

Interim Core Map Documentation for the Eastern Prairie Fringed Orchid

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Draft Interim Core Map Developer: Compliance Services International (CSI)

Species Summary

The eastern prairie fringed orchid (*Platanthera leucophaea*; Entity ID 984) is a dicotyledonous threatened plant found primarily in the North-Central United States. The U.S. Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the eastern prairie fringed orchid. This species inhabits a wide variety of habitats, including mesic prairie, marshes, and bogs. Additional habitat information is provided in **Appendix 1**.

EPA Review Note

The developers created this core map using the U.S. Environmental Protection Agency's (EPA) process available at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>. EPA reviewed the draft interim map and documentation and evaluated if: (1) the map and documentation are consistent with the agency's process; (2) areas included or excluded from the interim core map are consistent with the biology, habitat, and/or recovery needs of the species; (3) data sources are documented and appropriate; and (4) the GIS data and mapping process are consistent with the stated intention of the developer. EPA agrees that this map is a reasonable depiction of core areas for this species and was consistent with the agency's mapping process. This documentation was not prepared by EPA, and EPA may have edited this documentation for clarity or other purposes. Some views in this documentation may not necessarily be the views of EPA or its staff.

The core map developed for this species is considered interim and can be used to develop pesticide use limitation areas (PULAs). This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS.

This core map does not replace or revise any range or designated critical habitat developed by FWS.

Description of Core Map

The core map for the eastern prairie fringed orchid is based on biological information, which was used to refine an extent determined by known location information for the species buffered by different uncertainty distances as described below. The most recent 5-Year Review includes textual descriptions of locations where the species maintains extant populations (FWS 2020). Known location information from iNaturalist was also used to identify extant species locations; the Global Biodiversity Information Facility (GBIF) database provided support for these general locations, although it is noted that many of the sites in GBIF were originally sourced from iNaturalist. Public data from NatureServe were used for comparison purposes.

The core map for the eastern prairie fringed orchid is based on biological information, which was used to refine an extent based on known location information. Habitat within these identified sites—which were buffered to varying distances based on uncertainty as described below—were clipped to the species range to develop the core map.

The core map developed in this document for the eastern prairie fringed orchid spans 242,411 acres (Figure 1). A summary of acreage by National Landcover Database (NLCD) land use type is provided in

Table 1.

Based on EPA's "best professional judgment classification" system, CSI has graded this core map as "moderate" because assumptions were made when connecting species life history and/or biological needs (habitat preferences) to a Geographical Information System (GIS) dataset, in this case the LANDFIRE dataset (LANDFIRE 2024). More information about this classification system and its definitions can be found in the core map process document (EPA 2024).

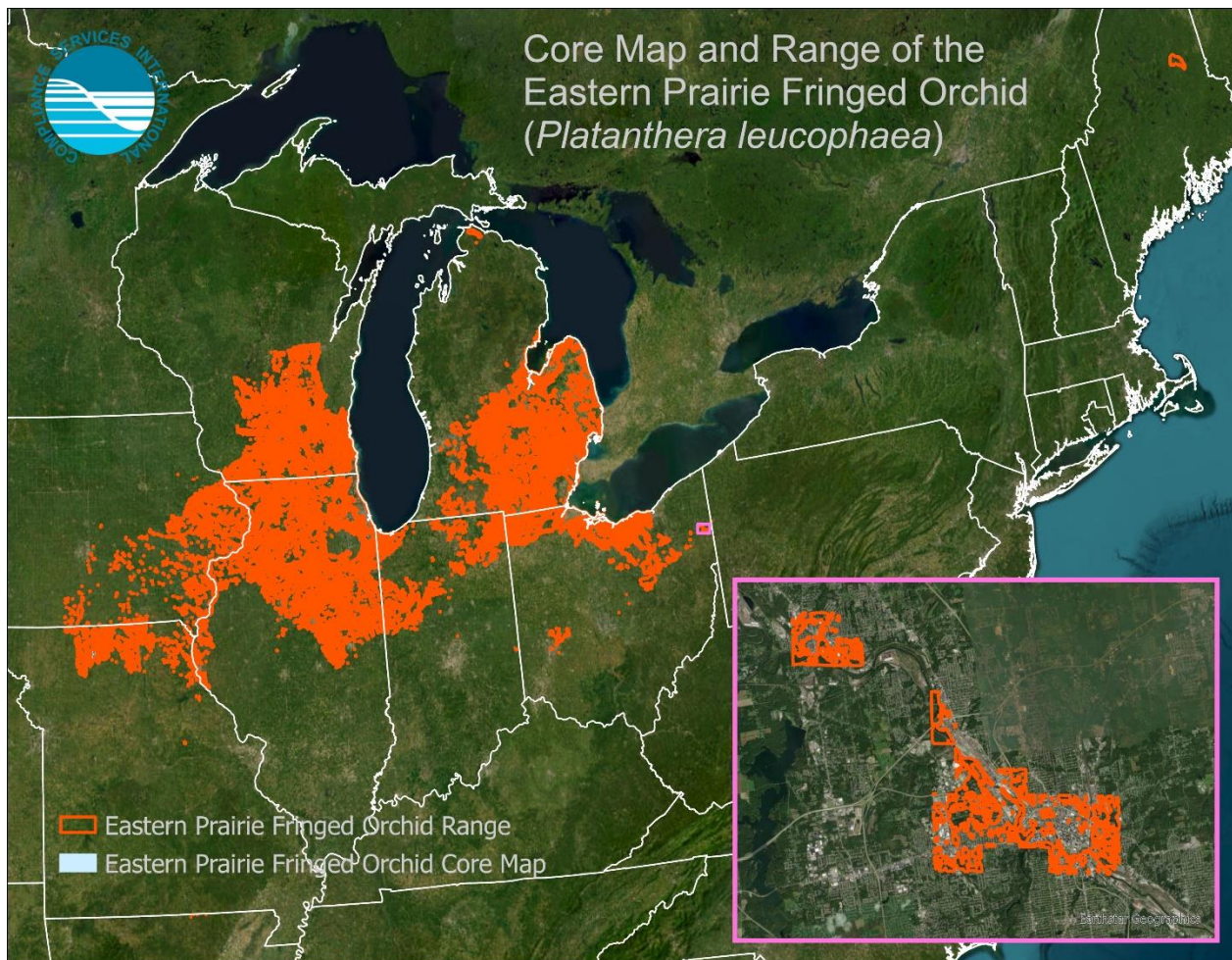


Figure 1. Interim core map for the eastern prairie fringed orchid.

Table 1. Acres by National Land cover Database (NLCD) class within the core map of the eastern prairie fringed orchid. The total core map area (based on NLCD pixel count) is 242,796 acres.

NLCD_Land_Cover_Class	Acres	%
Hay/Pasture	139,504	57.5
Emergent Herbaceous Wetlands	31,665	13
Woody Wetlands	12,662	5.2
Developed, Low Intensity	12,082	5
Deciduous Forest	10,612	4.4
Developed, Open Space	9,786	4
Cultivated Crops	9,757	4
Developed, Medium Intensity	5,673	2.3
Herbaceous	2,903	1.2
Open Water	2,459	1
Mixed Forest	2,443	1
Barren Land	1,381	0.6
Developed, High Intensity	1,139	0.5
Shrub/Scrub	619	0.3
Evergreen Forest	111	0

Evaluation of Known Location Information

There were four evaluated datasets with known location information:

- Descriptions of locations provided by FWS.
- Occurrence locations in iNaturalist.
- Occurrence locations in GBIF; and
- Occurrence locations in NatureServe.

Compliance Services International evaluated these four datasets before developing the core map. Overall, there were 340 research-grade observations found in iNaturalist since 2020.¹ The GBIF dataset comprised 402 georeferenced observations, 237 of which were considered usable based on criteria described below. Both datasets were useful to identify extant population sites for the eastern prairie fringed orchid. These datasets were somewhat redundant because the iNaturalist observations comprise the majority of GBIF observations; ultimately, the iNaturalist dataset was selected to represent sites because it was the more robust dataset and the original source of point location uncertainty information was reported. These sites were buffered by their respective uncertainty distances (based on the “public positional accuracy” field in the source data), typically about 28 km.

FWS location information provided additional site areas, many of which were not within the uncertainty

¹ According to iNaturalist, an observation is designated as “research grade” if it 1) is verifiable with date, coordinates, photos/sounds, and not captive; 2) achieves community agreement defined as “more than 2/3 of identifiers needs to agree on the species level ID or lower;” and 3) “must pass a data quality assessment, which includes checks for accurate date and location, evidence of a wild organism, and clear evidence of the organism itself” (<https://help.inaturalist.org/en/support/solutions/articles/151000169936-what-is-the-data-quality-assessment-and-how-do-observations-qualify-to-become-research-grade->).

distances associated with iNaturalist observations. The most recent 5-Year Review catalogues 103 unique sites; an attempt was made to identify each of these and delineate a polygon to represent that location. Ninety-five of these sites were positively identified using the Protected Areas Database of the United States (PAD-US), the National Wetlands Inventory (NWI) dataset, and other tools and were incorporated into the core map. These site locations were buffered by an uncertainty distance of 402 meters (m) because this is the distance associated with the highest threshold for habitat size assigned by FWS (2020), 125 acres, assuming a circular distribution.

NatureServe public element occurrence (EO) data were also evaluated and are considered by CSI to be a good corroboration of the datasets used.

