

***Dirca palustris* L. (leatherwood, Thymelaeaceae), Distribution and Abundance in Illinois**

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ABSTRACT

During the present study we searched for populations of *Dirca palustris* L. (eastern leatherwood) throughout Illinois. We started by searching for this species in most herbaria in Illinois, and a few outside the state, to determine potential population sites. More than 110 specimens of *D. palustris* were found representing 30 populations. Of these 30 populations identified from herbarium searches, we relocated 16. Nearly all populations were in good-quality mesic upland forests associated with ravines and mostly on N- to NW-facing slopes. During the field trips, extending throughout the growing seasons of 2011 to 2016, we found four previously unreported populations of this species, bringing the total to 20 known populations in Illinois.

Keywords: abundance, associates, *Dirca palustris*, habitat, Illinois, eastern leatherwood, populations

INTRODUCTION

Dirca palustris L. (eastern leatherwood) is a wide-ranging understory shrub of eastern North America forests whose geographic range extends from Nova Scotia, New Brunswick, Quebec, Ontario, Minnesota, and eastern North Dakota, south into Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, and Florida (Gleason and Cronquist 1991, Ward and Horn 1998). Eastern leatherwood is a member of the family Thymelaeaceae (Mezereum Family) with more than 500 species that are mostly found in the Eastern hemisphere, few species being reported for North America. In addition to the native *D. palustris*, only the European adventive *Thymelaea annua* L. (Thymelaea) is rarely encountered in Illinois, being confined to the northeastern counties (Mohlenbrock 2002).

Dirca palustris is a small shrub to 2 m tall with jointed, flexuous (zigzag appearance) twigs and very tough bark; leaves simple, alternate, the blade elliptic to broadly obovate to ovate, 4-8 cm long, with entire margins; petioles 2-5 mm long; flowers light yellow, 4-merous, 7-10 mm long, appearing before the leaves. A relatively uncommon

species, we have always considered it a plus if we encounter it during a field trip. It is generally uncommon to rare throughout the state and the habitat is usually given as rich, shaded woods (Mohlenbrock 2002).

We determined the former presence of 30 populations of eastern leatherwood in Illinois based on the more than 110 specimens from a search of 19 regional herbaria. Though relatively uncommon, this site and habitat specific species is not endangered or threatened in Illinois (Illinois Endangered Species Protection Board 2015). However, most Botanists rarely encounter eastern leatherwood, and even Dr. Loran I. Nevling (1962), past Chief of the Illinois Natural History Survey (1987-1993) and authority on the Thymelaeaceae, on several occasions asked one of us (JEE) if I had encountered this species during my many trips throughout Illinois. The response was always "still only the population at Fox Ridge State Park." Later, Dr. Nevling informed me that he had found two previously unreported populations in Illinois (Appendix, La Salle Co.). This study was undertaken to determine the present status of *D. palustris* in Illinois, to com-

pare historic distribution with current populations, and to locate previously unreported populations of this species.

METHODS

We reviewed pertinent literature, discussed the species with local biologists, and visited most herbaria in Illinois and some larger herbaria in surrounding states to determine the location of Illinois populations of *Dirca palustris*. Listed below are the locations and acronyms of herbaria where specimens were examined: Burpee Museum of Natural History, Rockford, Illinois (BUR); Chicago Academy of Science, Chicago, Illinois (CHAS); Chicago Botanical Garden, Glencoe, Illinois (CHIC); Northern Illinois University, DeKalb, Illinois (DEK); Eastern Illinois University, Charleston, Illinois (EIU); Field Museum of Natural History, Chicago, Illinois (F); Gray Herbarium of Harvard University, Cambridge, Massachusetts (GH); University of Illinois, Urbana, Illinois (ILL); Illinois Natural History Survey, Champaign, Illinois (ILLS); Indiana University, Bloomington, Indiana (IND); Illinois State Museum, Springfield, Illinois (ISM); Illinois State University, Normal, Illinois (ISU); Knox College, Galesburg, Illinois

(KNOX); Missouri Botanical Garden, St. Louis, Missouri (MO); The Morton Arboretum, Lisle, Illinois (MOR); Western Illinois University, Macomb, Illinois (MWI); Natural Land Institute, Rockford, Illinois (NLI); Rockford College, Rockford, Illinois (RCH); and Southern Illinois University, Carbondale, Illinois (SIU). We also tried to determine the associated species, ecological requirements, and other data concerning leatherwood from label information on the herbarium specimens. Field searches during the growing season from 2010 to 2016 were undertaken throughout Illinois, visiting all known sites based on herbarium records, and other sites based on information from other Illinois Botanists. Nomenclature follows Mohlenbrock (2002).

