

Ribes echinellum
(Miccosukee gooseberry)

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



Mays Pond, Jefferson County, 2008. Photos by Vivian Negrón-Ortiz.

U.S. Fish and Wildlife Service
Southeast Region
Panama City Field Office
Panama City, Florida



5-YEAR REVIEW
***Ribes echinellum* (Miccosukee gooseberry)**
TABLE OF CONTENTS

| | |
|--|----|
| I. General Information..... | 1 |
| A. Methodology..... | 1 |
| B. Reviewers..... | 1 |
| C. Background..... | 2 |
| II. Review Analysis..... | 3 |
| A. Distinct Population Segment Policy..... | 3 |
| B. Recovery Criteria..... | 3 |
| C. Updated Information and Current Species Status..... | 3 |
| 1. Biology and Habitat..... | 3 |
| 2. Five Factor Analysis..... | 10 |
| D. Synthesis..... | 13 |
| III. Results | |
| A. Recommended Classification..... | 13 |
| B. New Recovery Priority Number..... | 13 |
| IV. Recommendation for future action..... | 14 |
| V. References..... | 15 |

| | |
|--|----|
| VI. Figures | |
| Figure 1. Map of Southeastern United States showing the locations of <i>R. echinellum</i> populations..... | 3 |
| VII. Tables | |
| Table 1. Number of transects, date of most recent prescribed burn, number of reproductive ramets, and total number of ramets monitored in each size class in the North and South sites of Florida..... | 4 |
| Table 2. Number of ramets and stems reported on 10 permanent plots in Steven’s Creek..... | 5 |
| Table 3. Number of ramets and stems reported on four surveys conducted on seven subpopulations of Miccosukee gooseberry in Sumter National Forest..... | 6 |
| Table 4. Species associated with <i>R. echinellum</i> ’s habitat..... | 9 |
| VIII. Appendix | |
| A. Summary of peer review for the 5-year review of <i>Ribes echinellum</i> (Miccosukee gooseberry) | 20 |

5-YEAR REVIEW

***Ribes echinellum* / Miccosukee gooseberry**

I. GENERAL INFORMATION

A. Methodology used to complete the review

This review was accomplished using information obtained from several unpublished field monitoring works from The Nature Conservancy (TNC), Sumter National Forest (Sumter NF) and Steven's Creek Heritage Preserve (Steven's Creek), unpublished research projects, peer-reviewed scientific publications, unpublished field observations by U.S. Fish and Wildlife Service (Service), State and other experienced biologists, and personal communications from experts. These documents are on file at the Panama City Field Office. A *Federal Register* notice announcing the review and requesting information was published on April 26, 2007 (72 FR 20866). No part of this review was contracted to an outside party. Comments and suggestions from peer reviewers were incorporated as appropriate (see Appendix A). This review was completed by the Service's lead Recovery botanist in the Panama City Field Office, Florida.

B. Reviewers

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C. Background

1. FR Notice citation announcing initiation of this review:

72 FR 20866 (April 26, 2007): Endangered and threatened wildlife and plants: 5-year review of 22 Southeastern species.

2. Species status: Stable (Recovery Data Call 2007); populations seem to be stable based on 1) monitoring data for the Perkins property (FL) and Sumter NF (So. Carolina); and 2) recent observations for the Steven's Creek Preserve (So. Carolina).

3. Recovery achieved: 1 (0 - 25% recovery objectives achieved); Recovery Data Call 2007; a few recovery actions have been initiated.

4. Listing history

Original Listing

FR notice: 50 FR 29338-29340 (July 18, 1985).

Date listed: August 19, 1985

Entity listed: species

Classification: Threatened

5. Associated rulemakings:

Not applicable

6. Review History:

Status Review: No formal 5-year reviews have been conducted for *Ribes echinellum* since the final rule for listing the species was approved.

Recovery Data Calls:

2003 (stable); 2004 (stable); 2005 (stable); 2006 (stable); 2007 (stable).

7. Species' Recovery Priority Number at start of review:

14. *Ribes echinellum* is ranked as a species with low threats, and high recovery potential.

8. Recovery Plan or Outline

Neither a recovery plan nor an outline has been written for this species.

II. REVIEW ANALYSIS

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

Ribes echinellum is a plant; therefore, it is not covered by the DPS policy.

B. Recovery Criteria

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

No. This species does not have a recovery plan.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends.