Approach Used to Create Core Map

The core map was developed using EPA's process for developing core maps for species listed by FWS and their designated critical habitat (referred to as "the process"). This core map was developed by CSI using the four steps described in the process document:

1. Compile available information for a species;
2. Identify core map type from among the following defined types: designated critical habitat, range, and biological information. From EPA, summaries of each core map type are provided below (EPA 2024).
3. Develop the core map for the species; and
4. Document the core map.

For step 1, CSI compiled available information for the eastern prairie fringed orchid from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the eastern prairie fringed orchid is included in **Appendix 1**. Influential information that impacted the development of the core map includes occurrence information and habitat descriptions.

For step 2, CSI used the compiled information including the species range, known locations, and habitat location information to determine the core map type. Compliance Services International compared the known location data to the range and found that known locations from both FWS and larger databases (iNaturalist and GBIF) were useful refinements, identifying areas of known occupancy within a vast range. Known location information from FWS was considered more precise and therefore buffered to 402 m (based on the highest threshold for habitat size assigned by FWS (2020) - 125 acres – and assuming a circular distribution, a radial distance of 401.27 m [rounded up to 402 m] was used); iNaturalist sites were buffered according to their public positional accuracy value, usually about 28 kilometers (km).

Review of the available data also suggested that the core map should exclude landcover types inconsistent with the eastern prairie fringed orchid habitat. To represent the species' habitat, the LANDFIRE dataset was used to identify habitat classes associated with the species habitat description above; using the "EVT_NAME" field, 45 unique land cover types were selected from the subset of classes falling within the species range. There was enough information to positively classify the eastern prairie fringed orchid as an "off field" species, so CSI further refined the core map using the EPA cultivated areas > 25 acres layer to derive this core map. Further details about the LANDFIRE class selections and rationale that inform the core map are provided in **Appendix 2**.

For step 3, CSI used the best-available data sources to generate the core map. Data sources are discussed in EPA's core map process document. For this interim core map, CSI followed EPA's decision framework to arrive at a core map type of biological information. Designated critical habitat was quickly eliminated as a core map type because the eastern prairie fringed orchid does not have critical habitat. The range core map type was not selected because the species range is not refined in most geographic areas and not considered endemic.

Extant site locations from FWS were identified using the PAD-US and NWI datasets, or by searching for and identifying sites in mapping software; these sites were buffered by 402 m as described above. Additional sites from iNaturalist were incorporated and buffered to distances associated with the observations' respective uncertainty. The LANDFIRE database was clipped to species range and reclassified to create a layer representing potential habitat for the eastern prairie fringed orchid; this reclassified layer was further clipped to the extent described above and converted to a polygon layer as a usable core map. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

Discussion of Approaches and Data that were Considered but not Included in Core Map

Known Observation Datasets

Datasets such as GBIF and NatureServe were considered for further utility. Ultimately, it was decided that these data were most suitable for comparison purposes.

Appendix 1. Information compiled for the eastern prairie fringed orchid

1. Recent FWS documents

- 5-Year Review (2020): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3211.pdf.
- 5-Year Review (2016): https://ecos.fws.gov/docs/five_year_review/doc5685.pdf
- Recovery Plan (1999): https://ecos.fws.gov/docs/recovery_plan/990929.pdf

2. Background information

- Status: Federally listed as threatened in 1989.
- Resiliency, redundancy, and representation (the 3Rs)
 - The 3 Rs were not specifically described in the species recovery plan or most-recent 5-Year Review for this species and there is no species status assessment.
- Habitat, Life History, and Ecology
 - Wetlands species
 - Habitat: “The eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetland communities such as sedge meadows, marsh edges and even bogs. It requires full sunlight for optimum growth and flowering, which restricts it to grass- and sedge-dominated plant communities. The substrate of the sites where it occurs ranges from more or less neutral to mildly calcareous” (FWS 1999).
 - “Seedling establishment requires development of mycorrhizae with soil-inhabiting fungi, and maintenance of graminoid habitat, usually by fire. Increasing pesticide use may impact both pollinators and fungi” (FWS 1999).
 - Pollinators: Long term population maintenance requires reproduction from seed, which is accomplished only with pollination by hawkmoths (FWS 1999).
- Taxonomy
 - Wetland plant – Although Gleason and Cronquist (1991) treat the western prairie fringed orchid (*Platanthera praeclara*) as a variety of the eastern prairie fringed orchid, this classification fails to consider quantitative differences in flower structure, which are essential in interpreting evolution and speciation in the *Orchidaceae* (van der Pijl and Dodson 1966, Dressler 1981, Marlin Bowles, Morton Arboretum, pers. comm. 1991). The eastern prairie fringed orchid and its western species pair are separated by morphologically different flower structures that prevent hybridization (Sheviak and Bowles 1986). When the western prairie fringed orchid is visited by pollinators, pollen is placed on the compound eyes of the moth. Pollinators visiting the eastern prairie fringed orchid collect pollen on the proboscis. This difference prevents cross pollination between the two species. The eastern prairie fringed orchid also has slightly smaller flowers, and often a more elongated and open flower cluster (FWS 1999).
- Relevant Potential Pesticide Use Sites
 - The eastern prairie fringed orchid occurs at many sites throughout its range. It is likely that herbicides and/or insecticides are used on private lands. Lands managed by private groups (such as The Nature Conservancy) and publicly managed lands (DuPage (Illinois) Forest Preserve, and the Ottawa National Refuge (Ohio)) have known populations and may use

herbicides and insecticides but are protective of the orchid's locations.

- Relevant Recovery Criteria and Actions
 - 5-Year Review (2020) – Delisting Criteria (all criteria must be met)
 1. Criterion 1 of the Eastern Prairie Fringed Orchid Recovery Plan (1999) requires twenty-two populations distributed across plant communities and physiographic regions within the historic range of the species.
 - Currently 96 populations exist throughout the range of the species; however, the populations are not distributed as specified in the recovery plan (i.e., by plant community, and physiographic region). The four populations must occur in three plant communities (prairie, sedge meadow, or minerotrophic sphagnum peatland) within seven physiographic regions to achieve this criterion (FWS 1999). Currently, 96 populations occur in all three plant communities, however, these populations occur in only three of the seven physiographic regions suggested in the Recovery Plan (1999). Therefore, criterion 1 has not been met.
 2. Criterion 2 in the 1999 Recovery Plan calls for 22 populations to be highly viable range wide.
 - A highly viable population typically has more than 50 flowering plants; a population trend that is stable or increasing over a monitoring period of five years; available habitat of at least 50 hectares (~125 acres) in size; assurances of ongoing management to reduce impacts from drainage, invasive non-native plant species or woody vegetation encroachment; and protection through long-term conservation easements, legal dedication as nature preserves, or other means. According to the most recent Population Viability Assessment (**Appendix 1**) using demographic data from 2015 through 2019, 12 populations are highly viable, 29 populations are moderately viable, and 51 populations are of low viability (Table 1). Three populations were unable to be assessed due to insufficient data and one population is not included in the rangewide total number of viable populations for reasons described below. Therefore, criterion 2 has not been met.

3. Range

- Size: 99,187,665 acres

The eastern prairie fringed orchid's range was last updated on July 14, 2025, according to the FWS ECOS Profile ([Species Profile for Eastern prairie fringed orchid \(*Platanthera leucophaea*\)](#)). "The eastern prairie fringed orchid formerly occurred from eastern Iowa, Missouri, and Oklahoma eastward across southern Wisconsin, northern and central Illinois, southern Michigan, northern Indiana and Ohio, and northwestern Pennsylvania to western New York and adjacent southern Ontario. Disjunct populations also occurred in New Jersey, Virginia and Maine" (FWS 1999).

“The eastern prairie fringed orchid’s distribution has not changed appreciably since 1991; however, three newly discovered populations were added since the last 5-Year Review in 2016 (FWS 2016). A new population in Iowa, owned by The Nature Conservancy, was initially documented by Dale Maxson in July of 2018 (Maxson, TNC, July 10, 2018, pers. comm.). Again in 2018, another previously undocumented population was discovered in Illinois by Kim Roman (Illinois Nature Preserves Commission (INPC)). At this site *P. leucophaea* seed was introduced in 2002 (Roman, July 9, 2018, pers. comm.). Not until 2018 did Kim Roman observe 7 blooming *P. leucophaea* plants at this site (Roman, July 9, 2018, pers. comm.) although it had been searched in the past. In 2019, in Illinois, a previously undocumented population (one blooming plant) was discovered by Erin Faulkner” (FWS 2020).

