

**Golden Sedge (*Carex lutea*)**

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



**U.S. Fish and Wildlife Service  
Southeast Region  
Raleigh Ecological Services Field Office  
Raleigh, North Carolina**

**FIVE-YEAR REVIEW**  
**Golden Sedge (*Carex lutea*)**

**I. GENERAL INFORMATION**

**A. Methodology used to complete the review**

Little has been published on *Carex lutea*. The information used to prepare this 5-year review was gathered from peer reviewed scientific publications (LeBlond 1994, Derieg et al. in press), LeBlond's 1996 status survey and his 1998 supplement to the status survey, data from the North Carolina Natural Heritage Program (NCNHP) and personal field observations. The review was completed by the lead recovery biologist for *Carex lutea* in the Raleigh, North Carolina Ecological Services Field Office. The recommendations resulting from this review are a result of thoroughly assessing the best available information on *Carex lutea*. Comments and suggestions regarding the review were received from peer reviews within and outside the U.S. Fish and Wildlife Service (Service). A detailed summary of the peer review process is provided in Appendix A. No part of the review was contracted to an outside party.

**B. Reviewers**

**Lead Region:**

Kelly Bibb, Southeast Region, 404-679-7132

**Lead Field Office:**

Dale Suiter, Raleigh, North Carolina, Ecological Services, 919-856-4520 extension 18

**C. Background**

**1. FR Notice citation announcing initiation of this review:**

July 28, 2006 (71 FR 42871)

**2. Species status:**

In the 2009 Recovery Data Call, the status of *Carex lutea* was listed as uncertain or unknown. *Carex lutea* was only named as a distinct species in 1994 (LeBlond 1994) and it was listed as endangered in 2002. Therefore, little information is available on the status of the species. The only status survey for *Carex lutea* was completed in 1996 and no formal surveys have been conducted since that time; therefore, the status of *Carex lutea* is considered unknown at this time. A long-term monitoring project will be initiated in 2010.

**3. Recovery achieved**

1 (0 to 25% of species recovery objectives achieved)

**4. Listing history**

Original Listing

FR notice: 67 FR 3120

Date listed: January 23, 2002

Entity listed: Species

Classification: Endangered

**5. Associated rulemakings:**

There are no associated rulemakings.

**6. Review History:** Since *Carex lutea* was named as a distinct species in 1994 and listed as endangered in 2002, there is very little information available on the status of the species. This is the first five-year review to be completed for *Carex lutea* and the Service is currently preparing a recovery plan for this species. The only status survey for *Carex lutea* was completed in 1996. Between 2005 and 2007, NCNHP staff conducted surveys at all but four subpopulations of *Carex lutea*. The results of these surveys will be included in the next Recovery Data Call.

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

*Carex lutea* has been assigned a recovery priority number of 8, indicating a moderate degree of threats or impacts, a high potential for recovery and a taxonomic status of full species.

**8. Recovery Plan:**

The *Carex lutea* Recovery Plan is under development at this time.

**II. REVIEW ANALYSIS**

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

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable and will not be discussed further.

**B. Recovery Criteria**

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

A recovery plan is currently under development.

## C. Updated Information and Current Species Status

### 1. Biology and Habitat

#### a. Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

This species was only discovered in 1991 and named a distinct species in 1994. Further, its growth habit as a clumping perennial makes quantitative surveys very difficult. There is no formal monitoring program for this species. NCNHP staff visited most of the populations between 2005 and 2007 and they have population estimates for the sites that they visited. Populations have not been monitored enough to predict long-term population trends.

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

According to the only genetic study completed for *Carex lutea*, this species maintains relatively high levels of genetic diversity compared to other North American endemics. Growth habitat and genetic data both point to typical levels of inbreeding in *Carex lutea*. Therefore, it does not appear that a shift toward increased outcrossing is responsible for maintaining genetic diversity. Because *Carex lutea* contains a high degree of population differentiation (about 40% of the genetic diversity maintained at the assayed loci is due to differences among populations), the extirpation of a single population could impact levels of genetic diversity for the entire species (Derieg et al. in press). Derieg et al. (in press) indicate that maintaining habitat quality is likely one of the most critical aspects of managing the species. The data provide strong evidence for the protection of all distinct populations of *Carex lutea* in order to maintain genetic diversity and avoid increasing pressures of inbreeding depression.

#### c. Taxonomic classification or changes in nomenclature:

There have been no changes to the taxonomic classification or nomenclature since *Carex lutea* was named a distinct species in 1994.

