

Alabama leather flower
Clematis socialis

**5-Year Review:
Summary and Evaluation**



Alabama leather flower
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**U.S. Fish and Wildlife Service
Southeast Region
Mississippi Ecological Services Field Office
Jackson, Mississippi**

5-YEAR REVIEW
Alabama leather flower (*Clematis socialis* Kral)

I. GENERAL INFORMATION

A. Methodology used to complete the review

In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life histories, and habitats of this species. We announced initiation of this review and requested information in a published *Federal Register* notice (see below). We conducted an internet search, reviewed all information in our files, and solicited information from all knowledgeable individuals including those associated with academia and State conservation programs. Our sources included the final rule listing this species under the Endangered Species Act (Act) (51 FR 34420); the species' Recovery Plan (USFWS 1989); peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished studies and survey reports; and notes and communications from other qualified biologists or experts. The completed draft review was sent to affected Service offices and three peer reviewers for their review. Comments were incorporated into this final document as appropriate (see Appendix A).

B. Reviewers

Lead Region – Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office – Jackson, Mississippi, Ecological Services Field Office: Cary Norquist, 601-321-1128

Cooperating Field Offices

Daphne, Alabama: Dan Everson, 251-441-5837

Athens, Georgia: Pete Pattavina, 706-613-9493

C. Background

1. Federal Register Notice citation announcing initiation of this review:

June 14, 2005. (70 FR 34492)

2. Species status: Stable (2009 Recovery Data Call) There are a total of 5 populations, with one in Georgia and the rest in north Alabama. Two populations are considered permanently protected and a third is under a voluntary management agreement. Monitoring data indicated a decrease in flower numbers overall in 2009 but this was likely an artifact of monitoring later in the season (Martin 2009). One of the larger sites (Etowah County) was subjected to habitat clearing in 2008 which greatly altered the habitat and likely destroyed plants. Additional monitoring is needed to accurately assess the impact of these habitat alterations on this

population in the long-term. All populations continue to need active management to maintain suitable habitat.

3. Recovery achieved: 1 (0-25% recovery objectives achieved)

4. Listing history

Original Listing

FR notice: 51 FR 34420

Date listed: September 26, 1986

Entity listed: Species

Classification: Endangered

5. Review History

Recovery Data Call: 2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, 2001, and 2000

Five Year Review: November 6, 1991.

In this review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors as they pertained to the different species' recovery. In particular, no changes were proposed for the status of this plant in the review.

7. Species' Recovery Priority Number at start of this review (48 FR 43098): 2

Degree of Threat: High

Recovery Potential: High

Taxonomy: Species

8. Recovery Plan

Name of plan: Recovery Plan for Alabama Leather Flower (*Clematis socialis*)

Date issued: December 27, 1989

II. REVIEW ANALYSIS

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

The Act 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 DPS to only vertebrate species of fish or wildlife. Because the species under review is a plant and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

B. Recovery Plan and Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? ? Yes

2. Adequacy of recovery criteria

a. Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?

Yes.

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?

The recovery criteria take into account threats to this species in association with the 5 listing factors, since the assurance that populations are viable and are protected from any foreseeable threats is part of the criteria.

3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

Criteria: Reclassification to threatened when at least 10 geographically distinct, self-sustaining populations, occupying a minimum of 1 acre of habitat each, are known and protected from any foreseeable threats. Delisting will be considered when 20 such populations are secured. Viability of populations will be assessed through a periodic monitoring program for at least a 10-year period.

