeschynomene virginica (L.) BSP., sensitive joint-vetch, LT, SH. According to Tatnall (1946) this species was "formerly frequent on tidal shores of the Delaware River, from Holly Oak to Delaware City." Tucker et al. (1979) considered the species to be "definitely extirpated." Historical localities all occur in New Castle Co.: (1) river shores, near Wilmington, Aug 1878 (W. M. Canby s.n., NY); (2) Holly Oak, 23 Aug 1888 (J. B. Brinton s.n., NY); and (3) tidewater along Brandywine-Christina Rivers, 1846 (B. Hoopes 486, NY). Although much of Delaware's tidal habitat has been degraded, areas requiring more thorough surveys include the Christina, Appoquinimink, and Nanticoke Rivers and Drawyers Creek.

Amaranthus pumilus Raf., seabeach pigweed, PT, SH. The sea-beach amaranth is extirpated from most of the northern half of its range south to Virginia, although it has reappeared in New York, possibly as a result of severe storms in 1990 that may have transported propagules from the Carolinas (S. Young pers. comm.), or unearthed a seed bank (A. Weakley pers. comm.). It was reported by Tatnall (1946) to be "rare, on sea beaches; southeastern Sussex Co.," with a single, documented collection: Baltimore Hundred (area from the Indian River Inlet south to state line), 10 Sep 1875 (A. Commons s.n., PH). A winter storm that battered Delaware's coastal beaches in January 1992 brought some hope of its reappearance in the state, but surveys of the beaches from Cape Henlopen to Fenwick Island in the summer of 1992 failed to relocate this plant.

Arabis drummondii A. Gray, Drummond rock-cress, SH. Tatnall (1946) cited one Delmarva collection: Concord Station, Wilmington, Jun 1897 (A. Commons, s.n., PH).

Arethusa bulbosa L., dragon's-mouth, SH. Tatnall (1946) stated that this distinctive orchid was "rare and local" and Tucker et al. (1979) believed it "definitely extirpated." Historical locations include: (1) Farnhurst, McCrones Swamp (now State Hospital), New Castle Co., 30 May, 2 Jun 1866, 30 May 1882 (A. Commons s.n., PH), and 5 May 1866, 30 May 1882 (W. M. Canby s.n., PH); (2) Millsboro, Sussex Co., sandy swamp, 23 May 1876

(A. Commons s.n., PH); (3) Milford, 5 miles south at margin of Clendaniel Pond (Hudson Pond?), Sussex Co., 30 May 1928, 11 May 1929, 30 May 1930 (R. R. Tatnall, DOV, PENN); and (4) near Dagsboro, Sussex Co., Jun 1809 (T. Nuttall s.n., PH).

Arnica acaulis (Walter) BSP, leopard's-bane, SH. Tatnall (1946) listed this species as "infrequent; sandy woods and roadsides on the coastal plain . . .," while Tucker et al. (1979) thought that it was extirpated from the state. Historical collections, all from New Castle Co., include: (1) "New Castle Co." Jul 1862 (W. M. Canby s.n., PH); (2) Townsend, 30 May 1890 (J. B. Brinton s.n.), and sandy woods, 11 Jun 1890 (A. Commons s.n., PH); (3) 4.0 mile south of Odessa, DuPont Hwy, meadow, 19 Jun 1933 (H. E. Stone s.n., PH); (4) 5.0 mile south of Odessa, open grass roadside, DuPont Hwy, 0.25 mile south of Union Church, 3 Jun 1934 (R. R. Tatnall s.n., PH), and border of low woods, near Union Church, ca. 1.0 mile northwest of Blackbird, 15 Jun 1937 (B. Long 50096, 50097, PH).

Asclepias longifolia Michx., long-leaf milkweed, SH. This species was last collected in 1934 and according to Tatnall (1946) was "very rare . . . now apparently extinct in our area." Tucker et al. (1979) considered it to be "definitely extirpated." It was known from one location: Ellendale, in ditches along the railroad, south of the village (DOV, GH, PH).

