

Interim Core Map Documentation for Mohr's Barbara's Buttons

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

Species Summary

Mohr's Barbara's buttons (*Marshallia mohrii*; Entity ID 764) was Federally listed as a threatened plant species in 1988. The U.S. Fish and Wildlife Service (FWS) has not designated a critical habitat for the Mohr's Barbara's buttons. The U.S. Army Corps of Engineers (USACE) (2014) National Wetland Plant List designates Mohr's Barbara's buttons as a Facultative Wetland (FACW), which indicates that the species usually occurs in wetlands, but may occur in non-wetlands" (Lichvar et al. 2012). Two habitats supporting Mohr's Barbara's buttons have received increased attention in recent years: Ketona Dolomite Glades and Coosa Valley prairies. The plant typically occurs in moist, prairie-like openings in woodlands and along shale-bedded streams. Several populations are in swales extending onto rights-of-way (ROW). The soils are sandy clays, which are alkaline, high in organic matter, and seasonally wet. Most currently known populations occur on soils of the Conasauga-Firestone Association. Allison (1991) notes that plants occur in full sun or partial shade in a grass-sedge community. Common associates include *Helenium autumnale*, *Helianthus anaustifolius*, *Lvthrum alatum*, *Ruellia caroliniensis*, and prairie elements such as *Asclepias viridis*, *A. hirtella*, *Helianthus mollis*, and *Silphium terebinthinaceum*, one of the best indicators of suitable soils for *Marshallia mohrii*. Additional information on the species is provided in **Appendix 1**.

Description of Core Map

The core map is a biological information core map type based on known location and habitat information available in FWS' 5-year review. The outer extent of the core map is defined by locations named in FWS documents and preferred habitats that exist within counties that are mentioned in the FWS' 5-year review. The species is known from the Southwestern Appalachians and Ridge and Valley Level III ecoregions. Level IV ecoregions from which the species is known include the Southern Limestone/Dolomite Valleys and Low Rolling Hills, Southern Shale Valleys, Southern Sandstone Ridges, Southern Table Plateaus, and Shale Hills. See Griffith et al. (2001) and U.S. Environmental Protection Agency (EPA) (2013) for more information on these ecoregions (see more details in **Appendix 1**). The summary of Mohr's Barbara's buttons' distribution presented in the 2016 5-year review remains current (5-Year Review, 2022).

Since no critical habitat has been designated for this species, the critical habitat cannot be the core map type. The species' range spans approximately 150 miles from central Alabama to northwestern Georgia's Floyd County (see **Appendix 1**). Occurrences identified in FWS documents and iNaturalist fall within the species range. FWS documentation notes established populations. Overall, species range is limited to distinct counties and range is overall refined and limited within size. However, whole counties are used in the range, and it can be refined using location information from FWS documents

Figure 1 depicts the resulting interim core map for Mohr’s Barbara’s Buttons. The size of the core map is approximately **198,790** acres. Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly forest, woody wetland, and developed open space.

The core map developed for the Mohr’s Barbara’s buttons is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Mohr’s Barbara’s Buttons. 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 species expert feedback from FWS. This interim core map has a “moderate” (4) best professional judgment classification to describe major uncertainties/limitations. The map is based on named sites and counties described by FWS, and EPA added some additional areas based on habitat needs of the species. There are some uncertainties regarding boundaries of FWS named sites as well as whether the list of EVT Names fully and adequately capture all relevant habitat for this species. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

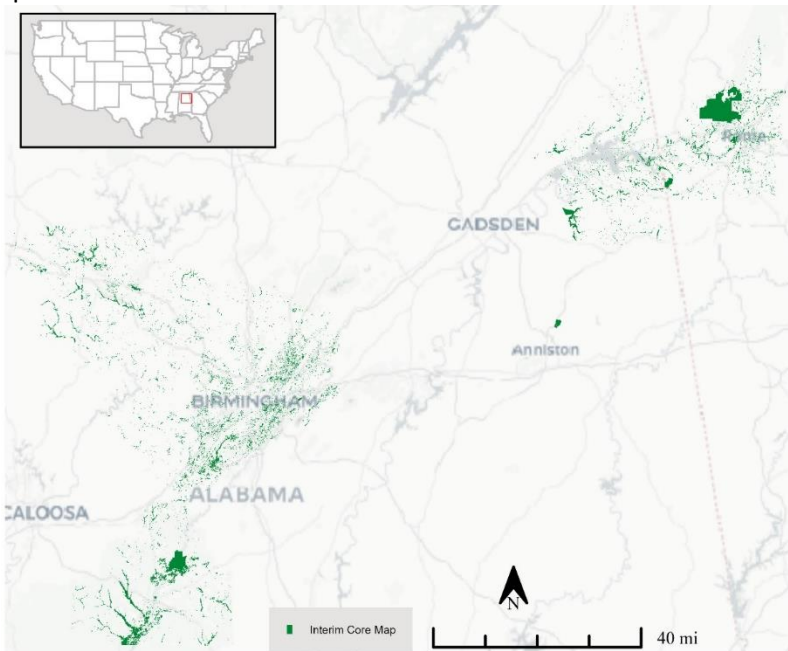


Fig. 1. Interim Core Map for Mohr’s Barbara’s Buttons.