Status: Criteria have not been met. There are only five extant populations currently known for this species, and of these, only two populations occupy at least an acre of habitat. The Nature Conservancy's Dry Creek Prairie Preserve, is considered protected in perpetuity from habitat destruction, as is the Georgia population which was recently purchased by the Georgia Department of Transportation as mitigation lands (Moffett *in litt.* 2007a). None of the five sites are currently protected from all foreseeable threats, as aggressive, competing vegetation poses a problem at all sites and appropriate management has yet to be implemented consistently. Periodic subjective monitoring has occurred at most sites and a few monitoring plots have been recently established at four of these. A detailed demographic monitoring program has yet to be established at all sites to accurately assess population trends. Population numbers at four of the five extant sites have been relatively stable over the past few years (Sherbundy and Martin 2007, Martin 2008, Martin 2009). The fifth site, in Etowah County, suffered habitat degradation in 2008 and the long-term impacts to the population are yet to be determined.

C. Updated Information and Current Species Status

1. Biology and Habitat:

The Alabama leather flower was known from only two sites, one each in St. Clair and Cherokee counties, Alabama, at the time of listing in 1986 (USFWS 1986). However, surveys since its listing resulted in the location of six additional populations, including five in Alabama and one population in northwest Georgia. Currently, a total of five populations are known to be extant with two in St. Clair County, Alabama and one each in Etowah and Cherokee counties, Alabama; and one in Floyd County, Georgia. Three small Alabama populations, which were found after the species' listing (Bartig *in litt.* 1991, Boyd and Hilton 1992, Sherbundy and Martin 2007), are no longer thought to be extant (Norquist pers. obs. 1993, Emanuel 1998, Martin 2008, 2009).

Little biological information was available for this species prior to its listing; however, ecological studies and analyses have been conducted since that time (Boyd and Hilton 1992, Boyd and Hilton 1994, Govus 1999, Ware 1999, Garrett 2005), as well as investigations into its reproductive biology (Boyd and Wall 1998, Timmerman-Erskine 1992, Timmerman-Erskine and Boyd 1999, Wall *et al.* 2003), management needs (Boyd 1994, Tassin 2007), and genetics (Boyd *et al.* 1998, Goertzen and Boyd 2007). Detailed information on this species' biology and habitat can be found in these reports. A synopsis of this information is presented below.

Populations of the Alabama leather flower have been found only in areas disturbed by human activity, so it is difficult to discern its natural habitat. Natural habitats are believed to be open grass-seed-rush prairie areas and adjoining hardwood swamp forests. Govus (1999) suggests that this species' apparent association with disturbed habitats is indicative of a relict species that prospered when sites had a more open woodland structure due to more frequent fires when the climate was hotter and drier. Kral (1982) speculated that prior to European settlement the Alabama leather flower likely grew in natural prairie-like openings in the forest. Boyd and Hilton (1994) found support for Kral's hypothesis with the positive association between it and *Phlox glaberrima*, a common prairie associate. Still another suggestion was presented that this species may have been a component of the mature forest and adapted to old growth conditions, where it thrived in canopy gaps from deaths of mature trees (Garrett 2005). Fire and grazing may have also played an important role in maintaining forest openings in the past (Garrett 2005).

In Alabama, populations are associated with soils of the Conasauga and Firestone series (Boyd and Hilton 1994). These soils are developed from weathered shale, are acidic (average pH of sites was 5.64), and have low fertility and organic matter (Boyd and Hilton 1994). In Georgia, the Alabama leather flower occurs in calcareous flatwood communities growing on circum-neutral soils of the Tupelo series with likely Dowellton series inclusions (Moffett *in litt.* 2007b)

The Alabama leather flower is clonal and is found occurring in tight patches or sparsely scattered (Goertzen and Boyd 2007), the latter condition observed most often in areas with a more closed canopy. It is often found growing at forest edges and in forest/field ecotones where sunlight is more abundant (Garrett 2005). Plants have been observed to rapidly expand into adjacent forest openings, presumably due to a growth response of the once dormant rhizomes (Norquist pers. obs. 1985, Garrett 2005). Though plants are found in sunny and shaded conditions, they are more vigorous in full or partial sunlight where plant competition is low (Emanuel 2000, 2002; Garrett 2004, 2005; Garrett and Schotz 2005; Sherbundy and Martin 2007).