Asclepias quadrifolia Jacq., whorled milkweed, SH. Tatnall (1946) considered this distinctive milkweed "infrequent, in dry hilly woods of the Piedmont; rare on the Coastal Plain . . .," while Tucker et al. (1979) believed that it had been extirpated. Historical collections include: (1) near Centreville, dry woods, Jun 1865 (A. Commons, s.n., PH); (2) Mt. Cuba, 3 Jun 1894 (J. B. Brinton, s.n., PH) and 30 May 1895 (I. A. Keller, s.n., PH); and (3) below Yorklyn along the Red Clay Creek, loamy wooded slope, 24 May 1924 (B. Long 30251, PH).

Asplenium rhizophyllum L., walking fern, SH. According to Tatnall (1946) this plant was "rare, on wooded rocky slopes of the Piedmont." Tucker et al. (1979) considered it to be "definitely extirpated." Historical collections include: (1) Mt. Cuba, Jul 1865 (A. Commons, s.n., PH); near foot of rocky slope, just above deep railway cut, 0.5 mile north of Mt. Cuba 27 Jun 1931 and 17 April 1942 (R. R. Tatnall 1195, 5004 DOV); (2) near Centreville, 13 Jun 1877 (A. Commons, s.n., PH); (3) White Clay Creek Valley, reported by Linehan et al. 1970 (cited in Fleming 1978); and (4) high up the rocky slope, along east side of Brandywine Creek above Rockland, 24 Mar 1929 (R. R. Tatnall 232, DOV).

Carex bicknellii Britton, Bicknell sedge, SX. This sedge was known from a single Delaware location: near Centreville, on serpentine barren, dry soil, 26 May 1863 (A. Commons, PH).

Carex polymorpha Muhl., variable sedge, C2, SH. Tatnall (1946) stated there was one known collection of this species on the Delmarva (Cecil Co., MD). Apparently he overlooked the only known Delaware collection: "Sussex Co.," 1874 (W. M. Canby s.n., DOV). Because this sedge grows in xeric to mesic woods, it is hoped that it will yet be relocated in the state.

Carex striatula Michx., lined sedge, SH. Tatnall (1946) considered the species to be "rare; wooded banks, Piedmont and Coastal Plain. . . ." Historical locations include the following: (1) Mt. Cuba, rocky woods, 26 May 1884, 19 Jun 1895 (A. Commons s.n., PH), and 4 Jul 1903 (W. Stone s.n., PH); (2) Greenbank, woods, 27 May 1879 (A. Commons s.n., PH); (3) 1.5 mile north of Choate, road bank, edge of woods along Pike Creek, 18 May 1940 (R. R. Tatnall 4495, DOV, PH); and (4) Wilmington, May 1893 (W. M. Canby s.n., DOV).

Chamaedaphne calyculata (L.) Moench., leatherleaf, SH. Tatnall (1946) stated that [illegible] not recently found within our limits, in spite of careful search."

Tucker et al. (1979) considered it "definitely extirpated." Historical locations: (1) Thompson's Swamp, 1.5 mile northwest of New Castle, 1858 (W. M. Canby s.n., DOV); (2) Frankford, 1875 (A. Commons s.n., PH); and (3) Townsend, sandy swamps, 11 Jun 1890 (A. Commons s.n., PH).

Cheilanthes lanosa (Michx.) D. C. Eat., hairy lip-fern, SX. Tatnall (1946) reported that this species was "rare, on rocky hills . . . in and near Wilmington, where now extinct." Tucker et al. (1979) considered the hairy lip-fern to be "definitely extirpated." Historical collections include: (1) near Wilmington, 1861 (I. Hoopes, s.n., PH); (2) Wilmington, east side of Brandywine Creek below Jessup's papermill (site now destroyed), rocky ridge, 13 Sep 1864 (A. Commons, s.n., PH); and (3) Wilmington, banks of Brandywine opposite Bancroft's Factory, on rocks, 3 Dec 1889 (A. Commons, s.n., PH). All three of the above collections may have been made at the same location. As shale outcrops, the habitat that typically supports this species, are lacking in Delaware, it is doubtful that this fern will be relocated.

