

Title: Proposed Status Change for *Symphyotrichum dumosum* (L.)
G.L.Nesom in the State of Pennsylvania

Author: Sara M. Helm

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Abstract:

Symphyotrichum dumosum (L.) G.L.Nesom has a status of Tentatively Undetermined (TU) in the State of Pennsylvania. Based on herbarium specimens collected between 1860 and 2000, and environmental conditions similar to those from where *S. dumosum* was collected, 20 locations in 4 counties in southeastern Pennsylvania were surveyed for evidence of extant populations. Three extant populations were found; two in Chester County where herbarium specimens had been collected in the past, and one new occurrence in Bucks County. A fourth extant population exists in Erie County, but this area was not surveyed due to knowledge that the population there is still viable. Due to the small numbers of occurrences and individual plants, a status change of Pennsylvania Endangered (PE) is recommended.

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BACKGROUND

Symphotrichum dumosum (L.) G.L.Nesom, a perennial, herbaceous plant in the Asteraceae, is found in Ontario and all eastern states in the US except Maine, and as far west as Wisconsin, Iowa, Missouri, Oklahoma and Texas. Known commonly as bushy aster, it spreads rhizomatously or reproduces by seed. The inflorescence, which blooms from August to early November, is made up of yellow reproductive disk flowers that fade to purple, surrounded by light blue to white sterile ray flowers. It grows from 3-9 decimeters high, has alternate branching, linear-oblongate sessile leaves along the stem, and numerous reduced leaves on the peduncle below the inflorescence (Rhoads and Block, 2007). Historically, it has been found in Pennsylvania on many rock substrates, including diabase, hornfels, and serpentinite, in environments spanning from dry barrens, fields, pastures, and open woods, to bogs, marshes, fens, and sandy shores of lakes and ponds (Flora of North America, 2006).

The Vascular Plants Technical Committee (VPTC) of the Pennsylvania Biological Survey is a cooperative made up mostly of volunteer scientists who work to provide plant occurrence data to the Pennsylvania Natural Heritage Program (PNHP), which maintains locational and biological information on vascular plants listed as species of special concern.

The VPTC has given *Symphotrichum dumosum* a status of TU, or Tentatively Undetermined. This is a status that indicates that the species is believed to be of conservation concern, but that there is not enough evidence to assign it some other status. The other statuses for species of special concern are: Pennsylvania Rare (PR) - 21-50 extant sites or 10,000-100,000 individuals; Pennsylvania Threatened (PT) - 6-20 extant sites or 5,000-10,000 individuals; Pennsylvania Endangered (PE) - 1-5 extant sites or less than 5,000 individuals; Pennsylvania Extirpated (PX) - not documented for 50 years or otherwise known to be extirpated (PA DCNR, 1988).

It is important for plants to be listed by PNHP with statuses other than TU. Tracking numbers of plants over time can give scientists and others some insight into the past, present, and future viability of an ecosystem. When a plant is listed as PE or PT, the plant, its parts, and the land that supports the plant is protected by the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) under the federal Wild Resource Conservation Act of 1982, (P.L. 597, No. 170), 32 P.S. §§ 5301-5314. Under this act, the PA DCNR also has the ability to designate sites where these species occur as wild plant sanctuaries.

METHODS

Label information was obtained from 58 (excluding duplicates) dried, pressed *S. dumosum* specimens in five major Pennsylvania herbaria. These specimens were collected between 1860-2000, from a total of 28 locations in 11 Pennsylvania counties. This label information included: month, day, and year collected; collector name and collection number; nearest town to collection site; specific collection site locality information; any other collector notes; corrected annotations, annotator name, and year annotated. The herbaria from which the label information was collected are: Academy of Natural Sciences (PH), Carnegie Museum of Natural History (CM), Morris Arboretum of the University of Pennsylvania (MOAR), North Museum of Natural History and Science (FMC), and Pennsylvania State University (PAC). Occurrence information from the Pennsylvania Natural Heritage Program (PNHP) was also obtained, but did not add to the herbarium information.

