

## Re-Discovery of the Globally-Rare *Crataegus harbisonii* Beadle (Rosaceae) in Obion County, Tennessee, and an Update on Other Historically-Reported Populations in the State

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**Abstract**—Harbison’s Hawthorn (*Crataegus harbisonii* Beadle: Rosaceae), is a globally-rare shrub or small tree reported from five Tennessee counties (Davidson, Lawrence, Obion, Shelby, Weakley), but heretofore known to be extant only from a declining population in Davidson County. We here document discovery of the species 70 years after the initial observation in Obion County, although from a different location in the county. Descriptive data from the newly-discovered site is provided. Our studies further indicate that: (1) the 1948 voucher from Lawrence County is of questionable identity and since field studies have not located the species there, that county should be removed from distribution records for the species; and (2) Shelby and Weakley Counties are represented by annotated vouchers collected 1947–1948, but there have been no reports since then and categories of historic and possibly extirpated are appropriate for the species in those counties pending additional data.

### Introduction

The genus *Crataegus*, hawthorns or haws (Rosaceae), is a large genus of shrubs-small trees of the northern hemisphere, most with thorny stems. Leaves are deciduous, simple, usually serrated, variously lobed, or both serrated and lobed. Perfect flowers have five white to pinkish petals and usually occur in terminal inflorescences. Fruits are pomes and range in color at maturity from yellow to red or purplish to black. Each fruit contains 1-5 bony nutlets (pyrenes), each with one seed. Phipps (2014) provided an extensive description.

At least 170 species and numerous hybrids occur in North America (Phipps, 2014) and about 30 species occur in Tennessee (Lance, 2014b, 2015). *Crataegus* taxonomy and species identification present considerable difficulty due to complicated breeding biology (hybridity, polyploidy, apomixis) and a complicated nomenclatural history where species have been often recognized based on minor morphological variations (Lance, 2014a, 2014b, 2015)

Harbison’s Hawthorn (*Crataegus harbisonii* Beadle), one of Tennessee’s rarest woody plants, is state-endangered and listed S1, i.e., extremely rare and critically imperiled (Tennessee Natural Heritage Program, 2016). It also is a long-time candidate for Federal listing (U.S. Fish and Wildlife Service, 1980). Until recently, only one naturally-occurring population was known (Lance and Phipps, 2000; Lance, 2014a). This declining population, possibly now consisting of only one plant, is in Davidson County at the site of the type collection. In addition to this well-documented population, there are herbarium specimens, collected in 1947–1948, that ostensibly document occurrences in Lawrence, Obion, Shelby, and Weakley Counties. However, there have been no reports from these counties since the original collections and the species is

considered historic if not extirpated there (Wofford and Chester, 2002; Chester et al., 2009; Jones and Wofford, 2013; The Tennessee Flora Committee, 2014, 2015).

The purpose of this paper is to document re-discovery of *Crataegus harbisonii* in Obion County. In addition, we report the results of a subsequent visit to the Obion County site to obtain additional descriptive data, and provide notes on reported occurrences in the other counties noted above, including site visits in some cases.

### Materials and Methods

Historic and current literature concerning the species, and floristic and vegetation studies from areas of reported occurrences, were accumulated. Extant herbarium specimens were examined at The University of Tennessee (hereafter as TENN; standard acronyms are followed for all herbaria cited), and Austin Peay State University (APSC), apparently the only Tennessee herbaria with collections (SERNEC, 2017). No attempt was made to seek specimens in out-of-state herbaria since earlier studies by others (summarized and cited) had made those contacts. Field studies were conducted in Lawrence, Obion, and Weakley Counties.

### Results and Discussion

*Taxonomic history*—Phipps et al. (2006) and Phipps (2014) observed that *C. harbisonii* is similar to both *C. ashei* and *C. triflora* and could “perhaps be thought of as a particularly robust form of *C. ashei*; however it is perhaps more likely of hybrid origin between these species.” Lance and Phipps (2000) and Phipps et al. (2006) noted that the nearest relative is *C. triflora* and that a critical comparison indicates validity of species status for *C. harbisonii*. Lance (2014a) further noted

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“that the status of *C. harbisonii* as a distinct species has not been in doubt since its original description.”