Cicuta bulbifera L., bulb-bearing water hemlock, SX. Although Tatnall (1946) did not specifically comment on the abundance or rarity of this species, Tucker et al. (1979) thought that it was "definitely extirpated." There is one historical site: New Castle Co., wet ground at top of north bank of C & D Canal, west of Summit Bridge, 24 Aug 1869 (A. Commons, s.n., PH).

Cleistes divaricata (L.) Ames, spreading pogonia, SH. Tatnall (1946) considered this species "rare" and Tucker et al. (1979) thought it "probably extirpated." Historical collections, all in Sussex Co. include: (1) meadow and thicket-pasture east of Ellendale, 22 Jul 1908 (B. Long s.n., PH), and 7 Sep 1938, 12 Jun 1939 (A. V. Smith & R. R. Tatnall s.n., DOV); (2) 3 miles northwest of Rehoboth, in ditch along railroad, 4 Jul 1930, 5 Sep 1936 (R. R. Tatnall s.n., DOV); and (3) near Dagsboro, Jun 1809 (T. Nuttall s.n., PH).

Crassula aquatica (L.) Schonl., pygmy-weed, SX. Tatnall (1946) stated that this species was "rare, on muddy shores . . ." and listed one historical site: Brandywine Creek above railroad bridge, collected by Canby in 1867, but no specimen was seen. Ferren and Schuyler (1980) stated that it "has not been collected in the Delaware system for over 50 years."

Cyperus plukenetii Fern., a flatsedge, SX. Tatnall (1946) considered this species to be "rare, in dry ground. . . ." Historical localities include: (1) Rehoboth, Sussex County, 13 Aug 1896 (A. Commons s.n., PH); (2) Millsboro, 21 Sep 1907 (S. Brown, PH); and (3) Wilmington, Giant's Cave, on Brandywine, 28 Jul 1866 (A. Commons s.n., PH).

Cyperus tenuifolius (Stuedel) Dandy, thinleaf flatsedge, SH. Tatnall (1946) cited one known collection from the Delmarva: "moist soil," Baltimore Hundred (Sussex Co., south of Indian River Inlet), 10 Sep 1875 (A. Commons s.n., PH).

Desmodium humifusum (Muhl.) Beck, spreading tick-clover, C2, SH. Tatnall (1946) reported the species to be "rare, in sandy soil." Historical collections, all in New Castle Co., include: (1) sandy woods near Collins Beach, 27 Aug 1867 (A. Commons s.n., NY); (2) wooded hillside of Red Clay Creek, near Delaware Western RR tank, Sep 1879 and 1 Oct 1879 (W. M. Canby s.n., NY); (3) cedar swamp, 9 Aug 1866 (A. Commons s.n., NY); and (4) New Castle City, rare, 27 Aug 1867 (A. Commons s.n., NY). Considering that it is known to occur in disturbed habitats (i.e. along powerline clearings) it may yet be relocated in Delaware.

Eriophorum gracile Koch ex Roth, slender cotton-grass, SX. This species was thought to be "rare . . ." in Delaware (Tatnall 1946). Historical locations include: (1) Thompson's swamp, 1.5 miles northeast of New Castle (E. Tatnall, 1858, DOV); (2) McCrone's swamp,

near Farnhurst, 20 Jun 1876 (A. Commons s.n., PH); and (3) in sphagnum, east of VanDyke, 7 Jun 1881 (A. Commons, s.n., PH). The State Hospital now occupies the former McCrone's swamp site, and Thompson's swamp has been destroyed (or severely degraded) due to expansion of Wilmington and New Castle. The best area for relocating this species is the wetlands near Vandyke.

Eupatorium resinosum Torr., pine barrens boneset, C2, SH. Tatnall (1946) considered the pine-barrens boneset to be "rare, in low pine barrens . . .," while Tucker et al. (1979) stated that this species was "definitely extirpated." There are two historical sites: (1) in low pine barrens near Gumboro, 5 Aug 1874 (A. Commons, s.n., PH); and (2) Baltimore Hundred (south of Indian River Inlet), 10 Sep 1875 (A. Commons, s.n., PH).