Table 1. Percentage of Interim Core Map Represented by NLCD¹ 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) | 20 | 40 |
| Forestry | Evergreen Forest (42) | 9 | |
| Forestry | Mixed Forest (43) | 11 | |
| Agriculture | Pasture/Hay (81) | 3 | 3 |
| Agriculture | Cultivated Crops (82) | 0 | |
| Mosquito adulticide, residential | Open space, developed (21) | 20 | 24 |
| Mosquito adulticide, residential | Developed, Low intensity (22) | 3 | |
| Mosquito adulticide, residential | Developed, Medium intensity (23) | 1 | |
| Mosquito adulticide, residential | Developed, High intensity (24) | 0 | |
| Invasive species control | Woody Wetlands (90) | 27 | 33 |
| Invasive species control | Emergent Herbaceous Wetlands (95) | 1 | |
| Invasive species control | Open water (11) | 1 | |
| Invasive species control | Grassland/herbaceous (71) | 2 | |
| Invasive species control | Scrub/shrub (52) | 2 | |
| Invasive species control | Barren land (rock/sand/clay; 31) | 0 | |
| Total Acres | Interim Core Map Acres | 198,709 | |

Evaluation of Known Location Information

There are four datasets with known location information:

- Descriptions of locations provided by FWS;
- Occurrence locations in iNaturalist;
 - https://www.inaturalist.org/observations?taxon_id=67784
- Occurrence locations in NatureServe; and

¹ Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

- https://explorer.natureserve.org/pro/Map?taxonUniqueId=ELEMENT_GLOBAL.2.134344
- No precise geodata, but largely consistent with range and core map
- Occurrence locations in the Global Biodiversity Information Facility (GBIF).
 - Observations are included in other data sources
 - https://www.gbif.org/occurrence/search?basis_of_record=HUMAN_OBSERVATION&basis_of_record=OCCURRENCE&taxon_key=5393637&year=2010,2025

EPA evaluated these four sets of data before selecting the type of and developing the core map. FWS provided named locations of all protected areas with extant populations of this species within the range which spans approximately 150 miles from central Alabama to northwestern Georgia’s Floyd County (**Appendix 1**). FWS also provided descriptions of the species’ preferred habitat. Occurrences in GBIF contain information that is duplicated in iNaturalist and NatureServe. Neither iNaturalist nor NatureServe contained information that support expanding the core map outside of the range. **Appendix 1** includes more information on the available known location information.

Approach Used to Create Core Map

The core map was developed using the “Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats”² (referred to as “the process”). EPA developed the core map using the 4 steps described in the process document:

1. Compile available information for a species;
2. Identify core map type;
3. Develop the core map for the species; and
4. Document the core map.

The core map is based on the known locations from FWS and preferred habitat for species Mohr's Barbara's buttons (*Marshallia mohri*) identified in the 2016 and 2022 Five Year Reviews.

For step 1, EPA compiled available information for Mohr's Barbara's buttons from FWS, as well as observation information available from various publicly available sources (including iNaturalist, NatureServe, and GBIF). The information compiled for Mohr's Barbara's buttons is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- FWS known locations of the Mohr's Barbara's buttons are 5 counties in Alabama and 1 county in Georgia; and
- Description species preferred habitat.

For step 2, EPA used the compiled information to identify the core map type, which is based on known location information and preferred habitat. No critical habitat has been designated and the FWS specifically mentions that known locations often fall outside of the current species range. Therefore, the biological information-based core map type is most appropriate.

² Dated 2024, available online at: <https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas>

For step 3, EPA used the best available data sources to generate the core map. Data sources are discussed in the process document and are identified in Appendices 1 and 2. For this core map, EPA merged the relevant habitat type raster cells within relevant counties with the FWS named sites.

EPA manually located the geographical locations and found external boundary delineations for the named sites (see **Appendix 1**). Accompanying each named site is information for how the boundary delineations are found. After the boundary and locations are confirmed, the agency then drew the maps using the online tool <https://geojson.io/>.

Combined with the named sites are the areas (raster cells) within the mentioned counties that are consistent with the species preferred habitat. The shapefiles for the preferred habitat are taken from the LandFire Existing Vegetation Type (EVT) dataset version 2.4.0. For Calhoun County, since all populations are within Ft. McLellan, none of the preferred habitat within that county is used for the interim core map.

The combination of these specific areas delineating suitable habitat and the named sites from FWS together form the interim core map. **Appendix 2** provides more details on the Geographic Information System (GIS) analysis and data used to generate the core map.

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

Alternative analyses and data sources not described in this document were not explored.