RESULTS

A specimen collected by George Vasey (s.n., Kane Co.: Elgin, May 1862, ILL, ISM) is the earliest collection of *Dirca palustris* we found for Illinois during the herbarium searches. The second oldest was collected by J. T. Stewart (s.n., Peoria Co: Peoria, Illinois, April 1876, F). We also found herbarium specimens, or located previous unreported populations, from 24 Illinois counties. These were mostly from northern and central Illinois counties, but included both Jackson and Pope Counties in the southern part of the state (Appendix). Mohlenbrock and Ladd (1978) listed 19 counties for this species, including Johnson and Whiteside counties, where we have not recorded voucher specimens.

We relocated 16 populations of *Dirca palustris* in 11 Illinois counties (Table 1). Most were from the northern third of Illinois, one from the central part of the state (Coles Co.) and three from southern Illinois (Pope Co.). Also, we found four previously unreported populations, one from Jackson County in southern Illinois, two from Vermilion County in central Illinois, and the other from Stephenson County to the north (Appendix).

Few herbarium labels indicated the size of eastern leatherwood populations. The number of individuals we

encountered varied extensively, ranging from just a few plants to more than 600, with typically 25-80 individuals being found. Some of the populations were divided into smaller units, with groups of individuals in separate and adjacent ravines. This was common in the two Vermillion County populations that had not been previously reported (Appendix).

DISCUSSION

The habitat specificity and rarity of *Dirca palustris* has resulted in some interesting studies concerning this species regionally spotty distribution and tendency to aggregate on a local scale. Schulz et al. (2004) studied variation in inflorescence and fruit produc-

tion on the reproductive potential of this species across seven years. They determined that shrub size, and, secondarily, light availability were the important determinants for fruit production. More recently, Peterson et al. (2011) studied the variation within and among five populations of eastern leatherwood scattered from Florida to eastern North Dakota, and found phenotypic and genetic differentiation characteristic of limited gene flow, with the northern and southern range limits having the most unique phenotypes and genotypes. In an additional study using these same populations, Peterson and Graves (2011) found that restricted seed dispersal rather than clonal reproduction explains the occurrence of *D.*

Table 1. Populations of *Dirca palustris* relocated during the present study are listed by county along with the original collector, year first collected, present habitat with latitude and longitude, the collecting number of Loy R. Phillippe, and the number of years the population is known to persist (first known collection to our study).

County	First Collector, collecting number and year	Present Habitat Latitude and Longitude	Collecting number	Years
Boone	R. Moran s.n./1976	Wooded, NW-facing slope 42.41468 -88.92475	43619	38
Carroll	R.P. Wunderlin 2911/1966	Wooded, N-facing slope 42.10007 -90.00902	43092	45
Coles	G. D. Fuller 11048/1945	Wooded, N-facing slope 39.40224 -88.15587	43387	68
Kane	G. Wilhelm 4386/1978	Wooded, N-facing slope 42.14597 -88.28918	43660	36
Kankakee	R.A. Schneider 542/1937	Wooded, NW-facing slope 41.21782 -87.98509	43176	75
La Salle	L.I. Nevling 352/1997	Wooded, N-facing slope 41.35007 -89.00674	43655	17
	L.I. Nevling 353/1997	Wooded, W-facing slope 41.29388 -89.02828	43002	14
	E. Evert 36460/1999	Wooded, W-facing slope 41.31186 -88.96963	42981	12
Lee	G.N. Jones 15837/1943	Wooded, N-facing slope 41.8508 -89.3464	43010	68
Ogle	Fell & Fell 268/1945	Upland, mesic woods 42.1452 -89.47286	42995	66
Pope	H.E. Ahles 7499/1953	Wooded, N-facing slope 37.51922 -88.64539	43978	62
	L. Schopf 1168/1931	Upland, mesic woods 37.4733 -88.68999	42939	80
	Bailey & Swayne 365/1952	Rocky, mesic woods 37.51416 -88.54018	42952	59
Tazewell	V.H. Chase 5025/1934	Wooded, SW-facing slope 40.72824 -89.51144	43029	77
Winnebago	Fell & Fell 58-31/1958	Wooded ravine, N-facing 42.34489 -88.98921	43630	46
	Fell & Fell 45-159/1945	Wooded, NE-facing slope 42.20491 -89.19641	43724	69

palustris in clumps with plant densities and recruitment greatest in the North Dakota population.

The habitat recorded for eastern leatherwood, based on the information recorded from herbarium labels varies extensively and was mostly inadequate. In many instances it was not even recorded that this taxon was a woodland species (Table 1, Appendix). We found that the best way to search for this species was to use topographic maps that gave the extent of the woodlands. Closely spaced contour lines in wooded areas on N-facing slopes with associated ravines and commonly with a small perennial stream at the base were good clues. Sometimes the populations extended from these steep slopes onto the flat uplands or onto the terrace of a river or stream. Observations at the relocated populations indicate this is the typical habitat for this species.

