Where did the Carolina Hemlock come from?

Becky MacKay[a] and Ryan Trimbath[b]
[a]Volunteer, Cuyahoga Valley National Park
Contact information: rmackay4462@gmail.com

[b]Biologist, Cuyahoga Valley National Park
15610 Vaughn Road, Brecksville, OH 44141

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Introduction

Eastern hemlock (*Tsuga canadensis*), also known as Canadian hemlock, is a native evergreen conifer found in the eastern half of Ohio. The tree is distinguished by a pyramidal shape, short flat needles, and a lacy, graceful appearance due to its drooping twig tips. Ranging from Minnesota to the Atlantic Ocean and from Nova Scotia to northern Alabama, this tree thrives especially on north-facing slopes of hills and mountains and in ravines where there is more shade and moisture and cooler conditions.[1]



Figure 1. Hemlock trees along the western edge of the Ledges plateau, north of Ledges Overlook.

Eastern hemlock is an important foundation species that regulates ecosystem processes of a community.[2,3,4] Hemlock trees provide critical plant and wildlife habitat. Aquatic habitats also benefit from hemlock growing along streams, because the hemlock's dense, year-round shade keeps water temperatures cooler, which is important for native fish and amphibians. Hemlock trees also provide great aesthetic value.

Eastern hemlock is growing throughout Cuyahoga Valley National Park. The largest stands of hemlock are located at the Ledges in Virginia Kendall Park, in Brandywine Gorge, at Hemlock Point off Plateau Trail, along Columbia Run near the Buckeye Trail, and on the high eastern bank of the Cuyahoga

River, north of Station Road Bridge. There are additional hemlock stands on property owned by Cleveland Metroparks at Bedford and Brecksville Reservations.

This paper will focus on the hemlock stand seen flourishing today on top of the Ritchie Ledges near the Overlook in Virginia Kendall Park (Figure 1). Two different species of hemlock are actually growing in this particular area, and it is this second, rare species of hemlock (Carolina hemlock) that will be the subject of much of this paper. We will close on a brief discussion of the future health of hemlock in the park.

Two Species of Hemlock in Cuyahoga Valley National Park

Close inspection reveals some differences in the needles, twigs, and cones between individual hemlock trees along the western edge of the Ledges plateau near the Ledges Overlook. The most obvious difference is how the needles are arranged on the twigs. The 0.5 inch-long needles of Eastern Hemlock (Figure 2) are strongly "two-ranked,"[5,6] meaning that the needles emerge from opposite sides of the twig,180^{o} apart. In contrast, other hemlock trees in the area have slightly longer needles that are in a spiral arrangement and emerge at different angles around the twig (Figure 3).



Figure 2. Eastern hemlock twig.



Figure 3. Carolina hemlock twig.

The hemlock trees with the spiral needle arrangement have been identified as Carolina hemlock (*Tsuga caroliniana*). This species is a rare conifer that is not native to the Cuyahoga Valley, or to Ohio. While the Eastern hemlock has an extensive natural range (shown in green in Figure 4[7]), Carolina hemlock is indigenous to a very limited

area in the southern Appalachian Mountains[4,8,9,10] of North Carolina, South Carolina, Tennessee, Virginia, and Georgia (shown in blue in Figure 4[11]).

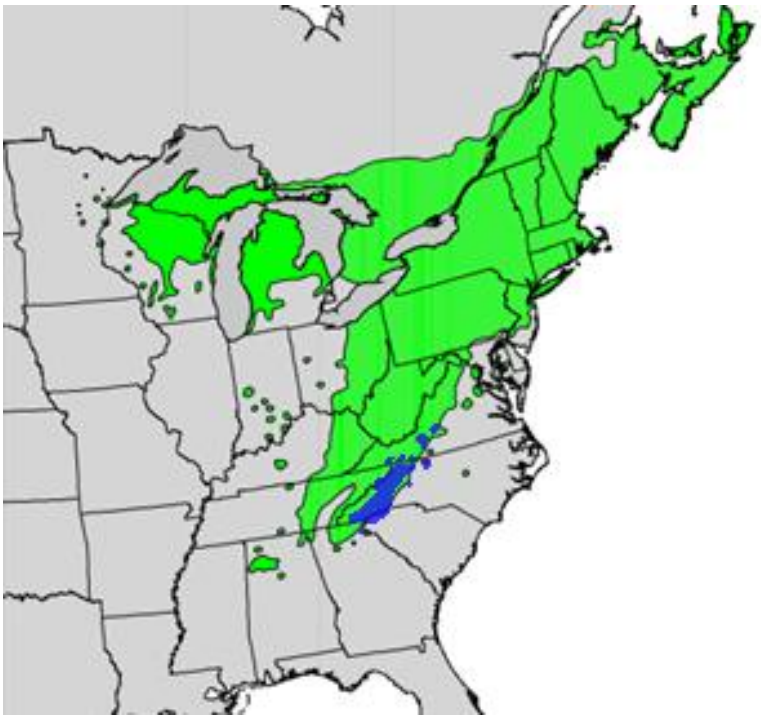


Figure 4. Natural ranges are shown for Eastern hemlock (green) and for Carolina hemlock (blue). Map was generated using digital representations in References 7 and 11.

Carolina hemlock stands often occur naturally on exposed rocky outcroppings at elevations between 600 and 1500 m (1970 and 4920 ft).[8,9,10,12] These stands tend to be in discrete, isolated pockets that are small in area and in the number of trees.[10] A few outlier populations of Carolina hemlock are also found in the Piedmont of North Carolina and Virginia at elevations between 100 and 600 m (328 and 1970 ft).[9,12]

In Cuyahoga Valley National Park, both Carolina hemlock and Eastern hemlock are growing along the western edge of the Ledges plateau near the Overlook. This is an unusual occurrence because Carolina hemlock and Eastern hemlock do not typically grow on the same site and do not hybridize.[13]

Since northeast Ohio is so far outside the natural range of Carolina hemlock, and both Eastern hemlock and Carolina hemlock are growing on the same site, *how did this non-native evergreen get to Virginia Kendall Park?* To begin to answer this question, we must first look back into the recent history of this area to discover its early land ownership and how the land was used before it became a state park and eventually part of Cuyahoga Valley National Park.

Early Land Ownership of the Ledges

By about 1910, forest coverage in Ohio had dropped from an estimated 95% to only 10%.[14] Much of the forest in the state had been cleared during the 1800's for farming, pastures, homesteads, boat building, and even fueling furnaces for building cities. Similar activities and deforestation occurred in the Cuyahoga Valley. It is hard to imagine today that some of what later became Virginia Kendall Park was heavily logged and over-farmed during the 19th century, when the Ritchie family owned the property.[15]

An 1874 plat map[16] of Boston Township in Figure 5 shows that William and Samuel Ritchie owned the land parcels from Lots 12, 25, and 26 that roughly corresponded to the boundaries of what later became Virginia Kendall State Park. The plat map also includes a horseshoe-shaped feature that is labeled, "Ritchey Ledges." Records from the U. S. Census Productions of Agriculture indicate that by 1870 about 50% of the Ritchie land parcels had been developed for dairy farming, raising hogs, and growing Indian corn.[17]

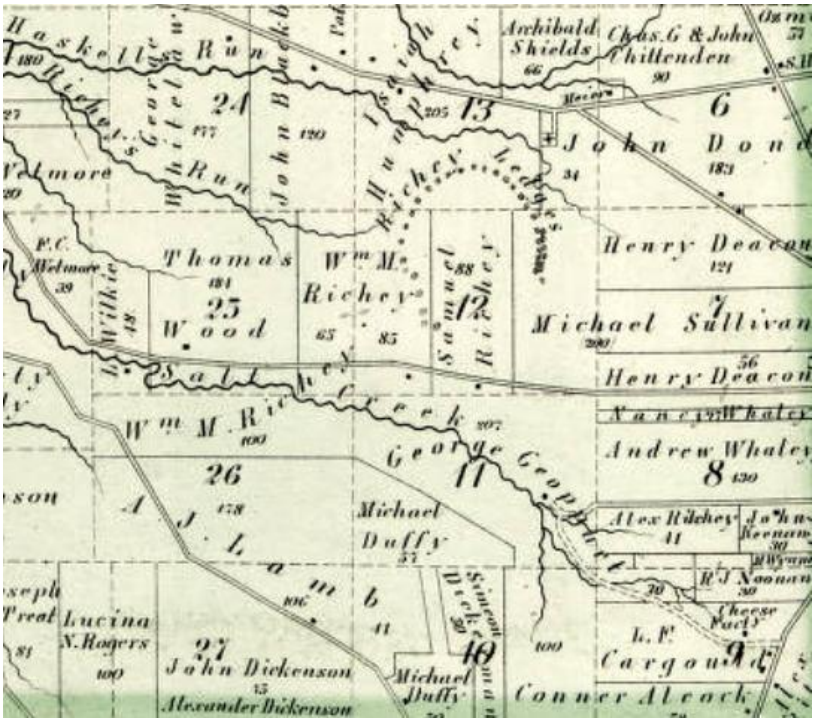


Figure 5. Portion of plat map for Boston Township in 1874. From Reference 16.