Based on locality information from these herbarium specimens, seven of the specimen collection sites were re-visited to determine if *S. dumosum* is currently extant there. Twenty-one sites were not visited due to: vague locality information on the herbarium sheets, human construction of buildings and roads since the collection of the specimens, native aggressive or non-native species invasions, and respected field botanists' knowledge that *S. dumosum* does or does not occur there.

When found, samples of *S. dumosum* were taken and new herbarium specimens were made and stored at MOAR. Soil samples were taken at two of the sites, in an attempt to understand the pH, nutrient, and mineral content that *S. dumosum* prefers. Surrounding flora was identified and noted, as well as any topographic and environmental conditions of interest.

In addition to the historical sites, 13 sites were visited where *S. dumosum* had not previously been documented to occur. These sites typically had some environmental factor in common with the historical sites, such as similar rock substrate, similar soil nutrient or mineral levels, or similar hydrologic features.

RESULTS

There were seven sites where *S. dumosum* was known to occur, based on herbarium specimens collected in the last 25 years. Based on correspondence with a respected botanist, *S. dumosum* is known to occur on one of those sites, and after exploring four more of those sites, it was found to occur on only two. The two unexplored locations are private properties that have likely been overgrown by invasive species. An additional property was explored where *S. dumosum* had never been known to occur, so the total adds up to four known extant occurrences

of *Symphyotrichum dumosum* in the state of Pennsylvania. The four sites are: Presque Isle State Park in Erie County, Chrome Barrens in southern Chester County, Willisbrook Preserve in eastern Chester County, and a private property known as the McArthur Property in northern Bucks County.

Herbarium specimens from the years 1860-2000 show that *S. dumosum* has occurred in 28 locations in the state of Pennsylvania (Table 1). There have never been large numbers of occurrences of *Symphyotrichum dumosum* in the state of Pennsylvania in any 25 year period. The largest number of herbarium-vouchered occurrences of *S. dumosum* in any 25 year period since 1860 is 15, between the years of 1921-1946.

See Table 2 for a list of the seven sites surveyed based on historic specimens, and Table 3 for the 13 sites surveyed not based on herbarium specimens. Table 4 shows the 21 remaining historic sites and the reasons for not surveying them.

Two of the four sites where *S. dumosum* occurs, Chrome Barrens and Willisbrook Preserve, were surveyed due to historic records. One site, the McArthur Property, was a site where *S. dumosum* was not previously known to exist. The fourth site, Presque Isle State Park, was not surveyed, but *S. dumosum* is known to exist there based on a fellow botanist's knowledge (J. Bissell, email correspondence, October 31, 2008).

On September 10, 2008, there were about 200 individuals of *Symphyotrichum dumosum* on Chrome Barrens near the top of an east facing slope, in full sun and dry conditions, on serpentinite rock substrate. Three soil samples taken there showed very low levels of phosphate (P_2O_5), potash (K_2O), and calcium (CaO), and the pH level averaged 5.8. The magnesium content was very high. None of these mineral or nutrient levels were quantified. Appendix A shows a list of the surrounding plants.

At Willisbrook Preserve on September 12, 2008, there were about 1000 individual plants of *S. dumosum*, near the top of both the north and south facing slopes of a small hill, in full sun and dry conditions, on serpentinite rock substrate. Six soil samples taken there showed very low levels of phosphate (P_2O_5), potash (K_2O), and calcium (CaO), and the pH level averaged 5.7. The magnesium content was very high. None of these mineral or nutrient levels were quantified. Appendix B shows a list of the surrounding plants.

On the McArthur property on October 2, 2008, about 100 individual plants of *S. dumosum* were found in the seasonally wettest part of an old field, in full sun to part shade, on hornfels substrate. The shade was provided by *Acer rubrum*, or red maple. Appendix C shows a list of the surrounding plants.

At Presque Isle State Park, *S. dumosum* occurs on a palustrine sand plain, in wet conditions. The present estimated population is about 1,000 plants when Lake Erie is high or 200-300 plants during low level years. *Phragmites australis*, or giant reed, and *Typha angustifolia*, or narrow-leaf cattail, are invading this habitat (J. Bissell, email correspondence, October 31, 2008).

