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A Floristic Survey of Andalusia: A Historic Preservation Site in Baldwin County, Georgia

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A Floristic Survey of Andalusia:

A Historic Preservation Site in Baldwin County, Georgia

by

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Preface

This thesis has been written in journal format and conforms to the style appropriate to my discipline. This manuscript will be submitted for publication in the Georgia Journal of Science, a peer reviewed interdisciplinary scientific journal, and therefore reflects the required formatting for this publication. Figures and tables follow the text of the manuscript as required by Georgia Journal of Science and this thesis committee.

Acknowledgements

This research could not have been conducted without permission from the Andalusia Foundation to collect specimens from Andalusia and look through historical archives. Another pivotal factor was the collective effort of the thesis committee members: Dr. Gretchen Ionta, Dr. Christine Mutiti, and Dr. Sam Mutiti. A special thanks to Dr. Gretchen Ionta for leading the thesis committee, providing professional guidance, supplying plant collection materials and herbarium supplies, managing specimens after collection, verifying and updating all specimen identifications and nomenclature, and providing general help throughout the entire process of this research. Thank you, Georgia College & State University Department of Biological and Environmental Sciences, for supporting this process both through course supplementation and financially via a graduate teaching assistantship. Lastly, I would like to thank the committee members of the Marie Mellinger Field Botany Research Grant for providing funding for this project.

Introduction

Andalusia, the former home of the renowned author Flannery O'Connor, is a nationally recognized historic site (since 1980; National Register of Historic Places 2020) and museum located in Milledgeville, Baldwin County, Georgia. This 212 ha (523.9 acre) property lies approximately 7 km (4.3 mi) south of Lake Sinclair, 6 km (3.7 mi) northwest of downtown Milledgeville, and 1 km (0.6 mi) west of Highway 212 (Figures 1 and 2). The northeastern border of the roughly diamond-shaped property follows Highway 441, with the remainder surrounded by mostly-forested private land holdings. The survey area comprises three separate parcels: 067 007, 067 007A, and 067 007C (Baldwin County Board of Assessors 2020). The combined ca. 203.1 ha (501.8 acres) of parcels 067 007A and 067 007C make up the majority of the study site, today comprising a mix of forest and open areas; much of this land has been under agricultural use at some point over the past 200 years. Parcel 067 007 (ca. 8.9 ha; 22 acres) encompasses all the site buildings, including the main house, farm buildings, small peripheral pastures, and a parking area. These three lots surround parcel 067 007B, a private landholding that was excluded from this study. Areas open to the public include the historic farm buildings and Tobler Loop, a 1.2 km (0.8 mi) nature trail that meanders through a wooded area bordering Tobler Creek as it flows towards the southeastern edge of the property.

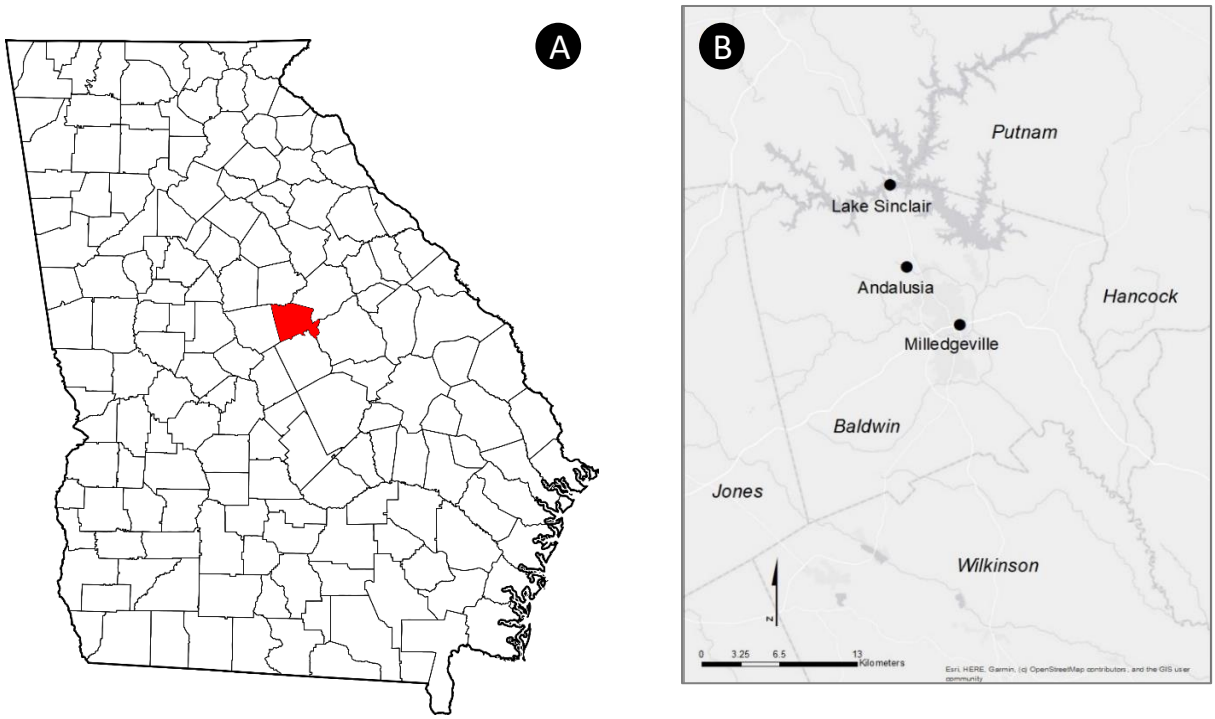

Fig. 1. Location of Andalusia in Baldwin County, Georgia. A) Map of Georgia with Baldwin County highlighted (red). B) Location of Andalusia in respect to Lake Sinclair and downtown Milledgeville.

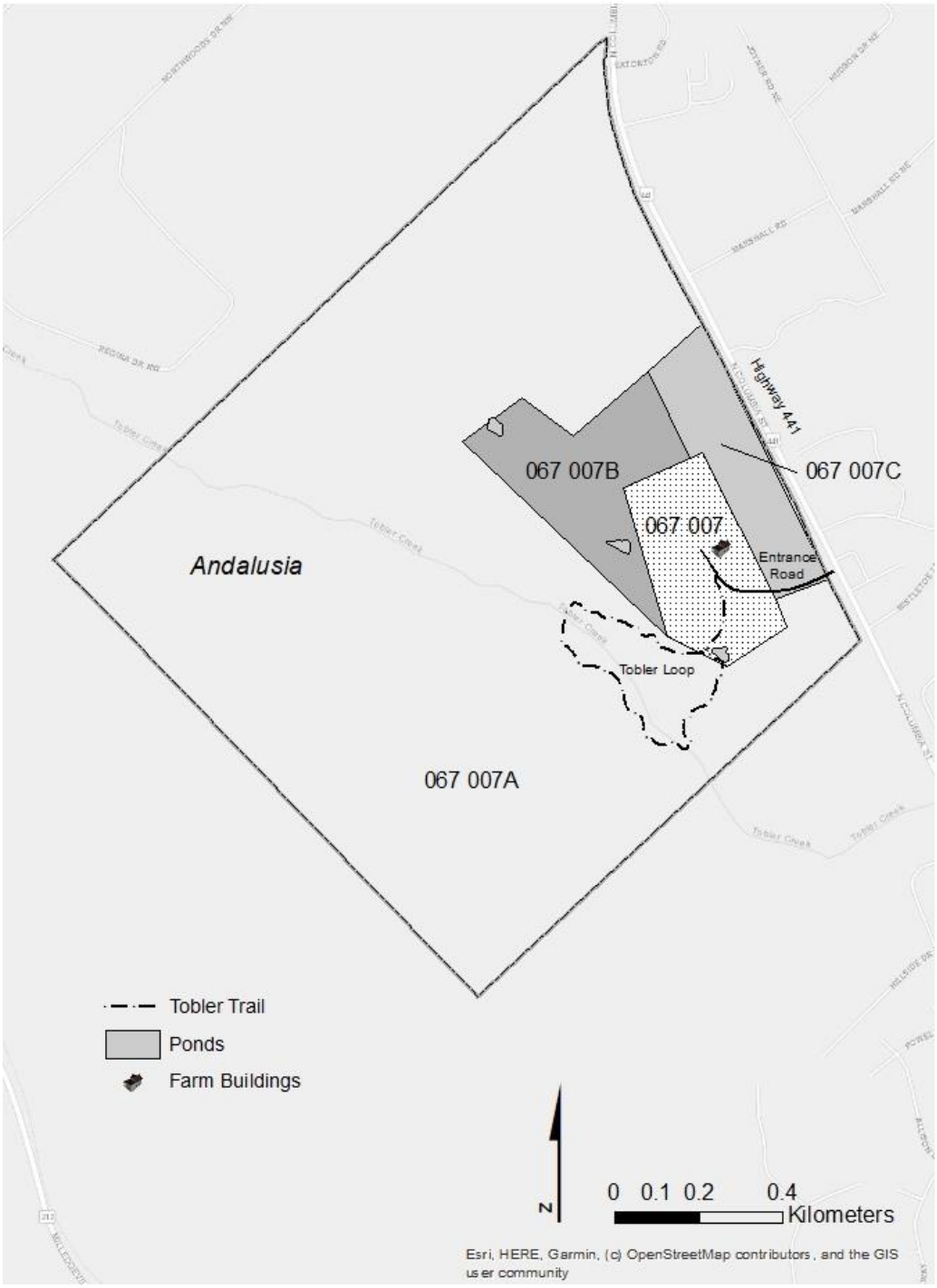

Fig. 2. Location of Andalusia. A. (Inset) Primary north and south landmarks (Lake Sinclair and Milledgeville). B. Detail of study site, showing lot boundaries and locations of farm buildings, ponds, Tobler Creek, and Tobler Loop trail.

Soils, Geology, and Physiography

Milledgeville is located along the fall line of the Oconee river, a gently sloping region that represents the transition between the underlying Precambrian-Paleozoic crystalline rock layers of the Georgia Piedmont from the Cretaceous-Tertiary sediments of the Georgia Coastal Plain. The rock layer underlying Andalusia comprises metamorphic gneiss with components of hornblende gneiss, granite gneiss, and biotite gneiss (Geologic maps of US States 2020). The soil layer is primarily made up of Wilkes, Congaree, and Toccoa (a range of fine sandy loam to clay loam), with smaller distributions of sandy loam and sandy clay (Figure 3; Web Soil Survey 2019). Site topography elevation ranges from 120-150 m above sea level (Figure 4). Major land features include three small ponds located in parcels 067 007 and 067 007B, and Tobler Creek, which enters at the north border of parcel 067 007A and runs southeast through the survey area, ultimately feeding into the Oconee River.