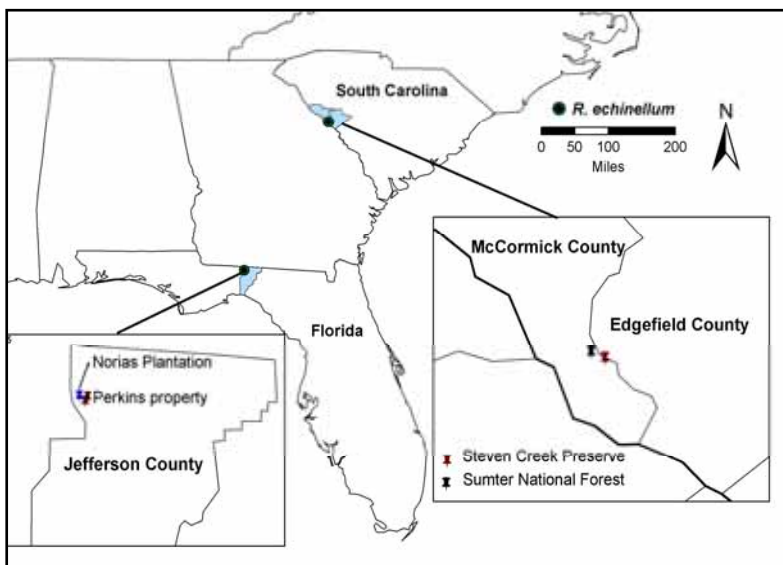


Figure 1. Map of Southeastern United States showing the locations of *Ribes echinellum* populations.

Ribes echinellum (Coville) Rehder (Miccosukee gooseberry) is a shrub located along the north shoreline of Lake Miccosukee near Monticello, Florida, and in two locations in South Carolina, McCormick County: Steven's Creek, a site 1.5 m northeast of Clark Hill, and in Sumter NF, Edgefield Ranger District (Catling 1998) (Figure 1). The Florida population was discovered in 1924, and the South Carolina populations were found in 1957 and 1981

with the first protected at Steven's Creek Heritage Preserve.

Jefferson County, Florida

On Lake Miccosukee, the populations are under three private ownerships (Perkins property and Norias Plantation properties). Perkins property is under a conservation easement administered by Tall Timbers Research Station (Tall Timbers); this property was administered by The Nature Conservancy (TNC) until 2001. Norias Plantation (NP) is divided into two properties with each containing about the same number of plants (W. W. Baker, 2007, pers. comm.). The plants are locally abundant and the populations appear to be stable at all sites (V. Negrón-Ortiz, 2007, pers.

observ.; Slapcinsky and Gordon 2005). In a recent survey, the plants located along the shoreline of Lake Miccosukee (NP site) were not abundant, and the soil was extremely dry (V. Negrón-Ortiz, 2007, pers. observ.). Schultz and Hardin (1985) estimated that there were about 5,000 plants over an area of 0.099830 acres at the type location (NP site). This species appears to be most abundant in the shade of deciduous trees on moist and well-drained soils with a pH of 6.7 to 7.4.

Monitoring

The population located on Mays Pond (Perkins property) was monitored from 1992 to 2001 by TNC staff. The property was supervised by Tall Timber after 2001. Variables such as the height and number of ramets ('ramets' = cluster of rooted stems 10 cm apart from any other cluster), and the number of flowers and fruits were monitored in eighteen 50 m x 1 m and two 30 m x 1 m permanent randomly located belt transects facing North and South. Ten transects in the North side were partially burned in March 1996, and seven of the ten transects were re-burned in 1999. Using a 0.25 m² quadrat placed every 5 m along the transects, the percent ground cover for plants <1 m tall, litter and bare ground, as well as the presence or absence of *Ribes* ramets were monitored at three year intervals (1992, 1995 and 1998). In addition, the ramets were classified into two size classes: < 30 cm tall ('small') and ≥ 30 cm tall ('large') (Slapcinsky and Gordon 2005).

The results indicated that the number and mean density of large ramets increased in the North facing side during monitoring (Table 1). Mean density of small ramets were variable but increased from 1992-1996. In the South side the mean ramet density peaked in 1994 (Table 1). Reproductive stems were observed on larger size classes, but were found in only 5% of these ramets (Table 1).

Table 1. Year, date of most recent prescribed burn, number of reproductive ramets monitored in each size class, and total number of ramets monitored in each size class in the North and South sites. The South side was not burned. Twenty transects were monitored per year; 25 transects were monitored in the South side during 2001. ^a the prescribed burn on 3/4/96 affected 10 transects; ^b the prescribed burn on 3/16/99 affected seven of the ten North site transects burned in 1996. Data from Slapcinsky and Gordon 2005.

| Year | North | | | South | |
|------|----------------------|--------------|----------|--------------|----------|
| | Burn | Rep. / Total | | Rep. / Total | |
| | | <30 | ≥30 | <30 | ≥30 |
| 1992 | -- | 0 / 247 | 1 / 335 | 1 / 163 | 20 / 345 |
| 1993 | -- | 2 / 396 | 8 / 435 | 0 / 220 | 6 / 349 |
| 1994 | -- | 0 / 220 | 25 / 456 | 8 / 253 | 40 / 515 |
| 1995 | -- | 0 / 216 | 4 / 479 | 1 / 213 | 17 / 471 |
| 1996 | 3/4/96 ^a | 1 / 441 | 2 / 476 | 0 / 197 | 12 / 307 |
| 1997 | 3/4/96 | 1 / 315 | 10 / 355 | 2 / 270 | 23 / 439 |
| 1998 | 3/4/96 | 0 / 368 | 9 / 528 | 3 / 173 | 22 / 466 |
| 1999 | 3/16/99 ^b | 0 / 372 | 1 / 295 | 0 / 233 | 0 / 353 |
| 2000 | 3/4/96 | 0 / 395 | 8 / 431 | 0 / 290 | 5 / 286 |
| 2001 | 3/16/99 ^b | 0 / 278 | 2 / 567 | 0 / 282 | 13 / 337 |

