A Floristic Checklist of Shenandoah River State Park Warren Co., Virginia

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at George Mason University

by

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DEDICATION

This thesis is dedicated to the women and LGBTQIA+ scientists who have paved the way to allow me to be successful while remaining unconditionally me. Their work and persistence have created a space within the scientific community for researchers of all backgrounds, gender expressions, and sexualities to have a space at the table of knowledge.

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Lastly, Dr. Emily Gillespie, Dr. Allan Nelson, and Dr. Donna Ford-Werntz who've helped establish the foundation of my botanical and floristic interests. Dr. Gillespie gave me my first opportunity to work in a lab and encouraged me to apply for the NSF summer REU. The REU with Dr. Allan Nelson was foundational in my interest in floristic research. Following the REU I worked for Dr. Donna Ford-Werntz who graciously taught me the basics of plant taxonomy as an independent study.

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LIST OF ABBREVIATIONS AND SYMBOLS

degrees celsius .... °C
average ....avg.
collections ....coll.
kilometers.. km
meters above sea level ....masl
millimeters .... mm
million years ago...mya
subspecies .... ssp.
temperature ....temp.
variety .... var.
Shenandoah River State Park...SHSP
Southeast Regional Network of Expertise and Collections .... SERNEC

ABSTRACT

A FLORISTIC CHECKLIST OF SHENANDOAH RIVER STATE PARK WARREN CO., VIRGINIA

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A floristic checklist of vascular plants was conducted at Shenandoah River State Park (SHSP) in Bentonville, Virginia during the 2021 and 2022 growing seasons. SHSP encompasses 665 hectares (1619 acres) of the northern Shenandoah Valley between the Massanutten Mountains and Shenandoah National Park. The park lies in Warren County which has been botanically underexplored, consistently ranking last in plant collection metrics among the five northern Shenandoah Valley counties. SHSP contains 11 community types that span 165 – 296 masl from inland wetlands and river scour communities to upland forests, including endemic Central Appalachian Shale Barrens. A total of 797 collections yielded 536 unique taxa from 109 vascular plant families. These collections were secondarily extended with in-field pictures that were aggregated on an iNaturalist project page. Quick Response (QR) codes were used to link herbarium vouchers to their respective iNaturalist entry. Sixty-four county records of taxa not yet observed in Warren County and one state record, *Equisetum laevigatum* A. Braun were

documented. As a first for SHSP, this floristic checklist provides baseline botanical knowledge of the park and expands the available digital data of vascular plants for Warren County by 20%. This augmented knowledge, in tandem with the accompanying iNaturalist project page, will not only be useful to park managers for future development and conservation plans but will also serve as a tool for community scientists to enhance their knowledge of the local flora.

1. INTRODUCTION

Despite over 300 years of botanical exploration, our understanding of plant distributions within Virginia is still developing. Within the eight years between the publication of the first and second editions of the *Flora of Virginia*, 74 native plant taxa and 113 non-native plant taxa were added (Weakley et al. 2020). Such discoveries are the consequence of contemporary floristic research. Publicly accessible digital data such as digitized herbarium specimens and county-level distributions via the *Digital Atlas of the Virginia Flora* (Virginia Botanical Associates 2022) has allowed Virginia botanists to identify localities having sparse collection histories and to target these areas for greater investigation.

Warren County, one of five counties that make up the northern Shenandoah Valley in Virginia, ranks last in terms of the number of plant collections on the SERNEC Symbiota portal (n = 2063; 3.73 collections/km^2) (sernecportal.org). Comparatively, the most represented county in terms of plant collection metrics in the northern Shenandoah Valley is Shenandoah County (n = 4909 collections; 5.6 collections/km^2). Additionally, Clarke County, similar in size to Warren County contained 2554 total collections, 5.6 collections/km^2. Warren County's rank has remained consistent even following the recent digitization of ca. 8500 northern Virginia specimens from the Lord Fairfax Community College (LFCC) herbarium. Currently, there are about 57 species that have yet to be documented in Warren County but are present in all or almost all bordering counties. The sparse collection history compounded with the number of potential taxa not yet reported suggests that botanical exploration within Warren County would yield a number of discoveries that would improve the Flora of Virginia.

This study builds an exhaustive plant inventory of vascular plants present at Shenandoah River State Park (SHSP) located in Warren County. As the first of its kind for SHSP, this project supplements the sparse collection history and expands plant distribution knowledge for the northern Shenandoah Valley. This checklist will also be useful to park managers for conservation, future development plans, and community outreach purposes.

1.1 Study Area

This study was conducted at Shenandoah River State Park in Bentonville [Warren County], Virginia which opened to the public in 1999. The park is a conglomeration of ten private properties purchased by the State in 1992 and encompasses 1619 acres of natural and managed ecosystems between the Massanutten Mountains and Shenandoah National Park (**Figure 1**) (Brown 1993). The park lies within the Valley and Ridge physiographic province, created from the erosion of sedimentary rocks that were folded and faulted during the Alleghenian orogeny around 325 mya (Weakley et al. 2012).

The park is bordered to the north by 8.4 km of the South Fork of the Shenandoah River frontage, to the east by privately owned land consisting of woodlands and agricultural fields, to the south by Lee Highway (U.S. 340), and the west by Indian Hollow Road. Currently, the 165-acre, northeastern panhandle is undeveloped as access is limited. However, plans to develop this property exist within the master plan of the park (Maroon 2011). Elevation within the park ranges from 165 masl at the river's edge to 296 masl atop Allen's Mountain.

1.2 Geology and Soils

The sedimentary Martinsburg Formation underlies the entirety of SHSP and is classified as three distinct sections: a lower black shale/argillite/sandstone, a middle lithic arenite/limestone, and an upper cub sandstone (Epstein et al. 1995; Withmeyer et al. 2012). The upper cub sandstone serves as the parent material for the weather-resistant rocky mulch of the endemic shale barren communities along the ridges that overlook the South Fork of the Shenandoah River (Withmeyer et al. 2012).

SHSP contains eleven soil types mapped by the USGS on slopes from 0 – 65% (**Figure 2**) (Soil Survey Staff 2022). Three-quarters of these are inceptisols, soils that are developmentally immature with a weak accumulation of clays, as erosion washes away newly formed soils (Soil Survey Staff 1999). Seventeen percent of soils are ultisols which are characteristically red in color from the increased concentrations of iron oxides and are readily visible when first entering the park from U.S. Route 340 (Soil Survey Staff 1999). The remaining soils are entisols and occur along the floodplains of the South Fork of the Shenandoah River. These soils, like inceptisols, are immature in terms of horizon development but differ in that there is no accumulation of clays (Soil Survey Staff 1999).

1.3 Vegetation and Climate

Shenandoah River State Park lies in the Temperate Continental climate zone according to the Köppen-Trewartha classification system (Belda et al. 2014). The National Weather Service Station USC00443229, 10 km east of SHSP, indicates this area has an annual mean temperature of 12.6 °C with July being the warmest (avg. temp. = 24.1 °C) and January the coldest (avg. temp. = 0.9 °C). Precipitation averages 990 mm annually (Sparks 2018).

Around 17% of the park is currently developed or managed while the remaining 83% is made up of nine natural ecological communities (**Figure 3**) (Taverna & Fleming 2016). Upland areas of SHSP are composed of successionally mature acidic Oak-Hickory or Oak-Heath forests. *Quercus* and *Carya* species dominate the overstory with scattered *Pinus strobus* L., *Tsuga canadensis* (L.) Carriere, and *Juniperus virginiana* L.. The acidic soils support a characteristically acid-loving understory shrub layer of *Kalmia latifolia* L., *Vaccinium stamineum* L., and *Vaccinium pallidum* Aiton.

A series of river scour communities cover the northern border of SHSP where water-tolerant tree species such as *Platanus occidentalis* L. and *Populus deltoides* Bartram ex Marshall are common while *Asimina triloba* (L.) Dunal and *Lindera benzoin* (L.) Blume dominates the understories. About 81 acres of the alluvial floodplain along the South Fork of the Shenandoah River within SHSP were converted to agricultural fields before the park's establishment and are mowed annually for hay production. The remaining bands of floodplain forest along the river have been invaded by aggressive nonnative species such as *Microstegium vimineum* (Trinius) A. Camus and *Humulus japonicus* Siebold & Zuccarini.

The park contains endemic Central Appalachian Shale Barrens (G2/S2) along the ridges overlooking the South Fork of the Shenandoah River. These communities are unique because they form only under a specific combination of abiotic factors. On hillsides having slopes greater than 20 degrees, where soil development is hindered by water runoff, and a southern aspect maximizing the incoming solar radiation, the exposed weather-resistant shales and sandstones absorb and retain solar heat gain (Steele 1911; Allard 1946; Keener 1983; Southworth et al. 2009; Withmeyer et al. 2012). These shales, derived from the Ordovician-aged Martinsburg Formation, form edaphic 'heat islands' that cause surface temperatures to reach up to 60 °C, too harsh for local vegetation to successfully colonize. These harsh conditions exclude many species and select species with adaptations to survive them (**Table 1**). Adapted species are obligate heliophytes with thicker seed coats and proportionally much larger root systems compared to above-ground biomass (Artz 1935; Keener 1983; Withmeyer et al. 2012). Vegetation cover is 50% less dense on shale barren slopes compared to adjacent slopes of the same mountain having different aspect (Keener 1983; Southworth et al. 2009; Withmeyer et al. 2012). Stunted *Pinus virginiana* P. Miller and *Quercus montana* Willdenow dominate the overstory while the abundance of endemic or near-endemic herbaceous species defines shale barrens.

