Interim Core Map Documentation for the Harper's Beauty

Date Uploaded to EPA's GeoPlatform: August 2025

Interim Core Map Developer: U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs

Species Summary

The Harper's beauty (*Harperocallis flava* McDaniel; Entity ID: 723) is an endangered grass-like perennial plant found in Liberty, Franklin, and Bay Counties, along with a very small part of eastern Gulf County, on the Florida Panhandle. The species occurs in wet prairies on gentle slopes, seepage savannas between pinelands, and cypress swamps to open roadside depressions. It has been observed growing in pine flatwoods bog areas, along roadsides, and in damp roadside ditches adjacent to planted pines near flatwoods. Wet prairie occurs on low, relatively flat, poorly drained terrain of the Florida coastal plain, which is seasonally inundated or saturated for 50 to 100 days each year and burns every 2 to 4 years. The Harper's beauty blooms from mid-April through May, with fruits maturing in July. It reproduces both sexually via seeds and asexually via rhizomes. Additional information is provided in **Appendix 1**.

Description of Core Map

The core map for the Harper's beauty is based on the species range. The species range is predominantly within National and State Forests. Occurrences include areas throughout the range. **Figure 1** depicts the interim core map for the Harper's beauty. The core map represents approximately 130,416 acres in northwest Florida.

The core map includes habitats identified by the U.S. Fish and Wildlife Service (FWS) 2022 5-year Review: pine flatwoods bog areas surrounded with swamp titi (*Cyrilla racemiflora*), wiregrass (*Aristida stricta*), and slash pine (*Pinus elliottii*); along roadsides, and in damp roadside ditches adjacent to planted pines near flatwoods. The species range also includes wet prairies, in transitions to wetter shrub zones and roadside ditches. Landcover categories within the core map area are included in **Table 1.** Landcover is predominantly woody wetlands and evergreen forest, which are consistent with the habitat of this species.

The core map developed for the Harper's beauty is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Harper's beauty. 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 interim core map has a "none" best professional classification because it consists of the species' range without additions or subtractions. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

