AN ASSESSMENT OF INVASIVE STATUS
OF NON-NATIVE VASCULAR PLANT SPECIES IN OKLAHOMA

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ABSTRACT

The proliferation of non-native invasive species globally has created ecologic and economic duress. The Convention on Biological Diversity has called for the identification and prioritization of invasive non-native species by 2020. Although numerous ranking methodologies exist to meet this goal, the data required are often lacking for most taxa in a region. I used the Fundamental Invasiveness Index to assess the invasive potential of 436 non-native species of vascular plants in Oklahoma. It evaluates taxa based on five criteria: (1) nativity, (2) approximate date of introduction, (3) current geographic distribution, (4) ecological/reproductive behavior, and (5) basic habitat and growth. Seventeen species are ranked as F1, 115 as F2, and 305 as F3. Amaranthus graecizans and Glinus lotoides are the first recorded non-native vascular plants in Oklahoma. Eight counties have ten or more first reports of a non-native taxa. Thirty-four species are designated as Watch. The Fundamental Invasiveness Index provides great facility for evaluating a large number of non-native taxa.

METHODS

Government agencies and NGOs have developed and/or adopted frameworks for evaluating invasive potential to assist conservation biologists and land managers in recognizing which non-native species pose a current or potential threat as an invasive; the NatureServe (Morse 2004)
Invasive Species Impact Rank and the New York Non-Native Plant Assessment (2019) are two of many examples. The majority of these frameworks require access to extensive geographic and life history data that often is not complete or readily available. In many cases, the data required are lacking for some taxa. This presents a challenge for the assessment and ranking of non-native species in a state or regional flora. The Fundamental Invasiveness Index (Nesom 2009) is a readily accessible framework for the assessment of invasive potential of a large pool of non-native species in a flora. Each non-native taxon is evaluated based on five categories: (1) nativity, (2) approximate date of introduction, (3) current geographic distribution, (4) ecological/reproductive behavior, and (5) Basic habitat and growth (Nesom 2009). Each species or taxon is then evaluated and assigned to one of four categories (Nesom 2009):

**F1:** Invasive in both disturbed and natural habitats, negatively affecting native species or natural biodiversity by altering native vegetation and habitats or by outcompeting or hybridizing with native species, or, invasive into agricultural habitats and causing significant economic damage, including woody, herbaceous, and aquatic species.

**F2:** Abundant in number and widespread, commonly invasive in disturbed habitats, much less commonly in natural habitats, subdivided into woody, herbaceous, and aquatic species.

**F3:** Relatively few in number, known from relatively few localities, usually in disturbed habitats, subdivided into woody and herbaceous species.

**F4:** Status unknown

I initiated this project by generating a list of non-native vascular plants from the Oklahoma Vascular Plants Database (OVPD 2019). The OVPD contains >240,000 records, each representing a voucher deposited in one of eight in-state herbaria. The OVPD captures all information provided by the collector on the voucher label, which is parsed into Darwin Core (Wieczorek et al. 2012) fields. The OVPD also contains the annotation history of each voucher. Some taxa on the preliminary list are ornamental or other cultivated plants. These were discarded if the collector indicated that the voucher was planted or cultivated. If not indicated as such, the taxon was retained on the list.

Nativity was determined using Taylor and Taylor (1994) and USDA Plants (2019). Approximate date of introduction is defined as the specimen of a non-native species in the OVPD with the earliest collection date. It is recognized that the non-native species probably arrived in the state long before the first collection, but herbarium records are the closest approximation of arrival times available. For example, the Robert Bebb Herbarium at the University of Oklahoma (OKL) is the oldest herbarium in the state and was therefore the primary source for approximate date of introduction. Founded in 1893 by Professor Edwin DeBarr, at which time it housed 250 specimens from Oklahoma, OKL grew to 4,000 specimens by 6 January 1903. Sadly, OKL was destroyed by fire in that year and all specimens were lost (Rice & Cross 1990). Although the OVPD does contain records from 1894 to the present, the destruction of OKL in 1903 may resulted in the loss of vouchers with earlier approximate dates of introduction. Therefore, it seemed prudent to review floristic lists from Oklahoma that predated the fire, the most comprehensive of which are Holzinger (1892), Olive (1895), and Bogue (1900). Only the *Annotated catalogue of the ferns and flowering plants of Oklahoma* by Ernest Everett Bogue included non-native plant species. Bogue, a botanist and entomologist at the Oklahoma Agricultural Experiment Station (located in Guthrie, Oklahoma Territory), based his catalog upon specimens maintained at the station. Professor Joseph W. Blankenship, who was a member of the faculty at Montana State College of Agriculture and Mechanical Arts, assisted Bogue with identifications and contributed information from his personal collections made in Oklahoma Territory (Bogue 1900). There are no records in the OVPD bearing either the name Bogue or Blankenship.
County distribution records in the OVPD were the basis for current geographic distribution. Ecological/reproductive behavior in Oklahoma and in other regions was based on published literature, information provided herbarium collection labels, and expert knowledge. Basic habitat and growth form (forb, graminoid, vine, or woody) information was determined using Taylor and Taylor (1994) and USDA Plants (2017). The taxonomy follows the ITIS (2019).

Figure 1. A count of approximate first date of introduction by county for non-native vascular plant taxa based upon records in the Oklahoma Vascular Plant Database (2019).

Figure 2. A count of approximate first date of introduction by year for non-native vascular plant taxa based upon records in the Oklahoma Vascular Plant Database (2019).
RESULTS AND DISCUSSION

A total of 436 species in 265 genera and 73 families were assessed and assigned a Fundamental Invasiveness Index score (Table 1). Four families have 30 or more non-native taxa: Asteraceae (n=37), Brassicaceae (n=32), Fabaceae (n=46), and Poaceae (n=86). The five genera containing the most species evaluated are Bromus (n=10), Eragrostis (n=8), Medicago (n=6), Rumex (n=6), Trifolium (n=11), and Veronica (n=6). In terms of life history, 216 are annuals, 35 biennials, 185 perennials, and among life history categories 305 (including two ferns) were forbs, 90 are graminoids, 40 trees or shrubs, and eight vines. The number of taxa in each Fundamental Invasiveness Index rank are F3 = 294, F2 = 119, F1 = 21.