The burned plot showed an increase in the mean density of small ramets likely due to seedling recruitment after fire because of decreased litter levels. Density of small ramets declined to zero in all transects following the 1999 prescribed burn, recovering in 2000. Reproduction was not enhanced by fire (Table 1, Slapcinsky and Gordon 2005).

In general, results indicated that small ramets are more frequent in areas with high herbaceous cover and low litter levels. Fire may positively affect the plant's density, but does not enhance reproduction (Table 1).

The response of *R. echinellum* to fire raised some questions. Since fire failed to stimulate reproduction, the lower size classes (small ramets) that increased after fire could be explained by: 1) seedlings recruited from a seed bank present in the soil, 2) rooting branches no longer connected to the 'parent' ramet and growing as a new entity, 3) formation of adventitious buds which eventually gave rise to new branches, or 4) any combination of these. If the second and third alternatives are the explanations, then the increase in the number of small ramets occurred solely by stimulation of vegetative reproduction, a common effect of fire on plants (Whelan 1995).

Monitoring has not been established at the NP site.

McCormick County, South Carolina

Steven's Creek Heritage Preserve

The plants are protected at the 0.000247 acres Steven's Creek under the South Carolina Heritage Trust Act of 1976, with the South Carolina Wildlife and Marine Resources Commission acting as trustee. The population covers approximately 0.034841 acres with thousands of plants (<http://www.sas.usace.army.mil/pgsberry.htm>). The plants appear to be 'fairly stable' (M. Bunch, 2007, pers. comm., <http://www.sas.usace.army.mil/pgsberry.htm>; R. Mackie, 2008, pers. comm.), but may be declining (D. Rayner, 2007, pers. comm.).

Table 2. Number of ramets and stems reported on 10 permanent plots in Steven's Creek.

| Plot # | Clumps/stems in 0.1 acre plot |
|--------|----------------------------------|
| 1 | 180 / 500 |
| 2 | 100 / 300 |
| 3 | 60 / 180 |
| 4 | 100 / 300 |
| 5 | 50 / 150 |
| 6 | 65 / 260 |
| 7 | 75 / 225 |
| 8 | 130 / 390 |
| 9 | 140 / 325 |
| 10 | 120 / 360 |
| Total | 1,020 / 2,990 |

With the purpose of conducting a long-term study, ten 0.1-acre circular plots were established in February 2008 (Table 2). The survey, conducted in the spring of 2008 by Gaddy (2008) for the SC Department of Natural Resources, indicated that *R. echinellum* is extremely dense, with plots having up to 500 stems (Table 2). Based on the permanent plots and other sampled areas, it is estimated that as many as 9,870 clumps are present in Steven's Creek (Gaddy 2008). The plants are not evenly distributed, but are most common in light gaps, tree fall areas, and disturbed rocky sites.

Sumter National Forest, Edgefield Ranger District

The Sumter National Forest (Sumter NF) was established in 1936 and is being managed by the USDA Forest Service (USDA 2004). There is one population represented by seven small subpopulations (each 1-2 m²) containing about 1,563 *R. echinellum* stems or about 270 ramets (Table 3). This population covers an area of 0.044146 acres.

The subpopulations seem to be stable based on monitoring data collected every four to five years from 1994 to 2007. One newly discovered population was documented in 2007 (Table 3). The 2007 monitoring data indicated an overall increase in population size for five subpopulations (Table 3). Subpopulation no. four declined by 95% (Table 3). This subpopulation is found on the edge of an old erosion gully, and declines could likely be explained by drought, deer herbivory, or lack of suitable habitat in the immediate vicinity of the subpopulation (Mackie, 2008, pers. comm.).