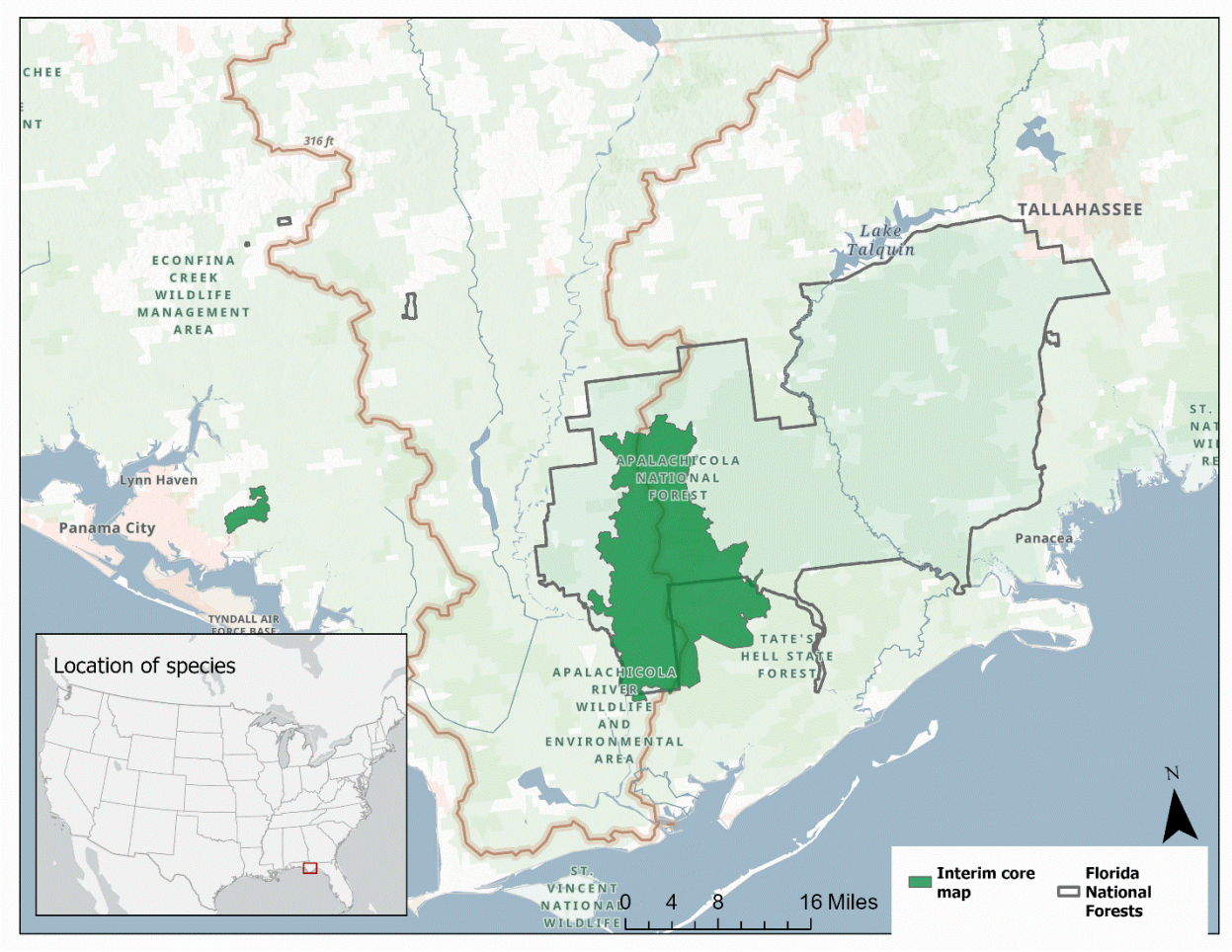

Figure 1. Interim core map for Harper's beauty. The total acreage of the interim core map is approximately 130,416 acres.

Table 1. Percentage of Interim Core Map Represented by NLCD[1] Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Landcover (Value)	% of core map represented by landcover	% of core map represented by example pesticide use
Forestry	Deciduous Forest (41)	0	22
Forestry	Evergreen Forest (42)	22	22
Forestry	Mixed Forest (43)	0	22
Agriculture	Pasture/Hay (81)	0	0
Agriculture	Cultivated Crops (82)	0	0
Mosquito adulticide, residential	Open space, developed (21)	3	4
Mosquito adulticide, residential	Developed, Low intensity (22)	1	4
Mosquito adulticide, residential	Developed, Medium intensity (23)	0	4
Mosquito adulticide, residential	Developed, High intensity (24)	0	4
Invasive species control	Woody Wetlands (90)	71	74
Invasive species control	Emergent Herbaceous Wetlands (95)	2	74
Invasive species control	Open water (11)	0	74
Invasive species control	Grassland/herbaceous (71)	0	74
Invasive species control	Scrub/shrub (52)	0	74
Invasive species control	Barren land (rock/sand/clay; 31)	0	74
Total Acres	**Interim Core Map Acres**	**130,416**	

Evaluation of Known Location Information

There are four datasets with known location information for this species:

- Descriptions of locations provided by FWS
- Occurrence locations included in iNaturalist
- Occurrence locations included in the Global Biodiversity Information Facility (GBIF)
- Occurrence locations included in NatureServe

[1] Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, https://www.usgs.gov/data/national-land-cover-database-nlcd-2021-products

EPA evaluated these four sets of data to inform or support the core map. FWS provided the most refined descriptions of the occurrence information and confirmed that all known locations of extant populations are located within the range. iNaturalist has 44 research grade observations, which are consistent with the species range. GBIF's occurrence data includes older records than iNaturalist (dating back to 1975), but these older records did not have coordinates. All GBIF records with coordinates were from iNaturalist. NatureServe data were also consistent with the FWS species range. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

EPA compiled available information for the Harper's beauty from FWS and compiled additional observational information available from iNaturalist, GBIF, and NatureServe. The information compiled for the Harper's beauty is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- The species range is refined, reflecting the species' occurrence in four counties in Florida.
- The species range includes all 27 identified EOs of the species.
- Occurrence data from other sources are consistent with the species range location.

EPA used the compiled information to identify the core map type. EPA compared known location data to the range and found that these known locations are consistent with the species range. Based on the narrow range that includes all occurrence data identified by FWS, EPA selected the ECOS species range to use as the species core map for Harper's beauty.

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

Data not described in this documentation were not explored for this species.

