Etonia Rosemary (*Conradina etonia*)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Jacksonville Ecological Services Field Office
Southeast Region
Jacksonville, Florida

5-YEAR REVIEW
Species reviewed: Etonia Rosemary (*Conradina etonia*)

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Etonia Rosemary/*Conradina etonia*

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 history, and habitat of this species. The Service lead recovery biologist for this species conducted the review. Our sources include the final rule listing this species under the Act; the recovery plan; peer reviewed scientific publications; unpublished field observations by the Service, State, and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists. The public notice for this review was published on September 27, 2006, with a 60-day public comment period. No comments were received for this species.

B. Reviewers

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

Lead Field Office -- Jacksonville, FL, Ecological Services: Annie Dziergowski, 904-232-2580

C. Background

1. **FR Notice citation announcing initiation of this review:** 71 FR 56545, September 27, 2006

2. **Species status:** Improving (2006 Recovery Data Call)
The 2005 surveys for *C. etonia* at Etonia Creek State Forest (ECSF) and Dunns Creek State Park, which contain 10 of the 11 currently known sites occupied by this plant, located more plants in additional areas from the previous year. The survey at ECSF found a 22% increase in the number of plants from 2004.

3. **Recovery achieved:** 3 (50-75% recovery objectives achieved)
The recovery achieved was listed at 1 during the 2006 Recovery Data Call, which does not accurately account for the increase in population size and increase in protected lands that has occurred over the past several years. Only one population still exists on private lands, the rest of the populations are located on protected lands. The protected lands have approved management plans that include protection for this species. The correct recovery achieved number should be at three to account for the increase in population size and protected lands.

4. **Listing history**
Original Listing
FR notice: 58 FR 37432
Date listed: July 12, 1993
Entity listed: Species
Classification: Endangered

5. **Associated rulemakings:** None

6. **Review History:**
Final Recovery Plan - 1994
Recovery Data Call - 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, and 1998.

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

8. **Recovery Plan**
Name of plan: Recovery Plan for Etonia Rosemary (*Conradina etonia*)
Date issued: September 27, 1994

II. REVIEW ANALYSIS

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

1. **Is the species under review listed as a DPS?** No. 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 and 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 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 and most up-to-date information on the biology of the species and its habitat?** New information on this species has been collected since the recovery plan was written in 1994. Although new information has been collected, the recovery criteria still apply

and can be used to show how recovery actions have reduced threats to this species. The recovery criteria should be updated to reflect this new information when the recovery plan is revised.

b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** Factor A (present or threatened destruction, modification or curtailment of its habitat or range) was identified as the primary factor affecting the species at the time of listing, and this factor is addressed in the recovery criteria. However, based on new information Factor E (other natural or manmade factors affecting its continued existence) should be included in the recovery criteria as well to address threats such as hurricanes.

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. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.**

At the time of listing, 1993, *Conradina etonia* occurred on only two sites, both on private lands. The recovery criteria were written according to the information known at that time: *"Etonia rosemary (Conradina etonia) may be considered for reclassification from endangered to threatened when five geographically distinct, self-sustaining populations are protected and appropriately managed. Criteria for delisting may be developed once this species is reclassified. Based on the limited range of C. etonia and the limited knowledge of its biology, recovery goals cannot be established at this time."*

Since *C. etonia* was listed, most of the land occupied by this plant has been acquired by the State of Florida and is now under the management of the Division of Forestry (Etonia Creek State Forest (ECSF)) and the Florida Park Service (Dunns Creek State Park (DCSP)), both found in Putnam County, Florida. There are now a total of 11 sites occupied by *C. etonia* (10 on the two State properties and on 1 private land that is not protected). However, only 8 of these 11 sites have 10 or more plants and are considered to be viable self-sustaining populations (3 on ECSF, 4 on DCSP, and 1 mostly on private land adjacent to ECSF). There was only one plant found on the remaining three sites which does not constitute a viable population. The species was originally thought to occur only on two sites on what is now ECSF. However, *C. etonia* was discovered at Dunns Creek State Park in 2001 during plant & animal surveys and the

natural community mapping of the DCSP when it was first being acquired by the State of Florida. The 2002-2003 floristic surveys of DCSP and the 2004 survey for *C. etonia* documented several more areas with larger populations. Due to the distances that occur between populations, they appear to be geographically distinct from one another. Both of these sites are currently being managed to benefit *C. etonia.*

The existing recovery criteria for reclassification of *C. etonia* from endangered to threatened have been met. However, it is our recommendation to revise the current recovery plan to update the recovery criteria to include delisting criteria, as well as new information on the biology of this species.