Appendix 1. Information Compiled for the Mohr's Barbara's Buttons During Step 1

1. Recent FWS documents/links and other data sources

- Five Year Review 2022 https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/3728.pdf
- Five Year Review 2016 https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2359.pdf
- Recovery Plan 1991 (https://ecos.fws.gov/docs/recovery_plan/911126b.pdf)

2. Background information

- **Status:** Federally listed as threatened in 1988
- **Resiliency, redundancy, and representation** (the 3Rs)
 - No direct information mentioned in documents (no SSA for this species)
- **Habitat**
 - “*Marshallia mohrii* typically occurs in moist, prairie-like openings in woodlands and along shale-bedded streams. Several populations are in swales extending onto rights-of-way (ROWs). The soils are sandy clays, which are alkaline, high in organic matter, and seasonally wet. Most currently known populations occur on soils of the Conasauga-Firestone Association. Plants occur in full sun or partial shade in a grass-sedge community. Common associates include *Helenium autumnale*, *Helianthus anaustifolius*, *Lythrum alatum*, *Ruellia caroliniensis*, and prairie elements such as *Asclepias viridis*, *A. hirtella*, *Helianthus mollis*, and *Silphium terebinthinaceum*, one of the best indicators of suitable soils for *Marshallia mohrii* (Allison 1991). Allison (1991) notes that the potential to find *Marshallia mohrii* increases when *Lythrum alatum* is found with *Silphium terebinthinaceum*, indicating that the soils are at a “moister zone of tolerance range for this *Silphium*. The endangered *Clematis socialis* (Alabama leather flower) and *Sarracenia oreophila* (green pitcher plant) occur with *M. mohrii* at two separate sites. The surrounding forest type is mixed hardwoods with various species of oak and pine (Kral 1983, McDaniel 1981).” Mohr's Barbara's Buttons Recovery Plan 1991
 - “This species appears to maintain itself only in areas which are naturally or artificially cleared and was probably maintained naturally through occasional fire or local soil conditions that promoted a grass-sedge community (Kral 1983).” Mohr's Barbara's Buttons Recovery Plan 1991
 - “Relatively little is known about the population ecology and dynamics of Mohr's Barbara's buttons. Accordingly, it is not currently known what constitutes an ecologically discrete or viable population of this species” Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2016
 - “Mohr's Barbara's buttons' biology and life history remain poorly understood with limited new information available since completion of the 2016 5-year review (Service 2016).” Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2022;
 - “Mohr's Barbara's buttons' biology and life history remain poorly understood. However, a small-scale germination study for this species has been completed by staff of the Missouri Botanical Garden (M. Albrecht pers. comm. 2015a, b, Q. Long pers. comm. 2015a). Results of this study are not currently available. An informal study found that 90-day cold treatment is effective for germination (A. Highland pers. comm. 2015). Chafin

and Owers (2010) have suggested that the species' pollinators are small insects, such as beetles and butterflies, and have further suggested that its seeds may be dispersed by small animals, such as birds; however, no studies are known that confirm the identity or importance of any of these potential pollinators or dispersal agents." Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2016

- "Mohr's Barbara's buttons is often found within open to partially shaded graminoid-dominated (sedges) habitats within the Ridge and Valley... and Cumberland Plateau physiographic regions (Fig. 1). The species can be found along a variety of roadsides and utility rights-of-way, along stream margins, and within open woodlands, prairies, and barrens in Alabama and Georgia. Habitats where the species occurs typically have mesic to moist soils, but some tend to be comparatively dry (Schotz 2014). Additionally, the U.S. Army Corps of Engineers (USACE) (2014) National Wetland Plant List designates Mohr's Barbara's buttons as a Facultative Wetland (FACW), which indicates that the species "[u]sually occur[s] in wetlands, but may occur in non-wetlands" (Lichvar et al. 2012). Two habitats supporting Mohr's Barbara's buttons have received increased attention in recent years: Ketona Dolomite Glades and Coosa Valley prairies." Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2022
 - Herbaceous wetlands. Floodplains, full sun, well-drained soils, and occasionally limestone outcrops. Nature Serve (1996)
 - Full sunlight is required for optimum growth.
 - Occasional flooding, and other land disturbances, eliminate competing species. (Recovery Plan 2006)
 - Occurs in agricultural fields (Enlist Biological Opinion)
- **Pollinator/reproduction**
 - Flowering time not reported
 - Chafin and Owers (2010) have suggested that the species' pollinators are small insects, such as beetles and butterflies, and have further suggested that its seeds may be dispersed by small animals, such as birds; however, no studies are known that confirm the identity or importance of any of these potential pollinators or dispersal agents."
 - Not capable of self-fertilization
 - Pollinator is not identified or described in FWS documentation
- **Taxonomy**
 - Terrestrial Plant – Family: Asteraceae
- **Relevant Pesticide Use Sites**
 - Cultivation of corn and soybean in Wilson County, TN.
 - No information specific to pesticides. However, agriculture is a mechanism for maintaining the species' habitat. (Recovery Plan, 2006)
- **Recovery Criteria/Objectives (2006 recovery plan)**
 - "This species typically occurs in moist prairie-like openings in woodlands and along shale-bedded streams. Populations extending onto rights-of-way (ROWs) are threatened by routine application of herbicides, future road expansion, and the potential use of these ROWs for installation of utility lines (water and sewer lines). Suitable habitat

continues to be converted for agricultural or silvicultural use.” Mohr's Barbara's Buttons Recovery Plan 1991