In 1913, Hayward Kendall first purchased 15 acres of the Ritchie property around the Ledges for a weekend hunting retreat. Kendall became a wealthy Cleveland businessman during World War I, and continued to buy up the Ritchie farmland until he acquired 430 acres.[17]

Creation of Virginia Kendall State Park

The importance of preserving natural resources began to be appreciated In the early 1900's, and as a result, counties in the state of Ohio were given the authority to establish metropolitan park districts.[18] The Akron Metropolitan Park District (AMPD), now called Summit Metro Parks, was formed in 1921. Harold Wagner was appointed the Director-Secretary of the AMPD in 1925. He played a key role in the reforestation of the park district, and from 1929 to 1930, Wagner was responsible for the planting of 88,520 trees in four AMPD reservations, which included Sand Run, Gorge, Goodyear Heights, and Furnace Run.[19] In 1932, the park district helped Summit County lead the state in forest plantings with a total of 255,610 trees planted.[15]

The opportunity for the AMPD to acquire prime parkland in Cuyahoga Valley occurred after Hayward Kendall's death on November 19, 1928.[20] Kendall's will stipulated that his "farm property" be used in perpetuity for park purposes and be named "Virginia Kendall Park," in honor of his mother, Virginia Kendall.[17,21] In 1930, the Kendall trustees gave 389.59 acres[21] of his farm property to the State of Ohio, making Virginia Kendall State Park a reality. The state park experienced high visitation, but public dissatisfaction grew from the absence of road maintenance and lack of facilities. In September 1933, the state assembly granted management authority of Virginia Kendall Park to the AMPD.[17,21,22]

One of Harold Wagner's top priorities as Director-Secretary of the AMPD was to transform Virginia Kendall Park into an accessible recreation destination for the public, while preserving its natural features and wilderness feel.[15] Wagner used Civilian Conservation Corps (CCC) labor from December 1933 to 1939 to grade roads, install water and sewer lines, plant trees and shrubs, build shelters and foot trails, establish picnic areas, and create Kendall Lake. Reforestation was a key part of the transformation of Virginia Kendall Park, as it encouraged aesthetic appreciation and enabled park visitors to connect with nature.[15] A dominant feature of Wagner's naturalistic landscape design plan included the planting of large stands of trees in areas that were identified for forest improvements.[17]

Reforestation of Virginia Kendall Park

Aerial photographs taken of Virginia Kendall Park on August 2, 1933, clearly reveal large treeless areas. Two of these photos[23] with a common boundary are placed side-by-side in Figure 6. The photographs show original farm fields and logged areas, as well as remaining stands of trees, before any construction and reforestation projects began by the CCC. It is apparent that the Ledges area had large treeless expanses on

the Ledges plateau and to the west-southwest of the Ledges in 1933. It is also evident that the Kendall Lake area was largely farmland and pastureland with some trees visible along a creek bank. Thus, a fairly large fraction of Virginia Kendall State Park was devoid of trees in 1933 as a result of 19th century farming and logging. In addition, American chestnut trees were killed in the Midwest by chestnut blight beginning in the 1920's, which also took its toll on the park landscape.[17]

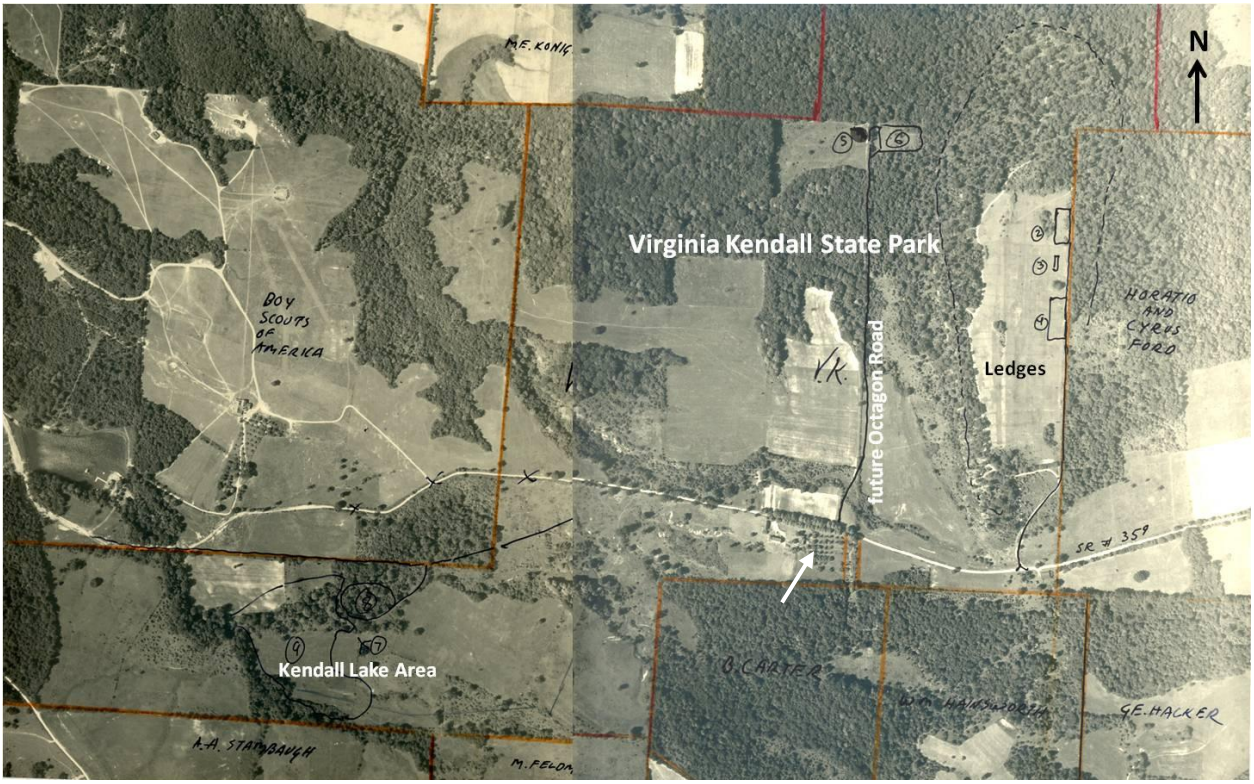
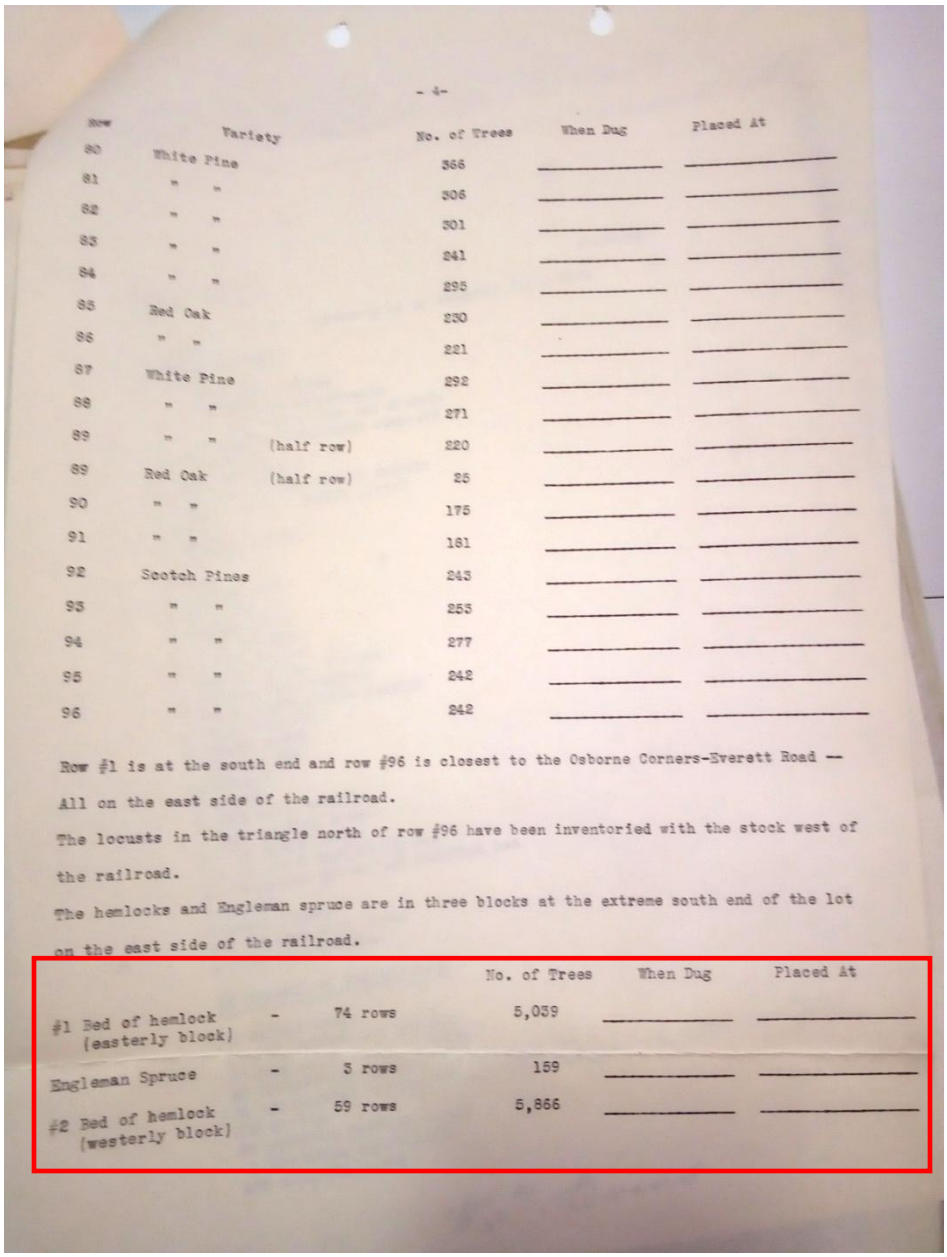


Figure 6. Aerial photographs of Virginia Kendall State Park and surrounding area on August 2, 1933, prior to construction and reforestation projects. From Reference 23. White arrow points to rows of planted trees near the future location of the tree nursery on the south side of SR 359.