It is not known whether the *Symphyotrichum dumosum* found at any of these sites were seed-produced plants or if they had spread rhizomatously.

DISCUSSION

Importance of Species Conservation

All species in an ecosystem interact on some level with each other. Some species may appear to have more of an environmental impact than others, but it is impossible for humans to know every way in which one particular species impacts the species and habitats around it. This is explained well in Paul Ehrlich's analogy:

Society should no more assume abundant functional redundancy among populations and species and exterminate them *ad lib* than a pilot should pop rivets from the wing of his aircraft and sell them based on a similar redundancy assumption.

In other words, humans must preserve species and population diversity, because the extinction of a species may be a catalyst in impairing the future of the planet.

Status Change Proposal

As of 2008, *Symphyotrichum dumosum* occurs in four known locations in the State of Pennsylvania, with a total of 1500-2300 individual plants. The definition of Pennsylvania Endangered (PE) is: 1-5 extant sites or less than 5,000 individuals (PA DCNR 1988). Therefore, the recommendation is that the status of *Symphyotrichum dumosum* should change from TU to PE.

Recommendations for Management for Perpetuity of the Species

Because the numbers of occurrences of *S. dumosum* are low, preservation of its existing habitat is recommended, so that the current populations can continue to be viable and perhaps grow in number.

Chrome Barrens is currently owned by The Nature Conservancy, which occasionally manages the land there with prescribed fire and invasive plant removal to preserve the general prairie habitat found there. This management should continue and likely will continue, as The Nature Conservancy's mission is to protect species by preserving the land and water that the species require for growth and reproduction.

Willisbrook Preserve is owned and consistently managed by the Natural Lands Trust, who also uses prescribed fire and other methods to maintain the prairie habitat. This property and other properties owned by the Natural Lands Trust are managed for preservation and protected from development. This management should also continue and likely will continue, as the Natural Lands Trust acquires, protects, and manages land for preservation of species with the intent of doing so forever.

The McArthur Property is neither protected from development nor managed for preservation. *Acer rubrum* is growing in the wet field where *Symphyotrichum dumosum* is found, so the ecosystem there is going through a natural succession from old field to wooded lot. Recommended management for preservation of *S. dumosum* would be to remove the *A. rubrum* and any other trees and invasive plants that are encroaching upon the field.

Presque Isle State Park is owned and managed by the State of Pennsylvania as a natural recreation area, but is not managed specifically for preservation of the species that occur there. In 1985, there were about 5000 plants there on a year when the level of Lake Erie was high, and now there are about 1000 plants there when the level is high (an 80% decline in 23 years). This is likely due to two plant species (*Phragmites australis* and *Typha angustifolia*) invading *S. dumosum*'s habitat there, so management for removal of these species should be more aggressive, if the numbers of *S. dumosum* are to remain stable or increase.

Symphyotrichum dumosum could also be a candidate for *ex situ* conservation. This would mean propagating the species outside of its natural environment, so that if its habitat is lost, it will at the very least be established in private or public gardens. This is not the preferred method of preservation, but when faced with the possibility of extirpation, it is a reasonable alternative to *in situ* maintenance of species perpetuity.

Possibilities for Further Study

S. dumosum is found in both wet (palustrine sand plain and wet field) and dry (serpentine barrens) conditions. Though the hydrology of these areas seems opposite, they are low nutrient conditions, so plant and fungal competitors may be different, or lacking. Nutrient level and competition level studies would assist with the culture requirements of *S. dumosum* for both *ex situ* and *in situ* conservation.

It is unknown whether the plants within populations of *S. dumosum* found in Pennsylvania or other states are genetic clones spread by rhizomes or have genetic diversity via seed dispersal. Knowledge of the genetic diversity of the populations, as well as percent viability of seeds, could help further dictate species perpetuity management practices.

TABLES AND FIGURES

Table 1: Herbarium specimen label information collected from five major Pennsylvania herbaria, sorted by year, from earliest to most recent specimen collected.

