



Native Hawthorn (*Crataegus*) Tree Forms of Georgia: An Introduction To The Genus & Field Checklist

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Hawthorns (*Crataegus* spp.) are small trees or shrubs, usually with straight sharp thorns, in the rose family (*Rosaceae*). This genus is large, complex and taxonomically confused, making identification to species level difficult. Most people use the generic term “hawthorn” for any of the genus members, and seldom try to identify trees to species level. This publication is designed for tree, forest, naturalist, and nursery professionals, and is not suitable for land owners / tree owners. This is the briefest of introductions to native hawthorn trees in Georgia. This coverage is for tree forms only, and not shrub species. All species listed are tree forms greater than 12ft tall at maturity. Height values were not maximum recorded, but expected height at maturity.

Large & Many

Crataegus is a large but nebulous genus with many named species and varieties. Before 1895 only ~20 species were recognized in North America. Between 1895 and 1915, three authors described ~1,500 species in North America. One author alone named more than 1,000 species based upon minor visual differences. In 1925, ~300 species were described in the southeastern United States. (Phipps 1988) Today, *Crataegus* is considered to have about 150 species across the Northern Hemisphere with ~90 in North America and ~60 in Eurasia. *Crataegus* species found in eastern North America range from Newfoundland to Florida. The genus *Crataegus* is cited by one author having ~50-60 species in the southeastern United States. (Phipps 1988)

Common names for generic *Crataegus* species include hawthorn, haw, red haw, she-haw, thorn, thorn-apple, hog-apple, quickthorn, May-tree, white-thorn, chastity tree, and hawberry. With so many species, local common names abound and a number of species have the same common name, leading to identification confusion.

Generic Hawthorn Characteristics

Leaf - Flower - Fruit: *Crataegus* species in the southeast are small trees and shrubs with dominantly deciduous leaves, although some far southern species may have persistent leaves through the winter. (Phipps 1988) Leaves are simple, alternately attached, usually toothed and sometimes lobed. Stipules are usually present. Strong fall color is expressed in most species. Figure 1 and Figure 2 show example leaf forms. Flowers are usually regular, perfect, and cosexual in terminal clusters, with 5 showy white

petals – rarely pink. Flowering varies by native species with 42% in early Spring (before leaves or when leaves are barely expanded); 42% in middle Spring (when leaves are rapidly expanding); and, 16% in late Spring (after leaves are fully expanded).

The fruit is a small apple-like pome 0.2" - 0.8" in diameter, varying in color from a common red color to more rare black, purple, orange, yellow or pinkish yellow. Generally, fruit ripens in Fall and are distributed predominantly by birds. (Phipps 1988) Native Georgia tree fruiting occurs from May to February, depending upon the species and location within the State. Fruit maturation and ripening is concentrated in the September to October period for 44% of species, August to September for 20% of species, and September to November for 16% of species, all with significant overlap. Some fruit are fleshy and moist enough to be used as food and jellies – some fruits are dry and mealy. The fruit contains 1-5 nutlets. Viable seeds can be from either sexual or asexual reproduction (apomixis).

Twigs: Twigs and branchlets are round and stiff with a zig-zag or straight growth form, bearing small, pale, oblong lenticels. Leaf scars are small and slightly raised. Twigs are greenish when young, turning orange brown to grey with age. Twigs are usually armed with sharp thorns of varying length and stiffness. Thorns are straight and between 0.6" and 3.5" long. In addition, variously sharp-tipped short shoots can be found within crowns, as well as branched thorns generated on the main stem. (Phipps 1988) Figure 3 and Figure 4 show examples of thorns among foliage. Buds are shiny brown.

Crown - Bark - Wood: The tree crown is open, rounded, wide-spreading, and sometimes drooping. Stem periderm is dark reddish to grey in color, and furrowed and scaly. Thorns can grow from the main stem with straight and occasionally branched forms. The genus name means strong wood. Wood is heavy, hard and tough with a tight grain and diffuse-porous architecture. Heartwood is reddish brown. *Crataegus* is commercially unimportant for wood products due to small size and poor form. It has been used for handles, canes, and small hobby items. There has been a strong and persistent food and medicinal cultural history using *Crataegus* species.

