# Interim Core Map Documentation for Price's Potato-Bean

**Version 1**
**Review Completed**: April 2026
**Core Map Developer:** Compliance Services International (CSI) on behalf of the United Soybean Board; Reviewed by Center for Biological Diversity

## Species Summary

The Price's potato-bean (*Apios priceana*; Entity ID 628) is a dicotyledonous threatened plant in Alabama, Kentucky, Mississippi, and Tennessee. The Price's potato-bean (*Apios priceana*; Entity ID 628) is a dicotyledonous threatened plant in Alabama, Kentucky, Mississippi, and Tennessee. The U.S. Fish and Wildlife Service (FWS) has not assigned designated critical habitat for the Price's potato-bean. This species inhabits open wooded areas and is often found in low areas near a stream or along the banks of streams and rivers. Additional habitat information is provided in **Appendix 1**.

## Review Notes

The developers created this core map using the 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 core map and documentation and evaluated if: (1) the map and documentation are consistent with EPA's process; (2) areas included or excluded from the 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 Geographic Information System (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 given the available data and was consistent with EPA's mapping process. This documentation was not prepared by EPA, and EPA may have edited this documentation for clarity or other purposes. Some views included 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 has not yet been reviewed by FWS species expert(s). EPA intends to use this core map to develop pesticide use limitation areas (PULAs). This core map incorporates information developed by FWS and made available to the public. This core map may be revised in the future after FWS species expert(s) review the map or as additional relevant information becomes available.

## Description of Core Map

The core map for the Price's potato-bean is based on biological information, which was used to refine an extent determined by known observations and counties with extant populations (when sub-county data could not be used). The most recent 5-Year Review (FWS 2022) includes a table of locations where extant locations occurring on protected lands have been

documented, counties in which the species is presumed extant, and textual descriptions of habitats where the species is known to occur. Known location information from the iNaturalist and Global Biodiversity Information Facility (GBIF) databases, and NatureServe supported the use of these sites as the outer boundary of core map extent but were not otherwise used in core map development.

Habitat areas were represented using the LANDFIRE Existing Vegetation Type (EVT) layer, with selected land cover types matching descriptions of species habitat (LANDFIRE 2023).

The core map developed in this document for the Price's potato-bean spans 1,646,125 acres (Figure 1). A summary of acreage by National Landcover Database (NLCD 2021) land use type is provided in **Error! Reference source not found.**.

Based on the U.S. Environmental Protection Agency's (EPA) "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 (i.e. habitat preferences) to a Geographical Information System (GIS) dataset, in this case the LANDFIRE dataset (LANDFIRE 2023). These assumptions involved associating the species' primary habitat—wooded areas often in proximity to the banks of streams or rivers—with corresponding LANDFIRE classifications listed in **Appendix 2** Section 2.6. More information about the best professional judgment classification system and its definitions can be found in the core map process document (EPA 2024).