**Collection history 1. Davidson County collections, including the type specimen**—The species was first collected in 1877 by Augustin Gattinger in Davidson County (Gattinger, 1901), although not recognized as a distinct taxon. The Gattinger voucher, seen and cited by Lance and Phipps (2000) and by Phipps et al. (2006), is at the Missouri Botanical Garden Herbarium (MO). That voucher may well be a duplicate, since Gattinger regularly distributed duplicates to a number of individuals and herbaria throughout eastern North America, retaining the original in his personal herbarium (Oakes, 1932). Gattinger sold his personal herbarium to the University of Tennessee in 1899, but the entire University Herbarium was lost to fire in 1934 (Bishop and Priestley, 2014).

The type collection, probably from the same site as the original Gattinger collection, was by T.G. Harbison in 1899 from “a hilltop in limestone soil, west Nashville.” Harbison was a botanical collector for the Vanderbilt Estate at Biltmore, North Carolina, and later Curator of the Herbarium at the University of North Carolina at Chapel Hill. The voucher specimen at the U.S. National Herbarium (US) was seen and cited by Lance and Phipps (2000) and Phipps et al. (2006). The species was named in commemoration of Harbison by C.D. Beadle, who visited the type location and noted that “numerous examples were observed during the past summer” (Beadle, 1899).

A few additional collections were made from the type locality by Harbison and other botanists between 1899 and 1916; these specimens were cited by Lance and Phipps (2000). More recently, field work by Lance and others in the Nashville area during the period from 1993 to 1997 found two specimens, but one of these had died by 1997. Lance and Phipps (2000) cited vouchers from this time period and Lance (2014a) noted that after extensive searches “no additional plants have been found.” The last collection seen by us is a flowering specimen taken in 2006 (Appendix) from “the last living plant.” However, that plant (and perhaps others) still exists in the area (personal conversation with Andrea Bishop, Tennessee Natural Heritage Program, July 2017). Interestingly, stems collected by RL from that population were grafted to other rootstocks and grown at the North Carolina Arboretum, Asheville. The grafts have resulted in several hundred plants that flourish there and elsewhere, producing abundant flowers and fruits (Lance, 2014a).

**Collection history 2. Collections from other counties**—During the late 1940s, A.J. Sharp and R.E. Shanks from the University of Tennessee, along with several colleagues, led an extensive effort to document the Tennessee vascular flora. Thousands of specimens were collected from across the state and accessioned into TENN. Hawthorn taxa were regularly collected, but most were identified only to genus. Species determination was left to experts who would later examine specimens. Ernest J. Palmer (1875–1962), with The Arnold Arboretum of Harvard University, was the early-on recognized authority and annotated TENN specimens collected before 1960. Current authorities are James B. Phipps, University of Western Ontario, who annotated TENN specimens during the early 2000s, and Ron Lance, formerly with the North Carolina Arboretum. Phipps provided the *Crataegus* treatment for the Flora of North America (Phipps, 2014); Lance studied *Crataegus* extensively and developed the outstanding treatment of Southeastern U.S. taxa (Lance, 2014a). Annotations by one or more of these experts

showed that in addition to Davidson County, *C. harbisonii* ostensibly occurred in Lawrence, Obion, Weakley, and Shelby Counties (see Appendix for specimen citations). However, there have been no verifications or additional reports from these sites in subsequent accounts of the Tennessee woody flora, including Shanks (1952, 1953, 1954), Sharp et al. (1960), Wofford and Kral (1993), Chester et al. (1997), Wofford and Chester (2002), Jones and Wofford (2013), and The Tennessee Flora Committee (2014, 2015). Wofford and Chester (2002) noted, in regard to vouchered sites outside of Davidson County, that “no extant specimens have been located and these populations are presumed to be extirpated.” The Tennessee Flora Committee (2014, 2015) further noted that “these reports are historic”.

### Obion County

The previous reports from Obion County were based on an annotated voucher (Appendix) from Samburg, a community on the Mississippi Alluvial Plain Ecoregion, east side of Reelfoot Lake. This is an area of intense botanical study over the years, summarized by Heineke (1987) and Guthrie (1989), and including numerous forays by us, in one case since the 1960s (EWC). To our knowledge, this collection site has not been relocated.

Immediately east of Samburg, elevations increase and the resulting bluffs and uplands become the Bluff Hills, which grade into the Loess Plains that extend eastward. Bluff Hills and Loess Plains are Subsections of the Mississippi Valley Loess Plains Ecoregion (Griffith et al., 1997; Chester, 2014, 2015). Botanizing on the eastern edge of the Bluff Hills on 1 October 2014, Barry Hart located two robust stems that he tentatively identified as *C. harbisonii*. A single collection was obtained from one of the two individuals on that date (Appendix). A subsequent collection was obtained from the second stem on 8 October 2014, which was later verified by Ron Lance on 24 October 2014.

