

VASCULAR FLORA OF THE PENOBSCOT EXPERIMENTAL FOREST, WITH PROVISIONAL LISTS OF LICHENS AND BRYOPHYTES

Subspecies are included as they represent the species in the region. Two *Carex oronensis* and *Clematis occidentalis*, have been documented. Omitted taxa overlap known species (e.g., “*Salix* sp.” in which a single species is indicated), or are thought to be misidentifications. Sixty-two lichen and 49 bryophyte species are included provisionally. More species could be found in surveys for (1) ruderal plants in disturbed ground; (2) species found in the 1960s that are unknown today at the PEF; (3) expected common species of spruce-fir that have not been documented; (4) graminoids, which seem underrepresented; and (5) species in riparian zones and wetlands. The plant checklist could be especially useful in documenting shifts in the flora that might be attributable to climate change. Nomenclature in a new flora of New England differs from the U.S. Department of Agriculture, Natural Resources Conservation Service database in significant ways; both sources should be considered in vegetation research in the PEF.

INTRODUCTION

Plant lists have value for estimating species diversity, summarizing large data sets, pointing out rare species and invasive plants, and stimulating additional study of an area, among many other uses (Palmer et al. 1995). This report is the first comprehensive vascular plant list for the Penobscot Experimental Forest (PEF) in Bradley, Penobscot County, Maine. The PEF is a long-term research site of the Northern Research Station of the U.S. Department of Agriculture (USDA), Forest Service, and is owned by the University of Maine Foundation. Ongoing research is conducted jointly and separately by the Forest Service and the university. The plants have been studied since the 1950s (Kenefic et al. 2006), yet plant species mentioned in peer-reviewed publications have not been compiled into a plant list for the 1,618-ha forest until now. Vegetation has been reported especially regarding changes in overstory composition and tree regeneration in response to silvicultural experiments (Brissette 1996,

Kenefic et al. 2006). Earliest studies focused entirely on valuable timber species, and by the late 1960s, 105 woody plant species were on a list (Safford et al. 1969). Recent studies not only have included silvicultural treatments but also have broadened the focus, emphasizing the herb layer (Dibble et al. 1999, Schofield 2003), epiphytic lichens (Miller et al. 2007, 2008), and invasive plants (Bryce 2009). Observations and surveys apart from the system of Continuous Forest Inventory (CFI) plots (also called permanent sample plots or PSPs) have included some of the roadsides, successional forest, and former agricultural land.

Any flora can have significance for conservation planning in that emphasis tends to fall on species that are seldom collected. Once their rarity is recognized, attention might flow toward further understanding of habitat requirements for such species, and management activities can help assure their continued occurrence within an area. However, common and

Dominant vegetation consists of mixed northern conifers, and has been described as representative of the Acadian Forest (Sendak et al. 2003), an ecotone between the conifer-dominated boreal forest and the hardwoods prevalent southward. The type is characterized especially by red spruce (*Picea rubens*), an economically valuable conifer with low genetic variability (Hawley and DeHayes 1994) that is common in parts of Maine, New Brunswick, and Nova Scotia, with smaller populations in New Hampshire, eastern New York, Vermont, high elevations of the Appalachians farther to the south, and Quebec, and an outlying population in Ontario. With it grow balsam fir (*Abies balsamea*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and northern white-cedar (*Thuja occidentalis*). Also present but rarely dominant are white spruce (*Picea glauca*), black spruce (*P. mariana*), tamarack (*Larix laricina*), and red pine (*Pinus resinosa*). Hardwoods include especially red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), gray birch (*B. populifolia*), quaking aspen (*Populus tremuloides*), and bigtooth aspen (*P. grandidentata*). Additional hardwoods are American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), white ash (*Fraxinus americana*), and sugar maple (*Acer saccharum*).

In the Acadian Forest, natural disturbances tend to be in the form of small gaps rather than stand-replacing events. Fire-return interval and catastrophic windthrow events are thought to occur on a cycle of no less than 800 years, though human disturbance can alter this frequency (Seymour et al. 2002). Longevity of red spruce, eastern hemlock, and northern white-cedar contribute to a stable shade environment unless stands are influenced by timber harvest, insect outbreak, or similar canopy disturbances.