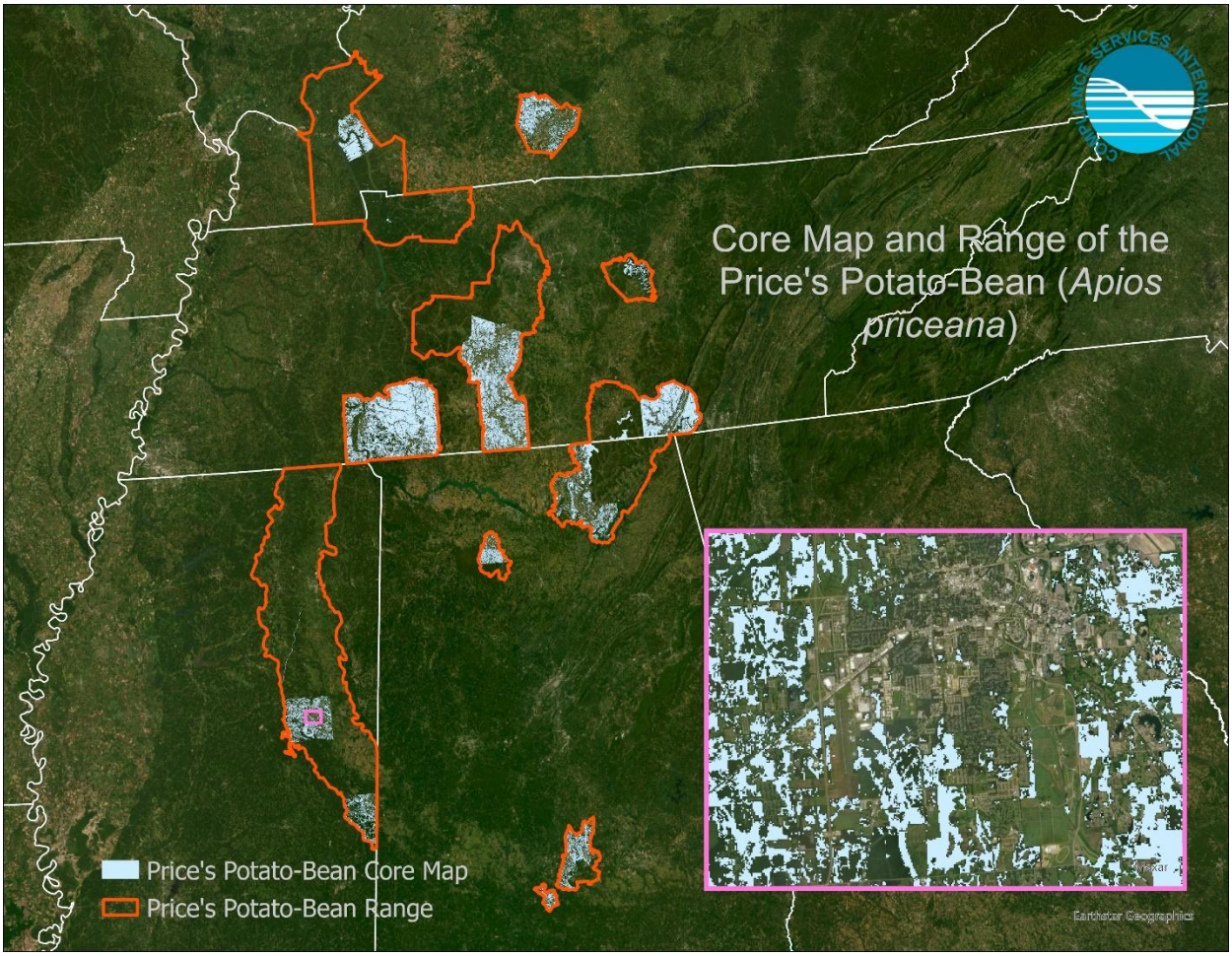


**Figure 1. Interim core map for the Price's potato-bean (Apios priceana; Entity ID 628). The core map spans 1,646,125, while the range is 10,431,707 acres.**

**Table 1. Acres by National Land cover Database (NLCD 2021) class within the core map of the Price's potato-bean. Total core map area (based on NLCD pixel count): 1,646,323 acres[1].**

| NLCD_Land_Cover_Class | Acres | % |
|---|---|---|
| Deciduous Forest | 1,160,448 | 70.5 |
| Mixed Forest | 169,815 | 10.3 |
| Evergreen Forest | 129,336 | 7.9 |
| Woody Wetlands | 95,057 | 5.8 |
| Shrub/Scrub | 26,010 | 1.6 |
| Hay/Pasture | 23,831 | 1.4 |
| Herbaceous | 18,515 | 1.1 |
| Developed, Open Space | 8,969 | 0.5 |
| Emergent Herbaceous Wetlands | 6,486 | 0.4 |
| Cultivated Crops | 3,174 | 0.2 |

[1] This acreage is slightly different from the core map acreage (1,646,125) due to the pixelation of NLCD land cover. The core map is not developed exclusively from raster data.

| NLCD_Land_Cover_Class | Acres | % |
|---|---|---|
| Open Water | 2,497 | 0.2 |
| Developed, Low Intensity | 1,286 | 0.1 |
| Barren Land | 559 | 0 |
| Developed, Medium Intensity | 313 | 0 |
| Developed, High Intensity | 27 | 0 |

## Evaluation of Known Location Information

There were four evaluated datasets with known location information:

- Descriptions of locations included in FWS documents
- Occurrence locations in iNaturalist
- Occurrence locations in the GBIF
- Occurrence locations in NatureServe

Compliance Services International evaluated these four datasets before developing the draft core map. Overall, there were sixty-nine usable research-grade observations found in iNaturalist.[2] The GBIF dataset comprised fifty-two georeferenced observations, thirty-seven of which were considered usable based on the criteria described below. Both datasets were useful to identify extant population sites for the Price's potato-bean, but not precise enough to be used to define the core map extent for this species. These datasets were largely redundant because the iNaturalist observations comprised all the GBIF observations.

FWS location information comprised a mix of identifiable sites on protected lands and waters and county information where the species is known to occur; this provided a refinement of the core map.

NatureServe public element occurrence (EO) data were also evaluated and used for comparative purposes and did not support further expanding the core map outside of the boundaries of the range.

## 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: critical habitat,

[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-).

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
4. Document the core map

For step 1, CSI compiled available information for the Price's potato-bean (*Apios priceana*) from FWS, as well as observation information available from various publicly available sources including iNaturalist, GBIF, and NatureServe. The information compiled for the Price's potato-bean (*Apios priceana*) 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:

- '*Apios priceana* thrives in open, wooded areas, often in forest gaps or along forest edges… The species seems to prefer mesic areas and is often found in open, low areas near a stream or along the banks of streams and rivers. The species is sometimes found near the base of small limestone bluffs (Medley 1980, Kral 1983). Most populations are located in cleared areas associated with powerline or roadside rights-of-way… *Apios priceana* often grows in well drained loams or old alluvium over limestone on rocky, sloping terrains' (FWS 1993).

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 (extant populations identifiable in PAD-US, NHD, or at the county level) were usable as a refinement in determining the core map extent. Other known location data from GBIF, iNaturalist, and NatureServe were used for comparison purposes, but were not used directly to develop the core map.

Review of the available data also suggested that the core map could exclude landcover types inconsistent with the Price's potato-bean habitat. To represent the species' habitat, the LANDFIRE 2023 dataset was used to identify habitat classes associated with the species habitat description above, using the "EVT_NAME" field. The resulting shapes were dissolved together, converted to a vector polygon feature class, dissolved into a single shape, and then had contiguous cultivated areas > 25 acres (EPA 2024) 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 within an extent defined by known location data, including counties. Designated critical habitat was eliminated as a core map type because the Price's potato-bean does not have critical habitat. The range core map type was not selected because the species range is large and includes areas that are unlikely to include the species. **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

