Interim Core Map Documentation for the Western Prairie Fringed Orchid

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

Species Summary

The western prairie fringed orchid (*Platanthera praeclara*; Entity ID 1080) is a dicotyledonous threatened plant found primarily in the Midwest and Central United States. The U.S. Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the western prairie fringed orchid. This species inhabits a wide variety of habitats, including tallgrass prairies, sedge meadows, and disturbed sites in successional communities such as borrow pits, old fields, and roadside ditches. 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 western prairie fringed orchid is based on biological information, which was used to refine an extent determined by counties, ecoregions with extant populations of the species, and iNaturalist observations buffered to their public positional accuracy. The most recent 5-Year Review (FWS 2021) included textual descriptions of counties where the species has changed occupancy status (presence or absence) since the previous 5-Year Review in 2009. Known location information from the iNaturalist database provided validation of these general locations and was used as a refinement of extent in core map development. Habitat within these areas were additionally clipped to the species range to develop the core map.

The core map developed in this document for the western prairie fringed orchid spans 810,614 acres (Figure 1). A summary of acreage by National Landcover Database (NLCD) land use type is provided in Table 1.

Based on the 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 2024a).

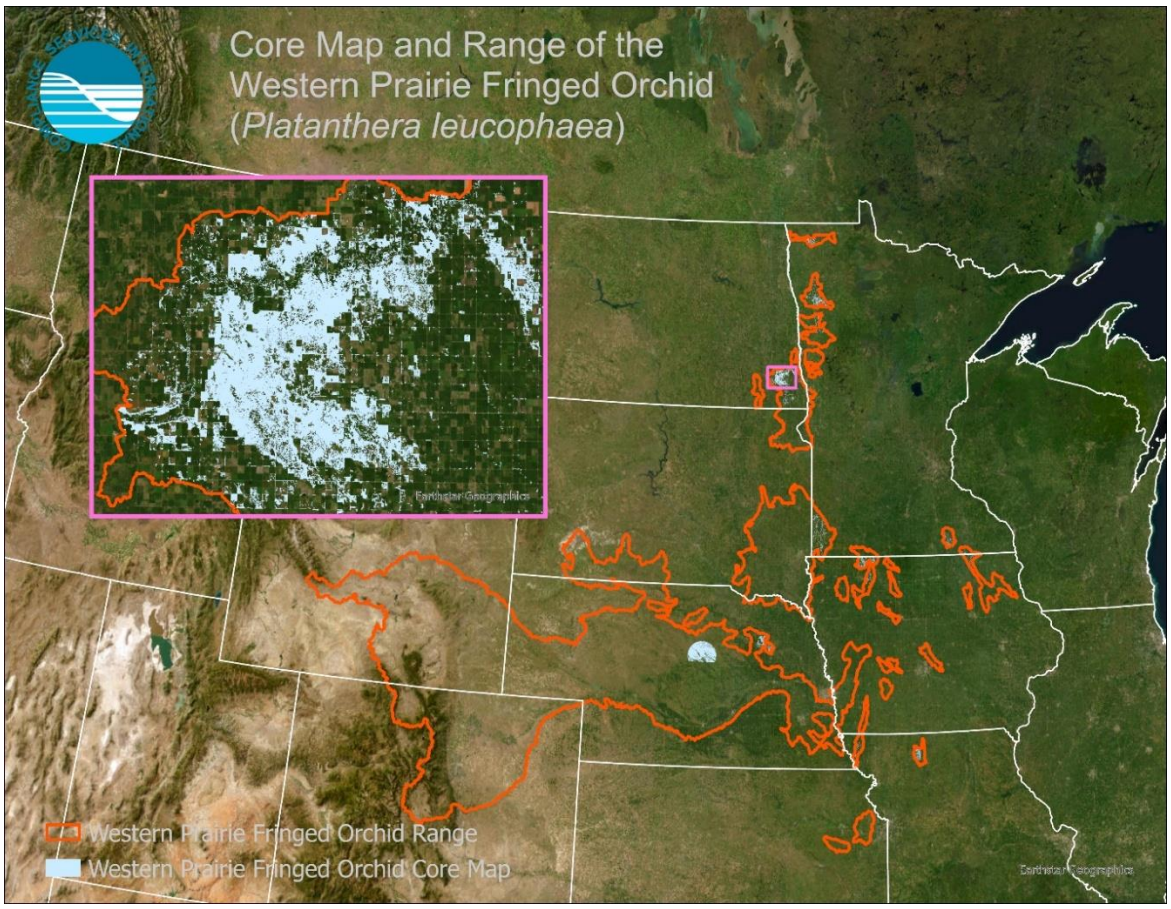

Figure 1. Interim core map for the western prairie fringed orchid.

NLCD_Land_Cover_Class	Acres	%
Herbaceous	529,189	65.1
Cultivated Crops	87,838	10.8
Emergent Herbaceous Wetlands	55,611	6.8
Hay/Pasture	45,147	5.6
Developed, Open Space	27,927	3.4
Deciduous Forest	21,933	2.7
Developed, Low Intensity	16,781	2.1
Woody Wetlands	12,066	1.5
Developed, Medium Intensity	6,075	0.7
Open Water	3,498	0.4
Mixed Forest	2,214	0.3
Barren Land	1,433	0.2
Developed, High Intensity	1,256	0.2
Shrub/Scrub	922	0.1
Evergreen Forest	471	0.1

Table 1. Acres by National Land cover Database (NLCD) class within the core map of the western prairie fringed orchid. The total core map area (based on NLCD pixel count) is 812,361 acres[1].

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 the Global Biodiversity Information Facility (GBIF); and
- Occurrence locations in NatureServe.

Compliance Services International evaluated these four datasets before developing the core map. Overall, there were 207 usable research-grade observations found in iNaturalist[2]. The GBIF dataset comprised 202 georeferenced observations, 92 of which were considered usable based on criteria described below. The iNaturalist dataset was useful to identify extant population sites for the western prairie fringed orchid and to refine the overall extent used in core map development. The GBIF dataset was largely redundant because all the usable GBIF observations were originally sourced from iNaturalist, the latter of which also contained more records.

FWS location information provided substantial refinement. The identification of counties with known extant populations corroborated by an absence of location data from other sources helped focus the core map. Additionally, ecoregion information was used to remove a small amount of area (5.7%) within selected

[1] This acreage is slightly different from the core map acreage (810,614) due to the pixelation of NLCD land cover. The core map is not developed exclusively from raster data.

[2] 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-).

counties.

NatureServe public element occurrence (EO) data were also evaluated but not used to generate the core map shape; however, they are considered by CSI to have supported 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 the 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 2024a).
3. Develop the core map for the species; and
4. Document the core map.

For step 1, CSI compiled available information for the western 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 western prairie fringed orchid is included in **Appendix 1**. Influential information that impacted the development of the core map includes a description of the species habitat from the Recovery Plan and occurrence information.

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 FWS (counties, ecoregions, and iNaturalist observations buffered to their positional uncertainty) were useful refinements, identifying areas of potential occupancy within a vast range.

Review of the available data also suggested that the core map should exclude landcover types inconsistent with the western 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, 20 unique land cover types were selected from the subset of classes falling within the core map extent. These land cover types were converted to polygonal spatial data and clipped to the species range, then had contiguous cultivated areas > 25 acres (USEPA 2025) removed to develop the core map.

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 western 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.

Counties and ecoregions known to be inhabited by the western prairie fringed orchid were identified in FWS documentation; these areas represent the outer boundary ("extent") considered for core map development. The LANDFIRE database was clipped to this extent and reclassified to create a layer representing potential habitat for the western prairie fringed orchid; this reclassified layer was 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 but not used as the basis for the core map. 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 encompasses all the occurrences based on visual inspection. A different refinement (not based directly on known observation data) was selected as the outer extent and further refined with biological data. If additional known observation data is acquired that improves upon the extent used here (based on extant counties, ecoregions, and iNaturalist data), then this would be a suitable alternative for core map use.

Appendix 1. Information compiled for the Western Prairie Fringed Orchid

1. **Recent FWS documents**
   - 5-Year Review (2009): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1353.pdf.
   - 5-Year Review (2021): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/964.pdf.
   - ECOS Species Profile Page (2025): https://ecos.fws.gov/ecp/species/1669.
   - Recovery Plan (1996): https://ecos.fws.gov/docs/recovery_plan/960930a.pdf.

