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THE SECOND ONE HUNDRED YEARS

CONTENTS

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BARTONIA

Journal of the Philadelphia Botanical Club

Since its founding in 1891, the Philadelphia Botanical Club has offered outstanding programs, field trips, and other opportunities for those with an interest in plants to meet and exchange information. Monthly meetings (www.philbotclub.org/meeting.html) feature speakers from various botanical backgrounds. They are held at 7:30 p.m. on the fourth Thursday of the month in September, October, and January through May and the third Thursday in November and December, usually at the Marvin Comisky Conference Center, One Logan Square (one block east of the Academy of Natural Sciences of Philadelphia). From April to October, expert field botanists lead field trips in the mid-Atlantic region and occasionally elsewhere in North America or overseas (www.philbotclub.org/field_trips.html).

Bartonia, in publication since 1909, was named for William P. C. Barton (1786-1856), Professor of Botany at the University of Pennsylvania and author of the first local flora (1818), *Compendium Florae Philadelphicae* (and nephew of physician and botanist Benjamin Smith Barton, who was a mentor of the explorer Meriwether Lewis). The journal began as an annual abstract of the Club's proceedings with short articles on the plants of the Philadelphia area. Its scope has broadened to encompass original research in plant systematics, plant ecology, and plant conservation biology with articles on floristics, distribution, methods, biography, bibliography, history of botanical exploration, and other topics of botanical interest ranging throughout—and well beyond—the mid-Atlantic region.

A subscription to Bartonia comes with Club membership (annual dues are $20.00 for regular members, $12.00 for full-time students) and the cost is $25.00 per issue for non-members and institutions. The membership year is from 1 January through the following 31 December. The Club is exempt from federal income tax under section 501(c)(3) of the Internal Revenue Code; contributions above the subscription cost are tax-deductible

Membership/subscription correspondence:
Subscription Manager
The Philadelphia Botanical Club
Botany Department, Academy of Natural Sciences
1900 Benjamin Franklin Parkway
Philadelphia, PA 19103-1195

Manuscript submission:
Sasha W. Eisenman, Editor, *Bartonia*
Temple University Dept. of Landscape Architecture and Horticulture
201 Dixon Hall
580 Meetinghouse Road
Ambler, PA 19002
eisenman@temple.edu

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The Second One Hundred Years of *Bartonia*

The first issue of *Bartonia* was published in February 1909. In an "Introductory," we learn that the title was chosen to honor Prof. Wm. P. C. Barton, "Professor of Botany in the University of Pennsylvania, 1815, and author of the first local flora relating to this vicinity, the COMPENDIUM FLORAE PHILADELPHICAE, published in 1818." Early papers in *Bartonia* were focused on local botany in southeastern Pennsylvania, southern New Jersey, northern Delaware, and northern Maryland. In 1924, Francis W. Pennell succeeded Stewardson Brown as the second editor of *Bartonia*, a position he held from 1924 (No. 8) to 1949 (No. 25). In *Bartonia* No. 9 (1926), Pennell published a paper on Benjamin Smith Barton and his herbarium, which was his first of many on people who made important contributions to botany. These included Lewis David von Schweinitz (No. 16), Elias Durand (No. 17), Thomas Nuttall (No. 18), Witmer Stone (No. 20), and Constantine Samuel Rafinesque (Nos. 23 and 25). Edgar T. Wherry edited *Bartonia* from 1952 (No. 26) to 1970 (No. 39). He authored numerous papers between 1924 and 1978, mostly on Polemoniaceae and *Phlox*. In later issues he published check-lists of plants in Delaware (No. 37), Philadelphia (No. 38), Montgomery (No. 41), and Bucks (No. 43) counties, Pennsylvania, and one with Otway Brown for Cape May County, New Jersey (No. 40). Alfred E. Schuyler was editor of *Bartonia* from 1971 (No. 40) to 1996 (No. 59), Roger Latham from 2000 (No. 60) to 2007 (No. 63), and Gerry Moore from 2009 (No. 64) to the present. The current issue (No. 65) begins the second one hundred years. Sasha Eisenman will be the editor for the next issue (No. 66). Since the early 1970s the journal has included papers on diverse aspects of plant systematics and ecology that go beyond the original focus on local flora, although this subject area continues to be of interest today.

ALFRED E. SCHUYLER
Curator Emeritus of Botany
Academy of Natural Sciences

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A Preliminary Catalog of New Jersey Hornworts and Liverworts

KERRY BARRINGER
Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, New York 11225, USA
kerrybarringer@bbg.org

ABSTRACT. Based on a survey of herbarium collections, three species of hornworts (Anthocerotophyta) and ninety-three species of liverworts (Marchantiophyta) are know to have grown in New Jersey. More than half of these records are based on collections more than 50 years old. Eighteen species of liverworts are potentially rare.

INTRODUCTION

Liverworts (Marchantiophyta) and hornworts (Anthocerotophyta) have been largely ignored in studies of the plant diversity of New Jersey. Though they are widespread and sometimes abundant, they are usually overlooked by collectors. Most specimens in herbaria were collected before 1950 and many genera have not been sampled for more than 100 years. The only lists for the state are also more than 100 years old (Parker 1881, Rau 1889), and Formann (1998) mentions only a few species occurring in the pine barrens. We have almost no understanding of the current status and distribution of these plants in the state.

To gain a better understanding of liverworts and hornworts in New Jersey, there is a need for new collections of these plants throughout the state. Both liverworts and hornworts, like mosses, can be conveniently collected into envelopes or packets (Hicks 1992). They should be sought in wet to moist habitats, especially along stream corridors and on fallen, rotting branches and trunks that have lost their bark. They are frequent in all kinds of swamps and wetlands, and many interesting species can be found growing in wet portions of fallow fields (Crum 1991).

Identifications are not difficult with fresh material and proper magnification. Most of the common species can be reliably identified even in sterile condition using Hicks (1992), Conard & Redfearn (1979), Crum (1991), and Lincoln (2008). For detailed information and keys to all of our species, Schuster (1966-1992) is unsurpassed. Within the next few years, a definitive treatment of the liverworts and hornworts will appear as part of the Flora North America series (Zander & Eckel 2007).

METHODS

The following checklist was compiled from specimens at the Academy of Natural Sciences, Philadelphia (PH), Brooklyn Botanic Garden (BKL), and the Chrysler Herbarium at Rutgers University (CHRB). In addition, database records of the specimens at the Lewis Anderson Herbarium of Duke University (DUKE), the University of Michigan Herbarium

(MICH), the Missouri Botanical Garden (MO) and the New York Botanical Garden (NY) were checked, as were the lists of representative specimens in Schuster (1966-1992).

Results

Based on a survey of herbarium records, three species of hornworts in three genera and 93 species of liverworts in fifty genera are known from New Jersey (Appendix 1). For all of the hornwort species and 55 liverwort species (about 60%), the most recent collections were made before 1950.

Discussion

With so few recent collections of hornworts and liverworts available, it is difficult to determine which species are truly rare in New Jersey. Vascular plant rarities tend be either plants that occupy very specific or uncommon habitats, or plants whose range has been severely limited by habitat change, or plants near their climatic or distributional limits (Breden, et al. 2006, Snyder 2006). If we apply these criteria, a few liverwort species stand out as potentially rare species for the state (Table 1).

Table 1. Species that appear to be rare.

Aneura pinguis
Cephaloziella elachista
Cephaloziella rubella
Chiloscyphus minor
Chiloscyphus pallescens
Fossombronia brasiliensis
Fossombronia foveolata
Frullania inflata
Herbertus aduncus
Jubula pennsylvanica
Lepidozia reptans
Mannia fragrans
Marsupella emarginata
Mylia anomala
Pellia epiphylla
Preissia quadrata
Scapania glaucocephala
Tritomaria exsecta

Four species appear to be limited to cool sphagnum bogs similar to those found in extreme northern and northwestern New Jersey (Breden, et al. 2001). *Cephaloziella elachista* (J. B. Jack) Schiffn., *C. rubella* (Nees) Warnst., *Mylia anomala* (Hook.) Gray, and *Scapania glaucocephala* (Taylor) Austin were collected from cool bogs in Sussex, Passaic, and Bergen counties. All but *C. rubella* are limited to this habitat throughout their range, which tends to be northern, with an extension south along the Appalachians to Virginia. The historical records from Bergen County seem odd today, when no suitable sites are known, but other historical collections in the county, notably the historical occurrence of *Cornus canadensis* L., provide further evidence for the occurrence of cool bogs in Bergen County in the past.

Other species share the Appalachian distribution of these species, and they appear to be rare even though they are not limited to bogs, because they are at the eastern edge of their range. *Chiloscyphus pallescens* (Ehrh.) Dumort., *Frullania riparia* Hampe, *Herbertus aduncus* (Dicks.) Gray, *Lepidozia reptans* (L.) Dumort., *Mannia fragrans* (Balbis) Freye & Clark, *Preissia quadrata* (Scop.) Nees, and *Tritomaria exsecta* (Schmidel) Schiffner all occur in the Appalachian mountains and are found at the edge of their range in northwest New Jersey.

Limestone endemics and calciphiles are usually rare in New Jersey because there is so little undisturbed habitat (Breden, et al. 2006). *Aneura pinguis* (L.) Dumort. and *Preissia quadrata* have been collected twice in New Jersey, and are known to be limited in the northeastern United States to wet, basic substrates, like wet limestone, which are uncommon in New Jersey (Schuster 1992).

Two of the species of *Fossombronia* with historical records in the state, *F. brasiliensis* Steph. and *F. foveolata* Lindb., prefer clay soils. The known collections were made on the inner coastal plain, which is known for its clay deposits (Breden, et al. 2001). This area has been subject to extreme population pressures and it is likely that habitat destruction has severely limited their distribution.

Conclusion

Further study and collecting will greatly expand our understanding of New Jersey's liverworts and hornworts. It is very likely that there are more species in the state than are included in this list. For example, six species that have been collected on the Pennsylvania side of the Delaware Water Gap have not been found on the New Jersey side: *Barbilophozia barbata* (Schreb.) Loeske, *Frullania brittoniae* Evans, *Metzgeria crassipilis* (Lindb.) A. Evans, *M. furcata* (L.) Corda, *Pellia endiviifolia* (Dicks.) Dumort., and *Tritomaria exsectiformis* (Briedl.) Schiffner. Nevertheless, suitable habitat exists on the New Jersey side, so the proximity of good populations strongly suggests that they will be found there.

Some species that are widespread in other states are known from only one or a few counties in New Jersey, so it is likely that further collecting will show that these species are more widespread. For example, *Cephalozia catenulata* (Huebn.) Lindb. appears to be limited to white cedar swamps on the coastal plain in New Jersey, based on the records we have now. However, Hicks (1992) points out that it also grows in inland cedar swamps and, therefore, should be searched for in northwestern New Jersey. Also, our only record of *Cololejeunea biddlecomiae* is from shaded ravines in Bergen county. South of New Jersey, this species grows on the coastal plain (Hicks 1992).

Finally, we cannot be sure that many of the species listed here still occur in the state, because many have not been seen in more than 50 years. We have no idea how the rapid development in the state has affected the populations of these organisms, but it is likely that many are now rare or endangered (Breden, et al 2006).

Only additional collecting and study can begin to answer the many questions still outstanding on the distribution and health of the hornwort and liverwort populations in the state. I hope that this list will make that work a little easier.

Acknowledgments

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APPENDIX

CHECKLIST OF THE HORNWORTS AND LIVERWORTS OF NEW JERSEY

Nomenclature generally follows Stotler & Crandall-Stotler (1977) unless a more recent treatment is available. If there has been any confusion, or a recent nomenclatural change, synonyms are cited. Accepted names are in boldface.

When there is no field number for a collection, the collection date is cited. If the specimens are part of a numbered distribution of exsiccatae, the exsiccata number is cited. The two distributions cited are C. F. Austin's *Hepaticae Boreali-Americanae* [Hep. Bor.-Amer.] and Caroline C. Haynes' *American Hepaticae* [Amer. Hep.].

Because of the paucity of specimens for some species, habitat notes are drawn from the literature as well as from specimens labels.

Hornworts (Anthocerotophyta)

Anthoceros (Anthocerotaceae)
Anthoceros agrestis **Paton**
capsules: fall and early winter
on dripping basalt cliffs, also reported from harvested cornfields (Schuster 1992b)
Bergen: *Wiegmann 1212* (BKL, NY)
Monmouth: *N. Britton s.n.*, 2 Oct 1886 (CHRB)
Anthoceros laevis L. (see *Phaeoceros laevis*)
Anthoceros punctatus L. (ours are *Anthoceros agrestis*)
Aspiromitus (Anthocerotaceae)
Aspiromitus punctatus ssp. *agrestis* (Paton) R. M. Schust. (see *Anthoceros agrestis*)
Notothylas (Notothyladaceae)
Notothylas orbicularis **(Schwein.) Sull.**
capsules: Aug-Nov
on wet soil at the edges of corn fields, in ruts and trails
Bergen: *C. F. Austin s.n.*, Oct 1863 (MO, NY)
Hunterdon: *E. Britton s.n.*, 28 Sep 1886 (CHRB)
Sussex: *Nearing s.n.*, 27 Sep 1947 (NY)
Phaeoceros (Anthocerotaceae)
Phaeoceros laevis **(L.) Prosk.**
capsules: fall and early winter
on wet soil in harvested cornfields
Monmouth: *Haynes 1638* [Amer. Hep. 20] (BKL, NY)
Morris: *N. Britton s.n.*, 21 Sep 1886 (CHRB)
Sussex: *N. Britton s.n.*, 20 Sep 1887 (CHRB)
Schuster (1992b) reports an Austin specimen from Bergen County.

Liverworts (Marchantiophyta)

Aneura (Aneuraceae)
Aneura pinguis **(L.) Dumort.**
capsules: Mar-May
wet limestone or traprock ledges and on mossy soil (Schuster 1992)
Bergen: *Austin s.n.* [112 Hep. Bor.-Amer.] (BKL, NY)

Morris: *R. Torrey s.n.*, 8 Jan 1922 (NY)

Asterella (Aytoniaceae)

***Asterella tenella* (L.) P. Beauv.**

capsules: Mar-Jun

on soil-covered ledges on trap rock or limestone, usually dripping wet

Bergen: *M. A. Howe 16* (NY)

Essex: *Underwood s.n.*, 9 May 1897 (NY)

Hudson: *J. Torrey s.n.*, *s.d.*(NY)

Somerset: *Wiegmann 5002* (NY)

Schuster (1992b) reports a specimen from Passaic County.

Bazzania (Lepidoziaceae)

***Bazzania trilobata* (L.) Gray**

on wet soil, rocks, decaying logs, or tree bases in moist forests, swamps

Bergen: *C. F. Austin s.n.* [79 Hep. Bor.-Amer.] (BKL, NY)

Burlington: *H. Webster s.n.*, 27 Feb 1968 (CHRB)

Cumberland: *Long 1376* (PH)

Gloucester: *Long 1395* (PH)

Hunterdon: *Cantlon & Moul 1001* (CHRB)

Monmouth: *Cantlon & M. Buell s.n.*, 13 Apr 1949 (CHRB)

Ocean: *Long 2232* (PH)

Passaic: *Barringer 20493* (BKL)

Salem: *Long 995* (PH)

Sussex: *Barringer 20623* (BKL)

Blasia (Blasiaceae)

***Blasia pusilla* L.**

capsules: spring

wet, disturbed roadbanks, ditches, rarely on rocks in streambeds

Bergen: *Wiegmann s.n.*, 12 Oct 1916 (NY)

Essex: *Haynes s.n.*, 10 May 1902 (NY)

Monmouth: *M. A. Howe s.n.*, 15 Jun 1918 (NY)

Morris: *Britton s.n.*, 21 Sep 1886 (CHRB)

Sussex: *Lawton 544* (NY)

Warren: *Henley s.n.*, 1940 (NY)

Blepharostoma (Pseudolepicoleaceae)

***Blepharostoma trichophyllum* (L.) Dumort.**

usually mixed with bryophytes or on moist, shaded rocks in mountains (Hicks 1992)

Atlantic: *M. Robertson 7206* (PH)

Burlington: *Thiers 1254* (NY)

Cumberland: *Thiers 1255* (NY)

Gloucester: *Rau s.n.*, Jul 1882 (NY)

Ocean: *Matzke s.n.*, Oct 1933 (NY)

Union: *Barringer 20532* (BKL)

Calypogeia (Calypogeiaceae)

***Calypogeia fissa* (L.) Raddi**

on various moist substrates in shaded woods, esp. near streams

Bergen: *Beals s.n.*, 28 Nov 1946 (NY)

Monmouth: *Haynes s.n.*, 28 May 1908 (NY, PH)

Passaic: *Barringer 20503* (BKL)

Somerset: *Stevenson s.n.*, 27 Mar 1962 (CHRB)

Sussex: *Barringer 20630* (BKL)

Union: *Barringer 20528* (BKL)

***Calypogeia muelleriana* (Schiffner) Mull. Frib.**
on soil of moist streambanks
Hudson: *Austin s.n.*, 1862 (NY)
Monmouth: *Barringer & D. Barringer 21594* (BKL)
Passaic: *Barringer 22356* (BKL)
Sussex: *Barringer 21003* (BKL)
Union: *Barringer 21485* (BKL)
Warren: *Barringer 22091* (BKL)
***Calypogeia sphagnicola* (Arnell & J. Perss.) Warnst. & Loeske**
peat bogs and *Sphagnum* stands
Burlington: *Thiers 1249* (NY)
Camden: *Barringer 20826* (BKL)
Cape May: *Wonderly 818* (NY)
Gloucester: *Rau s.n.*, Jun 1882 (NY)
Middlesex: *Moul 6995* (CHRB)
Monmouth: *Haynes 1123* (BKL, MO, NY)
***Calypogeia sullivantii* Austin**
on soil or acid rocks in shade
Bergen: *Austin* [74b Hep. Bor.-Amer.] (BKL, NY)
Burlington: *Evans s.n.*, 12 Aug 1892 (NY)
Somerset: *Stevenson s.n.*, 19 Mar 1962 (CHRB)
Calypogeia trichomanis (L.) Corda (ours are *C. muelleriana* or *C. fissa*)
Cephalozia (Cephaloziaceae)
***Cephalozia bicuspidata* (L.) Dumort.**
on shaded, wet, usually peaty soils along stream and trails, rarely on acidic rocks (Schuster 1974)
Bergen: *Wurdack & Cowan 7* (NY)
Gloucester: *Barringer 21205* (BKL)
Hunterdon: *Barringer 20752* (BKL)
Monmouth: *Barringer & D. Barringer 21592 (BKL)*
Ocean: *Gilly s.n.*, 25 Oct 1941 (NY)
Sussex: *Barringer 20627* (BKL)
***Cephalozia catenulata* (Huebner) Lindb.**
on decaying logs, *Chamaecyparis* swamps
Bergen: *Howe s.n.*, 22 Sep 1898 (NY)
Burlington: *Evans s.n.*, 12 Aug 1892 (NY)
Monmouth: *Howe s.n.*, 15 Jun 1918 (NY)
Ocean: *Torrey Botanical Club s.n.*, 29 May 1896 (NY)
***Cephalozia connivens* (Dicks.) Lindb.**
on soil in swamps and bogs with *Sphagnum*
Atlantic: *Long 1984* (PH)
Burlington: *Barringer 20696* (BKL)
Camden: *Barringer 20846* (BKL)
Gloucester: *Rau s.n.*, Jun 1882 (NY)
Mercer: *Long 1885* (PH)
Monmouth: *Barringer & D. Barringer 21599* (BKL)
Ocean: *Barringer 20921* (BKL)
Cephalozia fluitans (Nees) Spruce (see *Cladopodiella fluitans*)
***Cephalozia lunulifolia* (Dumort.) Dumort.**
on peaty soils, rotting wood and in bogs and swamps with *Sphagnum*
Bergen: *Barringer 22301* (BKL)

Burlington: *Underwood s.n., s.d.* (NY)
Camden: *Barringer 20881* (BKL)
Gloucester: *Barringer 21230* (BKL)
Ocean: *Matzke s.n, s.d.*. (NY)
Sussex: *Barringer 21906* (BKL)
Cephaloziella (Cephaloziellaceae)
***Cephaloziella divaricata* (Sm.) Warnst.**
on soil in woods
Bergen: *Howe s.n, s.d.*. (NY)
Burlington: *Evans s.n., s.d.* (NY)
Ocean: *Matzke s.n.*, 1 Nov 1947 (NY)
***Cephaloziella elachista* (J. B. Jack) Schiffner**
in *Sphagnum* bogs often with *Mylia*
Bergen: *Austin* [54 Hep. Bor.-Amer.] (BKL, NY)
***Cephaloziella rubella* (Nees) Warnst.**
on peaty soil, wet roadbanks, and sometimes on rotting wood
Sussex: *Barringer 20595* (BKL)
Warren: *Barringer 20985* (BKL)
Chiloscyphus (Geocalycaceae)
***Chiloscyphus cuspidatus* (Nees) J. Engel & R. M. Schust.**
on tree bases along streams in uplands
Warren: *Barringer 21218* (BKL)
***Chiloscyphus minor* (Nees) J. J. Engel & R. M. Schust.**
on soil and tree bases in coastal plain swamps
Burlington: *Barringer 20700* (BKL)
Monmouth: *Barringer & D. Barringer 21590* (BKL)
Passaic: *C. Gilly s.n.*, 18 Oct 1941 (NY)
***Chiloscyphus pallescens* (Ehrh.) Dumort.**
on moist soil and decorticated logs in swamps
Passaic: *Barkley s.n.*, 10 Oct 1958 (NY)
***Chiloscyphus polyanthos* (L.) Corda**
Bergen: *Matzke s.n.*, 10 Apr 1947 (NY)
Burlington: *T. P. James s.n.*, Jul 1851 (NY)
***Chiloscyphus profundus* (Nees) J. J. Engel & R. M. Schust.**
on soil and tree bases, occasionally on rotting wood
Atlantic: *Long 2036* (PH)
Bergen: *Wiegmann 5008* (NY)
Burlington: *Burlington 20682* (BKL)
Camden: *Burlington 20851* (BKL)
Cumberland: *M. Robertson 3145* (PH)
Essex: *Haynes s.n.*, 10 May 1902 (NY)
Gloucester: *Long 1926* (PH)
Hunterdon: *Barringer 20797* (BKL)
Mercer: *Conard 0-1521* (NY)
Middlesex: *E. Britton s.n.*, 19 Apr 1884 (CHRB, NY)
Monmouth: *Barringer & D. Barringer 21591* (BKL)
Morris: *Barringer 20115* (BKL)
Ocean: *E. Britton s.n.*, 28 May 1887 (CHRB)
Passaic: *Barringer 20603* (BKL)
Salem: *Long 2117* (PH)
Sussex: *Barringer 20586* (BKL)

Union: *Barringer 20096* (BKL)
Warren: *Barringer 21231 (BKL)*
Chiloscyphus rivularis (Schrad.) Hazsl. (ours are *C. polyanthos*)
Cladopodiella (Cephaloziaceae)
***Cladopodiella fluitans* (Nees) Jörg.**
peat bogs, in sun (Schuster 1974)
Bergen: *Austin* [35 Hep. Bor.-Amer.] (BKL)
Burlington: *Leonard 6395* (NY)
Ocean: *Allen 16892* (MO)
Cololejeunea (Lejeuneaceae)
***Cololejeunea biddlecomiae* (Austin) A. Evans**
on tree bark, rarely on rocks in shaded ravines
Bergen: *Howe s.n.*, 5 Nov 1898 (NY)
Sussex: *Barringer 22359* (BKL)
Conocephalum (Conocephalaceae)
Conocephalum conicum (L.) Underw. (not in NJ, see *C. salebrosum*)
***Conocephalum salebrosum* Szweyk., Buczkowska and Ordzyoski**
on soil or rocks along streams and in swamps
Bergen: *Wiegmann 5005* (NY)
Essex: *Haynes s.n.*, 10 May 1902 (NY)
Hunterdon: *Barringer 20743* (BKL)
Mercer: *Long 1886* (PH)
Monmouth: *Haynes 12* (NY)
Morris: *Barringer 18238* (BKL)
Ocean: *Barringer 22149* (BKL)
Passaic: *Barkley 36* (NY)
Sussex: *Barringer 18056* (BKL)
Warren: *Barringer 21226* (BKL)
Diplophyllum (Scapaniaceae)
***Diplophyllum apiculatum* (A. Evans) Stephani**
on peaty soil on roadbanks, thin soil over rocks, steep roadcuts
Bergen: *Howe s.n.*, 6 Oct 1898 (NY)
Monmouth: *Barringer & D. Barringer 21606* (BKL)
Passaic: *Barringer 21445* (BKL)
Warren: *Barringer & D. Barringer 21845* (BKL)
***Diplophyllum obtusifolium* (Hook.) Dumort.**
Bergen: *Austin* [20 Hep. Bor.-Amer.] (NY)
Fossombronia (Fossombroniaceae)
***Fossombronia brasiliensis* Stephani**
moist, exposed clay of ditches and old fields (Schuster 1992)
no county designated: *Austin* s.n, *s.d.* (NY)
Fossombronia cristula Austin (see *F. foveolata*)
***Fossombronia foveolata* Lindb.**
on exposed clay and moist sand (Schuster 1992)
Burlington: *Austin* [121 Hep. Bor.-Amer.] (BKL, NY)
Monmouth: *Haynes s.n., s.d.* (BKL)
Frullania (Jubulaceae)
***Frullania asagrayana* Mont.**
on bark and rock (Schuster 1992)
Atlantic: *H. A. Green s.n.*, 1882 (NY)
Bergen: *Austin s.n.*, 1861 (NY)

Gloucester: *Rau s.n.*, 1882 (NY)

***Frullania eboracensis* Gottsche**

on tree bark, especially maples, birches, poplars

Bergen:: *Austin s.n.*, 17 Jun 1865 (BKL, NY)
Burlington: *Barringer 20900a* (BKL)
Cape May: *Long 2012* (PH)
Cumberland: *Long 854* (PH)
Essex: *Haynes 510* (NY)
Gloucester: *Long 918* (PH)
Mercer: *M. Barbun s.n.*, Jul 1900 (PH)
Middlesex: *Barringer 21764* (BKL)
Monmouth: *Barringer & D. Barringer 21606* (BKL)
Morris: *Barringer & Zielinski 21667* (BKL)
Ocean: *Copeland 660* (NY)
Passaic: *Barringer 21468* (BKL)
Salem: *Long 927a* (PH)
Sussex: *Barringer 20327b* (BKL)
Warren: *Barringer 20986* (BKL)

***Frullania ericoides* (Nees) Mont.**

on rocks and tree bark

Bergen: *Austin s.n.*, Sep 1867 (NY)
Burlington: *M. Haines s.n., s.d.* (NY)

***Frullania inflata* Gottsche**

on dry rock walls, often traprock (Schuster 1992)

Bergen: *Austin* [104 Hep Bor.-Amer.] (BKL, NY, PH)

***Frullania plana* Sull.**

calciphile, on dry, exposed rocks (Schuster 1992)

Bergen: *Austin* [102 Hep. Bor.-Amer.] (BKL, NY, PH)

***Frullania riparia* Hampe**

On vertical faces of shaded rock (Schuster 1992)

Bergen: *Matzke s.n., s.d.* (NY)

Schuster (1992) reports this species from Ogdensburg in Sussex County.

Frullania tamarisci (L.) Dumort. (see *F. asagrayana*)

Frullania virginica Gottsche (see *F. eboracensis*)

Geocalyx (Geocalycaceae)

***Geocalyx graveolens* (Schrad.) Nees**

on rotting wood or humus in conifer woods, usually mixed with bryophytes

Ocean: *Matzke s.n.*, 1 Nov 1947 (NY)

Gymnocolea (Jungermanniaceae)

***Gymnocolea inflata* (Huds.) Dumort.**

on soil in *Sphagnum* bogs, swamps, occasionally on wet rock faces

Bergen: *Austin* [34 Hep. Bor.-Amer.] (NY, PH)
Burlington: *Thiers 1253* (NY)
Ocean: *E. Britton s.n.*, 30 Jun 1900 (NY)
Passaic: *Nearing s.n.*, 15 Dec 1946 (NY)

Herbertus (Herbertaceae)

***Herbertus aduncus* (Dicks.) Gray**

on rocks and trees in conifer woods, in gorges on rock underledges

Passaic: *Underwood 52a* (NY)

Jamesoniella (Jungermanniaceae)

***Jamesoniella autumnalis* (DC.) Stephani**

coastal plain swamps or black spruce swamps, on soil or rotting logs (Hicks 1992)
Bergen: *Howe s.n.*, 22 Sep 1898 (NY)
Cumberland: *Long 853* (PH)
Sussex: *Buser 12033* (NY)

Jubula (Jubulaceae)

***Jubula pennsylvanica* (Stephani) A. Evans**
on wet rocks along streams in shaded ravines (Hicks 1992, Schuster 1992)
Bergen *Matzke s.n.*, Oct 1931 (NY)
Schuster (1992) reports a specimen from Gloucester County.

Jungermannia (Jungermanniaceae)

Jungermannia biformis Austin (see *J. hyalina*)

***Jungermannia crenuliformis* Austin**
on acid rocks along shaded streams
Bergen: *Austin* [31 Hep. Bor.-Amer.] (BKL, NY)
Burlington: *Moul 7982* (CHRB)
Hunterdon: *Cantlon 1024* (CHRB)
Middlesex: *Moul 11052* (CHRB)
Monmouth: *Haynes 6626* (MO)
Ocean: *E. Moul 2667* (CHRB, NY)

Jungermannia divaricata Sm. (see *Cephaloziella divaricata*)

***Jungermannia fossombronioides* Austin**
thin soil over acid rocks, especially along streams (Hicks 1992)
Bergen: *Austin* [32 Hep. Bor.-Amer.] (BKL, NY)

***Jungermannia gracillima* Sm.**
on moist soils and acid rocks in woods
Bergen: *Barkley s.n.*, 3 Oct 1958 (NY)
Burlington: *Barringer 20693* (BKL)
Monmouth: *Haynes 809* (NY)

***Jungermannia hyalina* Lyell**
on soil over rocks in deciduous woods
Bergen: *Austin* [28 Hep. Bor.-Amer.] (BKL, NY)
Warren: *Barringer 15988* (BKL)

Jungermannia lanceolata L. (see *J. leiantha*)

***Jungermannia leiantha* Grolle**
on wet soil, usually near streams and falls, on wet rocks in ravines
Hunterdon: *Barringer 20743b* (BKL)
Sussex: *Nearing s.n.*, 27 Sep 1947 (NY)
Union: *Stephenson s.n.*, Mar 1962 (CHRB)

Jungermannia laxa Lindb. (see *Lophozia laxa*)

Jungermannia novae-caesareae A. Evans (see *Lophozia capitata*)

***Jungermannia pumila* With.**
on damp, shaded, acidic rocks along streams (Hicks 1992)
Bergen: *Austin* [33 Hep. Bor.-Amer.] (NY)

Kurzia (Lepidoziaceae)

***Kurzia sylvatica* (A. Evans) Grolle**
on peaty soil beside streams, sometimes mixed with bryophytes on logs
Bergen: *Cowan & Wurdack 22* (NY)
Burlington: *Barringer 20707* (BKL)
Camden: *Krout s.n.*, Aug 1914 (BKL, CHRB, PH)
Gloucester: *Rau s.n.*, 13 Jul 1882 (NY)
Mercer: *Long 1886* (PH)

Middlesex: *Wiegmann 5001* (NY)
Monmouth: *Haynes s.n.*, 15 May 1910 (BKL, NY)
Ocean: *Cowan & Wurdack 135* (NY)
Sussex: *Barringer 21917* (BKL)
Union: *Rudolph & Rissanen s.n.*, 19 Jun 1949 (NY)

Lejeunea (Lejeuneaceae)
Lejeunea cavifolia **(Ehrh.) Lindb.**
on bark
Passaic: *Barkley 215* (NY)
Union: *Rissanen & Rudolph s.n.*, 19 Jun 1949 (NY)

Lepidozia (Lepidoziaceae)
Lepidozia reptans **(L.) Dumort.**
on soil, tree bases, rotting wood (Hicks 1992)
without county designation: *Austin* [75 Hep. Bor.-Amer.] (BKL, NY)

Leucolejeunea (Lejeuneaceae)
Leucolejeunea clypeata **(Schwein.) A. Evans**
on trees, but in uplands can grow on rocks
Cumberland: *Theirs 1257* (NY)
Gloucester: *Barringer 21201* (BKL)
Warren: *Rau s.n., s.d.* (NY)

Lophocolea (Geocalycaceae)
Lophocolea bidentata (L.) Dumort. (not in NJ, ours are *Chiloscyphus profundus*)
Lophocolea heterophylla (Schrad.) Dumort. (see *Chiloscyphus profundus*)
Lophocolea minor Nees (see *Chiloscyphus minor*)

Lophozia (Jungermanniaceae)
Lophozia bicrenata **(Schmidel) Dumort.**
moist, acid, leached soils, abandoned farmland
Bergen: *Austin* [40 Hep. Bor.-Amer.] (BKL, NY)
Monmouth: *Haynes 1490* (BKL, NY)
Passaic: *Cowan & Wurdack 95* (NY)
Lophozia capitata **(Hook.) Macoun**
moist, sandy barrens and dune swales
Atlantic: *Evans s.n.*, Apr 1893 (NY)
Burlington: *Evans s.n.*, Aug 1892 (NY)
Lophozia laxa **(Lindb.) Grolle**
peat bogs
Bergen: *Austin* [46 Hep. Bor.-Amer.] (BKL, NY)

Lunularia (Lunulariaceae)
Lunularia cruciata **(L.) Dumort.**
weedy in greenhouses
Passaic: *Nash s.n.*, 29 Nov 1893 (NY)

Mannia (Aytoniaceae)
Mannia barbifrons Shimuzu & S. Hatt. (not in NJ, ours are *M. fragrans*)
Mannia fragrans **(Balbis) Frye & L. Clark**
on rock or thin soil over siliceous rocks in sun (Schuster 1992b)
Bergen: *Austin s.n.*, May 1858 (NY)
Warren: *T. C. Porter s.n.*, 4 May 1869 (PH)

Marchantia (Marchantiaceae)
Marchantia polymorpha **L.**
on soil or rocks in disturbed sites, a weed in greenhouses
Atlantic: *Moul 6138* (CHRB)

Burlington: *Krout s.n.*, Jun 1907 (BKL)
Camden: *E. Gadsby s.n.*, 15 Jun 1910 (PH)
Essex: *Nash 910* (NY)
Gloucester: *Lippincott s.n.*, 3 Jun 1894 (PH)
Hudson: *Torrey s.n., s.d.* (NY)
Mercer: *Stowell 2* (NY)
Monmouth: *Haynes* [11 Amer. Hep.] (NY)
Passaic: *Nash 625* (NY)
Salem: *Heritage s.n.*, 14 Jun 1888 (CHRB)
Somerset: *Moul 10827* (CHRB)
Warren: *Barringer 21210* (BKL)

Marsupella (Gymnomitriaceae)
***Marsupella emarginata* (Ehrh.) Dumort.**
on wet rocks and thin soil along streams (Schuster 1974)
Sussex: *Barringer 21875* (BKL)
Warren: *Buser 12048* (NY)

Metzgeria (Metzgeriaceae)
***Metzgeria conjugata* Lindb.**
shaded rock outcrops and on trees in uplands
Bergen: *Wiegmann s.n.*, 9 July 1915 (NY)
Hunterdon: *Barringer 20742b* (BKL)
Morris: *Barringer 18248* (BKL, CHRB)
Passaic: *Cowan & Wurdack 46* (NY)
Sussex: *Barringer 21549* (BKL)
Union: *Wynne 2788* (NY)
Warren: *Barringer 21217* (BKL)

Mylia (Jungermanniaceae)
***Mylia anomala* (Hook.) Gray**
in sphagnum bogs in uplands
Bergen: *Austin* [25 Hep. Bor.-Amer.] (BKL, NY, PH)
Sussex: *Beals s.n.*, 11 Oct 1947 (NY)

Nardia (Jungermanniaceae)
***Nardia geoscyphus* (De Not.) Lindb.**
thin soil over acid rocks, sandy streambanks
Bergen: *Cowan & Wurdack 18* (NY)
Burlington: *Evans s.n.*, Aug 1892 (NY)
Monmouth: *Haynes 803* (BKL, PH)

Nardia lescurii (Austin) Underw. (not in NJ, ours are *N. geoscyphus*)

Nowellia (Cephaloziaceae)
***Nowellia curvifolia* (Dicks.) Mitt.**
on decorticated, rotting logs, rarely on adjacent soil
Bergen: *Kuwahara 6954* (NY)
Hunterdon: *Barringer 22168* (BKL)
Middlesex: *Barringer 21763* (BKL)
Morris: *Barringer & Zielinski 21646* (BKL)
Ocean: *Barringer 22125* (BKL)
Passaic: *Barringer 20668* (BKL)
Sussex: *Barringer 20989* (BKL)
Warren: *Barringer 21230* (BKL)

Odontoschisma (Cephaloziaceae)
***Odontoschisma denudatum* (Nees) Dumort.**

on soil and rotting logs
Atlantic: *Long 208* (PH)
Burlington: *Barringer 21149* (BKL)
Gloucester: *Barringer 21197* (BKL)
Monmouth: *Haynes s.n.*, 29 Apr 1908 (BKL, NY)
Ocean: *Cowan & Wurdack 131* (NY)
Cumberland: *Thiers 1256* (NY)

***Odontoschisma prostratum* (Sw.) Trevis.**
on peaty soil and rotting logs
Atlantic: *Tees 1354* (NY)
Bergen: *Barringer 20280* (BKL)
Burlington: *Barringer 20697* (BKL)
Camden : *Barringer 20844* (BKL)
Cape May: *Long 2154* (PH)
Cumberland: *Long 1175* (PH)
Gloucester: *Long 2115* (NY, PH)
Mercer: *Long 1888* (PH)
Monmouth: *Barringer & D. Barringer 21595* (BKL)
Ocean: *Barringer 20920* (BKL)
Passaic: *Barringer 21475* (BKL)
Salem: *Long 941* (PH)
Sussex: *Barringer: 21090* (BKL)

Pallavicinia (Pallaviciniaceae)

***Pallavicinia lyellii* (Hook.) Gray**
on soil and bark in wet woods, swamps, cedar swamps, pond edges
Atlantic: *Underwood s.n.*, 6 Sep 1884 (NY)
Bergen: *Barringer 21730* (BKL)
Burlington: *Barringer 16714* (BKL)
Camden: *Barringer 20872* (BKL)
Cumberland: *Long 1253* (NY, PH)
Gloucester: *Barringer 21200* (BKL)
Hudson: *s.l. s.n., s.d.* (NY)
Middlesex: *Barringer 21810* (BKL)
Monmouth: *Barringer & D. Barringer 21598* (BKL)
Morris: *Barringer 17793* (BKL)
Ocean: *Barringer 22110* (BKL)
Passaic: *Barringer 20612* (BKL)
Sussex: *Barringer 20616* (BKL)
Union: *Moul s.n.*, 16 Apr 1947 (PH)
Warren: *Barringer 22082* (BKL)

Pellia (Pelliaceae)

***Pellia epiphylla* (L.) Corda**
on soil along streams and on the edges of lakes and ponds
Bergen: *Barkley s.n.*, 3 Oct 1958 (NY)
Essex: *Haynes s.n.*, 10 May 1902 (NY)
Mercer: *s.l. s.n.*, 27 Apr 1909 (CHRB)
Monmouth: *Barringer & D. Barringer 21598* (BKL)
Morris: *Barringer 18238* (BKL, CHRB)
Passaic: *Barringer 21427* (BKL)
Sussex: *Barringer 21569* (BKL)
Union: *Rissanen s.n.*, 19 Jun 1941 (NY)

Warren: *Barringer & D. Barringer 21844* (BKL)

***Pellia neesiana* (Gottsche) Limpr.**

on wet soil, especially along streams (Schuster 1992)

Bergen: *Wurdack & Cowan 9* (NY)

Schuster (1992) reports specimens from Camden and Burlington Counties.

Plagiochila (Plagiochilaceae)

***Plagiochila porelloides* (Torr.) Lindenb.**

on shaded rocks along streams

Bergen : *Wiegmann s.n.*, 19 Jul 1915 (NY)

Burlington: *Montaigne s.n.*, Apr 1851 (NY)

Morris: *Austin s.n.*, Aug 1867 (NY)

Porella (Porellaceae)

***Porella pinnata* L.**

on rocks along streams

Bergen: *Barringer 21262* (BKL)

Burlington: *M. Haines s.n., s.d.* (NY)

Hunterdon: *Cantlon 1010* (CHRB)

Morris: *Barringer 18505* (BKL)

Ocean: *Barringer 22109* (BKL)

Passaic: *Barringer 18182* (BKL)

Union: *Barringer 18133* (BKL)

Somerset: *Barringer 18129* (BKL)

Sussex: *Barringer 20308* (BKL)

Union: *Barringer 18133* (BKL)

Warren: *Barringer 21211* (BKL)

***Porella platyphylla* (L.) Pfeiff.**

on trees or occasionally rocks in moist woodlands

Atlantic: *Long 2033* (NY)

Bergen: *Haynes s.n.*, 29 Nov 1902 (NY)

Burlington: *Stowell 1* (NY)

Essex: *Haynes s.n.*, 10 May 1902 (NY)

Gloucester: *Rau s.n.*, Jun 1882 (NY)

Hudson: *Brainerd s.n., s.d.* (BKL)

Hunterdon: *Cantlon 1011* (CHRB)

Mercer: *Torrey s.n.*, 1831 (NY)

Morris: *Barringer 18505* (BKL)

Ocean: *Cowan & Wurdack 129* (NY)

Passaic: *Barringer 20607* (BKL)

Warren: *Barringer 21227* (BKL)

***Porella platyphylloidea* (Schwein.) Lindb.**]

Hunterdon: *Moul 6789* (CHRB)

Ocean: *Cowan & Wurdack 129* (NY)

Sussex: *H. Webster 170* (CHRB)

Warren: *Matzke s.n.*, 10 Nov 1946 (NY

Preissia (Marchantiaceae)

***Preissia quadrata* (Scop.) Nees**

calciphile, on rocks near running water, ravines, dripping cliffs (Hicks 1992, Lincoln 2008)

Middlesex: *Vail s.n.*, May 1891 (NY)

Ptilidium (Ptilidiaceae)

***Ptilidium pulcherrimum* (Weber) Hampe**

on fallen logs and rock outcrops in uplands

Atlantic: *Long 1996* (PH)
Bergen: *Howe s.n.*, 6 Oct 1898 (NY)
Camden: *Long 1527* (PH)
Cumberland: *Long 774* (PH)
Hudson: *Austin s.n., s.d.* (NY)
Hunterdon: *Cantlon & Moul 1022* (CHRB)
Middlesex: *Barringer 21784* (BKL)
Morris: *Barringer & Zielinski 21675* (BKL)
Passaic: *Barringer 20657* (BKL)
Sussex: *Barringer 21490* (BKL)
Warren: *Barringer 21250* (BKL)

Radula (Radulaceae)

***Radula complanata* (L.) Dumort.**

on tree bark and rock outcrops (Hicks 1992, Lincoln 2008)
Bergen: *Austin* [86 Hep. Bor.-Amer.] (NY)
Hunterdon: *Cantlon 1008* (CHRB)

***Radula obconica* Sull.**

on rock outcrops or bark in deep shade along streams (Hicks 1992, Lincoln 2008)
Bergen: *Austin* [88 Hep. Bor.-Amer.] (MO, NY)

Reboulia (Aytoniaceae)

***Reboulia hemisphaerica* (L.) Raddi**

on soil over rocks, humid sites; a calciphile, but not exclusively (Schuster 1992b)
Bergen: *Wiegmann 5018* (NY)
Hudson: *Torrey 3* (NY)
Hunterdon: *Barringer 20742* (BKL)
Warren: *Cowan & Wurdack 174* (NY)

Riccardia (Aneuraceae)

***Riccardia chamaedryfolia* (With.) Grolle**

on dripping rocks near streams (Schuster 1992)
Monmouth: *Haynes* [14 Amer. Hep.] (NY)

Riccardia latifrons (Lindb.) Lindb. (ours are *R. palmata*)

***Riccardia multifida* (L.) Gray**

in N on soil or rocks in wet seeps and near falls, in S on trees in cedar swamps (Schuster 1992)
Bergen: *Austin s.n.*, 1873 (NY)
Burlington: *Evans s.n.*, 10 Aug 1892 (NY)
Gloucester: *Rau s.n.*, 1882 (NY)
Hudson: *Austin s.n.*, 1861 (NY)

***Riccardia palmata* (Hedw.) Carruth.**

on wet, rotting wood, especially in streams, shaded gorges
Bergen: *Howe s.n.*, 22 Sep 1898 (NY)
Hudson: *Austin* [15 Hep. Bor.-Amer.] (BKL, NY)
Sussex: *Barringer 21130* (BKL)

Riccia (Ricciaceae)

Riccia austinii Stephani (see *R. lamellosa*)

***Riccia beyrichiana* Hampe**

on soil in wet fields and ditches, usually in partial shade (Hicks 1992, Lincoln 2008)
Bergen: *Austin* [143 Hep. Bor.-Amer.] (NY)

***Riccia bifurca* Hoffm.**

spores: fall (Lincoln, 2008)
on wet soil at edges of plowed fields or along streams (Hicks 1992, Lincoln 2008)

Bergen: *Austin* [141 Hep. Bor.-Amer.] (MO, NY)
Monmouth: *Haynes1649* (NY
***Riccia cavernosa* Hoffm.** (in NJ?)
spores: Sep-Oct
on wet or seasonally wet soil in disturbed sites and pond edges (Schuster 1992b)
no county designated: *Austin s.n.*, 1863 (MO)
***Riccia fluitans* L.**
on still water of ditches and ponds or along their margins
Bergen: *C. C. Curtis s.n.*, 22 Sep 1898 (NY)
Burlington: *R. Sim s.n.*, 1934 (PH)
Camden: *Underwood s.n.*, Oct 1855 (NY)
Cape May: *Heritage s.n.*, 7 May 1857 (PH)
Gloucester: *Long 2905* (PH)
Hudson: *Howe s.n.*, 22 Sep 1898 (NY)
Ocean: *Cowan & Wurdack 136* (NY)
Salem: *Long 1246* (PH)
Sussex: *Barringer 19930* (BKL)
***Riccia huebeneriana* Lindenb.**
on soil in grassy ditches or at the edges of ponds
Atlantic: *A. Tuckerman s.n.*, 12 Oct 1970 (CHRB)
Bergen: *Cowan & Wurdack 27* (NY)
Mercer: *James s.n.*, 1867 (NY)
Monmouth: *Haynes* [116 Amer. Hep.] (BKL, NY)
***Riccia hirta* (Austin) Underw.**
on wet soil in stubble fields or along the banks of streams (Schuster 1992b)
Bergen: *Austin 669* (NY)
***Riccia lamellosa* Raddi**
on thin soil of exposed outcrops and overgrazed fields (Schuster 1992b)
Bergen: *Austin s.n.*, 1864 (NY)
***Riccia membranacea* Gottsche & Lindenb.**
on soil in periodically flooded sites (Hicks 1992, Schuster 1992b)
Bergen: Austin [150 Hep. Bor.-Amer.] (BKL, NY)
***Riccia sorocarpa* Bisch.**
on soil in ditches and periodically flooded fields (Schuster 1992b)
Bergen: *Austin* [139 Hep. Bor.-Amer.] (BKL, NY)
Monmouth: *Haynes 1493* (NY)
Riccia sullivantii Austin (see *R. huebeneriana*)
Riccia tenuis Austin (see *R. membranacea*)
Ricciocarpos (Ricciaceae)
***Ricciocarpos natans* (L.) Corda**
floating on still water or on soil along ponds and swamps
Bergen: *Wiegmann 1119* (BKL, NY)
Burlington: *Stowell 3* (NY)
Mercer: *Underwood s.n.*, Dec 1888 (CHRB)
Morris: *Moul 73-2* (CHRB)
Sussex: *Nearing s.n.*, 27 Sep 1947 (NY)
Scapania (Scapaniaceae)
***Scapania glaucocephala* (Taylor) Austin**
on rotting wood in shade, usually evergreen logs (Schuster 1974)
Bergen: *Austin s.n., s.d.* (NY)
***Scapania nemorea* (L.) Grolle**

on soil in seeps and moist roadbanks
Bergen: *Barringer 22300* (BKL)
Cape May: *Long 870* (PH)
Cumberland: *Long 1111* (PH)
Gloucester: *Long 2060a* (PH)
Hudson: *Williams s.n.*, 7 Nov 1899 (NY)
Hunterdon: *Barringer 20746* (BKL)
Monmouth: *Haynes 987* (BKL, NY)
Morris: *Barringer 20111* (BKL)
Ocean: *Barringer 22123* (BKL)
Passaic: *Barringer 20648* (BKL)
Sussex: *Barringer 20550* (BKL)
Warren: *Barringer 20925* (BKL)

Scapania nemorosa (L.) Dumort. (see *S. nemorea*)

***Scapania undulata* (L.) Dumort.**
on rocks along streams, always near fast running water (Schuster 1974)
Bergen: *Wurdack & Cowan 19* (NY)
Burlington: *Moul s.n.*, 23 Jul 1950 (PH)
Sussex: *Barringer 21037* (BKL)
Union: *Stephenson s.n.*, 27 Mar 1962 (CHRB)
Warren: *Barringer 21248* (BKL)

Telaranea (Lepidoziaceae)

***Telaranea nematodes* (Austin) M. Howe**
in swamps
Burlington: *Buck 28290* (NY)
Gloucester: *Barringer 21206* (BKL)
Monmouth: *Haynes s.n.*, 30 Sep 1905 (BKL, NY)

Trichocolea (Trichocoleaceae)

***Trichocolea tomentella* (Ehrh.) Dumort.**
along cool, shaded streams, swamps
Bergen: *Howe s.n.*, 6 Oct 1898 (NY)
Hudson: *Austin s.n, s.d.* (NY)
Middlesex: *Marshall* [56 Amer. Hep.] (BKL, NY)
Monmouth: *Haynes* [9 Amer. Hep.] (NY)
Passaic: *Barringer 22543* (BKL)
Sussex: *Moul 7186* (CHRB, NY)

Tritomaria (Jungermanniaceae)

***Tritomaria exsecta* (Schmidel) Schiffner**
on rocks or tree bark in uplands (Hicks 1992)
Bergen: *Austin* [46 Hep. Bor.-Amer.] (BKL, NY)

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Contributions to the Lichen Flora of Pennsylvania - Rare and Important Lichen Habitats and Lichen Communities: Part 1, the Northeastern Counties

JAMES C. LENDEMER
Cryptogamic Herbarium, Institute of Systematic Botany
The New York Botanical Garden
Bronx, NY, 10458-5126, USA
jlendemer@nybg.org

ABSTRACT. A summary of three biologically significant lichen habitats found in the northeastern counties of Pennsylvania is presented.