Hiking trails allow access to the 0.3-acre Montane Depression Wetland (S1). Present across the Ridge and Valley and Blue Ridge physiographic provinces, these depressions arise from the weathering of underlying bedrock or landslide benches which then get filled with natural runoff (Virginia Dept. of Cons. & Rec. 2022). The Montane Depression Wetland at SHSP becomes saturated over winter, eventually drying out toward late summer. *Carex typhina* Michaux and *Carex squarrosa* L. first dominate the herbaceous layer which transitions to *Boehmeria cylindrica* (L.) Swartz as the wetland dries.

The undeveloped northeastern panhandle consists mainly of old field regenerative forests with *Platanus occidentalis* and *Juniperus virginiana* along the alluvial plains. Acidic Oak-Hickory forests and Oak-Heath forests make up most of the remaining communities. The construction of two powerline corridors that cut across the property has left a stand of successional *Pinus virginiana*. All soils present within the main park boundaries are present in the panhandle as well as the Lodi – Rock Outcrop Complex on the eastern side of the panhandle.

The park contains three known cultivated areas: the visitor's center native perennial flower garden, a seeded pollinator meadow, and annually hayed fields. The garden was excluded from surveying; however, both the seeded pollinator meadow and fields were surveyed because they are potential sources of naturalized populations of species in the park and as grassland habitats, may accumulate native and non-native species.

Three populations of rare plants have been monitored at SHSP by the Virginia Natural Heritage program including Torrey's Rush *Juncus torreyii* Coville (S1), Chestnut Lipfern *Myriopteris rufa* Fèe (S2), and Field Chickweed *Cerastium velutinum* Rafinesque var. *velutinum* (S1/S2). In 2001, fifteen individuals of *J. torreyii* were found growing within a vernal pool in the northern portion of the park between the river and the shale barren community (Fleming pers. comm.). In 2019, a population of *M. rufa* was found growing on exposed rock spines of the western shale barren communities (Fleming pers.

comm.). *C. velutinum* var. *velutinum* was documented in 1995 growing along what is presently the RV campground and water treatment facility (Fleming pers. comm.). Of these three, both *J. torreyii* and *C. velutinum* var. *velutinum* have yet to be relocated since their initial documentation.

2. MATERIALS AND METHODS

2.1 Floristic Survey

Weekly collection trips to SHSP were conducted from March 2021 to October 2022 [collection bias was combated using ArcGIS Pro software to map previous collection localities to target under-visited areas]. Plants in reproductive stages were prioritized for voucher specimen collection in duplicate. Prior to specimen collection, digital pictures of the plant were taken with an iPhone to document reproductive parts, leaves, stems, and habit. These pictures were then uploaded to the iNaturalist project page made for the survey (Sheik 2022). GPS coordinates and elevation data were derived from the metadata of these digital pictures. The soil type and ecological community type were determined by georeferenced PDFs of the soil types mapped by the Virginia Web Soil Survey and the community type as designated by the Virginia Natural Heritage Program. These PDFs were uploaded to the Avenza map application (Avenza Systems Inc. 2022) and this information was recorded in-field. Associated species, relative abundance, and morphological characteristics were documented as well. Photographic vouchers were created for rare or endangered species as well as species for which few individuals were encountered (Townsend 2022). Locality data for these instances were redacted from public view (Weeks 2016).

2.2 Specimen Preparation, Identification, Deposition, and Dissemination

Voucher specimens were pressed and dried at 37 °C for at least a week. Specimen identification was done using the Flora of Virginia app (Weakley et al. 2020), Flora

North America (Flora of North America Editorial Committee 1993), other herbarium specimens, and digital resources (iNaturalist 2022; USDA 2022) which were then verified by my advisor, Dr. Andrea Weeks. Identified plants were then frozen for two weeks at -20 °C to kill potential pests.

iNaturalist was used to streamline specimen label creation. The .csv document downloaded from iNaturalist contained a custom selection of Darwin Core fields including collector, record number (entered in the description of the iNaturalist occurrence), collection date, latitude, longitude, country, state, and county. Columns for specific locality information, relative abundance, elevation, ID verification, substrate information, community type, and associated taxa were added. Then, the .csv was uploaded to the GMUF Symbiota database on the Southeast Regional Network of Expertise and Collections (SERNEC) portal via the 'Skeletal Text File Import' tool in the Administration Control Panel. This methodology required transcription of data only once across digital platforms. QR codes were also added to the labels that linked the physical specimens to their iNaturalist project entry following modified methods described in Herberling & Isaac (2018). We utilized the Symbiota label generation tool instead of the described 'Mail Merge' method in Microsoft Word to generate labels.

3. RESULTS AND DISCUSSION

In total, 797 collections yielded 536 total plant taxa encompassing 342 genera and 109 families (**Appendix I**). The most represented families include Asteraceae (12% of taxa), Poaceae (9.6%), and Fabaceae (5.8%). Nonnative species make up 26% (143 taxa) of species present, a proportion like those of previous Virginia studies (Domangue & McMullen 2013; McMurchie & Weeks 2019; Nakahata et al. 2020). Of the 36 nonnative species that are on the Virginia invasive species list, 12 are ranked 'high' invasiveness, 17 are 'medium', and 7 are 'low'.

Sixty-four county records of plant taxa not yet documented in Warren County were discovered. Thirteen of these records include taxa from the list of 57 documented in all or almost all surrounding counties. Six county records are nonnative species associated with old home-sites and include populations of *Ajuga reptans* L., *Narcissus pseudonarcissus* L., *Narcissus* × *incomparabilis* P. Miller (pro sp.), *Wisteria sinensis* (Sims) Augustin de Candolle, *Muscari botryoides* (L.) P. Miller, and *Forsythia suspensa* (Thunberg) Vahl. Japanese Knotweed, *Reynoutria japonica* Houttuyn, considered highly invasive in riparian areas, was documented for the first time along the South Fork of the Shenandoah River, expanding the known distribution further north into the Shenandoah Valley. Four 'medium' ranked invasives: *Agrostis capillaris* L., *Hedera helix* L. var. *helix*, *Paulownia tomentosa* (Thunberg) Siebold & Zuccarini ex Steudel, and *W. sinensis* were also documented for the first time in Warren County.

Native records include *Morella cerifera* (L.) Small, a shrub common in the Coastal Plain and rare in the outer Piedmont. This record documents the first occurrence of this species in the Ridge and Valley physiographic province. The voucher was collected from a drainage ditch along with *Fraxinus pennsylvanica* Marshall, *Typha latifolia* L., and *Typha* × *glauca* Godron (pro sp.), which is also a county record. The documentation of *Rhus copallinum* L. for the first time completes the known distribution of this species across northern Virginia. *Phyllanthus caroliniensis* Walter, considered infrequent in the Coastal Plain and Piedmont and rare in the mountains, was found growing in the Montane Depression Wetland habitat.

Four county records, two native and two nonnative taxa were collected in the planted pollinator meadow including *Scutellaria integrifolia* L., *Paspalum floridanum* Michx., *Galium anglicum* Huds. and *Echinacea purpurea* (L.) Moench. The broad distribution of *P. floridanum* and *G. anglicum* throughout SHSP suggests this species was present before the planting of this field in 2018. Without the information of the seed mix used, we cannot assume the other two taxa are wild populations. These were excluded from the total count of county records. *Iris verna* L. var. *smalliana*, a native variety with an inland and Appalachian distribution was documented for the first time growing in the upland Oak-Heath forests of SHSP.

This project documents Smooth Horsetail, *Equisetum laevigatum* A. Braun, for the first time in the state of Virginia and has been verified by botanists Gary Fleming and William Carl Taylor. The population of over 250 individual stems occurs in a moist field between a corridor consistently flooded by the South Fork of the Shenandoah River and a gravel service road. This habitat resembles the moist prairies, riverbanks, and roadsides east of the Ohio and Mississippi rivers where this species is typically found (Flora of North America Editorial Committee 1993). The closest documented occurrence of *E. laevigatum* occurs 370 km northeast in Erie County, Pennsylvania (Glowenke 9699 PH). *E. laevigatum* can be distinguished from the commonly found *Equisetum praealtum* Rafinesque, also a county record from this study, through its smooth sheaths, rounded cone apex, and two dark bands around its leaf sheaths. The stems of *E. praealtum* overwinter, whereas *E. laevigatum* stems last less than a year (Flora of North America Editorial Committee 1993). The presence of both *E. praealtum* and *E. laevigatum* suggests the known hybrid, *Equisetum* × *ferrissii* Clute might also be encountered, although not observed in this study.