2. **Background information**

- Status: Federally listed as threatened in 1989.
- Resiliency, redundancy, and representation (the 3Rs) (FWS 2021)
  - Resiliency describes the ability of populations to withstand stochastic events, arising from random factors. Due to the wide distribution of the orchid, it is not likely that a range-wide environmental or stochastic event would affect all the extant populations on the landscape. Stochastic events (e.g., extreme drought or agricultural practices) could impact individual populations. Habitat quality has been reduced over time due to land conversion, hydrologic changes, and encroaching dominant vegetation (native plants and non-native, invasive plan species).
  - Redundancy influences the ability of a species to survive catastrophic events and is often assessed in terms of the number of populations of a species and distribution of those populations across the landscape. Historically, the western prairie fringed orchid was found in nine states. Currently, there are 299 extant western prairie fringed orchid populations across 6 states. Twenty-nine new orchid sites have been documented since the last review and nineteen sites are now considered extirpated. Six of the eight ecoregions with extant orchid sites contain more than ten populations except for the Minnesota and Northeast Iowa Morainal-Oak Savannah (222M) and Central Dissected Till Plains (251C) ecoregions. The Minnesota and Northeast Iowa Morainal-Oak Savannah ecoregion contains 6 populations spread across 130 miles (209 km) and the Central Dissected Till Plains ecoregion contains 1 population. The orchid sites in these ecoregions are separated by at least 168 miles (270 km). The populations in these ecoregions are at a higher risk from a catastrophic event (e.g., a multi-year ecoregion-wide drought).
  - Representation influences the ability of a species to adapt to changing environmental conditions over time. Representation refers to the breadth of genetic diversity within a species; however, environmental diversity may be used as a surrogate for genetic diversity. Orchid populations are currently found in eight ecoregions (Fig. 1) that represent a range of ecological settings. Recent genetic research on the orchid suggests that the species may be vulnerable to inbreeding depression in the future (Ross and Travers 2016; Travers et al. 2017). Northern populations sampled by Ross and Travers (2016) exhibited moderate genetic diversity. Overall, the species occupies numerous ecoregions but genetic diversity across ecoregions is unknown.

- Habitat, Life History, and Ecology
  - *Platanthera praeclara* is a perennial orchid of the North American tallgrass prairie and is found most often on unplowed, calcareous prairies and sedge meadows. Its occurrence has also been suggested at disturbed sites in successional communities, such as borrow

pits, old fields, and roadside ditches
    - This species is dependent on mycorrhizal fungi, especially for seed germination and for nutritional support before plants are capable of photosynthesis.
    - Pollination is required for seed production. Western prairie fringed orchid (WPFO) is pollinated by a few species of sphinx moths. Some observations suggest that non-sphingid moths may cause pollination in *P. praeclara*.
    - Fox et al. (2013, p. 321) confirmed that western prairie fringed orchid do not produce seed capsules asexually or via self-fertilization. As such, pollinators are essential for seed capsule production and population growth. Pollinaria are often removed from the flowering orchid when the sphinx moth feeds on the nectar, but they can also be removed when wind is strong enough to brush the orchid against nearby vegetation (Borkowsky and Westwood 2009, p. 116). When pollinaria are brushed against nearby vegetation, fertilization does not occur, and seed capsules are not produced.
    - Annual mortality rates of monitored plants were as low as 1.2% and, in a drought year, as high as 13.5%.
    - Two months of vegetative growth may pass before an inflorescence will fully develop on a flowering plant. Plants bloom from mid-June in the southern portion of the range to late July in the northern portion. Most plants observed over a 7-year period that included both droughty conditions and flooding in this study area were present aboveground less than three years, and once absent, plants rarely reappeared (Sieg and King 1995). Although a small number of orchids on the Sheyenne National Grassland appeared aboveground every year for eight years, a predictable pattern in life states was not apparent.
- Taxonomy
    - *Platanthera*, included in the genus *Habenaria* by some taxonomists, comprises approximately 200 species of temperate and tropical North Africa, North America, Central America, and Eurasia (Airy Shaw 1973, Luer 1975). There are 24 species, 36 taxa, and 5 named hybrids of *Platanthera* in North America, north of Mexico (Luer 1975). Previously, the species was included in a broader taxonomic concept of *P. leucophaea*.

- Relevant Potential Pesticide Use Sites
    - The Nebraska Natural Heritage Inventory identified four major threats to orchid populations (FWS, 2021; Page 11):
        1. Conversion of suitable habitat to cropland.
        2. Other land use or land management changes.
        3. Inappropriate application of herbicides and insecticides.
        4. Non-native, invasive species encroachment (Steinauer 2013; Stansberry, U.S. Fish and Wildlife Service, February 19, 2021, pers. comm.).
    - Seed capsule formation or production in western prairie fringed orchid may be linked to several factors including habitat quality, herbivory, wind speed, and the abundance of sphinx moths in the areas surrounding orchid populations. Habitat fragmentation and herbicide or pesticide use may reduce the amount of suitable habitat for sphinx moth pollinators (Borkowsky and Westwood 2009, p. 111).
    - A decline in sphinx moth pollinators may ultimately lead to a decrease in orchid seed capsule production.
    - In its recovery plan (FWS 1996), the FWS mostly reiterated the threats it described in the final listing rule, but emphasized that conversion of habitat to cropland was the greatest remaining threat to southern populations. It also emphasized that little was known about how to ensure that burning, grazing, and mowing are conducted in a manner not adverse

to western prairie fringed orchid populations and pointed out that actions that directly or indirectly lower water levels in the rooting zone of plants "have the potential of serious adverse impacts." In addition, it implied that potential impacts of pesticides to the western prairie fringed orchid and its pollinators were also a threat.

- Relevant Recovery Criteria and Actions
    - Relevant Recovery Goals
        1. *Platanthera praeclara* will be **considered for delisting when sites that include occupied habitat harboring 90% of plants in each ecoregion are protected** at protection levels 4 through 9 (The Nature Conservancy 1996) and managed in accordance with a Service-approved management plan or guidelines. This plan must assure implementation of management practices that provide the range and spatial distribution of successional and hydrologic regimes required to **maintain the species and its pollinators in self-sustaining, naturally occurring populations**, and must remain in effect following delisting. Implementation of these criteria is further clarified in the strategy of recovery section above and in the recovery narrative below.
            - The recovery criteria may be divided into two distinct components—ensuring that:
                - A minimum proportion of plants within each inhabited ecological region occur on lands that are protected from habitat destruction.
                - Management of these protected habitats is conducive to the conservation of western prairie fringed orchid.
    - Recovery Criteria (FWS 2021)
        1. Sites that include occupied habitat harboring 90 percent of plants in each ecoregion are protected at protection codes 4 through 9 (public ownership or higher level of protection) and managed in accordance with a Service-approved management plan or guidelines.
        2. This plan must assure implementation of management practices that provide the range and spatial distribution of successional and hydrologic regimes required to maintain the species and its pollinators in self-sustaining, naturally occurring populations, and must remain in effect following delisting.
    - Recovery Actions (FWS 1996)
        1. Maintain habitat of known populations as native prairie.
        2. Provide the highest level of state legal protection appropriate for all populations.
        3. Develop and implement habitat management plans that sustain and enhance *P. praeclara* populations.
        4. Conduct appropriate research and monitoring.
        5. Identify and search potential habitat.
        6. Disseminate information about the species to a variety of audiences.
    - Recommendations for Future Actions
        1. Revise the recovery criteria to include clear and measurable standards to determine whether western prairie fringed orchid plants are part of a viable population. The recovery criteria require that plants be under protective ownership or control and appropriately managed to count towards recovery in each ecoregion. There are no standards within the criteria, however, to assess whether these plants are part of populations that are viable. Although not

addressed by the recovery criteria, actions 42 (Determine parameters required to maintain viable self-sustaining populations) and 424 (Conduct a population viability analysis for the species) do address this issue and a preliminary population viability analysis has been completed based on demographic monitoring.

