

An Appraisal of the University of Tennessee Arboretum Holly Collection

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Abstract. Maintaining land resources for research and education requires sound stewardship. These environments are affected by factors that can impact the health and benefits of the property. The University of Tennessee Forest Resources AGResearch and Education Center (Knoxville, Tennessee, U.S.) includes an arboretum of 101 hectares. Established in 1965, this section of the Oak Ridge Forest includes more than 2,500 native and exotic woody plant specimens. Identifying the value of the collections was necessary for determining the extent of resources that should be dedicated to its upkeep. Should weather, infestations, and other occurrences damage the property, replacement values need to be accurate. The Elmore Holly Collection was the only section that had not been appraised. This study examined the *Ilex* aquifoliaceae to appraise the current value of the collection. The objectives were to 1) identify the best appraisal method, and 2) apply that method to every holly plant in the collection to determine the total value. The traditional appraisal methods did not suit the study. A slight modification of the Replacement Cost Method was found to be the best approach. The method was repeated to confirm accuracy of the appraisal. The modified valuation method provides a tool that gives practical application of a research method to use in collection appraisals and is repeatable in all sections of the United States.

Key Words. Appraisal; Aquifoliaceae; Holly; *Ilex*; Replacement Cost; Shrub/Small Tree Appraisal; Tennessee.

The University of Tennessee Forest Resources AgResearch and Education Center (Knoxville, Tennessee, U.S.) consists of 4,613.5 hectares. The mission of the center aims to 1) provide the land and supporting resources necessary for conducting modern and effective forestry, wildlife, and associated social, biological, and ecological research programs; 2) demonstrate the application of optimal forest and wildlife management technologies; and 3) assist with transfer of new technology to forest land owners and industries (forestry.tennessee.edu). The center includes three forest units in eastern and middle Tennessee: 1) Oak Ridge Forest, 2) Cumberland Forest, and 3) Highland Rim Forest.

The Oak Ridge Forest was established in 1964 and boasts 891 hectares, with 101 of these hectares dedicated in 1965 as an arboretum to provide public education and public service (Figure 1). The arboretum has a collection of more than 2,500 native and exotic woody plant specimens. Interpretive nature

trails and ecological points of interest support ongoing research and educate the public about environmental and land-use stewardship.

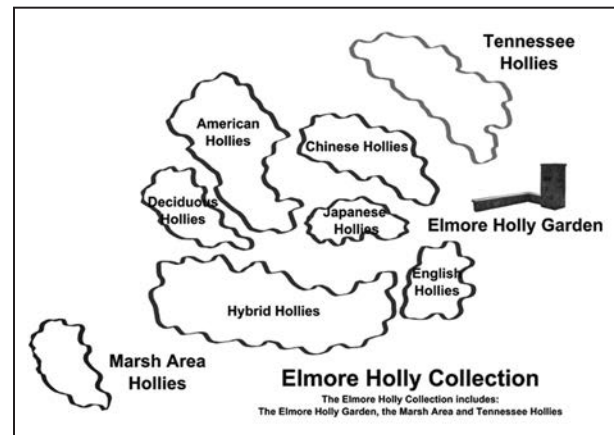


Figure 1. The Elmore Holly Collection boasts hollies native to Europe, Asia, and the United States.

In April 2008, the University of Tennessee Arboretum Society determined that the only task remaining to determine the total value of

contributions received since its inception was to assess the present-day value of the holly collection. The holly is a part of the aquifoliaceae family, within the *Ilex* genus. Aquifoliaceae include more than 400 species and can be evergreen and deciduous trees, shrubs and climbers, and typically have needle-point leaves with serrated edges and small berries that are usually red but also can be orange, brown, or black.

Beginning in 1985, holly grower Harold Elmore introduced the major collection of hollies to the arboretum. He acquired many of the plants from the Holly Society of America and from cuttings he propagated as a grower. Elmore donated all of the original collection, and since his passing in 2002, new plants have been acquired from nurserymen associated with the Holly Society and retail nurseries. The Harold L. Elmore Holly Collection has hollies native to Europe, Asia, and the U.S., including many varieties native to Tennessee. The Holly Society of America recognizes the Elmore Holly Collection as an official Holly Arboretum. The Elmore Holly Collection has over 200 trees and shrubs, ranging from 13–132 L container size, 0.6–5 m tall, and 5.1–12.7 cm diameter.