#### 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.):

All known populations of *Carex lutea* occur in the Northeast Cape Fear River watershed in Pender and Onslow counties, North Carolina. There has been no further work on the spatial distribution of this species since the status survey in 1996.

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

The area supporting the *Carex lutea* populations is located in the Black River Section of the Coastal Plain Province, and within the Northeast Cape Fear River watershed. The land surface is characterized by large areas of broad, level flatlands and shallow stream basins. The broad flatlands support longleaf pine forests, pond pine woodlands, shrub swamp pocosins, pine plantations, and cropland. The geology is characterized by unconsolidated sand overlying layers of clayey sand and weakly consolidated marine shell deposits (coquina limestone). These sediments were deposited and reshaped during several cycles of coastal emergence and submergence from the Cretaceous period to the present (LeBlond 1996, 1998).

All known and extant *Carex lutea* populations occur in sandy soils overlying coquina limestone deposits. The taxon shows a preference for the ecotone between the pine savanna and adjacent wet hardwood or hardwood-conifer forest, and edges of shrubby depressions within savannas. Most plants occur in the partially tree-shaded savanna/swamp ecotone, with scattered shrubs and a moderate to dense herb layer. The savanna/swamp ecotone is subject to frequent fires which favor an herbaceous ground layer and suppress shrub dominance. Several sites have been lightly to extensively disturbed by plow lines or surface impacts associated with past clearing, and *Carex lutea* has successfully colonized or re-established in suitable habitats where the disturbance created a condition similar to the ecotone created by natural fires. *Carex lutea* is a patch dominant at a few sites. Occurrences are densest in areas of partial tree or tall shrub shading with an open ground layer. Frequent associates include *Taxodium ascendens* (Pond cypress), *Liriodendron tulipifera* (Tulip poplar), *Acer rubrum* var. *trilobum* (Red maple), *Morella caroliniensis* (Wax myrtle), *Thalictrum cooleyi* (Cooley's meadowrue), *Aletris farinose* (White colicroot), *Rhynchospora globularis* var. *pinetorum* (Globe beaksedge), and *R. thornei* (Thorne's beaksedge) (LeBlond 1996, 1998).

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

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

According to LeBlond (2006, pers. comm.), *Carex lutea* is threatened by fire suppression and the ecological succession (competition and/or shading by woody species) that occurs in areas that are not burned on a regular basis. *Carex lutea* is also threatened by timber operations such as harvesting, bedding and ditching. Sites located within utility rights-of-way are threatened by herbicide use or mowing during critical growth

periods. Habitat destruction, due to development or land conversion, also threatens *Carex lutea*, but to a lesser degree than the other factors listed above. High human population growth rates (recorded and predicted) in Pender and Onslow counties will most likely increase habitat fragmentation and decrease suitable habitat for *Carex lutea* (North Carolina State Demographics <http://demog.state.nc.us/>). Roads, fields and residential and commercial development limit the use of prescribed fire in adjacent habitat that might otherwise be or become suitable for *Carex lutea*. Even though many *Carex lutea* sites occur on conservation lands, it is difficult to manage these sites using prescribed fire without permission from adjacent landowners and those landowners are often hesitant to grant permission for fires in close proximity to their homes and property.

See Appendix B for a detailed discussion of threats to specific sites.

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

There is currently no evidence to suggest that *Carex lutea* is being overutilized for commercial, recreational, scientific or educational purposes.

**c. Disease or predation:**

Herbivore grazing of overwintering plants and early spring vegetative growth has been observed in *Carex lutea* at The Neck Savanna, with subsequent culm production by grazed plants. No other signs of predation or disease have been observed in this species.

**d. Inadequacy of existing regulatory mechanisms:**

Because of its Federal endangered status, *Carex lutea* is protected on federal lands; however, there are no known populations on federal lands. *Carex lutea* is listed as state endangered by North Carolina under the Plant Protection and Conservation Act of 1979, but this protection is largely limited to the regulation of collecting and trade (North Carolina Department of Agriculture 02 NCAC 48F .0301)

In 2006, the N.C. Division of Parks and Recreation (NCDPR) was granted permission to create the Sandy Run Savannas State Natural Area and began acquiring land from The Nature Conservancy (TNC) and other local landowners soon thereafter. When complete, the Sandy Run Savannas State Natural Area will protect a variety of fire dependent plant communities including areas that are important for the recovery of *Carex lutea*. Currently, the NCDPR protects the Neck Savanna, Watkins Savanna and the Sandy Run Savannas (including the Cooley's Meadowrue Powerline Site and the Pine Plantation Survey Site). One site, the Haws Run Mitigation Site, is owned by the N.C. Department of Transportation and is managed by the N.C. Ecosystem Enhancement Program (NCEEP).