INTRODUCTION

The last several years have seen a significant increase in our knowledge of the lichen biota (lichenized, lichenicolous, and allied fungi) of the Commonwealth of Pennsylvania. Much of this information has been published in the form of floristic reports and checklists (Harris and Lendemer 2005, 2006; Lendemer 2005, 2008a, 2008b, 2009, 2010a, 2010b; Lendemer et al. 2009; Lendemer and Macklin 2006a, 2006b) and a number of new taxa have been described based on material collected in the state (e.g., Knudsen et al. 2007; Lendemer 2010a; Lendemer and Elix 2010; Lendemer and Harris 2007, 2009; Lendemer and Hodkinson 2010). Until 2007, the majority of the counties in Pennsylvania were represented by <100 known voucher specimens (historical or modern; see Plate 1). In an effort to remedy this situation the author (chairman of the Bryophyte and Lichen Technical Commission [BLTC] of the Pennsylvania Biological Survey [PABS]) in collaboration with the Western Pennsylvania Conservancy (WPC) began to systematically survey the lichen biota of important natural areas throughout the state. The goal of this survey is to gather data relating to rare and significant lichen habitats in the Commonwealth while at the same time documenting occurrences to determine the conservation status and potential needs of the taxa that comprise the lichen biota in Pennsylvania. The first phase of this study was conducted during the 2008-2009 field season and focused on the northeastern counties (Plate 1). The present communication is intended to be the first in a series of reports documenting rare and significant lichen habitats and communities in Pennsylvania.

Further phases of this study were completed during the 2009-2010 and 2010-2011 field seasons. These phases focused on the southeastern counties and north-central counties respectively. Comparable summaries of the rare and significant lichen habitats in those regions are currently in prepatation.

MATERIALS AND METHODS

The discussion presented here is based on a survey of natural areas conduced by the author in the northeastern counties of Pennsylvania. Field work was carried out between June 2008

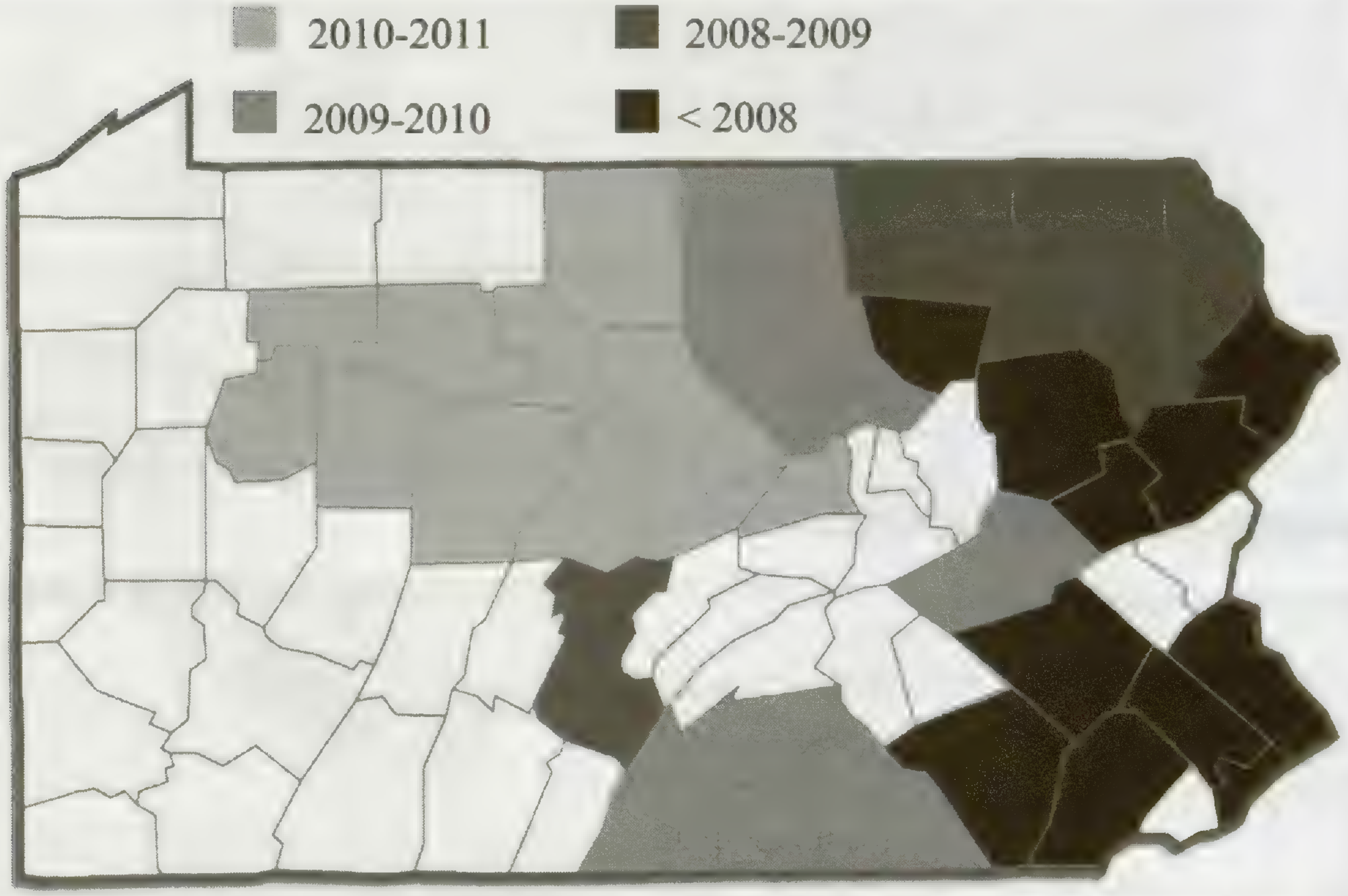

Plate 1. Degree of completion of lichen county inventories to date. Counties represented by >100 modern vouchers are shaded (above), with the hue corresponding to field seasons.

and June 2009 and represents two months (60 days) of person time. Survey localities were chosen by consulting the files and staff of the Western Pennsylvania Conservancy (WPC) as well as the Natural History Inventories for each country that are available through the Department of Conservation and Natural Resources (DCNR) of Pennsylvania. Each locality was visited and an attempt was made to document total diversity by searching for all taxa of lichens and allied fungi. While it is impossible to document the entire lichen biota of a given site, it is assumed the repeated sampling of the same habitats and communities in a small geographic area gives a reliable picture of the total diversity of lichens and allied fungi. Voucher specimens were identified upon return to The New York Botanical Garden and deposited in the herbarium of that institution (NY). All vouchers were also databased with the data (including georeferenced localities) available online via the C.V. Starr Virtual Herbarium (http://sciweb.nybg.org/science2/VirtualHerbarium.asp). While filing the vouchers from this field study, all additional lichen specimens from Pennsylvania at NY were databased, and collectively these records have been used to create a dynamic checklist of the lichens and lichenicolous fungi of the state which can be viewed online at the following address (http://sciweb.nybg.org/science2/hcol/lena/index.asp).

Rare and Significant Lichen Habitats and Communities

I) Exposed Rocky Summits

The summits of many mountains and ridge-tops in northeastern Pennsylvania, especially on the Pocono Plateau, are exposed and rocky and in these habitats lichens can represent a

Plate 2. Detail of study area.

significant amount of the diversity and biomass of the community. This habitat type roughly corresponds to the "Ridgetop Acidic Barrens Complex"of Fike (1999) and in Pennsylvania is frequently characterized by a scrub oak (*Quercus illicifolia*) - pitch pine (*Pinus rigida*) forest with an understory of ericaceous shrubs (*Vaccinium*, *Gaylussacia*, *Kalmia*). This habitat type is found throughout central and northeastern Pennsylvania and extends both northward and southward along the Appalachian Mountains where it is also characterized by a distinctive and significant lichen biota that often includes significant disjunct populations.

In Pennsylvania the lichen biota of this habitat type is frequently not as diverse as others discussed in this paper, but rather often hosts disjunct populations of taxa at the northern or southern ends of their ranges (Lendemer in rev.). Presumably the persistence of large open rocky areas and pockets of humus allows species to become established and persist. As most of these habitats were glaciated during the last ice age the present day lichen biota represents relatively recent introductions since the end of that geologic period. Species with notable disjunct occurrences in this habitat type in Pennsylvania include *Cladonia crispata*, *C. stellaris*, *Lecidea auriculata*, *Parmeliopsis hyperopta*, and *Porpidia contraponenda*. Interestingly, this habitat type also supports populations of *Cladonia atlantica* and *C. floridana*, species of the coastal plain which also have disjunct populations in the Shawangunk Mountains of New York State (Dirig 1994).

In the study area, Bartlett Mountain in State Game Lands No. 57 without a doubt represents the most significant exemplification of this habitat type and should be considered of high conservation priority. Another important example of this habitat on public land is the summit of the north end of the Moosic Mountains in State Game Lands No. 300. An excellent example of this habitat type also occurs on Bald Mountain in Lackawanna County. Of immediate concern to the site in SGL 300, and other ridge tops and rocky summits, is the installation of wind turbines for the generation of electricity. Further study of the impact of wind turbines on the lichen biota of this habitat type is clearly needed. In

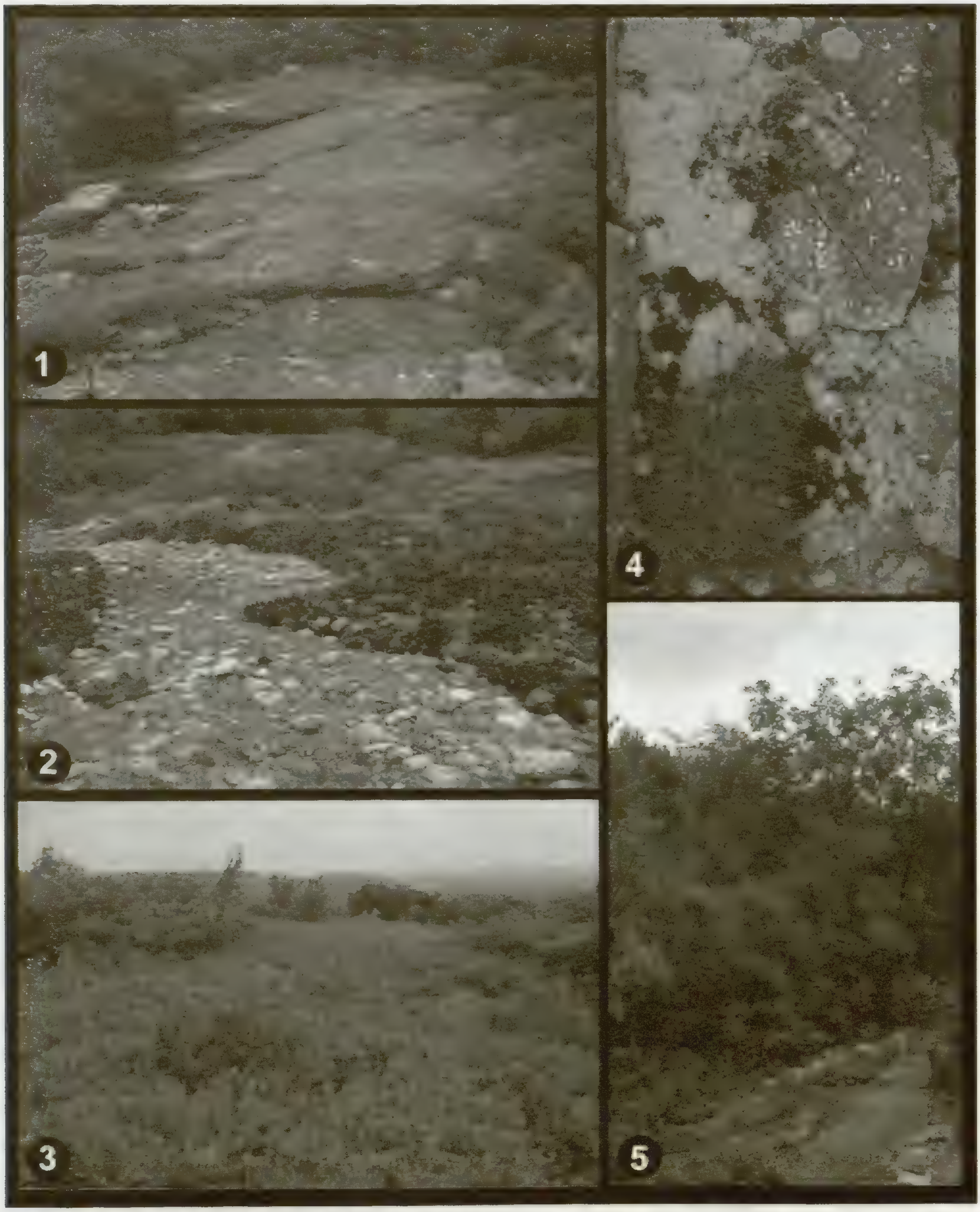

Plate 3. Rare and critical lichen habitats in northeastern Pennsylvania: exposed rocky summits. Figures 1, 2, 4, 5, Moosic Mountain TNC Preserve, Lackawanna County. Figure 3, Moosic Mountain, summit of N end, Lackawanna County.

addition to the disturbance caused by the installation and maintenance of these structures there is the possibility that the change in wind currents created by the turbines could result in the establishment of new fungi altering the integrity of the community.

Plate 4. Rare and critical lichen habitats in northeastern Pennsylvania: Boulderfields and talus slopes. Figures 1-2, Bald Mountain, W-slope, Lackawanna County. Figures 3 and 4, Boulderfield Natural Area, Hickory Run State Park, Carbon County. (Figure 4 illustrates a cool, humid, protected microhabitat in between and below two large boulders.)

II) Boulder fields and talus slopes

The potential biological significance of boulder fields and talus slopes to the lichen biota of Pennsylvania has been outlined by Lendemer et al. (2009). These habitats are not typically included in present community classifications in the state, likely because they are only marginally vegetated. It is also likely that they are included in other community types as they frequently occur as part of larger community complexes such at that outlined above. Regardless of their classification in other schemes, they warrant particular attention here because of the diversity of lichens and lichenicolous fungi they host.

In northeastern Pennsylvania boulder fields and talus slopes are usually associated with flowing water or cold air flows that alter the temperature and humidity regime significantly from the surrounding area. It is almost certainly this factor that fosters the persistence of disjunct populations of species, particularly those with arctic-boreal affinities. The lichen biota of boulder fields and talus slopes stand in contrast to those of exposed rocky summits in that they are more diverse and frequently harbor the bulk of this diversity as isolated populations of variable (usually small) size.

Notable species found in this habitat in northeastern Pennsylvania include *Arctoparmelia centrifuga* (common N of PA, arctic-boreal), *Chrysothrix chlorina* (rare, boreal), *Cladonia stygia* (common N of PA, arctic-boreal), *Fuscidea recensa* (common, northern-boreal), *Lepraria cryophila* (common throughout Appalachians), *L. morozii* ined. (rare, Appalachian endemic), *Melanelia culbersonii* (rare, eastern North American endemic), *M. panniformis* (common N of PA, arctic-boreal), *M. sorediata* (common N of PA, arctic-boreal), *Parmelia neodiscordans* (rare outside of PA, eastern North American endemic), *P. omphalodes* (common N of PA, arctic-boreal), *Phlyctis petraea* ined. (common, undescribed eastern North American endemic), *Porpidia cinereoatra* (common N of PA, arctic-boreal), *P. contrapondenda* (same as previous), *P. soredizodes* (infrequent in PA, distribution elsewhere unknown), *P. tuberculosa* (common N of PA, arctic boreal), *Protothenella corrosa* (rare, scattered occurrences in boreal North America), and *Stereocaulon glaucescens* (rare, eastern North American boreal endemic).

As a result of the fact that the rare or disjunct species in this habitat type occur as small scattered populations many occur only at one or a handful of localities, contributing to a high heterogeneity among sites. The best two examples of this habitat type reviewed during the present phase of the study were in Rothrock State Forest (Huntingdon Co., see Lendemer et al. In press) and on the W-facing slope of Bald Mountain (Lackawanna Co.). Boulder Field Natural Area in Hickory Run State Park (Carbon Co.) hosts populations of significant lichen taxa however is heavily visited by hikers and thus large portions of the site have been degraded by foot traffic and the movement of rocks which damages slow growing lichen communities. The first two sites mentioned above should be given high conservation priority and the climate regimes protected from future alteration.

III) Rock Overhangs

Rock overhangs represent a common habitat in North America that is frequently overlooked by lichenologists. Such habitats, especially when occurring on steep slopes near flowing water, are characterized by high humidity and relatively stable temperatures. In these respects they are similar to the crevices between and under rocks in boulder fields or talus slopes and as such there is some overlap in the species that are typically found (e.g. *Lepraria normandinoides, Phlyctis petraea,* and *Psilolechia lucida*). In the study area however, acidic rock overhangs are often composed of sandstone rocks with weakly calcareous cement that facilitates the growth of a unique community of lichens. Most of these species are widespread, and occur where the habitat occurs, however populations of rare lichens are also often found intermixed with the more common species.

Species that are typical of acidic rock overhangs in northeastern Pennsylvania include the following: *Amandinea punctata* s.l. (saxicolous populations), *Botryolepraria lesdainii, Caloplaca flavocitrina, C. flavovirescens, C. subsoluta, Phlyctis petraea* ined., *Psilolechia lucida, Ramalina intermedia,* and *Physcia subtilis.* Rare species that occur in this habitat include a number of species with proposed relictual distributions reflecting a wider distribution in the past. These species

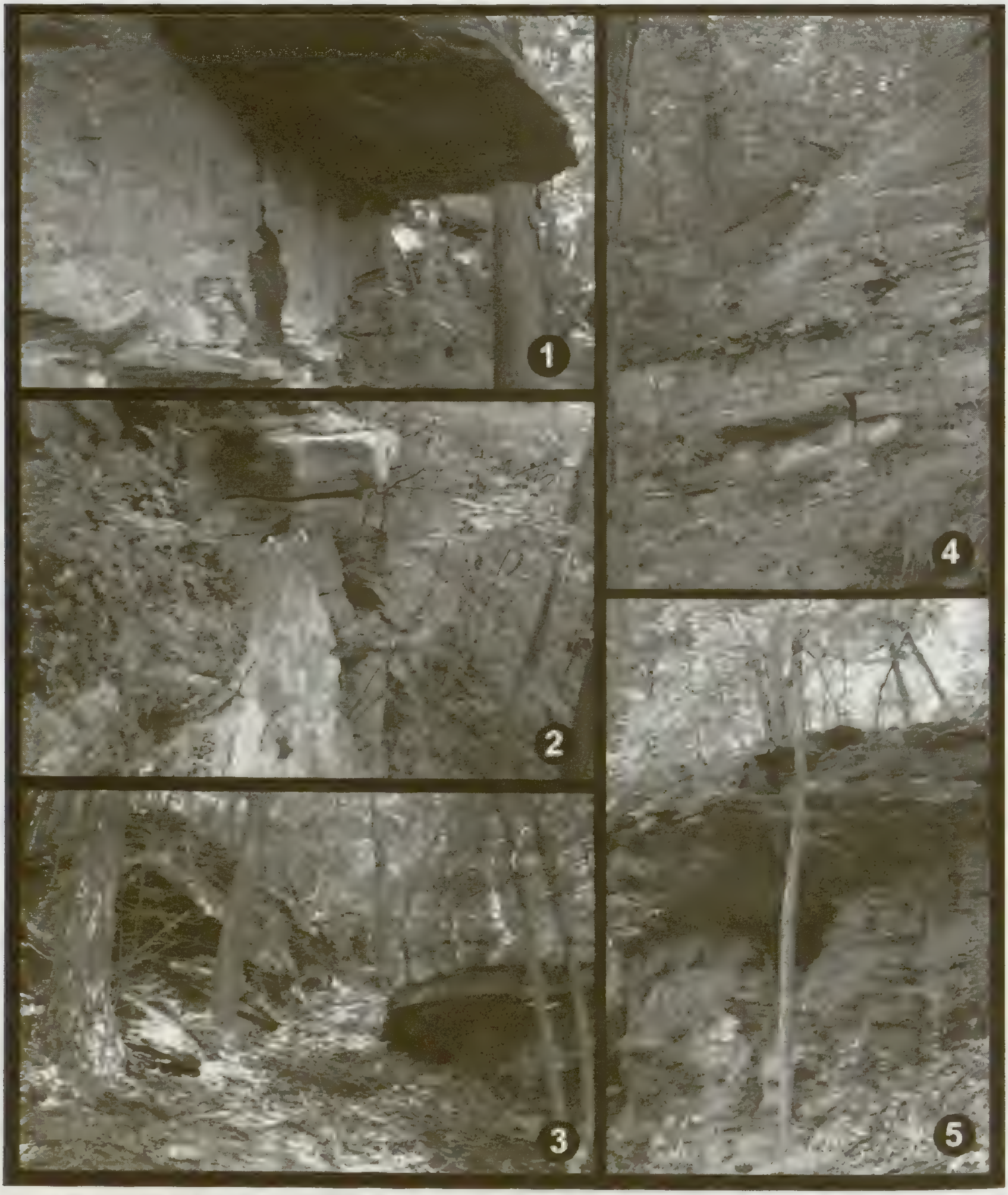

Plate 5. Rare and critical lichen habitats in northeastern Pennsylvania: rock overhangs. Figure 1, Wallenpaupack Ledges, Lacawac Sanctuary, Wayne County. Figures 2 and 4, middle slopes of Moosic Mountains, State Game Lands No. 300, Lackawanna County. Figures 3 & 5, Bowmans Creek Ledges, Wyoming County.

include: *Diplotomma alboatrum*, *Lecanora cinereofusca* var. *appalachensis*, *Lepraria adhaerens*, *Ramalina petrina*, and *Caloplaca reptans* ined. It should be noted that this habitat type supports several occurrences of the only known extant member of the Pannariaceae in the commonwealth, *Vahliella leucophaea*. Though common elsewhere this species and all other members of the

family which were historically at least widespread in Pennsylvania seem to have been extirpated. The reason for the disapearence of these taxa is not clear, however it likely was a result of the extensive deforestation that occurred in the state. A species that should be given protection if extant populations are found is *Santessoniella crosssophylla* (see Lendemer and Anderson 2008), it is globally rare, and extremely rare in North America. A historical record from Glen Onoko, Carbon County is known, however the species has been extirpated from that site.

Acid rock overhang communities are extremely fragile because they rely on a narrow environmental resigeme, changes to which can alter the community and cause rare species to be extirpated. Several species (*Botryolepraria lesdainii, Lepraria adhaerens, Caloplaca reptans*) often occur on loose pebbles and soil in these overhangs and any disturbance to populations of these species should be avoided. Excellent examples of this habitat type occur in State Game Lands 300 in the north end of the Moosic Mountains, State Game Lands 57 near the Wyoming/Luzerne County line, along Bowmans Creek in Wyoming County, on the middle-low slopes of Bald Mountain in Lackawanna County, and on the property of Lacawac Sanctuary in Wayne County.

Conclusion

Lichens and allied fungi represent a biologically diverse group of taxa that has already suffered, and continues to suffer, significant negative impacts from anthropogenic changes to the natural landscape of Pennsylvania. Widespread deforestation throughout the commonwealth caused significant declines in the populations of many species (Lendemer unpublished data). It is also likely that this factor, combined with air pollution and acid rain following the industrial revolution that caused further declines and extirpations of other species. Unfortunately study of this phenomenon is hampered by a lack of adequate historical data except for a select group of large (and thus frequently collected) ecologically sensitive macrolichens such as those in the genera *Ramalina* and *Usnea*. The contrast between the historical abundance of these taxa in our forests, and their near absence in modern times is almost certainly only a hint at the degree of change that has occurred to the lichen biota of Pennsylvania, and eastern North America as a whole, during the last three centuries.

Outlined above are three habitat types that are critical to the management and preservation of the present-day lichen biota of the northeastern counties of Pennsylvania. Evaluation and protection of occurrences of these habitat types is necessary to maintain the diversity of lichens, lichenicolous fungi, and allied fungi of the region. A habitat based approach towards the conservation of the lichen biota of the commonwealth is advocated for several reasons. First, the small size and isolated scattered nature of the populations of some of the rarest species make a species based conservation approach untenable. Second because of their small size many species cannot be reliably identified, in the field or the lab, by a non-expert and there are only a handful of experts in North America. Third, rare species often occur together at a given locality because the factors allowing one taxon to survive facilitate the survival of others. By conserving exemplary examples of significant habitat types, it is possible to conserve an entire interdependent lichen community that is often dependent on a specific long-term climatic regime.

After three years of intensive field work it is nothing short of remarkable that collecting even in the best known areas continues to result in the discovery of previously unreported taxa, extant populations of taxa known only from historical reports, and even taxa that are new to science (see citations above). The shear number of new reports is a clear indication of how poorly studied and under collected Pennsylvania remains at the end of the first decade

of the 21st century. This paucity of data is particularly troubling in light of the rapid pace of development of natural resources in the Commonwealth as well as the large-scale changes to forest structure that are projected to occur due to the spread invasive species. It is clear that this significant gap in our knowledge of the biota of Pennsylvania will only be filled through continued large scale field inventories.

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An Overview and Checklist of the Vascular Flora of the Delaware Water Gap National Recreation Area in New Jersey and Pennsylvania

RICHARD STALTER[1], YANA MICHAELS[1], TOMAS MUJO[1], M. H. CHOO[1], PATRICK LYNCH[2] AND STACY JOERGLE-GILDEA[2]

[1]*Department of Biological Sciences, St. John's University, Jamaica, New York 11439*

[2]*National Park Service, Delaware Water Gap National Recreation Area, 294 Old Milford Road, Milford, Pennsylvania 18337*

ABSTRACT. A survey of vascular plants of the Delaware Water Gap national Recreation Area in New Jersey and Pennsylvania was conducted. A total of 1,271 species (in 154 families and 546 genera) were identified, with 1,055 species being native to the region. Overviews are also provided on vegetational history, current vegetational communities, and management of invasive species.

INTRODUCTION

Delaware Water Gap National Recreation Area (DEWA) was established by an act of Congress on September 1, 1965, for public outdoor recreation use and for the preservation of scenic, scientific and historic resources (Public Law 89-158). The federal boundaries extend to over 27,200 ha. in northeastern Pennsylvania and northwestern New Jersey (see www.nps.gov/dewa/planyourvisit/maps.htm) . The actual "water gap," 40.979 N 75.143 W, is a distinctive geologic feature cut across the Kittatinny Ridge of the Appalachian Mountain chain by the erosive action of the Delaware River.

Natural areas within this national park area include uplands associated with the Kittatinny Ridge, wetlands, and riparian areas surrounding the Middle Delaware Scenic and Recreational River and its tributary streams. The areas also include hemlock ravines and rhododendron glades endemic to the New Jersey Highlands and the Pocono Plateau, several waterfalls and upland native grasslands, and river valley bottomlands. These areas have been historically farmed and are now maintained as open space and farmland to maintain the pastoral scene under DEWA's open space mandate.

Vegetational History

Pinus strobus and *Tsuga canadensis* were the former climax species in the region (Kuchler 1964). Sites that were disturbed by windthrows or fire were populated by hardwoods (Trembly et al., 1963). In the 1840s *P. strobus* was cut for lumber. Debris from pine logging provided fuel for fires that ravaged portions of the cut forest. Succession at burned sites produced a different community from the original pine forest. Hardwoods, especially *Castanea dentata,* replaced the old pine community. *C. dentata* was decimated by chestnut blight (1910-1920). With the demise of American chestnut, many landowners converted

their hardwood woodlots to pine forests since *P. strobus* grew faster and was a more valuable timber crop than the slower growing hardwoods.

Floodplain forest

The floodplain forest borders the Delaware River and its larger tributaries. Common species here are *Acer saccharinum*, *Betula nigra*, *Populus* spp., *Salix discolor*, *S. eriocephala*, *S. nigra*, and *Platanus occidentalis. Ulmus americana* was more common in the early 1960s but has since been largely reduced due to Dutch elm disease.

Successional Fields

Fields in various stages of succession are populated by grasses notably *Schizachyrium scoparium*. The park has over 1,093 ha. of cropland and over 1,619 ha. of transitional fields.

Toxicodendron radicans, *Rubus allegheniensis*, *R. flagellaris*, *R. hispidus*, *R. occidentalis*, and *Rhus glabra* are common shrubs while *Juniperus virginiana* and *Fraxinus americana* are pioneer tree species. On higher-drier sites grasses predominate, including *Schizachyrium scoparium. Aster (e.g., Eurybia, Symphyotrichum)* and goldenrods *(Euthamia, Solidago)* are conspicuous in late summer and early fall. Common woody invaders are *Populus grandidentata*, *P. tremuluides*, *Betula populifolia*, *Juniperus virginiana*, *Sassafras albidum*, *Prunus serotina*, and *Pinus rigida. P. rigida* is common and occurs sporadically on the driest sites.

Upland Forests

Quercus alba, *Q. coccinea*, *Q. montana*, *Q. rubra*, *Q. velutina*, and *Acer saccharinum* are the dominant trees at upland forested sites occasionally mixing with *Pinus strobus*. In moist ravines, *Tsuga canadensis* dominates often forming pure stands. The park has over 140 distinct hemlock stands totaling over 1,241 ha. The hemlock woolly adelgid (*Adelges tsugae*) is a recent alien pest on *T. canadensis* that threatens this species.

Scrub Oak Barrens

Quercus ilicifolia, scrub oak, is the dominant species in the barrens. *Pinus rigida* is also present at the driest sites while *Populus* spp. occupy the wettest sites in the barrens. Ericaceous species, especially *Vaccinium pallidum* and *V. angustifolium*, may be locally abundant.

Cliffs

A prominent feature of DEWA are the nearly sheer cliffs with talus slopes at their base (Trembley et al. 1963). *Juniperus virginiana* forms nearly pure stands at times at the top border of the cliffs and also grows in crevices in the cliff walls. Some individual trees may be much older than the *J. virginiana* in the successional fields since the cliff trees are protected from fire and have little competition from hardwoods. *Opuntia humifusa* often thrives at the xeric cliff edge.

Talus slopes

The vegetation of the talus slopes is sparse because of the unstable nature of the habitat. *Juniperus virginiana* and *Populus* spp. may invade the area but their footholds here are tenuous.

Ravine Banks

Ravine banks are characterized by their steepness and lower amounts of sunlight. *Pinus strobus* may be abundant on the sunny drier north facing slopes, while oaks (*Quercus montana* and Q. *rubra*) and hemlocks (*Tsuga canadensis*) are more common on the moister south facing slopes. Oaks may become more abundant on the south facing slopes in the future because of the demise of *T. canadensis* due to the woolly adelgid.

River Banks and Islands

Flooding and ice scouring have a powerful effect on the vegetation of the Delaware River floodplain forest. Successional species such as *Populus deltoides*, *Salix eriocephala*, and *S. nigra* often form dense thickets on the Delaware's banks.

The islands in the Delaware River are forested by *Acer saccharinum*, *Betula nigra*, *Populus deltoides*, and *Salix* spp. A stand of *Liriodendron tulipifera* occupies Depue Island, the only site within Delaware Water Gap where *Liriodendron* occurs in pure stands. The exotic Japanese knotweed (*Polygonum cuspidatum*) has invaded these areas.

Ruderal Sites

While not included in Trembley's list of habitats, ruderal sites support a rich and varied group of vascular plants including many non-native species. Ruderal sites include roadsides, old habitations, disturbed power line right-of-ways and other disturbed habitats. Non-native species of grasses and composites are generally found here as well as members of the Amaranthaceae, Brassicaceae, Chenopodiaceae, and Polygonaceae families. A common grass genus is *Setaria*. *Microstegium vimineum* is rapidly invading shaded roadsides and may become more abundant at these sites in the future.

Ponds and Lakes

There are 256 ponds and lakes within DEWA. These water bodies range in size from 0.01 hectares at Mashipicong to 5.9 hectares at Hidden Lake. Within lakes and ponds *Nymphaea odorata*, *Nuphar microcephala*, *N. variegata*, *Potamogeton crispus*, *P. epihydrus*, and *P. nodosus* flourish while many species of Cyperaceae, Juncaceae, Malvaceae, and Poaceae populate their moist shores.

Exotic Species Management

Park staff has targeted the following invasive non-native vascular plants for control in 2005 (Lynch et al. 2005): *Elaeagnus umbellata, Ailanthus altissima, Rosa multiflora, Polygonum cuspidatum, Lythrum salicaria, Lonicera* spp., and *Humulus japonicus.*

Detailed information in Lynch et al. (2005) on the biology and management of *Lythrum salicaria*, whorled loosestrife, was prepared by Shreiner (2005). The park hopes to reduce *L. salicaria's* spread and restore sites severely degraded by loosestrife.

Research on the effect of defoliation of *Tsuga canadensis* by the woolly adelgid was initiated in 2003 to determine the effects of defoliation on the growth of alien Japanese stiltgrass (*Microstegium vimenium*). Preliminary results suggest that *M. vimenium* is more abundant under adelgid denuded *T. canadensis,* and may become more widespread in the future (Evans, 2005). Park staff predict that all *T. canadensis* will succumb to woolly adelgid infestation in 25 to 35 years.

Climate

Northeastern Pennsylvania and northwestern New Jersey are classified as having a humid continental climate (Garwood 1996). Three weather stations bordering the Park: Stroudsburg, PA, Monroe County (40.59N, 75.24W); Port Jervis, Orange County, NY, (41.23N, 74.60W); and Sussex County, NJ (41.13N, 74.75W) provided long term weather data for the region.

Rainfall is evenly distributed throughout the year. The wettest months are May (112 mm. Port Jervis), June (118 mm Sussex), and August and September (115 mm Stroudsburg). February is the month with the lowest average rainfall at all 3 stations ranging from 72 mm. (Port Jervis) and 75 mm. (Sussex and Stroudsburg). Yearly rainfall ranges from 1124 mm. (Port Jervis) to 1227 mm. (Stroudsburg).

Winters are cold with January means of –8.5° C at Stroudsburg to –4.8° C at Sussex. Snowfall was highest at the northern station, Port Jervis (1155.7 mm.) and least at the southern Stroudsburg station (962.7 mm.); no snowfall records were available at Sussex. July was the warmest month at all stations with a mean of 23° C at Stroudsburg, 22.4° C at Port Jervis, and 21.6° C at Sussex.

Methods

The objective of the study was to prepare a list of the families, genera, and species of vascular plants found within DEWA. Collecting trips were made to DEWA in September 2003, October 2003, May 2004, July 2004, August 2005, October 2005, and August 2006. Objectives for each were the collection of voucher specimens and information on habitat preference for each species. Approximately 400 species were collected by the senior author. These specimens and species lists generated by investigators (National Parks Service 2006), who provided most of the data, form the basis for this flora.

Taxonomically problematic specimens were sent to various experts for identification. Experts consulted were Ihsan Al-Shebaz (Brassicaceae), Jim Montgomery (ferns and fern allies), Eric Lamont (Asteraceae), Charles Sheviak (Orchidaceae), and Gordon Tucker (Cyperaceae). Voucher specimens collected in the present study are deposited at the National Park herbarium in Bushkill, Pennsylvania. Catalogue numbers have been assigned by the National Park Service to the primary sets of specimens at the herbarium in Bushkill, Pennsylvania and are available on request from the National Park Service.

Nomenclature follows Rhoads and Block (2007). Non-native plant status was determined by Gleason and Cronquist (1991); these taxa are preceded by an asterisk.

Results and Discussion

A total of 154 families, 546 genera, and 1,271 species have been identified. One thousand fifty-five species were native to the region. Largest families in the flora were the Cyperaceae (121 species), Asteraceae (114 species), and Poaceae (96 species). Altogether these families composed 26% of the flora. The largest genera were *Carex* (90 species), *Polygonum* (17 species), and *Salix* (15 species). Non-native taxa composed 17% of the park's flora.

While non-native taxa composed a small percentage of the flora, their potential impact on native species may be considerable. Some additional problematic non-native vascular plant species, not discussed earlier were *Acer platanoides, Alliaria petiolata, Celastrus orbiculatus,*

Lonicera japonica, and *Rosa multiflora*. *A. petiolata* is one of the most common species in the most northeastern woodlands. *A. petiolata* continues to colonize the floor of the forest and may become the most common herbaceous understory species. Two woody lianas, *Lonicera japonica* and more recently *Celastrus orbiculatus*, have invaded woods and fields smothering, shading, and out competing native species. *Acer platanoides* leafs out earlier than native trees and holds its leaves in the fall longer than most native species. Few native plants can survive in the dense shade of *Acer platanoides*. *Rosa multiflora* is common in fields and open woodlands.

Microstegium vimineum, a native of tropical Asia, is rapidly invading moist open woodlands, especially hemlock woodlands near the Delaware River. *Microstegium* out competes native grasses and forbs, and may have a greater deleterious impact on native vascular plant species at DEWA in the future when *Tsuga canadensis* death reduces shading and enables *M. vimineum* to become more abundant on newly sunny opened portions of the forest floor.

Classification of Vegetation Types

Kuchler (1964) classified this region as "Appalachian oak forest" within the Eastern deciduous forest zone. Drier ridge tops and slopes are populated by a preclimax forest of *Quercus montana* and *Q. alba*, while *Q. rubra* is more common on more mesic soils.

Trembly et al. (1963) defined eight major plant communities at the Delaware Water Gap National Recreation Area (DEWA). We expanded these to include ten general habitats: old upland fields/successional fields/meadows, ruderal sites/roadsides/disturbed sites/old home sites/power line rights-of-way, slopes/upland forests/woodlands, lowlands/swamps, lakes/ponds/marshes/bogs, river banks/islands/floodplain forests, ravine banks/ravines, scrub oak barrens, cliffs/ridges, talus slopes. While our general habitat descriptions follow Trembly et al. (1963), our habitat classification also recognizes: ruderal sites and lakes, marshes, and bogs. The abundance classes for vascular plant species at each habitat are based on personal observations.

The greatest number of vascular plant species were observed in slopes, upland forests and woodlands, old upland fields, successional fields, meadows, and ruderal (disturbed) roadsides and old home sites. The unstable talus slopes support the fewest vascular plant species (Table 2). The vascular flora at the ten sites may vary in number and kind, as conditions (drought, insect damage) vary at each site from year to year.

There are 167 listed species of management concern throughout the national park.

Table 1. A summary of the vascular flora of Delaware Water Gap National Recreation Area.

	Ferns	Fern allies	Conifers	Dicots	Monocots	Totals
Families	17	4	4	107	22	154
Genera	23	6	9	385	123	546
Species	39	20	16	842	354	1271
Native species	39	20	16	670	310	1055
Non-native species	0	0	0	173	45	218

Table 2. Number of vascular plant species at the ten recognized habitats. Habitat codes: OSF, old upland fields, successional fields, meadows; R, ruderal sites, roadsides, disturbed sites, old home sites, power line rights-of-way; SUF, slopes, upland forests, woodlands; LS, lowlands, swamps; LPM, lakes, ponds, marshes, bogs; RIF, river banks, islands, floodplain forests; RB, ravine banks, ravines; SOB, scrub oak barrens; C, cliffs, ridges; TS, talus slopes.

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS
Spore Plants	12	10	32	7	15	3	5	1	15	2
Conifers	3	4	7	2	2	0	2	2	3	0
Dicots	327	336	421	111	118	94	45	28	22	6
Monocots	85	72	136	50	144	7	9	8	3	3
Totals	427	424	595	170	278	104	61	39	42	11

Acknowledgments

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Appendix

Annotated Checklist of Species.

The vascular plant taxa have been arranged to the following categories: ferns and fern allies, gymnosperms, dicots, and monocots. Within each category, category, families, and lower taxa are arranged alphabetically. Each entry includes the scientific name. Names from Gleason and Cronquist (1991) and/or Kartesz (1994) have been provided in brackets.

Habitat codes: see Table 2. Frequency: **V**, very abundant; **F**, frequent; **I**, infrequent; **R**, rare. Other codes: *, populations not known native to DEWA; **O**, observed. State status in New Jersey: **NJE**, endangered. State status in Pennsylvania: **PE**, endangered; **PT**, threatened; **PR**, rare; **PX**, extirpated. State (S) and Global (G) ranks given follow NatureServe (www.natureserve.org). Citation of a plant rarity status for NJ or PA does not imply that the taxon was found from that state within the DEWA.

