Fringed Campion
(*Silene catesbaei* (= *polypetala*))

5-Year Review:
Summary and Evaluation

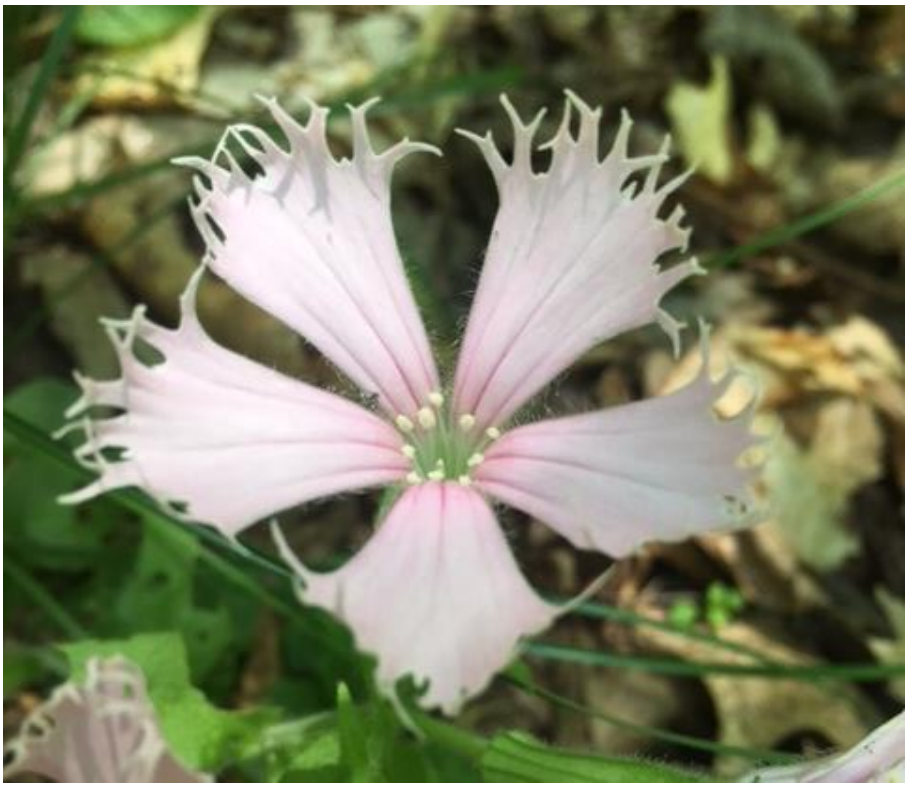

Photo Credit: U.S. Fish and Wildlife Service

August 2021

U.S. Fish and Wildlife Service
South Atlantic–Gulf and Mississippi Basin Regions
Georgia Ecological Services Field Office
Athens, Georgia

5-YEAR REVIEW

Species reviewed: Fringed campion (*Silene catesbaei* (=*polypetala*))

I. GENERAL INFORMATION

A. Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973 (ESA), as amended, the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. The United States Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the fringed campion to inform this status review. In conducting this 5-year review, we relied on the best available information pertaining to historical and contemporary distributions, life histories, genetics, habitats, and threats of this species. We announced initiation of this review and requested information in a published *Federal Register* notice with a 60-day comment period on March 25, 2020 (85 FR 16951). We received no public comments during the open comment period. We used a variety of information resources, including monitoring reports, surveys, and other scientific and management information. Specific sources included the final rule listing this species under ESA (56 FR 1932); peer reviewed scientific publications; unpublished field observations by Federal, State (Georgia Department of Natural Resources (GADNR) and Florida Natural Areas Inventory (FNAI)), and other experienced biologists; unpublished studies and survey reports; and notes and communications from other qualified individuals. We have not received significant new information since the last status review and the level of public interest is low and non-controversial; therefore, no peer review was conducted.

B. Reviewers

Lead Regional Office -- Contact name(s) and phone numbers: South Atlantic-Gulf Region, Carrie Straight, (404) 679-7226

Lead Field Office -- Contact name(s) and phone numbers: Georgia Ecological Services Field Office, Michele Elmore, (706) 613-9493

Cooperating Field Office(s) -- Contact name(s) and phone numbers: Vivian Negrón-Ortiz, Florida Ecological Services Field Office, Panama City (850) 348-3503

C. Background

1. **Federal Register Notice citation announcing initiation of this review:** March 25, 2020, 85 FR 16951

2. **Listing history**
   Original Listing
   Federal Register Notice: 56 FR 1932
   Federal Register Notice date: January 18, 1991
   Effective listing date: February 19, 1991
   Entity listed: *Silene polypetala*
   Classification: Endangered

3. **Associated rulemakings**
   N/A

4. **Review History**
   Each year, the Service reviews and updates listed species information for inclusion in the required Recovery Report to Congress. Through 2013, we did a recovery data call that included status recommendations such as "Stable, Decreasing, or Increasing" for this species. We continue to show the species status recommendation as part of our 5-year reviews. The most recent evaluation for the fringed campion was completed in 2015 as part of the 5-year status review (Service 2015).

   2015, 5-Year Review (70 FR 35689): Status of species was described as declining and did not recommend a change in status.

5. **Species' Recovery Priority Number at start of review:** 8
   Degree of Threat: Moderate
   Recovery Potential: High
   Taxonomy: Species

6. **Recovery Plan**
   Name of plan: No plan finalized
   Date issued: N/A

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

The ESA defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPSs to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable.

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?**
   No. We distributed the 1996 Technical/Agency Draft Recovery Plan for public comment (Service 1996). The Technical/Agency Draft Recovery Plan was revised in 2006 (Service 2006) based on public comments and included specific information on recovery criteria, however, we did not finalize and publish the plan. Recovery criteria

need to be reviewed to ensure they address population resiliency and species' representation and redundancy as a guide to prioritize management and protection of populations throughout the species' range to ensure long-term species viability. Therefore, this review will focus on new information on species status and recovery actions implemented since the last 5-Year Review (Service 2015).

C. Updated Information and Current Species Status

This section integrates relevant new information with information from the last status review for fringed campion (Service 2015). Detailed information on the species biology, life history, and habitat needs are outlined in the species' listing rule (Service 1991) and previous 5-year review (Service 2015).

