Technical/Agency Draft
Recovery Plan
For
Fringed Campion
(*Silene polypetala*)

TECHNICAL/AGENCY DRAFT RECOVERY PLAN FOR FRINGED CAMPION, *SILENE POLYPETALA* (WALT.) FERN. & SCHUB.

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EXECUTIVE SUMMARY

CURRENT STATUS: *Silene polypetala* (fringed campion) is listed as an endangered species. It is known to be extant at only 26 locations, 19 in central and southwest Georgia and 7 near the Apalachicola River in Florida.

HABITAT REQUIREMENTS AND LIMITING FACTORS: This species inhabits hardwood bottoms and ravines in a very limited geographic range. As a result, it was probably comparatively rare even before the time of European contact. The greatest threat to this forest species is the progressive alteration or degradation of its habitat due to logging. The resultant increased sunlight, lack of replenishment of the humus layer, and growth of aggressive exotic weeds such as Japanese honeysuckle, act in concert to eliminate this species. Also, sexual reproduction is impacted by browsing of flowering stems by deer.

RECOVERY OBJECTIVES: Reclassification of *Silene polypetala* to threatened and eventual delisting.

RECOVERY CRITERIA: Reclassification of *Silene polypetala* to threatened will be considered if 10 viable and geographically distinct populations are protected from foreseeable threats. Delisting of *Silene polypetala* will be considered if 20 of the known populations (including at least 16 in Georgia and 4 in Florida) are protected. Population viability should be confirmed through periodic monitoring for at least a 10-year period (including at least 5 years of monitoring after delisting).

ACTIONS NEEDED:

1. Protect populations.
2. Preserve genetic stock from acutely threatened populations.
3. Monitor populations to determine trends and developing threats.
4. Control exotic pest plants.
5. Search for additional populations.
6. Reestablish fringed campion at protected locations, if necessary.
7. Manage sites to maintain and/or enhance populations.

ESTIMATED COST OF RECOVERY: The cost of implementation of tasks over the next three years, for which cost estimates have been made, totals $59,000. There will be ongoing costs for maintaining germplasm in cultivation, monitoring wild populations, landowner contact, establishment of new populations, and possibly control of exotic pest plants. Continuing conservation efforts could cost at least $10,000/year for a decade.

DATE OF RECOVERY: Impossible to determine at this time.

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PART I. INTRODUCTION

A. BACKGROUND

On January 18, 1991, the U.S. Fish and Wildlife Service (1991) published in the Federal Register a final rule determining *Silene polypetala* (Walt.) Fern. & Schub. (fringed campion) to be an endangered species under the Endangered Species Act of 1973, as amended. The species is restricted to the western Piedmont of Georgia and a small area of the Gulf Coastal Plain in Georgia and Florida where the Flint and Chattahoochee Rivers meet to form the Apalachicola River. It is known from only about 26 sites[1].

Silene polypetala was described in 1788 by Thomas Walter as *Cucubalus polypetalus*. The name of the original collector is not known, but the locality was in central Georgia (Walter 1788). The species was subsequently collected by William Baldwin. In 1818 Thomas Nuttall, unaware of the identity of Walter's species, used Baldwin's collections as the basis for a new species, *Silene baldwynii*. Baldwin's specimen was said by Nuttall (1818) to have come from the banks of Flint River, Florida [sic], most likely in present day Taylor or Talbot County, Georgia. The name *Silene baldwynii*, or as later corrected, *S. baldwinii*, was universally employed for fringed campion for many years, as the exact nature of Walter's *Cucubalus* remained unclear. The original material in Walter's herbarium, which formed the basis for the new plants he described in his *Flora Caroliniana*, was early on lost to science. However, a number of fragments, including one of *Cucubalus polypetalus*, found their way into a folio volume of some 117 pages, preserved at the British Museum (Fernald and Schubert 1948). Finally, 130 years after Walter described the plant, Fernald & Schubert (1948) published a photograph of the Walter material of *Cucubalus polypetalus* alongside a photograph of pressed material of the nearly-as-obscure *Silene baldwinii*. Concluding that Walter's plant was the same species as *Silene baldwinii*, they published the name accepted ever since, *Silene polypetala* (Walt.) Fern. & Schub.

Brief History of the Species:

1788 Thomas Walter publishes new species, *Cucubalus polypetalus*, presumably from near the Flint River (Walter 1788, Faust 1981).

1818 Thomas J. Nuttall publishes the name *Silene baldwynii*, based on Baldwin's collection from the banks of the Flint River (Nuttall 1818). Subsequent collections until 1948 routinely given this name. This is the name used in the manual by Small (1933).

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[1] For purposes of this report, a site for *Silene polypetala* is an occurrence of the plant separated, so far as known, from others of the species by at least 0.5 km.

1821 William Baldwin, probably unaware that Nuttall had already named the plant, described it again as *Silene fimbriata* Baldw.; the name is invalid in any event, as it had already been used by Sims for a different species in 1808 (Hitchcock and Maguire 1947).

1843 Ferdinand Rugel collects species near Aspalaga, Florida (*Rugel s.n.* [NY])[2].

18?? A. W. Chapman collects species in Gadsden County, Florida (specimens at NY, FLAS)(Faust 1981). Collections in Gadsden and neighboring Jackson counties continue with A. H. Curtiss (late 19th century) and H. H. Hume (1935-37)(*Curtiss 286* [NY, FLAS]; *Hume s.n.* [FLAS 10522, 13127, 13128]).

1868 Paul Rohrbach, monographer of the genus, places the species in *Melandrium*, a segregate genus from *Silene* not maintained today: *Melandrium baldwinii* (Nutt.) Rohrb. (Hitchcock & Maguire 1947).

1894 Miss Eliza Frances Andrews collects species in the vicinity of Macon, Bibb County, Georgia (*Andrews s.n.* [AUA]).

1938 Rogers McVaugh and Joseph Pyron discover Decatur County, Georgia population (*McVaugh & Pyron 2259* [GA]).

1946 Wilbur H. Duncan collects the species in Talbot County, Georgia, probably near the type locality (*Duncan 6261* [GA]).

1947 C. Leo Hitchcock and Bassett Maguire publish their taxonomic revision of the North American species of *Silene*, which included localities for the species in Levy and Dixie counties, Florida, near the Suwannee River. Robert Kral (in litt.[3] to R. Altevogt, Fish and Wildlife Service, 1977) thought these localities were probably mistaken. A search of the herbarium of the New York Botanical Garden (where Maguire worked) failed to locate any specimens from this area (W. W. Thomas, New York Botanical Garden, in litt. to David Martin 1990). Nor does the Atlas of Florida Vascular Plants (Wunderlin et al.) show this species away from Gadsden and Jackson counties.

1948 M. L. Fernald and Schubert locate presumed type material of *Cucubalus polypetalus* Walter at the British Museum, determine it to be conspecific with *Silene baldwinii* Nutt., and publish the combination *Silene polypetala* (Walt.) Fern. & Schub.