Amaranthus graecizans and Glinus lotoides are the first vouchered non-native vascular plants in Oklahoma; both were collected in 1894. Neither, however, can be confidently attributed to a county of collection. Seven specimens dating from 1902-1930 also lacked a county of collection. This represents one of two challenges when working with older collections: (1) lack of geographic location and/or (2) no collection date recorded on the label. In regard to the former, location of the collection was either not provided on the label or was confounded by changes in the internal geography of the state. The specimen of Glinus lotoides was collected by Benjamin Franklin Bush of Missouri on 30 July 1894, which is prior to statehood (Oklahoma entered the Union in 1907). It was one of several vouchers labeled as “Plants of Indian Territory” at OKL and the Oklahoma State University herbarium (OKLA). The location is listed as “Verdigris,” which either refers to the settlement of Verdigris (present day Rogers County) or a location along the Verdigris River, which passes through several counties. Less problematic is the Bush specimen of Amaranthus graecizans, collected at a location reported as Sapulpa, Creek Nation, Indian Territory. At the time of the collection, Sapulpa was part of the Okmulgee District of the Creek Nation, but after statehood it became the county seat for Creek County.

First occurrences are reported from 67 of the 77 counties in Oklahoma (Figure 1). Eight counties have ten or more first reports of a non-native taxon: Cleveland (n=57), Payne (n=45), McCurtain (n=40), Muskogee (n=25), Cherokee (n=24), Oklahoma (n=22), Bryan (13), LeFlore (n=13), and Woods (n=13). The leading two counties are home to the University of Oklahoma and Oklahoma State University, respectively. Five species had the same year of approximate date of introduction but specimens reported from two counties: LeFlore and Pushmataha (Cardamine hirsuta, 1968), Kiowa and Tilman (Glaucom flavum, 1985), Cleveland and Murray (Ipomoea purpurea, 1919), Adair and Delaware (Leucanthemum vulgare, 1938), and Cleveland and Oklahoma (Lythrum salicaria, 1993). The most broadly distributed of the non-native species are Capsella bursa-pastoris and Echinochloa crus-galli (both ranked F2), reported from 72 of the 77 counties respectively.

The year 1913 has the most approximate dates of introduction (n=46) for non-native vascular plants, with subsequent peaks in 1927 and 1940 (15 records each; Figure 2). In the 123 years since the first documentation of a non-native vascular plants in Oklahoma, there have been only 23 years without a first occurrence record.

All records for 1913 were collected by George Walter Stevens (1868-1936), a faculty member at the State Normal School in Alva (now Northwestern Oklahoma State University) from 1904 to 1912 and director of the State Botanical Survey (which is defunct) in 1913 (Lawson et al. 1978). He and four assistants conducted five collecting expeditions, each to a different region of Oklahoma, from 6 April to 20 September 1913, resulting in some 4,600 specimens (Goodman et al. 1978). He later completed the first flora of Oklahoma (Stevens 1916).

As mentioned earlier, two vexing aspects of this research have been the lack of location information and/or collection date for a voucher. In the case of Matricaria recutita, only two vouchers exist; one lacks a collection date, the other location information. The only specimen of
Tanacetum vulgare, collected by Celeste Whaley in Delaware County, lacks a collection date. Many vouchers collected by Stevens, an important source of early 20th century botanical material for Oklahoma, often lack collection dates. Two examples are his collections of Cyperus rotundus and Heliotropium indicum from McCurtain County, which was not included in the itinerary of the 1913 expeditions. To ascertain the year of collection, I determined that collection numbers for Stevens work in McCurtain County range from 3745 and ends with 3888. A collection date accompanies only one of those specimens: Asplenium platyneuron, collection number 3857, 28 May 1916. Cyperus rotundus and H. indicum bear the collection numbers 3745 and 3752, so the approximate date of introduction for these two species is indicated as 1916. Otherwise, the approximate date of introduction for C. rotundus is 1941, based on the specimen collected by C. Smith and W. Randel from Pontotoc County, and 1919 for H. indicum, from a specimen by R.E. Jeffs from LeFlore (Appendix 1). Of course, this would change the first county of collection as well.

Based on the species list provided by Bogue (1900), there were 27 species for which the approximate date of introduction was earlier than the specimen in the OVPD (Appendix 2). Actual collection dates were not provided by Bogue. For example, the first collection in the OVPD of Sorghum halepense was by Stevens on 21 June 1913 from Harmon County. Sorghum halepense appears in Bogue’s catalog for Oklahoma Territory with the note “introduced from Texas. Considered by many as a most troublesome weed and by others as a most valuable forage plant. It is very tenacious…”

Bogue (1900) also reported Anredera baselloides as occurring in Oklahoma Territory, noting “Determined by J.W. Blankinship, this is the first record north of its appearance north of Mexico. Collected only once by F.M. Greiner at Stillwater. Have not been able to find plants since the first collection,” nor has it been found since. Also included in his list is Canavalia ensiformis (L.) DC. “a volunteer in sandy soil along the Cimarron” River. There are no records of either plant in the OVPD.

Of the 436 taxa assessed, only 17 (4%) are ranked as F1. The majority of species are ranked as F3 (n=305, 70%); F2 species account for 26% (n=115). Thirty-four species are designated as Watch (W): F3W=15, F2W=20. The watch list for Oklahoma Invasive Plants Council lists 29 species, of which 26 species are designated as Watch species here. It should be noted that the watch designation in this research is not intended to contradict or call in to question the OKIPC watch list.

CONCLUSIONS

Existing frameworks for evaluating and ranking the potential for invasive behavior by non-native species can be challenging when employed for a large number of taxa. In this research, the Fundamental Invasiveness Index provided great facility for evaluating numerous species of non-native taxa. Pairing the Fundamental Invasiveness score with a Watch designation, as recommended by Nesom (2009), provides an understanding of whether the taxa possesses a moderate or high level threat. Watch species in this research are F2 and F3 due to the limited number of geographic locations reported. For example, Hydrilla verticillata is ranked as F2W, primarily due to the low number of occurrences within the state. The same is true for Onopordum acanthium and Murdannia keisak, both ranked as F3. As with all ranking systems, the Fundamental Invasiveness score should be reevaluated for each species at regular intervals. If the number of populations reported increases, the Fundamental Invasiveness Index score could change. But to have timely and relevant data requires funds allocated by agencies for continued inventory.