The Southwest Ridge Savanna site, is owned by the State of North Carolina and managed by the Wildlife Resources Commission. Another site, Shaken Creek Savanna, is owned by TNC. Only two populations remain threatened due to lack of protection: the McLean Savanna site and the Maple Hill School Road Savanna site.

Wetland permitting actions by the U.S. Army Corps of Engineers have the potential to impact this species and the habitat where it occurs. Permits for wetland alterations (Section 404 of the Clean Water Act) have the potential to adversely impact *Carex lutea* and its habitat. It is the responsibility of the permitting agency (The U.S. Army Corps of Engineers) to address impacts to federally protected species that may occur as a result of the issuance of a Clean Water Act permit.

Federal regulations and/or policies regarding compensatory mitigation for highway construction have the potential to impact the Haws Run Mitigation Site if required mitigation activity precludes restoration of natural communities and/or protection of rare species populations. The U.S. Army Corps of Engineers and the Service are among those involved in compensatory mitigation approval.

**e. Other natural or manmade factors affecting its continued existence:** No other natural or manmade factors affecting the continued existence of *Carex lutea* are known at this time.

In summary, the most important factors that justify its endangered status are related to its extreme rarity due to high habitat specificity and narrow range of distribution. Within this limited habitat area, habitat destruction is an important threat due to the inadequate regulatory mechanisms to protect listed plants on private lands. Habitat for *Carex lutea* is threatened by fire suppression and timber operations such as harvesting, bedding and ditching. *Carex lutea* sites located within utility rights-of-way are threatened by herbicide use or mowing during critical growth periods. Until recently, another important factor affecting the status of *Carex lutea* was the fact that nearly all populations were on privately owned land. In 2006, NCDPR began purchasing land with funding from the Natural Heritage Trust Fund in cooperation with TNC and NCEEP. These lands will be formally protected as Dedicated Nature Preserves following policies and procedures established by the NC Nature Preserves Act (Article 9A).

#### **D. Synthesis**

All known and extant *Carex lutea* populations occur in sandy soils overlying coquina limestone deposits. They are all located in the Black River Section of the Coastal Plain Province, and within the Northeast Cape Fear River watershed. Several sites have been lightly to extensively disturbed by plow lines or surface impacts associated with past clearing, and *Carex lutea* has successfully colonized or re-colonized some disturbed areas. While new populations of *Carex*

*lutea* have been found since listing, the general distribution of the species has not changed and all nine extant populations are located in Onslow and Pender Counties, North Carolina. With such a small number of populations, NatureServe and NCNHP have assigned *Carex lutea* a Global Rank of G-2, indicating that the species is imperiled globally because of rarity or factors making it very vulnerable to extinction.

Threats to *Carex lutea* include fire suppression and the associated ecological succession such as competition and/or shading by woody species. Further, this species is also threatened by timber operations such as harvesting, bedding, ditching and fire suppression. Inappropriate herbicide use threatens sites located within utility rights-of-way. Of the eight known populations of *Carex lutea*, six occur on properties that are in conservation ownership and two occur completely on privately owned land. Despite the fact that most sites are on conservation lands, it is still difficult to manage these sites using prescribed fire without permission from adjacent landowners. Dedication agreements will be established to protect *Carex lutea* at each site that is in conservation ownership.

Since the species was listed in 2002, several additional locations (new populations or sub-populations) of *Carex lutea* have been found. The Service is working on a recovery plan for the species. In addition, the North Carolina Botanical Garden is the Center for Plant Conservation repository for this species and garden staff collected seeds from several populations in 2006. Seeds are stored for long term preservation of genetic material, for research and reintroduction. Due to the small number of genetically distinct populations and threats to the species such as the destruction or modification of habitat (they are mostly in private ownership and subject to fire suppression and other types of poor management) and the inadequacy of existing state or federal laws to protect plants, we believe that the species is only slightly less threatened with extinction now as it was at the time of listing and, therefore, *Carex lutea* still meets the definition of endangered under the ESA.

The next five years are expected to bring formal protection agreements on State-owned lands and opportunities to manage protect sites and monitor populations.

