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Oklahoma County Flora:
Plant surveys and Floristic Quality Assessment

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ABSTRACT:

Plant surveys were conducted at Arcadia Lake and Belle Isle on the Deep Fork River (BIDFR) in Oklahoma County, Oklahoma. The plant survey data was used to perform a Floristic Quality Assessment (FQA) at both sites. Based on an area's floristic composition, FQA produces a numerical value that quantifies how much or little environmental degradation has occurred. Arcadia Lake had a Mean C of 3.8 and FQI of 66.5, and Belle Isle at the Deep Fork River had a Mean C of 3.2 and 30.9 FQI. The FQA for Arcadia Lake indicates an ecosystem that is more intact with fewer anthropogenic stressors. In contrast, the FQA for BIDFR indicates an ecosystem in peril from anthropogenic stressors. FQA is a crucial tool for communicating to a broad audience what natural areas to prioritize for conservation. This study aimed to assess the ecological integrity of these sites and provide a baseline model for future FQA use in Oklahoma.

OKLAHOMA COUNTY FLORA:
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CHAPTER 1: INTRODUCTION AND SUMMARY OF RESEARCH

INTRODUCTION

An area's floristic composition and the corresponding ecological niche give insight into one of the most pressing questions–how to manage ecosystems. Deciding what land to prioritize for conservation is paramount for preserving biodiversity. Of the 342,953 accepted vascular plant species on Earth, scientists estimate that 45% are at risk of extinction (Govaertz 2023; POWO 2024). The biggest threat to biodiversity is land use change, also known as anthropogenic change, resulting from agriculture, urbanization, and deforestation (IPBES 2019). Land use change affects biodiversity through altering ecosystem drivers such as climate, soil, hydrology, and disturbance regimes. Out of these drivers, ecosystem management is mostly about the management of disturbance–due to the feasibility at the landscape scale (Anderson 2022). Disturbances fall into two categories: natural disturbance and anthropogenic disturbance. Natural disturbance removes biomass, and anthropogenic disturbance limits the production of biomass (Grimes 1977; Calderon-Aguilera et al. 2012; Anderson 2022). The rate at which biomass is being limited by deforestation, large-scale agriculture, and urbanization, as well as the overall stress that these factors have on the environment, are deciding factors in defining anthropogenic disturbance.

To maintain biodiversity and ecosystem health, methodologies are needed to identify, prioritize, and manage habitats for conservation. The first step in conservation biology is to study the land's inhabitants, i.e., conduct an organismal study. The next step is to use the data to convey the ecological integrity and importance of the land. Studying the inhabitants of the land underpins how we understand ecological integrity, which is an ecosystem's composition, structure, and function (Andreasen et al. 2001; Dale & Beyeler 2001; Wurtzebach & Schultz 2016). Composition refers to species, populations, and communities (Noss 1990; Niemi & McDonald 2004). Ecosystem structure includes physical aspects of the landscape: topography, light availability, habitat physiognomy, moisture, and geology. Function includes interactions between organisms, natural disturbance regimes, and biological processes (Dale & Beyeler 2001; Wurtzebach & Schultz 2016). Simply put, ecological integrity is a framework for understanding how intact an ecosystem is. This framework refers to a system of wholeness that includes species, populations, communities, environmental conditions, and ecological processes to create system-level indicators that inform land management and conservation (Karr, 1991; Angermeier & Karr 1994; Wohl 2019). The various life forms in this system of wholeness have coevolved for thousands of years to create a vast network of associations and interrelatedness.

Reference points or benchmarks are needed to assess and evaluate ecological integrity. A common reference point is the Historic Range of Variation (HRV). Using Potential Natural Vegetation Types (PNVT), HRV describes the condition of natural areas prior to large-scale human changes to the environment (Kuchler 1964; Cissel et al. 1994; Morgan et al. 1994; Shcussman & Smith 2006; Wohl 2019). The system's current state in relation to the past guides HRV theory (Morgan et al. 2008). PNVT describes the potential floristic community in an ecosystem when natural disturbance regimes and biological processes prevail. PNVT share common composition, structure, and function, such as geography, vegetation, and historic disturbance processes like fire, drought, and herbivory (Shcussman & Smith 2006). Great Plains Grassland, Spruce-fir forest, or sub-alpine grassland are all types of PNVT.

The time period that frames the onset of large-scale human changes to the environment in North America varies from location to location but is predominantly characterized by European settlement (Wilhelm & Masters 1995; Shcussman & Smith 2006). In the midwestern United States, the mid-19th century is a focal point that marks the onset of the anthropogenic disturbance period, or post-Eurosettlement period (Shcussman & Smith 2006). This period is characterized by: deforestation, railroad construction, river damming, fire suppression, large-scale species die-offs, livestock grazing, fence building, and canal construction. Thus, the pre-Eurosettlement period is the reference point for comparing our current ecological condition. The challenge then becomes how we measure the current state of a natural area relative to its evolutionary past or the current anthropogenic disturbance period relative to the pre-Eurosettlement era.

Various methods have been created and used to measure ecological conditions, notably biodiversity indices and bioindicator studies. In both methods, megafauna or megaflora are studied due to relative ease of identification, public interest, and relatively large numbers of species with known associations (Niemi & Mcdonald 2004). Biodiversity indices like the Shannon and Wiener Index (Shannon & Weaver 1949) and Sørensen–Dice coefficient (Dice 1945; Sørensen 1948) compare community composition, such as species richness, evenness, and abundance.

Bioindicator studies utilize one or numerous species to indicate general environmental conditions or stress-response relationships (Niemi & Mcdonald 2004). These methods are then applied to other species with similar ecological requirements. Bioindicator studies are used to study the effects of anthropogenic stressors and, most specifically, anthropogenic environmental contamination. Examples of bioindicator studies include: studying heavy metal concentrations in the tissues of marine limpet (aquatic snails) to gauge heavy metal contamination in seawater (Pérez-López & Alonso-Díaz et al. 2003), using ant species richness and composition to gauge restoration success in mining sites (Majer & Day 1984; Anderson et al. 2002), or using *Zizania palustris's* (northern wild rice) sensitivity to sulfate and sulfide pollution (from extraction and manufacturing industries) as a barometer to study water quality (Sinbuathong & Khaodhiar et al. 2007; Pastor et al. 2017).

Bioindicators and biodiversity indices are widely used and accepted tools for measuring environmental quality. However, they are limited in efficiently assessing the overall quality of natural areas and do not offer clear paths for obtaining restoration monitoring data. Biodiversity indices are mostly used to compare one site to another and thus do not incorporate HRV. Bioindicator research usually focuses on one species and requires intense monitoring, expensive equipment, and lab capabilities. Therefore, a better method is needed to communicate ecological integrity.

Gerould Wilhelm (1977) developed a method that combines aspects of biodiversity indices, bioindicator research, and management tracking data within an HRV framework to create a concise method for assessing and evaluating natural areas. This method is termed Floristic Quality Assessment (FQA). The early iterations of FQA came to fruition in 1971 while Wilhelm was on assignment in the US Army to develop “a formula for the ecology” of the Chicago Sanitary and Ship Canal (CSSC) (Diblik 2021). Wilhelm was tasked to evaluate 50 potential “spoil” sites to dump overburden from the CSSC's dredging (Diblik 2021). Being new to environmental science, Wilhelm collaborated with Chicago area botanists Floyd Swink and Ray Schulenberg to evaluate the 50 sites. Out of the 50 sites, Schulenberg advised Wilhelm that one site had remnant quality and was thus worthy of conservation. Nonetheless, Wilhelm's superiors needed a formula describing the ecological condition of each site, which eventually led to the creation of FQA (Swink & Wilhelm 1994).

FQA has evolved over the years, but the main principle of species conservatism has remained. Species conservatism is defined as a species' fidelity or faithfulness to a remnant or pre-Eurosettlement condition (Wilhelm & Ladd 1988; Herman et al. 2001; Rocchio & Crawford 2001; Ladd & Thomas 2015). Before applying the FQA metrics, a plant survey inventorying all vascular plant species must be completed. The inventory can be conducted on a transect, quadrant, or entire study area (Rocchio & Crawford 2013). Various plant survey methods exist, but a floristic inventory is the most conclusive type.

A floristic inventory includes creating plant vouchers for all observed plants. Plant vouchers consist of harvesting a plant, pressing it, identifying it, labeling it, mounting it on herbarium archive paper, and archiving it in a herbarium. Plant vouchers can be verified for correct identification, threatened or rare species, and county records. Other less time-consuming inventories can be made by field identification, logging observations in field notebooks, or documenting observations via photographs. However, by photograph or field identification, even a trained botanist will likely have problems identifying many plants to the species level in the Poaceae, Cyperaceae, and Juncaceae families.

Once a thorough inventory is complete, C values are assigned to plant species based on species conservatism or their fidelity to remnant habitats. Species conservatism is expressed as a numerical value between 0 - 10, called the C value (Miller & Wardrop 2005). The C value is an estimated probability that a species will likely occur in a remnant ecosystem (Herman et al. 2001; Rocchio & Crawford 2013). The most conservative species have a C value of 10 and are only found in remnant natural areas while the least conservative species have a C value of zero and are found in highly degraded areas or are non-native.

When the species list with corresponding C values is complete, FQA metrics can be utilized to assess the ecological condition. Two main calculated parameters are used with FQA analyses: Mean C ($\bar{c}$) and Floristic Quality Index (FQI). $\bar{c}$ is calculated by averaging all of the native species' C values from a study site. A higher $\bar{c}$ represents an area with fewer anthropogenic disturbances and is thus more likely to resemble a remnant ecosystem. In contrast, a lower $\bar{c}$ represents an area with more anthropogenic stressors resulting in more invasives and non-native flora. FQI is calculated by multiplying the $\bar{c}$ by the square root of the number of native species observed. FQI combines quality and species richness, which is useful when comparing FQA scores between varying study site sizes (Ladd & Thomas 2015).

For this research, I conducted two plant surveys in Oklahoma County: Arcadia Lake and Belle Isle at the Deep Fork River. Local botanists collectively determined C values and used some C values from surrounding states. The plant inventories and corresponding C values were uploaded to the Universal FQA Calculator to produce the FQA results.

Like many places, Oklahoma has gaps in its botanical knowledge. Oklahoma County has had two floristic inventories (Waterfall 1942; Caddell et al. 2017) and no substantial floristic-based ecological integrity assessments. For the entire state, there has only been one FQA (Ewing & Hoagland 2012).

Oklahoma County was chosen for a floristic study to fill the gaps in botanical knowledge and study the effects of anthropogenic stress on the most densely populated county in the state. This research aims to guide land use decisions and provide baseline floristic data for long-term monitoring and restoration.

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CHAPTER 2: A FLORISTIC INVENTORY AND PLANT SURVEY ON THE NORTH SIDE OF ARCADIA LAKE IN EDMOND, OKLAHOMA

This chapter has been formatted for submission to the Oklahoma Native Plant Record.

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ABSTRACT

A floristic inventory and plant survey were conducted on the north side of Arcadia Lake in Edmond, Oklahoma. This study aimed to collect herbarium vouchers and document all vascular plant species in the study area. Fieldwork and plant voucher preparation were conducted from April 2022 to July 2023. The survey documented 368 plant species representing 75 plant families and 235 genera. 199 plants were collected, and their corresponding voucher were deposited at the University of Central Oklahoma Herbarium (CSU). 55 plant species were not collected, but they were observed and uploaded on iNaturalist. 115 plant species found in the study site were observed on iNaturalist and verified by the authors of this paper. The Oklahoma Natural Heritage Inventory tracked one plant species, and twelve Oklahoma County records were observed. Eighty-three percent of observed species were native, while seventeen percent were non-native.

INTRODUCTION AND STUDY AREA

Arcadia Lake is in northeastern Oklahoma County, six miles east of Edmond, Oklahoma. The county is centrally located in the state and includes the county seat, Oklahoma City, and nineteen other cities. Arcadia Lake is a human-made reservoir constructed in 1984 to supply the city of Edmond with water, control flooding, and provide outdoor recreation for the surrounding communities. This land is a mixture of five different Edmond city parks, Edmond's municipal water facilities, and the University of Central Oklahoma Boathouse. The lake has approximately 26 miles of shoreline and 736 ha of surface area (U.S. Army Corps of Engineers 2024). Approximately 1,560 ha of recreational land surrounds the lake (Figure 1). The north side study site is approximately 274 ha, between E 2nd St on the north side, the lake shore to the south, N Air Depot Blvd on the west, and N Post Rd on the east (Figure 2). The study site ranges between the latitude 35.652685 and 35.644860 and longitude -97.407465 and -97.35392.

Arcadia Lake is within the Cross Timbers Ecoregion, which stretches from north-central Texas through central Oklahoma to its northern reaches in southern Kansas (Figure 3). The Cross Timbers is over 4.8 million hectares, approximately half of it in Oklahoma (Küchler 1964, Thomas & Hoagland 2011). The Cross Timbers is a mixture of diverse habitats: forest, savanna, grassland, and wetland. The predominant tree species are *Quercus stellata* Wangenh. (post oak) and *Quercus marilandica* Münchh. (blackjack oak) (Duck & Fletcher 1945). Arcadia Lake falls within the temperate humid subtropical climate zone. This climate zone is characterized by hot and humid summers and cool to mild winters (Köppen 1936). Oklahoma County's average annual climate statistics include a growing season of 213 days, 92.4 cm of rainfall, a temperature of 15.5 °C, the last spring freeze is April 4th, the first fall freeze is November 2, 17.5 cm of snowfall, and a wind speed of 12.8 kph. The record high temperature is 45 °C, and the record low is - 26 °C. The latest recorded freeze date is April 20, and the earliest is October 21 (Oklahoma Climatological Survey 2000; Mesonet 2022).

METHODS

Fieldwork was conducted from April 5th, 2022 - July 24th, 2023. Twenty-nine site visits were made during this time. Site visit frequency was determined by the likelihood of flowering plants being more abundant. Temperature and rainfall were also deciding factors in determining site visit frequency. Two transects were designed to cover as many habitat types as possible to observe and collect as many species as possible. Transect 1 was 2.082 km, and Transect 2 was 1.718 km (Figure 2). Most plants were collected along the two transects, but some were collected in the broader study area. In most cases, plants were collected while flowering and documented with an iPhone 11 camera to be posted on iNaturalist. Plants not abundant (< 10) were not collected but photographed. After each site visit, specimens were pressed in a plant press and dried in a drying cabinet. An iNaturalist project, Flora of Arcadia Lake, was created for the entirety of Arcadia Lake. The project boundary encircled the lake 250 m from the shore (Figure 1). Plant species not observed during the fieldwork but found on the iNaturalist app (within the study area) were added to the overall plant species count. Only species that could be confidently identified through the image uploaded on iNaturalist were added to the species list.

Specimens were identified using the *Flora of Oklahoma: Keys and Descriptions* (2023 and 2024 editions) and *Illustrated Flora of North Central Texas* (2000), After identification, the corresponding iNaturalist post was updated with the correct genus and species. The USDA Plants Database (2024) was used to determine nativity, duration, and growth habit. Nomenclature and classification follow the Integrated Taxonomic Information System. All vouchers were deposited at the University of Central Oklahoma Herbarium (CSU).

RESULTS AND DISCUSSION

A total of 368 plant species representing 75 plant families and 235 genera were observed and documented on the north side of Arcadia Lake (Appendix A). 199 plant species were collected, identified, and vouchered, 55 were documented via iNaturalist, and the remaining 115 were observed by iNaturalist users. Two of these plants were not collected due to low abundance (<10 individuals): *Agalinis heterophylla* (Nutt.) Small (prairie false foxglove) and *Hypericum hypericoides* (L.) Crantz (St. Andrew's cross). Plant duration statistics include 152 annuals (41.3%), 201 perennials (54.6%), and 15 biennials (4.1%). The growth habits statistics were 266 forbs (72.3%), 30 grasses (8.2%), 13 shrubs (3.5%), 12 sedges (3.3%), five rushes (1.4%), 10 vines (2.7%), and three ferns (0.8 %). The most prominent plant families observed were Asteraceae 75 (20.4%), Fabaceae 30 (8.2%), and Poaceae 32 (8.7%). Plant families with the most non-native species were Asteraceae, Poaceae, Brassicaceae, Caryophyllaceae, and Fabaceae. Eighty-three percent (306) of the total species were native, while seventeen percent (62) were non-native. The 368 vascular plant species observed on the north side of Arcadia Lake constitute 14% of the 2,657 vascular plant species found in Oklahoma (Fishbein et al. 2024).

The current Arcadia inventory had the greatest species richness compared to four other plant inventories in the region (Table 1). This might be due to utilizing iNaturalist observations or the large study site size with varying habitats. The four nearest inventories were found in Oklahoma, Cleveland, Canadian, and Mcclain counties. Twelve county records were collected: *Myosotis macrosperma* Engelm., *Samolus valerandi* L., *Scleranthus annuus* L., *Trepocarpus aethusae* Nutt. ex DC., *Erigeron modestus* A. Gray, *Facelis retusa* (Lam.) Sch. Bip., *Juncus acuminatus* Michx., *Lolium multiflorum* Lam., *Carex crus-corvi* Shuttlew. ex Kunze, *Carex lurida* Wahlenb, and *Eragrostis sessilispica* Buckley (Figures 4 & 5). One county record was not collected but observed on iNaturalist, *Dalea multiflora* (Nutt.) Shinners (Figure 6). Three of these county records are non-native, *Scleranthus annuus, Lolium multiflorum*, and *Facelis retusa*. One species tracked by the Oklahoma Natural Heritage Inventory (ONHI) was observed: *Mimulus ringens* L. (Allegheny monkeyflower) (Figure 6). *Mimulus ringens* has a state conservation status of SH and a global conservation status of G5. The Oklahoma Natural Heritage Inventory lists *Mimulus ringens* as possibly extirpated. Prior to this research, *Mimulus ringens* had been documented twice in Oklahoma County in 1940 and 1941 and seven times in all of Oklahoma, the last time being in 1988 (TORCH 2024). According to iNaturalist (2024), *M. ringens* has had zero observations in Oklahoma. Three county records, *Trepocarpus aethusae*, *Carex lurida,* and *Juncus acuminatus*, were observed near a stream flowing into the lake surrounded by a natural wetland area (Figure 4). Many wild waterways within Oklahoma County have been decimated due to urban infrastructure projects, so no prior records of these taxa could likely result from low species abundance due to habitat loss.

