

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Leavenworthia crassa* Rollins

COMMON NAME: gladecress

LEAD REGION: 4

INFORMATION CURRENT AS OF: March 2010

STATUS/ACTION

Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

New candidate

Continuing candidate

Non-petitioned

Petitioned - Date petition received: May 11, 2004

90-day positive - FR date: _____

12-month warranted but precluded - FR date: _____

Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

Listing priority change

Former LP: _____

New LP: _____

Date when the species first became a Candidate (as currently defined): October 1, 1999

Candidate removal: Former LP: _____

A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

- F – Range is no longer a U.S. territory.
- I – Insufficient information exists on biological vulnerability and threats to support listing.
- M – Taxon mistakenly included in past notice of review.
- N – Taxon does not meet the Act’s definition of “species.”
- X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plants- Brassicaceae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Alabama

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Alabama- Morgan, Lawrence counties

LAND OWNERSHIP

One population occurs on U.S. Forest Service land in the William Bankhead National Forest (WBNF). The remaining sites are located on private land with plants at some populations extending onto county-maintained roadside rights-of-way. Approximately 10% of populations are on federal land (0.45 hectare (ha)) (1.1 acre (ac)); remaining sites are on private and/or locally maintained road rights-of-way (approximately 4 ha (9 ac)).

LEAD REGION CONTACT: Rob Tawes, 404/679-7142, robert_tawes@fws.gov

LEAD FIELD OFFICE CONTACT: Alabama Field Office, Dan Everson, 251/441-5837, dan_everson@fws.gov

BIOLOGICAL INFORMATION

Species Description/Taxonomy

Leavenworthia crassa is a glabrous winter annual from 1 to 3 decimeters (4 to 12 inches (in.)) tall. The leaves are mostly basal, forming a rosette and entirely to very deeply lobed or parted. Flowers are on elongating stems and approximately 8 to 15 millimeters (mm) (0.3 to 0.6 in.) long. The petals are either yellow with orange or white with yellow, usually with both color forms intermixed in a single population. The fruit is globe-shaped or slightly more elongate and about 12 mm (0.5 in.) long with a slender beak at the tip.

Leavenworthia crassa can be distinguished from *Leavenworthia alabamica*, another glabrous species which occurs in the area, by its globular to oblong fruit with smooth exterior, in contrast to the much more elongated linear fruit, with corrugated surfaces, of the latter species.

Leavenworthia alabamica also does not have the yellow and orange flower forms usually found mixed in population of *L. crassa* (McDaniel and Lyons 1987, p. 10).

Leavenworthia crassa, was described by Rollins in 1963 from material collected in 1959 from Morgan County, Alabama. Rollins (1963, p. 61-68) delineated the species into two varieties (var. *crassa* and var. *elongata*) based on differences in fruit length. However, herbarium and field studies have shown var. *elongata* to have variation in fruit length within the range of fruit

lengths for var. *crassa* (McDaniel and Lyons 1987, p. 2-3). Thus, the species is treated as one taxon throughout this document.

Habitat

This species is a component of glade flora and occurs in association with limestone outcroppings. The terms glade and cedar glades refer to shallow-soiled, open areas that are dominated by herbaceous plants and characterized by exposed sheets of limestone or gravel. Eastern redcedar (*Juniperus virginiana*) trees are frequent in the deeper soils along the edges of the glades (Hilton 1997, p. 1; Baskin *et al.* 1986, p. 138; Baskin and Baskin 1985, p. 1). Historically, glades in northern Alabama occurred as glade complexes where open areas of exposed or nearly exposed limestone were separated by segments of woody vegetation to form an intricate pattern of habitats grading into one another (Hilton 1997; p. 1, 5, 64). Few undisturbed examples of this community type remain (Hilton 1997, p. 8; McDaniel and Lyons 1987, p. 11; Baskin and Baskin 1985, p. 1; Rollins 1963, p. 5-6). Populations of *Leavenworthia crassa* are now located in glade-like areas exhibiting various degrees of disturbance including pastures, roadside rights-of-way, and cultivated or plowed fields (Hilton 1997). As with most of the cedar glade endemics, *Leavenworthia crassa* exhibits weedy tendencies, and it is not uncommon to find the species growing in altered habitats; however, its geographical range is probably very similar to what it was in pre-settlement times since none of the cedar glade endemics appear to spread far from their original glade habitat (Baskin *et al.* 1986).