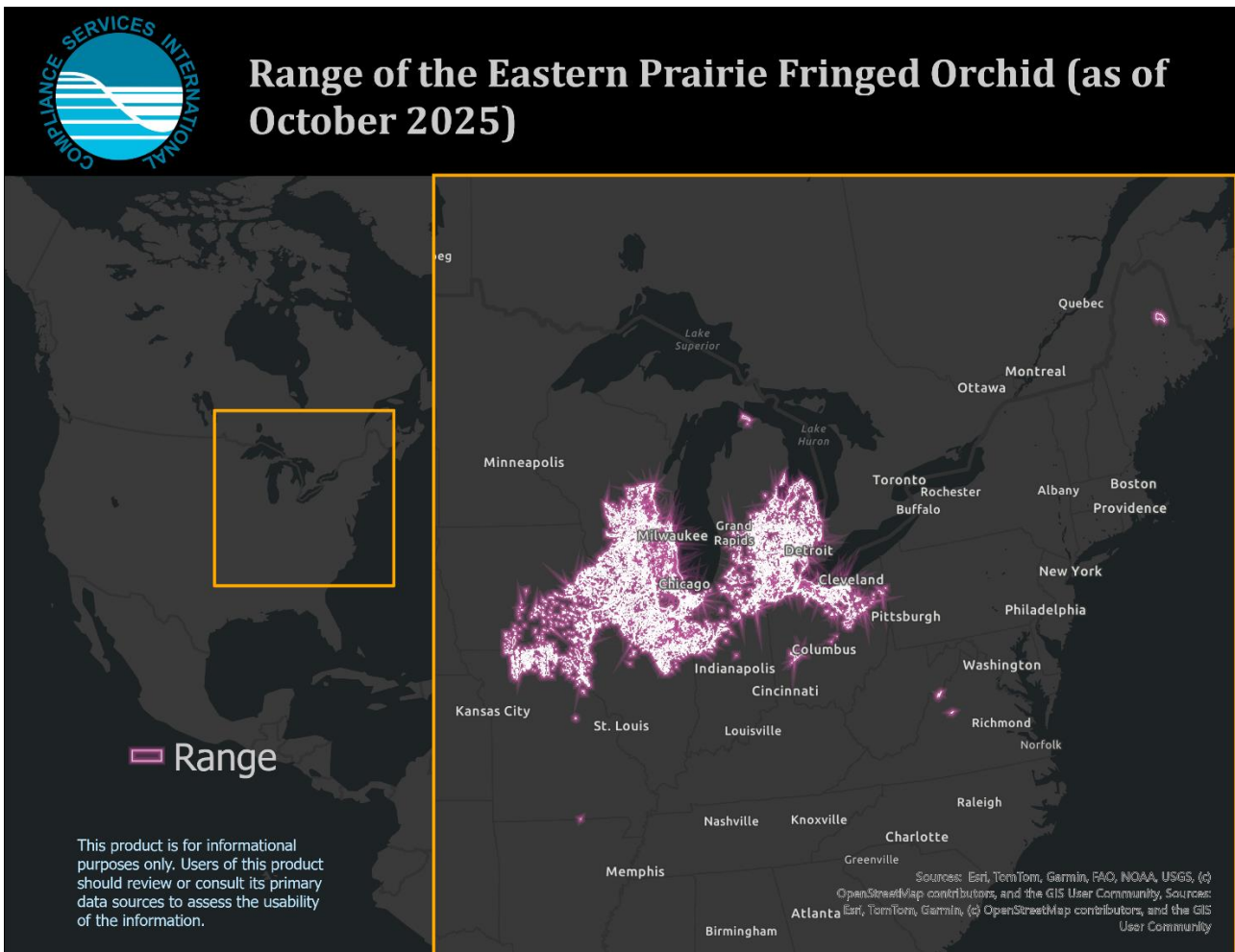


Figure 2. Range of the eastern prairie fringed orchid.

4. Description of Critical Habitat

This species does not have a designated critical habitat.

5. Known Locations

- Known populations by state (2020 5-Year Review).
 - The 5-Year Review document (FWS 2020) counts the known populations by state as

follows:

- Illinois supports 42 *P. leucophaea* populations (five are highly viable).
 - Indiana supports one population.
 - Iowa supports five populations.
 - Maine supports one population.
 - Michigan supports 18 populations (one is highly viable).
 - Missouri supports one population.
 - Ohio supports 10 populations.
 - Virginia may support one population.
 - Wisconsin supports 17 populations (six are highly viable).
- FWS known population locations are enumerated in Appendix 1 of the most recent 5-Year Review (FWS 2020; summarized in Table 2). These locations comprise the most comprehensive catalog of extant populations for the eastern prairie fringed orchid; as such, these locations were identified and made into usable spatial data for use in core map development; see **Appendix 2** for more details about this process.

Table 2. Eastern Prairie Fringed Orchid Sites and Core Map Delineation Details (FWS 2020).

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
1	Illinois	Abbott Park	Low	Yes	PAD-US	Unit_Nm LIKE '%Abbott Park%' And State_Nm = 'IL'
2	Illinois	Ascension Sedge Meadow FP	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Sedge Meadow Forest%' And State_Nm = 'IL'
3	Illinois	Bunker Hill	Low	Yes	PAD-US	Unit_Nm LIKE '%Bunker Hill%' And State_Nm = 'IL'
4	Illinois	Bystricky Prairie NP	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Bystricky Prairie%' And State_Nm = 'IL'
5	Illinois	Bystricky Prairie (Steadman Parce)	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Bystricky Prairie%' And State_Nm = 'IL'
6	Illinois	Churchill Prairie Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Churchill Prairie Nature Preserve%' And State_Nm = 'IL'
7	Illinois	Dokum Mskoda Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Dokum Mskoda%' And State_Nm = 'IL'
8	Illinois	Florsheim Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Florsheim%' And State_Nm = 'IL'
9	Illinois	Gensburg-Markham Prairie Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Gensburg%' And State_Nm = 'IL'
10	Illinois	Glenview Air Station Prairie	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Glenview Naval%' And State_Nm = 'IL'
11	Illinois	Grant Creek Nature Preserve	High	Yes	PAD-US	Unit_Nm LIKE '%Grant Creek%' And State_Nm = 'IL'
12	Illinois	Harrison Benwell	Low	Yes	PAD-US	Unit_Nm LIKE '%Harrison Benwell%' And State_Nm = 'IL'
13	Illinois	Helm Road	Low	Yes	PAD-US	Unit_Nm LIKE '%Helm Woods Nature Preserve%' And State_Nm = 'IL'
14	Illinois	Hildy Prairie Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Hildy Prairie%' And State_Nm = 'IL'
16	Illinois	HUM RR Prairie NP	Low	Yes	PAD-US	Unit_Nm LIKE '%HUM%' And State_Nm = 'IL'
17	Illinois	Hybernia Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Hybernia%' And State_Nm = 'IL'
18	Illinois	Illinois Beach State Park Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Illinois Beach State Park Nature%' And State_Nm = 'IL'

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
19	Illinois	James Woodworth Prairie	Low	Yes	Google/manual	
20	Illinois	Loda Cemetery Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Loda Cemetery%' And State_Nm = 'IL'
21	Illinois	Lone Grove FP	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Lone Grove%' And State_Nm = 'IL'
22	Illinois	Long Grove Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Buffalo Creek Forest Preserve%' And State_Nm = 'IL'
23	Illinois	Lyons Prairie & Woods Nature Preserve	High	Yes	PAD-US	Unit_Nm LIKE '%Lyons Prairie and Woods%' And State_Nm = 'IL'
24	Illinois	Miami Woods FP	Low	Yes	Google/manual	
25	Illinois	Middlefork Savanna Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Middlefork Savanna Nature%' And State_Nm = 'IL'
26	Illinois	Munson Cemetery Prairie Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Munson%' And State_Nm = 'IL'
27	Illinois	Nachusa Grasslands NP	High	Yes	PAD-US	Unit_Nm LIKE '%Nachusa Grasslands Nature Preserve%' And State_Nm = 'IL'
28	Illinois	Nippersink/ Glacial Park	Low	Yes	PAD-US	Unit_Nm IN ('Nippersink', 'Nippersink 6', 'Nippersink 7', 'Nippersink Forest Preserve', 'Nippersink 1')
29	Illinois	Paintbrush Prairie Nature Preserve	Low	Yes	PAD-US	Unit_Nm LIKE ('%Paintbrush Prairie%') And State_Nm = 'IL'
30	Illinois	Queen Anne NP	Low	Yes	PAD-US	Unit_Nm LIKE ('%Queen Anne%') And State_Nm = 'IL'
31	Illinois	Rudd Farm	Low	Yes	PAD-US	Unit_Nm LIKE ('%Rudd%') And State_Nm = 'IL'
32	Illinois	Schiller Woods FP	Low	Yes	PAD-US	Unit_Nm LIKE ('%Schiller Woods%') And State_Nm = 'IL'
33	Illinois	Somme Woods Nature Preserve	High	Yes	PAD-US	Unit_Nm LIKE ('%Somme Prairie%') AND Unit_Nm LIKE ('%Nature Preserve%') And State_Nm = 'IL'
34	Illinois	Somme Woods Prairie FP	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Somme Prairie%' And Loc_Ds = 'Forest Reserve'
35	Illinois	Sundrop Prairie Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Sundrop%' And State_Nm = 'IL'

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
36	Illinois	Swift Prairie	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Swift Prairie%' And State_Nm = 'IL'
37	Illinois	Truitt-Hoff Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Truitt-Hoff%' And State_Nm = 'IL'
38	Illinois	Vaught Pauper Cemetery Prairie	Low	Yes	PAD-US	Unit_Nm LIKE '%Voight%' And State_Nm = 'IL'
39	Illinois	Wadsworth Prairie Nature Preserve	High	Yes	PAD-US	Unit_Nm LIKE '%Wadsworth Prairie Nature Preserve%' And State_Nm = 'IL'
40	Illinois	Wayside Prairie	Low	Yes	PAD-US	Unit_Nm LIKE '%Wayside Prairie%' And State_Nm = 'IL'
41	Illinois	Wolf Road Prairie Nature Preserve	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Wolf Road Prairie%' And State_Nm = 'IL'
42	Illinois	Wrigley Tract	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Wrigley%' And State_Nm = 'IL'
43	Indiana	Lowe Prairie	Low	Yes	PAD-US	Unit_Nm LIKE '%Lowe Prairie%' And State_Nm = 'IN'
44	Iowa	Muskrat Slough Wildlife Management Area	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Muskrat%' And State_Nm = 'IA'
45	Iowa	Williams Prairie State Preserve	Low	Yes	Google/manual	
47	Iowa	Swamp White Oak TNC preserve	Low	Yes	PAD-US	Unit_Nm LIKE '%White Oak%' And State_Nm = 'IA'
48	Iowa	Baldwin Marsh Wildlife Area	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Baldwin Marsh%' And State_Nm = 'IA'
49	Maine	Crystal Bog	Low	Yes	PAD-US	Unit_Nm LIKE '%Crystal Bog%' And State_Nm = 'ME'
53	Michigan	Point Mouillee North	Low	Yes	PAD-US	Unit_Nm LIKE '%Mouillee%' And State_Nm = 'MI'
54	Michigan	Harsons Island- Middle Channel Golf Course	Insufficient data to determine	Yes	PAD-US	Unit_Nm LIKE '%Middle Channel%' And State_Nm = 'MI'
55	Michigan	Point Mouillee South	Low	Yes	PAD-US	Unit_Nm LIKE '%Mouillee%' And State_Nm = 'MI'
56	Michigan	George Reserve	Low	Yes	PAD-US	Unit_Nm LIKE '%Edwin S. George%' And State_Nm = 'MI'