Like many natural areas, Arcadia Lake is constantly threatened by development projects. Previous projects and developments have occurred across the lake, including a water treatment facility, home construction, recreation buildings, and widening walking and biking trails. In 2022, the City of Edmond signed a deal with LandPlan Consultants to develop a master plan for development projects on Arcadia Lake. Development projects could be as simple as maintaining and building new trails or as big as building a marina, resort, restaurants, hotels, floating cabins, or a new RV park (Tomlinson 2022). It’s up to citizens, land managers, the City of Edmond, conservation organizations, scientists, and the business community, to decide how to manage Arcadia Lake. With 306 native vascular plant species, twelve county records, and one plant species tracked by ONHI, Arcadia Lake is a natural area worth protecting.

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Study Site	County	Reference	Size of site	Number of Taxa	Percent non-native
Arcadia Lake	Oklahoma	Friedman & Messick 2024a	274 ha	368	17%
E.C. Hafer Park	Oklahoma	Caddell & Christoffer et al. 2017	49 ha	270	22.2%
John W. Nichols Scout Ranch	Canadian	Crosswhite & Ryburn 2019	150 ha	152	13.6%
University of Oklahoma's Kessler Atmospheric and Ecological Field Station	Mcclain	Hoagland & Buthod 2016	146 ha	361	14.7%
Belle Isle at the Deep Fork River (plant survey)	Oklahoma	Friedman & Messick 2024b	83 ha	135	31.8%

Table 1. The four closest plant inventories to the Arcadia Lake study site.

FIGURES

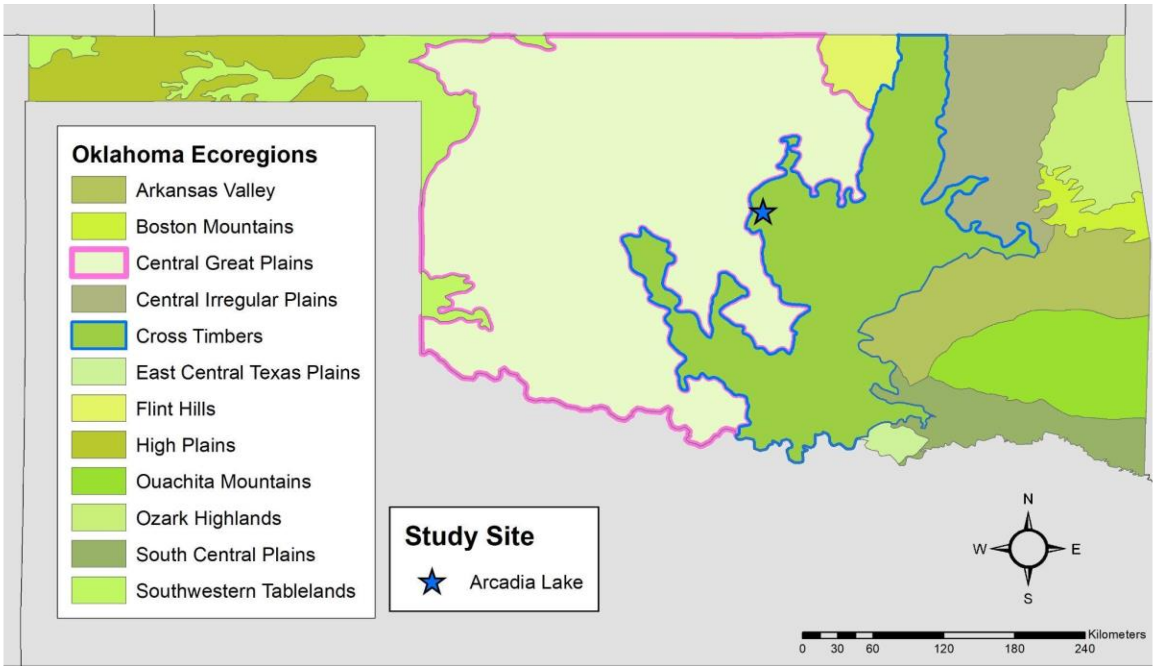

Figure 1. Oklahoma ecoregions and Arcadia Lake study site.

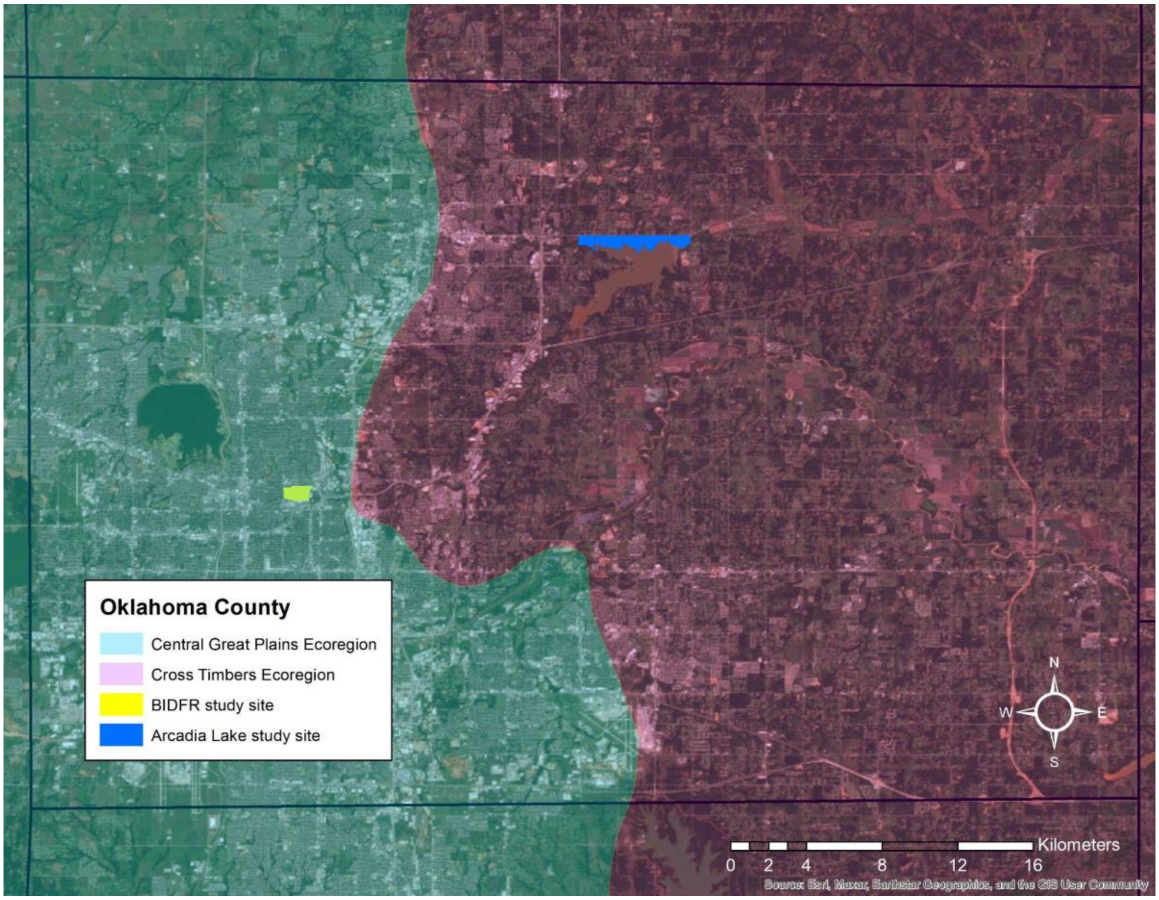

Figure 2. Oklahoma County ecoregions and study sites.

Figure 3. Arcadia Lake study site with transects.

Figure 4. Wetland area where three county record native plant species were collected, 35.649748, -97.376541.

Figure 5. Oklahoma County records, a: *Scleranthus annuus* L., b: *Erigeron modestus* A. Gray, c: *Facelis retusa* (Lam.) Sch. Bip., d: *Trepocarpus aethusae* Nutt. ex DC., e: *Juncus acuminatus* Michx., f: *Lolium multiflorum* Lam..

Figure 6. Oklahoma County records, a: *Myosotis macrosperma* Engelm., b: *Carex lurida* Wahlenb, c: *Eragrostis sessilispica* Buckley, d: *Carex crus-corvi* Shuttlew. Ex Kunz., e: *Samolus valerandi* L., f: *Dalea multiflora* (Nutt.) Shinners. *D. multiflora* photo taken by @sjcyoung 2019.

Figure 7. *Mimulus ringens* L., listed by the ONHI as possibly extirpated in Oklahoma (2024).

APPENDIX A.
List of vascular plant taxa from Arcadia Lake, Oklahoma County, Oklahoma.
Taxa list with duration, growth habit, collection number, nativity, and heritage status.

* denotes exotic taxa. † denotes taxa tracked by the Oklahoma Natural Heritage Inventory. Duration is denoted by A = Annual, P = Perennial, and B = Biennial. Growth habit is denoted by: F = forb, FN = fern, S = shrub, V = vine, S = sedge, and R = rush.
NC denotes a plant that was not collected.
iNat denotes a plant not observed by the authors but posted on iNaturalist and observed within the northside study area.
Nativity, duration, and growth habit were determined using the USDA Plants Database (USDA 2024). Voucher specimens were deposited at the University of Central Oklahoma Herbarium (CSU).

Acanthaceae
Ruellia humilis Nutt. (hairy ruellia); P; F; 571

Amaranthaceae
Amaranthus arenicola I.M. Johnst. (sand amaranth); A; F; 0
**Chenopodium album* L. (common lambsquarters); A; F; 0
Chenopodium pratericola Rydb. (desert goosefoot); A; F; 470
Froelichia gracilis (Hook.) Moq. (slender snakecotton); A; F; 416
Allium canadense L. (Canadian meadow garlic); P; F; 556
**Allium vineale* L. (wild garlic); P; F; 0
Nothoscordum bivalve (L.) Britton (crowpoison); P; F; 498

Anacardiaceae
**Pistacia chinensis* Bunge (Chinese pistache); P; T; iNat
Rhus copallinum L. (shining sumac); P; S; iNat
Rhus glabra L. (smooth sumac); P; S; 594
Toxicodendron pubescens Mill. (Atlantic poison oak); P; F; 0
Toxicodendron radicans (L.) Kuntze (eastern poison ivy); P; F; 0

Apiaceae
Chaerophyllum procumbens (L.) Crantz (spreading chervil); A; F; iNat
Chaerophyllum tainturieri Hook. (hairyfruit chervil); A; F; 529
**Conium maculatum* L. (poison hemlock); B; F; 585
Daucus pusillus Michx. (American wild carrot); A; F; 566
Polytaenia nuttallii DC. (prairie parsley); B; F; 545
Sanicula canadensis L. (black snakeroot); B; F; 591
Trepocarpus aethusae Nutt. ex DC. (whitenymph); A; F; 599

Apocynaceae
Asclepias tuberosa L. (butterfly milkweed); P; F; 588
Asclepias verticillata L. (whorled milkweed); P; F; iNat

Asclepias viridiflora Raf. (green comet milkweed); P; F; 617
Asclepias viridis Walter (green antelopehorns); P; F; 0
**Vinca major* L. (greater periwinkle); P; F; iNat

Aquifoliaceae
Ilex vomitoria Aiton (yaupon Holly); P; S; iNat

Araliaceae
**Hedera helix* L. (common ivy); P; V; iNat
Hydrocotyle verticillata Thunb. (whorled pennywort); P; F; 435

Asparagaceae
Androstephium coeruleum (Scheele) Greene (funnel-flower); P; F; iNat
**Ornithogalum umbellatum* L. (common star-of-Bethlehem); P; F; iNat
Yucca arkansana Trel. (Arkansas Yucca); P; F; iNat
Yucca glauca Nutt. (Great Plains yucca); P; F; 0
Asplenium platyneuron (L.) Britton, Sterns & Poggenb. (ebony spleenwort); P; FN; 542

Asteraceae
Achillea millefolium L. (common yarrow); P; F; 561
Ageratina altissima (L.) King & H. Rob. (white snakeroot); P; F; 0
Ambrosia bidentata Michx. (lanceleaf ragweed); A; F; 593
Ambrosia psilostachya DC. (western ragweed); A; F; 471
Ambrosia trifida L. (giant ragweed); A; F; 474
Amphiachyris dracunculoides (DC.) Nutt. (prairie broomweed); A; F; 0
Antennaria neglecta Greene (field pussytoes); P; F; iNat
Antennaria parlinii Fernald (Parlin's pussytoes); P; F; iNat
Antennaria plantaginifolia (L.) Richardson (plantain-leaved pussytoes); P; F; 539
Artemisia ludoviciana Nutt. (silver wormwood); P; F; 0
Bidens aristosa (Michx.) Britton (bearded beggarticks); A; F; 0
Bidens bipinnata L. (Spanish needles); A; F; 472
Bidens polylepis S.F. Blake (tickseed sunflower); A; F; 481
Bradburia pilosa (Nutt.) Semple (soft goldaster); A; F; 621
**Carduus nutans* L. (musk thistle); B; F; 578
Cirsium altissimum (L.) Hilln (tall thistle); B; F; 431
Cirsium undulatum (Nutt.) Spreng. (wavyleaf thistle); B; F; 664
Conoclinium coelestinum (L.) DC (blue mistflower); P; F; 480
Coreopsis grandiflora Hogg ex Sweet (large-flowered tickseed); P; F; 575
Coreopsis tinctoria Nutt. (plains coreopsis); P; F; 389
Diaperia prolifera (Nutt. ex DC.) Nutt. (flathead rabbit tobacco); A; F; 538
Diaperia verna (Raf.) Morefield (many stem evax); A; F; iNat
Echinacea angustifolia DC. (narrow-leaved purple coneflower); P; F; 577
Eclipta prostrata (L.) L. (false daisy); A; F; 422
Elephantopus carolinianus Raeusch. (leafy elephant's-foot); P; F; 0
Erigeron canadensis (L.) Cronquist (horseweed); A; F; 644
Erigeron modestus A. Gray (plains fleabane); P; F; 602

Erigeron philadelphicus L. (Philadelphia fleabane); B; F; 555
Erigeron strigosus Muhl. ex Willd. (daisy fleabane); A; F; 587
Eupatorium serotinum Michx. (late boneset); P; F; 648
**Facelis retusa* (Lam.) Sch. Bip. (annual trampweed); A; F; 554
Gaillardia aestivalis (Walter) H. Rock (lanceleaf blanketflower); P; F; 444
Gaillardia pulchella Foug. (Indian blanket); P; F; iNat
Gaillardia suavis (A. Gray & Engelm.) Britton & Rusby (perfumeballs); P; F; 549
Gamochaeta pensylvanica (Willd.) Cabrera (Pennsylvania cudweed); A; F; 655
Gamochaeta purpurea (L.) Cabrera (purple cudweed); A; F; 537
**Gamochaeta ustulata* (Nutt.) G.L. Nesom (featherweed); A; F; iNat
Grindelia ciliata (Nutt.) Spreng. (Spanish gold); A; F; 467
Helenium amarum (Raf.) H. Rock (bitterweed); A; F; 0
Helianthus annuus L. (common sunflower); A; F; 660
Helianthus maximiliani Schrad. (Maximilian sunflower); P; F; iNat
Helianthus petiolaris Nutt. (prairie sunflower); A; F; iNat
Helianthus tuberosus L. (Jerusalem artichoke); P; F; 0
Heterotheca subaxillaris (Lam.) Britton & Rusby (camphorweed); A; F; 455
Hymenopappus scabiosaeus L'Hér. (Carolina woollywhite); B; F; 544
Krigia (dwarf dandelions); A; F; iNat
Lactuca floridana (L.) Gaertn. (woodland lettuce); A; F; 0
**Lactuca serriola* L. (prickly lettuce); A; F; 643
Liatris punctata Hook. (dotted gayfeather); P; F; 475
Palafoxia rosea Bush (Cory) (rosy palafox); A; F; 432
Pluchea odorata (L.) Cass. (marsh fleabane); A; F; 453
Pseudognaphalium obtusifolium (L.) Hilliard & B.L. Burtt (sweet everlasting); A; F; 0
Pyrrhopappus carolinianus (Walter) DC. (Carolina desert-chicory); B; F; 658
Pyrrhopappus grandiflorus (Nutt.) Nutt. (tuberous desert-chicory); P; F; 528
Pyrrhopappus pauciflorus (D. Don) DC. (smallflower desert-chicory); A; F; iNat
Ratibida columnifera (Nutt.) Woot. & Standl. (upright prairie coneflower); P; F; 623
Rudbeckia hirta L. (black-eyed Susan); A; F; 620
**Senecio vulgaris* L. (common groundsel); A; F; iNat
Solidago canadensis L. (Canada goldenrod); P; F; iNat
Solidago missouriensis Nutt. (Missouri goldenrod); P; F; 0
Solidago nemoralis Aiton (field goldenrod); P; F; 484
Solidago rigida L. (stiff-leaved goldenrod); P; F; iNat
**Sonchus asper* (L.) Hill (prickly sowthistle); A; F; iNat
Symphyotrichum divaricatum (Nutt.) G.L. Nesom (southern annual saltmarsh aster); A; F; iNat
Symphyotrichum drummondii (Lindl.) G.L. Nesom (Drummond's aster); P; F; 486
Symphyotrichum ericoides (S.F. Blake) G.L. Nesom (white heath aster); P; F; 469
Symphyotrichum oblongifolium (Nutt.) G.L. Nesom (aromatic aster); P; F; 0
Symphyotrichum subulatum (Michx.) G.L. Nesom (annual saltmarsh aster); A; F; 397
**Taraxacum officinale* F.H. Wigg. (common dandelion); P; F; iNat
Thelesperma filifolium (Hook.) A. Gray (stiff greenthread); A; F; 0
**Tragopogon dubius* Scop. (yellow salsify); A; F; 0
Verbesina encelioides (Cav.) Benth. & Hook. f. ex A. Gray (cowpen daisy); A; F; 651

Verbesina virginica L. (frostweed); B; F; iNat
Vernonia baldwinii Torr. (western ironweed); P; F; 647
Xanthium strumarium L. (rough cocklebur); A; F; 459

Berberidaceae
*****Nandina domestica* Thunb. (heavenly bamboo); P; S; iNat

Bignoniaceae
Campsis radicans (L.) Seem. ex Bureau (American trumpet vine); P; V; 0