Euphorbia purpurea (Raf.) Fern., Darlington's or glade spurge, C2, SH. Tatnall (1946) stated that it was "rare, in the Piedmont Province," while Tucker et al. (1979) considered it to be "definitely extirpated." There is one known historical location: swamp west of Hockessin, 8 Jun 1881 (A. Commons s.n., PH). This site is in the northwest part of the state within 10 km of an extant PA population (Pennsylvania Natural Diversity Inventory pers. comm.).

Fimbristylis annua (All.) Roemer & Schultes, annual fimbry, SX. Tatnall (1946) stated that the annual fimbry was "rare, known from serpentine soil of New Castle Co., . . . no recent collections." Tucker et al. (1979) thought that it was "possibly extirpated." Historical location: near Centreville, New Castle Co., moist soil (serpentine barrens), Sep 1972 (A. Commons s.n., PH).

Gentiana autumnalis L., pine barren gentian, SH. Tatnall (1946) cited one historical location: Sussex Co., pine barrens, 10 Sep 1875 (A. Commons, s.n., PH). Botanists should continue to search for this species in the moist pinewoods of southern Delaware.

Gentianopsis crinita (Froelich) Ma., fringed gentian, SH. Tatnall (1946) reported this species "rare, New Castle Co. . . . now extinct in most or all of the above localities." Tucker et al. (1979) reported that it was "definitely extirpated." Collections include: (1) near Centreville, 1865, 1878 (A. Commons s.n., PH); (2) Faulkland, 24 Sep 1886 (R. R. Tatnall s.n., DOV); (3) Southwood, Oct 1894 (W. M. Canby, DOV); (4) Brandywine Springs, 8 Oct 1896 (W. M. Canby, DOV); and (5) roadside bank one mile west of Centreville, 12 Oct 1928 (R. R. Tatnall 221, DOV, PENN).

Hydrangea arborescens L., American hydrangea, SX. Tatnall (1946) reported that this species was ". . . rare in New Castle Co." It was known from one site: Mt. Cuba, 13 May 1892 (J. Crawford s.n., PH).

Lobelia boykinii T. & G., Boykin's lobelia, C2, SH. Tatnall (1946) considered the species "rare; meadows and ditches . . .," and Tucker et al. (1979) reported it "probably extirpated." It was known from one location: Ellendale, 24 Jul 1893 (W. M. Canby, s.n. DOV); ditches along RR, 9 Jul 1908, 20 Jun 1909 (C. S. Williamson, s.n., PH), and 6 Jul 1913 (Long & Bartram PH).

Lophiola aurea Ker Gawler (=*L. americana* (Pursh) Wood), gold-crest, SH. This species was cited by Tatnall (1946) as "very rare. . . ." There is one historical site: Sussex Co., pine-barren bogs between Gumboro and Laurel, 5 Aug 1874 (A. Commons, s.n., PH).

Lygodium palmatum (Bernh.) Sw., climbing fern, SH. This distinctive fern was known from two historical collections in New Castle Co., and more recently, from southwestern Sussex Co.: (1) border of wooded swamp ca. 1 mile north of streamlet tributary to Christina Creek, 22 Apr 1933 (B. Long s.n., CHRB); (2) woods along bank above Christina Creek 1.25 miles wnw of Bear Station (A. W. Leeds s.n., CHRB); and (3) low woods near Woodland Ferry (discovered by R. Radis in 1976, pers. comm.). The two New Castle

collections may represent the same locality reported by Tatnall (1946). The Sussex Co. site needs to be revisited to determine the current status of this plant.

Menyanthes trifoliata L., buckbean, SX. Tatnall (1946) stated that the species was "formerly rare in swamps of New Castle Co. . . . now probably extinct in our area." Tucker et al. (1979) thought it "probably extirpated." It was known from two locations: (1) Thompson's Swamp, nw of New Castle, 1840 (E. Tatnall s.n., DOV); and (2) Cedar Swamp, 1866 (Tatnall 1946). Thompson's Swamp has been virtually destroyed, but the Cedar Swamp area still has extensive "intact" habitat.

Micranthemum micranthemoides (Nutt.) Wettst., Nuttall's micranthemum, C1*, SX. This species is presumed to be extinct and has not been seen anywhere since 1941 (The Nature Conservancy 1987). According to Tatnall (1946) it was "infrequent . . . in New Castle Co.," and was known to occur "near Claymont, Delaware River between tides," 3 Oct 1866 (A. Commons s.n., DOV).