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LITERATURE CITED


**APPENDIX I**

Fundamental Invasiveness Index scores for alien vascular plants known to occur in Oklahoma. Each entry consists of the assigned Fundamental Invasiveness Index (F1-F3). Note that a “W” immediately following the F-rank indicates a Watch species [i.e., F1W]), life history (P=perennial, A=annual, B=biennial), growth habit (F=forb, G=graminoid, V=vines, W=woody), CO=number of counties from which the taxon is currently known to occur, the name of the county from which the taxon was first reported (in some cases, first report may have been from two counties in the same year. Unknown indicates that the collector did not provide the county of location), and the date of first collection. Symbols: † = species on the Oklahoma Invasive Plant Council Watch List (www.okinvasives.org/watch-list-1); * = designated as a noxious aquatic plant by the Oklahoma Department of Wildlife Conservation; # = designated as a noxious weed by the Oklahoma Department of Agriculture, Food, and Forestry. The taxonomy follows the ITIS (2017).

### ACORACEAE

*Acorus calamus* L. - F1, P, F, CO=5, Cleveland, 1937

### AMARANTHACEAE

*Alternanthera caracasana* Kunth - F3, P, F, CO=2, Cleveland, 1944

*Alternanthera paronychioides* A. St.-Hil. - F1, P, F, CO=1, Pushmataha, 2001


*Alternanthera pungens* Kunth - F3, P, F, CO=1, Bryan, 1972


*Alternanthera pungens* Kunth - F3, P, F, CO=1, Bryan, 1972

*Chenopodium album* L. - F2, A, F, CO=33, Blaine, 1913

*Chenopodium glaucum* L. - F3, A, F, CO=5, Harmon, 1926

*Chenopodium murale* L. – F3, A, F, CO=1, Canadian, 2006

### AMARYLLIDACEAE

*Allium ampeloprasum* L. - F3, P, F, CO=2, Comanche, 1942

*Allium sativum* L. - F3, P, F, CO=10, Osage, 1959

*Allium vineale* L. - F3, P, F, CO=11, Payne, 1941


*Narcissus pseudonarcissus* L. - F3, P, F, CO=1, Muskogee, 1993

### APIACEAE

*Anethum graveolens* L. - F3, A, F, CO=6, Kingfisher, 1935

*Anthriscus caucalis* M. Bieb. - F3, A, F, CO=3, Canadian, 1964

*Conium maculatum* L. - F2, B, F, CO=15, Payne, 1934

*Coriandrum sativum* L. - F3, A, F, CO=2, Oklahoma, 1930
Daucus carota L. - F2, B, F, CO=24, Bryan, 1919
Falcaria vulgaris Bernh. - F3, P, F, CO=2, Major, 1957
Pastinaca sativa L. - F3, B, F, CO=2, Cleveland, 1924
Torilis arvensis (Huds.) Link - F2, A, F, CO=51, Muskogee, 1927

APOCYNACEAE
Catharanthus roseus (L.) G. Don – F3, A, F, CO=2, Payne, 1934
Vinca major L. - F3, P, F, CO=7, Payne, 1939

ARALIACEAE
Hedera helix L. F3, P, V, CO=2, Pontotoc, 1989

ASPARAGACEAE
Asparagus officinalis L. - F3, P, F, CO=18, Pottawatomie, 1923
Muscari botryoides (L.) P. Mill. - F3, P, F, CO=4, Oklahoma, 1926

ASTERACEAE
Anthemis cotula L. - F2, A, F, CO=24, LeFlore, 1914
Arctium minus Bernh. - F2, B, F, CO=17, Cherokee, 1925
Artemisia annua L. - F3, A, F, CO=7, Murray, 1936
Carduus nutans L. - F1, B, F, CO=32, Payne, 1946
Centaurea cyanus L. - F2, A, F, CO=22, Cleveland, 1928
Centaurea solstitialis L. - F3, A, F, CO=2, Creek, 1947
Cichorium intybus L. - F2, P, F, CO=11, Murray, 1945
#Cirsium vulgare (Savi) Ten. - F2, B, F, CO=15, Cherokee, 1951
Cosmos sulphureus Cav. - F3, A, F, CO=2, McClain, 1960
Facelis retusa (Lam.) Sch. Bip. - F3, A, F, CO=11, McCurtain, 1957
Galinsoga parviflora Cav. - F3, A, F, CO=2, Cimarron, 1967
Galinsoga quadriradiata Cav. - F3, A, F, CO=2, Cherokee, 1924
Lactuca saligna L. - F3, B, F, CO=7, Oklahoma, 1972
Lactuca sativa L. – F3, B, F, CO=3, Comanche, 1938
Lactuca serriola L. - F2, B, F, CO=51, Woods, 1913
Leucanthemum vulgare Lam. - F2, P, F, CO=20, Adair and Delaware, 1938
Matricaria discoidea DC. - F3, A, F, CO=8, Cleveland, 1930
Matricaria chamomilla L. - F3, A, F, CO=1, Pittsburg, no date available
#Onopordum acanthium L. - F3W, B, F, CO=1, Roger Mills, 1976
Parthenium hysterophorus L. - F2, A, F, CO=21, Garvin, 1926
Scorzonera laciniata L. - F3, P, F, CO=1, Cimarron, 2014
Senecio vulgaris L. - F3, A, F, CO=6, Oklahoma, 1997
Silybum marianum (L.) Gaertn. - F3, B, F, CO=1, Blaine, 1986
Sonchus asper (L.) Hill - F2, A, F, CO=58, Cleveland, 1916
Sonchus oleraceus L. - F3, A, F, CO=7, Payne, 1912
Tagetes erecta L. - F3, A, F, CO=3, Payne, 1972
Tanacetum vulgare L. - F3, P, F, CO=1, Delaware, date unavailable
Taraxacum erythrospermum Andrž. ex Besser - F2, P, F, CO=23, Payne, 1935
Taraxacum officinale F.H. Wigg. - F23, P, F, CO=60, Cleveland, 1913
Tragopogon dubius Scop. - F2, B, F, CO=60, Oklahoma, 1939
Tragopogon porrifolius L. - F3, B, F, CO=11, Oklahoma, 1920
Tragopogon pratensis L. - F3, B, F, CO=14, Cleveland, 1926
Xanthium spinosum L. - F3, A, F, CO=3, Marshall, 1950

