

**Effect of Disturbance on on recovery of Eriocaulon
kornickianum**

Final report, Project E-38

SUBMITTED BY

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Introduction

Eriocaulon kornickianum, the small headed dwarf pipewort, is rapidly declining in the western part of its distribution (Oklahoma, Texas, and Arkansas; Watson 1989, Watson et al. 1994, Watson and Uno 1988). The only protected population in Oklahoma is on a Nature Conservancy Preserve, Boehler Seeps and Sandhills Preserve (Boehler). Annual monitoring from 1987 to 1994 (Oklahoma Natural Heritage Inventory and The Nature Conservancy, unpublished) indicates that this population is declining. This is probably a result of encroaching vegetation and accumulation of dead vegetation and debris, resulting from fire suppression (Watson et al. 1994). Studies of artificial disturbance support this hypothesis (Watson et al. 1994). Because the Boehler population has continued to decline, efforts need to be made to recover this population before critical limits have been reached. Therefore, a disturbance and monitoring regime will be established, that focuses on this population. The objective of this study is to open up potential sites for *E. kornickianum* followed by two years of monitoring to determine success.

It is hoped that clearing vegetation from the immediate sites will create potential habitat will allow *E. kornickianum* plants to become (re)established. At this time, this is the only real management option, since fire management proved ineffective.

Methods

During the fall of 1994, a latin square layout was establish a grid of plots on the *E. kornickianum* population at Boehler. The grid consists of two columns, or transects, 6m long. Each column was then divided into 20 1m by 30cm plots for a total of forty experimental plots were established (figure X). The width of each plot, 30 cm, is equivalent to the width of a

council rake wide, the device to be used for disturbing a plot. Experimental design consisted of two treatments, raked and unraked. Treatment of a plot was determined by a coin toss. Raking was done to remove all standing and dead vegetation in order to expose bare soil.

The population was visited in June and September in the years 1995 and 1996. In June, *E. kornickianum* flowers and at that time the total number of individuals in each plot were counted. In addition, the name of all species in the plot were recorded and their percent cover in the plot visually estimated. These measurements were taken again in September after seed set. Sampling was repeated in 1996.

Results and discussion

A total of 19 plots were raked and 21 plots were left unraked. A total of 59 *E. kornickianum* plants were counted in 1995. Of those, two occurred in unraked plots, and the remaining 57 were in raked plots. In 1996, no individuals of *E. kornickianum* were found. In 1995, *E. kornickianum* in plots with exposed soil ranging from 40% - 80%. The correlation coefficient was 0.645301.

At total of 27 associated species were encountered in 1995 and 31 species in 1996 (Table X). The total number of species tended to be higher in raked versus unraked plots. In raked plots, 25 species were encountered in 1995 and 26 in 1996. In unraked plots, 20 species were encountered in 1995 and 25 in 1996.

Panicum scoparium had the greatest cover in 1995 and 1996. There was a significant decline in the percent cover of *Sphagnum* spp. between the years 1995 and 1996. In 1995, *Sphagnum* spp. had the second highest percent cover in the study. The percent cover differed with treatment. Raked plots had a percent cover of 30.79% and unraked plots 6.55%. In 1996,

mean percent cover dropped to 0.71%. Percent cover was still higher in raked plots (1.07%) versus unraked plots (0.32%). The amount of exposed soil also decreased between the two years. In 1995, 29.54% of the plots were exposed soil, 55.87% in raked plots and 5.71% in unraked. However, in 1996, the percentage of exposed soil decreased to an average value of 7.0%, 10.92% for raked and 3.45% for unraked plots.

Literature cited

Watson, L. E., G. E. Uno, N. McCarty, and A. B. Kornkven. 1994. Conservation biology of a rare specie, *E. kornickianum* (Eriocaulaceae). American Journal of Botany 81: 980-986.

Figure 1: Experimental design. Two transects were established of contiguous 1m x 30 cm plots.

R = raked plot, UR = unraked plot.