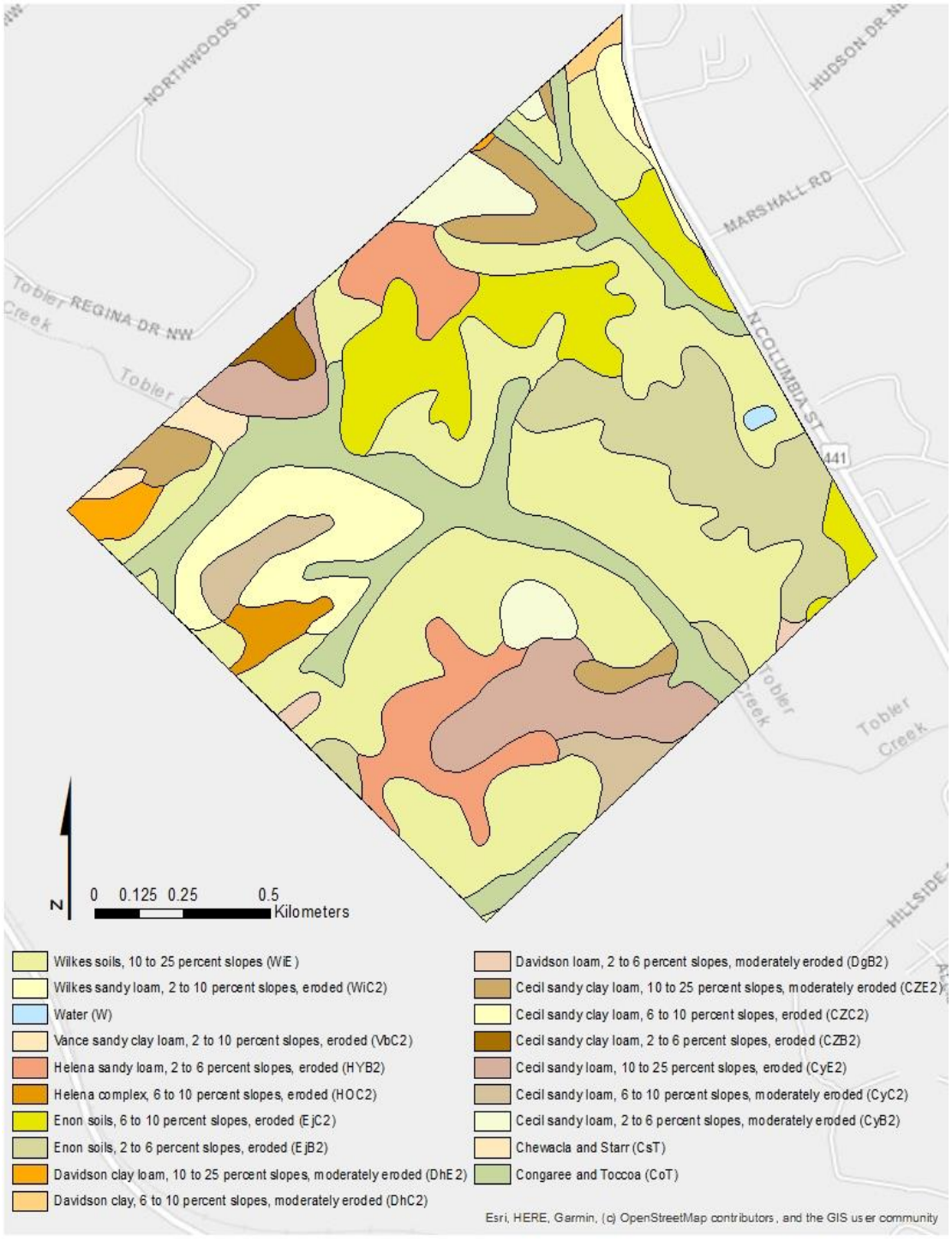

Fig. 3. Soil composition. Soil data for Area of Interest (AOI) was compiled using the United States Department of Agriculture (USDA) web soil survey (USDA 2019).

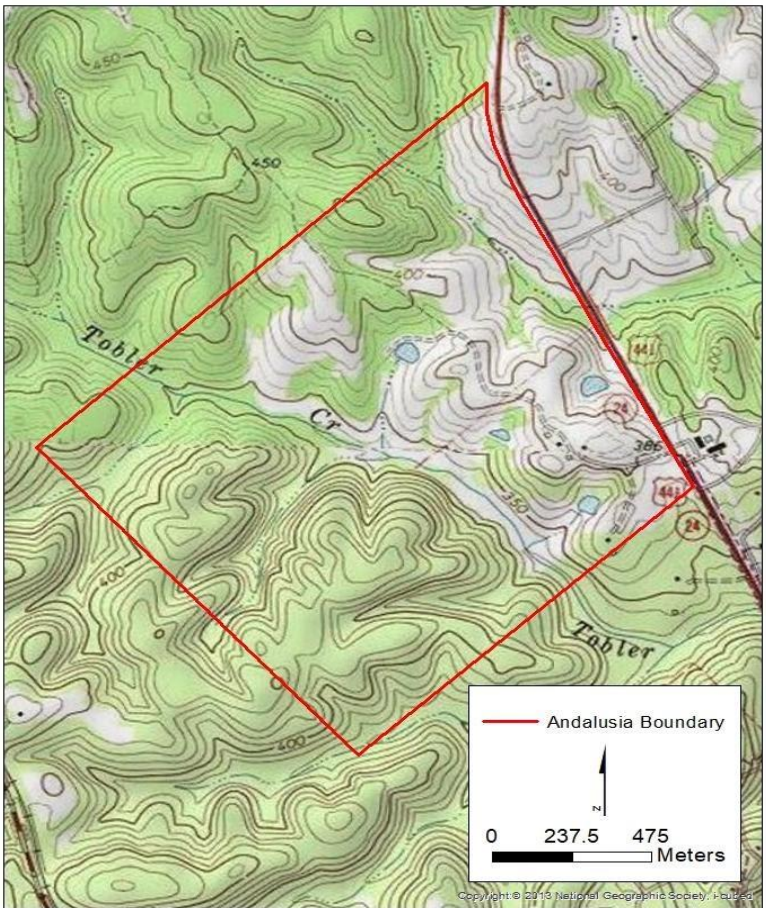

Fig. 4. Topography. Topographical data was modified from a basemap using ArcMap version 10.7.1.

Climate

The climate of Baldwin County is temperate; summers are hot and humid (June-August average high 32.9 °C [91.3 °F]), with relatively mild, rainy winters (December-February average high 14.83 °C [58.7 °F]). Average humidity varies dramatically based on season, with the lowest percentages in the cooler months (November-March [1-5% humidity]) and the highest in the warm season (April-October [10-90% humidity]). July tends to be the most humid month, with percentages often exceeding 90%. Annual rainfall averages 120.9 cm (47.6 inches) and is spread

throughout the year, with the heaviest rainfall in February (11.2 cm [4.4 in]) (Weather Spark 2016; U.S. Climate Data 2020).

History of the Study Site

The land comprising present-day Andalusia and what is now Baldwin County was originally inhabited by indigenous peoples, most recently the Muscogee (Creek) people. In 1802, with the intent of creating an official boundary between Native American and colonial lands, the United States government imposed the Treaty of Fort Wilkinson, in which the Muscogee people ceded control of a tract of land west of the Ocmulgee and Apalachee rivers; a portion of this land was used to create Baldwin County in 1803 (Baldwin County 2018; Coleman 1991). The city of Milledgeville was established along the Oconee River (the easternmost major tributary of the Altamaha River) to serve as a trade checkpoint between northern and southern areas of the state. Together these rivers flow southeast for 357 mi (570 km), from Hall County (northeast Georgia) to the Atlantic Ocean. Milledgeville served as capital of Georgia from 1804 to 1868 (Coleman 1991).

In 1805 the land encompassing present-day Andalusia was distributed among four Georgia landowners via the land lottery system: Josiah Darden, Shepherd Mize, Charity Ward, and Isaac Sibley; it is unknown whether they ever occupied the site. In 1814 Joseph Stovall acquired the property, establishing the plantation Stovall Place and initially converting much of what was likely forested land to cotton farming; this was later expanded to include other crops such as Indian corn, wheat, oats, and sweet potatoes. For nearly a century, the land would remain in agricultural use by Stovall and subsequent landowners, with only the westernmost corner of the property remaining relatively undisturbed. Upon the death of Joseph Stovall's widow in 1855, the property changed ownership and was renamed Hawkins Plantation (Amason 2003;

Andalusia Foundation 2014). Farming continued on the property and several new buildings were constructed, including several that survive to this day, e.g. the Main House and Hill House (UGA College of Environment and Design 2015). In 1870 the construction of Hwy 441 bisected the property, reducing the landholding to the portion lying to the west of the highway, and establishing the present-day property boundaries of Andalusia. The property again changed hands in 1970 and 1905, becoming the Johnson and Allen-McCraw Estates, respectively.

Dr. Bernard Cline purchased the property in 1931 and began the process of converting fields previously used for crop production to cattle farming, while also adding several new buildings: the dairy barn, horse barn, calf barn, equipment shed, water tower, well house, and pump house—all of which are still standing (UGA College of Environment and Design 2015). During this period Flannery O'Connor, a close relative of Dr. Cline, began visiting Andalusia. Upon his death in 1947, Dr. Cline bequeathed Andalusia Farm to his two siblings, Louis Cline and Regina Cline O'Connor (Flannery O'Connor's mother). Flannery O'Connor took up residence in 1951 and would remain there until her death in 1964; the bulk of her fictional works were written during her years at Andalusia Farm (Andalusia Farm: Home of Flannery O'Connor 2018).

In 2003 Andalusia was donated to the Flannery O'Connor-Andalusia Foundation for use as a museum. By this time much of the farmland had returned to a forested state (Figure 5), with the exception of the main cattle fields in the northern part of the property, which have since transitioned into ruderal fields (Figure 6A). Between 2009 and 2013 Andalusia's land cover experienced significant degradation, mainly due to timber harvest. Clearing began in 2009 with a stand of pines in the southern part of the property in a previously undisturbed area, and continued into 2010, reaching the southern corner of the property by the end of the year (Figures 6B, C).

Between 2010 and 2013 clear-cutting extended into the forested area lying northwest of the previous clearing, ultimately rendering nearly the entire southwestern half of Andalusia treeless. There are also indications of selective harvest in the northern part of the property (Figure 6D). In 2017 Andalusia was gifted to Georgia College & State University, and it continues to operate as a historic preservation site (Georgia College 2020). Aerial photographs taken in 2017 indicate the beginnings of regrowth in previously cleared areas (Figure 6E).