To achieve the University's goal of valuing the hollies, an appraisal of the holly trees and shrubs was essential for current and future budgetary, planning, maintenance, and insurance considerations. Some conditions that affect the health of the collection are variable: weather (such as freezing conditions, wind shear, tornados, flooding, and drought), construction adjacent to the property, damage caused by visitors, and insect and disease infestations. All of these were reasons for the need of a baseline appraisal, which needed to be relatively simple and repeatable over time.

MATERIALS AND METHODS

A number of methods offer the means to determine tree and plant values. The major source of plant valuation information and guidance in the United States is the Council of Tree and Landscape Appraisers' *Guide for Plant Appraisal* (ninth edition).

Based upon the criteria, the Replacement Cost Method, with slight modification, presented the most practical method to appraise the holly col-

lection. This method was used for trees that are considered to be of replaceable size, usually 20.3 cm caliper or smaller. The McMinnville area of middle Tennessee is known as the wholesale tree nursery capital of the southeastern U.S., where wholesale trees, shrubs, and plants up to 20.3 cm caliper can be purchased.

A review of nursery catalogues was helpful to establish the base wholesale cost of transplantable plant materials. By doing this, most of the species in the arboretum were identified, and cost data were collected. There were some unusual and rare species in the collection for which no data could be found; these plants were not listed. At the same time, many species of hollies and cultivars, including rare ones, were found in the catalogues that were not in the arboretum collection.

To solve this conundrum, hypothetical holly trees and shrubs of all species and cultivars listed in the catalogues were created based upon field and container size. Values were determined based on dimensional information confirmed in the nursery catalogues (Table 1).

Comparative holly values in the nursery market catalogues were based on two criteria: height grades for field-grown stocks, and by container size for non-field-grown stocks. The heights for field-grown stocks ranged from 0.6–5 m, and value was determined by size, independent of species or cultivar (Table 2).

Container-grown holly stocks in a range of 4.4–132 L were developed, with tree-form size in containers ranging from 5–12 cm caliper; values were assigned by container size regardless of species or cultivar (Table 3). Container-grown caliper was not used in the valuation process of this case.

Mean size class values were developed from the surveyed nursery wholesale pricing structures. This produced the average cost of a holly in each size category, regardless of its specific species or cultivar.

A committee of three from the U.T. arboretum board ocularly assessed the condition of the hollies in the collection. Each plant was assigned an optical condition rating of 1–10, where 10 is excellent. The majority of the collection is in excellent condition. The average of this rating for the collection was 7.3. This number was converted to 73%, or 0.73, and multiplied by the determined wholesale value of the plants. The collection

wholesale value was discounted by this amount to take into consideration the condition of the plants at the time of inspection and measurement.

The determined average wholesale cost of each plant multiplied by the actual size of the holly plants in the Elmore Holly Collection resulted in a wholesale price of the collection. Summarizing these costs provided a wholesale price of the entire collection. Multiplying the wholesale value by three, an industry standard conversion factor identified the retail replacement value of the collection (Table 4).

RESULTS

This study method determined that the Elmore Holly Collection was valued at USD \$138,597 in 2008, an average of \$660 per plant. A subsequent assessment, independent from this initial study, conducted in 2010 showed a value of \$140,841, an average value per holly of \$671. This is a 1.7% increase from the first appraisal. This follow-up assessment used the same protocol as the 2008 assessment. New, 2010 nursery wholesale price lists were ordered from the same and other nurseries in the McMinnville area, and all hollies were broken down and placed into the previously determined categories.

DISCUSSION

The Elmore Holly Collection is a significant property. The oldest tree in the collection is *Ilex verticillata*, commonly known as winterberry. There are 216 holly species and cultivars in the collection: 18% are *Ilex opaca*; 15% are *Ilex cornuta*; 10% *Ilex crenata*; 8% *Ilex aquifolium*; 7% *Ilex verticillata*; and the other 42% is miscellaneous. Additional hollies planted circa 1965 along the drive to the collection were not included in the appraisal of the collection.

The second, follow-up assessment was attempted to see if the results could be replicated, and would be consistent with the first. The second effort generated a value within two percent of the first effort and had followed the same protocol. This protocol was repeatable in this arboretum collection and could be used in others.

The specific modification to the Replacement Cost Method of appraisal is the creation and use of hypothetical plants instead of the actual plants in the arboretum collection. The analysis of nursery plants included standard hollies and some rare species and cultivars.

CONCLUSION

Despite gaps of information regarding specific species and their values, the Replacement Cost Method, with modification, presented acceptable results. Another review two years later drew values that confirmed accuracy and ability to replicate the method in the future. The University of Tennessee Arboretum offers significant research, education, and public service throughout its properties. The method applied in this appraisal proved to be reliable and provides a baseline for researchers to maintain and improve the value of the collection.