Land use at the PEF has consisted of some timber harvest since the 1790s, especially near Blackman Stream, but not much clearing for agriculture except at the west end of the property. The PEF has been the site of continuous, ongoing silvicultural treatments and monitoring conducted by the U.S. Forest Service,

Northern Research Station since the 1950s. Repeated harvests have been conducted in 10 replicated treatments that include even-age and uneven-age prescriptions with entries from 5-20 years (Kenefic et al. 2006, Safford et al. 1969, Sendak et al. 2003). Approximately 580 CFI plots are arranged within the treatment compartments on a more-or-less evenly distributed pattern that typically avoids the road system and wetter areas. Data have been collected especially on more productive sites and uplands, whereas the wetlands contain fewer plots and have not been thoroughly inventoried.

Valuable knowledge about sustainable forest management has been derived from the data collected in these experiments, with focus on timber management, spruce budworm, coarse woody material, economics, biodiversity, growth and yield modeling, avian habitats, invasive plants in relation to soil properties and silvicultural treatment, and much more. Few stands at the PEF are unharvested old growth; at one time or another, most or all of the forest has

level only. Nomenclature for vascular plants follows the USDA Natural Resources Conservation Service (NRCS) database, an atlas of all vascular plants and some bryophytes in the United States, which is online. The NRCS database is used by the U.S. Forest Service's Forest Inventory and Analysis Program and has gained acceptance for many uses, though its practicality as a sole nomenclatural source for a flora is questionable. Resources such as Haines (2011) that have gained popular usage among Maine botanists make a nationwide treatment less relevant unless the NRCS database reflects recent name changes.

The papers consulted include, in chronological order: Safford et al. 1969, Rinaldi 1970, Dibble et al. 1999 (including unpublished data for PEF vascular plant species that had not occurred with sufficient frequency to be included in analyses for the study), Schofield 2003, Miller et al. 2007, Miller et al. 2008, and Bryce 2009. Effort was made to consult every written document that contains a plant list, including unpublished masters theses that are not in peer-reviewed journals. For observations of ferns, graminoids, shrubs, subshrubs, vines, and forbs, only growing-season data were used. For trees, data collected during other times of year were also used.

Because study objectives and sampling methods differed between studies, plant lists are not directly comparable. For example, in some studies percentage cover of every vascular plant species was included (Bryce 2009, Dibble et al. 1999); in another, percentage cover of grasses, sedges, and rushes was not to the species level (Schofield 2003). The list was evaluated for plausibility as some identifications could be incorrect. Voucher specimens for questionable entries were examined if they were available. Nomenclature for species and family names, and native status (i.e., plants thought to be native to Maine rather than introduced or adventives) follow the NRCS database. Each taxon was assigned a growth form, e.g., fern (or fern ally), herb, graminoid, shrub, subshrub, tree, and vine. No abundance metric was assigned.

In addition to published reports, the checklist includes data from an informal list of lichens that were observed by James W. Hinds and Patricia Hinds during a field meeting of the Josselyn Botanical Society at the PEF in 1994. Nomenclature follows Hinds and Hinds (2007). Bryophyte species information came from several sources. Some bryophytes were included in plot data by Dibble et al. (1999) and Bryce (2009) but most of those were at the genus level. Miller et al. (2007, 2008) found certain epiphytic bryophytes and lichens to be important to invertebrate diversity. Otherwise bryophyte and lichen observations have been incidental in just a few studies at the PEF. Some

were: Massabesic Experimental Forest in Alfred and Lyman, York County (Dibble et al. 2004); Great Pond Mountain Wildlands in Orland, Hancock County; and Coastal Mountains Land Trust properties at Bald and Ragged Mountains, Camden, Knox County. A very well documented land holding, Acadia National Park with headquarters in Bar Harbor, Maine, was used as a far outlier in this comparison because the flora has been recently updated (Mittelhauser et al. 2010), and because bryophytes and lichens are especially well documented there. All these other areas are not necessarily similar to the PEF in terms of elevation; topography; soils; proximity to major water bodies, including the Atlantic Ocean; or forest management. Plant lists for two of the sites¹ are contained in in-house natural resource inventory reports prepared for land trusts, and are used in development of management plans.