1970 Robert Lane extends known range of *Silene polypetala* to include Crawford County, Georgia (Lane 1976).

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[2] Herbarium specimens are cited using botanists' conventions, giving collector's name, specimen number (or the Latin abbreviation *s.n.* if there is no number), and the herbarium's abbreviation (i.e. NY is the New York Botanical Garden; AUA, Auburn University; GA , University of Georgia.

[3] The abbreviations *pers. comm.* and *in litt.* refer to information received verbally and in some sort of written communication (such as a letter), respectively.

1976 Species is protected in Georgia under provisions of the Wildflower Preservation Act (McCollum & Ettman 1991).

1979 Henry Daniel discovers only known population within the greater Chattahoochee River watershed in central Georgia (Site No. 15).

1981 Status report completed on *Silene polypetala* (Faust 1981).

1987 Mildred Pinnell completes masters work at the University of Georgia involving tissue culture of *Silene polypetala* and *Baptisia arachnifera* Duncan (Pinnell 1987).

1988 Species rediscovered (see 1894, above) in drainage of the Ocmulgee River, vicinity of Macon, Bibb County, Georgia by Bobbye Anderson. Extant populations in Georgia surveyed by J. Allison.

1990 *Silene polypetala* is proposed for listing as an endangered species (USFWS 1990).

1991 *Silene polypetala* is listed as an endangered species (USFWS 1991).

1993 Will Griffin, of the Georgia Department of Transportation, extends range to Upson county, Georgia (pers. comm. 1993, confirmed 1994).

Silene polypetala has been considered extremely rare ever since it was discovered. The species has presumably been suffering habitat loss for many years, with the majority of extinctions probably due to clearing of hardwood forest for conversion to farmland or pasture, or due to the cumulative effects of repeated timber harvest.

B. TAXONOMY AND DESCRIPTION

Silene polypetala, though it has borne several other names in the past (*Cucubalus polypetalus* Walt., *Silene baldwinii* Nutt., *S. fimbriata* Baldw.) has always been treated as a distinct species. No infraspecific taxa have been named. Kruckeberg and Rabinowitz (1985) noted that *Silene polypetala* is probably rare because it is restricted to forested ravines and hardwood bottoms along just a few rivers. Other eastern species of *Silene* occupy less mesic habitats. *Silene polypetala* has been crossed with other eastern North American silenes, yielding F^1 hybrids that were vigorous but wholly sterile (Kruckeberg 1964).

Nontechnical description: Fringed campion is a perennial herb that forms mats by spreading vegetatively, with long, slender stolon-like rhizomes and leafy offshoots, both of which terminate in overwintering clusters of leaves (rosettes). Leaves of the rosette and stem are opposite, widest toward the tip, mostly 1-4 inches long. Each rosette produces one to several erect flowering shoots, each of which is unbranched or sparingly branched, up to 16 inches tall.

The flowers are arranged in groups of 3-5 at the top of the flowering shoot. The calyx is tubular and covered with long, weak hairs. The 5 separate petals are each divided into a lower part about as long as the calyx and a triangular upper part that extends 1-1½ inch from the calyx. The wide apex of each petal is divided into slender segments, giving the flower a fringed appearance. The petals are pink or white. Flowering is from late March to May (Kral 1983, Hitchcock and Maguire 1947, Faust 1981). The plant is easily recognized by its distinctive flowers.

Technical description: Perennial herb with slender, weak, sprawling to ascending, thinly pilose stems to 40 cm long, simple or sparingly branched, spreading vegetatively by long, slender, stolon-like rhizomes and lax, leafy offshoots, both terminating in overwintering rosettes.

Leaves opposite, entire, spreading, pale green, those of the rosettes and lower stem leaves spatulate, 2-6 (rarely to 9) cm long, mostly (0.8) 1.0-1.5 cm broad, obtuse, often apiculate, the surfaces glabrous or sometimes thinly subpilose with soft, pale, spreading hairs along the margin and midrib beneath, margins glabrous or occasionally ciliate, petiole narrowly winged and prominently ciliate, usually shorter than the blade. Leaves progressively shorter up the stem, becoming elliptic, oblong, or lanceolate, with rounded to clasping bases.

Inflorescence a terminal cyme of 3-5 flowers, sometimes with another, fewer-flowered cyme on the next lower node.

Flowers on slender, hairy, erect or slightly spreading stalks. Bracts large, foliaceous; pedicels (0.5) 1-2 cm long, densely villous and stipitate-glandular. Calyx clavate, 2.2-2.5 (3) cm long, the tube weakly 10-nerved, moderately subpilose and glandular, puberulent within, lobes 5, 3-5 (9) mm long, erect, acute, narrowly triangular and pink-margined. Petals showy, separate, 5, the claws ciliate and about equaling the calyx, appendages lacking, the blades spreading, subequal, (2) 3-4 cm long, flabellate, the truncate apex conspicuously fimbriate, margins ciliate. Stamens 10, not much longer than the petal claws and thus only slightly exserted, filaments scantily arachnoid-pilose near the base; carpophore 7-10 mm long. Ovary superior, styles 3-5. distinct, slender; placentation free-central.

Fruit a capsule, 7-9 (12) mm long (thus hidden in the persistent calyx), broadly ellipsoid-ovoid, many-seeded, completely 1-celled; seeds dark reddish brown, 0.9-1.2 mm broad, lateral papillae low, radially elongate, marginal papillae rounded, conspicuous (Hitchcock and Maguire 1947, Kral 1983).

C. DISTRIBUTION AND OWNERSHIP

Silene polypetala is known from only 26 locations, 19 in Georgia (Bibb, Crawford, Decatur, Talbot, Taylor, and Upson Counties) and 7 in Florida (Gadsden and Jackson Counties) (map, page 23). It is not known to have been extirpated from any sites, but many of the sites have been impacted by disturbance from logging or other human activities and their long-term viability is in serious doubt.

Five populations of *Silene polypetala* are publicly owned. Three of these are on U.S. Army Corps of Engineers property: two in Decatur County, Georgia, plus the only known occurrence in Jackson County,

Florida. A few plants are found on public lands at Chattahoochee, Florida (Gadsden County) in the Chattahoochee Nature Park and on the grounds of the Florida State Hospital.

The largest known population of *Silene polypetala*, in Taylor County, Georgia, is in multiple private ownership (Allison 1991).

D. HABITAT

Silene polypetala occurs in various situations within hardwood forests. It is often on fairly steep slopes of deep ravines or north-facing hillsides, sometimes on nearly level ground, particularly in flatwoods developed on Iredell soils. The great majority of populations of *Silene polypetala* occur in the watershed of the Apalachicola River and its tributary, the Flint River. One factor that the sites seem to have in common is a circumneutral soil reaction, due to the nature of the parent material. In the Coastal Plain occurrences (Florida and Decatur County, Georgia) the parent material is limestone. In the Piedmont localities the parent material is a magnesium-rich rock, hornblende gneiss.