Appendix 1. Information Compiled for Species During Step 1

1. **Recent FWS Documents**
   - Harper's Beauty 5-Year Review 2022
   - Harper's Beauty 5-Year Review 2016
   - Harper's Beauty 5-Year Review 2009
   - Harper's Beauty Recovery Plan

2. **Background information on Species**
   - **Status:** Federally listed as endangered in 1979

   - **Taxonomy**. Monocot, member of the family Tofieldiaceae. There are no other species in the genus.

   - **Resiliency, Redundancy, and Representation**
     Resiliency, redundancy, and representation are not explicitly included in the 5-year reviews (5YR) for the Harper's beauty. The 2022 5YR notes, "Except for one EO on private land, the highest density of sites with plants is found in ANF [Apalachicola National Forest]. Therefore, the current EOs at ANF contribute the most to the representation, resiliency, or redundancy of the species, and thus, their loss would result in a decrease in the ability to conserve the species. At present, the estimated viability of 12 (42%) EOs range from excellent to good (FNAI 2021); two roadside EOs are considered possibly extirpated (Fig. 1). In 2018, no plants were observed in 2 EOs, prescribed fire is likely needed for these locations to reverse shrub encroachment." (5-Year Review 2009, p. 9)

   - **Habitat Description** (5-Year Review 2022)
     - Endemic to Florida (mainly from Apalachicola National Forest).
     - Mostly in Bay, Franklin, and Liberty counties with a very small portion of the range in Gulf County.
     - Occurs on gentle slopes, seepage savannas between pinelands, and cypress swamps to open roadside depressions.
     - Observed growing in pine flatwoods bog areas surrounded with swamp titi (*Cyrilla racemiflora*), wiregrass (*Aristida stricta*), and slash pine (*Pinus elliottii*); along roadsides, and in damp roadside ditches adjacent to planted pines near flatwoods
     - Typically occurs in wet prairies, in transitions to wetter shrub zones and roadside ditches.
     - Wet prairie is characterized as a treeless plain with a sparse to dense ground cover of grasses and herbs and dominated by wiregrass in the Apalachicola National Forest.
     - Wet prairie occurs on low, relatively flat, poorly drained terrain of the coastal plain, which is seasonally inundated or saturated for 50 to 100 days each year and burns every 2 to 4 years.

   - **Relevant Life History Information:**
     The Harper's beauty is a grass-like perennial plant that blooms from mid-April through May, with fruits maturing in July. The leaves are basal and narrow, and the yellow flowers are solitary, perfect, and born on a stalk much longer than the leaves. The flowers consist of six

tepals that are 9 to 15 mm long and become green when the plant is in fruit, six stamens, and a superior ovary with 3 to 4 carpels. It reproduces both sexually via seeds and asexually via rhizomes. (5-year Review 2016, p. 13)

- **Ecology**
  "Harper's beauty occurs on gentle slopes, seepage savannas between pinelands, and cypress swamps to open roadside depressions. It has been observed growing in pine flatwoods bog areas surrounded with swamp titi (*Cyrilla racemiflora*), wiregrass (*Aristida stricta*), and slash pine (*Pinus elliottii*); along roadsides, and in damp roadside ditches adjacent to planted pines near flatwoods. Typically, this species occurs in wet prairies, in transitions to wetter shrub zones and roadside ditches. Wet prairie is characterized as a treeless plain with a sparse to dense ground cover of grasses and herbs and dominated by wiregrass in the ANF [Apalachicola National Forest]. Wet prairie occurs on low, relatively flat, poorly drained terrain of the coastal plain, which is seasonally inundated or saturated for 50 to 100 days each year and burns every 2 to 4 years (Jenkins et al. 2007)." (5-Year Review 2022, pp. 8-9)

  "This species occurs in fire-prone habitats. Lack of fire, or reduced fire frequency, and subsequent growth of shrubs and saplings in the understory, reduces *H. flava* abundance in areas where it was previously at high density. Where fire management is implemented, it stimulates the emergence of individuals and maintains healthy, stable populations." (5-Year Review 2022, pp. 12-13)

- **Relevant Pesticide Use Sites**
  - Recovery Plan (1983, p. 25)
    - Rights-of-way: "Florida DOT is currently restricting the use of herbicides on the right-of-way where Harper's beauty is found. Considering the habitat type that Harper's beauty is found in, some research into the types of herbicides used in the area that may affect Harper's beauty through runoff should be done"
  - 5-Year Reviews (2009, p. 8; 2016, p. 10): Both reviews contain identical information
    - Forestry/natural areas: "the Forest Service only allows spot treatment application of herbicide in the ANF [Apalachicola National Forest] to control invasive and exotic species"
  - 5-Year Review (2016, p. 14)
    - Agriculture/tree farms: this "species now occurs on AgReserves, Inc.-owned property in Bay County, Florida, and this property may be utilized for timber and agriculture production. Therefore, tree farming remains a threat to this species."