As part of the effort to standardize checklists worldwide, this report was contrasted with Palmer et al. (1995) and with a list of desired components for floras, which is under development (M. Palmer, Oklahoma State University, pers. communication). The PEF checklist of vascular plants reported here is in compliance with Palmer's working list of features so that it could be referred to as an example in the standardization of floras and to assure best utility in the future.

RESULTS

More than 300 vascular plant taxa in 71 families and 186 genera were considered appropriate for the PEF checklist (Appendix I), of which 45 species (about 15 percent) are not native to Maine. The list contains five genera for which "sp." is given, meaning that a species was not determined but, in my opinion, is likely to be other than those listed. Ideally the list would be fully resolved to infraspecific taxa; it includes 14 subspecific taxa but for some species it was not possible to resolve further. Vouchers are available for many of these taxa, but not all; collections by Olson et al. (2011), which were examined for this report, are especially useful in documenting the flora. Most are deposited at the Hart Building on the PEF, and unusual species were deposited at the University of Maine Herbarium in Orono. Families that are especially well-represented are the Asteraceae, Rosaceae, Cyperaceae, and Caprifoliaceae (Appendix II, based on NRCS designations). Perennials consisting of forbs, graminoids, shrubs, and trees were the majority of growth forms, with fewer ferns and fern allies, subshrubs, and only a few vines. Two rare plants, *Carex oronensis* (Fig. 1) and *Clematis occidentalis*, have been documented. Ten of the 45 nonnative plants are considered invasive or potentially so according to an unpublished list kept by the Maine Natural Resources Bureau by Olson (Rhams w caciartpcEn <</MCID 432 >>BL



Figure 2.—*Frangula alnifolia*

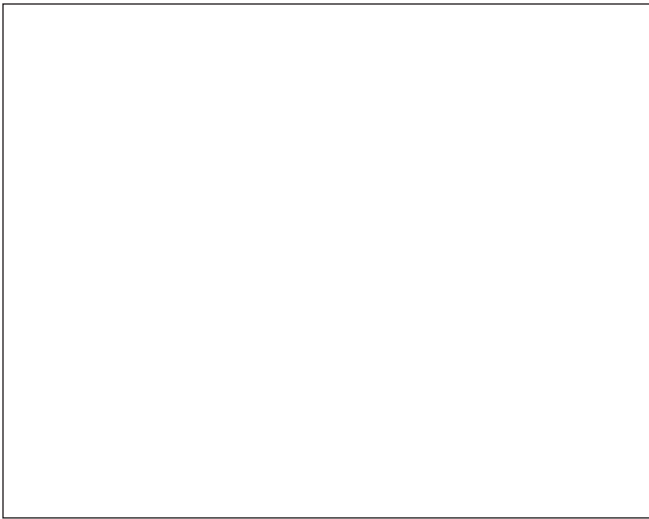


Figure 4.—*Trillium undulatum*, painted trillium. It can tolerate

representing 12.1 percent of the flora, whereas in the entire state, 30.1 percent are nonnative. The percentage at the PEF is not particularly low for small floras (Palmer, pers. communication).

The changes in focus over time for observations at the PEF are reflected in the checklist. Earliest studies focused on the trees valuable for timber; then shrubs were included in the list of Safford et al. (1969).

Rinaldi (1970) quantified trees, shrubs and herbs and the latter were in broad groups, not to species. In the early 1990s, I included percentage cover estimates for all vascular plant species and some bryophytes and lichens in a study of red spruce regeneration habitat that included plots in the PEF, but species with low frequency were dropped for analyses, and a complete list for the PEF was not published. The

most comprehensive plant list for the PEF was Bryce 19w <</MCID 636 BDC 0 -1.3t EMC /Span <</MCID 638 2/Span <</

can be updated and cross-referenced with powerful and widely available Web tools, but the NRCS plant database lags behind important taxonomic treatments including Haines (2011). There is wide expectation

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found that species that had been shown in other studies to frequent shady understory conditions did not always do so at the PEF, so other factors could be involved in their distribution.

et al. 2007). By comparing the number of more flammable species in a checklist to those thought to be relatively unflammable, differences in the fuels might

Dibble, A.C.; Campbell, C.S. 2001. **Conservation status of (Cyperaceae), a Maine endemic.** *Rhodora*. 103: 351-379.

Dibble, A.C.; Rees, C.A. 2005. **Does the lack of reference ecosystems limit our science? A case study in nonnative invasive plants as forest fuels.** *Journal of Forestry*. Oct/Nov: 1-10.