1. Biology and Habitat

a. Summary of new information of species biology and life history:

Fringed campion is a perennial herb that forms evergreen rosettes connected by runners. The species flowers from late March to mid-May and fruits from April to June. Information on the life history and biology of fringed campion is very limited as described in the Technical Agency Draft Recovery Plan (Service 1996, 2006). While fringed campion can successfully reproduce vegetatively via stolons, there has been little documentation of sexual reproduction in the wild. Some factors reported that potentially limit sexual reproduction may be from reduced flowering due to low light conditions from high canopy cover (Birkhead and Ward 2015), competition from invasive plant species (Bowman Cutway 2019), herbivory of flowering stems by white-tailed deer (*Odocoileus virginianus*) (Bowman Cutway 2019), and pollen limitation (Birkhead and Ward 2015, Bowman Cutway 2019). Birkhead and Ward (2015) documented pollen limitation as a potential limiting factor for a fringed campion site that was established from cuttings. At this site, flowers that were hand pollinated produced more fruit than open pollinated flowers. Further, hand pollinated flowers produced more than 40 seeds per capsule while open pollinated flowers averaged three seeds per capsule. Pollen transfer may be limited because small, isolated populations of rare plant species often receive less pollinator visitation in comparison with larger populations or more widespread plant species (Ellstrand and Elam 1993). Pollinators for fringed campion are unknown and Birkhead and Ward (2015) suggest that fringed campion may require specialized pollinators. Bowman Cutway (2019) collected seeds and after applying several germination treatments only yielded a five percent germination rate. In addition, Bowman Cutway (2019) reported that half of the seed capsules collected had no seeds and those with seeds only had one to two seeds.

b. Abundance, population trends, demography:

Fringed campion continues to be known from approximately 44 sites (i.e., elemental occurrences or EOs) in Florida (11 sites) and Georgia (33 sites) (Table 1). These 44 sites include the 40 sites reviewed in the 2015 Five-Year Review with some sites merged into the same site (3 EOs merged into 1 in Florida). This

review documents three new sites for the species (1 in Florida, 2 in Georgia) and one new "safeguarding site" (in Georgia).

No comparable, long-term data exists to determine trends for the species; however, most sites (30 of 44 or 69 percent) have been re-visited since our 2015 Five-Year Review. Therefore, in this review, we provide an update to the viability table provided in the 2015 5-Year Review (Appendix A) with the most currently available data for each fringed campion site. We also present data on sites not previously reviewed. Overall, available habitat and population conditions continue to decline over much of the species' range. Key updates since our last review are summarized below.

Table 1. Summary of site information for fringed campion in Florida and Georgia. Some sites include multiple elemental occurrences. Number of protected sites in parentheses are extirpated sites. Site and elemental occurrence details can be found in Appendix A.

State	County	Number of Extant Sites	Number of Extirpated Sites	Number of Protected Sites
Florida	Gadsden	10	0	2
	Jackson	1	0	1
Georgia	Bibb	5*	1	1*
	Crawford	3	0	0
	Decatur	2	1	1(1)
	Houston	2	0	1
	Talbot	8	3	(2)
	Taylor	7	0	0
	Twiggs	2	0	0
	Upson	4	0	3
Total		44	5	9(3)

*One site in Bibb County is an outplanted, safeguarding site on protected land

Five sites are considered extirpated (or possibly extirpated), three of which were not previously reported as extirpated. In our last review we reported:

(1) (1a) Rivoli Lakes, Bibb County, Georgia; (1b) Colaparchee Creek, Bibb County, Georgia (GADNR EO 19); [In this review, we consider Rivoli Lakes and Colaparchee Creek sites in Bibb County, Georgia to be the same site (GADNR EO 19)], and
(2) Lumpkin Road, Talbot County, Georgia (GADNR EO 7) as extirpated.

Three new possibly extirpated sites include:

(3) Pobiddy Bridge Bluff, Talbot County, Georgia (GADNR EOs 1 & 9);
(4) Woodruff Dam Ravine 5, Decatur County, Georgia (GADNR EO 11); and
(5) Big Lazer Creek (GADNR EO 22).

Contributing factors to the decline and loss of these sites include small population sizes, timber harvest, erosion, urbanization, damage from feral hogs, fire, and severe habitat damage from Hurricane Michael.

At least 21 sites have experienced significant habitat degradation or steep reduction in abundance of fringed campion. Some of these sites were reported to have significant declines in our last review (Service 2015) and have declined further (8 sites), while additional sites have experienced declines since our last review (13 sites).

All Florida sites appear to have significant habitat damage (e.g., downed trees) from Hurricane Michael (October 2018). Most of these sites have not been revisited post-hurricane but significant habitat damage is apparent from aerial imagery. These sites include the 4 reported to be in decline in our last review (2015):

(1) Pope's Lake, Jackson County, Florida (FNAI EO 7);
(2) (2a) Nature Park Central, Gadsden County, Florida; (2b) Nature Park North, Gadsden County, Florida; (2c) Satsuma Road, Gadsden County, Florida (these 3 were merged into one EO, FNAI EO 9);
(3) River Road Site, Gadsden County, Florida (FNAI EO 8); and
(4) Selway Site, Gadsden County, Florida (FNAI EO 11).

In addition, the following Florida sites have also had significant habitat damage from Hurricane Michael and fringed campion is likely declining due to habitat impacts:

(5) Medical Pond, Gadsden County, Florida (FNAI EO 6);
(6) Powerline Site, Gadsden County, Florida (FNAI EO 1);
(7) Apalachicola River South, Gadsden County, Florida (FNAI EO 2);
(8) Dolan Road Site, Gadsden County, Florida (FNAI EO 5);
(9) Georgia Line Site, Gadsden County, Florida (FNAI EO 10);
(10) Southern Site, Gadsden County, Florida (FNAI EO 12); and
(11) Aspalaga Tract, Gadsden County, Florida (FNAI EO 13).

In Georgia, the following sites were in decline at the time of our last review (Service 2015) and have further declined since that time:

(12) Savage Branch/Winship Woods, Bibb County, Georgia; and
(13) Torreya Ravines, Decatur County, Georgia (GADNR EOs 3 & 12).

(14) The Woodruff Dam Ravines, Decatur County, Georgia (GADNR EO 11) and;
(15) Pobiddy Bridge Bluff, Talbot County, Georgia (GADNR EOs 1 & 9) are now possibly extirpated.

Additional Georgia sites that have declined include:

(16) Potato Creek Woods, Upson County, Georgia (GADNR EO 21);

(17) Potato Creek Woods North, Upson County, Georgia (GADNR EO 30);
(18) Pobiddy-Upson Ravines, Upson County, Georgia (GADNR EO 31);
(19) Mincey Tract, Taylor County, Georgia (GADNR EOs 27 & 36);
(20) Blackman Branch, Talbot County, Georgia (GADNR EO 5); and
(21) Baker Creek, Talbot County, Georgia (GADNR EOs 26 & 28).

In addition to Hurricane Michael, invasive plants, feral hogs, deer herbivory, and timber harvest contributed to the decline of these sites.

Eight sites are so small in size, occurring over less than two acres or have so few plants, that they have fair to poor estimated viability. These eight sites include the six reported in the 2015 review plus two additional sites in Florida:

(1) Dolan Road Site, Gadsden County, Florida (FNAI EO 5); and
(2) River Road Site, Gadsden County, Florida (FNAI EO 8).

