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PENNSYLVANIA

Thomas L. Smith of the Pennsylvania Natural Diversity Inventory, who surveyed the state's old-growth in *Natural Areas Journal* in 1989, wrote that in "attempting this initial review . . . , it has become alarmingly clear how little information is available on this critical natural resource. A thorough inventory and mapping of quantity, quality, and composition . . . is needed." The one complete study had been conducted by the Pennsylvania Bureau of Forestry on its own lands. The Bureau identified 13 old-growth areas, which it protected by designating them state forest natural areas (Smith 1989b).

We wrote in the 1993 edition of the survey at hand that our research underlined the need for the thorough inventory for which Smith calls. Site descriptions that we had been able to obtain often conflicted with one another as to species, acreage, and amount of past disruption. Furthermore, given the number of sites that researchers have discovered without a thorough inventory, it seemed safe to assume that numerous other sites remain to be identified.

Since, various scientific studies of known sites have been conducted. Furthermore, individuals knowledgeable about old growth have visited sites and reported on them to us. Among them are Bruce Kershner, co-founder of the Western New York Old Growth Survey, Ernest Ostuno, and Bill Sweeney. As a result, we have made subtractions and additions to the list of sites in the earlier edition of the survey. However, questions still remain about the acreage of old growth (primary forest) at given sites, presumably in large part due to different definitions of old growth.

A County Natural Heritage Inventory (CNHI) Program "designed to identify important ecological areas" may resolve some of the questions, although researchers are not centering their search on old growth (Wagner 2002). The Western Pennsylvania Conservancy is conducting the study in western Pennsylvania; The Nature Conservancy, in eastern Pennsylvania (Wagner 2003).

Small tracts of known old growth or near old growth include **Jenkins Woods** (Monroe County): 30 acres of privately owned Eastern Hemlock with a rhododendron understory (Smith 1989a, Davis 1992); **Chalfont site** (Bucks County): 10 or 15 acres of bottomland old growth with White Oak (Thatford 1993); **Schall's Gap*** (Centre County): about 25 acres of old-growth hemlocks, about 3 acres of which may never have been logged, owned by the Pennsylvania Department of Conservation and Natural Resources (PCNR) (Ostuno 2001; Black 2001); **Tiadaghton State Park** (Lycoming County): 20 or so acres of Red Pine about 200 years old, mixed with mature oak and younger birch. The pine are believed to have originated after a fire and to be virgin (Tiadaghton 1993); **Ferncliff*** (Fayette County): 15 acres of Eastern Hemlock, Tulip Tree, Sweet Birch, and oaks beside the Youghiogheny River in Ohio State Park (Kershner and Leverett 2002); **Salt Springs State Park*** (Susquehanna County): 10 to 20 acres of old-growth hemlock around the gorge of Fall Brook (Kershner and Leverett 2002); **Martins Creek Environmental Preserve*** (Northampton County): possible old growth of uncertain extent, but perhaps 15 acres, with oaks, hickories, Tulip Tree, and other species, within

the 750-acre preserve owned by PPL (formerly Pennsylvania Power and Light) (Sweeney 2002, Drabic 2002); **Tyler State Park*** (Bucks County): some 15 acres of old growth divided between two sites, the larger running along Porter Creek (Sweeney 2003); **Northern hardwood-conifer forest** (Wayne County): 10-15 privately owned acres with hemlock of all age classes, large Northern Red Oak, American Beech, and Black Cherry, and Yellow and Sweet Birch on an island surrounded by open water and swamp (Davis 1992); **Lower Jerry Run*** in Elk State Forest (Cameron County): two areas: an acre or two of old trees and 10 acres of old growth half a mile to their east (Ostuno 2000); **Tryon-Weber Woods*** (Crawford County): 10-20 acres of beech-maple old growth in a preserve owned by the Western Pennsylvania Conservancy (Carson 2002); **Mount Riansares*** (Clinton County): an estimated 10 or more acres of undisturbed old-growth hemlock on steep upper slopes, owned by the Pennsylvania Bureau of Forestry (Wagner 2002); **Erie National Wildlife Refuge** (Crawford County): 10 acres of old but selectively cut northern hardwoods, with oaks, American Beech, Sugar Maple, and large Black Cherry, among other species (Mountain 1993, Shaffer 1993); **Hopewell Furnace National Historic Site** (Berks County): a 360-year old Chestnut Oak stand of 8 to 10 acres on a steep talus slope owned by the National Park Service (Abrams 1993); **Sophia's Woods** at Friendship Hill National Historic Site (Fayette County): an 8- to 10-acre presettlement remnant of White Oak owned by the National Park Service (Abrams and Downs 1990, Abrams 1993); **Hickory Run State Park** (Carbon County): "virgin" Red Spruce surrounding a boulder field (Erdman and Weigman 1974), but they are young (Whitney 1993) and park authorities do not know the stand's origin (Troutman 1993); **Hemlock Trail Natural Area*** (Somerset County): within the 5.8-acre natural area at Laurel Hill State Park, an old-growth stand of hemlocks and hardwoods with Black Cherry up to 47 inches in diameter (Ostuno 1999, 2002).