Dibble, A.C.; Rees, C.A.; Sendak, P.E.; Brissette, J.C. 2004. **Vegetation of forested uest fuels.**

APPENDIX I.

Checklist of the vascular plants of the Penobscot Experimental Forest, Bradley, Maine, at the level of species, with family name, growth form, status as nonnative (= *) or nonnative invasive (= **). Nomenclature follows that used in the NRCS database (NRCS 2013). Changes in family (“ ”), genus, species, or subspecies in Haines (2011) are shown.

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Alismataceae	<i>Sagittaria latifolia</i> Willd.		forb	1
Anacardiaceae	<i>Rhus typhina</i> L.	<i>Rhus hirta</i> (L.) Sudworth	shrub	1
Anacardiaceae	<i>Toxicodendron radicans</i> (L.) Kuntze		subshrub	1
Apiaceae	<i>Hydrocotyle americana</i> L.		forb	1
Apiaceae	<i>Sium suave</i> Walter		forb	1
Aquifoliaceae	<i>Ilex mucronata</i> (L.) Powell, Savolainen & Andrews		shrub	1
Aquifoliaceae	<i>Ilex verticillata</i> (L.) A. Gray		shrub	1
Araceae	<i>Arisaema triphyllum</i> (L.) Schott		forb	1
Araceae	<i>Calla palustris</i> L.		forb	1
Araliaceae	<i>Aralia hispida</i> Vent.	(Apiaceae)	subshrub	1
Araliaceae	<i>Aralia nudicaulis</i> L.	(Apiaceae)	subshrub	1
Araliaceae	<i>Aralia racemosa</i> L.	<i>Aralia racemosa</i> L. ssp. <i>racemosa</i> (Apiaceae)	shrub	1
Araliaceae	<i>Aralia spinosa</i> L.	(Apiaceae)	shrub	1
Asteraceae	<i>Achillea millefolium</i> L.*	<i>Achillea millefolium</i> L. ssp. <i>lanulosa</i> (Nutt.) Piper	forb	
Asteraceae	<i>Anaphalis margaritacea</i> (L.) Benth. & Hook.*		forb	
Asteraceae	<i>Doellingeria umbellata</i> (Mill.) Nees		forb	1
Asteraceae	<i>Erechtites hieraciifolia</i> (L.) Raf. ex DC.	<i>Erechtites hieraciifolius</i> (L.) Raf. ex DC. var. <i>hieraciifolius</i>	forb	1
Asteraceae	<i>Eurybia macrophylla</i> L.		forb	1
Asteraceae	<i>Eurybia radula</i> (Aiton) G.L. Nesom		forb	1
Asteraceae	<i>Euthamia graminifolia</i> (L.) Nutt.		forb	1
Asteraceae	<i>Hieracium aurantiacum</i> L.*		forb	
Asteraceae	<i>Hieracium caespitosum</i> Dumort.*		forb	
Asteraceae	<i>Hieracium lachenalii</i> C. C. Gmel.*		forb	

(Appendix I continued on next page)

Appendix I (continued)