Site Colonization: As a general attribute, *Crataegus* species reproduce aggressively, but usually with slow growth after establishment. Hybridization, polyploidy, vegetative reproduction, and propagation of unfertilized seeds has led to many combinations of species, varietal, and individual traits. Most species are intolerant of interference and shade. *Crataegus* species range in interference tolerance from full sun and dry sites, to some with significant shade tolerance and tolerant of wet sites. The most common site for *Crataegus* are in moist open oak or oak/pine woodland understories, and open early successional sites. (Phipps 1988)

Brief History of Genus

The earliest fossils of *Crataegus* are from the late Oligocene (28mya - million years ago) in North America. *Crataegus* probably originated in North America and spread around the Northern hemisphere in roughly four major dispersal events. (Lo et.al. 2009) The genetics of *Crataegus* species suggests rapid divergence and diversification due to hybridization and polyploidy. (Lo et.al. 2009) It is estimated *Crataegus* species first began to separate from a common ancestor about 16.5mya. Divergence accelerated in eastern North American around 14.3mya with a rapid diversification of species around 5.2mya. (Lo et.al. 2009)

The pressure of multiple glacial expansions southward across North America in the Pleistocene (starting 1.8mya) forced otherwise isolated species to clump together. As each glacial wave moved southward, *Crataegus* species migrated southward, becoming concentrated in the south-central and southeastern United State's Coastal Plain and lower Mississippi River valley. (Lo et.al. 2009) These glacial refugia acted as concentrated genetic caldrons allowing hybridization and polyploidy to be generated. Multiple periods of glacial retreat northward then allowed species from refugia to be scattered and re-isolated through migration northward. (Talent & Dickinson 2005)

Visualizing Differences

The end result of past taxonomic splitting and rearranging is a genus still in need of taxonomic organizational work and clarity. In a world data base there are roughly 2,230 species of *Crataegus* which have been named, with many being synonyms of the same currently accepted species. There are many unresolved naming issues.

Most general tree references usually lump all hawthorns into a genus group and do not attempt individual species identification other than for a few common, widespread species. *Crataegus* species taxonomy and field identification are notorious for their difficulty, in part due to original species concepts based upon minor morphology differences. (Lance 2014) The *Crataegus* genus has many traditional species, as well as many asexually reproducing species (agamospecies). The interactions among all these species and their overlap in ranges has led to confusion in species identification. (Lance 2014)

Genetic Counts

The base chromosome number in *Crataegus* species is 17 (n), with diploids (2n), triploids (3n), and tetraploids (4n) species common. (Phipps 1988; Talent & Dickinson 2005; Talent & Dickinson 2007) Pentaploid (5n) and hexaploid (6n) species are rare but have been identified. (Talent & Dickinson 2005) Some individual species identified have both diploid and polyploid individuals, with triploids and tetraploids the most numerous in North America.

Crataegus species reproduce by a mix of sexual and asexual reproduction. Diploid species only rarely use apomixis. (Talent & Dickinson 2007) Sexual reproducing species have self-incapable pollen and require cross-fertilization. Asexual unfertilized reproduction through seeds (apomixis) is almost always associated with polyploidy and hybridization in hawthorns. (Coughlan et.al. 2014; Talent & Dickinson 2007) Species with strong apomixis usually have self-compatible pollen which stimulates its own asexual reproduction. (Lance 2014; Phipps 1988; Talent & Dickinson 2005; Talent & Dickinson 2007) Apomixis requires pollination of the flowers for promotion of embryo development, even though no fertilization takes place. (Lance 2014)

Clonal Seeds

Triploid and tetraploid species primarily reproduce asexually, but not exclusively. (Lance 2014) Triploids are obligate apomicts and usually pollen sterile. Tetraploid species are dominantly asexually reproducers stimulated with pollen of their own or from diploid species. Some tetraploid species also generate limited sexually produced seeds which can contain a mix of diploid to hexaploid embryos. (Talent & Dickinson 2005; Talent & Dickinson 2007) The development of different ploidy levels can

include: triploid embryos generated by diploids pollinated by tetraploids; tetraploid embryos generated by triploids pollinated by diploids; and, pentaploids embryos generated by triploids pollinated by tetraploids. (Talent & Dickinson 2007)

Self-incompatible pollen from diploids or self-compatible pollen among polyploids are required to maintain apomitic populations since pollination is required for generation of clonal seed. (Talent & Dickinson 2007) A long-term advantage of apomixis and polyploidy is allowing a species to increase their range wider and faster than sexual reproduced species. (Coughlan et al. 2014; Talent & Dickinson 2005) Glacial refugia processes of migration, range expansion, and range contraction show diploid species stay close to historic refugia areas, and polyploid apomixis species range widely. (Talent & Dickinson 2005)

Hybrids

Low fertility hybrid forms of *Crataegus* can rarely occur after major disturbance processes, but are usually ephemeral. (Talent & Dickinson 2007) Hybrids in *Crataegus* occur in only ~15% of the species, all between different series groupings and usually limited in extent. These hybrids are almost always rare, transient, and non-persistent. A great majority of all *Crataegus* species in the field are non-hybrids. (Phipps 2005) Hybrids between diploids have not been seen, but diploid hybrids with tetraploids species do occur. (Talent & Dickinson 2007) Hybridization in *Crataegus* is not common and is not a significant cause or reason for taxonomic complexity within the genus. (Phipps 2005)