### **III. RESULTS**

**A. Recommended Classification:**  
**X   No change is needed**

### **IV. RECOMMENDATIONS FOR FUTURE ACTIONS**

A prioritized list of recommendations for future actions that will contribute to the recovery of *Carex lutea* include:

- complete the recovery plan with appropriate recovery criteria,
- protect and manage as many *Carex lutea* populations as possible,
- develop monitoring protocols and initiate long term population monitoring,
- conduct research on general life history and biology of the species, and
- develop propagation protocols.



## V. REFERENCES

Derieg, N.J., A. Sangaumphai and L.P. Bruederle. In press. Genetic diversity and endemism in North American *Carex* section *Ceratocystis* (Cyperaceae).

LeBlond, R.J. 1994. New plant species confirmed in North Carolina. The Steward, Vol. 8 No. 11, N.C. Division of Parks and Recreation, DEHNR, Raleigh, NC.

LeBlond, R. 1996. Status survey for *Carex lutea* LeBlond. Unpublished report submitted to the Asheville Field Office, U.S. Fish and Wildlife Service, Asheville, NC.

LeBlond, R. 1998. Supplement to the status survey for *Carex lutea*. Unpublished report submitted to the Asheville Field Office, U.S. Fish and Wildlife Service, Asheville, NC.

North Carolina State Demographics <http://demog.state.nc.us/>

### **Additional Literature referencing *Carex lutea* (but not cited in this document):**

Glover, L. 1994. *Carex lutea*: alive and well in Pender County, North Carolina. Report prepared by the North Carolina Chapter of The Nature Conservancy, Durham, NC.

**U.S. FISH AND WILDLIFE SERVICE  
FIVE-YEAR REVIEW OF GOLDEN SEDGE (*CAREX LUTEA*)**

Current Classification Endangered  
Recommendation resulting from the Five-Year Review

- Downlist to Threatened**
- Uplist to Endangered**
- Delist**
- No change is needed**

Appropriate Listing/Reclassification Priority Number, if applicable \_\_\_\_\_

Review Conducted By Dale Suiter, Fish and Wildlife Biologist

**FIELD OFFICE APPROVAL:**

Pete Benjamin, Lead Field Supervisor, Fish and Wildlife Service

Approve  Date 12/16/09

**REGIONAL OFFICE APPROVAL:**

*Acting*  
Lead Regional Director, Fish and Wildlife Service

Approve  Date 12/18/09

## APPENDIX A

### Summary of peer review for the Five-Year review of golden sedge (*Carex lutea*)

#### A. Peer Review Method:

A draft copy of the Five-Year Review was emailed to botanists with the N.C. Plant Conservation Program, N. C. Natural Heritage Program, N. C. State University (Department of Plant Biology), and the N.C. Botanical Garden. In addition, a botanist who retired from the N.C. Natural Heritage Program reviewed the document. Reviewers provided comments by email, and by modifications to the original document. Of the four peer reviewers used, two reviewers know the species, *Carex lutea*, and are very familiar with the habitats where the species occurs and the threats to its long term survival. The other two reviewers do not know *Carex lutea*, specifically; however, they are familiar with the flora of eastern North Carolina where the species occurs and they are also familiar with state and Federal regulations, plant conservation issues and the threats to rare species.

#### B. Peer Review Charge:

Peer reviewers were asked to provide written comments on the information presented in our analysis of *Carex lutea* and to provide comments on the validity of the data. Peer reviewers were asked not to provide recommendations on the legal status of the species.

#### C. Summary of Peer Review Comments/Report:

In general, the peer reviewers provided positive feedback but few specific comments. The most substantial comments included new information about the acquisition of various *Carex lutea* populations by the N.C. Division of Parks and Recreation (NCDPR). Once management plans are written and implemented, these sites will significantly contribute toward the recovery of *Carex lutea*. One reviewer stated that “the passages relating to threats and lack of sufficient protection are well explained.” Another reviewer only made corrections to an incorrect date for the most recent status survey. Other reviewer comments confirmed some of the field observations that were cited in the report as a personal communication. Another reviewer who is not familiar with *Carex lutea* recommended clarifying some comments that may seem obvious to those that know the species, but that were not clear to other readers who have not observed the species in the field.

#### D. Response to Peer Review:

The primary author was in agreement with all comments and concerns received from the peer reviewers and tried to address every comment as appropriate.