Month	Day	Year	Collector name	Collector's number	County	Location	Ancillary location	Herbarium	Accession number	Comment
		1860	H. Dacken	s.n.	Chester			CM	309796	
8	29	1861	T.C. Porter	s.n.	Lancaster	Martic Forge		CM	88339	
9	3	1861	T.C. Porter	s.n.	Lancaster			PAC	72833	
8	18	1862	T.C. Porter		Lancaster	Martic Forge	Swamp, near	PH		
9	17	1868	A.P. Garber		Lancaster	Smithville		PH		
9	17	1868	T.C. Porter	s.n.	Lancaster			CM	88340	
8	30	1889	John K. Small		Lancaster	Smithville	Smithville Swamp	PH	9227	
9	10	1898	C.F. Saunders	510649	Montgomery	Willow Grove	Swamp N of	PH	510649	
9	20-22	1906	O.E. Jennings	s.n.	Erie	Presque Isle		CM	89254	
9	26	1908	Edwin B. Bartram		Chester	Paoli	On serpentine	PH		
9	23	1908	Francis W. Pennell	809	Chester	Sugartown	Sugartown Barrens	PH		

10	16	1910	Edwin B. Bartram	1341	Chester	North Valley Hills		PH		
9	24	1910	Francis W. Pennell	2683	Chester	Sugartown	Sugartown Barrens	PH		
10	16	1910	Edwin B. Bartram	1341	Chester	Valley Forge	Diamond Rock west of	PH		sandy woods edge
Month	Day	Year	Collector name	Collector's number	County	Location	Ancillary location	Herbarium	Accession number	Comment
9	5	1910	Joel J. Carter		Lancaster	Quarryville	Gleisner's Swamp, near	PH		
9	3	1910	Joel J. Carter		Lancaster	White Oak	Gleisner's Swamp, near	PH		
9	3	1911	Edwin B. Bartram	1747	Chester	Nottingham Barrens		PH		
8	9	1913	Harold W. Pretz	6046	Lehigh	Emaus	Springy slope along S side of P.R.R. 3/4 mile SW by S of Emaus, P.O.	PH		
9	2	1921	E.M. Gress	s.n.	Cumberland	Hunters Run		CM	408358	
10	5	1924	Hugh E. Stone		Chester	Sadsburyville	Meadow, near Oldmixon, 2 m. N of	PH		
10	5	1924	Bayard Long	31746	Chester	Sadsburyville	Thicket-margin of swale, West Caln Twp. Upper reaches of Rock Run	PH		
9	18	1927	J. Bright	s.n.	Bucks	Ringing Rocks	Cedar woods, near	CM	88344	
9		1927	W.H.Auxer		Lancaster		Field near filter plant	FMC		Dry waste places

9	11	1927	Harold W. Pretz	13125	Lehigh	Friedensville	Open-scrubby-marshy-springy area beside a rivulet at semi-crest of S. slope about 1 3/4 miles W by NW of Friedensville, P.O. crossroads	PH		Rays white
9	8	1929	Fred McDowell	414	Bucks	Neshaminy	Old field 2 1/2 mi. NW of	PH		
9	8	1929	Hugh E. Stone		Chester	Lincoln University	Meadow, West Branch Elk Creek, near	PH		
9	18	1929	H.E. Stone	s.n.	Chester	Lincoln University	Elk Creek near	PAC	72834	
10	6	1929	Hugh E. Stone		Chester	Nottingham Station	Low ground along railroad 1 mile south of	PH		
11	8	1931	Bayard Long	36003	Bucks	Yardley	Gravel and cobble bar (or island), NW along Delaware River	PH		
10	25	1931	O.E. Jennings	s.n.	Erie	Presque Isle		CM	88342	
Month	Day	Year	Collector name	Collector's number	County	Location	Ancillary location	Herbarium	Accession number	Comment
8	6	1933	Hans Wilkens	2940	Berks	Hopewell	Thicket west of	PH		
9	24	1939	Hans Wilkens	6061	Berks	Hopewell	Clearing in thicket 1 1/4 mile southwest of	PH		
9	9	1939	R.L. Schaeffer, Jr.	5414	Montgomery	Greenlane	2 miles SW of	PH	949097	
9	8	1940	Bayard Long	55058	Delaware	Folsom	Open thickets and clearings near 6th Ave. and Rutledge Ave.,	PH	951359	flowers lilac

