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## OHIO

Ecologists seem to agree that Ohio has no truly virgin forest. Probably all woods have had some trees removed; and most, if not all, have had some livestock grazing, at least in the nineteenth century. Still, the state does have old-growth tracts that resemble the pre-settlement forest. Of the old-growth areas 40 or more acres in extent that have come to our attention, the sites described individually below appear to be the least disturbed.

Smaller old-growth tracts of interest include **Ault Park** (Hamilton County): about 25 acres of mixed mesophytic forest in a 224-acre park owned by the Cincinnati Park Board (Bryant 1987, 1993, Carroll 2000); **Sigrist Woods** (Stark County): a selectively cut 25-acre tract, dominated by Red and White Oak, American Beech, and Sugar Maple, "many" trees with a dbh (diameter at breast height) of over 70 cm, in a forest owned by the non-profit Wilderness Center (Hawes 1992, ODNR 1990); **Rothenbuler Woodland** (Monroe County): a 20-acre mixed mesophytic woodland on a steep slope, with several Northern Red Oaks more than four feet in diameter, in a 45-acre Nature Conservancy preserve (Kromer 1993); **Davey Woods** (Champaign County): old growth Tulip Tree-red oak community, variously described as 40 acres (Kromer 1993) or 15 to 20 acres (Woischke 1993, Anderson 1993) in a 103-acre woods owned by the Ohio Department of Natural Resources (ODNR); **Little Rocky Hollow Nature Preserve** (Hocking County): 20 acres of hemlock-dominated forest "undisturbed except for windthrows" in a 259-acre preserve owned by ODNR but surrounded by Hocking State Forest; **Sheick Hollow Nature Preserve** (Hocking County): 8 acres of "little disturbed" forest dominated by Eastern Hemlock and Tulip Tree in a 151-acre preserve, owned by ODNR but surrounded by Hocking State Forest (Neal 2001); **Hocking Hills State Park** (Hocking County): Old Man's Cave Hollow, with some 20 acres of hemlock-dominated old growth (Cornett 1993, Jones 2001); **White Pine Bog Forest Preserve** (Geauga County): a 14.5-acre tract of old-growth Eastern Hemlock, White Pine, and hardwoods within the 375-acre preserve, owned and managed by The Nature Conservancy (Jones 2001); **Clear Fork Gorge Nature Preserve** (Ashland County): 8 acres of unlogged White Pine-hemlock forest in a steep gorge within a 29-acre preserve owned by ODNR (Denny 1999, Neal 2001).

Of special interest, though not, as far as we can ascertain, containing any true old growth, is the 130-square mile Oak Openings Region in northwest Ohio. At the time of settlement, the region supported beach ridges with oak savanna and woodland, interspersed with wet prairie. In the savannas and woodlands, White Oak and Black Oak were the dominant trees; beneath them grew a wide variety of herbs, grasses, and sedges. Agriculture and urbanization destroyed most of this habitat; drainage and fire suppression degraded what was left (Abella et al. 2001). Now conservationists are working to reverse the pattern. Plans have received a boost because of a land acquisition levy passed by residents of Lucas County in 2002 and grants from the State of Ohio to match a portion

of the money thus raised. The goal is to protect some 20,000 acres (8000 ha) of the Oak Openings region and to restore at least 5,000 acres (2000 ha) of this land by 2025 [Abella 2007]. The Nature Conservancy in its 728-acre **Kitty Todd Nature Preserve**, formerly known as Schwamberger Prairie (Lucas County), is restoring oak savanna and wet prairie (TNC 2007). The condition of the land varies. For some areas, the only direct impact in the past has been logging (Seidel 2001). Burning, mowing, thinning trees, and restoring drainage patterns are among the restoration methods that The Conservancy is using. Meanwhile, Toledo Metroparks is restoring savanna remnants at its 3693-acre **Oak Openings Preserve Metropark**. As of 2001, Metroparks had restored 170 acres of savanna habitat. Its goal was restoring 250 acres of habitat in the next several years (Jaeger 2001). We describe below Old Parkway, the site in the Metropark that, before the restoration program began in 1988, came closest to being true old growth. Because of the large size of the maples among the oak, this site was not, however, one of those chosen for early restoration. [Revised 2/18/07]