# Appendix 1. Information compiled for Price's Potato-Bean

1. **Recent FWS documents**
   - 5-Year Review (2016): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2363.pdf
   - 5-Year Review (2022): https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3971.pdf
   - Recovery Plan (1993): https://ecos.fws.gov/docs/recovery_plan/930210.pdf
2. **Background information**
   - Status: Federally listed as threatened in 1990.
   - Resiliency, redundancy, and representation (the 3Rs) were not evaluated for this species.
   - Habitat, Life History, and Ecology
     - '*Apios priceana* thrives in open, wooded areas, often in forest gaps or along forest edges (Medley 1980). The species seems to prefer mesic areas and is often found in open, low areas near a stream or along the banks of streams and rivers. The species is sometimes found near the base of small limestone bluffs (Medley 1980, Kral 1983). Most populations are located in cleared areas associated with powerline or roadside rights-of-way. *Apios priceana* often grows in well drained loams or old alluvium over limestone on rocky, sloping terrains (Kral 1983). The species can survive a broad range of pH from less than five (Duke 1983) to greater than eight (Walter et al. 1986)' (FWS 1993).
     - '*Apios priceana* flowers from late mid-July through mid-August and produces fruit in August and September. The flowers are pollinated by the long tailed skipper (*Urbanus proteus* Linnaeus) and by honey bees (*Apis mellifera* Linn.) and bumble bees (Subfamily Apinae, Tribe Bombini), although bees are reported to have some difficulty accessing the nectar (Robinson 1898). Flowers in the genus *Apios* have a tripping mechanism that causes the keel to coil when triggered by an insect. When the keel coils, it exposes the anthers and pistil, allowing pollination to occur (Bruneau and Anderson 1988)' (FWS 1993).
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   - Taxonomy
     - 'Woods (2005) revised the taxonomy of the North American species of *Apios* (Fabaceae). In doing so, he maintained recognition of Price's potato-bean as *Apios priceana* Robinson, as originally published. A phylogenetic analysis indicated that the genus Apios originated in Southeast Asia, and that the North American species (*A*. *americana* and *A*. *priceana*) are more

closely related to one another than to any of the Asian species (Li et al. 2014). The parent species of these two taxa likely migrated to North America via the Bering land bridge and have diverged into separate species as a response to ecological or biological pressures or physical barriers (Li et al. 2014)' (FWS 2016).

- Relevant Potential Pesticide Use Sites
  - 'We have identified herbicide overspray from agricultural fields as another emerging threat. Overspray has been observed near a protected population in Tennessee, but is most notable in Mississippi, where three of four known Price's potato-bean populations occur on property adjacent to cropland (MNHP 2022). Most recently, the Chickasaw Preserve (part of the larger Coonewah population and one of Mississippi's two protected populations) sustained substantial herbicide damage due to its proximity to neighboring soybean fields (J. Franklin pers. comm. 2022). While seed set is expected to be reduced or eliminated for the year because of exposure, uncertainty remains regarding the extent, severity, and precise impacts of how Price's potato-bean individuals will be affected by herbicide activity for agricultural purposes; therefore, more directed assessments are required (J. Franklin pers. comm. 2022)' (FWS 2022).
- Relevant Recovery Criteria and Actions
  - Criteria for delisting (FWS 2022)
    - 'Price's potato-bean will be considered for delisting when there are at least 25 geographically distinct, self-sustaining, protected populations and they have been maintained for 10 years. A population will be considered self-sustaining if the population size is stable and there is evidence of successful reproduction. Protected populations will have appropriate legal protection and appropriate management" (Service 1993)' (FWS, 2022).
  - Recovery Actions (FWS 2022)
    - Continue efforts to work with local governments and highway officials to reduce threats associated with roadside maintenance, including installing signage, training staff and contractors on appropriate management techniques and avoidance measures, and establishing cooperative agreements, when possible.
    - Continue management at Land Between the Lakes National Recreation Area and Sauta Cave National Wildlife Refuge to reduce canopy cover and invasive species encroachment and promote flowering, seed production, and population growth. Encourage similar management efforts at other protected sites.
    - Work cooperatively with the National Park Service and U.S. Forest Service to develop conservation strategies for populations at Fort Donelson National Battlefield in Tennessee, Natchez Trace National Parkway in Mississippi, and Bankhead National Forest in Alabama.
    - Collaborate with State and Federal agencies to initiate and perform feral hog eradication and control efforts across the range of the Price's potato-bean.

- Work with landowners of protected sites to develop conservation agreements that establish biological goals for the Price's potato-bean, identify management strategies to achieve those goals, and include a monitoring plan for measuring effectiveness of conservation efforts as related to the species' status.
- Work cooperatively with the Chickasaw Nation to develop strategies for expanding populations at Chickasaw Preserve in Mississippi, while also increasing protections for the existing population.
- Ensure that *ex situ* accession information and propagation protocols are maintained and curated in the Center for Plant Conservation National Collection of Endangered Plants centralized database.