The Alabama leather flower overwinters as underground rhizomes; aerial shoots emerge in late winter; and flowers (usually one terminal flower per rhizome meristem) are produced from March through early June (Timmerman-Erskine and Boyd 1999, Goertzen and Boyd 2007). Achenes (seed like fruit) typically mature by late July to early August and plants have usually completely senesced by August (Timmerman-Erskine 1992, Timmerman-Erskine and Boyd 1999, Goertzen and Boyd 2007).

Plants are believed to reproduce primarily by forking and spreading rhizomes which form dense clones (Kral 1982, Garrett 2004); however, the relative importance of clonal and sexual reproduction to maintenance of populations has yet to be determined (Goertzen and Boyd 2007). Timmerman-Erskine and Boyd (1999) found no evidence of population recruitment through seedlings in the population they studied. Within this population, they observed greater aborted flower buds in those areas where there was less light. They found that pollination was not required for fruit set but that fruit set doubled when pollinators were allowed. However, hand-pollinated flowers produced even more achenes, indicating that pollinator frequency limited reproduction. In conclusion, Timmerman-Erskine and Boyd (1999) suggested that sexual reproduction in this species was limited by a combination of pollinator frequency, herbivory, low light levels, and post-maturation achene predation by mice.

Flowering in the Alabama leather flower is strongly influenced by average mean daily temperature in winter resulting in earlier flower production (if warm) or later flower production (if cooler) (Wall *et al.* 2003) . Principal pollinators also varied with respect to timing of flowering with *Bombus pennsylvanicus* (Queen bumblebee) being the principal pollinator in an early flowering season and *Anthophora ursina* (bee) being the primary pollinator with a later flowering season. However, *Anthophora ursina* was found to be the most effective of all pollinators (Boyd and Wall 1998).

Boyd (1994) investigated effects of management treatments (mowing and burning) on the Alabama leather flower at one site. They found that their treatments showed no statistically significant effects on plant numbers or on achene production. However, Boyd (1994) expressed concern that the study site was already relatively open from a recent cut, and he questioned if the treatment plots were placed in areas where light levels were different enough to be able to detect different effects on the plants. Data showed an overall increase in plant numbers across this site, which Boyd (1994) attributed to the residual effects of disturbance from the selective logging that occurred previously. The increase in plant numbers here, likely following the initial opening of the canopy, and observations at other sites, led Boyd (1994) to surmise that a dense canopy is poor habitat for the growth and reproduction of the Alabama leather flower, and management will be needed to maintain openness of habitat to enhance populations. Observations and monitoring data over the years have shown plant numbers and flower production to be greatest in more open habitats (i.e. Boyd 1994, Boyd and Hilton 1994, Emanuel 2000, 2002, Garrett 2004, Garrett and Schotz 2005, Sherbundy and Martin 2007, Tassin 2007).

Boyd *et al.* (1998) used starch gel electrophoresis to examine genetic diversity of the Alabama leather flower, as compared to the more common *Clematis crispa*, and found that both species had moderate levels of genetic diversity. The level of genetic diversity in the Alabama leather flower is higher than average for rare species and surprising given that it is a narrow endemic with a clonal nature, thus suggesting that considerable sexual reproduction has likely occurred in these populations despite low observed seedling recruitment (Boyd *et al.* 1998, Goertzen and Boyd 2007). These analyses were based on samples taken from two populations, and further studies are currently underway using DNA-based marker systems to examine genetic diversity incorporating samples from all currently known populations (Goertzen and Boyd 2007). Information from these ongoing studies will assist in determining genetic differentiation within and among

populations and investigate the importance of clonal growth within populations (Boyd *in litt.* 2006).