Wide-Ranging

In North America, tetraploids represent the largest group of species, with diploids the next largest. (Talent & Dickinson 2005) In eastern North America nearly 2/3 of species are triploids and tetraploids, with the rest diploids. (Lo et.al. 2009) Asexual species and polyploids tend to have larger ranges and quicker expansion after disturbance than sexual species. Polyploids tend to rapidly expand, colonize, and diversify into new spaces due to many gene set combinations available for novel expressions in unique environments. (Coughlan et.al. 2014)

In North American, *Crataegus* species can be categorized into four diversity groups based upon their genetic background and reproductive strategy: isolated species with almost no hybrids; species which generate rare, non-persistent hybrids; large species complexes undergoing vigorous diversification without hybrids; and, small groups of hybrids within species complexes undergoing vigorous diversification. (Phipps 2005)

Confusion In Complexity

There are roughly 140-200 *Crataegus* species described across the north temperate regions of the Northern Hemisphere depending upon the author. (Lo et.al. 2009) In the past, *Crataegus* has had over 1,700 species names published, divided into about 40 taxonomic series, with these grouped into 14 sections within the genus, all based upon geographic location and morphology differences. (Lo et.al. 2009; Talent & Dickinson 2005)

The 90 - 100 species of North American hawthorns have been divided into 11 sections, and further divided into 25 series – each representing a small natural group with low diversity. (Lo et.al. 2009; Phipps 1988) Another author has cited North American *Crataegus* having 6 sections and these are divided into 32 series, all containing ~240 species. (Lance 2014) There are many microspecies

within species definitions of *Crataegus*, some being synonyms, hybrids, varieties, and geographical subspecies. These have yet to be defined. (Phipps 1988)

Genetic & Reproductive Summary

The *Crataegus* genus in North American is heavily apomitic and polyploid. (Phipps 1988) Both sexual reproduction and asexual reproduction are common. (Talent & Dickinson 2007) Hybridization, apomixis, and polyploidy have played a crucial role in aggressive diversification of *Crataegus* species, which has lead to its complex taxonomy. (Coughlan et.al. 2014; Phipps 1988; Talent & Dickinson 2005)

Checklist of Native Hawthorn Trees

There are roughly 93 native *Crataegus* species listed in Georgia composed of small to large shrubs and small trees. In this paper, only small native trees are listed. Diversity of species and forms require discipline in field identification to differentiate between a mature shrub and a young tree of different species. Table 1 is a field checklist of native hawthorn trees of Georgia.

One issue with all hawthorn species are the large number of scientific names which have been assigned over many years to the same species by many authors. There is one officially designated scientific species name with many other names proposed or assigned to the same species or population of a species. These other scientific names for the same species are called synonyms. Table 2 shows one example for a wide-spread, well-known native hawthorn tree species and all the names (synonyms) given to it over many years by many authors through many species examinations. Only one scientific name is officially sanctioned. Having many names, some split-off due to minute geographic and morphological variations, has perpetuated a troubling mix of species definitions within this particular species and within the *Crataegus* genus. As varied as scientific names are, common names across species and portions of geographic ranges, are equally diverse.

Table 3 presents a synonym expanded list of hawthorn trees native to Georgia. This table provides all the scientific names given to various species, and the one established official species name they all represent. Reference authors and sources for these names are listed after the single recognized species name. The key to authors listed and sources are at the end of the table. Table 4 lists eight known hybrids of native hawthorn trees of Georgia.

Because there are few geographic range descriptions for most *Crataegus* species, Table 5 provides for some select native *Crataegus* tree species of Georgia their presence in surrounding states. This provides an appreciation of whether a hawthorn tree species is wide-spread or localized. For example, there is one hawthorn tree species only found in Georgia (*Crataegus fragilis* – fragile hawthorn), three hawthorn trees native to Georgia found in only one other state, and four native Georgia hawthorn trees found in 30 or more states. Unfortunately, there are few accurate references for within-state ranges for different native hawthorn tree species.

Conclusions

You may not see them, but hawthorns surround us hidden in open woodlands, on mountain sides, and beside coastal plain bay heads. Hawthorns represent many individual species, but usually go

unnoticed as a group. If noticed at all, they are frequently lumped together into a single taxonomic unit. These small trees are worth understanding and appreciating for their values and uniqueness in Georgia woodlands. How many can you find and identify in the field?