**North Chagrin Reservation**, northeast of the city of Cleveland (Lake and Cuyahoga Counties)

A 1050-acre old-growth upland beech-maple forest (Tyler 2001), within the 1912-acre reservation owned by Cleveland Metroparks. The old-growth beech-maple forest includes the 65-acre A.B. Williams Memorial Woods. The beech-maple forest is 2.5 miles long north-south, and only 0.75 miles wide. The eastern edge adjoins a slope, indented by steep-sided ravines, that plunges 100-120 feet to the Chagrin River. The western edge abuts second growth on land that was used for pastures and crops prior to the 1930s and 1940s.

Williams, a naturalist, studied the ecology of the 65 acres named after him and also, in 1935, compiled an oral history of the 1050-acre forest. The only known logging of live trees (other than dying chestnut) was the removal of selected Tulip Trees and a few White Ash in 1871. The chestnut blight attacked the forest in 1936; some chestnut trees that died or were ill were cut up and used for buildings on the site. In 1936-1938 Eastern Hemlock suffered a decline, but older hemlock are nevertheless well represented in the forest today. The forest supports some American Beech over 500 years old; Sugar Maple 250-300 years old (trunk rot in fallen Sugar Maple makes aging difficult); and White Pine over 300 years old. A Black Gum that fell had lived 486 years. The ground layer has been disturbed by the numerous trails that zigzag through the forest. The trails also appear to have impacted the surface drainage, which the staff of Cleveland Metroparks is trying to restore to its earlier condition. The old growth does not enjoy any formal protection (Tyler 2001).

**Rocky River Reservation**, west of the city of Cleveland (Cuyahoga County)

Extensive old growth in the floodplain and smaller patches of old growth on the slopes of the valley cut by the Rocky River in a narrow 3432-acre reservation owned by Cleveland Metroparks. The largest concentration of old growth is toward the southern end of the reservation, which supports at least 600 acres of floodplain forest with American Sycamore, Eastern Cottonwood, and Black Willow, and here and there Tulip Trees and White Oaks. Where the land rises a few feet, beech grow, quite a few over 200 years in age. The walls of the valley have slumped in places, due in part to bad

management and bad drainage. Uncut patches of old growth on the walls include sycamores, cottonwoods, and White Oak approaching 300-350 years in age. The Reservation Concept Value Plan states that southern part of the reservation “has been designated a conservation area,” but the old growth has no formal protection (Tyler 2001; Cleveland Metroparks 1995).

**Bedford Reservation**, southeast of Cleveland (Cuyahoga County)

Extensive old growth within Tinker’s Creek Gorge, plus patches of old growth along some adjacent ridges, in the 2154-acre reservation owned by Cleveland Metroparks. The gorge, cut by the creek through Bedford siltstone, was designated a National Natural Landmark in 1968. It is 220 feet deep and approximately 900 acres in size. Some farming has occurred in the gorge, but Dick Squire of the Bedford Historical Society, who has written a history of Bedford and knows where logging took place, has found that approximately 60% of the gorge has not been disrupted by EuroAmericans. Among the numerous plant species in the gorge are American Sycamore, Bur Oak, Pumpkin Ash, Black Ash, Blue Ash, White Oak, Eastern Cottonwood, and Yellow Birch. Hemlock are as much as 200-250 years in age and 55-56 inches in circumference. The rich understory includes Spicebush, viburnum, and Mountain Laurel. The Reservation Concept Value Plan focuses “primarily on protecting, preserving, and enhancing this [Tinker’s Creek Gorge] unique resource,” but again the old growth is not formally protected (Tyler 2001).