2. Ensure that any revised recovery criteria are objective and measurable and address the following threats, as appropriate: Drainage and other actions that directly or indirectly lower water levels in the rooting zone of plants; Isolation and low reproduction of small populations; Herbicide and pesticide impacts to western prairie fringed orchid and its pollinators; Collection of plants from small populations; Effects of invading exotic species and actions to control those species; Inter-seeding of non-native species into wet prairie in Nebraska, especially creeping foxtail (*Alopecurus arundinaceus* Poir, also called Garrison creeping foxtail).
3. Describe a process by which the Service will evaluate management plans for the purposes of measuring progress towards recovery. This should include a description of the Service's review process (e.g., who will conduct and approve these reviews for the Service) and the basis for evaluating the adequacy of each plan.
4. Compile existing management plans for sites where the western prairie fringed orchid is extant and protected from conversion and determine whether they are adequate to ensure the conservation of the respective western prairie fringed orchid populations.
5. Implement recovery action 33 – Develop or maintain appropriate mowing regimes (FWS, 1996; Page 20). Steinauer (2000:4) briefly summarized the importance of the Nebraska's eastern Sandhills region for the conservation of the western prairie fringed orchid and suggested that significant progress towards the species' conservation could be made by modifying haying practices at some sites.
6. Conduct additional surveys in the Nebraska Sandhills when soil moisture levels may be suitable for significant levels of flowering. Additional surveys in this region may identify additional populations of western prairie fringed orchid (Steinauer 2000:4), but significant surveys have not been conducted since 2000 (recovery action 52 – Identify and search potential new sites (USFWS 1996)).
7. Improve tracking of invasive species threats for each site, in cooperation with the states and others, to determine the relative range-wide harm of each invasive species. Invasive species should be identified as a threat at a site if they are present and if current or anticipated management is unlikely to be sufficient to control invasives to the extent that the invasive(s) will no longer pose a threat to Western Prairie Fringed Orchid (FWS 2009).

3. Range

- Size: 72,219,998 acres

"Minor changes to the spatial distribution of the species have occurred since the previous five year review was published (Fig. 1, FWS 2009). Fox et al. (2015) suggest there may be a northward shift in the range of the western prairie fringed orchid due to the relative success of the Canadian and United States populations in the Red River Valley (251A in Figure 1 below) and Lake Agassiz-Aspen Parklands ecoregions (222N) (p. 1000). Currently, there are 299 extant western prairie fringed orchid populations across Iowa, Kansas, Minnesota, Missouri, Nebraska,

and North Dakota. Orchid populations were documented in three additional counties (two in Nebraska and one in Minnesota); however, the orchid is now presumed extirpated from five counties (two in Iowa, one in Nebraska, and two in Kansas) since the previous 5-year review. Consistent with the recovery plan, we considered a population to be extant if one or more plants were recorded within the last 25 years (i.e., in 1995 or later), unless the population was known to be extirpated" (FWS 2021).

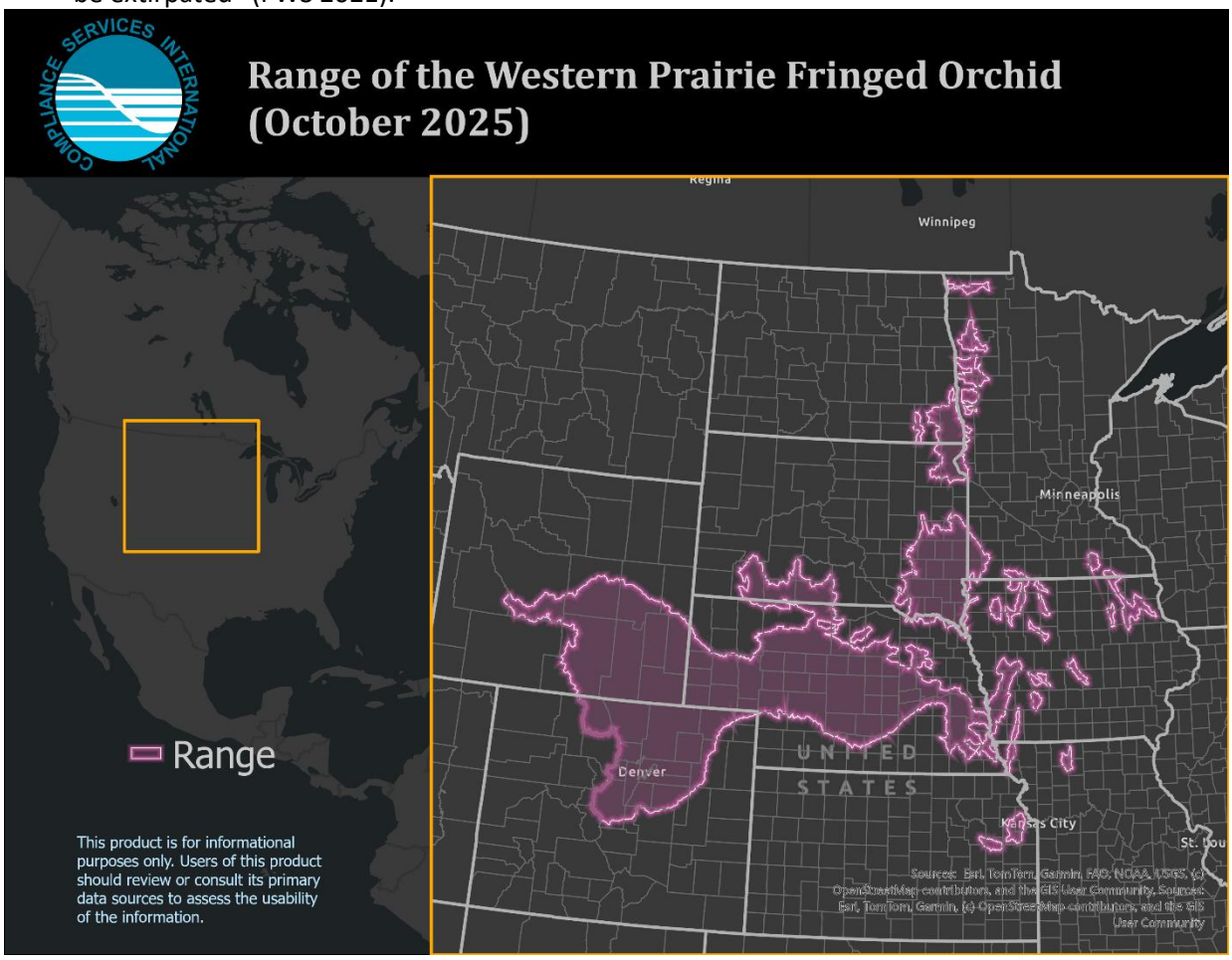

Figure 2. Range of western prairie fringed orchid.

4. Description of Critical Habitat

- Critical habitat has not been designated for this species.

5. Known Locations

- Known populations by state (2021 5-year review).
    - The most recent 5-Year Review document (FWS 2021) describes the counties with known extant populations by state as follows, often referencing the previous 5-Year Review (FWS 2009).
        - Iowa: No new populations of western prairie fringed orchids have been discovered in Iowa since the previous review. In 2015, nearly all the known, extant populations of the western prairie fringed orchid in Iowa were surveyed as part of a new census effort. Two western prairie fringed orchids sites were

not surveyed because requests for permission to survey the sites were met with no response. Only sites with western prairie fringed orchid observations after 1980 were included in the census effort (Watson and Pearson, 2015; p. 24). A census of known, extant orchid populations was conducted in 2020; however, the results are not currently available (Pearson, Iowa Department of Natural Resources, September 11, 2020, pers. comm.). Ten populations are now considered extirpated as they have not been observed since at least 1995 and were included in the 2015 census effort. The Service now considers the species extirpated from Bremer and Cherokee counties).