The Georgia Piedmont deciduous hardwood forests where fringed campion occurs have northern red and white oaks, mockernut and pignut hickories, tulip tree, beech, maples, and loblolly and shortleaf pines. Understory species include oak-leaf hydrangea, blue palmetto (*Sabal minor*), and the Piedmont rhododendron (*Rhododendron minus*)(Faust 1981). At three sites in Georgia, one in Talbot County and two in Upson County, fringed campion occurs with the endangered relict trillium (*Trillium reliquum*). In Decatur County, Georgia and some of the Florida localities, fringed campion occurs with the endangered Florida torreya (*Torreya taxifolia*) and other rare plants, including croomia (*Croomia pauciflora*) and bay starvine (*Schisandra coccinea*). In Bibb County, Georgia, fringed campion occurs with Ocmulgee skullcap, *Scutellaria ocmulgee*, a plant that the state of Georgia lists as threatened and has been under consideration for federal listing.

At the southern extreme of its range, *Silene polypetala* occurs on a north facing slope near Chattahoochee, Florida with giant chickweed (*Stellaria pubera*), pinkroot (*Spigelia marilandica*), a horse-balm (*Collinsonia serotina*), bloodroot (*Sanguinaria canadensis*), eastern hophornbeam (*Ostrya virginiana*), basswood (*Tilia americana*), beech (*Fagus grandifolia*), American holly (*Ilex opaca*), and southern magnolia/bullbay (*Magnolia grandiflora*) (Herbarium specimen, *A. Gholson, Jr. 11805 with R. Godfrey* [FLAS]).

Rich hardwood sites suitable for *Silene polypetala* make up a small fraction of the overall landscape (Kruckeberg and Rabinowitz 1985), and appear to have often consciously been protected by landowners. These patches of hardwoods may be valuable to game animals and other wildlife, and probably merit conservation attention by landowners independently of having this rare plant.

E. REPRODUCTIVE BIOLOGY

Although no studies of the reproductive biology of *Silene polypetala* are known to the author, the large, showy, nectariferous flowers are indicative of a sexually reproducing species dependent upon insects for pollination, perhaps supplemented by hummingbirds. In the genus *Silene*, the nectar is concealed at the base of the calyx tube, and the flowers are probed by larger bees and lepidoptera (Zomlefer 1994). Flowering begins in March at the Florida locales, and ends sometime in May at the sites near the Fall Line in Georgia, with fruits maturing about a month later.

Some, if not all, plants in cultivation exhibit male sterility as evidenced by flattened anther sacs and the production of few, if any well-formed pollen grains. Lack of sexual reproduction may, therefore, be one reason for this species not persisting in cultivation.

Sexual reproduction is supplemented by, and quite possibly exceeded by, asexual reproduction. *Silene polypetala* produces runners, nearly leafless basal, procumbent stems terminating in rooted rosettes of leaves. In time, these rosettes produce flowering stems and the connection to the original plant decays. Thus a colony that appears to be composed of numerous individuals may, in fact, harbor only one or very few genetic individuals. The clonal nature of this species creates difficulties for monitoring its status and progress toward recovery. Counting individuals appears impossible without genetic testing. There is no clear reason to examine the genetic structures of populations if they are stable. Possibly, the best approach for monitoring populations is by detailed mapping using permanent stakes (metal stakes driven into the ground can be relocated with a metal detector) combined with geographic positioning systems, which are useful relocating populations. While plants can be mapped precisely, use of the mapping methods is limited by the need for trained personnel and costly equipment.

F. HORTICULTURAL USE

The genus *Silene* includes a number of ornamentals, so it is no surprise that *Silene polypetala* is cultivated as a garden plant. At Callaway Gardens during the 1950's, F. C. Galle (pers. comm. to D. Martin, USFWS, Jacksonville 1977) found that fringed campion is very easy to propagate from cuttings, collected cuttings from a wild population, maintained nursery stock, established the plant on their wildflower trail, and distributed plants to other gardens in the United States. Callaway Gardens continued to grow fringed campion with limited success (Patricia L. Collins, Director of Education, pers. comm. to D. Martin, USFWS, Jacksonville 1990). As an example of the dissemination of this species, the Royal Botanic Gardens, Kew, England received material from Longwood Gardens, Kennett Square, Pennsylvania in 1989; the plants died, apparently from the stress of the very hot summer of 1990 (J. L. S. Keesing, Royal Botanic Gardens, Kew, pers. comm. to D. Martin, USFWS, Jacksonville 1991). As of the 1970's, *Silene polypetala* was cultivated in alpine plant nurseries and private gardens around Seattle (J. Wurdack, Smithsonian Institution, cited on data card prepared for Smithsonian Institution Endangered Flora

Project,1976). Linda G. Chafin (currently at Florida Natural Areas Inventory, Tallahassee; pers. comm. to D. Martin, USFWS, Jacksonville 1990), an experienced gardener, noted that attempts to maintain this species in gardens over the long term have not been very successful. Armitage (1989) considers fringed campion useful for partially or heavily shaded areas in porous, well-drained moist soil. Armitage also notes that Dr. Jim Ault, while at the University of Georgia, developed a horticultural hybrid between *Silene polypetala* and *Silene virginica* with garden potential. The hybrid is sold by at least one nursery (as of fall 1996). Pinnell (1987) confirmed that *Silene polypetala* is easily propagated by tissue culture techniques as well as by cuttings.

Trade in *Silene polypetala* or its horticultural hybrids is not likely to threaten this species, although it is possible that in localities like suburban Macon, the species might be successfully planted on a wooded slope, then mistaken for a wild population. A collection from Harris County, Georgia (*Hruska et al. 1230* [JSU]) is surely from planted material, although the label data do not so state.

G. THREATS

Under the different conditions which prevailed prior to the modern era, this species may have benefited from disturbance. Although *Silene polypetala* will persist quite well in the shade of the closed canopy, flowering is promoted by increased sunlight. Thus sexual reproduction would have been enhanced in the light gaps created by the occasional tree fall. When such disturbance was limited in area and habitat for the *Silene* had not been reduced in size and isolated by fragmentation, conditions existed for relatively fast and complete recovery.

1. **Habitat loss or degradation**: Occurrences on level ground or gentle slopes have doubtless been impacted in the past by logging or other land uses incompatible with species of rich woodlands (e.g., sites nos. 15 and 16, as referenced on page 25). Several sites in Talbot and Taylor Counties, Georgia, occur within areas presently being clear-cut or within areas scheduled for future logging. To date, efforts by the Georgia Department of Natural resources, Game and Fish Division, Law Enforcement Section, particularly on the part of Cpl. Henry Daniel, spared these latter sites from the bulldozer and chain saw. Corporal Daniel, however, has since retired. The continued existence of the Crawford County, Georgia population is critically imperiled due to its position downslope from an active excavation for fill material. Sediment is washing down close to the plants highest on the slope (Jerry Payne, pers. comm. 1996). These plants may already have been impacted at the time of writing.