For the large scale reforestation projects, Harold Wagner purchased most of the trees "at very low prices" from the State Forest Nursery in Wooster, Ohio.[19,22] However, some trees were also procured from private nurseries across the U.S.

To facilitate the reforestation efforts, Wagner set up several forest tree nurseries within the AMPD, including one in Everett in 1931.[19] These tree nurseries were used to propagate seedlings and to establish and maintain tree stock before its final planting in the AMPD. The trees in the Everett nursery ranged in height from about 12 inches to 7 feet.[19,22] By Wagner's own account in February 1936, the Everett nursery contained about 350,000 trees, which was enough to plant 325 acres of forest.[19,22]

A tree nursery was also established by 1934 in Virginia Kendall Park on the south side of SR 359 (current day Truxell Road) near its junction with present day Octagon Road.[17,19] Interestingly, regular rows of planted trees may be seen near this spot in the 1933 aerial (see white arrow in Figure 6). Although plant inventories for the Virginia Kendall Park nursery could not be found, we did locate an inventory of trees at the Everett nursery, as of January 1935. An example of one page of the extensive inventory is shown in Figure 7,[24] where it may be seen that over 10,000 hemlock trees had been planted in the Everett nursery.



- 4 -

Row	Variety		No. of Trees	When Dug	Placed At
80	White Pine		366		
81	" "		306		
82	" "		301		
83	" "		241		
84	" "		295		
85	Red Oak		230		
86	" "		221		
87	White Pine		292		
88	" "		271		
89	" "	(half row)	220		
89	Red Oak	(half row)	25		
90	" "		175		
91	" "		161		
92	Scotch Pines		243		
93	" "		255		
94	" "		277		
95	" "		242		
96	" "		242		

Row #1 is at the south end and row #96 is closest to the Osborne Corners-Everett Road — All on the east side of the railroad.

The locusts in the triangle north of row #96 have been inventoried with the stock west of the railroad.

The hemlocks and Engleman spruce are in three blocks at the extreme south end of the lot on the east side of the railroad.

			No. of Trees	When Dug	Placed At
#1 Bed of hemlock (easterly block)	-	74 rows	5,039		
Engleman Spruce	-	3 rows	159		
#2 Bed of hemlock (westerly block)	-	59 rows	5,866		

Figure 7. Inventory sheet of trees planted at the Everett nursery as of January 1935. From Reference 24.

These hemlock trees would have been Eastern hemlock, based on purchase records from the early 1930's (Appendices A and B[24]). Unfortunately, the right-hand columns for documenting when and where the trees were placed in their final location(s) were left blank on all the inventory sheets, as seen in Figure 7. It is not known where these Eastern hemlock trees were planted in the AMPD.

Harold Wagner seemed to have made a concerted effort to obtain Eastern hemlock from nurseries in different parts of the country. Both nursery-grown stock and seedlings that were collected in the field were procured. Eastern hemlock seedlings were purchased from nurseries in New York (Appendices A and B[24]), Ohio (Appendix C[24]), and Wisconsin (Appendices D and E[25]). Numerous attempts, without success, were also made between 1932 and 1939 to purchase Eastern hemlock seedlings from Harrisburg, Pennsylvania, that were grown in a nursery from locally collected seed.[24] In 1941, Wagner wrote that he sought Eastern hemlocks from more northern areas such as northeast Wisconsin, because prior Eastern hemlock purchases were from nurseries at more southern latitudes (Appendix D).[25] It was not clear if he was trying to obtain genetic diversity or if he simply wanted trees from a more northern climate that might be better able to withstand harsh winter conditions.

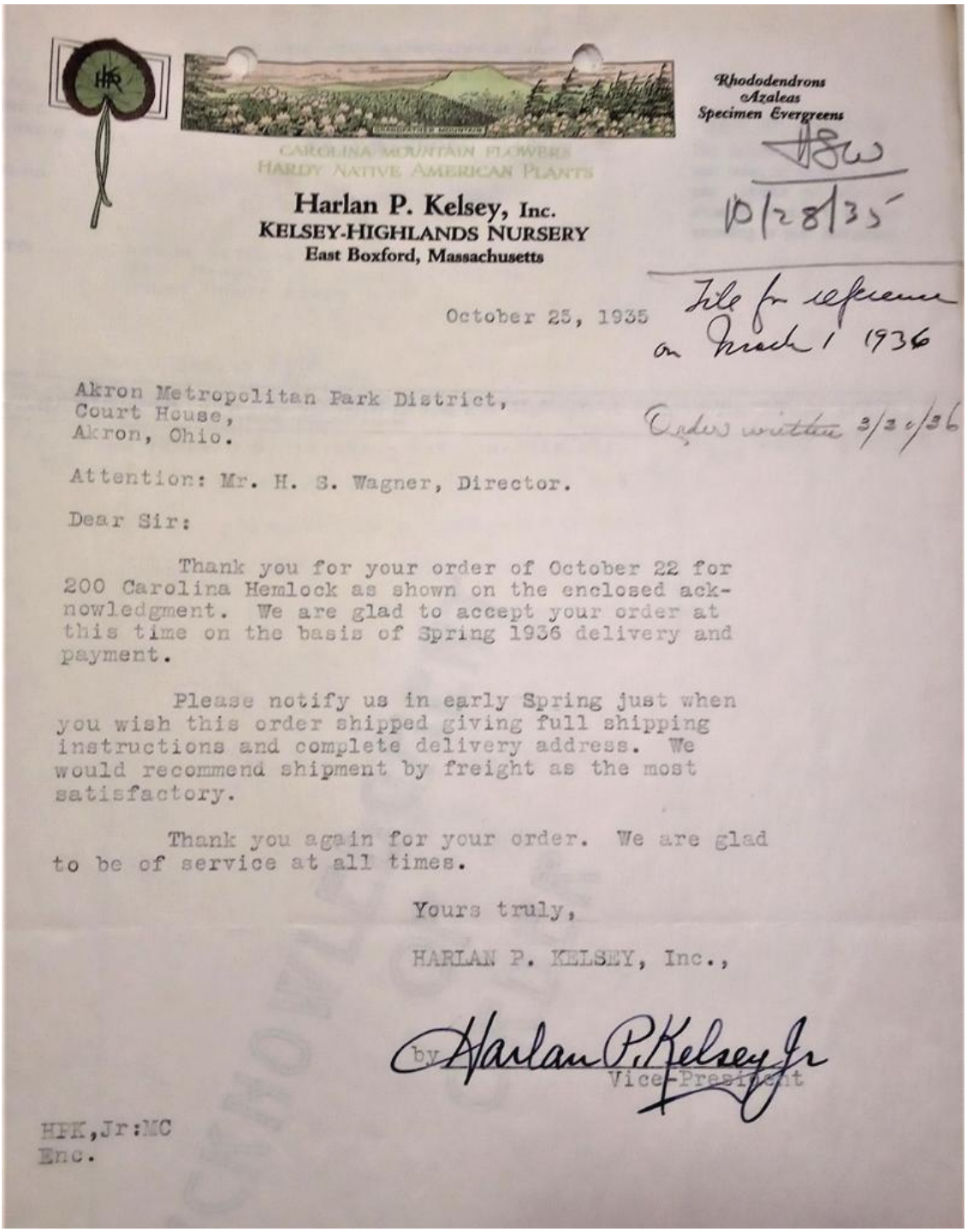
Between December 1, 1933, and December 31, 1938, 122 acres of Virginia Kendall Park had been planted with evergreen and hardwood trees.[15,17] Some of these trees were likely planted below the Ledges plateau on the south and west-southwest sides and down toward the valley to the west.[15,17] The western edge of Kendall Hills near Pine Hollow was also planted with trees after the CCC created Kendall Lake.[17] Tens of thousands of native collected trees and shrubs were also moved within the park, in order to cover scarred areas after road grading or construction.[17,26,27]

Harold Wagner purchased both native and non-native tree species for planting in the AMPD. In a February 1936 report, Wagner indicated that, except for scotch pine and Norway spruce, very few non-native trees were used during reforestation of the park district's land.[19,22] He also wrote in the same report, "There is… almost a rigid rule now in force…calling for the elimination of any exotic species."[19,22] Yet despite this statement, a rare, non-native evergreen was ordered in the fall of 1935 for delivery in the spring of 1936.