The Pennypack Wilderness, owned and managed by a non-profit citizens' organization, contains two small areas of old growth or near old growth, which are of particular interest to designers of wildland reserves. The Pennypack Ecological Restoration Trust has succeeded in assembling a 720-acre corridor from more than 50 separate tracts with varying histories. Today half the acreage owned by the Trust is covered with forest; half is meadow or old-field. **Brandywine Forest** and **Peak Forest**, each approximately 7 acres in size, are the old sections of the forest. Both are "fairly even-aged stands" with "mature trees" 150 or more years old. Brandywine is a Black Oak-American Beech stand, bounded on three sides by a younger Tulip Tree-White Ash community and on the west by a swamp forest. Periwinkle "has largely overwhelmed the herbaceous layer." Tulip Tree and American Beech dominate Peak Forest, which seems more disrupted than Brandywine, since some oak trees appear to have been removed prior to 1984 when the Trust obtained it. Japanese Honeysuckle and other exotics are spreading into this forest from adjacent hayfields. The Trust owns all of Peak Forest and half of Brandywine Forest, the other half of which is under a conservation easement (Robertson 1991, Nyholm 2002).

The staff of Allegheny National Forest began to revise the Forest's management plan in 1997. The process shortly thereafter came to a halt when Congress withdrew funding for the revision. Work began again in late 2002, and the first public meeting is expected to be held in early 2003. The plan is not expected to be complete until 2006 (Barone 2002).

Because of the large number of sites in Pennsylvania, we have divided the bigger sites into 3 geographic areas: east, center, and west.

EASTERN PENNSYLVANIA

Arbutus Peak Oak Barren Macrosite, in east-central Pennsylvania (Luzerne County)

A 5313-acre, old-growth Pitch Pine-scrub oak barren, with Bear Oak *Quercus*, owned by the Pennsylvania Game Commission and others. Probably the pine barren has not been logged, but it has burned in the last twenty years. It is not clear to what extent fires in this and most other Pennsylvania pine barrens have been natural, and to what extent they have been caused by people (Smith 1989a, Davis 1992, 1993, 2002). The macrosite includes shallow peatlands, most of which have been manipulated. Biologist Gordon Whitney writes that most accounts he has seen of the Pitch Pine-scrub oak barrens of northeastern Pennsylvania make it appear that barrens there are "an artifact" of heavy logging for lumber to use in mines and elsewhere and of burning to further crop production; and that, in his view, the best of eastern Pennsylvania's Pitch Pine-scrub oak barrens have been "relatively undisrupted" for only about seventy years (1993).

Long Pond Macrosite, in east-central Pennsylvania (Monroe County)

An old-growth Pitch Pine-scrub oak (Bear Oak) barren, interspersed with bogs, vernal pools, and wetland forests of Balsam Fir, Tamarack, and Red Spruce, the whole totaling 5740 acres. The wetlands, which comprise some 10% to 20% of the site, have probably been logged; but the barrens probably not. The area has a history of natural fire. The Nature Conservancy has purchased 720 acres of barrens and surrounding wetlands and secured, by easements and other means, 1500 additional acres. The city of Bethlehem and various private parties also own land within the macrosite (Smith 1989a, Davis 1992, 1993, 2002, Myer 1993).

Ricketts Glen State Park, in northeastern Pennsylvania (Luzerne, Sullivan and Wyoming Counties)

Virgin forest within the 13,134-acre state park. The old growth has never been delineated (Adamic 2002) and estimates vary. Erdman and Weigman describe Kitchen Creek Gorge with some 2000 acres of "largely virgin hemlock-northern hardwood forest," and, near the Gorge, a "superb" Eastern Hemlock-White Pine stand (Erdman and Wiegman 1974, Wiegman 1993). Kershner writes that the park has "unquestionably at least 2000 acres of old growth, possibly more." Here as elsewhere, the large trees near streams are more frequently recognized as old growth than are the smaller trees on dry ridges, he points out (2002). The Bureau of Forestry lists only 30 acres of virgin forest (Croop 1990). Ostuno describes old growth on either side of Route 118. The northern site is comprised of at least 30 acres of old-growth hemlock, hardwoods, and scattered White Pine. The site to the south of the road includes an approximately 10-acre stand of virgin White Pine/hemlock," surrounded by similarly old White Pine/hemlock with some evidence of cutting, along Boston Run (Ostuno 2001, Feb. 14). A hemlock log in the park was reportedly found to have 900 growth rings (Ostuno 2000).

Glen Onoko Cove, east-central Pennsylvania (Carbon County)

Undetermined acreage of virgin hemlock-hardwoods on steep slopes. The Glen Onoko area is part of the 17,000-acre Pennsylvania State Game Land 141 owned by the State Game Commission (Kershner and Leverett 2002). Jeans Run Gorge, described below, is "around the corner of the mountain" from Glen Onoko (Erdman and Wiegman 1974, Costa 1993).