Boraginaceae
**Buglossoides arvensis* (L.) I.M. Johnst. (corn gromwell); A; F; iNat
Heliotropium tenellum (Nutt.) Torr. (pasture heliotrope); A; F; 0
Lithospermum incisum Lehm. (narrowleaf puccoon); P; F; 515
Myosotis macrosperma Engelm. (large-seeded forget-me-not); A; F; 667
Myosotis verna Nutt. (early forget-me-not); A; F; 534

Brassicaceae
**Camelina microcarpa* DC. (littlepod false flax); A; F; 540
**Cardamine hirsuta* L. (hairy bittercress); A; F; 505
**Chorispora tenella* (Pall.) DC. (crossflower); A; F; iNat
**Descurainia paradisa* (Walter) Britton (western Tansymustard); A; F; iNat
**Descurainia sophia* (L.) Webb ex Prantl (flixweed); A; F; 512
Draba brachycarpa Nutt. ex Torr. & A. Gray (short-fruited draba); A; F; iNat
Draba cuneifolia Nutt. ex Torr. & A.Gray (wedgeleaf draba); A; F; 494
**Lepidium densiflorum* Schrad. (common peppergrass); A; F; 506
Lepidium virginicum L. (Virginia pepperweed); A; F; 532
Rorippa palustris (L.) Besser (bog yellowcress); A; F; 0
Rorippa sessiliflora (Nutt.) Hitchc. (stalkless yellowcress); A; F; 614

Cactaceae
Escobaria missouriensis (Sweet) D.R. Hunt (Missouri Foxtail Cactus); P; S; iNat
Opuntia macrorhiza Engelm. (prairie pricklypear); P; S; 0

Campanulaceae
Lobelia cardinalis L. (Cardinal flower); P; F; 479
Triodanis holzingeri McVaugh (Holzinger's venus' looking-glass); A; F; 605
Triodanis perfoliata (L.) Nieuwl. (Clasping venus's looking glass); A; F; 581

Cannabaceae
Celtis laevigata Willd. (sugar hackberry); P; T; 509
Celtis occidentalis L. (common hackberry); P; T; iNat
Celtis laevigata Torr. (netleaf hackberry); P; T; iNat

Caprifoliaceae
**Lonicera japonica* Thunb. (Japanese honeysuckle); P; V; iNat
Symphoricarpos orbiculatus Moench (coralberry); P; S; iNat
Valerianella radiata (L.) Dufr. (beaked cornsalad); A; F; iNat

Caryophyllaceae
**Arenaria serpyllifolia* L. (thyme-leaved sandwort); A ; F; iNat
**Cerastium glomeratum* Thuill. (sticky mouse-ear chickweed); A; F; iNat
**Cerastium pumilum* W. Curtis (dwarf mouse-ear); A; F; 508
**Holosteum umbellatum* L. (jagged chickweed); A; F; 495
**Scleranthus annuus* L. (annual knawel); A; F; 527
**Stellaria media* (L.) Vill. (common chickweed); A; F; 507

Celastraceae
**Euonymus fortunei* (Turcz.) Hand.-Maz. (wintercreeper); P; S; iNat
Commelinaceae
**Commelina communis* L. (Asiatic dayflower); A; F; 607
Commelina erecta L. (whitemouth dayflower); P; F; iNat
Tradescantia occidentalis (Britton) Smyth (western spiderwort); P; F; iNat
Tradescantia ohiensis Raf. (bluejacket); P; F; 560

Convolvulaceae
**Ipomoea hederacea* Jacq. (ivy-leaved morning-glory); A; V; iNat

Cornaceae
Cornus drummondii C.A. Mey. (roughleaf dogwood); P; S; 576

Cupressaceae
Juniperus virginiana L. (eastern redcedar); P; T; 589

Cyperaceae
Carex blanda Dewey (eastern woodland sedge); P; S; 535
Carex crus-corvi Shuttlew. ex Kunze (ravenfoot sedge); P; S; 564
Carex grisea Wahlenb. (inflated narrow-leaved sedge); P; S; iNat
Carex hyalinolepis Steud. (shoreline sedge); P; S; iNat
Carex lurida Wahlenb. (sallow sedge); P; S; 609
Cyperus croceus Vahl (Baldwin's flatsedge); P; S; 650
Cyperus echinatus (L.) Alph. Wood (globe flatsedge); P; S; 611
Cyperus squarrosus L. (gearded flatsedge); A; S; 0
Eleocharis acicularis (L.) Roem. & Schult. (needle spikerush); A; R; 429
Eleocharis obtusa (Willd.) Schult. (blunt spikerush); P; S; 0
Eleocharis palustris (L.) Roem. & Schult. (common spike-rush); P; S; iNat
Fuirena simplex Vahl (western umbrella-sedge); P; S; 396

Ebenaceae
Diospyros virginiana L. (common persimmon); P; T; 580

Equisetaceae
Equisetum hyemale A. Braun (rough horsetail); P; F; 606
Equisetum laevigatum A. Braun (smooth horsetail); P; F; iNat

Euphorbiaceae
Acalypha ostryifolia Riddell (hophornbeam copperleaf); A; F; 413
Acalypha virginica L. (Virginia three-seed mercury); A; F; 468
Chamaesyce maculata (L.) Small (spotted spurge); A; F; 400
Croton capitatus Michx. (hogwort); P; F; 0
**Croton glandulosus* L. (tropic croton); A; F; 0
Croton lindheimerianus Scheele (threeseed croton); A; F; iNat
Croton monanthogynus Michx. (prairie tea); A; F; 390
Euphorbia corollata L. (flowering spurge); P; F; 476
**Euphorbia dentata* Michx. (green poinsettia); A; F; 410
Euphorbia hexagona Nutt. ex Spreng. (sixangle spurge); A; F; 0
Euphorbia nutans Lag. (nodding spurge); A; F; 448
Euphorbia spathulata Lam. (reticulate-seeded spurge); A; F; 550

Fabaceae
Astragalus lotiflorus Hook. (low milkvetch); P; F; 513
Baptisia australis (L.) R. Br. (tall blue wild indigo); P; F; 551
Cercis canadensis L. (eastern redbud); P; T; 0
Chamaecrista fasciculata (Michx.) Greene (partridge pea); A; F; 0
Clitoria mariana L. (pigeonwings); P; F; iNat
Dalea aurea Nutt. ex Fraser (golden prairie clover); P; F; 645
Dalea candida Michx. ex Willd. (white prairie clover); P; F; 616
Dalea enneandra Nutt. ex Fraser (nine-anther prairie clover); P; F; 634
Dalea multiflora (Nutt.) Shinners (roundhead prairie clover); P; F; iNat
Dalea purpurea Vent. (purple prairie clover); P; F; iNat
Desmanthus illinoensis (Michx.) MacMill. ex B.L. Rob. & Fernald (Illinois bundleflower); P; F; iNat
Desmodium sessilifolium (Torr.) Torr. & A. Gray (sessileleaf ticktrefoil); P; F; 443
Gleditsia triacanthos L. (honey locust); P; F; 557
Gymnocladus dioicus (L.) K. Koch (Kentucky coffeetree); P; T; iNat
Lespedeza capitata Michx. (round-headed bush clover); P; F; 0
**Lespedeza cuneata* (Dum. Cours.) G. Don (Chinese bushclover); P; F; 451
Lespedeza virginica (L.) Britton (slender bush clover); P; S; iNat
**Medicago minima* (L.) L. (little bur-clover); A; F; iNat
Mimosa nuttallii (DC. ex Britton & Rose) B.L. Turner (catclaw briar); P; F; iNat
Mimosa quadrivalvis L. (fourvalve mimosa); P; F; 573
Neptunia lutea (Leavenw.) Benth. (yellow puff); P; F; 638
Pediomelum digitatum (Nutt. ex Torr. & A. Gray) Isely (palmleaf indian breadroot); P; F; 624
Psoralidium tenuiflorum (Pursh) Rydb. (slimflower scurfpea); P; F; 445
Strophostyles helvola (L.) Elliott (trailing fuzzy-bean); A; F; 464
Strophostyles leiosperma (Torr. & A. Gray) Piper (slickseed fuzzybean); A; F; 465

Stylosanthes biflora (L.) Britton, Sterns & Poggenb. (sidebeak pencilflower); P; F; 603
**Trifolium arvense* L. (rabbitfoot clover); A; F; 619
**Trifolium campestre* Schreb. (hop trefoil); A; F; iNat
**Vicia sativa* L. (Common vetch); A; F; 517
**Vicia villosa* Roth (hairy vetch); A; F; 583

Fagaceae
Quercus macrocarpa Michx. (bur oak); P; T; iNat
Quercus marilandica Münchh. (blackjack oak); P; T; 510
Quercus muehlenbergii Engelm. (chinkapin oak); P; T; iNat
Quercus shumardii Buckley (Shumard's oak); P; T; iNat
Quercus stellata Wangenh. (post oak); P; T; 541

Gentianaceae
Sabatia campestris Nutt. (meadow pink); A; F; 615

Geraniaceae
**Erodium cicutarium* (L.) L'Hér. ex Aiton (redstem stork's-bill); A; F; 490
Geranium carolinianum L. (Carolina crane's-bill); A; F; 530

Grossulariaceae
Ribes aureum L. (golden currant); P; S; 501

Hypericaceae
Hypericum hypericoides (L.) Crantz (St. Andrew's cross); P; F; 0

Iridaceae
Sisyrinchium angustifolium Mill. (narrow-leaved blue-eyed grass); P; F; iNat

Juglandaceae
Juglans nigra L. (eastern black walnut); P; T; iNat

Juncaceae
Juncus acuminatus Michx. (tapered rush); P; R; 569
Juncus diffusissimus Buckley (slim-pod rush); P; R; 613
Juncus torreyi Coville (Torrey's rush); P; R; 393
Juncus validus Coville (roundhead rush); P; R; 610

Krameriaceae
Krameria lanceolata Torr. (trailing rhatany); P; F; 596

Lamiaceae
Hedeoma drummondii Torr. (Drummond's false pennyroyal); A; F; 0
Hedeoma hispida Pursh (rough false Pennyroyal); A; F; 568
Hedeoma reverchonii (A. Gray) A. Gray (Reverchon's false pennyroyal); P; F; 665
**Lamium amplexicaule* L. (henbit deadnettle); A; F; iNat

Monarda clinopodioides A. Gray (basil beebalm); A; F; 636
Monarda punctata L. (spotted horse mint); A; F; 635
Salvia azurea L. (giant blue sage); P; F; 477
Teucrium canadense L. (American germander); P; F; 0

Linaceae
Linum rigidum Pursh (yellow flax); A; F; 0
Linum sulcatum Riddell (grooved yellow flax); A; F; iNat

Linderniaceae
Lindernia dubia (L.) Pennell (yellowseed false pimpernel); A; F; 438

Loasaceae
Mentzelia oligosperma Nutt. ex Sims (stick-leaf); P; F; 639

Lythraceae
Ammannia coccinea Rottb. (scarlet toothcup); A; F; 439
Lythrum alatum Pursh (winged Loosestrife); P; F; iNat

Malvaceae
Callirhoe involucrata (Torr. & A. Gray) A. Gray (winecup mallow); P; F; 633
Hibiscus moscheutos L. (swamp rose mallow); A; F; iNat
Sida spinosa L. (prickly fanpetals); A; F; 427

Mazaceae
**Mazus pumilus* (Burm. f.) Steenis (Japanese mazus); A; F; 0

Menispermaceae
Cocculus carolinus (L.) DC. (Carolina snailseed); P; V; iNat

Molluginaceae
Mollugo verticillata L. (green carpetweed); A; F; 418

Montiaceae
Claytonia virginica L. (Virginia springbeauty); P; F; 0

Moraceae
Maclura pomifera (Raf.) C.K.Schneid. (Osage-orange); P; T; 0
Morus rubra L. (red mulberry); P; T; 0

Nyctaginaceae
Mirabilis albida (Walter) Heimerl (white four o'Clock); P; F; 478
Mirabilis gigantea (Standl.) Shinners (giant four o'Clock); P; F; 601

Oleaceae
Fraxinus americana L. (white ash); P; T; iNat
Fraxinus pennsylvanica Marshall (green ash); P; T; iNat

Onagraceae
Ludwigia peploides (Kunth) P.H. Raven (floating primrose-willow); P; F; iNat
Oenothera berlandieri (Spach) Steud. (Berlandier's sundrops); A; F; 552
Oenothera biennis L. (common evening-primrose); B; F; 460
Oenothera curtiflora W.L. Wagner & Hoch (velvetweed); A; F; 0
Oenothera filiformis (Small) W.L. Wagner & Hoch (longflower beeblossom); A; F; 388
Oenothera glaucifolia W.L. Wagner & Hoch (false gaura); B; F; 0
Oenothera laciniata Hill (cutleaf evening primrose); A; F; 553

Ophioglossaceae
Ophioglossum engelmannii Prantl (limestone adder's-tongue); P; FN; iNat

Orobanchaceae
Agalinis heterophylla (Nutt.) Small (prairie false foxglove); A; F; 0
Castilleja indivisa Engelm. (Texas paintbrush); A; F; 394

Oxalidaceae
Oxalis corniculata L. (creeping woodsorrel); A; F; iNat
Oxalis dillenii Jacq. (slender yellow woodsorrel); P; F; 0
Oxalis violacea L. (violet woodsorrel); P; F; iNat

Papaveraceae
Argemone polyanthemos (Fedde) G.B. Ownbey (thistle poppy); A; F; 442
Corydalis aurea Willd. (golden corydalis); A; F; iNat
Corydalis micrantha (Engelm. ex A. Gray) A. Gray (smallflower fumewort); A; F; 511

Passifloraceae
Passiflora incarnata L. (purple passionflower); P; V; 449

Phrymaceae
†Mimulus ringens L. (Allegheny monkeyflower); P; F; 666

Plantaginaceae
Leucospora multifida (Michx.) Nutt. (Obi-Wan conobea); A; F; 395
Nuttallanthus texanus (Scheele) D.A. Sutton (Texas toadflax); A; F; 526
Penstemon cobaea Nutt. (cobaea beardtongue); P; F; 572
Penstemon laxiflorus Pennell (nodding beardtongue); P; F; 559
Plantago aristata Michx. (bracted plantain); A; F; 586
**Plantago lanceolata* L. (ribwort plantain); A; F; 0
Plantago patagonica Jacq. (woolly plantain); A; F; 597
Plantago rhodosperma Decne. (redseed plantain); A; F; 531
Veronica anagallis-aquatica L. (blue water-speedwell); B; F; iNat
**Veronica arvensis* L. (corn speedwell); A; F; iNat

Veronica peregrina L. (purslane Speedwell); A; F; iNat

Poaceae

Andropogon gerardii Vitman (big bluestem); P; G; iNat
Andropogon ternarius Michx. (splitbeard bluestem); P; G; iNat
Andropogon virginicus L. (broomsedge bluestem); P; G; iNat
**Bothriochloa ischaemum* (L.) Keng (king ranch bluestem); P; G; 622
Bothriochloa laguroides (DC.) Herter (silver bluestem); P; G; iNat
Bouteloua curtipendula (Michx.) Torr. (sideoats grama); P; G; 653
Bouteloua dactyloides (Nutt.) Columbus (buffalograss); P; G; 562
Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griffiths (blue grama); P; G; iNat
Bouteloua hirsuta Lag. (hairy grama); P; G; 659
**Bromus catharticus* Vahl (rescue brome); P; G; iNat
**Bromus tectorum* L. (cheatgrass); A; G; 520
Cenchrus spinifex Cav. (coastal sandbur); A; F; 434
Chasmanthium latifolium (Michx.) Yates (inland wood oats); P; G; iNat
Chasmanthium laxum (L.) H.O. Yates (slender spikegrass); P; G; 0
Dichanthelium oligosanthes (Schult.) Gould (Heller's rosette grass); P; G; 563
Digitaria cognata (Schult.) Pilg. (fall witchgrass); P; G; iNat
Elymus glabriflorus (Vasey ex L.H. Dewey) Scribn. & C.R. Ball (southeastern wildrye); P; G; iNat
Eragrostis secundiflora J. Presl (red lovegrass); P; G; 654
Eragrostis sessilispica Buckley (tumble lovegrass); P; G; 656
Festuca octoflora Walter (sixweeks grass); A; G; iNat
**Lolium multiflorum* Lam. (Italian ryegrass); A; G; 604
**Lolium perenne* L. (perennial ryegrass); A ; G; 595
Muhlenbergia schreberi J.F. Gmel. (nimblewill); P; G; iNat
Paspalum setaceum Michx. (thin paspalum); P; G; 0
Schizachyrium scoparium (Michx.) Nash (little bluestem); P; G; iNat
**Setaria faberi* Herrm. (giant foxtail); A; G; iNat
**Setaria pumila* (Poir.) Roem. & Schult. (yellow foxtail); A; F; 649
Sorghastrum nutans (L.) Nash (Indiangrass); P; G; iNat
Sphenopholis obtusata (Michx.) Scribn. (prairie wedge grass); A; G; 582
Tridens albescens (Vasey) Wooton & Standl. (white Tridens); P; G; 0
Tridens flavus (L.) Hitchc. (purpletop tridens); P; G; iNat
Vulpia octoflora (Walter) Rydb. (sixweeks fescue); A; G; 0

Polygonaceae

Eriogonum annuum Nutt. (annual buckwheat); A; F; 415
Eriogonum longifolium Nutt. (longleaf buckwheat); P; F; 426
**Polygonum persicaria* L. (lady's Thumb); A; F; iNat
Persicaria punctata (Elliott) Small (dotted knotweed); A; F; 436
**Rumex acetosella* L. (sheep's sorrel); P; F; iNat
**Rumex crispus* L. (curly dock); P; F; 584
Rumex hastatulus Baldwin (hastate-leaved dock); P; F; 570

Primulaceae
Samolus parviflorus Raf. (seaside brookweed); P; F; iNat
Samolus valerandi L. (seaside brookweed); P; F; 612

Ranunculaceae
Ranunculus abortivus L. (small-flowered buttercup); B; F; iNat
Ranunculus sceleratus L. (cursed crowfoot); A; F; iNat

Rosaceae
Geum canadense Jacq. (white avens); P; F; iNat
Prunus angustifolia Marshall (Chickasaw plum); P; S; 499
Prunus mexicana S.Watson (Mexican plum); P; S; 0
**Rosa multiflora* Thunb. (multiflora rose); P; V; iNat
Rubus allegheniensis Porter (Allegheny blackberry); P; S; iNat
Rubus flagellaris Willd. (common dewberry); P; F; 579