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Ferns and fern allies												
Adiantaceae	*Adiantum pedatum* L.		O	F								
	Cheilanthes lanosa (Michx.) D.C. Eat									R		S2 (NJ)
	Phegopteris connectilis (Michx.) Watt	O				R						S2 (NJ)
	Phegopteris hexagonoptera (Michx.) Fee [*T. hexagonoptera* (Michx.) T. Moore]	R		F		R						
	Pellaea atropurpurea (L.) Link		R							R		
Aspleniaceae	*Asplenium bradleyi* D.C. Eat.									R		NJE, PT, S1 (NJ, PA)
	Asplenium montanum Willd.									R		S2 (NJ)
	Asplenium pinnatifidum Nutt.									R		NJE S1 (NJ), S3 (PA)
	Asplenium platyneuron (L.) BSP.			F						F		
	Asplenium rhizophyllum L.			R						R		
	Asplenium ruta-muraria L.									R		
	Asplenium trichomanes L. ssp. *trichomanes*			R						R		
	Asplenium × *ebenoides* R.R. Scott (pro sp.) [*A. ebenoides*]									R		
Blechnaceae	*Woodwardia areolata* (L.) T. Moore			I								

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Woodwardia virginica (L.) Sm.			I								
Dennstaedtiaceae	*Dennstaedtia punctilobula* (Michx.) T. Moore	F		V								
	Pteridium aquilinum (L.) Kuhn	F		V					F			
Dryopteridaceae	*Cystopteris tenuis* (Michx.) Desv.			F								
	Diplazium pycnocarpon (Spreng.) Braun						O	O				
	Dryopteris clintoniana (D.C. Eat) Dowell				R							S3 (NJ), S2(PA)
	Dryopteris marginalis (L.) Gray		O	F				F				
	Dryopteris × *slossoniae* Wherry ex Lellinger			R								
	Dryopteris × *triploidea* Wherry		R	R	R							
	Gymnocarpium dryopteris (Rupr.) Ching							O			R	S1S2 (NJ)
	Matteuccia struthiopteris (L.) Todaro			O	R		O					
	Onoclea sensibilis L.	F	O	F		F						
	Polystichum acrostichoides (Michx.) Schott			F			O					
	Woodsia ilvensis (L.) R. Br.									V		
	Woodsia obtusa (Spreng.) Torr.									O		
Equisetaceae	*Equisetum arvense* L.	F	F									
	Equisetum fluviatile L.	R				F						
	Equisetum hyemale L.		R					R			R	
	Equisetum laevigatum A. Braun											
	Equisetum × *litorale* Kühlewein ex Rupr. (pro sp.)				I							
	Equisetum sylvaticum L.	R	R	I/O								S3 (NJ)

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Equisetum variegatum Schleich ex F. Webert & D.M.H Mohr					R		R				NJE PE, S1 (NJ, PA)
Hymenophyllaceae	*Trichomanes intricatum* Farrar.		R									S2 (NJ)
Isoetaceae	*Isoetes engelmannii* A. Braun					I/O						
	Isoetes riparia Engelm. ex A. Braun					I/O						S3 (NJ)
Lycopodiaceae	*Diphasiastrum digitatum* (Dill. ex A. Braun) Holub [*Lycopodium complanatum* L., *Lycopodium d.* Dill. ex A. Braun]			I								
	Diphasiastrum tristachyum (Pursh) Holub [*Lycopodium t.* Pursh]			I								
	Huperzia lucidula (Michx.) Trevisan [*Lycopodium lucidulum* Michx.]			F								
	Huperzia porophila (Loyd & Underwood) Trevisan [*Lycopodium porophilum* L. Loyd & Underwood]									R		PE, S1 (PA)
	Lycopodiella inundata L.					R						S1 (NJ)
	Lycopodium clavatum L.			F		O						
	Lycopodium dendroideum Michx.			R		R						
	Lycopodium obscurum L.	O		F								
Ophioglossaceae	*Botrychium dissectum* Spreng.	R		F/O								
	Botrychium multifidum (Gmel.) Trev.	R		R								NJE, S1 (NJ)
	Ophioglossum pusillum Raf.	R		R								S3 (NJ)
Osmundaceae	*Osmunda cinnamomea* L.			F	V	F						
	Osmunda claytoniana L.			F	F	I/O						
	Osmunda regalis L.			V	F							

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Polypodiaceae	*Polypodium virginianum* L.			O						O		
Selaginellaceae	*Selaginella apoda* (L.) Spreng.		O			O						
	Selaginella rupestris L.			R						R		S2 (NJ)
Thelypteridaceae	*Thelypteris palustris* var. *pubescens* (Lawson) Fern. [*Dryopteris thelypteris auct. non* (L.) Sw.]					V						
	Thelypteris simulata (Davenport) Nieuwl.					R						
Gymnosperms												
Cupressaceae	*Juniperus communis* L.	R								R		
	Juniperus virginiana L.	F								V		
	**Thuja occidentalis* L.		O	R		R						
Pinaceae	*Abies balsamea* (L.) P. Mill.				R	I						
	**Larix decidua* P. Mill.		O	R								
	**Picea abies* (L.) Karst		R									
	Picea glauca (Moench) Voss			R								
	Picea rubens Sarg.				R							NJE, S1 (NJ)
	Pinus resinosa Soland			I/O								NJE, S1.1 (NJ)
	Pinus rigida P. Mill.								F			
	Pinus strobus L.			F								
	**Pinus sylvestris* L.	O	R/O									
	Pinus virginiana P. Mill.								O	I/O		
	Tsuga canadensis (L.) Corr.			V			V					
Taxaceae	*Taxus canadensis* Marsh.			I/O			O					S2 (NJ)

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Angiosperms Dicots												
Acanthaceae	*Justicia americana* (L.) M. Vahl.					F						
Adoxaceae	*Sambucus canadensis* L.	O		F/O		F/O	F	F				
	Sambucus racemosa L. var. *pubens* (Michx.) Koehne			R				R				
	Viburnum acerifolium L.			V								
	Viburnum dentatum L.			I/O	O							
	Viburnum lantanoides (Michx.) [*V. alnifolium* Marsh.]			R				R				NJE, S1 (NJ)
	Viburnum lentago L.		I/O	I/O	O							
	**Viburnum opulus* L.		O									
	Viburnum plicatum Thunb.		R									
	Viburnum prunifolium L.	F	R	O								
	Viburnum rafinesquianum J. A. Schultes			R					R			
	Viburnum recognitum Fern. [*V. dentatum* var. *lucidum* Ait.]	O		O	O							
	Viburnum trilobum Marsh. [*V. opulus* L. var. *americanum* Ait.]		R	R	R							S3 (NJ),S1S2 (PA)
Altingiaceae	*Liquidambar styraciflua* L.		R				R					
Amaranthaceae	**Amaranthus albus* L.		F									
	**Amaranthus hybridus* L.		F									
Anacardiaceae	*Rhus copallina* L. var. *copallina*	V		R/O								
	Rhus glabra L.	V		O								
	Rhus typhina L. [*R. hirta* (L.) Sudworth.]	V	O									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Toxicodendron radicans (L.) Kuntze [*Rhus r.* L.]	V	F	F								
	Toxicodendron vernix (L.) Kuntze				O	I/O						
Annonaceae	*Asimina triloba* (L.) Dunal			R								NJE, S1 (NJ)
Apiaceae	*Angelica atropurpurea* L.	I/O		O	R							
	Angelica venenosa (Greenway) Fern.	I/O	I/O	O								S1S2 (NJ)
	Chaerophyllum procumbens (L.) Crantz var *procumbens*			I/O			I/O					S3 (NJ)
	Cicuta bulbifera L.	R		R		I/O						
	Cicuta maculata var. *maculata* L.				O	F						
	Cryptotaenia canadensis L. DC.			O				O				
	**Daucus carota* L.	V	F									
	Heracleum maximum Bartr.		R			O						
	Hydrocotyle americana L.	R				V						
	Osmorhiza claytonii Michx. C. B. Clarke			F/O			F					
	Osmorhiza longistylis (Torr.) DC.			F								
	Oxypolis rigidior (L.) Raf.	R			I/O	O						
	**Pastinaca sativa* L.	O	F/O									
	**Pimpinella saxifraga* L.	I	I/O									
	Sanicula canadensis L. var. *canadensis*			F								
	Sanicula marilandica L.			F								
	Sium suave Walter	F/O				F						
	Taenidia integerrima(L.) Drude			R								

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Zizia aptera (Gray) Fern.		R	I/O								
	Zizia aurea (L.) W. V. J. Koch	I/O					R					
Apocynaceae	*Apocynum androsaemifolium* L.	F	O	R								
	Apocynum cannabinum L.	F	O									
	Apocynum cannabinum L. var. *hypericifolium* [*A. sibiricum* Jacq.]	I										
	Asclepias exaltata L.	R		R								
	Asclepias incarnata L. ssp. *incarnata*				O	F/O	O					
	Asclepias purpurascens L.		R			R/O						
	Asclepias syriaca L.	V	O									
	Asclepias tuberosa L.	V	O									
	Asclepias variegata L.			R								S2 (NJ) PE, S1 (PA)
	Asclepias verticillata L.	R		R								S2 (NJ)
	Asclepias viridiflora Raf.	R										
	**Vinca minor* L.		F/O	F/O								
Aquifoliaceae	*Ilex laevigata* (Pursh) A. Gray				I/O							
	Ilex montana (T & G.) A. Gray			R								NJE, S1 (NJ)
	Ilex opaca Ait.		R									PT, S2 (PA)
	Ilex verticillata Ait.			O	F/O	R						
	Nemopanthus mucronatus (L.) Trel.			O	I/O	I/O						
Araliaceae	**Aralia elata* (Miq) Seem		R	I/O				O				
	Aralia hispida L.	F		F/O					R			

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Aralia nudicaulis L.			V								
	Aralia racemosa L.			F								
	Panax quinquefolius L.			I/O								G3 G4, S2 (NJ)
	Panax trifolius L.			F/O								
Aristolochiaceae	*Aristolochia serpentaria* L.			R								S3 (NJ)
	Asarum canadense L.			R			R					
Asteraceae	**Achillea millefolium* L.	V	O									
	Ageratina altissima (L. King & H. E. Robins. [*Eupatorium rugosum* Houtt.]			V								
	Ambrosia artemisiifolia L.	F	V									
	Ambrosia trifida L.	F	F				F					
	Anaphalis margaritacea (L.) Benth. & Hook.	F	O	F/O								
	Antennaria neglecta Greene	F		O								
	Antennaria plantaginifolia (L.) Richards	F		O								
	Arctium minus Schk.	F	O	O								
	**Artemisia vulgaris* L.	F	F									
	Bidens bipinnata L.		F/O	O						O		
	Bidens cernua L.		F/O		F/O	F						
	Bidens connata Muhl. ex Willd.	O			O	F						
	Bidens coronata L. Britt.		R		R							
	Bidens frondosa L.	F	F									
	**Carduus nutans* L.	F	F									

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
**Centaurea stobe* ssp. *micranthus* [*C. maculosa* Lam.]	F	F	O					F			
**Cichorium intybus* L.	V	V									
Cirsium altissimum (L.) Cronq.	F	O	O								SX.1 (NJ)
**Cirsium arvense* (L.) Scop.	V	F									
Cirsium discolor (Muhl. ex Willd.) Spreng.	R										
Cirsium muticum Michx.	F			F							
Cirsium pumilum (Nutt.) Spreng.	F		O			O				I/O	
**Cirsium vulgare* (Savi) Ten.	V	F/O									
Conyza canadensis (L.) Cronq. var. *canadensis*	F	V									
Doellingeria infirma (Michx.) Greene [*Aster infirmus* Michx.]			R					R			
Doellingeria umbellata (P. Mill.) Nees [*Aster umbellatus* P. Mill.]	O		O			O					
Erechtites hieraciifolius (L.) Raf.	F	F	O								
Erigeron annuus (L.) Pers.	F	F									
Erigeron philadelphicus L.	F	F									
Erigeron pulchellus Michx.	F	F	O								
Erigeron strigosus Muhl. ex Willd. var. *strigosus*	V	R									
Eupatorium altissimum L.	R/O	R/O	R								
Eupatorium perfoliatum L.				F/O	F	O					
Eupatorium sessilifolium L.		R	R								
Eurybia divaricata (L.) Nesom [*Aster divaricatus* L.]			V								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Eurybia macrophylla [*Aster macrophyllus* L.]			I/O								
Eurybia schreberi (L.) Cass. [*Aster s.*]			R								
Euthamia graminifolia (L.) Nutt.	F	F			F						
Eutrochium dubium [*Eupatorium d.* Willd. ex Poir]				R	R						
Eutrochium fistulosum [*Eupatorium f.*] Barratt	I/O	I/O				O					
Eutrochium maculatum L. [*Eupatoriadelphus maculatus* (L.) King & H. E. Robins. *Eupatorium m.* L.]				F/O	F						
Eutrochium purpureum L. [*Eupatorium p.* L.]	F		F/O			O					
**Galinsoga quadriradiata* Ruiz & Pavon	O	V									
**Gnaphalium uliginosum* L. [*Filaginella uliginosa* (L.) Opiz.]	R		R								
Helenium autumnale L.		R		R							
Helianthus decapetalus L.	R	R									
Helianthus divaricatus L.			R						R		
Helianthus strumosus L.	R	R	R								
Helianthus tuberosus L.	R	R									
Heliopsis helianthoides L. [*Helianthus h.*]	R		R			R					
**Hieracium caespitosum* Dumort [*H. pratense* Tausch]	V	F	I/O								
Hieracium paniculatum L.			I/O								
**Hieracium pilosella* L.	R	R									
Hieracium scabrum Michx.	F										
Hieracium venosum L.			F								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Ionactis linariifolius (L.) Greene [*Aster l.* L.]			R								
Krigia biflora (Walt.) S. F. Blake	I/O	I/O	R								
Krigia virginica (L.) Willd.	R							R			
Lactuca biennis (Moench) Fern.		F/O	R								
Lactuca canadensis L.	F	F									
Lactuca floridana (L.) Gaertner var. *floridana*	R	R	R								
**Lactuca serriola* L.	F	V	F								
**Lapsana communis* L.		R	R								
**Leucanthemum vulgare* Lam. [*Chrysanthemum leucanthemum* L.]	V	F	O								
Liatris spicata (L.) Walt. var. *spicata*	F/O	R									S3 (NJ)
**Matricaria discoidea* DC. [*M. matricarioides* (Less.) Porter]		I/O									
Oclemena acuminata (Michx.) Greene [*Aster acuminatus* Michx.]			I/O								
Packera anonyma (Wood) W.A. Weber & A. Löve [*Senecio anonymus* A. Wood]	R		R					R			SU (NJ), PR, S2 (PA)
Packera aurea (L.) A.& D. Löve [*Senecio aureus* L.]	I										
Packera obovata (Muhl. ex Willd.) W.A. Weber & A. Löve [*Senecio obovatus* Muhl.]	R	R				R					
Packera paupercula (Michx.) A.& D. Löve [*Senecio pauperculus* Michx.]	R	R									S3 (NJ)
**Picris hieracioides* L.	R	I/O									
Prenanthes alba L.		R	R/O								
Prenanthes altissima L.			R								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Prenanthes trifoliolata (Cass) Fern.	V	F								R	
Pseudognaphalium obtusifolium (L.) Hilliard & Burtt [*Gnaphalium o.* L.]	F	F						O			
Rudbeckia hirta L. var. *hirta*	V	F									
Rudbeckia laciniata L.var. *laciniata*	R					R					
Rudbeckia triloba L.var. *triloba*	R										
Senecio vulgaris L.		V									
Sericocarpus asteroides (L.) B.S.P. [*Aster paternus* Cronq.]	O		O					O			
Smallanthus uvedalius (L.) Mack. ex Small [*Polymnia u.* Lam.]						R					NJE, S1 (NJ) S3 (PA)
Solidago altissima L. [*Solidago canadensis* var. *scabra* Torr. & Gray]	V	F									
Solidago bicolor L.			F					O			
Solidago caesia L.			V								
Solidago canadensis L. var. *canadensis*	V	F									
Solidago flexicaulis L.			O								
Solidago gigantea L. var. *gigantea*	I/O										
Solidago juncea Ait.	V	O	O								
Solidago nemoralis Ait.	V	O	F/O								
Solidago odora ssp. *odora* Ait.			R					R			
Solidago patula ssp. *patula* Muhl. ex Willd.			O	I/O		R					
Solidago puberula Nutt.		R	R					R			
Solidago rugosa Mill. ssp. *rugosa*	F	F	O								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Solidago speciosa Nutt. var. *speciosa*	R	R	R								PT, S2 (NJ, PA)
Solidago uliginosa Nutt.	R			R	R						
**Sonchus arvensis* L. ssp. *arvensis*	F	V									
Symphyotrichum cordifolium (L.) Nesom [*Aster cordifolus* L., *Aster lowrieanus* T. C. Porter]	F	O	O								
Symphyotrichum ericoides (L.) Nesom ssp. *ericoides* [*Aster e.* L.]	R										S1S2 (NJ), S3 (PA)
Symphyotrichum laeve var. *laeve* (L.) A.& D. Löve Nesom [*Aster laevis* var laevis L.]	I	F	F								
Symphyotrichum lanceolatum ssp. *lanceolatum* (Willd.) Nesom [*Aster lanceolatus* Willd., *Aster simplex* Willd.]	F	O	O								
Symphyotrichum lateriflorum (L.) A.& D. Löve [*Aster lateriflorus* (L.) Britt., *Aster vimineus* Lam.]	F/O	F/O	F								
Symphyotrichum novae-angliae (L.) Nesom [*Aster n.* L.]	F	F									
Symphyotrichum patens var. *patens* (Ait.) Nesom [*Aster p.* Ait.]	F		O								
Symphyotrichum pilosum var. *pilosum* (Willd.) Nesom [*Aster pilosus* Willd.]	O	V	O								
Symphyotrichum pilosum var. *pringlei* (Gray) Nesom [*Aster pilosus* Willd. var. *demotus*, *Aster pilosus* var. *pringlei* (Gray) Blake]		F									
Symphyotrichum prenanthoides (Muhl. ex Willd.) Nesom [*Aster p.* Muhl.]			R	R							S2 (NJ)
Symphyotrichum puniceum (L.) A.& D. Löve [*Aster puniceus* L..]	I/O	I/O									
Symphyotrichum racemosum (Ell.) Nesom [*Aster racemosus* Ell.]											

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Symphyotrichum tradescantii (L.) Nesom [*Aster lateriflorus* (L.) Britt. var. *hirsuticaulis*, *Aster t.* L.]	O		R								S2 (NJ)
	**Tanacetum vulgare* L.	R	I/O									
	Taraxacum officinale G. H. Weber ex Wiggers	F	V									
	**Tragopogon dubius* Scop.	F	O									
	**Tragopogon porrifolius* L.	R	R									
	**Tragopogon pratensis* L.	R	R									
	**Tussilago farfara* L.		I/O					R				
	Verbesina alternifolia (L.) Britt. ex Keamey			R			R					
	Vernonia noveboracensis (L.) Michx.	F	F/O					O				
	**Xanthium strumarium* L.	O	R									
Balsaminaceae	*Impatiens capensis* Meerb.	F		O		F						
	Impatiens pallida Nutt.			O	I/O							
Berberidaceae	**Berberis thunbergii* DC.	O	F	F								
	**Berberis vulgaris* L.	F/O	O	F								
	Caulophyllum thalictroides (L.) Michx.			R								
	Podophyllum peltatum L.			F								
Betulaceae	*Alnus incana* (L.) Moench. ssp. *rugosa* (Du Roi) Clausen [*A. rugosa* (Du Roi) Spreng.]				I/O							
	Alnus serrulata (Aiton) Willd.			R	I/O							
	Alnus viridis ssp. *crispa* (Ait.) Turrill			R								PE, S1 (PA)
	Betula alleghaniensis Britt. [*B. lutea* Michx.]			I/O								
	Betula lenta L.			F				O				

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Betula nigra L.			F/O	O		F					
	Betula papyrifera Marsh.			R								S2 (NJ)
	Betula populifolia Marsh.	V		O								
	Carpinus caroliniana Walter			F				O				
	Corylus americana Walter			F								
	Corylus cornuta Marsh.			I/O								
	Ostrya virginiana (Miller) K. Koch			I/O								
Bignoniaceae	**Campsis radicans* (L.) Seem.		R	R								
	**Catalpa speciosa* (Warder) Warder ex Engelm.		R	R								
Boraginaceae	**Echium vulgare* L.	R	I/O									
	Hackelia virginiana (L.) I. M. Johnson			F/O								
	Hydrophyllum canadense L.			I/O				R				NJE, S1 (NJ)
	Hydrophyllum virginianum L.			I/O				R				
	Mertensia virginica (L.) Pers.			I/O			O					
	**Myosotis arvensis* (L.) Hill.	R	R									
	Myosotis laxa Lehm.				I/O							
	**Myosotis scorpioides* L.		R				O					
	Myosotis verna Nutt.		R	R								
	**Symphytum officinale* L.	R	R									
Brassicaceae	**Alliaria petiolata* (Bieb.) Cavara & Grande		V	V			F					
	**Arabidopsis thaliana* (L.) Hegnh.		V									
	Arabis canadensis L.		I/O	F								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Arabis glabra (L.) Bernh.	R										
Arabis laevigata (Muhl.) Poir. var. *laevigata*			R								
Arabis lyrata L.			R						R		
Arabis missouriensis Greene			R							R	S1.1 (NJ), PE, S1 (PA)
**Armoracia rusticana* P. G. Gaertn., B. Mey & Scherb.	R	R									
**Barbarea vulgaris* R. Br.	V	F									
**Berteroa incana* (L.) DC.		I/O									
**Brassica juncea* (L.) Czernj	R	R									
**Brassica nigra* (L.) Koch	V					O					
**Capsella bursa-pastoris* (L.) Medik.		V									
Cardamine bulbosa (Schreb. ex Muhl) B. S. P.				R	R						
Cardamine concatenata (Michx.) 0. Schwartz			R								
Cardamine diphylla (Michx.) A. Wood			I/O			R					S3 (NJ)
Cardamine douglassii Britt.			R		R	R					S2 (NJ)
Cardamine pensylvanica Muhl. ex Willd.				I/O		R					
**Cardamine pratensis* L.			R		R						
Cardamine rotundifolia Michx.						R					NJE, S1 (NJ)
**Cardaria draba* (L.) Desv.	R										
**Coincya monensis* (L.) Greuter & Burdet	R										
**Erysimum cheiranthoides* L.	R										
**Hesperis matronalis* L.	R	R				R					

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Lepidium campestre* (L.) R. Br.	O	I/O									
	**Lepidium densiflorum* Schrad.		R									
	**Lepidium ruderale* L.		R									
	Lepidium virginicum L.	F	V									
	Nasturtium officinale Ait. f. [*Rorippa nasturtium-aquaticum* (L.) Hayek]					I/O						
	Rorippa palustris (Butters & Abbe) var. *glabra* (O. E. Schulz) R. Stuckey [*R. islandica* (Oeder) Borbas]					F						
	**Rorippa sylvestris* (L.) Besser		R									
	**Sisymbrium officinale* (L.) Scop.		R									
	**Thlaspi arvense* L.	I/O										
Cabombaceae	*Brasenia schreberi* J. F. Gmel.					I/O						
	**Cabomba caroliniana* A. Gray					R						
Cactaceae	*Opuntia humifusa* (Raf.) Raf.									F		PR, S3 (PA)
Campanulaceae	*Campanula americana* (L.) Small [*Campanulastrum americanum* (L.) Small]			R								
	Campanula aparinoides Pursh				R	R						
	**Campanula rapunculoides* L.		R									
	Campanula rotundifolia L.			R						R		
	Lobelia cardinalis L.	F	F/O			F						
	Lobelia inflata L.	F/O	F									
	Lobelia kalmii L.	R	R		R							PE, S1 (PA)
	Lobelia siphilitica L.		R		O	I/O						

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Lobelia spicata Lam. var. *spicata*	R		R								
	Triodanis perfoliata (L.) Nieuwl var. *perfoliata* [*Specularia p.*(L.) A. DC.]	O	F									
Cannabaceae	*Celtis occidentalis* L.			R			F					
	Humulus lupulus L.		R	R			R					
Caprifoliaceae	*Diervilla lonicera* P. Mill.			I/O								
	Lonicera canadensis Barter. ex Marsh.			R								NJE, S1 (NJ)
	Lonicera dioica L. var. *dioica*			R						R		
	**Lonicera japonica* Thunb.	F		F				O				
	**Lonicera maackii* (Rupr.) Maxim	I/O	I/O	R								
	**Lonicera morrowii* A. Gray	I/O	I/O				R					
	Lonicera sempervirens L.		R									
	**Lonicera tatarica* L.		R	R								
	Symphoricarpos albus (L.) Blake. var. *albus*		R	R								
	Symphoricarpos orbiculatus Moench	R		I/O								
	Triosteum aurantiacum Bickn.			R				R				
	Triosteum perfoliatum L.			R								
Caryophyllaceae	**Arenaria serpyllifolia* L.		F									
	Cerastium arvense L. ssp. *arvense*	F	F	O								
	**Cerastium beeringianum* Cham. & Schlecht.											
	**Cerastium vulgatum* L. [*C. fontanum* ssp. *triviale*]		F									
	**Dianthus armeria* L.	F										

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Moehringia lateriflora (L.) Fenzl	I/O			I/O							
	Myosoton aquaticum(L.) Moench [*Stellaria aquatica* (L.) Scop.]		I/O				R					
	Paronychia canadensis (L.) A. Wood			F								
	Sagina procumbens L.		F									
	**Saponaria officinalis* L.	F	O									
	**Scleranthus annuus* L.		F								R	
	Silene antirrhina L.	F	O	R								
	**Silene latifolia* Poir. ssp. *alba* [*S. pratensis* (Rafn.) Godr. & Green.]	F	O									
	Silene nivea (Nutt.) Otth.			R			R					NJE, S1 (NJ)
	Silene stellata (L.) Ait. f.		R	R					R			
	**Silene vulgaris* (Moench) Garcke	R/O	R									
	**Stellaria alsine* Grimm				R							
	**Stellaria graminea* L.	I/O			I/O							
	Stellaria pubera Michx.			R								NJE, SH (NJ)
Celastraceae	**Celastrus orbiculatus* Thunb.	F		F								
	Celastrus scandens L.			R								
	Euonymus atropurpureus Jacq.			I/O				O				S1? (NJ)
Ceratophyllaceae	*Ceratophyllum demersum* L.					I/O						
Chenopodiaceae	**Chenopodium album* L. var. *album*		V									
	**Chenopodium ambrosioides* L.	O	F									
	**Chenopodium pumilia* R. Br.		R									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Dysphania ambrosioides* L. [*Chenopodium a.* L.]	O	F									
	**Dysphania pumilio* R. Br. [*C. pumilio* R. Br.]		R									
Cistaceae	*Helianthemum canadense* (L.) Michx.			I/O					O			
	Lechea intermedia Leggett ex Britt.	I/O								R		S2 (NJ)
	Lechea tenuifolia Michx.											NJE, S1 (NJ)
Clethraceae	*Clethra alnifolia* L.			V	F							
Convolvulaceae	*Calystegia sepium* (L.) R. Br.	F	F									
	Convolvulus arvensis L.	F	F									
	Cuscuta gronovii Willd.	I/O										
	Ipomoea pandurata (L.) G. F. W. Mey.		F/O									
Cornaceae	*Cornus alternifolia* L.			O				O				
	Cornus amomum Mill. ssp. *amomum*	F			F		O					
	Cornus amomum ssp. *obliqua* (Raf.) J. S. Wilson	F			F							
	Cornus canadensis L.			R	R							S1S2 (NJ)
	Cornus florida L.	O		F								
	Cornus racemosa Lam.	F		F	O							
	Cornus rugosa Lam.			R						R		
	Cornus sericea L. [*C. stolonifera* Michx.]	R			I/O							
Crassulaceae	**Sedum acre* L.		I/O							R		
	**Sedum sarmentosum* Bunge		R							R		
	**Sedum spurium* M. Bieb.		R									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Sedum telephium* L.		R	R								
	Sedum ternatum Michx.									R		
Cucurbitaceae	*Echinocystis lobata* (Michx.) T. & G.			R		I/O		I/O				
	Sicyos angulatus L.		R			R		R				
Dipsacaceae	**Dipsacus sylvestris* Hudson	F	R									
Droseraceae	*Drosera intermedia* Hayne					R						
	Drosera rotundifolia L.					I/O						
Ebenaceae	*Diospyros virginiana* L.	R										
Elaeagnaceae	**Elaeagnus umbellata* Thunb.	V										
Ericaceae	*Chamaedaphne calyculata* (L.) Moench. var. *angustifolia*				F	F						
	Chimaphila maculata (L.) Pursh			V								
	Epigaea repens L.	R		I/O								
	Gaultheria procumbens L.			F					F			
	Gaylussacia baccata (Wangenh) K. Kotch			F					O			
	Gaylussacia dumosa (Andr.) T. & G.											PE, SH (PA)
	Gaylussacia frondosa (L.) T. & G.			I/O								
	Kalmia latifolia L.			F					O			
	Kalmia polifolia Wangenh.					R						NJE, S1 (NJ)
	Leiophyllum buxifolium (Berg.) Ell.											PX, SX (PA)
	Leucothoe racemosa (L.) Gray			R								
	Lyonia ligustrina (L.) DC.			F								
	Monotropa hypopithys L.			R								

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Monotropa uniflora L.			I/O								
	Orthilia secunda (L.) House			I/O								S2 (NJ)
	Pyrola americana Sweet [*P. rotundifolia* L.]			F								
	Pyrola chlorantha Sw.			R								NJE, S1 (NJ, PA)
	Pyrola elliptica Nutt.			F/O								
	Rhododendron canadense (L.) Torr.					I/O			R			NJE, S1 (NJ)
	Rhododendron maximum L.			F	O							
	Rhododendron periclymenoides Michx. Shinn.			R								
	Rhododendron prinophyllum (Small) Millais			R								S3 (NJ)
	Rhododendron viscosum (L.) Torr.			F	F							
	Vaccinium angustifolium Ait.	O		F								
	Vaccinium corymbosum L.	O		F								
	Vaccinium macrocarpon Ait.					F/O						
	Vaccinium myrtilloides Michx								R			
	Vaccinium oxycoccos L.					R						S2 (NJ)
	Vaccinium pallidum L.			F					F			
	Vaccinium stamineum L.			F					F			
Euphorbiaceae	*Acalypha rhomboidea* Raf.	O	F	O								
	Acalypha virginica L.	O	F/O			R		R				
	**Euphorbia cyparissias* L.	F/O	F/O	R								
	Euphorbia maculata L. [*Chamaesyce m.* (L.) Small]		V									
	**Euphorbia marginata* Pursh.		R									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Euphorbia nutans Lag. [*Chamaesyce n.* (Lag.) Small]		F									
Fabaceae	**Amorpha fruticosa* L.	I/O										
	Amphicarpaea bracteata (L.) Fern.			R			I/O					
	Apios americana Medik.			O			F					
	Baptisia tinctoria (L.) R. Br.	F/O		F/O								
	Cercis canadensis L.[1]		R									NJE, S1
	Chamaecrista nictitans (L.) Moench.	F	F									
	Crotalaria sagittalis L.	I/O	F									
	Desmodium canadense (L.) DC.			F								
	Desmodium canescens (L.) DC.	R		R								
	Desmodium ciliare (Muhl.) DC.			R								
	Desmodium cuspidatum (Muhl.) Loudon			R			R					
	Desmodium glutinosum (Muhl.) A. Wood			I/O								
	Desmodium marilandicum (L.) DC.		R	R								
	Desmodium nudiflorum (L.) DC.			F								
	Desmodium paniculatum (L.) DC.			F								
	Desmodium rotundifolium DC.			I/O								
	Desmodium viridiflorum (L.) DC.	R										S2 (NJ), SU (PA)
	Gleditsia triacanthos L.		O				O					
	Gymnocladus dioicus (L.) K. Koch			R			R					
	**Lathyrus latifolius* L.	I										
	Lathyrus palustris L.	R			R							

[1] Material my be introduced.

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Lespedeza capitata Michx.	F/O	O									
**Lespedeza cuneata* (Dum.) G. Don.	F	F									
Lespedeza hirta (L.) Hornem	F		F/O								
Lespedeza procumbens Michx.	I/O	F	O								
Lespedeza repens (L.) Barton			R								
Lespedeza violacea (L.) Pres.			R								
Lespedeza virginica (L.) Britt.	R							R			
**Lotus corniculatus* L.	I	F									
**Medicago lupulina* L.	F	I									
**Melilotus alba* Medik.	F	F									
**Melilotus officinalis* (L.) Lam.	F	F									
Phaseolus polystachios (L.) BSP.			R								S2 (NJ), S1S2 (PA)
Robinia pseudoacacia L.		O	F			F					
Senna hebecarpa (Fernald) Irwin & Barneby		R									
Tephrosia virginiana (L.) Pers.			I/O								
**Trifolium arvense* L.	F	F									
**Trifolium aureum* Pollich	R	I									
**Trifolium campestre* Schreb.	I	I									
**Trifolium dubium* Sibth.	I	F									
**Trifolium hybridum* L.	F	V									
**Trifolium pratense* L.	R	I									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Trifolium repens* L.	F	V									
	Vicia americana Muhl.	F	F									S1 (NJ)
	**Vicia cracca* L.	F	F				O					
	**Vicia tetrasperma* (L.) Moench.	I/O	I/O						R			
	**Wisteria sinensis* (Sims) Sweet		R	R								
Fagaceae	*Castanea dentata* (Marsh.) Borkh.			I/O								
	**Castanea mollissima* Blume		R									
	**Castanea sativa* P. Mill.		R									
	Fagus grandifolia Ehrh.			F								
	**Fagus sylvatica* L.		R									
	Quercus alba L.			F								
	Quercus bicolor Willd.				F							
	Quercus coccinea Muenchh.			F								
	Quercus ilicifolia Wangenh.								V	O		
	Quercus montana Willd. [*Q. prinus* L.]			F								
	Quercus muhlenbergii Engelm.			R								S3 (NJ)
	Quercus palustris Muenchh.			O	F							
	Quercus prinoides Willd.	I	R	R						R		
	Quercus rubra L. var. *ambigua* (Gray) Fern. [*Q. borealis* Michx. f.]			F								
	Quercus rubra var. *rubra* L. [*Q. borealis* Michx. f.]			F								
	Quercus stellata Wangenh.			R					R			

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Quercus velutina Lam.			V								
Gentianaceae	*Bartonia virginica* (L.) B. S. P.			R								
	Gentiana linearis Froel.	R										NJE, SH (NJ)
	Gentianella quinquefolia L.			R		R		R				S2 (NJ)
	Gentianopsis crinita (Froelich) Ma.	R	R									
Geraniaceae	**Erodium cicutarium* (L.) L'Her.	R	I/O									
	Geranium carolinianum L.		R	O								
	Geranium maculatum L.			V								
	**Geranium robertianum* L.			F				O				
	**Pelargonium* × *hortorum* Baily (pro sp.)		R									
Grossulariaceae	*Ribes americanum* P. Mill.			I/O								
	Ribes cynosbati L.			F/O								SU (NJ)
	Ribes glandulosum Graurer			R								NJE, S1.1 (NJ)
	Ribes hirtellum Michx.			R								
	Ribes rotundifolium Michx.			R								
	**Ribes rubrum* L. [*R. sativum* Syme]	R										
	Ribes uva-crispa L.var. *sativum* [*R. grossularia* L.]	R										
Haloragaceae	*Myriophyllum farwellii* Morong					R						PE, S3 (PA)
	Myriophyllum heterophyllum Michx.					R						S2 (NJ), PE, S4 (PA)
	Myriophyllum humile (Raf.) Morong					R						
	**Myriophyllum spicatum* L.					I/O						
	Proserpinaca palustris L. var. *palustris*				O	F						

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Hamamelidaceae	*Hamamelis virginiana* L.			V								
Hydrangeaceae	**Deutzia scabra* Thunb.		R									
	Hydrangea arborescens L.			O				R				
Hypericaceae	*Hypericum ascyron* L.											
	Hypericum ellipticum Hook.					I/O	O					S2 (NJ)
	Hypericum gentianoides (L.) B. S. P.	O		F					O			
	Hypericum mutilum L.	F			F/O		O					
	**Hypericum perforatum* L.	F	O									
	Hypericum prolificum L.	R			I/O							NJE, S1 (NJ)
	Hypericum punctatum Lam.	F	O				F					
	Hypericum pyramidatum Ait.				I/O		I/O					S3 (NJ)
	Triadenum fraseri (Spach) Gleason	I/O			I/O							S3 (NJ)
	Triadenum virginicum (L.) Raf.				F/O	F						
Juglandaceae	*Carya cordiformis* (Wangenh.) K. Koch			F				O				
	Carya glabra (Miller) Sweet			F								
	Carya ovalis (Wangenh.) Sarg.											
	Carya ovata (Miller) K. Koch			I/O								
	Carya tomentosa (Lam. ex Poir.) Nutt. [*C. alba* (L.) Nutt. ex Ell.]											
	Juglans cinerea L.		R	R								
	Juglans nigra L.			O			R					
Lamiaceae	*Agastache nepetoides* (L.) Kuntze	F	F									S2 (NJ)

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Agastache scrophulariifolia (Willd.) Kuntze		R	R								S2 (NJ)
**Ajuga reptans* L.	I	I									
Collinsonia canadensis L.			F			F					
Cunila origanoides (L.) Britt.			R								
**Galeopsis bifida* Boenn. [*G. tetrahit* L.]		F			F						
**Glechoma hederacea* L.		F									
Hedeoma pulegioides (L.) Pers.	I	I									
**Leonurus cardiaca* L.	F				F		F				
Lycopus americanus Muhl. ex. W. Bart.	F			F							
Lycopus uniflorus Michx.					I						
Lycopus virginicus L.				F							
Mentha arvensis L.	F			F							
**Mentha spicata* L.	F			F							
**Mentha* × *rotundifolia* (L.) Hudson	R										
Monarda didyma L.[1]						F					S2 (NJ)
Monarda fistulosa L.	I	I									
**Nepeta cataria* L.	I	I									
**Physostegia virginiana* (K.) Benth.					I						
Pycnanthemum incanum (L.) Michx.	F										
Pycnanthemum muticum (Michx.) Pers.	R		R								
Pycnanthemum tenuifolium Schrad.	I					I					

[1] Material my be introduced.

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Pycnanthemum virginianum (L.) Durand & B.D. Jackson	R		R								
	Scutellaria galericulata L.	I			I							
	Scutellaria incana Biehler		R	R								
	Scutellaria lateriflora L.						I					
	**Stachys palustris* L. var. *palustris*	I				I		I				
	Teucrium canadense var. *virginicum* (L.) Eat.					F	F					
	Trichostema dichotomum L.	I	I									
Lardizabalaceae	**Akebia quinata* (Houtt.) Decne		R	R								
Lauraceae	*Lindera benzoin* (L.) Blume			V	V							
	Sassafras albidum (Nutt.) Nees.	F/O		F								
Lentibulariaceae	*Utricularia macrorhiza* Le Conte [*U. vulgaris* L.]					I/O						
	Utricularia purpurea Walt.					R						S3 (NJ), PR (S4)
Limnanthaceae	*Floerkea proserpinacoides* Willd.	R		R								
Linaceae	*Linum striatum* Walt.	F		O								
	Linum virginianum L.	I		I								
Lythraceae	*Decodon verticillatus* (L.) Ell.				F	O	F					
	**Lythrum salicaria* L.		F/O			V/O		F/O				
Magnoliaceae	*Liriodendron tulipifera* L.			F								
	**Magnolia macrophylla* Michx.		R									
Malvaceae	**Abutilon theophrastii* Med.		F									
	Hibiscus moscheutos L. [*H. palustris* L., *Malva m.* L.]		F			O							

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Malva neglecta* Wallr.		F									
Menispermaceae	*Menispermum canadense* L.						F	O				
Menyanthaceae	*Menyanthes trifoliata* L.				R	I/O						
	Nymphoides cordata (Elliott) Fern.					R						S3 (NJ), PT, S2 (PA)
Molluginaceae	**Mollugo verticillata* L.		V									
Moraceae	**Morus alba* L.		F/O									
	Morus rubra L.			R								
Myricaceae	*Comptonia peregrina* (L.) J. M. Coulter	I/O	R	R								
	Myrica gale L.					R						S3 (NJ), PT, S2 (PA)
	Myrica pensylvanica Mirbel.	R										
Myrsinaceae	**Anagallis arvensis* L.		R									
	Lysimachia ciliata L.						R/O					
	Lysimachia hybrida Michx.	R				R						S3 (NJ), S1 (PA)
	Lysimachia lanceolata Walt.	R				R						S1 (NJ)
	**Lysimachia nummularia* L.	O	I/O	O			R					
	Lysimachia quadrifolia L.			F								
	Lysimachia terrestris (L.) B. S. P.				F	R						
	Trientalis borealis Raf.			F								
Nyctaginaceae	**Mirabilis nyctaginea* (Michx.) Mac Millan		R									
Nymphaeaceae	*Nuphar advena* (Ait.) Kartesz & Gandhi [*N. lutea* ssp. *advena* (Ait.) Ait. f.]					R						

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Nuphar microphylla (Pers.) Fern. [*N. lutea* ssp. *pumila* (Timm) E. O. Beal]					R						NJE, SH (NJ), S1 (PA)
	Nuphar variegata Dur. [*N. lutea* ssp. *variegata* (Dur.) E. O. Beal]					R						
	Nymphaea odorata Ait.					I/O						
Nyssaceae	*Nyssa sylvatica* Marsh.				F		F					
Oleaceae	*Chionanthus virginicus* (L.)[1]			R								S3 (NJ, PA)
	**Forsythia viridissima* Lindl.		I/O									
	Fraxinus americana L.			F								
	Fraxinus nigra Marsh.			I/O	O		I/O					
	Fraxinus pennsylvanica Marsh.			O			F					
	**Ligustrum vulgare* L.	R	F	F/O								
Onagraceae	*Circaea alpina* L.			I/O		R		R				
	Circaea canadensis (L.) Aschers. & Magnus ssp. *canadensis* [*C. lutetiana* ssp. *canadensis* (L.) Aschers. & Magnus, *C. quadrisulcata* var. *canadensis* (L.) Hara]			F			F/O					
	Epilobium ciliatum Raf. [*E. ciliatum* ssp. *glandulosum* (Lehm.) Hoch & Raven, *E. glandulosum* Lehm.]	I/O	I	R								
	Epilobium coloratum Biehler	R				F/O						
	Epilobium leptophyllum Raf.					R						S2 (NJ)
	Epilobium strictum Muhl. ex Spreng.					R						S2 (NJ), PE, S3 (PA)
	Gaura biennis L.	F/O					R					S3 (NJ)
	Ludwigia alternifolia L.			R	R							
	Ludwigia palustris (L.) Ell.	F/O			R	F						

[1] Material my be introduced.