Bald Mountain, in northeastern Pennsylvania (Lackawanna County)

A 742-acre, old-growth Pitch Pine-scrub oak barren, with Bear Oak. It is in private ownership (Smith 1989a, Davis 1992, 2002).

Nescopeck Mountain Oak Barren, in eastern Pennsylvania (Luzerne County)

A 712-acre, old-growth Pitch Pine-scrub oak barren, of Bear Oak, on very narrow sandstone ridge tops with little soil. The Pennsylvania Game Commission and others own the land (Smith 1989a, Davis 1992, 1993, 2002).

Stafford Bald, in northeastern Pennsylvania (Lackawanna County)

A 610-acre, old-growth Pitch Pine-scrub oak barren, with Bear Oak. The land is privately owned. The trees have probably not been cut, but the area has experienced fires. Now houses are being built next to the area and perhaps on the barrens itself (Smith 1989a, Davis 1992, 1993, 2002).

Wyoming Mountain Oak Barren, in eastern Pennsylvania (Luzerne County)

A 290-acre old-growth Pitch Pine-scrub oak barren, with Bear Oak and Gray Birch. The barren is probably uncut, and has burned quite frequently (Smith 1989a, Davis 1992, 1993, 2002).

Woodbourne Forest and Wildlife Sanctuary, in northeastern Pennsylvania (Susquehanna County)

A 120-acre virgin hemlock-northern hardwood forest on a 654-acre preserve owned by The Nature Conservancy. Hardwoods include Sweet Birch, Sugar Maple, Northern Red Oak, White Ash, and beech. The beeches are fewer in number than they once were due to beech bark disease. The Hemlock Woolly Adelgid is near the preserve, but as of 2002 did not appear to have entered it. Nine species of salamander live in the forest. The birds, which are reminiscent of more northern woods, include the Blackburnian Warbler, Oven Bird and Black-Throated Green and Blue Warblers. For more than 150 years the majority of the forest was owned by the Cope family, which donated it to The Conservancy (Skinner 2002).

Camelback Mountain, in east-central Pennsylvania (Monroe County)

A 180-acre, dwarf Pitch Pine-scrub oak barren on the top of a ridge. Owners include the Pennsylvania Bureau of Parks and Game Commission (Smith 1989a, Davis 1992, 1993).

Jeans Run Gorge, in east-central Pennsylvania (Carbon County)

An old-growth northern conifer forest covering 140 acres. The Pennsylvania Game Commission owns the forest (Smith 1989a, Davis 1992, Fazzini 2002).

Otter Creek Natural Area, Holtwood Environmental Preserve, southeastern Pennsylvania (York County)

Within a 260-acre natural area, a rugged gorge much of which is lined with mixed mesophytic forest. Stands of Chestnut Oak grow on the upper slopes. Umbrella Magnolia, a rare species in Pennsylvania, flourishes here. Erdman and Weigman have described the gorge as including 200 uncut acres (1974), a description that Weigman said in 1993 was still valid (1993). Smith spoke of 100 acres of old-growth mixed mesophytic forest (1989b). Davis writes that the site has been at least selectively logged (1992). PPL (formerly Pennsylvania Power and Light) Co., which owns it, believes that portions, if not the whole, are unlogged, because they are very steep. In recent years the Hemlock Woolly Adelgid has killed many hemlock and, in the process, made the site more open.

The utility has formally set aside and does not cut Otter Creek and its other Natural Areas. Otter Creek and Kelly's Run, described below, have trails and are open to visitors (Arbogast 1993, 2001).

Chrome Serpentine Barrens Preserve, in southeastern Pennsylvania (Chester County)

One hundred and sixty acres of eastern serpentine barrens, a community that occurs only in Maryland and Pennsylvania. On an outcropping of green serpentine rock are savanna-like Pitch Pine barrens, wildflower meadows, and cliff outcroppings. Serpentine barrens are fire dependent; and the Chrome Barrens, owned by the township of Elk, is maintained by prescribed burning. The larger Goat Hill Serpentine Barrens, owned mostly by the Department of Environmental Resources' Bureau of Forestry, is similar, but is not in as good condition, because it has not burned for some time (Myer 1993).

Rupert Bluffs, in east-central Pennsylvania (Columbia County)

A 65-acre mesic calcareous shale talus forest, in private ownership (Smith 1989a, Davis 1992, 2002).

Delaware Water Gap National Recreation Area, northeastern Pennsylvania (Pike County)

Old growth of undetermined extent on cliffs within the 70,000-acre area (Kershner and Leverett 2002). Specific places in which old growth has been identified on the Pennsylvania side of the Delaware River are noted below.

