

Reintroduction of Lakeside Daisy (*Tetraneuris herbacea* Greene, Asteraceae) at Manito Prairie Nature Preserve, Tazewell County, Illinois

William E. McClain¹, John E. Ebinger²

¹Adjunct Research Associate in Botany

Illinois State Museum, Springfield, Illinois 62706

²Adjunct Professional Scientist

Illinois Natural History Survey, Champaign, Illinois 61820

ABSTRACT

Lakeside daisy (*Tetraneuris herbacea* Greene, Asteraceae) was re-introduced into dry gravel prairie at three locations within Manito Prairie Nature Preserve, Tazewell County, Illinois in 1988 with additional plantings at four other preserve locations in 1994 and 1995. Monitoring documented the disappearance of all but one population within five years following reintroduction. This population has persisted for nineteen years, but declined to one flowering and 63 non-flowering individuals in 2003. Long-term survival of this taxon at Manito Prairie Nature Preserve appears unlikely.

INTRODUCTION

Lakeside daisy (*Tetraneuris herbacea* Greene) is an herbaceous, thick-rooted, spring-blooming, polycarpic perennial herb in the family Asteraceae characterized by a short, fibrous-rooted caudex; tufted, oblanceolate, punctate, basal leaves, 1-8 cm long and 2-10 mm wide, and a solitary head terminating a scape up to 25 cm in length (Wunderlin 1971, Gleason and Cronquist 1991). An extremely rare species, populations of Lakeside daisy were known from Illinois and about Lake Erie in Ohio and southern Ontario, Canada (Cusick 1991, DeMauro 1993). Naturally occurring populations are currently restricted to Ontario, Canada, and Ottawa County, Ohio (Cusick 1991, Gleason and Cronquist 1991).

Lakeside daisy was initially discovered in Will County in northeastern Illinois on a glacial deposit known as Joliet Mound. The habitat at Joliet Mound, as well as other localities within Illinois, was well-drained gravel prairie, dry limestone prairie, or dolomite prairie. In the early 1900s, Pepoon (1927) discovered numerous colonies along a five-mile stretch of the Des Plaines River in Will County. These colonies have since been destroyed by development within the river corridor. The last surviving native population in Illinois, located near Joliet, was destroyed in 1981 by mining operations. Lakeside daisy also occurred at Manito Prairie in Tazewell County, but the last plants disappeared from this locality in the early 1960s (Wunderlein 1971). The loss of the Will County

population caused the Illinois Endangered Species Protection Board to regard this taxon as extirpated from the state (Herkert and Ebinger 2002).

The one-nerved, spatulate leaves form rosettes in which flower buds develop in autumn. These buds overwinter within rosettes, emerge in early spring, and flower between late April and early June, with peak flowering during the first half of May. The bright yellow inflorescence contains fertile disc and ray florets that are both capable of producing viable seeds. Approximately 49 viable seeds are produced per inflorescence in naturally occurring populations (DeMauro 1994).

Sexual reproduction within Lakeside daisy involves a strong sporophytic, self-incompatibility system. This self-incompatibility prevents self-fertilization or cross-fertilization between plants having identical self-incompatibility genotypes. Plants having identical genotypes, known as mating groups, must cross with plants from other mating groups in order to produce viable seed (DeMauro 1994).

Vegetative growth by rhizome formation or branching of the woody stem of older plants also results in the formation of new rosettes. Most rosettes die after about a year of growth, causing the separation of the new plants into individual rosettes as the old plant material decomposes. This vegetative growth pattern results in independent and genetically identical plants (DeMauro 1994).

Lakeside daisy was considered lost from Illinois until it was discovered that a horticulturist living in Chicago had collected and propagated plants from the last native Illinois population. Plants were obtained from this individual and discussions were initiated among management personnel in the 1980s regarding the potential of reintroducing Lakeside daisy into suitable sites in Illinois with the objective of re-establishing viable, wild-growing populations. Three Illinois Nature Preserves, two in Will County and one in Tazewell County were selected as suitable reintroduction sites. The purpose of this study was to describe the results of Lakeside daisy reintroduction efforts at Manito Prairie Nature Preserve, Tazewell County, Illinois.