Where Did the Rare, Non-Native Carolina Hemlock Come From?

Arrangements were made by Harold Wagner in October 1935 to purchase Carolina hemlock for planting in the AMPD, despite the apparent shift toward the use of native species in reforestation efforts. Purchase records in Figures 8 and 9 show that 200

Carolina hemlock, 12 to 18-inch high, were procured for $100 from the Kelsey-Highlands Nursery in East Boxwood, Massachusetts, for delivery in the spring of 1936.[24]



Rhododendrons
Azaleas
Specimen Evergreens

CAROLINA MOUNTAIN FLOWERS
HARDY NATIVE AMERICAN PLANTS

Harlan P. Kelsey, Inc.
KELSEY-HIGHLANDS NURSERY
East Boxford, Massachusetts

HPK
10/28/35

October 25, 1935

File for reference on March 1 1936

Akron Metropolitan Park District,
Court House,
Akron, Ohio.

Order written 3/2/36

Attention: Mr. H. S. Wagner, Director.

Dear Sir:

Thank you for your order of October 22 for 200 Carolina Hemlock as shown on the enclosed acknowledgment. We are glad to accept your order at this time on the basis of Spring 1936 delivery and payment.

Please notify us in early Spring just when you wish this order shipped giving full shipping instructions and complete delivery address. We would recommend shipment by freight as the most satisfactory.

Thank you again for your order. We are glad to be of service at all times.

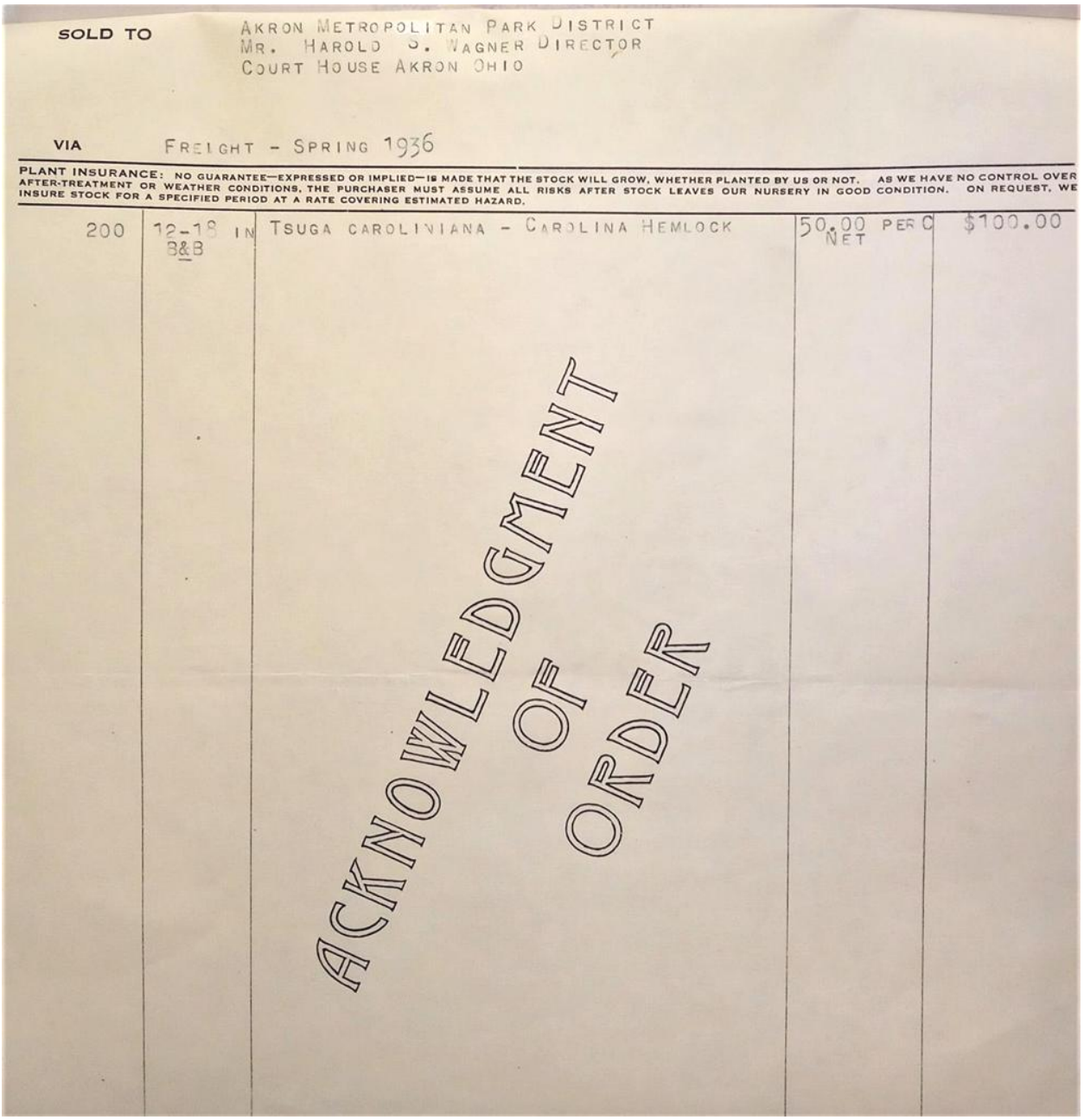
Yours truly,

HARLAN P. KELSEY, Inc.,

by Harlan P. Kelsey Jr
Vice-President

HPK,Jr:MC
Enc.

Figure 8. Letter from Kelsey-Highlands Nursery on October 25, 1935, acknowledging purchase order from Akron Metropolitan Park District for Carolina hemlock. From Reference 24.



SOLD TO AKRON METROPOLITAN PARK DISTRICT
MR. HAROLD S. WAGNER DIRECTOR
COURT HOUSE AKRON OHIO

VIA FREIGHT - SPRING 1936

PLANT INSURANCE: NO GUARANTEE—EXPRESSED OR IMPLIED—IS MADE THAT THE STOCK WILL GROW, WHETHER PLANTED BY US OR NOT. AS WE HAVE NO CONTROL OVER AFTER-TREATMENT OR WEATHER CONDITIONS, THE PURCHASER MUST ASSUME ALL RISKS AFTER STOCK LEAVES OUR NURSERY IN GOOD CONDITION. ON REQUEST, WE INSURE STOCK FOR A SPECIFIED PERIOD AT A RATE COVERING ESTIMATED HAZARD.

200	12-18 IN B&B	TSUGA CAROLINIANA - CAROLINA HEMLOCK	50.00 PER C NET	$100.00

ACKNOWLEDGMENT OF ORDER

Figure 9. Document from Kelsey-Highlands Nursery acknowledging details of purchase order for Carolina hemlock. Delivery to Akron Metropolitan Park District is shown for Spring 1936. From Reference 24.

No records have been found that document the specific location(s) where Carolina hemlock were planted permanently. It is assumed that these seedlings were first planted at the Virginia Kendall nursery until they were established. Purchase records show that Harold Wagner paid *thirty times more* per seedling for Carolina hemlock than for native Eastern hemlock. One could argue that he must have had a special plan for planting this rare species.

At first glance, it may seem hard to imagine that roots of young trees could take hold in the rocky areas near the Ledges Overlook. However, this site seems somewhat similar to that in which Carolina hemlock grow naturally, as both have rocky outcroppings and shallow, well-drained soil. The elevation at the Ledges is about 320 m (1050 ft), which is lower in elevation than typical native Carolina hemlock sites, although a few small, disjunct populations of Carolina hemlock have been observed growing naturally at elevations between 100 and 600 m (328 and 1970 ft).[9,12]

As seen in the 1933 aerial photograph presented earlier in Figure 6, the Ledges plateau was largely devoid of trees, except along the perimeter. An aerial photograph taken from a blimp in 1939 provides a closer look at the Ledges Overlook, Figure 10.[28] Some gaps between trees are apparent along the western edge of the Ledges plateau, in directions both north and south from the Overlook. These locations correspond to where the Carolina hemlocks are found today. No Carolina hemlock trees are known to exist in Summit Metro Parks[29] (formerly called Akron Metropolitan Park District), so it seems unlikely that Wagner planted Carolina hemlocks outside of Virginia Kendall Park.