- “Personnel of the Alabama Highway Department (Department) are aware of the plants on or near the ROWs they maintain and of the importance of protecting them. An informal agreement exists between the U.S. Fish and Wildlife Service (Service) and the Department for protection of the plants on their ROWs. This involves the abolishment of herbicides near these sites and a 4 special mowing schedule to allow the species ample time to flower and set seed. Mowing, at appropriate times, may actually enhance populations by reducing competition and spreading seeds.” Mohr's Barbara's Buttons Recovery Plan 1991
- “recent road widening and indiscriminate use of herbicides to maintain road shoulders may have eliminated Mohr’s Barbara’s buttons plants along County Road 65 in Bibb County, Alabama (M. Scott Wiggers, Botanist, Service, pers. obs., August 2017), that were discovered in the 1990s. Such indiscriminate use of herbicide application has resulted in the extirpation of other sensitive plants elsewhere along County Road 65 (Schotz, pers. comm., December 8, 2021)” Mohr’s Barbara’s Buttons (Marshallia mohrii) 5-Year Review 2022
- “Marshallia mohrii is threatened by the potential destruction or adverse modification of its habitat. Ten populations are confined to roadside ROWs and at several other sites plants extend onto ROW swales. These plants are vulnerable to accidental disturbances. Any future road improvements (expansion) or roadside maintenance activities (i.e., herbicide treatment, bulldozing, planting of non-native competitive grasses, mowing during flowering) at these sites, could adversely impact or destroy populations if proper planning does not occur.” Mohr’s Barbara’s Buttons Recovery Plan 1991
- “Mohr’s Barbara’s buttons is particularly vulnerable to herbicides and incompatible mowing regimes within its habitats; however, appropriate mowing regimes may also serve as valuable conservation tools in these areas (Schotz 2014).” Mohr's Barbara's Buttons (Marshallia mohrii) 5-Year Review 2016

- **Recovery Actions (from 2006 recovery plan)**

- **Recovery Criteria/Objectives**

- “Marshallia mohrii will be considered for delisting when there are at least 15 viable populations of this species and all are protected from any foreseeable human-related threat. At least three populations should be located within the two physiographic regions represented by its historic range (Cumberland Plateau, Ridge and Valley). At least three populations should be located within Alabama and three in Georgia. Viability of populations will be assessed through periodic monitoring for at least a 15-year period. The number of individuals necessary and the quantity and quality of habitat needed to meet these criteria will be determined as one of the recovery tasks.” Mohr's Barbara's Buttons Recovery Plan 1991
- “A viable population is a reproducing population that is of sufficient size and genetic variability to enable it to survive and respond to natural habitat changes (stable or increasing).” Mohr's Barbara's Buttons Recovery Plan 1991
- “These recovery criteria are preliminary and may be revised on the basis of new information.” Mohr's Barbara's Buttons Recovery Plan 1991

Recovery Actions

- “Recovery criteria have not been met. Progress has been made locating and protecting populations in both Alabama and Georgia, but opportunities to enhance protection and management of plants remain. Currently, of the species’ 19 extant populations, only 8 (including 5 entire populations and 3 partial populations) receive some protections on Federal, State, or non-governmental conservation organization lands. These populations all occur in the Ridge and Valley (also known as, Valley and Ridge) physiographic region. No populations within the Cumberland Plateau physiographic region are known to be protected. Various other populations are located along road and utility rights-of-way and receive some conservation considerations pursuant to sections 7 and 9 of the ESA but are otherwise unprotected. Range-wide, regular monitoring of populations is inconsistent with most populations receiving no regular monitoring, hampering assessment of long-term population trends. Furthermore, limited progress has been made toward determining the factors required to define and sustain viable populations of this species. Some genetics work has begun to elucidate the evolutionary and phylogenetic history of the species, but little research into the life history, ecology, and management of this species has been conducted—these studies are vital to successful long-term conservation of Mohr’s Barbara’s buttons. Similarly, no known demographic studies have been conducted for this species. Lack of information coupled with inconsistent and irregular monitoring limits our ability to determine the viability of Mohr’s Barbara’s buttons populations.” Mohr’s Barbara’s Buttons (Marshallia mohrii) 5-Year Review 2022

From the 1991 Recovery Plan:

- Protect populations and habitat.
- Determine population size.
- Conduct demographic studies and obtain life history information.
- Determine parameters of a viable population.
- Determine habitat characteristics.
- Determine and implement appropriate management.
- Conduct monitoring studies.
- Preserve genetic stock.

3. Description of Species Range

The species range from FWS is presented below. The range encompasses approximately 2.5 million acres in the southeastern United States.