- **Threats**
  "The primary threat to these plants is the adverse modification of its habitat: industrial forestry practices, fire suppression, and soil and hydrological disturbances. In addition, this species is threatened by its very limited range, small population number, the rarity of this species' habitat (about 85 to 98% of herb bog habitat has been estimated to be lost)." (5-Year Review 2022, p. 9)

  "No problems have been detected with disease, but crayfish and Orthopteran [grasshopper, cricket] activities at the ANF populations may pose a threat to this plant." (5-Year Review 2022, pp. 12-13)

- **Reclassification/Delisting Criteria**
  "Harper's beauty may be considered for delisting when a minimum of five secure wild populations, with a minimum of three colonies each, have been found or established in a habitat similar to that of the type locality so as to reestablish colonies away from the roadside. Colony 1-1, the type locality, should be one of these colonies. Criteria regarding minimal percent frequency and cover for each colony needs to be set, but will require prior research. Before a colony can be considered secure it must be protected and managed in such a way as to insure its continued survival. Steps to insure this are outlined below. Harper's beauty could be considered for downlisting to Threatened when five populations have two colonies each or when three populations have three colonies each." (Recovery Plan, p. 11)

- **Recovery Actions** (Recovery Plan, pp. 17-19)
  - Protect habitat and existing colonies of the Harper's beauty
  - Conduct searches for new colonies
  - Preserve existing germ plasm
  - Establish additional colonies
  - Monitor and manage colonies to assist and maintain recovery
  - Determine appropriate means of public education

3. Description of Species Range

"*Harperocallis flava* is endemic to the Florida Panhandle, and occurs in Bay, Franklin, and Liberty Counties...Currently there are 29 FNAI [Florida National Area Inventory] EOs documented in these three counties with the majority located in Liberty County. Since two EOs are presumed extirpated, only 27 FNAI EOs are considered extant (FNAI 2021) with the status of Bay County EO unknown." (5-Year Review 2022, p. 5; **Figure A1-1**).

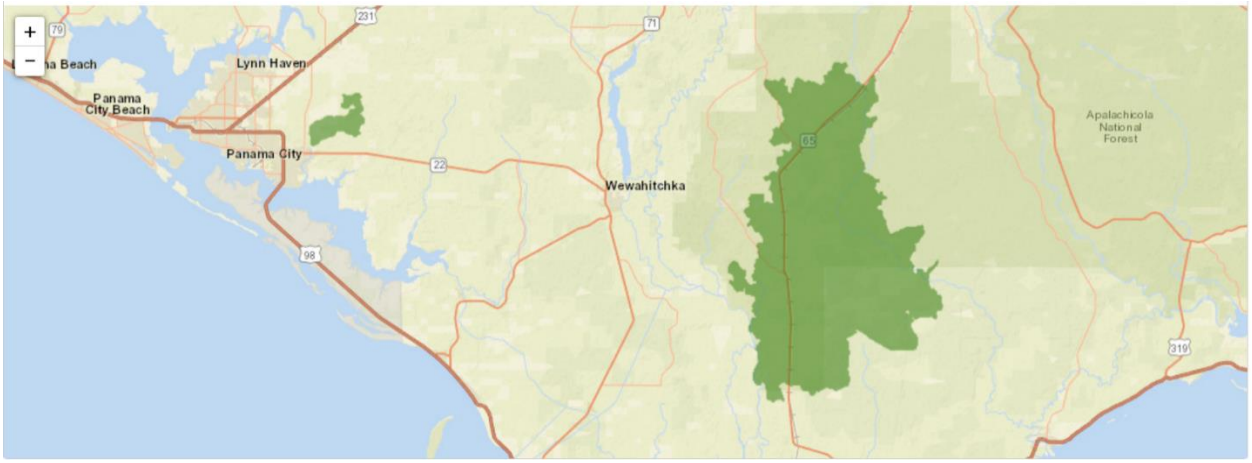

Figure A1-1. Range map of the Harper's beauty. (FWS ECOS)

4. Critical Habitat

There is no designated critical habitat for this species.