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Figure 1: Examples of leaves and twig of a native *Crataegus* tree species. (photo credit Dr. Kim D. Coder)



Figure 2: Examples of leaves and twigs of a native *Crataegus* tree species. (photo credit Dr. Kim D. Coder)



Figure 3: Examples of twigs with thorns of a native *Crataegus* tree species. (photo credit Dr. Kim D. Coder)



Figure 4: Examples of twigs with thorns of a native *Crataegus* tree species. (photo credit Dr. Kim D. Coder)

Table 1: Field checklist of native hawthorn (*Crataegus*) tree species of Georgia.

species scientific name	common name
<u>Crataegus aemula</u>	Rome hawthorn
<u>Crataegus aestivalis</u>	mayhaw
<u>Crataegus X agrestina</u>	swamp Allegheny hawthorn
<u>Crataegus alabamensis</u>	Alabama hawthorn
<u>Crataegus aprica</u>	sunny hawthorn
<u>Crataegus berberifolia</u>	barberry hawthorn
<u>Crataegus brachyacantha</u>	blueberry hawthorn
<u>Crataegus buckleyi</u>	Buckley hawthorn
<u>Crataegus calpodendron</u>	pear hawthorn
<u>Crataegus collina</u>	hillside hawthorn
<u>Crataegus X condigna</u>	river junction hawthorn
<u>Crataegus crus-galli</u>	cockspur hawthorn
<u>Crataegus dispar</u>	Aiken hawthorn
<u>Crataegus X egregia</u>	(no name)
<u>Crataegus X flava</u>	yellow hawthorn
<u>Crataegus fragilis</u>	fragile hawthorn
<u>Crataegus frugiferans</u>	Allegheny hawthorn
<u>Crataegus iracunda</u>	forest hawthorn
<u>Crataegus lacrimata</u>	weeping hawthorn
<u>Crataegus lancei</u>	Lance hawthorn

(continued)

Table 1: Field checklist of native hawthorn (*Crataegus*)
 tree species of Georgia. (continued)

species scientific name	common name
<u>Crataegus lassa</u>	Selma hawthorn
<u>Crataegus macrosperma</u>	bigfruit hawthorn
<u>Crataegus marshallii</u>	parsley hawthorn
<u>Crataegus mendosa</u>	Albertville hawthorn
<u>Crataegus mollis</u>	downy hawthorn
<u>Crataegus X mohrii</u>	Mohr hawthorn
<u>Crataegus phaenopyrum</u>	Washington hawthorn
<u>Crataegus pruinosa</u>	frosted hawthorn
<u>Crataegus pulcherrima</u>	beautiful hawthorn
<u>Crataegus quaesita</u>	Florida hawthorn
<u>Crataegus X rigens</u>	Gadsden hawthorn
<u>Crataegus X rufula</u>	rusty hawthorn
<u>Crataegus senta</u>	rough hawthorn
<u>Crataegus sororia</u>	sister hawthorn
<u>Crataegus spathulata</u>	little-hip hawthorn
<u>Crataegus X vailiae</u>	Vail hawthorn
<u>Crataegus viridis</u>	green hawthorn

Table 2: An example list of synonym names representing the same native hawthorn tree species (*Crataegus crus-galli* -- cockspur hawthorn) developed over many years and by many authors. Some synonym names represent minor geographic populations or populations with minute morphological differences. (primarily from USDA, NRCS. 2021 & Lance 2014)

SPECIES: Crataegus crus-galli
cockspur hawthorn
SPECIES SYNONYMS:

<u>Crataegus acutifolia</u>	<u>Crataegus hannibalensis</u>
<u>Crataegus acutifolia</u> var. <u>insignis</u>	<u>Crataegus limnophila</u>
<u>Crataegus algens</u>	<u>Crataegus mohrii</u>
<u>Crataegus barrettiana</u>	<u>Crataegus operta</u>
<u>Crataegus bushii</u>	<u>Crataegus palliata</u>
<u>Crataegus canbyi</u>	<u>Crataegus palmeri</u>
<u>Crataegus cherokeensis</u>	<u>Crataegus permixta</u>
<u>Crataegus cocksii</u>	<u>Crataegus pyracanthifolia</u>
<u>Crataegus crus-galli</u> var. <u>barrettiana</u>	<u>Crataegus pyracanthoides</u>
<u>Crataegus crus-galli</u> var. <u>bellica</u>	<u>Crataegus pyracanthoides</u> var. <u>arborea</u>
<u>Crataegus crus-galli</u> var. <u>capillata</u>	<u>Crataegus regalis</u>
<u>Crataegus crus-galli</u> var. <u>crus-galli</u>	<u>Crataegus regalis</u> var. <u>paradoxa</u>
<u>Crataegus crus-galli</u> var. <u>exigua</u>	<u>Crataegus sabineana</u>
<u>Crataegus crus-galli</u> var. <u>leptophylla</u>	<u>Crataegus schizophylla</u>
<u>Crataegus crus-galli</u> var. <u>macra</u>	<u>Crataegus signata</u>
<u>Crataegus crus-galli</u> var. <u>oblongata</u>	<u>Crataegus subpilosa</u>
<u>Crataegus crus-galli</u> var. <u>pachyphylla</u>	<u>Crataegus tantula</u>
<u>Crataegus crus-galli</u> var. <u>pyracanthifolia</u>	<u>Crataegus tenax</u>
<u>Crataegus danielsii</u>	<u>Crataegus triumphalis</u>
<u>Crataegus denaria</u>	<u>Crataegus unica</u>
<u>Crataegus fecunda</u>	<u>Crataegus vallicola</u>
<u>Crataegus fontanesiana</u>	

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation.