   Before the massive alteration of the Georgia landscape by humans, fringed campion occurred within extensive expanses of hardwood-dominated forest. This forest has been reduced to isolated patches in a landscape of diverse land-use types, such as urban/suburban, agricultural, and pine plantation. Braking up the hardwood forest into isolated remnants has had negative effects on many organisms. When this habitat extended over such a large, nearly continuous area that any particular catastrophic

event could affect only a small portion of it, animals and plant seeds or spores were able to move in from the adjacent, untouched areas and repopulate the impacted area. With fragmentation of the habitat and of populations, it becomes more likely that a disturbance event would wipe out an entire population, with no persisting populations sufficiently close by to recolonize the site. The reduction of gene flow between populations may also result in inbreeding and loss of genetic variability within populations (Patrick et al. 1995).

2. **Overutilization**: This species has rarely been collected for herbarium specimens. As virtually all known sites are fairly remote from dwellings the plants are unlikely to be often vandalized for transplant or sale. The species is sometimes cultivated as a ground cover, but this demand is met by commercially propagated material, so cultivation need not threaten wild populations.

3. **Disease or predation**: Several populations throughout the range regularly exhibit moderate to heavy grazing of flowering stems, presumably by deer. This could greatly limit the potential for population expansion and dispersal by sexual means, particularly as most populations are rather small.

4. **Inadequacy of existing regulation**: Neither the Preservation of Native Plants of Florida Act nor the Georgia Wildflower Preservation Act (see Current Protection, below) has had a significant effect upon habitat degradation or fragmentation on private lands, the primary threat to the listed species. Georgia's Wildflower Preservation Act of 1973 provides protection for this species, especially on State land (however, the plant is not known to occur naturally on any State-owned land in Georgia). Sites owned by the U.S. Army Corps of Engineers should be considered protected. The Endangered Species Act prohibits deliberate removal of endangered plants from these areas, and the Army has a responsibility to conserve endangered plants. Incidental additional protection is provided to these two populations inasmuch as they fall within the proposed preserve area for federally endangered *Torreya taxifolia* (Allison 1988a).

5. **Exotic pest plants**: Another reason why disturbance in *Silene polypetala* habitat is far more damaging to the species than in earlier centuries is the prevalence today of aggressive, exotic weeds like Japanese honeysuckle (*Lonicera japonica*), Chinese privet (*Ligustrum sinenese*), Nepal grass (*Eulalia* [*Microstegium*] *viminea*) , and Japanese climbing fern (*Lygodium japonicum*). Other exotics less notorious in Georgia but ultimately perhaps as much a threat to the native vegetation, are also present at some of the sites. Among these are heavenly bamboo (*Nandina domestica*), silverthorn (*Elaeagnus pungens*), and coral ardisia (*Ardisia crenulata*)[4]. All of these are promoted by disturbance and, unlike many weeds, persist after canopy reclosure. Japanese honeysuckle is present, sometimes abundant, at several of the sites and could pose a long-term danger of local extirpation regardless of any future human activities. According to Angus Gholson (pers. comm. 1995) one of the

[4] *Ardisia crenulata* Sims is the name used by Wunderlin et al. for the plant that is infesting Gadsen County, Florida; Kartesz (1994) prefers *Parathesis crenulata* (Vent.) Hook f.

subpopulations in Decatur county, Georgia, has seemingly been eliminated by the aggressive growth of cultivated bamboo (probably *Phyllostachys aurea*).

In the future, more pest plants are likely to become problems. Heavenly bamboo (*Nandina domestica*) is invading a hardwood forest over limestone at Florida Caverns State Park near Marianna, Jackson County, not far from *Silene* sites. Skunkvine (*Paederia foetida*), a serious pest north of Tampa, has been found and appears to be hardy, near Interstate 10 in Madison County, Florida about 100 miles east of the Apalachicola River sites for *Silene* (information from K. Burks, Fla. Dept. Environmental Protection, pers. comm. to D. Martin, USFWS 1995). Once *Silene* habitat is given over to one or more of these, it is unlikely that it will be regained without intensive human intervention. Florida has an Exotic Pest Plant Council dedicated to these problems. At least two state biologists are tracking exotics: one with the Florida Department of Environmental Protection, Bureau of Aquatic Plants and the other with the Florida Department of Agriculture and Consumer Services, Division of Plant Industry.

H. CONSERVATION MEASURES

1. State protective measures. *Silene polypetala* is protected under two state laws.

- In Florida it has endangered status under the provisions of Rule Chapter 5B-40 of the Florida Administrative Code, entitled "Preservation of Native Plants of Florida." To summarize the protection this law affords (Paul Hornby, Florida Dept. of Agriculture and Consumer Services, pers. comm. 1996): the removal of such a plant from a property, whether for transplant, sale, or any other purpose, requires both the written permission of the landowner and a permit from the Florida Department of Agriculture and Consumer Services. The law does not impede government actions such as highway construction, and private landowners may do as they see fit with such plants on their own land. Copies of the law may be obtained from the Florida Department of Agriculture & Consumer Services, Division of Plant Industry, P.O. Box 147100, Gainesville, FL 32614-7100.
- Under the provisions of Georgia's Wildflower Preservation Act, *Silene polypetala* is a legally protected species with endangered status. This law protects State listed plant species by regulating their removal from State-owned lands (Patrick et al.1995). It further requires that any removal of State-protected plants from private land be with the written permission of the landowner, and it also regulates any traffic in these plants by requiring both transport tags and permits to sell or collect in Georgia.

Whenever federally listed plant species are involved, violations of these State laws (or any other State law or regulation, including State criminal trespass laws), are also violations of the Endangered Species Act of 1973, as amended. As a result, the substantial civil and criminal penalties specified in section 9 of the Act can be added to State penalties.

State heritage programs compile and update databases for species of conservation concern, with information on each occurrence, such as site name, location, population size and ownership. These databases are used to evaluate relative rarity and degree of threat (e.g. Florida Natural Areas

Inventory 1995), to assign protection priorities, and to provide information relative to specific sites for purposes such as environmental impact statements.

An additional Georgia State law affording some protection to listed species is the Georgia Environmental Policy Act (GEPA). Modeled after the National Environmental Policy Act (NEPA), this 1991 law established requirements and procedures for assessing the environmental effects of all proposed State government actions that "may significantly adversely affect the quality of the environment." Guidelines for implementation of GEPA, as promulgated by the Georgia Department of Natural Resources, Environmental Protection Division, describe certain types of activities as "clearly significant," among these being any "action that affects threatened or endangered species or their habitats" (Georgia DNR 1991).

2. **Federal protective measures**. Section 9 of the Endangered Species Act makes it illegal to "remove and reduce to possession [*Silene polypetala*] . . . from areas under Federal jurisdiction [that is, land owned by the Federal government]; maliciously damage or destroy any such species on any such area; or remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any law or regulation of any state or in the course of any violation of a state criminal trespass law." Section 9 also prohibits interstate sale or shipment of the species without a permit, which can be obtained under section 10 of the Act.