9	14	1941	O.E. Jennings	s.n.	Butler	West Liberty	Sphagnum bog, 1.5 mi W of	CM	88343	
9	13	1942	W.C. Brumbach	3444	Berks	Hopewell Furnace	Pine Swamp, 1.5 mi SW of	PH		Damp soil in low woods
9	26	1943	David Berkheimer	4382	Berks	White Bear	Swale, alt. 370 ft. 1/2 mi. wnw of	PH		
8	31	1944	Bayard Long	62070	Bucks	Trevoise	Swale along Philmont Road ca. 0.75 mi. WSW of	PH	925919	
9	17	1944	Bayard Long	62362	Bucks	Trevoise	Swale along Philmont Road ca. 0.75 mi. WSW of	PH		Flowers lavender
9	16	1944	O.E. Jennings	s.n.	Erie	Presque Isle		CM	88341	
8	17	1946	L.K. Henry	s.n.	Berks	Geigertown	Hopewell State Park	CM	88346	moist soil
8	14	1948	W.E. Buker	s.n.	Chester			CM	89261	
10	18	1953	Edgar T. Wherry		Lehigh	Center Valley	Open woods on rocky slope 2 miles east of	PH		
9	10	1973	Robin Hart		Chester	Willistown	Serpentine barren, east of Line Road 1 mile south of Paoli Pike.	PH	941063	
9	10	1985	T.J. Grisez	929	Erie	Presque Isle	Presque Isle State Park, along trail from Budny Beach parking lot to Thompson Bay	CM	319239	sand flat, open
9	18	1986	T.J. Grisez	1039	Erie	Presque Isle	Presque Isle State Park, playing field	CM	320981	wet field
Month	Day	Year	Collector name	Collector's number	County	Location	Ancillary location	Herbarium	Accession number	Comment
10	7	1987	James K. Bissell &	JKB:1987:344	Erie	Erie	Presque Isle State Park: Budny Beach: <i>Myrica--Calamagrostis canadensis</i> palustrine flats just	PH	981789	

			Beverly Danielson				south of lake shore; 1.22 miles and 16 degrees from Perry Monument; Mill Creek Twp.			
9	24	1996	Holt, J.		Chester	Nottingham County Park	Meadow S of nature center parking lot	MOAR		Meadow
10	25	1996	Rhoads, A.F.; Block, T.A.		Chester	Nottingham County Park	along Fitness Trail	MOAR		
9	17	1997	Rhoads, A.F.; Block, T.A.		Chester	Sugartown Barrens	Edge of thickets on serpentine	MOAR		
9	20	1999	Rhoads, A.F.; Block, T.A.		Berks	French Creek State Park	Old field off Harmonyville Rd.; upper sphagnous area near powerlines	MOAR		
10	17	1999	Ebert, J.; Holt, J.		Chester	Elkdale	1.6 km SSE; New London Township; Mt. Hope Rd. about 0.6 mi S of Oxford Rd.; old pond on E side of road; dam of old pond	MOAR		Now mostly shaded by maple.
10	3	1999	Holt, J.		Chester	Forestville	1.1 km ESE; Upper Oxford Township; Grist Mill Farm, open space; 0.5 km S of Baltimore Pike flood plain, wet meadow along E branch Big Elk Creek	MOAR		
10	23	1999	Ebert, J.; Holt, J.		Chester	Upper Oxford Township	ca. 100 yds. N of Cullen Rd.; and ca 0.2 mi. E of Rt. 10; well drained level area above small stream at edge of old pasture	MOAR		
9	18	2000	Rhoads, A.F.; Block, T.A.		Berks	French Creek State Park	Pine Swamp, Kravitz Tract	MOAR		Behind barn

Table 2: Sites surveyed based on herbarium specimens.	
County	Locality
Bucks	Ringing Rocks
Chester	French Creek State Park
Chester	Nottingham County Park
Chester	Chrome Barrens
Chester	Willisbrook Preserve
Montgomery	Frazer's Bog
Montgomery	Green Lane County Park