Of the three previously monitored rare species at SHSP, only *Myriopteris rufa* (S1, critically imperiled) was relocated. Last documented in 2019 by the Virginia Natural Heritage Program, this species occurs on hard-to-access exposed rock spines of the Central Appalachian Shale Barrens at SHSP. The small floodplain population of *J. torryii* has most likely been wiped out by a flooding event or outcompeted by the invading aggressive weedy species. The construction of the water treatment facility in proximity to the RV campground area after 1995 most likely destroyed the population of *C. velutinum* var. *velutinum*. Therefore, both *J. torryii* and *C. velutinum* var. *velutinum* are assumed to be locally extirpated. Additionally, three taxa on the rare plant watchlist including *Viola septentrionalis* Greene, *Asclepias incarnata* L. subsp. *incarnata*, and *Carex shortiana*

Dewey were documented. The study marks the discovery of a new population of *V. septentrionalis* farther north than previously known populations in Virginia.

Ten of the thirty-four endemic or near-endemic species to the Central Appalachian Shale Barrens were documented. Those specifically associated with shale barren ecosystems include *Packera antennariifolia* (Britton) W. A. Weber & Á. Löve, *Scuttelaria ovata* Hill subsp. *rugosa* (Wood) Epling, *Solidago harrisii* Steele and *Paronychia montana* (Small) Pax & K. Hoffmann. *Sedum glaucophyllum* R.T. Clausen was only observed on rock outcrops in the undeveloped portion of the park along with *Asplenium rhizophyllum* L.. The shale barrens at SHSP have seen disturbances from the introduced livestock to high levels of foot traffic via park trails. This particularly high level of disturbance may be the cause for herbaceous species richness to be minimal. Additionally, dependent on the geological origins and the variation of the specific combination of abiotic factors that form shale barrens, endemic species become extremely localized to different shale barren types (Keener 1983). The expectation of observing all known plants endemic to shale barrens at SHSP is unrealistic.

Overall, digital data on the SERNEC portal for vascular plants has been increased by 20%, promoting the county to the fourth most represented of the five northern Shenandoah Valley counties in total collections (n = 3441) and second in collections per unit area (6.12 coll./km^2). This project also highlights the use of iNaturalist as a tool for education, secondary extension of vouchered specimens, and the streamlining of transcription and label creation. The documentation of *E. laevigatum* warrants reevaluation of the unbranched Horsetail herbaria specimens within the state to determine if previous *Equisetum praealtum* collections contain initially misidentified *E. laevigatum* specimens. The checklist, in tandem with the iNaturalist project page, will serve as a publicly accessible and visual tool for citizen scientists and park managers to increase knowledge and appreciation of the local flora.

Botanical exploration at SHSP is just beginning, with this study serving as the first baseline of thorough vascular plant knowledge. This will allow for comparative studies on the change in species composition with future floristic surveys. Specifically, more rigorous sampling of the northeastern, undeveloped panhandle is necessary, as access becomes sporadically difficult depending on weather-induced tree falls and wet conditions. The iNaturalist project page will serve as an educational tool and visual resource for park staff and community scientists. QR code-enabled signage directly linked to the project page ensures easy access to this resource and increases the longevity of its broader impacts. Overall, this survey is one of many that must be conducted at SHSP to document the entire scope of biodiversity present. The lack of existing surveys, particularly looking at lichens, mosses, and insects permit studies at SHSP to expand our understanding of the distributions of organisms across Kingdoms.

4. TABLES

Table 1: A list of the 34 plant taxa endemic or near-endemic to the Appalachian Shale Barren Ecosystem (Keener 1983; Fleming & Moorhead 2000). Underlined taxa have been observed in this study.

Taxon
Allium oxyphilum Wherry
Antennaria virginica Stebbins
Astragalus distortus Torrey & A. Gray var. *distortus*
Avenella flexuosa (L.) Drejer
Blephilia ciliate (L.) Bentham
Boechera serotina (Steele) Windham & Al-Shehbaz
Brickellia eupatorioides (L.) Shinners var. *eupatorioides*
Bryodesma rupestre (L.) J. Soják
Carex pensylvanica Lamarck
Calystegia spithamaea (L.) Pursh ssp. *stans* (Michaux) Brummitt
Clematis addisonii Britt.
Clematis albicoma Wherry
Clematis coactilis (Fern.) Keener
Clematis viticaulis Steele
Corallorhiza bentleyi Freudenstein
Danthonia spicata (L.) Palisot de Beauvois ex Roemer & J. A. Schultes
Dichanthelium appalachiense Townsend and LeBlond
Eriogonum allenii S. Watson
Erysimum capitatum (Douglas ex Hooker) E. L. Greene var. *capitatum*
Helianthus laevigatus Torr. & Gray
Hieracium traillii Greene
Monarda brevis (Frosberg & Artz) Floden
Oenothera argillicola Mackenzie
Packera antennariifolia (Britton) W.A. Weber & A. Love
Paronychia montana (Small) Pax & K. Hoffmann
Phlox buckleyi Wherry
Phlox subulata L.
Potentilla canadensis L.
Scutellaria ovata Hill ssp. *rugosa* (Wood) Epling
Schizachyrium scoparium (Michaux) Nash var. *scoparium*
Sedum glaucophyllum Clausen
Solidago harrisii Steele
Taenida montana (Mackenzie) Cronquist
Trifolium virginicum Small

5. FIGURES

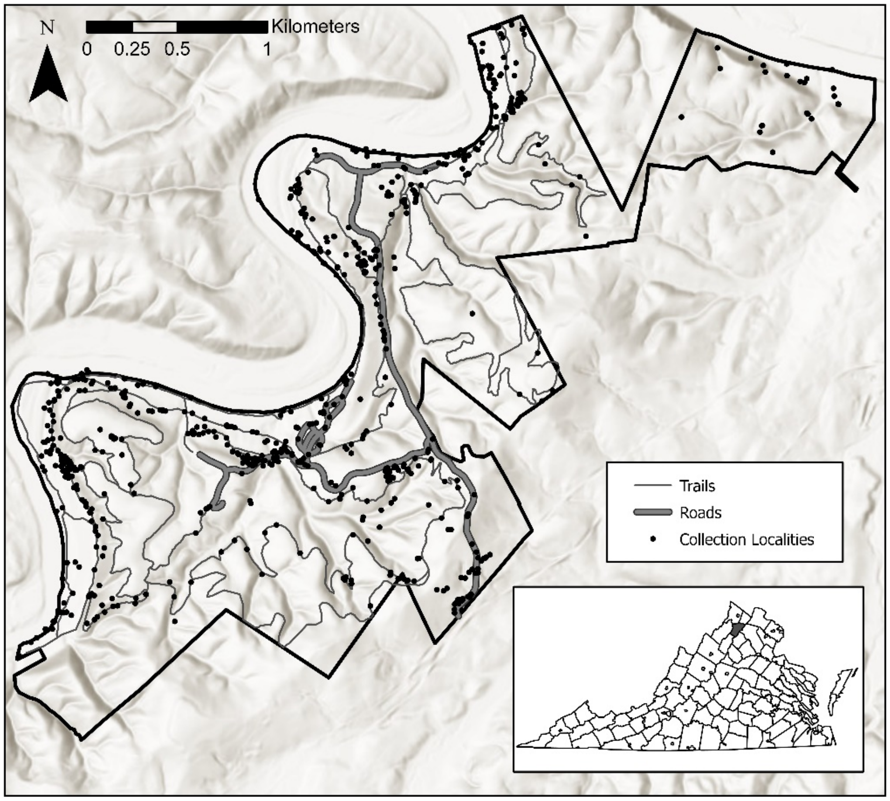

Figure 1: Boundary map of Shenandoah River State Park in Warren County. Voucher specimen localities are marked with black dots while main roads and the 23 km of trails are also mapped.

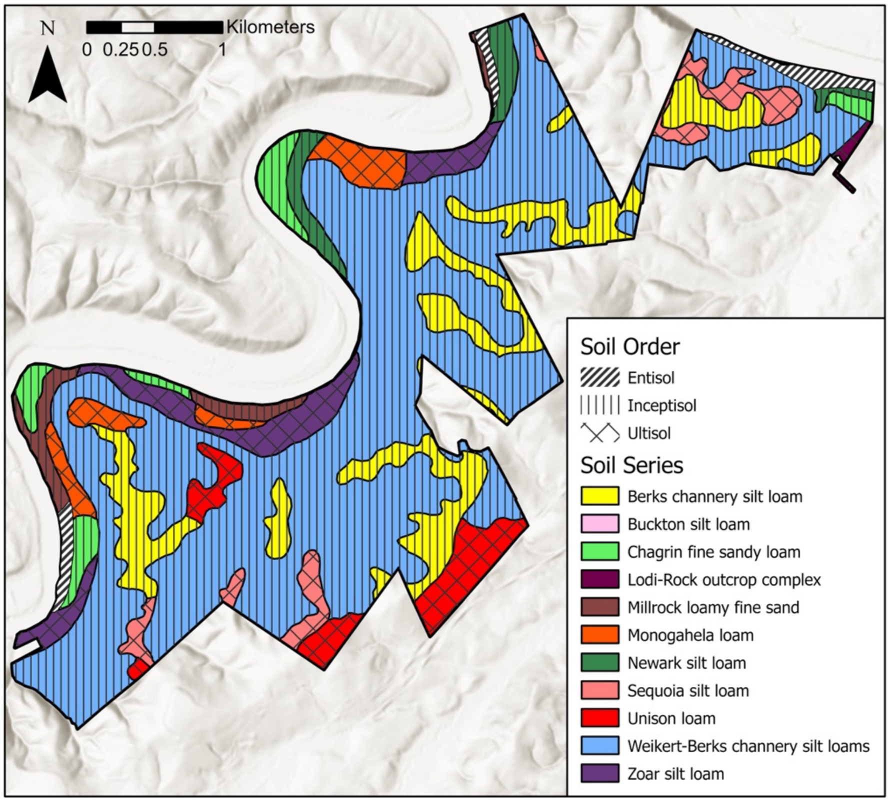

Figure 2: Map of the eleven soil series present at Shenandoah River State Park. Soil series with cross-hatching represents ultisols, vertical hatching represents inceptisols, and horizontal hatching represents entisols.