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

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

Populations continue to be threatened by habitat destruction and/or adverse habitat modification. Three populations found in Alabama, after the species' listing, have not been relocated despite repeated searches. These populations are thought to be extirpated (Emanuel 1998; Alabama Natural Heritage Program 1998; Sherbundy and Martin 2007; Martin 2008, 2009). One of these was located in a pasture which had been impacted by disking and the placement of a gas pipeline (Garrett and Schotz 2005, Sherbundy and Martin 2007); the second site, located along a gas pipeline right-of-way, has not been relocated since its initial discovery in 1992 despite repeated visits to the site (Norquist pers. obs. 1993, Emanuel 1998); and the third population, located along a county road which had been resurfaced, has not been seen since 2005 (Martin 2008, 2009). Habitat at one of the largest populations was severely degraded due to clear-cutting and associated ground disturbance from heavy equipment in 2008. It is estimated that over 90% of the area which served as habitat for the Alabama leather flower was impacted and numbers of plants decreased from 250 to around 35 plants (T. Martin, U.S. Fish and Wildlife Service, *in litt.* 2008). The population seems to have rebounded somewhat (Everson *in litt.* 2009, Martin 2009) but additional monitoring will be needed, to assess the long-term impact the clearing activities have had on this population. Population declines have been shown at two other Alabama populations due to clear-cutting and associated ground disturbing activities (Garrett and Schotz 2005, Martin 2008).

Four of the Alabama populations extend onto roadside rights-of-way and continue to be vulnerable to adverse roadside improvement measures (*i.e.* herbicide spraying, road resurfacing, road widening, mowing during flowering/fruitleting) (Sherbundy and Martin 2007; Martin 2008, 2009). Road-widening is planned at the Etowah County, Alabama site and has potential to further negatively impact the population. However, the City of Gadsen has verbally committed to providing for the conservation of the Alabama leather flower by fencing the area and providing for management of the site (Everson, U.S. Fish and Wildlife Service, *in litt.* 2009). Herbicide usage continues to be a concern for those

sites near roadsides and near power line rights-of-way (Alabama Natural Heritage Program 2007; Georgia Natural Heritage Program 2007; Martin 2008, 2009). Land use changes involving pasture improvement, timbering, or residential development are identifiable threats for other sites (Garrett and Schotz 2005, Alabama Natural Heritage Program 2007, Martin 2008, 2009).

The majority of plants at the type locality in St. Clair County are protected due to their location on a 26-acre Nature Conservancy Preserve (Dry Creek Prairie). However, plants within the same population but located outside the boundary of the preserve are not secure. A second Alabama population in Cherokee County is under a voluntary protection/management agreement with a private landowner, but this agreement offers no permanent protection to the site. The recent purchase of one of the Georgia populations by the Georgia Department of Transportation, as mitigation lands, will assure the protection of this population (Moffett *in litt.* 2007a). Future protection plans for this site may involve the transfer of ownership of this population to the city/county for their greenspace program (Moffett *in litt.* 2007a, Sherbundy and Martin 2007).

By avoiding herbicide use in the area and adhering to a special mowing schedule, the Alabama Department of Transportation (ALDOT) and Alabama Power Company have cooperated in the protection and management of the plants located on their rights-of-way at several sites. However, these rights-of-way remain vulnerable, due to inconsistency in implementation of protective measures.

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

There was concern, at the time of listing, that publicity from its listing would generate an increased demand for this species, resulting in over-collecting in the wild. Indications, thus far, are that this has not materialized as a significant threat to this species.

c. Disease or predation

This factor was not considered applicable at the time of listing. Timmerman-Erskine and Boyd (1999) documented significant achene (small seed like fruit) predation from mice at one site and suggested that this may be limiting the population size at this site. Further study is needed to evaluate if seed predation is a significant threat to the species across populations.