The remaining sites, we reported as small in the previous 2015 review:

(3) Selway Site, Gadsden County, Florida (FNAI EO 11);
(4) Southern Site, Gadsden County, Florida (FNAI EO 12);
(5) Musella Woods, Crawford County, Georgia (GADNR EO 2);
(6) Dry Creek, Houston County, Georgia (GADNR EO 32);
(7) Oaky Woods, Houston County, Georgia (GADNR EO 29); and
(8) Big Lazer Creek, Talbot County, Georgia (GADNR EO 22).

There are five sites that were reported in the 2015 review as superior sites that appear to have significantly declined since that time. These sites have been impacted by feral hogs, fire, and timber harvests and include:

(1) Potato Creek Woods, Upson County, Georgia (GADNR EO 21);
(2) Pobiddy-Upson Ravines, Upson County, Georgia (GADNR EO 31);
(3) Mincy Tract, Taylor County, Georgia (GADNR EO 27 & 36);
(4) Baker Creek, Talbot County, Georgia (GADNR EO 26 & 28); and
(5) Blackman Branch, Talbot County, Georgia (GADNR EO 5).

There are three sites that were reported in the 2015 review as superior sites that have not been revisited, therefore the statuses are uncertain. Forest overstory conditions appear stable from examination of aerial imagery; however, impacts from invasive plants, hogs, and deer cannot been detected from aerial images and may be affecting these sites. These sites include:

(1) Powerline Site, Gadsden County, Florida (FNAI EO 1);
(2) Barfield Creek, Taylor County, Georgia (GADNR EO 14);
(3) Carsonville Powerline Woods, Taylor County, Georgia (GADNR EOs 15 & 18);

Remaining superior sites (i.e., excellent viability) where fringed campion was recently observed in what appears to be stable habitat [with few immediate threats] and seemingly stable qualitative abundance, occur at only five sites:

(1) Trillium Shoals, Taylor County, Georgia (GADNR EO 8);

(2) South Fork West, Talbot County, Georgia (GADNR EO 25); and
(3) Shellstone Creek, Twiggs County, Georgia (GADNR EO 33).

Recent surveys confirmed broader extents and low threats for the following two sites that are also considered stable with excellent to good viability:
(4) Tanyard Creek, Crawford County, Georgia (GADNR EO 35); and
(5) Damascus Church Ravines, Taylor County, Georgia (GADNR EO 4).

Three new fringed campion sites have been discovered and the extent of four sites have been found to be larger than previously reported. The three new sites include the Aspalaga Tract, Gadsden County, Florida (FNAI EO 13), that is located on protected land at the Torreya State Park. This site has experienced habitat damage from Hurricane Michael. Two new sites have been discovered in Georgia: Shellstone Creek, Twiggs County, Georgia and Flint River/Roberta, Crawford County, Georgia. Neither site has been assigned an EO number by GADNR. Shellstone Creek has good quality habitat with numerous plants. Fringed campion is known to occur at the Flint River/Roberta site, but no data are available on its condition.

Only nine sites are protected, and no protected site is considered to have very good to excellent viability. Three of the protected sites are considered extirpated, and the remaining protected sites have fair to poor viability or are declining (Table 1, Appendix A).

In summary, the abundance of fringed campion continues to decline range wide. Impacts from invasive plants and browsing from white-tailed deer continue to reduce viability at many sites. In addition, impacts from timber harvests, feral hogs, and severe storms (e.g., hurricanes) also appear to be negatively impacting fringed campion at multiple sites across its range. These emerging threats are further discussed below. Due to continued and increasing threats, fringed campion appears to be stable and in good to excellent viability at only five sites compared to 12 sites highlighted in the 2015 Five Year Review (Service 2015).

c. Genetics:
No new information.

d. Taxonomic classification or changes in nomenclature:
As documented in the 2015 5-year review, fringed campion was listed under the scientific name *Silene polypetala*. Since listing the specific epitaph has been changed from '*polypetala*' to '*catesbaei*' (Ward 2006). This change in nomenclature has been accepted by species experts and its acceptance is illustrated in Weakley's Flora of the Southeastern United States (Weakley 2020).

e. Distribution and trends in spatial distribution:
Fringed campion is historically and currently known from seven counties in Georgia and three counties in Florida (Figure 1) and are distributed within four

major river watersheds: the Apalachicola (13 sites), Chattahoochee (5 sites), Flint (15 sites) and Ocmulgee (10 sites plus 1 safeguarding site). Fringed campion is associated with drainage systems such as streams and ravines due to its mesic habitat requirements. Because these mesic habitats are in a matrix of upland dry sites, pine forest, and cleared lands, it is likely that fringed campion spread along drainage systems to arrive at its present distribution and that the populations in each watershed have diverged genetically from each other over time (Service 2006). Sites in Gadsden and Jackson County, Florida and Decatur County, Georgia are within the Apalachicola watershed. Sites in western Talbot County, Georgia are within the Chattahoochee watershed. Sites in eastern Talbot, Crawford, Taylor, and Upson counties, Georgia are within the Flint watershed. Sites in Bibb, eastern Crawford, Houston, and Twiggs counties, Georgia are within the Ocmulgee watershed.

Since listing, the spatial distribution of the species has been reduced with five extirpated or possibly extirpated sites occurring in three of the four watersheds (Table 1). Extirpated sites include one site in Decatur County, Georgia in the Apalachicola watershed, three sites in Talbot County, Georgia, within the Flint watershed, and one in Bibb county, Georgia in the Ocmulgee watershed. Several sites in the Chattahoochee watershed (western Talbot County, Georgia) have reduced extents due to severe habitat degradation from timber harvest. However, three new sites have been discovered, two in the Ocmulgee watershed: Flint River/Roberta, Crawford County, Georgia and Shellstone Creek/Mill Branch, Twiggs County, Georgia, and one in the Apalachicola watershed – Aspalaga Tract, Gadsden County, Florida. The Aspalaga Tract site extends the southern spatial extent of the species by about 2.4 kilometers (km) (1.5 miles (mi)).

f. Habitat or ecosystem conditions:

As discussed in the last status review, habitat quality appears to be gradually degrading for this species in many parts of its range. There have been no significant changes to habitat since the last review. A review of aerial imagery shows impacts to at least two sites in Florida caused by Hurricane Michael in October 2018.

g. Other:

In an effort to preserve genetic stock and allow for further research on pollination and seed production, plant material from several sites has been brought into *ex-situ* safeguarding with partner organizations. Plants are being propagated and maintained at approved nurseries using a combination of vegetative (cuttings) and sexual (seeds) reproduction approaches (Bowman Cutway 2019). In 2018 to 2019, one safeguarding site was outplanted in the wild, within the species' range (Bibb County, Georgia), on protected land at Ocmulgee Mounds National Heritage Preserve (see Appendix A). Seed banking efforts are also underway at the Atlanta Botanical Gardens with seeds collected in 2021 from the Tanyard Creek and Savage Branch sites (Service 2021).