- Kansas: There have been no new populations of western prairie fringed orchid discovered in Kansas since the previous review. There has not been an effort to census sites since 1989, but individual sites have been surveyed as recently as 2017 (Delisle, Kansas Biological Survey, July 2, 2020, pers. comm.). The Osage County, Kansas population in the Missouri Loess Hills ecoregion was considered extirpated for the purpose of this review, as the last observation was in 1991 and no plants were observed in 2017 when the site was surveyed ahead of planned construction activities.
- Minnesota: Approximately 80% of the western prairie fringed orchid populations in Minnesota are surveyed annually (Anderson 2019, p. 7). The spatial distribution has remained largely the same in Minnesota since the previous review. Five new populations have been documented since the previous review in Pipestone, Polk, and Rock counties. An orchid population was rediscovered in Dodge County, where the orchid had previously been considered extirpated (Anderson, Minnesota Biological Survey, July 1, 2020, pers. comm.).
- Missouri: There are currently three extant populations in Missouri and each site is surveyed annually. The spatial distribution in Missouri has not changed since the previous review and no new populations have been discovered.
- Nebraska: The Nebraska populations outside of *Valentine National Wildlife Refuge* were surveyed as part of a larger survey effort in 2012 and many populations have not been visited since (Steinauer 2013). The orchid populations within *Valentine National Wildlife Refuge* are surveyed annually by refuge staff (Nenneman, Valentine National Wildlife Refuge, December 16, 2020, pers. comm.). Twenty-three new populations have been discovered within the following counties in Nebraska: Boone, Cherry, Douglas, Garfield, Holt, Logan, Pierce, and Rock. Five populations are now considered extirpated, as no orchids have been observed since 1995 or the habitat is no longer suitable for western prairie fringed orchids. Populations were discovered in two counties not previously considered extant, Douglas and Logan (Nebraska Natural Heritage Program, Nebraska Game and Parks Commission, December 4, 2020).
- North Dakota: The North Dakota Natural Heritage Program annually hires a contractor to complete surveys in the *Sheyenne National Grasslands*. Western prairie fringed orchid sites outside of the *Sheyenne National Grasslands* were surveyed regularly during the 1990's but the North Dakota Natural Heritage Program has not completed any inventories or surveys outside of the grasslands for many years (Duttenhefner, North Dakota Natural Heritage Program, December 10, 2020, pers. comm.). The western prairie fringed orchid distribution in North Dakota remains confined to Richland and Ransom counties. Since the previous review, a new population was discovered, and nine

populations are now considered historical by the North Dakota Natural Heritage Program. Three sites are now presumed extirpated, as no orchids have been observed since 1995 or the habitat is no longer suitable for western prairie fringed orchids.

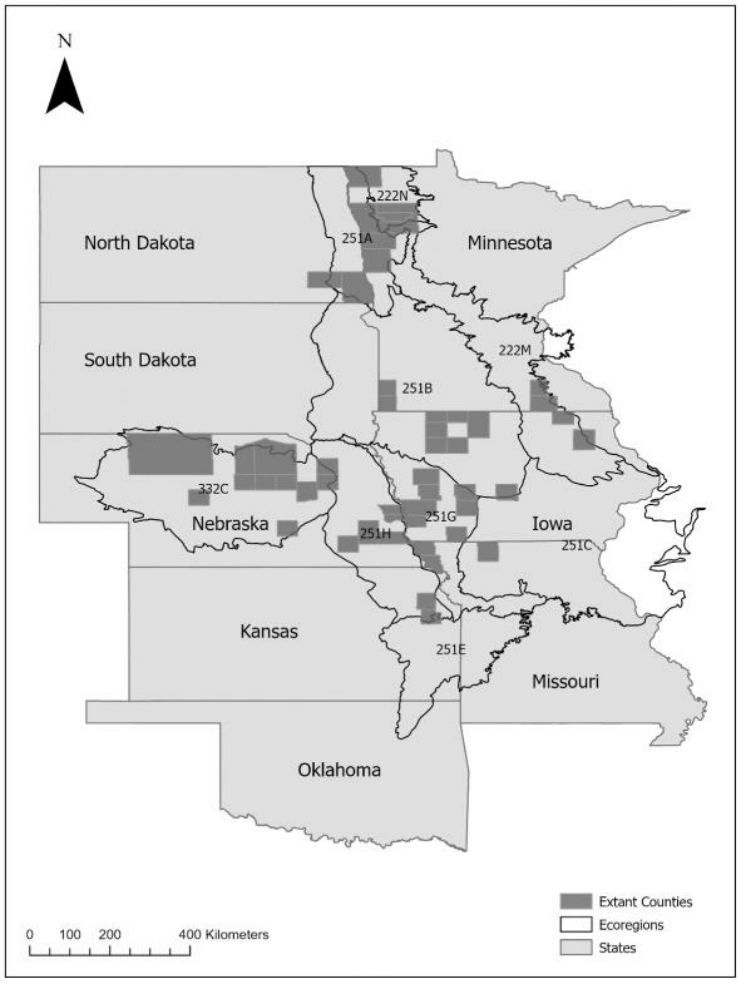

*Figure 3. Ecoregions (McNab et al. 2007) that contain extant populations of western prairie fringed orchid (*Platanthera praeclara*). Populations are presumed extant if a survey has been conducted since 1995 and at least one plant has been observed or if the population is not otherwise known to have been extirpated. Copied from Figure 1 of the most recent 5-Year Review (FWS 2021).*

The counties with extant populations in Figure 3 are considered for this analysis to be up to date (no information from FWS has been published since then). This map is meant to update one from the 2009 5-Year Review, copied below in Figure 4. Core map developers tracked the textual descriptions of changes for each state with the counties represented in both maps, and noticed three discrepancies:

1. Red Lake, MN, is included in the 2021 update without textual justification.
2. Leavenworth, KS, is excluded from the 2021 update without textual justification.
3. Seward, NE, is excluded from the 2021 update without textual justification.

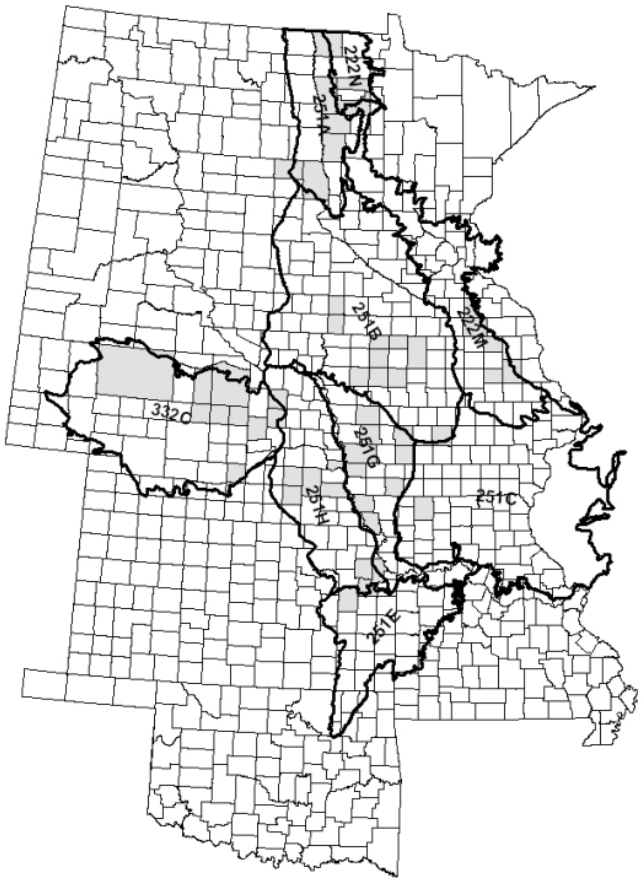

Figure 4. Revised ecological sections (McNab et al. 2007) that contain extant populations of western prairie fringed orchid. Copied from Figure 1 of the 2009 5-Year Review (FWS 2009).

Ultimately, extant county information was judged by CSI to be a valuable refinement in considering core map extent. To be conservative, the three counties with discrepancies were included in the core map development process. If there is updated information to exclude one or more of these counties, these areas should be removed from consideration for this analysis.

Both recovery documents state that the species is not found outside of certain designated ecoregions. The regions delineated in Figure 3 and Figure 4 correspond to these Level 3 (Level III) descriptions:

- Central Dissected Till Plains (Level 3 code 251C)
- Central Irregular Plains (251H)
- Central Loess Plains (251G)
- Lake Agassiz Plain (222M)
- Nebraska Sand Hills (332C)
- Northern Glaciated Plains (222N)
- Osage Plains (251E)
- Red River Valley (251A)

These ecoregion boundaries are no longer considered up to date. A new ecoregion classification system maintains some of these names and boundaries, but not all. To account for ecoregions relevant to the

western prairie fringed orchid, a Level III layer was downloaded and queried for regions relevant to the species extent. The following Level III ecoregions were used as a modest refinement of species extent after the counties-based revision was made:

- Central Great Plains
- Central Irregular Plains
- Driftless Area
- Lake Agassiz Plain
- Nebraska Sand Hills
- North Central Hardwood Forests
- Northern Minnesota Wetlands
- Western Corn Belt Plains

A small amount of area was removed from the core map where part of the extant population counties lies outside of the corresponding ecoregion in Minnesota, Nebraska, and North Dakota.