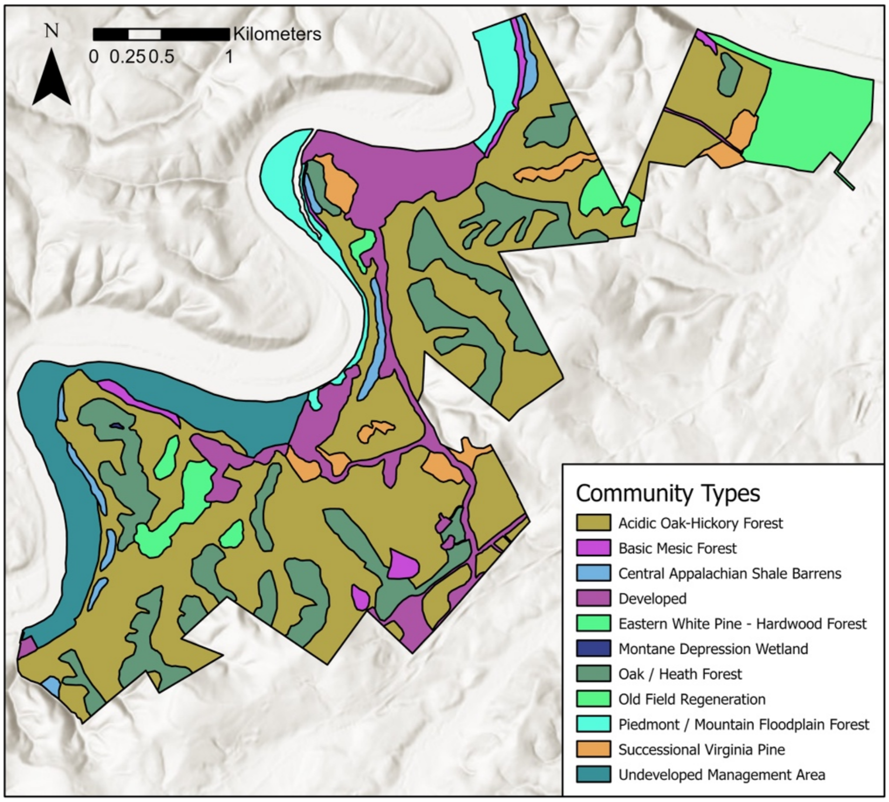

Figure 3: Map of the eleven community types present at Shenandoah River State Park. Modified from Taverna & Fleming (2016).

APPENDIX 1: ANNOTATED CHECKLIST OF THE VASCULAR PLANTS LOCATED AT SHENANDOAH RIVER STATE PARK

underline = Warren County Records
! = Virginia State Records
(*) = Introduced taxa (Weakley et al. 2020)
H* = ranked 'high' invasive status
M* = ranked 'medium' invasive status
L* = ranked 'low' invasive status
† = plants on the rare, threatened, or endangered list for Virginia (Townsend 2022)
(Sheik #) = voucher collection number
(Digital) = Digital voucher

Relative abundance abbreviations
A = abundant
F = frequent
I = infrequent
R = rare

LYCOPHYTES

Lycopodiaceae
Diphasiastrum digitatum (Dillenius ex. A. Braun) Holub; (Sheik 354), A

PTERIDOPHYTES

Aspleniaceae
Asplenium platyneuron (L.) Britton, Sterns & Poggenburg; (Sheik 27, 259, 561), A
Asplenium rhizophyllum L.; (Sheik 637), I
Asplenium trichomanes L.; (Sheik 287, 600, 623), F

Dennstaedtiaceae
Dennstaedtia punctilobula (Michaux) T. Moore; (Sheik 781), A

Dryopteridaceae
Dryopteris carthusiana (Villars) H. P. Fuchs; (Sheik 227, 756), A
Dryopteris marginalis (L.) A. Gray; (Sheik 18, 791), A
Polystichum acrostichoides (Michaux) Schott; (Sheik 17, 604), F

Equisetaceae
<u>*Equisetum praealtum* Rafinesque</u>; (Sheik 671), A
!*Equisetum laevigatum* A. Braun; (Sheik 427, 689), F

Onocleaceae
Onoclea sensibilis L. var. *sensibilis*; (Sheik 484), F

Ophioglossaceae
Botrypus virginianus (L.) Holub.; (Sheik 265), I

Polypodiaceae
Polypodium virginianum L.; (Sheik 43), F

Pteridaceae
Adiantum pedatum L.; (Sheik 268), F
Myriopteris lanosa (Michaux) Grusz & Windham; (Sheik 562), F
†*Myriopteris rufa* Fée; (Sheik 581) (Digital), I
Pellaea atropurpurea (L.) Link; (Sheik 582) (Digital), I

Thelypteridaceae
Parathelypteris noveboracensis (L.) Ching; (Sheik 353), F

Woodsiaceae
Woodsia obtusa (Sprengel) Torrey ssp. *obtusa*; (Sheik 332, 583), A

GYMNOSPERMS

Cupressaceae
Juniperus virginiana L.; (Sheik 12), F

Pinaceae
Pinus strobus L.; (Sheik 375), F
Pinus virginiana P. Miller; (Sheik 635), A
Tsuga canadensis (L.) Carrière; (Sheik 651), I

ANGIOSPERMS: DICOTS

Acanthaceae
Justicia americana (L.) Vahl; (Sheik 701), F
Ruellia strepens L.; (Sheik 337), I
<u>*Ruellia caroliniensis* (J. F. Gmelin) Steud.</u>; (Sheik 414), F

Adoxaceae
Sambucus canadensis L.; (Sheik 254, 307), I
Viburnum acerifolium L.; (Sheik 279), I
Viburnum prunifolium L.; (Sheik 112, 703), I

Amaranthaceae
**Amaranthus spinosus* L.; (Sheik 504), I
**Chenopodium album* L.; (Sheik 792), F

Anacardiaceae

Rhus aromatica Aiton; (Sheik 675), A
<u>*Rhus copallinum* L.</u>; (Sheik 786), I
Rhus glabra L.; (Sheik 392), A
Rhus typhina L.; (Sheik 742), F
Toxicodendron radicans (L.) Kuntze; (Sheik 437), A
Toxicodendron radicans (L.) Kuntze var. *radicans*; (Sheik 536), A

Annonaceae
Asimina triloba (L.) Dunal; (Sheik 93), A

Apiaceae
Chaerophyllum procumbens (L.) Crantz var. *procumbens*; (Sheik 110, 645), A
Conium maculatum L.; (Sheik 238), A
Cryptotaenia canadensis (L.) A. P. de Candolle; (Sheik 346), A
Daucus carota L.; (Sheik 34, 458), A
Osmorhiza claytonii (Michaux) C. B. Clarke; (Sheik 178), F
Sanicula canadensis L. var. *canadensis*; (Sheik 348), F
Taenidia integerrima (L.) Drude; (Sheik 89), I
Torilis arvensis (Hudson) Link; (Sheik 693), F
Torilis japonica (Houttuyn) A. P. de Candolle; (Sheik 355, 713), F
Zizia aptera (A. Gray) Fernald; (Sheik 664), F

Apocynaceae
Apocynum cannabinum L.; (Sheik 256, 361, 461), F
Asclepias incarnata L. ssp. *incarnata*; (Sheik 471, 393, 783), A
Asclepias quadrifolia Jacquin; (Sheik 242), I
Asclepias syriaca L.; (Sheik 338), F
Asclepias tuberosa L. var. *tuberosa*; (Sheik 390), R
Asclepias verticillata L.; (Sheik 737), F
Cynanchum laeve (Michaux) Persoon; (Sheik 728), F
L**Vinca minor* L.; (Sheik 71), F

Aquifoliaceae
Ilex opaca Aiton var. *opaca*; (Sheik 550), I

Araliaceae
<u>M**Hedera helix* L. var. *helix*</u>; (Sheik 475), F

Aristolochiaceae
Asarum canadense L.; (Sheik 122), F

Asteraceae
Achillea borealis Bongard; (Sheik 314), F
Ageratina altissima King & H. E. Robinson var. *altissima*; (Sheik 477, 574), F