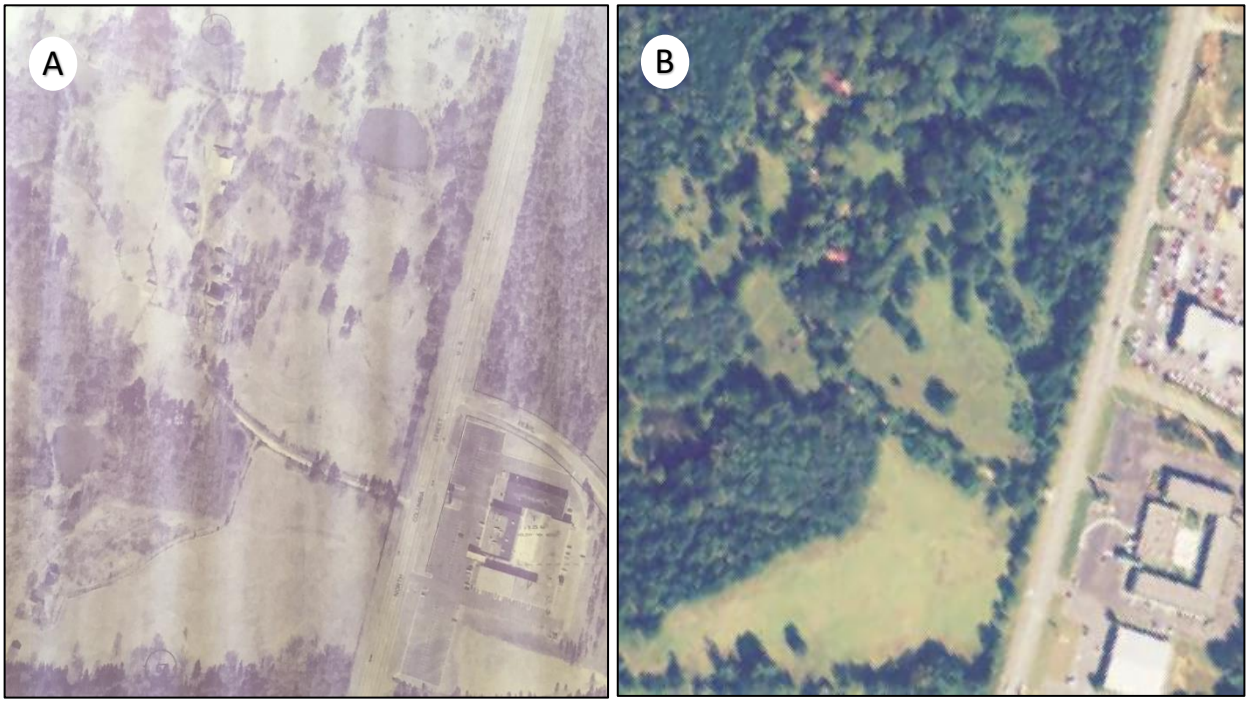

Fig. 5. Comparison of southeast quadrant of Andalusia from 1985 to 2005. A. 1985; modified from aerial image provided by Flannery O'Connor-Andalusia Foundation. B. 2005; modified from image downloaded from Georgia College & State University GIS database.

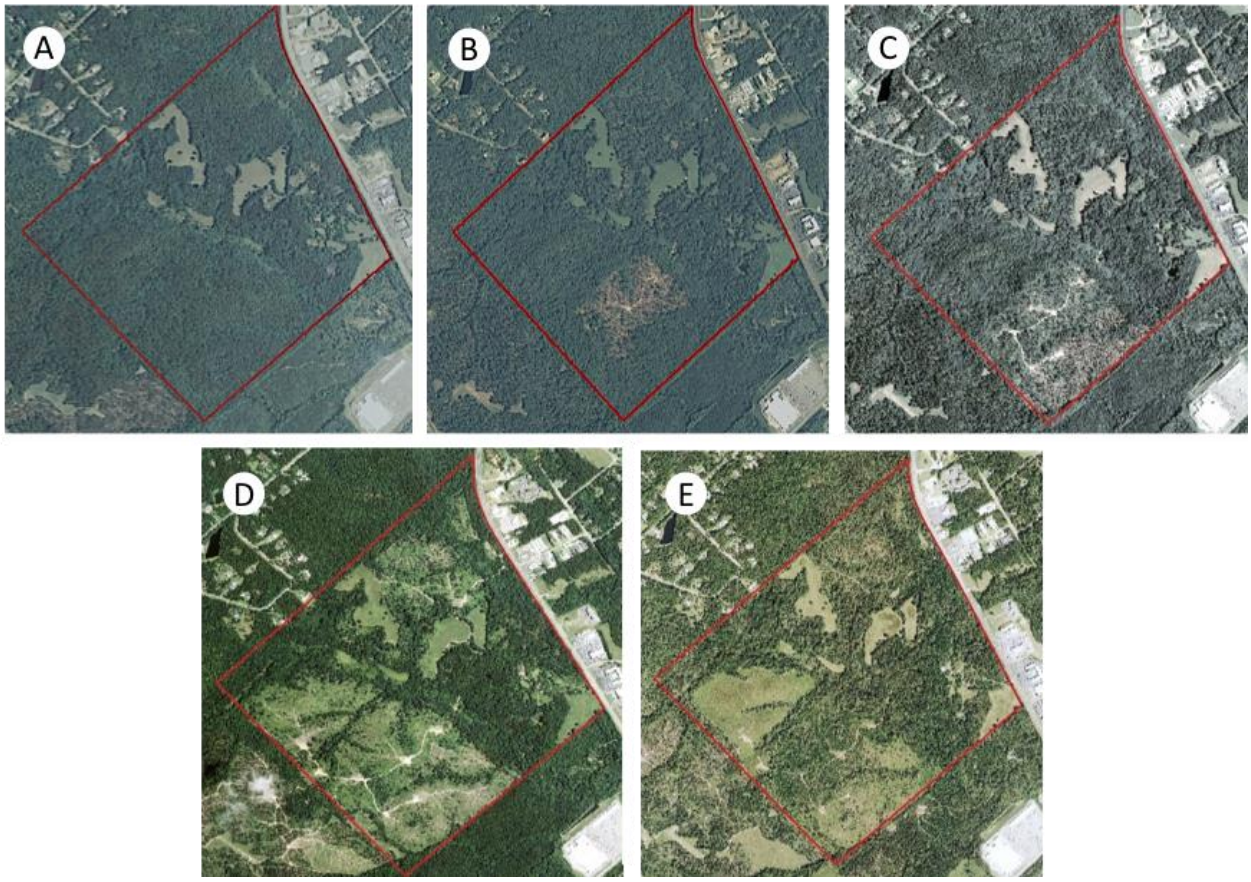

Fig. 6. Aerial images depicting vegetation changes from 2006-2017. A) 2006. B) 2009; note significant clearing of forested area near the center of the southern area. C) 2010; note additional clearing extending to the southern corner. D) 2013; significant clearing of the forested area in the northern and western quadrants. E) 2017; note beginnings of reforestation in southwest-central area and northern quadrant. Images modified from the GCSU Department of Geography GIS database.

Many of the agricultural fields located in the northern half of Andalusia that were previously used for crop production and cattle grazing were converted to coastal Bermuda hay production in 2003, including the large field in the eastern property corner, the three smaller fields toward the front of the Main House and extending downhill to the pond, the two large fields ca. 0.3 km northwest of the farm buildings, and the elongated field touching the northwestern property boundary (Andalusia Foundation Inc. 2014). The mix of grasses, forbs, and young trees such as pines and sweetgums currently growing in these areas suggests that only

the large field in the eastern property corner continues to be used for hay production. Over the past several years, portions of the property were leased to a private hunting club, who established a network of ATV trails. Although no longer used, cleared ATV trails remain along the Tobler Loop and field edges, extending into the far west, northwest, and northeast areas of the property.

Floristics

The flora of Baldwin County and surrounding counties in middle Georgia is relatively poorly collected, as evidenced by the number of digitized specimens from this county currently available on the SouthEast Regional Network of Expertise and Collections data portal, a consortium of 233 herbaria in 14 states in the southeastern United States (SERNEC 2020). A comparison of herbarium specimen data shows Baldwin County (578 specimens) to have fewer specimens than all but seven of 21 similar-sized counties in Georgia (i.e. within 25 sq. miles of the area of Baldwin County). Counties near active herbaria are unsurprisingly represented by a greater number of specimens, regardless of county area. For example, DeKalb County, home of the Emory University Herbarium (GEO), is similar in size to Baldwin County, yet represented by significantly more specimens (8323) than Baldwin County and its six surrounding counties combined (totaling to 2956 sq. miles, ca. 10 times the size of DeKalb County). Similarly, Clarke County, home of the University of Georgia Herbarium (GA), is represented by 8739 specimens, despite a land area less than half that of Baldwin County. In 2017 the Georgia College and State University Herbarium (GCSU) was established, with a goal of increasing herbarium collections from Baldwin and surrounding counties.

The SERNEC data portal (2020) also offers a view into the history of plant collecting in Baldwin county and Milledgeville. The earliest specimen from Baldwin county represented in the database is the sedge *Rhynchospora wrightiana* Boeckeler (deposited at the New York

Botanical Garden Herbarium [NY]), collected in Milledgeville in 1836 by Samuel Boykin, a Milledgeville physician and naturalist. Four additional specimens were collected in 1840 and 1884, all from Milledgeville; 27 years would pass before additional specimens are seen in 1911. Collecting increased in the 1930s, with 131 specimens, and remained steady for the rest of the century, with an average of 38 specimens per decade. The 21st century is represented by only nine specimens, the most recent from 2011. Unsurprisingly, 151 of the 158 specimens from Baldwin county were collected in Milledgeville, the population center for the county. Major collectors include Wilbur Duncan (64 specimens, most collected from 1939-42 and one in 1979; the majority deposited at GA), Don Eyles (56, 1937-1948; GEO), and John Bright (35, 1911-1930; most at Carnegie Museum of Natural History Herbarium [CM]). A single specimen collected at Andalusia is represented, *Vicia villosa* subsp. *varia* (Host) Corb., collected in May 1972 by J. Cline (CM). Of note are five specimens collected in 1970 by Harriet Whipple, Professor Emerita of Biology at Georgia College & State University, where she taught botany and other courses for nearly a half century (specimens housed at the University of North Carolina at Chapel Hill Herbarium [NCU]).

Prior to this study, the only herbarium specimens known from the site comprise the collection by J. Cline noted above and 65 vouchers collected in 2016 by Georgia College alumnus Andrew Wright, as part of an undergraduate research project; the Wright specimens are currently housed at GCSU and were included in this survey. The goal of this project was to conduct a floristic inventory of all vascular plant species occurring within Andalusia, in order to provide a comprehensive list of native and non-native species, and descriptions of the plant communities occurring at the site. This inventory is intended to serve as a foundational work, providing a baseline accounting of the vascular plants of Andalusia for use by Georgia College

students, faculty, and researchers from other institutions, while also providing information for educating visitors of this historic site.