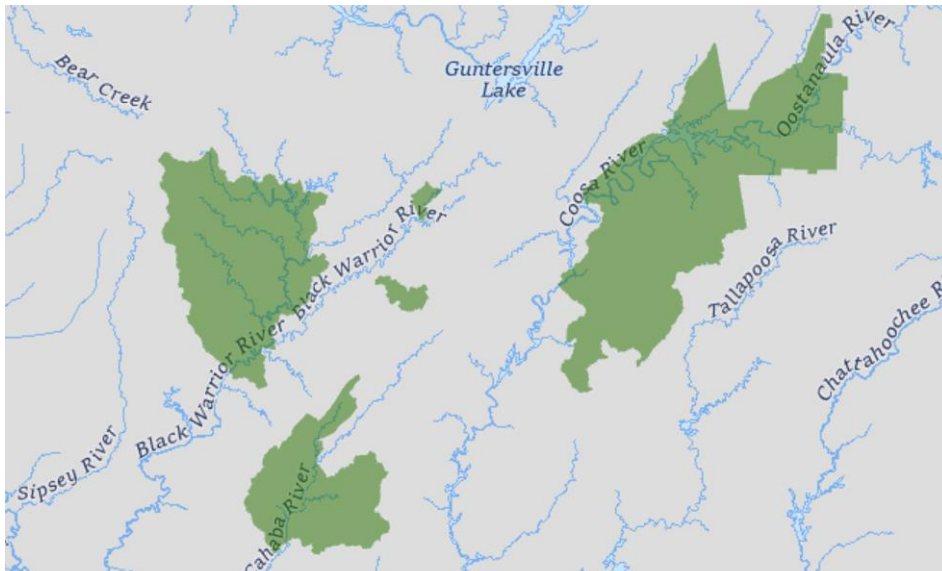


Figure A1. Species Range (<https://ecos.fws.gov/ecp/species/7610>). Last updated in 2020.

4. Critical Habitat

- No Critical Habitat Documents currently available for this species.

5. Description of Known Locations and Distribution

Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2016

The species' confirmed range spans approximately 150 miles from central Alabama's Bibb County to northwestern Georgia's Floyd County (see Fig. 1 and Table 1). In Alabama, the species is known historically from eight counties (Bibb, Blount, Calhoun, Cherokee, Cullman, Etowah, Jefferson, and Walker), but has not been observed in Blount, Cullman, or Etowah Counties since the initial discoveries of these populations (Schotz 2014, pers. comm. 2015, C. Hansen pers. comm. 2015). Georgia's only confirmed populations occur in Floyd County (Patrick et al. 1995, Schotz 2014) and continued searches have discovered previously unknown occurrences within the county, extending the species' range further northeast (Allison 1995, Govus 1999, Ware 1999). Mohr's Barbara's buttons was reputedly collected in Walker County, Georgia, during the late 1800s, but further investigation has shown this record to be erroneous (Allison 1995, Patrick et al. 1995). Similarly, both NatureServe (2015) and U.S. Department of Agriculture's (USDA) PLANTS Database (USDA 2015) indicate that Mohr's Barbara's buttons occurs or has occurred in Florida, but these accounts are erroneous (A. Jenkins pers. comm. 2015).

State Population Summaries

Alabama

Five populations of Mohr's Barbara's buttons have been found in Bibb County and support more than 2,800 plants (Schotz 2014). Most of Bibb County's known sites occur on private property with no known formal protections. However, portions of two populations are found on conservation lands owned and managed by The Nature Conservancy (TNC) (Kathy Stiles Freeland Bibb County Glades Preserve) and by FWS (Cahaba River National Wildlife Refuge [NWR]), which, together protect over 1,500 plants (Schotz 2014). One of these two 8 populations extends onto both TNC's Preserve and the Service's NWR, but both populations also extend onto unprotected properties.

While six populations of Mohr's Barbara's buttons have been found in Cherokee County, only three are considered to be extant. Additionally, a portion of one these extant populations has not been relocated since it was discovered. The easternmost population within Cherokee County is part of a larger population that traverses the Alabama–Georgia state line into neighboring Floyd County, Georgia (2012 collection by D. Estes No. 11621 stored at Austin Peay State University Herbarium, Clarksville, Tennessee; Schotz 2014, C. Hansen pers. comm. 2015).

Three populations of Mohr's Barbara's buttons occur in Calhoun County, where it is only known from the AANG Ft. McClellan Army National Guard Training Center (Ft. McClellan).

In 2014, Mohr's Barbara's buttons was discovered in Jefferson County along a Tennessee Valley Authority (TVA) electrical transmission right-of-way (Schotz 2014, TVA 2015). Three populations (each separated by at least a mile) are found spread along nearly 4 miles of this right-of-way. Together, these TVA populations may support around 2,000 Mohr's Barbara's buttons plants; however, no definition of "plants" was provided by TVA 2015.

The species was also rediscovered in Walker County in 2012 at a previously unknown site (A. Schotz pers. comm. 2015), which represents the one extant population known for this County. Two other populations within the County have not been relocated since their discoveries in the 1970s and 1980s (Schotz 2014) and they are now considered to be historical occurrences.

Three counties within the state previously had documented populations of Mohr's Barbara's buttons—Cullman, Blount, and Etowah—but repeated searches have been unable to relocate these populations and all are considered historical. In particular, the species has not been found in Cullman County since the late 1800s and has not been relocated in Blount County since 1998 (Schotz 2014, C. Hansen pers. comm. 2015). One population in Etowah County, discovered in 1994, is thought to have been extirpated by logging operations (Schotz 2014, D. Spaulding pers. comm. 2015).