Note all species listed are trees between 12ft & 25ft tall at maturity with a single stem. Height values are not maximum recorded, but expected height at maturity. (primarily from USDA, NRCS. 2021 & Lance 2014)

#	species scientific name synonym scientific name	common name (# of synonyms, if any)	source
1.	<u>Crataegus aemula</u>	Rome hawthorn	PL FNA LAN
2.	<u>Crataegus aestivalis</u> <u>Crataegus luculenta</u> <u>Crataegus maloides</u>	mayhaw (2 synonyms)	PL FNA LAN RAD LIT KAR
3.	<u>Crataegus alabamensis</u> <u>Crataegus alabamensis</u> var. <u>florens</u> <u>Crataegus alabamensis</u> var. <u>ravenelii</u> <u>Crataegus alabamensis</u> var. <u>teres</u> <u>Crataegus insidiosa</u>	Alabama hawthorn (4 synonyms)	PL FNA LAN FNA LAN LAN LAN
4.	<u>Crataegus aprica</u>	sunny hawthorn	FNA LAN
5.	<u>Crataegus berberifolia</u> <u>Crataegus berberifolia</u> var. <u>berberifolia</u> <u>Crataegus berberifolia</u> var. <u>edita</u> <u>Crataegus berberifolia</u> var. <u>engelmannii</u> <u>Crataegus crocina</u> <u>Crataegus edita</u> <u>Crataegus edura</u>	barberry hawthorn (12 synonyms)	PL FNA LAN KAR FNA LAN LAN LAN LAN LAN LAN LAN LAN LAN LAN

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation. (continued)

6.	<u>Crataegus brachyacantha</u>	blueberry hawthorn	PL	FNA	LAN	LIT	KAR
7.	<u>Crataegus buckleyi</u>	Buckley hawthorn			FNA	LAN	
8.	<u>Crataegus calpodendron</u>	pear hawthorn (11 synonyms)	PL	FNA	LAN	RAD	LIT KAR
	<u>Crataegus acanthacolonensis</u>						
	<u>Crataegus calpodendron</u> var. <u>gigantea</u>						
	<u>Crataegus calpodendron</u> var. <u>globosa</u>						
	<u>Crataegus calpodendron</u> var. <u>hispida</u>						
	<u>Crataegus calpodendron</u> var. <u>hispidula</u>						
	<u>Crataegus calpodendron</u> var. <u>microcarpa</u>						
	<u>Crataegus calpodendron</u> var. <u>mollicula</u>						
	<u>Crataegus calpodendron</u> var. <u>obesa</u>						
	<u>Crataegus chapmanii</u>						
	<u>Crataegus fontanesiana</u>						
	<u>Crataegus globosa</u>						
9.	<u>Crataegus collina</u>	hillside hawthorn (6 synonym)	PL	FNA	LAN	RAD	
	<u>Crataegus collina</u> var. <u>collina</u>	FNA					
	<u>Crataegus collina</u> var. <u>collicola</u>						
	<u>Crataegus collina</u> var. <u>secta</u>						
	<u>Crataegus collina</u> var. <u>sordida</u>						
	<u>Crataegus collina</u> var. <u>succincta</u>						
	<u>Crataegus fastosa</u>						
10.	<u>Crataegus crus-galli</u>	cockspur hawthorn (43 synonyms)	PL	FNA	LAN	RAD	LIT KAR
	<u>Crataegus acutifolia</u>						
	<u>Crataegus acutifolia</u> var. <u>insignis</u>						
	<u>Crataegus algens</u>						
	<u>Crataegus barrettiana</u>						
	<u>Crataegus bushii</u>						

(*Crataegus crus-galli* synonyms continued on next page)

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation. (continued)