**3. Range**

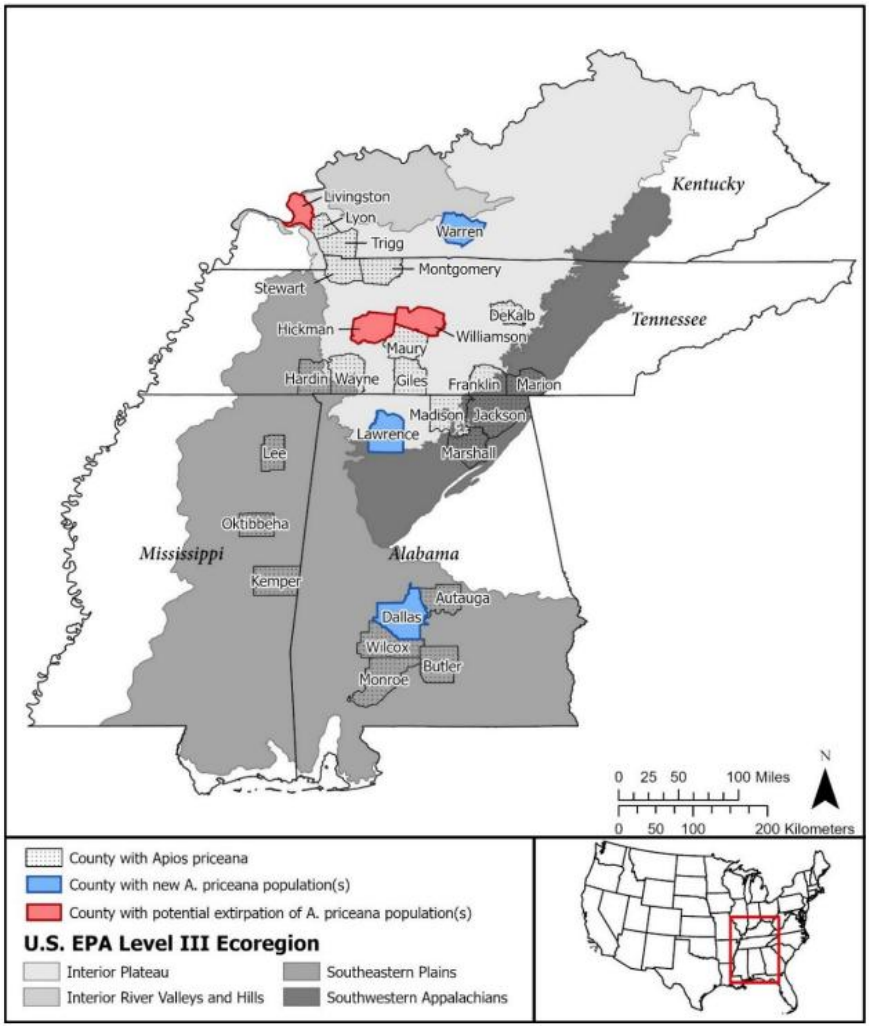


**Figure 2. The Price's potato-bean range by county occurrence. Copied from Figure 1 of the most recent 5-Year Review (FWS 2022).**

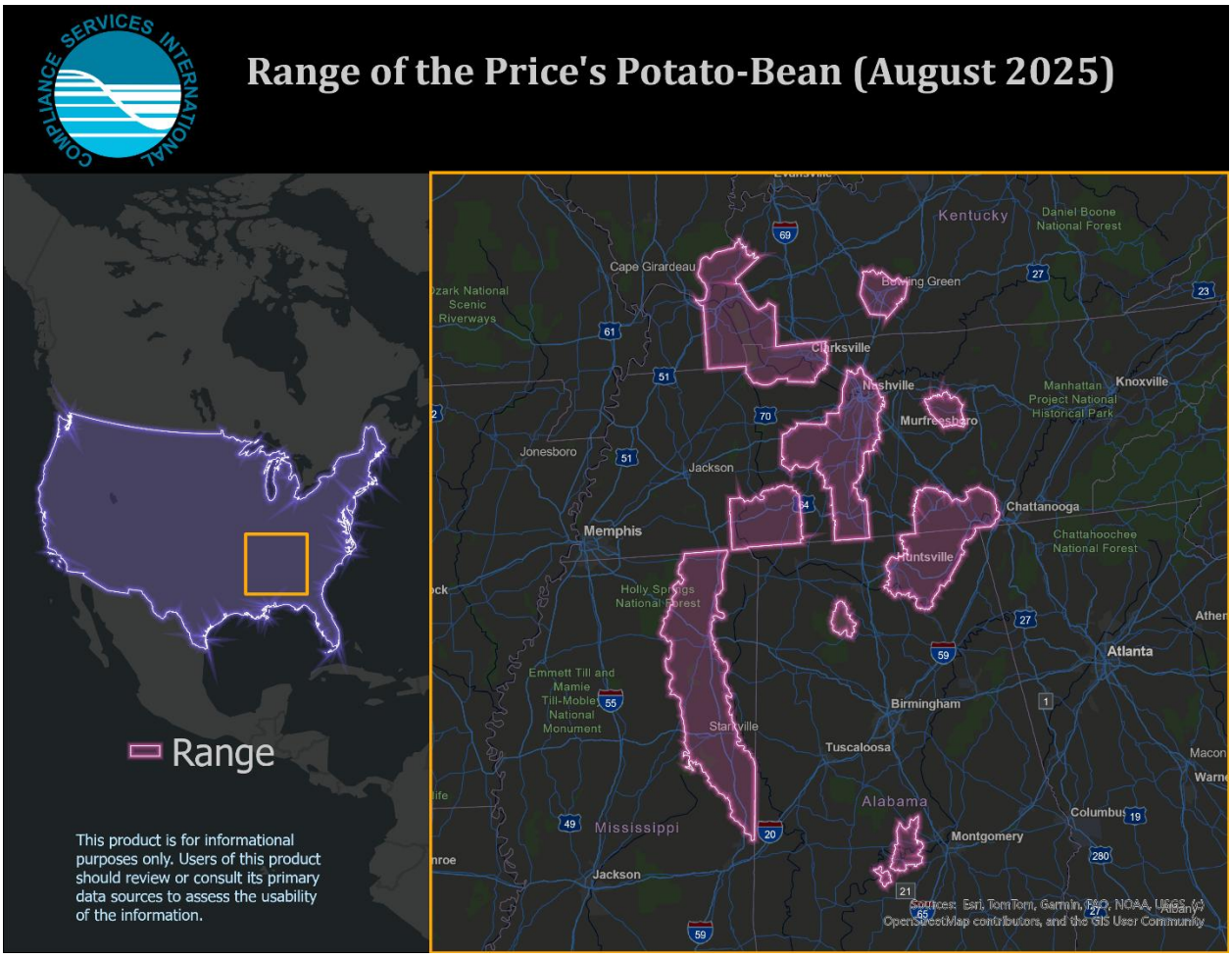


**Figure 3. Range of the Price's potato-bean (FWS 2025).**

4. **Description of Critical Habitat**
   - Critical habitat has not been designated for this species.