## APPENDIX B

### Threats to *Carex lutea* Populations

LeBlond (2006, pers. comm.) and NCNHP data (M.A. Franklin, 2007, pers. comm.) summarized the threats to *Carex lutea* by location, as follows:

- The Neck Savanna (Principal EO 18, EO 001, 0016 and 017): Most of this site is privately owned, with portions of the *Carex lutea* population occurring on land owned by NCDPR and managed for protection and enhancement of rare species populations and natural communities. Other portions of the population occur on land subject to timber harvesting and fire suppression. Drainage ditches impact the hydrology of the soils supporting *Carex lutea*. Even on the TNC-owned portion, fewer *Carex lutea* plants have been seen in recent years, apparently due to woody competition and/or shading. The portion of the population formerly known as Sandy Run Savanna occurs in a small powerline corridor along a roadside and is vulnerable to woody growth and herbicide use. NCDPR is currently negotiating the designation of a Dedicated Nature Preserve with the NCNHP.
- Watkins Savanna (Principal EO 5, EO 012, 0013 and 019): The population at this site occurs on land purchased in 2007 by NCDPR with help from TNC and the Natural Heritage Trust Fund. Only a small portion remains privately owned. This site is very fire suppressed and has been altered by timber management. NCDPR is currently negotiating the designation of a Dedicated Nature Preserve with the NCNHP.
- Sandy Run Savannas (Principal EO 15) including Sandy Run Swamp Powerline Savanna, Cooley's Meadowrue Powerline Site (EO 003) and Sandy Run Swamp Powerline Savanna, Pine Plantation Survey Site (EO 004): Sandy Run Swamp Powerline Savanna is owned by NCDPR with a powerline right-of-way easement owned by Progress Energy. The habitat was prescribed burned in 1996 and 2007. In a 2005 Registry Agreement with the NCNHP, Progress Energy agreed not to use herbicides or mow during critical *Carex lutea* growth periods. The population is small and subject to extirpation from localized impacts. The Sandy Run Swamp Powerline Savanna, Pine Plantation Survey Site is also owned by NCDPR and has been impacted by previous timber management, including bedding and ditching. NCDPR and TNC are currently engaged in habitat restoration in this area, but the *Carex lutea* population is small and vulnerable to localized impacts. NCDPR is currently negotiating the designation of a Dedicated Nature Preserve with the NCNHP.
- Haws Run Mitigation Site (EO 007): This site is owned by the State of North Carolina (N.C. Department of Transportation) and managed by the NCEEP. It is currently undergoing restoration of natural communities and protection and enhancement of rare species populations. The population at this site appears to be stable and not vulnerable to extirpation, but prescribed burning is needed as portions of the habitat are becoming overgrown.
- Shaken Creek Savanna (Principal EO 21, EO 008 and 020): The population at this site is the largest globally and occurs in the highest quality natural habitat. It is owned by TNC, and has been managed with frequent prescribed fires for hunting for several decades. With continued fire management, this site should remain stable.
- McLean Savanna (EO 009): This privately-owned site has been kept open for hunting by prescribed burning, at least as of the time of the last visit (1997). Subsequent to the last visit, the owner has not permitted entry for biological surveys. The extent of this population is unknown, likely small, and vulnerable to extirpation from changes in land use.

- Maple Hill School Road Savanna (EO 010): This privately-owned site has not been revisited since it was discovered in 1998. The size of the population is unknown and habitat is vulnerable to land use changes.
- Southwest Ridge Savanna, Ashes Creek *Carex lutea* Survey Site (EO 011): The site was added to the state-owned Holly Shelter Game Land after it was discovered by a private biologist in 2002. The population occurs within a Progress Energy powerline right-of-way easement, and the utility company entered into a Registry Agreement with the NCNHP and agreed not to use herbicides or mow during critical *Carex lutea* growth periods. The population is moderately small but appears to be stable.

Recent coordinated efforts among TNC, NCDPR, N.C. Wildlife Resources Commission, Progress Energy and the Natural Heritage Trust Fund have resulted in protection of contiguous tracts of land linking Sandy Run Swamp Powerline, Pine Plantation Survey Site, Haws Run mitigation site, Shaken Creek Savanna and Holly Shelter Game Land. Two entire populations (McLean Savanna and Maple Hill School Road) and parts of two additional populations (The Neck Savanna and Watkins Savanna) remain in private ownership with no formal protection agreements in place. All of these sites are high priorities for acquisition and conservation. TNC is actively working on exploring protection options for these species. Because *Carex lutea* occurs in a rare type of very wet clay savanna, and co-occurs with a suite of globally rare species, protection efforts for this species have extraordinary implications for conservation of global biodiversity.