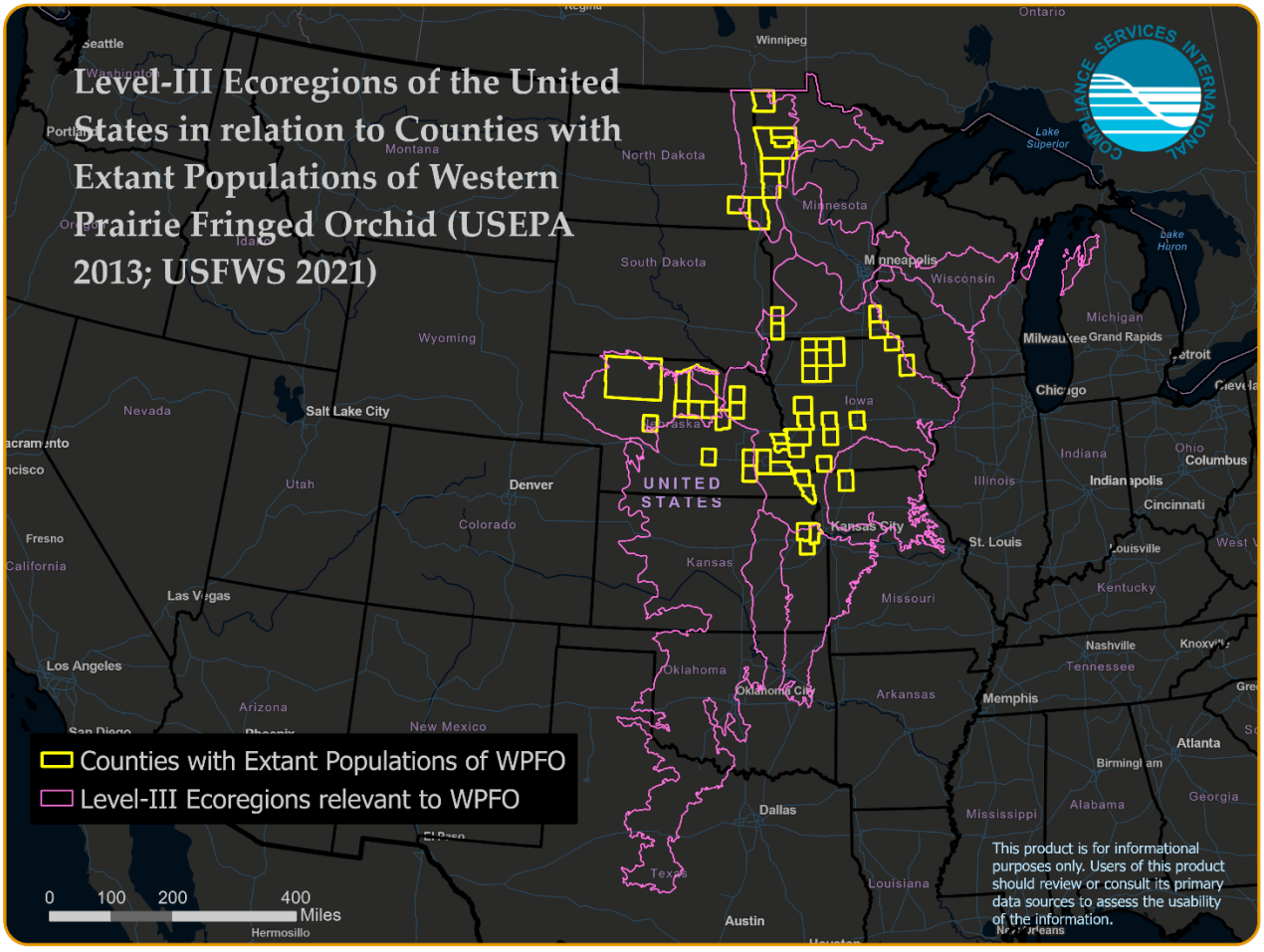

Figure 5. Level III ecoregions of the United States in relation to counties with extant populations of western prairie fringed orchid (EPA 2013; FWS 2021).

- GBIF: https://www.gbif.org/species/2798503
    - GBIF includes 981 occurrence records; 202 of which are georeferenced. Ninety-two 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 92 usable coordinates were mapped against the species range to evaluate their utility in representing species extent. Not every state or region is represented (Figure 7). It was observed that all the usable GBIF coordinates are originally sourced from iNaturalist, which also had more records. Therefore, the GBIF dataset was not used for core map development.

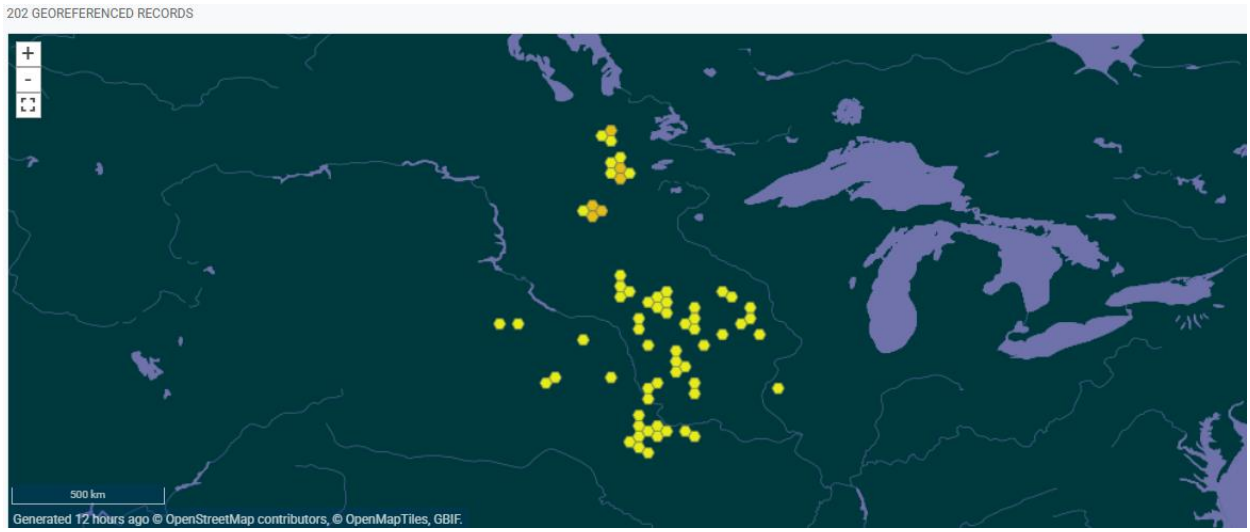

Figure 6. GBIF occurrences for the western prairie fringed orchid.