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Asteraceae	<i>Hieracium pilosella</i> L.*		forb	
Asteraceae	<i>Hieracium piloselloides</i> Vill.*		forb	
Asteraceae	<i>Lactua canadensis</i> L.		forb	1
Asteraceae	<i>Lapsana communis</i> L.*		forb	
Asteraceae	<i>Leontodon autumnalis</i> L.*	<i>Scorzoneroides autumnalis</i> (L.) Moench	forb	
Asteraceae	<i>Oclemena acuminata</i> (Michx.) Greene		forb	1
Asteraceae	<i>Petasites frigidus</i> (L.) Fr.	<i>Petasites frigidus</i> (L.) Fries var. <i>palmatum</i> (Ait.) Cronq.	forb	1
Asteraceae	<i>Solidago altissima</i> L.	<i>Solidago altissima</i> L. ssp. <i>altissima</i>	forb	1
Asteraceae	<i>Solidago canadensis</i> L.		forb	1
Asteraceae	<i>Solidago gigantea</i> Ait.		forb	1
Asteraceae	<i>Solidago hispida</i> Mulh. ex Willd.	<i>Solidago hispida</i> Mulh. ex Willd. var. <i>hispida</i>	forb	1
Asteraceae	<i>Solidago juncea</i> Ait.		forb	1
Asteraceae	<i>Solidago nemoralis</i> Ait.	<i>Solidago nemoralis</i> Ait. var. <i>nemoralis</i>	forb	1
Asteraceae	<i>Solidago puberula</i> Nutt.	<i>Solidago puberula</i> Nutt. var. <i>puberula</i>	forb	1
Asteraceae	<i>Solidago rugosa</i> Mill.		forb	1
Asteraceae	<i>Symphyotrichum ciliolatum</i> (Lindl.) A. Löve & D. Löve		forb	1
Asteraceae	<i>Symphyotrichum lateriflorum</i> (L.) A. Löve & D. Löve		forb	1
Asteraceae	<i>Symphyotrichum novi-belgii</i> (L.) G.L. Nesom		forb	1
Asteraceae	<i>Symphyotrichum puniceum</i> (L.) A. Löve & D. Löve		forb	1
Asteraceae	<i>Symphyotrichum racemosum</i> (Elliott) G.L. Nesom		forb	1
Asteraceae	<i>Taraxacum officinale</i> F.H. Wigg.*	<i>Taraxacum officinale</i> G.H. Weber ex Wiggers*	forb	
Balsaminaceae	<i>Impatiens capensis</i> Meerb.		forb	1
Berberidaceae	<i>Berberis thunbergii</i> DC.**		shrub	
Betulaceae	<i>Alnus incana</i> (L.) Moench ssp. <i>rugosa</i> (Du Roi) R.T. Clausen		shrub	1
Betulaceae	<i>Betula alleghaniensis</i> Britton		tree	1
Betulaceae	<i>Betula papyrifera</i> Marsh.		tree	1
Betulaceae	<i>Betula populifolia</i> Marsh.		tree	1

(Appendix I continued on next page)

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Betulaceae	<i>Corylus americana</i> Walter		shrub	1
Betulaceae	<i>Corylus cornuta</i> Marsh.	<i>Corylus cornuta</i> Marsh. ssp. <i>cornuta</i>	shrub	1
Betulaceae	<i>Ostrya virginiana</i> (Mill.) K. Koch		tree	1
Brassicaceae	<i>Erysimum cheiranthoides</i> L.*		forb	
Callitrichaceae	<i>Callitriche palustris</i> L.	(Plantaginaceae)	forb	1
Campanulaceae	<i>Lobelia inflata</i> L.		forb	1
Caprifoliaceae	<i>Diervilla lonicera</i> Mill.		shrub	1DT2If ta

Appendix I (continued)

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Cyperaceae	<i>Carex tenera</i> Dewey		gramin	1
Cyperaceae	<i>Carex tribuloides</i> Wahlenb.	<i>Carex tribuloides</i> Wahlenb. var. <i>tribuloides</i>	gramin	1
Cyperaceae	<i>Carex trisperma</i> Dewey		gramin	1
Cyperaceae	<i>Scirpus cyperinus</i> (L.) Kunth		gramin	1
Cyperaceae	<i>Scirpus hattorianus</i> Makino		gramin	1
Dennstaedtiaceae	<i>Dennstaedtia punctilobula</i> (Michx.) T. Moore		fern	1
Dennstaedtiaceae	<i>Pteridium aquilinum</i> (L.) Kuhn var. <i>latiusculum</i> (Desv.) Underw. ex A. Heller	<i>Pteridium aquilinum</i> (L.) Kuhn ssp. <i>latiusculum</i> (Desv.) Hultén	fern	1
Dryopteridaceae	<i>Athyrium filix-femina</i> (L.) Roth.	<i>Athyrium angustum</i> (Willd.) C. Presl. (Woodsiaceae)	fern	1
Dryopteridaceae	<i>Dryopteris campyloptera</i> Clarkson	<i>Dryopteris campyloptera</i> (Kunze) Clarkson	fern	1
Dryopteridaceae	<i>Dryopteris carthusiana</i> (Vill.) H. P. Fuchs		fern	1
Dryopteridaceae	<i>Dryopteris clintoniana</i> (D.C. Eaton) Dowell		fern	1
Dryopteridaceae	<i>Dryopteris cristata</i> (L.) A. Gray		fern	1
Dryopteridaceae	<i>Dryopteris intermedia</i> (Mulh. ex Willd.) Gray		fern	1
Dryopteridaceae	<i>Dryopteris marginalis</i> (L.) A. Gray		fern	1
Dryopteridaceae	<i>Gymnocarpium dryopteris</i> (L.) Newman	(Woodsiaceae)	fern	1
Dryopteridaceae	<i>Onoclea sensibilis</i> L.	(Onocleaceae)	fern	1
Dryopteridaceae	<i>Polystichum acrostichoides</i> (Michx.) Schott		fern	1
Equisetaceae	<i>Equisetum arvense</i> L.		fern	1
Equisetaceae	<i>Equisetum pratense</i> Ehrh.		fern	1
Ericaceae	<i>Andromeda polifolia</i> L. var. <i>glaucophylla</i> (Link) DC.		shrub	1
Ericaceae	<i>Chamaedaphne calyculata</i> (L.) Moench		shrub	1
Ericaceae	<i>Epigaea repens</i> L.		subshrub	1
Ericaceae	<i>Gaultheria hispidula</i> (L.) Muhl. ex Bigelow		subshrub	1
Ericaceae	<i>Gaultheria procumbens</i> L.		subshrub	1