**Morgan Sisters Woods Special Interest Area**, Wayne National Forest, in southeastern Ohio (Gallia County)

About 200 acres of apparently old-growth forest within a 355-acre Special Area. The primarily mixed mesophytic woods includes Sugar Maple, American Beech, White Ash, White Oak, Tulip Tree, Black Walnut, elm, and sycamore. On some upland areas, Northern Red Oak, Black Oak, and Chestnut Oak are prominent. The north-facing slopes have a dense understory with Red Elm, Sugar Maple saplings, and Spicebush. In much of the area and particularly on the south- and west-facing slopes, the understory is open and parklike.

As far as local residents know, the area was not cut when surrounding tracts were logged for charcoal to be burned in iron furnaces. Livestock grazing may have occurred on the slopes; during the early settlement period, farmers often grazed livestock in areas too steep for planting. Some of the flat ridgetops show evidence of grazing and farming more than 40 years ago. Within the boundary of the Special Area are a 10-15-year-old clearcut and open brush lands (Miller 1993, Smith 1992).

**Goll Woods Nature Preserve**, in northwestern Ohio (Fulton County)

A 321-acre preserve, with 140 acres of old-growth beech-oak-Red Maple forest and 40 acres of old-growth oak-maple swamp. Outstanding among the preserve's large trees are Bur Oaks with dbh of up to 56 inches. Unfortunately, the preserve is also the site of a pine plantation, and has been drained, selectively cut, and crossed by a road and trails (Woischke 1992, 1993).

**Johnson Woods State Nature Preserve** (formerly Graber Woods) (Wayne County)

A 206-acre preserve, the bulk of which is old growth. Lucy Braun described the forest “viewed in its entirety” as “a virgin white oak forest” moving toward “the ultimate establishment of beech-maple” (Braun 1950). The drier areas of the forest are today undergoing natural succession from an oak-hickory community to a beech-maple community. In less well-drained sections are swamp forest communities dominated by Red Maple and Pin Oak. Depressions in the swamps harbor Buttonbush (Ohio DNR 2001).

The forest is in two sections, bisected by a road. Some 30 acres in the southeastern corner of the south side support forest planted in the twentieth century, with trees still noticeably smaller than most in the old growth. A 1.5 mile boardwalk allows visitors to tour the south section without trampling on wildlife. A gas well, which may still be operating, is located beside the road on the north side. Another gas well, probably no longer in service, is located in the southern area (Reed 2000).

The forest is believed to have escaped logging by early settlers to the area because of its wet condition. Later the Johnson family protected it. Mrs. Clela Johnson donated 155 acres on the south side of the road to the Division of Natural Areas and Preserves in 1994. She sold 51 acres on the north side of the road to the Division, which purchased the land with Income Tax Checkoff donations (Ohio DNR 2001).

**Hueston Woods Nature Preserve**, in Hueston Woods State Park (Butler and Preble Counties)

A much-studied, approximately 165-acre (Runkle 1990) or 200-acre (Woischke 1992) old-growth forest. Beech predominates (44% of the canopy), followed by Sugar Maple (33%) and, to a much lesser extent, White Ash and Tulip Tree. An abundance of saplings includes Black Cherry, Sugar Maple, American Beech, and White Ash (Runkle 1990). The stand occupies a flat upland and a slope through which a stream flows to a man-made lake. A road and trails also cross the preserve. A number of large individual trees, including Tulip Tree and Northern Red Oak, were removed in the 1930s for veneer. They were dug out, so left no stumps (Udstuen 1993). A National Natural Landmark, the woods are owned by ODNR but managed by the Division of Natural Areas and Preserves (Denny 1999)

**Sears/Carmean Woods State Nature Preserve**, in north-central Ohio (Crawford County)

Old growth within two adjacent areas that comprise a 138-acre preserve owned by the Ohio Department of Natural Resources.