Methods

Approximately 47-50 field trips were conducted during all seasons between August 2018 and January 2020, covering all areas of the study site; cultivated plants near the main house and surrounding farm buildings were excluded from the survey. At least one voucher specimen in reproductive condition was collected for each species encountered, using standard herbarium techniques (Alexiades 1996). Specimens were pressed between newspaper in an herbarium press such that identifying features were readily visible, and allowed to dry completely. Distinguishing characteristics that would not be apparent in the dried specimen (e.g. fragrance, flower color) were noted, along with relative abundance and habitat. A handheld GPS unit (Garmin, Olathe, KS) was used to record specimen locations. Vouchers were collected mostly in duplicate, and a complete set was deposited at GCSU. Weakley's Flora of the Southern and Mid-Atlantic States (2015) was the primary source for plant identification. Plant communities were identified following The Natural Communities of Georgia (Edwards et al. 2013), with the exception of the disturbed areas plant community, which we define in this manuscript.

In addition to collecting herbarium vouchers, a pilot program was developed to test the efficacy of drone imaging as an aid in floristic studies such as this one; potential uses include identification of landmarks of interest that could then be explored on foot, and demarcation of plant communities. In the summer of 2019, several field trips were conducted the intent of creating an aerial map with high-quality imagery covering the entire property. A remote-controlled drone (DJI Mavic 2 Pro) collected flyover photographs, and GIS software (ArcMap 10.7.1) was used for final map creation. Unfortunately, a significant portion of the data was lost

due to a ransomware attack at Georgia College in September 2019, rendering a majority of the data irrecoverable.

Results

One hundred and ninety-one vascular plant species representing 139 genera and 68 families were documented at the site. An additional specimen was only identified to genus so is not included in the total count. Ten species were collected solely by Wright. The best represented families were Poaceae (22), Asteraceae (20), Rosaceae (16), and Fabaceae (10). The largest genera were *Trifolium* (5), *Carex* (4), *Quercus* (4), *Andropogon* (3), *Ilex* (3), *Juncus* (3), *Pinus* (3), *Plantago* (3), *Prunus* (3), *Rosa* (3), and *Rubus* (3). One hundred and twenty-three species are native to Georgia. Of the 68 exotic species, 12 are listed as non-native invasive plants by the Georgia Exotic Pest Plant Council (GA-EPPC 2018; Table 1).

Discussion

Plant Communities

Prior to 1814 and the establishment of the Stovall Place plantation, much of the survey area likely consisted of two plant communities: oak-pine-hickory forest, a common natural community of the lower Georgia Piedmont (Edwards et al. 2013) that covered most of site, and small stream bottomlands, following Tobler Creek and the small creeks in the north and southeast corners of the property. Over the past two centuries much of the property has experienced repeated disturbance due to agricultural use, timber harvest and hunting. Only the section between the southeastern and southwestern portions of the property seems to have remained relatively undisturbed throughout this time period. While large sections of the property have since experienced natural reforestation, in the past 13 years some of these areas have been recut (these areas are here designated as disturbed areas), and others persist as ruderal fields (Figure 7). The two latter plant communities foster greater numbers of early successional and exotic species, in greater abundance, than do the natural communities represented at the site.

Fig. 7. Plant communities. Designations are based on the presence of species characteristic of each plant community type, as outlined in The Natural Communities of Georgia (Edwards et al. 2013).

Oak-Pine-Hickory Forest (Figure 8). Overstory species characterizing the oak-pine-hickory plant community within the study site include *Quercus falcata, Quercus stellata, Pinus taeda, Pinus echinata, Carya carolinae-septentrionalis,* and *Ulmus alata*. Distribution of these species within this plant community varies within the site, with some areas dominated by hardwood species, and others made up almost entirely of pine. Characteristic understory trees such as *Cornus florida* are occasionally observed in the forest, and shrubs such as *Crataegus spathulata* are common along forest edges. In lower elevation, more shaded areas, *Muscadinia rotundifolia* is an occasional vine, whereas *Parthenocissus quinquefolia, Smilax* spp., and *Toxicodendron radicans* var. *radicans* more frequently observed at higher elevations in the northeastern and southeastern portions of the property. Characteristic ground layer species include the ferns *Asplenium platyneuron* and *Woodsia obtusa*, the native grass *Chasmanthium latifolium,* and spring ephemerals such as *Viola sororia*.

Fig. 8. Distribution of Oak-Pine-Hickory forest plant community

Small Stream Bottomland (Figure 9). Tree species characterizing this plant community at Andalusia include *Acer negundo* var. *negundo*, *Acer rubrum*, *Celtis laevigata*, *Liquidambar styraciflua*, *Platanus occidentalis*, and *Quercus nigra*, which are occasionally to commonly found along the banks of Tobler Creek. Species observed less frequently include *Carpinus caroliniana*, which was seen and collected only once, ca. 30 m from the first bridge on Tobler Loop. Characteristic shrubs and vines in this plant community include *Alnus serrulata*, *Smilax* spp., and *Muscadinia rotundiflora*. Along the creek beds *Chasmanthium latifolium* is common, and populations of *Polystichum acrostichoides* and *Zephyranthes atamasco* are found infrequently. At the point where Tobler Creek meets the south property line, a small population of *Arundinaria gigantea* was noted.

Fig. 9. Distribution of small stream bottomland plant communities.

Disturbed Areas (Figure 10). Currently, the western half of the property is dominated by disturbed areas, due to recent clear cutting of oak-pine-hickory forests. The disturbed areas in the study site harbor a mix of native and exotic species. Native species include *Eupatorium serotinum*, *Geranium carolinianum*, *Krigia virginica*, *Krigia cespitosa*, *Plantago virginica*, and *Valerianella radiata*. Exotic species are represented by *Cardamine hirsuta*, *Cerastium glomeratum*, *Galium sherardia*, *Geranium molle*, *Helenium amarum*, *Stellaria media*, *Taraxacum erythrospermum*, *Veronica arvensis*, and *Youngia japonica*. Some of these areas are beginning to return to a forested state, with native *Liquidambar styraciflua* and *Pinus echinata* saplings rising above ground-level species. Other sections, such as the area along the south property line closest to Tobler Creek, are nearly overrun by early successional *Rosa* (exotic) and *Rubus* (native) species.

Ruderal Fields (Figure 10). This plant community is defined as being disturbed due to previous agriculture, thus is here treated separately from the previous category. The majority of the fields on the property are currently undergoing successional growth, with saplings such as *Liquidambar styraciflua* and *Pinus echinata* emerging from a groundcover comprising a mix of native and exotic grasses and forbs. Native species include graminoids such as *Andropogon*, *Danthonia*, and *Juncus* species, and forbs such as *Erechtites hieraciifollius*, *Pseudognaphalium obtusifolium*, and *Cirsium horridulum*. Exotic species include the grasses *Aira elegans* and *Briza minor*, and a variety of forbs, such as *Allium ampeloprasum*, *Carduus nutans*, *Gamochaeta chionesthes*, *Plantago lanceolata*, and *Wahlenbergia marginata*.

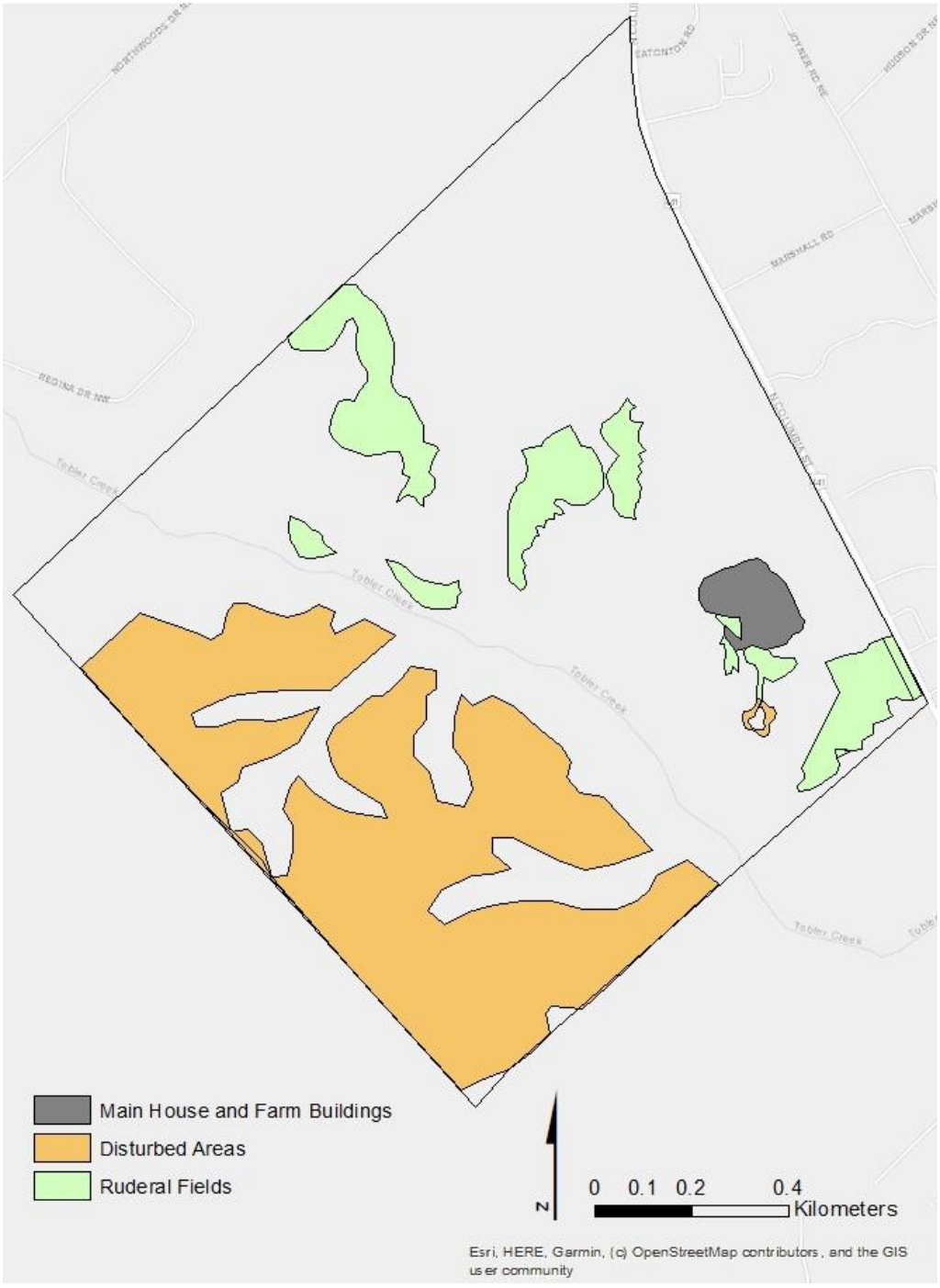

Fig. 10. Distribution of disturbed areas and ruderal fields. A. Lt. orange; ruderal woodlands; most of the disturbance can be traced back to pine tree harvesting in 2009-2013. B. Lt. green; ruderal fields.