The Endangered Species Act mandates all Federal agencies to conserve endangered species on their land, and section 7 of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species. If a Federal agency action may affect a listed species, the agency must consult with the Fish and Wildlife Service.

The Endangered Species Act provides for Federal assistance to the states, and authorizes the Fish and Wildlife Service and the Forest Service to acquire land to conserve llisted species.

Federal programs aimed at encouraging private landowners to conserve habitat for migratory birds (such as the Fish and Wildlife Service's Partners in Flight and Partners in Wildlife programs) have the potential to help with *Silene* conservation. Rich hardwood stands with *Silene polypetala* may also be valuable habitat for migratory birds.

Neither Federal nor State regulation addresses legitimate concern that horticultural use of endangered plants might threaten the genetic integrity of natural populations. This concern has led to suggestions that endangered species should not be commercially available, or that records should be kept of sources and out-planting locations for horticultural projects, just as for conservation projects, so that introductions and resulting population dynamics can be reconstructed (Doria Gordon, The Nature Conservancy, Gainesville, Florida, in litt. to David Martin, USFWS 1995). The same questions are being raised with respect to the use of native plants for wetlands restoration and other mitigation projects (where long-distance transport of plant material is common). At the present time, use of these listed plants for horticultural purposes does not pose serious conservation problems inasmuch as plantings are likely to be small and may not be very permanent. If problems arise, they will have to be addressed through voluntary cooperation with propagators/vendors. The Endangered Species Act does not regulate propagation and sales practices within a state. The Service is able to

place conditions on the interstate sale of this plant. Planting of *Silene polypetala* for mitigation or other vegetation restoration purposes may be subject to approval by permitting agencies, and can be reviewed on a case by case basis.

Within the Center for Plant Conservation network and its Board, there is increasing support for ornamental use of endangered plants (B. Meilleur, Executive Director, Center for Plant Conservation, as summarized in notes from meeting of Georgia Plant Conservation Alliance meeting, Athens, Feb. 1996).

3. **Habitat preservation**. Due to public ownership or private nature preserve status, five sites supporting *Silene polypetala* are theoretically protected. No plans for protection of additional sites, whether by governmental or private entities, are known to the writer.

4. **Studies**. *Silene polypetala* has been a featured element in several botanical surveys. The Crawford County, Georgia population was discovered during the course of Robert Lane's (1976) dissertation work, The vascular flora of the west central Upper Coastal Plain of Georgia. [5] Several of the Florida populations were discovered during the course of Leonard and Baker's (1982) Biological survey of the Apalachicola Ravines biotic region of Florida. Potential habitat and extant populations of several rarities, including *Silene polypetala* in Georgia were surveyed by the author (Allison 1988b). Additional populations (numbers 19-22) were discovered or documented during a botanical survey by Linda Chafin (1989) of the site for a proposed hazardous waste processing facility (incinerator). these occurrences were confirmed in a later study by the author (Allison 1991). Plans for the facility sere later abandoned, at least in part due to the occurrences of *Silene polypetala*. The author has visited 21 of the 26 known sites for *Silene polypetala*.

5. **Captive breeding**. *Silene polypetala* is cultivated at arboreta and botanical gardens. The Center for Plant Conservation serves as a clearinghouse for information on the rare species holdings of numerous cooperating institutions. The Georgia Plant Conservation Alliance, a group of Georgia's botanical gardens with committees on science and education, is likely to take an interest in the propagation of this species.

[5] Despite the title, the *Silene polypetala* site is (barely) in the Piedmont.

PART II. RECOVERY

A. RECOVERY OBJECTIVE

Reclassification of *Silene polypetala* to Federal threatened status will be considered if 10 viable and geographically distinct populations, each with 100 or more clumps, are protected. Delisting will be considered if 20 such populations (including at least 4 populations in Florida) are permanently protected to such a degree that the species no longer qualifies for protection under the Endangered Species Act. Viability of populations will be assessed through periodic monitoring for a period of not less than 10 years. A viable population has the reproductive capability to sustain itself. After the species is delisted, the Endangered Species Act requires that it be monitored for a minimum of five years under procedures to be set up cooperatively by the Service and the States.

The recovery objective is not stated in terms of the number of individuals per site because this species spreads clonally. The only way to determine the number of genetically distinct individuals is to utilize molecular markers. This not necessary, and it is too costly except for setting up long-term germplasm conservation through garden propagation.

The number of populations that need to be protected nearly equals the number of populations that are currently known to exist.

Recovery criteria are preliminary and may be revised on the basis of new information, including information gained from completed recovery tasks.

B. NARRATIVE OUTLINE

1. **Protect populations.** *Silene polypetala* has an inherently narrow geographic and ecological distribution. In the absence of active conservation efforts, sites with this plant will gradually be lost or degraded for reasons described above. This plan emphasizes the conservation of existing populations rather than the creation of new ones. The plan assumes that most owners of sites with this plant are interested in its conservation and that they may be receptive to offers of biological monitoring and assistance with conservation measures such as honeysuckle control. Planning of exotic pest plant control is important enough to be a separate recovery task (4).

   1.1 **Protect existing publicly owned populations**
   The mandate of the Endangered Species Act to conserve endangered plants on Federally owned land applies to Lake Seminole. Public lands with *Silene polypetala* also have many other species of special interest.

1.1.1 **Lake Seminole**, Decatur County, Georgia and Jackson County, Florida. The area is owned by the U.S. Army Corps of Engineers. *Spigelia gentianoides* (gentian pinkroot), an endangered plant, occurs on Corps land in Jackson County, and the endangered *Torreya taxifolia* (Florida torreya or stinking cedar) on Corps land in Decatur County. It is essential that no disturbance occur in the vicinity of *Silene polypetala*, including areas upslope from the plants.

1.1.2 **Chattahoochee Park**, Gadsden County, Florida. This is a city park. The chief threat here is posed by noxious exotic weeds, especially Japanese honeysuckle, but possibly including *Nandina domestica,* heavenly bamboo, an ornamental shrub that has become a pest at Florida Caverns State Park near Marianna. Honeysuckle is a chronic, if not perpetual threat. It is doubtful that herbicide application can control the honeysuckle without seriously impacting the *Silene.* Hand pulling is possibly the only available method of control at this time. Perhaps interest could be stimulated on the part of a local garden club for a yearly cleanup of honeysuckle around the *Silene* plants.

1.2 **Secure plants on private property.**

1.2.1 **Landowner contacts.** This is the first step towards securing plants on private property. Landowner information should be obtained for all *Silene polypetala* populations (this has already largely been done). Landowners should be contacted, the importance of populations on their lands should be explained, and possible management options discussed.