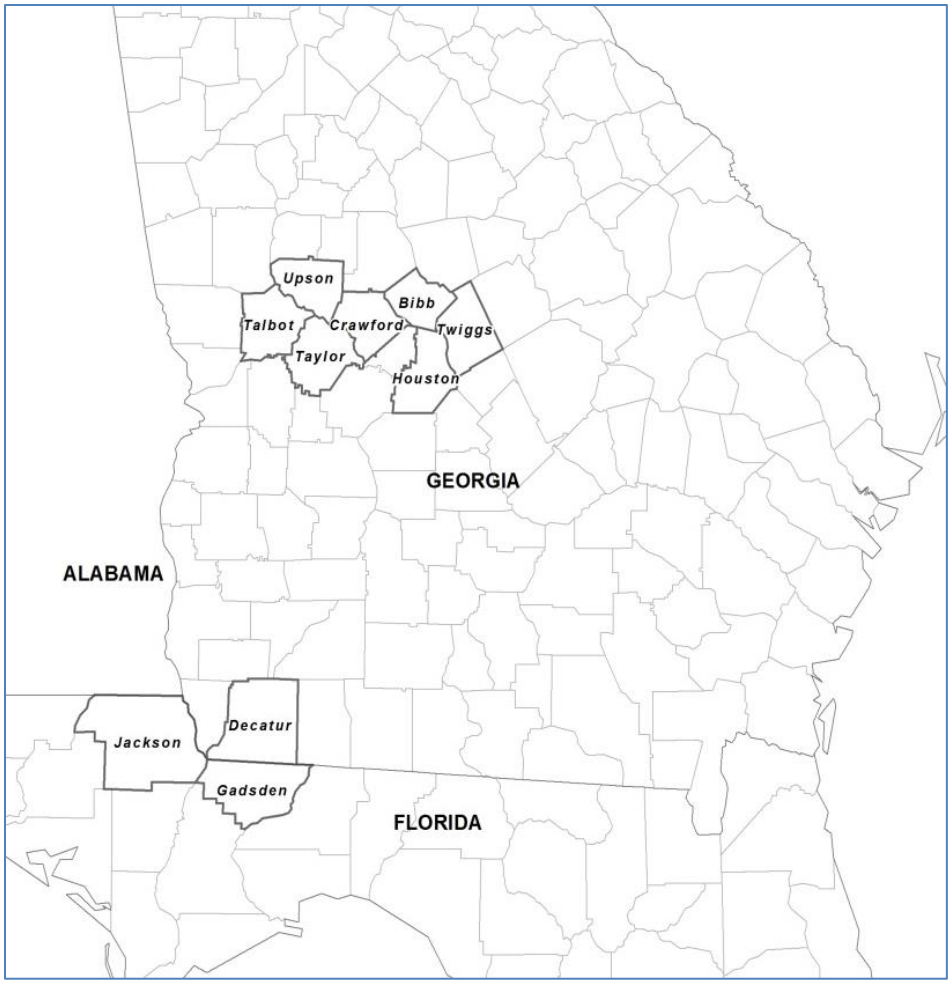

Figure 1: County distribution of fringed campion occurrence in northwest Florida and central and extreme southwest Georgia.

2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms):

The purpose of a 5-year review is to recommend whether a listed taxon continues to warrant protection under the ESA and, if so, whether it should be reclassified (from threatened to endangered or from endangered to threatened). This task requires that the analysis of the threats to the species be performed while assuming that the species is not receiving the regulatory protections, funding, recognition, and other benefits of ESA listing. Summaries of ongoing applications of ESA protections may shed light on some future activities that constitute threats to the species. However, the analysis under Factor D (Inadequacy of Existing Regulatory Mechanisms) focuses on the adequacy of existing alternative (i.e., non-ESA) mechanisms to address the continuing and foreseeable threats.

A detailed presentation of the species' threats and risk are assessed in both the final listing rule (Service 1991) and the last 5-year status review (Service 2015). Unless otherwise noted, all information in that review remains valid. Some details are

reemphasized below to indicate continued concerns or changes in threats since the last review.

a. Present or threatened destruction, modification or curtailment of its habitat or range:

The primary threats to fringed campion still include loss and disturbance of habitat through timber harvests, invasive species, and impacts related to urban development (Service 1991, 2015). Since the last review (Service 2015), Blackman Branch and Baker Creek sites in Talbot County, Georgia have been significantly degraded by hardwood forest removal where fringed campion was known to occur. Blackman Branch site was reported to be in excellent condition in 2015 but no plants were found in 2019 and timber harvest within and adjacent to the site was evident. The Baker Creek site was reported to be in excellent condition in 2015, however, in 2019 timber harvest was evident and fewer plants were found within a reduced extent (Appendix A). Timber harvest in close proximity to fringed campion habitat has also been documented at the Actinolite Bluff, in Bibb County, Georgia. Impacts from this harvest are unknown. Invasive plants continue to out-compete and negatively influence fringed campion viability. At least 13 sites have established nonnative, invasive plant species (Appendix A). As noted in the listing rule (Service 1991), encroachment of invasive species takes over habitats of species and is exacerbated by habitat fragmentation and disturbance.

Feral hogs (*Sus scrofa*), or evidence of them, have been increasingly documented across the range of fringed campion. Hogs can negatively affect almost all aspects of ecosystem structure and function (Jolley et al. 2010) and are known to have significant impacts to native plant communities both directly (through consumption) and indirectly through rooting and soil disturbance (Barrios-Garcia and Ballari 2012). Hogs can be extremely destructive to vegetation in hardwood forests where they root around and severely disturb the soil and ground cover over large areas (Edwards et al. 2013). Recent surveys (2017-2021) documented habitat damage from hogs in at least eight sites (Appendix A). One site (Mincy Tract) had extensive damage reported and hogs have been implicated in the decline in abundance at that site.

b. Overutilization for commercial, recreational, scientific, or educational purposes:

There is no indication that the species has ever been over-collected at any site for commercial, recreational, scientific, or educational purposes.

c. Disease or predation:

We have no information that disease is currently a concern for fringed campion. However, surveyors report that fringed campion continues to be negatively impacted by herbivory (browsing) from white-tailed deer (*Odocoileus virginianus*). Over the last century, white-tailed deer population numbers have increased substantially (Horsely et al. 2003). White-tailed deer can be a major

threat to endangered and threatened plants in the southeast United States (Miller et al. 1992) including impacts to species density, diversity, composition, and plant development (Horsely et al. 2003). Fringed campion are often browsed by deer and this herbivory can prevent reproduction of stems for the year. In addition, some individual plants may also be pulled from the ground during browsing. Deer herbivory is a persistent threat across the species' range and if not managed may have long-term impacts of species viability and persistence.