Species of Special Interest

Three species were collected at the boundaries of their geographical distributions in Georgia (Figure 11). *Asclepias obovata* and *Opuntia mesacantha* var. *lata* are both restricted to the Coastal Plains region of Georgia, and are absent north of the fall line, which runs through Milledgeville. In contrast, the fall line roughly represents the southern limit of distribution in Georgia for *Carya carolinae-septentrionalis*, a characteristic tree of the Georgia Piedmont.

A large *Celtis laevigata* specimen housed in the woods ca. 30 m east of the elongated tip of the ruderal field in the eastern property corner was awarded the designation of champion tree by the Georgia Forestry Commission (GFC) in 2010, a recognition given to the largest known tree of a particular species in Georgia. Candidate trees are judged by a number of criteria set by the GFC, and specimens are re-assessed every ten years to maintain their title (GFC 2013 American Forests 2020).

Unsurprisingly, the areas within the study site showing the least disturbance yielded species not documented elsewhere on the property. For example, in the forest between the elongated field touching the northwestern boundary and the two large fields in the center/northeastern quadrant, *Frangula caroliniana* and *Lonicera sempervirens* were documented, and a population of *Passiflora incarnata* was growing in the northwestern property corner. Given the extensive disturbance to land cover on the property in recent years, the few undisturbed areas remaining warrant protection from future land clearing, as well as monitoring to prevent further encroachment of exotic species in these areas.

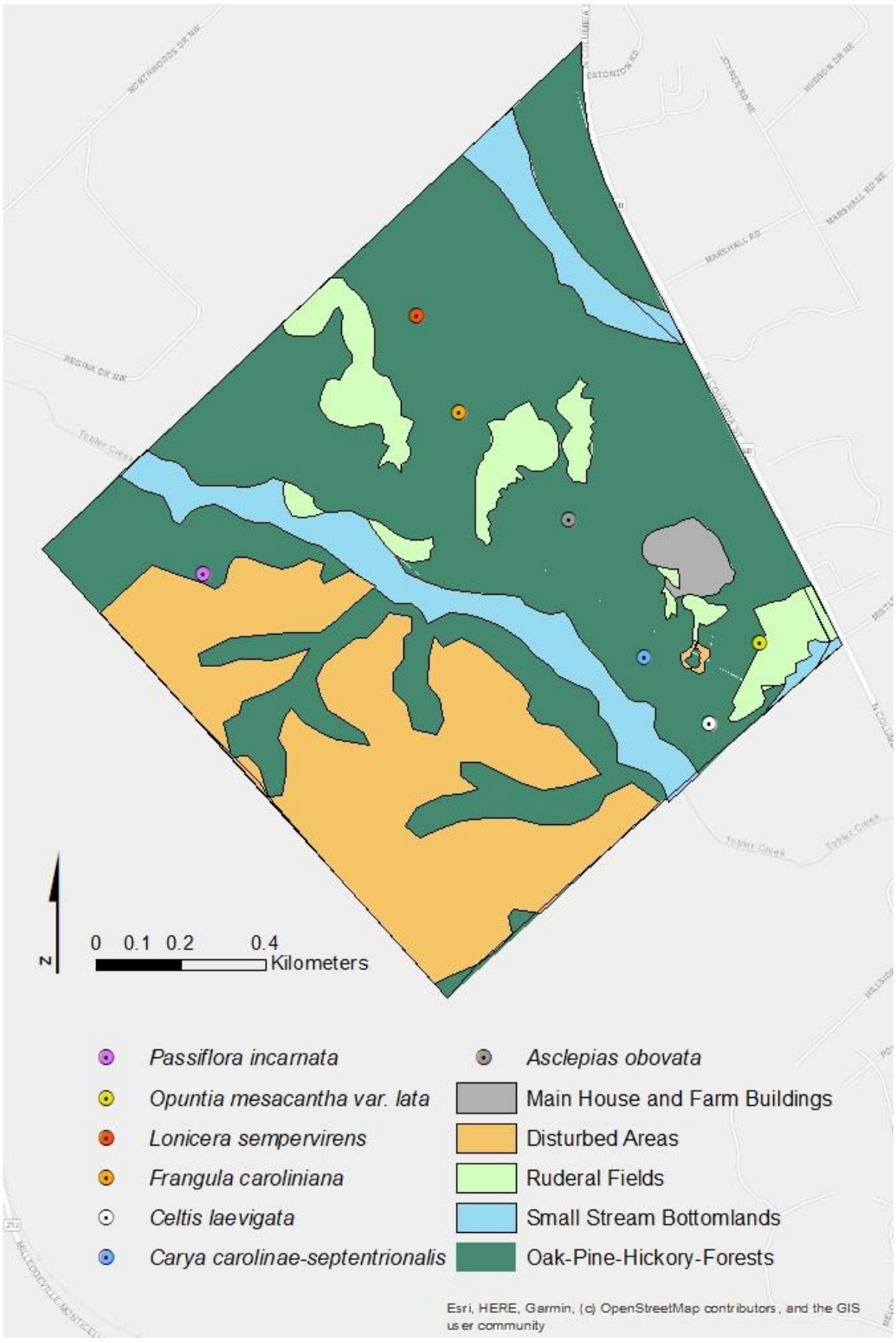

Fig. 11. Vegetation map depicting species of special interest.

Invasive Exotic Species

The most notable invasive exotic species on the property were *Ligustrum sinense*, *Melia azedarach*, *Elaeagnus umbellata*, and *Elaeagnus pungens* (see Table 1 for GA-EPPC rankings). *Ligustrum sinense* was almost ubiquitous throughout the property, with the densest populations concentrated in disturbed areas, such as those surrounding the pond and lining the entrances to the Tobler Loop trail. *Melia azedarach* was frequently observed growing along field edges, primarily those of the four larger fields on the property. Individuals of *Melia azedarach* were also frequent along the property boundary running alongside Highway 441. This was especially noticeable in winter months due to *Melia azedarach*'s persistent yellow fruits. *Elaeagnus pungens* and *Elaeagnus umbellata* were less frequently observed, with most specimens restricted to the edges of the ruderal field in the eastern corner of the property. However, specimens of both species were also infrequently noted in wooded areas in the southern section of Andalusia.

Unfortunately, areas within Andalusia currently dominated by invasive exotic species, such those mentioned above, would be nearly impossible to restore to a pristine native state. However, efforts to control invasive exotics would benefit the property as a whole, and development of a site-specific plan for the removal/prevention of exotic species at Andalusia is highly recommended. The USDA Management Guide for Invasive Plants in Southern Forests (Miller et al. 2015) provides detailed management procedures for prominent invasive species in the southern United States.

Table 1. List of 12 invasive exotic species, with rankings denoted by GA-EPPC (2018): Category 1 (serious threat), Category 2 (moderate threat), Category 3 (minor threat or potential threat not yet known), and Category 4 (naturalized in Georgia, additional data needed). Habitats: $_{OPH}$ – oak-pine-hickory forest; $_{SB}$ – small stream bottomland; $_{DA}$ – disturbed areas; $_{RF}$ – ruderal fields; $_{Hab?}$ – habitat data not recorded for voucher. Relative abundance: c – common; o – occasional; i – infrequent; r – rare; ab? – abundance data not recorded

Species (Common name)	Rank	Habitat; Abundance
Elaeagnus pungens (Autumn silverberry)	2	OPH, SB, DA; o
Elaeagnus umbellata (Spring silverberry)	1	OPH, DA; o
Ilex cornuta (Chinese holly)	4	OPH; o
Leucanthemum vulgare (Oxeye daisy)	2	DA; i
Ligustrum sinense (Chinese privet)	1	OPH, SB, DA; c
Lonicera japonica (Japanese honeysuckle)	1	OPH; i
Berberis bealei (Leatherleaf mahonia)	3	OPH, SB; i
Melia azedarach (Chinaberry)	1	DA; o
Murdannia keisak (Marsh dewflower)	1	DA; r
Nandina domestica (Sacred bamboo)	2	DA; o
Verbascum thapsus (Woolly mullein)	4	DA; r
Vinca major (Greater periwinkle)	2	DA; i

Other Land Management Concerns

The study site has a high erosion potential, which poses an additional threat to the land cover, and may also hinder future restoration attempts. According to data from the NRCS Web Soil Survey (Web Soil Survey 2019), almost 60% of the site was rated as severe (Figure 12, Table 2, Figure 13). This implies that in many areas of the property, disturbance will potentially be followed by a loss of soil layers that are essential for supporting natural land cover. There is currently evidence of erosion in areas within Andalusia that have experienced extensive off-road and off-trail activities. In order to reduce erosion at the site, off-road and off-trail traffic should be restricted to necessary activities, and precautions should be taken to limit the encroachment of

these activities into currently unaffected areas. Information regarding the impact of erosion on native ecosystems should be provided to the public, and visitors encouraged to stay on pre-constructed trails such as the Tobler Loop, to avoid further damage to the property. The network of old trails running throughout the property and sites of developing gully erosion warrant repair, by means of revegetation using native species, installation of control structures, and redirection of runoff flow (Elliot and Tysdal 1999; Robichaud et al. 2013; Owen et al. 2019). Exotic species management should precede erosion control since the elimination of invasive exotic species will likely increase site disturbance through the temporary use of heavy machinery and increased foot traffic. Visitors from around the world travel to Andalusia Farm to tour the home where Flannery O'Connor created the bulk of her literary works. The woods and fields of the property offer additional opportunities for education and research, and should be protected and restored to a more natural condition.