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
57	Michigan	Cotter Road North / Coryeon Point	Low	Yes	PAD-US	Unit_Nm LIKE '%Cotter Road%' And State_Nm = 'MI'
58	Michigan	Saginaw Wetlands (Wildfowl Bay Prairie)	High	Yes	PAD-US	Unit_Nm LIKE '%Wildfowl%' And State_Nm = 'MI'
59	Michigan	Yankee Springs	Low	Yes	PAD-US	Unit_Nm LIKE '%Yankee Springs Recreation%' And State_Nm = 'MI'
60	Michigan	Little Cedar Lake	Low	Yes	PAD-US	Unit_Nm LIKE '%Little Cedar Lake%' And State_Nm = 'MI'
61	Michigan	Dickinson Island	Low	Yes	Google/manual	
63	Michigan	Tamarack Lake	Low	Yes	PAD-US	Unit_Nm LIKE '%Tamarack Lake State%' And State_Nm = 'MI'
64	Michigan	Clements Airport	Low	Yes	Google/manual	
65	Michigan	Fish Point	Low	Yes	PAD-US	Unit_Nm LIKE '%Fish Point%' And State_Nm = 'MI'
66	Michigan	Williams Lake	Low	Yes	NWI	NWI_ID IN ('202409CSw{EB4007D8-D51D-449F-A78B-2E65537F467F}_01','202409CSw{67D40309-D0E1-4CE5-B208-0DBA67BC63D6}_01','202409CSw{0064C6BC-82BC-4EAA-AD5D-0CC29EF015F9}_01')
67	Michigan	Dowagiac Creek - LaGrange Lake	Low	Yes	NWI	NWI_ID IN ('202409CSw{E0E7D078-4DBD-48C1-A07C-053B1A1C5314}_01','202409CSw{3A738715-067D-4E13-9BF2-C1682B5FC9A8}_01','202409CSw{9340E89A-1356-4AF1-A2EE-F0C6522062CE}_01','202409CSw{72DBD34C-CFD2-4692-B77A-19EC7402F551}_01','202409CSw{090BE2E2-9FA7-4EF2-8A7B-0E889E3CAFE8}_01','202409CSw{60E2017F-01B8-41A0-8944-00C9B3E107B1}_01','202409CSw{5C086C26-1470-4C56-B5D7-

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
						9FB76E6BD5D2}_01','202409CSw{92FC09A1-3822-44CA-BAC2-590875D7C143}_01','202409CSw{51FA85C9-16BF-471F-9385-F0F281F665E3}_01','202409CSw{9742764F-7166-498C-A1DD-E2369EA0438C}_01','202409CSw{2E2A9DF5-3AA5-4D69-90B5-2AB23D6CF943}_01','202409CSw{20CBFE89-27F8-421E-A028-35F3799438C4}_01','202409CSw{BC6BD4A4-8032-4848-8FB3-77F70AA0538D}_01','202409CSw{39A99827-AC4C-4042-AD12-8A7BB6710E3E}_01','202409CSw{803650C2-C307-4999-AE0F-EC21BAD73D19}_01','202409CSw{C8B0C6FC-0007-4A02-A791-8DD15A578B8D}_01','202409CSw{0C633F1B-13F9-4D42-B239-ECCDFEE67E92}_01','202409CSw{1141C1D1-D754-4EC5-A432-2FC0976A71BF}_01','202409CSw{81DD7E26-7DA9-474E-B5AA-E2DF42256BB2}_01','202409CSw{5EA85AE7-1F01-4B45-8E78-67924C807BE8}_01','202409CSw{033A7737-6F35-4A7C-A625-C30E5DD1C17E}_01','202409CSw{906539FD-4239-4659-BF72-EB7DF8B4DB30}_01','202409CSw{EFB6876B-45D9-4426-87B9-346DB792FDDA}_01','202409CSw{3920AD2E-7933-44C2-B0A5-9EEC11981538}_01','202409CSw{FD1A137B-

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
						014D-4F3C-8164-009EDA7D2665}_01','202409CSw{1637CB01-A8C4-49AD-9876-0DCEB3D3B37D}_01','202409CSw{7024F823-8185-45DA-98A8-EB7A4A9A5DD0}_01','202409CSw{BC516623-8146-4B00-89BC-292A7F75730D}_01','202409CSw{3933D832-599C-4154-A6AE-462BE2479989}_01','202409CSw{84EC4134-29F8-4D85-98F3-6DF601298E2E}_01','202409CSw{2A20B5A7-D329-4943-8C9E-8D2F78132506}_01','202409CSw{A37747B3-E15A-4A8D-8698-5D840C54EE43}_01','202409CSw{CC9D17C3-4244-4BB2-ADC7-2627A87C5D4A}_01','202409CSw{DBA9E83E-8137-4C42-B59D-7A1BDACEC6D8}_01')
69	Ohio	Mallard Club Wildlife Area	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Mallard Club%' And State_Nm = 'OH'
70	Ohio	Maumee Bay	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Maumee Bay%' And State_Nm = 'OH'
71	Ohio	Metzger	Low	Yes	PAD-US	Unit_Nm LIKE '%Metzger Marsh%' And State_Nm = 'OH'
72	Ohio	Ottawa NWR Crane Creek	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Ottawa National Wildlife Refuge%' And State_Nm = 'OH'
73	Ohio	Ottawa NWR Cedar Point	Low	Yes	PAD-US	Unit_Nm LIKE '%Ottawa National Wildlife Refuge%' And State_Nm = 'OH'
74	Ohio	Ottawa NWR Cedar Young	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Ottawa National Wildlife Refuge%' And State_Nm = 'OH'
75	Ohio	Pickrel Creek	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Pickrel%' And State_Nm = 'OH'

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
76	Ohio	Wightman's Grove	Moderate	Yes	Google/manual	
77	Ohio	Yodonta Road	Low	Yes	Google/manual	
78	Ohio	Dayton (Medway)	Low	Yes	Google/manual	
79	Ohio	Killbuck SM (Cemetery Road)	Low	Yes	Google/manual	
80	Ohio	Killbuck SM (Holmesville)	Low	Yes	Google/manual	
82	Ohio	Leadingham	Moderate	Yes	Google/manual	
83	Wisconsin	Bain Station Road Prairie	Low	Yes	Google/manual	
84	Wisconsin	Pell Lake Railroad Prairie	Low	Yes	NWI	NWI_ID IN ('202409CSw{3D9C12B6-6042-46B1-9555-C7F9DED54CCC}_01','202409CSw{694A02BA-F183-4807-9CE8-2094679C9FF4}_01','202409CSw{F035DBCF-A6E7-4F42-9580-D8FD7AFB5270}_01','202409CSw{6FA24F08-B19F-440E-9C19-EE8E8E0BFF9E}_01','202409CSw{9F1C0053-4C63-4C1A-9AA1-A19959A77F52}_01')
85	Wisconsin	Koshkonong Wetland	High	Yes	PAD-US	Unit_Nm LIKE '%Koshkonong%' And State_Nm = 'WI'
86	Wisconsin	Snapper Prairie	High	Yes	Google/manual	
87	Wisconsin	Uihlein (Waukau Marsh)	Moderate	Yes	Google/manual	
88	Wisconsin	Chiwaukee Prairie - South	High	Yes	PAD-US	Unit_Nm LIKE '%Chiwaukee Prairie%' And State_Nm = 'WI'
89	Wisconsin	Chiwaukee Prairie	High	Yes	PAD-US	Unit_Nm LIKE '%Chiwaukee Prairie%' And State_Nm = 'WI'
90	Wisconsin	Chiwaukee Prairie - Carol Beach Low Prairie	Low	Yes	PAD-US	Unit_Nm LIKE '%Chiwaukee Prairie%' And State_Nm = 'WI'
91	Wisconsin	Taylor Creek Prairie	Low	Yes	Google/manual	
92	Wisconsin	Young Prairie	Moderate	Yes	PAD-US	Unit_Nm LIKE '%Kettle Moraine%' And State_Nm = 'WI'