A mature beech-maple and mixed swamp forest occupies some 75 acres in the center of a 99-acre area known as Sears Woods. The most abundant tree is Sugar Maple, followed by beech. Seven species of oaks are also present. The ecologist Paul Sears, who owned the preserve prior to its transfer in 1986 to ODNR, “considered that the old-growth portions of the [preserve] were essentially undisturbed” (Do-Soon and Boerner 1991). Other portions of the site show evidence of an orchard, farming, and burned buildings, and have young successional woodland (Woischke 1992). Unfortunately, Garlic Mustard, an exotic species, has gained a hold throughout the woods (Kershner 1990, Reed 2000).

Adjacent to Sears Woods is the 39-acre Carmean Woods, beech-maple forest

owned by ODNR. "Large (mostly dead) oak stems" were removed from this woods over the past 30 years. Otherwise it is little disturbed, but Garlic Mustard is present (Do-Soon and Boerner 1991, Reed 2000).

The preserve has been leased to the Crawford County Park System. The Park System and the Ohio Department of Natural Resources share responsibility for protecting it (Reed 2000).

### **The Holden Arboretum**, northeastern Ohio (Lake County)

More than a hundred acres of documented old growth on land owned by the non-profit Holden Arboretum. The 191-acre Little Mountain Preserve (Geauga and Lake Counties) supports approximately 50 acres of old-growth White Pine and Eastern Hemlock. A 500-acre conservation easement held by the Arboretum buffers the preserve. The 700-acre Stebbins Gulch (Geauga County) includes a mile-long, 20 foot to-30 foot-wide band of old-growth forest, mostly Chestnut Oak and hemlock, on one rim of a deep ravine (Parsons 2001). At least part of the beech-maple forest within the natural area may also have escaped logging and livestock grazing (Forrester and Runkle 2000, Parsons 2001). The Arboretum, which owns 3460 acres of land, plans to inventory its forests for old growth (Parsons 2001).

### **Caldwell Park**, southwestern Ohio (Hamilton County)

A 122-acre park with an old-growth beech-maple segregate of the mixed mesophytic forest, in which Sugar Maple and American Beech are almost equal in importance. They are associated with Tulip Tree, Black Cherry, White Ash, Hackberry, Northern Red Oak, and other species. Caldwell Park is the property of the Cincinnati Parks Board (Carroll 2000).

The park is one of six old-growth forests in Hamilton County parks and preserves that William Bryant systematically sampled. He found that five of them appeared little disturbed and that, in dominant species and composition, they are similar to the area's forests at the time of settlement. Other forests in his study included California Woods Nature Preserve, Bowles Woods (described below) and Ault Park (mentioned above). One of the forests that he studied has since been cut (Bryant 1987, 1993).

### **Riddle State Nature Preserve**, in southeastern Ohio (Athens County)

An 86-acre (McCarthy et al. 1987) or 105-acre (Cantino 2003) old-growth forest on 25-40% slopes drained by intermittent streams in a 105-acre nature preserve, formerly known as Hawk Woods. Mixed oak-Tulip Tree and mixed mesophytic communities predominate. The tract also has one large White Oak stand, and, on upper slopes and ridge tops, oak-hickory and oak-heath communities. Cattle grazed the area, probably only prior to 1910; but it now has a "rich herbaceous layer" and 240 species of vascular plants. Some logging may have occurred in the 19th century, although no stumps remain. Representatives of five tree species are 90-99 cm dbh (McCarthy et al. 1987).

The longtime private owners sold 105 acres to Dale W. Riddle Forest Products in February 2003. Dale Riddle agreed to sell the land to the city of Athens, which applied for a grant to cover 75% of the purchase price from the Clean Ohio Conservation Fund. The matching 25% was expected to come from Dale Riddle (through the difference between the asking price and the assessed value), from the Athens Foundation, and from

a variety of other donors (Martha's Journal 2003). The preserve stands as a memorial to the late Dale Riddle, founder of Riddle Forest Products, and to his wife Jackie.