d. Inadequacy of existing regulatory mechanisms:
State laws do not restrict private landowners from any lawful activity that would modify or destroy threatened or endangered plants. Therefore, neither the Preservation of Native Plants of Florida Act nor the Georgia Wildflower Preservation Act has had a significant effect in minimizing habitat degradation or fragmentation on private lands, the primary threat to fringed campion. Fringed campion is state listed as endangered in Florida and therefore the Preservation of Native Plants of Florida Act confers some protections from collection without a permit or written permission. Fringed campion is state listed as endangered in Georgia and as such the Georgia's Wildflower Preservation Act of 1973 protects the species on any public lands from cutting, digging, pulling, or removing unless the GADNR has authorized such acts. Sites owned by the United States Army Corps of Engineers should be considered protected, although close communication with land managers is necessary to ensure fringed campion's needs are included in approved management protocols. The ESA prohibits deliberate removal of endangered plants from these areas, and all Federal agencies have a responsibility to conserve endangered plants. However, the ESA does not provide protection for plants on private lands unless it is in violation of state law.

e. Other natural or manmade factors affecting its continued existence:
Catastrophic events: Severe storm events can alter forest structure where fringed campion occurs. The Coastal Plain of the southeastern United States is vulnerable to extreme storm events, especially due to tropical storms and hurricanes. Hurricane force winds can blow down trees and greatly alter forest structure. Most fringed campion sites are more than 300 km (186 mi) inland and are largely buffered from the widespread effects of tropical storms and hurricanes. However, 15 of the 44 fringed campion sites are located in the Florida Panhandle and southwest Georgia (Gadsden, Jackson, and Decatur counties) and are approximately 90 km (145 mi) inland. This distance may also buffer effects of most tropical storms and hurricanes. However, in October 2018 Hurricane Michael made landfall near Mexico Beach, Florida as a category 5 hurricane. The storm tracked across these 15 sites into southwest Georgia. Review of field surveys and aerial imagery shows considerable impacts to the forest habitat (downed trees) to all 15 sites. Reduction of the forest canopy at these sites may increase the vegetative competition for fringed campion and the long-term persistence for the species at these sites is unknown. The effect of this disturbance has not been examined.

Climate change: Climate change may also influence the long-term viability of fringed campion. Within mixed hardwood forests where the species occurs, drought conditions due to higher temperatures and variable precipitation could reduce the available resources required for plant survival, increase the risk of negative effects from flooding and erosion, and limit the ability of fringed campion to produce viable seed and persist over time. Despite the recognition of climate effects on ecosystem processes, there is uncertainty within climate models about what the exact climate future for the southeastern United States will be, and there is uncertainty in how the ecosystems and species will respond. Although there are several potential risks associated with long-term climate change there is uncertainty regarding the how fringed campion will respond to these risks.

Fire: The influence of fire on fringed campion is uncertain. Several sites have experienced incidental fire from prescribed fires that burned into fringed campion habitat. Where fire burned into fringed campion habitat, the density of fringed campion appears to have decreased post-fire. Fringed campion is a shallowly rooted plant and may not be resilient to the effects of fire. The long-term impacts of natural or prescribed fire still need to be assessed for the species.

D. Synthesis

Fringed campion continues to be threatened with extinction throughout its range. Few sites (12 of 44) occur on protected property (federal, state, or private owned conservation lands), three of these are considered extirpated, and no protected site is considered to have "very good to excellent" viability. The remaining protected sites have declined or have uncertain statuses. Since the last review three new sites were discovered and one safeguarding site was established, however, this increase was offset by three sites that were previously considered extant being placed in the extirpated or possibly extirpated categories. Across the range, the species continues to face serious threats from nonnative, invasive plant species and incompatible timber harvests. Several sites have been severely impacted by timber harvests within and adjacent to fringed campion habitat. Additionally, new and increasing threats include impacts from feral hogs, widespread severe storms (e.g., hurricanes), and fire.

Although a few new sites have been found since our last 5-Year Review (Service 2015), many sites have significantly declined due to continuing and increasing threats and few conservation efforts have been implemented to abate these threats or provide long-term protections for the species. Therefore, fringed campion continues to meet the definition of endangered and no change in status is recommended at this time.

III. RESULTS

A. Recommended Classification:

_X_ No change is needed

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Activities:

1. Update and finalize the Technical/Agency Draft Recovery Plan (Service 1996, 2006), incorporating population resiliency and species' representation and redundancy into recovery criteria.
2. Revisit and assess all known sites for viability and other population variables at least every two years.
3. Promote and fund long-term population and/or demographic monitoring projects through partnerships.
4. Develop and implement conservation plans for populations on protected lands to improve long-term viability at these sites.
5. Protect additional sites to increase redundancy of protected sites across all four watersheds (Apalachicola, Chattahoochee, Flint, and Ocmulgee). Formal conservation agreements and conservation easements with private landowners may also be effective conservation tools.
6. Standardize long-term monitoring protocols to be used range-wide to track progress toward recovery.
7. Fund and implement long-term management at priority (recovery) sites to abate threats from nonnative, invasive plants, feral hogs, and white-tailed deer.
8. Work with private landowners and the forestry industry to encourage best management practices (e.g., appropriately sized habitat buffers) for forestry and agricultural land uses to protect fringed campion habitat.
9. Identify sites within the species range for establishment of new sites and/or population augmentation.
10. Preserve genetic stock using various approaches such as seed banking and *in situ* and *ex situ* safeguarding.
11. Develop and distribute public educational materials supporting fringed campion recovery.
12. Formally adopt the change in nomenclature of fringed campion to *Silene catesbaei* by publishing a notice in the *Federal register* to change the listed entity name in 50 CFR 17.12.

Research:

1. Expand knowledge of basic ecology and demography of fringed campion such as pollination ecology and seed viability studies.
2. Expand genetic studies to further evaluate genetic diversity of the species across the range.
3. Monitor and study the long-term effects of habitat alteration from hurricanes (storms) at sites affected by Hurricane Michael.

4. Develop habitat and species distribution models to guide habitat protection efforts and guide searches for new sites in the field.
5. Implement studies to evaluate the effectiveness of deer and hog exclosures.
6. Refine population and representation (recovery) units, as appropriate, using results from ecological, demographic, and genetic research.

V. REFERENCES

Barrios-Garcia, M.N. and S.A. Ballari. 2012. Impact of wild boar (*Sus scrofa*) in its introduced and native range: a review. Biological Invasions (14)11: 2283-2300.

Birkhead, R. and Ward, C. 2015. Pollen limitation in *Silene polypetala*. Tipularia. The Journal of the Georgia Botanical Society. 30:25-30.

Bowman Cutway, H. 2019. Fringed Campion: Conservation and Reintroduction of a Federally Endangered Species. Tipularia. The Journal of the Georgia Botanical Society. 43: 25-29.

Edwards, L., J. Ambrose, and L.K. Kirkman. 2013. The Natural Communities of Georgia. University of Georgia Press.

Ellstrand, N.C. and D.R. Elam. 1993. Population genetic consequences of small population size: implications for plant conservation. Annual Review of Ecology and Systematics: 217-242.

Florida Natural Areas Inventory (FNAI). 2021. *Silene polypetala* (*catesbaei*) EO data updates for Florida. Unpublished data. Received May 4, 2021.