5. **Known Locations** (from FWS 2022)
   - 'There are now 57 extant populations of Price's potato-bean distributed among 27 counties in 4 states (Table 1; Figure 1; ANHP 2022; KSNPC 2022; MNHP 2022; TDEC 2022). These populations are distributed across multiple U.S. Environmental Protection Agency (EPA) Level III ecoregions, which represent different ecological zones that share a characteristic set of natural communities, floral and faunal species, ecological dynamics, and environmental conditions (Figure 1 in FWS 2022; Omernik 1987). We are presuming that the 15 populations that were not surveyed since the last 5-year review remain extant (FWS 2016; ANHP 2022; KSNPC 2022; MNHP 2022; TDEC 2022). The general spatial extent of the species remains similar to what was reported in the last 5-year review. There is one new county included in the species distribution (e.g., adding Warren County, Kentucky), and the species remains extirpated from Illinois. A number of the populations are small and isolated from other known extant populations, limiting connectivity and potential gene flow. Because Price's potato-bean is known to periodically assume dormancy during the growing season until conditions are more suitable, numbers in this document should be considered best available estimates (FWS 1993; Schotz 2018).
   - Of the 59 total populations reported in the 2016 5-year review, 7 are presumed extirpated. However, an additional five populations have been identified since the last 5-year review (Service 2016). Four of the new populations were found in Alabama ranging in size from 12-24 plants and an additional new, very small population, i.e., 2 plants, was discovered in Kentucky. Of the extant populations, 13 in Alabama, 5 in Kentucky, 2 in Mississippi, and 6 in Tennessee are located on publicly owned lands or private conservation lands that are currently considered protected (Table 2).' (FWS 2022)

**Table 2. Number of extant Price's potato-bean populations by county in 1993, 2016, and 2022 status reviews. Parentheses indicate number of populations included in the total that are uncertain and are only presumed extant (FWS 2022).**

| State | County | 1993 Recovery Plan | 2016 5-year Review | 2022 5-year Review |
|---|---|---|---|---|
| Alabama | Autauga | 2 | 2 | 2 (1) |
| Alabama | Butler | - | 1 | 1 (1) |
| Alabama | Dallas | - | 2 | 3 (1) |
| Alabama | Jackson | - | 2 | 2 |
| Alabama | Lawrence | - | 1 | 4 (1) |
| Alabama | Madison | 1 | 5 | 5 (4) |
| Alabama | Marshall | 1 | 1 | 1 (1) |
| Alabama | Monroe | - | 1 | 1 (1) |
| Alabama | Wilcox | - | 1 | 1 (1) |
| Kentucky | Livingston | 1 | 2 | 1 |

| State | County | 1993 Recovery Plan | 2016 5-year Review | 2022 5-year Review |
|---|---|---|---|---|
| Kentucky | Lyon | 1 | 3 | 3 |
| Kentucky | Trigg | 2 | 2 | 2 |
| Kentucky | Warren | - | - | 1 |
| Mississippi | Clay | 1 | - | - |
| Mississippi | Kemper | - | 1 | 1 (1) |
| Mississippi | Lee | 1 | 2 | 2 |
| Mississippi | Oktibbeha | 2 | 1 | 1 (1) |
| Tennessee | Dekalb | 1 | 1 | 1 |
| Tennessee | Franklin | - | 2 | 2 (1) |
| Tennessee | Giles | - | 2 | 2 |
| Tennessee | Hardin | - | 3 | 3 |
| Tennessee | Hickman | 6 | 10 | 6 |
| Tennessee | Marion | 1 | 1 | 1 |
| Tennessee | Maury | 1 | 2 | 2 (1) |
| Tennessee | Montgomery | 1 | 1 | 1 |
| Tennessee | Stewart | - | 2 | 2 |
| Tennessee | Wayne | - | 4 | 4 |
| Tennessee | Williamson | 3 | 4 | 2 |
| **Total** | | **25** | **59** | **57 (15)** |

Sources: ANHP 2022; KSNPC 2022; MNHP 2022; TDEC 2022.

- iNaturalist: https://www.inaturalist.org/observations?nelat=39.412177942462954&nelng=-69.53359412960708&subview=map&swlat=29.469924830331895&swlng=-99.68007850460708&taxon_id=158451
    - iNaturalist includes sixty-nine total observations, forty-four of which are research-grade with usable coordinate data based on these criteria:
        - U.S. only (excludes Canada and Mexico).
        - 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 (PPA) value no greater than 30 km [3]
            - 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.
    - iNaturalist locations are compatible with the range of the Price's potato-bean when accounting for the PPA uncertainty value (Figure **44**).
    - These data were useful for comparison purposes and did not support expanding the core map outside of the range.

[3] For "obscured" observations, public positional accuracy (PPA) represents the diagonal of a 0.2 x 0.2 arc cell. See the iNaturalist geoprivacy page for more details on this and related terms What is geoprivacy? What does it mean for an observation to be obscured? : iNaturalist Help.