ID	State	Site Name from FWS 2020	Viability from FWS 2020	Identified/Geo referenced for Core Map	GIS Data Source for Core Map	Query for Core Map
93	Wisconsin	Faville Prairie	High	Yes	PAD-US	Unit_Nm LIKE '%Faville Grove Sanctuary%' And State_Nm = 'WI'
94	Wisconsin	Scuppernong Prairie	High	Yes	PAD-US	Unit_Nm LIKE '%Kettle Moraine%' And State_Nm = 'WI'
95	Wisconsin	Newark Road Prairie	Low	Yes	Google/manual	
96	Wisconsin	Cedarburg Bog - Patterned Fen	High	Yes	PAD-US	Unit_Nm LIKE '%Cedarburg Bog%' And State_Nm = 'WI'
97	Wisconsin	UW-Madison Arboretum - Greene Prairie	High	Yes	PAD-US	Unit_Nm = 'Uw Arboretum' And State_Nm = 'WI'
98	Wisconsin	White River Prairie Tamaracks	High	Yes	PAD-US	Unit_Nm = 'White River Marsh Wildlife Area' And State_Nm = 'WI'
99	Wisconsin	Oshkosh-Larsen - Allenville	Low	Yes	Google/manual	
100	Wisconsin	Oshkosh-Larsen - Maxwell	Low	Yes	Google/manual	
101	Wisconsin	Oshkosh-Larsen - Breezewood	Low	Yes	Google/manual	
102	Wisconsin	Des Plaines River Prairie - West	Low	Yes	Google/manual	
103	Wisconsin	Heide Prairie	Moderate	Yes	Google/manual	

- GBIF: <https://www.gbif.org/species/2798308>
 - GBIF includes 1,118 occurrence records; 402 of which are georeferenced and 237 of these had usable coordinate data based on these criteria:
 - U.S. only (excludes Canada)
 - Latitude and longitude precision were both 3+ decimal places.
 - Relative recency (2010-present)
 - Must include date information.
 - No “preserved specimen” observations; only “human observation.”
 - The 237 usable coordinates were mapped against the species range to evaluate their utility in representing species extent and found to be in agreement, though not every state or region is represented (Figure 3, Figure 4). These observations were used alongside other sources to refine the core map extent. More details on their use are provided in **Appendix 2**.

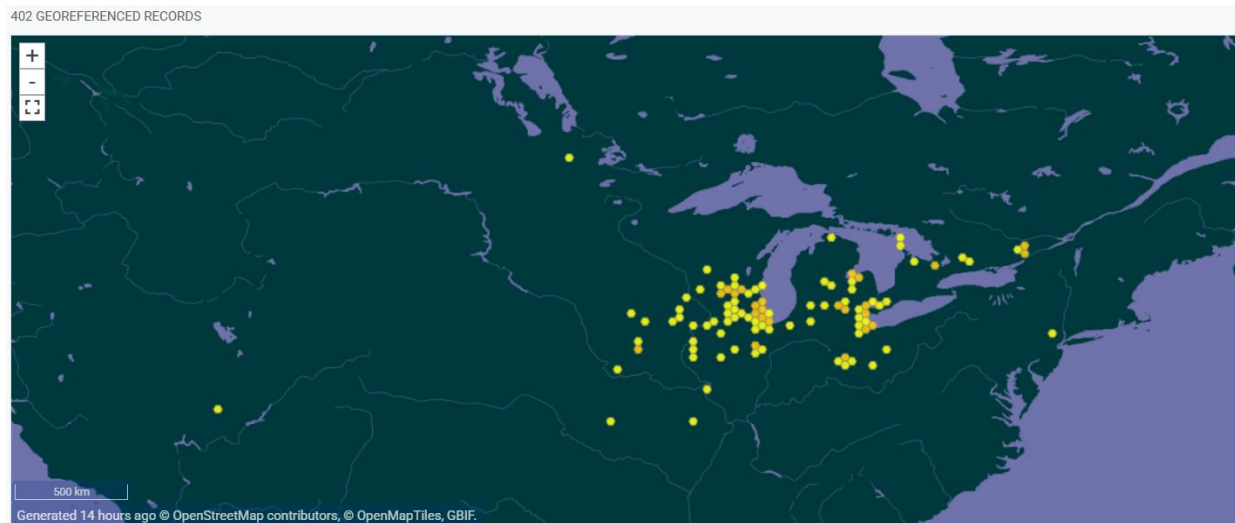


Figure 3. GBIF occurrences for the eastern prairie fringed orchid.

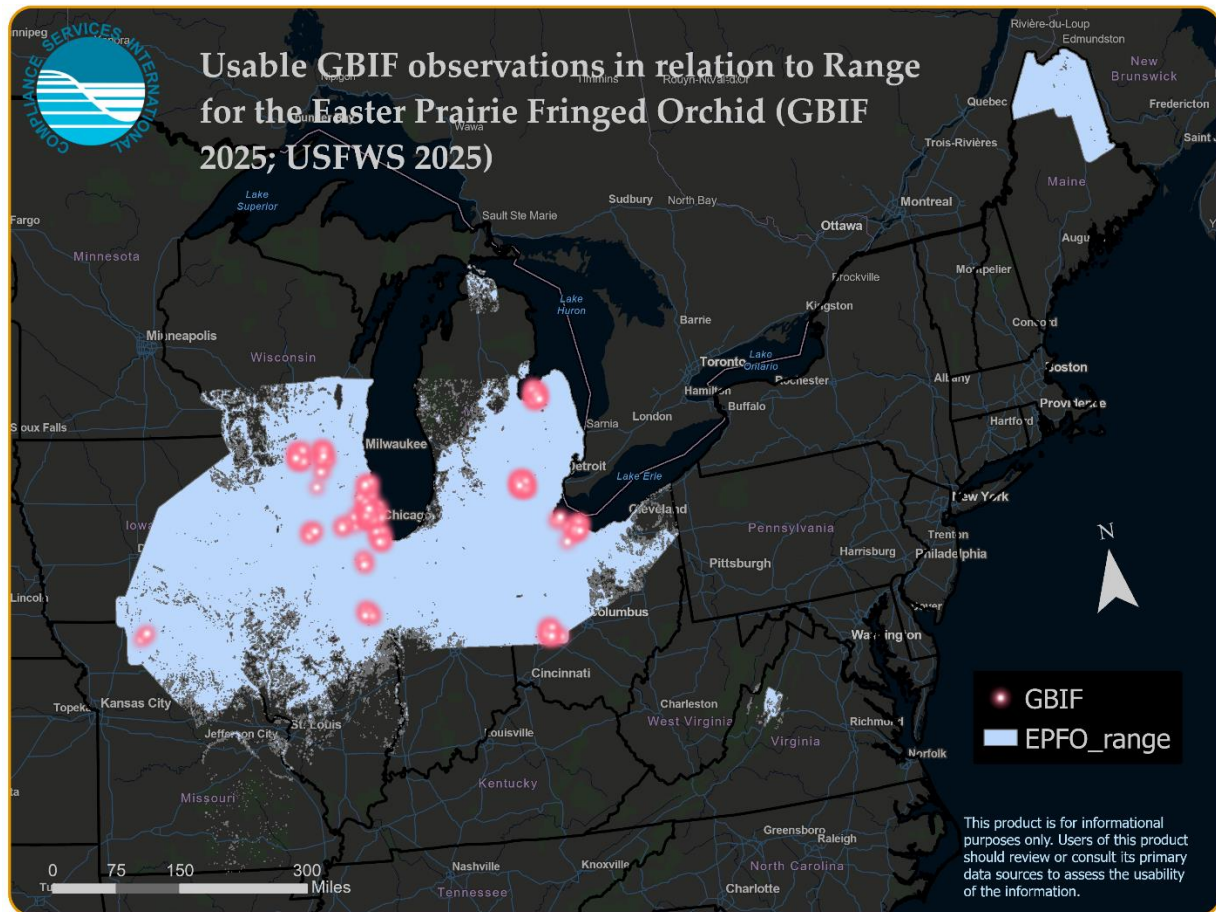


Figure 4. Usable GBIF occurrences (pink) in relation to the range of the eastern prairie fringed orchid (GBIF 2025; FWS 2025).

- iNaturalist: https://www.inaturalist.org/observations?taxon_id=167023
 - iNaturalist includes 550 total observations (Figure 5), 324 of which are research-grade with usable coordinate data based on these criteria:
 - U.S. only (excludes Canada)
 - Latitude and longitude precision were both 3+ decimal places.
 - Relative recency (2010-present)
 - Observation description did not include the text “intentionally incorrect.”
 - Public positional accuracy value no greater than 30 km
 - This resulted in the exclusion of 5 records.
 - Locations align very well with GBIF, which is not surprising because many of the GBIF observations are imported from iNaturalist (Figure 6). There are some areas in Ohio and one in Iowa that are not represented by the GBIF dataset.
 - All the iNaturalist data are within the range of the EPFO, or offshore in adjacent areas.

Observations

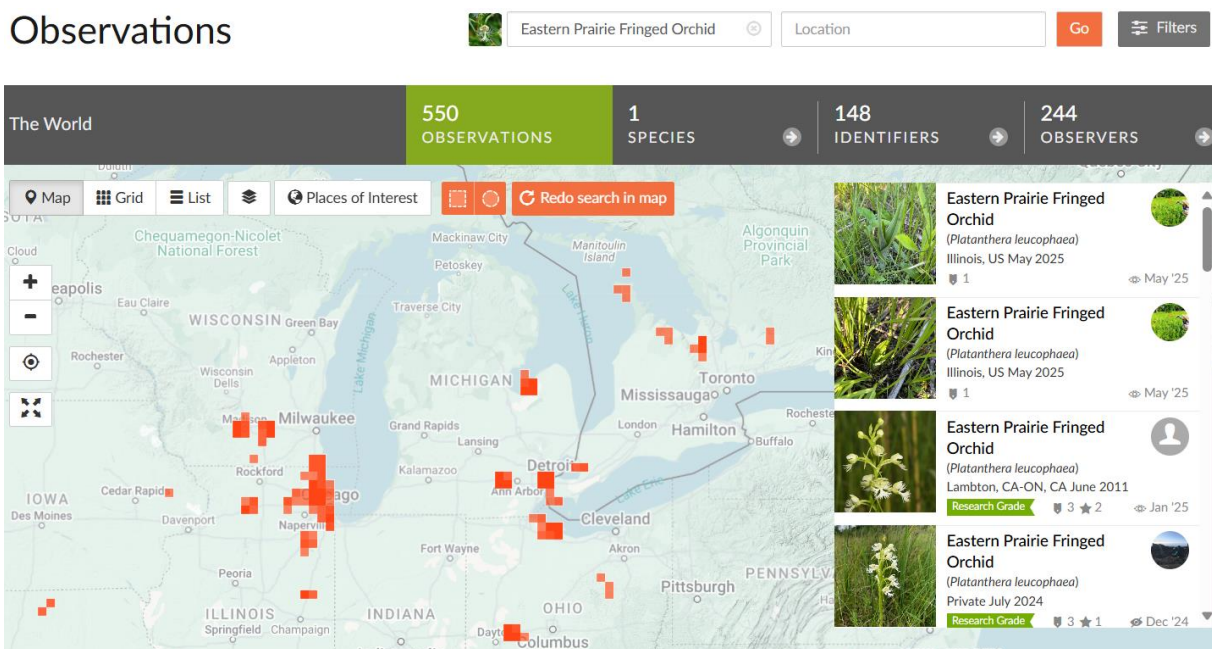


Figure 5. iNaturalist occurrences for the eastern prairie fringed orchid.