Georgia

In Georgia, Mohr's Barbara's buttons is currently only found in Floyd County (Schotz 2014). Six populations have been found in Floyd County, one of which crosses into neighboring Cherokee County, Alabama. Malcolm Hodges (pers. comm. 2015) was unable to relocate plants at three of the sites visited by Schotz (2014) but also located three additional sites not reported by Schotz. It is unknown why plants at some sites were not relocated, but Hodges suggested revisiting them following fire. Of Floyd County's known Mohr's Barbara's populations, several are located on state-owned and managed properties or on privately owned conservation lands. Conservation lands in Floyd County include Berry College WMA (home to two extant and one historical population) and a conservation easement on timber lands held by TNC, which protects part of one larger population.

The summary of Mohr's Barbara's buttons' distribution presented in the 2016 5-year review remains current" Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2022

Description of Species Distribution in FWS Documents

According to the 2016 and 2022 Five Year Reviews of Mohr's Barbara's buttons' distribution (presented in **Figure A-1** and **Tables A1 & A2**), Mohr's Barbara's buttons was considered stable overall, with some local populations in decline while others were likely increasing. Likewise, additional populations were discovered, expanding the species' known range, but some populations were extirpated or considered to be historical.

Table 1. Distribution and status of Mohr's Barbara's Buttons (*Marshallia mohrii*) 5-Year Review 2016.

| State Population Count | County Population Count |
|--|------------------------------|
| Alabama: 15 ¹ (8) | Bibb: 5 |
| Alabama | Blunt: (1) |
| Alabama | Calhoun: 3 |
| Alabama | Cherokee: 3 ¹ (3) |
| Alabama | Cullman: (1) |
| Alabama | Etowah: (1) |
| Alabama | Jefferson: 3 |
| Alabama | Walker: 1 (2) |
| Georgia 5 ¹ (1) | Floyd 5 ¹ (1) |
| Total: 19¹ (9³) | |

Notes: Parentheses indicate populations that are either extirpated or historical, whereas numbers that are not in parentheses denote extant populations. ¹One population traverses the Alabama-Georgia state line and is shared by Cherokee and Floyd Counties. This population is recorded as one population for tallies within each county and state but is only counted as one population toward the overall total. Therefore, the total (19) does not equal the sum of either the State or County population counts; rather, it represents one population less than either of these sums.

²Portions of five populations have also not been relocated in recent years.

Table 2. Distribution of extant Mohr's Barbara's buttons occurring on State, Federal, or non-governmental lands receiving at least some protection.

| State | County | Site | Owner/Manager | Pop. Count ¹ |
|--------------|---------|---|-------------------------------|--------------------------|
| Alabama | Bibb | Cahaba River NWR | FWS | <u>1</u> ² |
| Alabama | Bibb | Kathy Stiles Freeland Bibb County Glades Preserve | TNC | <u>2</u> ² |
| Alabama | Calhoun | Ft. McClellan | AANG | 3 |
| Georgia | Floyd | Berry College WMA | Berry College/GDNR | 2 |
| Georgia | Floyd | Conservation Easement | Private timber company/TNC | <u>1</u> |
| Total | | | | 5, <u>3</u> ² |

Notes: AANG= Alabama Army National Guard; GDNR= Georgina Department of Natural Resources; NWR= National Wildlife Refuge; TNC= The Nature Conservancy; FWS= U.S. Fis and Wildlife Service; WMA= Wildlife Management Area. ¹Population count indicates number of unique populations (not underlined) or partial populations (underlined) receiving some level of protection.²Cahaba River NR and Kathy Stiles Freeland Bibb County Glades Preserve share one population.

Figure 1. Mohr's Barbara's buttons distribution.