The overstory tree species most often associated with *Dirca palustris* were those typical of mesic habitats: *Acer saccharum* Marsh. (sugar maple), *Carya cordiformis* (Wangenh.) K. Koch (bitternut hickory), *C. ovata* (Mill.) K. Koch (shagbark hickory), *C. tomentosa* (Poir.) Nutt. (mockernut hickory), *Fagus grandifolia* Ehrh. (American beech), *Fraxinus americana* L. (White ash), *F. quadrangulata* Michx. (blue ash), *Juglans nigra* L. (black walnut), *Liriodendron tulipifera* L. (tulip poplar), *Nyssa sylvatica* Marsh. (sour gum), *Quercus alba* L. (white oak), *Q. macrocarpa* Michx. (bur oak), *Q. rubra* L. (red oak), *Tilia americana* L. (basswood), *Ulmus americana* L. (American elm), and *U. rubra* Muhl. (slippery elm). Native understory trees and shrubs included *Asimina triloba* (L.) Dunal (pawpaw), *Carpinus caroliniana* Walt. (musclewood), *Cornus florida* L. (flowering dogwood), *Hamamelis virginiana* L. (witch hazel), *Lindera benzoin* (L.) Blume (Spicebush), *Ostrya virginiana* (Mill.) K. Koch (ironwood), *Prunus virginiana* L. (common chokecherry), and *Staphylea trifolia* L. (bladder-nut).

The woody vegetation encountered at one of the *Dirca palustris* populations was previously surveyed by Ebinger (1985). This population at Fox Ridge

State Park, Coles County, is on a steep N-facing hillside just south of Ridge Lake. Tree species averaged 407 stems/ha with an average basal area 20.19 sq m/ha. *Quercus rubra* dominated with an Importance Value (IV) of 86.4, followed by *Acer saccharum* (IV 58.0), and *Q. alba* (IV 44.8); these tree species accounting for more than half of the total IV (total possible 300). Other tree species encountered were *Carya ovata*, *Tilia americana*, *C. tomentosa*, *Q. muhlenbergii*, *Fraxinus americana*, and *F. quadrangulata*, along with the understory trees *Ostrya virginiana* and *Cornus florida*. Sugar maple dominated the understory, as well as the lower diameter classes, indicating the mesic conditions of this woodlot.

Dirca palustris was relocated in more than half of the original population sites discovered during herbarium searches, is probably due to the relatively stable habitat in which this species commonly grows: N-facing, relatively steep slopes in rugged terrain, are rarely cultivated, though they were commonly grazed and occasionally selectively logged. Selective logging opens the canopy but usually does not destroy the understory while grazing is mostly a problem of the past and now rarely occurs in most Illinois woodlots. One threat is the increase in exotic plant species. During the past half century there has been an explosive increase in abundance of exotic shrubs in the Illinois flora. Presently, the exotic species *Elaeagnus umbellata* Thunb. (autumn olive), *Lonicera maackii* (Rupr.) Maxim. (Amur honeysuckle), and *Rhamnus cathartica* L. (common buckthorn) have taken over the understory of many woodlots. These three shrubby exotic species were observed in many of the eastern leatherwood populations we examined.

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APPENDIX: Populations of *Dirca palustris* in Illinois. The populations are listed by county and include a representative specimen with collecting data and herbarium acronym of all known Illinois populations. (*new populations).

Boone Co.: Dry slope, Kinnikinnick Conservation Area, S1/2 S31 T46N R3E, 10 Apr 1976, R. Moran s.n. (MOR).

Carroll Co.: Woods, Sterling-Rock Falls YMCA Camp, 2 miles W of Mt. Carroll, 16 Apr 1966, R.P. Wunderlin 2911 (ILL).

Champaign Co.: High bank, Crystal Lake, Urbana, 11 Aug 1899, G.P.G. Del s.n. (ILL).

Coles Co.: Ravine, Fox Ridge State Park, 22 Aug 1945, G.D. Fuller 11048 (ISM).

Cook Co.: Moist woods, valley of Springbrook, Lemont, 9 May 1904, E.J. Hill 8 (ILL).

Jackson Co.: Wooded N-facing slope, about 3 miles E and 2.25 miles S of Piney Creek Ravine Nature Preserve, NW1/4 SW1/4 NW1/4 S5 T8S R4W, (37.86334, -89.57971) 18 May 2015, L.R. Phillippe & P.B. Marcum 43736* (ILLS).