Of the five listing factors, only habitat loss from development (Factor A) is addressed in the recovery plan. Other natural factors such as hurricanes (Factor E) have impacted areas occupied by *C. etonia*, as evidenced during the 2004 hurricane season, and should be addressed during revision of the recovery plan. Factors B, C, and D have not been documented as threats at this time.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends, demographic features, or demographic trends: Results from recent surveys indicate that the total number of individual wild populations on the ECSF has increased since the species was listed (Pederson 2006, 2005, 2004, 2003, 2002, 2001, and 2000). It appears that there has been a 22% and 7% increase in the number of individual plants in 2005 and 2006, respectively. There are several reasons to account for the increase in plants. The wet season in 2005 accounted for a good year for seedlings (C. Pederson, ECSF, personal communications). Also, more plants were discovered along trails cleared during crooked wood (*Lyonia* spp.) harvesting activities. It is possible that these plants previously existed in these areas but were not discovered until after the areas became more easily accessible. There are plans to timber and then prescribe burn 500-600 acres adjacent to a large *C. etonia* population at ECSF later this year. There is uncertainty as to how *C. etonia* will respond to this kind of disturbance. However, based on a clear cut and burn that took place in 2004 on the Quail Road site at ECSF, it is believed that the plants will respond favorably. Although two mature plants were destroyed by the fire, a year later two seedlings

were found in an adjacent area that had burned as well (C. Pederson, ECSF, personal communication).

The recently discovered DCSP populations have also shown signs of an increase over the past few years (J. DePue, DCSP, personal communication). *C. etonia* was found at six sites during floristic surveys of DCSP that were conducted by the Florida Natural Areas Inventory (FNAI) in 2002-2003 (Herring 2004). During a 2004 survey, the first full inventory of *C. etonia* at DCSP, FNAI surveyed 10 sites, including the six sites found during the 2002-2003 surveys and four new or previously undiscovered sites. The 2004 survey found the number of plants had increased from 500-600 to 800-1,000 individuals (Herring 2004).

b. **Genetics, genetic variation, or trends in genetic variation:** Edwards *et al.* (2006) analyzed molecular material for all species of *Conradina* to look at the relationship between these different species. Although *C. etonia* was included in this study, no genetic analyses have been conducted on specific populations to determine if *C. etonia* is experiencing inbreeding depression due to small population size or to determine how similar the populations are at ECSF and DCSP.

c. **Taxonomic classification or changes in nomenclature:** None. The Integrated Taxonomic Information System (ITIS 2007) was checked while conducting this review.

d. **Spatial distribution, trends in spatial distribution, or historic range:** When listed in 1993, *C. etonia* was thought to occur only on two sites, both on what were then private lands, in Putnam County, Florida. The 2006 surveys at ECSF in Putnam County, Florida, located five populations (10 or more plants) at seven sites (Etoniah Trail population, Long Leaf Pine Hiking Trail population, Quail Road population, Woods Road population, and Garden Drive/Blossom Street population). The Garden Drive/Blossom Street population occurs on private land located within ECSF and is not protected. Since 2000, there has always been less than 10 plants found at Quail Road even after the prescribed burn in 2004. Over the past several years, new locations have been found along the crooked wood trails in the ECSF. These new locations are in close proximity to Etoniah Trail, where the largest population (800 plants) of *C. etonia* occurs, and are considered to be part of that population. Longleaf Pine Hiking Trail has the second largest population with 414 plants.