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Oenothera biennis L.	F	F									
	Oenothera perennis L.	F	R									
Orobanchaceae	*Agalinis paupercula* (Gray) Britt. [*Gerardia p.* (Gray) Britt.]					R						S2 (NJ), PE, S1 (PA)
	Agalinis purpurea (L.) Pennell	F				F						
	Agalinis tenuifolia (Vahl.) Raf. [*Gerardia t.* Vahl.]	F		O								
	Aureolaria flava (L.) Farw. var. *flava*	R		I/O								
	Aureolaria pedicularia (L.) Raf. [*Gerardia p.* L.]			R								
	Aureolaria virginica (L.) Pennell			I/O								
	Castilleja coccinea (L.) Sprengel	R										S2 (NJ, PA)
	Conopholis americana (L.) Wallr.			R								
	Epifagus virginiana (L.) Barton			F								
	Melampyrum lineare Desr. var. *americanum*			I/O		I						
	Orobanche uniflora L.			R								
	Pedicularis canadensis L.	F/O		F								
Oxalidaceae	*Oxalis stricta* L. [*O. fontana* Bunge]	O	V									
	Oxalis violacea L.			F								
Papaveraceae	*Adlumia fungosa* (Ait.) Greene			R								S2 (NJ)
	**Chelidonium majus* L.		F									
	Corydalis flavula (Raf.) DC.			R								
	Corydalis sempervirens (L.) Pers.			F						R		
	Dicentra canadensis (Goldie) Walp.			F								NJE, S1 (NJ)

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Dicentra cucullaria (L.) Bernh.			F								
	Dicentra eximia (Ker Gawler) Torr.		R	R								NJE, SH.1 (NJ), PE, S1 (PA)
	Sanguinaria canadensis L.			F								
Parnassiaceae	*Parnassia glauca* Raf.	R										PE, S2 (PA)
Paulowniaceae	**Paulownia tomentosa* (Thunb.) Steudel		R/O									
Penthoraceae	*Penthorum sedoides* L.											
Phrymaceae	*Mimulus alatus* Ait.				I/O	I/O						S3 (NJ)
	Mimulus moschatus Douglas					R						S2 (NJ)
	Mimulus ringens L.	F			F/O	R						
	Phryma leptostachya L.			V	F/O							
Phytolaccaceae	*Phytolacca americana* L.	F/O	F									
Plantaginaceae	*Callitriche palustris* L.				F/O	F						S2 (NJ)
	Callitriche terrestris Raf. [*C. deflexa* A. Braun]					R		R				
	Chelone glabra L.			R	F/O	F		F				
	**Cymbalaria muralis* P. Gaertner, Meyer & Scherb.		R									
	**Digitalis purpurea* L.	R	R									
	Gratiola neglecta Torr.	O				O						
	Linaria canadenis (L.) Chaz. [*Nuttallanthus c.* (L.) D. A. Sutton]	V	I									
	**Linaria vulgaris* P. Mill.	V	F/O									
	Lindernia dubia (L.) Pennell var. *dubia*					F						
	Penstemon canescens (L.) D. A. Sutton			R						R		

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Penstemon digitalis Nutt.	I/O	R									
	Penstemon hirsutus (L.) Willd.	O	R	I/O								
	**Plantago aristata* Michx.	F	O									
	**Plantago lanceolata* L.	F	V									
	**Plantago major* L.	F	V									
	Plantago rugelii Dcne.	O	R									
	Plantago virginica L.	R	R									
	**Veronica agrestis* L.		R									
	Veronica americana (Raf.) Schwein.		R			I		I/O				
	**Veronica chamaedrys* L.		R	R								
	**Veronica longifolia* L.		R									
	**Veronica officinalis* L.	R	F	R								
	Veronica peregrina L. ssp. *peregrina*		R	F/O								
	Veronica scutellata L.			O	I/O							
	Veronicastrum virginicum (L.) Fern.	R			R							
Platanaceae	*Platanus occidentalis* L.			O			F					
Podostemaceae	*Podostemum ceratophyllum* Michx.											S2 (NJ)
Polemoniaceae	*Phlox divaricata* L. ssp. *divaricata*		R	R								NJE, S1 (NJ)
	Phlox paniculata L.					I/O		I/O				
	Phlox subulata L. ssp. *subulata*			I/O						I/O		
Polygalaceae	*Polygala paucifolia* Willd.			F								
	Polygala sanguinea L.	F	F/O									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Polygala verticillata L. var. *verticillata*	F	O									
Polygonaceae	*Fallopia cilinodis* (Michx.) Holub [*Polygonum cilinode* Michx.]			R								S2 (NJ)
	**Fallopia convolvulus* (L.) A. Löve [*Polygonum c.* L.]	O	F									
	**Fallopia japonica* (Houtt.) Dcne. [*Polygonum cuspidatum* Sieb. & Zucc.]	F/O	F/O				O					
	Fallopia scandens (L.) Holub [*Polygonum s.* L.]		I/O	O								
	Persicaria amphibia (L.) S.F. Gray p.p. [*Polygonum amphibium* var. *emersum* Michx.]		I			F						
	Persicaria arifolia [*Polygonum arifolium* L.]				F/O	F						
	Persicaria hydropiperoides (Michx.) Small [*Polygonum h.* Michx. var. *hydropiperoides*]					V						
	**Persicaria lapathifolia* (L.) S.F. Gray [*Polygonum lapathifolium* L.]		F	O								
	**Persicaria longiseta* (de Bruyn) Moldenke [*Polygonum caespitosum* Blume.]	F	F									
	**Persicaria maculosa* [*Polygonum persicaria* L.]		F									
	**Persicaria orientalis* (L.) Spach [*Polygonum orientale* L.]		R									
	Persicaria pensylvanica (L.) G. Maza [*Polygonum pensylvanicum* L.]	F/O	F									
	Persicaria punctata (Ell.) Small [*Polygonum punctatum* Ell.]					F						
	Persicaria sagittata (L.) Gross [*Polygonum sagittatum* L.]					F						
	Persicaria virginiana (L.) Gaertn. [*Polygonum virginianum* L.]			O			I/O					
	Polygonum aviculare L.	F	F									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Polygonum tenue Michx.								R		R	
	***Rumex acetosella* L.**	V	F									
	***Rumex crispus* L.**	F	F/O									
	***Rumex obtusifolius* L.**	I/O	R									
Portulacaceae	*Claytonia virginica* var. *hammondiae* (Kalmbacher) Doyle, Lewis & Snyder					R						NJE, G5T1, S1.1 (NJ)
	Claytonia virginica L. var. *virginica*	R		F								
	***Portulaca oleracea* L.**		V									
Ranunculaceae	*Actaea pachypoda* Ell. [*A. alba* (L.) Miller]			F								
	Actaea racemosa L. [*Cimicifuga r.* L. Nutt.]			R/O				R				
	Actaea rubra (Ait.) Willd.			R								S2 (NJ)
	Anemone americana (DC.) Hara [*Hepatica a.* (DC.) Ker-Gawl., *Hepatica nobilis* var. *obtusa* (Pursh) Steyermark]			I/O								
	Anemone quinquefolia L.			F								
	Anemone virginiana var. *alba* (Oakes) Wood			O								
	Anemone virginiana var. *virginiana* L.			I/O								
	Aquilegia canadensis L.		R	I/O						R		
	Caltha palustris L.			O	F/O	F/O						
	Clematis occidentalis (Hornem.) DC. [*C. verticillaris* DC.]			R/O						R		S2 (NJ)
	***Clematis terniflora* DC.**	R	R									
	Clematis virginiana L.	R	R	F/O								
	Coptis trifolia (L.) Salisb.			F	O							

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Ranunculus abortivus L.	F	O	F								
	**Ranunculus acris* L.	F	F/O									
	Ranunculus aquatilis L. var. *diffusus* [*R. longirostris* Godr.]					R						S3 (PA)
	**Ranunculus bulbosus* L.	F	R/O									
	Ranunculus fascicularis L.			R						R		NJE, S1 (NJ), PE, S1S2 (PA)
	Ranunculus hispidus Michx. var. *caricetorum* [*R. caricetorum* Greene, *R. septentrionalis* Poir.]											
	Ranunculus hispidus var. *hispidus* Michx.			I/O								
	Ranunculus recurvatus Poir.			F								
	**Ranunculus repens* L.		R									
	Ranunculus sceleratus L.					F/O						
	Ranunculus trichophyllus Chaix.											S2 (NJ)
	Thalictrum dioicum L.			F/O				F				
	Thalictrum pubescens Pursh			O	O			R				
	Thalictrum revolutum DC.			R								
	Thalictrum thalictroides (L.) Eames & Boivin [*Anemonella t.* (L.) Spach]							I/O				
	Trollius laxus Salisb. subsp. *laxus*				R	R						NJE, PE, G4 T3, S1 (NJ, PA)
Rhamnaceae	*Ceanothus americanus* L.	I/O		O								
	Rhamnus alnifolia L'Her.					R						
Rosaceae	*Agrimonia gryposepala* Wallr.	O		O			F/O					
	Agrimonia parviflora Ait.			I/O								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Agrimonia rostellata Wallr.	R		R								
Agrimonia striata Michx.						I/O					
Amelanchier arborea (Michx. f.) Fern.			I/O								
Amelanchier laevis Weig.			I/O				O				
Crataegus coccinea L.	R		I/O			R					
Crataegus intricata Lange	R		R								
Crataegus punctata Jacq.			R				R				S2 (NJ)
Crataegus succulenta Schrad. ex Link	R		R				R				NJE, S1 (NJ)
**Duchesnea indica* (Andrews) Focke		R/O	F								
Filipendula rubra (Hill) B. L. Robinson	R	R									NJE, SX (NJ), S1S2 (PA)
**Fragaria vesca* ssp. *vesca* L.			R								
Fragaria virginiana Duchesne	F										
Geum aleppicum Jacq.	F	F/O									
Geum canadense Jacq.		F/O	F								
Geum laciniatum Murray			R	R							
Geum rivale L.					R						S3 (NJ)
Gillenia trifoliata (L.) Moench			R								
Photinia melanocarpa (Michx.) Robertson & Phipps [*Aronia m.* (Michx.) Ell., *Sorbus m.* (Michx.) Heynh.]			I/O	I/O							
Photinia pyrifolia (Burm. f.) Nakai [*Aronia arbutifolia* (L.) Pers., *Sorbus arbutifolia* (L.) Heynh.]			R/O	F	F	R					
Physocarpus opulifolius (L.) Maxim.					R	R	R				

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
**Potentilla argentea* L.	F	O									
Potentilla arguta Pursh.	R		R						R		S2 (NJ)
Potentilla canadensis L.	F		F/O								
Potentilla fruticosa L. [*Dasiphora f.* auct. non (L.) Rydb., *Pentaphylloides floribunda* (Pursh) A. Löve nom. super.]					R						PE S1 (PA)
Potentilla norvegica L. ssp. *monspeliensis* (L.) Aschers. & Graebn.	R	R									
**Potentilla recta* L.	F										
Potentilla simplex Michx.	V		F								
Prunus americana Marsh.		R									
**Prunus avium* L.			I/O								
Prunus pensylvanica L. f.	O		F								
**Prunus persica* (L.) Batsch.			R								
Prunus pumila L. var. *depressa* (Pursh) Bean [*P. depressa* Pursh]							R				S1 (NJ, PA)
Prunus pumila L. var. *pumila*							R				
Prunus serotina Ehrh.	V		F								
Prunus virginiana L.		O	O	I/O							
**Pyrus communis* L. [*P. pyrifolia* (Burm. f.) Nakai]		R									
**Rosa canina* L.		R									
Rosa carolina L.	F										
**Rosa eglanteria* L.	R	R									
**Rosa gallica* L.		R									

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
**Rosa multiflora* Thunb.	V	F	F/O								
Rosa palustris Marsh.				F	V						
Rosa virginiana Mill.	R		R								S1 (PA)
**Rosa wichuraiana* Crép.		R									
Rubus allegheniensis Porter	F		O								
Rubus canadensis L.			I/O								NJE, S1 (NJ)
Rubus flagellaris Willd.	F		F					F/O			
Rubus hispidus L.			F	F							
Rubus idaeus L. ssp. *strigosus* (Michx.) Focke [*R. strigosus* Michx.]	I/O		I/O								
Rubus occidentalis L.	F		O								
Rubus odoratus L.			I/O						R		
**Rubus phoenicolasius* Maxim.	O	F/O	F/O								
Rubus pubescens Raf.			R	R							
Sanguisorba canadensis L.	O			I/O		I/O					
Sorbus americana Marsh.			R	R							S2 (NJ)
**Sorbus aucuparia* L.		R									
Spiraea alba Du Roi	F			R							S1 (NJ)
Spiraea latifolia (Ait.) [*S. alba* var. *latifolia* (Ait.) Dippel]	F			R							
**Spiraea prunifolia* Siebold & Zucc.		R									
Spiraea tomentosa L.	F			F/O							
Spiraea × *billardii* Herincq. (pro sp.) [*S.* × *vanhouttei* (Briot) Carr.]		R									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Waldsteinia fragarioides (Michx.) Tratt.	R		R								S2 (NJ)
Rubiaceae	*Cephalanthus occidentalis* L.				F/O	F						
	Galium aparine L.		F	F								
	Galium asprellum Michx.				F		O					
	Galium boreale L.	F	I/O	I/O								S3 (NJ)
	Galium circaezans Michx. var. *circaezans*			I/O								
	Galium lanceolatum Torr.			O								
	**Galium mollugo* L.	F/O	F									
	Galium obtusum Bigelow			R	R							
	Galium palustre L.					R		R				S3 (NJ)
	Galium tinctorium L.						F					
	Galium triflorum L.			R								
	**Galium verum* L.	F	O									
	Houstonia caerulea (L.) Hook. [*Hedyotis c.* L.]	F		I/O								
	Mitchella repens L.			V								
Salicaceae	**Populus alba* L.	I/O	I/O									
	Populus balsamifera L.					R						PE, S1 (PA)
	Populus deltoides Marsh.				R		I/O					
	Populus grandidentata Michx.	F/O		R								
	**Populus nigra* L.		R									
	Populus tremuloides Michx.			F								
	Populus × *jackii* Sarg.			R								

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Salix alba* L.	R	R									
	Salix bebbiana Sarg.	I/O	R									
	Salix candida Fluegge ex Willd. [*S. candida* var. *denudata* Andress.]	R										S2 (NJ), PT, S1 (PA)
	**Salix caprea* L.		R									
	Salix discolor Muhl.		F	O	O							
	Salix eriocephala Michx. [*S. rigida* Muhl.]					F/O						
	Salix exigua Nutt. [*S. interior* Rowlee]					I/O	I/O					
	**Salix fragilis* L.		R									
	Salix humilis Marsh. var. *humilis*	I/O										
	Salix lucida Muhl. ssp. *lucida*				I/O	O						S1? (NJ)
	Salix nigra Marshall				O		F					
	Salix petiolaris L.	R										
	**Salix purpurea* L.	R										
	Salix sericea Marshall				I		I					
	Salix serissima (Bailey) Fern.	R		R			R					S2 (NJ), PT, S2 (PA)
Santalaceae	*Arceuthobium pusillum* Peck					R						NJE, S1 (NJ), PT, S2 (PA)
	Comandra umbellata (L.) Nutt.			F/O								
Sapindaceae	*Acer negundo* L.			F			F					
	Acer nigrum Michx. f.			I/O				I/O				
	Acer pensylvanicum L.			I/O								

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Acer platanoides* L.		F/O	F								
	Acer rubrum L.	F			V							
	Acer saccharinum L.			F/O			F					
	Acer saccharum Marshall			F			O					
	Acer spicatum Lam.			F								
	**Aesculus parviflora* Walt.		R									
Sarraceniaceae	*Sarracenia purpurea* L.					I/O						
Saxifragaceae	*Chrysosplenium americanum* Schwein.			R	I/O							
	Heuchera americana L.			I/O						I/O		
	Mitella diphylla L.			I/O								
	Saxifraga pensylvanica L.			I/O	I/O							
	Saxifraga virginiensis Michx.			R						R		
	Tiarella cordifolia L.			I/O								NJE, S1 (NJ)
Scrophulariaceae	*Scrophularia lanceolata* Pursh		I/O			R		R				
	Scrophularia marilandica L.		R			I/O						
	**Verbascum blattaria* L.	I/O	R									
	**Verbascum lychnitis* L.		R									
	**Verbascum thapsus* L.	V	F/O									
Simaroubaceae	**Ailanthus altissima* (Mill.) Swingle		R/O	O								
Solanaceae	**Petunia* × *hybrida* Vilm. [*P. axillaris* (Lam,) B. S. P.]		R									
	**Physalis alkekengi* L.	R	R									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Physalis subglabrata Mackenzie & 'Bush [*P. longifolia* var. *subglabrata* (Mackenzie & Bush) Cronq.]	R										
	Solanum americanum Mill.	F/O	F	R								
	Solanum carolinense L.	F/O	F/O									
	**Solanum dulcamara* L.		F/O	O								
	**Solanum melongena* L.											
	**Solanum nigrum* L.	F/O	F	O								
Staphyleaceae	*Staphylea trifolia* L.			R/O		R	R	R				
Thymelaeaceae	*Dirca palustris* L.			R								S2 (NJ)
Tiliaceae	*Tilia americana* L. var. *americana*			I/O								
Ulmaceae	*Ulmus americana* L.			R			I/O	O				
	**Ulmus pumila* L.	R	O									
	Ulmus rubra Muhl.			R			F/O	R				
Urticaceae	*Boehmeria cylindrica* (L.) Sw. var. *cylindrica*			F/O			F					
	Laportea canadensis (L.) Wedd.			I/O			I/O					
	Parietaria pensylvanica Muhl ex Willd.		F/O	R								
	Pilea fontana (Lunell) Rydb.				R							
	Pilea pumila (L.) A. Gray		R	F/O								
	**Urtica dioica* ssp. *dioica* L.						F					
	Urtica dioica L. ssp. *gracilis* [*U. procera* Muhl. ex Willd.]						F/O					
Verbenaceae	*Verbena hastata* L.		F/O				F/O					
	Verbena urticifolia L. var. *urticifolia*	I/O										

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Vitex agnus-castus* L.		R									
Violaceae	*Viola bicolor* Pursh			I/O			I/O					
	Viola blanda var. *blanda* Willd.			F	F							
	Viola blanda Willd. var. *palustriformis* Gray [*V. incognita* Brainerd]			I	I							S3 (NJ)
	Viola canadensis L.			I/O	I/O							NJE, S1 (NJ)
	Viola cucullata Ait.				I/O	I/O						
	Viola labradorica Schrank [*V. conspersa* Reichneb.]				I/O	I/O						
	Viola macloskeyi F. Floyd ssp. *pallens* (Banks ex Ging.) M.S. Baker [*V. pallens* (Banks ex DC.) Brainerd]			F	F							
	Viola palmata L.			I/O								
	Viola pedata L.			R								
	Viola pubescens Ait. var. *pubescens*			I/O								
	Viola rostrata Pursh			I/O								S3 (NJ)
	Viola rotundifolia Michx.			R								
	Viola sagittata Ait. var. *ovata* (Nutt.) Torr. & Gray [*V. fimbriatula* Sm.]			I/O								
	Viola sororia Willd. [*V. papilionacea* Pursh p.p.]		O	V								
	Viola striata Ait.			F	F/O							
Vitaceae	*Parthenocissus quinquefolia* (L.) Planch.	V	O	O								
	Vitis aestivalis Michx.			V								
	Vitis labrusca L.			F		F	O	F				
	Vitis riparia Michx.						I/O					
	Vitis vulpina L.		R									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Monocots												
Acoraceae	*Acorus americanus* (Raf.) Raf.					R						S1? (NJ), PE, S1 (PA)
	Acorus calamus L.					R/O						
Agavaceae	**Hosta lancifolia* Engl.		R									
	**Yucca flaccida* L. [*Y. filamentosa*]		R							R		
Alismataceae	*Alisma subcordatum* Raf.					F						
	Alisma triviale Pursh					R						NJE, PE, S1 (NJ, PA)
	Sagittaria latifolia Willd. var. *latifolia*					V						
Alliaceae	*Allium canadense* L.			I/O								
	**Allium oleraceum* L.		R									
	**Allium schoenoprasum* var. *sibiricum* (L.) Hartman		R									
	Allium tricoccum Ait.			F								
	**Allium vineale* L.	F/O	F									
	**Galanthus nivalis* L.		R									
	**Narcissus pseudonarcissus* L.		R									
Araceae	*Arisaema dracontium* (L.) Schott				V	F						
	Arisaema triphyllum ssp. *stewardsonii* (Britt.) Huttleston				R							S2 (NJ)
	Arisaema triphyllum (L.) Schott ssp. *triphyllum*				V							
	Calla palustris L.				R	R						S3 (NJ)
	Lemna minor L.					V						

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Lemna trisulca L.					I/O						S2 (NJ)
	Orontium aquaticum L.				R	R						PR, S4 (PA)
	Peltandra virginica (L.) Schott & Endl.				O	R						
	Spirodela polyrhiza (L.) Schleiden					I/O						
	Symplocarpus foetidus (L.) Nutt.				V							
	Wolffia borealis (Engelm. ex Hegelm.) Landolt ex Landolt & Wildi					R						
	Wolffia brasiliensis Weddell [*W. papulifera* Griseb, *W. punctata* C. H.]					I/O						
Colchicaceae	*Uvularia perfoliata* L.			V								
	Uvularia sessilifolia L.			V								
Commelinaceae	**Commelina communis* L.		R									
Cyperaceae	*Bulbostylis capillaris* (L.) C. B. Clarke		F/O									
	Carex aestivalis Curtis ex Gray			I/O								
	Carex albicans Willd. ex Spreng.				R	R						
	Carex annectens (Bickn.) Bickn.											
	Carex arctata Boott ex Hook.			R								NJE, S1 (NJ)
	Carex argyrantha Tuckerm.			R					R			
	Carex atlantica Bailey ssp. *atlantica*				I/O	I/O						
	Carex baileyi Britt.	I/O			I/O							
	Carex bebbii Britt.	I/O				I/O						S2 (NJ), PE, S1 (PA)
	Carex bicknellii Britt.	I/O		I/O								S2 (NJ), PE S1 (PA)

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Carex blanda Dewey			I/O					R			
Carex bromoides Schkuhr ex Willd.			R	R							
Carex bushii Mackenzie	R		R								NJE, S1 (NJ)
Carex canescens L. var. *canescens*				I/O	I/O						
Carex caroliniana Schwein	R		R								SU (NJ)
Carex cephalophora (Dewey) Dewey			I/O								S3 (NJ)
Carex collinsii Nutt.					R						PE, S2 (PA)
Carex communis Bailey			I/O								
Carex comosa Boott				I/O							
Carex conoidea Schkurh ex Willd.			F/O		V						S2 (NJ)
Carex crawei Dewey	R				R						NJE, S1 (NJ)
Carex crawfordii Fern.				I/O	I/O						S2 (NJ)
Carex crinita Lam. var. *crinita*				F/O	V						
Carex cristatella Britt.				F/O	V						
Carex cryptolepis Mackenzie					R						S2 (NJ), PT, S1 (PA)
Carex cumulata (Bailey) Fern.										R	NJE, SH (NJ)
Carex davisii Schwein & Torr.		R									
Carex debilis Michx. var. *debilis*		I/O									
Carex deweyana Schwein. var. *deweyana*		R									NJE, S1 (NJ)
Carex digitalis Willd.		R									
Carex disperma Dewey		R									S1S2 (NJ), PR, S3 (PA)

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Carex echinata Murr. var. *echinata*			R		R						
Carex emoryi Dewey		R			R						
Carex flava L.					R						PT, S2 (PA)
Carex folliculata L.				I/O							
Carex glaucodea Tuckerm. ex Olney. [C. *flaccosperma* Dewey]				I/O							
Carex gracillima Schwein.			I/O								
Carex granularis Muhl. ex Willd. var. *granularis*					R						
Carex grayi Carey					R						
Carex grisea Wahlenb. [C. *amphibola* var. *turgida* Fern.]	V		F/O								
Carex gynandra Schwein.				F	F						
Carex haydenii Dewey	R				R						NJE, S1 (NJ), S1S2 (PA)
Carex hirsutella Mackenzie [C. *complenata* Torrit Hook.]	R		I/O								
Carex hirtifolia Mackenzie			R								
Carex hitchcockiana Dewey			R								S2 (NJ)
Carex hystericina Muhl. ex Willd.				R	R						
Carex interior Baily				F/O	F						
Carex intumescens Rudge.			F/O		F						
Carex lacustris Willd.				R	I/O						
Carex laevivaginata (Kukenth.) Mackenzie			R								
Carex lasiocarpa Ehrh.					I/O						PR, S3 (PA)

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Carex laxiculmis Schwein. var. *laxiculmis*	R				R						
Carex laxiflora Lam.			R					R			
Carex leptalea Wahlerb.					I/O						
Carex leptonervia (Fern.) Fern.			I/O		O						NJE, S1 (NJ)
Carex lupulina Muhl. ex Willd.	F				V						
Carex lurida Wahlerb.	F			F	V						
Carex muhlenbergii Schkuhr ex Willd.	I/O										
**Carex muricata* L. ssp. *lamprocarpa*		R									
Carex nigromarginata Schwein			I/O								
Carex pellita Muhl. [*C. lanuginosa* Michx.]	F/O				F						
Carex pensylvanica Lam.			V								
Carex platyphylla Carey			R								
Carex polymorpha Muhl.			R								NJE, PE, G3 (NJ, PA), S1 (NJ), S2 (PA)
Carex prasina Wahlenb.			R								
Carex radiata (Wahlenb.) Small.					R						
Carex retroflexa Muhl. ex Willd.			I/O					R			
Carex rosea Schkuhr ex Willd. [*C. flaccidula* Steud.]					I/O						
Carex scabrata Schwein				R							
Carex scoparia Schkuhr					I/O						
Carex siccata Dewey	I/O	I/O	R								NJE, S1 (NJ), PE, S2 (PA)
Carex sparganioides Muhl. ex Willd.			I/O								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Carex sprengelii Dewey ex Spreng.	R								R		S3 (PA)
Carex squarrosa L.			I/O	I/O	O						
Carex sterilis Willd.					R						S2 (NJ), PT, S1 (PA)
Carex stipata Muhl. ex Willd. var. *stipata*	F				V						
Carex stricta Lam.				O	F						
Carex swanii (Fern.) Mackenzie			I/O								
Carex tenera Dewey var. *tenera*	R				R						S2 (NJ)
Carex tetanica Schkuhr.	R				R						PT, S2 (PA)
Carex torta Boott ex Tuckerm.	O					F					
Carex tribuloides Wahlenb. var. *tribuloides*			I/O								
Carex trisperma Dewey					R						
Carex typhina Michx.			R		I/O						S3 (NJ), PE, S2 (PA)
Carex utriculata Boott [*C. rostrata* var. *utriculata* (Boott) Bailey]					I/O						
Carex vesicaria L.					I/O						S2 (NJ)
Carex virescens Muhl. ex Willd.			V				R				
Carex viridula Michx. var. *viridula*					R						S2 (NJ), PE, S1 (PA)
Carex vulpinoidea Michx.					R						
Cyperus bipartitus Torr. [*C. rivularis* Kunth.]					F						
Cyperus compressus L.	F										
Cyperus dentatus Torr.					R						

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Cyperus erythrorhizos Muhl.	F	R			F						
Cyperus esculentus L.		V									
Cyperus lupulinus (Spreng.) Marcks [*C. filiculmis* Vahl.]	F	O									
Cyperus strigosus L.		V									
Dulichium arundinaceum (L.) Britt. var. *arundinaceum*				R	I/O						
Eleocharis acicularis (L.) R. & S.					F						
Eleocharis compressa Sullivant var. *compressa*					R						NJE, PE, S1 (NJ, PA)
Eleocharis elliptica Kunth					I/O						
Eleocharis obtusa (Willd.) Schultes var. *obtusa*					R						S2 (NJ)
Eleocharis ovata (Roth) R. & S.					R						
Eleocharis palustris (L.) R. & S.					R						
Eleocharis quinqueflora (Hartman) Schwarz [*Scirpus pauciflorus* Lightf.]					R						
Eleocharis tenuis (Willd.) Schultes var. *tenuis*					R						
Eriophorum virginicum L.	R	R									
Eriophorum viridicarinatum (Engelm.) Fern.	R	R									S3 (NJ), PT, S2 (PA)
Rhynchospora capitellata Torr.	R										
Schoenoplectus pungens (Vahl) Palla [*S. americanus* (Pers.) Volk. ex Schinz & P. Kellen, *Scirpus americanus* Pers., *Scirpus p.* Vahl.]					F						
Schoenoplectus smithii (Gray) Soják [*Scirpus s.* Gray]					R						S2 (NJ), PE, S1 (PA)

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Schoenoplectus tabernaemontani K. C. Gemel [*Scirpus validus* Vahl.]					I						
	Scirpus atrovirens Willd.					R						
	Scirpus cyperinus (L.) Kunth.					F						
	Scirpus expansus Fern.					I						
	Scirpus microcarpus J. & K. Pers.					R						NJE, S1 (NJ)
	Scirpus polyphyllus Vahl.				I							
	Scleria pauciflora Muhl. ex Willd. var. *pauciflora*			R								S1? (NJ), PT, S2 (PA)
	Trichophorum planifolium(Sprengel) Palla [*Scirpus verecundus* Fern.]			R								
Dioscoreaceae	*Dioscorea villosa* L.			I/O								
Eriocaulaceae	*Eriocaulon aquaticum* (Hill) Druce [*E. septangulare* Withering]					R						
Hemerocallidaceae	**Hemerocallis fulva* (L.) L.	I/O	I/O									
	**Hemerocallis lilioasphodelus* L.		I/O									
Hyacinthaceae	**Muscari botryoides* (L.) Miller		R									
	**Ornithogalum umbellatum* L.		F									
Hydrocharitaceae	*Elodea canadensis* Michx.					I/O						
	Elodea nuttallii (Planch.) St. John					R						
	Najas flexilis (Willd.) Rostk. & Schmidt					I/O						
	Vallisneria americana Michx. var. *americana*					F						
Hypoxidaceae	*Hypoxis hirsuta* (L.) Cov.			F					O			
Iridaceae	**Crocus vernus* (L.) Hill		O									

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Iris germanica* L.		R									
	**Iris pseudacorus* L.					I/O						
	**Iris sibirica* L.		R									
	Iris versicolor L.					F						
	Sisyrinchium angustifolium P. Mill.	V		F/O								
	Sisyrinchium montanum Greene var. *crebrum* Fern.	R		R								NJE, S2 (NJ)
	Sisyrinchium mucronatum Michx.	V		R								
Juncaceae	*Juncus acuminatus* Michx.				F/O	V						
	Juncus brachycephalus (Engelm.) Buch.		R			R						S3 (NJ), PT, S2 (PA)
	Juncus bufonius L.		V									
	Juncus canadensis J. Gray ex La Harpe					F						
	Juncus dichotomus Ell.	R				R						PE, S1 (PA)
	Juncus dudleyi Weig. [*J. tenuis* var. *dudleyi* (Wieg.) F. J. Herm.]	R										S3 (NJ)
	Juncus effusus L. var. *solutus*				F/O	F	F/O					
	Juncus marginatus Rostk.	F/O			F/O							
	Juncus nodosus Coville	I/O				I/O						S3 (NJ)
	Juncus subcaudatus (Englem.) Corville & Blake				F	F						
	Juncus tenuis Willd. var. *tenuis*	F/O	V									
	Luzula multiflora (Ehrh.) Lej.	I/O		I/O	F/O		F					
Liliaceae	*Clintonia borealis* (Ait.) Raf.			V								S3 (NJ)
	Erythronium americanum Ker-Gawl.			V								

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Lilium canadense L. ssp. *canadense*	I/O		I/O								
	**Lilium lancifolium* Thunb.		R									
	Lilium philadelphicum L.	R		R								S2 (NJ)
	Medeola virginiana L.			F								
	Streptopus amplexifolius (L.) DC.			R				R				NJE, PT, S1 (NJ, PA)
	Streptopus roseus var. *perspectus* Fassett			F		F		F				NJE, S1 (NJ)
Melanthiaceae	*Chamaelirium luteum* (L.) Gray			R								S3 (NJ)
	Trillium cernuum L. var. *cernuum*			I/O								S2 (PA)
	Trillium erectum L. var. *erectum*			F/O								
	Trillium undulatum Willd.			F								S2 (NJ)
	Veratrum latifolium [*Melanthium hybridum* Walt., *Melanthium l.* Desr.]	I/O										
	Veratrum virginicum (L.) Ait. f. [*Melanthium v.* L.]	R										NJE, S1 (NJ, PA)
	Veratrum viride Ait.	V				F						
Orchidaceae	*Coeloglossum viride* (L.) Hartman [*Habenaria viridis* (L.) R. Br. Ex Ait. F.]	R										S2 (NJ), SH (PA)
	Corallorhiza maculata (Raf.) Raf.	I/O										
	Corallorhiza odontorhiza (Willd.) Nutt.	R										
	Corallorhiza trifida Chatelein	R				R						S2 (NJ)
	Cypripedium acaule Ait.	F										
	Cypripedium parviflorum var. *pubescens* Willd. [*C. calceolus* var. *pubescens* (Willd.) Correll, *C. pubescens* Willd.]	F/O										PE, S1 (PA)

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	**Epipactis helleborine* (L.) Crantz		F	R								
	Galearis spectabilis (L.) Raf. [*Orchis s.* L.]			I/O								
	Goodyera pubescens (Willd.) R. Br.			F								
	Goodyera repens (L.) R. Br. ex Ait. f.			R		R						S2 (PA)
	Isotria verticillata Raf.			I/O								
	Liparis liliifolia (L.) L.C. Rich. ex Ker-Gawl.			R								NJE, SX.1 (NJ), S1 (PA)
	Liparis loeselii (L.) L. C. Rich.	R				R		R				
	Listera cordata (L.) R. Br. ex Ait. f.			R		R						NJE, PE, S1 (NJ, PA)
	Malaxis unifolia Michx.			I/O								SH (NJ)
	Platanthera flava var. *herbiola* (R. Br. ex Ait. f.) Luer [*Habenaria f.* (L.) R. Br., *Plantathera f.* (L.) Lindl. var. *flava*]			I/O	R							S2 (NJ)
	Platanthera lacera (Michx.) D. Don	I/O		I/O		R						
	Platanthera psycodes (L.) Lindl.	R		R		R						S2 (NJ)
	Spiranthes cernua (L.) L. C. Rich.	F		F/O								
	Spiranthes lacera var. *gracilis* (Bigelow) Luer [*S. gracilis* (Bigelow) Beck]	R		R								
	Spiranthes lucida (H. Eaton) Ames	R				R						S2 (NJ), S3 (PA)
	Spiranthes ochroleuca (Rydb.) Rydb.			I/O								S3 (NJ)
Poaceae	*Agrostis hyemalis* (Walt.) B. S. P.	V		F/O								
	Agrostis perennans (Walt.) Tuckerm.	F										
	**Agrostis stolonifera* L. var. *palustris*	F	O			F/O						

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Alopecurus aequalis Sobol.	R			R							S2 (NJ), S3 (PA)
Andropogon gerardii Vitman	I/O	I/O									
**Anthoxanthum odoratum* L.	F	F/O									
Aristida dichotoma Chapman var. *dichotoma*	F										
**Arrhenatherum elatius* (L.) J. & C. Presl.	F	F/O	F/O								
**Avena sativa* L.	R	I/O									
Brachyelytrum erectum Schreb. ex Spreng. Beauv.			F	R							
Bromus altissimus Pursh [*B. latiglumis* (Shear) A. S. Hitchc.]			F/O								
**Bromus inermis* Leyss	O	V									
**Bromus japonicus* Thunb. ex Murr.	O	V									
Bromus kalmii A. Gray			R								S2 (NJ), S3 (PA)
Bromus pubescens Muhl. ex Willd.			F/O								
**Bromus tectorum* L.	F										
Calamagrostis canadensis (Michx.) Beauv. var. *canadensis*	F/O			F/O	F						
Calamagrostis cinnoides (Torr.) Eat. (?) [*C. coarctata* (Torr.) Eat.]											
Cinna arundinacea L.			F/O	F/O	O						
**Dactylis glomerata* L.	V		O								
Danthonia compressa Austin	I/O		I/O								
Danthonia spicata (L.) Beauv. ex R. & S.	F		F/O								
Deschampsia cespitosa (L.) Beauv.					F				F		S3 (NJ, PA)
Deschampsia flexuosa (L.) Trin.			I/O								

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Dichanthelium acuminatum (Sw.) Gould & C. A. Clark											
Dichanthelium boreale (Nash) Freckmann					R						NJE, S1 (NJ), SH (PA)
Dichanthelium boscii Gould & C. A. Clark			I/O		I		O				
Dichanthelium clandestinum (L.) Gould		F	F/O								
Dichanthelium depauperatum (Muhl.) Gould.			R								
Dichanthelium dichotomum (L.) Gould [*Panicum d.* L.]			I/O								
Dichanthelium linearifolium(Scribn. ex Nash) Gould [*Panicum l.* Scribn. ex Nash]	I/O	R	I/O								
**Digitaria sanguinalis* (L.) Scop.	F	V									
**Echinochloa crusgalli* (L.) Gaertn. var. *crusgalli*	O	V									
**Eleusine indica* (L.) Gaertn.		V									
Elymus canadensis L. var. *canadensis*					F/O	F/O					
Elymus hystrix L. [*Hystrix patula* Moench]											
**Elymus repens* (L.) Desv. ex B. D. Jackson	F	F									
Elymus villosus Muhl. ex Willd.			R		R		R				
Elymus virginicus L.			F/O		F/O		F/O				
**Elytrigia repens* (L.) Desv. ex B. D. Jackson [*Agropyron r.*]	F	F									
Eragrostis capillaris (L.) Nees		F	F/O								
**Eragrostis cilianensis* (All.) Janchen	I/O	I/O									
Eragrostis hypnoides (Lam.) BSP.					R	R					
Eragrostis spectabilis (Pursh) Steud.	V	F/O									

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Festuca obtusa Biehler [*F. subverticillata* (Pers.) Alexeev]			R								
**Festuca ovina* L.	V		F/O								
**Festuca ovina* L. var. *capillata*	V	O	O								
Glyceria acutiflora Torr.				F/O	F/O						
Glyceria canadensis (Michx.) Trin.				F/O	F/O						
Glyceria melicaria (Michx.) C. E. Hubbard			F/O	F/O	F/O		F/O				S3 (NJ)
Glyceria striata (Lam.) A. S. Hitchc.			F/O	F/O	F/O						
**Holcus lanatus* L.	F	F				F/O					
Leersia oryzoides L. Sw.	F				F						
Leersia virginica Willd.			F/O	F							
**Lolium perenne* L.		F									
**Microstegium vimineum* (Trin.) A. Camus [*Eulalia viminea* (Trin.) Kuntze]		V	V								
Muhlenbergia frondosa (Poir.) Fern.			F/O		F/O		F/O				
Muhlenbergia sobolifera (Muhl.) Trin.			I/O							R	
Oryzopsis asperifolia Michx.			R								NJE, S1 (NJ)
Panicum capillare L.		F									
Panicum rigidulum Nees				R	R						
Panicum virgatum L.	F				F/O						
Paspalum setaceum var. *setaceum*	I/O	I/O									
Phalaris arundinacea L.					V						
**Phleum pratense* L.	V	F/O									

	OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
**Phragmites australis* (Cav.) Trin. ex Steud. ssp. *australis*					F						
**Poa annua* L.		V	F/O								
**Poa compressa* L.			F						F	O	
Poa languida A. Hitchc.			R								S2 (NJ, PA)
**Poa nemoralis* L.		R	R								
Poa paludigena Fern. & Wieg.				R							PT, S3 (PA)
Poa palustris L.	I/O				I/O						
**Poa pratensis* L.	F	F/O	F/O								
Poa saltuensis Fern. & Wieg.			R								NJE, SH (NJ)
Poa sylvestris A. Gray			R								SH (NJ)
Schedonorus pratensis [*Festuca p.* Hudson, *Lolium arundinaceum* (Schreb.) S.J. Darbyshire]	O	O									
Schizachyrium scoparium (Michx.) Nash var. *scoparium* [*Andropogon scoparius* Michx.]	V	F									
**Secale cereale* L.	I/O	R									
**Setaria faberi* Herrm.		F									
**Setaria italica* (L.) Beauv.		F									
Setaria parviflora (Poir.) Kerguelen											
Setaria pumila (Poir.) Roemer & J.A. Schultes [*S. glauca* (L.) Beauv.]		F									
Setaria viridis (L.) Beauv.		V									
Sorghastrum nutans (L.) Nash	I/O							I			
Spartina pectinata Link		I			O						

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
	Sphenopholis obtusata var. *major* (Torr.) K.S. Erdman [*S. intermedia* (Rydb.) Rydb.]					I		I/O				
	Sphenopholis obtusata (Michx.) Scribn. var. *obtusata*	O		O								
	Sphenopholis pensylvanica (L.) A. S. Hitchc.	F/O		F/O	F/O							
	Sporobolus vaginiflorus (Torr.) Wood	O	F/O									
	Tridens flavus (L.) Smyth [*Triodia flava* (L.) A. S. Hitchc.]	V	V									
	**Triticum aestivum* (L.)		V/O									
	Vulpia octoflora (Walt.) Rydb. var. *glauca* [*Festuca o.* Walt.]	I/O	O									SU (NJ)
	**Zea mays* L.	R	R									
	Zizania aquatica L.					R						PR, S3 (PA)
Pontederiaceae	*Heteranthera dubia* (Jacq.) Mac. M. [*Zosterella d.* (Jacq.) Small]					R						
	Pontederia cordata L.					F						
Potamogetonaceae	*Potamogeton alpinus* Balbi					R						NJE, S1 (NJ)
	**Potamogeton crispus* L.					F						
	Potamogeton diversifolius Raf.					I/O						
	Potamogeton epihydrus Raf.					F						
	Potamogeton foliosus Raf.					F						
	Potamogeton illinoensis Morong.					R						NJE, S1 (NJ)
	Potamogeton natans L.					R						
	Potamogeton nodosus Poir.					F						
	Potamogeton perfoliatus L.					R						

		OSF	R	SUF	LS	LPM	RIF	RB	SOB	C	TS	state status
Ruscaceae	**Convallaria majalis* L.		R	R								
	Maianthemum canadense Desf.			V								
	Maianthemum racemosum (L.) Link [*Smilacina racemosa* (L.) Desf.]			V								
	Maianthemum trifolium (L.) Sloboda [*Smilacina trifolia* (L.) Desf.]											NJE, S1 (NJ)
	Polygonatum biflorum (Walter) Elliott			V								
	Polygonatum biflorum var. *commutatum* (J. A. & J. H. Schultes) Morong [*P. canaliculatum* (Muhl. ex. Willd.) Pursh]			F								
	Polygonatum pubescens (Willd.) Pursh			F								
Smilacaceae	*Smilax herbacea* L.			I/O			I/O					
	Smilax tamnoides L. [*S. hispida* Muhl. ex Torrey]			I/O	I/O							S3 (NJ)
	Smilax pulverulenta Michx.			R								S3 (NJ)
	Smilax rotundifolia L.	F		F								
Sparganiaceae	*Sparganium americanum* Nutt.					F						
Typhaceae	*Typha angustifolia* L.					R						
	Typha latifolia L.					V						
Xyridaceae	*Xyris torta* Sm.					R						

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Long-term Observations of Plant Succession on an Abandoned Cornfield in Southern Chester County, Pennsylvania, (1967-2000)

WILLIAM OVERLEASE AND EDITH OVERLEASE
1645 Sycamore Court
Bloomington, Indiana, 47401

ABSTRACT. Vegetational succession of an abandoned cornfield on the campus of West Chester University was studied for 34 years from 1967-2000. The succession followed three stages involving 1) dominance by herbaceous annuals, 2.) dominance by herbaceous perennials and 3) dominance by woody plants. Specific details for these three stages are provided.

INTRODUCTION

In the mid 1960s we began to collect data on early plant succession in disturbed urban sites and old fields, especially abandoned cornfields in Chester County, Pennsylvania. These data were summarized and presented in a series of papers given to the Pennsylvania Academy of Science (Overlease 1969, 1973, 1978). Most of these studies were short term, 1-3 years, with two over ten years. Since West Chester University had set aside an area on the campus for environmental studies (The Robert B. Gordon Natural Area for Environmental Studies), which included an abandoned cornfield, it seemed appropriate to conduct a long term study in this area. A site was established in 1967 and was monitored each year for 34 years. The following is a summary of these observations.

METHODS

A site was selected at the southwest corner of South New Street and Tigue Road in the Robert B. Gordon Natural Area for Environmental Studies, West Chester, Pennsylvania. The study area was 40 × 40 m. It was subdivided into 16 10 × 10 m subplots. Metal stakes were driven to mark the corners of the plots.

Recording of vegetation cover and species abundance was done at the end of the growing season, usually mid- to late-October or early November. For more accurate measurement of cover and general distribution of species, all plot corners were connected by twine. Data for each of the 16 subplots were compiled independently for possible future reference of individual species establishment, change, and abundance.

Mapping of plant cover was done on graph paper with each square representing one square meter. The sum of squares was used to calculate the total square meter cover by species.

Crown cover and plant cover were calculated by what cover was observed when looking down on the site from above. The upper cover was considered the recorded cover for an

area. A nine foot step ladder was used for better perspective during the early years. When multiple strata developed in later years, the understory cover was not mapped, though records of abundance and distribution were made.

Stem counts for tall goldenrod *(Solidago altissima)* and aster *(Aster pilosus)* were based on number of plants with mature, well-developed inflorescences. In some years, for example, 1980 and 1993, aborted inflorescences were very common due to the dry growing season, and very low stem counts were recorded these years.

The nomenclature of the plant species follows Overlease (1986).

Results

Plant succession on the Tigue Road site can be divided into three major stages: 1.) dominance by herbaceous annuals; 2.) dominance by herbaceous perennials; 3.) dominance by woody plants.

DOMINANCE BY HERBACEOUS ANNUALS

For the first three years, over 50% of the study area was dominated by the herbaceous annuals foxtail grass *(Setaria faberii)* and common ragweed *(Ambrosia artemisiifolia)*. It was completely covered in year one with annuals, with 92% cover in year two, 73% year three, and 40% year four. In year five, there was a major decrease to 4.5% cover of the 1600 m^2 site. Though it normally would have covered less than 1% in year six, a disturbance occurred that resulted in 13% cover. Ground crews from the college cut a strip covering 210 m^2 along the west side of the site. They had decided to remove the tops of the goldenrod-aster cover so that lost balls from a nearby practice field could be more easily found. They were not aware of the study in progress on a weed-covered field. The foxtail was abundant but in a dwarfed condition under a goldenrod-aster cover. When the tops were removed in early summer, the area reverted to a well-developed foxtail cover. However, by the end of the next growing season, there was no evidence of the disturbance, with the entire local area covered by normal goldenrod-aster cover. Dwarf foxtail grass continued to be abundant under an herbaceous perennial plant cover for three years from year five through year seven. It was still locally frequent until year eight. From then on, only occasional individual plants were observed.

As shade developed over portions of the study area with increasing tree cover, native shade-tolerant, moisture-requiring annuals appeared. These included touch-me-not *(Impatiens capensis)* and great ragweed *(Ambrosia trifida)* in year 22, and richweed *(Pilea pumila)* in year 30. Though often locally frequent to common, these annuals never became abundant enough to map as plant cover. The exception was bur cucumber *(Sicyos angulatus)* which covered a local area of 57 m^2 in year 28 only. It had been locally common from year 26 on, but never abundant enough to be mapped.

The Tigue road site was not a typical site of early plant succession on abandoned cornfields in southern Chester County, Pennsylvania. After studying over 22 succession sites on cornfields in Chester County for up to 11 years of succession, I found a consistent pattern. Generally the first year, fields had abundant foxtail grass *(Setaria faberii)* with common ragweed *(Ambrosia artimiisifolia)* common to locally abundant. The second year, aster *(Aster pilosus)* was very abundant. From the third year to over 20 years, tall goldenrod *(Solidago altissima)* dominated the fields until shrub and tree cover shaded it out.

Table 1. Other herbaceous annuals found on the study site (1967-2000).