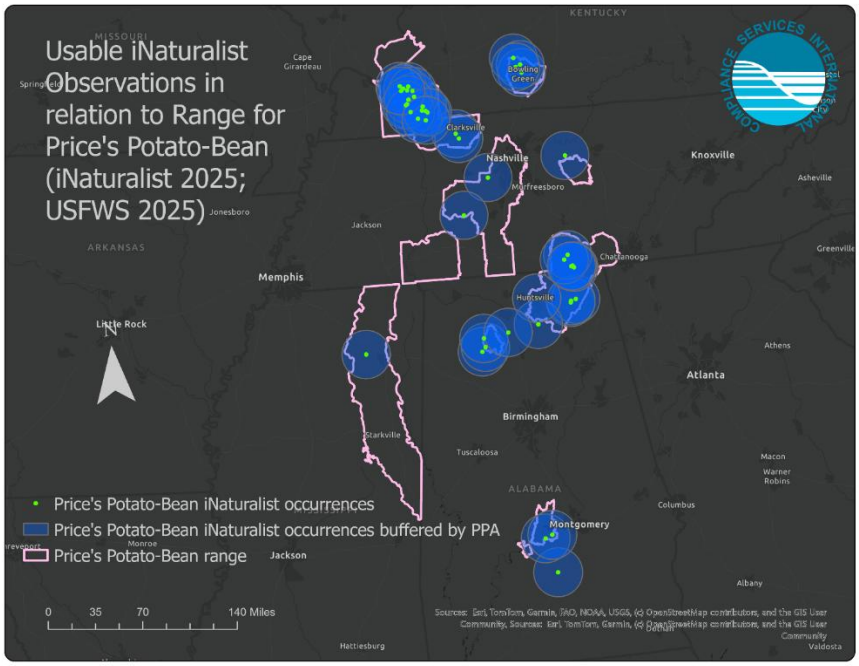


**Figure 44. Usable iNaturalist observations, buffered by PPA, for the Price's potato-bean in relation to species range (iNaturalist 2025; FWS 2025).**

- GBIF: https://www.gbif.org/species/2966791
  - GBIF includes three hundred fifty-one occurrence records; fifty-two of which are georeferenced. Thirty-seven of these had usable coordinate data based on these criteria:
    - U.S. only (excludes Canada and Mexico)
    - Latitude and longitude precision were both 3+ decimal places.
    - Coordinate uncertainty values no greater than 30 km.
    - Relative recency (2010-present)
      - Must include date information.
    - No "preserved specimen" observations; only "human observation."
  - The usable coordinates were mapped against the species range to evaluate their utility in representing species extent. The usable GBIF coordinates were all originally sourced from iNaturalist, which also had more records.

- NatureServe Explorer: https://explorer.natureserve.org/
  - Available public occurrence information from NatureServe Explorer aligns with the information from iNaturalist and GBIF.
  - EOs were generally consistent with the range and other datasets and did not support further expanding the outer boundary of the core map.

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

The core map for this species is based on biological information, which includes a land cover based refinement of locations identified in the Protected Areas Database of the United States (PAD-US) and the National Hydrography Dataset (NHD), and counties known to contain extant occurrences on privately-owned lands. Additionally, the core map was further refined to exclude areas of contiguous cultivated land > 25 acres according to a spatial layer developed by EPA.

**1. References and Software**

- LANDFIRE 2023: https://landfire.gov/data/FullExtentDownloads.
- National Hydrography Dataset (Version 2.1): https://nhdplus.com/NHDPlus/NHDPlusV2_tools.php.
- PAD-US v. 4.1 (USGS 2024): https://www.sciencebase.gov/catalog/item/652d4fc5d34e44db0e2ee45e.
- Software used: ArcGIS Pro version 3.5.2.
- FWS 2022 5-Year Review: https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3971.pdf.
- FWS Species Range: https://ecos.fws.gov/ecp/species/7422.

**2. Datasets Used in Core Map Development**

**2.1. Range**

The range for this species was last updated by FWS on March 22, 2018. A shapefile including species range for all listed species was downloaded from the FWS Environmental Conservation Online System (ECOS) website on August 7, 2025, and the species profile for this species was checked on August 28, 2025 for any updates. 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 628 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 known observation datasets. The range was used to represent the outer boundary of the core map; other sources including FWS documents, LANDFIRE, and NHD were used to develop the core map.

**2.2. U.S. Geological Survey (USGS): Protected Areas Database of the United States (PAD-US Version 4.1) and the National Hydrography Dataset Version 2.1**

The individual populations of the Price's potato-bean are catalogued in the species' 5-Year Review document (FWS 2022). Some of these populations inhabit nature preserves, conservation easements, or similar types of public lands that are identifiable by name in the USGS PAD-US and NHD datasets.

Table ***3***3 lists the populations that were found this way and includes the queries that were used from these sources. Several queries identified multiple polygons or linear features, all of which were included in the core map extent.

**Table 3. Price's potato-bean population sites obtained from PAD-US version 4.1 and NHD Plus v. 2, and the queries used to find corresponding shapes (USGS 2024; USGS 2012).**

| State, County Name | Site | Source | Query | FC_Name |
|---|---|---|---|---|
| Jackson, AL | Little Coon Creek | NHD Plus v. 2 (NHDNetworkFlowline) | GNIS_NAME LIKE '%Little Coon%' | Little_Coonewah_Creek |
| Jackson, AL | Sauta Cave | PAD-US | Unit_Nm LIKE '%Sauta%' And State_Nm = 'AL' | Sauta |
| Livingston, KY | Livingston Co. WMA | PAD-US | (Unit_Nm LIKE '%Livingston%' And Unit_Nm LIKE '%Wildlife Management Area%') And State_Nm = 'KY' | Livingston_WMA |
| Trigg, KY | Hematite Lake | NHD Plus v. 2 (NHDWaterbody) | GNIS_NAME LIKE '%Hematite%' And GNIS_ID = '494017' | Hematite_Lake |
| Trigg, KY | Laura Furnace | NHD Plus v. 2 (NHDNetworkFlowline) | GNIS_NAME LIKE '%Laura Furnace%' | Laura_Furnace |
| Lee, MS | Coonewah | NHD Plus v. 2 (NHDNetworkFlowline) | GNIS_NAME LIKE '%Coonewah%' (within Lee, MS only) | Coonewah_Creek |
| Lee, MS | Natchez Trace | PAD-US | Unit_Nm LIKE '%Natchez Trace%' And State_Nm = 'MS' And Own_Name = 'NPS' | Natchez_Trace |
| DeKalb, TN | Center Hills Bluffs | PAD-US | Unit_Nm LIKE '%Center Hill%' And State_Nm = 'TN' | Center_Hill |
| Franklin, TN | Bear Hollow | PAD-US | Unit_Nm LIKE '%Bear Hollow%' And State_Nm = 'TN' | Bear_Hollow |
| Montgomery, TN | Barnett's Woods SNA | PAD-US | Unit_Nm LIKE '%Barnett''s Woods%' And State_Nm = 'TN' | Barnetts_Woods |
| Stewart, TN | Neville Creek | NHD Plus v. 2 (NHDNetworkFlowline) | GNIS_NAME LIKE '%Neville Creek%' | Neville_Creek |
| Steward, TN | Ft Donelson NB | PAD-US | Unit_Nm LIKE '%Donelson%' And State_Nm = 'TN' And Own_Name = 'NPS' | Fort_Donelson |