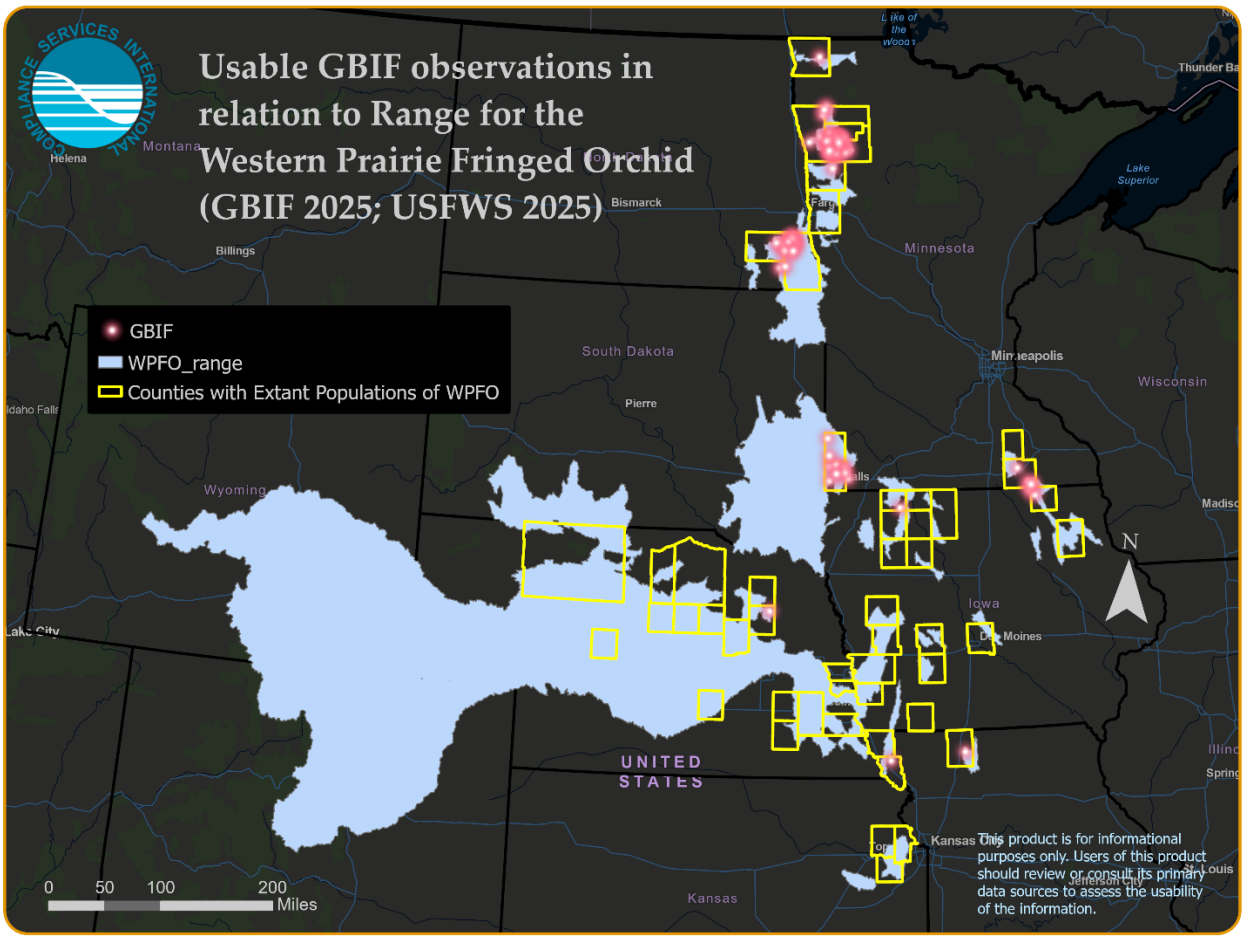

Figure 7. Usable GBIF occurrences (pink) in relation to the range of the western prairie fringed orchid (GBIF 2025; FWS 2025).

- iNaturalist: https://www.inaturalist.org/observations?taxon_id=167027
    - iNaturalist includes 182 total observations (Figure 8), 106 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 one record.
    - Locations are consistent with GBIF, which is expected because all the GBIF observations are imported from iNaturalist. There is one area in Iowa that is not represented by the GBIF dataset (Figure 9).
    - Twenty of the iNaturalist locations are just outside of the range of the western prairie fringed orchid; this is likely due to the uncertainty associated with their locations, between 26-28 km for each point.
    - Fifteen iNaturalist records are outside of the counties known to FWS to have extant populations.
    - The iNaturalist data are neither comprehensive (exclusive of FWS extant population counties) nor precise enough (often falling outside of those counties) to be used in core map development. However, these data may provide insight into where the species is

more commonly found.

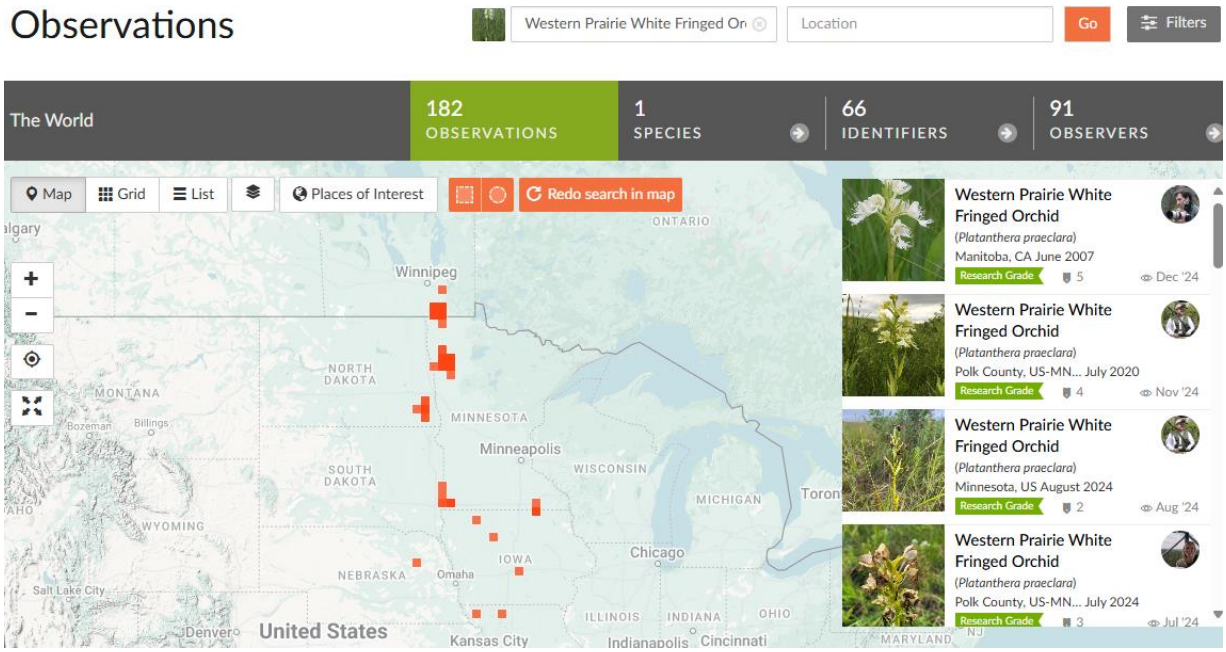

Figure 8. iNaturalist occurrences for the western prairie fringed orchid.