Annuals	
Conyza canadensis	LF, years 1-7; 2 in year 20; 2 in year 25; 1 in year 30
Chenopodium album	LF, years 1-6; 26 plants on 3 subplots in year 27
Galium aparine	VL years 8 to 18; LF from year 24 on
Capsella bursa-pastoris	VL, years 1 to10
Polygonum persicaria	VL, years 4 to 7
Polygonum pensylvanicum	VL, years 3 and 4
Impatiens capensis	VL years 13 and 14; LF from year 22 on
Veronica arvensis	LF from years 2 to 20; VL in year 30
Lamium purpureum	VL, years 8 to 10
Arabidopsis thaliana	VL, years 10 and 12; LF year 34
Erechtites hieraciifolia	One in year 3; LF in year 20 on
Pilea pumila	LF from year 30 on
Ambrosia trifida	VL, year 22 on
Thalaspi arvense	VL year 7; LF year 29; VL year 31
Annual-like biennials or perennials	
Lactuca scariola	Locally abundant years 4 and 5; LF from year 1 to 7
Lychnis alba	LC up to year 8; LF from then on
Lepidium campestre	LF to year 25; VL from then on
Barbarea vulgaris	LF throughout years 1 to 34
Oxalis stricta	LF throughout years 1 to 34
Erigeron annuus	Occasional to LF years 1 to 16; VL to year 27. Not found thereafter. LA on all 16 subplots in year 11.
Stellaria media	Present years 1 to 3; LA years 7 and 8; present years 9 and 10; LF years 31, 33, and 34.

VL: very local; 10 or fewer plants
LF : locally frequent, 10-20 plants
LC : locally common 100-500 plants
LA: locally abundant, 500 to 1000+ plants.

On the Tigue road site, foxtail dominated the study area for three consecutive years, along with common ragweed. It formed a thick thatch of litter at the end of each growing season. It continued to be abundant under goldenrod-aster perennial cover for three more years as dwarf understory plants.

This was unexpected. Back in the 1960s, Jack McCormick, ecologist for the field station of the Academy of Natural Sciences of Philadelphia at Waterloo Mills, showed me some of their study plots on early plant succession. He told me that they had statistical evidence that *Setaria faberii* would not grow on its own litter. The Tigue road site demonstrates that it is possible for foxtail to grow for several years on its own litter. The probable reason for the change to goldenrod-aster cover was a matter of the foxtail being suppressed by the taller dominant herbaceous perennials. When the shade (top of the overstory) was removed, the foxtail came back quite vigorously. This would probably continue as long as there was

an abundance of dwarf suppressed plants in the understory. Eventually they were shaded out and would no longer be available if the tops were then removed.

If the site were plowed, however, the foxtail, which has long-lived seeds, would be able to come back in abundance. I observed this in Chester County on a 20 year old abandoned cornfield with tall goldenrod cover. It was plowed and came back with a foxtail (*Setaria faberii)* cover the first year, though no corn had been planted on the site for 20 years.

DOMINANCE BY HERBACEOUS PERENNIALS

The tall goldenrod *(Solidago altissima)* and aster *(Aster pilosus)* dominance of the 1600 m^2 study site began slowly in year two with five stems of aster on three subplots and 24 stems of goldenrod, scattered in small groups on ten of the 16 subplots. By year three, it had increased to 320 aster stems on nine sub, and 696 goldenrod stems on 13 subplots. It was first mapped at this point, covering 10% of the 1600 m^2 area. Each succeeding year it rapidly increased in dominance with 21% cover in year four, 54% in year five, 72% year six, 97% year seven, and finally 100% in year eight. It continued to dominate with over 90% of the plant cover until year 14 when it first decreased to 84% cover. It continued to play an important role with nearly 50% to over 60% cover until year 24. Though goldenrod was the most abundant plant, aster was consistently common until year 16. From the year 19 on, it was only occasionally observed on the site.

By year 27, woody plants, both shrubs and trees, dominated 74% of the overstory plant cover and goldenrod was reduced to 24% cover. On the final year 34, it covered only 7.6% of the study area with woody plants covering 91% of the site.

The herbaceous perennial Canada thistle *(Cirsium arvense)* played a prominent role for several years of early plant succession. It was common throughout the site in year one, having survived as root sprouts. By year two, it covered 8% of the area, increasing to 17% in year three and to 31% in year four. It reached a peak of 35% of the total plant cover on 1600 m^2 in year five. It rapidly decreased to 15% cover in year six and to 2% in year seven. Scattered stems were common for two more years and then, after year nine, only occasional stems were observed. In year 30, it reappeared again, with 105 stems on five of the subplots in shaded and semi-shaded areas. It was continuously recorded with 100-200+ stems in these areas through the end of the study.

Wild carrot *(Daucus carota)*, a biennial, was also important in the early years of succession. It shared dominance with common ragweed on 2% of the area in year two, and 2% cover with common ragweed and aster in year three. By year four, it shared 6% of the study site with a tall goldenrod-aster-wild carrot plant community. This specific community increased to 28% cover of the area in year five and into year six. It was not recorded as cover in year seven, but was again mapped with 15% cover in year eight. From then on, it was no longer recorded as cover. It became uncommon to rare on the site from year 19 on.

A small unusual plant community of evening primrose *(Oenothera biennis*), a biennial, and Canada thistle, made up 2% of the study area in year seven. It was recorded only once as a cover, though evening primrose was an occasional to frequent plant until year 20. It was absent or very rare after that.

In year 28, stiltgrass *(Microstegium vimineum)* was first recorded with 34 stems on two of the subplots. It covered 5 m^2 on three subplots in year 30 and rapidly increased to 60 m^2 cover on ten subplots by year 34. It is becoming very aggressive in shaded areas of the site.

Eighty-one species of herbaceous perennials were recorded on the 1600 m^2 study site during 34 years of observations. However, most species were not major contributors to the

mapped dominant plant cover. In addition, 21 species of intermediate herbaceous perennials (annual-biennial, annual-perennial, biennial-perennial, biennial) were listed. A total of 102 species of herbaceous perennials and intermediates were found on the site in 34 years.

Of the 102 species, just over half, or 53 species, were uncommon or rare or did not persist. However, 26 species, or 25%, persisted nearly throughout the 34 years (Table 2). Six species of early established herbaceous perennials persisted up to 25 years. Nine species of later-established perennials (from year six on) persisted up to the year 31. From year 18 on to year 34, nine species of later-arriving, shade-tolerant, herbaceous perennials became established. The arrival of some of the typical local woodland species such as Virginia knotweed *(Tovara virginiana)* and jack-in-the-pulpit *(Arisaema triphyllum)* in years 27 and 28 of the study was exceptionally noteworthy.

Table 2. Herbaceous perennials reported from the study site.

Early herbaceous perennials not persisting for 34 years of study	
Species	**Years present**
Physalis subglabrata	2–8
Convolvulus sepium	2–7
Verbascum thapsus	2–19 (biennial)
Agrimonia parviflora	2–25
Aster puniceus	3–11
Prunella vulgaris	5–18
Later herbaceous perennials not persisting for 34 years of study	
Species	**Years present**
Senecio aureus	6–21
Triodia flava	8–27
Pimpinellia saxifraga	8–28
Hypericum punctatum	8–28
Pycnanthemum flexuosum	8–29
Hieracium pratense	8–31
Achillea millefolium	9–28
Linaria vulgaris	11–20
Solidago juncea	11–26
Herbaceous perennials persisting through 34 years of study	
Species	**Years present**
Rumex crispus	1 on
Allium vineale	1 on
Taraxacum officinale	1 on
Solanum carolinense	1 on
Aster pilosus	1 on
Cirsium arvense	1 on
Silene alba	1 on
Barbarea vulgaris	1 on
Oxalis stricta	1 on
Soliago altissima	2 on
Asclepias syriaca	2 on
Cirsium discolor	2 on
Daucus carota	2 on

Herbaceous perennials persisting through 34 years of study (cont.)	
Species	**Years present**
Circaea quadrisculata	3 on
Solidago graminifolia	3 on
Potentilla canadensis	4 on
Aster novae-angliae	4 on
Polygonum scandens	4 on
Poa trivalis; P. pratensis	5 on
Carex spp. (leaves 3/8" wide)	5 on
Viola papilionacaea	5 on
Rumex acetosella	5 on
Solidago rugosa	6 on
Duchesnia indica	7 on
Galium aparine	8 on
Apocynum cannabinum	11 on

Late arriving herbaceous perennials persisting to year 34	
Species	**Years present**
Agrostis hyemalis	18 on
Conium maculatum	21 on
Hackelia virginiana	23 on
Cinna arundinacea	26 on
Muhlenbergia schreberi	27 on
Tovara virginiana	27 on
Arctium minus	28 on (biennial-perennial)
Microstegium vimineum	28 on
Arisaema triphyllum	28 on

DOMINANCE BY WOODY PLANTS

SHRUBS

The first shrubs to appear on the study site were blackberry (*Rubus allegheniensis*, year four, one stem), and Japanese honeysuckle (*Lonicera japonica*, year four, one stem). By year five, multiflora rose (*Rosa multiflora*, year five, one stem), poison ivy (*Toxicodendron radicans*, year five, one stem), and wild grape (*Vitis aestivalis*, year five, one stem) appeared. Three stems of oriental bittersweet *(Celastrus orbiculatus)* were also found in year five, one on each of three subplots. New arrivals in year six included black raspberry *(Rubus occidentalis)*, wineberry *(Rubus phoenicolasius)*, and greenbriar *(Smilax rotundifolia)*. All arrived with one stem except for black raspberry which had two stems on one subplot.

Blackberry became generally common, with over 100 stems on 15 of the 16 subplots by year eight. Multiflora rose was slower to become established and did not reach a total of 100 stems on 11 subplots until year 20. However, it began to develop clusters of stems from the roots from year seven on. By year 20, 11 clusters of multiple stems were recorded. It soon spread rapidly, forming dense thickets. In year 34 there were 68 stem clusters with 475 stems on the 1600 m^2 site.

Black raspberry was found totaling 100 stems on ten subplots in year 14. It continued at about that level through the study. In contrast, blackberry rapidly increased with a total of over 1000 stems in year 16 on all 16 of the subplots. It continued at near that level through the end of the study.

Japanese honeysuckle spread rapidly from one stem in year four to locally frequent in nine subplots in year eight. On year 13, it was mapped covering 115 m^2, or 7% of the study area. It very soon increased to 30% of the cover on year 15 and reached a peak cover

at 47% in year 19. It continued at over 36% cover until the 24th year when severe winter kill reduced it to 5% cover. Though it recovered to 17% the following year, it gradually decreased to 1% in year 30 and to zero cover by year 31. Although not recorded as a specific cover in the later years, it continued as a prominent species of a newly designated mixed shrub community from year 24 on.

Oriental bittersweet increased rapidly with a total of over 100 stems in all of the 16 subplots by year 13. It continued to be locally abundant throughout the study.

As was noted above, by year 24, the common shrubs and twining shrubs had become such thickets that they were mapped as a mixed shrub cover. It covered 16% of the site year 24 and increased to 26% by year 28. It continued to be mapped near that level for the rest of the study.

Poison ivy didn't become locally frequent until year 20 when it was found in ten subplots. It was a locally frequent shrub, though not abundant, throughout the study.

Amur honeysuckle *(Lonicera maackii)* became established in year 19 with two stems in one subplot. It remained as one large bush until year 24 and then began to gradually increase as shade developed. By year 28, it had increased to 18 stems in seven subplots. It was mapped with a cover of 29 m^2 in year 29. By the year 34, it covered 51 m^2 with 108 stems in 13 subplots.

Autumn olive *(Eleaegnus umbellata)* first appeared in year 24 with one stem. It had increased to eight stems by year 29, covering 3 m^2 in two subplots. By year 34 it had increased to 13 stems covering 25 m^2 in four subplots.

Other species of shrubs recorded, though not common, included silky dogwood *(Cornus amomum)*, greenbriar *(Smilax glauca)*, fox grape, *(Vitis labrusca)*, black haw *(Viburnum prunifolium)*, and Virginia creeper *(Parthenocissus quinquefolia)*. In year 33, privet (*Ligustrum* sp.) and spice bush *(Lindera benzoin)*, a forest shrub, were first recorded.

It is important to note that all species of shrubs appear to have seeded onto the study site as none were found until the fourth year of succession. The small numbers of the first arrivals of shrub species appears significant though rapid buildup of numbers was evident for some species.

TREES

No tree seedlings or sprouts were found on the study site until the third year when one seeding black cherry *(Prunus serotina)* was found. Though present with scattered stems, black cherry never became a prominent tree on the site. By year 29, nine stems covering 10 m^2 on seven subplots were present. In year 34, it had increased to 15 stems covering 21 m^2 on nine subplots.

Another common tree of early plant succession, tulip tree *(Liriodendron tulipifera)*, was rarely found. One seedling was observed in year five and again in year seven. They did not persist.

Red maple *(Acer rubrum)* first appeared in year six and persisted throughout the study with one to five stems. In year 34 it consisted of two stems on two subplots covering 15m^2.

Bird cherry *(Prunus avium)* was also an early arrival with one seedling in year seven and again in year eight. Neither seedling persisted.

Box elder *(Acer negundo)* also was first observed in year seven with three seedlings. By year 29, eight stems were found covering 9 m^2 in four subplots. In year 34, thirteen stems covered 29 m^2 in six subplots.

The most dominant tree, black locust *(Robinia pseudo-acacia)* first appeared with five root sprouts spreading from nearby roadside trees on two subplots in year 7. By the year

13, it had increased to 23 root sprouts in four subplots with a crown cover of 2% of the study site. In year 20 there were 50 root sprouts found in ten subplots covering 14% of the site. In recent years, the crown cover had increased dramatically. It covered 46% of the 1600 m^2 study area in 13 subplots in year 34. Six trees had trunks with diameters at breast height (d.b.h.) of over 10". Eighteen trees had d.b.h's over 5". The first dead black locust sprouts and sapling trees were noted year 22. From three to six dead saplings were recorded each year until the end of the study.

Three new species of trees appeared for the first time in year eight: white ash *(Fraxinus americana)*, crabapple *(Malus domestica)*, and flowering dogwood *(Cornus florida)*. One seedling white ash was found in three subplots. By year 20, there were 17 stems in six subplots. The first crown cover of white ash was recorded in year 29 with 11 m^2 cover. It has also increased dramatically in crown cover in recent years. In year 34, it covered 80 m^2 with 32 stems in 11 subplots. One tree had a d.b.h. of 6" in year 34 and four trees had 4" d.b.h's.

One seedling crabapple was found in year eight. It slowly increased to five stems in three subplots by year 20. The first crown cover was recorded in year 29 with 5 m^2 cover. By year 34, 31 stems were found in 14 subplots with 45 m^2 of crown cover.

Flowering dogwood continued to persist with only two to three stems from year eight on. It was recorded with 14 m^2 of crown cover in year 29 though nearly covered with a tangle of wild grape and Japanese honeysuckle. It continued at nearly 14 m^2 cover until the end of the study.

Black walnut did not appear until year 13, with one seedling. In year 22, six seedlings were noted in five subplots. By year 28, it had increased to 33 seedlings in 13 subplots. The first crown cover was recorded in year 29 with 52 m^2. In year 34, 40 seedlings and saplings were found in all 16 subplots with 92 m^2 of crown cover. One black walnut was 8" (d.b.h.) and one 4" (d.b.h.).

Other species of trees found as seedlings on the 1600 m^2 study site but not persisting included Chinese elm *(Ulmus pumila)*, three times; red mulberry *(Morus rubra)*, twice; Norway maple *(Acer platanoides)*, once; honey locust *(Gleditsia triacanthos)*, once; and Chinese chestnut *(Castanea mollissima)*, four times. One sapling of red cedar *(Juniperus virginiana)* persisted from years 17 to 24 when it was girdled and killed by rodents. It had reached a height of nine feet.

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A Note on the Host Species of Mistletoe *(Phoradendron leucarpum)* in the Eastern United States

WILLIAM OVERLEASE AND EDITH OVERLEASE
1645 Sycamore Court
Bloomington, Indiana, 47401

[Editor's Note: Prior to his passing (see pp. 115-116 of this number for obituary), Bill Overlease submitted a manuscript on the distribution, abundance, and host species of the American mistletoe, *Phoradendron leucarpum.* The manuscript consisted of one page of text and 61 distribution maps that provided the results of this study. Most of the findings of this report are provided in this note, with the data from the distribution maps being given in Tables 1 and 2. The data provided here are strictly based on the observations of the Overleases. For example, the only host species reported from New Jersey is *Nyssa sylvatica* even though reports of *Phoradendron leucarpum* occurring on *Acer rubrum* (N. L. B. Britton. *Final Rep. State Geol.* 2: 213. 1889), *Acer saccharinum* (J. Arsenault, p. 138 of this number), and *Liquidambar styraciflua* (W. Stone. *Ann. Rep. New Jersey State Mus.* 1910. Part II: 416-417. 1912) are known. No literature was cited in the original manuscript. The following are some publications that provide additional information on this topic:

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WAGENER, W. W. 1957. The limitation of two leafy mistletoes of the genus *Phoradendron* by low temperatures. *Ecology* 38:142–145.]

In 1993, we were told that mistletoe, *Phoradendron leucarpum (=P. serotinum)* no longer occurred in Indiana. This intrigued us to the point that we decided to try and see if we could find it. For three years we investigated southern Indiana near the Ohio River. Though not common, we did find small colonies and often only individual plants all along the river from Illinois on the west to near the Ohio border on the east. We enjoyed the adventure of the search so much that we wondered about its distribution in the nearby states. First Kentucky, then Illinois and finally Ohio. By now we were hooked on mistletoe and continued our search in subsequent years throughout the eastern United States during our travels.

We were primarily interested in its abundance, its distribution, and in particular, its host tree species. We found that mistletoe was rather host specific and that the hosts varied from region to region. One of the most interesting questions that resulted from our field work was why mistletoe only occurred on a tree species in certain parts of its range. The following tables summarize some of what we have observed.

Table 1. Observational data (number of trees observed with mistletoe, number of host species, species observed) reported for each state.

States	Number of trees observed with mistletoe	Number of Host Species	Species observed (number of individuals infected)
Ala.	507	27	*Acer rubrum* (30), *Acer saccharinum* (10), *Betula nigra* (3), *Broussonetia papyrifera* (1), *Carya glabra* (1), *Carya illinoinenis* (28), *Carya ovata* (13), *Carya tomentosa* (1), *Celtis laevigata* (3), *Fraxinus americana* (33), *Juglans nigra* (2), *Liquidambar styraciflua* (1), *Maclura pomifera* (3), *Nyssa aquatica-N. biflora* (14), *Nyssa sylvatica* (1), *Oxydendrum arboretum* (1), *Platanus occidentalis* (1), *Prunus serotina* (3), *Pyrus calleryana* (1), *Quercus falcata* (37), *Quercus laurifiolia* (1), *Quercus nigra* (301), *Quercus phellos* (11), *Quercus stellata* (1), *Quercus velutina* (3), *Quercus virginiana* (1), *Ulmus americana* (2)

States	Number of trees observed with mistletoe	Number of Host Species	Species observed (number of individuals infected)
Ark.	476	27	*Acer rubrum* (6), *Acer saccharinum* (27), *Carya illinoinenis* (11), *Carya ovata* (4), *Celtis laevigata* (2), *Diospyros virginiana* (2), *Fraxinus americana* (7), *Gleditisia triacanthos* (2), *Maclura pomifera* (1), *Nyssa sylvatica* (4), *Ostrya virginica* (1), *Platanus occidentalis* (30), *Prunus serotina* (3), *Quercus alba* (77), *Quercus coccinea* (2), *Quercus falcata* (184), *Quercus marilandica* (1), *Quercus muehlenbergii* (2), *Quercus nigra* (3), *Quercus palustris* (3), *Quercus phellos* (8), *Quercus rubra* (1), *Quercus stellata* (3), *Ouercus velutina* (2), *Ulmus americana* (85), *Ulmus pumila* (3), *Ulmus rubra* (2)
Del.	38	3	*Acer rubrum* (33), *Acer saccharinum* (4), *Nyssa sylvatica* (1)
Fla.	2097	21	*Acer rubrum* (4), *Acer saccharinum* (2), *Betula nigra* (4), *Carya illinoinenis* (242), *Carya tomentosa* (9), *Celtis laevigata* (6), *Fraxinus americana* (5), *Juglans nigra* (1), *Nyssa aquatica-N. biflora* (198), *Planera aquatica* (3), *Platanus occidentalis* (4), *Prunus caroliniana* (1), *Prunus serotina* (11), *Quercus falcata* (55), *Quercus hemisphaerica* (33), *Quercus laurifiolia* (96), *Quercus nigra* (1404), *Quercus phellos* (3), *Quercus virginiana* (13), *Sapium sebiferum* (1), *Ulmus crassifolia* (2)
Ga.	1375	24	*Acer rubrum* (1), *Acer saccharinum* (3), *Betula nigra* (1), *Carya illinoinenis* (179), *Carya ovata* (1), *Celtis laevigata* (4), *Fraxinus americana* (1), *Liquidambar styraciflua* (1), *Malus baccata* (2), *Nyssa aquatica-N.biflora* (467), *Nyssa sylvatica* (3), *Persea borbonia* (2), *Platanus occidentalis* (1), *Prunus serotina* (3), *Pyrus calleryana* (35), *Quercus coccinea* (10), *Quercus falcata* (95), *Quercus laurifiolia* (31), *Quercus marilandica* (5), *Quercus montana* (3), *Quercus nigra* (450), *Quercus phellos* (26),*Quercus virginiana* (45), *Ulmus americana* (6)
Ill.	158	8	*Acer rubrum* (7), *Acer saccharinum* (93), *Acer saccharum* (9), *Betula nigra* (1), *Celtis laevigata* (4), *Fraxinus americana* (1), *Juglans nigra* (4), *Ulmus americana* (39)
Ind	125	10	*Acer saccharinum* (18), *Acer saccharum* (1), *Celtis occidentalis* (1), *Fraxinus americana* (6), *Juglans nigra* (58), *Nyssa sylvatica* (11), *Prunus serotina* (1), *Quercus alba* (1), *Ulmus americana* (22), *Ulmus rubra* (6)

States	Number of trees observed with mistletoe	Number of Host Species	Species observed (number of individuals infected)
Ky.	557	16	*Acer rubrum* (12), *Acer saccharinum* (84), *Acer saccharum* (13), *Carya glabra* (6), *Celtis occidentalis* (14), *Fraxinus americana* (15), *Juglans nigra* (247), *Maclura pomifera* (5), *Nyssa sylvatica* (26), *Platanus occidentalis* (1), *Prunus serotina* (18), *Quercus alba* (17), *Quercus rubra* (1), *Robinia pseudoacacia* (21), *Ulmus americana* (74), *Ulmus rubra* (3)
La.	602	16	*Acer rubrum* (2), *Acer saccharinum* (1), *Carya illinoinensis* (38), *Celtis laevigata* (5), *Fraxinus americana* (19), *Fraxinus caroliniana* (6), *Liquidambar styraciflua* (32), *Quercus falcata* (37), *Quercus hemisphaerica* (1), *Quercus laurifiolia* (3), *Quercus nigra* (441), *Quercus pagoda* (1), *Quercus phellos* (1), *Quercus virqiniana* (2), *Ulmus americana* (11), *Ulmus crassifolia* (2)
Md.	106	4	*Acer rubrum* (95), *Acer saccharinum* (2), *Liquidambar styraciflua* (2), *Nyssa sylvatica* (7)
Miss.	731	22	*Acer saccharinum* (1), *Broussonetia papyrifera* (1), *Carya illinoinenis* (16), *Carya ovata* (2), *Celtis laevigata* (4), *Diospyros virginiana* (1), *Fraxinus americana* (6), *Liquidambar styraciflua* (80), *Maclura pomifera* (1), *Malus baccata* (2), *Nyssa aquatica-N. biflora* (6), *Populus heterophylla* (5), *Prunus serotina* (2), *Pyrus calleryana* (1), *Quercus coccinea* (1), *Quercus falcata* (116), *Quercus nigra* (451), *Quercus phellos* (19), *Quercus stellata* (2), *Robinia pseudoacacia* (1), *Ulmus americana* (9), *Ulmus rubra* (4)
Mo.	21	6	*Acer saccharinum* (1), *Fraxinus americana* (1), *Juglans nigra* (1), *Nyssa sylvatica* (2), *Platanus occidentalis* (9), *Ulmus americana* (7)
N.J.	19	1	*Nyssa sylvatica* (19)
N.C.	447	21	*Acer rubrum* (160), *Acer saccharinum* (4), *Acer saccharum* (5), *Betula nigra* (2), *Betula populifolia* (1), *Carya illinoinenis* (10), *Carya ovata* (1), *Fraxinus americana* (5), *Fraxinus pennsylvanica* (16), *Juglans nigra* (1), *Liquidambar styraciflua* (11), *Nyssa aquatica-N. biflora* (53), *Nyssa sylvatica* (100), *Prunus serotina* (2), *Quercus coccinea* (41), *Quercus imbricaria* (2), *Quercus nigra* (10), *Quercus rubra* (5), *Quercus velutina* (1), *Robinia pseudoacacia* (14), *Ulmus americana* (3)

States	Number of trees observed with mistletoe	Number of Host Species	Species observed (number of individuals infected)
Okla.	110	13	*Acer saccharinum* (1), *Betula nigra* (3), *Carya tomentosa* (1), *Celtis laevigata* (3), *Celtis occidentalis* (2), *Platanus occidentalis* (21), *Quercus falcata* (33), *Quercus marilandica* (1), *Quercus stellata* (6), *Quercus velutina* (1), *Ulmus americana* (36), *Ulmus crassifolia* (1), *Ulmus pumila* (1)
Ohio	100	8	*Acer saccharinum* (29), *Acer saccharum* (5), *Carya illinoinensis* (1), *Celtis occidentalis* (5), *Fraxinus americana* (1), *Juglans nigra* (32), *Robinia pseudoacacia* (11), *Ulmus americana* (16)
S.C.	579	23	*Acer rubrum* (18), *Acer saccharinum* (2), *Betula nigra* (6), *Carya illinoinensis* (9), *Carya tomentosa* (1), *Fraxinus americana* (4), *Fraxinus caroliniana* (1), *Liquidambar styraciflua* (54), *Nyssa aquatica-N. biflora* (158), *Nyssa sylvatica* (26), *Populus heterophylla* (1), *Prunus serotina* (1), *Pyrus calleryana* (1), *Quercus alba* (2), *Quercus coccinea* (1), *Quercus falcata* (24), *Quercus laurifiolia* (1), *Quercus nigra* (260), *Quercus phellos* (3), *Quercus stellata* (1), *Quercus virginiana* (1), *Robinia pseudoacacia* (2), *Ulmus americana* (2)
Tenn.	303	23	*Acer rubrum* (4), *Acer saccharinum* (82), *Acer saccharum* (1), *Carya cordiformis* (1), *Carya glabra* (33), *Carya illinoinenis* (2), *Carya ovata* (19), *Carya tomentosa* (1), *Diospyros virginiana* (1), *Fraxinus americana* (29), *Juglans nigra* (4), *Liquidambar styraciflua* (5), *Maclura pomifera* (1), *Nyssa sylvatica* (15), *Platanus occidentalis* (11), *Prunus serotina* (2), *Quercus coccinea* (10), *Quercus falcata* (21), *Quercus nigra* (36), *Quercus palustris* (1), *Quercus rubra* (3), *Robinia pseudoacacia* (8), *Ulmus americana* (13)
Tex.	232	16	*Acer saccharinum* (3), *Carya illinoinenis* (3), *Carya tomentosa* (1), *Celtis laevigata* (2), *Fraxinus americana* (7), *Platanus occidentalis* (9), *Pyrus calleryana* (2), *Quercus falcata* (145), *Quercus marilandica* (1), *Quercus nigra* (5), *Quercus phellos* (13), *Quercus stellata* (5), *Quercus virginiana* (2), *Ulmus americana* (25), *Ulmus crassifolia* (7), *Zanthoxylum clava-herculis* (2)

States	Number of trees observed with mistletoe	Number of Host Species	Species observed (number of individuals infected)
Va.	219	21	*Acer rubrum* (92), *Acer saccharinum* (20), *Acer saccharum* (4), *Broussonetia papyrifera* (9), *Carya cordiformis* (17), *Carya glabra* (4), *Carya illinoinenis* (13), *Carya tomentosa* (2), *Celtis laevigata* (2), *Fraxinus americana* (24), *Gleditisia triacanthos* (3), *Juglans nigra* (1), *Liquidambar styraciflua* (3), *Nyssa sylvatica* (10), *Platanus occidentalis* (2), *Prunus serotina* (2), *Quercus alba* (3), *Quercus coccinea* (1), *Quercus phellos* (1), *Robinia pseudoacacia* (4), *Ulmus americana* (2)
W.Va.	101	7	*Acer saccharinum* (55), *Betula nigra* (1), *Celtis occidentalis* (1), *Juglans nigra* (6), *Prunus serotina* (6), *Robinia pseudoacacia* (19), *Ulmus americana* (13)
TOTAL TREES COUNTED	8903		

Table 2. Host species observed for mistletoe and number of states each species was observed as host.

Species	Number of states observed as host for mistletoe
Acer rubrum	13
Acer saccharhinum	20
Acer saccharum	7
Betula nigra	8
Betula populifolia	1
Broussonetia papyrifera	3
Carya cordiformis	2
Carya glabra	4
Carya illinoinensis	12
Carya ovata	6
Carya tomentosa	7
Celtis laevigata	10
Celtis occidentalis	5
Diospyros virginiana	3
Fraxinus americana	16
Fraxinus caroliniana	2
Fraxinus pennsylvanica	1
Gleditisia triacanthos	2

Species	Number of states observed as host for mistletoe
Juglans nigra	11
Liquidambar styraciflua	9
Maclura pomifera	5
Malus baccata	2
Nyssa aquatica-N. bilora	6
Nyssa sylvatica	13
Ostrya virginiana	1
Oxydendrum arboreum	1
Persea borbonia	1
Planera aquatica	1
Platanus occidentalis	10
Populus heterophylla	2
Prunus caroliniana	1
Prunus serotina	12
Pyrus calleryana	4
Quercus alba	5
Quercus coccinea	7
Quercus falcata	10
Quercus hemispherica	2
Quercus imbricaria	1
Quercus laurifolia	5
Quercus marilandica	4
Quercus muhlenbergii	1
Quercus nigra	10
Quercus pagoda	1
Quercus palustris	2
Quercus phellos	9
Ouercus montana (Q. prinus)	1
Quercus rubra	4
Quercus stellata	6
Quercus velutina	4
Quercus virginiana	6
Robinia pseudoacacia	8
Sapium sebiferum	1
Ulmus americana	17
Ulmus crassifolia	4
Ulmus pumila	2
Ulmus rubra	4
Zanthtoxylum clava-herculis	1

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Remembering Frank Hirst and His Recollection of the Discovery of *Utricularia olivacea* in New Jersey

WILLIAM A. MCAVOY
1291 Fords Corner Road.
Hartly, Delaware 19953

Frank Hirst (1928–2009), well-known field botanist and master plumber, passed away on August 3, 2009, at the age of 81 (see pp. 121–122 for obituary by Ronald Wilson).

Frank was a New Jersey native and Pine Barrens botanist, but he and his wife, Jean, and two daughters moved to the Eastern Shore of Maryland on the Delmarva Peninsula in 1971. Frank was a plumber by trade and a self-taught botanist. He was a member of the Philadelphia Botanical Club for 50 years and made many significant botanical discoveries, both in New Jersey, with his brother Bob Hirst (1925–1963; Evert 1964) (e.g., Hirst and Hirst 1962), and on the Delmarva Peninsula (e.g., Hirst 1983, 1990; Boone et al. 1984).

During a conversation with Frank prior to his passing, he entertained me with a story about the discovery by him and his brother Bob of *Utricularia olivacea* Wright ex Griseb. in New Jersey back in 1958. I found his story to be very interesting and thought that this was a tale that others should know. Furthermore, what better way is there to remember Frank than to relive one of his many noteworthy botanical discoveries?

Utricularia olivacea (dwarf bladderwort, minute bladderwort) is a diminutive, aquatic bladderwort no taller than 1 cm. It is usually found in ponds and depression wetlands, and often forms mats on the surface of the water. The species is known from Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia, and the Pine Barrens of southern New Jersey (NatureServe 2008), where it is known from a single location. In all states of occurrence but Florida the species is considered to be rare (NatureServe 2008). The species is also is found in the West Indies, Central America, and South America (Taylor 1989).

The following is a paraphrasing of Frank's recollection of his discovery of *Utricularia olivacea* in New Jersey in 1958 as told to me.

Even though I am 80 years of age, I still remember most of the details about what transpired 50 years ago.

Bob and I had just recently "discovered" and botanized for the first time the now well-known Goose Ponds (consisting of Little Goose and Big Goose Ponds) near Egg Harbor City in the Atlantic County Pine Barrens (Wherry 1959). The old U.S.G.S. topographical maps that we were using around this time showed the Goose Ponds to be swamp, but new maps for the area had recently become available, and these maps showed the Goose Ponds as open bodies of water, which as you can imagine, greatly sparked our interest. We visited

the Little Goose Pond first, which was drawn-down at the time, and we were overwhelmed by the number of rare plants that we saw. One species in particular was *Rhexia aristosa* Britton, the awned meadow-beauty, not seen in New Jersey since 1898 (Stone 1911; Hirst and Hirst 1962; Snyder 1996). Other noteworthy plants seen that day included *Sagittaria teres* S. Watson and *Utricularia resupinata* B. D. Greene (Hirst and Hirst 1962).

Finding the tiny bladderwort was by chance; I believe it was our first or second visit to the ponds. We were in Little Goose Pond that day, and as I stood gawking at an intensely rose-colored meadow-beauty blossom, I happened to notice something sticking up amongst a mat of algae and peat moss. It appeared as a group of tiny stalks with pinhead-like tips. "Wow!" I said to myself, I had never seen a moss or alga or anything quite like this before. Bob came over for a look and he very carefully examined the tiny stalks. Using his hand lens, Bob replied, "They look like they have tiny flowers!" The plants were very small, about 3 or 4 mm high, and we could not make out any kind of foliage. At home later that night, after dissecting and magnifying the flowers we collected, we concluded that it could only be a species of *Utricularia*.

We talked with other botanists about it, including Bayard Long (1885–1969), and Lou Hand (1901–1988). They all wanted to visit the site to see it for themselves, which we did not long after. Mr. Long and the rest of the group were perplexed as to what this plant could be, but we all agreed that it had to be a wee species of *Utricularia*. We checked the Big Goose Pond for the plant, but never did find it; it was only in Little Goose Pond, which seemed to have the right habitat. Despite Mr. Long's failing health at the time, he kept up with us and even brought along his field press, which he carried on a strap over his shoulder. I recall that when he collected an aquatic plant, he would splash water on the newspaper sheet to keep it moist, and then pull the strap to tighten the press.

Also in the group that day was a woman who was especially amazed and interested in this tiny mystery plant. Her name was Ruth McVaugh Allen (1913–1984). Besides being a student of botany and lover of native plants, she was a gifted and extremely talented artist, illustrator, and photographer (Anderson 1985). Ruth mentioned at the time that she was working on the illustrations for a book on the slime molds by George Willard Martin and Constantine John Alexopoulos (1969). Ruth was so fascinated with this tiny bladderwort that she decided she was going to study it more closely, and perhaps describe it as a new species. Ruth did some beautiful, detailed sketches of the plant, and after hours of studying Latin in order to write a formal description, she was nearly ready to submit a manuscript to *Bartonia* and name the species *Utricularia hirstiorum* in honor of Bob and me.

Before submitting, Ruth thought that it might be wise to first ask Dr. Edgar Wherry (1885–1982) if he would review her description for accuracy. He agreed to do so and after review said, "Ruth, before you submit this, I seem to remember reading about a small bladderwort in John Kunkel Small's *Manual of the Southeastern Flora* (Small 1933); you might want to research that (Wherry 1959)." So Ruth took Dr. Wherry's advice, and to her great disappointment, found that Small had listed *Biovularia olivacea* (C.Wright) Kamieński, a synonym of *Utricularia olivacea* C. Wright ex Griseb. (in *Catalogus Plantarum Cubensis:* 161. 1866). The species Ruth had worked so hard on had already been formally described over ninety years earlier. However, Ruth did get some satisfaction from her labors by publishing a brief study of *Utricularia olivacea* in *Bartonia* (Allen 1959). Her paper included a morphological description of the plant and her meticulous illustrations.

Despite our regrets that Ruth was unable to author a species new to science, our discovery of *Utricularia olivacea* in New Jersey was still very exciting. Small cited only one record for

this species in North America at the time: "shallow water, near Sanford, Seminole County, Florida" (Small 1933; Wherry 1959). This record was just over 1,000 miles south of the Little Goose Pond population! Of course, it is now known from several other southeastern states, but at the time we were thrilled about our discovery. Still, I must admit that we were a bit disappointed that the species was not new to science and, therefore, it would not be named for us. But we just smiled and moved on to new places to explore and new rare plants to find. These explorations did lead to the discovery of a new species, *Dichanthelium hirstii* (Swallen) Kartesz (*Panicum hirstii* Swallen). Swallen, who described the grass (1961), failed to honor both Bob and me by not using the plural specific epithet (*hirstiorum*). That is why I refer to the species as the Hirst brothers' panic grass, so that Bob can get the recognition that he deserves, but the story of the discovery of this rare grass I'll save for another time.

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Bartonia No. 65: 115–116, 2011

William R. Overlease (1925-2007)

When Bill passed away on November 30, 2007, we lost more than a botanist. We lost an ornithologist, an ecologist, a historian, a mentor, and a friend.

Bill was born October 2, 1925, in Elkhart, Indiana, where he spent his early years. Then like so many of his generation he answered the call of his nation, spending four years from 1943 to 1946 with the US Navy in the Pacific. This tour of duty awoke in him a desire to travel, and in later years he managed to visit all seven continents. But Bill was always happy to come home, not only to Indiana, where he spent a number of years after the war working as a naturalist in the state park system, but to Benzie County, Michigan, where he spent many summers exploring the woods, swamps, and dunes of that part of the lower peninsula, collecting plants, studying birds, and conducting ecological studies.

Bill was tireless in his quest to learn why plants and birds they grew where they grew and lived where they did. He was fascinated by plant distribution and succession and forest ecology. After graduating from Michigan State University in 1950 with a bachelor of science degree in forestry, followed up by a master of science in conservation (1952) and a doctorate in botany and plant pathology (1964) he moved to West Chester State College (later University), where he taught ecology and botany from 1963 to 1986. Once there, among other projects, he set up a plant succession study in an abandoned cornfield at the southwest corner of Tigue Road and New Street, which he monitored for 34 years (see pp. 97-104 of this issue). One of his greatest contributions while at West Chester, and one he was

very proud of, was helping to persuade the Board of Trustees in 1973 to formally establish the Robert B Gordon Natural Area at the South Campus as a permanent natural laboratory to study plants and animals in a suburban setting. Before and after its establishment as a preserve he spent much time there studying the structure and composition of the woody vegetation.

With his teaching load, field studies, and other scholarly duties, it was often a wonder that Bill was able to get out in the field as much as he did. But when he did, he was an exhaustive and careful note taker. And when he got back, he spent innumerable hours writing them up, posting to his catalog of index cards and then hammering the data into shape for publication. Bill published innumerable articles on plants, birds, and other subjects, never letting weather, illness, or anything else interfere with his work.

Botany was not his only love. Bill spent probably as many hours studying birds, both in Indiana, where he participated in many summer surveys both before and after his sojourn at West Chester, Michigan, and in Chester County, where he was a regular participant in the annual Audubon Christmas Count, as he did plants. He was an amateur historian, gathering, writing down, and publishing the tales and oral traditions of the frontier days of the Midwest. Not surprisingly, as befitted a man who spent years in Bruce Catton country, he was also a Civil War buff, collecting lyrics of marching songs, photographing old cemeteries, and gathering and publishing information on many of the unsung and forgotten contributors to the Northern war effort.

It has been said that behind every great man is a woman. This was so true for Bill, for without his devoted wife, Edith, he would not have accomplished nearly as much he did. They first met at Turkey Run State Park in Indiana, in the 1950s, and were married in a log church there in 1955. Edith and Bill were inseparable, traveling, working, and writing together. Their last papers, published jointly, are in this issue (pp. 97-111).

Bill was an incurable optimist, always able to see the silver lining in every dark cloud, to find the rare plant lurking amidst a mass of invasive aliens. As a result he was able to inspire generations of students to emulate him, not only in the field of botany, but in other pursuits. His memorial service and dedication ceremony on April 18, 2009 at West Chester was attended by a horde of former pupils ranging from college presidents to landscapers. This member of the greatest generation will be missed.

JACK HOLT
NOVEMBER 2010

Bartonia No. 65: 117–118, 2011

Ann Elizabeth Wolff Newbold (1922–2008)

Ann Elizabeth Newbold, a fine, self-taught botanist who has made significant contributions to our knowledge of the flora of Pennsylvania and a past president of the Philadelphia Botanical Club (January 1977–May 1978), died of congestive heart failure on July 14, 2008 at Lima Estates, an assisted living facility in Media, Pennsylvania. After suffering several strokes, Ann was compelled to live life in a wheelchair during most of her last five years. For a woman accustomed to traveling, botanizing, playing tennis, skating, and skiing up to age 80, such confinement often proved difficult to accept.

Throughout her life, Ann Newbold was a champion of racial equality and nuclear disarmament. She staunchly supported the Freedom Riders that headed to the Deep South. During the Vietnam War, she co-founded the Pottstown Peace Committee and served as a draft counselor, proud that she was able to persuade many young men to stay out of the war. In 1965, while standing in a silent Quaker peace vigil, Ann and her daughter suffered the indignity of being bombarded by eggs and tomatoes.

Ann's love of wildflowers was nurtured during childhood on the Wolff's family apple orchard in Lima, Pennsylvania. At their home overlooking a pond in Bechtelsville, Montgomery County, she and her late husband Albert G. Newbold (died 1982) transformed a ten-acre parcel of meadow and woodland into a native wildflower garden, the Glenn Flora Preserve. This remarkable preserve was frequently a destination of field trips, especially to observe spring ephemerals or late-season asters and goldenrods. It also served as a "classroom" for students enrolled in Ann's plant identification classes.

Ann Newbold was a frequent participant on field trips sponsored by the Philadelphia Botanical Club and the leader or co-leader of 21 excursions conducted from 1976 through 1997, each of them documented in various issues of *Bartonia.* Her deliberate and intensive approach in the field stemmed from a desire to put a precise Latin name on every species encountered. She encouraged all attendees to break out their plant manuals on the spot. Rarely did the group advance far beyond the parking lot in the first hour of botanizing. Ann once told the writer that "keying out" plants was one of her favorite activities. On extended joint field meetings of the Northeast Section of the Botanical Society of America, the Torrey Botanical Society, and the Philadelphia Botanical Club, she would often provide dissecting scopes and make arrangements for keying difficult species, especially members of the *Cyperaceae.* These valuable sessions often lasted late into the night. Gerry Moore fondly remembered: "My lasting recollection of Ann was her rainbow colored umbrella hat. She would wear it on days when rain was in the forecast, opening the umbrella when the rains came."

Teaching courses in botany and plant identification at the Barnes Foundation and the Morris Arboretum of the University of Pennsylvania provided Ann with great satisfaction. Equally rewarding was her work as a botanical consultant. During 1980-1982 she conducted a vegetation survey in an extensive area around a Pennsylvania nuclear power plant near Berwick. Another major assignment included her plant communities and vegetation diversity inventory of Valley Forge National Historical Park in the 1990s. Ann also provided major input for "A Natural Areas Inventory of Montgomery County, Pennsylvania," a document produced in the 1990s by the Pennsylvania Science Office of the Nature Conservancy for the Montgomery County Planning Commission. Throughout the 1980s, Ann Newbold served

as a steadfast member of a survey team (along with director Ann Rhoads, Richard Mellon, Roger Latham, and Jack Holt) of the Eastern Pennsylvania Rare Plant Survey, a project of the Morris Arboretum in cooperation with the Pennsylvania Natural Diversity Inventory. The persistent efforts of this team have resulted in the discovery of numerous county and state records. In the 1990s, Ann was engaged by the Delaware Heritage Program to serve on a similar survey team seeking rare plants especially in New Castle County, Delaware.

A significant chapter in Ann Newbold's life began in 1987 when she met Dr. Heinrich Zoller, professor emeritus at the University of Basel in Switzerland, and leader of a weeklong field excursion in the Swiss Alps that she attended during an international botanical congress. Their deep love of wildflowers and nature was an immediate bond that kindled an abiding relationship. A number of Philadelphia Botanical Club members will recall celebrating their "Affirmation of Love" reception at Bechtelsville on August 26, 1989. Ann's daughter Monica recalls: "For the next 15 years, their story was a wonder. He would come to Pennsylvania or she would go to Switzerland for a month or two. Then the two of them would spend some time apart, pursuing their independent lives. Then again they would switch to visit the other person's country. Together they went on botanical trips to Madagascar, Jamaica, the Swiss Alps, the U.S. West, Alaska, and more. When Mom moved into Lima Estates, the traveling stopped, but the love did not. She and Heinrich spoke to each other often by phone." During the final two and a half to three years of Ann's life, Heinrich's own failing health made him too weak to endure an overseas flight to visit Ann.

Ann Newbold was survived by Heinrich Zoller (since deceased) and is survived by son J. Denis Newbold of Cochranville, Pennsylvania, son Edward Newbold of Seattle, daughter Monica Shay of New York, brother Kenneth Wolff of Lima, Pennsylvania, and three grandchildren.