--**Dingmans Falls**. Inaccessible virgin stands of hemlock-hardwoods on the gorge walls of the 100-foot Falls (Erdman and Wiegman 1974, Wiegman 1993, Kershner and Leverett 2002);

--**Fulmer Falls**,* Deer Leap Falls, and Factory Falls within George Childs Recreation Site. Tall White Pines and Eastern Hemlock on ledges from top to bottom of the cliffs (Kershner and Leverett 2002);

--**Walpack Bend**.* Perhaps as much as 30 acres of old growth on a steep north-facing slope. Eastern Hemlock and Chestnut Oak dominate (Sweeney 2002).

Kelly's Run Natural Area, Holtwood Environmental Preserve, in southeastern

Pennsylvania (Lancaster County)

Up to 65 acres of probably unlogged old growth on the south side of the steep mouth of a ravine. Kershner writes that there are at least 25 acres and “possibly” as much as 65 acres (Kershner and Leverett 2002). In the past, 65 acres has been the accepted figure. The old growth is mixed mesophytic with much hemlock and a thick rhododendron understory. The upper slopes of the ravine have second-growth mixed oak and some Table Mountain Pine. PPL (formerly Pennsylvania Power and Light) Co. is the owner. See Otter Creek Natural Area above. The Hemlock Woolly Adelgid has killed some of the hemlock at the site, according to Mark Arbogast. Anthony Davis describes the damage done by the adelgid as so severe that the site is no longer worthy of inclusion in our report. (Erdman and Wiegman 1974, Wiegman 1993, Arbogast 1993 and 2001, Davis 2001).

Ferncliff Wildflower and Wildlife Preserve, in southeastern Pennsylvania (Lancaster County)

A National Natural Landmark composed of a mile-long ravine with 65 acres of "near virgin mixed mesophytic forest." The forest includes Eastern Hemlock, Tulip Tree, American Beech, Red and Sugar Maples, and American Basswood. The herbaceous layer is rich. Henry Hough Bagel donated it to the Lancaster County Conservancy in 1996 (Erdman and Wiegman 1974, Wiegman 1993, Devine 2002).

Jakey Hollow Natural Area,* in Wyoming State Forest, east-central Pennsylvania (Columbia County)

A hollow with 58 acres of old-growth White Pine, Eastern Hemlock, and northern hardwoods along a stream (Ostuno 2002, Kershner and Leverett 2002). The area may have been selectively logged in the past, as “faint evidence of large stumps can be found.” A field borders the natural area on the south (Ostuno 1999).

Henry’s Woods* in Jacobsburg Environmental Education Center, east-central Pennsylvania (Northampton County)

Forty acres of old-growth woodland, within the 1168-acre Environmental Center. The old growth was preserved by the family of William Henry, a manufacturer of fire arms during the Revolutionary War. Part of the site is flat land next to Bushkill Creek, part is steep slopes. Tree species include Eastern Hemlock; Northern Red, White, and Chestnut Oaks; Yellow and Sweet Birch; White Pine; and Sugar Maple. The Bureau of State Parks administers the Center (Kershner and Leverett 2002, Sweeney 2002).

Counselman Run Natural Area, southeastern Pennsylvania (York County)

A tract of either virgin forest or very old second growth, with Tulip Tree and Sugar Maple, on the steep west wall of the Susquehanna River. The area is owned and protected by Pennsylvania Power and Light (Erdman and Weigman 1974, Arbogast 1993).

CENTRAL PENNSYLVANIA

Raystown Shale Barrens, south-central Pennsylvania (Huntingdon and Bedford Counties)

A complex comprised of some 2000 acres of shale barrens and contiguous natural areas, on both sides of Raystown Lake, an artificial "lake" formed when the US Corps of Engineers dammed the Raystown Branch of the Juniata River. The complex is the largest and probably the least disrupted group of shale barrens in Pennsylvania. The impoundment destroyed the bottoms of some shale barren slopes, but left intact the mid and upper slopes. The tree cover, often sparse, is generally Eastern Red-cedar, Virginia Pine, and stunted oak, frequently Chestnut Oak. Shale outcrops are common (Bier 1993, Kimball 1976).

Tussey Mount Barrens, south-central Pennsylvania (Huntingdon County)

Bear Oak-Pitch Pine barrens in several sites with sandy, infertile soil, on the ride of Tussey Mountain above 2000 feet elevation. Erdman and Wiegman give a figure of 800 acres for the site, but it is not clear whether they refer only to the barrens. As of 1974 they were privately owned (Erdman and Wiegman 1974).

Rothrock State Forest, south-central Pennsylvania

--**Bear Meadows Natural Area** (Centre County). Within an 890-acre Natural Area, a nearly enclosed basin of approximately 350 acres with a "high mountain" old-growth bog forest. Communities on the edges of the bog include Black Spruce-Balsam Fir and Eastern Hemlock-Yellow Birch, both ranked A in the Western Pennsylvania Conservancy database. (Erdman and Wiegman 1974, Bier 1993, Kelly 1993). Through a dendroecological investigation, Abrams et al. learned that the 50 acres of bog forest that they studied were selectively logged in the 1890s and subject to fires around 1900 and 1914. Balsam Fir, which has been present at the site for 10,000 years, is dying out, as most of the Balsam Fir have attained their pathological age of 50 to 85 years and are suffering from root rot and insects. There is no local seed source to make reestablishment possible. The Black Spruce are healthier (Abrams et al. 2001).