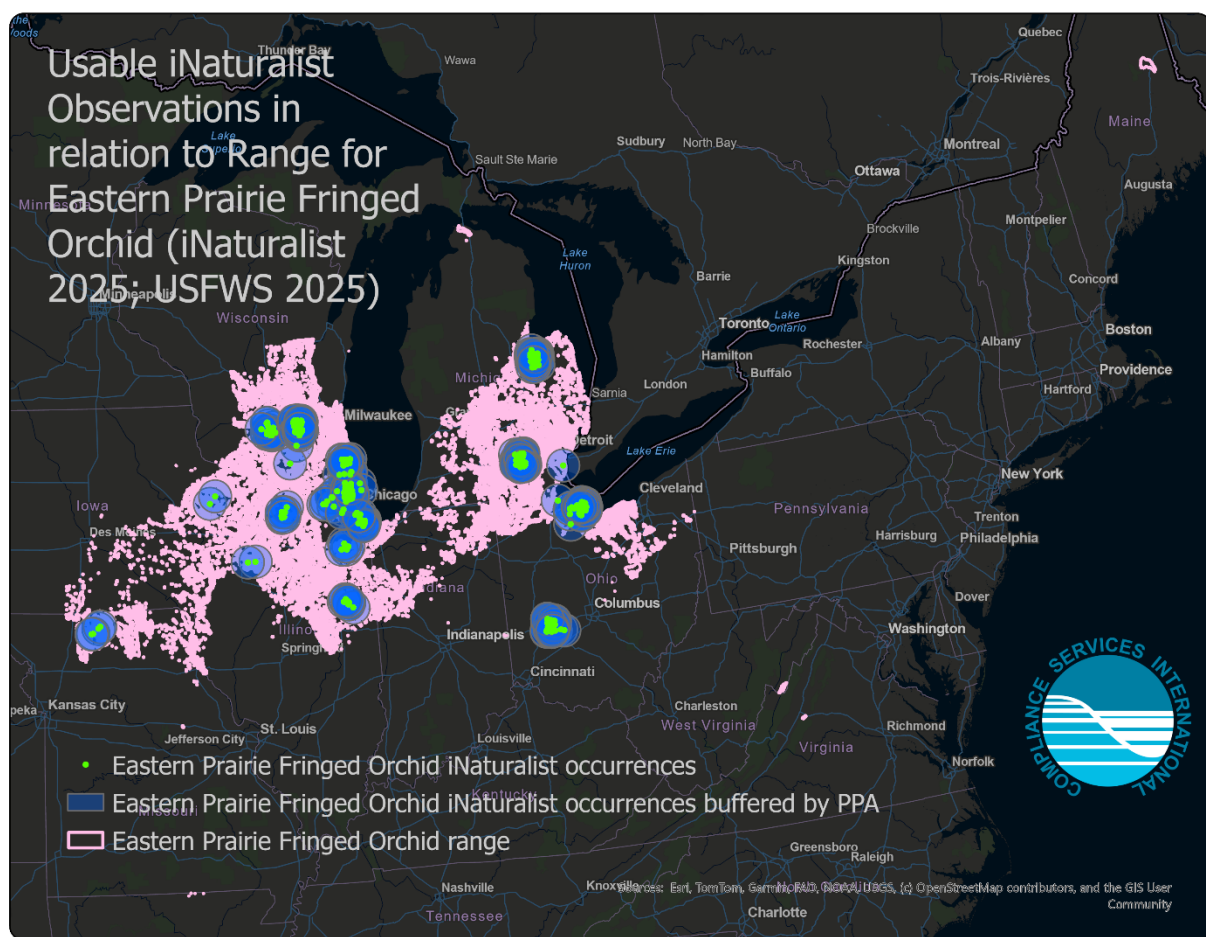


Figure 6. Usable iNaturalist and GBIF observations for the eastern prairie fringed orchid (iNaturalist 2025; FWS 2025).

- NatureServe Explorer: <https://explorer.natureserve.org/>
 - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and GBIF (Figure 7) and is generally consistent with FWS range (including some representation in Maine, which does not have iNaturalist or GBIF observations).
 - Element occurrences were used to validate publicly available datasets from FWS, iNaturalist, and GBIF, but were not used to develop the core map.

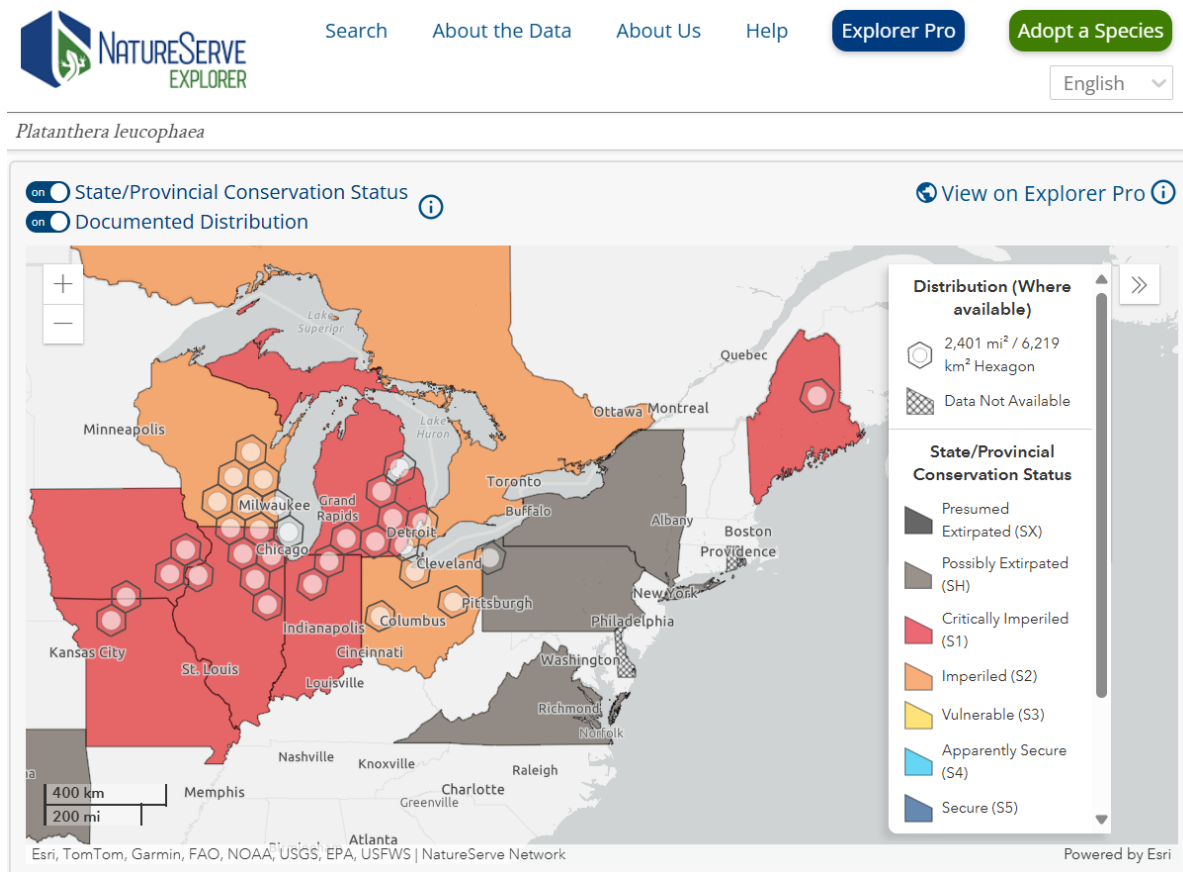


Figure 7. NatureServe Explorer occurrences for the eastern prairie fringed orchid (NatureServe 2025).

Appendix 2. GIS Data Review and Method to Develop Core Map

The core map for this species is based on biological information, which includes the habitat used by this species found within a spatial extent based on known observations. The core map identifies all areas within the extent (described below) matching a habitat description of “a wide variety of habitats, from mesic prairie to wetland communities such as sedge meadows, marsh edges and even bogs” (FWS 1999). Professional judgment was used to match Existing Vegetation Type (EVT) classes in the LANDFIRE dataset as described below (LANDFIRE 2024). LANDFIRE is regarded as a high quality national-level dataset that is appropriate to identify terrestrial habitat for plant species such as the eastern prairie fringed orchid.