Table 3. Number of ramets and stems reported on four surveys conducted on seven subpopulations of Miccosukee gooseberry in Sumter National Forest. Ramets = cluster of rooted stems < 10 cm apart from any other cluster. --- no survey.

| Subpopulation | Number of ramets / stems | | | |
|---------------|--------------------------|-------------|---------|-----------|
| | 1994 | 1998 | 2003 | 2007 |
| 1 | 19/--- | ---/45 | ---/163 | 22/85 |
| 2 | 10/--- | ---/17 | ---/26 | 20/62 |
| 3 | 1/--- | ---/50 | ---/69 | 17/152 |
| 4 | 22/--- | ---/60 | ---/69 | 1/3 |
| 5 | 29/--- | ---/100's | ---/79 | 37/98 |
| 6 | 47/--- | ---/100-200 | ---/177 | 73/163 |
| 7 | | | | ~100/1000 |

b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No genetic studies have been conducted.

c. Taxonomic classification or changes in nomenclature:

Kingdom: Plantae
 Division: Magnoliophyta
 Class: Magnioliopsida
 Order: Saxifragales
 Family: Grossulariaceae
 Genus: *Ribes* L.
 Subgenus: *Grossularia* Miller
 Species: *echinellum* (Coville) Rehder
 Common names: Miccosukee gooseberry, Florida gooseberry, spiny gooseberry

Ribes L., which includes the cultivated currants and the gooseberries, comprises about 150 - 200 shrubby species with extremely diverse floral and fruit characters. It is widely distributed throughout the temperate regions of Europe, Asia, and North America, and extends south in mountainous areas of South America and northwest Africa (Brennan 1996, Shultheis and Donoghue 2004). The genus is ecologically important (e.g., can be used to re-vegetate disturbed mountain areas; Plummer 1976) and some species (*R. nigrum* L. and *R. rubrum* L., *R. uva-crispa* L.) are worldwide berry crops (Brennan 1996, Finn 1999, Harmat et al. 1990).

The genus belongs to the family Grossulariaceae, but was originally placed in the large polyphyletic Saxifragaceae, within the monogeneric woody subfamily Ribesoideae (Heywood 1993, Morgan and Soltis 1993). Some authors have defined the Saxifragaceae more narrowly and the subfamilies are now often treated as segregate families (Morgan and Soltis 1993). Numerous infrageneric classifications have been proposed for the genus generating a complex taxonomy (Shultheis and Donoghue 2004, Weigend et al. 2002). Consistently, however, is the division between the currants and the gooseberries, treated either as separate subgenera, *Ribes* and *Grossularia* Miller, or even distinct genera. Recent molecular data indicated monophyly for *Grossularia* but nested within *Ribes* s.l. (Senters and Soltis 2003, Shultheis and Donoghue 2004, Weigend et al. 2002). Therefore, the recognition of *Grossularia* as a genus distinct from *Ribes* is not justified.

***R. echinellum* (subgenus *Grossularia*)**

Miccosukee gooseberry was described as *Grossularia echinella* by Coville in 1924 from Lake Miccosukee, Jefferson County, Florida. In 1926, Rehder revised the species to the present nomenclature. *Ribes echinellum* is a gooseberry belonging to the subgenus *Grossularia* (Weakly 2007).

Miccosukee gooseberry is a perennial shrub about 1 m tall. It is deciduous, shedding most leaves after mid-summer with new leaves emerging in the autumn (November) and over-wintering. The branches are erect to spreading-recurved, frequently rooting when decumbent branches are in contact with soil. The leaves are alternate and petiolate, with blades palmately 3-lobed with toothed margins. The leaf nodes are armed with purple-brown, sharp-pointed 1-3 spines. Flowering is during early spring, March and April, with flowers greenish white, 15 to 20 mm long, usually solitary but occasionally 2-flowered, pendent, bisexual, protandrous, and radially symmetrical. The petals are recurved at anthesis with a 2-parted floral tube. The calyx is green, pubescent, and reflexed with five lobes 4-7 mm long. The stamens are 9-15 mm long, exerted at anthesis with anthers reddish-pink. The pistil, with a slender divided style, is 10-15 mm long. The lower part of the hypanthium is more or less globular, covered with gland-tipped bristles. The many-seeded fruit is a green berry of 2-3 cm in diameter, densely covered with many spicules.

d. Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Pleistocene glaciations are important events used to explain historical migration, and in many cases, these migrations have led to the formation of disjunct populations of plants and animals (Church 2003). These disjunct populations may represent remnants of what was once widespread Tertiary vegetation, now representing Pleistocene refugia (Church 2003, Estill and Cruzan 2001). James (1961) has explained the present distribution of *R. echinellum*, according to the Pleistocene refugia concept, as a species that retreated during periods of climate changes into two widely separately disjunct areas (Florida and South Carolina, Figure 1).

The present distribution of *R. echinellum* is still limited to its historic range (Figure 1). Within these sites, the plants are abundant and stable, at least in Florida (Slapcinsky and Gordon 2005) and at Sumter NF. Monitoring data for the Florida populations indicated that total number of ramets was higher in 2001 than in 1992 with an increase in the number of larger ramets for the North facing side. In addition, plants were vigorous in burned sites.

The current status of the Steven's Creek population (South Carolina) is uncertain, with conflicting observations on trends over the last 31 years [e.g., declining (Rayner, 2007, pers. comm.), relatively stable (Mackie, 2008, pers. comm.)]. A recent survey indicated that *R. echinellum* is extremely dense (Gaddy 2008), however, the lack of a long-term monitoring study preclude any conclusive statement about trends. Therefore, surveys and monitoring are important actions that should be immediately implemented at this site.