<u>Crataegus canbyi</u>			
<u>Crataegus cherokeensis</u>			
<u>Crataegus cocksii</u>			
<u>Crataegus crus-galli</u> var. <u>barrettiana</u>			
<u>Crataegus crus-galli</u> var. <u>bellica</u>			
<u>Crataegus crus-galli</u> var. <u>capillata</u>			
<u>Crataegus crus-galli</u> var. <u>crus-galli</u>	FNA		
<u>Crataegus crus-galli</u> var. <u>exigua</u>			
<u>Crataegus crus-galli</u> var. <u>leptophylla</u>			
<u>Crataegus crus-galli</u> var. <u>macra</u>			
<u>Crataegus crus-galli</u> var. <u>oblongata</u>			
<u>Crataegus crus-galli</u> var. <u>pachyphylla</u>			
<u>Crataegus crus-galli</u> var. <u>pyracanthifolia</u>	LAN		
<u>Crataegus danielsii</u>			
<u>Crataegus denaria</u>		<u>Crataegus pyracanthoides</u> var. <u>arborea</u>	
<u>Crataegus fecunda</u>		<u>Crataegus regalis</u>	
<u>Crataegus fontanesiana</u>		<u>Crataegus regalis</u> var. <u>paradoxa</u>	
<u>Crataegus hannibalensis</u>		<u>Crataegus sabineana</u>	
<u>Crataegus limnophila</u>		<u>Crataegus schizophylla</u>	
<u>Crataegus mohrii</u>		<u>Crataegus signata</u>	
<u>Crataegus operta</u>		<u>Crataegus subpilosa</u>	
<u>Crataegus palliata</u>		<u>Crataegus tantula</u>	
<u>Crataegus palmeri</u>		<u>Crataegus tenax</u>	
<u>Crataegus permixta</u>		<u>Crataegus triumphalis</u>	
<u>Crataegus pyracanthifolia</u>		<u>Crataegus unica</u>	
<u>Crataegus pyracanthoides</u>		<u>Crataegus vallicola</u>	

(*Crataegus crus-galli* synonyms continued from previous page)

- | | | | | | |
|-----|------------------------------|--------------------|----|-----|-----|
| 11. | <u>Crataegus dispar</u> | Aiken hawthorn | PL | FNA | LAN |
| 12. | <u>Crataegus fragilis</u> | fragile hawthorn | | PL | KAR |
| 13. | <u>Crataegus frugiferans</u> | Allegheny hawthorn | | FNA | LAN |

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation. (continued)

14.	<u>Crataegus iracunda</u>	forest hawthorn (10 synonyms)	PL FNA LAN RAD KAR
	<u>Crataegus beckwithiae</u>		
	<u>Crataegus brumalis</u>		
	<u>Crataegus iracunda</u> var. <u>brumalis</u>		
	<u>Crataegus iracunda</u> var. <u>diffusa</u>		
	<u>Crataegus iracunda</u> var. <u>populnea</u>	LAN	
	<u>Crataegus iracunda</u> var. <u>silvicola</u>	PL RAD	
	<u>Crataegus iracunda</u> var. <u>stolonifera</u>		
	<u>Crataegus macrosperma</u> var. <u>demissa</u>		
	<u>Crataegus populnea</u>		
	<u>Crataegus stolonifera</u>		
15.	<u>Crataegus lacrimata</u>	weeping hawthorn	FNA
16.	<u>Crataegus lancei</u>	Lance hawthorn	FNA LAN
17.	<u>Crataegus lassa</u>	Selma hawthorn (6 synonyms)	FNA LAN
	<u>Crataegus crocea</u>		
	<u>Crataegus lassa</u> var. <u>colonica</u>	LAN	
	<u>Crataegus lassa</u> var. <u>integra</u>	PL LAN	
	<u>Crataegus lassa</u> var. <u>lanata</u>	PL FNA LAN	
	<u>Crataegus lassa</u> var. <u>recurva</u>	LAN	
	<u>Crataegus meridiana</u>		
18.	<u>Crataegus macrosperma</u>	bigfruit hawthorn (14 synonyms)	PL LAN RAD KAR
	<u>Crataegus chadsfordiana</u>		
	<u>Crataegus fluviatilis</u>		
	<u>Crataegus fetalis</u>		
	<u>Crataegus macrosperma</u> var. <u>acutiloba</u>		
	<u>Crataegus macrosperma</u> var. <u>eganii</u>		
	<u>Crataegus macrosperma</u> var. <u>matura</u>		

(*Crataegus macrosperma* --
bigfruit hawthorn
continued on next page)

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation. (continued)