<-----1M-----><-----1M----->

1-R	21-R
2-UR	22-R
3-R	23-UR
4-R	24-R
5-UR	25-UR
6-UR	26-UR
7-UR	27-UR
8-UR	28-R
9-R	29-R
10-R	30-R
11-UR	31-UR
12-UR	32-UR
13-R	33-R
14-R	34-UR
15-UR	35-R
16-UR	36-R
17-UR	37-UR
18-UR	38-R
19-R	39-R
20-UR	40-UR

Table 1: Number of individual *Eriocaulon kornickianum* plants and percent of exposed soil in plots at Boehler Seeps and Sandhills Preserve.

Plot number	<i>E. kornickianum</i>	Soil95	<i>E. kornickianum</i>	Soil96
Plot 1 (Raked)	0.0	45.0	0.0	0.0
Plot 2 (Unraked)	0.0	0.0	0.0	0.0
Plot 3 (Raked)	2.0	65.0	0.0	15.0
Plot 4 (raked)	0.0	75.0	0.0	0.0
Plot 5 (unraked)	0.0	0.0	0.0	10.0
Plot 6 (unraked)	0.0	0.0	0.0	25.0
Plot 7 (unraked)	0.0	0.0	0.0	5.0
Plot 8 (unraked)	0.0	0.0	0.0	0.0
Plot 9 (raked)	5.0	70.0	0.0	55.0
Plot 10 (raked)	0.0	55.0	0.0	45.0
Plot 11 (unraked)	0.0	25.0	0.0	25.0
Plot 12 (unraked)	0.0	0.0	0.0	0.0
Plot 13 (raked)	9.0	70.0	0.0	10.0
Plot 14 (raked)	8.0	60.0	0.0	60.0
Plot 15 (unraked)	0.0	40.0	0.0	0.0
Plot 16 (unraked)	0.0	0.0	0.0	0.0
Plot 17 (unraked)	0.0	0.0	0.0	0.0
Plot 18(unraked)	0.0	0.0	0.0	0.0
Plot 19 (raked)	7.0	70.0	0.0	15.0
Plot 20 (unraked)	0.0	0.0	0.0	5.0
Plot 21 (raked)	2.0	40.0	0.0	0.0

Plot number	<i>E. kornickianum</i>	Soil95	<i>E. kornickianum</i>	Soil96
Plot 22 (raked)	1.0	30.0	0.0	0.0
Plot 23 (unraked)	0.0	0.0	0.0	0.0
Plot 24 (raked)	0.0	75.0	0.0	0.0
Plot 25 (unraked)	0.0	0.0	0.0	0.0
Plot 26 (unraked)	0.0	0.0	0.0	0.0
Plot 27 (unraked)	0.0	0.0	0.0	0.0
Plot 28 (raked)	4.0	65.0	0.0	5.0
Plot 29 (raked)	3.0	60.0	0.0	0.0
Plot 30 (raked)	4.0	75.0	0.0	0.0
Plot 31 (unraked)	0.0	0.0	0.0	10.0
Plot 32 (unraked)	0.0	0.0	0.0	0.0
Plot 33 (raked)	1.0	40.0	0.0	15.0
Plot 34 (unraked)	0.0	0.0	0.0	10.0
Plot 35 (raked)	3.0	70.0	0.0	15.0
Plot 36 (raked)	5.0	50.0	0.0	20.0
Plot 37 (unraked)	0.0	35.0	0.0	10.0
Plot 38 (raked)	3.0	25.0	0.0	10.0
Plot 39 (raked)	0.0	30.0	0.0	0.0
Plot 40 (unraked)	2.0	50.0	0.0	10.0

Table 2: Percent cover values for treatment types and year at Bohler Seeps and Sandhills Preserve.