Rubiaceae
Cephalanthus occidentalis L. (buttonbush); P; F; 0
Diodia teres Walter (rough buttonweed); P; F; 387
Diodia virginiana L. (buttonweed); A; F; 608
Galium aparine L. (catchweed bedstraw); A; F; iNat
Galium virgatum Nutt. (southwestern bedstraw); A; F; 0
Houstonia pusilla Schoepf (tiny bluet); A; F; 496
**Sherardia arvensis* L. (field madder); A; F; 0
Stenaria nigricans (Lam.) Terrell (diamond-flowers); P; F; iNat

Salicaceae
Populus deltoides W. Bartram ex Marshall (eastern Cottonwood); P; T; iNat
Salix nigra Marshall (black willow); P; T; iNat

Sapindaceae
Acer negundo L. (boxelder); P; T; iNat
Acer saccharinum L. (silver maple); P; T; iNat
Sapindus drummondii Hook. & Arn. (western soapberry); P; T; 618

Sapotaceae
Sideroxylon lanuginosum Michx. (gum bumelia); P; T; 637

Scrophulariaceae
**Verbascum thapsus* L. (great mullein); B; F; 440

Smilacaceae
Smilax bona-nox L. (saw greenbrier); P; V; 547

Solanaceae
**Datura wrightii* Regel (sacred datura); P; F; iNat

Physalis angulata L. (cutleaf groundcherry); A; F; 446
Solanum carolinense L. (carolina horsenettle); P; F; 590
Solanum dimidiatum Raf. (western horsenettle); P; F; 558
Solanum rostratum Dunal (buffalo-bur); A; F; 441

Ulmaceae
Ulmus americana L. (American elm); P; T; 491
**Ulmus procera* Salisb. (field Elm); P; T; iNat
**Ulmus pumila* L. (Siberian elm); P; T; iNat
Ulmus rubra Muhl. (slippery elm); P; T; iNat

Urticaceae
Parietaria pensylvanica Muhl. ex Willd. (Pennsylvania pellitory); A; F; 592

Verbenaceae
Glandularia pumila (Rydb.) Umber (dwarf verbena); A; F; 533
Phyla nodiflora (L.) Greene (turkey tangle frogfruit); P; F; 425
Verbena stricta Vent. (hoary vervain); A; F; 0
Verbena urticifolia L. (white vervain); P; F; 433

Viburnaceae
Viburnum rufidulum Raf. (rusty blackhaw); P; T; iNat

Violaceae
Viola missouriensis Greene (Missouri Violet); A; F; iNat
Viola rafinesquei Greene (American field pansy); A; F; 502
Viola sororia Willd. (common blue violet); A; F; iNat
Viola villosa Walter (Carolina violet); P; F; iNat

Vitaceae
Parthenocissus quinquefolia (L.) Planch. (virginia creeper); P; V; iNat
Vitis vulpina L. (frost grape); P; V; 565

Woodsiaceae
Woodsia obtusa (Spreng.) Torr. (blunt woodsia); P; FN; 546

CHAPTER 3: FLORISTIC SURVEY AT BELLE ISLE AT THE DEEP FORK RIVER IN OKLAHOMA CITY, OKLAHOMA

This chapter has been formatted for submission to the Oklahoma Native Plant Record.

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ABSTRACT

A floristic survey was conducted at Belle Isle at the Deep Fork River in northwest Oklahoma City. Belle Isle at the Deep Fork River is an urban semi-natural area that has been subject to a wide array of anthropogenic disturbances. This study aimed to observe and document all vascular plant species within the research area. Twenty-eight site visits yielded 138 plant species from 40 plant families and 78 genera. One plant species was found in the study area via iNaturalist, bringing the total plant species count to 139. Thirty-three percent of observed species were non-native. All observed vascular plant species were posted on iNaturalist and logged in a field notebook. Two county records were documented, and no species tracked by the Oklahoma Natural Heritage Inventory were observed. This baseline floristic data will be used for biodiversity studies and ecological assessments.

INTRODUCTION AND STUDY AREA

Belle Isle at the Deep Fork River (BIDFR) is in central Oklahoma County, located in northwest Oklahoma City, Oklahoma (Figure 1). Belle Isle is an area of Oklahoma City that encompasses the Wileman's Belle Isle Neighborhood, Penn Square Mall, Belle Isle Station (a shopping center), Rose Hill Cemetery, and various green spaces and semi-natural areas. The green spaces and semi-natural areas consist of mowed fields, forests, grasslands, two streams, a pond, and a 1.2 km section of the Deep Fork River. The southwest and northeast sections of the river are concrete drainage ditches, while the central area is a semi-natural river (Figure 2).

The BIDFR study area is approximately 83 ha. It is between Pennsylvania Avenue on the west, Classen Boulevard on the east, northwest 59th Street on the north, and Northwest 53rd Street on the south. The study site ranges between the latitude 35.531357 and 35.531140 and longitude -97.540018 and -97.540404.

BIDFR sits on the border of the Central Great Plains and the Cross Timbers ecoregions (Figure 3). The Cross Timbers stretches from north-central Texas through central Oklahoma to its northern reaches in southern Kansas (Omernik 1987). The Cross Timbers comprises over 4.8 million hectares, approximately half of which are in Oklahoma (Küchler 1964, Thomas and Hoagland 2011). The Cross Timbers is a mixture of diverse habitats: forest, savanna, grassland, and wetland. The predominant tree species are *Quercus stellata* Wangenh. (post oak) and *Quercus marilandica* Münchh. (blackjack oak) (Duck and Fletcher 1945). The Central Great Plains ecoregion is a mixed-grass prairie that extends from Nebraska south through Kansas, Oklahoma, and Texas (Omernik 1987). The mixed-grass prairie is a combination of tallgrass and shortgrass vegetation. The dominant genera are *Schizachyrium, Stipa, Elymus, Pseudoroegneruai, Pascopyrum, Calamovilfa, Bouteloua, Sporobolus, Buchloe, Muhlenbergia, Carex, and Aristida* (Barbour and Billings 2000).

BIDFR falls within the temperate humid subtropical climate zone. This climate zone is characterized by hot and humid summers and cool to mild winters (Köppen 1936). Oklahoma County's average annual climate statistics include a growing season of 213 days, 92.4 cm of rainfall, a temperature of 15.5 °C, the last spring freeze is April 4th, the first fall freeze is November 2, 17.5 cm of snowfall, and a wind speed of 12.8 kph. The record high temperature is 45 °C, and the record low is - 26 °C. The latest recorded freeze date is April 20, and the earliest is October 21 (Oklahoma Climatological Survey and Mesonet 2022).

METHODS

Fieldwork was conducted from April 19th, 2022, to October 23rd, 2023. Thirty-four site visits were made during this time. Site visit frequency was determined by the likelihood of more abundant flowering plants. Temperature and rainfall were also deciding factors in determining site visit frequency. Two transects were designed to cover as many habitat types as possible to observe as many species as possible. Transect 1 was 1,329 m, and Transect 2 was 753 m (Figure 4). Most plants were observed along the two transects, but some plants were observed in the broader study area. An iNaturalist project, Belle Isle at the Deep Fork River, was created for the study site.

Most plants were not collected due to time constraints and the likelihood of many non-native plants being there–making identification easier. Instead, photos of key morphological characteristics (flower, stem, and leaves) were uploaded to iNaturalist. All plants were identified using a combination of *Flora of Oklahoma: Keys and Descriptions* (2023 and 2024 editions), *Illustrated Flora of North Central Texas* (2000), iNaturalist algorithm, and iNaturalist user suggestions. The USDA Plants Database (2024) was used to determine nativity, duration, and growth habit. Nomenclature and classification follow the Integrated Taxonomic Information System.

RESULTS AND DISCUSSION

A total of 139 individual taxa representing 40 plant families and 78 genera were observed and documented at BIDFR (Appendix A). Forty-six (33%) species found at BIDFR were non-native. Plant duration statistics include 54 annuals (39%), 81 perennials (58%), and four biennials (3%). The growth habit statistics were 92 forbs (66%), 13 (9%) trees, 12 grasses (9%), ten shrubs (7%), three sedges (2%), four rushes (3%), five vines (4%), and zero ferns. The most prominent plant families observed were Asteraceae 30 (22%), Fabaceae 17 (12%), Poaceae 14 (10%), and Cyperaceae 6 (4%). Plant families with the most observed non-native species include Fabaceae, Poaceae, Asteraceae, and Rubiaceae. Two county records were found: *Quercus fusiformis* Small (Texas live oak) and *Mimosa quadrivalvis* L. (fourvalve mimosa). No species tracked by the Oklahoma Natural Heritage Inventory were observed. The observed taxa constitute 5% of the 2,657 vascular plants found in Oklahoma (Fishbein et al. 2024).

Compared to four other nearby plant surveys, BIDFR had the highest percentage of non-native species and the lowest plant species richness (Table 1). This is likely due to the anthropogenic stressors affecting BIDFR: soil compaction, increased nutrient load, pollution, herbicides, pesticides, and ecosystem fragmentation. The four nearest inventories used for comparison were found in Oklahoma, Cleveland, Canadian, and Mcclain counties.

Belle Isle at the Deep Fork River is a familiar landscape across US cities–a river running through a city surrounded by pockets of green space, strip malls, utility infrastructure, litter, encampments, and neighborhoods. Considering all of the development and ecological damage BIDFR has been through, this land still provides ecological services and supports a variety of organisms. Understanding the plant community composition at BIDFR will add to the region's botanical knowledge and help us understand areas that have undergone significant anthropogenic stressors. This baseline floristic data can be used for tracking invasives, monitoring rare or threatened species, climate research, and future biodiversity indices.

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Study Site	County	Reference	Size of site	Number of Taxa	Percent non-native
Arcadia Lake	Oklahoma	Friedman & Messick 2024	274 ha	368	17%
E.C. Hafer Park	Oklahoma	Caddell & Christoffer et al. 2017	49 ha	270	22.2%
John W. Nichols Scout Ranch	Canadian	Crosswhite & Ryburn 2019	150 ha	152	13.6%
University of Oklahoma’s Kessler Atmospheric and Ecological Field Station	Mcclain	Hoagland & Buthod 2016	146 ha	361	14.7%
Belle Isle at the Deep Fork River (plant survey)	Oklahoma	Friedman & Messick 2024	83 ha	135	31.8%

Table 1. The four closest plant inventories to the BIDFR study site.

FIGURES

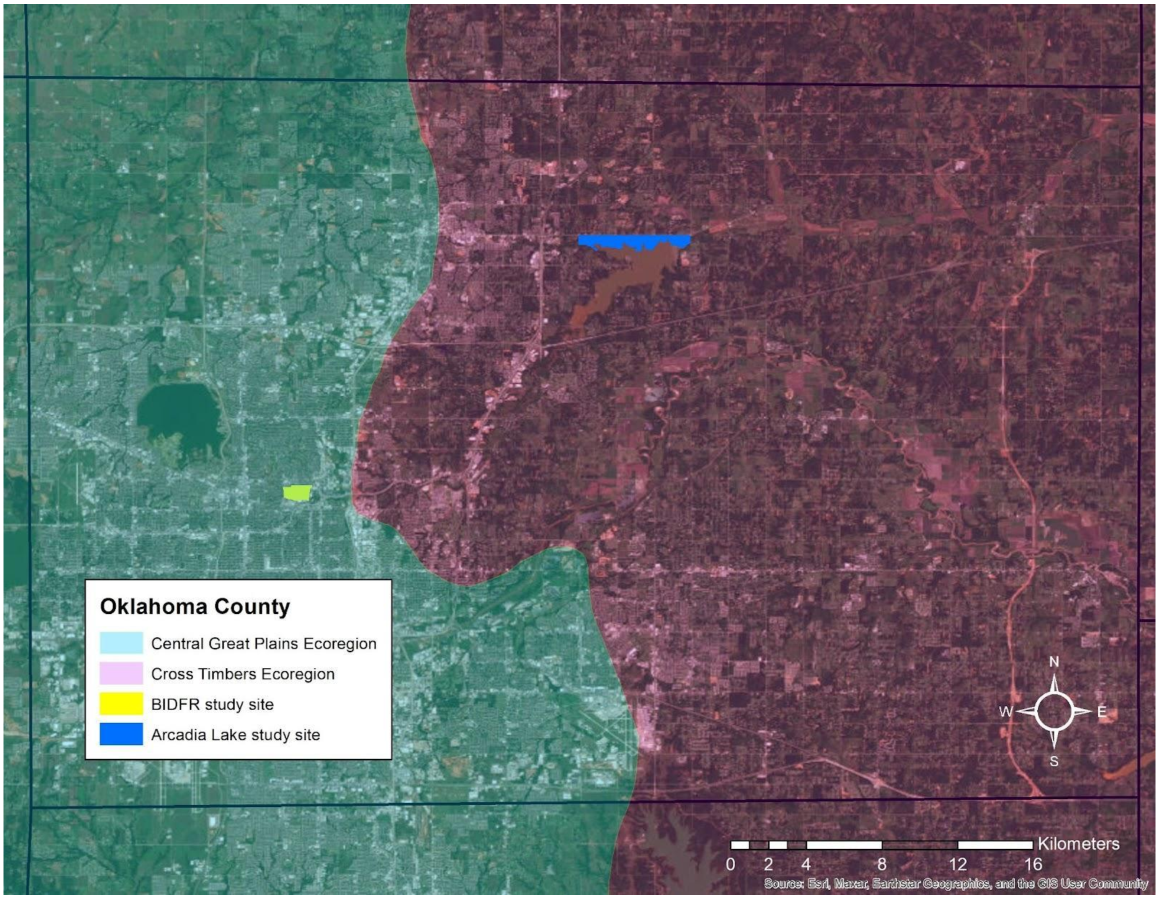

Figure 1. Oklahoma County, along with ecoregions and study sites.

Figure 2. Semi-natural river section of Belle Isle at Deep Fork River. Benjamin Davis 2024.

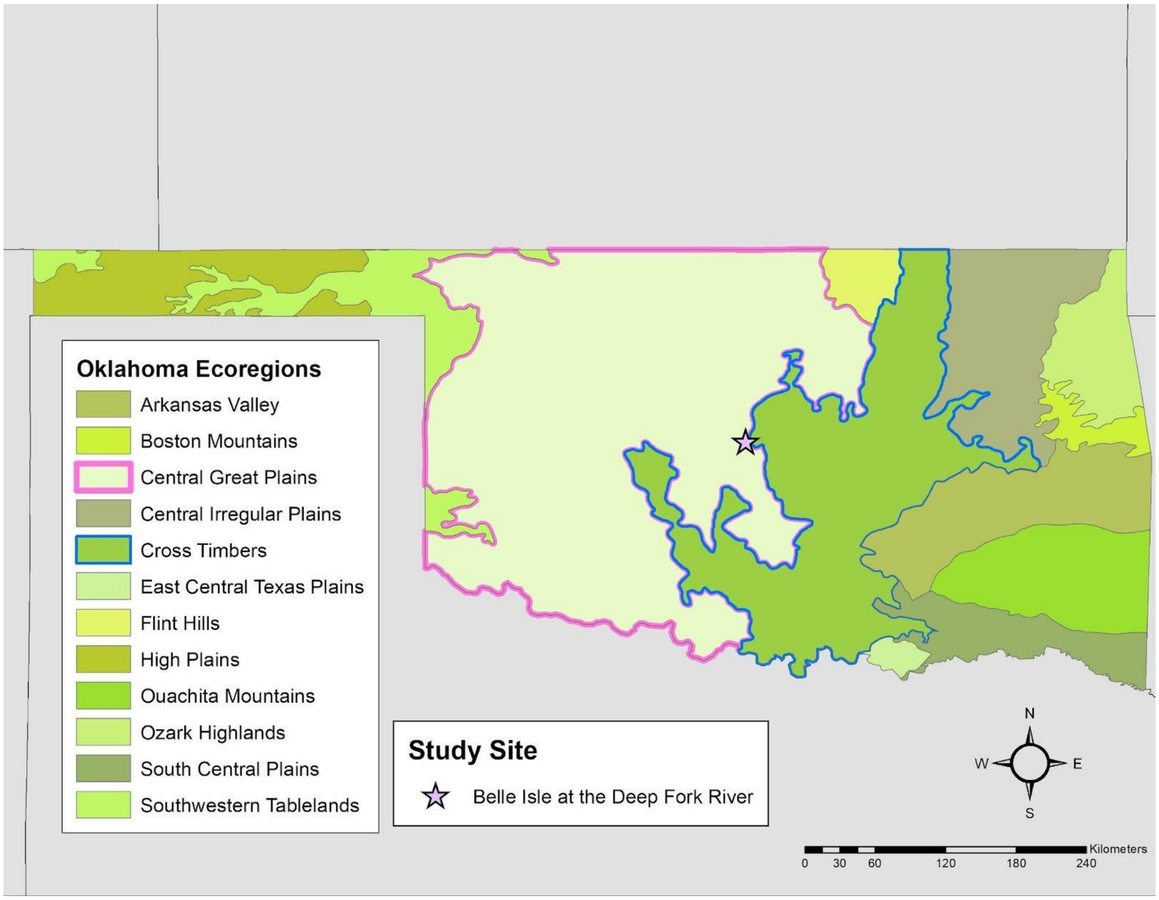

Figure 3. Oklahoma ecoregions and BIDFR study site.

Figure 4. Belle Isle at the Deep Fork River study area with transects.

APPENDIX A.
List of vascular plant taxa from Belle Isle at the Deep Fork River, Oklahoma County, Oklahoma.
Taxa list with duration, growth habit, and nativity.

* denotes an exotic taxa.
Duration is denoted by A = Annual, P = Perennial, and B = Biennial.
Growth habit is denoted by: F = forb, FN = fern, S = shrub, V = vine, S = sedge, and R = rush.
Nativity, duration, and growth habit were determined using the USDA Plants Database (USDA 2024).