**Old Parkway**, in Oak Openings Preserve Metropark, west of Toledo (Lucas County)

An 85-acre remnant of oak savanna within the Metropark in the Oak Openings Region of Ohio. The site supports large, widely-spaced White Oak with open-grown canopies. The older oaks are 300-400 years old and have dbhs of 80-120 cm. Mixed among the White Oaks are large Black Oaks, approximately 200 years old with dbhs of 80-100 cm, some with open-grown canopies. Younger oaks as small as 20 cm dbh are also present. Red Maple are numerous, both as trees, up to about 40 cm dbh, and saplings. Scattered Black Cherries are also present.

Indians likely maintained the site as a White Oak savanna for hundreds of years. White Oak still dominated the site in 1835, but by then Black Oak was becoming prominent, presumably as a result of draining and less frequent fires. The site has few herbaceous species, perhaps as a result of draining, distance from any former wet prairie, and light grazing. Any grazing would have stopped by about 1970 when the Red Maple invaded. Oak has not reproduced at the site for thirty years, and without removal of the Red Maple, the site will eventually be dominated by maple (Brewer [nd]).

**Bowles Woods**, in the Miami-Whitewater Forest, southwestern Ohio (Hamilton County)

An 80-90 acre old-growth woods within a 3648-acre forest owned by the Hamilton County Park District. Sugar Maple is by far the dominant species in this little disturbed Sugar Maple-oak and mixed hardwood forest. Oaks and hickories, which rank next to Sugar Maple in importance, are most prominent on west-facing slopes. Beech is found only on east-facing areas (Bryant 1987, 1993).

**Howard Collier State Nature Preserve**, north-central Ohio (Seneca County)

An old-growth floodplain community of about 80 acres within a 200-acre preserve on the Sandusky River. The community harbors big oaks, cottonwoods, ash, American Sycamore, and Tulip Tree. The ground layer includes Marsh-Marigolds (*Caltha palustris*) and Skunk Cabbage (*Symplocarpus foetidus*). The preserve also includes ridge top forest with large beech. The Sandusky is a State Scenic River, and the Division of Natural Areas and Preserves originally acquired the site as a Scenic River Area (Denny 1999, Reed 2000).

**Wadsworth Glen**, in Ravenna Arsenal in northeastern Ohio (Portage County)

Some 60 acres of old growth in a gorge that have been lightly and selectively cut twice since 1940. The forest is beech-maple with Northern Red Oak and Black Cherry. Close to the borders of the gorge are remnants of hemlock, but hardwoods are crowding out the hemlock. The tract is the southernmost extension in Ohio of the White Pine-hemlock-northern hardwoods association.

The Army acquired the land on which the arsenal stands in 1940, and cut trees for timber to construct buildings for the installation. The forest as a whole has since been cut only selectively but repeatedly (Morgan 1993).

**Dysart Woods**, in eastern Ohio, south of Belmont (Belmont County)

A 57-acre tract of mixed mesophytic deciduous forest within a 506-acre research area, the former Dysart Farm, owned by Ohio University. The old growth is in three tracts. The two largest are separated from each other by a wide ridge. A hiking trail crosses each of the two. The balance of the property is in meadows, early successional old fields, and second-growth forest. “An occasional log was obviously removed from a damaged or windthrown tree, but for the most part the woods qualify as a virgin forest” (Ungar 1988). The University keeps the woods in their natural state, although it conducts research in them.

In the old growth, American Beech, Sugar Maple, White Oak, and Tulip Tree are “the major dominants.” The beech and the maple are increasing in importance, and the oak is decreasing in importance. The oak, in fact, are in “an obvious state of decline,” probably in part because of their age (up to 300-350 years), air pollution, and a severe drought in 1988. All other canopy species appear to be healthy (McCarthy et al. 2001).