1. References and Software

- Google. *Google Maps*. Accessed May 16, 2025. <https://maps.google.com/>.
- iNaturalist: https://www.inaturalist.org/observations?taxon_id=167023.
- National Wetlands Inventory: <https://www.fws.gov/program/national-wetlands-inventory>.
- PAD-US: <https://www.sciencebase.gov/catalog/item/652d4fc5d34e44db0e2ee45e>.
- Software used: ArcGIS Pro version 3.2.
- FWS 5-Year Review (2020): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3211.pdf.
- FWS Species Range: <https://ecos.fws.gov/ecp/species/601>.

2. Datasets Used in Core Map Development

2.1. Range

The range for this species was last updated by FWS on July 14, 2025. A shapefile including species range for all listed species was downloaded from the FWS ECOS website on October 14, 2025. The shapefile was converted to a feature class stored in a file geodatabase and reprojected to WKID #4269 (“North America Albers Equal Area Conic”).

1. Using an ArcGIS Web Map the species was queried based on the ECOS listed “Entity ID” of 984 and exported as a feature class to a temporary file geodatabase as a standalone Entity ID-specific layer.
2. The area of the range was calculated automatically by loading it into the software (ArcGIS Pro version 3.2) and reading its area from the attribute table (“Shape_Area”), then converting its units (square meters) into acres with a conversion factor of 0.000247105.

This shapefile was added to an ArcGIS Pro map and compared against the available known locations described in the FWS 5-Year Review (FWS 2020). The range was used to establish the outer boundary (“extent”) of the core map.

2.2. FWS 5-Year Review (2020)

The most recent 5-Year Review includes the most up-to-date list of known occurrences of the eastern prairie fringed orchid that have been documented by FWS. These sites are catalogued in the document’s Appendix 1, which additionally includes information about population such as size, population trend, management needs, viability, and other measures.

Because the appendix does not include spatial information in any form (e.g. size, maps, coordinates,

etc.), CSI developed a spatial layer for these locations by identifying sites based on the “site name” field and use of professional judgment/knowledge of spatial datasets. The PAD-US and NWI datasets were queried as described below. If a site could still not be found, Google and ESRI Basemaps were used to find site boundaries and/or geographic coordinates approximating the species location. See Table 2 in the main part of this document for details about each site.

All sites were buffered to account for observation uncertainty. Sites that were obtained from PAD-US, NWI, or Google/ESRI basemaps had a buffer distance of 402 meters applied to them to account for population size. 402 meters represents a radial distance of a circle covering an area of 125 acres, which is the highest threshold value for habitat size as identified by FWS (FWS 2020).

Additionally, some iNaturalist observations were used to supplement the known occurrence information used to represent the core map of the eastern prairie fringed orchid. iNaturalist points were buffered by their “public positional accuracy” field (described in **Appendix 1**), usually a distance of about 28 km. Only sites with a buffered distance that did not intersect observations located from FWS documentation were selected and incorporated into core map development; the buffered versions of these points contributed to core map development. This added 5 additional observations to the core map shape.

2.3. Internal Counties-based Investigation

In 2019, CSI investigated the accuracy of the county-level species distribution published by EPA. This investigation included several wide-ranging species, including the eastern prairie fringed orchid. It was found that 43 counties in Illinois do not contain extant populations of this species. A spatial layer was developed for these counties and used as a refinement of species extent. These data were processed according to the procedure given in Section 3.

2.4. PAD-US

Many of the sites identified by FWS are prairies, preserves, forests, wildlife areas, and other types of locations that are often included in the PAD-US layer; thus, PAD-US was queried for each site name. The queries used are included in Table 2. Where a site was positively identified, matching records were selected and exported as a standalone layer. Section 3 describes how these layers were aggregated and incorporated into core map development. Of the 103 sites listed, 70 were identified in PAD-US and exported as standalone layers.

2.5. NWI

Three site names were determined to be water bodies, hence better suited to identification in a spatial layer for aquatic land cover. The NWI dataset was used to identify Williams Lake, Dowagiac Creek – Lagrange Lake, and Pell Lake. Professional judgment was used to select features associated with each of these sites and export them as standalone layers. The features selected can be obtained using the queries on the “NWI_ID” field that are included in Table 2.

2.6. Google and ESRI Basemaps

Twenty-one site names were identifiable by site name using a combination of Google Maps and ESRI Basemaps. Eight of these sites were delineated with polygonal boundaries in an Edit session using ESRI ArcGIS Pro v. 3.2. The remaining thirteen sites were identified as point locations and buffered to an uncertainty distance of 402 m. These were processed as separate points layers by state (Ohio and Wisconsin only).

2.7. iNaturalist

The non-FWS known location information was robust enough to be used to supplement FWS locations for this species. NatureServe data were considered but ultimately ruled against because of data privacy concerns. iNaturalist and GBIF were examined in relation to each other (Figure 6) and it was observed that iNaturalist had a slightly more robust dataset; that is, iNaturalist included some areas that were missing from GBIF, and did not exclude any relevant areas included in GBIF.

The iNaturalist dataset included clusters of observations that were not accounted for in the FWS list of extant populations, despite there being no reason to believe the iNaturalist data comprise extirpated populations; in fact, more than half of iNaturalist records are dated more recently than the 2020 5-Year Review, and so there is reason to believe that the FWS dataset may underrepresent the species distribution.

iNaturalist observations are obscured for public use, to varying resolutions. Thus, the “public positional accuracy” field was used to buffer each point by its respective value. For usable observations (described in Section 1.5), these buffer distances ranged from 27,411 to 28,520 m (Figure 8).

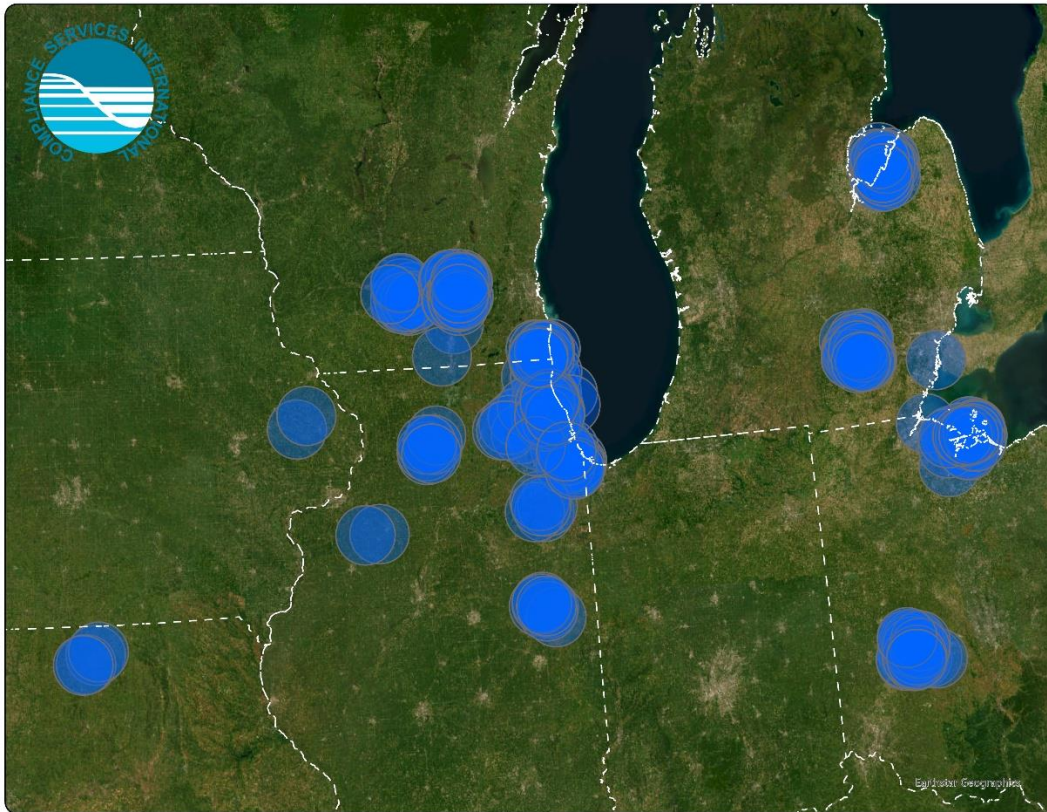


Figure 8. Usable iNaturalist observations buffered by respective “public positional accuracy” (iNaturalist 2025).

2.8. LANDFIRE

Once the species extent was established using the datasets above, the LANDFIRE database was used to identify areas within the extent corresponding to the habitat of the eastern prairie fringed orchid. The EVT layer was clipped to species range and professional judgment was used to identify land cover types associated with the species’ habitat. The first iteration of review involved the use of these key words: Prairie, Wetland, Meadow, Bog, Marsh, Floodplain, Small Stream, Fen, Peatland, Swamp, Stream, Pond,

Estuary, Riparian, and River. Then multiple reviewers re-examined these selections and included additional classes to arrive at a comprehensive list of land cover types representing the eastern prairie fringed orchid habitat within its range (Table 3).