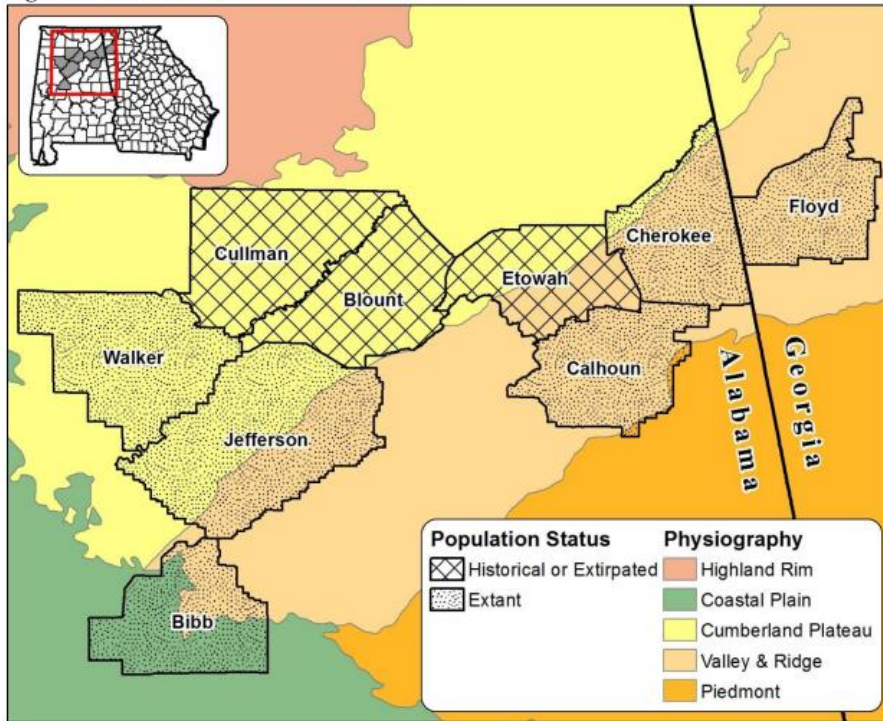


Figure A2. Species Distribution Map Presented in FWS 5-Year Review

Locations in iNaturalist

- There are 101 research grade occurrences on iNaturalist. The majority of these occurrences are in Alabama with two in Georgia close to the Alabama boundary. All occurrences fall within the species' known range.
- Table 3. Summary of Mohr's Barbara's buttons observations on iNaturalist.

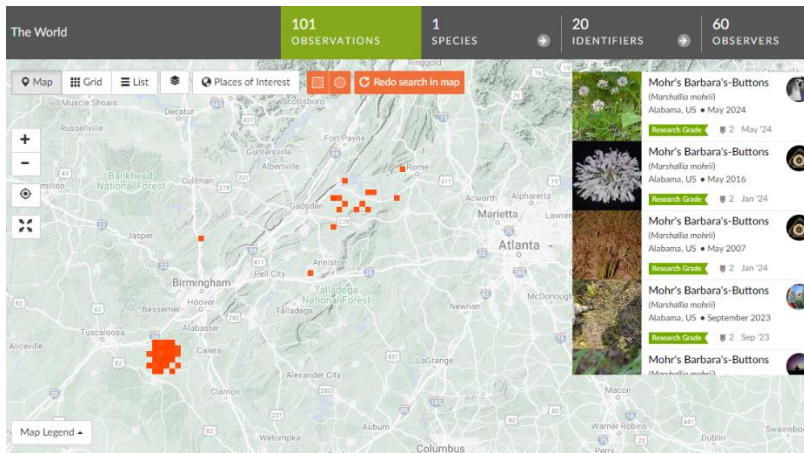


Figure A1.3. iNaturalist Occurrence Locations

There are no occurrences in GBIF that are unique from iNaturalist and NatureServe.

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

FWS-Named Sites:

- Cahaba River National Wildlife Refuge (Bibb County, AL)
 - Boundary: <https://www.fws.gov/refuge/cahaba-river/map?trail=rail-road-trail-0>
- Kathy Stiles Freeland Bibb County Glades Preserve (Bibb County, AL) – managed by The Nature Conservancy
 - Boundary: <https://app.regrid.com/us/al#base=street&t=property&p=/us/al/bibb/piper-coleanor/20665>
 - Parcel ID: 1006130000003000
- Fort McClellan – Alabama Army National Guard (Calhoun County, AL)
 - No boundary map found. Instead, the Agency drew the boundary using Google street view where the boundary delineation is based on (i) which sections of the area does not have street view capability and (ii) whether one can see a visible barrier (e.g., barbed fence) separating the parts where street view is available and where it is not.
- Berry College Wildlife Management Area (Floyd County, GA)
 - Boundary: <https://georgiawildlife.com/sites/default/files/wrd/pdf/maps/2021%20Berry%20College%20WMA%20Map%20Topo.pdf>
- The Nature Conservancy (TNC) Easement on lands owned by a timber company (all within GA, some in Floyd County)
 - National conservation easement database: <https://www.conservationaleasement.us/adv-search/>
 - Search criteria:
 - Easement Holder Names – contains – nature
 - Location (Primary state) – includes – Georgia
 - Location (county) – contains – Floyd
 - Search returned 5 easements held by TNC – 4 are within the Marshall Forest Preserve (Floyd County) and the last is a prairie that’s right on the border with Alabama.
 - Drew 2 separate outer extents. One is based on approximate convex hull of all 4 combined easements within the Marshall Forest Preserve and the other is based on the Coosa Valley Prairie Easement.

Preferred Habitat: Landfire Existing Vegetation Type (version 2.4.0).

This data set is cropped to fit the boundaries of the relevant counties and filtered by EVT_NAME to include the following values:

- Alabama Ketona Glade and Woodland
- Southern Ridge and Valley Patch Prairie
- Southern Coastal Plain Seepage Swamp and Baygall Shrubland
- Eastern Cool Temperate Urban Deciduous Forest
- Eastern Cool Temperate Urban Mixed Forest
- Eastern Cool Temperate Urban Herbaceous
- Eastern Cool Temperate Urban Shrubland
- Eastern Warm Temperate Urban Mixed Forest