Acanthaceae
Dicliptera brachiata (Pursh) Spreng. (false mint); A; F

Altingiaceae
Liquidambar styraciflua L. (American sweetgum); P; T

Amaryllidaceae
Allium canadensen L. (Canadian meadow garlic); P; F
Allium drummondii Regel (Drummond's onion); P; F
**Allium vineale* L. (wild garlic); P; F
Nothoscordum bivalve (L.) Britton (crowpoison); P; F

Anacardiaceae
**Pistacia chinensis* Bunge (Chinese pistache); P; T
Rhus glabra L. (smooth sumac); P; S

Apiaceae
Ammoselinum popei Torr. & A. Gray (plains sandparsley); A; F
**Conium maculatum* L. (poison hemlock); B; F
**Torilis arvensis* (Huds.) Link (common hedge parsley); A; F

Apocynaceae
Asclepias viridis Walter (green antelopehorns); P; F

Aquifoliaceae
Ilex decidua Walter (possumhaw); P; S

Araceae
Lemna minor L. (common duckweed); P; F

Asparagaceae
**Muscari neglectum* Guss. ex Ten. (grape hyacinth); P; F

Asteraceae
Achillea millefolium L. (common yarrow);P; F
Ambrosia psilostachya DC. (western ragweed); A; F
Amphiachyris dracunculoides (DC.) Nutt. (prairie broomweed); A; F
Artemisia ludoviciana Nutt. (silver wormwood); P; F
Bidens frondosa L. (devil's beggarticks); A; F
**Carduus nutans* L. (musk thistle); B; F
Cirsium altissimum (L.) Hilln (tall thistle); B; F
Coreopsis tinctoria Nutt. (plains coreopsis); P; F
Eclipta prostrata (L.) L. (false daisy); A; F
Erigeron philadelphicus L. (Philadelphia fleabane); B; F
Erigeron strigosus Muhl. ex Willd. (daisy fleabane); A; F
Eupatorium serotinum Michx. (late boneset); P; F
Gaillardia suavis (A. Gray & Engelm.) Britton & Rusby (perfumeballs); P; F
Grindelia ciliata (Nutt.) Spreng. (Spanish gold); A; F
Helenium amarum (Raf.) H. Rock (bitterweed); A; F
Helianthus annuus L. (common sunflower); A; F
**Lactuca serriola* L. (prickly lettuce); A; F
Liatris punctata Hook. (dotted gayfeather); P; F
Packera plattensis (Nutt.) W.A. Weber & Á. Löve (prairie groundsel); P; F
Pyrrhopappus pauciflorus (D. Don) DC. (smallflower desert-chicory); A; F
Ratibida columnifera (Nutt.) Woot. & Standl. (upright prairie coneflower); P; F
Solidago nemoralis Aiton (field goldenrod); P; F
**Sonchus asper* (L.) Hill (prickly sowthistle); A; F
Symphyotrichum divaricatum (Nutt.) G.L. Nesom (southern annual saltmarsh aster); A; F
Symphyotrichum drummondii (Lindl.) G.L. Nesom (Drummond's aster); P; F
Symphyotrichum oblongifolium (Nutt.) G.L. Nesom (aromatic aster); P; F
**Taraxacum officinale* F.H. Wigg. (common dandelion); P; F
Thelesperma filifolium (Hook.) A. Gray (stiff greenthread); A; F
Xanthium strumarium L. (rough cocklebur); A; B

Bignoniaceae
Catalpa speciosa (Warder) Warder ex Engelm. (northern catalpa); P; F

Boraginaceae
**Buglossoides arvensis* (L.) I.M. Johnst. (corn gromwell); A; F

Brassicaceae
**Lepidium oblongum* Small (veiny pepperweed); A; F
**Nasturtium officinale* W.T. Aiton (watercress); P; F

Caprifoliaceae
**Lonicera maackii* (Rupr.) Herder (amur honeysuckle); P; S

Caryophyllaceae
**Arenaria serpyllifolia* L. (thyme-leaved sandwort); A; F
Dianthus armeria L. (deptford pink); A; F

Commelinaceae
**Commelina communis* L. (asiatic dayflower); A; F

Convolvulaceae
**Convolvulus arvensis* L. (field bindweed); P; V
Cuscuta campestris Yunck. (field dodder); P; V

Cornaceae
Cornus drummondii C.A. Mey. (roughleaf dogwood); P; S

Cyperaceae
Cyperus esculentus L. (yellow nutsedge); P; S
Cyperus squarrosus L. (bearded flatsedge); A; S
Eleocharis compressa Sull. (flat-stem spikerush); P; R
Eleocharis montevidensis A. Gray (sand spikerush); P; R
Eleocharis palustris (L.) Roem. & Schult. (common spike-rush); P; R
Schoenoplectus pungens (Vahl) Palla (three-square bulrush); P; R

Ebenaceae
Diospyros virginiana L. (common persimmon); P; T

Euphorbiaceae
Croton monanthogynus Michx. (prairie tea); A; F
Euphorbia nutans Lag. (nodding spurge); A; F

Euphorbiaceae
Euphorbia spathulata Lam. (reticulate-seeded spurge); A; F

Fabaceae
**Albizia julibrissin* Durazz. (Persian silk tree); P; T
Amorpha fruticosa L. (false indigo bush); P; S
Dalea candida Michx. ex Willd. (white prairie clover); P; F
Desmanthus illinoensis (Michx.) MacMill. ex B.L. Rob. & Fernald (Illinois bundleflower); P; F
Desmanthus leptolobus Torr. & A. Gray (prairie bundleflower); P; F
Gleditsia triacanthos L. (honey locust); P; T
**Lathyrus hirsutus* L. (hairy vetchling); A; F
**Medicago lupulina* L. (black medick); A; F
**Melilotus officinalis* (L.) Lam. (yellow sweetclover); A; F
Mimosa quadrivalvis L. (fourvalve mimosa); P; F
Neptunia lutea (Leavenw.) Benth. (yellow puff); P; F
Pediomelum tenuiflorum (slimflower scurfpea); P; F
Robinia pseudoacacia L. (black locust); P; T
**Trifolium repens* L. (white clover); P; F
**Vicia sativa* L. (common vetch); A; F
**Vicia villosa* Roth (hairy vetch); A; F

Fagaceae
Quercus fusiformis Small (Texas live oak); P; T

Gentianaceae
Sabatia campestris Nutt. (meadow pink); A; F
Geraniaceae
**Erodium cicutarium* (L.) L'Hér. ex Aiton (redstem stork's-bill); A; F
**Geranium dissectum* L. (cut-leaved crane's-bill); A; F

Iridaceae
Sisyrinchium ensigerum E.P. Bicknell (sword-leaf blue-eyed grass); P; F

Juncaceae
Juncus torreyi Coville (Torrey's rush); P; R

Lamiaceae
**Lamium amplexicaule* L. (henbit deadnettle); A; F
Lycopus americanus Muhl. ex W.P.C. Barton (American bugleweed); P; F
Teucrium canadense L. (American germander); P; F

Lythraceae
Ammannia coccinea Rottb. (scarlet toothcup); A; F

Moraceae
Maclura pomifera (Raf.) C.K.Schneid. (Osage-orange); P; T

Oleaceae
Fraxinus pennsylvanica (green ash); P; T
**Ligustrum quihoui* Carrière (quihoui privet); P; S
**Ligustrum sinense* Lour. (Chinese privet); P; S

Onagraceae
Oenothera suffulta (Engelm. ex A. Gray) W.L. Wagner & Hoch (roadside gaura); A; F

Oxalidaceae
Oxalis violacea L. (violet woodsorrel); P; F

Plantaginaceae
Plantago patagonica Jacq. (ribwort plantain); A; F
Plantago virginica L. (dwarf plantain); A; F
**Veronica arvensis* L. (corn speedwell); A; F
**Veronica peregrina* L. (purslane speedwell); A; F
**Veronica polita* Fr. (grey field-speedwell); A; F

Poaceae
Andropogon glomeratus (Walter) Britton, Sterns & Poggenb. (maritime bluestem); P; G
**Arundo donax* L. (giant reed); P; S
Bothriochloa laguroides (DC.) Herter (silver bluestem); P; G
**Bromus catharticus* Vahl (rescue brome); A; G
**Cynodon dactylon* (L.) Pers. (Bermuda grass); P; G
Dichanthelium oligosanthes (Schult.) Gould (Scribner's panicgrass); P; G
**Echinochloa crus-galli* (barnyardgrass); A; G
Elymus canadensis L. (Canada wild rye); P; G
Eragrostis spectabilis (Pursh) Steud. (purple lovegrass); P; G
Hordeum pusillum Nutt. (little barley); A; G
**Paspalum dilatatum* Poir. (Dallis grass); P; G
Poa arachnifera Torr. (Texas bluegrass); P; G
**Secale cereale* L. (rye); A; G

Polygonaceae
**Rumex crispus* L. (curly dock); P; F

Ranunculaceae
Anemone caroliniana Walter (carolina anemone); P; F
**Clematis terniflora* DC. (autumn clematis); P; V
Ranunculus sceleratus L. (cursed crowfoot); A; F

Rosaceae
Prunus angustifolia Marshall (Chickasaw plum); P; S
**Pyrus calleryana* Decne. (callery pear); P; T
**Spiraea cantoniensis* Lour. (Reeve's spirea); P; S

Rubiaceae
**Cruciata pedemontana* (Bellardi) Ehrend. (piedmont bedstraw); A; F
**Galium divaricatum* Pourr. ex Lam. (Lamarck's bedstraw); A; F
Houstonia pusilla Schoepf (tiny bluet); A; F
**Sherardia arvensis* L. (field madder); A; F

Salicaceae
Populus deltoides W. Bartram ex Marshall (eastern cottonwood); P; T
Salix nigra Marshall (black willow); P; T

Solanaceae
Solanum dimidiatum Raf. (western horsenettle); P; F
Solanum elaeagnifolium Cav. (silverleaf nightshade); P; F
Solanum rostratum Dunal (buffalo-bur); A; F

Verbenaceae
Phyla lanceolata (Michx.) Greene (lanceleaf frogfruit); P; F

Vitaceae
Ampelopsis cordata Michx. (heart leaf peppervine); P; V
Vitis rotundifolia Michx. (muscadine); P; V

Zygophyllaceae
**Tribulus terrestris* L. (puncture vine); A; F

CHAPTER 4: FLORISTIC QUALITY ASSESSMENT OF TWO SITES IN OKLAHOMA COUNTY, OKLAHOMA

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ABSTRACT

Floristic Quality Assessment (FQA) was conducted at Arcadia Lake and Belle Isle on the Deep Fork River (BIDFR) in Oklahoma County, Oklahoma. This study aimed to assess the ecological integrity of these sites and provide a baseline model for future FQA use in Oklahoma. Based on an area's floristic composition, FQA produces a numerical value that quantifies how much or little environmental degradation has occurred. Arcadia Lake had a Mean C of 3.8 and FQI of 66.5, and Belle Isle at the Deep Fork River had a Mean C of 3.2 and 30.9 FQI. The FQA for Arcadia Lake indicates an ecosystem that is more intact with fewer anthropogenic stressors. In contrast, the FQA for BIDFR indicates an ecosystem in peril from anthropogenic stressors. FQA is a crucial tool for communicating to a broad audience what natural areas to prioritize for conservation.

INTRODUCTION

Floristic Quality Assessment (FQA) is a metric used to assess the quality of natural areas. FQA requires two main components: 1) a species list of vascular plants for a defined area and 2) a corresponding coefficient of conservatism value (C value) for each species in the study area. This metric is based on species conservatism, defined as a species' fidelity or faithfulness to remnant or high-quality natural areas (Herman et al. 1997; Rocchio & Crawford 2013). A remnant habitat represents an ecosystem believed to be reminiscent of or close to resembling a pre-Eurosettlement condition (Bernthal 2003; Ladd & Thomas 2015). Species conservatism is expressed as a numerical value between 0 - 10, called the C value (Miller and Wardrop 2005). The C value is an estimated probability that a species will likely occur in a remnant ecosystem (Herman et al. 1997; Rocchio and Crawford 2013). The most conservative species have a C value of 10 and are only found in remnant natural areas while the least conservative species have a C value of zero and are found in highly degraded areas or are non-native. Assigning C values requires an in-depth knowledge of species' ecological role in a geographic area because C values can significantly change from region to region (Wilhelm & Masters 1995). For example, the C value for *Dalea enneandra* Nutt. ex Fraser (nine-anther prairie clover) ranges from 0-10. It has a zero C value in the Chicago region, a 5 in Kansas, a 7 in the Dakotas, and a 10 in Oklahoma and Missouri (Universal FQA Calculator https://universalfqa.org/ 2024).

<u>The C value scale</u>:

0-3: No degree of certainty that this plant comes from a remnant site. Taxa readily occur in ecosystems that have undergone severe degradation from human-caused stressors. Typical taxa of Disturbed Area Old Fields (DAOF) (Hoagland & Buthod 2007). These taxa can also be found in remnant ecosystems but do not indicate a remnant ecosystem (Rocchio & Crawford 2013; Ladd & Thomas 2015).

4-6: Taxa has the potential of coming from a remnant site. Taxa are found in a wide variety of ecosystems that are moderately degraded, and taxa have some ability to adapt to disturbance (Rocchio & Crawford 2013; Ladd & Thomas 2015).

7-10: Conservative taxa with narrow ecological tolerances and good indicators of remnant ecosystems (Rocchio & Crawford 2013; Ladd & Thomas 2015).

The main factors determining a species' C value are its ability to tolerate anthropogenic disturbance and its preference for a given association (Bernthal 2003). Plant associations include biological factors, environmental factors, and spatial constraints (Mcgill et al. 2006; Verberk et al. 2013). Species with a multitude of associations inhabit remnant ecosystems, and species with few associations and a broad range of ecological tolerances inhabit degraded ecosystems.

Platanthera leucophaea (Nutt.) Lindl. (Eastern prairie fringed orchid) exemplifies a species with multiple associations and narrow ecological tolerances. Believed to be extirpated in Oklahoma (Oklahoma Natural Heritage Inventory 2024), *P. leucophaea* requires full sun, a prairie or wetland community, depends on hawkmoths for pollination, and requires the mycorrhizae *Ceratorhiza* present in the soil for seed germination (US Fish and Wildlife Service fws.org 2023). Furthermore, the caterpillars of hawkmoths need specific host plants nearby (US Fish and Wildlife Service 2023). In contrast, *Erigeron canadensis* L. (horseweed) has virtually unrestricted habitat requirements–it grows through cracks in sidewalks, in fields, and under forest canopies. *E. canadensis* has high reproductive success due to being a winter annual and having self-pollinated wind dispersed seeds (Regehr & Bazzaz 1979). Additionally, *E. canadensis* has developed a resistance to glyphosate herbicides (VanGeesel 2001). The environmental needs of both of these species are drastically different, thus being on opposite ends of the C value scale. With the exception of Ohio (C value of 8) and Iowa (C value of 9), *P. leucophaea* has a C value of 10 across its range (IN, OK, IL, IA, WI, MI, MA, ND, SD and southern ON). *C. canadensis* has a C value of zero across most of its range (IN, LA, NE, KA, OK, IL, IA, WI, MI, MA, ND, SD and southern ON), a C value of one in DE, WV, NJ, TX and western WA, a C value of two in ME and eastern WA, and lastly, a C value of 3 in NH (Universal FQA Calculator https://universalfqa.org/ 2024).

Two main calculated parameters are used with FQA analyses: Mean C ($\bar{c}$) and Floristic Quality Index (FQI). $\bar{c}$ is calculated by averaging all of the native species' C values from a study site. A higher $\bar{c}$ represents an area with fewer anthropogenic disturbances and is thus more likely to resemble a remnant ecosystem. In contrast, a lower $\bar{c}$ represents an area with more anthropogenic stressors resulting in more invasives and non-native flora. FQI is calculated by multiplying the $\bar{c}$ by the square root of the number of native species observed. FQI combines quality and species richness, which is claimed to be useful when comparing FQA values between varying study site sizes (Wilhelm & Masters 1995). Non-native species are not included in $\bar{c}$ or FQI calculations. The presence and proportion of conservative native species define a natural area, not the presence or absence of non-native species (Wilhelm & Masters 1995). Nonetheless, the presence of non-native species is measured indirectly by the negative toll they take on an ecosystem by reducing conservative species numbers (Wilhelm & Masters 1995). The continuum of degradation suggests that a $\bar{c}$ below three represents a degraded natural area, four has some remnant quality, and five is remnant quality–having high conservation significance (Wilhelm 2007; Ladd & Thomas 2015). An FQI ranking of 55 represents an intact ecosystem, 42 represents a slightly degraded ecosystem, and 32 represents a severely degraded ecosystem (Wilhelm 2007).

STUDY AREA

FQA was conducted as part of floristic inventories for two sites in Oklahoma County, Oklahoma: Arcadia Lake (Friedman and Messick 2024a) and Belle Isle at the Deep Fork River (BIDFR) (Friedman and Messick 2024b). Arcadia Lake is on the outskirts of Edmond, OK, and BIDFR is in the heart of Oklahoma City, OK (Figure 1). These sites were chosen for FQA to study the effects of human-caused environmental degradation in the most densely populated county in Oklahoma. The FQA continuum of degradation informs us on the degree to which anthropogenic stressors have affected a natural area, thus being a tool for managing land in densely populated areas (Miller & Wardrop 2005).

Arcadia Lake is a human-made reservoir in northeastern Oklahoma County. The lake was constructed to supply the city of Edmond with water, control flooding, and provide outdoor recreation for the surrounding communities. The lake has approximately 26 miles of shoreline and 736 ha of surface area (U.S. Army Corps of Engineers 2024). Approximately 1,100 ha of recreational land surrounds the lake. The north side of the lake study site is approximately 274 ha and is between E 2nd St on the north side, the lake shore to the south, N Air Depot Blvd on the west, and N Post Rd on the east (Figure 2). The study site is between latitude 35.652685 and 35.644860 and longitude -97.407465 and -97.35392.

Belle Isle at the Deep Fork River (BIDFR) is in an area called Belle Isle in northwest Oklahoma City (Figure 3). The Belle Isle area encompasses the Wileman's Belle Isle Neighborhood, Penn Square Mall, Belle Isle Station (a shopping center), Rose Hill Cemetery, and various green spaces and semi-natural areas. The green spaces and semi-natural areas consist of mowed fields, forests, grasslands, two streams, a pond, and a 1.2 km section of the Deep Fork River. The southwest and northeast sections of the river are a concrete drainage ditch, while the central area is semi-natural river. The BIDFR study area is approximately 83 ha. It is between Pennsylvania Avenue on the west, Classen Boulevard on the east, northwest 59th Street on the north, and Northwest 53rd Street on the south. The study site is between latitude 35.531357 and 35.531140 and longitude -97.540018 and -97.540404.