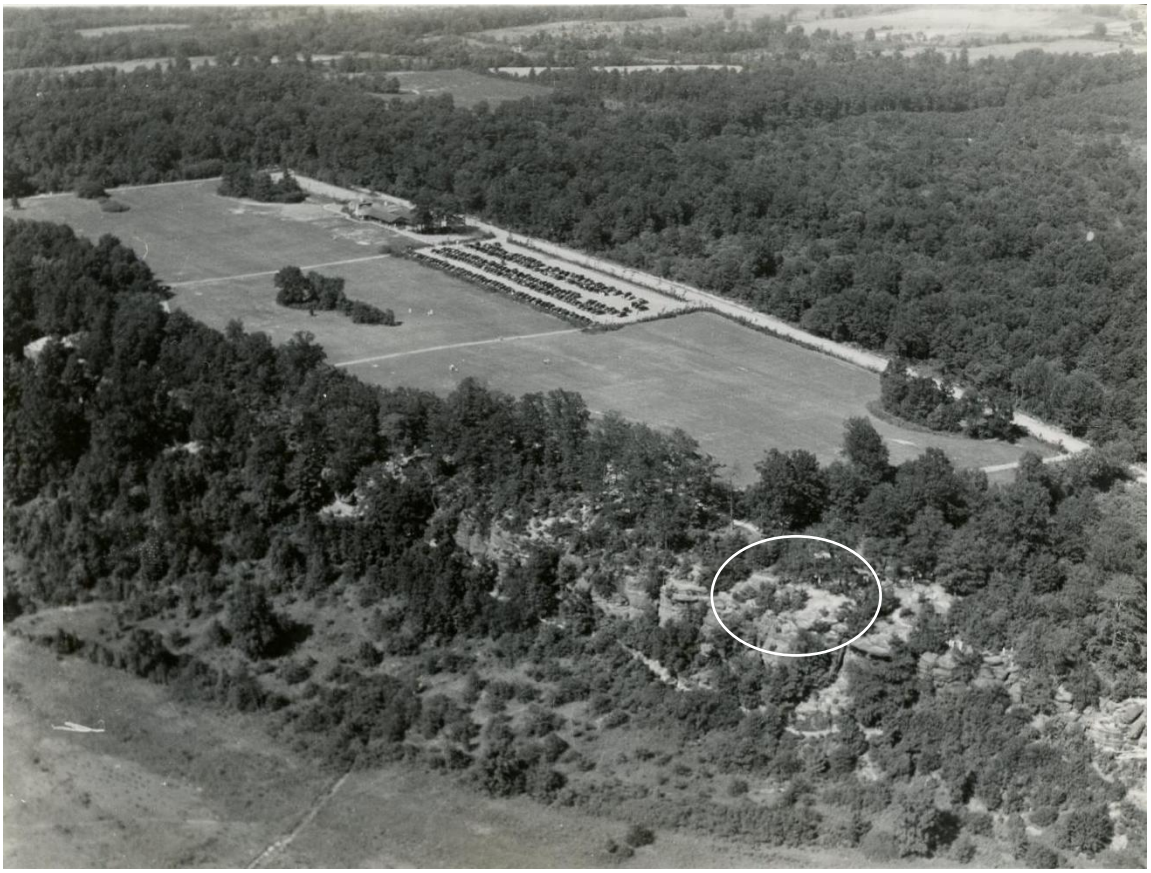


Figure 10. August 1939 aerial of Ledges plateau and outcropping, as viewed from the southwest. From Reference 28. Ledges Overlook is circled in the foreground.

Carolina hemlock trees are also growing in another location in Virginia Kendall Park, just west of the dam at Kendall Lake.[30] These trees are smaller in diameter than the Carolina hemlock on top of the Ledges. However, it should be noted that hemlock are extremely shade-tolerant and can grow very slowly in the understory as a suppressed tree. As a result, hemlock of the same age can vary widely in tree diameter due to very localized growing conditions.[31] These smaller diameter hemlock trees, which are on a shaded, north-facing slope near the dam, may still be the same age as those on the Ledges plateau that are exposed to more sunlight.

Furthermore, these Carolina hemlock trees near the dam at Kendall Lake are growing at about the same height above Salt Run, and also appear to be spaced out regularly, rather than being randomly distributed. These trees have the appearance of being planted. A few hemlock are also growing midway up the slope. As stated earlier, other evergreens were known to have been planted in that same general area after Kendall Lake was created by the CCC,[17] so it seems plausible that these Carolina hemlock were also planted at the same time.

The idea that Carolina hemlock were planted at the Ledges is further bolstered by the research of Potter, et al.,[10] who conducted a genetic study on samples taken from 439 Carolina hemlock trees in 29 different areas. Samples of Carolina hemlock from the Ritchie Ledges were included in this study. Potter, et al., indicated that if the Carolina hemlock population in the Cuyahoga Valley was natural, it would be expected to have genetics highly similar to the more northern populations of Carolina hemlock,[10] since the Cuyahoga Valley is far outside the known natural range of Carolina hemlock. However, the genetic composition of Carolina hemlock at the Ritchie Ledges encompasses a large proportion of the southern gene pools.[10] This result and another measure of genetic divergence enabled Potter, et al., to conclude that the Carolina hemlock population at the Ledges is not likely to be naturally occurring.[10]

Kelsey-Highlands Nursery

Harlan P. Kelsey was the owner of Kelsey-Highlands Nursery from which Harold Wagner purchased Carolina hemlock. Kelsey specialized in collecting and propagating plants and trees that were indigenous to the southern Appalachian mountain region.[32] He opened his first nursery in Highlands, North Carolina,[33,34] and by 1890, had moved to a new nursery grounds in the Blue Ridge Mountains in Linville, North Carolina.[32,33] Linville is in the core of the natural range for the Carolina hemlock species.

Harlan Kelsey began selling Carolina hemlock by 1890.[32] He advertised Carolina hemlock as “the rarest and most beautiful American conifer” (Figure 11) and “The

Queen of American Evergreens."[35] Carolina hemlock continued to be highlighted in Kelsey-Highlands Nursery sales catalogs as "the aristocrat of evergreens" through at least 1940.[36]



62.34

CAROLINA HEMLOCK

The Rarest and Most Beautiful American Conifer

APR 5 1920

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RECEIVED
U.S. Department of Agriculture

CAROLINA HEMLOCK supplied by us now growing on an estate near Boston where it has proven the most conspicuously beautiful Hardy Evergreen in an almost complete collection of Native and Exotic Conifers. Beautiful examples may be seen at the Arnold Arboretum where its remarkably distinctive character places it in the lead of this greatest collection of specimen evergreens in America.

Introduced by **HARLAN P. KELSEY,** *Hardy American Plants*
SALEM, MASSACHUSETTS

Figure 11. A 1920 Kelsey-Highlands Nursery brochure. From Reference 35.

The Kelsey-Highlands Nursery was relocated several times between 1894 and 1920,[35,37,38,39] but it remained in North Carolina within six miles of Linville. Each new nursery grounds was advertised as being in the Blue Ridge Mountains at an elevation of 3,800 feet.[37,38,39] Although Harlan Kelsey moved his sales office to Boston by 1900[34,38] and then to Salem, Massachusetts, in 1912,[34,39] his nursery stock continued to be grown at and shipped from the Kelsey-Highlands Nursery in North Carolina until 1921.

In 1921, Kelsey's nursery was moved permanently to East Boxford, Massachusetts, where over 30,000 Carolina hemlock trees of all sizes were grown.[40] Thereafter, no

mention was made in the sales catalogs of a nursery in North Carolina. So although the original stock came directly from North Carolina, propagation of these Southern Appalachian trees apparently took place in northern Massachusetts after 1921.

Kelsey established a regional impact in the northeast by distributing his annual catalogs during this time frame.[34] Having done some conservation work in Yellowstone and Shenandoah National Parks, the Everglades, and the White Mountains, Kelsey became nationally recognized and was said to "cast an extremely long shadow in his day."[34]

Harold Wagner's Professional Ties and Influences

It is not known if Harold Wagner knew Harlan P. Kelsey personally, but they had, at the very least, some indirect professional ties. Kelsey introduced and supplied Carolina hemlock to the Arnold Arboretum at Harvard University in 1884,[41] and later worked with Frederick Law Olmsted, Jr. Harold Wagner also had ties to the Arnold Arboretum, as he was trained there for four years as a landscape architect.[17,19,42,43] Wagner worked summers for no pay for Frederick Law Olmsted, Jr., and John Charles Olmsted,[19,42,43] until he was hired by Warren H. Manning around 1917.[17,19,42,43]

Warren H. Manning was known nationally for creating planting designs that emulated natural landscapes.[17] His planting plans had a strong influence on Harold Wagner, who was quoted as saying that Manning knew more about plants than did the entire Olmsted organization.[17] Manning had designed planting plans for Vanderbilt's Biltmore Estate in North Carolina while working with the Olmsted brothers between 1888 and 1896.[17,44] Potter, et al., concluded from their genetic studies that the Carolina hemlock trees at the Biltmore Estate were "almost certainly planted" and came from a source near the estate.[10] Harold Wagner remained in frequent contact with Manning for more than a decade after becoming Director-Secretary of the AMPD, and invited Manning in 1934 to visit Virginia Kendall Park to see the scenery and discuss the on-going construction.[45]

It seems feasible that Harold Wagner became aware of Kelsey's penchant for Carolina hemlock during his time in Boston. It also seems quite probable that Wagner knew of his mentor's use of planted Carolina hemlock in the landscape designs for the Biltmore Estate. These connections likely contributed to Wagner's decision to plant Carolina hemlock as part of his reforestation efforts in Virginia Kendall Park.