Ohio Valley Coal Company owns the right to mine underneath Dysart Woods. Mining could cause a chronic water shortage and even subsidence. An application from the company to mine within the Dysart Woods watershed led the Buckeye Forest Council and Ohio University to file separate Lands Unsuitable for Mining petitions with the Ohio Division of Mines and Reclamation in early 1998. Later that year, the division’s head, Lisa Morris, announced a decision to prohibit surface mining within a 605-acre buffer zone and longwall underground mining within an overlapping 622-acre buffer (for technical reasons the buffer zones have since been somewhat reduced in size). Room and pillar mining, an underground technique, would be allowed beneath the woods. The issue, which is complex from the point of view of the law, was expected to be tied up in appeals for years (Tochman 2000). As of May 2003, Ohio Valley Coal Company had filed for a permit to use room and pillar mining directly beneath the woods; and the new chief of what is now the Division of Mineral Resources Management, Michael Sponsor, was in the process of making a decision on the application.

#### **Fowler Woods Nature Preserve**, in north-central Ohio (Richmond County)

Fifty acres of forest that was selectively cut, but still has old-growth characteristics in the western half of a 148-acre preserve. Beech and Sugar Maple dominate. White Ash and American Basswood are common; and Spicebush and mesic herbs dominate the understory. The preserve, which is owned by the Ohio Department of Natural Resources, also includes scattered patches of maple-ash swamp and a Buttonbush shrub swamp (Woischke 1992, 1993, Web 2001).

#### **Emerald Hills State Nature Preserve**, in eastern Ohio (Belmont County)

A 74-acre forest that, according to the records of the Ohio Department of Natural Resources, includes 44 acres uncut though possibly grazed by livestock. Red and White Oaks (up to 70 cm dbh) and Sugar Maples (30-50cm dbh) dominate. Other species include American Beech, Black Gum, Tulip Tree, and Black Oak. Hickory is common in the subcanopy, and the herb layer is diverse (Ohio DNR 1990). The preserve is owned and managed by the state’s Division of Natural Areas and Preserves (DNAP 2003).

#### **California Woods Nature Preserve**, in southwestern Ohio (Hamilton County)

An old-growth mixed mesophytic stand, more than 40 acres in size, known as the

Cincinnati Water Works Woods. Sugar Maple, American Beech, Tulip Tree, Yellow Buckeye, Northern Red Oak, and Hackberry are most prominent. Braun described the forest in 1916 as part of a sequence in ravine development and in 1926 as a climax deciduous forest. The Cincinnati Parks Board owns the little-disturbed forest (Bryant 1987, 1993, Thorn 2000).

**Crall Woods**, in north-central Ohio (Ashland County)

A 40-acre tract of old-growth hardwood forest, described by Whitney and Runkle as "an essentially undisturbed remnant of the beech-maple forest type which once dominated the Till Plains of northern Ohio." Since their article was published in 1981, a tornado damaged part of the forest; and salvage cutting may have been carried out (Anderson 1993). Dominant species are Sugar Maple, American Beech, and basswood. Also present are Tulip Tree, White Ash, Red Oak, and Shagbark Hickory. The herbaceous layer includes Wood Nettle, Hairy Sweet Cicely, and violets (Whitney and Runkle 1981, Runkle 1992, Jones 2001). On the north of the forest is a 19-acre tract of second growth, and on the south an Eastern Red-cedar field of 44 acres (Woischke 1992, Lindsey and Escobar 1976). \*In 2004 Crall Woods became part of Pine Hill Park, which is owned by the Ashland County Park District (rev. 4/22/08)

**Gross Memorial Woods Nature Preserve**, in western Ohio (Shelby County)

Within a 75-acre woods, a preserve, comprising 49 acres of old growth dominated by American Beech, Bur Oak, and Red Oak, among which are American Basswood, White Ash, White Oak, and hickories. Silver Maple is common in wet areas; Sugar Maple and basswood in the understory. The preserve is owned by the Ohio Department of Natural Resources; the other half of the woods, more disturbed than the preserve, is in private hands (Woischke 1992, 1993).

**Hach-Otis Sanctuary State Nature Preserve**, in northeastern Ohio (Lake County)

Unlogged hemlock forest within three deep ravines and mature beech-maple-oak mixed mesophytic forest comprising an 81-acre preserve. The upland forest is known to have been selectively logged in 1870. The preserve is on a bluff that rises 150 feet above the Chagrin River. It is owned by the Audubon Society of Greater Cleveland (Lillich 2001).