--**Thickhead Mountain Wild Area*** (Centre and Huntingdon Counties). A 3844-acre Wild Area of ridge and valley, mountain forestland, in which are a more than 50-acre (21.5 ha) Chestnut Oak community on a south-facing talus slope (within the Detweiler Run Watershed) (Ruffner and Abrams 1998) plus scattered ridgetop old-growth communities (Ruffner 1998). The talus slope forest includes Sweet Birch, Red Maple, and Black Gum in addition to the dominant Chestnut Oak, and is uneven-aged. Chestnut Oak was recruited almost continuously between 1670 and 1950 (Ruffner and Abrams 1998). Most of the Wild Area was owned by a charcoal iron company until the early 1900s when it was sold to the state. Thus, a great deal of the forest, particularly on the valley floors and side slopes, was cut for charcoal, but ridgetop timber that was poor in form was likely to be left intact. Chestnut oaks have been found to be as much as 300 to 350 years old (Ruffner 1998).

--**Detweiler Run Natural Area** (Huntingdon County). Eastern Hemlock-White Pine old growth with a rhododendron understory in the lower ravine through which Detweiler Run flows. Calculations of the unlogged acreage differ: The Bureau of Forestry states 185 acres (Croop 1990); Micakalitis, 20 acres (1956). Kershner, who found hemlock up to 4.5 feet in diameter, believes that Croop's figure is the more

accurate (Kershner 2002).

--**Alan Seeger Natural Area** (Huntingdon County). Possible unlogged forest within a 370-acre Natural Area that supports stream bottom, stream terrace, upland cove, and upland slope forest communities. Hemlock are 112 feet in height and 4.5 feet in diameter (Kershner and Leverett 2002). However, in 1990 Nowacki and Abrams analyzed ten stands with the help of tree coring, and concluded that every stand showed "evidence of large-scale logging during the mid-1840s." Even 25 acres of stream bottom forest characterized by Mickalitis in 1956 as "virgin hemlock, white pine, and hardwoods" had been impacted, though modifications to the 25 acres may have been the result of logging of the stand's buffer rather than of direct logging. Nowacki and Abrams conclude that for researchers who accept "limited human disturbance" some "stands having a substantial number of old-aged trees" may be seen as old growth, though the small size and isolated character of the Natural Area limit the functional role of any old growth present (Nowacki and Abrams 1994).

--**Shingletown Gap*** (Centre County). Two areas of old growth separated by second-growth mixed oak and surrounded by second-growth hemlock, pine, and hardwoods: 1) about 10 acres of mature and old-growth hemlock, White Pine and hardwoods in a stream valley and 2) 20 acres of primarily hemlock old growth on a ridge top. The area on the ridge top is partially in Rothrock State Forest and partially on land owned by the State College Borough Water Authority. Only a small portion of the area in the valley is in the State Forest (Ostuno 2001, 2002).

Big Flat Barren, south-central Pennsylvania (Adams and Cumberland Counties)

A 600-acre old-growth Pitch Pine-scrub oak barren, with Bear Oak-Black Tupelo-Pitch Pine. People burn this barren to improve the blueberry crop, but it has probably not been cut. The Pennsylvania Bureau of Forestry and others are owners (Smith 1989a, Davis 1992 and 1993).

Bald Eagle State Forest, central Pennsylvania

--**Snyder-Middleswarth Natural Area** (Snyder County). "Virgin" forest in a 500-acre Natural Area in the valley of Swift Run: 250 acres according to Mickalitis (1956); 500 acres according to Croop (1990) and Johnson (1993). Croop and Johnson refer to communities of Eastern Hemlock-White Pine and Pitch Pine (1990, 1993); Mickalitis to "chiefly" hemlock and White Pine (1956). Wiegman and Erdman write of approximately 330 acres of virgin Eastern Hemlock-White Pine on the north slope and bottom and poor quality mixed oak on the south slope (1974), but the Natural Area may have been enlarged to include adjacent acreage with Pitch Pine since they wrote this description. Kershner and Leverett write that the old growth in Snyder-Middleswarth and Tall Timbers (below) equals 600 acres (Kershner and Leverett 2002). There is only scattered recruitment of White Pine and hemlock (Ostuno, 1999, Dec. 7).

--**Tall Timbers Natural Area**. Approximately 100 acres of old-growth hardwoods with some Pitch Pine and an occasional Shortleaf Pine within a 660-acre natural area. The old-growth trees, which are concentrated in the stream corridor, were selectively cut, principally around 1900 and 1902. Tall Timbers State Natural Area extends westward from the western boundary of Snyder-Middleswarth (Johnson 1993).