Ambrosia artemisiifolia L.; (Sheik 515), I
Antennaria parlinii Fernald ssp. _fallax_ (Greene) Bayer and Stebbins; (Sheik 94, 626, 630, 631), A
Antennaria parlinii Fernald ssp. _parlinii_; (Sheik 648), A
Antennaria plantaginifolia (L.) Richardson; (Sheik 171), F
*_Anthemis arvensis_ L.; (Sheik 301), I
*_Arctium minus_ Bernhardi; (Sheik 492), I
Bidens bipinnata L.; (Sheik 524), F
Bidens frondosa L.; (Sheik 769), I
Brickellia eupatorioides (L.) Shinners; (Sheik 738), I
*_Carduus acanthoides_ L. ssp. _acanthoides_; (Sheik 11), F
*_Carduus nutans_ L.; (Sheik 318), F
*_Chondrilla juncea_ L.; (Sheik 424), I
Chrysogonum virginianum L. var. _virginianum_; (Sheik 116), I
*_Cichorium intybus_ L.; (Sheik 374), I
H*_Cirsium arvense_ (L.) Scopoli var. _horridum_ Wimmer & Gräbner; (Sheik 343), F
M*_Cirsium vulgare_ (Savi) Tenore; (Sheik 469), F
Conoclinium coelestinum (L.) A. P. de Candolle; (Sheik 8), F
Doellingeria infirma (Michaux) E. Greene; (Sheik 718), I
*_Echinacea purpurea_ (L.) Moench; (Sheik 402), F
Eclipta prostrata (L.) L.; (Sheik 558), I
Erechtites hieraciifolius (L.) Rafinesque ex de Candolle.; (Sheik 535, 549), A
Erigeron annuus (L.) Persoon; (Sheik 342, 352, 364, 372, 406, 608), A
Erigeron canadensis L.; (Sheik 522), I
Erigeron philadelphicus L. var. _philadelphicus_; (Sheik 108, 165, 641), A
Erigeron strigosus Muhlenberg ex Willdenow var. _strigosus_; (Sheik 249, 324, 387, 688, 697), A
Eupatorium sessilifolium L.; (Sheik 483), I
Euthamia graminifolia (L.) Nutt.; (Sheik 532), I
Eutrochium purpureum (L.) E. E. Lamont var. _purpureum_; (Sheik 491), I
Helianthus decapetalus L.; (Sheik 368), F
Helianthus divaricatus L.; (Sheik 481, 708), F
Helianthus maximiliani Schräder; (Sheik 773), F
Heliopsis helianthoides (L.) Sweet var. _helianthoides_; (Sheik 425), I
Hieracium venosum L.; (Sheik 166), A
*_Hypochaeris radicata_ L.; (Sheik 494), F
Lactuca canadensis L.; (Sheik 412), F
*_Lactuca saligna_ L.; (Sheik 754) (Digital), R
*_Lapsana communis_ L.; (Sheik 315, 698), F
*_Leucanthemum vulgare_ Lamarck; (Sheik 29, 239, 316, 589, 677), A
Packera anonyma (Wood) W. A. Weber & Á. Löve; (Sheik 687), I
Packera antennariifolia (Britton) W. A. Weber & Á. Löve; (Sheik 69), F
Packera obovata (Muhlenburg ex Willdenow) W. A. Weber & Á. Löve; (Sheik 85, 251), F

**Pilosella caespitosa* (Dumortier) P. D. Sell & C. West; (Sheik 217, 672), F
Pseudognaphalium obtusifolium (L.) Hilliard & Burtt; (Sheik 551), I
Rudbeckia hirta L.; (Sheik 359), F
<u>*Rudbeckia hirta* L. var. *pulcherrima* Farwell</u>; (Sheik 373), F
Smallanthus uvedalia (L.) Mackenzie ex Small; (Sheik 513), I
Solidago altissima L. var. *altissima*; (Sheik 32, 784), A
Solidago caesia L. var. *caesia*; (Sheik 6), F
<u>*Solidago canadensis* L. var. *canadensis*</u>; (Sheik 19, 516), A
Solidago canadensis L. var. *hargeri* Fernald; (Sheik 772), A
Solidago flexicaulis L.; (Sheik 564), F
Solidago harrisii Steele; (Sheik 576), F
Solidago juncea Aiton; (Sheik 446), F
Solidago nemoralis Aiton var. *nemoralis*; (Sheik 534, 542), F
**Sonchus asper* (L.) Hill; (Sheik 507), F
Symphyotrichum lanceolatum (Willdenow) G. L. Nesom var. *lanceolatum*; (Sheik 531, 609), F
Symphyotrichum lanceolatum (Willdenow) Nesom var. *latifolium* (Semple & Chmielewski) Nesom; (Sheik 25), F
Symphyotrichum lateriflorum (L.) Á. Löve & D. Löve; (Sheik 595), F
Symphyotrichum novae-angliae (L.) Nesom; (Sheik 5, 553), F
Symphyotrichum patens (Aiton) Nesom var. *patens*; (Sheik 35), A
<u>*Symphyotrichum pilosum* (Willdenow) Nesom var. *pilosum*</u>; (Sheik 586, 594), A
Symphyotrichum racemosum (Elliott) Nesom var. *racemosum*; (Sheik 607), F
Symphyotrichum undulatum (L.) Nesom; (Sheik 15, 16, 585, 790), A
<u>**Taraxacum erythrospermum* Andrzejowski ex Besser</u>; (Sheik 70), A
**Taraxacum officinale* G. H. Weber ex Wiggers; (Sheik 132), A
**Tragopogon dubius* Scopoli; (Sheik 310), I
Verbesina alternifolia (L.) Britton ex Kearney; (Sheik 14, 464), A
Vernonia noveboracensis (L.) Michaux; (Sheik 528), F
Xanthium strumarium L.; (Sheik 788), F

Balsaminaceae
Impatiens capensis Meerburg; (Sheik 538, 710, 766), F

Berberidaceae
Jeffersonia diphylla (L.) Persoon; (Sheik 60), F
Podophyllum peltatum L.; (Sheik 160), A

Betulaceae
Carpinus caroliniana Walter; (Sheik 399), F
Ostrya virginiana (P Miller) K. Koch; (Sheik 384, 654), A

Boraginaceae
Andersonglossum virginianum (L.) J. I. Cohen; (Sheik 167), F

Buglossoides arvensis (L.) I. M. Johnston ssp. *arvensis*; (Sheik 644), F
Ellisia nyctelea (L.) L.; (Sheik 156), A
Hackelia virginiana (L.) I. M. Johnston; (Sheik 396), I
Mertensia virginica (L.) Persoon ex Link; (Sheik 64), A
Phacelia dubia (L.) Trelease var. *dubia*; (Sheik 649), I

Brassicaceae
H**Alliaria petiolata* (Bieberstein) Cavara & Grande; (Sheik 86), A
**Barbarea verna* (Mill.) Asch.; (Sheik 102), F
**Barbarea vulgaris* R. Brown; (Sheik 81), A
Boechera laevigata (Muhlenberg ex Willdenow) Al-Shehbaz; (Sheik 73), F
Cardamine bulbosa (Schreber ex Muhlenberg) Britton, Sterns, & Poggenberg; (Sheik 128, 650); F
Cardamine concatenata (Michaux) O. Schwarz; (Sheik 39, 621), A
**Cardamine hirsuta* L.; (Sheik 161, 618), A
Cardamine pensylvanica Muhl. ex Willd.; (Sheik 659), A
Draba ramosissima Desv.; (Sheik 37, 106), F
**Draba verna* L.; (Sheik 639), A
**Hesperis matronalis* L.; (Sheik 181), F
**Isatis tinctoria* L.; (Sheik 75), F
**Lepidium campestre* (L.) R. Brown; (Sheik 74), A
<u>**Lepidium densiflorum* Schrader</u>; (Sheik 285), R
*Lepidium virginicu*m L. var. *virginicum*; (Sheik 202), F
**Noccaea perfoliata* (L.) F. K. Meyer; (Sheik 44, 624), A
**Rorippa sylvestris* (L.) Besser; (Sheik 284, 463), F

Cactaceae
Opuntia humifusa (Rafinesque) Rafinesque; (Sheik 340), I

Campanulaceae
Campanula americana L.; (Sheik 721) (Digital), I
Lobelia cardinalis L.; (Sheik 724), F
Lobelia inflata L.; (Sheik 415), F
Lobelia siphilitica L.; (Sheik 545), I
Lobelia spicata Lamarck var. *scaposa* McVaugh; (Sheik 260), I
Triodanis perfoliata (L.) Nieuwland; (Sheik 289), F

Cannabaceae
Celtis pumila Pursh; (Sheik 667), F
M**Humulus japonicus* Siebold & Zuccarini; (Sheik 540, 761), A

Caprifoliaceae
**Dipsacus laciniatus* L.; (Sheik 433), A
H**Lonicera japonica* Thunberg; (Sheik 28), A

H**Lonicera maackii* (Ruprecht) Maximowicz; (Sheik 175), I
H**Lonicera morrowii* A. Gray; (Sheik 87), F
?*Symphoricarpos orbiculatus* Moench; (Sheik 474, 488), F
**Valerianella locusta* (L.) Latterade; (Sheik 104, 129, 633), A

Caryophyllaceae
**Cerastium glomeratum* Thuillier; (Sheik 632), F
**Dianthus armeria* L. ssp. *armeria*; (Sheik 319), F
Paronychia montana (Small) Pax & K. Hoffmann; (Sheik 740), F
**Saponaria officinalis* L.; (Sheik 418), F
Silene antirrhina L.; (Sheik 690), F
Silene caroliniana Walter var. *pensylvanica* (Michaux) Fernald; (Sheik 48), A
**Silene latifolia* Poiret; (Sheik 312), F
Silene stellata (L.) Aiton f.; (Sheik 429 (Digital), 560), I
**Silene vulgaris* (Moench) Garcke; (Sheik 196), R
M**Stellaria media* (L.) Villars; (Sheik 121), A
Stellaria pubera Michaux; (Sheik 58, 61, 634), A