5. Known Locations

- Occurrences Described in FWS Documents (see figure and table below)
  - "Currently there are 29 FNAI EOs documented in these three counties with the majority located in Liberty County (**Fig. A1-2**, **Table A-1**; FNAI 2021). Since two EOs are presumed extirpated (**Fig. A1-2**), only 27 FNAI EOs are considered extant (FNAI 2021) with the status of Bay County EO unknown." (5-Year Review 2022, p. 5)

  - "Populations and subpopulations: Twenty-six extant occurrences are found in ANF (Fig. 1), with one EO extending its distribution into Tate's Hell State Forest (FNAI 2021). Within these EOs, the level of genetic diversity is low with a moderate amount of clonal reproduction, although individuals are not genetically identical (von Wettberg et al. 2015). These EOs are comprised of many overlapping source features (hereafter 'subpopulations') that do not form discrete areas (FNAI and USFS 2022a). To discern what's a subpopulation, data were buffered by 50 m [determined by using a "nearest feature" function (FNAI and USFS 2022a)] resulting in 83 subpopulations. To delineate populations, FNAI and USFS (2022a) proposed three main options, each presenting different outcomes."
    - a. Use EOs to define populations, and the standard 1 km separation distance representing one EO. This option shows 28 populations (EOs), of which two are extirpated, resulting in 26 extant populations. Each population consists of more than 2 subpopulations."
    - b. Use watershed boundary dataset (HUC12) to define populations where all EOs within the same watershed would be combined into a unique population. This option displays 8 populations and all but 1 of those EOs comprise more than 2 subpopulations."
    - c. Use a combination of one of the two above options in addition to other data such as connectivity of habitat, genetic information (von Wettberg et al. 2015), etc. For instance, the unique multi-clone assemblages and distinctive genotypes of H. flava plants within the SR 65 roadside and USFS compartment no. 80 can be used to further demarcate populations. Whether there are 28 or 8 distinct populations, these approaches need further analysis and discussion as each method has its strengths and weaknesses." (5-Year Review 2022, pp. 5-6)

  - Monitoring data: "The US Forest Service and Florida Natural Areas Inventory have field data and photos related to habitat condition for all the EOs, and several EOs have multiple plots. Since 2011 they have collected data from a total of 78 plots, all of which have been revisited at least twice. For 9 plots distributed across the range of known locations, subplots were established in 2018 to provide information on the number of flowering stems in relation to habitat conditions and prescribed fire effectiveness. *H. flava* floral stem counts varied across these 9 plots and years: more floral stems were observed in 2021 (192) than in 2018 (65) (FNAI and USFS 2022b). Stem abundance was influenced by treatment type: more plants were observed on untreated plots across all years, but on average, highest abundance on mechanically-treated subplots. Mechanical + prescribed fire had the next highest abundance followed by untreated plots and prescribed fire (FNAI and USFS 2022b)" (5-Year Review 2022, p. 7)

  - Occurrence on private lands (**Figure A1-3**): "Only one site on private land has been reported for Bay County and is not protected. It was first observed in 2003 and surveyed in 2006 and 2007 (Keppner and Anderson 2008). The authors observed a 61% decline in

the number of ramets during the surveyed years (from 115 to 70 ramets) possibly due to drought, a dense mid-story, human error during surveying, or other unknown factors. The last survey was done in 2008 by the FWS lead botanist; access to conduct surveys in subsequent years was denied by the current landowner. At present, plant and habitat status are unknown, and therefore it is crucial to foster a working partnership with the private landowner to survey and implement conservation measures for this population." (5-Year Review 2022, p. 7)

Figure A1-2. Locations of *H. flava* (dots and polygons) in Bay, Franklin and Liberty counties, FL. Bay County population: the shaded area represents the uncertainty in the estimated range of *H. flava*, as it was mapped by FNAI based on description in Keppner and Anderson (2008). Red circles: presumed extirpated. (5-year Review 2022, p. 6)

Figure A1-3. Harperocallis flava location (green) and corresponding habitat in Bay Co., Florida. Private timberlands (present habitat in 2015) were cleared and converted to cattle pasture in 2018, within 5 years of the land being sold. Source of aerials: 2016 - Florida Depart. of Transportation; 2021- Pictometry International Corp. (5-year Review 2022, p. 7)