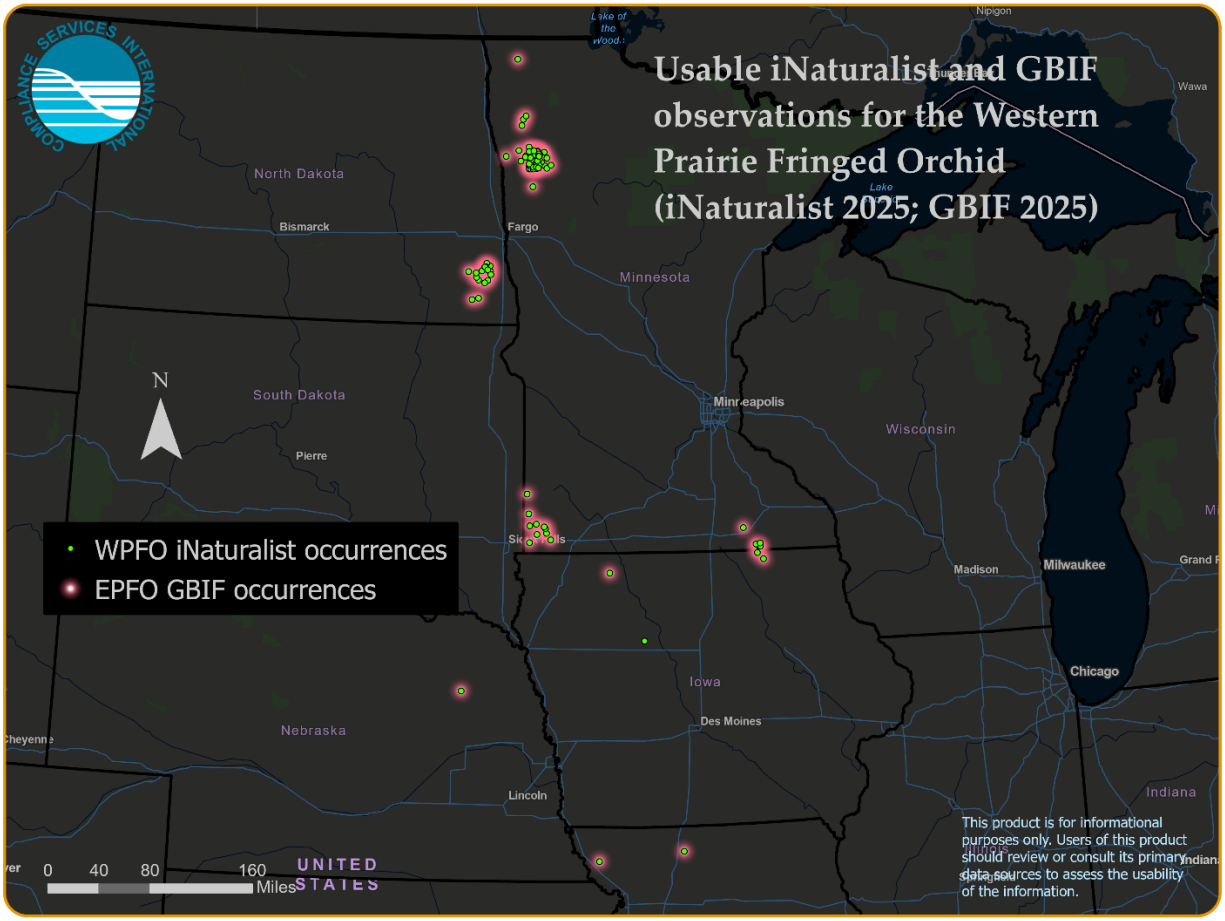

Figure 9. Usable iNaturalist and GBIF observations for the western prairie fringed orchid (iNaturalist 2025; GBIF 2025).

- NatureServe Explorer: https://explorer.natureserve.org/
    - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and GBIF and additionally includes more area in the western portion of the range (Figure 10).
    - EOs were used to support the decision to use a combination of range, ecoregion, and counties with extant populations to develop the core map. These observations confirm that the locations by iNaturalist are not comprehensive enough to form the sole basis of the core map.

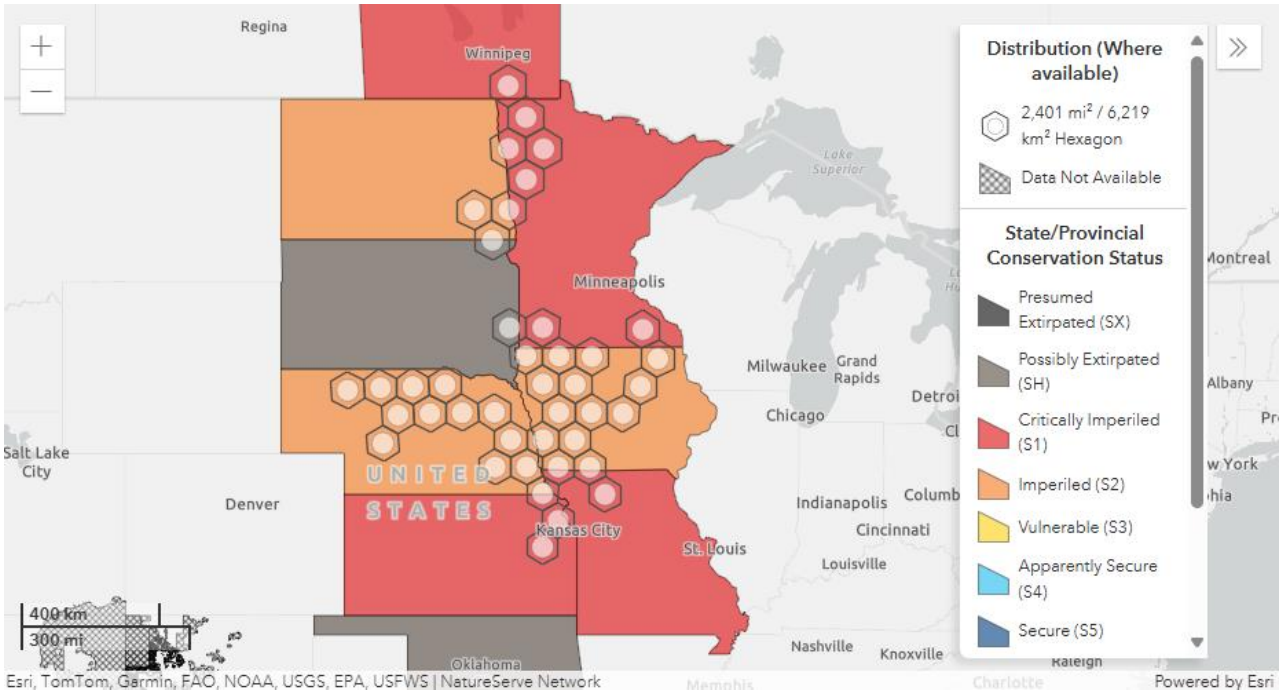

Figure 10. NatureServe Explorer occurrences for the western prairie fringed orchid (NatureServe 2025).

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 counties with known extant populations and refinements based on ecoregions and buffered iNaturalist observations. The core map identifies all areas within the extent (described below) matching the species habitat description from **Appendix 1**. 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 western prairie fringed orchid.

1. References and Software

- Level III and IV Ecoregions: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states.
- Software used: ArcGIS Pro version 3.2.
- FWS 5-Year Review (2021): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/964.pdf.
- FWS Species Range: https://ecos.fws.gov/ecp/species/1669.

2. Datasets Used in Core Map Development

2.1. Range

The range for this species was last updated by FWS on August 15, 2024. 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 #102008 ("North America Albers Equal Area Conic").

1. Using an ArcGIS Web Map the species was queried based on the ECOS listed "Entity ID" of 1080 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 counties with known location information and ecoregions described in the FWS 5-year review (FWS 2021). The range was used to establish the outer boundary ("extent") of the core map.

2.2. FWS 5-Year Review (2021)

The most recent 5-Year Review includes the most up-to-date list of counties known to include extant populations of the western prairie fringed orchid that have been documented by FWS. These sites are catalogued in the document's Figure 1, which additionally includes information about ecoregions that are relevant to the western prairie fringed orchid. A layer of these counties was provided to CSI by EPA and used to develop the core map extent as described in Section 3.

The ecoregions in that figure (Figure 3) provided an additional level of refinement. CSI received ecoregion boundaries relevant to the western prairie fringed orchid from EPA, corresponding to the following regions:

- Central Dissected Till Plains (Level 3 code 251C)
- Lake Agassiz-Aspen Parklands (222N)

- Minnesota and Northeast Iowa Morainal-Oak Savannah (222M)
- Nebraska Rolling Hills (251H)
- Nebraska Sand Hills (332C)
- North Central Glaciated Plains (251B)
- Osage Plains (251E)
- Red River Valley (251A)

Limiting the extent to just these ecoregions removed a small amount of area (5.1%) from the combined area of counties with extant populations.

2.3. Ecoregions

Textual descriptions of physiographic regions inhabited by the species are given in the 5-Year Review (FWS 2021). Spatial data for these regions were provided to CSI by EPA on May 22, 2025. Ecoregion names relevant to the western prairie fringed orchid are listed above in Section 2.2. See Figure 11 for a map of all the Level III ecoregions of the United States.