A State Champion Tree

Approximately 80 mature Carolina hemlock trees currently exist at the Virginia Kendall Ledges, and about 40 mature Carolina hemlock are growing near the Kendall Lake dam. One was identified in 2011 as being the largest in the park. This tree is shown in



Figure 12. State of Ohio Champion Carolina hemlock tree (left of center) in Virginia Kendall Park.

the photo in Figure 12 (left of center) and was identified by Steve Galehouse.[30] Because Carolina hemlock is not native to Ohio and is not known to exist at other sites in the state,[46] this particular tree is also considered to be the largest Carolina hemlock in the State of Ohio. It has been designated by the Ohio Department of Natural Resources as the Carolina Hemlock State Champion in the Non-Native Big Tree Champion Registry.[47]

State Champion trees are selected by the tree's circumference, height, and canopy spread. The Carolina Hemlock State Champion is on top of the Ledges, along the western edge of the plateau about 200 feet south of the Ledges Overlook. This is the only State Champion tree of any species that exists in Cuyahoga Valley National Park.

Future Health of Hemlock in Cuyahoga Valley National Park

Close inspection of the landscape reveals that numerous, small Carolina Hemlock seedlings (Figure 13) appear to have regenerated on their own, within about 15 m (50 ft) from the mature hemlock trees along the western edge of the Ledges plateau. This suggests that the Carolina hemlock population in the park is currently self-sustaining.



Figure 13. Carolina hemlock seedlings growing naturally on Ledges plateau.

As a native species, the Eastern hemlock population in the park has long been self-sustaining. Two hundred-year-old Eastern hemlock trees were identified along the Ledges Trail in the 1970's.[48]



Figure 14. Hemlock Wooly Adelgid (white masses) and Elongate Hemlock Scale (brown insects) are seen on the underside of this infested hemlock twig. Source: Tom Macy, ODNR.

Unfortunately, however, hemlock trees in the eastern United States are suffering from the infestation of a destructive pest called Hemlock Woolly Adelgid (HWA).[2,8,9,10,13,49] The pest is seen as white wooly masses in Figure 14. Hemlock that are affected by HWA become discolored and lose needles and branches, which eventually leads to the death of the tree. HWA can be fatal to hemlock trees after 4-15 years of infestation. This pest has caused widespread hemlock decline and mortality with millions of hemlock trees being killed in the eastern U.S.[2] Both Eastern hemlock and Carolina hemlock are affected by HWA.

Although HWA has begun to infect hemlock in nearby Ohio counties as well as in Sand Run Reservation of Summit Metro Parks, it has not yet reached Cuyahoga Valley National Park. The health of hemlock stands in the park is currently being monitored for HWA and another invasive pest also seen in Figure 14. The brown insect is called Elongate Hemlock Scale (EHS). EHS feeds on the sap of the host tree, which leads to yellow spotting on the needles and premature needle drop.

It is difficult to imagine the landscape at the Ledges, in Brandywine Gorge, at Hemlock Point, and along the Columbia Run without large, healthy hemlock. Future work may include treatment of hemlock stands for their protection and preservation in Cuyahoga Valley National Park. Additionally, as part of a coordinated effort in the Great Lakes States, seeds from hemlock in Ohio are being collected for long-term storage at the National Seed Lab, in order to assist with future conservation and tree breeding efforts of hemlock trees.

References

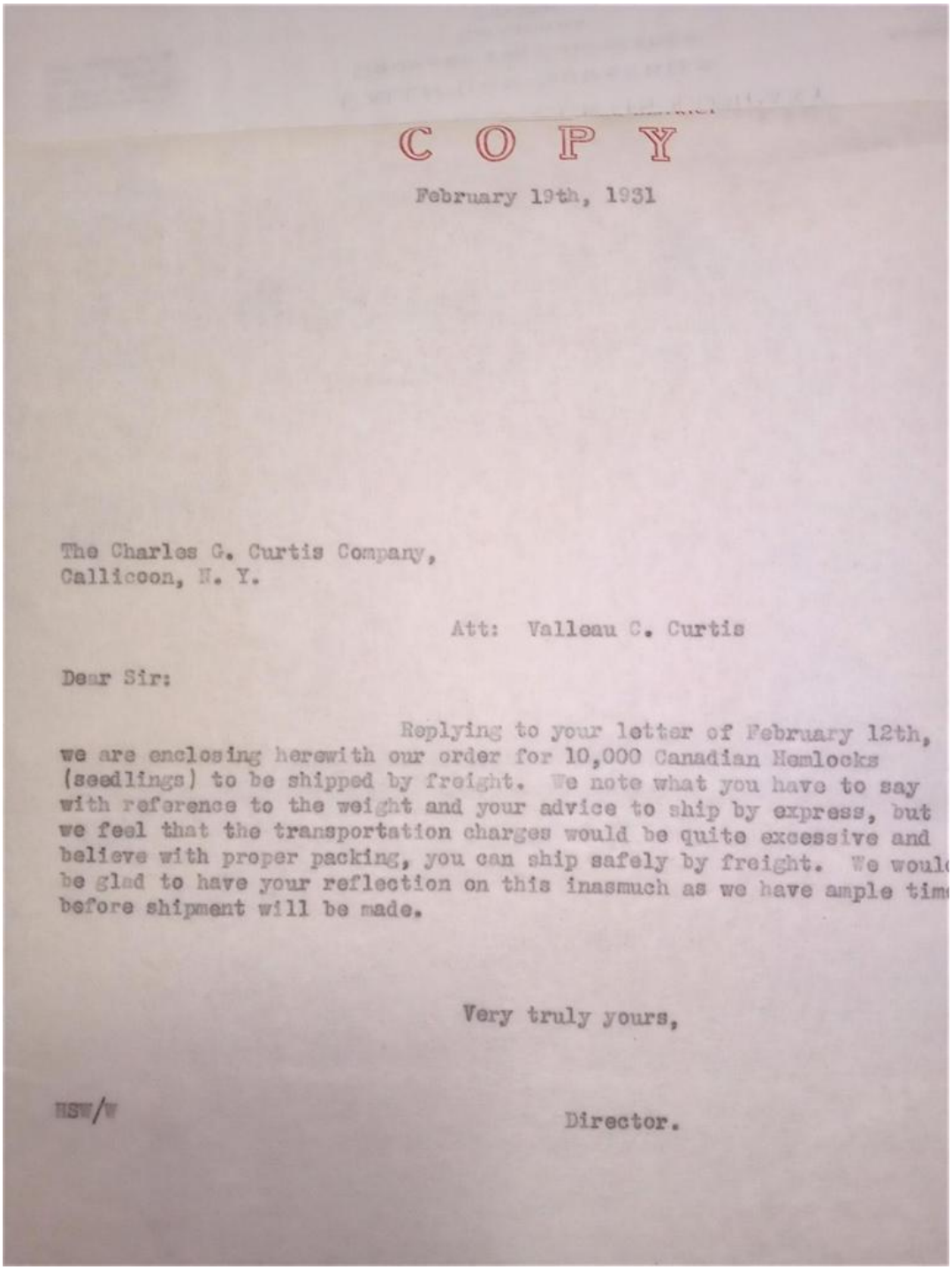
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Appendix A:
1931 Purchase Order for 10,000 Eastern (or Canadian) hemlock seedlings from Callicoon Nurseries of The Charles G. Curtis Company in Callicoon, New York



C O P Y

February 19th, 1931

The Charles G. Curtis Company,
Callicoon, N. Y.

Att: Valleau C. Curtis

Dear Sir:

Replying to your letter of February 12th, we are enclosing herewith our order for 10,000 Canadian Hemlocks (seedlings) to be shipped by freight. We note what you have to say with reference to the weight and your advice to ship by express, but we feel that the transportation charges would be quite excessive and believe with proper packing, you can ship safely by freight. We would be glad to have your reflection on this inasmuch as we have ample time before shipment will be made.