Arcadia Lake is within the Cross Timbers ecoregion, while BIDFR sits on the border of the Central Great Plains and the Cross Timbers ecoregions (Figure 4). The Cross Timbers comprises over 4.8 million hectares and stretches from north-central Texas through central Oklahoma to its northern reaches in southern Kansas (Omernik 1987, Küchler 1964, Thomas & Hoagland 2011). The Cross Timbers include forest, savanna, grassland, and wetland. The predominant tree species are *Quercus stellata* Wangenh. (post oak) and *Quercus marilandica*

Münchh. (blackjack oak) (Duck & Fletcher 1945). The Central Great Plains ecoregion is a mixed-grass prairie with tallgrass and shortgrass vegetation that extends from Nebraska south through Kansas, Oklahoma, and Texas (Omernik 1987). The dominant genera are *Schizachyrium, Stipa, Elymus, Pseudoroegneruai, Pascopyrum, Calamovilfa, Bouteloua, Sporobolus, Buchloe, Muhlenbergia, Carex, and Aristida* (Barbour & Billings 2000).

Oklahoma County is within the temperate humid subtropical climate zone. This climate zone is characterized by hot and humid summers and cool to mild winters (Köppen 1936). Oklahoma County's average annual climate statistics include a growing season of 213 days, 92.4 cm of rainfall, a temperature of 15.5 °C, the last spring freeze is April 4th, the first fall freeze is November 2, 17.5 cm of snowfall, and a wind speed of 12.8 kph. The record high temperature is 45 °C, and the record low is - 26 °C. The latest recorded freeze date is April 20, and the earliest is October 21 (Oklahoma Climatological Survey https://climate.ok.gov/ 2022; Mesonet https://www.mesonet.org/ 2022).

METHODS

Fieldwork was conducted from April 2022 - October 2023. Twenty-nine site visits were made at Arcadia Lake (Friedman & Messick 2024a) and thirty-four at BIDFR (Friedman & Messick 2024b). Site visit frequency was determined by the likelihood of flowering plants being more abundant. Temperature and rainfall were also deciding factors in determining site visit frequency. Transects were designed to cover as many habitat types as possible to observe and collect as many species as possible. Arcadia Transect 1 was 2,082 m, Arcadia Transect 2 was 1,718 m (Figure 3), BIDFR Transect 1 was 1329 m, and BIDFR Transect 2 was 753 m (Figure 4). Most plants were observed and/or collected along the transects, but some were observed and or collected within the broader study areas. The species lists generated from these two floristic inventories were used for the present FQA analysis (Friedman & Messick 2024a; Friedman & Messick 2024b).

Before this research, one FQA study was conducted in Oklahoma (Ewing & Hoagland 2012). Ewing and Hoagland (2012) published C values for 676 species, but the remaining 1,981 species in Oklahoma did not have published C value rankings. Therefore, various measures were taken to obtain the most accurate C values. Dr. Bruce Hoagland from the University of Oklahoma assisted in sharing his C values for Oklahoma, C values from Missouri, Kansas, and Texas were utilized, and lastly, a collaborative effort of assigning C values between the authors and guidance from Hoagland (personal communication 2024), Wilhelm (personal communication 2024), and

Justin Thomas (personal communication 2024). Individual species in the Arcadia Lake and BIDFR inventories were attributed with their corresponding duration, growth habit, nativity, and C value, then they were uploaded to the Universal FQA Calculator (Universal FQA Calculator https://universalfqa.org/ 2024). The FQA Calculator calculated $\bar{c}$, FQI, physiognomy, duration, and nativity statistics (FQA Calculator 2024; the complete species lists can be downloaded from the FQA Calculator).

RESULTS

The plant survey at Arcadia Lake yielded 368 individual plant species representing 75 plant families and 235 genera (Appendix A) (Friedman & Messick 2024a). Seventeen percent of species were non-native. Twelve county records were observed: *Myosotis macrosperma* Engelm., *Samolus valerandi* L., *Scleranthus annuus* L., *Trepocarpus aethusae* Nutt. ex DC., *Erigeron modestus* A. Gray, *Facelis retusa* (Lam.) Sch. Bip., *Juncus acuminatus* Michx., *Lolium multiflorum* Lam., *Carex crus-corvi* Shuttlew. ex Kunze, *Carex lurida* Wahlenb, and *Eragrostis sessilispica* Buckley, and *Dalea multiflora* (Nutt.) Shinners. One species tracked by the Oklahoma Natural Heritage Inventory (ONHI) was observed: *Mimulus ringens* L. (Allegheny monkeyflower) (Oklahoma Natural Heritage Inventory The University of Oklahoma https://ou.edu/oknaturalheritage 2024).

The FQA results for Arcadia Lake include a C value distribution of 6.5% with a C value of 0, 8% with a C value of 1, 10% with a C value of 2, 17.5% with a C value of 3, 13% had a C value of 4, 7% with a C value of 5, 6.5% with a C value of 6, 5% with a C value of 7, 0.5% with a C value of 9, and 4% with a C value of 10 (Figure 5). The native Mean C was 3.8, and the total Mean C (including non-native species) was 3.2. The native FQI was 66.5, and the total FQI was 61.5 (Universal FQA Calculator https://universalfqa.org/ 2024).

The plant survey at BIDFR yielded 139 individual plant species representing 41 plant families and 120 genera (Appendix B). Thirty-three percent of observed species were non-native (Friedman & Messick 2024b). Two county records were observed: *Quercus fusiformis* Small (Texas live oak) and *Mimosa quadrivalvis* L. (fourvalve mimosa), and no species tracked by the ONHI were observed (Oklahoma Natural Heritage Inventory The University of Oklahoma https://ou.edu/oknaturalheritage 2024).

The FQA results for BIDFR include a C value distribution of 7% with a C value of 0, 6.5% with a C value of 1, 9% with a C value of 2, 21% with a C value of 3, 6.5% with a C value of 4, 8.5% with a C value of 5, 7% with a C value of 6, 1.5% with a C value of 7, and no plants with a C value of 8, 9, and 10 were observed (Figure 6). The native $\bar{c}$ was 3.2, and the total $\bar{c}$ (including non-native species) was 2.1. The native FQI was 30.9, and the total FQI was 24.8 (Universal FQA Calculator https://universalfqa.org/ 2024).

DISCUSSION

Arcadia Lake had the greatest species richness, while BIDFR had the lowest (Friedman & Messick 2024a; Friedman & Messick 2024b). BIDFR had a significantly greater number of non-native species than Arcadia Lake (Friedman & Messick 2024a; Friedman & Messick 2024b). Arcadia Lake's high species richness may be a result of the large study site, including iNaturalist observations (making the survey more thorough), or it being a more intact ecosystem. BIDFR's low species richness and high number of non-native species are likely a consequence of habitat degradation, which in turn creates opportunities for non-native species to occupy new niches (Shea & Chesson 2002; Madougall et al. 2009). Furthermore, non-native species can create a monoculture effect that lessens overall diversity.

According to the FQA continuum of degradation theory, Arcadia Lake's 3.8 native $\bar{c}$ is 0.2 points away from the benchmark of having some remnant quality, while BIDFR's 3.2 native $\bar{c}$ is 0.2 points above the benchmark of a degraded natural area (Wilhelm 2007; Ladd & Thomas 2015). As for FQI, the continuum of degradation theory suggests that Arcadia Lake's 64.1 native FQI is within the range of being a statewide-significant natural area, and BIDFR's 30.9 native FQI is in between a degraded area (native FQI of 20) to an area that has marginal natural area qualities (native FQI of 35) (Wilhelm & Masters 1995). The C Value distribution at both sites differs dramatically. Arcadia Lake had 43 plant species with C values in the 7-10 range, while BIDFR only had two plant species with a C value of 7 and 0 plant species with 8, 9, or 10 C values.

Deciphering FQA metrics can be challenging. Fundamental questions regarding the effectiveness of FQA metrics include: 1) Does FQA accurately and consistently measure anthropogenic disturbance?, 2) Can FQA be used for inter-habitat comparability?, 3) Can FQA be used for inter-region comparability?, and 4) Is the subjective nature of assigning C values valid? FQA must be based on a regional context with defined parameters (habitat, region, study site size, survey methods). For example, Ewing and Hoagland's (2012) FQA in Oklahoma examined 33 wetland sites with FQI values ranging from 0.5 to 25.3. This range in FQI values is low due to their sampling method: a plot survey ($10m^2$) versus a whole site or large transect survey. A plot survey of $10m^2$ will result in a much smaller species list (MacArthur & Wilson 1963), thus resulting in a lower FQI value. Ewing and Hoagland (2012) concluded that an FQI value of 15 or higher represented a possible remnant ecosystem. Nonetheless, the study produced a gradient for measuring degradation, but the FQI scores would not be comparable to other studies unless a plot survey of $10m^2$ were conducted.

Bowers and Boutin (2008) surveyed 27 sites along stream bank habitats in Ontario, Canada. Each site exhibited varying degrees of agricultural disturbance that they classified as disturbed, moderate, or pristine zones. They found FQA more effective for determining human-caused degradation than the "% non-native plant species" measure and total species richness. They concluded that the "% non-native species" does not factor in the sensitivity and fidelity of native plant species, and total species richness was ineffective due to a quadratic trend across their 27 study sites. Francis et al. (2000) conducted an FQA of woodlands in southern Ontario, Canada, and found a decrease in $\overline{c}$ correlated to increased human disturbance. They noted an increase in generalist species (low C value plant species), which corresponded to less mature forest stands and increased human disturbance. They found FQI scores ineffective for measuring ecological integrity based on how strongly species richness influences the score, thus skewing the conservatism factor (Francis et al. 2000).

Determining C values is another issue that deserves attention. Some species have very narrow geographical ranges but have broad ecological tolerances. One example is *Penstemon oklahomensis* Pennell. *P. oklahomensis* is endemic to the southern Great Plains region of Oklahoma and one location in northern Texas (Messick & Hoagland 2013). *P. oklahomensis* is tracked by the Oklahoma Natural Heritage Inventory and labeled an S1 (rare) plant species (Oklahoma Natural Heritage Inventory The University of Oklahoma Ou.edu/oknaturalheritage 2024). Globally, *P. oklahomensis* has a ranking of G3, which is considered rare but can be abundant at a given site (Messick & Hoagland 2013; Oklahoma Natural Heritage Inventory 2024). Although *P. oklahomensis* is mostly found in remnant tallgrass prairie, it is also found in other prairie types, open woodlands, and grassy roadside areas with various mowing regimes (Messick & Hoagland 2012). If one were following the C value protocol scale, *P. oklahomensis* would have a relatively low C value, which would not reflect the significance of its endemism and reliance on regional ecological conditions.

FQA research in Illinois forests and wetlands showed that C values tend to exhibit ecological integrity for a site (Matthews et al. 2015). This research found that the C values of individual species could be used to predict co-occurring plant species of similar C values. In other words, highly conservative species tend to co-occur with other highly conservative species, and non-conservative species tend to co-occur more with non-conservative species.

While FQA might be the most conclusive single metric for measuring overall ecological integrity, utilizing other metrics will always paint a bigger and better picture. The Floristic Quality Assessment of Arcadia Lake and Belle Isle at the Deep Fork River portray two sites that vary in ecological integrity, most likely resulting from anthropogenic disturbance. To better understand anthropogenic disturbance in Oklahoma County, a broader FQA study with more sites would help demonstrate a gradient of ecological integrity and an association of accrued human disturbance. Furthermore, greater C value scrutiny from a team of regional botanists and a measure of defined anthropogenic disturbances would aid the process.

The future of FQA will likely include issues related to climate change, financial incentives, and the loss of qualified botanists due to a decline in university botany programs (Zimmer 2024). Ecosystem changes resulting from climate change will likely alter plant species conservatism. In the coming years, C values will need to be revisited and altered according to shifting habitats. The financial costs of FQA will also be a factor based on the large amount of time associated with plant surveys and the collective process of assigning C values. As universities across the US put an end to botany programs, we are losing valuable resources like herbariums and courses that are needed to train the next generation of botanists. Botany departments, citizen science groups, funding, and educational resources are needed for further conservation and monitoring of natural areas.

Although Arcadia Lake and BIDFR show varying degrees of ecological integrity, both sites provide a plethora of ecological services. Their floristic compositions support a variety of wildlife and outdoor recreation. Conservation measures should be implemented for Arcadia Lake and BIDFR to monitor, maintain, and improve the ecological integrity of two of the most significant natural areas in Oklahoma County.

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FIGURES

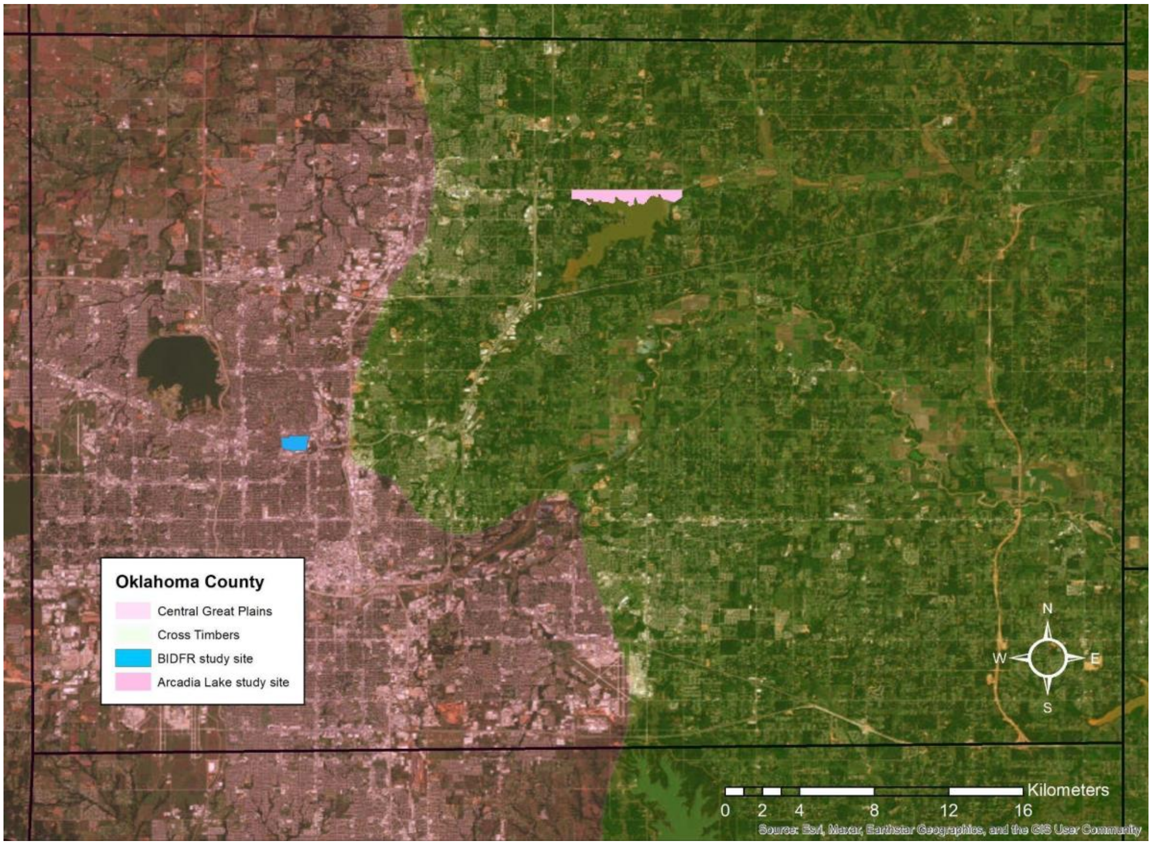

Figure 1. Oklahoma County with study sites and ecoregions.

Figure 2. Arcadia Lake with northside study site and transects.

Figure 3. BIDFR study site with transects.

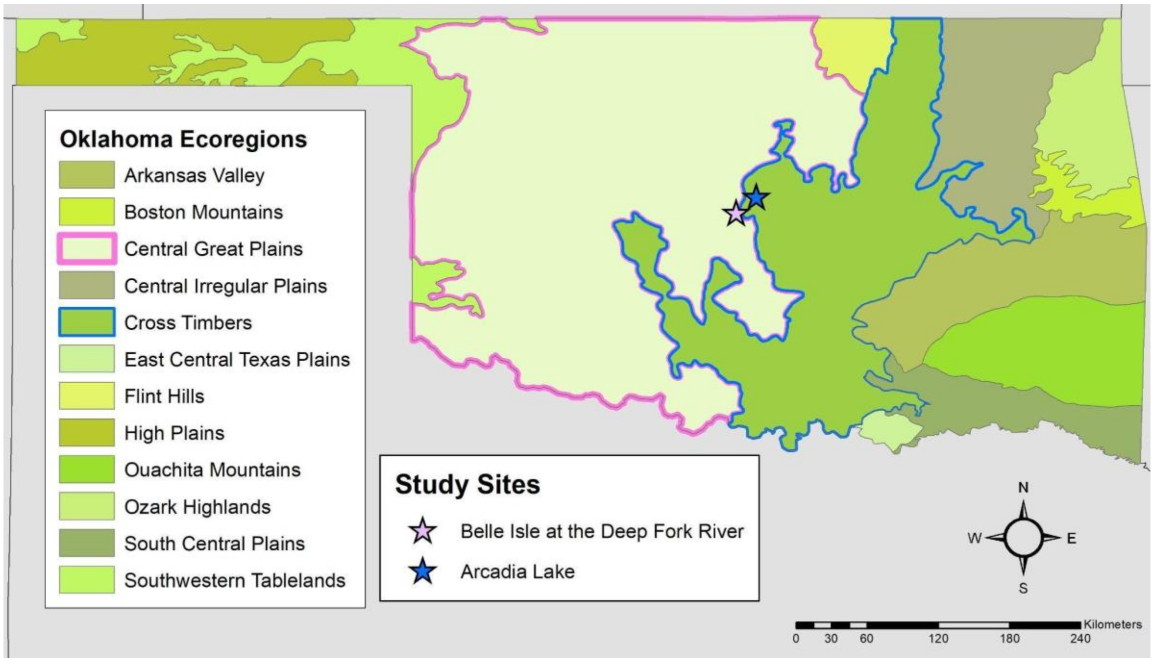

Figure 4. Oklahoma with ecoregions and study sites

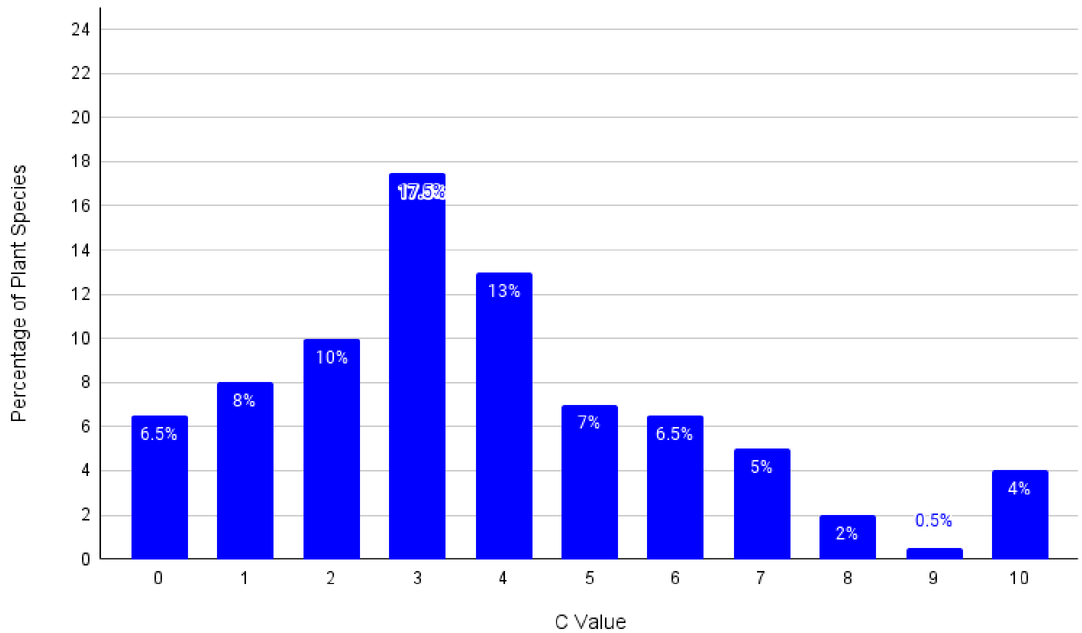

Figure 5. C Value Distribution at Arcadia Lake.