The authors visited the area on 27 April 2015 and found more than 30 plants over a linear distance of about one mile on the east side of Phillips Road (vouchers cited in the Appendix). The largest plant observed was 4 m in height, 8 cm in diameter at the base, and in flower. All observed plants were along the roadside, part of a fencerow thicket, or within a deciduous forest on a ridgetop adjacent to a steep backslope forest (see <<http://herbarium.utk.edu>> for images by EWC). The canopy consists of sugar maple (*Acer saccharum*), pignut hickory (*Carya glabra*), shagbark hickory (*C. ovata*), southern hackberry (*Celtis laevigata*), blackgum (*Nyssa sylvatica*), southern red oak (*Quercus falcata*), chinkapin or yellow chestnut oak (*Q. muehlenbergii*), and black oak (*Q. velutina*). The understory, often thicket-forming along the woodland margin, fencerow, and roadside, consists mostly of hop hornbeam (*Ostrya virginiana*), but with sugar maple (*Acer saccharum*), American ash (*Fraxinus americana*), red cedar (*Juniperus virginiana*), oaks (*Quercus spp.*), sassafras (*Sassafras albidum*), American elm (*Ulmus americana*), and winged elm (*U. alata*). A recent visit to the area by others on 29 April 2017 found at least six trees in late flower stage (Jones, 2017).

### Lawrence County

Reports, based on a collection in 1948, were from the Clear Fork Creek, Fall River Community, south (slightly SW) of Nashville and just north of the Alabama border. The sterile

specimen (Appendix), consists of a stem with about 10 leaves and is questionably *C. harbisonii*, although annotated as such by Palmer. *Crataegus specimens from TENN were examined by J.B. Phipps (Phipps et al., 2006), but this specimen, if examined, was not annotated, and Lawrence County was not mapped as a county of occurrence in the resulting publication.*

Clear Fork Creek in the rural Fall River Community was visited twice by RL during his 1993–1997 studies, accompanied by J.B. Phipps on one trip; the only *Crataegus* taxon observed was one plant of *C. collina*. *EWC and BH visited the area on 28 June 2017, noting the presence of several abandoned houses and farmsteads and speculating that the human population may have declined since 1948. The creek margins now mostly consist of extensive thickets of the invasive Ligustrum sinense Lour. (Chinese Privet). Searches of more than a mile of streamside and roadside vegetation where Clear Fork Creek and CFC Road are basically paralleled did not locate Crataegus of any species.*

### Shelby County

Two annotated vouchers from 1947–1948 document reports of *C. harbisonii* in Shelby County (Appendix). *We have not sought the species there, but an intensive county survey (Thompson, 1974) identified three taxa of Crataegus (C. crusgallii, C. marshallii, and C. viridis), all distinct from C. harbisonii. A well-documented study of the Third Chickasaw Bluff (Miller and Neiswender, 1989), which included the site of the second voucher cited, reported only Crataegus without species identification. Voucher specimens were apparently not collected and there are no collections of C. harbisonii in the University of Memphis Herbarium (SERNEC, 2017).*

### Weakley County

Reports are vouchered by two annotated sheets collected in 1948 (Appendix). The collections were from Gardner, a community just northwest of Martin on Highway 22. The area was searched by RL during his 1993–1997 studies and by all authors on 27 April 2015. However, Highway 22 was re-routed sometime after 1948, and fencerows are practically non-existent due to developments in the area. We did not observe any species of *Crataegus* in the Gardner area.

### Summary

A small population of *C. harbisonii* is extant in Davidson County at the site of the type collection made more than a century ago. However, the dramatic decrease in number of stems does not portend a favorable outlook for that population. Fortunately, the area now is within the extensive Warner Parks, a Metropolitan Nashville facility, and hopefully is protected. Also, grafts from cuttings taken from this population have successfully produced hundreds of healthy plants that flower and fruit, ensuring survival of the species should natural populations become extirpated.

The Obion County site near Samburg, vouchered in 1948, has not been relocated. However, a sizeable population is here reported from a nearby site. The observed plants are on private property and near or perhaps on a roadside right-of-way and as such, are highly vulnerable.

The Lawrence County collection from 1948 is of doubtful identity and our searches in the area have been unsuccessful.