d. Inadequacy of existing regulatory mechanisms

There are no State laws in Alabama protecting the Alabama leather

flower and its habitat. In Georgia, this species is State Protected as Endangered, under the state Wildflower Preservation Act of 1973 (Moffett *in litt.* 2007a). This law authorizes rules for the collection, transport, sale, and listing of protected plants. No protected plant may be collected without landowner approval, and no transport within the state is allowed without a permit (Patrick *et al.* 1995). Otherwise, protections are afforded to this species under sections 7 and 9 of the ESA. Two populations are considered protected from outright habitat destruction or adverse habitat modification due to their protection on a TNC preserve and on lands set aside by the State of Georgia.

e. Other natural or manmade factors affecting its continued existence

The greatest threat to current populations is loss of suitable habitat from canopy closure and encroaching competing vegetation (Garrett and Schotz 2005; Sherbundy and Martin 2007; Martin 2008, 2009). Four of the five populations have shown decreased vigor due to shading and/or competing vegetation from lack of consistent management (Garrett and Schotz 2005, Alabama Natural Heritage Program 2007, Sherbundy and Martin 2007, Martin 2008, Martin 2009, Barger *in litt.* 2010). Monitoring data has consistently shown that plants thrive in full or partial sun conditions as long as competition is kept at bay, as evidenced by greater production of stems and flowers in these more open conditions. The removal of competing vegetation by mowing at several populations increased plant numbers and flowers the following season (Tassin 2007, Sherbundy and Martin 2007). Long-term management will be needed to maintain appropriate habitat for the enhancement of this species.

The Alabama leather flower appears to be a poor competitor and suffers when the canopy is opened too much, due to the aggressive growth of competing vegetation in these circumstances (Garrett 2004). Optimum management at more wooded areas should involve clearing competing vegetation and selectively thinning the canopy to allow partial sun exposure (Sherbundy and Martin 2007). Sexual reproduction may be limited in this species and pollinator frequency is suspected to be one of the contributing factors (Timmerman-Erskine and Boyd 1999). Thus, management should also take into account the conservation of the most important pollinators, including an evaluation of adjacent landowner activities and possible negative impacts on pollinator populations (Wall *et al.* 2003).

A number of the populations remain vulnerable due to the small

number of plants and the limited area they occupy. Three of the populations occupy no more than an acre in area and one of these consists of only 2 plants occupying a 15 m² area (Martin 2008, 2009).

It was previously suspected that this species may have a small pool of genetic variability due to its clonal nature and restricted range. However, genetic studies of two populations have shown this species to have a surprisingly moderate level of genetic variability (Boyd *et al.* 1998). Additional studies are ongoing to evaluate genetic variability within and among all populations utilizing a different set of genetic markers (Goertzen and Boyd 2007).

D. Synthesis

The Alabama leather flower is an extremely rare species that was known from only two sites at the time of listing in 1986. Despite intensive surveys since that time, the species is currently known from only four populations in Alabama and one population in Georgia. Only two of the five populations are permanently protected from outright habitat destruction. Four of the five populations appear to support stable populations, but only two of these occupy at least one acre of habitat. There has been progress in recovery efforts for this species; however, there remain many unanswered questions that need to be addressed relative to possible limiting factors for this species (see “Recommendations”). All populations continue to face some form of threat including habitat destruction/modification or the loss of plants and fitness from inadequate habitat management. At this time, the Alabama leather flower continues to meet the definition of an endangered species under the Act.

III. RESULTS

A. Recommended Classification

No change is needed. Recovery criteria have not been met. Additional populations, of sufficient size, need to be located and come under ownership, ensuring their perpetual protection and management. Appropriate management needs to be determined and consistently implemented on all sites. Long-term monitoring is needed at all sites to accurately assess population trends. Additional information provided above under “Synthesis”.

B. New Recovery Priority Number 5

This species continues to be under a “high” degree of threat; however, based on this review, a change in recovery potential from “high” to “low” appears to be more appropriate at this time. There are only five populations and only two of these are at least an acre in size. It is possible that additional populations will be located; however, the protection and management of 20 populations of sufficient size seems unlikely at this point. Survey efforts have been ongoing and intensive for this species since its listing, and populations found thus far are mostly small in size and difficult to secure. Survey efforts to date validate the extreme rarity of this species.