BORAGINACEAE
Buglossoides arvensis (L.) I.M. Johnston - F2, A, F, CO=43, Kingfisher, 1938
Cynoglossum amabile Stapf & J.R. Drumm. - F3, B, F, CO=4, McCurtain, 1930
Myosotis stricta Link ex Roem. & Schult. - F3, A, F, CO=3, Tulsa, 1957

BRASSICACEAE
†Allaria petiolata (M. Bieb.) Cavara & Grande - F3W, B, F, CO=1, Delaware, 1994
Alyssum alyssoides (L.) L. - F3, A, F, CO=3, Cleveland, 1927
Arabidopsis thaliana (L.) Heynh. - F3, A, F, CO=1, McCurtain, 1941
Barbarea vulgaris W.T. Aiton - F3, B, F, CO=11, Cleveland, 1926
Brassica juncea (L.) Czern. - F3, A, F, CO=8, Cleveland, 1922
Brassica napus L. - F3, A, F, CO=5, Payne, 1940
Brassica nigra (L.) W.D.J. Koch - F3, A, F, CO=19, Cleveland, 1927
Brassica rapa L. - F3, A, F, CO=16, Cleveland, 1924
Camelina microcarpa DC. - F2, A, F, CO=42, Oklahoma, 1925
Camelina rumelica Velen. - F3, A, F, CO=14, Kingfisher, 1937
Camelina sativa (L.) Crantz - F3, A, F, CO=2, Muskogee, 1940
Capsella bursa-pastoris (L.) Medik. - F2, A, F, CO=72, Unknown, 1902
Cardaria draba (L.) Desv. - F3, P, F, CO=6, Payne, 1937
Conringia orientalis (L.) Dumort. - F3, A, F, CO=10, Cleveland, 1919
Descurainia sophia (L.) Webb ex Prantl - F3, A, F, CO=29, McClain, 1937
Eruca vesicaria (L.) Cav. - F3, A, F, CO=2, Oklahoma, 1974
Erysimum repandum L. - F2, A, F, CO=44, Cleveland, 1926
Lepidium apetalum Willd. - F3, B, F, CO=3, Beaver, 1913
Lepidium campestre (L.) W.T. Aiton - F3, B, F, CO=4, Sequoyah, 1955
Lepidium densiflorum Schrad. – F3, B, F, CO=67, Unknown, 1906
Lepidium perfoliatum L. - F3, B, F, CO=3, Payne, 1937
Lepidium ruderale L. - F3, B, F, CO=1, Payne, 1934
Myagrum perfoliatum L. - F3, A, F, CO=1, Tillman, 2012
Microthlaspi perfoliatum (L.) F.K. Mey. - F3, A, F, CO=1, Kay, 1973
Nasturtium officinale W.T. Aiton - F2, P, F, CO=35, Ellis, 1913
Sinapis arvensis L. - F3, A, F, CO=16, Murray, 1934
Sisymbrium altissimum L. - F3, A, F, CO=20, Cleveland, 1919
Sisymbrium irio L. - F3, A, F, CO=1, Cleveland, 1928
Sisymbrium officinale (L.) Scop. - F3, A, F, CO=18, Cherokee, 1926
Thlaspi arvense L. - F3, A, F, CO=20, Cleveland, 1919

CANNABACEAE
Cannabis sativa L. - F3, A, F, CO=13, Lincoln, 1909
Humulus lupulus L. - F3, P, V, CO=9, Ottawa, 1955
CAPRIFOLIACEAE
Lonicera japonica Thunb. - F1, P, V, CO=46, Payne, 1936
†Lonicera maackii (Rupr.) Herder - F3W, P, V, CO=7, Woodward, 1980

CARYOPHYLLACEAE
Agrostemma githago L. - F3, A, F, CO=12, Lincoln, 1938
Arenaria serpyllifolia L. - F2, A, F, CO=52, Muskogee, 1927
Cerastium brachypetalum Pers. - F3, A, F, CO=7, Cherokee, 1952
Cerastium brachypodium (Engelm. ex A. Gray) B.L. Rob. - F2, P, F, CO=43, Mayes, 1905
Cerastium fontanum Baumg. - F2, B, F, CO=24, Cleveland, 1923
Cerastium glomeratum Thuill. - F2, A, F, CO=41, Muskogee, 1927
Cerastium pumilum W. Curtis - F3, A, F, CO=19, Muskogee, 1958
Dianthus armeria L. - F2, B, F, CO=28, Delaware, 1938
Gypsophila paniculata L. - F3, P, F, CO=2, Cleveland, 1928
Holosteum umbellatum L. - F2, A, F, CO=22, Cleveland, 1953
Petrorhagia prolifera (L.) P.W. Ball & Heywood - F2, A, F, CO=17, Cleveland, 1922
Silene noctiflora L. - F3, A, F, CO=2, McCurtain, 1930
Stellaria media (L.) Vill. - F2, A, F, CO=58, Cleveland, 1915
Vaccaria hispanica (Mill.) Rauschert - F3, A, F, CO=5, Pontotoc, 1941

CELASTRACEAE
Euonymus alatus (Thunb.) Siebold - F3, P, W, CO=1, Tulsa, 1989
Euonymus kiautschovicus Loes - F3, P, W, CO=1, Tulsa, 2010

CLEOMACEAE
Gynandropsis gynandra (L.) Briq. - F3, A, F, CO=2, Muskogee, 1939
Tarenaya hassleriana (Chodat) Iltis - F3, A, F, CO=6, LeFlore, 1913

COMMELINACEAE
Commelina communis L. - F2, A, F, CO=35, Muskogee, 1926
Murdannia keisak (Hassk.) Hand.-Maz. - F3W, P, F, CO = 1, McCurtain, 2013

CONVOLVULACEAE
†Convolvulus arvensis L. - F2W, P, F, CO=61, Woods, 1913
Ipomoea coccinea L. - F3, A, F, CO=13, Payne, 1915
Ipomoea hederacea Jacq. - F2, A, F, CO=33, Logan, 1905
Ipomoea purpurea (L.) Roth - F3, A, F, CO=25, Cleveland and Murray, 1919
Ipomoea quamoclit L. - F3, A, F, CO=5, Pushmataha, 1932
Ipomoea wrightii Gray - F3, P, F, CO=1, McCurtain, 1950