Life History

Leavenworthia crassa is a winter annual. The seeds germinate anytime from September to October. The plants overwinter as rosettes and flower in March and April. The first seeds mature in late April and during most years, the plants have died and dropped all of their seeds by the end of May. It is unlikely that all seeds produced in spring germinate the next fall, but the length of dormancy in the soil is not known (McDaniel and Lyons 1987, p. 10).

Historical and Current Range

Leavenworthia crassa is endemic to a 13-mile radius area in north central Alabama in Lawrence and Morgan counties (Rollins 1963, p. 63). A 1961 record from Lauderdale County has never been confirmed (McDaniel and Lyons 1987, p. 6). Surveys by Lyons (*in litt.* 1981 to R. Sutter), McDaniel and Lyons (1987, p. 5-6), and Hilton (1997) were unsuccessful at locating a number of historical sites for *Leavenworthia crassa*. McDaniel and Lyons (1987) failed to locate eight sites previously reported by Rollins (1963, p. 63) and Lloyd (1965), and Hilton (1997) was unsuccessful at relocating seven sites listed in McDaniel and Lyons (1987, p. 5-6). Currently, only six populations of this species are thought to survive with three populations each in Morgan and Lawrence counties, Alabama.

Population Estimates/Status

Only one of the six populations is rated as a high quality site (A-rank), having an estimated 1200+ plants in a relatively undisturbed glade (Schotz, 2009, p.10). Of the remaining

populations, one is given a B-rank. This site has approximately 5000-6000 plants but the site is heavily grazed. Three sites have a C-rank (2 sites have approximately 2400 plants in a disturbed glade community, the other site has 75-100 plants); and one is given a D-rank (few plants in unrestorable habitat) (Hilton 1997, Schotz, 2009). The Nature Conservancy ranks sites and populations using A through D, but criteria may vary depending upon the species and habitat type. Hilton (1997) developed these ranks specific to *Leavenworthia crassa* and its habitat type.

THREATS

- A. The present or threatened destruction, modification, or curtailment of its habitat or range. This species is endemic to cedar glade areas in north central Alabama that have been significantly altered from their original condition. More than a 50 percent loss in glade habitat has occurred since European settlement (Hilton 1997). Glade habitats today have been reduced to remnants fragmented by agriculture and development.

Hilton (1997) conducted a thorough survey of cedar glade communities in north Alabama using historical records, soil maps, topographic maps, geology and aerial photography. Her efforts resulted in the identification of 22 high priority glades. However, field surveys found only five of these to be in good condition and restorable, and only two of these were considered high quality sites (Hilton, pers. comm., 1999).

At four of the *Leavenworthia crassa* populations, plants occur in pasture areas, on roadside rights-of-way, and/or in planted fields surrounded by agriculture or residential developments (Hilton 1997). Periodic disturbance, such as plowing in row crop farming, arrests succession and maintains populations in this type of habitat; however, plowing or herbicide treatment in the spring prior to seed set and dispersal could be detrimental to populations. Plants extend into pastures at two sites. Populations are enhanced by the disturbance created from light grazing; however, pastures that are heavily grazed create unfavorable conditions (i.e. soil compaction, soil eutrophication) for *Leavenworthia crassa*. Grazing during the reproductive period also reduces vigor of the populations (Schotz, 2009, p.2). Improvement of pastures with fertilizer treatments and/or the introduction of forage grasses would eventually obliterate populations due to competition. Lyons (*in litt.* 1981 to R. Sutter) considered that her failure to relocate many of the historical *Leavenworthia crassa* sites from the 1960s was due to the change in agricultural practices from growing corn to using those sites for cattle pastures. McDaniel and Lyons (1987, p. 11) considered the trend toward converting agricultural sites for use as pasture as a primary threat to the species.