### 2.3. LANDFIRE

Once the species extent was established using the most recent 5-Year Review document, PAD-US, and NHD Plus; the LANDFIRE 2023 database was used to identify areas within the extent corresponding to the habitat of the Price's potato-bean. This is because the 5-Year Review states that the species is often found in "low areas near streams or along the banks of streams and rivers," a land cover description that is easily matched the land cover classes in the LANDFIRE dataset. The EVT layer was clipped to the core map extent and professional judgment was used to identify land cover types associated with the species' habitat. Land cover selections for the Price's potato-bean are listed in Table ***4***.

**Table 4. LANDFIRE EVT classes associated with the habitat of the Price's potato-bean within its extent (LANDFIRE 2023).**

| Value | EVT_NAME |
|---|---|
| 7305 | Southern Interior Low Plateau Dry-Mesic Oak Forest |
| 7307 | East Gulf Coastal Plain Northern Dry Upland Hardwood Forest |
| 7315 | Southern Appalachian Oak Forest |
| 7317 | Allegheny-Cumberland Dry Oak Forest and Woodland |
| 7321 | South-Central Interior Mesophytic Forest |
| 7325 | East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest |
| 7326 | South-Central Interior/Upper Coastal Plain Flatwoods |
| 7328 | Southern Coastal Plain Limestone Forest |
| 7330 | Southern Coastal Plain Dry Upland Hardwood Forest |
| 7527 | East Gulf Coastal Plain Interior Oak Forest |
| 7588 | East Gulf Coastal Plain Southern Hardwood Flatwoods |
| 7589 | East Gulf Coastal Plain Loblolly-Hardwood Flatwoods |
| 9085 | East Gulf Coastal Plain Small Stream and River Floodplain Forest |
| 9224 | South-Central Interior Small Stream and Riparian Forest |
| 9247 | Southern Coastal Plain Blackwater River Floodplain Forest |
| 9250 | Southern Coastal Plain Oak Dome and Hammock |
| 9312 | Northeastern North American Temperate Forest Plantation |
| 9315 | Northern & Central Native Ruderal Forest |
| 9321 | Southeastern Native Ruderal Forest |

The "Value" field associated with these land cover classes was used during the reclassification process stage in Step 2 of the "Refinement Based on Biological Information" procedure given in **Appendix 2**, Section 3.2.

### 2.4. EPA Cultivated Lands Layer

EPA has developed and published its own cultivated layer for use in core map development as a potential refinement of extent. For the Price's potato-bean, extent was refined by this layer using the Pairwise Erase tool to remove significant areas of agriculture because the species habitat is not consistent with cultivated land and is therefore considered by CSI to be an "off-field" species. This decision was based on an overall interpretation of the following statements from a recent EPA Biological Evaluation of bicyclopyrone:

- "[Price's Potato-Bean] occurs in multiple habitat types, but is not expected to establish on agricultural fields" (Bicyclopyrone; EPA 2025a).

This removed only 0.37% of area (6,088 acres) but is considered a reasonable refinement for core map development for off-field species.

## 3. Creating the Core Map

### 3.1. Defining Extent

The core map extent for the Price's potato-Bean was developed from multiple sources including the PAD-US, NHD HUC-8 boundaries, and county boundaries where the species is known to occur on privately-owned land.

Counties with sites on privately-owned land

The Price's potato-bean is known to occur on both federally protected public lands and on private lands. The most recent 5-Year Review document includes information about populations on protected lands and in total; for counties that include some sites on private land, the entire county was used to represent the core map extent. These areas were developed as follows:

- Save an image of the map displayed in Figure 1 of the most recent 5-Year Review document (**Figure *2*** of this document) to a local folder. Use the Raster To Geodatabase tool to import this image to a working geodatabase, saved as "Fig_PNG". Add to a map with state and county boundaries.
- Render the image partially transparent. 70% transparent was used in this analysis.
- Initiate a georeferencing session and fit the previous layer ("Fig_PNG") to the display. Use control points to orient the image to match the underlying state and boundary counties.
- Use the Select tool to select counties from the underlying counties layer that are associated with extant populations. Export selected counties as "PPB_counties".
- Identify all counties with at least one population not on federally protected lands or that could be geospatially located. Use the Select tool to select these counties from "PPB_counties" and save as a standalone layer, "PPB_counties_NoObs". Note that "NoObs" does not mean that there are no observations in that county, only that their extent is not determined by observations. This layer comprises the following counties:

**Table 5. Counties with at least one extant population on privately-owned lands. These were used to form part of the extent in those counties.**

| State | County | FIPS |
|---|---|---|
| Alabama | Autauga | 1001 |
| Alabama | Madison | 1089 |
| Alabama | Marshall | 1095 |
| Alabama | Wilcox | 1131 |
| Alabama | Dallas | 1047 |
| Alabama | Butler | 1013 |
| Tennessee | Giles | 47055 |
| Tennessee | Maury | 47119 |
| Tennessee | Marion | 47115 |
| Kentucky | Warren | 21227 |
| Tennessee | Wayne | 47181 |
| Mississippi | Oktibbeha | 28105 |
| Mississippi | Kemper | 28069 |
| Kentucky | Lyon | 21143 |
| Tennessee | Hardin | 47071 |
| Alabama | Monroe | 1099 |
| Alabama | Lawrence | 1079 |