The Sumter NF population (South Carolina) is stable with a 16% increase in the number of ramets since monitoring was established in 1994. The increase of ramets can be attributed to the discovery of a new subpopulation in 2007, in proximity to the others. As previously stated (section II.C.1.a), only one site exhibited a decline (of 95% of plants). Drought since 1998 and evidence of deer herbivory in 2003 appear to be the causes of this decline (Sumter National Forest, 2007).

e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Jefferson County, Florida

Miccosukee gooseberry is found over an area of 0.104752 acres between 24.4 to 36.6 m of elevation, at sites of high floristic diversity (Table 4), on mesic and well drained soils with an underlying rock of limestone (Schultz and Hardin 1985, USFWS 2000). Interestingly, these sites are dominated by deciduous species (Table 4, Harper 1925), with the west-facing slope dominated by a mixed hardwood forest containing trees such as hickories, elms, white ash, hackberries, and oaks (Table 4) (Catling 1998, USFWS 2000) and a shrub layer dominated by buckeye and poison ivy. The site, located in the bottomland hammock is dominated by American beech and southern magnolia.

McCormick County, South Carolina

Steven's Creek Heritage Preserve

The plants are found over an area of 34.9999 acres along Steven's Creek on a steep north facing slope containing stands of deciduous hardwood trees (<http://www.sas.usace.army.mil/pgsberry.htm>). The forest community was described by Radford (1959) as mixed mesophytic. It is also floristically very rich with species of *Carya* and *Quercus* accounting for over 50% of the composition of the tree size-class (Table 4). The soil texture is considered a sandy loam with high pH (6.7 to 7.4) and calcium levels (Jones 1986).

Sumter National Forest, Edgefield Ranger District

The site is characterized by a lower slope with an easterly aspect. The plants are found over an area of 0.044146 acres. The forest, a mature (<100 years) hardwood forest with a sparse understory, is dominated by cherrybark oak, swamp chestnut oak, painted buckeye, and southern sugar maple. In addition, scarlet oaks, beech, witch hazel and ironwood are common members of the community. The soil is Tatum, a derivative from fine-grained phyllite, with pH ranging from 6.2 to 6.4.

Table 4. Species associated with *R. echinellum*'s habitat (Catling 1998, USFWS 2000). ■ species dominating Steven's Creek, * species dominating Sumter NF.

| Species and common names | Species and common names |
|---|--|
| <i>Acer saccharum</i> (sugar maple), <i>A. barbatum</i> * (Florida Maple, southern sugar maple) | <i>Aesculus pavia</i> (red buckeye) |
| * <i>Carya glabra</i> (pignut hickory), ■ <i>C. cordiformis</i> (bitternut hickory) | <i>Aralia spinosa</i> (devil's walking stick, prickly ash, prickly elder, angelica tree, pigeon tree, shotbush) |
| * <i>Celtis occidentalis</i> (hackberry) | <i>Carex wildenowii</i> (Wildenow's sedge) |
| * <i>Fagus grandifolia</i> (American beech) | <i>Polygonatum biflorum</i> (Solomon's seal) |
| <i>Fraxinus americana</i> (white ash) | * <i>Rhus radicans</i> (poison ivy) |
| <i>Liquidambar styraciflua</i> (witch hazel) | <i>Trillium underwoodii</i> (longbract wakerobin), * ■ <i>T.</i> <i>lancifolium</i> (Narrow-leaved Trillium) |
| <i>Magnolia grandiflora</i> (southern magnolia) | * ■ <i>Isopyrum biternatum</i> (false rue anemone) |
| * <i>Ostrya virginiana</i> (ironwood) | * ■ <i>Sanguinaria Canadensis</i> (bloodroot) |
| <i>Quercus shumardii</i> (Shumard oak), <i>Q. michauxii</i> (swamp chestnut oak), ■ <i>Q. rubra</i> (red oak), ■ <i>Q. alba</i> (white oak) | * ■ <i>Geranium maculatum</i> (wild geranium) |
| <i>Tilia</i> spp. (linden) | |
| <i>Ulmus rubra</i> (slippery elm), <i>U. ulata</i> (winged elm) | |

f. Other

Reproductive biology

1. Pollination.

Floral biology and flower visitors were observed and described for the Florida and South Carolina populations (Caitling 1998). The author concluded that pollinators and/or visitors were not the limiting factor determining the species' abundance. Below is a detailed account of the findings.

a. Floral biology and behavior at anthesis.

The stamens are the first reproductive structure elongating within one or two days of floral anthesis. It is followed by reflexing of the calyx lobes and dehiscence of the anthers. The style elongates within one to three days of stamen elongation, separates into two parts, reaching an equal or longer length than the stamen. This floral maturation suggests protandry (male function precedes female function), a breeding system that promotes outcrossing.