Populations extend onto roadsides or are near roads at five of the six sites. Mowing and herbicide application prior to seed set pose threats to those populations located on roadside rights-of-way. Three historical sites near roads have not been relocated and a portion of one of the existing populations was destroyed by road widening and grading in the 1980s (McDaniel and Lyons 1987, p. 7-9). Additional road widening at this site in recent years has further reduced the size of this population (Schotz *in litt.* 2007). The largest population of this species has a dirt road traversing through a portion of the site, and this has made the site vulnerable to off-road vehicles and dumping (Hilton 1997,

p.31). Other sites have also been negatively affected by trash dumping and off-road vehicles including the site on Forest Service land. The U.S. Forest Service has posted the area as closed and recently gated the area to block all-terrain vehicle access to the site (T. Counts, U.S. Forest Service, *in litt.* 2008). Thus far, it appears to have been effective at reducing damage to the glade (A. Cochran, U.S. Forest Service, *in litt.* 2005, Schotz *in litt.* 2007).

Hilton (pers. comm. 1999) considers residential and industrial development to be the primary threat to cedar glade communities today and the primary reason for the loss of cedar glade habitat in the last decade. One of the six populations is located in the front yard of a residence. However, at this time, we know of no projects planned in the area that would lead to the destruction of habitat where this species is currently located.

- B. Overutilization for commercial, recreational, scientific, or educational purposes. Overutilization is not considered a threat to this species.
- C. Disease or predation. One population was lost due to infection by a mustard rust in the early 1980's (Lyons and Antonovics 1991, p. 274; McDaniel and Lyons 1987, p. 11). It is not known if this disease poses a significant long-term threat to the species.
- D. The inadequacy of existing regulatory mechanisms. This species is considered endangered in Alabama by the Alabama Natural Heritage Program; however, there are no State or Federal laws that give this species any legal protection. The population within the WBNF is within a Native American cultural site and, as such, is taken out of active timber management. Furthermore, WBNF considers cedar glade areas on the WBNF, which are habitat for this species, to be a priority community type. These priority communities are protected from detrimental effects caused by management actions. Surveys are conducted for such rare communities in proposed project areas which have potential to adversely affect them (A. Cochran, U.S. Forest Service, *in litt.* 2005; Gaines, William Bankhead National Forest, pers. comm. 2004).
- E. Other natural or manmade factors affecting its continued existence. Winter annuals, such as *Leavenworthia crassa*, are excluded from many habitats because they are poor competitors (Baskin and Baskin 1985, p. 387). The most vigorous populations of *Leavenworthia crassa* are located in areas which receive full, or near full, sunlight at the canopy level and have limited herbaceous competition (Hilton 1997, p.5). Rollins (1963, p. 17) documented the loss of *Leavenworthia crassa* individuals caused by invading grasses in an unweeded portion of an experimental plot, while *Leavenworthia crassa* individuals in the hand-weeded part of the plot thrived. Hilton (1997, p. 12) was unable to relocate five populations in abandoned fields and pastures, which McDaniel and Lyons (1987, p. 7-9) had noted as appearing depressed due to competition from invading weedy species. Shading and competition are potential threats at the two largest populations of *Leavenworthia crassa* (Hilton 1997, p. 68). One site, reported to be widely open in 1968, is now partially shaded due to a partial closing of the canopy (Hilton 1997, p.18).

Non-native plants including common privet (*Ligustrum vulgare*) and bush honeysuckle

(*Lonicera maackii*) are a major problem in many glades due to the ever present disturbances that allow for their colonization (Hilton 1997, p. 68). Non-native plant species pose a threat to one population of *Leavenworthia crassa* where they have established near an unimproved road traversing the site (Hilton 1997, p.18).

Under natural conditions, cedar glades are maintained edaphically (related to or caused by particular soil conditions) through drought and erosion. The shallow soil, exposed rock, and frequent hot, dry summers create xeric conditions that keep competition and/or shading effects of encroaching vegetation in check (Hilton 1997, McDaniel and Lyons 1987, p. 6; Baskin *et al.* 1986, p. 138; Rollins 1963, p. 5). The soils that develop on glades are easily eroded, moving downslope or into fractures in the substrate. Periodic fires also likely played a role in maintaining these communities (Hilton 1997). Due to the continuing loss and modification of cedar glade habitats, presently available habitat for *Leavenworthia crassa* is primarily in areas modified by human activity where less than optimum conditions exist to perpetuate appropriate habitat. Periodic disturbance is needed to arrest succession and perpetuate suitable habitat.