Celastraceae
Euonymus atropurpureus Jacquin; (Sheik 765), F

Cistaceae
Lechea racemulosa Michaux; (Sheik 497), F

Convolvulaceae
Calystegia sepium (L.) R. Brown; (Sheik 438), F
Cuscuta gronovii Willdenow ex Schultes; (Sheik 552, 598), F
?*Ipomoea hederacea* Jacquin; (Sheik 596), I
Ipomoea lacunosa L.; (Sheik 593, 755), A

Cornaceae
Cornus florida L.; (Sheik 88), F
Nyssa sylvatica Marshall; (Sheik 541), F

Crassulaceae
Sedum glaucophyllum Clausen; (Sheik 684), F
**Sedum sarmentosum* Bunge; (Sheik 696), I
Sedum ternatum Michaux; (Sheik 183), F

Cucurbitaceae
Sicyos angulatus L.; (Sheik 539, F

Ebenaceae
Diospyros virginiana L.; (Sheik 434), F

Elaeagnaceae
H**Elaeagnus umbellata* Thunberg; (Sheik 113, 557), I

Ericaceae
Chimaphila maculata (L.) Pursh; (Sheik 335), A
Epigaea repens L.; (Sheik 99), F
Hypopitys monotropa Crantz; (Sheik 719), I
Kalmia latifolia L.; (Sheik 184), F
Monotropa uniflora L.; (Sheik 327), F
Rhododendron periclymenoides (Michaux) Shinners; (Sheik 660), F
Vaccinium pallidum Aiton; (Sheik 91), A
Vaccinium stamineum L.; (Sheik 91, 173), A

Euphorbiaceae
Acalypha gracilens A. Gray; (Sheik 743), F
Acalypha rhomboidea Rafinesque; (Sheik 778), I
Acalypha virginica L.; (Sheik 739), I
Euphorbia corollata L.; (Sheik 579), F
Euphorbia maculata L.; (Sheik 502), F
Euphorbia nutans Lagasca y Segura; (Sheik 521, 741), F
Euphorbia pubentissima Michaux; (Sheik 482), F

Fabaceae
M**Albizia julibrissin* Durazzini; (Sheik 407), I
Amphicarpaea bracteata (L.) Fernald; (Sheik 510), F
Baptisia tinctoria (L.) Ventenat; (Sheik 397), I
Cercis canadensis L. var. *canadensis*; (Sheik 83), A
Chamaecrista fasciculata (Michaux) Greene var. *fasciculata*; (Sheik 520), F
Chamaecrista nictitans (L.) Moench; (Sheik 496), F
Clitoria mariana L.; (Sheik 386), F
<u>*Desmodium nuttallii* (Schindler) Schubert</u>; (Sheik 512), F
Desmodium paniculatum (L.) Augustin de Candolle var. *paniculatum*; (Sheik 771), A
Galactia regularis (L.) Britton, Sterns & Poggenburg; (Sheik 732), F
?*Gleditsia triacanthos* L.; (Sheik 453, 777), F
**Kummerowia stipulacea* (Maximowicz) Makino; (Sheik 533), F
Lathyrus venosus Muhlenburg ex Willdenow; (Sheik 666), F
H**Lespedeza cuneata* (Dumont-Cours.) G. Don; (Sheik 519), A
Lespedeza procumbens Michaux; (Sheik 570), F
Lespedeza repens (L.) W. Barton; (Sheik 569, 709, 734), F
Lespedeza violacea (L.) Persoon; (Sheik 571, 733), F
Lespedeza virginica (L.) Britton; (Sheik 775), F
**Medicago lupulina* L.; (Sheik 140), I
**Melilotus albus* Medikus; (Sheik 313), F

**Melilotus officinalis* (L.) Pallas; (Sheik 321), F
Robinia pseudoacacia L.; (Sheik 187), F
L**Securigera varia* (L.) Lassen; (Sheik 231), F
Senna hebecarpa (Fernald) Irwin & Barneby; (Sheik 468, 746), I
**Trifolium arvense* L.; (Sheik 366), I
**Trifolium campestre* Schreber; (Sheik 220), A
**Trifolium hybridum* L.; (Sheik 240), A
**Trifolium pratense* L.; (Sheik 229), A
Vicia caroliniana Walter; (Sheik 100), F
Vicia sativa L. ssp. *nigra* (L.) Ehrhart; (Sheik 134), I
**Vicia villosa* Roth ssp. *varia* (Host) Corbière; (Sheik 195), A
M**Wisteria sinensis* (Sims) Augustin de Candolle; (Sheik 139), I

Fagaceae
Fagus grandifolia Ehrhart; (Sheik 615), F
Quercus alba L.; (Sheik 309, 543), A
Quercus coccinea Müenchhausen; (Sheik 663), A
Quercus marilandica Müenchhausen, var. *marilandica*; (Sheik 661), I
Quercus montana Willdenow; Sheik 606, 653, 708), A
Quercus rubra L.; (Sheik 580, 614, 674), A

Gentianaceae
Obolaria virginica L.; (Sheik 665) (Digital), I

Geraniaceae
**Erodium cicutarium* (L.) L'Héritier; (Sheik 640), I
**Geranium columbinum* L.; (Sheik 250) (Digital), F
Geranium maculatum L.; (Sheik 130, 642), F

Hamamelidaceae
Hamamelis virginiana L. var. *virginiana*; (Sheik 40, 616, 793), A

Hypericaceae
Hypericum mutilum L.; (Sheik 699, 779), I
**Hypericum perforatum* L.; (Sheik 369, 419), F
Hypericum prolificum L.; (Sheik 423, 599), I
Hypericum punctatum Lamarck; (Sheik 378), F
Hypericum stragulum P. Adams & N. Robson; (Sheik 440, 573), I

Juglandaceae
Carya glabra (P. Miller) Sweet; (Sheik 233 662), A
Carya ovata (P Miller) K. Koch; (Sheik 575), F
Carya tomentosa (Lamarck ex Poiret) Nuttall; (Sheik 509), F
Juglans nigra L.; (Sheik 592, 681), A

Lamiaceae
Agastache nepetoides (L.) Kuntze; (Sheik 527) (Digital), I
<u>Ajuga reptans</u> <u>L.</u>; (Sheik 142), F
**Chaiturus marrubiastrum* (L.) Reichenbach; (Sheik 489), I
Clinopodium vulgare L.; (Sheik 516, 531), F
Collinsonia canadensis L.; (Sheik 757), I
Cunila origanoides (L.) Britton; (Sheik 517), F
M**Glechoma hederacea* L.; (Sheik 45), A
Hedeoma pulegioides (L.) Persoon; (Sheik 498, 518, 776), F
**Lamium purpureum* L.; (Sheik 38), A
Lycopus americanus Muhlenberg ex W. Barton; (Sheik 442), I
**Mentha* × *piperita* L.; (Sheik 565), F
Monarda fistulosa L.; (Sheik 404, 457), F
**Nepeta cataria* L.; (Sheik 380), F
L**Perilla frutescens* (L.) Britton; (Sheik 526, 744), F
Prunella vulgaris L.; (Sheik 377), F
Pycnanthemum muticum (Michaux) Persoon; (Sheik 448), I
Pycnanthemum tenuifolium Schrader; (Sheik 362), I
Pycnanthemum virginianum (L.) T. Durand & B. D. Jackson ex B. L. Robinson & Fernald; (Sheik 466), A
Salvia lyrata L.; (Sheik 189), I
<u>*Scutellaria elliptica* Muhlenberg ex Sprengel var. *elliptica*</u>; (Sheik 325), I
Scutellaria integrifolia L.; (Sheik 391), I
Scutellaria lateriflora L.; (Sheik 725), I
<u>*Scutellaria ovata* Hill ssp. *rugosa* (Wood) Epling</u>; (Sheik 334, 472), F
Teucrium canadense L.; (Sheik 367, 409, 432), A

Lauraceae
Lindera benzoin (L.) Blume, (Sheik 54, 767), A
Sassafras albidum (Nuttall) Nees; (Sheik 395), F

Lythraceae
Cuphea viscosissima Jacquin; (Sheik 720) (Digital), I

Magnoliaceae
Liriodendron tulipifera L.; (Sheik 228), F

Malvaceae
Hibiscus laevis Allioni; (Sheik 730), I
Hibiscus moscheutos L.; (Sheik 729), I
**Hibiscus syriacus* L.; (Sheik 529), I
Tilia americana L. var. *heterophylla* (Ventenat) Loudon; (Sheik 485, 563), F

Menispermaceae
Menispermum canadense L.; (Sheik 243), F

Molluginaceae
**Mollugo verticillata* L.; (Sheik 505), A

Montiaceae
Claytonia virginica L.; (Sheik 46), A

Moraceae
**Broussonetia papyrifera* (L.) L'Héritier ex Ventenat; (Sheik 211), I
L**Morus alba* L.; (Sheik 673), F

Myricaceae
Morella cerifera (L.) Small; (Sheik 753), R

Oleaceae
**Forsythia suspensa* (Thunberg) Vahl; (Sheik 65), I
Fraxinus pennsylvanica Marshall; (Sheik 752), F
**Syringa vulgaris* L.; (Sheik 141), R