Horsely, S.B., S.L. Stout, and D.S. DeCalesta. 2003. White-tailed deer impact on the vegetation dynamics of a northern hardwood forest. Ecological Applications 13(1): 99-118.

Jolley, D.B. S.S. Ditchkoff, B.D. Sparklin, L.B. Hanson, M.S. Mitchell, and J.B. Grand. 2010. Estimate of herpetofauna depredation by a population of wild pigs. Journal of Mammalogy 91: 519-524.

Klaus, J.M. 2019. Fringed Campion (*Silene catesbaei*) population monitoring at high-priority sites in south and central west Georgia. Unpublished report to Georgia Department of Natural Resources. June 2019. 20 pp.

Klaus, J.M. 2020. Fringed Campion (*Silene catesbaei*) population monitoring at high-priority sites in south and central west Georgia. Unpublished report to Georgia Department of Natural Resources. June 2020. 15 pp.

Miller, S.G., S.P. Bratton, and J. Hadidian. 1992. Impacts of White-tailed Deer on Endangered and Threatened Vascular Plants. Natural Areas Journal 12(2): 67–74.

U.S. Fish and Wildlife Service. 1991. Endangered and Threatened Wildlife and Plants; Endangered Status for the Plant *Silene polypetala* (Fringed campion). Federal Register. Volume 56, No. 13: 1932-1936.

U.S. Fish and Wildlife Service (Service). 1996. Technical/Agency Draft Recovery Plan for Fringed Campion *Silene polypetala* (Walt.) fern. & Schub. Atlanta, Georgia. 32 pp.

U.S. Fish and Wildlife Service (Service). 2006. Technical/Agency Draft Recovery Plan for *Silene polypetala* (Fringed campion). Unpublished report, on file USFWS, Athens, Georgia. Draft dated May 2006. 51pp.

U.S. Fish and Wildlife Service (Service). 2015. Five-Year Review: Summary and Evaluation. Fringed Campion. *Silene catesbaei* (Walter) Formerly *Silene polypetala* (Walter) Fernald & Shubert. 26pp.

U.S. Fish and Wildlife Service (Service). 2021. Electronic mail (email) record, dated 7/2/2021 from Jason Ligon, Seed Bank Coordinator, Atlanta Botanical Garden and Heather Bowman Cutway, Professor, Mercer University to Michele Elmore, Biologist, Service.

Ward, D.B. 2006. *Silene catesbaei*, Rather than *Silene polypetala*, the Correct Name of the Endangered Fringed Catchfly. Castanea 71: 324-329.

Weakley, A.S. 2020. Flora of the southeastern United States. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, NC. https://ncbg.unc.edu/research/unc-herbarium/floras/

U.S. FISH AND WILDLIFE SERVICE
5-Year Review of Fringed Campion (*Silene catesbaei* (=*polypetala*))

Current Classification: Endangered.

Recommendation resulting from the 5-Year Review:

___ **Downlist to Threatened**
___ **Uplist to Endangered**
___ **Delist**
_X_ **No change needed**

Review Conducted By: Michele Elmore, Georgia Ecological Services Field Office.

FIELD OFFICE APPROVAL:

Field Supervisor, Georgia Ecological Services Field Office, Fish and Wildlife Service

Approve PETER MAHOLLAND Digitally signed by PETER MAHOLLAND Date: 2021.08.17 17:33:58 -04'00' Date _____

* Since 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.

APPENDIX A: Summary of Fringed campion sites with updated population, habitat, threats, and viability information since the last 5-Year Review (Service 2015). Protected sites are in **bold type** and extirpated (or possibly extirpated) sites are gray filled cells.

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Powerline Site, FNAI EO#1	FL	Apalachicola	Gadsden	1982/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Good, Possibly declining)
Apalachicola River South/203 Bluff Site, FNAI EO#2	FL	Apalachicola	Gadsden	1982/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Good, Possibly declining)
Satsuma Road/Satsuma Road West; FNAI EO#3 (merged with EO#9) PROTECTED ANGUS GHOLSON NATURE PARK	**FL**	**Apalachicola**	**Gadsden**	**1956/2006**	**See EO 9**	**Merged with EO 9**	**N/A**

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Angus K Gholson Nature Park/Nature Park Central, FNAI EO#4 (merged with EO#9) PROTECTED ANGUS GHOLSON NATURE PARK	**FL**	**Apalachicola**	**Gadsden**	**1970s/2006**	**See EO 9**	**Merged with EO 9**	**N/A**
Dolan Road Site, FNAI EO#5	FL	Apalachicola	Gadsden	1982/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Fair, Possibly Declining)
State Hospital Pond/Medical Pond, FNAI EO#6	FL	Apalachicola	Gadsden	1982/2010	2 patches, 25-50 vegetative plants observed	Minimal threats observed in 2006. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Fair, Likely Declining)
Apalachicola River West/Pope's Lake, FNAI EO#7 PROTECTED ARMY CORP OF ENGINEERS	**FL**	**Apalachicola**	**Jackson**	**1937/2019**	**7 plants in flower, uncertain if non-flowering plants were observed**	**Habitat heavily damaged by Hurricane Michael with increased sunlight and damaged trees (FNAI 2021)**	**Unknown (Fair, Likely Declining)**

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
G Hill Bluff/River Road Site, FNAI EO#8	FL	Apalachicola	Gadsden	2001/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Fair, Possibly Declining)
Nature Park North, FNAI EO#9 (EOs 3 and 4 part of 9) PROTECTED ANGUS GHOLSON NATURE PARK	**FL**	**Apalachicola**	**Gadsden**	**2000/2021**	**Plants are scattered in many places in this area as small clusters of healthy plants. EOs 3 and 4 have been merged into this EO**	**No new substantial data since last review, however, reports from public in 2021 confirmed flowering plants. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)**	**Unknown (Fair, Likely Declining)**
Georgia Line Site, FNAI EO#10	FL	Apalachicola	Gadsden	2006/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Good, Possibly Declining)
Selway Site, FNAI EO#11	FL	Apalachicola	Gadsden	2006/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Fair, Possibly Declining)

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Southern Site, FNAI EO#12	FL	Apalachicola	Gadsden	2006/2006	No new information	No new data since last review. Aerial imagery shows site has extensive impacts to forest overstory from Hurricane Michael (October 2018). Current condition of EO and site is unknown (FNAI 2021)	Unknown (Fair, Possibly Declining)
Aspalaga Tract, FNAI EO# 13 PROTECTED TORREYA STATE PARK	**FL**	**Apalachicola**	**Gadsden**	**2018/2019**	**14 flowering plants on lower portion of slope**	**High quality slope forest. Heavily damaged by Hurricane Michael (October 2018) (FNAI 2021)**	**Good**
Woodruff Dam Ravine 5, GADNR EO#11 PROTECTED ARMY CORP OF ENGINEERS	**GA**	**Apalachicola**	**Decatur**	**1988/2020**	**No plants detected (Klaus 2020)**	**Hurricane Michael caused significant damage in October 2018. Numerous large canopy trees were on the ground directly covering the former location of *S. catesbaei* plants. Groundcover was mostly intact within the habitat, but in large canopy gaps *Vitis spp.* and other weedy species were becoming rank. Several patches of *Ardisia crenata* occurred in and near the habitat**	**Possibly Extirpated**