Without further evidence, the former existence and current presence of the species in Lawrence County is questionable and the county should be removed from distribution records for the species. The Shelby County vouchers are from 1947–1948 and include rather general location data. We have not personally sought to relocate the sites, but an extensive floristic study of the county did not report *C. harbisonii* and a vegetation study of the Third Chickasaw Bluff in Shelby County did not reveal any specific *Crataegus* taxa. The Weakley County site, vouchered in 1948, could not be relocated; the site may have been destroyed by new and re-routed roads and major developments in the area. Historic or possibly extirpated is the appropriate designation for the species from Shelby and Weakley Counties unless further field work confirms the previous reports.

Based on the results presented here, *Crataegus harbisonii* must be considered as one of the rarest woody plants in Tennessee and perhaps in the nation. Protecting currently known populations and additional field work, especially within forests and thickets on loess bluffs in counties bordering the Mississippi River, is warranted.

### Acknowledgments

Appreciation is extended to herbarium curator Dr. E. Wofford, University of Tennessee-Knoxville, for allowing access to collections under his supervision. A. S. Bishop, Tennessee Natural Heritage Program, shared her knowledge and experiences with the Davidson County location. Several land-owners were hopefully understanding when we scouted on their lands without permission. We are especially appreciative of staff and parishioners at the Fall River United Methodist Church and the Fall River Church of Christ, both adjacent to Clear Fork Creek in Lawrence County, for access to their facilities while we searched the nearby creek sides. Staff of the Interlibrary Loan Department of the Woodward Library, Austin Peay State University, was extremely helpful in obtaining materials.

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## Appendix: Specimen Citations

- Davidson County specimens not previously cited by Lance and Phipps (2000).** Percy Warner Park. Deep Well past picnic area on left side of park road. The one surviving tree in park, 25 April 2006, Andrea Shea Bishop and David Lincicome, not numbered (APSC).
- Lawrence County.** Near Fall River, along Clear Fork Creek, 12 July 1948, A.J. Sharp, E. Clebsch, A. Clebsch, S. Fairchild 9694 (TENN). Annotated *C. harbisonii* by E.J. Palmer in 1953, and *C. iracunda* Beadle by Mason Brock, April 2015.
- Obion County (1-6).** 1. Near Samburg, roadside thicket, 26 June 1948, A.J. Sharp, E. Clebsch, A. Clebsch, S. Fairchild 8007 (TENN). Two sheets annotated *C. harbisonii* by E.J. Palmer, 2 June 1959, and by J.B. Phipps, 12 November 1992.
2. Loess Hills physiographic subsection approximately 1.0 air mile SE of Minnick Community on Phillips Road, and 0.2 mile N of Phillips Road/Lippard Road jct, 1 October 2014, Barry Hart, not numbered (APSC). Two sheets, one vegetative, one with fruit.
3. Loess Hills physiographic subsection approximately 1.6 miles SSE of Minnick Cemetery on Phillips Road, and 0.4 mile N of Phillips Road/Lavender Hill Road jct, 8 October 2014, Barry Hart, not numbered (APSC and TENN). Verified by Ron Lance on 24 October 2014.
4. 1.0 air mile SE of Minnick Cemetery, four stems observed, 27 April 2015, Edward W. Chester 14882, with Barry Hart and Ron Lance (TENN).
5. 1.4 air miles SE of Minnick Cemetery, ten stems observed, 27 April 2015, Edward W. Chester 14880, with Barry Hart and Ron Lance (TENN).

6. 1.6 air miles SSE of Minnick Cemetery, twenty stems observed, 27 April 2015, Edward W. Chester 14879, with Barry Hart and Ron Lance (TENN).

**Shelby County (1-2).** 1. Roadside NW of Millington, 29 June 1948, A.J. Sharp, E. Clebsch, S. Fairchild 8143 (TENN), annotated *C. harbisonii* by E.J. Palmer, 2 June 1959, and J.B. Phipps, 12 November 2002.

2. North edge of Shelby Forest, shrub, 19 August 1947, A.J. Sharp, E. Clebsch, A. Clebsch 6463 (TENN). Two sheets, annotated *C. ashei* Beadle by E.J. Palmer, September 9, 1953, and *C. harbisonii* by J.B. Phipps, 13 November 2002.

**Weakley County.** N. of Gardner, near Martin, fence row, 23 June 1948, S. Fairchild, E. Clebsch, A. Clebsch 7788 (TENN). Annotated *C. ashei* Beadle by E.J. Palmer, 9 September 1953, and *C. harbisonii* by J.B. Phipps, 12 November 2002.