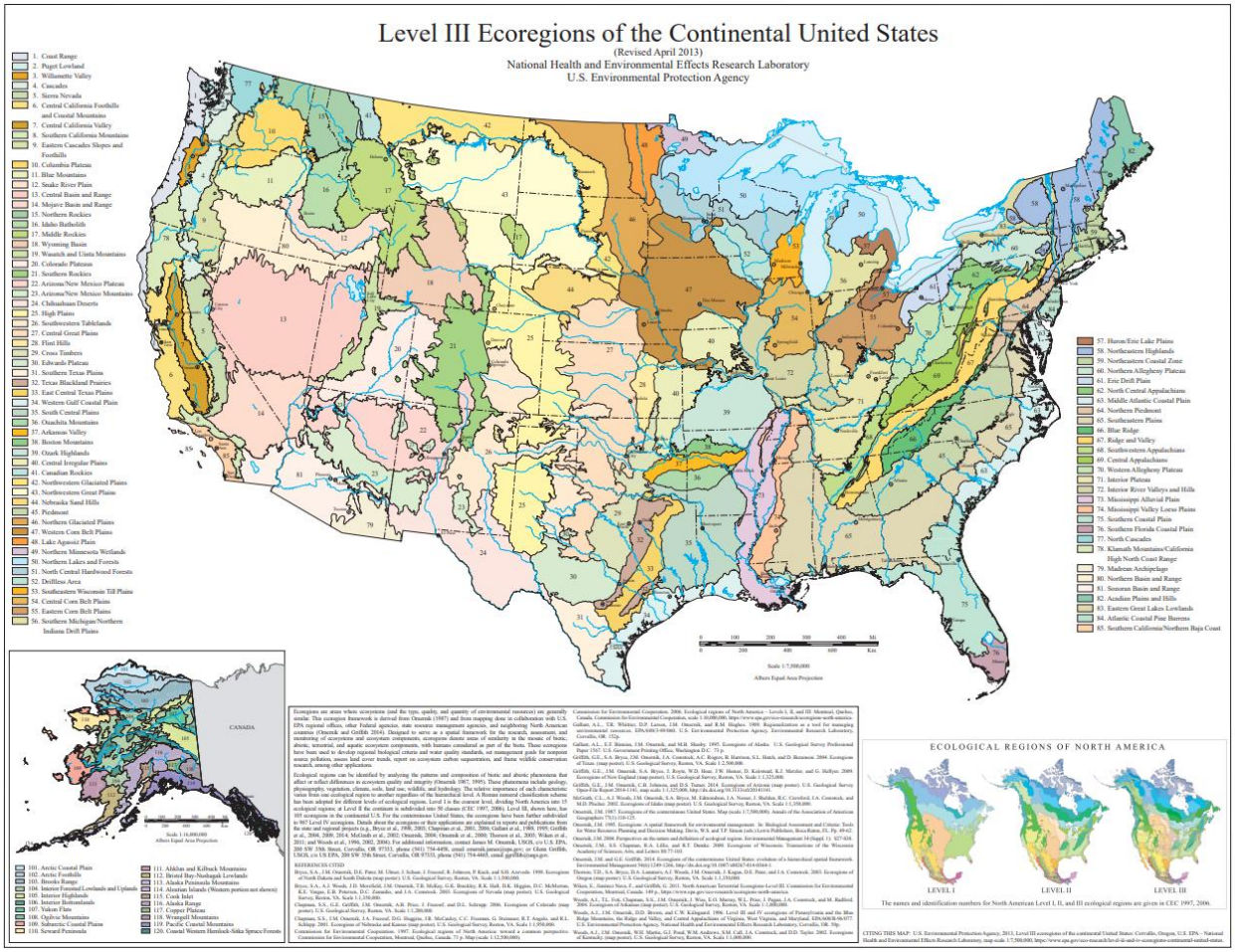

Figure 11. Ecoregions of the United States (EPA 2023).

2.4. LANDFIRE

Once the species extent was established using the most recent 5-Year Review document, the LANDFIRE

database was used to identify areas within the extent corresponding to the habitat of the western prairie fringed orchid. The EVT layer was clipped to extent and professional judgment was used to identify land cover types associated with the species' habitat.

LANDFIRE classes within the species spatial extent were reviewed to identify suitable habitat layers according to FWS's habitat descriptions (Table 2). After consultation with FWS, classes with wetland habitat types were removed from consideration.

EVT_NAME
Central Mixedgrass Prairie Grassland
Northwestern Great Plains Mixedgrass Prairie
Western Great Plains Sand Prairie
Western Great Plains Tallgrass Prairie
Central Mixedgrass Prairie Shrubland
Eastern Great Plains Tallgrass Aspen Shrubland
Eastern Great Plains Tallgrass Aspen Forest and Woodland
North-Central Interior Sand and Gravel Tallgrass Prairie
Northern Tallgrass Prairie
Central Tallgrass Prairie
Southeastern Great Plains Tallgrass Prairie
Great Plains Prairie Pothole
Agriculture-Cultivated Crops and Irrigated Agriculture
Western Cool Temperate Fallow/Idle Cropland
Western Cool Temperate Pasture and Hayland
Eastern Cool Temperate Fallow/Idle Cropland
Eastern Cool Temperate Pasture and Hayland
Western Great Plains Floodplain Herbaceous
Northern & Central Plains Ruderal & Planted Grassland
Northern & Central Ruderal Meadow

Table 2. LANDFIRE EVT classes associated with the habitat of the western prairie fringed orchid within its extent (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.

2.5. EPA Cultivated Lands > 25 Acres

In EPA's 2024 Final Biological Evaluation for Glufosinate-P Appendix M (EPA-HQ-OPP-2020-0250-0039), EPA indicated that the western prairie fringed orchid is "No" for "On Ag Fields", and "Species habitat description suggests it is not likely to establish at uses sites" (USEPA 2024b). Similarly, the Draft Bicyclopyrone Biological Evaluation Appendix G states that "Most populations are unlikely to establish on agricultural use sites due to habitat preference for moist/wet calcium-rich tallgrass prairies and sedge meadows that flood 1-2 wks/yr."

Based on this consistent documentation of not on agricultural fields for this species, EPA's cultivated layer was used to refine the core map.

3. Creating the Core Map

3.1. Defining Extent

The core map for the western prairie fringed orchid was developed using counties and ecoregions known to include extant populations of the species. The extent used for core map development was created as follows:

1. Load a layer of US county boundaries into a GIS. Carefully inspect Figure 1 of the most recent 5-Year Review (FWS 2021) to select corresponding counties. Export selected counties as a new layer, "USFWS_5YR_2021_counties". Ensure that this and subsequent layers are outputted to the preferred projection, WKID #102008.
2. Load a layer of Level 3 ecoregions. Save output to a new layer ("Ecological_Sections").
3. Use the Pairwise Dissolve tool to dissolve the selected features from the previous layer ("Ecological_Sections") into a feature class with a single shape, saved as "Ecological_Sections_pd".
4. Use the Pairwise Clip tool to clip the counties with known extant populations ("USFWS_5YR_2021_counties") by the dissolved ecoregions layer ("Ecological_Sections_pd") and save as a new layer, "WPFO_counties_pcEcological_Sections_pd".
5. Use the Pairwise Clip tool to clip the previous layer ("WPFO_counties_pcEcological_Sections_pd") by the species range ("WPFO_range") and save as a new layer, "WPFO_counties_pcEcological_Sections_pd_pcRange".
6. Use the Pairwise Dissolve tool to dissolve features from the previous layer ("WPFO_counties_pcEcological_Sections_pd_pcRange") into a feature class with a single shape, saved as "WPFO_counties_pcEcological_Sections_pd_pcRange_pd".
7. Use the Pairwise Buffer tool to buffer the previous layer ("WPFO_counties_pcEcological_Sections_pd_pcRange_pd") by the buffered iNaturalist layer (iNat_pbPPA") and save as a new layer, "WPFO_counties_pcEcological_Sections_pd_pcRange_pcINat".
8. (Optional) Export the previous layer ("WPFO_counties_pcEcological_Sections_pd_pcRange_pcINat to a new feature class with a name that is easily recognizable as the core map extent ("WPFO_extent").

3.2. Refinement based on Biological Information

The total extent of the western prairie fringed orchid core map—which comprises counties with extant populations clipped to select ecoregions and species range—includes a significant area and number of different land cover types that do not align with descriptions of western prairie fringed orchid habitat. To improve confidence in the core map, a refinement based on biological information was applied to the core map 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 ("LF2024_EVT_240_CONUS") layer into a GIS.
2. Use the Clip Raster tool to clip the "LF2024_EVT_240_CONUS" layer by the species extent ("WPFO_extent"). Examine the "EVT_NAME" field to identify land cover types associated with habitat descriptions of the western prairie fringed orchid. Positive identifications are given in Table 2. Save as a new Layer "LF_crExtent". Choose to output this layer in the preferred projection, WKID #102008.
3. Use the Reclassify tool to reclassify the previous layer ("LF_crExtent") to identify areas of Western 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".
4. Use the Raster to Polygon tool to convert the previous layer ("LF_crExtent_rec") into a polygonal spatial layer, saved as "LF_crExtent_rec_r2p".

5. Use the Pairwise Dissolve tool to dissolve the previous layer ("LF_crExtent_rec_r2p") into a feature class with a single shape, saved as "LF_crExtent_rec_r2p_pd".

3.3. Cultivated Lands-based Refinement

The western prairie fringed orchid is not expected to be found in agricultural areas, so a refinement to exclude areas of agriculture was applied. This decision is consistent with EPA's treatment of the species in a recent Biological Evaluations (BEs) (EPA 2024b).

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 according to a layer developed by USEPA ("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 the western prairie fringed orchid core map, "Western_prairie_fringed_orchid_CoreMap".

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