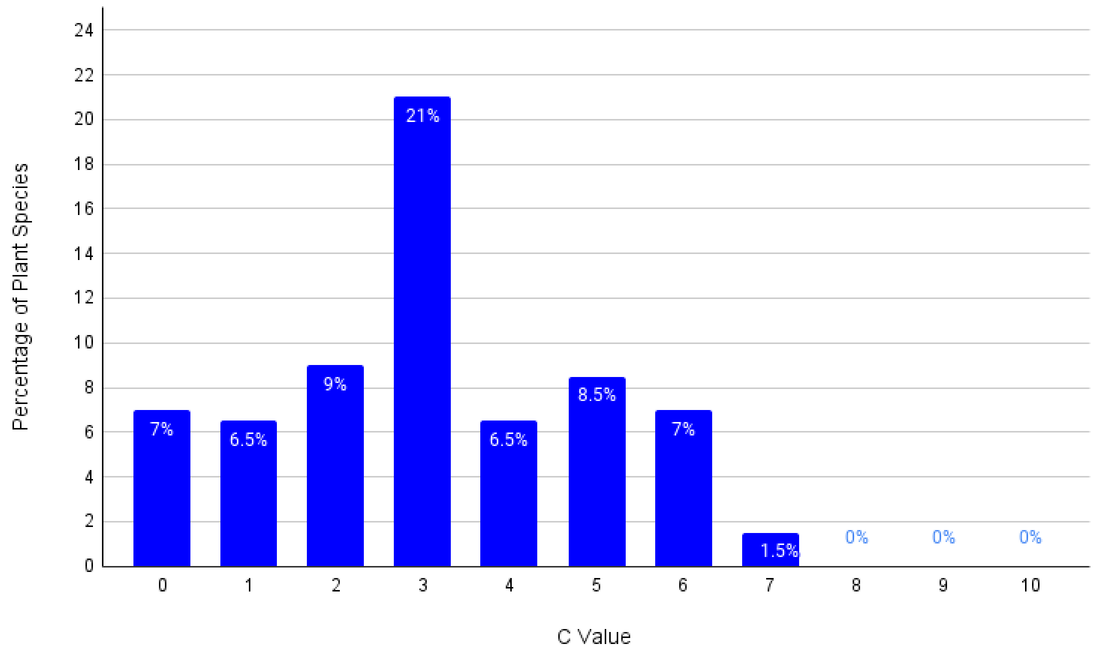

Figure 6. C Value Distribution at BIDFR.

APPENDIX A.

List of vascular plant taxa from Arcadia Lake, Oklahoma County, Oklahoma.

Taxa list with duration, growth habit, collection number, nativity, and heritage status.

* denotes exotic taxa. † denotes taxa tracked by the Oklahoma Natural Heritage Inventory.

Duration is denoted by A = Annual, P = Perennial, and B = Biennial.

Growth habit is denoted by: F = forb, FN = fern, S = shrub, V = vine, S = sedge, and R = rush.

Nativity, duration, and growth habit were determined using the USDA Plants Database (USDA 2024). Voucher specimens were deposited at the University of Central Oklahoma Herbarium (CSU).

C Value	**Scientific Name**	**P**	**D**	**Family**
1	*Acalypha ostryifolia*	F	A	Euphorbiaceae
2	*Acalypha virginica*	F	A	Euphorbiaceae
1	*Acer negundo*	T	P	Sapindaceae
2	*Acer saccharinum*	T	P	Sapindaceae
1	*Achillea millefolium*	F	P	Asteraceae
10	*Agalinis heterophylla*	F	A	Orobanchaceae
5	*Ageratina altissima*	F	P	Asteraceae
3	*Allium canadense*	F	P	Amaryllidaceae
*	*Allium vineale*	F	P	Amaryllidaceae
1	*Amaranthus arenicola*	F	A	Amaranthaceae
0	*Ambrosia bidentata*	F	A	Asteraceae
3	*Ambrosia psilostachya*	F	A	Asteraceae
2	*Ambrosia trifida*	F	A	Asteraceae
6	*Ammannia coccinea*	F	A	Lythraceae
3	*Amphiachyris dracunculoides*	F	A	Asteraceae
3	*Andropogon gerardi*	G	P	Poaceae
5	*Andropogon ternarius*	G	P	Poaceae
2	*Andropogon virginicus*	G	P	Poaceae
7	*Androstephium coeruleum*	F	P	Asparagaceae

4	*Antennaria neglecta*	F	P	Asteraceae
5	*Antennaria parlinii*	F	P	Asteraceae
4	*Antennaria plantaginifolia*	F	P	Asteraceae
*	*Arenaria serpyllifolia*	F	A	Caryophyllaceae
3	*Argemone polyanthemos*	F	A	Papaveraceae
3	*Artemisia ludoviciana*	F	P	Asteraceae
5	*Asclepias tuberosa*	F	P	Apocynaceae
2	*Asclepias verticillata*	F	P	Apocynaceae
7	*Asclepias viridiflora*	F	P	Apocynaceae
5	*Asclepias viridis*	F	P	Apocynaceae
4	*Asplenium platyneuron*	FN	P	Aspleniaceae
10	*Astragalus lotiflorus*	F	P	Fabaceae
8	*Baptisia australis*	F	P	Fabaceae
6	*Bidens aristosa*	F	A	Asteraceae
0	*Bidens bipinnata*	F	A	Asteraceae
2	*Bidens polylepis*	F	A	Asteraceae
*	*Bothriochloa ischaemum*	G	P	Poaceae
1	*Bothriochloa laguroides*	G	P	Poaceae
7	*Bouteloua curtipendula*	G	P	Poaceae
2	*Bouteloua dactyloides*	G	P	Poaceae
8	*Bouteloua gracilis*	G	P	Poaceae
10	*Bouteloua hirsuta*	G	P	Poaceae
3	*Bradburia pilosa*	F	A	Asteraceae
*	*Bromus catharticus*	G	P	Poaceae
*	*Bromus tectorum*	G	A	Poaceae
*	*Buglossoides arvensis*	F	A	Boraginaceae
5	*Callirhoe involucrata*	F	P	Malvaceae
*	*Camelina microcarpa*	F	A	Brassicaceae
3	*Campsis radicans*	V	P	Bignoniaceae
*	*Cardamine hirsuta*	F	A	Brassicaceae
*	*Carduus nutans*	F	B	Asteraceae
4	*Carex blanda*	S	P	Cyperaceae

7	*Carex crus-corvi*	S	P	Cyperaceae
4	*Carex grisea*	S	P	Cyperaceae
6	*Carex hyalinolepis*	S	P	Cyperaceae
7	*Carex lurida*	S	P	Cyperaceae
4	*Castilleja indivisa*	F	A	Orobanchaceae
5	*Celtis laevigata*	T	P	Cannabaceae
3	*Celtis occidentalis*	T	P	Cannabaceae
4	*Celtis reticulata*	T	P	Cannabaceae
3	*Cenchrus spinifex*	F	A	Poaceae
3	*Cephalanthus occidentalis*	F	P	Rubiaceae
*	*Cerastium glomeratum*	F	A	Caryophyllaceae
*	*Cerastium pumilum*	F	A	Caryophyllaceae
3	*Cercis canadensis*	T	P	Fabaceae
1	*Chaerophyllum procumbens*	F	A	Apiaceae
2	*Chaerophyllum tainturieri*	F	A	Apiaceae
2	*Chamaecrista fasciculata*	F	A	Fabaceae
1	*Chamaesyce maculata*	F	A	Euphorbiaceae
4	*Chasmanthium latifolium*	G	P	Poaceae
4	*Chasmanthium laxum*	G	P	Poaceae
*	*Chenopodium album*	F	A	Amaranthaceae
0	*Chenopodium pratericola*	F	A	Amaranthaceae
*	*Chorispora tenella*	F	A	Brassicaceae
4	*Cirsium altissimum*	F	B	Asteraceae
4	*Cirsium undulatum*	F	B	Asteraceae
3	*Claytonia virginica*	F	P	Montiaceae
7	*Clitoria mariana*	F	P	Fabaceae
3	*Cocculus carolinus*	V	P	Menispermaceae
*	*Commelina communis*	F	A	Commelinaceae
4	*Commelina erecta*	F	P	Commelinaceae
*	*Conium maculatum*	F	B	Apiaceae
4	*Conoclinium coelestinum*	F	P	Asteraceae
6	*Coreopsis grandiflora*	F	P	Asteraceae

2	*Coreopsis tinctoria*	F	P	Asteraceae
3	*Cornus drummondii*	S	P	Cornaceae
3	*Corydalis aurea*	F	A	Papaveraceae
8	*Corydalis micrantha*	F	A	Papaveraceae
2	*Croton capitatus*	F	P	Euphorbiaceae
*	*Croton glandulosus*	F	A	Euphorbiaceae
2	*Croton lindheimerianus*	F	A	Euphorbiaceae
3	*Croton monanthogynus*	F	A	Euphorbiaceae
5	*Cyperus croceus*	S	P	Cyperaceae
3	*Cyperus echinatus*	S	P	Cyperaceae
3	*Cyperus squarrosus*	S	A	Cyperaceae
6	*Dalea aurea*	F	P	Fabaceae
7	*Dalea candida*	F	P	Fabaceae
10	*Dalea enneandra*	F	P	Fabaceae
10	*Dalea multiflora*	F	P	Fabaceae
8	*Dalea purpurea*	F	P	Fabaceae
*	*Datura wrightii*	F	P	Solanaceae
4	*Daucus pusillus*	F	A	Apiaceae
*	*Descurainia pinnata*	F	A	Brassicaceae
*	*Descurainia sophia*	F	A	Brassicaceae
3	*Desmanthus illinoensis*	F	P	Fabaceae
6	*Desmodium sessilifolium*	F	P	Fabaceae
3	*Diaperia prolifera*	F	A	Asteraceae
4	*Diaperia verna*	F	A	Asteraceae
3	*Dichanthelium oligosanthes*	G	P	Poaceae
3	*Digitaria cognata*	G	P	Poaceae
1	*Diodia teres*	F	P	Rubiaceae
2	*Diodia virginiana*	F	A	Rubiaceae
3	*Diospyros virginiana*	T	P	Ebenaceae
0	*Draba brachycarpa*	F	A	Brassicaceae
5	*Draba cuneifolia*	F	A	Brassicaceae
8	*Echinacea angustifolia*	F	P	Asteraceae

3	*Eclipta prostrata*	F	A	Asteraceae
5	*Eleocharis acicularis*	rush	A	Cyperaceae
4	*Eleocharis obtusa*	S	P	Cyperaceae
7	*Eleocharis palustris*	S	P	Cyperaceae
3	*Elephantopus carolinianus*	F	P	Asteraceae
4	*Elymus glabriflorus*	G	P	Poaceae
3	*Equisetum hyemale*	F	P	Equisetaceae
4	*Equisetum laevigatum*	F	P	Equisetaceae
4	*Eragrostis secundiflora*	G	P	Poaceae
7	*Eragrostis sessilispica*	G	P	Poaceae
0	*Erigeron canadensis*	F	A	Asteraceae
6	*Erigeron modestus*	F	P	Asteraceae
3	*Erigeron philadelphicus*	F	B	Asteraceae
4	*Erigeron strigosus*	F	A	Asteraceae
0	*Eriogonum annuum*	F	A	Polygonaceae
10	*Eriogonum longifolium*	F	P	Polygonaceae
*	*Erodium cicutarium*	F	A	Geraniaceae
4	*Escobaria missouriensis*	S	P	Cactaceae
*	*Euonymus fortunei*	S	P	Celastraceae
3	*Eupatorium serotinum*	F	P	Asteraceae
4	*Euphorbia corollata*	F	P	Euphorbiaceae
*	*Euphorbia dentata*	F	A	Euphorbiaceae
2	*Euphorbia hexagona*	F	A	Euphorbiaceae
0	*Euphorbia nutans*	F	A	Euphorbiaceae
3	*Euphorbia spathulata*	F	A	Euphorbiaceae
*	*Facelis retusa*	F	A	Asteraceae
2	*Festuca octoflora*	G	A	Poaceae
6	*Fraxinus americana*	T	P	Oleaceae
3	*Fraxinus pennsylvanica*	T	P	Oleaceae
3	*Froelichia gracilis*	F	A	Amaranthaceae
6	*Fuirena simplex*	S	P	Cyperaceae
10	*Gaillardia aestivalis*	F	P	Asteraceae

2	*Gaillardia pulchella*	F	P	Asteraceae
5	*Gaillardia suavis*	F	P	Asteraceae
2	*Galium aparine*	F	A	Rubiaceae
4	*Galium virgatum*	F	A	Rubiaceae
4	*Gamochaeta pensylvanica*	F	A	Asteraceae
3	*Gamochaeta purpurea*	F	A	Asteraceae
*	*Gamochaeta ustulata*	F	A	Asteraceae
0	*Geranium carolinianum*	F	A	Geraniaceae
2	*Geum canadense*	F	P	Rosaceae
4	*Glandularia pumila*	F	A	Verbenaceae
2	*Gleditsia triacanthos*	F	P	Fabaceae
3	*Grindelia ciliata*	F	A	Asteraceae
4	*Gymnocladus dioicus*	T	P	Fabaceae
5	*Hedeoma drummondii*	F	A	Lamiaceae
3	*Hedeoma hispida*	F	A	Lamiaceae
6	*Hedeoma reverchonii*	F	P	Lamiaceae
*	*Hedera helix*	V	P	Araliaceae
1	*Helenium amarum*	F	A	Asteraceae
0	*Helianthus annuus*	F	A	Asteraceae
3	*Helianthus maximiliani*	F	P	Asteraceae
0	*Helianthus petiolaris*	F	A	Asteraceae
2	*Helianthus tuberosus*	F	P	Asteraceae
8	*Heliotropium tenellum*	F	A	Boraginaceae
3	*Heterotheca subaxillaris*	F	A	Asteraceae
4	*Hibiscus moscheutos*	F	A	Malvaceae
*	*Holosteum umbellatum*	F	A	Caryophyllaceae
3	*Houstonia pusilla*	F	A	Rubiaceae
6	*Hydrocotyle verticillata*	F	P	Araliaceae
7	*Hymenopappus scabiosaeus*	F	B	Asteraceae
6	*Hypericum hypericoides*	F	P	Hypericaceae
7	*Ilex vomitoria*	S	P	Aquifoliaceae
*	*Ipomoea hederacea*	V	A	Convolvulaceae

4	*Juglans nigra*	T	P	Juglandaceae
6	*Juncus acuminatus*	R	P	Juncaceae
5	*Juncus diffusissimus*	R	P	Juncaceae
6	*Juncus torreyi*	R	P	Juncaceae
7	*Juncus validus*	R	P	Juncaceae
1	*Juniperus virginiana*	T	P	Cupressaceae
7	*Krameria lanceolata*	F	P	Krameriaceae
5	*Krigia*	F	A	Asteraceae
2	*Lactuca floridana*	F	A	Asteraceae
*	*Lactuca serriola*	F	A	Asteraceae
*	*Lamium amplexicaule*	F	A	Lamiaceae
*	*Lepidium densiflorum*	F	A	Brassicaceae
0	*Lepidium virginicum*	F	A	Brassicaceae
6	*Lespedeza capitata*	F	P	Fabaceae
*	*Lespedeza cuneata*	F	P	Fabaceae
5	*Lespedeza virginica*	S	P	Fabaceae
0	*Leucospora multifida*	F	A	Plantaginaceae
7	*Liatris punctata*	F	P	Asteraceae
4	*Lindernia dubia*	F	A	Linderniaceae
1	*Linum rigidum*	F	A	Linaceae
5	*Linum sulcatum*	F	A	Linaceae
7	*Lithospermum incisum*	F	P	Boraginaceae
6	*Lobelia cardinalis*	F	P	Campanulaceae
*	*Lolium multiflorum*	G	A	Poaceae
*	*Lolium perenne*	G	A	Poaceae
*	*Lonicera japonica*	V	P	Caprifoliaceae
0	*Ludwigia peploides*	F	P	Onagraceae
6	*Lythrum alatum*	F	P	Lythraceae
2	*Maclura pomifera*	T	P	Moraceae
*	*Mazus pumilus*	F	A	Mazaceae
*	*Medicago minima*	F	A	Fabaceae
6	*Mentzelia oligosperma*	F	P	Loasaceae