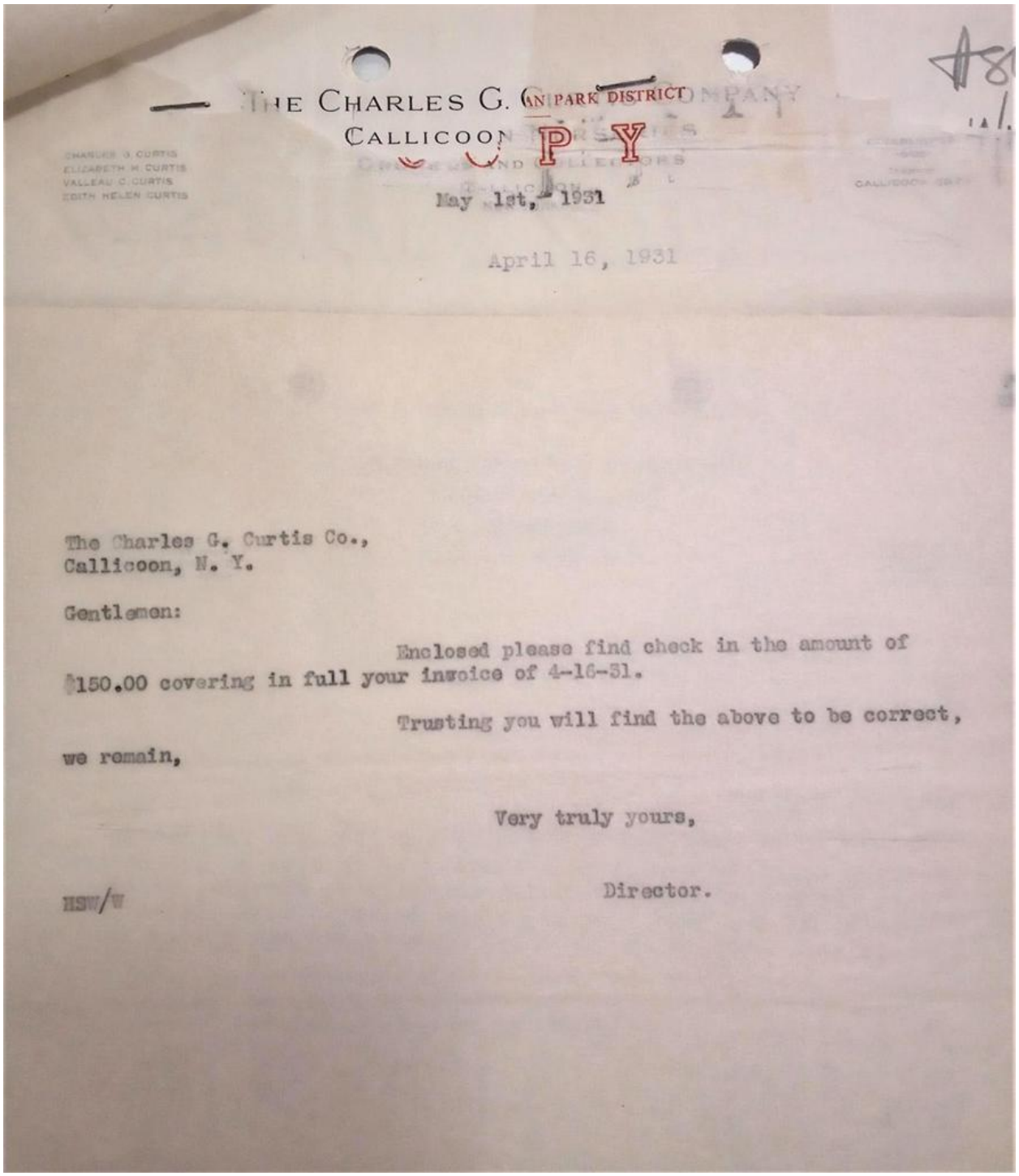
Very truly yours,

HSW/W

Director.

From Reference 24

Appendix B:
1931 Documentation of payment for 10,000 Eastern (or Canadian) hemlock seedlings from Callicoon Nurseries of The Charles G. Curtis Company in Callicoon, New York



THE CHARLES G. CURTIS COMPANY
CALLICOON PARK DISTRICT
CALLICOON P Y

May 1st, 1931

April 16, 1931

The Charles G. Curtis Co.,
Callicoon, N. Y.

Gentlemen:

Enclosed please find check in the amount of $150.00 covering in full your invoice of 4-16-31.

Trusting you will find the above to be correct, we remain,

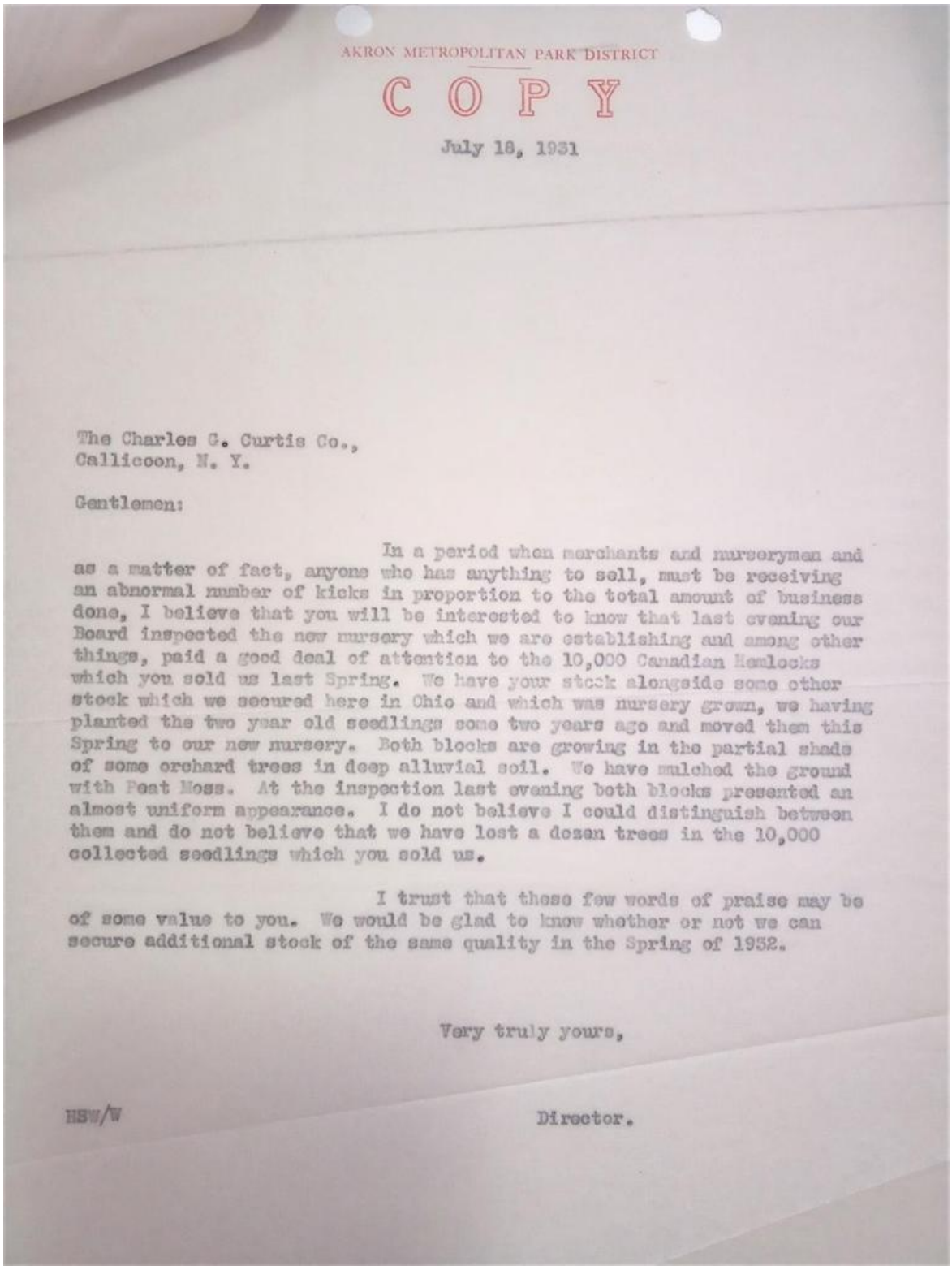
Very truly yours,

Director.

HSW/W

From Reference 24

Appendix C:
1931 Letter from Harold Wagner referencing Eastern hemlock stock from Ohio



AKRON METROPOLITAN PARK DISTRICT

COPY

July 18, 1931

The Charles C. Curtis Co.,
Callicoon, N. Y.

Gentlemen:

In a period when merchants and nurserymen and as a matter of fact, anyone who has anything to sell, must be receiving an abnormal number of kicks in proportion to the total amount of business done, I believe that you will be interested to know that last evening our Board inspected the new nursery which we are establishing and among other things, paid a good deal of attention to the 10,000 Canadian Hemlocks which you sold us last Spring. We have your stock alongside some other stock which we secured here in Ohio and which was nursery grown, we having planted the two year old seedlings some two years ago and moved them this Spring to our new nursery. Both blocks are growing in the partial shade of some orchard trees in deep alluvial soil. We have mulched the ground with Peat Moss. At the inspection last evening both blocks presented an almost uniform appearance. I do not believe I could distinguish between them and do not believe that we have lost a dozen trees in the 10,000 collected seedlings which you sold us.

I trust that these few words of praise may be of some value to you. We would be glad to know whether or not we can secure additional stock of the same quality in the Spring of 1932.