CUCURBITACEAE
Citrullus lanatus (Thunb.) Matsum. & Nakai var. lanatus - F3, A, F, CO=5, Muskogee, 1928
Cucumis melo L. - F3, A, F, CO=3, Cleveland, 1926
Lagenaria siceraria (Molina) Standl. - F3, A, F, CO=1, Cherokee, 1950
CYPERACEAE
Cyperus difformis L. - F1, A, G, CO=1, Payne, 2012
Cyperus esculentus L. - F2W, P, G, CO=42, Woods, 1913
Cyperus iria - F3, A, G, CO=6, McCurtain, 1962
†Cyperus rotundus L. - F2W, P, G, CO=16, McCurtain, 1916

DIOECOREACEAE
Dioscorea oppositifolia L. - F3, P, F, CO=3, Cherokee, 1960

DIPSACACEAE
†Dipsacus fullonum L. - F2W, B, F, CO=5, Delaware, 1956
Scabiosa atropurpurea L. - F3, P, F, CO=1, Bryan, 2015

ELAEAGNACEAE
Elaeagnus angustifolia L. - F2W, P, W, CO=17, Cleveland, 1934
†Elaeagnus pungens Thunb. - F3W, P, W, CO=4, Oklahoma, 1931

EUPHORBIACEAE
Ricinus communis L. - F3, A, F, CO=6, Unknown, 1930
Triadica sebifera (L.) Small – F2W, P, T, CO=1, McCurtain, 2019

FABACEAE
†Albizia julibrissin Durazz. - F2W, P, W, CO=28, Payne, 1946
†Alhagi maurorum Medik. - F3, P, W, CO=11, Cotton, 1947
Astragalus chinensis L. f. - F3, P, F, CO=1, Payne, 1940
Arachis hypogaea L. - F3, P, F, CO=2, Caddo, 1944
Erythrostemon gilliesii (Wall. ex Hook.) Klotzsch - F3, P, W, CO=11, Payne, 1941
Galega officinalis L. - F3, P, F, CO=1, Comanche, 1937
Halimodendron halodendron (L.f.) Voss - F3, P, W, CO=1, Ellis, 1964
Kummerowia stipulacea (Maxim.) Makino - F3, A, F, CO=35, Payne, 1937
Kummerowia striata (Thunb.) Schindl. - F3, A, F, CO=20, Payne, 1937
Lathyrus hirsutus L. - F3, A, F, CO=20, Delaware, 1940
Lathyrus latifolius L. - F3, P, F, CO=11, Pushmataha, 1932
Lathyrus sativus L. - F3, A, F, CO=1, Tulsa, 2003
Lespedeza bicolor Turcz. - F3, P, F, CO=2, Coal, 1989
Lespedeza cuneata (Dum. Cours.) G. Don - F1, P, F, CO=36, Johnston, 1961
Lespedeza thunbergii (DC.) Nakai - F3, P, F, CO=2, Ottawa, 2004
Medicago arabica (L.) Huds. - F3, A, F, CO=10, Cleveland, 1914
Medicago lupulina L. - F2, P, F, CO=35, Oklahoma, 1925
Medicago minima (L.) L. - F2, A, F, CO=34, Murray, 1929
Medicago orbicularis (L.) Bartal. - F3, A, F, CO=11, Murray, 1948
Medicago polymorpha L. - F3, P, F, CO=8, McCurtain, 1938
Medicago sativa L. - F2, P, F, CO=43, Cleveland, 1919
Melilotus albus Medik. - F2, B, F, CO=23, Woods, 1913
Melilotus indicus (L.) All. - F3, A, F, CO=1, Noble, 1939
Melilotus officinalis (L.) Lam. - F2, A, F, CO=60, Cleveland, 1919
Pisum sativum L. - F3, A, F, CO=6, LeFlore, 1944
†Pueraria montana (Lour.) Merr. - F2W, P, V, CO=15, Payne, 1941
Securigera varia (L.) Lassen - F3, P, F, CO=17, Payne, 1938
Senna occidentalis (L.) Link - F3, P, F, CO=7, LeFlore, 1913
Trifolium arvense L. - F2, A, F, CO=24, Haskell, 1948
Trifolium campestre Schreb. - F2, B, F, CO=44, Cleveland, 1926
Trifolium dubium Sibth. - F2, A, F, CO=29, Cleveland, 1927
Trifolium hybridum L. - F3, A, F, CO=9, Cleveland, 1927
Trifolium incarnatum L. - F2, A, F, CO=29, Kay, 1935
Trifolium pratense L. - F3, P, F, CO=26, Caddo, 1913
Trifolium repens L. - F2, P, F, CO=34, Caddo, 1913
Trifolium resupinatum L. - F3, A, F, CO=11, McCurtain, 1950
Trifolium striatum L. - F3, A, F, CO=1, Choctaw, 1939
Trifolium subterraneum L. - F3, A, F, CO=1, LeFlore, 1937
Trifolium vesiculosum Savi – F3, A, F, CO=20, Johnston, 1973
Vicia cracca L. - F3, P, F, CO=5, Muskogee, 1909
Vicia sativa L. - F2, A, F, CO=36, McClain, 1930
Vicia tetrasperma (L.) Schreb. - F3, A, F, CO=1, Murray, 1942
Vicia villosa Roth - F2, B, F, CO=35, Cleveland, 1903
Wisteria floribunda (Willd.) DC. – F3, P, V, CO=1, McCurtain, 2010

GERANIACEAE
Erodium cicutarium (L.) L'Hér. ex Aiton - F2, A, F, CO=40, Oklahoma, 1923
Geranium molle L. - F3, B, F, CO=7, Cherokee, 1947
Geranium pusillum L. - F3, B, F, CO=24, Cherokee, 1955

HELIOTROPIACEAE
Heliotropium indicum L. - F2, A, F, CO=30, McCurtain, 1916

HALORAGACEAE
Myriophyllum aquaticum (Vell.) Verdc. - F2W, P, F, CO=14, Carter, 1936
Myriophyllum spicatum L. - F2W, P, F, CO=10, Comanche, 1959

HYDROCHARITACEAE
Egeria densa Planch. - F3W, P, F, CO=7, Payne, 1940
*Hydrilla verticillata (L. f.) Royle - F2W, P, F, CO=3, Murray, 2006