Onagraceae
Circaea canadensis (L.) Hill; (Sheik 350, 376), A
Epilobium coloratum Biehler; (Sheik 785), I
Ludwigia alternifolia L.; (Sheik 487), I
Ludwigia palustris (L.) Elliott; (Sheik 759), F
Oenothera biennis L.; (Sheik 722), I

Orobanchaceae
Conopholis americana (L.) Wallroth; (Sheik 136), F

Oxalidaceae
Oxalis dillenii Jacquin; (Sheik 123), F
Oxalis violacea L.; (Sheik 150), F

Papaveraceae
**Chelidonium majus* L.; (Sheik 155), I
Corydalis flavula (Rafinesque) Augustin de Candolle; (Sheik 57), F
Dicentra cucullaria (L.) Bernhardi; (Sheik 55, 622); A
**Papaver dubium* L.; (Sheik 643), I
Sanguinaria canadensis L.; (Sheik 49), F

Paulowniaceae
M**Paulownia tomentosa* (Thunberg) Siebold & Zuccarini ex Steudel; (Sheik 214), F

Phrymaceae
Mimulus alatus Aiton; (Sheik 452), I
Mimulus ringens L. var. *ringens*; (Sheik 454), I
Phryma leptostachya L.; (Sheik 490), I

Phyllanthaceae
<u>*Phyllanthus caroliniensis* Walter</u>; (Sheik 760), I

Phytolaccaceae
Phytolacca americana L. var. *americana*; (Sheik 323), I

Plantaginaceae
**Linaria vulgar*is P. Miller; (Sheik 385), I
Penstemon canescens (Britton) Britton; (Sheik 153, 170), F
?*Penstemon digitalis* Nuttall ex Sims; (Sheik 269), F
**Plantago lanceolata* L.; (Sheik 205, 339), A
<u>**Plantago major* L.</u>; (Sheik 523), F
Plantago rugelii Decaisne; (Sheik 358, 360, 605), F
Plantago virginica L.; (Sheik 305), F
M**Veronica hederifolia* L.; (Sheik 619, 628), A
?*Veronica officinalis* L.; (Sheik 263), A
**Veronica persica* Poiret; (Sheik 50), A
**Veronica serpyllifolia* L.; (Sheik 192), A

Platanaceae
Platanus occidentalis L.; (Sheik 262), F

Polemoniaceae
Phlox divaricata L.; (Sheik 262), F
Phlox subulata L.; (Sheik 114), I

Polygonaceae
Fallopia scandens (L.) Holub; (Sheik 568), F
Persicaria hydropiperoides (Michaux) Small; (Sheik 7, 451), A
M**Persicaria longiseta* (de Bruijn) Kitagawa; (Sheik 326), A
Persicaria pensylvanica (L.) M. Gómez; (Sheik 514, 762), F
Persicaria punctata (Elliott) Small; (Sheik 26, 470, 566), A
Persicaria sagittata (L.) Gross ex Nakai; (Sheik 711), I
Persicaria virginiana (L.) Gaertner; (Sheik 450), A
Polygonum tenue Michaux; (Sheik 774), F
<u>H**Reynoutria japonica* Houttuyn</u>; (Sheik 559), F
M**Rumex acetosella* L.; (Sheik 252, 308), F
<u>**Rumex conglomeratus* Murray</u>; (Sheik 274, 298, 330), A

L**Rumex crispus* L. ssp. *crispus*; (Sheik 182), F

Primulaceae
M**Lysimachia nummularia* L.; (Sheik 426), A
Lysimachia quadrifolia L.; (Sheik 266), F
Samolus parviflorus Rafinesque; (Sheik 456, 695), F
Steironema ciliatum (L.) Baudo; (Sheik 328, 413), F

Ranunculaceae
Actaea racemosa L.; (Sheik 331), F
Anemone lancifolia Pursh; (Sheik 658), F
Anemone virginiana L.; (Sheik 478), F
Aquilegia canadensis L.; (Sheik 107), F
Clematis virginiana L.; (Sheik 736), F
Ranunculus abortivus L.; (Sheik 77, 629), A
**Ranunculus bulbosus* L.; (Sheik 209, 357), A
Ranunculus hispidus Michaux; (Sheik 92, 647), A
Ranunculus recurvatus Poiret var. *recurvatus*; (Sheik 655), F
Thalictrum thalictroides (L.) A. J. Eames & B. Boivin; (Sheik 52), F

Rosaceae
Agrimonia parviflora Aiton; (Sheik 486), F
Amelanchier arborea (Michaux. f.) Fernald; (Sheik 56), F
Fragaria virginiana P. Miller; (Sheik 135), A
Geum canadense Jacquin; (Sheik 349, 411), F
Physocarpus opulifolius (L.) Maximowicz var. *opulifolius*; (Sheik 347), I
**Potentilla indica* (Andrews) T. Wolf; (Sheik 90), A
Potentilla simplex Michaux; (Sheik 79), A
**Prunus persica* (L.) Batsch; (Sheik 627), I
Prunus serotina Ehrhart var. *serotina*; (Sheik 193), I
M**Pyrus calleryana* Decaisne; (Sheik 59, 625), I
H**Rosa multiflora* Thunberg ex Murray; (Sheik 177, 436), A
**Rubus laciniatus* Willdenow; (Sheik 712), F
Rubus pensilvanicus Poiret; (Sheik 191, 417, 459), A
H**Rubus phoenicolasius* Maximowicz; (Sheik 408), A
Spiraea corymbosa Rafinesque; (Sheik 322), I

Rubiaceae
Cephalanthus occidentalis L.; (Sheik 702), I
Diodia virginiana L.; (Sheik 430), I
**Galium anglicum* Hudson; (Sheik 590, 694), F
Galium aparine L.; (Sheik 120), A
Galium circaezans Michaux; (Sheik 276, 282), A
Galium concinnum Torrey & A. Gray; (Sheik 333), A

**Galium pedemontanum* (Bellardi) Allioni; (Sheik 300), F
Houstonia caerulea L.; (*SHEIK* 174), A
Houstonia longifolia Gaertner; (Sheik 686), F
Houstonia tenuifolia Nuttall; (Sheik 261), A

Rutaceae
Ptelea trifoliata L. ssp. *trifoliata*; (Sheik 435, 704), A

Salicaceae
Populus deltoides Bartram ex Marshall; (Sheik 234), F
Salix nigra Marshall; (Sheik 723), F

Sapindaceae
Acer negundo L.; (Sheik 62, 126, 159), A
Acer rubrum L.; (Sheik 610), A
Acer saccharinum L.; (Sheik 80), F
Acer saccharum Marshall; (Sheik 295, 682), A

Saxifragaceae
Heuchera americana L.; (Sheik 203), A
Micranthes virginiensis (Michaux) Small; (Sheik 42, 620), F
Scrophularia marilandica L; (Sheik 465), I
**Verbascum blattaria* L; (Sheik 365), I
**Verbascum phlomoides* L; (Sheik 317), F

Solanaceae
**Datura stramonium* L.; (Sheik 591), I
Physalis longifolia Nuttall var. *subglabrata* (Mackenzie & Bush) Cronquist; (Sheik 525), I
Solanum carolinense L. var. *carolinense*; (Sheik 9), A
Solanum ptychanthum Dunal; (Sheik 554, 715), F

Staphyleaceae
Staphylea trifolia L.; (Sheik 530, 638), F

Ulmaceae
Ulmus rubra Muhlenberg; (Sheik 294), F

Urticaceae
Boehmeria cylindrica (L.) Swartz; (Sheik 449), A
Laportea canadensis (L.) Weddell; (Sheik 601), I
Pilea pumila (L.) A. Gray; (Sheik 789), F
Urtica gracilis Aiton; (Sheik 336), F

Verbenaceae
Phyla lanceolata (Michaux) Greene; (Sheik 421), F
Verbena urticifolia L.; (Sheik 410), F

Violaceae
Viola bicolor Pursh; (Sheik 76, 636), F
Viola eriocarpa Schweinitz; (Sheik 78), A
Viola palmata L.; (Sheik 139, 148), F
Viola pedata L.; (Sheik 97, 98), F
Viola septentrionalis Greene; (Sheik 145), F
Viola sororia Willdenow; (Sheik 63, 68, 84), A
Viola striata Aiton; (Sheik 119, 646), F

Vitaceae
Parthenocissus quinquefolia (L.) Planchon; (Sheik 556, 700), A
Vitis vulpina L.; (Sheik 291), F

ANGIOSPERMS: MONOCOTS

Amaryllidaceae
**Allium vineale* L.; (Sheik 320), F
**Narcissus × incomparabilis* P. Miller (pro sp.); (Sheik 158), I
**Narcissus pseudonarcissus* L.; (Sheik 66), F

Araceae
Lemna minor L.; (Sheik 351), A
Lemna perpusilla Torrey; (Sheik 617), F

Asparagaceae
Maianthemum racemosom (L.) Link ssp. *racemosum*; (Sheik 164), I
**Muscari botryoides* (L.) P. Miller; (Sheik 117), I
**Ornithogalum umbellatum* L.; (Sheik 179), I
Polygonatum biflorum (Walter) Elliott var. *biflorum*; (Sheik 198), F