Taxa	Raked 95	Unraked 95	Mean	Raked 96	Unraked 96	Mean
<i>Ammania coccinea</i>	0.00	0.00	0.00	0.05	0.00	0.03
<i>Ampelopsis arborea</i>	1.32	0.53	0.88	1.13	0.52	0.81
<i>Andropogon virginicus</i>	1.63	2.26	1.85	1.45	2.74	2.13
<i>Aster ericoides</i>	2.11	1.45	1.69	4.13	3.26	3.68
<i>Bohemeria cylindrica</i>	0.00	0.00	0.00	0.00	0.12	0.06
<i>Carex</i> sp.	0.00	0.00	0.00	0.00	0.02	0.01
<i>Cephalanthus occidentalis</i>	0.21	0.00	0.10	0.00	0.00	0.00
<i>Coelorachis cylindrica</i>	0.18	0.00	0.09	1.18	0.71	0.94
<i>Desmodium</i> sp.	0.00	0.00	0.00	0.55	0.33	0.44
<i>Diodia teres</i>	0.18	0.00	0.09	0.00	0.00	0.44
<i>Diospyros virginiana</i>	0.00	0.00	0.00	0.66	0.00	0.31
<i>Eleocharis</i> sp.	1.45	2.11	0.00	0.00	0.00	0.06
Fabaceae sp.	0.00	0.00	1.69	0.13	0.00	0.00
<i>Helianthus angustifolius</i>	3.29	3.42	3.19	0.05	0.02	0.04
<i>Juncus marginalis</i>	0.00	0.00	0.00	0.05	0.00	0.03
<i>Juncus torreyi</i>	0.00	0.00	0.00	0.03	0.00	0.01

Taxa	Raked 95	Unraked 95	Mean	Raked 96	Unraked 96	Mean
<i>Juncus validus</i>	4.16	7.71	6.01	0.11	0.14	0.13
<i>Juniperus virginianus</i>	0.39	0.00	0.19	0.00	0.00	0.00
<i>Lobelia puberula</i>	0.66	0.00	0.31	0.00	0.00	0.00
Mosses	3.95	5.79	4.88	2.76	3.24	3.01
<i>Panicum agrostoides</i>	0.00	1.45	0.69	0.55	0.60	0.58
<i>Panicum brachyanthum</i>	0.26	0.00	0.31	0.00	0.00	0.00
<i>Panicum microcarpon</i>	0.00	0.13	0.06	0.79	0.71	0.75
<i>Panicum oligosanthos</i>	0.00	0.00	0.00	0.00	0.62	0.33
<i>Panicum scoparium</i>	17.11	22.50	19.38	17.39	19.88	18.70
<i>Paspalum laeve var. pilosum</i>	1.05	1.58	1.25	2.37	0.48	1.38
Poaceae sp.	0.39	1.18	0.75	0.03	0.19	0.11
<i>Psoralea simplex</i>	1.66	2.82	2.19	0.00	0.00	0.00
<i>Rhexia virginica</i>	4.58	7.53	6.09	4.50	4.31	4.40
<i>Rhynchospera caduca</i>	4.42	5.84	5.00	0.29	0.02	0.15
<i>Rudbeckia hirta</i>	0.18	0.63	0.39	0.00	0.00	0.00
<i>Setaria geniculata</i>	0.66	1.05	0.81	1.00	0.38	0.68
<i>Silphium astericus</i>	0.00	0.00	0.00	3.95	5.95	5.00

Taxa	Raked 95	Unraked 95	Mean	Raked 96	Unraked 96	Mean
<i>Solidago ulmifolia</i>	0.53	3.29	1.88	5.00	7.52	6.33
<i>Sphagnum</i> sp.	6.55	30.79	21.24	0.32	1.07	0.71
<i>Ulmus alata</i>	0.11	0.00	0.05	0.37	0.57	0.48
Unknown dicot	2.63	1.32	1.88	2.11	2.38	2.25
<i>Viola</i> sp	0.00	0.00	0.00	0.00	0.12	0.06
Total number of taxa	25	20	27	26	25	31
Exposed soil	55.87	5.71	29.54	10.92	3.45	7.00