REFERENCES

- Council of Tree and Landscape Appraisers. 2000. Guide for Plant Appraisal, ninth edition. International Society of Arboriculture, Champaign, Illinois, U.S. 143 pp.
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Table 1. Nurseries supplying plant dollar values (USD\$).

Nursery	Location
Bold Springs Nursery	Monroe, GA
Cedar Row Nursery	Knoxville, TN
Creekside Nursery	Morrison, TN
Don Yancey & Sons Nursery	McMinnville, TN
Flowerwood Nursery	Morrison, TN
Hidden Valley Nursery	Viola, TN
Kinsey Gardens	Knoxville, TN
Little River Nursery	McMinnville, TN
Myers Cove Nursery	McMinnville, TN
Oak Brook Farms	Morrison, TN
Shadow Nursery	Winchester, TN
Shahan Brothers Nursery	Tullahoma, TN
Tennessee Bush Farm	McMinnville, TN
Trivetts Nursery	McMinnville, TN
Wanamaker Nursery	McMinnville, TN
Additional 2010 Nurseries	
Odom Nursery	Morristown, TN
Stewart Nursery	McMinnville, TN
Boyd & Boyd Nursery	McMinnville, TN
Hale & Hines Nursery	McMinnville, TN
Warren County Nursery	McMinnville, TN

Table 2. Determination of average dollar value of holly plants by height.

Plant size (m)	Number of price quotes	Average value (USD\$)
0.6–0.91	9	\$23.50
0.92–1.22	18	\$32.50
1.23–1.52	25	\$42.00
1.53–1.83	30	\$57.00
1.84–2.15	39	\$88.00
2.16–2.46	18	\$115.00
2.47–2.76	21	\$154.00
2.77–3.07	11	\$184.00
3.08–3.66	15	\$285.00
3.67–4.27	9	\$417.00
4.28–4.88	8	\$508.00
4.89–5.49	4	\$585.00

Table 3. Determination of average dollar value of containerized holly plants.

Liter size	Number of price quotes	Average dollar value (USD\$)
3.78	23	\$4.50
7.57	27	\$10.50
11.35	22	\$11.00
18.92	9	\$22.00
26.49	15	\$28.50
37.85	3	\$53.00
56.78	6	\$74.00
75.70	3	\$89.00
94.63	2	\$104.00
113.56	2	\$125.00

Table 4. Holly valuation summary.

Plant size (m)	Average wholesale holly cost (USD\$)	Number of plants	Base wholesale holly value (USD\$)
0.6–0.91	\$23.50	4	\$94.00
0.92–1.22	\$32.50	13	\$422.50
1.23–1.52	\$42.00	18	\$756.00
1.53–1.83	\$57.00	16	\$912.00
1.84–2.15	\$88.00	14	\$1,232.00
2.16–2.46	\$115.00	10	\$920.00
2.47–2.76	\$154.00	10	\$1,540.00
2.77–3.07	\$184.00	10	\$1,840.00
3.08–3.66	\$285.00	12	\$3,420.00
3.67–4.27	\$417.00	10	\$4,170.00
4.28–4.88	\$508.00	16	\$8,128.00
4.89–5.49	\$585.00	5	\$2,925.00
5.50–6.10 ^z	\$673.00	9	\$6,057.00
6.11–6.71	\$776.00	6	\$4,656.00
6.72–7.32	\$890.00	1	\$890.00
9.17–9.75	\$1,558.00	1	\$1,558.00
20.73–21.34	\$22,184.00	1	\$22,184.00
Plant size (L)			
7.57	\$7.50	3	\$22.50
11.35	\$10.50	5	\$52.50
18.92	\$22.00	12	\$264.00
26.49	\$28.50	8	\$228.00
37.85	\$53.00	17	\$901.00
56.78	\$74.00	7	\$518.00
94.63	\$104.00	2	\$208.00
TOTAL	\$63,898.50^y		

^z For trees greater than 5.49 m, the value is increased by 15% per 0.61 m increment.