IV. RECOMMENDATIONS FOR FUTURE ACTION

- A. Work to secure protection of all populations.
- B. Survey in vicinity of known populations for outlying plants.
- C. Continue surveys for additional populations in Alabama, Georgia, and also into Tennessee (refer to previous survey reports for guidance).
- D. Develop site management plans for all sites and implement consistent management.
- E. Develop and implement long-term demographic monitoring as a means to track population trends and evaluate management efforts. Gather information on population size, numbers, reproduction, and environmental conditions (i.e. hydrology, soils, weather, light conditions etc.).
- F. Continue biological studies, particularly investigations into reproductive biology and possible limiting factors in sexual reproduction, including additional pollinator studies.
- G. Ensure preservation of genetic material from all populations (i.e. long-term seed storage, material in cultivation) through coordination with Center for Plant Conservation-sponsored gardens.
- H. Implement all other tasks identified in the recovery plan, as appropriate.
- I. Revise recovery plan.

V. REFERENCES

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Peer Reviewers

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Georgia Department of Natural Resources-
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Dr. Robert Boyd, Botanist/Ecologist
Auburn University

Carlen Emanuel, Forest Ecologist
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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
of
ALABAMA LEATHER FLOWER

Current Classification: Endangered
Recommendation resulting from the 5-Year Review

No change is needed

Review Conducted By: Cary Norquist

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve Stephen Ricks Date 8/31/10

REGIONAL OFFICE APPROVAL:

Acting
Lead Regional Director, Fish and Wildlife Service

Approve Aaron Walcott Date 7-12-10

APPENDIX A: Summary of peer review for the 5-year review of Alabama leather flower (*Clematis socialis*)

A. Peer Review Method: The draft 5-year review document was sent to biologists at affected FWS field offices (Daphne, AL and Athens, GA). In addition, the document was also sent to four independent peer reviewers including: Al Schotz, botanist with the Alabama Natural Heritage Program; Mincy Moffett, botanist with the Georgia Department of Natural Resources/Natural Heritage Inventory; Carlen Emanuel, botanist with The Nature Conservancy; and Dr. Robert Boyd, botanist/ecologist on staff at Auburn University, AL.

B. Peer Review Charge: The following cover letter was sent along with the draft 5 year review (excluding the signature page) to the peer-reviewers:

On June 14, 2005, the U.S. Fish and Wildlife Service published a notice in the Federal Register announcing a 5-year review of 25 federally listed species, including Alabama leather flower (*Clematis socialis*). The purpose of the 5-year review is to ensure that the classification of species as threatened or endangered is accurate and reflects the best available information.

You have provided data used to review the status of this species, and you have been identified as knowledgeable about this species. Therefore, in order to ensure that the best available information has been used to conduct this 5-year review, we now request your peer review of the attached document. Specifically we ask for comments on the validity of the data used, and identification of any additional new information on any of these species that has not been considered in this review. Please note that we are not seeking your opinion of the legal status of these species, but rather that the best available data and analyses were considered in reassessing their status.

We appreciate your interest in furthering the conservation of rare plants and animals by becoming directly involved in the review process of our Nation's threatened and endangered species. Your review and comments will become a part of the administrative record for this species, and you can be certain that your information, comments, and recommendations will receive serious consideration.

We hope that you view this peer review process as a worthwhile undertaking. Please give me a call if you have any questions (601-321-1128). Please feel free to respond by email or letter. Thank you for your assistance.

Sincerely,

Cary Norquist
Assistant Field Supervisor/Botanist
U.S. Fish and Wildlife Service
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C. Summary of Peer Review Comments and Response to Peer Review – We received comments from each of the peer reviewers and they were mostly editorial in nature. Comments were considered and incorporated into the final document as appropriate.