- Eastern Warm Temperate Urban Herbaceous
- Eastern Warm Temperate Urban Shrubland
- Eastern Cool Temperate Developed Mixed Forest
- Eastern Cool Temperate Developed Shrubland
- Eastern Cool Temperate Developed Herbaceous
- Eastern Warm Temperate Developed Mixed Forest
- Eastern Warm Temperate Developed Shrubland
- Eastern Warm Temperate Developed Herbaceous
- Cumberland Seepage Forest
- East Gulf Coastal Plain Depression Pondshore
- East Gulf Coastal Plain Large River Floodplain Forest
- East Gulf Coastal Plain Northern Seepage Swamp
- East Gulf Coastal Plain Small Stream and River Floodplain Forest
- South-Central Interior Large Floodplain Forest
- South-Central Interior Small Stream and Riparian Forest
- Southern Piedmont Small Floodplain and Riparian Forest
- Southern Ridge and Valley Calcareous Glade and Woodland
- Southern Ridge and Valley Seepage Fen
- Northern & Central Native Ruderal Forest
- Northern & Central Ruderal Wet Meadow & Marsh
- Southeastern Native Ruderal Flooded & Swamp Forest
- Southeastern Ruderal Wet Meadow & Marsh
- East Gulf Coastal Plain Large River Floodplain Shrubland
- East Gulf Coastal Plain Large River Floodplain Herbaceous
- East Gulf Coastal Plain Small Stream and River Floodplain Shrubland
- East Gulf Coastal Plain Small Stream and River Floodplain Herbaceous
- South-Central Interior Large Floodplain Shrubland
- South-Central Interior Small Stream and Riparian Shrubland
- South-Central Interior Large Floodplain Herbaceous
- South-Central Interior Small Stream and Riparian Herbaceous
- Southern Piedmont Small Floodplain and Riparian Herbaceous

The above EVT Names are chosen based on other variables (columns) within the Landfire EVT dataset. Specifically, EVT_CLASS was used to filter for habitats that are open while EVT_PHYS was used to ensure that the exotic-dominated habitats were not included since competition from other species including exotics pose problems for the Mohr's Barbara's Buttons. The EVT_PHYS column was also used to ignore agricultural habitats since the species does not occur on agricultural fields. Lastly, the remaining EVT Names are further filtered to remove any habitat types that are clearly very high dry habitats (e.g., some of the upland forests are not likely to be suitable).

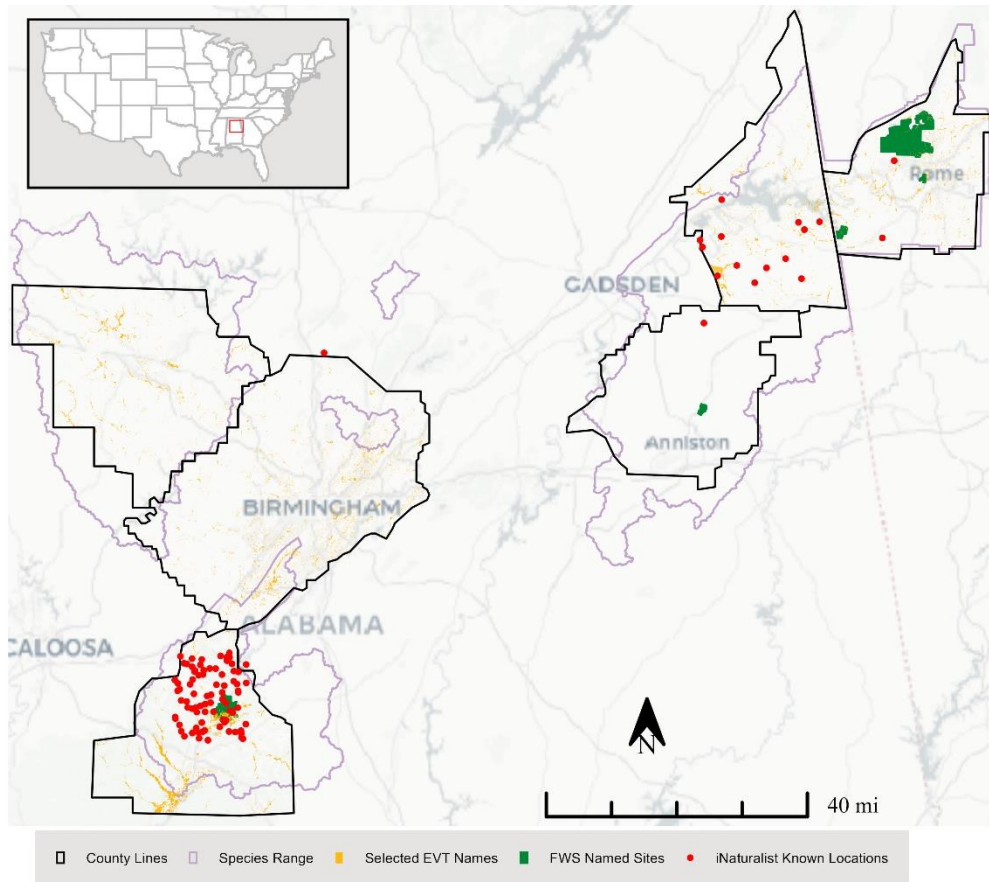


Figure A2.1. Map of all iNaturalist Occurrences, FWS Named Sites, and Preferred Habitat (Selected EVT Names)