(Appendix I continued on next page)

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Lamiaceae	<i>Scutellaria galericulata</i> L.		forb	1
Lamiaceae	<i>Scutellaria lateriflora</i> L.		forb	1
Liliaceae	<i>Clintonia borealis</i> (Aiton) Raf.		forb	1
Liliaceae	<i>Maianthemum canadense</i> Desf.	(Ruscaceae)	forb	1
Liliaceae	<i>Maianthemum racemosum</i> (L.) Link	<i>Maianthemum racemosum</i> (L.) Link ssp. <i>racemosum</i> (Ruscaceae)	forb	1
Liliaceae	<i>Medeola virginiana</i> L.		forb	1
Liliaceae	<i>Polygonatum pubescens</i> (Willd.) Pursh	(Ruscaceae)	forb	1
Liliaceae	<i>Streptopus lanceolatus</i> (Aiton) Reveal		forb	1
Liliaceae	<i>Trillium erectum</i> L.	(Melanthiaceae)	forb	1
Liliaceae	<i>Trillium undulatum</i> Willd.	(Melanthiaceae)	forb	1
Liliaceae	<i>Uvularia sessilifolia</i> L.	(Colchicaceae)	forb	1
Lycopodiaceae	<i>Lycopodium annotinum</i> L.	<i>Spinulum annotinum</i> (L.) A. Haines	fern	1
Lycopodiaceae	<i>Lycopodium clavatum</i> L.		fern	1
Lycopodiaceae	<i>Lycopodium hickeyi</i> W.H. Wagner, Beitel & Moran	<i>Dendrolycopodium hickeyi</i> (W.H. Wagner, Beitel & Moran) A. Haines	fern	1
Lycopodiaceae	<i>Lycopodium obscurum</i> L.	<i>Dendrolycopodium obscurum</i> (L.) A. Haines	fern	1
Lythraceae	<i>Lythrum salicaria</i> L.**		forb	
Monotropaceae	<i>Monotropa uniflora</i> L.			

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Poaceae	<i>Danthonia spicata</i> (L.) P. Beauv. ex Roem. & Schult.		gramin	1
Poaceae	<i>Dichanthelium acuminatum</i> (Sw.) Gould & C.A. Clark		gramin	1
Poaceae	<i>Glyceria striata</i> (Lam.) A. S. Hitchcock		gramin	1
Poaceae	<i>Muhlenbergia uniflora</i> L.	<i>Muhlenbergia uniflora</i> (Muhl.) Fern.	gramin	1
Poaceae	<i>Oryzopsis asperifolia</i> Michx.		gramin	1
Poaceae	<i>Poa nemoralis</i> L.**		gramin	
Polygalaceae	<i>Polygala paucifolia</i> Willd.		forb	1
Polygalaceae	<i>Polygala sanguinea</i> L.		forb	1
Polygonaceae	<i>Fallopia scandens</i> (L.) Holub.		forb	1
Polygonaceae	<i>Polygonum convolvulus</i> L. var. <i>convolvulus</i>	<i>Fallopia convolvulus</i> (L.) A. Löve	forb	1
Polygonaceae	<i>Polygonum sagittatum</i> L.	<i>Persicaria sagittata</i> (L.) H. Gross	vine	1
Polygonaceae	<i>Polygonum</i> sp.		forb	1
Polygonaceae	<i>Rumex orbiculatus</i> A. Gray	<i>Rumex britannica</i> L.	forb	1
Primulaceae	<i>Lysimachia quadrifolia</i> L.	<i>Lysimachia quadrifolia</i> Sims (Myrsinaceae)	forb	1
Primulaceae	<i>Lysimachia terrestris</i> (L.) B.S.P.	(Myrsinaceae)	forb	1
Primulaceae	<i>Trientalis borealis</i> Raf.	<i>Lysimachia borealis</i> (Raf.) U Manns & A. Anderb. (Myrsinaceae)	forb	1
Pyrolaceae	<i>Moneses uniflora</i> (L.) A. Gray	(