HYDRANGEACEAE
Philadelphus inodorus L. - F3, P, W, CO=4, Payne, 1933

HYPERICACEAE
Hypericum perforatum L. - F2, P, W, CO=25, Muskogee, 1951

IRIDACEAE
Iris domestica (L.) Goldblatt & Mabb. - F3, P, F, CO=5, McCurtain, 1930
Iris germanica L. – F3, P, F, CO=2, Comanche, 1995
Iris pseudacorus L. - F3, P, F, CO=2, McCurtain, 2002

JUNCACEAE
LAMIACEAE
Galeopsis tetrahit L. - F3, A, F, CO=1, LeFlore, 1969
Glechoma hederacea L. - F3, P, F, CO=14, Payne, 1936
Lamium amplexicaule L. - F2, B, F, CO=67, Cleveland, 1916
Lamium purpureum L. - F2, A, F, CO=40, Cherokee, 1925
Leonurus cardiaca L. - F3, P, F, CO=3, Cherokee, 1925
Leonurus sibiricus L. - F3, P, F, CO=3, Cherokee, 1956
Marrubium vulgare L. - F2, P, F, CO=25, Pawnee, 1905
Melissa officinalis L. - F3, P, F, CO=4, Mayes, 1955
Mentha arvensis L. - F3, P, F, CO=2, Oklahoma, 1940
Mentha spicata L. - F2, P, F, CO=11, Cotton, 1934
Mentha × piperita (pro sp.) - F2, P, F, CO=12, Cleveland, 1924
Nepeta cataria L. - F3, P, F, CO=10, Cherokee, 1924
†Perilla frutescens (L.) Britton - F2, A, F, CO=20, Muskogee, 1927
Vitex agnus-castus L. - F3, P, F, CO=8, Pawnee, 1935

LILIACEAE
Ornithogalum umbellatum L. - F3, P, F, CO=12, Kay, 1945

LINACEAE
Linum usitatissimum L. - F3, A, F, CO=6, Carter, 1913

LYGODIACEAE
†Lygodium japonicum (Thunb.) Sw. - F3, P, F, CO=1, McCurtain, 1980

LYTHRACEAE
Lagerstroemia indica L. - F3, P, W, CO=6, LeFlore, 1988
*†Lythrum salicaria L. - F3, P, F, CO=4, Cleveland and Oklahoma, 1993

MALVACEAE
Abutilon theophrasti Medik. - F2, A, F, CO=30, Osage, 1913
Alcea rosea L. - F3, P, F, CO=3, Pottawatomie, 1934
Hibiscus trionum L. - F3, A, F, CO=20, Stephens, 1905
Malva neglecta Wallr. - F2, P, F, CO=19, Oklahoma, 1925
Sida abutifolia Mill. - F3, P, F, CO=11, Murray, 1940

MARSILIACEAE
*Marsilea mutica Mett. – F3W, P, F, CO=1, Hughes, 2001

MELIACEAE
†Melia azedarach L. - F2W, P, W, CO=8, McCurtain, 1944

MENYANTHACEAE

MOLLUGINACEAE
Glinus lotoides L. - F3, A, F, CO=15, Unknown, 1894
MORACEAE
Fatoua villosa (Thunb.) Nakai - F3, A, F, CO=10, Grady, 1985
Morus alba L. - F2, P, W, CO=51, Cleveland, 1926

NYCTAGINACEAE
Mirabilis jalapa L. - F3, P, F, CO=6, Cherokee, 1952

OLEACEAE
Ligustrum quihouii Carr. - F3, P, W, CO=3, Oklahoma, 1959
Ligustrum sinense Lour. - F1, P, W, CO=22, Muskogee, 1940

ONAGRACEAE
Ludwigia grandiflora (Michx.) Greuter & Burdet - F3, P, F, CO=6, Payne, 1946

PAPAVERACEAE
†Glaucium corniculatum (L.) J.H. Rudolph - F3, A, F, CO=3, Payne, 1993
Glaucium flavum Crantz - F3, B, F, CO=2, Kiowa and Tillman, 1985
Papaver dubium L. - F3, A, F, CO=6, Muskogee, 1939

PAULOWNIACEAE

PHYLLANTHACEAE
Phyllanthus urinaria L. - F3, A, F, CO=1, Grady, 1999

PLANTAGINACEAE
Plantago lanceolata L. - F2, P, CO=25, Cleveland, 1907
Plantago major L. - F2, P, F, CO=29, Oklahoma, 1931

POACEAE
Aegilops cylindrica Host - F2, A, G, CO=50, Payne, 1938
Agrostis gigantea Roth -F3, P, G, CO=11, Caddo, 1913
Agrostis stolonifera L. - F3, P, G, CO=7, Caddo, 1913
Aira caryophyllea L. - F2, A, G, CO=26, Muskogee, 1939
Aira elegantissima Schur - F3, A, G, CO=19, McCurtain, 1949
Anthoxanthum aristatum Boiss. - F3, A, G, CO=2, McIntosh, 2009
Arthraxon hispidus (Thunb.) Makino - F3, P, G, CO=4, Cherokee, 1953
†Arundo donax L. - F2W, P, G, CO=10, Garfield, 1967
Avena fatua L. - F2, A, G, CO=23, Muskogee, 1927
Bothriochloa ischaemum (L.) Keng - F1, P, G, CO=39, Payne, 1940
†Bromus arvensis L. - F1, A, G, CO=65, Cleveland, 1923
Bromus commutatus Schrad. - F3, A, G, CO=32, Muskogee, 1927
Bromus catharticus Vahl - F2, P, G, CO=63, Love, 1913
Bromus diandrus Roth - F3, A, G, CO=3, Payne, 1940
Bromus hordeaceus L. - F2, A, G, CO=21, Muskogee, 1955
†Polypogon