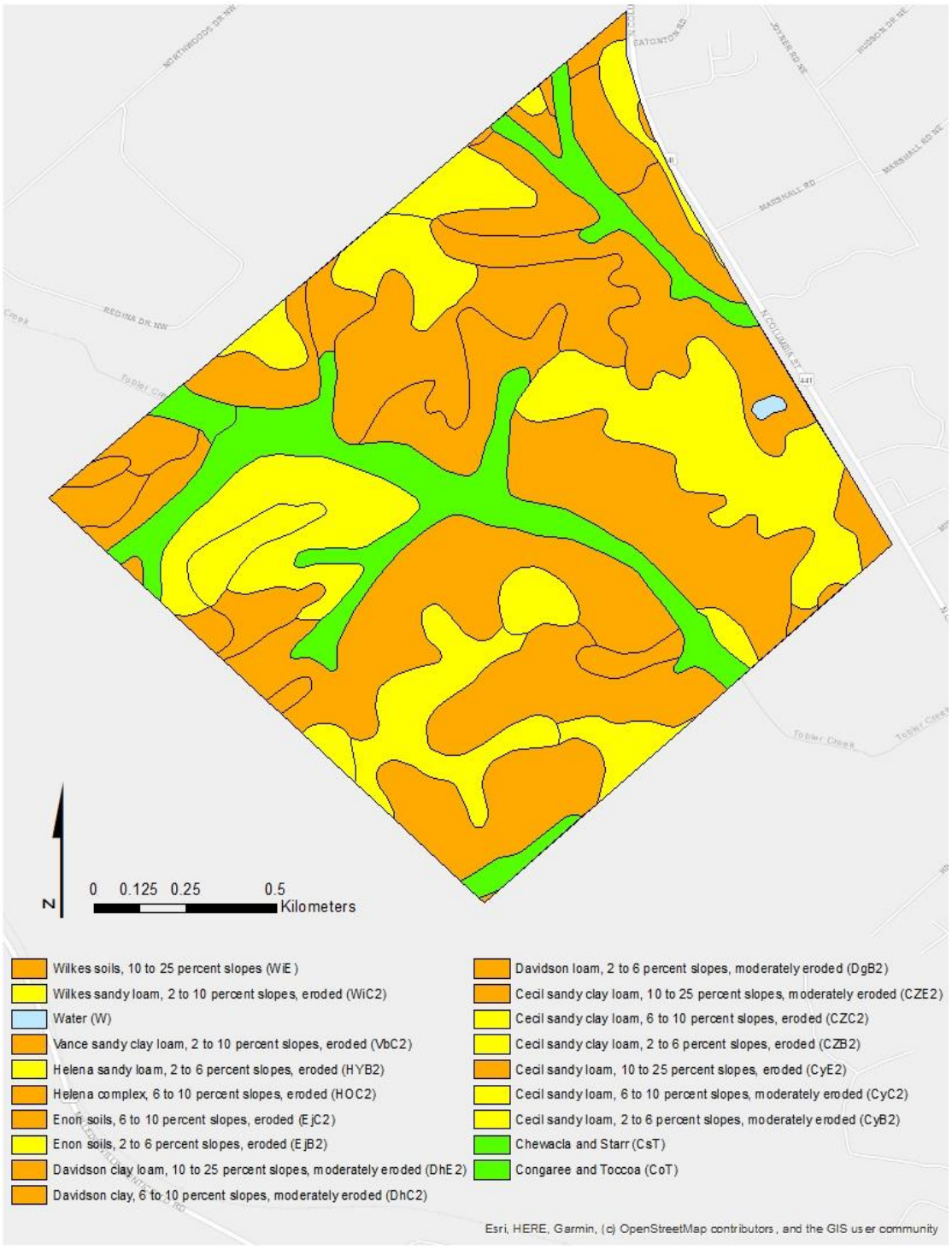

Fig. 12. Erosion hazard potential from off-road, off-trail disturbance. Areas highlighted in green represent slight hazard potential. Areas in yellow represent moderate hazard potential. Areas in orange represent severe hazard potential.

Table 2. Erosion hazard potential from off-road, off-trail disturbances. Ratings, their respective descriptions, acres in Area of Interest (AOI), and Percent of AOI are modified from NRCS Web Soil Survey (Web Soil Survey 2019).

Rating	Description of Rating	Acres in AOI	Percent of AOI
Very Severe	Significant erosion is expected; erosion control methods are generally costly and impractical	0	0
Severe	Erosion is very likely; erosion control methods are advised	311.5	57.6
Moderate	Some erosion is likely; erosion control methods may be needed	157.8	29.2
Slight	Erosion is unlikely under normal climatic conditions	70.9	13.1
Null/Not Rated	Area was not given a rating	.8	.1
Total		540.9	100

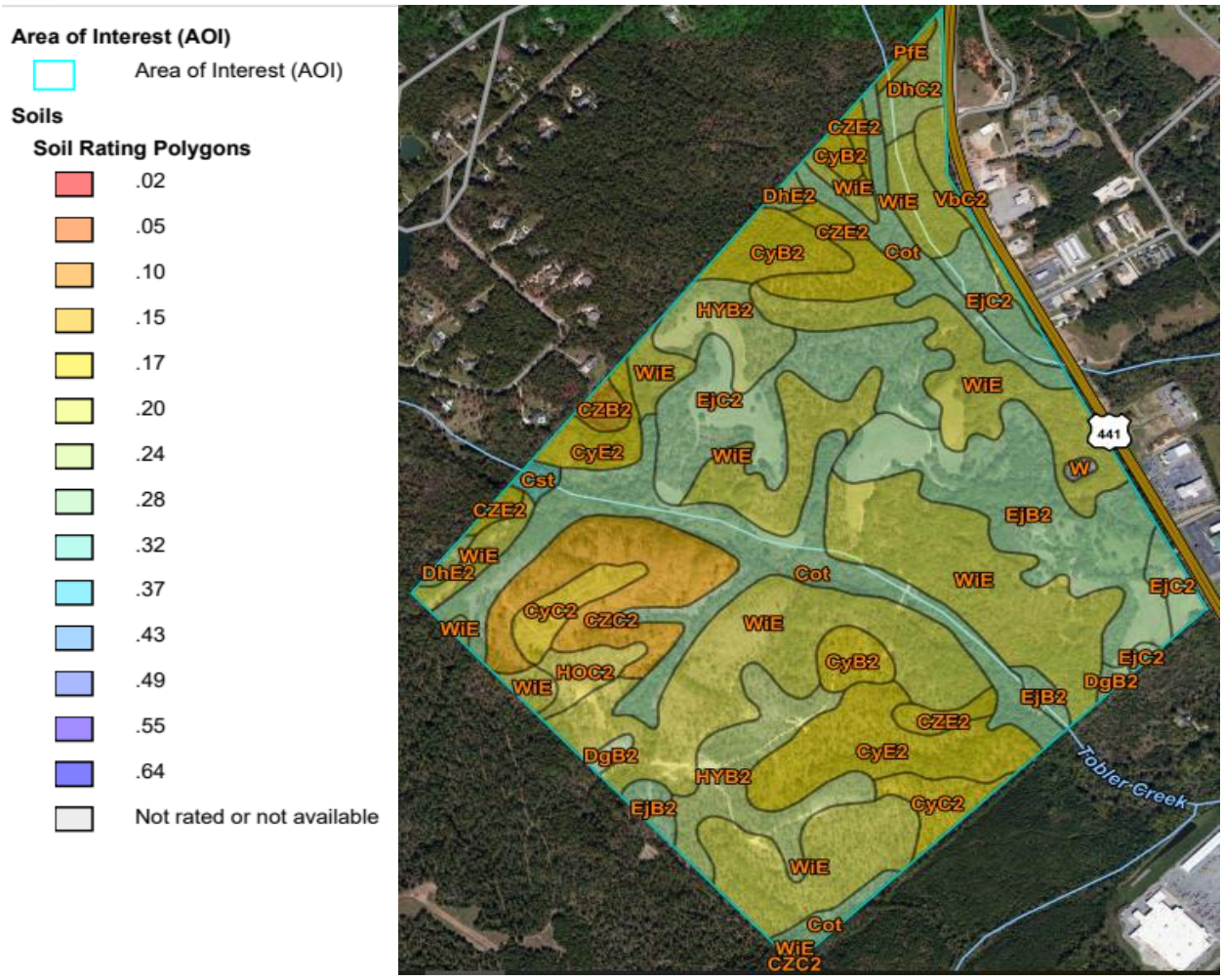

Fig. 13. Description Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

References

Alexiades, M.N. 1996. Standard techniques for collecting and preparing herbarium specimens. In Alexiades, M.N. (ed.). Selected Guidelines for Ethnobotanical Research: A Field Manual. New York Botanical Garden, Bronx, New York, pp. 99-126.

Amason, C.R. 2003. From agrarian homestead to literary landscape: A brief history of Flannery O'Connor's Andalusia. Flannery O'Connor Review 2, 4-14.

American Forests. 2020. National register of champion trees. https://americanforests.org/get-involved/americas-biggest-trees/

Andalusia farm: Home of Flannery O'Connor. 2018. https://andalusiafarm.org/

Andalusia Foundation Inc. 2014. Purpose of the plan.

Average weather in Milledgeville: Georgia, United States. 2016. Weather Spark. https://weatherspark.com/y/16255/Average-Weather-in-Milledgeville-Georgia-United-States-Year-Round.

Baldwin County. 2018. Georgiainfo, Digital Library of Georgia https://georgiainfo.galileo.usg.edu/topics/counties/baldwin.

Baldwin County Board of Assessors. 2020. https://qpublic.shneidercorp.com/Application.aspx?AppID=636&LayerID=11985&PageTypeID=1&KeyValue=067%20%20%20%20007A

Climate Milledgeville, Georgia. 2020. U.S. Climate Data. https://www.usclimatedata.com/climate/milledgeville/georgia/united-states/usga0376

Coleman, K. 1991. A History of Georgia. University of Georgia Press, Athens, Georgia.

Edwards, L., J. Ambrose, and L.K. Kirkman. 2013. The Natural Communities of Georgia. University of Georgia Press, Athens, Georgia.

Elliot, W.J., and L.M. Tysdal. 1999. Understanding and reducing erosion from insloping roads. Journal of Forestry 97(8), 30-34.

Geologic maps of US States. 2020.United States Geological Survey, U.S. Department of the Interior. https://mrdata.usgs.gov/geology/state

Georgia College. 2020. Andalusia. https://gcsu.edu/andalusia

Georgia Exotic Pest Plant Council (GA–EPPC). 2018. List of non-native invasive plants in Georgia. Center for Invasive Species and Ecosystem Health, University of Georgia, Athens, Georgia. https://www.gaeppc.org/list/

Georgia Forestry Commission (GFC). 2013. Georgia's champion tree program. https://gatrees.mobi/forest-management/champion-tree-program/

Georgia Info: An online Georgia Almanac. 2018. Baldwin County. https://georgiainfo.galileo.usg.edu/topics/counties/baldwin

Miller, J.H., S.T. Manning, and S.F. Enloe. 2015. A Management Guide for Invasive Plants in Southern Forests. Southern Research Station, Asheville, North Carolina.

Missouri Botanical Garden. 2020. Tropicos®. Missouri Botanical Garden, St. Louis, Missouri. http://www.tropicos.org/Home.aspx

National Register of Historic Places. 2020. National Park Service, U.S. Department of the Interior. https://www.nps.gov/subjects/nationalregister/database-research.htm#table.

Owen, D., A.P. Davis, and A.H. Aydilek. 2019. Use of compost for permanent vegetation establishment and erosion control. Maryland Dept. of Transportation.

Robichaud, P.R., S.A. Lewis, J.W. Wagenbrenner, L.E. Ashmun, and R.E. Brown. 2013. Post-fire mulching for runoff and erosion mitigation: Part I: Effectiveness at reducing hillslope erosion rates. Catena 105, 75-92.

SouthEast Regional Network of Expertise and Collections. 2018. Specimens and observations. https://sernecportal.org/portal/collections/index.php

UGA College of Environment and Design. 2015. Andalusia farm: Home of Flannery O'Connor. Cultural Landscape Documentation. Athens, GA.

Weakley, A.S. 2015. Flora of the southern and mid-Atlantic states, working draft of 21 May 2015. University of North Carolina Herbarium, Chapel Hill, North Carolina.