**Daughmer Prairie and Bur Oak Savanna** (Crawford County)

A Bur Oak savanna 35-40 acres in size. The Bur Oak are up to 300 years old. The site has never been plowed, but is currently used to pasture sheep. A family owns the site. Guy Denny describes it as "the best prairie bur oak savanna in Ohio" (Denny 1999, Jones 2000).

**\*\*Hunting Valley Old Growth**, east of Cleveland (Cuyahoga and Geauga Counties)

Thirty-five to forty acres of mixed forest within a 154-acre tract of land for which Scott Wolstein, a developer, has signed an easement with the Chagrin River Land Conservancy. The old growth is on a steep wall of land going down to the Chagrin River to its west, and is broken by huge ridges and ravines. In the gorges are Eastern Hemlocks estimated by Jim Bissell of the Cleveland Museum of Natural History, to be three

hundred years in age. Other trees in the old growth include Sugar Maple, Tulip Tree, Black Birch, American Beech, Northern Red Oak, and aspen (Breckenridge, 2005; Murphy 2006). [Added 1/22/06]

Abella, Scott R. et al. 2001. Restoring Historic Plant Communities in the Oak Openings Region of Northwest Ohio. *Ecological Restoration* 19(3):155-60.

Abella, Scott R., KJohn F. Jaeger, and Timothy A. Schetter. 2007. Public Land Acquisition and Ecological Restoration: An Example from Northwest Ohio's Oak Openings Region. *Natural Areas Journal* 27 (1):92-97.

Allen, Stacey, Naturalist, Williams Memorial Woods. 2000. Personal communication.

Anderson, Dennis. 1993. Personal communication.

Braun, E. Lucy. 1950. *Deciduous Forests of Eastern North America*. Philadelphia: Blakiston.

Breckenridge, Tom. 2006. Wolstein Agrees to Preserve 154 Acres. *Plain Dealer* [Cleveland], December 18, 2005.

Brewer, Lawrence G. [nd] A Survey of the Oak Barrens and Savannas of the Oak Openings Preserve Metropark, submitted to The Nature Conservancy and Toledo Area Metroparks.

Bryant, William S. 1987. Structure and Composition of the Old-Growth Forests of Hamilton County, Ohio and Environs. *Proceedings of the Central Hardwood Forest Conference* 6: 317-24.

Bryant, William S., Professor, Department of Botany, Thomas More College. 1993. Personal communication.

Cantino, P. D., Ohio University. 2003. Quoted in *Martha's Journal: A Publication of the Buckeye Forest Council* (2):3.

Carroll, Chris, Naturalist, Caldwell Park. 2000. Personal communication.

Cleveland Metroparks. 1995. *Metroparks 2000: Conserving Our Natural Heritage: Reservation Concept Value Plans*.

Cornett, Doug, Northwoods Wilderness Recovery. 1993. Personal communication.

Denny, Guy L., Chief, Division of Natural Areas and Preserves. 1999. Letter with photocopies from the Directory of Ohio's State Nature Preserves that Denny annotated.

Do-Soon, Cho and R. E. J. Boerner. 1991. Structure, Dynamics, and Composition of Sears Woods and Carmean Woods State Nature Preserves, North-Central Ohio. *Castanea* 56(2):77-89.

Forrester, Jodi A. and James R. Runkle. 2000. Mortality and Replacement Patterns of an Old-growth Acer-Fagus Woods in the Holden Arboretum, Northeastern Ohio. *American Midland Naturalist* 144:227-42.

Godby, Jim, Urban Forestry, Cincinnati. 2000. Personal communication.

Hawes, Robert H., Naturalist, The Wilderness Center. 1992. Personal communication.

Jaeger, John, Toledo Area Metroparks. 2001. Personal communication accompanied by reports.

Jones, Pat, Data Manager, State of Ohio Data Bank. 2000 and 2001. Personal communications.

Kershner, Bruce. 1990. Personal communication with enclosures.