<u>Crataegus macrosperma</u>		bigfruit hawthorn (continued))					
	<u>Crataegus macrosperma</u> var. <u>pastora</u>						
	<u>Crataegus macrosperma</u> var. <u>pentandra</u>						
	<u>Crataegus macrosperma</u> var. <u>roanensis</u>		PL	RAD			
	<u>Crataegus oreophila</u>						
	<u>Crataegus randiana</u>						
	<u>Crataegus roanensis</u>						
	<u>Crataegus roanensis</u> var. <u>fluviatilis</u>						
	<u>Crataegus roanensis</u> var. <u>heidelbergensis</u>						
19.	<u>Crataegus marshallii</u>	parsley hawthorn	PL	FNA	LAN	RAD	LIT KAR
20.	<u>Crataegus mendosa</u>	Albertville hawthorn				FNA	LAN
21.	<u>Crataegus mollis</u>	downy hawthorn (16 synonyms)				PL	LAN KAR
	<u>Crataegus albicans</u>	<u>Crataegus limaria</u>					
	<u>Crataegus arkansana</u>	<u>Crataegus mollis</u> var. <u>dumetosa</u>					
	<u>Crataegus brachyphylla</u>	<u>Crataegus mollis</u> var. <u>gigantea</u>					
	<u>Crataegus cibaria</u>	<u>Crataegus mollis</u> var. <u>incisifolia</u>					
	<u>Crataegus grvida</u>	<u>Crataegus mollis</u> var. <u>sera</u>					
	<u>Crataegus induta</u>	<u>Crataegus noelensis</u>					
	<u>Crataegus invisa</u>	<u>Crataegus pedicellata</u> var. <u>albicans</u>					
	<u>Crataegus lacera</u>	<u>Crataegus placens</u>					
22.	<u>Crataegus phaenopyrum</u>	Washington hawthorn (3 synonyms)	PL	FNA	LAN	LIT	KAR
	<u>Crataegus cordata</u>						
	<u>Crataegus populifolia</u>						
	<u>Crataegus youngii</u>						

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation. (continued)

23.	<u>Crataegus pruinosa</u>	frosted hawthorn (36 synonyms)	PL FNA LAN RAD KAR
	<u>Crataegus aspera</u>	<u>Crataegus platycarpa</u>	
	<u>Crataegus cognata</u>	<u>Crataegus porteri</u>	
	<u>Crataegus congesta</u>	<u>Crataegus porteri</u> var. <u>caerulescens</u>	
	<u>Crataegus crawfordiana</u>	<u>Crataegus pruinosa</u> var. <u>cognata</u>	
	<u>Crataegus deltoides</u>	<u>Crataegus pruinosa</u> var. <u>congesta</u>	
	<u>Crataegus formosa</u>	<u>Crataegus pruinosa</u> var. <u>conjuncta</u>	
	<u>Crataegus gattingeri</u>	<u>Crataegus pruinosa</u> var. <u>dissona</u>	FNA
	<u>Crataegus gattingeri</u> var. <u>rigida</u>	<u>Crataegus pruinosa</u> var. <u>gattingeri</u>	FNA LAN
	<u>Crataegus gaudens</u>	<u>Crataegus pruinosa</u> var. <u>grandiflora</u>	
	<u>Crataegus georgiana</u>	<u>Crataegus pruinosa</u> var. <u>latisepala</u>	
	<u>Crataegus lecta</u>	<u>Crataegus pruinosa</u> var. <u>leiophylla</u>	
	<u>Crataegus leiophylla</u>	<u>Crataegus pruinosa</u> var. <u>pachypoda</u>	
	<u>Crataegus littoralis</u>	<u>Crataegus pruinosa</u> var. <u>parvula</u>	
	<u>Crataegus mackenziei</u>	<u>Crataegus pruinosa</u> var. <u>porteri</u>	
	<u>Crataegus mackenziei</u> var. <u>aspera</u>	<u>Crataegus pruinosa</u> var. <u>rugosa</u>	PL RAD
	<u>Crataegus mackenziei</u> var. <u>bracteata</u>	<u>Crataegus pruinosa</u> var. <u>virella</u>	
	<u>Crataegus parvula</u>	<u>Crataegus rugosa</u>	
		<u>Crataegus vicinalis</u>	
		<u>Crataegus virella</u>	
24.	<u>Crataegus pulcherrima</u>	beautiful hawthorn (7 synonyms)	PL FNA LAN LIT KAR
	<u>Crataegus contrita</u>	<u>Crataegus pulcherrima</u>	
	<u>Crataegus opima</u>	var. <u>opima</u>	FNA LAN
	<u>Crataegus pulcherrima</u> var. <u>incilis</u>	<u>Crataegus pulcherrima</u> var. <u>pinetorum</u>	FNA
		<u>Crataegus robur</u>	
		<u>Crataegus tecta</u>	
25.	<u>Crataegus quaesita</u>	Florida hawthorn (4 synonyms)	PL FNA LAN KAR
	<u>Crataegus quaesita</u> var. <u>egens</u>	FNA LAN	
	<u>Crataegus quaesita</u> var. <u>floridana</u>	FNA LAN	
	<u>Crataegus resima</u>		
	<u>Crataegus versuta</u>		

Table 3: Checklist of native hawthorn (*Crataegus*) tree species of Georgia listed with official scientific name, synonyms of species name, common name, and botanical sources for the species designation. (continued)