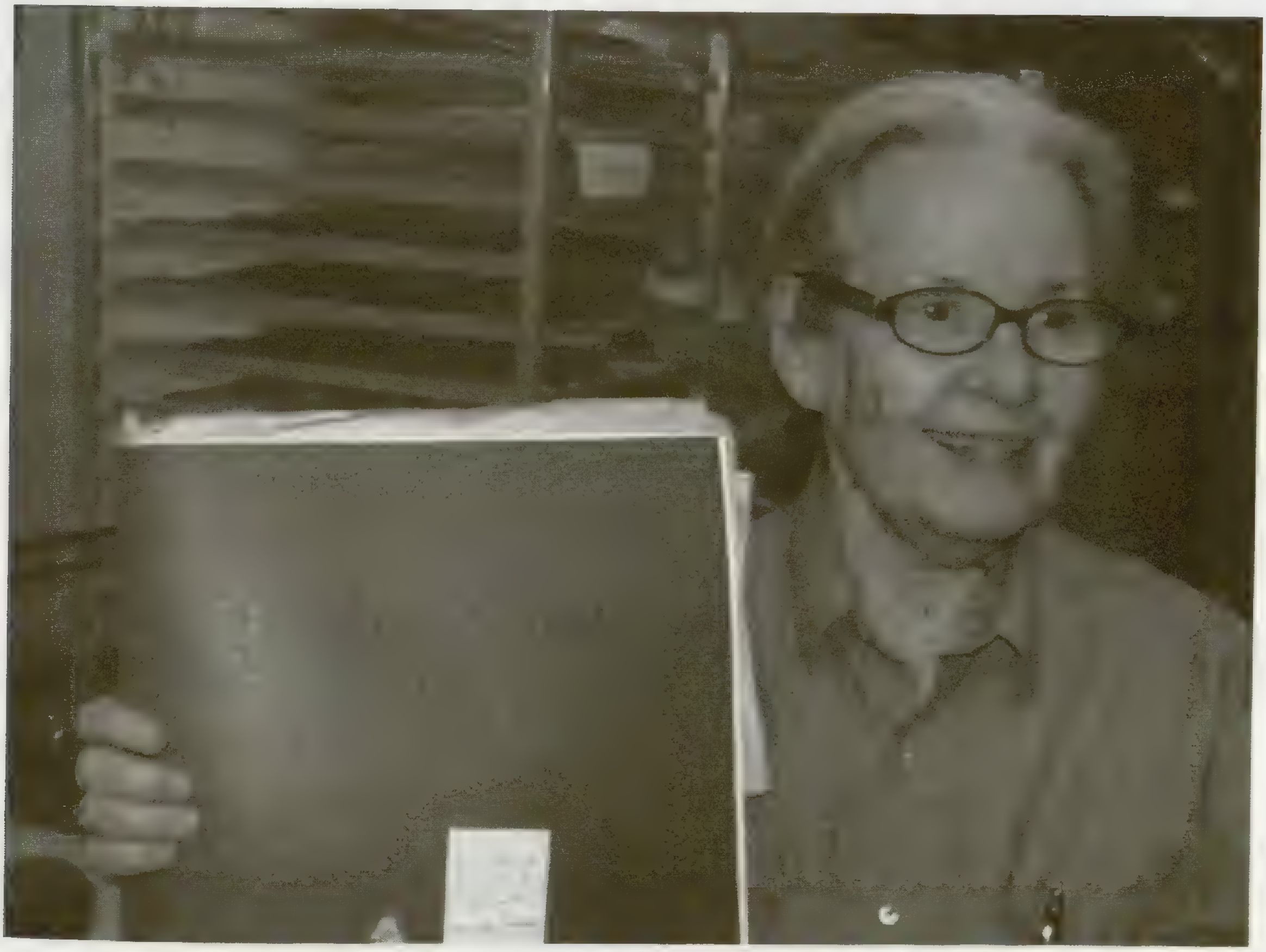
PUBLICATIONS BY ANN NEWBOLD IN *BARTONIA*

No. 44: 32–36, 1976	The Flora of Sunrise Mill Park, Montgomery County, Pennsylvania
No. 45: 5, 1978	Additions to the Check–List of the Flora of Montgomery County
No. 45: 15–17, 1978	Additions to the Flora of Sunrise Mill Park, Montgomery County, Pennsylvania
No. 46: 49–50, 1979	Additions to the Check-List of the Flora of Montgomery County, II
No. 47: 36, 1980	Additions to the Check-List of the Flora of Montgomery County, III (with Mariane McCabe)
No. 51: 77, 1985	*Montia chamissoi* Rediscovered along the Delaware River Wayne County, Pennsylvania (with Ann F. Rhoads, Richard H. Mellon, and Roger E. Latham)
No. 51: 115, 1985	Montgomery County Flower (*Tulipa sylvestris*)
No. 52: 78, 1986	Additions to the Check-List of the Flora of Montgomery County, IV (with Jack Holt)
No. 53: 41–43, 1987	Vascular Plants in Lord Petre's Herbarium Collection by John Bartram (with Alfred E. Schuyler)
No. 53: 47, 1987	Obituary: Leonard Sweetman
No. 56: 65–67, 1990	Delaware Rare Plant Survey–Finding and Relocating Rare Plants of the Piedmont of Delaware (with Janet Ebert, Jack Holt, and Alfred E. Schuyler)

TED GORDON
JULY 2010

Bartonia No. 65: 119–120, 2011

Naomi Dicker (1926-2009)



I (Anderson) believe I first met Naomi on a joint Torrey Botanical Club-Philadelphia Botanical Club field trip to New Jersey Coastal Ponds, led by Dr. Alfred E. Schuyler on September 6, 1981. She had waist-long black hair, which she wore in a single braid. And she spoke softly, but with great precision. Her botanical expertise was evident, but she never was aggressive in her identifications. Only rarely would she correct somebody – just kind of hint that perhaps another identification was possible. Generally her possibilities turned out to be actualities. She was very ready to share her expertise. Her specialty was grasses, and she introduced many aspiring field botanists into the world of the glume and the lemma.

Naomi had a wonderful command of language, enjoyed playing with words, and in addition had a great knowledge of word origins. She had studied linguistics; and was one of the few people around who could read (and understand) works such as Beowulf in their original Old English language. Not a terribly marketable skill, but one that made for some interesting conversation. As one might expect, she was also interested in art and history. She was enamored of New York City, and enjoyed showing out-of-towners the historic sites, architectural gems, and hidden public artworks of Manhattan. And she not infrequently housed visiting botanists in her apartment on west 93rd Street.

In the 1980s, the Torrey Botanical Club had a field trip committee, chaired by Richard Stalter. Naomi was one of several members, but was certainly the most active. In 1988, she promoted a meeting to discuss Matters of Interest to New York City Area Field Botanists. There were about 90 participants; the meeting was held at The New York Botanical Garden on 8 December 1988. Among other results, this led to the formation of a Metropolitan Flora Committee. In time, this provided the impetus for Brooklyn Botanic Garden's Metropolitan Flora project.

Naomi was an active Torrey Botanical Club trip leader. Between 1984 and 1997 she typically led one trip per season. Her trips usually took place in the vicinity of her beloved New York City within the five boroughs, or just across the Hudson in New Jersey. Especially noteworthy were the urban botany trips she led, often jointly with the New York City Audubon Society. Starting somewhere in midtown Manhattan's west side, she would walk her group north for several miles, examining the flora of sidewalk cracks, vacant lots, and street tree plots. It was not unusual for passers-by to join in, at least for a while. She would routinely find 80 or more plant species on these trips.

Shortly after I (Moore) began working at Brooklyn Botanic Garden in 2000, Naomi began volunteering with the New York Metropolitan Flora project. As expected, she focused primarily on grass identifications, often spending hours working on a single specimen and writing detailed notes to accompany her identification. She kept her own supply of fine dissecting needles that would allow her to dissect the smallest spikelets. I will always remember how delighted she would be when I would bring her material of an unusual grass species, such as *Amphicarpum amphicarpon, Gymnopogon ambiguus, Piptochaetium avenaceum, Setaria magna,* or *Tripsacum dactyloides.*

When working late, Naomi noticed that I would frequently listen to baseball games, and this led to numerous discussions about the sport, such as keeping score, something that both of us did when attending games. Naomi was a New York Giants fan who loved going to games at the Polo Grounds. She would often discuss the Giants 1951 season when the Giants came from 13 games behind in August to eventually defeat the Brooklyn Dodgers in a three game playoff thanks to Bobby Thompson's three run homerun (The Shot Heard 'Round the World) in the bottom of the ninth of the third game. On 14 August 2003, Naomi was at Brooklyn Botanic Garden when New York City (and other areas of the Northeast and Midwest) experienced a blackout. This prevented her from returning to her Manhattan apartment as the subways were not running, and she ended up staying at my Brooklyn apartment that night where we chatted about botany, baseball, and other subjects for much of the evening.

Another subject that Naomi was devoted to was opera, and she frequently went to shows with other opera buffs, including Paul Harwood, the manager of Brooklyn Botanic Garden's herbarium. Naomi was especially interested in Richard Wagner, and she had spent years working on a paper on Wagner's alliteration, stress and word choice in the libretti of the *Ring Cycle* (this ms remained unfinished at the time of her passing on July 14, 2009). She is acknowledged by John Louis DiGaetani in his book *Wagner and Suicide* published in 2003. One thing Naomi, Paul, and I had talked about but never did do was to go to Philadelphia and see a Phillies game and an opera on the same day.

Naomi will be missed for her grass determinations and wonderful company.

KARL ANDERSON
GERRY MOORE
SEPTEMBER 2009

Bartonia No. 65: 121–122, 2011

Franklin S. Hirst (1928-2009)

On 3 August 2009, the botanical world lost one of its best friends when Frank Hirst, a field botany legend in the Middle Atlantic area, passed away from heart complications at the age of 81.

As a young man, Frank frequented the Pine Barrens area of New Jersey. It was there that he forged a deep appreciation of all that was natural and right with the world. Frank and his brother Bob became interested in botany and scoured every nook and cranny of the Pine Barrens looking for rare and unusual plants. The list of species they found reads like a who's who in New Jersey botany.

In 1959 they found a species of grass that they had never seen before. This grass was later described as a new species, *Panicum hirstii* by Jason R. Swallen of the Smithsonian Institution (*Rhodora* 63: 235–236. 1961), the holotype for the name being a specimen collected by Frank Hirst in Atlantic County, New Jersey. Today there are only five known locations for this grass in the world, which is also referred to as *Dichanthelium hirstii* (Swallen) Kartesz by those who recognize the genus *Dichanthelium*.

In 1971 Frank moved to the Eastern Shore of Maryland to get away from the ever encroaching development of coastal New Jersey. Being a plumber by trade, he decided to teach at the Worcester County Vocational School. As a teacher, he took full advantage of his summers off by botanizing the new areas he found on the Delmarva Peninsula. In the early 1980s, he did a great deal of botanical survey work for the then fledgling Maryland Natural Heritage Program. Many of the more promising areas he discovered were later purchased and turned into nature preserves by the Maryland/D.C. Chapter of the Nature Conservancy (TNC). He did similar work for the Delaware Natural Heritage Program as well and discovered some of their rarest plants. Besides his botanical contributions, Frank donated countless hours of volunteer work for TNC, especially at the Nassawango Creek Preserve.

Some of his more notable accomplishments were finding species that were new to the states where he found them. Some of these discoveries included a population of Hirst's panic grass in Delaware, a pond filled with pondspice (*Litsea aestivalis*) in Maryland, another pond in Maryland with southern cutgrass (*Leersia hexandra*), a population of Harper's fimbry (*Fimbristylis perpusilla*) in Maryland, sticky hedgehyssop (*Gratiola brevifolia*) in Delaware, Fernald's ticktrefoil (*Desmodium fernaldii*) in Maryland, and Canby's dropwort (*Oxypolis canbyi*) in Maryland.

There is an interesting story that went along with the discovery of Canby's dropwort. It was late in the afternoon of a day spent visiting many potential rare-plant habitats. Frank and his companions, George Fenwick and Dan Boone of the Maryland Natural Heritage Program, decided to visit one last area that appeared to be a coastal plain pond on the aerial photo. As they entered the large pond, Frank looked out across the mass of vegetation and yelled out excitedly, "There's *Oxypolis canbyi*!" Considering that this plant had not been seen in 100 years on Delmarva and that Frank had never seen this species, this may have seemed like an outrageous statement, but not for Frank. He had done his homework and had pored over the literature, line drawings, and photos of plants that were historically found on Delmarva. At this point George Fenwick replied, "Either you're the greatest damn botanist that ever lived or you're crazy." I think the truth was closer to the first part of his statement, because later that night they verified that the plant was indeed Canby's dropwort.

Around 1989, I became obsessed with botany and took it upon myself to learn all of the plants I saw. The following year, Frank took me under his wing and greatly accelerated my climb up the learning curve. Later that year, we started what was to be 15 years of working together on botanical contracts with the Nature Conservancy of Maryland and Delaware and the Natural Heritage Programs of Maryland and Delaware. The close friendship that developed between us was as precious as the great memories I now possess of those days.

During our many years of botanizing together, I helped Frank carry on his legacy. I had figured that, by then, Frank had already found all of the rare plants there were to find, but together we added many new species to the state lists. Perhaps the greatest of our discoveries was in 1990, when we found the curly-grass fern (*Schizaea pusilla*) in Delaware. Before that day, the rather odd range of this fern was Newfoundland, New Brunswick, Nova Scotia, Long Island, New Jersey, and Peru. We were slogging through a wet Atlantic white cedar swamp, when we suddenly entered a clearing. Frank immediately commented, "This looks just like a cedar bog in New Jersey. I could picture almost anything in here!" About 30 seconds later, he yelled out, "I don't believe it! Here's curly-grass fern." Since it was early in my botanical career, I didn't fully realize the significance of what we had just found until I got home and looked it up.

On many occasions, while botanizing with Frank, I would see a plant that seemed to be in a strange habitat and I would invariably ask him why is that plant growing there? Frank always had the same wry response, "Plants are where you find 'em." I always knew that answer was coming, but I still asked. It was such a simplistic answer, but yet on another level it was profound. We really don't understand all of the complex interrelationships that determine why certain plants occupy the niches where we find them.

Frank had another stock answer to a question he was often asked, "What is your favorite wildflower?" His answer was always "It's the one I have in my hand right now." I think that summed up Frank's philosophy very accurately. He appreciated everything that Nature had to offer and felt it was all worth saving. He will be missed.

RONALD M. WILSON
MAY 2010

Bartonia No. 65: 123–125, 2011

BOOK REVIEWS

Uncorking the Past: The Quest for Wine, Beer, and Other Alcoholic Beverages, by Patrick E. McGovern. 2009. University of California Press, Berkeley. xv + 330 pages. $29.95.

If you like botany, wine, and beer, this book is a must. Despite its omission from the title, there is a lot of botany in this book, and it's good, drinkable botany.

In the first chapter, McGovern introduces two hypotheses: The drunken monkey hypothesis proposes that alcoholism is rooted in the evolutionary history of primates, who had a powerful incentive to overindulge in fermented fruits and high-sugar resources that were available only in season. The Paleolithic hypothesis proposes that hunter-gatherers went beyond an unconscious craving for fermented fruit to a "more conscious, intentional production and consumption of a fermented beverage." After presenting these hypotheses and commenting on the human benefits of alcohol, McGovern takes us on a world tour of fermented beverages. Some highlights follow.

Starting with China, McGovern discusses his analysis of residue in ancient pottery of the world's earliest known alcoholic beverage, made around 9,000 years ago. The ingredients were rice (*Oryza sativa*), grapes (possibly *Vitis amurensis* or *V. quinquangularis*), hawthorn fruits (*Crataegus pinnatifida* and/or *C. cuneata*), and honey. Neither beer nor wine, the beverage is described as a mixed fermented beverage, or grog.

On to the Near East, we learn about the earliest known wine made with Eurasian grapes (*V. vinifera*), which also had resin of the terebinth tree (*Pistacia atlantica*). This information comes from McGovern's analysis of residue in jars from Iran that were 7400–7000 years old. Also from Iran, a jug around 5,500 years old containing calcium oxalate (beerstone) provides chemical evidence of the earliest beer made from barley (*Hordeum vulgare*), the most widely consumed beverage in Mesopotamia.

McGovern identifies Scotland as the site of the earliest known fermented beverage made from grain and honey in Europe. Vats dating from the mid-fourth millennium BCE contained pollen of cereal, meadowsweet (*Filipendula ulmaria*), and heather (*Calluna vulgaris*). McGovern suggests this may have been a "Nordic grog" with added herbs such as cloudberry (*Rubus chamaemorus*) and lingonberry (*Vaccinium vitis-idaea*)—two of my own favorite fruits from Newfoundland, where they are known as bakeapple and partridgeberry, respectively. We then get a fascinating survey of ancient fermented beverages in Europe and western Asia made with diverse ingredients including mugwort (*Artemisia vulgaris*), cranberries (*Vaccinium oxycoccos*), bog myrtle (*Myrica gale*), and saffron (*Crocus sativus*).

Moving to South America, McGovern discusses the domestication of maize (*Zea mays*) in Mexico around 6,000 years ago. Humans' first taste of it may have been wine made from sugary juice squeezed from its stalks. Chicha, beer made by fermenting the kernels, apparently came later. Similarly, the juicy, fermentable, sugary pulp in the fruit of the cacao, or chocolate, tree (*Theobroma cacao*) probably led to its domestication in Mesoamerica. There also is archaeological evidence of large amounts of wine made from drupes of the Peruvian pepper tree (*Schinus molle*) in southern Peru around 600 CE.

In Africa south of the Sahara, the king of beers is made from fermented grains of *Sorghum bicolor*. Domesticated about 8,000 years ago, sorghum in the form of beer currently provides much of the caloric intake for hundreds of millions of Africans. In western sub-Saharan

Africa, beer is made from malted sorghum grains and clarified with bark of the raisin tree (*Grewia flavescens*) and okra (*Abelmoschus esculentus*).

McGovern concludes that the available evidence suggests the initial domestication of grains was motivated by a desire to increase alcoholic-beverage production. Similarly, beverages made from the sweet fruits of grapes, figs, dates, and cacao probably prompted the domestication of these fruits. With his detailed account of the human consumption of fermented beverages over the past 9,000 years in different parts of the world, McGovern gives a strong argument for considering alcohol as a driving force for plant domestication, and thus civilization.

ALFRED E. SCHUYLER
Curator Emeritus of Botany
Academy of Natural Sciences

Benjamin Smith Barton: Naturalist and Physician in Jeffersonian America by Joseph Ewan and Nesta Dunn Ewan (edited by Victoria C. Hollowell, Eileen P. Duggan, and Marshall R. Crosby). 2007. Monographs in Systematic Botany 100. Missouri Botanical Garden Press, St. Louis. xxvi + 1134 pages. $55.00.

The husband/wife team of Joseph and Nesta Ewan has long been familiar to Philadelphia naturalists and bibliophiles. They have spent many fruitful years in Philadelphia museums and libraries where they have plucked many "plums" that have enhanced our appreciation of colonial and early 19th century American natural history. Now we finally have their lengthy biography of Benjamin Smith Barton, Professor of Botany and Natural History in the Medical School of the University of Pennsylvania from 1790-1815.

The book is not a light read. To me it is an archive crammed full of unpublished documents with a wealth of information to be distilled by curious readers. There are 95 pages of illustrations, which include some outstanding botanical drawings and paintings in the archives of the American Philosophical Society. Of particular appeal to me are nine paintings by the talented French artist Pierre Jean François Turpin. These are among "at least fifty 'indigenous plants' Turpin drew for Barton." We can also appreciate the art of William Bartram and Frederick Pursh among these illustrations.

Barton had diverse interests, but his legacy is botanical. The Academy houses what remains of much of his herbarium with plant collections made by him and other well-known botanists of the day. He authored the first American textbook of botany in 1803, which Catherine the Great ordered translated into French for her gratification. We continue to appreciate the accomplishments of his protégés: Frederick Pursh, Meriwether Lewis, and Thomas Nuttall. Without Barton's support, Frederick Pursh would not have produced his classic *Flora Americae Septentrionalis* where he described and illustrated plants collected by Meriwether Lewis. Without his "crash course" in botany from Barton, we assume that Lewis would have been ill prepared for collecting and preserving botanical specimens. Today these specimens in the herbarium of the Academy of Natural Sciences are the most significant extant natural history artifacts of the Lewis and Clark Expedition.

And finally, Thomas Nuttall, who received his initial funding from Barton, went on to a distinguished career as America's foremost botanical traveler and collector. His work remains significant today because, like Frederick Pursh, he was an author who named and described many new American plant species.

There is much more in the Ewans' book. People interested in the history of medicine at the University of Pennsylvania will be rewarded as well as those with an interest in late 18th and early 19th century intellectual activities in Philadelphia. It fosters appreciation of the rich intellectual heritage of Philadelphia when it was the "Athens" of America.

ALFRED E. SCHUYLER
Curator Emeritus of Botany
Academy of Natural Sciences

Bartonia No. 65: 126–147, 2011

2007-2008 FIELD TRIPS

Reports reviewed, formatted, and edited by TED GORDON.

2007 Field Trips

18 March–13 October: Various Plant Communities in the Pinelands National Reserve, New Jersey.

The Pinelands Preservation Alliance (PPA) sponsored fourteen all-day Saturday lecture-workshop sessions in association with a Special Pinelands Plant Course at their PPA headquarters in Vincentown. Focusing on rare plants with legal protection in the Pinelands, each session was followed by a field trip, many of these with special guest speakers and field trip leaders. Some of the highlights included the following: 31 March—**leader Russell Juelg**, dwarf forest ecology and *Corema conradii.* 28 April—**leader Russell Juelg,** New Jersey Conservation Foundation's Four Mile Spring Preserve, characteristic Pine Barrens uplands, Pitch Pine lowlands, and a mixed-community wetland complex with *Listera australis.* 19 May—**leader Renee Scagnelli,** Tuckahoe area, a diverse wetland community, and a severely disturbed site with *Ophioglossum vulgatum.* 7 July—**leader Ted Gordon,** an intermittent pond ("Hampton–Central Big Pond") near Hampton Furnace, *Scleria minor, Calamovilfa brevipilis, Carex barrattii, Muhlenbergia torreyana, Nymphoides cordata,* and *Panicum hirstii.* 4 August—**leader Ernie Schuyler,** *Scleria nitida* in a diverse, semi-dry, disturbed area near the Lebanon Fire Tower, *Schoenoplectus novae-angliae* in tidal freshwater where Route 542 crosses the Merrygold Branch, and *Rhynchospora knieskernii* in an intermittent pond in the Stafford Forge Wildlife Management Area. 18 August—**leader Bill Olson,** a recently burned forest near Atsion. In unburned, diverse, wetland areas adjacent to the burn, we found *Lobelia canbyi, Rhynchospora cephalantha,* and *Panicum scabriusculum.* 8 September—**leader Wayne Ferren,** *Eleocharis olivacea* var. *reductiseta* in tidal wetlands of the Wading River, and *Eryngium aquaticum* and *Eriocaulon parkeri* in tidal wetlands of the Mullica River. In addition to the guest lecturers and trip leaders mentioned above, we also had **trip/instruction sessions with Gerry Moore, Ken Cameron, Joe Arsenault, and Karl Anderson.**

Registrants: 20. **Report by Russell Juelg.**

15 April: Biodiversity Blitz at the John A. Phillips Preserve, Old Bridge, Middlesex County, New Jersey. Trip cancelled because of stormy weather.

On 14 April, however, **Bill Olson** visited the site and observed the following species: broomsedge grass, *Andropogon virginicus*; hairy bittercress, *Cardamine hirsuta*; Pennsylvania sedge, *Carex pensylvanica*; shaved sedge, *Carex tonsa;* ground-pine, *Dendrolycopodium obscurum*; buttonweed, *Diodia teres*; spring whitlow-grass, *Draba verna*; threeway sedge, *Dulichium arundinaceum*; weeping lovegrass, *Eragrostis curvula*; love grass, *Eragrostis spectabilis*; common rush, *Juncus effusus*; scirpus-like rush, *Juncus scirpoides*; dewberry, *Rubus hispidus*; glaucous greenbrier, *Smilax glauca*; round-leaved greenbrier, *Smilax rotundifolia*; atrichum moss, *Atrichum angustatum*; little broom moss, *Dicranella*

heteromalla; hypnum moss, *Hypnum imponens*; pin cushion moss, *Leucobryum glaucum*; platygyrium moss, *Platygyrium repens*; common haircap moss, *Polytrichum commune*; juniper haircap moss, *Polytrichum juniperinum*; Ohio polytrichum moss, *Polytrichum ohioense*; a peat moss, *Sphagnum* sp.; lingzhi, *Ganoderma lucidum*; candleflame lichen, *Candelaria concolor*; mealy pixie-cup lichen, *Cladonia chloropheae*; common powderhorn lichen, *Cladonia coniocraea*; British soldier lichen, *Cladonia cristatella*; common greenshield lichen, *Flavoparmelia caperata*; bottlebrush shield lichen, *Parmelia squarrosa*; parmotrema lichen, *Parmotrema hypotropum*; wreath lichen, *Phaeophyscia pusilloides*; placynthiella lichen, *Placynthiella uliginosa*; rough-speckled shield lichen, *Punctelia subrudecta*; and oak apple gall wasp, *Amphibolips confluenta.*

Richard Lear (richard.lear@co.middlesex.nj.us) of Middlesex County, Department of Parks and Recreation is maintaining a comprehensive species list for this site.
Report by coordinators: Richard Lear and Lena Struwe.

28 April: Duke Island Park, Bridgewater, Somerset County, New Jersey. Joint trip with the Torrey Botanical Society.

Our plan for the day was to search the floodplain of the Raritan River for spring ephemerals, but torrential rains had caused the river to flood the area on the day previous. Overnight the water had receded, leaving a coating of mud on much of the low vegetation. Despite that, a few hardy souls braved the mud and debris in the east section of the park, finding a fine display of robust *Mertensia virginica*, which was in full bloom and only partially mud-coated. Several of the plants had all pink or all white flowers, rather than blue. With diligent searching, we were able to find other species that were identifiable and in good shape. In flower we found *Caulophyllum thalictroides, Erythronium americanum, Floerkea proserpinacoides, Viola pubescens, V. sororia, Cardamine pensylvanica*, and *Claytonia virginica. Hydrophyllum virginianum* was inbud. Beds of *Allium tricoccum* were frequent, but we found leaves only. The invasive *Ranunculus ficaria*, also in bloom, covered large patches of ground. Of course, the huge old-growth trees were awesome: *Platanus occidentalis, Acer saccharinum, Nyssa sylvatica, Fraxinus americana, Carya cordiformis*, and *Liriodendron tulipifera.*

Tiring of the mud, we decided after lunch to travel to nearby Sourland Mountain, where the vegetation was refreshingly green. Some species we found in flower there were *Arisaema triphyllum, Chrysosplenium americanum, Claytonia virginica, Ranunculus abortivus, Thalictrum thalictroides, Viola pubescens, Hepatica americana, Luzula multiflora*, and *Obolaria virginica*. Abundant *Orchis (Galearis) spectabilis* was in bud, as were *Podophyllum peltatum, Polygonatum pubescens*, and *Geranium maculatum*. A nice selection of ferns was also seen, including *Adiantum pedatum, Athyrium thelypterioides* (syn. *Deparia acrostichoides*), *A. filix-femina, Botrychium virginianum, Dryopteris marginalis, Osmunda claytoniana, Polypodium virginianum, Polystichum acrostichoides, Phegopteris hexagonoptera*, and several others. Thanks to Janet Novak for keeping a plant list for the day.
Attendance: 7. **Report by leader: Linda Kelly.**

12 May: Crosswicks Creek, Cream Ridge, Monmouth County, New Jersey. Leader: Linda Rohleder. No report received.

10 June: Biodiversity Blitz at John A. Phillips Preserve, Old Bridge, Middlesex County, New Jersey. Joint trip arranged by Chrysler Herbarium, Rutgers University

(Department of Ecology, Evolution and Natural Resources) and Middlesex County, Department of Parks and Recreation.

During this day, 92 species were cataloged from data sheets that were sent in to Middlesex County Parks and Recreation Office. Species that were seen included eastern kingbird, *Tyrannus tyrannus*; cedar waxwing, *Bombycilla cedrorum*; pine warbler, *Dendroica pinus;* ovenbird, *Seirus aurocapilla;* scarlet tanager, *Piranga olivacea*; red-tailed hawk, *Buteo jamaicensis*; Carolina chickadee, *Poecile carolinensis*; wood thrush, *Hylocichla mustelina*; indigo bunting, *Passerina cyanea*; common yellowthroat, *Geothlypis trichas*; black-and-white warbler, *Mniotilta varia*; red-eyed vireo, *Vireo olivaceus*; wild turkey, *Meleagris gallopavo*; red-bellied gnatcatcher, *Polioptila caerulea*; veery, *Turdus migratorius*; yellow-billed cuckoo, *Coccyzus americanus*; great crested flycatcher, *Myiarchus crinitus*; red admiral, *Vanessa atalanta*; wolf's milk slime, *Lycogala epidendrum*; Indian pipe, *Monotropa uniflora*; skunk cabbage, *Symplocarpus foetidus*; lone star tick, *Amblyomma americanum*; orchard spider, *Leucauge venusta*; partridgeberry, *Mitchella repens*; polyphemus, *Antheraea polyphemus*; royal fern, *Osmunda regalis*; Carolina locust, *Dissosteira carolina*; turkey tail, *Trametes versicolor*; greater bladder sedge, *Carex intumescens*; bracker fungi, *Postia caesia*; alsike clover, *Trifolium hybridum*; black medic, *Medicago lupulina*; white clover, *Trifolium repens*; hairy vetch, *Vicia villosa*; wild peppergrass, *Lepidium densiflorum*; perennial ryegrass, *Lolium perenne*; willow herb, *Epilobium ciliatum*; lowbush blueberry, *Vaccinium pallidum*; sheep laurel, *Kalmia angustifolia*; staggerbush, *Lyonia mariana*; yellow wood sorrel, *Oxalis stricta*; dangleberry, *Gaylussacia frondosa*; rabbit-foot clover, *Trifolium arvense*; red fox, *Vulpes vulpes*; comma butterfly, *Polygonia c-album*; mourning cloak butterfly, *Nymphalis antiopa;* southern ringneck snake, *Diadophis punctatus punctatus*; American kestrel, *Falco sparverius*; spicebush swallowtail, *Papilio troilus*; wood satyr, *Megisto cymela*; netted chain fern, *Woodardia areolata*; Virginia chain fern, *Woodardia virginica*; wolf's milk slime, *Lycogala epidendrum*; spring field cricket, *Grylus veletis*; scarlet tanager, *Piranga olivacea*; pink lady's slipper, *Cypripedium acaule*; box turtle, *Terrapene carolina*; spring azure, *Celestrina ladon*. (See also trip report for 15 April.)
Attendance: 16. **Report by coordinators: Richard Lear and Lena Struwe.**

17–21 June: Elkins, West Virginia. Joint Annual Field Meeting of the Torrey Botanical Society, the Philadelphia Botanical Club, and the Northeastern Section of the Botanical Society of America.

The meeting took place at Davis and Elkins College in Elkins, West Virginia, a gateway to the high Allegheny Mountains. The first day of field trips visited sites on Cheat Mountain in the area of Gaudineer Knob, including upland limestone forest, balsam fir swamp, young and old-growth red spruce forest, and riverscour prairie. The second day was at Dolly Sods, including several types of mountain laurel shrubland (with *Kalmia latifolia* in peak bloom), cranberry-beakrush peatland (with *Vaccinium oxycoccos* in peak bloom), and the picturesque red spruce-heath rocky woodland. The third day was spent at Canaan Valley National Wildlife Refuge and State Park to observe limestone meadow, beaver pond, oxbow fen, and several types of balsam fir swamp.

The field **trip leaders** were **Jim Vanderhorst, Elizabeth Byers, and Brian Streets** from West Virginia Natural Heritage Program; **Dr. Katherine Gregg** of West Virginia Wesleyan College; and **Leah Ceperley** from Canaan Valley National Wildlife Refuge. **Evening lectures** were given **by Elizabeth Byers, Katherine Gregg, Bill Roody** (West Virginia DNR), and **Rodney Bartgis** (The Nature Conservancy).

Attendance: 47, 42 full-time and 5 part-time participants representing 11 northeastern states plus the District of Columbia and Florida. Thanks to **Karl Anderson** for serving as the **treasurer.**
Report by Conference Chair: Larry Klotz. Assistant Chair: Marcia Minichiello.

June 30: Tucquan Preserve, Erbs Mill, Lancaster County, Pennsylvania. Joint trip with the Delaware Nature Society.

The group met at the entrance to the Tucquan Preserve in west-central Lancaster County north of the Holtwood dam. From the bucolic parking lot they went down the wooded trail along the south side of Tucquan Creek. The first portion of the walk proceeded through relatively level, rich oak-tulip forest, where *Carex torta* grew on gravelly bars. Interesting woody species encountered here included *Asimina triloba, Cercis canadensis, Chionanthus virginicus, Hydrangea arborescens,* and local colonies of the orchid *Goodyera pubescens.* Further west, as the slopes came down to the water's edge, the terrain grew increasingly rocky and difficult to traverse, as oaks, hemlocks, and great laurel dominated the landscape. Blueberries, partridge-berry, and striped pipsissewa were frequently encountered here. Less steep, richer ravines and slopes yielded *Corylus cornuta, Adiantum pedatum, Mitella diphylla, Trillium erectum* f. *album, Ostrya virginiana,* and *Caulophyllum thalictroides.* Occasional areas of glade-like, level ground along the stream, including where we ate lunch, were lush with a mixture of weedy native and non-native herbs, ferns, and shrubs. Notable plants growing in this habitat included *Lilium canadense, Salvia lyrata, Monarda clinopodia, Veratrum viride,* and a particularly large, fruiting specimen of *Fraxinus nigra.* Further downstream enormous outcrops of schistose, metamorphic rocks started jutting out from the hillsides. Here moister, shaded cracks were frequently lined with *Asplenium montanum* and occasional sprays of *Aquilegia canadensis.* Close to the Susquehanna the gorge opened up, with sycamore and silver maple taking over the canopy, shading flood-tolerant herbs including *Hydrophyllum virginianum.* Notable were large boulders in the stream bed now half-covered with sand, mud, and silt accumulated since the damming of the river.

Dominating the arid, steep banks and cinders along a railroad were a mixture of drought-tolerant grasses and herbs, mainly *Andropogon virginicus* and *Schizachyrium scoparium, Eupatorium rotundifolium v. rotundifolium, Hypericum gentianoides,* and *Linaria canadensis.* The moister west bank of the railroad was home to a wide variety of disturbance-loving species, including *Desmodium* spp., while *Lythrum salicaria* was the most noticeable herb on the bars and mudflats lining the Susquehanna.

The wooded north slope of Tucquan Creek, although weedy, had its share of less common plants, including *Tradescantia virginiana, Silene stellata, Solidago ulmifolia,* and *Bromus pubescens,* growing on the rich, loamy soil. Further east atop the ridge grew a deer-browsed oak-heath woodland, which gave way to a rich oak-tulip woodland. The most notable species seen here was a thin population of *Carex jamesii,* growing along an overgrown woodland lane. Downslope near the stream the botanists clambered through yet more rocky woodland, which yielded a fine population of *Conopholis americana* in fruit. *Passiflora lutea* was observed by a few stragglers.

The following is a **list of species compiled by Jack Holt** during the field trip:

Acalypha rhomboidea, Acer negundo, A. rubrum, A. saccharinum, A. saccharum, Adiantum pedatum, Aegopodium podagraria, Ageratina altissima (Eupatorium rugosum), Agrimonia pubescens, Agrostis perennans, Ailanthus altissima, Ajuga reptans, Alliaria petiolata, Allium

canadense, Amaranthus spinosus, Ambrosia artemisiifolia, A. trifida, Amelanchier arborea, Amphicarpaea bracteata, Andropogon virginicus, Anemone quinquefolia, Anthoxanthum odoratum, Apios americana, Apocynum cannabinum, Aquilegia canadensis, Arabis laevigata, Aralia nudicaulis, Arenaria serpyllifolia, Arisaema triphyllum, Artemisia vulgaris, Asarum canadense, Asimina triloba, Asplenium montanum, Athyrium filix-femina, Berberis thunbergii, Betula lenta, B. nigra, Bidens frondosa, Bidens sp., Boehmeria *cylindrica, Botrychium dissectum, B. virginianum, Brachyelytrum erectum, Bromus pubescens, B. tectorum, Callitriche* sp., *Calystegia sepium, Cardamine hirsuta, C. pensylvanica, Carex amphibola, C. blanda, C. communis, C. debilis, C. digitalis, C. gracillima, C. jamesii, C. laxiculmis, C. laxiflora, C. pensylvanica, C. radiata, C. sparganioides, C. swanii, C. torta, C. tribuloides, C. virescens, Carpinus caroliniana, Carya alba, C. cordiformis, C. glabra, Castanea dentata, Caulophyllum thalictroides, Celastrus orbiculatus, Celtis occidentalis, Cercis canadensis, Chamaecrista nictitans, Chamaesyce maculata, C. nutans, Chelone glabra, Chenopodium album, Chimaphila maculata, Chionanthus virginicus, Chrysosplenium americanum, Cimicifuga racemosa, Cinna arundinacea, Circaea lutetiana, Coincya monensis, Collinsonia canadensis, Commelina communis, Conopholis americana, Conyza canadensis, Cornus alternifolia, Corylus cornuta, Cryptotaenia canadensis, Danthonia compressa, D. spicata, Dennstaedtia punctilobula, Deparia acrostichoides, Desmodium glutinosum, D. nudiflorum, D. paniculatum, D. perplexum, Dichanthelium boscii, D. clandestinum, D. dichotomum, D. latifolium, Dioscorea quaternata, D. villosa, Diphasiastrum digitatum, Dryopteris intermedia, D. marginalis, Duchesnea indica, Elymus riparius, Eragrostis hypnoides, Erigeron annuus, E. philadelphicus, Eupatorium perfoliatum, E. rotundifolium v. rotundifolium, E. fistulosum (Eutrochium f.), E. purpureum, Eurybia (Aster) divaricata, Fagus grandifolia, Fallopia japonicum (Polygonum cuspidatum), F. scandens, Festuca elatior, F. obtusa, Fraxinus americana, Fraxinus nigra, Galinsoga ciliata, Galium aparine, G. circaezans, G. triflorum, Geranium carolinianum, G. maculatum, Geum canadense, G. verum, Glechoma hederacea, Glyceria striata, Goodyera pubescens, Hamamelis virginiana, Hedera helix, Helianthus decapetalus, Hemerocallis fulva, Hepatica americana, Hieracium venosum, Hosta ventricosa, Huperzia lucidula, Hydrangea arborescens, Hydrocotyle americana, Hydrophyllum virginianum, Hypericum gentianoides, H. mutilum, Ilex verticillata, Impatiens pallida, Juglans nigra, Juncus tenuis, Juniperus virginiana, Kalmia latifolia, Lactuca biennis, Lechea* sp., *Leersia virginica, Lepidium virginianum, Ligustrum obtusifolium, Lilium canadense, Linaria canadensis, Lindera benzoin, Lindernia dubia, Liriodendron tulipifera, Lobelia inflata, Lonicera japonica, L. morrowii, Luzula echinata, Lycopodium obscurum, Lycopus virginicus, Lysimachia ciliata, L. quadrifolia, Lythrum salicaria, Maianthemum canadense, M. (Smilacina) racemosum, Malus sp., Matteuccia struthiopteris, Medeola virginiana, Melilotus officinalis, Microstegium vimineum, Mitchella repens, Mitella diphylla, Monarda clinopodia, Monotropa uniflora, Muhlenbergia schreberi, Myosoton aquaticum, Nyssa sylvatica, Oenothera biennis, Onoclea sensibilis, Osmorhiza claytonii, O. longistylis, Osmunda cinnamomea, O. claytoniana, Ostrya virginiana, Oxalis dillenii, Parthenocissus quinquefolia, Passiflora lutea, Paulownia tomentosa, Penthorum sedoides, Perilla frutescens, Persicaria (Polygonum) arifolia, P. longiseta, P. perfoliata, P. virginiana, Phalaris arundinacea, Physalis subglabrata, Phytolacca americana, Pilea pumila, Plantago rugelii, Platanus occidentalis, Poa compressa, P. sylvestris, P. trivialis, Podophyllum peltatum, Polygonatum biflorum, P. pubescens, Polygonum aviculare, Polypodium virginianum, Polystichum acrostichoides, Potentilla canadensis, P. norvegica, P. simplex, Prenanthes altissima, Prunella vulgaris, Prunus avium, P. serotina,*

Quercus coccinea, Q. montana (Q. prinus), Q. rubra, Q. velutina, Ranunculus abortivus, Ranunculus sceleratus, Rhododendron maximum, R. periclymenoides, Ribes sp., Robinia pseudoacacia, Rosa multiflora, Rubus allegheniensis, R. flagellaris, R. phoenicolasius, Rudbeckia laciniata, Rumex crispus, R. obtusifolius, Salix nigra, Salvia lyrata, Sambucus canadensis, Sanguinaria canadensis, Sanicula canadensis, S. trifoliata, Saponaria officinalis, Sassafras albidum, Schizachyrium scoparium, Scirpus georgianus, Scrophularia marilandica, Scutellaria elliptica, Senecio aureus, S. vulgaris, Sicyos angulatus, Silene antirrhina, S. stellata, Smilax glauca, S. herbacea, S. pulverulenta, S. rotundifolia, Solanum nigrum, Solidago bicolor, S. caesia, S. canadensis, S. flexicaulis, S. gigantea, S. ulmifolia, Sphenopholis intermedia, Stellaria longifolia, Symphyotrichum (Aster) cordifolium, S. lanceolatum, S. lateriflorum, S. puniceum, Symphyotrichum sp., Symplocarpus foetidus, Teucrium canadense, Thalictrum pubescens, Thalictrum thalictroides, Thelypteris noveboracensis, Tilia americana, Toxicodendron radicans, Tradescantia virginiana, Trillium erectum v. album, Triodanis perfoliata, Tsuga canadensis, Ulmus rubra, Urtica dioica, Uvularia perfoliata, U. sessilifolia, Vaccinium corymbosum, V. pallidum, V. stamineum, Veratrum viride, Verbascum thapsus, Verbena urticifolia, Verbesina alternifolia, Veronica officinalis, Viburnum acerifolium, V. dentatum, Vinca minor, Viola arvensis, V. blanda, V. conspersa, V. eriocarpon, V. primulifolia, V. sororia, V. striata, Vitis aestivalis, V. labrusca, V. vulpina, Xanthium strumarium.
Attendance: 10. Leader: William Ryan. **Report by Jack Holt.**

21 July: Peaslee Wildlife Management Area, Cumberland County, New Jersey. Joint meeting with the Torrey Botanical Society and the Gloucester County Nature Club.

The morning of this trip was spent near Cumberland Pond. *Drosera intermedia* was in bloom along the shore, *Pontederia cordata* was in bloom in the shallows, and the flowers of *Nymphaea odorata* decorated the open waters. Also present were *Peltandra virginica, Lysimachia terrestris, Decodon verticillatus, Triadenum virginicum, Chamaedaphne calyculata, Rhynchospora alba,* and *Xyris smalliana*. An adjacent field, which at first glance seemed an unpromising site for botanical exploration, yielded *Asclepias tuberosa, Hypericum stragulum, H. gentianoides, Solidago odora, Jasione montana, Opuntia humifusa, Diodia teres, Eupatorium pilosum, E. album, E. hyssopifolium,* and *E. rotundifolium*, to name just a few species, all in bloom. A very good find was the rare *Desmodium strictum*, also in bloom. *Asclepias amplexicaulis* was found with fruit. A damp depression in this field had *Rhexia virginica, R. mariana, Apios americana,* and *Ludwigia alternifolia* in bloom.

A brief foray to a forested wetland edge just downstream from the lake found one flowering plant of *Platanthera lacera* and numerous plants of *P. clavellata*. Clumps of iris-like leaves near the site of the Cumberland Furnace, showing no sign that they had ever flowered, were identified by Janet Novak as *Belamcanda chinensis*. Trees and shrubs, here and near the lake, included *Quercus stellata, Q. alba, Q. falcata, Q. prinoides, Leucothoe racemosa, Vaccinium corymbosum,* and *Rhododendron viscosum.*

After lunch, a visit was made to a railroad crossing just north of Port Elizabeth. Here, the showy *Ipomopsis rubra*, a western species, has been established for over a century—it is mentioned in Witmer Stone's *Plants of Southern New Jersey* (1911) but has never spread from the site. It was found in bloom. Also seen at this location were numerous non-flowering plants of *Desmodium strictum*, along with *Monarda punctata* in good bloom. *Carya pallida* was found here - an unfamiliar tree species to some trip participants.

The next stops of the day were a utility line cut north of Halberton, and an intermittent pond nearby. The cut had *Polygala nuttallii, Lobelia nuttallii, Rhynchospora capitellata,*

Rhexia mariana, Carex complanata, and a large population of the uncommon and inconspicuous *Croton willdenowii. Oldenlandia uniflora* was found growing in the middle of a sand road. The pond, a circular opening about 100 meters across, rimmed with *Vaccinium corymbosum* and *Smilax rotundifolia*, was water-filled to an average depth of about 50 centimeters. Several large clones of *Panicum hemitomon* were seen here with their seldom-seen flowers and fruit. In many areas, the pond was covered with *Nymphaea odorata*, but there were patches of *Brasenia schreberi*, some with flowers. The dominant vegetation was *Schoenoplectus subterminalis (Scirpus s.). Eleocharis microcarpa, Xyris smalliana, Myriophyllum* sp., *and Utricularia* sp. were the only other visible plants.

After the "official" trip, several participants followed leader Linda Kelly to a tidal marsh south of Mays Landing, where hundreds of *Lilium superbum* were found in bloom. Also here were *Gratiola aurea, Scutellaria integrifolia, Sium suave*, and *Mikania scandens.*

Many thanks to Janet Novak for compiling a plant list for the day and for helping with some difficult identifications.