Interestingly, the style failed to elongate in 20% of the flowers, but unfortunately, the author did not provide a description of these flowers to assess whether these flowers are female sterile. If they are female-sterile, the breeding system is not simple protandry, but also andromonoecious (species that have bisexual and male flowers on the same plant).

b. Insect visitation and pollination.

The author recorded five different visitors to the flowers, with *Bombus impatiens* Cresson (bumble bee) and *Habropoda laboriosa* Fab. (southeastern blueberry bee) as the two most abundant visitors for both Florida and South Carolina populations. Visitation movements occurred between and within plants.

2. Reproduction and seed germination

Vegetative reproduction is common by cuttings and by rooting at the stem whenever the decumbent branches come in contact with the ground (Jones 1986). Fire appears to promote clonal reproduction by increasing the number of plant ramets (Slapcinsky and Gordon 2005).

Sexual reproduction might occur (Jones 1986), since low seed production has been observed, however, germination appears to be limited. Seed scarification and stratification treatments have been done with no success. Partially burying the fruit on mineral soil at the South Carolina site allowed for some germination within nine months (Caitling 1998).

Seed germplasm

The USDA National Germplasm Resources Laboratory, Corvallis, Oregon maintains seed collections of *R. echinellum* (accessions no. PI 555818 and PI 555817) made in 1984 and 1985 near Lake Miccosukee (USDA 2007).

***Ex-situ* collection**

The Historic Bok Sanctuary (Sanctuary), Lake Wales, FL, has worked on propagation of *R. echinellum* (Peterson and Campbell 2007). In 2006, the Sanctuary collected 50 cuttings and rhizomes from the northwest shore of Lake Miccosukee. After one year, only one cutting survived, and rhizomes didn't resprout. Seeds were not used due to the small quantities observed in the wild.

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

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

The decline of any particular species seldom has a single cause. The lack of historical reference data for *R. echinellum* makes it difficult to evaluate the present distribution of this species. The present populations are possibly remnants of a distribution which developed during the Pleistocene period. The extremely constrained distribution of this species, and the small size and number of populations increases the probability of significant impacts from any losses (even small-scale perturbations), whether natural or from human impact. Therefore, habitat destruction or degradation is a concern.

The threat of habitat destruction or alteration is greatest at the Florida site. *Ribes echinellum* occurs on private property, and there is no guarantee that the properties will not be developed for home-sites, agriculture, logging of associated hardwoods, recreational facilities, or other purposes in the future. The Perkins property was administered and monitored by TNC from 1992 until 2001. Currently it is under conservation easement with Tall Timbers, and personal communication with Dr. Christine Ambrose (Tall Timbers), indicated that the plants have been monitored since the easement was issued, but data are not available for evaluation. The landowner seems cooperative and has indicated his objective to maintain the site undisturbed. The Norias Plantation properties are of concern because there are no current protections in place to preserve *R. echinellum*. Additionally, at least one landowner has expressed reluctance to allow access for monitoring.

The South Carolina populations occur on public lands, therefore habitat loss is not a concern (Stowe 1999, USDA Forest Service 2008). However, there are other factors threatening the plants at these sites (see below). One of the primary management objectives for Steven's Creek is "to maintain the viability of *R. echinellum* by protecting and enhancing the bluff and cove hardwood forest (Stowe 1999)." Sumter NF is managed by the USDA Forest Service for multiple uses including watershed protection and improvement, timber and wood production, habitat for wildlife and fish species (including threatened and endangered species), wilderness area management, minerals leasing and recreation (USDA Forest Service 2008). On the National Forest, the population is managed as a Botanical/ Zoological Area, where goals are to perpetuate or increase plant or animal species that are of national, regional, or state significance as identified on proposed, threatened, and endangered species lists (USDA 2004).

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

Unlike other gooseberry species, there is no evidence to suggest that this factor is a threat for this species.

c. Disease or predation:

Deer browse

Deer browsing does not represent a threat to the Florida population. It has been reported for two subpopulations at Sumter NF, and is a major problem at Steven's Creek site. Dr. Rayner has been monitoring the effects of deer browse on *R. echinellum* at the Steven's Creek site for about five years. According to Dr. Rayner (2007, pers. comm.), deer browse is probably one of the reasons that the population of *R. echinellum* at the Steven's Creek site has declined since the property was acquired by the SC Department of Natural Resources. Preliminary results indicated a significant difference in the abundance of *R. echinellum* in a 100 m² fenced plot (i.e., treatment excluding deer), compared to the adjacent unfenced plot. In addition, he noted that the recovery of *Ribes* is not as immediate as would be expected and an insect pest is attacking the stems and causing die-back.