C. etonia was first discovered within the recently acquired DCSP in Putnam County, Florida, in 2001 by a State biologist (J.B. Miller, St. Johns Water Management District, personal communication). In 2002-2003, six *C. etonia* populations were documented by FNAI during floristic surveys of DCSP (Herring 2004). A full inventory of *C. etonia* took place at DCSP in 2004. A total of 10 potential *C. etonia* sites were surveyed, including the six sites where the species was originally recorded in 2002-2003 and four new sites. Plants were only located at six of the 10 sites, and of these, four of the six sites have populations of 10 or more plants (Sites 1, 2, 3, and Historic Site 6). Two of the largest populations were found during the 2004 surveys, Site 3 with 190-200 plants and Site 1 with 126-150 plants. At Site 4 and Historic Site 6, only one plant was found so these are not considered viable populations. Four of the historic sites were impacted by the 2004 hurricane season and no plants were found. Recent annual surveys (2005-2006) have shown an increase in the number of plants in the three new (Sites 1, 2, and 3) and one historic population (Historic Site 6) (J. DePue, DCSP, personal communication).

e. **Habitat or ecosystem conditions:** Although there are many natural communities that occur at ECSF and DCSP, *C. etonia* tends to occur in the scrub communities dominated by sand pine with various levels of understory thickness (Herring 2004). At ECSF, most of the plants are found in scrub with a low 8 to 12-foot tall canopy of sand live oaks (*Quercus geminata*) and scattered low sand pines (*Pinus clausa*) with a shrubby understory of scrub palmetto (*Sabal etonia*), myrtle oak (*Q. myrtifolia*), and blueberries (*Vaccinium stamineum, V. myrsintes*) (Johnson 1998).

The lack of fire at both sites has resulted in dense sand pine forests. More research is needed to determine if *C. etonia* is fire dependent. As described earlier, in 2004 a prescribed burn at one site in ECSF (Quail Road) destroyed two mature plants; however, during the 2005 survey, two new seedlings were found along Quail Road in a burned area adjacent to where the mature plants had occurred (C. Pederson, ECSF, personal communication). ECSF has plans to harvest timber and implement prescribed burns in the 500-600 acres adjacent to the one of the largest *C. etonia* populations. No *C. etonia* are currently found in this area but this area will be monitored to see if any plants are located after the fire.

Within ECSF, the Garden Drive/Blossom Street population is found mostly on private land. These plants are found along the roadside and within individual 1-acre lots. ECSF has acquired some of these lots adjacent to existing state lands and plans to acquire additional lots occupied by *C. etonia* as money becomes available. The state owned lots have been timbered and mechanically treated adjacent to privately owned lands to help control the vegetation. There are several existing homes within this area, which would make prescribed burning very difficult. Most of the populations of *C. etonia* are located along open dirt roads/trails throughout both the ECSF and DCSP. Crooked wood harvesting takes place at both ECSF and DCSP. During the harvest, small trails are cut to access the crooked wood. During the 2005 surveys of these trails at ECSF, several new *C. etonia* sites were discovered. Thus, it would appear that *C. etonia* favors open disturbed sites, such as those occurring along these trails and roadways.

Both the ECSF and DCSP sites have existing management plans that describe how to protect and manage *C. etonia* through the use of sand pine thinning, mechanical treatment to remove understory, and prescribed burning.

f. **Other:** One of the recovery actions identified in the 1994 recovery plan is to continue propagation of *C. etonia* (USFWS 1994). Historic Bok Sanctuary has had a cultivated population of *C. etonia* since at least 1994. Peterson and Wiegel (2002) have successfully used *in vitro* propagation (i.e., micropropagation) of *C. etonia* using tissue culture techniques. Micropropagation uses stem tips or other plant materials to generate numerous plantlets on culture media containing proper nutrients and plant growth regulators (Peterson and Weigel 2002). This technique has a minimum effect on small wild populations of threatened and endangered plants since only a small amount (stem tip) of the wild plant has to be taken to generate numerous plantlets. The *in vitro* technique causes callus production, which is important in the tissue culture because the callus can differentiate into organized structures such as roots and stems (Peterson and Weigel 2002). Callus in *C. etonia* has produced roots but no shoots. Shoots were produced from the main *C. etonia* explant (living tissue removed from an organism and placed in a medium for tissue culture) and developed into full plantlets on the media. This technique will be helpful in understanding more about the life history of this species. This technique can also be used to

produce plants for reintroduction on new sites. Historic Bok Sanctuary also contains a seed bank of *C. etonia* which eventually may be used in future reintroduction efforts. Propagation has not been used to reintroduce this species into the wild, but should be considered to expand the populations onto other public lands that have recently been managed or have existing suitable habitat.

