Conservation Assessment
For
Crawe's Sedge (Carex crawei) Dewey

USDA Forest Service, Eastern Region
2003

Prepared by:

This Conservation Assessment was prepared to compile the published and unpublished information and serves as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

Table of Contents

NOMENCLATURE AND TAXONOMY

Scientific Name: Carex crawei Dewey

Common Name: Crawe's sedge, early fen sedge

Family: Cyperaceae

Synonyms: None

USFS Region 9 Status: Sensitive Species

USFW Status: None

Illinois Status: None

Global And State Rank: G5

RANGE:

This species can be found in ND, MN, SD, NE, IA, KS, OK (N.S. to B.C., south to NJ, AL, OK, UT, and WA) (Kolstad, 1986) (figure 1). In Illinois, this species can be found in nine counties: Boone, Champaign, Cook, DuPage, Grundy, Kankakee, Lake, McHenry, and Will (figure 2).

PHYSIOGRAPHIC DISTRIBUTION:

Carex crawei can be found in the Southwestern Great Lakes Moraines Section of the Eastern Broadleaf Forest Continental Province and Central Till Plains Section of the Prairie Parkland Temperate Province (Key et al., 1995). Based upon the Natural Divisions of Illinois (Schwegman et al., 1973), Carex crawei can be found in the Grand Prairie Division and Northeastern Morainal Division (Eric Ulaszek per. comm.).

HABITAT:

This species can be found in calcareous soils, wet-mesic dolomite prairie particularly in the pavements (i.e. shallow depressions with exposed dolomite bedrock) (Swink and Wilhelm 1994), wetland pannes, fens growing on hummocks (John Taft per. comm.), and rarely in mesic prairie (Bowles, 1991). This species does well in areas free of C4 grasses and will persist in wetland areas where periods of inundation are short (John Taft per. comm.). Plants associated with Carex crawei in dolomite prairies are: Aster puniceus firmus, Carex tetanica, Deschampsia caespitosa, Eleocharis compressa, Epilobium leptophyllum, Eupatorium perfoliatum, Lycopus americanus, Lycopus uniflorus, Lythrum alatum, Scutellaria parvula, and Solidago riddellii (Swink and Wilhelm, 1994).

SPECIES DESCRIPTION:

Small stoloniferous perennial sedge, 0.2-4 dm tall. Leaves 1-4 mm wide with tight sheaths and ventral hyaline. Inflorescence unisexual spikes. Terminal spike staminate and recurved. Lateral spikes (2-4) pistillate. Perygynia ascending, green to brown (3-3.5 mm long, 1.2-2 mm wide), beak short. Achenes 1.7-2 mm long, 1.2 mm wide; 3 stigmas (Kolstad, 1986). This species can be confused with Carex granularis, Carex meadii, and Carex tetanica (e.g. vegetative or inflorescence).

LIFE HISTORY:

Carex crawei blooms from April to May. This species has unisexual spikes with a staminate terminal spike and pistillate lateral spikes. Pollen is wind blown. This species can reproduce vegetatively via stolons. No information is available regarding seed germination. However, in the case of seed dispersal the species produces achenes that, most likely, will fall and stay under the maternal plant. It is possible that because of its habitat, water can disperse the seeds of species.

Currently, Illinois has 21 populations of Carex crawei (Illinois Natural Heritage Database, 1999). In a study by Bowles (1991) when only 15 populations were known, five of these were preserved populations, eight were protected populations, and two were unprotected populations. Of these populations, 9 were considered stable, 3 threatened, and 3 endangered. Based upon this information, it was determined that the number of viable populations of Carex crawei was 10.23 (Bowles, 1991). Frequency of this species can range from 53 to 100% with densities (per ¼ m^2) ranging from 3.2 to 50.2 (Bowles, 1991).

NATURAL AND HUMAN LAND USE THREATS:

Because of land use practices and the association of this species with calcareous soils, dolomite prairies, and wetlands, concern regarding the decline of Carex crawei in the region is evident. The main threat to this species is the loss of habitat as a consequence of development, agriculture, and grazing. These activities can increase nutrient levels (e.g. fertilizers or cow/horse manure) in the soil potentially resulting in encroachment by vegetation (e.g. noxious weeds) or create a siltation problem. Also, because this species requires wet habitat, any changes in the hydrology may have a negative impact on Carex crawei. Steven R. Hill (per. comm.) suggests that prolonged droughts may severely affect the seed bank of the species.

VIABILITY:

To maintain minimum viable populations of Carex crawei throughout its habitat range, protection, management, and restoration of habitat should be provided as much as possible. A minimum viable population is defined as a population size likely to give a population a 95% probability of surviving over a 100 year period (Menges, 1992). To insure viability:

1. It is vital that the size of the existing populations of Carex crawei be maintained or increased to insure the persistence of this species in the region. Also, it is necessary that local seed sources are available for future reintroduction of the species to other areas. The only way to accomplish such a task is by protecting the already existing seed source (i.e. populations) in the region.