Disease is not a factor threatening *R. echinellum*.

d. Inadequacy of existing regulatory mechanisms:

Miccosukee gooseberry is protected under Florida State Law, chapter 85-426, which includes preventions of taking, transport, and the sale of the plants listed under the State Law. South Carolina has an endangered species law that protects animals but not plants (<http://ipl.unm.edu/cwl/statbio/southcarolina.htm>). However, the species is indirectly protected under South Carolina State Law, section 50-11-2200, against unauthorized plant taking from parks.

The Endangered Species Act (Act) of 1973, as amended offers limited protection for listed plants. The Act prohibits the removal of federally listed threatened and endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of state law or regulations or in the course of any violation of a state criminal trespass law. However, neither section of the Act provides protection for plants on private lands unless it's in violation of state law.

e. Other natural or manmade factors affecting its continued existence:

Non-native species

The proliferation of non-native (invasive) species represents a threat to *R. echinellum* in the Steven's Creek population and to some extent at Sumter NF and in Florida. In Florida, the invasive species Japanese climbing fern (*Lygodium japonicum*) and Chinese privet (*Ligustrum* spp.) were observed on the Perkins conservation easement property (Negrón-Ortiz, 2007, pers. observ.). These invasives are not abundant and were not seen where *R. echinellum* occur (Negrón-Ortiz, 2008, pers. observ.), thus this threat is a minor concern at the current time.

The manager for Steven's Creek (M. Bunch) noted significant invasion of the gooseberry site by privet and Japanese honeysuckle (*Lonicera japonica*),

predominantly in the riparian area and on the north facing outcrops. The SC Department of Natural Resources hosted several volunteer workdays, and staff has worked on the problem at Steven's Creek reducing the Chinese privet, mostly by manual removal. They have conducted a limited amount of cutting and painting Chinese privet stumps using glyphosate and started controlling the Japanese honeysuckle by hand pulling. The riparian area, which was most heavily covered with Chinese privet, is now greatly improved with about 70% of this invasive removed. The same invasives have been reported for the Sumter NF subpopulations, but this threat is not currently significant.

Drought

Currently, South Carolina and Florida are facing a severe drought. Although the plants are stable it is unknown how the plants would respond to long-term drought.

II.D. Synthesis

This is the first five-year status review prepared for *R. echinellum* since the species was listed; therefore, it provides the most current assessment of the species' status and the present threats.

The present confinement of *R. echinellum* to two disjunct localities, Florida and South Carolina, indicates that it is a very rare species, yet in both locations the plants are abundant. Monitoring data indicate that the species is stable and increasing in at least the Florida and Sumter NF populations, but the present status of the Steven's Creek site is uncertain. The Steven's Creek population requires a long term monitoring study to investigate its current status and to assess the effects of deer browse and invasive plant species. In general, the plants seem to be relatively stable and no problems have been detected with disease. Predation and low sexual reproduction are of concern.

The species occurs on both private and public lands. The species occurs on private property in Florida with one of the three properties under a conservation easement. There is no guarantee that the NP properties will not be utilized for residential or commercial development in the near future. The South Carolina populations are protected on public lands, but herbivory and invasive species continue to pose a threat. Permanent protection and management are necessary to conserve this species. *Ribes echinellum* should remain as a threatened species because the present impacts of invasive plants and deer herbivory, and potential impacts via development could cause this species to decline.

III. RESULTS

A. Recommended Classification

x No change is needed

B. New Recovery Priority Number Rationale: 11

The change from a recovery priority number of 14 to 11 is recommended because the degree of threat to *R. echinellum*, including its habitat has increased from being low to moderate due to the presence of herbivory (a new threat for this species) and several invasive species. Japanese honeysuckle was the only invasive species cited as a threat when the final rule for listing the species was approved. The species' recovery potential is considered low, as propagation efforts to date have proven unsuccessful and recovery rates appear slow.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Foster a working partnership between Tall Timbers, the Service, and the Perkins conservation easement for the Florida population.
2. Foster a working partnership with the Norias Plantation's landowners.
3. Fence a larger area at Steven's Creek to protect the plants from deer herbivory and to better assess the impact of browsing on *R. echinellum*.
4. Establish and implement monitoring for both Florida and South Carolina populations. Note: The Sumter NF already has a monitoring program, and Steven's Creek began a long-term study in February 2008.

Given the limited distribution of the species, a monitoring program should be implemented. Jones (1986) suggested a monitoring program at 10 year intervals, which was implemented to some extent by TNC but at one year interval from 1992 to 2001 in Florida. Since the results suggested that the populations seem to be stable over the long term, monitoring at 3-5 year intervals could be sufficient unless environmental disruptions such as hurricanes or natural fire occur.

- i. Since the populations are large, permanent plots could be established, and for each plot:
 - a. Establish size classes (colony length and width), and estimate population size (density and abundance of individuals and/or clumps) and reproductive parameters (no. of flowering plants, and no. of flowers, fruits and seeds/fruits per plant). The length of longest stem should be used as one of the monitoring parameters.
 - b. Reproductive biology studies

The lack of sexual reproduction over long-term may threaten this species, and requires further evaluation (Gordon, 2008, pers. comm.). Since recruitment from seed appeared rare, seed germination and breeding system studies should be conducted.