SOURCE KEY (see selected literature for full citation)

FNA	= Flora of North America, Volume 9.
KAR	= Kartesz, 2015. BONAP
LAN	= Lance, 2014. Haws.
LIT	= Little, 1981. Atlas ... Supplement.
PL	= PLANTS database – USDA-NRSC website.
RAD	= Radford, 1968. Manual ... Carolinas

Table 4: Hybrid forms (8 hybrids) and synonyms of native Georgia *Crataegus* tree species.

scientific name	common name	source
<u>Crataegus X agrestina</u>	swamp allegheny hawthorn	LAN
<u>Crataegus X condigna</u>	river junction hawthorn	PL FNA
<u>Crataegus X egregia</u>	(no name)	FNA
<u>Crataegus X flava</u>	yellow hawthorn (16 synonyms)	PL FNA LAN RAD LIT KAR
<u>Crataegus aprica</u>	<u>Crataegus michauxii</u>	
<u>Crataegus arrogans</u>	<u>Crataegus pentasperma</u>	
<u>Crataegus cullasagensis</u>	<u>Crataegus ravenelii</u>	
<u>Crataegus cuthbertii</u>	<u>Crataegus recurvata</u>	
<u>Crataegus floridana</u>	<u>Crataegus senta</u>	
<u>Crataegus leonensis</u>	<u>Crataegus tristis</u>	
<u>Crataegus lepida</u>	<u>Crataegus versuta</u>	
<u>Crataegus meridiana</u>	<u>Crataegus visenda</u>	
<u>Crataegus X mohrii</u>	Mohr hawthorn (1 synonyms)	FNA LAN
<u>Crataegus reverchonii</u> var. <u>mohrii</u>		
<u>Crataegus X rigens</u>	Gadsden hawthorn	PL KAR
<u>Crataegus X rufula</u>	rusty hawthorn	PL FNA LAN
<u>Crataegus X vailiae</u>	Vail hawthorn	FNA KAR

SOURCE KEY

- FNA = Flora of North America, Volume 9.
- KAR = Kartesz, 2015. BONAP
- LAN = Lance, 2014. Haws.
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Table 5: Distribution of select native hawthorn (*Crataegus*) trees of Georgia and surrounding states, and number of other states and provinces where found.

Because accurate range maps are not available in Georgia for native hawthorn species, other state locations are provided for which there are data in order to help represent the breadth of distribution for each species.

(USDA, NRCS. 2021)

scientific name	common name	SE States	total # of states / provinces
<u><i>Crataegus aemula</i></u>	Rome hawthorn	GA	(2)
<u><i>Crataegus aestivalis</i></u>	may hawthorn	GA AL FL NC SC	(7)
<u><i>Crataegus berberifolia</i></u>	barberry hawthorn	GA AL	(6)
<u><i>Crataegus brachyacantha</i></u>	blueberry hawthorn	GA AL	(7)
<u><i>Crataegus calpodendron</i></u>	pear hawthorn	GA AL NC TN	(28)
<u><i>Crataegus condigna</i></u>	river junction hawthorn	GA FL	(2)
<u><i>Crataegus crus-galli</i></u>	cockspur hawthorn	GA AL FL NC SC TN	(32)
<u><i>Crataegus dispar</i></u>	Aiken hawthorn	GA SC	(2)
<u><i>Crataegus flava</i></u>	yellow-leaf hawthorn	GA AL FL NC SC TN	(12)
<u><i>Crataegus fragilis</i></u>	fragile hawthorn	GA	(1)
<u><i>Crataegus iracunda</i></u>	stolon-bearing hawthorn	GA AL NC SC TN	(23)
<u><i>Crataegus macrosperma</i></u>	big-fruit hawthorn	GA AL NC SC TN	(30)
<u><i>Crataegus marshallii</i></u>	parsley hawthorn	GA AL FL NC SC TN	(16)
<u><i>Crataegus mollis</i></u>	downy hawthorn	GA AL TN	(36)
<u><i>Crataegus phaenopyrum</i></u>	Washington hawthorn	GA AL FL NC SC TN	(23)
<u><i>Crataegus pruinosa</i></u>	waxy-fruit hawthorn	GA NC TN	(31)
<u><i>Crataegus pulcherrima</i></u>	beautiful hawthorn	GA AL FL	(4)
<u><i>Crataegus rigens</i></u>	Gadsden hawthorn	GA AL TN	(3)
<u><i>Crataegus rufula</i></u>	rusty hawthorn	GA AL FL NC SC	(5)
<u><i>Crataegus spathulata</i></u>	little-hip hawthorn	GA AL FL NC SC TN	(17)
<u><i>Crataegus viridis</i></u>	green hawthorn	GA AL FL NC SC TN	(21)