--**Joyce Kilmer Natural Area** (Union County). On a ridge top, a 77-acre stand

that is usually described as “virgin White Pine-Eastern Hemlock.” However, a Ernest Ostuno in 1999 found only two large White Pine among the hemlock. Some hemlock recruitment was taking place, with seedlings growing near fallen logs (Ostuno, 1999). Sweet Birch are also present. Many of the trees are probably 300 to 400 years old, although due to difficult growing conditions, the larger trees are only around three feet in diameter (Ostuno 1999, Kershner 2002).

--**Mount Logan Natural Area** (Clinton County). A 512-acre Natural Area, which includes old-growth Eastern Hemlock on a Tuscarora quartzite outcrop. Estimates of the extent of the old growth have ranged from 3-4 acres (Johnson 1993) through 32 acres (Croop 1990) to 50 acres (Erdman and Weigman 1974). The hemlock, at least 200 years old, are growing on almost pure rock, under xerophytic conditions. Some have branches longer than the height of the boles (Johnson 1993). **Edward Frank visited Mount Logan in October 2007 and June 2009. Noting that the talus slope on the south side of the east-west oriented ridge as well as the top of the ridge may support old growth, he expresses the need for a thorough study of the site. Yellow Birch, Northern Red Oak, Red Maple, Chestnut Oak, and White Pine dominate the canopy on the talus (Frank 2009). (*Revised June 12, 2009*).

--**Bear Run Natural Area** (Centre County). Ostuno describes the old growth as “a very small area of about only two or three dozen large hemlocks along a three-acre section of Bear Run.” The older trees are 300-400 years in age, according to Pennsylvania State Forestry staff who took cores. Hemlock recruitment is good. A separate stand of large hemlock, to the north on a dirt road, seem to be old growth. It may be on private land (Ostuno 1999). The Center for Rural Pennsylvania describes the Bear Run stand as 15 acres of hemlock (Center 1995).

Tuscarora State Forest, south-central Pennsylvania

--**Hemlocks Natural Area** (Perry County). Unlogged hemlock hardwoods. Micklatis refers to 20 acres of virgin hemlock (1956); Croop to 131 acres of virgin hemlock and cove hardwoods (1990). Kershner believes that Croop is more nearly correct (Kershner and Leverett 2002). Some old growth may be located to the west of the boundary of the Natural Area. Otherwise the area is surrounded by second-growth hemlock hardwoods (Ostuno 1999). The Hemlock Woolly Adelgid is severely impacting the hemlock at this and other sites in the State Forest (Davis 2002).

--**Laurel Run Natural Area** (Perry County). Stands of old-growth hemlock near the river and of virgin hemlock on steep talus. The forest was apparently “burned or otherwise severely disturbed in the late 1700s,” but was only lightly cut in the late 1880s when many forests were heavily logged (Erdman and Wiegman 1974, Kelly 1993).

Pine Creek Gorge Natural Area, in Tioga State Forest, north-central Pennsylvania (Tioga County)

A twelve-mile long, 7216-acre Natural Area including “excessively steep” gorge walls on which the trees were never cut and virgin stands remain. Lower and more accessible parts of the gorge were cut or burned and are now second growth northern hardwoods or mixed oak. The Natural Area protects the gorge from “rim to rim.” Colton Point State Park and Leonard Harrison State Park are within Tioga State Forest and within the Natural Area (Erdman and Wiegman 1974, Kelly 1993).

Forrest H. Dutlinger Natural Area, in Susquehannock State Forest, north-central Pennsylvania (Clinton County)

158 acres of old-growth hemlock (Croop 1990, Kershner 2000). Erdman and Wiegman describe a 30-acre virgin stand of hemlock-hardwoods in a proposed Beach Bottom Natural Area (1974), which is now the Forrest H. Dutlinger Area (Kelly 1993). Ostuno notes that the unlogged area apparently resulted from a surveying error between the boundaries of the Goodyear and Lackawanna Lumber companies. The old growth consists primarily of hemlocks in the upper end of the valley of Beech Bottom Run; and a mixture of beech, hemlock, Black Cherry, Sugar Maple, and oak on the flat top of a mountain. Hemlock recruitment is sparse. The Natural Area includes two large White Pine, but it appears that other White Pine were removed before the boundary dispute arose (Ostuno 2001).

Gettysburg National Military Park,* south-central Pennsylvania (Adams County)

One hundred acres of possible old growth within the nearly 6000-acre Park.

--Big Round Top. Perhaps 70 acres of old growth dominated by White Oak, Northern Red Oak, White Ash, and Tulip Tree surround Big Round Top. Grazing and cutting of fuel wood probably took place, but boulders in the woods forestalled logging for agriculture.

--Philzer Woods. Some 10 acres of selectively cut old growth are located in the woods. White Oak dominates.

--Culps Hill. Some 5-10 acres of possible old growth are found, especially on the north side of the hill. The stand is dominated by White and Northern Red Oak. Boulders surround the hill.

--Possibly an additional 10 acres of old growth scattered through the Park (Sweeney 2002).