Monotropsis odorata Elliott, sweet pinesap, SH. Tatnall (1946) did not mention the species as occurring on the Delmarva. In Maryland it is known from Anne Arundel and Baltimore counties (G. Cooley pers. comm, Brown and Brown 1984). Apparently, there were two Delaware collections: (1) "Delaware," no date (E. Durand s.n. US 968638); and (2) "Delaware," no date (E. Durand s.n., PH). These may have been made in the 1860s, since Durand is known to have collected *M. odorata* in Maryland in 1867.

Muhlenbergia torreyana (Schultes) A. Hitchc., Torrey's dropseed, SH. This grass was considered "rare" by Tatnall (1946), while Tucker et al. (1979) thought it "definitely extirpated. . . ." Historical sites: (1) Felton, Kent Co. 25 Sep 1873, 25 Sep 1875 (A. Commons, s.n., NY, PH, US); and (2) bogs 0.5 mile east of Ellendale at RD 231, Sussex Co., Sep 1875 (W. M. Canby, s.n., NY); 27 Sep 1895 (A. Commons, s.n., PH); 12 Oct 1940 (A. Chase 12619, US); and also 12 Oct 1940 (R. R. Tatnall 4473, GH).

Narthecium americanum Hudson, bog-asphodel, C1, SX. Tatnall (1946) believed the species "rare . . ." while Tucker et al. (1979) stated that it was "definitely extirpated." Historical locations include: (1) swamp near Lewes, Sussex Co., 1 Aug 1895 (A. Commons s.n., PH); and (2) damp railroad bank at Vandyke, New Castle Co., 26 Sep 1894 (Tatnall 1946).

Ophioglossum vulgatum L. var. *pseudopodum* (Blake) Fawr., northern adder's tongue, SH. Tatnall (1946) considered this fern to be "rare," while Tucker et al. (1979) state that this species is "definitely extirpated." Historically, it is known from one New Castle Co. locale: near Centreville, moist place in woods, 14 Jul 1873 (A. Commons s.n., PH).

Oxypolis canbyi (Coult & Rose) Fern., Canby's dropwort, LE, SH. This plant was last collected in Delaware in 1894. The historical site, the type locality, was the meadows and bogs at Ellendale. According to Dill and Tucker (1986) a total of seven field trips to the site from 1867 to 1894 produced 23 herbarium sheets. Its recent discovery in Maryland (Boone et al. 1984) has renewed hope that *O. canbyi* will be rediscovered in Delaware.

Polygala paucifolia Willd., gay-wing mikwort, SX. Tatnall (1946) considered this plant "very rare, in the Piedmont of New Castle Co. . . .," while Tucker et al. (1979) thought it "possibly extirpated." It was known from a single locality: 0.25 mile north of Mt. Cuba Station, on railroad bank, May 1890 (W. Tatnall, Jr. s.n., DOV) and many later collections deposited at DOV, PENN, PH, and US.

Polygala senega L., seneca snakeroot, SX. Tatnall (1946) stated of this species "formerly rather frequent in rocky woods of the Piedmont, now rare or perhaps extinct in our range." Tucker et al. (1979) also thought *P. senega* extirpated. Historical collections include: (1) Wilmington, May 1890, (W. M. Canby, s.n., PH); (2) Mt. Cuba, rocky woods, 15 & 21 Jun

1865, 27 May 1873 (A. Commons, s.n., PH); and (3) Guyencourt, south of P. & R. Station, tributary of Brandywine Creek, loamy wooded slopes, 23 Jun 1923 (B. Long 27524) and 1 Jun 1924 (H. Williams, s.n. PH).

Rhynchospora knieskernii Carey, Knieskern's beakrush, LT, SH. This species is only known from Delaware and New Jersey (US Fish and Wildlife Service 1991b). Both historical localities were in Sussex Co.: (1) swamp near Gumboro, 5 Aug 1874 (A. Commons s.n., PH); and (2) Baltimore Hundred (south of Indian River Inlet), 10 Sep 1875 (A. Commons s.n., PH). Considering that *R. knieskernii* is found along powerline right-of-ways and other disturbed habitats in New Jersey (D. Snyder pers. comm.), there is still hope that it may be relocated in Delaware.