2. Five-Factor Analysis

a. Present or threatened destruction, modification or curtailment of its habitat or range: Development has and continues to be the primary threat to *C. etonia*. In 1991, there were only two known populations; both on what were then private lands (USFWS 1994). These private lands were platted and planned for development. In 1993, the State of Florida purchased much of these lands as the Etoniah Creek State Forest (ECSF), and surveys found additional populations of *C. etonia* in areas that are now protected. Within ECSF, there is still a large population located mostly on privately owned lots (Garden Drive/Blossom Street population). ECSF has purchased several of these lots and plans to continue to acquire additional property as funds become available (C. Pederson, ECSF, personal communication).

The State of Florida's acquisition of Dunns Creek State Park in 2001 also has provided *C. etonia* additional protection on state owned lands. There are also plans to manage the site to benefit this species.

Forest practices have benefited *C. etonia.* Harvesting of sand pines has opened up areas and allowed *C. etonia* to expand its populations. Disturbances along roads on both properties seem to have benefited this species. The use of prescribed burning in areas occupied by *C. etonia* needs more research, but initial management using prescribed burning has shown some success. Crooked wood harvesting has been occurring at both sites and seems to have benefited the species by creating openings. Several new sites have been located along the trails created to access the crooked wood for harvesting.

b. Overutilization for commercial, recreational, scientific, or educational purposes: The final rule listing *C. etonia* stated that "Commercial trade in the rarer species of *Conradina* should not adversely affect those species, provided it is dependent upon plants propagated from plants in cultivation."

Although the Center for Plant Conservation's plant profile for this species lists horticultural collection as a potential threat (Maddox and Race 2002), this has not been documented.

c. **Disease or predation:** Not known as a threat at the time of listing or at present.

d. **Inadequacy of existing regulatory mechanisms:** The Florida Administrative Code 5B-40 (Preservation of Native Flora in Florida) provides the Florida Department of Agriculture and Consumer Services with limited authority to protect these plants (primarily from the standpoint of illegal harvest) on state and private lands. However, *C. etonia* is located primarily on state owned lands (ECSF and DCSP) where they are being managed and protected.

ECSF was acquired in 1996 as part of the Etoniah/Cross Florida Greenway Conservation and Recreation Lands project and is managed by the Florida Division of Forestry. One of the purposes for which the acquisition was made included protection of *C. etonia* (Johnson 1998). DCSP was acquired by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida in 2001. That same year, the Trustees leased DCSP to the Florida Division of Recreation and Parks for a period of 50 years. The lease requires the Division of Recreation and Parks to manage DCSP only for the conservation and protection of natural, historical, and cultural resources and for resource-based public outdoor recreation compatible with the conservation and protection of the property (Florida Department of Environmental Protection 2004).

e. **Other natural or manmade factors affecting its continued existence:** In 2004, hurricanes impacted populations at ECSF and DCSP by blowing over sand pines and crushing plants in areas occupied by *C. etonia*. At DCSP, four of the historic sites of *C. etonia* could not be located since the area was covered with downed sand pines (Herring 2004). ECSF also had areas where the presence of downed sand pines made it difficult to access known sites of *C. etonia*. During the 2004 surveys at ECSF, it was determined that the number of plants did decrease after the hurricanes. However, since then surveys at ECSF and DCSP have shown an increase in the number of plants. The increase in plants is most likely due to more intensive surveys of additional areas at ECSF and DCSP.

Of the five listing factors, habitat loss and degradation (Factor A) is the main threat to *C. etonia*. Other natural factors such as hurricanes (Factor E) have affected areas occupied by *C. etonia*, as evidenced during the 2004 hurricane season. Factors B, C, and D are not considered significant threats at this time.

D. Synthesis

When this species was first discovered in 1990 by Karl and McCartney (1991), the species was thought to only be found on private lands. Now there are seven populations found on two protected State properties, ECSF and DCSP, and one population found on unprotected private land within ECSF, for a total of eight populations. ECSF has been working to acquire the private lands within their boundaries. After the 2004 hurricanes, population surveys showed a slight decrease in the number of plants. However, since then surveys at both sites have shown an increase in the number of plants. The increase in plants is most likely due to more intensive surveys of additional areas at both sites.

Both ECSF and DCSP have existing management plans. Habitat management (e.g., thinning of sand pine) needs to occur at both sites to prevent areas from becoming too overgrown. The use of prescribed burning needs further study as it is unknown exactly how *C. etonia* responds to fire.