Caledonia State Park, south-central Pennsylvania (Franklin County)

Possibly remnants of primary forest in a state park that is mainly second growth. Erdman and Wiegman describe remnants that are part of a hemlock-hardwood swamp forest with a thick rhododendron understory. Oak forests in the park are not as old and have been more disturbed (1974, Wiegman 1993).

Crawford Hollow, in east-central Pennsylvania (Cumberland County)

90 acres of old-growth Eastern Hemlock-White Pine, in private ownership (Smith 1989a, Davis 1992).

Johnson Run Natural Area, in Elk State Forest, north-central Pennsylvania (Cameron County)

Possibly 50 or more acres of old growth within a 216-acre Natural Area. Ostuno describes the area as "virgin or near virgin" and notes that it supports White Pines that in a few cases are close to four feet in diameter (Ostuno 2000). Croop cited 26 acres of old-growth hemlock-hardwood (Croop 1990).

WESTERN PENNSYLVANIA

Allegheny National Forest, in northwestern Pennsylvania (McKean and Warren Counties)

--**Tionesta Scenic and Research Natural Areas** (McKean and Warren Counties). A single tract of 4131 (Colaninno 1990) or 3500 (Mickalitis 1956, Croop 1990) acres of "virgin," old-growth climax hemlock-beech forest, within a 2018-acre Scenic Natural Area and a 2113-acre Research Natural Area (RNA), both administered by the US Forest Service (USFS). This tract and the Hearts Content Scenic Area were purchased by the federal government, because they were the only known uncut remnants of a 6 million acre hemlock-beech forest that once covered the Allegheny Plateau (Bjorkbom 1977). USFS describes the RNA as Eastern Hemlock; Sugar Maple-American Beech-Yellow Birch; American Beech-Sugar Maple; and Black Cherry-Maple (USFS 1987). Mohlenbrock writes that in the SNA beeches and hemlocks more than 100 feet tall tower over Sugar Maple, Red Maple, Sweet Birch, Yellow Birch, basswood, Black Cherry, Tulip Tree, and even Cucumber Tree (1984). In 1985, after Mohlenbrock had published his guide, 800 acres of the Scenic Area were flattened by a tornado. Salvage work was done on pipelines and existing roads (Smith 1989b).

Current threats to the continued existence of the old growth are severe. In the absence of large predators (extirpated decades ago), the browsing of deer prevents the regeneration of species other than the unpalatable beech, and has all but removed Hobblebush from the understory (Dunshie 1993, Bjorkbom 1977). Tionesta has no fencing to keep out deer (Nelson 2002) nor have plans been made to reintroduce the missing predators, including Eastern Cougar and Timber Wolf. The killing front of beech bark disease entered Tionesta in 2000 (Warren Times 2002). An estimated 156 oil and gas wells are scattered through the old growth. USFS owns the mineral rights below the RNA, but not below the Scenic Area (Johnson 2001). The boundaries of Tionesta are not clearly marked or are marked incorrectly, particularly on the north side. As a result, logging has encroached on old growth in recent years (Nowak and Nelson 1997).

Friends of the Allegheny Wilderness, led by Newkirk Johnson, has proposed the establishment of a Tionesta Wilderness Area of 20,000-32,000 acres (8000-13,000 ha), centering in the Tionesta Scenic and Research Natural Areas (Johnson 2001, Hopey 2001).

--**Hearts Content Scenic Area** (Warren County). Virgin old growth, 122 (Colaninno 1990) or 150 acres in extent (Croop 1990). The overstory includes White Pine, Eastern Hemlock, and American Beech. A predominantly White Pine segment of perhaps 20 acres has impressive trees 300-400 years old and 150-200 feet tall. Unfortunately the many trees that are now dead or dying, including beech suffering from beech bark disease, are not being replaced, because of heavy deer browsing. Only a few test plots in the forest have been fenced to exclude deer (Dunshie 1993, Whitney 1993, Colaninno 1990, Franklin 1989 and 1990, Johnson 2002).

--**Crull's and Thompson's Islands**. Old-growth riverine communities on islands in the Allegheny River, now in Allegheny River Islands Wilderness. Erdman and Wiegman describe these communities as "virgin," and dominated by Silver Maple and American Sycamore (1974). The Western Pennsylvania Conservancy data sheets speak of "maturing and mature forest," with Sugar Maple, American Sycamore, and Slippery Elm as the chief woody species (Bier 1993). Both sources report that the islands include

open areas. **Edward Frank reports that the southern end of Thompson Island is overrun by Japanese Knotweed up to twelve feet high [Frank 2009] (*rev. May 31, 2009*). Crull's Island is 96 acres, and Thompson's Island is 67 acres.