Table A-1. Number of *Harperocallis flava* historical locations and current EOs**.** (5-year Review 2022, p. 6)

Site	1965-2008 Historical locations	1965-2008 #EOs	2008-2015 Historical locations	2008-2015 #EOs	2016-2021 #EOs	Public/Private Partnership
Bay	1	1	1	1	1	Private
Franklin	2	1	9	2	2	Public
Liberty	19	16	135	25	26	Public
Total	22	19	145	28	29	

- Occurrences Described in iNaturalist:
  - Searched on June 30, 2025
  - https://www.inaturalist.org/observations?quality_grade=research&subview=table&taxon_id=157527&verifiable=any
  - iNaturalist includes 44 research grade observations dating back to May 2010 that are consistent with the species range.
  - **Figure A1-4** depicts the locations of these observations.

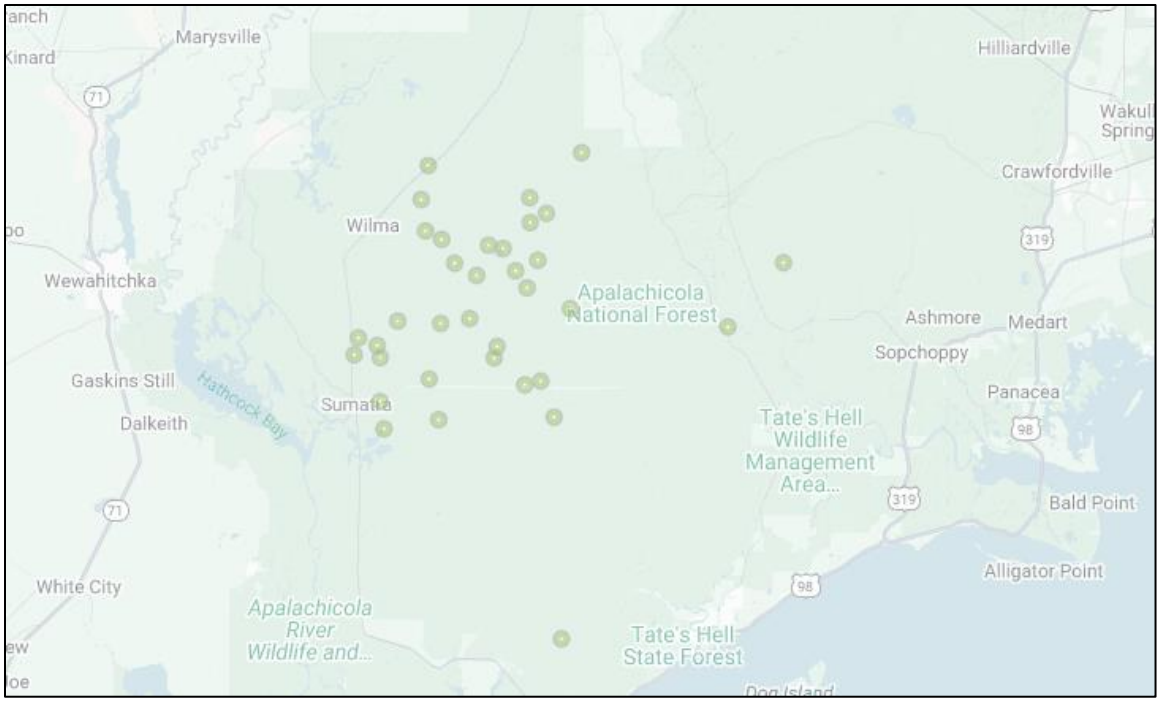

Figure A1-4. Occurrences of the Harper's beauty available in iNaturalist.

- Occurrences Described in GBIF:
    - Searched on June 30, 2025
    - https://www.gbif.org/occurrence/search?offset=0&basis_of_record=HUMAN_OBSERVATION&taxon_key=2864283
    - GBIF includes 66 observations dating back to 1975, only 36 which have coordinates. All observations with coordinates are from iNaturalist so are not displayed here.

- Occurrences Described in NatureServe:
    - Searched on June 30, 2025
    - https://explorer.natureserve.org/pro/Map?taxonUniqueId=ELEMENT_GLOBAL.2.154865
    - The observations available in NatureServe broadly align with those available in iNaturalist and occur in the same areas as the FWS range map.

Collectively, the occurrence data from iNaturalist and NatureServe do not support expanding the core map beyond the species' range.