4	*Mimosa nuttallii*	F	P	Fabaceae
4	*Mimosa quadrivalvis*	F	P	Fabaceae
10	*Mimulus ringens*	F	P	Phrymaceae
5	*Mirabilis albida*	F	P	Nyctaginaceae
10	*Mirabilis gigantea*	F	P	Nyctaginaceae
1	*Mollugo verticillata*	F	A	Molluginaceae
5	*Monarda clinopodioides*	F	A	Lamiaceae
9	*Monarda punctata*	F	A	Lamiaceae
1	*Morus rubra*	T	P	Moraceae
0	*Muhlenbergia schreberi*	G	P	Poaceae
4	*Myosotis macrosperma*	F	A	Boraginaceae
4	*Myosotis verna*	F	A	Boraginaceae
*	*Nandina domestica*	S	P	Berberidaceae
6	*Neptunia lutea*	F	P	Fabaceae
2	*Nothoscordum bivalve*	F	P	Amaryllidaceae
3	*Nuttallanthus texanus*	F	A	Plantaginaceae
6	*Oenothera berlandieri*	F	A	Onagraceae
0	*Oenothera biennis*	F	B	Onagraceae
1	*Oenothera curtiflora*	F	A	Onagraceae
1	*Oenothera filiformis*	F	A	Onagraceae
6	*Oenothera glaucifolia*	F	B	Onagraceae
0	*Oenothera laciniata*	F	A	Onagraceae
7	*Ophioglossum engelmannii*	FN	P	Ophioglossaceae
10	*Opuntia macrorhiza*	S	P	Cactaceae
*	*Ornithogalum umbellatum*	F	P	Asparagaceae
1	*Oxalis corniculata*	F	A	Oxalidaceae
0	*Oxalis dillenii*	F	P	Oxalidaceae
5	*Oxalis violacea*	F	P	Oxalidaceae
6	*Palafoxia rosea*	F	A	Asteraceae
1	*Parietaria pensylvanica*	F	A	Urticaceae
2	*Parthenocissus quinquefolia*	V	P	Vitaceae
3	*Paspalum setaceum*	G	P	Poaceae

2	*Passiflora incarnata*	V	P	Passifloraceae
5	*Pediomelum digitatum*	F	P	Fabaceae
10	*Penstemon cobaea*	F	P	Plantaginaceae
5	*Penstemon laxiflorus*	F	P	Plantaginaceae
*	*Persicaria maculosa*	F	A	Polygonaceae
3	*Persicaria punctata*	F	A	Polygonaceae
3	*Phyla nodiflora*	F	P	Verbenaceae
3	*Physalis angulata*	F	A	Solanaceae
*	*Pistacia chinensis*	T	P	Anacardiaceae
1	*Plantago aristata*	F	A	Plantaginaceae
*	*Plantago lanceolata*	F	A	Plantaginaceae
1	*Plantago patagonica*	F	A	Plantaginaceae
1	*Plantago rhodosperma*	F	A	Plantaginaceae
4	*Pluchea odorata*	F	A	Asteraceae
8	*Polytaenia nuttallii*	F	B	Apiaceae
1	*Populus deltoides*	T	P	Salicaceae
3	*Prunus angustifolia*	S	P	Rosaceae
3	*Prunus mexicana*	S	P	Rosaceae
2	*Pseudognaphalium obtusifolium*	F	A	Asteraceae
6	*Psoralidium tenuiflorum*	F	P	Fabaceae
3	*Pyrrhopappus carolinianus*	F	B	Asteraceae
3	*Pyrrhopappus grandiflorus*	F	P	Asteraceae
3	*Pyrrhopappus pauciflorus*	F	A	Asteraceae
4	*Quercus macrocarpa*	T	P	Fagaceae
4	*Quercus marilandica*	T	P	Fagaceae
3	*Quercus muehlenbergii*	T	P	Fagaceae
5	*Quercus shumardii*	T	P	Fagaceae
4	*Quercus stellata*	T	P	Fagaceae
4	*Ranunculus abortivus*	F	B	Ranunculaceae
3	*Ranunculus sceleratus*	F	A	Ranunculaceae
2	*Ratibida columnifera*	F	P	Asteraceae
3	*Rhus copallinum*	S	P	Anacardiaceae

3	*Rhus glabra*	S	P	Anacardiaceae
5	*Ribes aureum*	S	P	Grossulariaceae
2	*Rorippa palustris*	F	A	Brassicaceae
3	*Rorippa sessiliflora*	F	A	Brassicaceae
*	*Rosa multiflora*	V	P	Rosaceae
4	*Rubus allegheniensis*	S	P	Rosaceae
3	*Rubus flagellaris*	F	P	Rosaceae
3	*Rudbeckia hirta*	F	A	Asteraceae
3	*Ruellia humilis*	F	P	Acanthaceae
*	*Rumex acetosella*	F	P	Polygonaceae
*	*Rumex crispus*	F	P	Polygonaceae
1	*Rumex hastatulus*	F	P	Polygonaceae
5	*Sabatia campestris*	F	A	Gentianaceae
2	*Salix nigra*	T	P	Salicaceae
4	*Salvia azurea*	F	P	Lamiaceae
5	*Samolus parviflorus*	F	P	Primulaceae
5	*Samolus valerandi*	F	P	Primulaceae
3	*Sanicula canadensis*	F	B	Apiaceae
2	*Sapindus drummondii*	T	P	Sapindaceae
5	*Schizachyrium scoparium*	G	P	Poaceae
*	*Scleranthus annuus*	F	A	Caryophyllaceae
*	*Senecio vulgaris*	F	A	Asteraceae
*	*Setaria faberi*	G	A	Poaceae
*	*Setaria pumila*	F	A	Poaceae
*	*Sherardia arvensis*	F	A	Rubiaceae
0	*Sida spinosa*	F	A	Malvaceae
5	*Sideroxylon lanuginosum*	T	P	Sapotaceae
3	*Sisyrinchium angustifolium*	F	P	Iridaceae
5	*Smilax bona-nox*	V	P	Smilacaceae
1	*Solanum carolinense*	F	P	Solanaceae
0	*Solanum dimidiatum*	F	P	Solanaceae
0	*Solanum rostratum*	F	A	Solanaceae

3	*Solidago canadensis*	F	P	Asteraceae
6	*Solidago missouriensis*	F	P	Asteraceae
2	*Solidago nemoralis*	F	P	Asteraceae
7	*Solidago rigida*	F	P	Asteraceae
*	*Sonchus asper*	F	A	Asteraceae
5	*Sorghastrum nutans*	G	P	Poaceae
6	*Sphenopholis obtusata*	G	A	Poaceae
*	*Stellaria media*	F	A	Caryophyllaceae
7	*Stenaria nigricans*	F	P	Rubiaceae
2	*Strophostyles helvola*	F	A	Fabaceae
2	*Strophostyles leiosperma*	F	A	Fabaceae
7	*Stylosanthes biflora*	F	P	Fabaceae
1	*Symphoricarpos orbiculatus*	S	P	Caprifoliaceae
3	*Symphyotrichum divaricatum*	F	A	Asteraceae
3	*Symphyotrichum drummondii*	F	P	Asteraceae
5	*Symphyotrichum ericoides*	F	P	Asteraceae
4	*Symphyotrichum oblongifolium*	F	P	Asteraceae
4	*Symphyotrichum subulatum*	F	A	Asteraceae
*	*Taraxacum officinale*	F	P	Asteraceae
3	*Teucrium canadense*	F	P	Lamiaceae
5	*Thelesperma filifolium*	F	A	Asteraceae
3	*Toxicodendron pubescens*	F	P	Anacardiaceae
1	*Toxicodendron radicans*	F	P	Anacardiaceae
5	*Tradescantia occidentalis*	F	P	Commelinaceae
5	*Tradescantia ohiensis*	F	P	Commelinaceae
*	*Tragopogon dubius*	F	A	Asteraceae
10	*Trepocarpus aethusae*	F	A	Apiaceae
4	*Tridens albescens*	G	P	Poaceae
1	*Tridens flavus*	G	P	Poaceae
*	*Trifolium arvense*	F	A	Fabaceae
*	*Trifolium campestre*	F	A	Fabaceae
10	*Triodanis holzingeri*	F	A	Campanulaceae

1	*Triodanis perfoliata*	F	A	Campanulaceae
2	*Ulmus americana*	T	P	Ulmaceae
*	*Ulmus minor*	T	P	Ulmaceae
*	*Ulmus pumila*	T	P	Ulmaceae
3	*Ulmus rubra*	T	P	Ulmaceae
2	*Valerianella radiata*	F	A	Caprifoliaceae
*	*Verbascum thapsus*	F	B	Scrophulariaceae
4	*Verbena stricta*	F	A	Verbenaceae
3	*Verbena urticifolia*	F	P	Verbenaceae
1	*Verbesina encelioides*	F	A	Asteraceae
3	*Verbesina virginica*	F	B	Asteraceae
2	*Vernonia baldwinii*	F	P	Asteraceae
0	*Veronica anagallis-aquatica*	F	B	Plantaginaceae
*	*Veronica arvensis*	F	A	Plantaginaceae
0	*Veronica peregrina*	F	A	Plantaginaceae
4	*Viburnum rufidulum*	T	P	Viburnaceae
*	*Vicia sativa*	F	A	Fabaceae
*	*Vicia villosa*	F	A	Fabaceae
*	*Vinca major*	F	P	Apocynaceae
4	*Viola missouriensis*	F	A	Violaceae
0	*Viola rafinesquei*	F	A	Violaceae
2	*Viola sororia*	F	A	Violaceae
4	*Viola villosa*	F	P	Violaceae
3	*Vitis vulpina*	V	P	Vitaceae
2	*Vulpia octoflora*	G	A	Poaceae
5	*Woodsia obtusa*	FN	P	Woodsiaceae
0	*Xanthium strumarium*	F	A	Asteraceae
9	*Yucca arkansana*	F	P	Asparagaceae
10	*Yucca glauca*	F	P	Asparagaceae

APPENDIX B.

List of vascular plant taxa from Belle Isle at the Deep Fork River, Oklahoma County, Oklahoma. Taxa list with duration, growth habit, and nativity.

* denotes an exotic taxa.

Duration is denoted by A = Annual, P = Perennial, and B = Biennial.

Growth habit is denoted by: F = forb, FN = fern, S = shrub, V = vine, S = sedge, and R = rush.

C-value	Scientific Name	P	D	Family
1	*Achillea millefolium*	F	P	Asteraceae
*	*Albizia julibrissin*	T	P	Fabaceae
3	*Allium canadense*	F	P	Amaryllidaceae
4	*Allium drummondii*	F	P	Amaryllidaceae
*	*Allium vineale*	F	P	Amaryllidaceae
3	*Ambrosia psilostachya*	F	A	Asteraceae
4	*Ammannia coccinea*	F	A	Lythraceae
3	*Ammoselinum popei*	F	A	Apiaceae
6	*Amorpha fruticosa*	S	P	Fabaceae
2	*Ampelopsis cordata*	V	P	Vitaceae
3	*Amphiachyris dracunculoides*	F	A	Asteraceae
2	*Andropogon glomeratus*	G	P	Poaceae
5	*Anemone caroliniana*	F	P	Ranunculaceae
*	*Arenaria serpyllifolia*	F	A	Caryophyllaceae
2	*Artemisia ludoviciana*	F	P	Asteraceae
*	*Arundo donax*	S	P	Poaceae
5	*Asclepias viridis*	F	P	Apocynaceae
3	*Bidens frondosa*	F	A	Asteraceae

2	*Bothriochloa laguroides*	F	P	Poaceae
*	*Bromus catharticus*	G	A	Poaceae
*	*Buglossoides arvensis*	F	A	Boraginaceae
*	*Carduus nutans*	F	B	Asteraceae
1	*Catalpa speciosa*	T	P	Bignoniaceae
3	*Cephalanthus occidentalis*	F	P	Rubiaceae
4	*Cirsium altissimum*	F	B	Asteraceae
*	*Clematis terniflora*	V	P	Ranunculaceae
*	*Commelina communis*	F	A	Commelinaceae
0	*Conium maculatum*	F	B	Apiaceae
*	*Convolvulus arvensis*	V	P	Convolvulaceae
2	*Coreopsis tinctoria*	F	P	Asteraceae
3	*Cornus drummondii*	S	P	Cornaceae
3	*Croton monanthogynus*	F	A	Euphorbiaceae
*	*Cruciata pedemontana*	F	A	Rubiaceae
4	*Cuscuta campestris*	V	P	Convolvulaceae
*	*Cynodon dactylon*	G	P	Poaceae
0	*Cyperus esculentus*	S	P	Cyperaceae
3	*Cyperus squarrosus*	S	A	Cyperaceae
7	*Dalea candida*	F	P	Fabaceae
3	*Desmanthus illinoensis*	F	P	Fabaceae
5	*Desmanthus leptolobus*	F	P	Fabaceae
0	*Dianthus armeria*	F	A	Caryophyllaceae
3	*Dichanthelium oligosanthes*	G	P	Poaceae
5	*Dicliptera brachiata*	F	A	Acanthaceae
3	*Diospyros virginiana*	T	P	Ebenaceae
*	*Echinochloa crus-galli*	G	A	Poaceae

3	*Eclipta prostrata*	F	A	Asteraceae
6	*Eleocharis compressa*	R	P	Cyperaceae
6	*Eleocharis montevidensis*	R	P	Cyperaceae
4	*Eleocharis palustris*	R	P	Cyperaceae
5	*Elymus canadensis*	G	P	Poaceae
3	*Eragrostis spectabilis*	G	P	Poaceae
0	*Erigeron canadensis*	F	A	Asteraceae
3	*Erigeron philadelphicus*	F	B	Asteraceae
2	*Erigeron strigosus*	F	A	Asteraceae
*	*Erodium cicutarium*	F	A	Geraniaceae
3	*Eupatorium serotinum*	F	P	Asteraceae
0	*Euphorbia nutans*	F	A	Euphorbiaceae
3	*Euphorbia spathulata*	F	A	Euphorbiaceae
3	*Fraxinus pennsylvanica*	T	P	Oleaceae
5	*Gaillardia suavis*	F	P	Asteraceae
*	*Galium divaricatum*	F	A	Rubiaceae
*	*Geranium dissectum*	F	A	Geraniaceae
2	*Gleditsia triacanthos*	T	P	Fabaceae
3	*Grindelia ciliata*	F	A	Asteraceae
1	*Helenium amarum*	F	A	Asteraceae
0	*Helianthus annuus*	F	A	Asteraceae
1	*Hordeum pusillum*	G	A	Poaceae
3	*Houstonia pusilla*	F	A	Rubiaceae
5	*Ilex decidua*	S	P	Aquifoliaceae
6	*Juncus torreyi*	R	P	Juncaceae
*	*Lactuca serriola*	F	A	Asteraceae
*	*Lamium amplexicaule*	F	A	Lamiaceae

*	*Lathyrus hirsutus*	F	A	Fabaceae
5	*Lemna minor*	F	P	Araceae
*	*Lepidium oblongum*	F	A	Brassicaceae
7	*Liatris punctata*	F	P	Asteraceae
*	*Ligustrum quihoui*	S	P	Oleaceae
*	*Ligustrum sinense*	S	P	Oleaceae
3	*Liquidambar styraciflua*	T	P	Altingiaceae
*	*Lonicera maackii*	S	P	Caprifoliaceae
4	*Lycopus americanus*	F	P	Lamiaceae
2	*Maclura pomifera*	T	P	Moraceae
*	*Medicago lupulina*	F	A	Fabaceae
*	*Melilotus officinalis*	F	A	Fabaceae
4	*Mimosa quadrivalvis*	F	P	Fabaceae
*	*Muscari neglectum*	F	P	Asparagaceae
*	*Nasturtium officinale*	F	P	Brassicaceae
6	*Neptunia lutea*	F	P	Fabaceae
2	*Nothoscordum bivalve*	F	P	Amaryllidaceae
3	*Oenothera suffulta*	F	A	Onagraceae
5	*Oxalis violacea*	F	P	Oxalidaceae
5	*Packera plattensis*	F	P	Asteraceae
*	*Paspalum dilatatum*	G	P	Poaceae
3	*Phyla lanceolata*	F	P	Verbenaceae
*	*Pistacia chinensis*	T	P	Anacardiaceae
0	*Plantago lanceolata*	F	A	Plantaginaceae
1	*Plantago virginica*	F	A	Plantaginaceae
6	*Poa arachnifera*	G	P	Poaceae
1	*Populus deltoides*	T	P	Salicaceae

3	*Prunus angustifolia*	S	P	Rosaceae
6	*Psoralidium tenuiflorum*	F	P	Fabaceae
3	*Pyrrhopappus pauciflorus*	F	A	Asteraceae
*	*Pyrus calleryana*	T	P	Rosaceae
6	*Quercus fusiformis*	T	P	Fagaceae
3	*Ranunculus sceleratus*	F	A	Ranunculaceae
0	*Ratibida columnifera*	F	P	Asteraceae
3	*Rhus glabra*	S	P	Anacardiaceae
1	*Robinia pseudoacacia*	T	P	Fabaceae
*	*Rumex crispus*	F	P	Polygonaceae
5	*Sabatia campestris*	F	A	Gentianaceae
2	*Salix nigra*	T	P	Salicaceae
2	*Sapindus drummondii*	T	P	Sapindaceae
6	*Schoenoplectus pungens*	R	P	Cyperaceae
*	*Secale cereale*	G	A	Poaceae
*	*Setaria pumila*	G	A	Poaceae
*	*Sherardia arvensis*	F	A	Rubiaceae
6	*Sisyrinchium ensigerum*	F	P	Iridaceae
0	*Solanum dimidiatum*	F	P	Solanaceae
1	*Solanum elaeagnifolium*	F	P	Solanaceae
0	*Solanum rostratum*	F	A	Solanaceae
2	*Solidago nemoralis*	F	P	Asteraceae
*	*Sonchus asper*	F	A	Asteraceae
*	*Spiraea cantoniensis*	S	P	Rosaceae
3	*Symphyotrichum divaricatum*	F	A	Asteraceae
3	*Symphyotrichum drummondii*	F	P	Asteraceae
4	*Symphyotrichum oblongifolium*	F	P	Asteraceae

*	*Taraxacum officinale*	F	P	Asteraceae
2	*Teucrium canadense*	F	P	Lamiaceae
5	*Thelesperma filifolium*	F	A	Asteraceae
*	*Torilis arvensis*	F	A	Apiaceae
*	*Tribulus terrestris*	F	A	Zygophyllaceae
*	*Trifolium repens*	F	P	Fabaceae
*	*Veronica arvensis*	F	A	Plantaginaceae
1	*Veronica peregrina*	F	A	Plantaginaceae
*	*Veronica polita*	F	A	Plantaginaceae
*	*Vicia sativa*	F	A	Fabaceae
*	*Vicia villosa*	F	A	Fabaceae
4	*Vitis rotundifolia*	V	P	Vitaceae
0	*Xanthium strumarium*	F	A	Asteraceae