Cook Forest State Park, in western Pennsylvania (Clarion, Jefferson, and Forest Counties)

A 7822 acre park with old growth that is spectacular but of uncertain acreage. Erdman and Wiegman describe three uncut or slightly cut coves: the Cathedral Area, 100 acres of virgin White Pine; the Seneca Tract, approximately 70 acres of virgin hemlock on a steep slope; and the Hemlock Swamp, 125 acres of near virgin Eastern Hemlock-White Pine swamp. Much of the remainder of the forest is mature second growth with old-growth characteristics, they write (Erdman and Wiegman 1974, Wiegman 1993). Mickalitis wrote of "171 acres of remnants of original hemlock and white pine forests and several hundred acres of mature timber which had been selectively cut-over about a century ago" (1956). Leverett notes that accounts suggest between 171 and 500 acres. He himself will go with a middle figure of around 300 acres until the acreage can be accurately assessed through global positioning technology (Leverett 2002). The forest has experienced considerable storm damage (Wary 1993), including a tornado in 1976. Nevertheless, the Cathedral has more White Pine over 150 feet tall than any other site in the Northeast. The Longfellow Pine, 180.1 feet in height and 42 inches in diameter and the Seneca Pine, 172 feet in height and 48 inches in diameter, are particularly impressive. A hemlock in the Cathedral is 138 feet tall. Other large species include Red Maple, American Beech, Black Cherry, and White Ash. The old-growth forest in the park apparently renewed itself after a drought and fire in 1644 (Kershner and Leverett 2002).

Bucktail State Park* (Clinton and Cameron Counties)

Old-growth of undetermined extent on steep, north-facing slopes along the west branch of the Susquehanna River. The old growth is composed of hemlock and associates, including Sweet Birch. Clusters of 10 or so acres, scattered along the river, may amount to 100 acres in total (Wagner 2002). The park is a 75-mile ribbon through a narrow valley.

Pymatuning Swamp, in northwestern Pennsylvania (Crawford County)

More than 50 acres of little disturbed, mature Sugar Maple-American Beech-Yellow Birch forest, ranked "B"; and a 100-acre strip of White Pine-Tamarack forest, ranked "A," in portions of what remains of the once huge Pymatuning Swamp. The present swamp is a mixture of open marshland, shrub swamp, and swamp forest. According to the Western Pennsylvania Conservancy database, the Swamp needs further study (Bier 1993, Erdman and Weigman 1974).

Anders Run State Natural Area, in Cornplanter State Forest, northwestern Pennsylvania (Warren County)

Approximately 50 acres of old growth in the southern end of the 97-acre Natural Area. White Pine and Eastern Hemlock are the most conspicuous trees with diameters for the pine as high as 54 inches. According to ring counts of fallen trees, hemlock are as old as 400 years (Kershner 2002) and White Pine up to 220 years. Species in addition to

White Pine and hemlock include Cucumber Tree, American Beech, Ironwood, Black Cherry, and oaks (Ostuno 2000). Gordon Whitney has described the Natural Area as "mature, but hardly old-growth" (1993), and Donald Wary has spoken of possible logging in the early 1800s (1993). Kershner believes, however, that most of the southern end of the Natural Area, in and along a ravine, is unlogged, whereas the northern end has second growth. A road separates the two sections (Kershner 2002).

Buchanan State Forest, southwestern Pennsylvania (Bedford County)

--**Sweet Root Natural Area**. Within a 1403-acre Natural Area, 63 acres of forest that has never been logged. Trees are Eastern Hemlock, Sweet Birch, White Pine, basswood, and oaks (Croop 1990, Kershner and Leverett 2002). As of June 2003, approximately 90% of the hemlock were dead because of the woolly adelgid. The remaining hemlock were dying (Ostuno 2003).

--**Thirty to fifty acres of old growth*** within a steep ravine. Hemlock is the most common tree; Sweet Birch, second most common. Also present are Northern Red Oak, maple, and a little basswood (Hotopp 1998).

Bear Creek, in southwestern Pennsylvania (Westmoreland County)

A "near virgin woods" with Eastern Hemlock, Yellow Birch, and Sugar Maple, through which Bear Creek flows for half a mile. Bear Creek is a fork of Rolling Rock Creek. The land is in private hands (Erdman and Wiegman 1974, Wiegman 1993).

Silvermine Run, in southwestern Pennsylvania (Westmoreland County)

Stands of virgin forest in a deep valley. Hemlock predominates along the stream; Sugar Maple, on the upper slopes. Between them is a particularly fine stand of American Beech. Silvermine Run is a small tributary of Rolling Rock Creek. The site is privately owned (Erdman and Wiegman 1974, Wiegman 1993).

Bear Run Nature Reserve, southwestern Pennsylvania (Fayette County)

In Bear Run gorge, stands of old growth forest, some unlogged. Erdman and Wiegman speak of the steeper portion of Bear Run gorge as having "virgin stands of mixed oak with some mesic species" (1974). Wiegman estimates 35 acres of never cut or lightly cut old growth (1993). The Western Pennsylvania Conservancy database speaks of approximately 50 acres of mixed mesophytic "mature old growth forest" just below Fallingwater (a house designed by Frank Lloyd Wright), and points to the need for further investigation. Bier says that the reserve has a total of around 100 acres of various old-growth communities (1993). The reserve is mostly second-growth mixed oak (Erdman and Wiegman 1974) and is owned by the Western Pennsylvania Conservancy.

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