Rhynchospora oligantha A. Gray, few-flowered beakrush, SH. Tatnall (1946) considered this species to be "rare," while Tucker et al. (1979) thought it "possibly extirpated." There are two Sussex Co. collections, perhaps from the same site: (1) bogs, 1.5 mile south of Lewes, Jul 1878 (W. M. Canby s.n., DOV, PH); and (2) near Lewes, 26 Aug 1895 (A. Commons s.n., PH).

Schwalbea americana L., chaffseed, LE, SH. Tatnall (1946) considered the species "rare" and Tucker et al. (1979) stated that it was "definitely extirpated." Collections, all from New Castle Co. include: (1) St. Georges, Jun 1866 (W. M. Canby s.n., NY), along the canal (or south side of canal, below St. Georges), St. Georges, 22 Jul 1875 (A. Commons s.n., NY, PH); and (2) on a hill south side of C & D Canal, 1.0 mile below the crossing of the Delaware Railroad, Jun–Aug 1862 (W. M. Canby s.n., NY). Most of the habitat in this area has been destroyed or degraded during the past 100 years and there is little hope that the chaffseed will be relocated.

Scutellaria saxatalis Riddell, rock-skullcap, C2, SH. Tatnall (1946) reported the species to be "rare, in rocky woods" and Tucker et al. (1979) thought it "probably extirpated." Historical sites were in New Castle Co.: (1) stony places above Rockford, 10 Jun 1836 (E. Tatnall s.n., PH); (2) Brandywine, 1888 (W. Tatnall s.n., PH); and (3) Wilmington, rocky woods, 19 Jun 1897 (A. Commons s.n., PH).

Solidago uliginosa Nutt., bog-goldenrod, SH. Tatnall (1946) stated that this species was "infrequent, in bogs, Coastal Plain, New Castle, Sussex, . . . counties," and Tucker et al. (1979) thought it was extirpated. All of Delaware's collections were from New Castle Co.: (1) swamps, New Castle, no date (W. M. Canby s.n.); (2) McCrone's swamps, near Wilmington, 10 Oct 1876 (A. Commons s.n.); (3) Wilmington, 10 Sep 1890 (A. Commons s.n.); (4) Pencader Hundred, Porter's Station, in dry soil, 9 Oct 1890 (A. Commons s.n.); (5) Kiamensi, swamps, 8 Aug 1894 (A. Commons s.n.); (6) swamps, near Townsend, 21 Sep 1894 and 9 Oct 1896 (A. Commons s.n.); and (7) swampy margins of woods, southwest of Vandyke, 9 Oct 1908 (B. Long s.n.), all collections at PH.

Tofieldia racemosa (Walter) BSP, coastal false-asphodel, SH. This species was reported by Tatnall (1946) to be "rare, in wet ground or shallow water . . .," while Tucker et al. (1979) considered it "probably extirpated." Historical collections may all refer to the same locality: (1) "Glades south of Leweston," and swamp 1.0 mile south of Lewes, Sussex Co., 13 Jul, 22 Jul 1878 (W. M. Canby s.n., PH, NY); (2) near Lewes, 15 Aug 1895 (A. Commons s.n., PH); (3) three miles northwest of Rehoboth, 14 Aug 1923 (Otis s.n. GH, PH), 5 Sep 1936, and 5 Aug 1937 (R. R. Tatnall 3173, 3461, DOV, GH); and (4) wet ground on east side of railroad, 0.75 mile northwest of Howlands Glade bridge (Otis s.n., GH, PH).

Triphora trianthophora (Swartz) Rydb., three-birds orchid, SH. This species has not been collected in Delaware since before 1900 (Tucker et al. 1979). Tatnall (1946) considered it

"rare and local; meadows and low woods of the Piedmont." The one historical collection was from Hockessin, rich woods, no date (Tatnall 1946).

Xerophyllum asphodeloides (L.) Nutt., turkeybeard, SH. This species was known from one historical site: dry pine woods near Laurel, Sussex Co., 5 Aug 1874 (A. Commons s.n., PH).

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