Asphodelaceae
**Hemerocallis fulva* (L.) L.; (Sheik 370), I

Colchicaceae
Uvularia perfoliata L.; (Sheik 707), F

Commelinaceae
L**Commelina communis* L.; (Sheik 439), F
**Commelina diffusa* Burman f.; (Sheik 787), I
Commelina erecta L.; (Sheik 447), F

Tradescantia virginiana L.; (Sheik 105), A

Cyperaceae
Carex amphibola Steudel; (Sheik 180, 235), F
Carex blanda Dewey; (Sheik 190), F
Carex cephalophora Muhlenberg ex Willdenow; (Sheik 668), A
Carex frankii Kunth; (Sheik 428), F
Carex glaucodea Tuckerman ex Olney; (Sheik 685), F
Carex hirsutella Mackenzie; (Sheik 169, 248, 678), A
Carex laevivaginata (Kükenthal) Mackenzie; (Sheik 670), F
Carex lupulina Muhlenberg ex Willdenow; (Sheik 731), A
Carex pensylvanica Lamarck; (Sheik 53), F
Carex platyphylla Carey; (Sheik 676), A
Carex prasina Wahlenberg; (Sheik 657), F
Carex radiata (Wahlenberg) Small; (Sheik 237, 244), A
Carex shortiana Dewey; (Sheik 683), F
Carex suberecta (Olney) Britton; (Sheik 225), F
Carex typhina Michaux; (Sheik 311, 758), A
Carex vulpinoidea Michaux; (Sheik 303, 679), A
**Cyperus brevifolioides* Thieret & Delahoussaye; (Sheik 770), A
Cyperus hortensis (Salzmann ex Steudel) Dorr; (Sheik 748), I
Cyperus lancastriensis Porter ex A. Gray; (Sheik 714), F
Cyperus odoratus L. var. *odoratus*; (Sheik 747), F
Cyperus strigosus L.; (Sheik 4, 751), A
Schoenoplectus pungens (Vahl) Palla var. *pungens*; (Sheik 745), I
Scirpus cyperinus (L.) Kunth; (Sheik 441, 588), F
Scirpus georgianus R. M. Harper; (Sheik 296, 388), F
Scirpus pendulus Muhlenberg; (Sheik 297, 692), F

Dioscoreaceae
Dioscorea villosa L.; (Sheik 172), F

Hydrocharitaceae
Elodea canadensis Michaux; (Sheik 727), I
Vallisneria americana Michaux; (Sheik 726), A

Hypoxidaceae
Hypoxis hirsuta (L.) Coville; (Sheik 200), F

Iridaceae
Iris verna L. var. *smalliana* Fernald ex M. E. Edwards; (Sheik 149), I
Sisyrinchium angustifolium P. Miller; (Sheik 218), F

Juncaceae

Juncus dichotomus Elliott; (Sheik 257, 345, 691), A
Juncus effusus L. ssp. _solutus_ (Fernald & Wiegand) Hämet-Ahti; (Sheik 299, 680), F
Luzula multiflora (Ehrhart) Lejeune; (Sheik 201), F

Melanthiaceae
Trillium sessile L.; (Sheik 101), A

Orchidaceae
Aplectrum hyemale (Muhlenberg ex Willdenow) Torrey; (Sheik 267) (Digital), I
Cypripedium acaule (Aiton), (Sheik 146) (Digital), R
Goodyera pubescens (Willdenow) R. Brown; (Sheik 717) (Digital), I
Spiranthes lacera (Rafinesque) Rafinesque var. _gracilis_ (Bigelow) Luer; (Sheik 462) (Digital), R

Poaceae
M*_Agrostis capillaris_ L.; (Sheik 389), A
*_Alopecurus pratensis_ L.; (Sheik 210), A
Andropogon gerardi Vitman; (Sheik 578), A
Andropogon virginicus L. var. _virginicus_; (Sheik 597), A
*_Anthoxanthum odoratum_ L.; (Sheik 109, 124, 219), A
M*_Arthraxon hispidus_ (Thunberg) Makino var. _hispidus_; (Sheik 21, 555), A
Avenella flexuosa (L.) Drejer; (Sheik 230, 277), A
*_Bromus inermis_ Leysser; (Sheik 422), F
*_Bromus japonicus_ Thunberg; (Sheik 222), A
Bromus pubescens Muhlenberg ex Willdenow; (Sheik 398), I
*_Bromus racemosus_ L.; (Sheik 223), F
*_Bromus sterilis_ L.; (Sheik 204, 245), A
Chasmanthium latifolium (Michaux) Yates; (Sheik 401), F
Coleataenia anceps (Michaux) Soreng ssp. _anceps_; (Sheik 500), F
*_Cynodon dactylon_ (L.) Persoon; (Sheik 344, 508), A
*_Dactylis glomerata_ L.; (Sheik 206, 212), A
Danthonia spicata (L.) Palisot de Beauvois ex Roemer & J. A. Schultes; (Sheik 246), A
Dichanthelium boscii (Poiret) Gould & Clark; (Sheik 247), F
Dichanthelium commutatum (Schultes) Gould var. _commutatum_; (Sheik 197, 280), A
Dichanthelium linearifolium (Scribner) Gould; (Sheik 264), F
Dichanthelium sphaerocarpon (Elliott) Gould; (Sheik 356), F
Digitaria ciliaris (Retzius) Köler; (Sheik 506), A
*_Echinochloa crusgalli_ (L.) Palisot de Beauvois var. _crusgalli_; (Sheik 495), F
Echinochloa muricata (Palisot de Beauvois) Fernald var. _microstachya_ Wiegand; (Sheik 584), F
Echinochloa muricata (Palisot de Beauvois) Fernald var. _muricata_; (Sheik 750), F
Elymus hystrix L. var. _hystrix_; (Sheik 329), F
Elymus macgregorii R. Brooks & J. J. N. Campbell; (Sheik 283, 383), F
Elymus riparius Wiegand; (Sheik 23), A

Elymus villosus Muhlenberg ex Willdenow; (Sheik 400), F
Eragrostis capillaris (L.) Nees; (Sheik 420), F
Eragrostis hypnoides (Lamarck) Britton, Sterns & Poggenburg; (Sheik 749), F
Festuca subverticillata (Persoon) Alexeev; (Sheik 199, 236, 281), A
M**Holcus lanatus* L.; (Sheik 188), F
**Lolium arundinaceum* (Schreber) Darbyshire; (Sheik 208, 215, 221, 241, 379), A
**Lolium perenne* L. var. *aristatum* Willdenow; (Sheik 286), F
H**Microstegium vimineum* (Trinius) A. Camus; (Sheik 3, 24, 547), A
Muhlenbergia frondosa (Poiret) Fernald; (Sheik 567), A
Panicum virgatum L. var. *virgatum*; (Sheik 445), A
Paspalum floridanum Michaux; (Sheik 10, 511), A
?*Phalaris arundinacea* L.; (Sheik 232, 381), A
L**Phleum pratense* L.; (Sheik 341), F
**Poa annua* L.; (Sheik 131), A
M**Poa compressa* L.; (Sheik 304, 394), A
Poa cuspidata Nuttall; (Sheik 51, 133), A
Poa sylvestris A. Gray; (Sheik 111, 151, 207, 216), A
**Setaria faberi* R. A. W. Herrmann; (Sheik 503), F
Setaria parviflora (Poiret) Kerguélen; (Sheik 20), A
**Setaria pumila* (Poiret) Roemer & Schultes ssp. *pumila*; (Sheik 33, 393, 501), A
Sorghastrum nutans (L.) Nash; (Sheik 467), F
H**Sorghum halepense* (L.) Persoon; (Sheik 382, 444, 473), A
Sphenopholis nitida (Biehler) Scribner; (Sheik 185), A
Tridens flavus (L.) A. S. Hitchcock; (Sheik 22), A
Tripsacum dactyloides (L.) L.; (Sheik 443), A

Pontederiaceae
Heteranthera dubia (Jacquin) MacMillan; (Sheik 455), F

Potamogetonaceae
Stuckenia pectinata (L.) C. Börner; (Sheik 768), F

Smilacaceae
Smilax hispida Rafinesque; (Sheik 363, 479), A
Smilax rotundifolia L.; (Sheik 476), A

Typhaceae
Typha × glauca Godron (pro sp.); (Sheik 706), I
Typha latifolia L.; (Sheik 794), I

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BIOGRAPHY

Matthew Sheik graduated from Shady Spring High School, Shady Spring, West Virginia in 2016. He received his Bachelor of Biology from West Virginia University in 2020. His introduction to botanical research started in the Gillespie lab as a sophomore where he conducted systematic research producing microsatellite markers for Labrador Tea *Rhododendron groenlandicum* (Oeder) Kron & Judd. During the Summer of 2018 he participated in a National Science Foundation Research Experience for Undergraduates where he was first introduced to herbaria and floristic research by Dr. Allan Nelson in Stephenville, Texas. Following that Summer, he pursued a work study position as a herbarium assistant at the West Virginia University herbarium under Dr. Donna Ford-Werntz. He conducted an independent study with Dr. Ford-Werntz to study plant taxonomy and covered a plethora of monocot and dicot families his Senior year. This set the stage to pursue a master's degree already with the idea of a floristic checklist project as his thesis.