- c. Fire management

According to Gordon (2008, pers. communication), frequent, low intensity fire management of *Ribes* habitat should be encouraged. This species has responded in different ways to fire and potentially

fire is an effective tool to maintain the population. Management protocols cannot be implemented until a comprehensive study is conducted.

- i) Monitor the effect of fire (if the areas are burned) on density, fecundity, and size structure.
- ii) Address the following questions: What is the effect of local fire temperature, or the range of fire temperatures tolerable for the persistence of the species? How often should a prescribed fire be performed? Determine whether the lower size classes, (<30 cm tall), that were increased after fire represents 1) seedlings recruited from a seed bank present in the soil, and/ or 2) rooting branches no longer connected to the plants and growing as new ramets.

5. Monitoring and managing for invasive species

Frequent inventories or surveys of the Florida population for invasive plant species should be established, which will help with the early detection and eradication of small patches of exotic invasive plants within the sites. This is an ongoing action for the South Carolina populations conducted by SC DNR staff and volunteers and by Sumter NF staff.

6. Conduct surveys/inventories on potentially new sites, between Northern Florida and South Carolina. This action can include the use of GIS to initially determine potential sites, and later inspection for plants.

7. Population genetic studies

Molecular studies will help understand the extent and pattern of genetic variability throughout these populations and potential sources of rarity (e.g., unique alleles). Genetic data can indicate interrelationships between populations, the abilities to withstand present and future perturbation of the environment, help guide *in situ* conservation, and in many cases can provide data to understand the evolutionary history and origins of species.

8. A Recovery Plan should be developed for this species.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Ribes echinellum*

Current Classification: Threatened

Recommendation resulting from the 5-Year Review

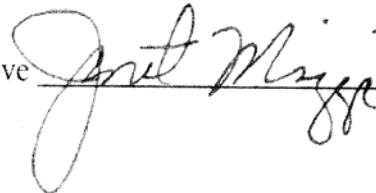
 X No change is needed

Reclassification Priority Number: 11

The review was completed by botanist Dr. Vivian Negrón-Ortiz, Panama City Field Office.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

for Approve  Date 7/7/08

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

for Approve  Date 7/15/08

APPENDIX A

Summary of peer review for the 5-year review of *Ribes echinellum*

(Miccosukee gooseberry)

A. Peer Review Method:

The document was peer-reviewed internally by Lorna Patrick and Janet Mizzi. Once the comments were added to the document, it was sent to three outside reviewers (see below). The outside peer reviewers were chosen based on their qualifications and knowledge of the species.

Mr. W. Wilson Baker is very knowledgeable about the plant species of the Florida panhandle. He has visited and surveyed the Perkins property often and has knowledge of the species' history.

Ms. Robin Mackie has collected baseline data, monitored, and managed *R. echinellum* at Sumter National Forest.

Dr. Doria Gordon (in collaboration with other TNC staff) monitored *R. echinellum* from 1992 to 2001 at Mays Ponds, Perkins property, FL. Monitoring data provided essential information on population trends and species' stability.

B. Peer Review Charge:

We indicated our interest in all comments the reviewers may have about the document, including assessment of scientific quality and completeness, the strength and logical structure of the arguments and their overall assessment of the status of Miccosukee gooseberry.

C. Summary of Peer Review Comments/Report

Dr. Gordon suggested evaluating the lack of sexual reproduction in this species and encouraged molecular studies and frequent, low intensity fire management of *Ribes* habitat. She concurs that monitoring for this species could be extended to every 3-5 years, but monitoring and control of invasives species should be more frequent. Overall, Dr. Gordon agreed with the conclusions of the status review.

Ms. Mackie provided various editing and useful comments related to Sumter NF. She considers the Steven's Creek population abundant and relatively stable. Table 4 was modified according to her observations in the field for Sumter NF. She recommended that colony area is a more realistic and feasible monitoring parameter than size classes. In addition, she suggested conducting photomonitoring and using the length of longest stem as one of the monitoring parameters.

Mr. Baker provided a few comments. He corrected the type locality (Norias Plantation) for this species. He considers the Florida population to be stable and concurs with overall conclusions of the status review.

C. Response to Peer Review

Most of peer reviewers' comments were incorporated into the document. Table 3 was modified according to Ms. Mackie's observations in the field. Photomonitoring, a method to estimate cover or density, is unlikely to be successful (i.e., individuals hidden under taller plants will not be counted); therefore counts would likely be underestimated. The recommendation to monitor based on area vs. size classes requires a careful evaluation and depends on the question that is being addressed. A better parameter for larger individuals would be colony length and width (which eventually translate into size classes) and the use size classes for smaller individuals.