1.2.2 **Make conservation arrangements.** Populations on private property may be protected through management agreements or conservation easements between owners and public agencies or private conservation groups, or through land acquisition (voluntary on the part of the landowner). To the extent possible, conservation arrangements should include arrangements for monitoring (see task 3). Some conservation arrangements may include provisions for population augmentation or reintroduction (see task 6).

2. **Preserve genetic stock from acutely threatened populations.** Due to the scarcity of extant populations, conservation of the genetic diversity that remains in the species is a high priority. Therefore, some living material of the species should be moved from any population facing imminent local extinction (i.e., where protection is not feasible or cannot be initiated in time to prevent extirpation). At the time of writing, this is necessary for the Crawford County, Georgia population. It is not known whether seed can be stored, which would be less costly than maintaining plants in cultivation.

The Center for Plant Conservation maintains a database of institutions growing this and other plant species of conservation concern. This provides a clearer picture of how many places are helping to maintain the species in cultivation, basic information for a genetic study of wild and cultivated stock to determine if the cultivated stocks represent an adequate sample of the genetic diversity in the species, and constitutes a roster of institutions that may exchange material and prevent inbreeding of cultivated stocks.

2.1 **Select sites from which germplasm needs to be conserved.** These are likely to be smaller sites, sites without conservation arrangements, and sites especially threatened by exotic pest plants.

2.2 **Determine how many plants per site need to be conserved.** Genetic assessment using molecular markers provides an effective method of ensuring that plant material taken into cultivation includes all or nearly all of the natural gene pool. The genetic assessment of *Torreya taxifolia* taken into cultivation by the Center for Plant Conservation is an example of how this approach can be applied. The cost of using molecular markers has become low compared to the cost of long-term maintenance of germplasm in cultivation.

2.3 **Make institutional arrangements for germplasm conservation.** Long-term maintenance of plants or storage of seeds requires expertise and funding.

3. **Monitor populations to determine trends and developing threats.** All sites supporting *Silene polypetala* should be monitored, if landowners grant permission. Arrangements with landowners to allow monitoring are included in Task 1.2.2.

3.1. **Find a responsible party or parties to supervise monitoring and obtain financial support and/or personnel to begin monitoring.** It would not be productive to expect ten-year commitments at the beginning, but work has to be started with this timeframe in mind.

3.2 **Establish monitoring methods, including procedures for maintaining records.** The Nature Conservancy and other organizations have plant monitoring protocols. Exact procedures may depend on who takes overall responsibility for monitoring. *Silene polypetala* should be censused yearly for a period of not less than 10 years. Approximate numbers (at least, numbers of patches), areal extent, and vigor should be noted, as well as any unfavorable developments (increasing competition, etc.).

3.3 **Conduct monitoring after delisting.** The Endangered Species Act requires that the Fish and Wildlife Service implement in cooperation with the states a system to monitor the status of recovered species for at least five years. For *Silene polypetala*, this will be a continuation of pre-delisting monitoring, perhaps done less intensely or at fewer sites.

4. **Plan control of exotic pest plants.**

   4.1 **Assess threats.** When sites are visited, the nature and extent of pest plant infestations must be noted. Information from *Silene* sites must be combined with information from similar habitats in central Georgia and the Apalachicola Bluffs region of Georgia, Florida, and Alabama.

   4.2 **Identify control methods.** A great deal of information is available on exotics control, as well as practical experience by land managers. As threats are identified, possible control methods need to be sought and tried, then modified with experience. Herbicide treatments have the potential to destroy native forest species.

5. **Search for additional populations**. As indicated above, this species has been searched for previously. However, additional potential habitat exists which has not been checked. Just one example: areas in Monroe County, Georgia indicated on the state geological map as underlain by hornblende gneiss, the same mapping unit as nearby Bibb County localities for the species.

6. **Reestablish populations and augment populations at protected locations, if deemed necessary**. The feasibility of (re)introduction has not been demonstrated, nor will introductions be necessary if other recovery actions are successful.

   6.1. **Assess damaged sites and sites where the species was extirpated**. It's possible that the first places needing *Silene* restoration may be sites where Japanese honeysuckle has been controlled.

   6.2. **Review results from past introductions.** Past introduction attempts on lands belonging to the state of Georgia, and probably elsewhere, may provide useful guidance.

   6.3. **Determine necessity/appropriateness** of introduction and chose the most appropriate sites. Restoring honeysuckle-ravaged sites seems the most plausible case.

   6.4. **Make reintroduction arrangements with landowners**. Conservation agreements with landowners are covered by Task 1.2.2. Agreements to reintroduce endangered plants will be different from those developed to reintroduce endangered animals. Because endangered animals are protected take by the Endangered Species Act, introduced populations are almost always designated as nonessential experimental populations to allow animals to be taken, if necessary. There is no need to designate experimental populations for plants because endangered plants on private land are <u>not</u> protected against take.

   6.5 **Identify appropriate germplasm source and conduct introduction(s).** The germplasm choice is likely to be between propagating material taken expressly for the purpose from a wild population or utilizing existing cultivated germplasm.

7. **Manage sites to maintain and/or enhance populations.** As *Silene polypetala* is adapted to an environment in which successional change is relatively slow, maintenance of populations chiefly requires protection from disturbance. Results of the monitoring program (Task 3) should indicate whether human manipulation might benefit *Silene polypetala* in certain natural or experimental microhabitats. Because exotic pest plants can invade otherwise pristine habitats, controlling them may become the main management action.

8. **Educate the public about the value and fragility of this species and its habitat.** Since most of the landscape of the Piedmont and Coastal Plain is developed, in cultivation, or in a successional state, relatively undisturbed hardwood forest can provide an all-too-rare primeval experience. They also have the potential to serve as outdoor classrooms for studying important ecological and/or evolutionary concepts such as succession, competition, endemism, and ecotypic differentiation.

9. **Apply laws protecting endangered plant species.** Employ local, State, and Federal regulations when they are appropriate to protect the sites where this plant occurs.

   9.1 **Initiate Section 7 consultation when applicable.** While the consultation provisions of Section 7 of the Endangered Species Act of 1973, as amended apply to endangered plants including *Silene polypetala*, these consultation provisions are in practice rarely invoked for plants. Concern for plant conservation has, however, affected the planning of roads, pipelines, and other construction projects.

   9.2 **Enforce take and trade prohibitions.** The most stringent protection afforded to *Silene polypetala* is on Federally-owned land at Lake Seminole, where the Endangered Species Act prohibits removing and reducing to possession any endangered plant from areas under Federal jurisdiction; maliciously damaging or destroying any such species on any such area; or removing, cutting, digging up any such species. Violation of State prohibitions (including criminal trespass law) is also a violation of the Endangered Species Act.

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PART III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and estimated costs for the first three years of the recovery program. It is a guide for meeting the objective discussed in Part II of this plan. This schedule indicates task priorities, task numbers, task descriptions, duration of tasks, the responsible agencies, and lastly, estimated costs.