EVT_NAME		
Northern & Central Ruderal Meadow	Great Lakes Wet-Mesic Lakeplain Prairie	North-Central Interior and Appalachian Acidic Peatland Shrubland
North-Central Interior and Appalachian Rich Swamp	Laurentian-Acadian Alkaline Conifer-Hardwood Swamp	Boreal-Laurentian Conifer Acidic Swamp and Treed Poor Fen
North-Central Interior Wet Meadow	North-Central Interior Graminoid Alkaline Fen	Acadian-Appalachian Conifer Seepage Forest
Northern & Central Ruderal Wet Meadow & Marsh	Eastern Cool Temperate Developed Shrubland	Boreal-Laurentian-Acadian Acidic Basin Fen
North-Central Interior Freshwater Marsh	Northern Great Lakes Interdunal Wetland	Laurentian-Acadian Shrub Swamp
Central Tallgrass Prairie	Great Lakes Wooded Dune and Swale	Central Interior Acidic Cliff and Talus
Northern Great Lakes Coastal Marsh	North-Central Interior Sand and Gravel Tallgrass Prairie	Laurentian-Acadian Alkaline Fen
Laurentian-Acadian Wet Meadow	Eastern Great Plains Wet Meadow-Prairie-Marsh	Laurentian-Acadian Freshwater Marsh
Developed-Roads	North-Central Interior Floodplain Shrubland	Laurentian-Acadian Floodplain Shrubland
Open Water	North-Central Oak Barrens Herbaceous	South-Central Interior Large Floodplain Forest
Eastern Cool Temperate Pasture and Hayland	Boreal-Laurentian Bog	Paleozoic Plateau Bluff and Talus Herbaceous
Eastern Cool Temperate Fallow/Idle Cropland	Great Lakes Freshwater Estuary and Delta	Great Lakes Alvar
North-Central Interior Shrub Swamp	Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp	Northern Atlantic Coastal Plain Pond
Northern & Central Ruderal Shrubland	Great Lakes Dune Grassland	Central Interior Calcareous Cliff and Talus
North-Central Interior Shrub Alkaline Fen	Great Lakes Dune	South-Central Interior Small Stream and Riparian Herbaceous

Table 3. LANDFIRE EVT classes associated with the habitat of the eastern prairie fringed orchid (LANDFIRE 2024).

The “Value” field associated with these land cover classes was used during the reclassification process state in Step 2 of the “Refinement based on Biological Information” procedure given in Section 3.2.

The 2020 5-Year Review identifies the greatest population viability for minimally disturbed sites:

- “Highly viable eastern prairie fringed orchid populations occur in late-successional habitat in high quality natural areas that are free of invasive species. Fire and other management techniques that mimic natural disturbance may be required to control or eliminate invasive species and to maintain stable late- successional vegetation...Values assigned to this variable are based on the degree of disturbance (i.e. natural quality grade) or habitat successional stage and are as follows: 0 = very heavily disturbed (grade D) or early successional; 1 = heavily disturbed (grade C) or early successional; 2 = moderately disturbed (grade B) or mid-successional; 3 = lightly or undisturbed (grade A) or late-successional (FWS 1999; Bowles et al. 1992).”

Appendix 3 within the 5-Year Review further clarifies disturbance as follows:

- “The successional stage, or “natural quality”, is an indicator of past or current disturbance impacts to vegetation. Grade “A” prairies are relatively stable or lightly disturbed communities. “Disturbance impacts” refer to ground disturbance (e.g., plowed or tilled). However, fire and other management techniques that mimic natural disturbance may be required to control or eliminate invasive species and to maintain stable late-successional vegetation.”

Based on the description of disturbance supporting 0 population viability, any heavily cultivated LANDFIRE layers were removed from the species extent.

3. Creating the Core Map

3.1. Defining Extent

The core map for the eastern prairie fringed orchid was developed using known location data of extant populations in all states in which the species occurs. The extent used for core map development was created as follows.

1. Download a .csv file (“iNat.csv”) of iNaturalist observations for the eastern prairie fringed orchid from the iNaturalist website. Load the file into Excel and filter to exclude records failing to meet

one or more of the requirements below.

- a. U.S. only (excludes Canada)
 - b. Latitude and longitude precision were both 3+ decimal places.
 - c. Relative recency (2010-present)
 - d. Observation description did not include the text “intentionally incorrect.”
 - e. Public positional accuracy value no greater than 30 km
2. Load iNat.csv into ArcGIS Pro. Right-click the file and select the “Display XY Data” tool. Follow prompts to create a points layer using longitude as the x-coordinate and latitude as the y-coordinate. Export previous layer as a new layer in the correct projection (WKID #4269), saved as “iNat” in the working geodatabase.
3. Use the Pairwise Buffer tool to buffer the previous layer (“iNat_1025”) by the public positional accuracy field. Save as a new layer (“iNat_1025_pbPPA”).
4. For FWS sites (Table 2), query the PAD-US and/or NWI datasets to identify shapes associated with each site. For each site, select the feature(s) and export as a standalone layer to a separate geodatabase (“Sites”). “S1” corresponds to the first site examined, “S2” the second site, and so on.
5. For sites unidentifiable in PAD-US or NWI, but recognizable in Google Maps and/or ESRI Basemaps, create separate points layers for Ohio and Wisconsin. In an Edit session, create new point features for each identified site. Save as separate feature classes, “Ohio_pts” and “WI_pts” in the “Sites” geodatabase.
6. Use the Pairwise Buffer tool to buffer the previous layers (“Ohio_pts” and “WI_pts”) by 1 m each, to convert them into usable polygon features and facilitate subsequent processing steps. Save the buffered layers as “Ohio_pts_pb1m” and “WI_pts_pb1m” respectively.
7. Use the Merge tool to merge each of the 95 identified FWS sites. Most of these are standalone layers exported from PAD-US, but this also includes layers from the previous step (“Ohio_pts_pb1m” and “WI_pts_pb1m”). Save as a new layer identifiable as FWS sites (“USFWS_sites_merge”) to the main geodatabase, EPFO.gdb. Layers developed subsequently are also saved to this geodatabase.
8. Use the Pairwise Buffer tool to buffer the features from the previous layer “USFWS_sites_merge” by 402 m, saved as a new layer (“USFWS_sites_pb402m”).
9. Use the Select By Location tool to select buffered iNaturalist features (“iNat_1025_pbPPA”) that do not intersect with other identified locations (“USFWS_sites_merge”).
10. Use the Merge tool to merge the selected buffered iNaturalist data (“iNat_1025_pbPPA”) and buffered FWS sites (“USFWS_sites_sel_pb402m”) into a single layer with a name recognizable as the core map extent (“EPFO_extent”).
11. Use the Pairwise Dissolve tool to dissolve the previous layer (“EPFO_extent”) into a layer with a single feature, “EPFO_extent_pd”.
12. Use a SQL query to select counties in IL known to not contain extant populations of the eastern prairie fringed orchid. Export selected features as a standalone layer, “IL_nonExtant”.
13. Use the Pairwise Erase tool to remove Illinois counties (“IL_nonExtant”) from the previous layer (“EPFO_extent_pd”), and save as a new layer, “EPFO_extent_pd_peIL”.
14. Use the Pairwise Clip tool to clip the previous layer (“EPFO_extent_pd_peIL”) by the species range (“EPFO_range”) and save as a new layer (“EPFO_extent_pd_peIL_pcRange”).

3.2. Refinement based on Biological Information

The total extent of the eastern prairie fringed orchid core map—which comprises buffered observation

locations clipped to species range—includes a significant area and number of different land cover types that do not align with descriptions of eastern prairie fringed orchid habitat. To improve confidence in the core map, a refinement based on biological information was applied to extent.

The best-available dataset for suitable species habitat was found to be the LANDFIRE dataset. This spatial layer was used as a refinement of the core map area as follows:

1. Load the LANDFIRE Existing Vegetation Type (“LF2023_EVT_240_CONUS”) layer into a GIS.
2. Use the Clip Raster tool to clip the “LF2023_EVT_240_CONUS” layer by the species range. Save as a new raster layer, “LF_crExtent”.
3. Examine the “EVT_NAME” field from the clipped LANDFIRE layer (“LF_crExtent”) to identify land cover types associated with habitat descriptions of the eastern prairie fringed orchid. Positive identifications are given in Table 3.
4. Use the Reclassify tool to reclassify the previous layer (“LF_crExtent”) to identify areas of eastern prairie fringed orchid habitat. Assign a value of “1” for acceptable land cover types, and “NODATA” for all others. Save as a new layer, “LF_crExtent_rec”.
5. Use the Raster to Polygon tool to convert the previous layer (“LF_crExtent_rec”) into a polygon feature class and save as “LF_crExtent_rec_r2p”.
6. Use the Pairwise Dissolve tool to dissolve the previous layer (“LF_crExtent_rec_r2p”) into a layer with a single feature. Save as a new layer, “LF_crExtent_rec_r2p_pd”.

3.3. Refinement based on Biological Information

The eastern prairie fringed orchid is not expected to be found in agricultural areas, so a refinement to exclude areas of agriculture was applied. This was determined according to a professional judgment of the species, partially informed by discussion with representatives from EPA. Here agricultural areas are represented by EPA’s modified cultivated layer, which includes areas spanning at least 25 acres. This was done as follows:

1. Use the Pairwise Erase tool to exclude cultivated areas > 25 acres from the previous layer (“LF_crExtent_rec_r2p_pd”) according to a layer developed by EPA (“CultivatedAreas_Over25acres”). Save as a new layer (“LF_crExtent_rec_r2p_pd_peCultivated25ac”).
2. (Optional) Export features from the previous layer (“LF_crExtent_rec_r2p_pd_peCultivated25ac”) into a new layer recognizable as eastern prairie fringed orchid, “Eastern_prairie_fringed_orchid_CoreMap”.

4. Datasets Considered but Not Used in Core Map Development

Known Observation Datasets

Datasets such as GBIF and NatureServe were considered but not used. NatureServe public EOs are viewable in their mapper as hexagons corresponding to locations where the species

may have been observed. The current range of the species intersects all but five of the total occurrences used, from the most recent 5-Year Review and iNaturalist.

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