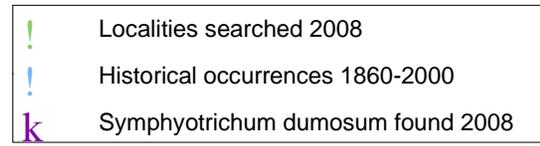
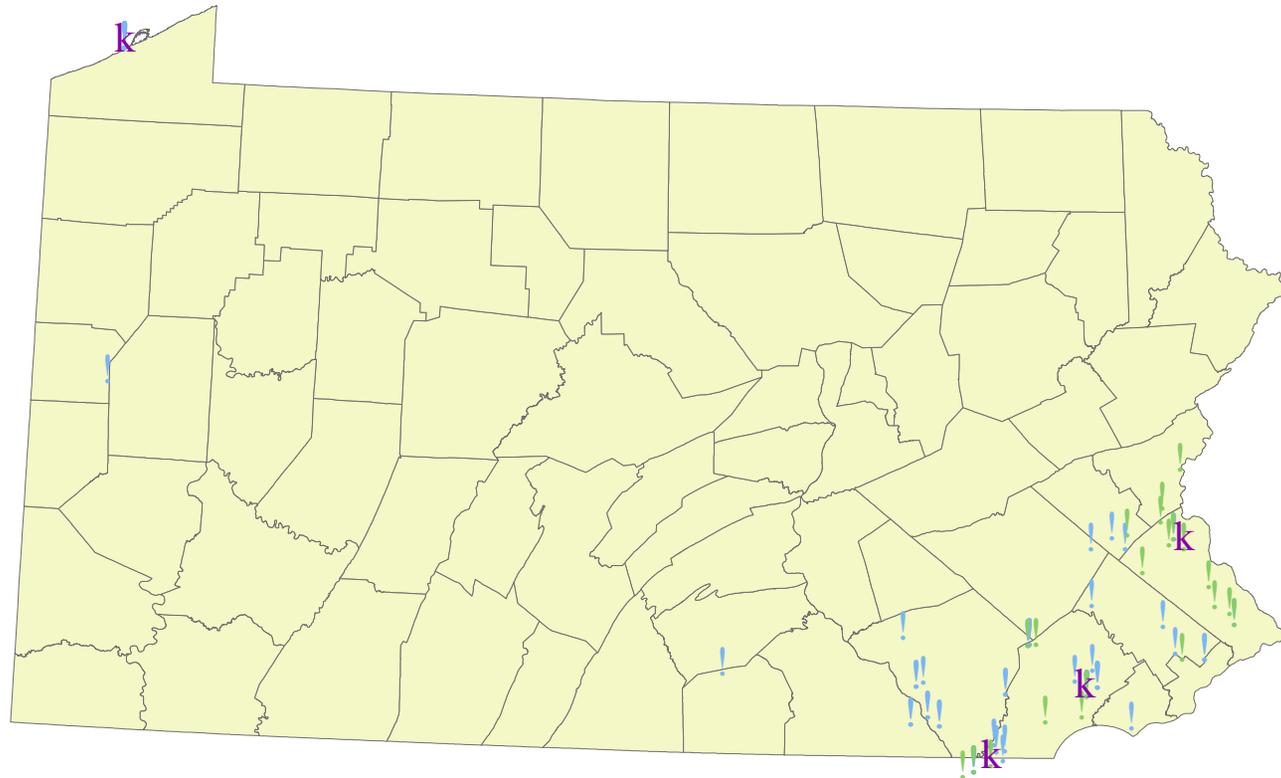
Table 3: Sites based on herbarium specimens that were not surveyed, and reasons for not surveying them.		
County	Locality	Reason for not surveying the site
Bucks	Neshaminy	Grown over by invasive species
Bucks	Trevoise	Urban growth
Butler	West Liberty	Locality too general
Chester	--	Locality too general
Chester	Diamond Rock, Valley Forge	Urban growth
Chester	Lincoln University/Elkdale	Urban growth
Chester	North Valley Hills	Locality too general
Chester	Sadsburyville	Urban growth
Chester	Upper Oxford Twp.	Grown over by invasive species (J. Ebert, phone correspondence, October 2008)
Chester	Forestville	Grown over by invasive species (J. Ebert, phone correspondence, October 2008)
Cumberland	Hunters Run	Locality too general
Delaware	Folsom	Urban growth
Erie	Presque Isle State Park	<i>Symphyotrichum dumosum</i> is known to exist there (J. Bissell, email correspondence, October 31, 2008)
Lancaster	--	Locality too general
Lancaster	Martic Forge	<i>Symphyotrichum dumosum</i> not known to exist there (T. Draude, phone correspondence, October 2008)
Lancaster	Quarryville; Gleissner's Swamp	<i>Symphyotrichum dumosum</i> not known to exist there (T. Draude, phone correspondence, October 2008 and Lancaster County NAI, 2008)