Priorities in column one of the following Implementation Schedule are assigned as follows:

1. **Priority 1** - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

2. **Priority 2** - An action that must be taken to prevent a significant decline in species population/habitat quality or to counteract some other significant impact.

3. **Priority 3** - All other actions necessary to meet the recovery objective.

Key to acronyms used in Implementation Schedule

COE	U.S. Army Corps of Engineers, Lake Seminole
CPC	Center for Plant Conservation
FDACS	Florida Department of Agriculture and Consumer Services, Division of Forestry
FNAI	Florida Natural Areas Inventory
GADNR	Georgia Department of Natural Resources, Georgia Natural Heritage Program
GAPCA	Georgia Plant Conservation Alliance (Georgia botanical gardens)
TNC	The Nature Conservancy in Georgia and Florida
FWS	U.S. Fish and Wildlife Service
Universities	Academic botany/genetics departments have facilities for molecular markers work.

IMPLEMENTATION SCHEDULE

Priority	Task	Task Description	Task Duration	Responsible agency	Cost estimates ($K) FY 1	FY 2	FY 3	Comments/Notes
1	1.1	Improve protection of publicly-owned populations	2 years	FWS, GADNR, FNAI, COE and other owners				Cost not yet determined.
1	1.2.1	Private landowner contacts	2 years intensive; ongoing	FWS, GADNR, FNAI.	2.0	2.0		Intensive effort for 2 years to make contact with landowners.
1	1.2.2	Make private landowner conservation agreements	Ongoing	FWS, GADNR, TNC?				
1	2.1	Preserve genetic stock: select sites from which germplasm needs to be conserved	1 year	FWS, GADNR, CPC				
1	2.2	Preserve genetic stock: determine how many plants to conserve per site.	1 year	FWS, GADNR, university biologists				Cost not yet determined. Preferably no more than $7,000.
1	2.3	Preserve genetic stock: institutional arrangements for germplasm conservation.	Ongoing	FWS, GADNR, CPC, GAPCA	7.0	7.0	7.0	Cost includes collecting efforts and fee into National Collection.
1	4.1	Assess exotic pest plant threats	2 years intensive; ongoing	FWS, GADNR, FDEP, COE				
1	4.2	Identify exotic pest plant control methods	1 year intensive; ongoing	GADNR, FDEP, COE?				
2	3.1	Monitor populations: find responsible parties and commitments.	Ongoing	FWS, GADNR, FNAI, FDACS, others	5.0	2.5	2.5	
2	3.2	Establish monitoring methods	1 year	FWS, GADNR, FNAI				
2	3.3	Monitor after delisting	at least 5 years	FWS, GADNR, FDACS				

Priority	Task	Task Description	Task Duration	Responsible agency	Cost estimates ($K) FY 1	FY 2	FY 3	Comments/Notes
2	5	Search for additional populations	2 years	FWS, GADNR, FNAI	4.0	4.0		
2	6.1	Reestablish populations: assess sites where campion was damaged or extirpated	Ongoing	FWS, GADNR, FNAI, CPC				Cost not yet determined.
2	6.2	Reestablish populations: review past introductions	1 year	GADNR?	6.0			Cost may be underestimated.
2	6.3	Reestablish populations: determine necessity/appropriateness	2 years?	FWS?, GADNR?				Cost not yet determined
2	6.4	Reestablish populations: arrangements with landowners	3 years?	GADNR. Others?				Cost can be determined after task 6.3 is completed.
2	6.5	Reestablish populations: find germplasm & conduct introductions.	Ongoing	CPC, GAPCA				Cost not yet determined.
2	7	Manage sites to maintain and/or enhance populations.	Ongoing	FWS, GADNR, FDACS, FNAI				Contingent on other studies.
3	8	Educate public about species	Ongoing	FWS, GADNR, FNAI, TNC				
3	9.1	Apply laws: consultation under section 7 of Endangered Species Act	Ongoing	FWS				
3	9.2	Apply laws: enforce take and trade prohibitions	Ongoing	FWS, COE	5.0	2.5	2.5	