Web Soil Survey. 2019. Natural Resources Conservation Service, United States Department of Agriculture. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Appendices

Annotated List of Vascular Plants

The species list is arranged alphabetically by family, genus and species, and monilophytes are followed by gymnosperms and angiosperms. Family circumscriptions, scientific nomenclature, common names and nativity designations follow Weakley (2015). Authority abbreviations follow *Tropicos*® (Missouri Botanical Garden 2019).

Specimen notations: *P* – Pharr; *W* – Wright; exotic plants are indicated with an *; invasive exotics (GA-EPPC 2018): [Cat 1] – Category 1, [Cat 2] – Category 2, [Cat 3] – Category 3, [Cat 4] – Category 4. Locality/habitat data: $_{OPH}$ – oak-pine-hickory forest, $_{SB}$ – small stream bottomland, $_{DA}$ – disturbed areas, $_{RF}$ – ruderal fields, $_{Hab?}$ – habitat data not recorded for voucher. Relative abundance: c – common; o – occasional; i – infrequent; r – rare; ab? – abundance data not recorded.

Monilophytes ('Ferns')

Aspleniaceae

Asplenium platyneuron (L.) Britton et al., Ebony spleenwort—$_{OPH}$, o; *P 9, 47, 169*

Dryopteridaceae

Polystichum acrostichoides (Michx.) Schott, Christmas fern—$_{SB}$, i; *P 22*

Polypodiaceae

Pleopeltis michauxiana (Weath.) Hickey & Sprunt, Resurrection fern—$_{OPH}$/$_{DA}$, o; *P 156*; *W 7B*

Woodsiaceae

Woodsia obtusa (Spreng.) Torr. subsp. *obtusa*, Common woodsia—OPH, o; *P 14*

Gymnosperms

Cupressaceae

Juniperus virginiana L., Eastern red cedar—OPH, i; *P 38, 52*

Pinaceae

Pinus echinata Mill., Shortleaf pine—OPH/RF, c; *P 84, 109, 168*; *W 3A*

Pinus taeda L., Loblolly pine—OPH, c; *P 35, 42, 85, 189*; *W 28*

Pinus palustris Mill., Longleaf pine—OPH, r; *P 252*

Angiosperms

Acanthaceae

Ruellia caroliniensis (J.F. Gmel.) Steud., Carolina wild petunia—OPH, i; *P 217*

Altingiaceae

Liquidambar styraciflua L., Sweet gum—OPH/RF, c; *P 92*

Amaryllidaceae

**Allium ampeloprasum* L., Wild leek—RF, i; *P 219*

Allium canadense L. var. *canadense*, Wild onion—RF, c; *P 179*; *W 43*

**Narcissus* x *intermedius* Loisel., Star daffodil—DA, i; *P 58*

**Narcissus pseudonarcissus* L., Daffodil—DA, i; *P 61*

Nothoscordum bivalve (L.) Britton, Grace garlic—RF, c; *P 33, 90*; *W 21*

Zephyranthes atamasco (L.) Herb., Common Atamasco-lilly—OPH, i; *P 118*; *W 23*

Anacardiaceae

Toxicodendron radicans (L.) Kuntze var.*radicans*, Eastern poison ivy—DA, c; *P 199*

Apiaceae

Chaerophyllum tainturieri Hook., Southern chervil—DA, c; *P 126*; *W 56*

Apocynaceae

Asclepias obovata Elliott, Pineland milkweed—DA, r; *P 245*

Asclepias tuberosa L. var. *tuberosa*, Common butterfly-weed—DA, r; *P 226*

Gonolobus suberosus (L.) R. Br. var. *suberosus*, Eastern anglepod—OPH, r; *P 229*

**Vinca major* L., Greater periwinkle—[Cat 2], DA, i; *P 62*; *W 7A*

Aquifoliaceae

**Ilex cornuta* Lindl. & Paxton, Chinese holly—[Cat 4], OPH, o; *P 105*; *W 13A*

Ilex opaca Aiton, American holly—DA, o; *P 46*; *W 4A*

Ilex vomitoria Aiton, Yaupon holly—DA, i; *P 258*

Araliaceae

**Hedera helix* L., English ivy—OPH, r; *P 86*

Asparagaceae

**Muscari neglectum* Guss. ex Ten., Grape hyacinth—RF, r; *P 111*

Yucca flaccida Haw., Weakleaf yucca—DA, i; *P 208*

Asteraceae

Baccharis halimifolia L., Silverling—DA, c; *P 57*

**Carduus nutans* L., Musk thistle—RF, i; *P 224*

Cirsium horridulum Michx. var. *horridulum*,Common yellow thistle—RF, o; *P 146, 151*

Erechtites hieraciifollus (L.) Raf. ex DC., Fireweed—RF, i; *P 246, 247*

Erigeron philadelphicus L. var. *philadelphicus*, Philadelphia daisy—DA, i; *P 183*

Erigeron strigosus Muhl. Ex Willd. var. *strigosus*, Common rough fleabane—Hab?, ab?; *W 37*

Eupatorium capillifolium (Lam.) Small, Common dog fennel—DA, o; *P 8, 49, 211*

Eupatorium serotinum Michx., Late eupatorium—DA, c; *P 17*

**Gamochaeta chionesthes* G.L. Nesom.—RF; i; *P 200*

**Gamochaeta coarctata* (Willd.) Kerguélen, Gray everlasting—Hab?, ab?; *W 44*

**Helenium amarum* (Raf.) H., Bitterweed—DA, c; *P 249*

Heterotheca subaxillaris (Lam.) Britton & Rusby, Camphorweed—DA, c; *P 251, 254, 255*

Krigia cespitosa (Raf.) K.L. Chambers, Opposite-leaf dwarf dandelion—DA, c; *P 142*; *W 16C*

Krigia virginica (L.) Willd., Virginia dwarf dandelion—DA, c; *P 113*

**Leucanthemum vulgare* Lam., Oxeye daisy—[Cat 2], DA, i; *P 120*; *W 36*

Packera anonyma (Alph. Wood) W.A. Weber & Á. Löve, Appalachian ragwort—DA, o; *P 166*; *W 49*

Pseudognaphalium obtusifolium (L.) Hilliard & B.L. Burtt, Fragrant rabbit tobacco—RF, o; *P 18*

Symphyotrichum lanceolatum (Willd.) G.L. Nesom, Panicled aster—DA, c; *P 6, 32*

Symphyotrichum patens (Aiton) G.L. Nesom var. *patens*, Late purple aster—DA, i; *P 29*

**Taraxacum erythrospermum* Andrz., Red-seeded dandelion—DA, c; *P 102, 133*; *W 6C*

**Youngia japonica* (L.) DC., Asiatic hawks-beard—DA, c; *P 117, 164*; *W 15A*

Berberidaceae

**Berberis bealei* Fortune, Leatherleaf mahonia—[Cat 3], SB/DA, i; *P 56, 74*; *W 45*

**Nandina domestica* Thunb., Sacred bamboo—[Cat 2], DA, o; *P 26*

Betulaceae

Alnus serrulata (Aiton) Willd., Smooth alder—SB, i; *P 106*

Carpinus caroliniana Walter, American hornbeam—SB, i; *P 238*; *W 8B, 25*

Boraginaceae

Myosotis verna Nutt., Early forget-me-not—DA, i; *P 124*; *W 53*

Brassicaceae

**Cardamine hirsuta* L., Hairy bittercress—DA, c; *P 67*; *W 8A, 16B*

Cardamine pensylvanica Muhl. ex Willd., Quaker bittercress—Hab?, ab?; *W 6A, 6B*

Cactaceae

Opuntia mesacantha subsp. *lata* (Small) Majure, Prickly-pear—DA, i; *P 222*

Campanulaceae

Triodanis perfoliata (L.), Clasping Venus' looking-glass—OPH/DA, i; *P 204*; *W 50*

**Wahlenbergia marginata* (Thunb.) A. DC., Wahlenbergia—RF, c; *P 28, 140*

Cannabaceae

Celtis laevigata Willd., Southern hackberry—OPH, o; *P 11, 115*

Caprifoliaceae

**Lonicera japonica* Thunb., Japanese honeysuckle—[Cat 1], DA, i; *P 19, 161*; *W 59*

Lonicera sempervirens L., Coral honeysuckle—OPH, r; *P 107*

Valerianella radiata (L.) Dufr., Beaked corn-salad—DA, c; *P 128, 201*

Caryophyllaceae

**Cerastium glomeratum* Thuill., Sticky mouse-ear—DA, c; *P 100*; *W 2B, 35*

**Stellaria media* (L.) Vill., Common chickweed—DA, c; *P 79*; *W 9*

Commelinaceae

**Commelina communis* L., Common dayflower—DA, i; *P 4*

**Commelina diffusa* Burm. f., Creeping dayflower—DA; i; *P 241*

**Murdannia keisak* (Hassk.) Hand.-Mazz., Marsh dewflower—[Cat 1], DA, r; *P 2*

Convolvulaceae

**Jacquemontia tamnifolia* (L.) Griseb., Jacquemontia—OPH, i; *P 240*

Cornaceae

Cornus florida L., Flowering dogwood—OPH, o; *P 16*; *W 29*

Cyperaceae

Carex crinita Lam. var. *crinita*, Long-fringed sedge—OPH, o; *P 212*

Carex lurida Wahlenb., Sallow sedge—OPH/SB, o; *P 197*; *W 54*

Carex oxylepis Torr. & Hook. Var. *oxylepis*, Sharp-scaled sedge—DA, i; *P 129*

Carex texensis (Torr. ex L.H. Bailey) L.H. Bailey, Texas sedge—DA, i; *P 103*

Cyperus croceus Vahl, Baldwin's flatsedge—DA, c; *P 233, 234, 235*

Ebenaceae

Diospyros virginiana L., American persimmon—DA, i; *P 213, 230*

Elaeagnaceae

**Elaeagnus pungens* Thunb., Autumn silverberry—[Cat 2], OPH/SB/DA, o; *P 43, 45*

**Elaeagnus umbellata* Thunb., Spring silverberry—[Cat 1], OPH/DA, o; *P 121, 149*

Ericaceae

Vaccinium elliottii Chapm., Mayberry—OPH/SB, i; *P 75, 78*; *W 27*

Euphorbiaceae

Euphorbia pubentissima Michx., False flowering spurge—DA, r; *P 191*

Fabaceae

**Albizia julibrissin* Durazz., Mimosa—DA, r; *P 244*

Cercis canadensis L. var. *canadensis*, Eastern redbud—SB/DA, o; *P 96, 119, 172, 194*; *W 12, 26*