Bromus inermis Leyss. - F3, P, G, CO=9, Payne, 1924
Bromus racemosus L. - F3, A, G, CO=5, Cleveland, 1923
Bromus secalinus L. - F2, A, G, CO=35, Unknown, 1905
Bromus sterilis L. - F3, A, G, CO=5, Rogers, 1957
Bromus tectorum L. - F1, A, G, CO=66, Oklahoma, 1925
Cynodon dactylon (L.) Pers. - F1, P, G, CO=45, Oklahoma, 1924
Cynodon echinatus L. - F3, A, G, CO=5, Carter, 1947
Dactylis glomerata L. - F2, P, G, CO=17, Payne, 1922
Catapodium rigidum (L.) Dony - F3, A, G, CO=1, Murray, 2012
Digitaria ciliaris (Retz.) Koeler - F2, A, G, CO=29, Ottawa, 1913
Digitaria ischaemum (Schreb.) Muhl. - F2, A, G, CO=21, Muskogee, 1927
Digitaria sanguinalis (L.) Scop. - F2, A, G, CO=69, Washita, 1913
Digitaria violascens Link - F3, P, G, CO=5, McCurtain, 1950
Echinochloa colona (L.) Link - F3, A, G, CO=17, LeFlore, 1938
Echinochloa crus-galli (L.) Beauv. - F2, A, G, CO=72, Blaine, 1913
Echinochloa crus-pavonis (Kunth) J.A. Schultes - F3, A, G, CO=3, Cotton, 1940
Echinochloa muricata (Beauv.) Fern. - F3, A, G, CO=31, Blaine, 1913
Eleusine indica (L.) Gaertn. - F2, A, G, CO=48, Major, 1913
Elymus repens (L.) Gould - F3, P, G, CO=1, Greer, 1931
Eragrostis barreliieri Daveau - F2, A, G, CO=35, Grady, 1938
Eragrostis ciliaris (All.) Vign. ex Janchen - F2, A, G, CO=57, Harmon, 1913
Eragrostis curvula (Schrad.) Nees - F2W, P, G, CO=28, Payne, 1941
Eragrostis japonica (Thunb.) Trin. - F3, A, G, CO=6, Coal, 1949
Eragrostis lehmanniana Nees - F3, P, G, CO=3, Payne, 1940
Eragrostis minor Host - F3, A, G, CO=3, Pontotoc, 1952
Glyceria declinata Bréb. - F3, P, G, CO=1, Love, 2018
Hordeum murinum L. - F3, A, G, CO=2, Cleveland, 1938
Hordeum vulgare L. - F3, A, G, CO=10, Payne, 1940
Lolium perenne L. - F2W, P, G, CO=41, Cleveland, 1923
†Microstegium vimineum (Trin.) A. Camus - F2W, A, G, CO=3, Cherokee, 2004
Oryza sativa L. - F3, A, G, CO=1, McCurtain, 1974
Panicum antidotale Retz. - F3, P, G, CO=1, Kiowa, 1964
Panicum miliaceum L. - F3, A, G, CO=2, McCurtain, 1930
Paspalum dilatatum Poir. - F2, P, G, CO=41, Harmon, 1913
Paspalum notatum Alain ex Flüggé - F2, P, G, CO=7, Pushmataha, 1968
Paspalum urvillei Steud. - F3, P, G, CO=5, McCurtain, 1936
Pennisetum glaucum (L.) R. Br. - F2, P, G, CO=48, Kay, 1913
Phalaris canariensis L. - F3, A, G, CO=6, Payne, 1922
Poa annua L. - F2, A, G, CO=69, Carter, 1913
Poa bulbosa L. - F3, P, G, CO=8, Pontotoc, 1947
Poa compressa L. - F3, P, G, CO=10, Caddo, 1913
Poa pratensis L. – F2, P, G, CO=37, Garvin, 1913
Polypogon monspeliensis (L.) Desf. - F2, A, G, CO=34, Cleveland, 1922
Polypogon viridis (Gouan) Breistr. - F1, P, G, CO=2, Cimarron, 1947
†Saccharum ravennae (L.) L. - F2W, P, G, CO=17, McCurtain, 1930
Schedonorus phoenix (Scop.) Holub - F1, P, G, CO=30, Bryan, 1963
Schedonorus pratensis (Huds.) P. Beauv. - F3, P, G, CO=3, Osage, 2005
Sclerochloa dura (L.) Beauv. - F3, A, G, CO=9, Cleveland, 1973
Setaria faberi Herrm. - F3, A, G, CO=1, Craig, 1999
Setaria italic a (L.) Beauv. - F3, A, G, CO=13, Woods, 1913
Setaria pumila (Poir.) Roem. & Schult. - F2, A, G, CO=18, Grady, 1972
Setaria viridis (L.) Beauv. - F2, A, G, CO=55, Woods, 1913
Sorghum bicolor (L.) Moench - F3, A, G, CO=9, Muskogee, 1927
Sorghum halepense (L.) Pers. - F1, P, G, CO=64, Harmon, 1913
Stenotaphrum secundatum (Walter) Kunze - F3, P, G, CO=2, Carter, 1944
Thinopyrum elongatum (Host) D.R. Dewey – F3, P, G, CO=3, Payne, 1941
Thinopyrum ponticum (Podp.) Barkworth & D.R. Dewey - F3, P, G, CO=2, Grant, 1999
Triptidium ravennae (L.) H. Scholz - F1, P, G, CO=17, McCurtain, 1930
Triticum aestivum L. - F3, A, G, CO=19, Muskogee, 1927
Vulpia myuros (L.) C.C. Gmel. - F3, A, G, CO=12, Adair, 1950

POLYGONACEAE

Fagopyrum esculentum Moench - F3, A, F, CO=1, Cherokee, 2004
Fallopia convolvulus (L.) Á. Löve - F2, A, F, CO=27, Woods, 1913
Fallopia japonica (Houtt.) Ronse Decr. var. japonica - F3, P, F, CO=2, Cleveland, 1936
Polygonum aviculare L. - F2, P, F, CO=54, Major, 1913
Polygonum aviculare ssp. buxiforme (Small) Coste & Tardif – F2, P, F, CO=3, Cherokee, 1957
Persicaria hydropiper (L.) Opiz - F3, A, F, CO=24, Kay, 1913
Persicaria longiseta (Bruijn) Kitag – F3, A, F, CO=5, McCurtain, 1994
Persicaria orientalis (L.) Spach - F3, A, F, CO=3, Pushmataha, 1932
Persicaria maculosa Gray - F2, A, F, CO=46, Kiowa (Swanson), 1913
Persicaria posumbu (Buch.-Ham. ex D. Don) H. Gross - F3, A, F, CO=1, Okmulgee, 2013
Rumex acetosella L. - F3, P, F, CO=19, Alfalfa, 1919
Rumex conglomeratus Merr. - F3, P, F, CO=1, McCurtain, 1956
Rumex crispus L. - F2, P, F, CO=65, Cleveland, 1903
Rumex obtusifolius L. - F3, P, F, CO=14, Ottawa, 1913
Rumex patientia L. - F3, P, F, CO=4, Beaver, 1913
Rumex pulcher L. - F3, P, F, CO=16, McCurtain, 1930