PAD-US and NHD Locations

For states with all extant populations on publicly owned lands, the core map extent of the Price's potato-bean was determined by sites found in the PAD-US or NHD datasets. The extent used for core map development using this approach was created as follows:

1. Load a layer of PAD-US polygons from USGS into a GIS.
2. Use the Select by Attributes tool to select the polygons associated with the populations of the Price's potato-bean, using the queries listed in
3. Table ***3***. For each population, export selected features to a layer name recognizable as that population location. The following populations were identified:
    - Sauta
    - Natchez Trace
    - Center Hill
    - Bear Hollow
    - Barnett's Woods
    - Fort Donelson
    - Livingston County Wildlife Management Area
4. Some sites were not identified in the PAD-US dataset but were obtained from the NHD Plus v. 2 dataset using either the NHDWaterbody or NHDNetworkFlowline layers by "GNIS_NAME"and county. The following populations were identified:
    - Little Coonewah Creek (NHDNetworkFlowline)
    - Hematite Lake (NHDWaterbody)

- Laura Furnace[4] (NHDNetworkFlowline)
- Coonewah Creek (NHDNetworkFlowline)
- Neville Creek (NHDNetworkFlowline)

5. Use the Merge tool to merge the sites identified from the NHDNetworkFlowline only, saved as "NHD_sel".
6. Add a new empty field (type = double) to the previous layer ("NHD_sel") named "HBW". This will eventually represent half of the bankfull width of each stream feature in a future buffering step.
7. Load a tabular dataset of bankfull width by "COMID" field. Use the Join tool to join this dataset to "NHD_sel".
8. Use the Calculate Field tool to populate the "HBW" field with a value representing half of the bankfull width from the joined dataset, using the following query: !Bankfull_Meanflow_CONUS.txt.bnk_width! * 0.5. Remove the previous join.
9. Use the Pairwise Buffer tool to buffer the previous layer ("NHD_sel") by the "HBW" field that was populated in the previous step. Save as a new layer, "NHD_sel_pbHBW".
10. Use the Merge tool to merge the previous layer "NHD_sel_pbHBW" with the lone NHDWaterbody feature ("Hematite_Lake") and save as a new layer, "NHD_merge".
11. Use the Pairwise Buffer tool to buffer the previous layer ("NHD_merge") by 100 ft to account for the species' presence in proximity to water bodies. Save as a new layer, "NHD_merge_pb100ft".
12. Use the Merge tool to merge the previous layer ("NHD_merge_pb100ft") with the layers representing sites identified in PAD-US. Save as a new layer, "PPB_ExtantSites".

### 3.2. Combining PAD-US, NHD, and County-Based Extents

1. Use the Merge tool to merge the previous layer ("PPB_ExtantSites") with the layer of counties used to represent core map extent in those counties ("PPB_counties_NoObs") and save as a new dataset named "PPB_extent".
2. Use the Pairwise Dissolve tool to dissolve the previous layer ("PPB_extent") into a layer with a single feature, saved as "PPB_extent_pd".
3. Use the Pairwise Clip tool to clip the previous layer ("PPB_extent_pd") by the counties with extant populations of the Price's potato-bean ("PPB_counties"). Save as a new layer, "PPB_extent_pd_pcPPBcounties".
4. Use the Pairwise Clip tool to clip the previous layer ("PPB_extent_pd_pcPPBcounties") by the species range ("PPB_range") and save as a new layer, "PPB_extent_pd_pcPPBcounties_pcRange".

[4] Laura Furnace could be in reference to either a creek or a site by the same name. The site is associated with a mile marker with geographic coordinates of 36.73093, -87.99795; this site is within 2 km of the stream. Therefore, the Laura Furnace site was represented by the stream buffered to 2 km.

### 3.3. Refinement Based on Biological Information

The total extent of the Price's potato-bean core map—which comprises PAD-US and NHD locations, and other datasets listed above—includes some area and land cover types that do not align with descriptions of the Price's potato-bean habitat. To improve confidence in the core map, a refinement based on biological information was applied to all core map extent areas. 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. Use the Clip Raster tool to clip the 2023 LANDFIRE EVT raster by the core map extent ("PPB_extent_pd_pcPPBcounties_pcRange") and save as a new layer, "LF_crExtent".
2. Use the Reclassify tool to reclassify the previous layer ("LF_crExtent") according to the land cover classes listed in
3. Table ***4***. These land cover types are assigned a value of 1, while all others are assigned a value of "NODATA." 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 feature class. Uncheck the default "Simplify Polygons" option in geoprocessing. Save as a new layer, "LF_crExtent_rec_r2p".
5. Use the Pairwise Dissolve tool to dissolve features from the previous layer ("LF_crExtent_rec_r2p") into a layer with a single feature, saved as "LF_crExtent_rec_r2p_pd".

### 3.4. Cultivated Lands-based Refinement

The Price's potato-bean 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 recent Biological Evaluation (BE) for bicyclopyrone, where the following was said about the Price's potato-Bean: "The species occurs in multiple habitat types but is not expected to establish on agricultural fields" (EPA 2025). 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 the Price's potato-bean core map, "Prices_potato_bean_CoreMap".

## 4. Datasets Considered but Not Used in Core Map Development

### 4.1. Known Observation Datasets

Datasets such as iNaturalist, 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. A different refinement from range (not based directly on known observation locations) was selected as the outer extent and further refined with biological data. If

the known location data for this species were made publicly available, this could be a useful refinement for the development of this core map.

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