2. The creation and maintenance of a metapopulation for Carex crawei is crucial for the persistence of the species in the region. A metapopulation is as an assemblage of populations existing in a balance between extinction and colonization, the boundaries of which can be a site or a geographical region (Husband and Barrett, 1996; Levins 1969, 1970). The populations that will form this metapopulation should be large because they may have a better opportunity of persistence than small populations (Hanski et al., 1996). Hanski et al. (1996) have suggested, based upon models, that a metapopulation should consist of a minimum of 15-20 well connected populations. However, Hanski et al. (1996) point out that if this cannot be achieved, the few remaining populations and habitats should be protected and other management techniques should be used to allow the persistence of these populations. Also, based upon models, populations should be >200 individuals to avoid demographical and environmental stochasticity (Menges, 1992). This number can be higher or lower depending upon the species. Marcella M. DeMauro (per. comm.) suggests that for Carex crawei between 400 to 500 individuals are needed for a viable population.

The existing populations of Carex crawei potentially can go extinct as a consequence of low recruitment, low reproduction for several years, or depletion of the seed bank. By developing multiple populations this situation may be prevented. Also, by having a metapopulation, other interactions that will impact the overall viability of Carex crawei in the region, such as genetic structure, gene flow (i.e. pollen movement) between and within populations, and seed dispersal, can be maintained.

3. Protection of existing and newly discovered populations in the region should be attempted. Protection of these populations also implies protection of their habitat.

MANAGEMENT:

To maintain minimum viable populations of Carex crawei throughout its habitat range specific, management practices will be needed to insure the persistence of the species.

1. To maintain and increase the existing populations of Carex crawei, specific practices should be followed:

a. Management practices such as prescribed burns, minimum grazing or mowing, and removal of vegetation (e.g. woody, noxious weeds, etc.) should be used to avoid encroachment in existing habitat. This species can spread out in areas free of C4 grasses (John Taft per. comm.). The use of an Integrated Pest Management Plan such as the one developed by Carroll and White (1997) can be used to control exotic species in these areas.

b. Tiles should not be broken to prevent changes in the hydrology of the site (existing habitat) that may impair reproduction, recruitment, and establishment of individuals.

c. Activities that increase the likelihood of noxious weed introduction or cause trampling (e.g. humans or animals) of the plants should be avoided or minimized.

d. Development of trails in areas where Carex crawei is found should be avoided or minimized to prevent negative impacts to the populations.

2. To develop and maintain a metapopulation of Carex crawei, attempts should be made to restore or reintroduce this species in areas that were historically dolomite prairie. This includes the improvement of areas that have dolomite prairie and the reconstruction of areas that have lost the dolomite prairie plant matrix. Part of this restoration and reconstruction will include the reintroduction of Carex crawei in the appropriate habitat. Potential habitat that can be used are sites that have soils found in dolomite prairies. The following is a list of soils found in dolomite prairies (Laatsch and Loebach, 1997; Eric Ulaszek per. comm.). For this particular species, priority should be given to Romeo silt loam (soil depth ~2-10" over bedrock) because Carex crawei can be found in shallow soils (i.e. dolomitic pavement). This should be followed by Channohon silt loam (soil depth 10-25" over bedrock), Joliet silty clay loam (soil depth 10-25" over bedrock), and Millsdale silty clay (soil depth 25-42" over bedrock). Other potential soil types that should be considered for Carex crawei are Brenton silt loam and Warsaw silt loam.

To maintain and increase these populations of Carex crawei, the following practices should be considered in addition to those measures outlined under 1 of this section:

a. To enhance the genetic diversity of the populations, seeds should be collected from nearby populations (e.g. 50-100 miles from the site) to develop seedlings, rootstock, etc.

b. Seed sowing and hand plantings should be used to develop populations in the proper areas.

c. Monitoring and evaluation should be conducted for any restored or reintroduced populations. In the event that a restored or reintroduced population is unsuccessful, a site's potential for a second reintroduction or restoration attempt should be reevaluated. This may require additional research.

3. In the case that additional populations of Carex crawei are found in the region, they should be marked and protected from any potential damage and the above practices for maintenance and enhancement of these populations should be followed. Their habitat should also be protected.

MONITORING:

In natural populations, regular counts of ramets should be done to determine population status. Transects and quadrats should be used to determine the size of a population in a large area. Hand counts can be done if a population is small (less than 100 individuals). In restorations, sampling should be done as above to detect increases or decreases in the population. If no significant changes are detected, reevaluation of seeding techniques and management practices should be done to enhance the population.