Jo Daviess Co.: Rich upland woods and talus slopes, Apple River Canyon State Park, 5 Sep 1982, J.R. Heim 915 (SIU); Rocky slope, Council Hill, 22 May 1953, G.S. Winterringer 10224 (ILL).

Kane Co.: Trout Park, Elgin, 19 Sep 1956, R.A. Evers 52670 (ILLS); Steep wooded bluff, W-side of Fox River, N of Carpentersville, S1/2 NW1/4 S3 T42N R8E, 27 Apr 1978, G. Wilhelm 4386 (MOR); Mooseheart, N-side Mill Creek, W of defunct railroad spur, SE1/4 S28 T39 R8E, 10 May 1979, G. Wilhelm 6464 (MOR).

Kankakee Co.: Steep, clay bluffs, Rock Creek, 9 miles NW of Kankakee near Rockville, 1 Jul 1937, R.A. Schneider 542 (F).

Kendall Co.: W-facing slope along floodplain of Big Creek, Emmons Woods, SW of South Hale St. and Needham Rd., Plano, 4 May 2012, S.R. Hill 38833 (ILLS).

La Salle Co.: White oak woods, ridge-top, E-side of La Salle Canyon, Starved Rock State Park, SW1/4 S23 T33N R2E, 4 Apr 1999, E. Evert 36460 (MOR); Along Clark Run, N of Utica, 17 Apr 1997, L.I. Neuling 352 (ILLS); Steep ravine, trail downstream of Cascade Falls, Matthiessen State Park, 16 Apr 1997, L.I. Neuling 353 (ILLS).

Lake Co.: 5 miles N of Barrington (Steyermark property, probably planted), 3 May 1981, Nee et al. 20604 (F).

Lee Co.: 3 miles NE of Franklin Creek, 18 Jun 1943, G.N. Jones 15837 (ILL).

Logan Co.: Eimer's bluff, 4 miles W of Lincoln, 10 Apr 1957, C. Heitman & D. Heitman 2 (ISM).

Macoupin Co.: Macoupin Station, 31 Mar 1894, W.E. Andrews 23172 (ILL).

Ogle Co.: Rocky bank, Leaf River near Adeline, SW1/4 S20 T25N R9E, 21 Jun 1945, E.W. Fell & G.B. Fell 45-268 (BUR).

Peoria Co.: Peoria, Apr 1876, J.T. Stewart s.n. (F).

Pope Co.: Woodland, base of cliff, Belle Smith Springs State Park, 21 Aug 1953, H.E. Ahles 7499 (ILLS); Ledge near top of sandstone bluff, Indian Kitchen, Lusk Creek, S34 T11S R6E, 21 May 1952, W.M. Bailey & J.R. Swayne 2365 (SIU); N-slope of Millstone Bluff, Sect. Brownfield, T12N R5E, 13 Aug 1931, L. Schopf 1168 (ILLS).

Shelby Co.: Wooded hillside, 29 Jul 1948, G.D. Fuller 13858 (ISM).

Stephenson Co.: Forest, steep, rocky slope, Cedar Creek N of Cedarville, SE1/4 NW1/4 S31, 28 Jul 1977, C.J. Sheviak 1204 (ISM); Wooded, N-facing slope, 1.3 miles NW of McConnell, SW1/4 NE1/4 NE1/4 S12 T28N R6E, (42.44169, -89.75481), 12 Oct 2011, L.R. Phillippe & W.C. Handel 43080* (ILLS).

Tazewell Co.: Open, wooded hillside, Clear Creek, John Knoke farm near prehistoric village site, S12 T26N R4W, 8 Apr 1934, V.H. Chase 5025 (ILL).

Vermilion Co.: Wooded ravine at base of slope and floodplain, 0.5 miles N of Kickapoo State Park, NW1/4 S21 T20N R12W, (40.1826, -87.73151), 9 May 2012, L.R. Phillippe 43115* (ILLS); S-bank, Salt Fork of the Vermilion River, 2.9 miles N of Fairmount, SW1/4 S22 T19N R13W, (40.08785, -87.82481), 1 Jun 2012, L.R. Phillippe et al. 43158* (ILLS).

Will Co.: Hickory Creek, Pilcher Arboretum, E of Joliet, spontaneous in rich woods, 17 Apr 1954, F.A. Swink 2667 (MOR).

Winnebago Co.: Beckman Woods, 3 miles E of Roscoe, E1/2 S1 T45N R2E, 30 May 1945, E.W. Fell & G.B. Fell 45-159 (BUR); Ravine at Rock Cut State Park, SW1/4 S27 T45N R3E, 2 May 1958, E.W. Fell & G.B. Fell 58-31 (BUR).