PONTEDERIACEAE

†Eichhornia crassipes (Mart.) Solms - F2W, P, F, CO=2, Payne, 1931

PORTULACACEAE

Portulaca halimoides L. – F3, A, F, CO=5, Cimarron, 1936
Portulaca oleracea L. – F3, A, F, CO=31, Woods, 1913

POTAMOGETONACEAE

Potamogeton crispus L. - F2, P, F, CO=8, Cleveland, 1937

PRIMULACEAE

Anagallis arvensis L. - F3, A, F, CO=6, Delaware, 1961
Anagallis foemina Mill. – F3, A, F, CO=1, Cleveland, 1966
Anagallis minima (L.) E.H.L. Krause - F3, A, F, CO=12, Muskogee, 1927
RANUNCULACEAE
Clematis terniflora DC. - F2, P, F, CO=18, Muskogee, 1940
Consolida ajacis (L.) Schur - F3, A, F, CO=19, Cleveland, 1927
Ranunculus muricatus L. - F3, A, F, CO=1, McIntosh, 2001
Ranunculus parviflorus L. - F3, A, F, CO=9, McCurtain, 1938
Ranunculus sardous Crantz - F3, A, F, CO=3, Sequoyah, 1955
Ranunculus testiculatus Crantz - F3, A, F, CO=1, Cimarron, 2014

ROSACEAE
Aphanes microcarpa (Boiss. & Reut.) Rothm. - F3, A, F, CO=1, McCurtain, 1984
Duchesnea indica (Andr.) Focke - F3, P, F, CO=7, McCurtain, 1948
†Potentilla recta L. - F2W, P, F, CO=38, Cherokee, 1924
Prunus persica (L.) Batsch - F3, P, W, CO=19, Muskogee, 1929
†Pyrus calleryana Decne. - F3W, P, W, CO=6, Cherokee, 2004

RUBIACEAE
Cruciata pedemontana (Bellardi) Ehrend. - F3, A, F, CO=15, McCurtain, 1970
Galium aparine L. - F2, A, F, CO=65, Cimarron, 1913
Galium tricornutum Dandy - F3, A, F, CO=1, Hughes, 2006

RUTACEAE

SALICACEAE
Populus alba L. - F3, P, W, CO=11, Pottawatomie, 1932

SAPINDACEAE
Cardiospermum halicacabum L. - F2, B, F, CO=35, Unknown (Little River), 1903

SCROPHULARIACEAE
Chaenorrhinum minus (L.) Lange - F3, A, F, CO=3, Tulsa, 1975
Kickxia elatine (L.) Dumort. - F3, A, F, CO=6, Delaware, 1938
†Linaria dalmatica (L.) Mill. - F3, P, F, CO=3, Texas, 1971
Linaria vulgaris Mill. - F3, P, F, CO=13, Cleveland, 1928
Mazus japonicus (Thunb.) Kuntze - F3, A, F, CO=6, Cherokee, 1952
Parentucellia viscosa (L.) Caruel - F3, A, F, CO=1, McCurtain, 2006
Verbascum blattaria L. - F3, B, F, CO=21, Osage, 1913
Verbascum thapsus L. - F2, B, F, CO=38, LeFlore, 1913
Veronica agrestis L. - F3, A, F, CO=5, Payne, 1934
Veronica arvensis L. - F2, A, F, CO=51, Oklahoma, 1920
Veronica hederifolia L. - F3, A, F, CO=4, Tulsa, 1957
Veronica persica Poir. - F3, A, F, CO=10, Delaware, 1961
Veronica polita Fr. - F3, A, F, CO=27, Payne, 1940
Veronica triphyllos L. - F3, A, F, CO=2, Cleveland, 1964

SIMAROUBACEAE
†Ailanthus altissima (Mill.) Swingle - F2W, P, F, CO=27, Cleveland, 1932
Solanaceae

*Datura inoxia* P. Mill. - F3, P, F, CO=23, Cherokee, 1951

*Datura stramonium* L. - F2, A, F, CO=39, Kay, 1913

*Lycium barbarum* L. - F3, P, V, CO=13, LeFlore, 1914

*Nicandra physalodes* (L.) Gaertn. - F3, A, F, CO=1, Grady, 2003

*Physalis philadelphica* Lam. var. *immaculata* Waterf. - F3, A, F, CO=1, Unknown, 1956

*Solanum lycopersicum* L. - F3, A, F, CO=2, McCurtain, 1976


Sphenocleaceae

*Sphenoclea zeylanica* Gaertn. - F3, A, F, CO=1, McCurtain, 1983

Tamaricaceae

*Tamarix chinensis* Lour. - F1, P, W, CO=23, Texas, 1946

*Tamarix gallica* L. - F1, P, W, CO=49, Oklahoma, 1910

*Tamarix parviflora* DC. - F1, P, W, CO=15, Cleveland, 1930

*Tamarix ramosissima* Ledeb. - F1, P, W, CO=44, Cleveland, 1921

Urticaceae


Ulmaeae


*Ulmus pumila* L. - F1, P, W, CO=33, Cleveland, 1934

Verbenaeeae

*Verbena bonariensis* L. - F2, B, F, CO=4, McCurtain, 1947

*Verbena brasiliensis* Vell. - F3, A, F, CO=5, Johnston, 1967

Violaceae

*Viola tricolor* L. - F3, A, F, CO=11, Oklahoma, 1925

Xanthorrhoeaceae

*Hemerocallis fulva* (L.) L. - F3, P, F, CO=2, LeFlore, 1949

*Hemerocallis lilioasphodelus* L. - F3, P, F, CO=5, Cherokee, 1959

*Ornithogalum umbellatum* L. - F3, P, F, CO=13, Kay, 1945

Zygophyllaceae

*Tribulus terrestris* L. - F2, A, F, CO=57, Greer, 1912