^y \$63,898.50 × 0.723 (condition classification) = \$46,198.62; 46,199.00 × 3 (standard wholesale-to-retail conversion factor) = \$138,597.00

Résumé. Le maintien de ressources foncières aux fins de la recherche et de l'enseignement nécessite une bonne intendance. Ces milieux sont affectés par des facteurs pouvant avoir un impact sur la condition et les bénéfices d'une telle propriété. Le centre d'enseignement et de recherches forestières de l'Université du Tennessee (Knoxville, Tennessee, U.S.) comprend un arboretum de 101 hectares. Constituée en 1965, cette section de la forêt Oak Ridge abrite plus de 2 500 spécimens de plantes ligneuses indigènes et introduites. L'établissement de la valeur des collections était nécessaire afin de déterminer l'ampleur des ressources à consacrer pour leur entretien. Que des incidents climatiques, des infestations ou d'autres événements endommagent la propriété, il importe de disposer de valeurs de remplacement précises. La collection de houx Elmore était la seule section à n'avoir pas été évaluée. Cette étude a examiné les *Ilex aquifoliaceae* afin d'établir la valeur actuelle de la collection. Les objectifs étaient : 1) d'identifier la meilleure méthode d'évaluation et 2) d'appliquer cette méthode à chacun des plants de houx de la collection afin d'en déterminer la valeur totale. Les méthodes traditionnelles d'évaluation se sont avérées inadéquates pour cette étude. La meilleure approche s'est avérée être une légère variante de la méthode de la valeur de remplacement. Cette méthode fut répétée afin de confirmer la justesse de l'évaluation. La méthode d'évaluation adaptée constitue un outil permettant l'application pratique d'une démarche de recherche pouvant être utilisée pour l'évaluation de collections et ce, dans l'ensemble des États-Unis.

Zusammenfassung. Die Unterhaltung von Ländereien für Forschung und Lehre erfordert gesicherte Verwaltung. Diese Umgebungen werden durch Faktoren beeinflusst, welche die Gesundheit und Vorteile dieser Grundstücke beeinträchtigen können. Die University of Tennessee Forest Resources AGResearch and Education Center (Knoxville, Tennessee, U.S.) besitzt ein Arboretum von 101 ha. Etabliert im Jahr 1965, enthält diese Sektion des Oak Ridge Forest mehr als 2.500 einheimische und exotische holzige Arten. Die Identifizierung des Wertes dieser Sammlung war erforderlich für die Bestimmung des Ausmaßes an Ressourcen, die für den Erhalt abgestellt werden müssen. Sollten Wetter, Heimsuchungen (z.B. Befall) und andere Erscheinungen den Besitz beschädigen,

müssen die Werte für den Ersatz akkurat sein. Die Elmore Holly (*Ilex*) Sammlung war die einzige Sektion, die nicht bewertet wurde. Diese Studie examiniert die *Ilex aquifoliaceae*, um den gegenwärtigen Wert der Sammlung zu bestimmen. Die Ziele waren: 1.) Identifikation der besten Bewertungsmethode und 2.) die Anwendung dieser Methode auf jede *Ilex*-Pflanze in der Sammlung, um den totalen Wert zu bestimmen. Die Methode wurde wiederholt, um Präzision der Bewertung zu überprüfen. Die modifizierte Bewertungsmethode liefert ein Werkzeug, welches eine praktische Applikation einer Forschungsmethode darstellt, um in der Bewertung von Sammlungen verwendet werden kann und in allen Sektionen der vereinigten Staaten anwendbar ist.

Resumen. El mantenimiento de los recursos de la tierra para investigación y educación requiere una buena administración. Estos entornos se ven afectados por factores que pueden impactar la salud y los beneficios de la propiedad. El Centro de Investigación y Educación de Recursos Forestales de la Universidad de Tennessee (Knoxville, Tennessee, EE. UU.) incluye un arboretum de 101 hectáreas. Establecida en 1965, esta sección del Bosque de Oak Ridge incluye más de 2,500 especímenes de plantas leñosas nativas y exóticas. Fue necesaria la identificación del valor de las colecciones para determinar el alcance de los recursos que deberían dedicarse a su mantenimiento. Si el clima, las infestaciones y otras ocurrencias dañan la propiedad, los valores de reemplazo deben ser precisados. La Colección Elmore Holly fue la única sección que no se había evaluado. Este estudio examinó el *Ilex aquifoliaceae* para evaluar el valor actual de la colección. Los objetivos fueron: 1) identificar el mejor método de evaluación, y 2) aplicar ese método a cada planta de acebo en la colección para determinar el valor total. Los métodos tradicionales de evaluación no se adecuaban al estudio. Se encontró que una ligera modificación del Método del Costo de Reemplazo era el mejor enfoque. El método se repitió para confirmar la precisión de la evaluación. El método de valoración modificado proporciona una herramienta que proporciona la aplicación práctica de un método de investigación para utilizar en evaluaciones de colecciones y es repetible en todas las secciones de los Estados Unidos.