Family	NRCS species with naming authority	Haines (2011), new name and change in family if applicable	Growth form	Native
Rosaceae	<i>Rubus pensilvanicus</i> Poir.		shrub	1
Rosaceae	<i>Rubus pubescens</i> Raf.		subshrub	1
Rosaceae	<i>Sorbus americana</i> Marsh.		tree	1
Rosaceae	<i>Spiraea alba</i> Du Roi var. <i>latifolia</i>		shrub	1
Rosaceae	<i>Spiraea tomentosa</i> L.		shrub	1
Rubiaceae	<i>Cephalanthus occidentalis</i> L.		shrub	1
Rubiaceae	<i>Galium asprellum</i> Michx.		forb	1
Rubiaceae	<i>Galium palustre</i> L.		forb	1
Rubiaceae	<i>Galium trifidum</i> L.		forb	1
Rubiaceae	<i>Galium triflorum</i> Michx.		forb	1
Rubiaceae	<i>Houstonia caerulea</i> L.		forb	1
Rubiaceae	<i>Mitchella repens</i> L.		subshrub	1
Salicaceae	<i>Populus balsamifera</i> L.	<i>Populus balsamifera</i> L. ssp. <i>balsamifera</i>	tree	1
Salicaceae	<i>Populus grandidentata</i> Michx.		tree	1
Salicaceae	<i>Populus tremuloides</i> Michx.		tree	1
Salicaceae	<i>Salix bebbiana</i> Sarg.		shrub	1
Salicaceae	<i>Salix discolor</i> Muhl.		shrub	1
Salicaceae	<i>Salix eriocephala</i> Michx.	<i>Salix eriocephala</i> Michx. ssp. <i>eriocephala</i> var. <i>eriocephala</i>	shrub	1
Salicaceae	<i>Salix lucida</i> Muhl.	<i>Salix lucida</i> Muhl. ssp. <i>lucida</i>	shrub	1
Salicaceae	<i>Salix pedicellaris</i> Pursh		shrub	1
Salicaceae	<i>Salix sericea</i> Marsh.		shrub	1
Sapindaceae	<i>Acer pensylvanicum</i> L.		tree	1
Sapindaceae	<i>Acer platanoides</i> L.**		tree	
Sapindaceae	<i>Acer rubrum</i> L.		tree	1
Sapindaceae	<i>Acer saccharinum</i> L.		tree	1
Sapindaceae	<i>Acer saccharum</i> Marsh.	<i>Acer saccharum</i> Marsh. var. <i>saccharum</i>	tree	1

Family	fern	graminoid	herb	shrub	subshrub	tree	vine	Total
Alismataceae			1					1
Anacardiaceae				1	1			2
Apiaceae			2					2
Aquifoliaceae				2				2
Araceae			2					2
Araliaceae				2	2			4
Asteraceae			31					31
Balsaminaceae			1					1
Berberidaceae				1				1
Betulaceae				3		4		7
Brassicaceae			1					1
Callitrichaceae			1					1
Campanulaceae			1					1
Caprifoliaceae				13	1			14
Caryophyllaceae			1					1
Celastraceae				1			1	2
Clusiaceae			1					1
Convolvulaceae			1					1
Cornaceae				4	1			5
Crassulaceae			2					2
Cucurbitaceae							1	1
Cupressaceae				1		1		2
Cyperaceae		26						26
Dennstaedtiaceae	2							2
Dryopteridaceae	10							10
Equisetaceae	2							2
Ericaceae				11	3			14
Euphorbiaceae			1					1
Fabaceae			5					5
Fagaceae						2		2