Lancaster	Smithville Swamp	<i>Symphyotrichum dumosum</i> not known to exist there (T. Draude, phone correspondence, October 2008 and Lancaster County NAI, 2008)
Lebanon	Penryn	Locality too general
Lehigh	Center Valley	Urban growth
Lehigh	Emmaus	Grown over by invasive species
Lehigh	Freidensville	Urban growth
Montgomery	Willow Grove	Urban growth

Table 4: Sites surveyed not based on herbarium specimens.

County	Locality
Bucks	Scudder Falls Bridge
Bucks	Washington Crossing Park
Bucks	Bowman's Hill Wildflower Preserve
Bucks	Hal Clark County Park
Bucks	Virginia Forrest Recreation Area Delaware Canal State Park
Bucks	Weisel Youth Hostel
Bucks	MacArthur Property
Chester	Crow's Nest Preserve
Chester	Goat Hill Serpentine Barrens
Chester	Unionville Barrens
Northampton	Raubs Island
Northampton	Wy-Hit-Tuk Park
Northampton	PPL Martins Creek Env. Preserve

Figure 1: County level map of the State of Pennsylvania showing localities searched in 2008, historical occurrences based on herbarium specimens collected from 1860-2000, and localities where *Symphotrichum dumosum* was found in 2008. The size of the symbols does not reflect the area of the localities.



APPENDIX A: List of plant species occurring at Chrome Serpentine Barrens

September 10, 2008

Ageratina aromatica

Deschampsia cespitosa

Dichanthelium clandestinum

Eupatorium pilosum

Euthamia graminifolia

Juniperus virginiana

Pinus rigida

Pinus virginiana

Polygala sanguinea

Prunus serotina

Pycnanthemum tenuifolium

Rubus sp.

Schizachyrium scoparium

Sericocarpus linifolius

Smilax rotundifolia

Solidago nemoralis

Solidago rugosa

Sorghastrum nutans

Symphyotrichum depauperatum

Symphyotrichum dumosum

Symphyotrichum lateriflorum

Talinum teretifolium

Viola sagittata

APPENDIX B: List of plant species occurring at Willisbrook Preserve

September 10, 2008

Ambrosia artemisiifolia

Andropogon gerardii

Asclepias verticillata

Dichanthelium xanthophysum

Eragrostis spectabilis

Euthamia graminifolia

Lonicera japonica

Microstegium vimineum

Panicum philadelphicum

Penstemon digitalis

Phlox subulata

Pinus strobus

Pinus virginiana

Polygonum tenue

Pycnanthemum tenuifolium

Quercus stellata

Rhus typhina

Rubus sp.

Sassafras albidum

Seteria faberi

Smilax rotundifolia

Solidago canadensis

Solidago puberula

Solidago rugosa

Sorghastrum nutans

Symphotrichum depauperatum

Symphotrichum dumosum

Symphotrichum lateriflorum

Verbascum thapsus

APPENDIX C: List of plant species occurring at the McArthur Property

October 2, 2008

Acer rubrum

Aristida sp.

Euthamia graminifolia

Juniperus virginiana

Lonicera japonica

Pycnanthemum tenuifolium

Rosa multiflora

Solidago nemoralis

Solidago rugosa

Sorghastrum nutans

Symphyotrichum dumosum

Symphyotrichum ericoides

Symphyotrichum lateriflorum

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