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Woodruff Dam Ravine 1&2/Torreya Ravines, GADNR EO#3, 12 <u>PROTECTED</u> ARMY CORP OF ENGINEERS	**GA**	**Apalachicola**	**Decatur**	**1938/2020**	**No plants detected (Klaus 2019)**	**Hurricane Michael caused significant damage in October 2018. Numerous large canopy trees were on the ground directly covering the former location of *S. catesbaei* plants. Groundcover was mostly intact within the habitat, but in large canopy gaps *Vitis spp.* and other weedy species were becoming rank. Several patches of *Ardisia crenata* occurred in and near the habitat (Klaus 2020)**	**Fair to Poor, Declining**
Blackman Branch, GADNR EO#5	GA	Chattahoochee	Talbot	1979/2019	No plants detected (Klaus 2019)	Site condition is extremely degraded. It is apparent on the ground and from satellite imagery that the EO location was targeted for hardwood harvest sometime between 2009-2011. All mature hardwoods between upland pine plantation and the streamside management zone were removed. Midstory re-growth consists of dense, nearly impenetrable, low-quality hardwoods, with *Arundinaria* sp., and *Rubus* sp. in some areas. No suitable habitat remains at this location (Klaus 2019)	Poor, Declining

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Eastern tributary to South Fork Upatoi Creek (merged with EO#5)	GA	Chattahoochee	Talbot	2010/2020	5 rosettes detected (Klaus 2020)	Timber harvest. A buffer around *S. catesbaei* *habitat* (e.g., buffer at ravine rims) would be beneficial to prevent changes to upland-ravine runoff patterns, acidification of soil, light regime and invasion by off-site and invasive species (Klaus 2020)	Good to Fair
Dry Creek (merged with EO#5)	GA	Chattahoochee	Talbot	2010/2020	42 rosettes detected. unique habitat in places, especially where *S. catesbaei* is hanging from nearly vertical walls of side drains (Klaus 2020)	Timber harvest. A buffer around *S. catesbaei* *habitat* (e.g., buffer at ravine rims) would be beneficial to prevent changes to upland-ravine runoff patterns, acidification of soil, light regime and invasion by off-site and invasive species (Klaus 2020)	Good to Fair
GADNR EO#23	GA	Chattahoochee	Talbot	1998/NA	No Information	No Information	No Information
South Fork East, GADNR EO#24	GA	Chattahoochee	Talbot	1998/2020	12 rosettes detected (Klaus 2020)	Habitat is relatively intact but would benefit from more of a buffer between timber harvest boundary and ravine rims. High quality habitat with other rare and interesting species including *Croomia pauciflora, Panax quinquefolius, Chamaelirium luteum, Actaea racemosa, Trillium vaseyi* and *Magnolia acuminata* (Klaus 2020)	Good, Possibly Declining

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
South Fork West & Jack Branch, GADNR EO#25.	GA	Chattahoochee	Talbot	1998/2019	Several patches, many rosettes and flowers. Diverse, intact, high-quality habitat. Extent of EO found to be larger with survey of Jack Branch containing 14 patches, more than 650 rosettes with many flowering (Klaus 2019)	South Fork West - No immediate threats observed. Bluffs are very steep making much of it difficult to access by feral hogs and deer. Jack Branch - Some hog disturbance and invasive plants noted (*Lonicera japonica*). Upslope forestry activities (erosion, minimal BMPs) and trampling from foot traffic are threats (Klaus 2019)	Excellent, Stable
Baker Creek, GADNR EO#26,28	GA	Chattahoochee	Talbot	1998/2019	8 patches, about 370 rosettes many with flowers. Number of patches and rosettes reduced from 2015 review data (Klaus 2019)	Both EOs have been significantly impacted by hardwood forest removal. Habitat is no longer suitable at EO 26 and about a 2.5 acre of suitable habitat remains at EO 28 where the plants were observed. Disturbance from foot traffic from hunting also noted (Klaus 2019)	Fair to Poor, Declining
Musella Woods, GADNR EO#2	GA	Flint Upper	Crawford	1970/2021	3 rosettes	Habitat appears good, no signs of recent disturbance but significant decline of *Silene* abundance (Hal Massie pers. Obs.)	Poor, Declining

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Damascus Church Ravines, GADNR EO#4	GA	Flint Upper	Taylor	1987/2021	15 patches, 392 rosettes, no flowers. The extent of this EO was found to be larger than previous surveys (Bowman Cutway 2021)	Deer herbivory present. Prescribed fire nearby site.	Good, Stable
Tributary of Little Patsiliga Creek/Prattsburg Flatwoods, GADNR EO#6	GA	Flint Upper	Taylor	1979/2014	No new information	No new information	Unknown (Fair to Poor?)
Lumpkin Road/Patsiliga Creek, GADNR EO#7	GA	Flint Upper	Talbot	1981/2013	No new information	No new information	Possibly extirpated
Fickling Mill/Flint Ravine/Trillium Shoals, GADNR EO#8	GA	Flint Upper	Taylor	1979/2020	More than 400 rosettes detected (Klaus 2020)	Significant issues with invasive species on this property, especially *Citrus trifoliata*, but the most densely invaded areas are near old fields and in the ravine heads, although there were scattered plants near to *S. catesbaei* locations (Klaus 2020)	Excellent to Good, Stable
Barfield Creek, GADNR EO#14	GA	Flint Upper	Taylor	1989/2006	No new information	No new information	Unknown (Excellent?)

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Beaverpond Bluff, GADNR EO#16	GA	Flint Upper	Taylor	1989/2006	No new information	No new information	Unknown (Very Good?)
US 19/US 80 Woods, GADNR EO#20	GA	Flint Upper	Upson	1993/1995	No new information	No new information	Unknown
Potato Creek Woods, GADNR EO #21 PROTECTED BIG LAZER WILDLIFE MANAGEMENT AREA (LEASED)	**GA**	**Flint Upper**	**Upson**	**1996/2019**	**A single rosette, with flower stalks was detected by two searchers searching for 120 minutes (Klaus 2019)**	**The habitat and surrounding area had evidence of feral hog activity and evidence that fire had moved significantly downslope (Klaus 2019)**	**Fair?, Declining**
Big Lazer Creek, GADNR EO#22 PROTECTED BIG LAZER WILDLIFE MANAGEMENT AREA	**GA**	**Flint Upper**	**Talbot**	**1980s/2019**	**No plants detected (Klaus 2019)**	**Despite the presence of relatively intact appropriate habitat, no plants were detected by two searchers searching for 140 minutes. Erosion and disturbance from an old logging road may have had some impact on habitat, and there was evidence of feral hog activity within the habitat and fire on the lower slopes (Klaus 2019)**	**Possibly Extirpated**