Attendance: 11. **Report by leaders: Karl Anderson and Linda Kelly.**

29 July: East Plains - Stafford Forge Wildlife Management Area (SFWMA), Ocean County & Warren Grove Gunnery Range (WGR), Burlington County, New Jersey.

Botanizing commenced on the SFWMA ca. 0.25 mile east of the gated WGR entrance. In Watering Place Pond were several flowering specimens of *Utricularia purpurea*,_purple bladderwort; *Sphagnum cuspidatum* and *S. trinitense*, two submersed peat mosses; and a single specimen of *Chrysemys scripta elegans,* red-eared turtle (introduced). Here we failed to re-locate an occurrence of *Sphagnum macrophyllum,* but near the pond outlet were a couple of plants of *Muhlenbergia torreyana,* Torrey's muhly, and about a dozen fruiting culms of *Rhynchospora knieskernii,* Knieskern's beaked rush, both elements discovered a number of years ago.

In the adjacent plains or dwarf pine-scrub oak community on a slope east of the pond, we observed eight scattered, well-established, 2- to 3-year-old seedlings of *Corema conradii,* broom crowberry, that survived the severe fire of May 2007. Occurring on a 1-acre patch, these seedlings were spared because they were surrounded by a substantial buffer of nearly bare mineral soil. In contrast, a nearby patch of several mature cushions of broom crowberry growing among a contiguous fuel layer of dense pine sprouts and shrubs was totally expunged by an earlier fire. Clearly, wide sandy buffers (actually created by fire) devoid of a fuel-load enhance the survival chances of populations of this state endangered shrub.

Along an abandoned airstrip within the WGR Target Zone, we visited highly productive rare species habitats severely impacted by such anthropogenic disturbances as bulldozing, scraping, detonation of munitions, mowing, and prescribed burning (the latter two still ongoing). These disturbances have helped to maintain early successional conditions that benefit the pioneer species that thrive here. An estimated 6000 fruiting tufts of Knieskern's beaked rush were observed in a periodically prescribed-burned seepage strip 100 m long x 3 m wide that parallels the central segment of the runway on the east side. An even larger population of this federally-threatened sedge occurred to the southwest of the runway near its southern end in a regenerating area marred by parallel "sight lines" or bulldozed strips that once served as navigational aids. There are at least eight other significant occurrences of Knieskern's beaked rush within the borders of the WGR. Together these occurrences rival those that thrive in the shallow, abandoned, clay pits and powerline right-of-way at Reega

in Atlantic County. For a list of associated species of the above two WGR sites, see *Bartonia* No. 63: 8 September, 57-58, 2006.

Three of co-leader Bien's Drexel University students showed us their *Gentiana autumnalis* study plots equipped with monitoring wells. Here the impacts of groundwater fluctuation and prescribed burning were being monitored and evaluated. Situated on the west side of the northern half of the runway, this parcel has fairly consistently produced thousands of flowering gentians annually. Associated species here were *Scleria minor*, slender nutrush; *Rhynchospora knieskernii; Calamovilfa brevipilis*, pine barren reedgrass; and *Panicum wrightianum*, Wright's panic grass. All of these species have a "wetland affinity" or are deemed to be moisture dependent. Thus it was perplexing to see them growing side-by-side with such upland species as *Quercus ilicifolia*, bear oak; *Q. marilandica*, blackjack oak; *Hudsonia ericoides*, pine barren heather; *Scleria pauciflora* var. *caroliniana*, Carolina nutrush; and *Eurybia compacta*, slender aster. Soil borings of this habitat, exhibiting pit and mound relief, have verified the presence of a semi-permeable clay fragipan that allows rain water to perch near the surface for extended periods. The leaders have designated this parcel a "complex hydroxeric habitat."(See *Bartonia* No. 64: 9-10, 2009 for the location and further discussion of this habitat.)

Plans to devote the remainder of the afternoon to conducting de novo surveys of lesser-known areas along the Oswego River, the northern border of WGR, came to an abrupt halt when a severe cloudburst produced torrential rain. We were fortunate to prevent our vehicles from getting stuck in deep puddles and ruts made slick by underlying clay.
Attendance: 18. Leaders: Ted Gordon and Walt Bien. **Report by T. Gordon.**

4 August: Intermittent Hampton-Central Ponds and Vicinity, Wharton State Forest, Burlington County, New Jersey.

Entering the Wharton State Forest at Hampton Gate via Carranza Road, we were pleased to learn that a small, though well established, occurrence of *Pityopsis falcata* was still flourishing along the east road shoulder just beyond the intersection of Moores Meadow Road. The rare sickle-leaved golden aster, associated with *Plantago aristata* and *Diodia teres*, was growing in a 12 meter-long strip of sparsely vegetated sand.

From the site of nearby Hampton Furnace, we traveled east on High Crossing Road, a sand trail, to reach our primary destination, the "Hampton-Central Ponds." En route, we stopped briefly at the edge of a former bog-ore excavation to record the following typical plants growing in wet sand: *Panicum verrucosum, Juncus canadensis, J. pelocarpus, J. effusus* var. *pylaei, Carex barrattii, Cyperus dentatus, Eleocharis tuberculosa, Rhynchospora capitellata, Triadenum virginicum, Hypericum canadense,* Lobelia nuttallii,* Polygala lutea,* Rhexia virginica,* Xyris difformis* var. *difformis,** and *Xyris torta.**

To reach the ponds, we had to traverse on foot a parcel of pitch pine lowland that was devastated by an extremely hot fire on July 18, 1999. Our passage was complicated by uneven terrain marred by depressions, haphazardly scattered dead tree trunks, thickets of regenerating shrubs and pine sprouts, and humid weather with a temperature approaching 95°. A thorough survey of this diverse, recovering landscape yielded the following 39 species: **trees & shrubs** - seedlings and saplings of both *Acer rubrum* forma *trilobum* and *Ilex opaca*, tall sprouts of *Pinus rigida, Chamaedaphne calyculata, Clethra alnifolia,* Gaultheria procumbens, Gaylussacia baccata, G. dumosa, G. frondosa, Hudsonia ericoides, Ilex glabra, Kalmia angustifolia, Leucothoe racemosa, Lyonia mariana, Morella pensylvanica, Pyxidanthera barbulata, Vaccinium corymbosum* var. *corymbosum, V. corymbosum* var. *caesariense, V. pallidum;* **herbs—***Hypericum denticulatum* var.

denticulatum, Lechea racemulosa, Lobelia nuttallii,* Minuartia caroliniana, Platanthera cristata** (4 in a moist depression), *Sabatia difformis,* Xerophyllum asphodeloides;* **grasses** - *Andropogon glomeratus, A. virginicus, Calamovilfa brevipilis, Panicum mattamuskeetense, P. virgatum, Schizachyrium scoparium* var. *scoparium;* **sedges** - *Rhynchospora capitellata, Scleria triglomerata;* **ferns** - *Pteridium aquilinum,* var. *latiusculum, Woodwardia virginica;* **mosses** - *Sphagnum tenerum, S. magellanicum,* and *S. fallax (?).* Two sedges, *Rhynchospora torreyana* and *Scleria minor,* the herb *Bartonia virginica*, and the fern *Schizaea pusilla* were seen here in July, 2004, but not during this exploration.

We next entered "Hampton-Central Big Pond," where on July 17, 2004, T. Gordon and R. Juelg discovered an occurrence of the globally imperiled grass, *Panicum hirstii* (= *Dichanthelium hirstii*). It was our intention to determine the extent and vigor of this population. However, since only about a dozen of these extremely narrow, wand-like culms still retained their fruit, it proved too difficult to see the delicate, bare inflorescences jutting out from the shallow water. A general survey of the pond resulted in finding the following 46 species, excluding woody plants: **herbs—***Brasenia schreberi,* Decodon verticillatus, Drosera intermedia,* Eriocaulon aquaticum, E. compressum^* (rosettes only), *E. decangulare,* Hypericum denticulatum* var. *denticulatum,* Lobelia canbyi,* L. nuttallii,* Lophiola aurea, Nymphaea odorata,* Nymphoides cordata,* Polygala cruciata,* Proserpinaca pectinata,^ Rhexia virginica,* Sabatia difformis,* Triadenum virginicum, Utricularia striata,* Xyris smalliana;*^* **rushes—***Juncus biflorus,* J. canadensis,^ J. pelocarpus;^* **sedges—***Carex barrattii, C. bullata, C. livida, C. striata, Cladium mariscoides,*^ Dulichium arundinaceum, Eleocharis olivacea, E. robbinsii,^ E. tuberculosa, Rhynchospora alba,*^ R. capitellata, R. cephalantha, R. gracilenta, R. fusca, Scleria minor;* **grasses—***Andropogon glomeratus, Calamovilfa brevipilis, Muhlenbergia torreyana,^ Panicum hirstii, P. spretum, P. virgatum, Saccharum giganteum;* **ferns—***Woodwardia virginica;^* **mosses—***Sphagnum cuspidatum.* Species seen here in 2004 but not during this survey were *Cyperus dentatus, Sphagnum cyclophyllum, S. macrophyllum,* and *Platanthera blephariglottis.* However, the current survey added 9 new species to the 2004 survey list.

(See also *Bartonia* No. 63: 17 July, 62-63, 2006.)

To reach adjacent "South Pond," much smaller than Big Pond and totally devoid of water, we followed a short, slightly elevated causeway. A casual survey resulted in finding the following species: **herbs—***Eriocaulon aquaticum, E. compressum,^ Hypericum denticulatum* var. *denticulatum,* Lachnanthes caroliniana, Lophiola aurea, Nymphaea odorata, Proserpinaca pectinata,^ Sabatia difformis,* Utricularia striata,* Xyris smalliana;** **rushes—***Juncus canadensis,^ J. pelocarpus;^* **sedges—***Cladium mariscoides,*^ Eleocharis olivacea,* E. robbinsii,^ E. tuberculosa, Rhynchospora alba,^ R. cephalantha,^ R. fusca;* **grasses—***Calamovilfa brevipilis, Muhlenbergia torreyana,^ Panicum spretum, Saccharum giganteum;* **ferns—***Woodwardia virginica.* Species seen here in 2004 (pond flooded) but not in 2007 were *Scleria minor, Rhynchospora pallida,* and *Utricularia juncea.*

The smallest pond of the cluster, "Southwest Pond," also devoid of water, yielded the following species: **herbs—***Lobelia canbyi,* Proserpinaca pectinata,^ Xyris smalliana;*^* **rushes—***Juncus pelocarpus;^* **sedges—***Cladium mariscoides,*^ Eleocharis robbinsii,^ Rhynchospora alba,*^ R. cephalantha;^* **grasses** - *Muhlenbergia torreyana;^* **ferns—***Woodwardia virginica.^* Seen in 2004, *Eriocaulon compressum^* and *Lachnanthes caroliniana* **were either overlooked or not present on this occasion.**

The flora of individual intermittent ponds in close proximity can vary dramatically.

The three ponds surveyed had in common only those ten species marked with a caret (^). It is anticipated that this number will increase with additional, timely field work.

We returned to Carranza Road to see a small occurrence of *Stylisma pickeringii* var. *pickeringii*, Pickering's morning glory, in bloom near the Carranza Memorial. A few trailing vines were growing in extremely dry sand along the railroad tracks in association with *Pinus echinata, P. rigida, Cyperus grayi, Diodia teres, Hudsonia ericoides, and H. tomentosa.* Further to the south, we searched unsuccessfully for an old occurrence of *Stylisma* at the "lost" village of Sandy Ridge. This fire-impacted site contained *Ionactis (Aster) linariifolius, Solidago odora, Melampyrum lineare* var. *pectinatum, Diodia teres,* and *Liatris graminifolia.*

Our final stop, a moist road shoulder and shrub thicket along Route 563 below the cranberry village of Hog Wallow, harbored a spectacular floral display of 372 specimens of *Platanthera blephariglottis*, white fringed orchid.

[* flowering plant; ^ indicates plant present in all three "Hampton-Central Ponds."]

Thanks go to Bill Standaert for maintaining a list of species observed.

Attendance: 8. **Report by leader: Ted Gordon.**

25 August: Daleville, Chester County, Pennsylvania.

In the Elk Creek watershed, we visited the extensive parcel of land owned by Anna Francis, a participant in the Conservation Reserve Enhancement Program (CREP), which rewards landowners for instating conservation practices on their land. Serving as our trip leader, the CREP facilitator gave a brief talk regarding the property, which has been extensively planted with trees. The tract, at the upper end of the headwaters of Elk Creek, was a dairy farm prior to current ownership; horses now graze the upland portions. Over 900 trees were planted along the riparian corridor during the initial planting in 1997, with an additional 2200 trees in 2003 along with 300 shrubs. The most common species planted included *Fraxinus pennsylvanica, Platanus occidentalis,* and *Betula nigra,* with some *Liquidambar styraciflua, Quercus palustris, Q. bicolor, Liriodendron tulipifera, Acer saccharinum,* and one or two *Fagus grandifolia.* Shrubs included *Alnus serrulata, Cephalanthus occidentalis, Cornus amomum, Ilex verticillata, Sambucus canadensis*, and *Viburnum dentatum.* The leader further discussed the evolution of the planting program, including how some local non-natives such as *Liquidambar* and *Betula nigra* have been dropped from her area planting list; the survival and growth rates of various species; the problems associated with mislabeled species, notably *Alnus glutinosa;* and methods of protecting the saplings from both deer and invasive species, especially *Phalaris arundinacea, Agrostis gigantea,* and *Microstegium vimineum* at this site; and protecting animals that use the tree tubes for shelter and food. Of special interest to the participants were the reason why netting is fitted atop the tubes (to reduce bluebird mortality), and the problems in the north of the state with black bears destroying trees to get at wasp nests inside the tubes.

We then went into the field both upstream and downstream, venturing into the extensive open and shrubby wetlands along the edges of the watercourse, where in the course of sloshing through the often thick herbage we encountered some of the unusual species known on the property. These included *Calamagrostis canadensis, Sagittaria australis, Rhexia virginica* in bloom, a nice flowering population of *Oxypolis rigidior,* and a sedge resembling *Carex tetanica* and, to some degree, *C. meadii.* This last *Carex* has been examined by Tony Reznicek and other sedge specialists. It apparently has not yet been determined whether it is an anomalous form of an existing *Carex* or a new taxon.

We finished the trip by examining an adjoining Brandywine Conservancy property, a low woodland dominated by oaks and red maple, and walking along the edge of a large, rectangular, abandoned farm pond.

Attendance: 6. Leader: Jessie Benjamin. **Report by Jack Holt.**

8 September: Welsh Mountain, Chester County, Pennsylvania.

On a brief walk along the edge of Struble Lake near the fishermen's parking lot, we saw *Agalinis tenuifolia* in bloom both in the tall grass at water's edge and in the rough-mown lawn. We then convoyed by car to the wooded upper north slope of Welsh Mountain near the junction of Berks, Chester, and Lancaster Counties. This tract was recently put under a conservation easement. We slowly walked up a gas line cut that ran straight up the mountain, observing numerous acid-tolerant edge and meadow plants. Frequent cutting had favored numerous low-growing and mat-forming species. These included four clubmosses, *Dendrolycopodium obscurum, D. hickeyi, Lycopodium clavatum,* and *Diphasiastrum digitatum, Epigaea repens, Lespedeza repens, Viola primulifolia, V. sagittata, V. lanceolata,* and *Spiranthes cernua* (in bud). The *Lycopodium, Epigaea, and Viola lanceolata* frequently formed large colonies, the first-named frequently found draped over the high edges of the cut. Other notable species included *Eupatorium pilosum* low down, and a single sprig of *Spiraea tomentosa,* atop the cut. Large colonies of *Kalmia latifolia,* including cut-over mats, lined the north edge of the cut.

We then ventured into the woods on either side of the cut. The slopes of Welsh Mountain possess an increasingly rare habitat in southeastern Pennsylvania, a mature oak-heath upland forest that has not yet been heavily impacted by deer. Chestnut oak was the most common oak, mixed with red, black, and white, with black gum, cherry birch, and a few red maples mixed in. Members of the *Ericaceae* dominated the shrub and ground flora, with *Kalmia latifolia* practically the only tall shrub, frequently forming near-impenetrable thickets. Lower down were the huckleberries and blueberries, consisting mainly of *Gaylussacia baccata, G. frondosa,* and *Vaccinium pallidum*, along with an occasional *V. stamineum* and *V. corymbosum.* Except for *Medeola virginiana*, few herbs grew with the heaths, but notable species included a local colony of *Trientalis borealis,* a nice colony of *Goodyera pubescens,* and the occasional *Cypripedium acaule.* After lunch some of the botanists walked along the lower edge of the woods above an expanding housing development, where we looked at a population of *Isotria verticillata* and a patch of *Viburnum nudum* var. *cassinoides.* Of concern to the leaders was the high mortality observed among the *Kalmia.* The previous year, most of the mountain laurel south of the utility cut was dead or dying, while most to the north was healthy and thriving. This year the southern population was re-sprouting from the bases while the northern thickets were dying off.

Attendance: 11. **Report by leaders: Janet Ebert and Jack Holt.**

15 September: Sandy Hook, Gateway National Recreation Area, Monmouth County, New Jersey. Joint trip with Torrey Botanical Society.

The beach was our first stop, to avoid potential crowds later in the day. Our primary objectives were two rare species, *Amaranthus pumilus* and *Polygonum glaucum.* We found both. We also saw large populations of *Artemisia campestris* around the parking lot and along the path to the beach and *Helianthus petiolaris* among the dunes along the road.

Our next stop was an *Ilex opaca* forest. Sandy Hook offers one of the best examples of this habitat in the region. Many of the trees are over one hundred years old, impressively large, and quite beautiful. The forest is on the bay side. We encountered salt marsh along the boardwalk on the way in and upper-marsh habitat near the entrance to the forest. Species we saw of note were *Bassia hyssopifolia, Limonium carolinianum, Maianthemum stellatum, Salicornia europaea, Salicornia virginica,* and *Salsola kali.*

We then proceeded to a large parking lot in the center of Sandy Hook where a "mystery plant" had been reported before the trip. Since Sandy Hook is home to a number of species

common in other regions, but rare in the Northeast, we had reason to be hopeful. Once again Sand Hook's reputation did not disappoint. The plant was *Eriogonum annuum*, a member of the *Polygonaceae* common on the Great Plains but very rare in the East.

After a stop for lunch, we set out to look for another relatively-recent arrival from a distant region, *Carex macrocephala*. This species is native to the Pacific Northwest, Alaska, and northeastern Asia, but is only found at three sites in the East. It somewhat resembles *Carex kobomugi* in its growth habit. Not far from the parking lot we were surprised by a small population of *Celastrus scandens*. Then, along the way we passed scattered populations of *Panicum amarum*. Far into the dunes we found a large swale filled with *Carex macrocephala* among more *P. amarum*.

Our last stop was Plum Island, just north of the park entrance. Here we observed *Atriplex cristata (A. arenaria)*. Other plants observed during the course of the trip were *Baptisia tinctoria, Cakile edentula, Lathyrus japonicus, Lechea maritima, Plantago psyllium, Berberis vulgaris*, and *Hudsonia tomentosa*. Thanks to Linda Kelly for keeping a species list.
Attendance: 16. **Report by leader: David Austin**

16 September: Silver Lake/Delhaas Woods and 5-Mile Woods, Bucks County, Pennsylvania

On this trip we examined the geology and how it influenced the plant communities. At Silver Lake Nature Center east of Bath Road and Delhaas Woods, west of Bath Road near Bristol, we looked at relatively undisturbed habitats underlain by pre-Wisconsin glacial deposits. These habitats exhibited very acidic conditions (pH ~ 3.8—4.5) that harbored acidophiles like *Andropogon glomeratus*, *Carex* cf. *bullata*, *Clethra alnifolia*, *Lilium superbum*, *Liquidambar styraciflua*, *Lyonia ligustrina*, *Maianthemum canadense*, *Quercus phellos*, *Q. falcata*, apparent *Q. phellos X falcata*, *Rhexia mariana*, *Rhododendron* cf. *periclymenoides*, *Rhynchospora capitellata*, *Spiraea latifolia*, *Symphyotrichum (Aster) novi-belgii*, and *Viola lanceolata*. A small, previously unknown colony of *Corallorhiza odontorhiza* was discovered in a disturbed area. In the marshes of Mill Creek, east of Bath Road in the Park, the soils were much richer, having washed down from the agriculturally enriched Pennsauken and Bridgeton formations and Wissahickon schist, which tends to be richer. Species observed here included *Cephalanthus occidentalis*, *Chelone glabra*, *Clematis virginiana*, *Convallaria majalis*, *Cornus amomum*, *Eupatorium dubium*, *Hibiscus palustris*, *Lythrum salicaria*, *Mikania scandens*, *Nuphar sp.*, *Leersia oryzoides*, *Sambucus canadensis*, *Saururus cernuus*, and many other common species.

At Five-Mile Woods Preserve in Lower Makefield Township, Bucks County, we looked at the influence of undisturbed Pennsauken, Bridgeton, and Chickies Quartzite formations, all of which tend to be very acidic. These conditions provided habitat for less-common to rare species in Bucks County like *Bartonia paniculata*, *Botrychium dissectum*, *Chimaphila maculata*, *Clethra alnifolia*, *Lyonia ligustrina*, *Medeola virginiana*, *Monotropa uniflora*, *Tipularia discolor*, *Vaccinium corymbosum*, and *Viola primulifolia*. In areas of former agricultural use and around old foundations on the same three geologic formations, species associated with richer soil were found. These included *Actaea pachypoda*, *Botrychium virginianum*, *Celtis occidentalis*, *Lindera benzoin*, *Lonicera japonica*, *Microstegium vimineum*, and *Polystichum acrostichoides*.

Thanks go to Janet Novak for maintaining a species list.
Attendance: 6. **Report by leader: Rick Mellon.**

2008 Field Trips

15 March: In Search of Mistletoe, Winslow Township, Camden County and Monroe Township, Gloucester County, New Jersey. Joint trip with the Flora of New Jersey Project.

The trip started in Folsom, Atlantic County, where a brief history of the region and the biology of *Phoradendron leucarpum* were discussed. Our goal was to see American mistletoe at multiple stations along the Great Egg Harbor River. Winter is the best time to find American mistletoe. Without the deciduous canopy foliage, colonies of this unusual parasite are readily visible. The parasite's affinity in New Jersey with *Nyssa sylvatica*, black gum, was discussed.

From Folsom, we drove a short distance to the Piney Hollow Road entrance into Winslow Fish and Wildlife Management Area. This state-owned tract supports many Pinelands habitats as well as a substantial population of American mistletoe. We entered the forest following the management area's dirt roads. Our first stop was Inskip's, the site of a historic inn and the famed Blue Hole. We searched the river banks for a population observed by the trip leader a few weeks prior. After a fruitless search it was discovered the tree in which a fine colony had existed was toppled during a winter storm. The large black gum was found sprawled across the river and its colony of mistletoe lost in the fast-moving current of the Great Egg Harbor River. The group laughed at the coincidence and continued to survey for additional colonies. Approximately 100 meters downstream, a small population was found at the top of a gnarled black gum. This was the only occurrence we observed near the historic site.

We left Inskip's and followed the old Blue Anchor Fireline north toward Winslow Road. We stopped approximately ½ mile before the paved county highway at the edge of a large, circular, wet depression. Here we discussed the regional geology and landscape formation while searching the tree line for mistletoe. We discovered one small colony of mistletoe in a young black gum sapling on the edge of the dirt road. We drove north from this depression, crossed Winslow Road, and followed the south side of the Atlantic City Expressway to a manmade excavation using a dirt service road. The group searched the tree line surrounding the pond, identifying squirrel's nests and witch's brooms but no additional mistletoe populations. The pond edge was inspected and the following species were identified: *Rhynchospora macrostachya, R. alba, R. capitellata, Lycopodiella alopecuroides, Triadenum virginicum, Andropogon glomeratus,* and *Juncus canadensis*. The fourth stop was on the Winslow Road bridge spanning the Great Egg Harbor River. From this vantage point, we were able to identify many colonies of American mistletoe. Dozens of large and small colonies occupied the lowest part of the river's floodplain, which apparently is providing ideal conditions to sustain this large occurrence. Each colony occupied the upper branches of the floodplain's large-stature black gums. After a brief lunch, the group drove north on Morgan Road to the intersection with Malaga Road in the historic village of New Brooklyn. We parked in a Winslow Fish and Wildlife Management Area parking lot and immediately spied dozens of large and small mistletoe colonies. The group was able to walk among the black gum trees supporting mistletoe and found parts of the plants on the forest floor. Fruiting specimens were examined and the anatomy of the parasite discussed. At this station one silver maple tree in an adjacent residential landscape was observed with a small colony of American mistletoe. This may be the only existing New Jersey documentation of mistletoe in *Acer saccharinum*, silver maple.

Report by leader: Joe Arsenault.

5 April: Field Botany Party, Pinelands Preservation Alliance Headquarters, Vincentown, New Jersey. Short trip to Smithville, Burlington County. No report received.

3 May: Bowman's Hill Wildflower Preserve (BHWP) "Phyto-Bio Blitz," New Hope, Pennsylvania. Joint trip with BHWP staff and volunteers.

BHWP features over 700 species of Pennsylvania plants, both native and originally non-native, growing along trails in a natural setting of woodland, meadow, and pond. The total acreage of the preserve is 134 acres, of which approximately 100 acres are surrounded by a deer exclusion fence, erected in 1994.

The phytobioblitz was just the beginning of an ongoing comprehensive survey with multiple goals. It is important to know what is growing on the preserve. It is also desirable to verify presence and current condition of some of the plants that were planted in previous years, going back into the 1950s. Finally, by using the Plant Stewardship Index it is possible to compare the "nativeness" of vegetation in selected areas inside and outside the deer fence. For a full explanation of the technique and rationale visit the BHWP website: www.bhwp.org/db.

For the phytoblitz, the preserve was divided into sixteen areas of about ten acres each. Groups of volunteers spent the morning and afternoon sampling the vegetation. Some of the species found included *Caltha palustris, Dicentra eximia, Mertensia virginica, Caulophyllum thalictroides, Polemonium repens, Trillium grandiflorum, T. cernuum, T. luteum* and *Viola labradorica.* For a complete lists of species found, see the preserve's website.

A delicious lunch in the Moore Pavilion and a catered dinner were served by BHWP. Attendance: 16. **Report by Coordinator: Jeannine Vannais.**

2–4 May: Field Workshop - Spring Wildflowers of the Delaware National Recreation Area, Pocono Environmental Education Center. Instructor: Bill Olson. Event was cancelled.

10 May: Flora of Ker-Feal (country estate of Albert Barnes), West Pikeland Township, Chester County, Pennsylvania. Joint trip with students of the Barnes Foundation.

We first examined cultivated plants in the yard near the house and then walked though fallow fields and early successional forest to a relatively late successional forest at the west end of the property. We saw most of the cultivated trees and shrubs around the house, outbuildings, and along the driveway that were reported on a previous trip in 2002 (*Bartonia* 62: 126). We noticed that two plants not reported on the previous trip, *Primula japonica* and *Photinia villosa*, were spreading to other parts of the property. Large stands of the invasive *Elaeagnus umbellata* were abundant in and along the margins of fallow fields. An early successional forest along the horse trail west of the driveway had numerous non native and invasive plants including *Acer platanoides*, *Phellodendron amurense*, *Euonymus alatus*, *Ligustrum obtusifolium*, *Rhodotypos scandens*, and *Celastrus orbiculatus*. The forest at the west end of the property was dominated by *Liriodendron tulipifera*, but in steeper portions there were numerous trees of *Quercus rubra*, *Quercus velutina*, and *Fagus grandifolia*. *Lindera benzoin* and *Viburnum acerifolium* were dominant understory shrubs. Spring wildflowers included *Arisaema triphyllum*, *Claytonia virginica*, *Galearis spectabilis*, *Maianthemum racemosum*, *Obolaria virginica*, *Podophyllum peltatum*, *Sanguinaria canadensis*, *Uvularia perfoliata*, *Viola cucullata*, and *Viola pubescens*.

Attendance: ca 15. **Report by leader: Alfred E. Schuyler.**

1–5 June: The Pinelands National Reserve, Sections of Ocean and Burlington Counties, New Jersey. Joint Field Meeting of the Northeastern Section of the Botanical Society of America, the Philadelphia Botanical Club, and the Torrey Botanical Society.

Participants were housed at the Lighthouse Center for Natural Resource Education on Barnegat Bay in Waretown, Ocean County. Five experts on the regional flora served as **trip leaders: Joseph Arsenault** of Arsenault Environmental Consulting; **Dr. Walter Bien** of Drexel University; **Ted Gordon,** Director of Pine Barrens Inventories; **Dr. Gerry Moore,** Director of Science, Brooklyn Botanic Garden; and **William Olson** of Maser Consulting. Travel to a diverse tapestry of wetland and upland plant communities was in 4 vans and 4 private vehicles.

In preparation for Monday's excursions, **Walter Bien's** Sunday evening PowerPoint program, **"Fire Effects on the Pitch Pine Plains,"** provided a comprehensive overview of the globally imperiled dwarf pitch pine (*Pinus rigida)* communities created and maintained by frequent intense fires. On Monday, following in the footsteps of botanists of the 19th and 20th centuries (J.H. Redfield, Constantine Rafinesque, John Torrey, Witmer Stone) in search of *Corema conradii* (broom crowberry) at its southernmost limit of range, we paused briefly at historic Cedar Bridge Tavern that had welcomed these travelers who then went on to seek the crowberry on the West Plains. Our next stop at a nearby plantation of towering white pines set out as seedlings in 1960 by forester Silas Little convinced us that soil impoverishment was not the cause of stunting in the plains. At the Le Clare homestead on the Little Plains near Warren Grove we again saw planted, non-native trees that were protected from wildfire towering over the endemic stunted pines and scrub oaks in adjacent fire ravaged areas. Also observed were many members of the heath family, including large areas of *Leiophyllum buxifolium* (sand myrtle), some still in bloom. Extensive carpets of broom crowberry and patches of *Pyxidanthera barbulata* (pyxie) were also seen. After lunch we viewed the Lower Plains from an observation tower at the Warren Grove Air National Guard Gunnery Range. Here we visited anthropogenically disturbed sites harboring many rare pioneer species recently documented by Bien and Gordon. Of special note were *Rhynchospora knieskernii*, (Knieskern's beaked rush), a large population of *Gentiana autumnalis* (pine barren gentian), and *Muhlenbergia torreyana* (Torrey's muhly). Bien also discussed regeneration plots on severely disturbed sites maintained by his graduate students.

The evening slide-illustrated program, **"Cedar Swamps, Savannahs, and Quaking Bogs of the New Jersey Pine Barrens,"** was presented **by Ted Gordon.** It provided an in-depth overview of a number of wetland communities visited the following day.

On Tuesday morning near Wells Mills County Park we walked through an upland pitch pine (*Pinus rigida)*-blackjack oak (*Quercus marilandica)* forest with some *Q. ilicifolia* (bear oak), *Q. stellata* (post oak), and *Sassafras albidum* (sassafras). No additional tree species can tolerate the severe fires that shaped this community. The understory was dominated by *Gaylussacia frondosa* (dangleberry), *G. baccata* (black huckleberry), and *Vaccinium pallidum* (lowbush blueberry). We also visited an adjacent fire-scorched pitch pine lowland dominated by *Calamovilfa brevipilis* (pine barren reedgrass) and *Gaylussacia dumosa* (dwarf huckleberry). Both of these communities produced large populations of *Xerophyllum asphodeloides* (turkeybeard) whose flowers were severely browsed by deer. Next we entered an adjoining cedar swamp along Cold Brook to see *Schizaea pusilla* (curly grass fern) and, in anthesis, *Arethusa bulbosa* (dragon mouth).

At the Oswego Cranberry/Blueberry Research Center near Jenkins, **Dr. Amy Howell** presented a PowerPoint program titled **"The Health Benefits of Cranberries and Blueberries."** In a canal at the center we noted the rare *Utricularia inflata* (swollen bladderwort), the rare *U. purpurea* (purple bladderwort), and the common *U. striata*

(striped bladderwort). After lunch we focused on the riverine savannahs, quaking bogs, and cedar swamps along the Oswego River above Martha Furnace. Highlights here were colorful sphagnum carpets, an abundance of flowering *Sarracenia purpurea* (pitcher plant), *Utricularia cornuta* (horned bladderwort), *Narthecium americanum* (bog asphodel), and *Eriocaulon compressum* (early pipewort). At the furnace site *Liparis loeselii* (Loesel's twayblade) and a small glade harboring a dozen fern species, including *Ophioglossum pusillum* (northern adder's tongue), attracted attention.

The evening PowerPoint program by **Gerry Moore** was titled **"Rare and Endangered Species of the New Jersey Pine Barrens."** This presentation provided the participants an opportunity to appreciate in flower the many special plants that thrive throughout the growing season.

On Wednesday at Webbs Mills, the group traversed a boardwalk over a bog created and favorably impacted by turf removal. Prolonged flooding by beaver had delayed flowering of many species. *Carex exilis* (coastal sedge) and a few dragon mouth were in bloom; bog asphodel and *Lophiola aurea* (gold crest) were in bud. The four leaders made a strong effort to teach the group to identify bog plants in their non-flowering state.

At Whitesbog, birthplace of the cultivated blueberry, we saw several banners of *Calopogon tuberosus* (grasspink), *Polygala lutea* (orange milkwort), *Minuartia caroliniana* (pine barren sandwort), *Cephalanthus occidentalis* (buttonbush), *Nymphaea odorata* (fragrant white water lily; inc. forma *rosea*), *Itea virginica* (Virginia willow), and two highlights, *Uvularia puberula* var. *nitida* (pine barren bellwort), and New Jersey's only native occurrence of *Schwalbea americana* (chaffseed).

After botanizing the edge of Pakim Pond in Brendan Byrne (Lebanon) State Forest, we examined an advanced growth *Chamaecyparis thyoides* (Atlantic white cedar) swamp along Shinn Branch. Here we noted *Ilex laevigata* (smooth winter holly), *Trientalis borealis* (star flower), *Smilax walteri* (coral greenbrier), *Thelypteris simulata* (bog fern), and *Woodwardia areolata* (netted chainfern).

In the evening a fine banquet was held at the nearby Captain's Inn in Forked River. Potential sites for next year's meeting were discussed, leading to the possibility of the Pocono Mountains. **Mark Demitroff,** University of Delaware Permafrost Group, presented a PowerPoint program titled **"Pine Barrens Wetlands: Geographic Reflections of South Jersey's Glacial Past."** Mark made a convincing case that permafrost played an important role in shaping regional wetlands in southern New Jersey.

Thanks go to the treasurer **Karl Anderson;** the **assistant chair Walter Bien; German Georgieff**, Chief Naturalist of Wells Mills County Park, his staff and associates for providing transportation; **Dr. Nicholi Vorsa,** Director of the Marucci Blueberry and Cranberry Research Center, for use of their facilities; and **Patricia Gordon** for assistance with all phases of this event.

Attendance: 58. **Report by conference chairperson: Ted Gordon.**

22 June: Haycock Mountain, Bucks County, Pennsylvania.

We climbed partway up the east side of Haycock Mountain on a trail that took us through rocky woods and past boulder fields. *Actaea racemosa* (*Cimicifuga racemosa*; black cohosh) was abundant. In the rockier areas, we saw *Sambucus racemosa* (red elderberry), a very large cluster of *Botrychium virginianum* (rattlesnake fern), and a single plant of *Adlumia fungosa* (Allegheny vine). In general the woods had few invasive plants, perhaps because the deer population is kept in check by hunting (Haycock Mountain is within one of the state

game lands). Other plants included *Amphicarpaea bracteata, Asarum canadensis, Asclepias quadrifolia, Castanea dentata, Collinsonia canadensis, Conopholis americana, Cornus alternifolia, Desmodium nudiflorum, Galearis spectabilis, Galium triflorum, Geranium maculatum, Hepatica nobilis* var. *americana, Mitchella repens, Phegopteris hexagonoptera, Podophyllum peltatum, Rhododendron periclymenoides* (?), *Rubus odoratus, Sanguinaria canadensis, Scutellaria elliptica, Thalictrum thalictroides, Uvularia perfoliata, U. sessilifolia, Viburnum prunifolium, Viola palmata, V. pubescens*, and a past-bloom orchid that we tentatively identified as *Liparis liliifolia*.

A second stop was State Game Lands 56. The main attraction was a small moist meadow east of Lake Warren. This meadow appears to be kept open by mowing. We noted numerous plants of *Liatris spicata* (blazing-star), *Krigia biflora* (two-flowered cynthia), and *Pedicularis canadensis* (wood betony). In wet ditches we noted two small annuals, *Juncus bufonius* (toad rush) and *Gratiola neglecta* (clammy hedge-hyssop). On somewhat higher ground we found lots of *Asclepias quadrifolia* (fourleaf milkweed) and *Aristolochia serpentaria* (Virginia snakeroot). Other plants included *Asclepias purpurascens, Cynoglossum virginianum, Hypericum perforatum, Hypoxis hirsuta, Lysimachia ciliata, Oenothera perennis, O. fruticosa, Penstemon digitalis, Polygala verticillata, Rosa caroliniana, Sisyrinchium angustifolium,* and *Triodanis perfoliata.*

Finally, we made a quick stop at Nockamixon Cliffs, which is a high wall of hornfels (a metamorphic rock) rising above the Delaware River. The north-facing orientation of the cliffs ensures that the site stays cool, and the cliffs have long been known as a site of northern plants, notably *Rhodiola rosea* (*Sedum rosea*; roseroot). We think we were able to spot this plant high on the cliffs, but, because we had neglected to bring a spotting scope, we could not be certain. Other highlights were *Adiantum pedatum, Aquilegia canadensis, Arabis lyrata, Asarum canadensis, Heuchera americana, Hydrangea arborescens, Penstemon hirsutus*, and *Saxifraga virginiensis*.

Attendance: 6. **Report by leader: Janet Novak.**

12 July: Ramapo Mountains, Bergen, Passaic Counties, New Jersey. Joint trip with the Torrey Botanical Society.

Steve Glenn, filled in for the listed leader, Gerry Moore, who was out of the country and unable to attend. The group began the trip botanzing areas adjacent to the New Jersey State Botanical Garden. Of note here were escaped specimens of *Gymnocladus dioicus* and a cut-leaved cultivar of elderberry, most likely *Sambucus canadensis* 'Maxima'. The non-native orchid *Epipactus helleborine* was also noted here in flower. The group also visited Swan Pond where they observed recently planted meadows. Here the orchid *Platanthera lacera* was also noted in bloom. The group then walked along the Halifax Trail enroute to Glasmere Ponds. Along this trail birches and hickories were studied with the following species being identified: *Betula alleghaniensis, Betula lenta, Betula populifolia* (at Swan Pond *B. nigra* was also observed as a possible cultivated remnant), *Carya cordiformis, C. glabra,* and *C. tomentosa. Viburnums* were also studied with the following species being identified: *V. acerifolium, V. dilatatum, V. prunifolium, V. rafinesquianum,* and *V. recognitum.* Herbs that were examined along the trail included *Carex* and *Pycnanthemum,* with the following species being recorded: *C. annectans, C. lurida, C. pensylvanica, C. rosea, C. stipata, C. stricta, C. swanii, P. incanum, P. tenuifolium,* and *P. virginianum. Asclepias exaltata* and *Corydalis sempervirens* in bloom were also noted along the trail.

At Glasmere Ponds the highlight was seeing the rare bladderwort species, *Utricularia radiata* in bloom, growing with *U. macrorhiza* (also in bloom), *Brasenia schreberi,*

Ceratophyllum demersum, Myriophyllum spicatum, Nuphar lutea ssp. *advena, Nymphaea odorata, Potamogeton robbinsii,* and *Sparganium americanum.* Other species of note at Glasmere Ponds included: *Aureolaria flava, Cryptotaenia canadensis, Frangula alnus, Hydrocotyle anericana, Lyonia ligustrina, Salix eriocephala,* and *Sanicula canadensis,*

Thanks to Bill Standaert for maintaining a species list.

Attendance 11. **Report by leader Steven Glenn.**

19 July: Burden Hill Forest, Salem County, New Jersey.

Our first stop was a Natural Lands Trust (NLT) property of <100 acres located east of Telegraph Road (Route 540) about 1 mile SSE of the village of Alloway. Situated on the exposed, unconsolidated marine deposit of the Kirkwood Formation, this Outer Coastal Plain parcel of silt, loamy sands, and sandy clays provides a mesic to wet environment suitable for plants that are more at home on the Inner Coastal Plain of the Delaware Valley. We explored both upland and wetland forests adjacent to open farmland. The upland was dominated by a forest canopy of large and mature *Fagus grandifolia,* associated with similarly large specimens of *Quercus rubra, Q. phellos, Q. falcata, Q. alba, Carya tomentosa, C. glabra, Liquidambar styraciflua, Liriodendron tulipifera, Ilex opaca, Prunus serotina,* and *Sassafras albidum.* Relatively devoid of saplings and shrubs, the understory contained only scattered individuals or clusters of species such as *Viburnum dentatum, Vaccinium corymbosum, V. pallidum, Kalmia latifolia, Leucothoe racemosa, Hamamelis virginiana, Clethra alnifolia, Smilax rotundifolia, S. glauca, Rubus hispidus, Euonymus americanus,* and *Fagus* seedlings. Herbs observed included *Medeola virginiana, Uvularia sessilifolia, Maianthemum canadense, M. racemosum* ssp. *racemosum, Dioscorea villosa, Goodyera pubescens, Tipularia discolor,* Mitchella repens, Chimaphila maculata, Monotropa uniflora, Epifagus virginiana,* Onoclea sensibilis, Osmunda cinnamomea, Thelypteris noveboracensis, Dryopteris intermedia,* Dennstaedtia punctilobula, Viola affinis,* Dichanthelium (Panicum) clandestinum, D. dichotomum, Leersia virginica, Carex blanda, C. swanii,* and *Lycopodium obscurum.* This suite of species reflected a mesic, nutrient-rich environment not typically associated with Outer Coastal Plain landscapes. It appeared that this mature forest was never totally clearcut, but trees were selectively harvested over many generations.

Immediately to the south along a tributary of Deep Run and in areas surrounding the mixed hardwood stand, we examined a wetland complex with steep stream banks and deeply incised, clayey flats. Here the canopy was primarily occupied by *Nyssa sylvatica,* and *Acer rubrum.* Occasionally flooded peri-glacial depressions, also ringed by these canopy species, were widely distributed within this forest as well as the upland forest. Scattered on the moist flats and in depressions were the following species: *Vaccinium corymbosum, Rhododendron periclymenoides, R. viscosum, Woodwardia areolata, W. virginica, Carex albolutescens, C. crinita* var. *crinita, C. intumescens, C. lupulina,* C. lurida, C. seorsa,* C. stricta, C. tribuloides,* Carex* sp.,* *Juncus effusus, Viola xprimulifolia, Lilium superbum,* and *Dichanthelium (Panicum) microcarpon.* It should be noted that several trees, shrubs, and herbs listed for the upland forest were also seen in the wetland. Both of the above communities were bisected by several canals, whose date of construction and function were not known to us. (We were surprised by the apparent absence of *Carpinus caroliniana,* ironwood or blue beech.)

On leaving the forest, we documented the following species along a path bordering the adjacent farm field: *Fraxinus pennsylvanica,* Cornus florida, Juniperus virginiana, Diospyros virginiana, Parthenocissus quinquefolia, Toxicodendron radicans, Rosa multiflora, Rhexia mariana, Spiraea tomentosa, Chamaecrista nictitans, Sisyrinchium atlanticum,**

*Microstegium vimineum, Dichanthelium acuminatum var. lindheimeri,** and *Muhlenbergia schreberi.* Thanks go to Marilyn Patterson, former owner of the property, for allowing us to eat lunch in her garden and providing refreshing drinks on this hot day.

About 1 mile to the south we briefly visited another NLT property, the "Telegraph Road Site," on the west side of Route 540. Here we learned that recent timber harvesting had no immediate negative impact on small occurrences of *Helonias bullata, Listera australis,* and *Amianthium muscitoxicum* concealed in a hardwood swamp of *Acer, Nyssa,* and *Magnolia virginiana.* Among the other associated species we observed were *Symplocarpus foetidus, Lilium superbum, Platanthera blephariglottis* (in fruit), *Sphagnum magellanicum,** *Sphagnum* sp. (section *Sphagnum**), *Carex folliculata, C. stricta, C. trisperma, C, collinsii, Eleocharis tuberculosa,** *Woodwardia areolata, W. virginica, Osmunda cinnamomea, Mitchella repens, Gaylussacia frondosa, Rhododendron viscosum, Vaccinium corymbosum,* and *Clethra alnifolia.*

Approximately 4.6 miles to the southwest and 1.2 miles due west of Jericho, we examined a portion of an oak-pine stand that roughly fell within an area that the late Silas Little, federal forester, referred to as the "Salem Barrens" (*Bulletin of the Torrey Botanical Club* Vol. 100, No. 2: 100-101, 1973). South of Hell Neck Road and north of the Buckhorn Gun Club, this upland forest, situated on the western-most expression of the Cohansey Formation, was underlain by very sandy, well drained soils of low fertility. During Little's investigation, there existed here a 38-year-old stand (plantation) of *Pinus echinata* being invaded by various oaks and other hardwoods. Our survey of this general vicinity yielded an extensive list of canopy species: *Quercus alba, Q, coccinea, Q. falcata, Q. marilandica, Q. prinus, Q. stellata, Q. velutina, Sassafras albidum, Carya pallida, Nyssa sylvatica, Prunus serotina, Juniperus virginiana, Diospyros virginiana, Ilex opaca, Acer rubrum, Cornus florida, Fagus grandifolia,* and only scattered specimens of *Pinus virginiana, P. rigida, and P. echinata.* The understory was dominated by *Gaylussacia baccata, G. frondosa,* and *Vaccinium pallidum.* Among the minor components were *Castanea dentata* (sprouts only), *Vaccinium corymbosum, Smilax glauca, Lyonia mariana, Toxicodendron radicans, Vitis aestivalis,* and *Amelanchier stolonifera (=A. spicata).** Likely because of thick leaf litter only a few herbs were found: *Carex pensylvanica, C. lucorum* var. *lucorum,** *Danthonia sericea,** *Nuttallanthus canadensis, Melampyrum lineare, Chimaphila maculata,* and *Epigaea repens.* Because of a scarcity of *Pinus echinata,* we suspected that we may have failed to relocate the precise spot of Little's stand. It was clear, however, that in the absence of fire and harvesting, the forest of this immediate vicinity (as Little had predicted) has become dominated by oaks, with only a minor component of pine.