PART IV. APPENDICES

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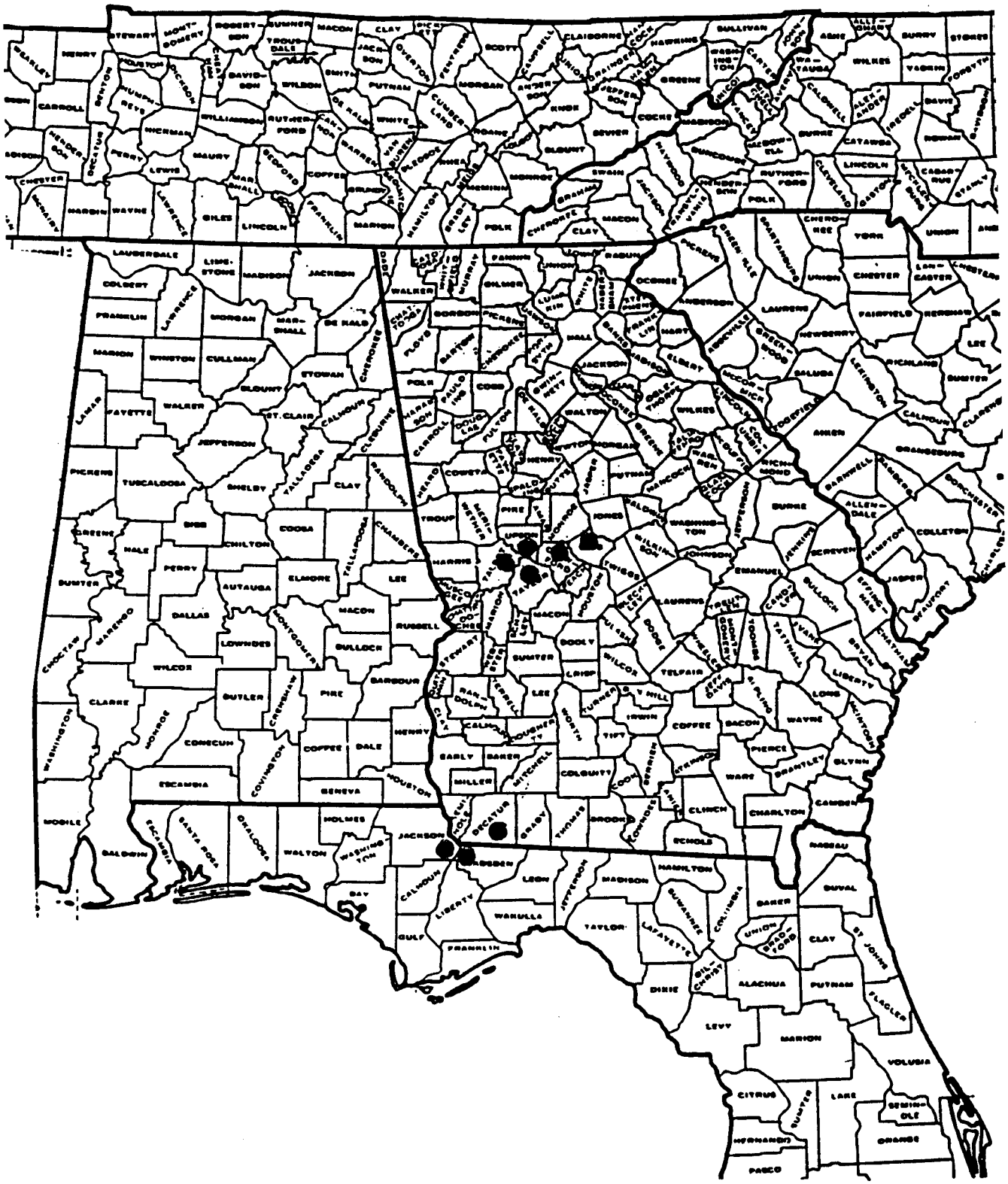
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HAWKINS
SULLIVAN
JOHNSON
ASHE
ALLEGHANY
SURRY
STOKES
WILKES
YADKIN
FORSYTH
HENRY
HOUSTON
DICKSON
CHEATHAM
DAVIDSON
WILSON
SMITH
PUTNAM
MORGAN
ANDERSON
KNOX
JEFFERSON
GREENE
UNICOI
CARTER
WATAUGA
CALDWELL
ALEXANDER
IREDELL
DAVIE
CARROLL
BENTON
HUMPHREYS
REYS
WILLIAMSON
RUTHERFORD
CANNON
WARREN
VAN BUREN
CUMBERLAND
WHITE
ROANE
LOUDON
SEVIER
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MADISON
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HENDERSON
DECATUR
HICKMAN
MAURY
BEDFORD
COFFEE
GRUNDY
SEQUATCHIE
BRADLEY
MCMINN
MONROE
SWAIN
HAYWOOD
BUNCOMBE
MITCHELL
YANCEY
LINCOLN
CLEVELAND
GASTON
CABARRUS
STANLY
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LAWRENCE
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CHEROKEE
CLAY
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TRANSYLVANIA
HENDERSON
RUTHERFORD
POLK
CHEROKEE
YORK
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LAUDERDALE
LIMESTONE
MADISON
JACKSON
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DADE
CATOOSA
WHITFIELD
MURRAY
FANNIN
UNION
TOWNS
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GREENVILLE
SPARTANBURG
CHEROKEE
COLBERT
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LAWRENCE
MORGAN
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MARION
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CLINCH
CHARLTON
CAMDEN
MOBILE
HOLMES
DECATUR
GRADY
THOMAS
BROOKS
LOWNDES
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NASSAU
BALDWIN
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
WASHINGTON
JACKSON
GADSDEN
LEON
JEFFERSON
MADISON
HAMILTON
DUVAL
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CALHOUN
LIBERTY
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TAYLOR
LAFAYETTE
SUWANNEE
COLUMBIA
BAKER
GULF
FRANKLIN
UNION
BRADFORD
CLAY
ST. JOHNS
DIXIE
GILCHRIST
ALACHUA
PUTNAM
FLAGLER
LEVY
MARION
VOLUSIA
CITRUS
SUMTER
LAKE
SEMINOLE
HERNANDO
ORANGE
PASCO

Fringed campion, *Silene polypetala*. Plant is shown life size. Arrow points to rosette of leaves at end of runner (stolon). Drawing by Vicky Holifield from Patrick et al.1995. Reproduced by permission.

Silene polypetala: Summary of Occurrences

All known populations are summarized in tabular form and assigned site numbers. Other site names are preceded by a minus sign (-) for extinct populations. The names of publicly owned locations are rendered in **bold type**. The next column provides the date on which the population was discovered, if known, followed by a column showing when the population was last observed by the author. Dates from 1988 onward represent visits by the author; visits by others are indicated in footnotes. The final column provides the names of property owners, if known.

Site No.	State	County	Site Name	First Observed	Last Observed	Ownership
1	Fla	Jackson	**Apalachicola River West**	1937	1995[6]	U.S. Army Corps of Engineers
2	Fla	Gadsden	**State Hospital Pond**	1982	1994-05-18	Florida State Hospital, Chattahoochee
3			**Chattahoochee Nature Park**	1970's?	1995[2]	City of Chattahoochee
4			Satsuma Road	1956	1995[2]	Radcliffe Materials[7]
5			G Hill Bluff		1994-05-18	
6			Dolan Road Ravines and Bluffs		1982-05-13[8]	
7			Apalachicola River South		1982-05-10[3]	
8	Ga	Bibb	Colaparchee Creek	1990's	1990's[9]	C. N. Smith
9			Beaverdam Creek	1988	1995-06-20	J. and B. Anderson and C. and N. Duggan
10			Rivoli Lakes	1990's	1990s[4]	[unknown]
11			Savage Branch	1987	1995-06-20	V. and E. Crawford and F. and C. Williams
12	Ga	Crawford	Musella Woods	1970	1995-06-20	R. L. Dickey II and L. P. Woods and B. B. Woods

[6] Seen by Angus Gholson, pers. comm. 1995.

[7] According to FNAI Element Occurrence Record. 003

[8] Leonard & Baker 1982

[9] Julie Duncan, pers. comm., 1995.

Site No.	State	County	Site Name	First Observed	Last Observed	Ownership
13	Ga	Decatur	**Woodruff Dam Ravine 5**	1988	1994-05-18	U.S. Army Corps of Engineers
14			**Woodruff Dam Ravines 1 & 2**	1938	1993-05-25	U.S. Army Corps of Engineers
15	Ga	Talbot	Blackmon Branch	1979	1988-06-05	G. B. Saunders
16			Lumpkin Road	1981	1995-06-21	J. F. Alexander Lumber Company
17			Pobiddy Bridge	1946	1995-03-24	J. R. Lumsden, et al.
18	Ga	Taylor	Tributary of Little Patsiliga Cr.	1979	1991-03-22	Mead Coated Board, Inc.
19			Barfield Creek	1989	1991-09-24	W. C. Matthews
20			Tributary of Richland Creek	1989	1991-09-24	O. W. Sherrif, Jr.
21			Beaverpond Bluff	1989	1991-09-24	(same as no. 13) Possibly also: (same address as nos. 8 & 15) Possibly also: Mead Coated Board, Inc. (see no. 11)
22			Carsonville Powerline Woods	1989	1991-09-24	R. V. Saunders (same address as nos. 8 & 14)
23			Damascus Church Ravines	1987	1988-05-27	E. W. Foy Farms Possibly also: Mead Coated Board, Inc. (see no. 11)
24			Fickling Mill/Flint Ravine	1979	1979[10]	Alarm Monitoring Corp., Inc.
25	Ga	Upson	US 19/80 Woods	1993	1995	M. Wilson
26			Potato Creek Woods	1996	1996	Mead container Corp.

[10] Fide Steve Bowling, pers. comm., 1995.

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