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Potato Creek Woods North, GADNR EO# 30 PROTECTED BIG LAZER WILDLIFE MANAGEMENT AREA (LEASED)	**GA**	**Flint Upper**	**Upson**	**2003/2017**	**11 patches, 186 rosettes, 1 flower stalks (Bowman Cutway 2021)**	**Deer browse. Plants were negatively impacted from a 2012 fire, extent of impacts not known but some plants still found within burned area. No fire since 2012**	**Good to Fair, Declining,**
Pobiddy—Upson Ravines, GADNR EO#31 PROTECTED BIG LAZER WILDLIFE MANAGEMENT AREA (LEASED)	**GA**	**Flint Upper**	**Upson**	**2003/2019**	**Six patches with about 70 rosettes, some flowering. Small area (~30 m^2) occupied (Klaus 2019)**	**Feral hogs, erosion and invasive plants (*Microstegium viminium*) documented at site (Klaus 2019)**	**Good to Fair, Declining**

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Pobiddy Bridge Bluff, GADNR EO#1, 9 <u>PROTECTED</u> PRIVATE CONSERVATION EASEMENT	**GA**	**Flint Upper**	**Talbot**	**1946/2019**	**No plants detected (Klaus 2019)**	**Repeated human disturbance and prescribed fires in *S. catesbaei* habitat. The site is highly disturbed by road reconstruction (as noted previously by others) and general highway right-of-way and river-access activity. Additionally, it appears that prescribed fire has been infiltrating habitat or burning in an unnatural manner, likely due to invasion of pine from adjacent planted pine areas. Dense areas of *Callicarpa americana* on the upper 1/3 of the slope (Klaus 2019)**	**Possibly extirpated**
Carsonville Powerline Woods, GADNR EO#15, 18	GA	Flint Upper	Taylor	1989/2006	No New Information	No New Information	Unknown (Excellent?)
Mincey Tract GADNR EO#27, 36	GA	Flint Upper	Taylor	2010/2019	3 patches, 4 plants, and no flowers (Klaus 2019)	Evidence of deer herbivory and extensive, intense feral hog activity. Overstory was high-quality and many *S. catesbaei*-associated species were present. Some native plants such as *Galium* aparine had become rank bordering on noxious, likely due to feral hog disturbance (Klaus 2019)	Fair to Poor, Declining

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Beaverdam Creek (Kentuck Downs), GDNR EO#10	GA	Ocmulgee	Bibb	1988/2021	No plants detected at original EO location (Bowman Cutway 2019). Plants found in vicinity. 7 patches, 174 rosettes, 4 flower stalks. In a small area, separated from a backyard by creek (Bowman Cutway 2021)	Original EO location data uncertain. Invasives like *Elaeagnus* and *Lonicera*, but also mature hardwoods and rivercane. Could be worth searching again, but population isolated and developed. Other plants found in vicinity, forest in good condition, invasives present, but not overrunning the area. Unlikely to be developed, but possible impacts from right-of-way and horse trail. Additional surveys needed (Bowman Cutway 2019, 2021)	Unknown (Good to Fair?)
Rivoli Lakes, Colaparchee Creek, GADNR EO#19	GA	Ocmulgee	Bibb	1980s/2014	No new information	Private ownership in heavily developed area, invasive plants.	Extirpated
Oaky Woods WMA, GADNR EO#29 <u>PROTECTED</u> OAKY WOODS WILDLIFE MANAGEMENT AREA	**GA**	**Ocmulgee**	**Houston**	**2005/2019**	**No plants located, but worth looking more since it is protected habitat (Bowman Cutway 2021)**	**Hog damage**	**Poor, if plants are still there**

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Shellstone Creek, GADNR EO#33	GA	Ocmulgee	Twiggs	2005/2021	Excellent estimated viability. Patrick and Bowling noted 4 large patches where Little Shellstone Creek and Shellstone Creek meet (2017) 9 patches, 436 rosettes, 85 flower stalks -- located 3 large patches along Little Shellstone Creek (Bowman Cutway 2021)	Some hog damage. Armadillos (Bowman Cutway 2021)	Excellent, Stable
Actinolite Bluff, GADNR EO#34	GA	Ocmulgee	Bibb	2006/2006	Good estimated viability 19 patches, 444 rosettes, 77 flower stalks	Portions of the habitat have been clear-cut, ravines were not cleared. Impacts of clearcutting are unknown. Site needs to be resurveyed post timber harvest	Good, Stable?

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Tanyard Creek, GADNR EO#35	GA	Ocmulgee	Crawford	2013/2021	Excellent viability, 31 patches, 935 rosettes, 268 flower stalks. Population continues down slope, on other side of creek and new plants discovered in 2021 across HWY 341	Based on monitoring population size underestimated in 2013, several years of strong flowering, seeds will be collected in 2021 for ABG. On west side of HWY 341, relatively small area where plants are located, herbivory of lower stalks, Lonicera japonica present, several plants with rounder leaves possibly unique diversity (Bowman Cutway 2021)	Excellent, Stable
Savage Branch and Winship Woods, GADNR EO#13, 17	GA	Ocmulgee	Bibb	1987/2021	Fair viability, 15 patches of plants, 354 rosettes and 85 flower stalks. (Bowman Cutway 2021)	Property off Lee Rd. only. Well maintained by owners, but invasives (*Hedra helix*) common throughout ravine. Could be impacted if not maintained	Fair, Declining
Flint River/Roberta	GA	Ocmulgee	Crawford	2017/2017	No information	Presence of *Silene* confirmed, but no data are available	Unknown
Shellstone Creek/Mill Branch	GA	Ocmulgee	Twiggs	2017/2021	First observed by Patrick and Bowling 2017, Revisited in 2021, 20 patches, 424 rosettes, 47 flower stalks on ridge and near creek (Bowman Cutway 2021)	Quality site but does have hog damage (Bowman Cutway 2021)	Good

Site Name & EO numbers	State	Watershed	County	First/Last Observed Year	Updated Population Vigor or Size	Updated Specific Habitat & Threats	Updated Estimated Viability and Trend
Dry Creek, GADNR EO#32	GA	Ocmulgee	Houston	2003/2021	Could not locate plants 2021 (Bowman Cutway 2021)	Fairly good forest condition	Fair, Declining
Ocmulgee Mounds NHP <u>PROTECTED</u> OCMULGEE MOUNDS NATIONAL HERITAGE PRESERVE	**GA**	**Ocmulgee**	**Bibb**	**2018/2021**	**Safeguarding site outplanted in 2018 and 2019. 14 patches, 105 rosettes, 49 flower stalks (Bowman Cutway 2021)**	**3 locations were planted at Ocmulgee Mounds NHP. One of the 3 locations (one closest to creek) did not survive (Bowman Cutway 2021)**	**Safeguarding Site**