RESEARCH NEEDS:

Immediate research needs that will help in the establishment and management of Carex crawei are:

1. Collect information on several aspects of the natural history such as specific habitat requirements (e.g. clay or dolomite soils, seed germination conditions, etc.) of the species. This will allow a better understanding of how and where the species can be reintroduced.

2. Collect demographic and population size information. This information is needed to determine the population structure and population changes (i.e. increases or decreases) of the species. With this information, specific recommendations can be made if the population is declining or only seedlings are found.

3. Develop a Population Viability Analysis (PVA). A PVA identifies the threats faced by a species and can evaluate the likelihood that the species will persist for a given time into the future. To develop a PVA, field studies, data analysis, modeling, assessment of extinction risks, sensitivity analysis, and monitoring, among other things, are needed.

4. Determine the impact of different management (e.g. grazing, fire) and recreational activities. It is important to determine the best management practice(s) to improve the habitat for the species. Also, it is important to determine which recreational activities are compatible with the species. This will prevent any risks to the species and its habitat.

REFERENCE LIST

Literature cited

Bowles, M. L. 1991. Some aspects of the status and ecology of seven rare wetland plant species in the Chicago Region of northeastern Illinois. Erigenia 11: 52-66.

Carroll, C. J. and J. White. 1997. Integrated Pest Management Methods for Control of Invasive Exotic Plant Species at Midewin National Tallgrass Prairie. Unpublished report by Ecological Services for the Illinois Department of Natural Resources, Springfield, IL.

Hanski, I., A. Moilanen, and M. Gyllenbergl. 1996. Minimum viable metapopulation size. The American Naturalist 147: 527-541.

Husband, B. C. and S. C. H. Barrett. 1996. A metapopulation perspective in plant population biology. Journal of Ecology 84: 461-469.

Illinois Natural Heritage Database. 1999. An electronic database housed in the Illinois Department of Natural Resources.

Key, J. Jr., C. Carpenter, S. Hooks, F. Koenig, W. H. McNab, W. Russell, and M. L. Smith. 1995. Ecological Units of the Eastern United States-First Approximation (map and booklet of map unit tables). U.S. Department of Agriculture-Forest Service, Atlanta, GA.

Kolstad, D. A. 1986. Cyperaceae Juss., the sedge family. In Flora of the Great Plains. ed. Great Plains Flora Association. Pp. 1059-1113. University Press of Kansas, Lawrence, KS.
Laatsch, J. and B. Loebach. 1997. Midewin Ecological Unit Map and Summaries. Unpublished report by Division of Natural Heritage-Illinois Department of Natural Resources, Springfield, IL.

Levins, R. 1969. Some demographical and genetic consequences of environmental heterogeneity for biological control. Bulletin of the Entomological Society of America 15: 237-240.

Levins, R. 1970. Extinction. In Lectures on Mathematics in the Life Sciences, 2. ed. M. Gerstenhaber. Pp. 77-107. American Mathematical Society, Providence, RI.

Menges, E. S. 1992. Stochastic modeling of extinction in plant populations. In Conservation Biology: The Theory and Practice of Nature Conservation, Preservation, and Management. eds. P. L. Fiedler and S. Jain. Pp. 253-275. Chapman and Hall, New York, NY.

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois Vascular Plants. Southern Illinois University Press, Carbondale, IL.

Schwegman, J. E., G. D. Fell, J. Hutchinson, G. Paulson, W. M. Shepard, and J. White. 1973. Comprehensive Plan for the Illinois Nature Preserve Commission. Part II - The Natural Divisions of Illinois. Illinois Nature Preserve Commission, Springfield, IL.

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region. 4th ed. Indiana Academy of Science, Indianapolis, IN.

Web pages cited

www.fs.fed.us/ne/delaware/ilpin/C.htm

www.itis.usda.gov/plantproj/plants/cgi_bin/fr_enter.cgi?earl=fr_qurymenu

Personal communication

Steven R. Hill. Illinois Natural History Survey-Center for Biodiversity. 607 East Peabody Drive. Champaign, Illinois 61820. Phone number: 217-244-8452.

Marcella M. DeMauro. Forest Preserve District of Will County, 22606 S. Cherry Hill Road, Joliet, Illinois 60433. Phone number: 815-727-8700

John Taft. Illinois Natural History Survey-Center for Biodiversity. 607 East Peabody Drive. Champaign, Illinois 61820. Phone number: 217-244-5046.

Eric Ulaszek. U.S. Forest Service. Midewin National Tallgrass Prairie. 30071 South State Route 53. Wilmington, Illinois 60481. Phone number: 815-432-6370.