As with all annuals, this species' long-term survival is dependent upon its ability to reproduce and reseed an area every year. Thus, populations decline and move toward extinction if conditions remain unsuitable for reproduction for many years.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:

The population and its habitat on WBNF is protected due to its occurrence in a Native American cultural site and the fact that cedar glade communities are considered "rare communities" on the WBNF and protected from any detrimental effects from management actions (A. Cochran, U.S. Forest Service, *in litt.* 2005). A thorough survey of limestone and sandstone glades on the WBNF was completed by Schotz in 2006.

The Service funded a survey of cedar glade habitats in the Moulton Valley physiographic region of northwestern Alabama, the major area for this habitat type, in the late 1990's. A survey and status update for all populations was part of that project. The Service recently funded surveys to update information on all populations of this species. All sites were visited in 2006 and 2007; no significant changes were noted (Schotz *in litt.* 2008). Surveys continued into 2009 with a final report prepared in November 2009 (Schotz 2009). Information from these surveys will continue to inform development of conservation measures needed to protect and enhance populations.

SUMMARY OF THREATS: *Leavenworthia crassa* is vulnerable due to the small number of sites and its limited range. Populations are located in remnant glade habitats due to the loss of much of this community type from agricultural and residential conversion of glade habitat. Populations of this species are now located in pastureland, roadside rights-of-way, and cultivated or plowed fields. These populations are potentially threatened by spring grazing, herbicide use and degradation of habitat by dumping, ATV use, and competition, including invasives. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

RECOMMENDED CONSERVATION MEASURES: Update landowner information for all sites; work with individual landowners to protect and manage for populations; develop agreement with AL Department of Transportation to ensure protection of populations near roads; work with U.S. Forest Service to develop management plan for population on their property.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5*
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: There are only six populations known for this species and only one of these receives some sort of protection. Populations are vulnerable and potential threats occur throughout the species' range. The loss of any sites would have a significant impact on this species' survival so the magnitude of threat is considered high.

Imminence: Although the species occurs in somewhat disturbed areas, populations appear to be able to adjust to periodic disturbances. The small number of sites makes this species vulnerable and potential impact to these populations from competition, exotics, and disturbance to glades by dumping and ATV use will require monitoring. At this time, we know of no projects planned in the area that would lead to the destruction of habitat where this species is currently located. The threats, therefore, are non-imminent.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No

Though there are only six populations known for this species, the threat of extinction is not

imminent. Threats to this species will have a slow and gradual effect on the populations. We know of no projects planned in the area that would destroy the habitat. This species responds favorably to periodic disturbance.

DESCRIPTION OF MONITORING: Species experts, land managers, affected Service offices, and the State were given copies of the candidate form and asked to provide additional information on this species, its habitat, and any conservation measure implemented. Al Schotz, botanist with the Alabama Natural Heritage Program; Wayne Barger, botanist with the Alabama Heritage Program/ State Land's Division of Alabama Department of Conservation and Natural Resources (DCNF); Allison Cochran and Gary Shurette with the Forest Service were all contacted in February 2010 for information.

Visits to all sites were made in 2007, 2008 and 2009 by Al Schotz of the Alabama Natural Heritage Program. The site on WBNF is visited regularly by Forest Service staff and was last monitored in 2009. There is no funding supporting continual annual monitoring of this species at all sites, however, the Alabama Natural Heritage Program was funded to survey sites during 2007, 2008 and 2009.

COORDINATION WITH STATES:

One site visit to a *L. crassa* site was reported by an Alabama DCNR botanist in 2008, who observed flowering plants. No additional information on this species was provided by the Alabama DCNR. This species is not included in the state wildlife action plan, the Alabama Comprehensive Wildlife Conservation Strategy. The Alabama plan does not include any plants, only animals.

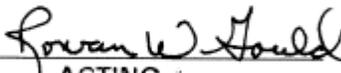
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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  June 15, 2010
for Regional Director, Fish and Wildlife Service Date

Concur: 
ACTING
Director, Fish and Wildlife Service Date: October 22, 2010

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: March 2010
Conducted by: Dan Everson, Alabama Field Office