We added 17 new species to our survey list for the Burden Hill Forest (marked with asterisks), bringing the total count to 408.

Attendance: 11. **Report by leaders: Ted Gordon and Joe Arsenault.**

26 July: Intermittent Ponds, Westecunk Creek Watershed, Stafford Forge Wildlife Management Area, Ocean County, New Jersey. Joint trip with participants of the Pinelands Preservation Alliance's Special Plant Course.

About 0.35 miles south of the fire house in Warren Grove, we veered southeast onto Cervetto Road on a 2.0 mile drive to our first stop. Recent heavy rains had filled deep, clay-lined potholes and treacherous ruts that brought our car caravan to a sudden halt. It was necessary to hike the remaining 1.5 miles through transitional pitch pine-shrub oaks plains, recovering from a severe May 2007 fire. En route we observed several fine patches of *Epigaea repens* and *Pyxidanthera barbulata* and the following herbs: *Hypericum*

gentianoides, Tephrosia virginica, Lechea racemulosa, Helianthemum canadense, Solidago odora var. *odora, Eurybia compacta (Aster gracilis), Melampyrum lineare* var. *pectinatum, Apocynum androsaemifolium,* and *Euphorbia ipecacuanhae.*

At the head of Three-Foot Branch of Westecunk Creek, directly north of the junction of another sand road, we turned into "3-Foot Headwaters Pond," partially concealed by a band of ericaceous shrubs and saplings. Underlain by Mullica sandy loam and devoid of standing water, the moist, open pond bottom of 100 yards x 21 yards contained a few thousand immature tufts of *Rhynchospora knieskernii,* a globally rare beaked rush. Associated rare species included emerging seedling of *Scleria reticularis* (LP—Pinelands listed), several rosettes of fruiting *Panicum wrightianum (= Dichanthelium w.;* an endangered grass), and some culms of the grass *Muhlenbergia torreyana.* Other species noted were *Amphicarpum purshii, Panicum longifolium, P. virgatum, Cuscuta gronovii, Juncus scirpoides, Drosera filiformis, D. intermedia, Hypericum canadense, Lobelia nuttallii, Rhexia virginica, Triadenum virginicum, Xyris difformis* var. *difformis, Eleocharis tricostata, Rhynchospora capitellata, R. chalarocephala, R. fusca,* and *R. torreyana.*

We next explored nearby "Round Pond," a peculiar roadedge, kettle-hole spung about 200 yards below the road split along the south-bearing road to the west. Bordered by a pitch pine lowland of ericaceous shrubs, *Ilex glabra,* and saplings of *Acer rubrum* forma *trilobum* and *Nyssa sylvatica,* this 33-yard-wide pond, underlain by Mullica sandy loam, was also devoid of standing water. We observed several hundred young tufts of *Rhynchospora knieskernii,* associated with 6 other rare elements: *Scleria reticularis* and *Calamovilfa brevipilis* (both Pinelands-listed), *Panicum wrightianum (= Dichanthelium w.), Muhlenbergia torreyana, Lobelia canbyi* (one flower only), and a few leaves of *Nymphoides cordata,* a new find. Other companion species were *Eurybia compacta, Rubus hispidus, Vaccinium macrocarpon, Gratiola aurea, Iris prismatica, Polygala cruciata* var. *aquilonia, Symphyotrichum (Aster) dumosum* var. *dumosum, Juncus effusus, J. pelocarpus, Andropogon glomeratus* var. *glomeratus,* and all species of *Rhynchospora* (except *R. torreyana)* seen at the first pond.

Since most known Knieskern's beaked rush populations occupy sites of anthropogenic disturbance, the presence of these two natural occurrences in intermittent ponds is of special significance. All rare species discovered at these sites were already documented by the leader in Gordon, T. 1996. "De Novo Field Survey of *Rhynchospora knieskernii* in New Jersey." Office of Natural Lands Management. Trenton, NJ. During the 2008 survey, it was found that these elements were still well-established. It was also learned that "Round Pond" had recently been marred by off-road vehicles. It appeared, however, that the site was able to recover from this impact.

Rising temperature and humidity made the "march" back to our vehicles unpleasant. Refreshed after eating a picnic lunch, we continued to "Pond 74" on the west side of Route 539 a few hundred yards north of Governors Branch. Behaving like an intermittent pond, this shallow, abandoned, gravel excavation was almost completely dried up. In addition to *Eriocaulon aquaticum, Cyperus dentatus, Rhynchospora alba, Scirpus cyperinus,* and species of *Lycopodiella,* this pit harbored almost all the species that were documented for the two natural ponds, including a small occurrence of *Rhynchospora knieskernii.* On occasions, several thousand specimens of the latter sedge have been seen here.

On the shore and wet, sandy flats bordering the northeast segment of the upper reservoir at Stafford Forge, we added the following species: *Dulichium arundinaceum* var. *arundinaceum, Eleocharis robbinsii, Lachnanthes caroliniana, Nuphar lutea* ssp. *lutea, Nymphaea odorata* ssp. *odorata, Sabatia difformis, Sparganium americanum,* and

Xyris smalliana. We entered the adjacent cedar swamp/quaking bog expressly to see *Xyris fimbriata*, the state-endangered fringed yellow-eyed grass, growing on hummocks. Among the many species seen here were *Carex exilis, Eriophorum virginicum, Rhynchospora alba, R. chalarocephala, R. gracilenta, Eriocaulon compressum* (decomposing), *Juncus canadensis, Pogonia ophioglossoides* (many leaves), *Calopogon tuberosus* (fruiting capsules), *Oclemena (Aster) nemoralis, Rhexia mariana, Polygala lutea, Sarracenia purpurea, Lycopodiella caroliniana* var. *caroliniana, Woodwardia virginica, Sphagnum magellanicum, S. papillosum, S. pulchrum,* and *S. tenerum.*

At the Stafford Business Park adjacent to the landfill in Manahawkin, we visited the leader's *Rhynchospora knieskernii* and *Spiranthes tuberosa* transplant plots established in November 2006. This controversial transplanting of rare species had the approval of the Pinelands Commission. While neither species was visible at this time, the initial response in 2007 was positive. It was clear, however, that the beaked rush was under severe stress from competing plants and the absence of suitable soil. In another section of the project's buffer, we saw the following rare plants: *Scleria pauciflora* var. *caroliniana, Pycnanthemum setosum,* and *Eupatorium hyssopifolium* var. *laciniatum.*

The trip concluded at Warren Grove where a small contingent paused to admire Bill Smith's recently constructed bog featuring a spectacular display of pitcher plant species and a variety of other carnivorous plants.

Thanks go to Bill Standaert for maintaining a list of species observed.

Attendance: 22. **Report by leader: Ted Gordon.**

9 August: Bowman's Hill Wildflower Preserve (BHWP), Bucks County, Pennsylvania. Joint trip with the Torrey Botanical Society.

The 134-acre BHWP features over 700 species of plants, along trails in a naturalistic setting. All are species that are native or naturalized in Pennsylvania (though not necessarily in Bucks County). It is a good place in which to observe some plants species that, though more or less local, are rather uncommonly seen in the wild.

The morning of this trip was spent in a three-acre meadow at the entrance of the preserve, where plantings of such species as *Helenium autumnale, Rudbeckia laciniata, Hibiscus moscheutos, Hypericum pyramidatum, Monarda fistulosa, Coreopsis tripteris, Pycnanthemum incanum, Physostegia virginiana, Senna hebecarpa,* and *Lobelia cardinalis* made a fine show and attracted numerous butterflies and photographers. A list of species was compiled to assist the preserve in its ongoing efforts to survey their collections.

After lunch in a picnic pavilion that had been reserved for our use, the field trip group moved into the central area of the preserve and walked the Marsh Marigold Trail, the Violet Trail, and the Audubon Trail. Again, species lists were compiled to complement lists made during a one-day bioblitz earlier in the year. Some of the species seen in bloom or in fruit were *Elephantopus carolinianus, Aralia racemosa, Helianthus decapetalus, Rudbeckia triloba, Agastache scrophulariifolia, Heliopsis helianthoides, Silphium perfoliatum,* and *Monarda clinopodia.*

Many thanks go to the Plant Stewardship Index coordinator, Jeannine Vannais, for her hospitality to the group.

Attendance: 10. Leaders: Karl Anderson and Linda Kelly. **Report by K. Anderson.**

27 September: Delaware Bay Shore, Cumberland County, New Jersey. Joint trip with the Torrey Botanical Society. The trip began in downtown Dividing Creek. Here along

the roadsides the group observed large patches of the non-native grass *Chloris verticillata*, which is currently spreading rapidly on New Jersey's Coastal Plain. The group then made a brief stop to Dividing Creek Crossing to see a small stand of *Eupatorium resinosum* in late bloom in an open boggy area adjacent to the railroad. The group's next stop was along Hansey Creek Road. Here along the roadsides the group saw *Lobelia puberula* and *Solidago latissimifolia* (=*S. elliottii*) in bloom and the rare oak species *Quercus michauxii* and *Q. nigra* in fruit. The group's last stop of the day was a recently disturbed sandy tidal area along Berrytown Road. Here the group identified numerous species of the chenopods, including: *Atriplex patula, Bassia hirsuta, Chenopodium album, Chenpodium ambrosioides, Cycloloma atriplicifolium, Salicornia depressa, Salsola kali,* and *Suaeda maritima.* Two rare species, *Leptochloa fusca* ssp. *fascicularis* (=*Diplachne maritima)* and *Setaria magna,* were also observed here. Attendance 10. **Report by Leaders: Renee Brecht and Gerry Moore.**

Bartonia No. 65: 148–149, 2011

Program of Meetings
September 2007–May 2011

Date	*Subject*	*Speaker*
2007		
27 Sept	Members' Reports on Summer Botanizing	
25 Oct	Benjamin Smith Barton: Naturalist and Physician in Jeffersonian America	Alfred E. Schuyler
15 Nov	Lichens of the Limestone Barrens of the Great Northern Peninsula of Newfoundland	James C. Lendemer
20 Dec	Botanical Collections in the Tepui Highlands of Guyana	Erin A. Tripp
2008		
24 Jan	Revealing Camera Studies of Plants in the Florida Everglades and Keys	Stevens Heckscher
28 Feb	The Diversity and Evolution of Rainforest Tree Communities in the New World Tropics	Benjamin Torke
27 Mar	The Ascomycete Genus *Neolecta* in New England	David Hewitt
24 Apr	Highlights of the Andean Flora	Alina Freire-Fierro
22 May	Rare Plant Conservation in the New Jersey Pinelands	G. Russell Juelg
25 Sep	Members' Reports on Summer Botanizing	
23 Oct	Two Centuries of Philadelphia Botany in Newfoundland	Ann F. Rhoads and Alfred E. Schuyler
20 Nov	To Boldly Botanize: Thomas Nuttall's Explorations in the Early Nineteenth-Century North America	Steve Grund
18 Dec	The Latest on the Systematics of North American *Atriplex*	Elizabeth H. Zacharias
2009		
22 Jan	Ecosystems and Plants of Cambodia and Thailand	Tatyana Livshultz
26 Feb	Notes on the Natural History and Evolution of the Cape Flora, Southern Africa	Chris Hardy
26 Mar	Pennsylvania's "Little Newfoundland": Glacial Till Barrens on the Pocono Plateau	Roger Latham
23 Apr	Unusual Ferns of North America	Robbin Moran
28 May	The Private Life of *Trillium*	John Gyer

24 Sep Members' Reports on Summer Botanizing
22 Oct Darwin and Botany in a Changing World: 150 Years after *The Origin of Species*
19 Nov Rare Plant Conservation in the Pinelands of New Jersey: Some Case Studies . . . . . Emile DeVito
17 Dec Biology and Restoration of *Schwalbea americana* (American Chaffseed) in New Jersey . . . . . Jay Kelley

2010

28 Jan Regularly Managed Native Vegetation: Roadsides and Right-of-Ways. . . . . Steve Eisenhauer
25 Feb Meeting cancelled
25 Mar Origin and Evolution of Beer. . . . . Ernie Schuyler
22 Apr Thomas Horsfield: Philadelphia to Java to London . . . . . Barbara Ceiga and Ernie Schuyler
27 May Vignettes from the Coastal Plain. . . . . Stevens Heckscher
23 Sep Members' Reports on Summer Botanizing
28 Oct Climate Change Research in Northern Mongolia: the Ecology of Warmer Pastures. . . . . Brenda Casper
18 Nov Diatoms: Philadelphia's Most Common Algae are Beautiful and Excellent Ecological Indicators. . . . . Donald Charles
16 Dec Floral Scents, Color and Architecture: A Look at the Floral Phenotypes of Pawpaws (*Asimina:* Annonaceae) . . . . . Kate Goodrich

2011

27 Jan Meeting cancelled
24 Feb Advancing Our Understanding of the Flora of the Northeastern U.S.A. and Adjacent Canada. . . . . Robert Naczi
24 Mar Putting Milkweeds in Context: Reconstructing The Biogeography and Ecology of the Evolution of Floral Novelty . . . . . Tatyana Livshultz
28 Apr Mycorrhizal Fungi and Their Interactions with Plants in Urban Environments . . . . . Amy Karpati
26 May Lewis David von Schweinitz: Mycologist, Botanist, Illustrator . . . . . David Hewitt

Bartonia No. 65: 150–157, 2011

2009-2011 Membership List

Honorary Members

FARLEY, ELIZABETH B.—600 Cathedral Rd., Apt A308, Philadelphia PA 19128, 215-984-8721, EBFAR@comcast.net

SCHUYLER, ALFRED E.—The Academy of Natural Sciences, 1900 Benj. Franklin Pwky., Philadelphia, PA 19103, 215-299-1193, schuyler@ansp.org

Life Members

ARSENAULT, JOE—961 Clark Ave., Franklinville, NJ 08322, njplants@aol.com

BARNARD, EDWARD—8038 Crittenden Street, Philadelphia, PA 19118, nedbarnard@gmail.com

BIEN, WALTER—144 Summit Ave, Langhorne PA 19047, 215-752-3762, wbien205@comcast.net

EISENMAN, SASHA—Temple University Dept. of Landscape Architecture and Horticulture, 201 Dixon Hall, 580 Meetinghouse Road, Ambler, PA 19002, 267-468-8168, eisenman@temple.edu

FRANK, KEN—2508 Pine St., Philadelphia, PA 19103, 215-732-9280, kenfrank@aol.com

FRANKLIN, CAROL—532 W. Springfield Ave., Philadelphia, PA 19118, 215-248-2783

GREENLAND, CHRISTINE MANVILLE—790 E. Street Rd., Warminster, PA 18974, 215-322-4105

GROSS, MICHAEL F.—c/o Georgian Court University Biology, 900 Lakewood Ave, Lakewood, NJ 08701, 732-987-2373, gross@georgian.edu

HEWITT, DAVID A.—Department of Botany, Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103, 617-495-2368, davidhewitt@post.harvard.edu

HOLT, ROBERT J.—1611 Smith Bridge Road, Chadds Ford, PA 19317, 610-584-5578, jack@mobilelifts.com

HURWITZ, ALISHEBA—215 Harrogate Road, Wynnewood, PA 19096, 610-322-1217, ali.hurwitz@gmail.com

IRETON, MARY LOU—213 4th Ave., Haddon Heights, NJ 08035, 856-547-1118

LAUER, DAVID—49 Cornell Ave., Churchville, PA 18966, 215-357-2646, DML1000@comcast.net

MACIEJEWSKI, STEPHEN—2030 Fitzwater St., Philadelphia, PA 19146, teciu@verizon.net

MCLEAN, ELIZABETH—139 Cherry Ln., Wynnewood, PA 19096-1208, 610-642-4196, Epmclean@comcast.net

MCLEAN, WILLIAM—139 Cherry Ln., Wynnewood, PA 19096-1208, 610-642-4196, Epmclean@comcast.net

MOORE, GERRY—East National Technology Support Center, Natural Resources Conservation Service, USDA, 2901 East Lee St., Suite 2100, Greensboro, NC 27401, 336-370-3337, Gerry.Moore@gnb.usda.gov

NOVAK, JANET—19 West Willow Grove Ave, Philadelphia, PA 19118, 215-248-2642, janet@indri.org

O'HERRON, JOHN—PO Box 126, 129 Juniper St., Cornwall, PA 17016-0126, 717-277-0587, joherronII@msn.com

OLSON, WILLIAM—1005 Lakewood-Farmingdale Rd., Howell, NJ 07727, 732-938-3187, Wolson3@optonline.com

PALMER, MATTHEW—1518 Millstone River Rd., Hillsborogh, NJ 08844, 908-359-2073, mp2434@columbia.edu

PATRICK, RUTH—750 Thomas Rd, Philadelphia, PA 19118

PETROW, CAROL—60 McLeod Pond Rd., Glenmoore, PA 19343

QUIGLEY, PATRICIA ANN—1080 Quarry Hall Road, Norristown, PA 19403, 610-584-1829, paqinc@aol.com
RHOADS, ANN—3 Blythewood Rd., Doylestown, PA 18901, 215-348-8139, rhoadsaf@exchange.upenn.edu
ROBERTS, WILLIAM H.—1806 Delancey St, Philadelphia, PA 19103, 215-569-5632, roberts@blankrome.com
STAILEY, HELEN M.—6555 Tabor Ave. Alpha 1709, Philadelphia, PA 19111-5385, 215-697-8037
STALTER, RICHARD—Dept. of Biology, St. John's University, Jamaica, NY 11439, 718-990-6269, stalterr@stjohns.edu
STARTUP, MICHAEL—718 Price St., West Chester, PA 19382, 610-692-5943, mstartup@haverford.edu
STEVENS, CHARLES E.—615 Preston Pl., Charlottesville, VA 22903, 804-293-8658
TEESE, PAUL—1183 Apple Road, Quakertown, PA 18951, 215-862-2924, teese@bhwp.org
THOMPSON, SUE—129 E. Sycamore St., Pittsburg, PA 15211-1719, 412-622-3295, sthomp@andrew.cmu.edu
TREADWAY, SUSAN—1509 Monk Rd., Gladwyne, PA 19035, 610-642-8050, sptreadway@aol.com

Sponsoring Members

CLARKE, TERENCE—15 East 6th Rd., Broad Channel, NY 11693, chelseaclarke@att.net
FERREN, WAYNE JR.—67 Main St., Vincentown, NJ 08088, 609-859-8682, wrfjr1@comcast.net
HENRY FOUNDATION FOR BOTANICAL RESEARCH—P.O. Box 7, Gladwyne, PA 19035-0007, 610-525-2037
JUELG, RUSSELL—79 Grassy Lake Rd., Shamong, NJ 08088, 609-654-6455, russell@pinelandsalliance.org
MCBRIDE, DONNA—4 Gentian Street, Browns Mills, NJ 08015, 609-893-3732, donnamcbride57@gmail.com
MCCOMBE, ROBERT—445 E. Main Street, Moorestown, NJ 08057, 609-313-5000, robmccombe@verizon.net
O'BRIEN, JOAN—PO Box 277, Maple Shade, NJ 08052, 610-329-1029
SOBEL, MARILYN—329 Haverford Place, Swarthmore, PA 19081, 610-604-0604, m_sobel@msn.com
WHITFORD, STEVE—41 Main Street, Port Republic, NJ 08241, whitfordsp@gmail.com

Regular and Student Members

ANDERSON, KARL—46 N. Childs St., Woodbury, NJ 08096-1535, 856-845-7075, karlanderson6@aol.com
ANGUS-ANDERSON, BLAKE—306 Hunter Street, Gloucester City, NJ 08030, 856-456-6132, blakeaaa@comcast.net
ARMSTRONG, REBEKAH—1357 E. Hewson St., Philadelphia, PA 19125, 215-713-7611, rebekah.armstrong@gmail.com
AUSTIN, JASON—419 Hillside Ave., Pine Beach, NJ 08741, 732-966-7541, diamonddobbs@yahoo.com
BAKER, MIKE—6 Hill Lane, Cream Ridge, NJ 08514, 609-577-9004, mike@mikebaker.com
BARRINGER, KERRY—126 Hutton Street, Jersey City, PA 07307, 201-659-1158, kerrybarringer@gmail.com
BAUCHSPIES, JAMES T.—4320 Chetwin Terrace, Easton, PA 18045-4908, 610-253-8925
BAUMGARTEN, JONI—4405 Osage Ave, Apt. 3, Philadelphia, PA 19104, 215-870-5654, joni.baumgarten@gmail.com
BENJAMIN, JESSIE L.—1062 Glen Hall Rd., Kennett Square, PA 19348, 484-887-8612, jessie@taprootnativedesign.com
BESSELMAN, THOMAS H.—147 Canna St, Browns Mills, NJ 08015-2040, oji1160@verizon.net
BEST, JAMES—1262 Ashbourne Rd., Elkins Park, PA 19027, jvb262@comcast.net

BIDDLE, DORRELL—701 Washington Ave., Palmyra, NJ 08065, 856-499-2343, dell2733@aol.com
BINCKLEY, SARAH—8101 Gladstone Road, Wyndmoor, PA 19038, 828-686-7358
BLAUSTEIN, MAXIMILIAN—6102 Ardleigh St., Philadelphia, PA 19138, maximilianjb@gmail.com
BLOCK, TIMOTHY—203 Juniper Court, Zieglerville, PA 19492, 610-754-1885, Block@exchange.upenn.edu
BOWELL, MICHAEL W.—2148 Bodine Rd., Malvern, PA 19355, 610-827-1268, mwb@createascene.com
BOYLE, MARY—1080 Plowshare Road, Blue Bell, PA 19422, 484-231-1408, mboyle299@yahoo.com
BRAXTON, J.W.—4712 Windsor Ave., Philadelphia, PA 19143, 215-724-1571, morbraxton@aol.com
BRECHT, DAWN—2244 East Main St, Millville, NJ 08332, pbfiddler@yahoo.com
BRENNER, HUGH—202 Edgemont Ave, Ardmore, PA 19003, hbrenner54@gmail.com
BUCK, WILLIAM R.—Institute of Systematic Botany, New York Botanical Garden, Bronx, NY 10458-5126, 718-817-8624, bbuck@nybg.org
CANTRELL, GREGORY—48 Mariners Cove, Freehold, NJ 07728, gregory_cantrell@yahoo.com
CARR, DEBBIE—314 E. Highland Ave., Philadelphia, PA 19118, 215-242-0734, carrwechsler@verizon.net
CHAMBERLAIN, AMY—570 State Route 2, Shelburne NH 03581, 207-443-4718, chamberlainedit@aol.com
CHANCE, REBECCA—4200 Pine St. Unit 204, Philadelphia, PA 19104, rebeccachance@gmail.com
CHERRY, LYNN—927 Black Rock Road, Gladwyne, PA 19035, rudy927@yahoo.com
COLE, MARGARET—106 Woodridge Place, Laurel, MD 20724-1800, 202-230-6616, m.e.cole@me.com
CONNOR, JACK—35 Clarks Landing Rd., Port Republic, NJ 08241, jconnor@stockton.edu
CONNOR, JESSE—35 Clarks Landing Rd., Port Republic, NJ 08241
COOMBS, ALEXANDRA—1086 King Road, Apt. FIR-114, Malvern, PA 19355, naturechic14@hotmail.com
COURTNEY, JOHN—439 Gladstone Ave., Haddonfield, NJ 08033, 856-429-4987, courtneyjohn9@gmail.com
CRAWFORD, ALLEN—508 Emma St, Mount Holly, NJ 08060, email@planktonart.com
CROOKS, CARLA—403 Watson Ave, Horsham, PA 19044, carlitacrux@yahoo.com
CUNNINGHAM, ROBERT—9 W. Whites Bog Road, Brown Mills, NJ 08015, beltane00@aol.com
DAVIS, CHARLES A.—1510 Bellona Ave., Lutherville, MD 21093, 410-252-4154, charliedavis1@sigmaxi.net
DAVIS, LINK M.—14 Cemetery Lane, Schwenksville, PA 19473, 610-316-0036, entoman@comcast.net
DE CASTRO, LINDA—1100 Concord Dr., Bridgewater, NJ 08807, lindadecastro@optonline.net
DELL, RACHEL—PO Box 7399, PMB 450, Breckenridge, CO 80424, rachelrdell@gmail.com
DENNE-HINNOV, BOËL—32 Morton Court, Lawrenceville, NJ 08648, 609-921-1272, hinnov2001@yahoo.com
DENNY, GUY—6021 Mount Gilead Rd., Fredericktown, OH 43019-9513, 740-694-6087, guydenny@ecr.net
DIEDRICH, ARMON—502 Highland Terrace, Pitman, NJ 08071, 856-589-8455
DIETRICH, JULIE—2914 W. Flora St., Philadelphia, PA 19121, 215-898-1708, julie2124@gmail.com
DIJOLS, ISABELLE—6626 Morris Park Road, Philadelphia, PA 19151, isabelledijols@yahoo.com
DODDS, JILL—56 Tumble Falls Rd., Stockton, NJ 08559-1309, jsdodds@biostarassociates.com
DORN, RUTH—1014 Dolphin Ave., Croydon, PA 19021, 215-499-0104, rdorn@aesop.rutgers.edu
DOUGHERTY, THOMAS J.—2022 Montrose Street, Philadelphia, PA 19146, tomd52052@comcast.net
EBERT, JANET—1611 Smith Bridge Road, Chadds Ford, PA 19317-9765, 610-459-0585, jack@mobilelifts.com
EDINGER, GREG—442 Ryan Rd., Greenwich, NY 12834, 518-692-1725
ESTEN, JOHN—2401 Pennsylvania Ave. 5C-52, Philadelphia, PA 19130, 215-235-1521

FERGESEN, SUSAN—209 Laurel Court, Morgantown, PA 19543, 610-913-0542, sfergesen@yahoo.com
FIELD, STEPHEN—5 Evelyn Ave., Vineland, NJ 08360
FIELD, THERESA—5 Evelyn Ave., Vineland, NJ 08360
FINE, NORMAN—73 Nature Lane, Sewell, NJ 08080, handnfine@comcast.net
FITTS, BEVERLY—634 Revere Road, Merion Station, PA 19066, 610-667-5468, beverlyfitts@verizon.net
FLANIGAN, TONI ANN—662 West Johnson Street, Philadelphia, PA 19144, 215-858-1692, toniann@philadelphiagardens.com
FOLIN, GRANT—319 Titan Street, Philadelphia, PA 19147, gfolin@verizon.net
FORD, JOANNE B.—729 Westview St., Philadelphia, PA 19119, 215-844-8054, Joanne.B.Ford@gmail.com
FOX, ANN—5741 Cranberry Ct., Egg Harbor City, NJ 08215, atthebog812@verizon.net
FREIRE-FIERRO, ALINA—1147 S Mole St, Philadelphia, PA 19146-3102, alina_ff@yahoo.com
FULLERTON, WILLIAM—1104 Blythe Ave., Drexel Hill, PA 19026, 610-446-0968, sharnbill@msn.com
GARBACK, MARY E.—3839 Janice St., Philadelphia, PA 19114-2826, 215-332-7105
GOFF, ELINOR I.—275 Bryn Mawr Ave., Apt. K17, Bryn Mawr, PA 19010-4246
GOODRICH, KATE—Dept. of Biology, Widener University, 1 University Place, Chester, PA 19013, 610-499-1086, kgoodrich@mail.widener.edu
GORDON, PATRICIA—31 Burrs Mill Road, Southampton, NJ 08088, 609-859-3566, Gordontrish@aol.com
GORDON, TED—31 Burrs Mill Road, Southampton, NJ 08088, 609-859-3566, pbitgordon@aol.com
GRACIE, CAROL—19 North Lake Circle, South Salem, NY 10590-1014, carol.gracie@gmail.com
GRAY, DENNIS—668 Princeton Ave., Collingswood, NJ 08108, 856-858-6642, gray@marine.rutgers.edu
GREMBOWICZ, DUANE—2210 Tiiu Court, Toms River, NJ 08755, 732-349-0364, dgrembowicz@ocean.edu
GRIM, DEBRA—710 Valentine Street Apt 2, Bellefonte, PA 16823, 814-234-2344 ext 223, dgrim@intelliqresearch.com
GRUND, STEVEN—1609 Cumberland St, Pittsburgh, PA 15205, SGrund@paconserve.org
GYER, JOHN—P.O. Box 185, Clarksboro, NJ 08020, 856-423-3889, fernhill@voicenet.com
HACKER, SUSAN—1501 Darmstadt Ave., Egg Harbor City, NJ 08215, 609-965-3297, susanspero1@verizon.net
HAEGELE, ELIZABETH—235 Mather Road, Jenkintown, PA 19046, haegele@sas.upenn.edu
HALLIWELL, THOMAS—19 Kings Rd., Netcong, NJ 07857, 973-347-6071, tbhalliwell@optonline.net
HARDESTY, GAIL—488 Big Oak Road, Morrisville, PA 19067, evergreem@aol.com
HARLAN, MARGARET—811 Quaker Hill Rd., Warren, PA 16365, 814-406-4239, maggie811@atlanticbb.net
HARRIS, JESSIE M.—4401 W St NW, Washington, DC 20007-1133, 202-338-9083, jes405@hotmail.com
HARRIS, LOUIS C.—1002 Abington Rd., Cherry Hill, NJ 08034, lougail58@verizon.net
HEAVERS, NATHAN—171 Longview Drive, Princeton, NJ 08540, heavers@gmail.com
HECKSCHER, STEVENS—1030 E. Lancaster Ave. Apt. 314, Bryn Mawr, PA 19010, 610-527-6607, sheckscher103@comcast.net
HELD, MICHAEL E.—Department of Biology, St. Peter's College, Jersey City, NJ 07306, 201-761-6430, mheld@spc.edu
HELM, SARA—303 W. Miner St., Apt. 2 Rear, West Chester, PA 19382, sara.helm.wallace@gmail.com
HENDERSON, LARRY—420 Willowbrook Drive, Norristown, PA 19403, 484-744-7035, allbethere@comcast.net
HOESS, CHRISTOPHER—18 Capano Dr. Apt. C5, Newark, DE 19702, choess@stwing.org

HOLMES, MARION—438 South 44th St., Philadelphia, PA 19104, a.triphyllum@gmail.com
HREHA, ALYCE—639 Lafayette Ave., Trenton, NJ 08610, 609-888-2672, alycehreha@optonline.net
HUGHES, COLIN—P.O. Box 707, Exton, PA 19341, 610-524-0424, km2442@comcast.net
HUGHES, STUART—721 E. Butler Pike, Maple Glen, PA 19002, stuhu2@comcast.net
HUMBERT, KAREN—2401 Pennsylvania Ave., # 7A6, Philadelphia, PA 19130, kchumbert@hotmail.com
HUTCHEON, DAVID—3229 Iris Ave., Trevose, PA 19053, 267-994-5103, davidhutcheon@comcast.net
INSKEEP, MICHAEL—412 N. Wayne Ave. Apt. 204, Wayne, PA 19087, 610-989-9358, mike@gentlehelpers.com
JAKUBOWSKI, ANNA—818 Bainbridge, Apt 3, Philadelphia, PA 19147, jakubowski_anna@yahoo.com
JANOSKI, JEFFREY—1801 Buttonwood St. Suite 1610, Philadelphia, PA 19130, janoski@sas.upenn.edu
JENEY, ROBYN—6 Chestnut Ave., Haddon Township, NJ 08108, 856-287-3727, robyn_jeney@hotmail.com
JESS, ROBIN—55 Lahiere Ave., Edison, NJ 08817, 732-572-5928, rjess5928@aol.com
JOHNSON, ALAN—63 Central Avenue, Audubon, NJ 08106-1903, aajohnson1@gmail.com
JOHNSON, KATHERINE—312 E. Gorgas Ln., Philadelphia, PA 19119, 267-614-0587, bluejaykj-PBC@bacteriophages
JOHNSON, KIRSTEN—550 W University Pky, Baltimore, MD 21210, kirsten2924@gmail.com
KARGER, MERMIE—P.O. Box 707, Exton, PA 19341, 610-524-0424, km2442@comcast.net
KELLY, LINDA—60 Forest Drive, Lakewood, NJ 08701, 732-363-1266, kellyLC01@aol.com
KHAN, NANCY—4323 Osage Ave., Philadelphia, PA 19104, nancyrkhan@yahoo.com
KIMELMAN, GAY—2212 St. James St., Philadelphia, PA 19103, 215-563-0285, gkimelman@yahoo.com
KLIGMAN, DOUGLAS—1198 Rossiter Lane, Radnor, PA 19087, 484-432-0794, kligahm@earthlink.net
KLOTZ, LARRY—27 Colonial Ct, Shippensburg, PA 17257-9588, 717-532-8978 (h) 717-477-1402 (w), larry_klotz@hotmail.com
KOBLER, EVELYN—118 South 21st Street #106, Philadelphia, PA 19103, 215-988-1774, koblerev@verizon.net
KUNA, JOSEPH—3523 Hamilton St., Philadelphia, PA 19104, joseph.kuna@yahoo.com
LAIDIG, KIM J.—712 Wood Lane, Haddonfield, NJ 08033, 856-354-3296, kim.laidig@gmail.com
LAMONT, ERIC—717 Sound Shore Rd., Riverhead, NY 11901, 631-722-5542, elamont@optonline.net
LATHAM, ROGER—P.O. Box 57, Rose Valley, PA 19086-0057, 610-565-3405, rel@continentalconservation.us
LECK, CHARLES—105 Kendall Rd., Kendall Park, NJ 08824, 732-821-8310, leck@rider.edu
LECK, MARY—105 Kendall Road, Kendall Park, NJ 08824, 732-821-8310, leck@rider.edu
LEE, LINDA—15 East 6th Road, Broad Channel, NY 11693, 718-945-5009, chelseaclarke@earthlink.net
LEFEVRE, WILLIAM M.—Duke University, 420 Anderson St., Box 90341, Durham, NC 27708-0341, bill.lefevre@duke.edu
LENDEMER, JAMES—1245 Park Ave. 16J, New York, NY 10128, 215-801-6948, jlendemer@nybg.org
LEVIN, MICHAEL H.—414 Mill Rd., Havertown, PA 19083, 610-449-7400, eraincmhl@aol.com
LEWANDOWSKI, RICK J.—Mt. Cuba Center, P.O.Box 3570, Greenville, DE 19807-0570, 302-239-4244, rlewandowski@mtcubacenter.org
LIVSHULTZ, TATYANA—2122 Mt. Vernon St., #2, Philadelphia, PA 19130, 617-710-7090, livshultz@ansp.org
LOEFFLER, CAROL—Biology Department, Dickinson College, P.O.Box 1773, Carlisle, PA 17103-2896, 717-245-1360, loeffler@dickinson.edu

LoFurno, Michael—2028 Fitzwater St., Philadelphia, PA 19146, 215-732-0849, mlfcomp@aol.com

Longwood Gardens Library—P.O. Box 501, Kennett Square, PA 19348-0501, 610-388-5440, library@longwoodgardens.org

Lynch, Jean—PO Box 127, Cape May, NJ 08204, jean.lynch.1@gmail.com

Maher, Carole—774 W. Church Road, Elkins Park, PA 19027, carolemaher@verizon.net

Maier, Agnes Lee—1815 JFK Blvd. Apt. 2209, Philadelphia, PA 19103, 267-773-7784, maier.agnes@gmail.com

Malone, Sara—1275 County Road 519, Frenchtown, NJ 08825, 908-996-3402, malonesa@sas.upenn.edu

Martin, Harris W.—5100 Bay Rd., Bensalem, PA 19020, 215-208-5264, harrismartin3@yahoo.com

Mattan, Steve—1475 Mt. Holly Road, B5 Cooper Valley Village, Edgewater Park, NJ 08010, 609-877-4292, stevemattan@comcast.net

McAvoy, William A.—1291 Fords Corner Rd., Hartly, DE 19953, 302-492-3541, william.mcavoy@state.de.us

McConnell, Scott—PO Box 572, Haddonfield, NJ 08033, scitchyrooroo@yahoo.com

McCrea, Esther J.—404 Cheswick Place, Apt. 408, Bryn Mawr, PA 19010, 610-527-1089

McGanney, Juliana—2307 Lombard Street, Philadelphia, PA 19146, 917-309-6222, juliemcganney@gmail.com

McKay, Nan—Box 370, 214 Pennsylvania Ave, Mt. Gretna, PA 17064, nanmckay@gmail.com

Mellon, Richard—200 South Flint Court, Yardley, PA 19067, 215-493-0697, RMellon@voicenet.com

Melton, Mary Beth—40 Jennings Rd., Medford, NJ 08055, 609-790-6044, mltn_mrybth@yahoo.com

Mickle, Ann M.—Department of Biology, LaSalle University, 1900 W. Olney Ave., Philadelphia, PA 19141, 215-951-1254, mickle@lasalle.edu

Milner, Norma M.—305 Westtown Circle, West Chester, PA 19382-7653, 610-344-0860, normamilner@comcast.net

Mitchell, John—25 Central Park West Apt. 9P, New York, NY 10023, 917-842-6940, katherinemitc@gmail.com

Mitchell, Katherine—25 Central Park West Apt. 9P, New York, NY 10023, 917-842-6940, katherinemitc@gmail.com

Montgomery, James—Ecology III, Salem Blvd, Berwick, PA 18603, 570-542-2191, jimm37@verizon.net

Moroz, Andrei—1245 Park Ave. 16J, New York, NY 10128, 215-801-6948, jlendemer@nybg.org

Morris, Wayne—45-12 Pearson Street, Long Island City, NY 11101, 718-361-7627, treeman16@msn.com

Morse, Larry—PO Box 34237, Washington, DC 20043, 202-347-6822

Mueller, Betty Lois—118 Race St., Apt. 11, Kennett Square, PA 19348, 610-444-9977, seagull9977@verizon.net

Murphy, Mary—2042 Maplewood Ave., Abington, PA 19001, 215-694-4222, bam842@cs.com

Naczi, Robert—New York Botanical Garden, 2900 Southern Blvd., Bronx, NY 10458, 718-817-8087, rnaczi@nybg.org

Neswald, Barbara—2034 Arch St., Philadelphia, PA 19103, 215-563-5412, b.neswald@comcast.net

Newstead, Edwin—270 Roseland Ave., Essex Fells, NJ 07021, 973-226-7651, enew001@aol.com

Nickerson, Gary W. Jr.—159 Holly Ave, Penndel, PA 19047, gwn099@gmail.com

O'Brien, Terry—3 Mystery Rose Lane, West Grove, PA 19390, 484-667-8418, obrien@rowan.edu

Page, Martin—9 Old Covered Bridge Rd, Newtown Square, PA 19073-1211, Martin_Page@msn.com

PANCHEN, ZOE—1014 Christina Mill Dr., Newark, DE 19711, 302-353-9052, zoepanchen@sympatico.ca
PEREZ, MIGUEL—234 Broughton Lane, Villanova, PA 19085, mikiperez@comcast.net
PEREZ, NYKIA—2125 E. Norris St., Philadelphia, PA 19125, 215-284-6383, nykia.perez@gmail.com
PLYLER, DOROTHY—418 Crosslands Dr., Kennett Square, PA 19348-2050
PUNNETT, HOPE—6635 Wissahickon Ave, Philadelphia, PA 19119, hpunnett@verizon.net
RADIS, RICHARD—69 Ogden Ave., Rockaway, NJ 07866, 973-586-0845, isotria@verizon.net
ROCHE, LESLIE—73 Hull Ave., Freehold, NJ 07728
ROSENBERG, ANN—5 Westview Road, Bryn Mawr, PA 19010, 610-525-8683, rosiebig@voicenet.com
ROSENBERG, DICK—5 Westview Road, Bryn Mawr, PA 19010, 610-525-8683, rosiebig@voicenet.com
RUCH, PAMELA—228 Cherokee St., Emmaus, PA 18044, 484-225-6679, pamruch@hotmail.com
RUDYJ, ERICH S.—1021 Irwins Choice, Bel Air, MD 21014, 410-420-8973, erudyj@aol.com
RUE, MARGARET—209 Arden Rd., Gulph Mills, PA 19428
SCHMIDT, GERRIE—733 Bradford Alley, Philadelphia, PA 19147, 267-324-3081, gerriehope@gmail.com
SCHMITT, WILLIAM—1470 Burgoyne Road, Downingtown, PA 19335, 610-363-7693, schmitt@temple.edu
SCHNEIDER, GEORGE—345 Nursery Rd., Wellsville, PA 17365, 717-292-4035, gwsam@att.net
SCHNEIDER, WILLIAM—340 Sugartown Road, Apt. C93, Devon, PA 19333, 610-964-0210, schndrw@aol.com
SCHUBERT, PAUL—16 Midland Road, Apt. D, Springfield, PA 19064, 610-328-2759, paulschubert88@yahoo.com
SCOTT, JOHN—55 Hertzog School Road, Mertztown, PA 19539, 610-682-2809, johnscott302@aol.com
SETTLEMYER, KENNETH T.—219 Maple St., Jersey Shore, PA 17740, 570-398-2546, ksettlem1@comcast.net
SILLER, DAVID—518 Burnham Road, Philadelphia, PA 19119, beezsveet@gmail.com
SLATER, MICHAEL—44121 New Holland Road, Mohnton, PA 19540, 610-775-3757, mslater@voicenet.com
SMEJKAL, BILL—97 Old Well Road, Easton, PA 18042, isotria@verizon.net
SMITH, A. WILLIAM—1408 Route 539, Warren Grove, Barnegat, NJ 08005-3010, 609-709-0769, bogmanbill@gmail.com
SMYTH, BRAD—840 S. 3rd Street, Philadelphia, PA 19147, smyth555@yahoo.com
SOLOMON, SEAN—6626 Morris Park Road, Philadelphia, PA 19151, isabelledijols@yahoo.com
SPITZ, LAUREN—370 David Drive, Langhorne, PA 19047, 267-391-6286, lauren.spitz@comcast.net
STAHL, STANLEY—104 Harvard Ave., Lancaster, PA 17603, 717-293-0292, sweepersuzi@yahoo.com
STANDAERT, WILLIAM F.—45 Maltbie Ave., Apt. 19B, Midland Park, NJ 07432, 201-612-9069, wfszzz@aol.com
STANTON, MICHAEL—15 Higbee Ave., Somers Point, NJ 08244, Michael0448@comcast.net
SWEETMAN, HAROLD—631 Berwyn Baptist Rd., Devon, PA 17333
SZUTARSKI, MARK—2301N Lakeshore Drive, Browns Mills, NJ 08015-2909, 609-735-1382, mszuta1046@aol.com
TAYLOR, SARAH—3622 Calumet St., Philadelphia, PA 19129, 610-357-0564, sarahlatifa@hotmail.com
TERRAMIN, NANCY—66 Llangollen Lane, Newtown Square, PA 19073, nterramin@gmail.com
TIPPING, CHRIS—1080 Plowshare Road, Blue Bell, PA 19422, 484-231-1408, mboyle299@yahoo.com
TREHER, AMANDA—426 Burnside Street, Apt 2, Annapolis, MD 21403, amanda.treher@gmail.com
TREXLER, NANCY—7501 Germantown Ave, Philadelphia PA 19119-1606, 215-242-1309, ntrexler@

mac.com
VERNICK, SANDRA—44 Seven Oaks Circle, Holmdel, NJ 07733, sandra.barenbaum@gmail.com
WECHSLER, DOUG—314 E. Highland Ave., Philadelphia, PA 19118, 215-242-0734, carrwechsler@verizon.net
WEINGARTNER, LORI—6358 Germantown Ave., Philadelphia, PA 19144, lrwxyz@yahoo.com
WHITE, DAVID—116 E. Franklin Ave., Edgewater Park, NJ 08010, 609-877-7950, whitedew@comcast.net
WILHELM, DONNA—6115 McCallum St., Philadelphia, PA 19144, 215-843-7987, donnawilhelm@verizon.net
WILLIAMS, CARL—P.O. Box 347, Hereford, PA 18056, 215-679-9196
WILLIAMS, DAVID L.—61 Coppermine Road, Princeton, NJ 08540, 732-297-0642, idwill@comcast.net
WILLIAMS, ELENA A.—178 Ewing St., Princeton, NJ 08540-2722
WILLIG, SALLY—190 Sycamore Lane, Phoenixville, PA 19460, 610-933-3539, sawillig@verizon.net
WILSON, RACHEL—66 Aspen Way, Schwenksville, PA 19473, 215-951-5497 or 610-287-6137, wilsonr@philau.edu
WILSON, RONALD M.—3740 Ridge Road, Snow Hill, MD 21863, 410-632-3892, rmwilson@comcast.net
WINDISCH, ANDREW—1509 Rt 532, Chatsworth, NJ 08019, 609-726-9054, a.windisch@hughes.net
WOLINSKI, JEFF—36643 Morrisonville Road, Lovettsville, VA 20180, 540-882-4947, jeff@jeffwolinski.com
YOUNG, MARK S.—2800 Forest View Ave., Baltimore, PA 21214-3109, 410-254-0419, asmarked@comcast.net

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