**Lespedeza cuneata* (Dum. Cours.) G. Don, Chinese lespedeza—DA, i; *P 223*

**Trifolium campestre* Schreb., Hop clover—Hab?, ab?; *W 11, 39*

**Trifolium dubium* Sibth., Low hop clover—DA, c; *P* 69, 99, *125*

**Trifolium incarnatum* L., Crimson clover—DA, i; *P 193*

**Trifolium repens* L., White clover—DA, o; *P 135*

**Trifolium vesiculosum* Savi, Arrowleaf clover—DA, i; *P 221*

**Vicia hirsuta* (L.) Gray, Tiny vetch—DA, i; *P 131*

**Vicia sativa* L. ssp. *nigra* (L.) Ehrh., Narrowleaf vetch—DA, i; *P 122*; *W 33*

Fagaceae

Quercus falcata Michx., Southern red oak—OPH, i; *P 138*

Quercus laurifolia Michx., Laurel oak—OPH, o; *P 256*

Quercus nigra L., Water oak—OPH, c; *P 34, 40, 136, 262*

Quercus stellata Wangenh., Post oak—OPH, c; *P 153, 157*

Gelsemiaceae

Gelsemium sempervirens (L.) J. St.-Hil., Carolina jessamine—OPH, o; *P 88, 195*

Geraniaceae

Geranium carolinianum L., Carolina crane's-bill—DA, c; *P 123, 141*

**Geranium molle* L., Dove's-foot crane's-bill—DA, c; *P 101, 137*; *W 31*

Hypericaceae

Hypericum hypericoides (L.) Crantz, St. Andrew's cross—DA, i; *P 50*

Iridaceae

**Iris pseudacorus* L., Yellow flag—DA, r; *P 97*

Iris virginica L., Southern blue flag—SB, r; *P 210*

Sisyrinchium rosulatum E.P. Bicknell, Lawn blue-eyed grass—DA, c; *P 198*; *W 41*

Juglandaceae

Carya carolinae-septentrionalis (Ashe) Engl. & Graebn., Carolina shagbark hickory—OPH, o; *P 174*

**Carya illinoinensis* (Wangenh.) K. Koch, Pecan—DA, i; *P 171, 231*

Juncaceae

Juncus coriaceus Mack., Leathery rush—RF, c; *P 152*

Juncus debilis A. Gray, Weak rush—Hab?, ab?; *W 48*

**Juncus effusus* L., Soft rush—DA, c; *P 173*

Luzula bulbosa (Alph. Wood) Smyth & L.C. Smyth, Bulbous woodrush—DA, o; *P 65*; *W 13B, 15B*

Lamiaceae

Callicarpa americana L., Beautyberry—DA, i; *P 5*

**Lamium amplexicaule* L., Henbit—Hab?, ab?; *W 5A*

**Perilla frutescens* (L.) Britton, Green shiso perilla—DA, i; *P 232*

Prunella vulgaris var. *lanceolata* (W.P.C. Barton) Fernald, American self-heal—DA, i; *P 196*; *W 58*

Salvia lyrata L., Lyreleaf sage—DA, o; *P 159*; *W 57*

Mazaceae

**Mazus pumilus* (Burm. f.) Steenis, Mazus—DA, r; *P 91*; *W 10*

Meliaceae

**Melia azedarach* L., Chinaberry—[Cat 1], DA, o; *P 3*, *203*; *W 12B*

Menispermaceae

Cocculus carolinus (L.) DC., Coralbeads—DA, o; *P 30*

Moraceae

Morus rubra L., Red mulberry—DA, i; *P 202*

Oleaceae

**Jasminum nudiflorum* Lindl., Winter jasmine—DA, r; *P 71*

**Ligustrum sinense* Lour., Chinese privet—[Cat 1], OPH/SB/DA, c; *P 1*, *27*, *54*, *257*; *W 2A*, *55*

Orchidaceae

Spiranthes vernalis Engelm. & A. Gray, Spring ladies' tresses—RF, o; *P 220*

Oxalidaceae

Oxalis dillenii Jacq., Southern yellow wood-sorrel—DA, o; *P 98*, *132*, *205*

Oxalis violacea L., Violet wood-sorrel—Hab?, ab?; *W 47*

Passifloraceae

Passiflora incarnata L., Maypop—DA, r; *P 225*

Platanaceae

Platanus occidentalis L., Sycamore—SB, i; *P 236*

Plantaginaceae

Nuttallanthus canadensis (L.) D.A., Common toadflax—DA, r; *P 139*; *W 46*

*?*Plantago aristata* Michx., Buckthorn plantain—DA/RF, c; *P 192*

**Plantago lanceolata* L., English plantain—DA/RF, o; *P 206*

Plantago virginica L., Virginia plantain—DA/RF, c; *P 163*; *W 42*

**Veronica arvensis* L., Corn speedwell—DA, c; *P 80*; *W 14B*

Poaceae

**Aira elegans* Roem. & Schult., Elegant hair grass—RF, c; *P 147*

Andropogon glomeratus (Walter) Britton, Sterns & Poggenb., Common bushy bluestem—RF, c; *P 53*

Andropogon ternarius Michx., Splitbeard bluestem—RF, c; *P 23*

Andropogon virginicus L. var *virginicus*, Old-field bluestem—RF, c; *P 21*

**Anthoxanthum odoratum* L., Sweet vernal grass—RF, c; *P 144*

Arundinaria gigantea (Walter) Muhl., Giant cane—SB, i; *P 76*

**Briza minor* L., Lesser quaking grass—RF, c; *P 134, 148*; *W 40*

Chasmanthium latifolium (Michx.) H.O. Yates, River oats—OPH/SB, c; *P 15*; *W 22*

Danthonia sericea Nutt., Silky oat-grass—RF, c; *P 190*

Dichanthelium commutatum (Schult.) Gould, Variable panicgrass—RF, o; *P 143*

Dichanthelium laxiflorum (Lam.) Gould, Open-flower witchgrass—DA, c; *P 160*

Dichanthelium sp.—RF, o; *P 259*

Elymus virginicus L. var. *virginicus*, Common eastern wild-rye—RF, c; *P 242*

Erianthus alopecuroides (L.) Elliott, Silver plume grass—RF, c; *P 55, 108*

**Lolium arundinaceum* (Schreb.) Darbysh., Tall fescue—RF, c; *P 177*

**Lolium perenne* L. var. *aristatum* Willd., Italian rye-grass—RF, c; *P 178*

Oplismenus setarius (Lam.) Roem. & Schult., Woods-grass—OPH, o; *P 39*

**Paspalum notatum* Flügg., Bahia grass—RF, c; *P 243*

**Paspalum urvillei* Steud., Vasey grass—RF, c; *P 237*

**Poa annua* L., Speargrass—DA, c; *P 104*

**Setaria viridis* (L.) P. Beauv. var. *viridis*, Green bristlegrass—RF, o; *P 248*

Sporobolus indicus (L.) R. Br., Smut grass—RF, c; *P 24*

Tridens flavus (L.) Hitchc., Redtop—Hab?, ab?; *W 20*

Polemoniaceae

Phlox carolina L., Carolina phlox—DA, i; *P 227*

Polygonaceae

Persicaria hydropiperoides (Michx.) Small, Waterpepper—SB, i; *P 239*

**Rumex acetosella* L., Sheep sorrel—RF, c; *P 114*

Rumex hastatulus Baldwin, Wild dock—DA, o; *P 214*

Ranunculaceae

Ranunculus fascicularis Muhl. ex Bigelow, Thick-root buttercup—OPH, r; *P 184*

Rhamnaceae

Berchemia scandens (Hill) K., Supplejack—OPH, i; *P 180*

Frangula caroliniana (Walter) A. Gray, Carolina buckthorn—OPH, i; *P 260*

Rosaceae

Crataegus spathulata Michx., Littlehip hawthorn—OPH/DA, c; *P 20, 31*

Crataegus uniflora Münchh., Oneflower hawthorn—OPH, i; *P 175*

**Photinia serratifolia* (Desf.) Kalkman, Taiwanese redtip—OPH, r; *P 87*

Potentilla canadensis L., Running five-fingers—OPH, i; *P 162*

Prunus angustifolia Marshall, Chickasaw plum—DA, i; *P 94*

Prunus caroliniana (Mill.) Aiton, Carolina laurel cherry—DA, i; *P 59*

Prunus serotina Ehrh., Wild black cherry—DA, i; *P 95, 154*

**Pyracantha koidzumii* (Hayata) Rehder, Formosan firethorn—DA, o; *P 7, 25*

**Pyrus calleryana* Decne., Bradford pear—DA, i; *P 44, 64*

**Rosa bracteata* J.C. Wendl., McCartney rose—OPH/DA, c; *P 36, 218*

Rosa carolina L., Carolina rose—DA, i; *P 207*

**Rosa multiflora* Thunb., Multiflora rose—OPH/SB/DA, c; *P 13, 150, 165, 167, 182*; *W 5B*

Rubus cuneifolius Pursh, Sand blackcherry—DA, i; *P 170*

Rubus flagellaris Willd., Common dewberry—DA, c; *P 176*; *W 32*

Rubus trivialis Michx., Southern dewberry—DA, c; *P 110*

**Spiraea cantoniensis* Lour., Reeve's spiraea—Hab?, ab?; *W 18*

Rubiaceae

Galium aparine L., Bedstraw—DA, o; *P 130, 209*; *W 52*

**Galium sherardia* (L.) E.H.L. Krause, Field-madder—DA, c; *P 81*

Houstonia longifolia Gaertn., Longleaf bluet—Hab?, ab?; *W 51*

Houstonia pusilla Schöpf, Tiny bluet—DA/RF, c; *P 66, 82*; *W 3B, 16A*

Santalaceae

Phoradendron leucarpum (Raf.) Reveal & M.C. Johnst., American mistletoe—OPH, o; *P 60*

Sapindaceae

Acer negundo L. var. *negundo*, Eastern box elder—SB, i; *P 10, 155*

Acer rubrum L., Eastern red maple—SB, o; *P 73, 89, 93*

Aesculus sylvatica W. Bartram, Painted buckeye—SB, i; *P 185*; *W 24*

Scrophulariaceae

**Verbascum thapsus* L., Woolly mullein—[Cat 4], DA, r; *P 77*

Smilacaceae

Smilax bona-nox L., Catbriar—OPH/SB/DA, c; *P 158, 250*

Smilax rotundifolia L., Common greenbriar—OPH/SB/DA, c; *P 12, 37, 51, 63*

Solanaceae

Solanum carolinense L. var. *carolinense*, Carolina horsenettle—DA, i; *P 215*

Ulmaceae

Ulmus alata Michx., Winged elm—OPH, c; *P 68, 70, 72*; *W 4B, 17*

Verbenaceae

**Verbena rigida* Spreng., Sand-paper verbena—RF, c; *P 145*; *W 38*

Violaceae

Viola bicolor Pursh, Wild pansy—DA/RF, c; *P 83, 112*; *W 34*

Viola sororia Willd., Common blue violet—OPH, o; *P 116*; *W 14B*

Vitaceae

Muscadinia rotundifolia (Michx.) Small var. *rotundifolia*, Muscadine—OPH/SB, o; *P 181, 186, 187, 188*

Parthenocissus quinquefolia (L.) Planch., Virginia creeper—OPH, o; *P 228*