Appendix II (continued)

Family	Growth form							Total
	fern	graminoid	herb	shrub	subshrub	tree	vine	
Geraniaceae			1					1
Grossulariaceae				2				2
Hamamelidaceae				1				1
Iridaceae			1					1
Juncaceae		5						5
Lamiaceae			6					6
Liliaceae			9					9
Lycopodiaceae	4							4
Lythraceae			1					1
Monotropaceae			1					1
Myricaceae				2				2
Oleaceae						3		3
Onagraceae			8					8
Orchidaceae			4					4
Osmundaceae	3							3
Oxalidaceae			3					3
Pinaceae						9		9
Poaceae		13						13
Polygalaceae			2					2
Polygonaceae			4				1	5
Primulaceae			3					3
Pyrolaceae			4					4
Ranunculaceae			8				1	9
Rhamnaceae				3				3
Rosaceae			6	15	2	8		31
Rubiaceae			5	1	1			7
Salicaceae				6		3		9
Sapindaceae						6		6
Saxifragaceae			2					2
Scrophulariaceae			6					6
Solanaceae							1	1
Sparganiaceae			1					1
Taxaceae				1				1

(Appendix II continued on next page)

Family	fern	graminoid	herb	shrub	subshrub	tree	vine	Total
Thelypteridaceae	4							4
Thymeliaceae				1				1
Tiliaceae						1		1
Ulmaceae						1		1
Valerianaceae ¹								

APPENDIX III.

- (a) Some vascular plant taxa that have been proposed for inclusion by various researchers, but are omitted from the list. These taxa may lack appropriate habitat at the PEF or be out of known range. Unavailability of voucher specimens prevents their listing.

Asplenium sp.

Cystopteris sp.

Krigia virginica

Lactuca sativa

Pyrola chlorantha

Rosa johannensis

- (b) Unresolved genera, some of which probably duplicate species already listed in Appendix I. During field work, plant material might have lacked flowers or fruits and could not be resolved below genus level, yet the genus is represented already by known species or subspecies in Appendix I.

Agrostis sp.

Amelanchier sp.

Aster sp.

Betula sp.

Bidens sp.

Carex sp.

Circaea sp.

Cornus sp.

Crataegus sp.

Danthonia sp.

Dryopteris sp.

Epilobium sp.

Equisetum sp.

Fraxinus sp.

Galium sp.

Geum sp.

Hieracium sp.

Hypericum sp.

Ilex sp.

Lonicera sp.

Luzula sp.

Lycopodium sp.

Oxalis sp.

Picea sp.

Poa sp.

Polygala sp.

Populus sp.

Potentilla sp.

Prenanthes sp.

Prunus sp.

Pyrola sp.

Ranunculus sp.

Ribes sp.

Rosa sp.

Rubus sp.

Salix sp.

Silene sp.

Solidago sp.

Sorbus sp.

Sparganium sp.

Thelypteris sp.

Trifolium sp.

Trillium sp.

Vaccinium sp.

Viola sp.

APPENDIX IV.

Provisional list of lichens of the Penobscot Experimental Forest, Bradley, Maine. Nomenclature follows Esslinger

<i>Peltigera aphthosa</i> (L.) Willd. or <i>leucophlebia</i> (Nyl.) Gyelnik	1
<i>Phaeophyscia pusilloides</i> (Zahlbr.) Essl.	1

Appendix V (continued)

Bryophytes

Mosses (continued)

Ptilium crista-castrensis (Hedwig) De Notaris

Rhizomnium appalachianum

Rhytidiadelphus triquetrus (Hedwig) Warnstorf

Sphagnum affine Renauld & Cardot

Sphagnum capillifolium (Ehrhart) Hedwig

Sphagnum fimbriatum Wils.

Sphagnum girgensohnii Russ.

Sphagnum palustre L.

Sphagnum squarrosum Crome

Sphagnum wulfianum Girg.

Tetraphis pellucida Milde.

Thuidium delicatulum (Hedw.) Schimp.

Ulota crispa (Hedw.) Brid.

Warnstorfia fluitans (Hedw.) Loeske