There have been no studies of the genetic differences between the ECSF and DCSP populations, which are separated by the St. Johns River. There also have been no studies to determine if genetic differences exist between populations at each site. Edwards *et al.* 2006 looked at the difference between the six *Conradina* species, but not specifically at just this species and the individual populations. *In vitro* propagation (i.e., micropropagation) has shown that *C. etonia* responds well to this technique and that it would be a good tool for use in reintroduction efforts. Reintroduction should be considered in areas that have been managed and are now suitable for this species. However, before reintroduction efforts are implemented, there should be research into whether *C. etonia* will hybridize with other more common *Conradina* species, which could equate to loss of genetic variability of *C. etonia.*

We are recommending reclassification of *C. etonia* from endangered to threatened. The recovery criteria for *C. etonia* indicates that the species may be considered for reclassification from endangered to threatened when five geographically distinct, self-sustaining populations are protected and appropriately managed. The existing recovery plan for *C. etonia* contains objective, measurable criteria that need to be updated when the recovery plan is revised. The major threat to *C. etonia* is habitat destruction, which has been greatly reduced since it was listed. Although more information is needed to determine if the seven protected populations (10 or more plants) that currently exist at ECSF and DCSP are genetically different, the populations have been increasing since the time of listing and additional sites have

been found during annual surveys. Due to the distances that occur between populations, they appear to be geographically distinct from one another. The major threat to the species at the time of listing, loss of habitat to development, is no longer a major factor affecting the species. Seven of the eight populations of *C. etonia* are currently in public ownership and are being managed. As long as proper management continues at these sites, populations should continue to increase.

III. RESULTS

A. Recommended Classification: Threatened

B. New Recovery Priority Number: 14

This recommendation represents a change in the recovery priority number from 2c to 14, based on our listing and recovery priority guidance for threatened and endangered species (48 FR 43098). *C. etonia* is a species with a low degree of threat and high recovery potential and, therefore, is now being assigned a recovery priority number of 14. Since this species is now found mostly on publicly owned land, there will be little to no conflict with economic development.

C. If a reclassification is recommended, indicate the Listing and Reclassification Priority Number:

Reclassification (from Endangered to Threatened) Priority Number: 6.

We believe that a low level of management burden occurs since the plant is located primarily on state property. Although one population occurs on private land, there are no Federal prohibitions on the taking of listed plants on private lands and limited State prohibitions that are primarily related to the harvest of plants without prior permission of the landowner. Therefore, human activities on private lands are minimally restricted. The reclassification priority number was selected because this is an unpetitioned action and the management impact is low.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Revise the current recovery plan to include updated objective and measurable recovery criteria, as well as updated information on the species distribution and biology.

2. Provide funding and technical support for further research on:

   a. The effects of prescribed burning and other management tools (e.g., thinning sand pines or mechanical clearing to reduce the understory) on *C. etonia*. Continue working with public land managers to increase the management on their sites.

b. The role pollinators play in the life history of *C. etonia*. Additional life history information may also be needed.

c. The genetics of the different populations to determine how different they are based on geographic distribution. Genetics could also tell us if inbreeding depression is occurring in some of the smaller populations. This information will help us determine what constitutes a stable population.

3. Acquire additional private lands within ECSF that currently contain *C. etonia.*

4. Work with the Service's Partners for Fish and Wildlife program staff to encourage private landowners to protect this species on their lands.

5. Conduct additional surveys on public lands adjacent to ECSF and DCSP (such as along the Crescent City Ridge) to look for suitable habitat and new populations of *C. etonia.* Continue annual surveys of populations at ECSF and DCSP.

6. Consider reintroduction and monitoring on adjacent publicly owned lands with suitable habitat. Conduct research into whether *C. etonia* will hybridize with other more common *Conradina* species, which could equate to loss of genetic variability of *C. etonia.* Reintroduction of *C. etonia* could help to increase the number of geographically distinct, self-sustaining populations on protected sites and augment populations where needed.

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Etonia Rosemary (*Conradina etonia*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review: Reclassify to Threatened

Appropriate Listing/Reclassification Priority Number, if applicable: 6

Review Conducted By: Annie Dziergowski

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 5/22/07
David L. Hankla

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 6/4/07