Kromer, Marlene, Ohio Chapter of The Nature Conservancy. 1993. Personal communication with enclosures.

Lillich, John, Audubon Society of Greater Cleveland. 2001. Personal communication and documents from the Audubon Society.

Lindsey, Alton A. and Linda Escobar. Eastern Deciduous Forest. 1976. Vol. 2: Beech-Maple Region. Natural History Theme Studies, Number 3. National Park Service, Washington, DC.

Martha's Journal: A Publication of the Buckeye Forest Council. 2003. 9(2):3.

McCarthy, B. C., et al. 1987. Vegetation patterns and structure of an old-growth forest in southeastern Ohio. *Bulletin of the Torrey Botanical Club* 114: 33-45.

McCarthy, B. C., C. J. Small, D. L. Rubino. 2001. Composition, Structure and Dynamics of Dysart Woods, an Old-Growth Mixed Mesophytic Forest of Southeastern Ohio. *Forest Ecology and Management* 140:193-213. Miller, Ralph, Wayne National Forest. 1993. Personal communications with enclosures.

Morgan, Tim, Land Manager, Ravenna Arsenal. 1993. Personal communication.

Murphy, Anne, Director of Conservation and Land Stewardship, Chagrin River Land Conservancy. 2006. Personal communication.

Neal, Michael. 2001. Personal communication.

Ohio Department of Natural Resources (ODNR). 1990. Print out from data base.

Ohio Department of Natural Resources (ODNR). 2001. Web site:

[www.dnr.state.oh.us/odnr/dnap/natural\\_areas/johnson.html](http://www.dnr.state.oh.us/odnr/dnap/natural_areas/johnson.html) .

Ohio Division of Natural Areas and Preserves (ODNAR). 2003. Web site:

[www.dnr.state.oh.us/dnap](http://www.dnr.state.oh.us/dnap) .

Parsons, Brian, Director of Holden Arboretum. 1992. Personal communication.

Parsons, Brian, Natural Areas Coordinator, Holden Arboretum. 2001. Personal communication.

Reed, Edward, Ohio Department of Natural Resources. 2000. Personal communication.

Runkle, James R. 1990. Gap Dynamics in an Ohio Acer-Fagus Forest and Speculations on the Geography of Disturbance. *Canadian Journal of Forest Research* 20:632-41.

Runkle, James R., Department of Biological Sciences, Wright State University. 1992. Personal communication.

Segelken, John G. 1929. The Plant Ecology of the Hazelwood Botanical Preserve. *Ohio Biological Survey, Bulletin* 21.

Seidel, Terry, Kitty Todd Preserve. 2001. Personal communication.

Smith, Jeff. 1992. Personal communication.

Snider, Jerry A., Curator, Harris Benedict Nature Preserve. 1992. Personal communication.

The Nature Conservancy (TNC). Kitty Todd Preserve. [2007.] Description on the Conservancy's Web site, [www.nature.org](http://www.nature.org) .

Thorn, Clara, Naturalist, California Woods Nature Preserve. 2000.

Tochman, Jason, Buckeye Forest Council. 1993. Personal communication.

Tochman, Jason, Buckeye Forest Council. 2000. Personal communication.

Tyler, Rick, Cleveland Metroparks. 2001. Personal communication.

Udstuen, Joel, Manager, Hueston Woods. 1993. Personal communication.

Ungar, Irwin A., Professor of Botany, Ohio University. 1988. Letter with brochure on Dysart Woods.

Web. 2001. Web site of the Division of Natural Resources

[www.dnr.state.oh.us/odnr/dnap/dnap.html](http://www.dnr.state.oh.us/odnr/dnap/dnap.html) .

Whitney, G. G. and J. R. Runkle. 1981. Edge versus Age Effects in the Development of a Beech-Maple Forest. *Oikos* 37:377-381.

Woischke, Debbie, Ecological Analyst, Division of Natural Areas and Preserves, Ohio Department of Natural Resources. 1992 and 1993. Personal communications with notes and brochures.