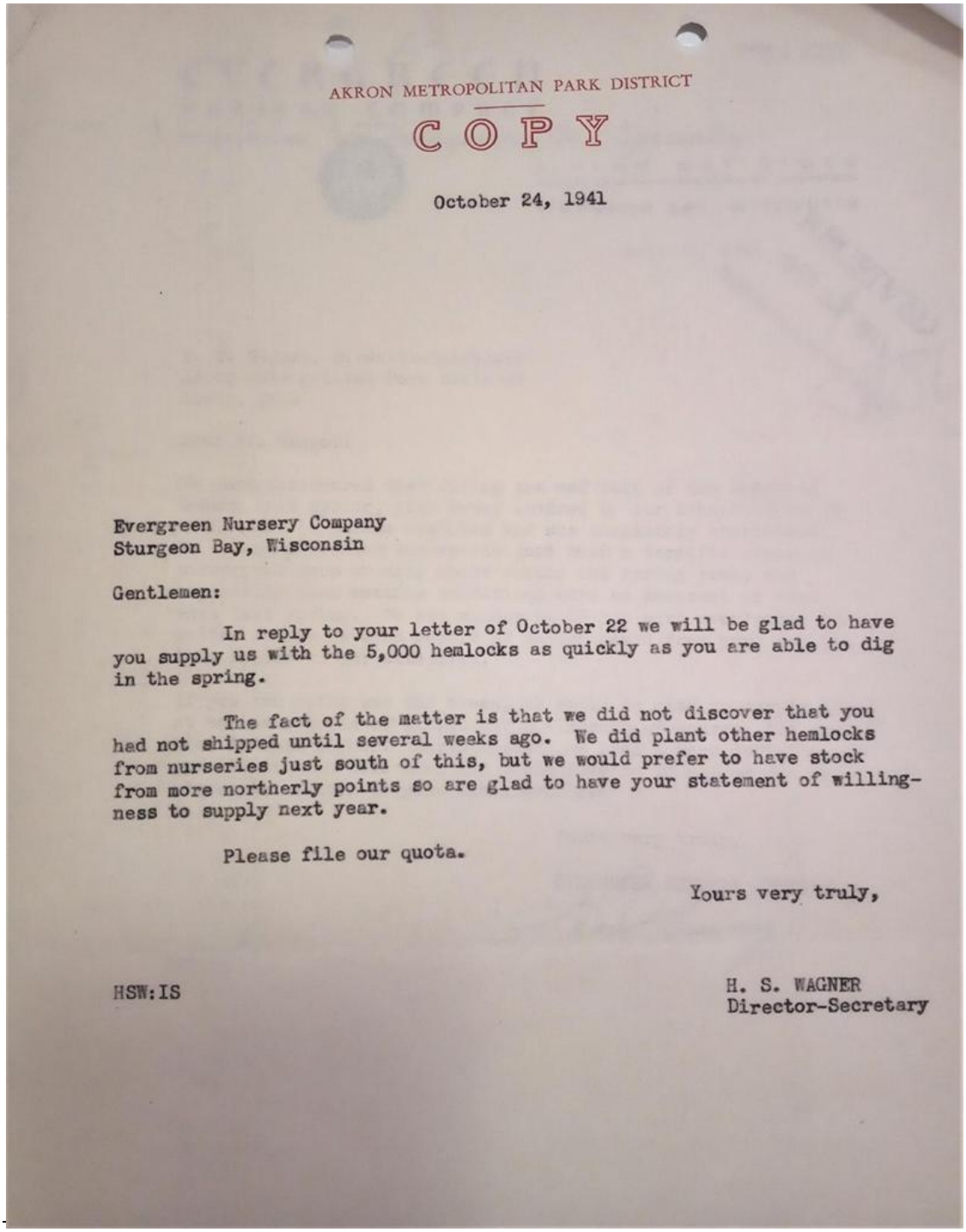
Very truly yours,

HSW/W

Director.

From Reference 24

Appendix D:
1941 Request for Shipment of 5,000 Eastern hemlock from Evergreen Nursery Company, Sturgeon Bay, Wisconsin



AKRON METROPOLITAN PARK DISTRICT

COPY

October 24, 1941

Evergreen Nursery Company
Sturgeon Bay, Wisconsin

Gentlemen:

In reply to your letter of October 22 we will be glad to have you supply us with the 5,000 hemlocks as quickly as you are able to dig in the spring.

The fact of the matter is that we did not discover that you had not shipped until several weeks ago. We did plant other hemlocks from nurseries just south of this, but we would prefer to have stock from more northerly points so are glad to have your statement of willingness to supply next year.

Please file our quota.

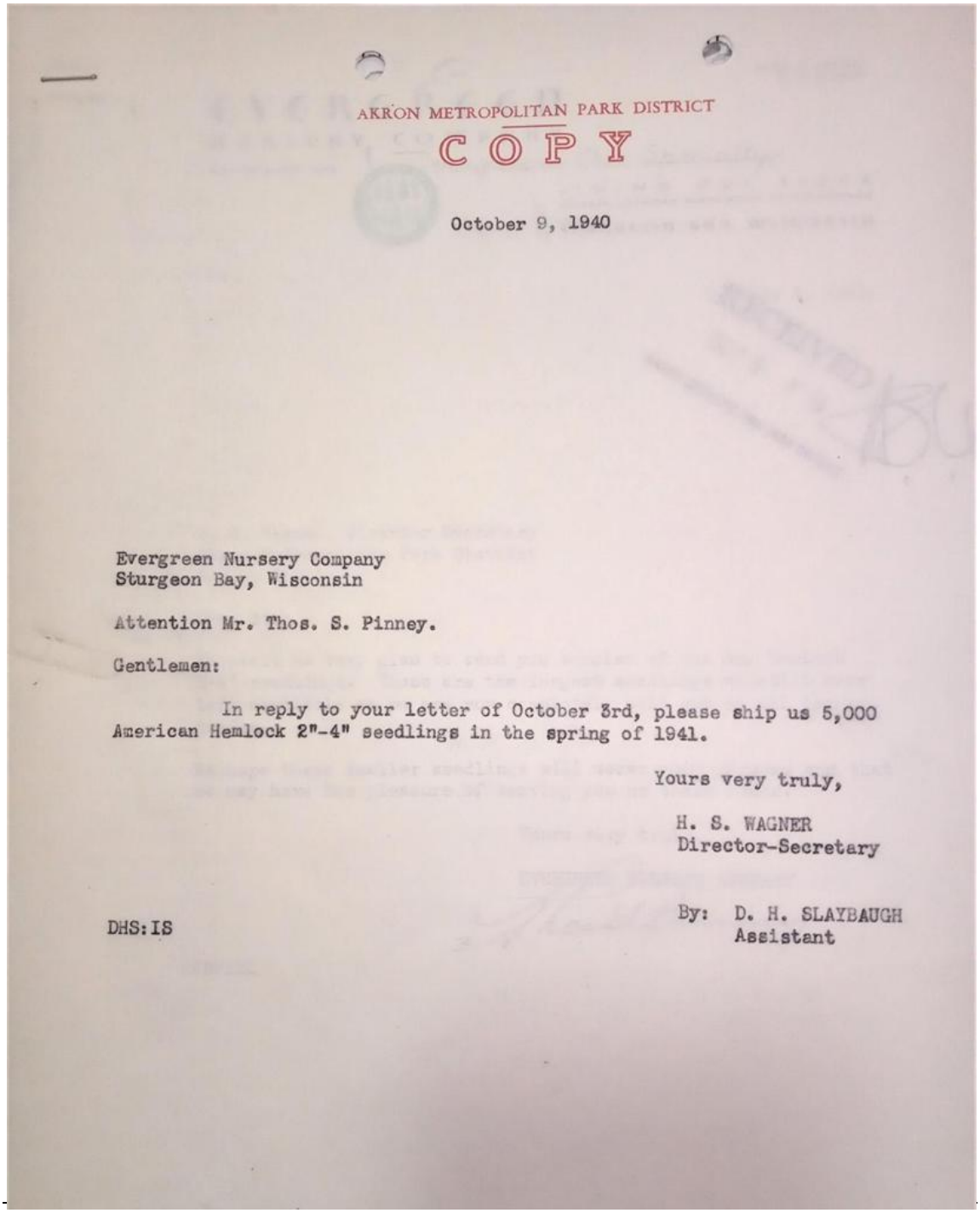
Yours very truly,

HSW:IS

H. S. WAGNER
Director-Secretary

From Reference 25

Appendix E:
1940 Purchase Order for 5,000 Eastern hemlock from Evergreen Nursery Company, Sturgeon Bay, Wisconsin



AKRON METROPOLITAN PARK DISTRICT

COPY

October 9, 1940

Evergreen Nursery Company
Sturgeon Bay, Wisconsin

Attention Mr. Thos. S. Pinney.

Gentlemen:

In reply to your letter of October 3rd, please ship us 5,000 American Hemlock 2"-4" seedlings in the spring of 1941.

Yours very truly,

H. S. WAGNER
Director-Secretary

By: D. H. SLAYBAUGH
Assistant

DHS:IS

From Reference 25