DESCRIPTION OF THE STUDY AREA

Manito Prairie Nature Preserve (MPNP) is an eight ha site located in Tazewell County, 11 km southwest of Pekin (S15 and S22 T24N R6W). The site is on a terrace above the Illinois River at the northern edge of the Illinois River Sand Areas Section of the Illinois and Mississippi River Sand Areas Natural Division (Schwegman et al. 1973). The gravels and sands forming this terrace were deposited during the post-glacial period of Wisconsin glaciation about 14,500 years ago. At that time glacial deposits in northeastern Illinois were breached, causing a great flood known as the Kankakee Torrent. These floodwaters carried huge amounts of sand and gravel which were deposited along the broad floodplain of the Illinois River below Hennepin, Illinois (Hunter 1966, Willman and Frye 1970). Subsequent erosion created extensive gravel terraces along the bluffs of the river.

Evaluated by the Illinois Natural Areas Inventory in 1977, MPNP was recognized as a site of statewide significance (White 1978). Four natural communities were identified within the preserve, including gravel hill prairie, sand prairie, dry mesic upland forest,

and successional field. Relatively undisturbed prairie occurs on gravelly slopes and occupies approximately 3.2 ha of the preserve (White 1978, McFall 1984). The predominant plants of these gravelly slopes are *Schizachyrium scoparium* (Michx.) Nash, *Dicranthium oligosanthes* (Schant.) Gould, *Dalea purpurea* Vent., and *Echinacea pallida* Nutt. (McClain et al. 2004). These open, gravelly slopes are considered to be the former habitat of Lakeside daisy.

Cattle and horses grazed MPNP until 1961. The owners also burned the prairie nearly every spring until the late 1970s. To ensure the preservation of gravel prairie communities and several rare plant species, the site was dedicated as an Illinois Nature Preserve in 1985 (McFall and Karnes 1995). Since ownership was obtained by the Illinois Department of Natural Resources, four prescribed spring burns have been conducted (1991, 1997, 2000, and 2001), and considerable amounts of brush have been removed to enhance the prairie community.

The landscape within the general vicinity of MPNP has changed considerably since the 1960s. A large housing development lies immediately north of the preserve, and other homes have been built on privately owned lands along Illinois Route 29 which forms the eastern boundary of MPNP. MPNP is now the only site known to retain original prairie vegetation on the sand and gravel bluffs along this portion of the Illinois River.

METHODS

Plants from the last Illinois population were crossed with plants from Ohio to produce fertile hybrid Lakeside daisy plants. Single rosette plants produced from seeds from these plants, seeds gathered from open pollinated F1 hybrid plants grown outdoors at the University of Illinois at Chicago, and seed collected from wild-growing plants in Ohio and Canada were the stock designated for transplantation (DeMauro 1990, 1993, and 1994). Reintroduction efforts began on gravel hill prairie slopes at MPNP considered favorable for the growth of Lakeside daisy with 100 plants each at Sites A, B, and C on September 29, 1988. Subsequent reintroductions included 50 seeds at Site D on May 18, 1994 and 40 seeds at Site G on May 13, 1994. On April 4, 1995 eight plants were placed at Site D, seven at Site E, seven at Site F, and eight at Site G.

Beginning in 1989, all sites were monitored at the time of flowering (first two weeks of May), and all flowering and non-flowering individuals were counted. However, Sites D through F were not counted in 1995, and none of the sites were monitored in 1996. For this study, a well-defined basal rosette was considered as one individual. Monitoring has taken place annually from 1989 through 2003, except as noted. Nomenclature follows Mohlenbrock (2002).

RESULTS

The initial plantings of Lakeside daisy (September 1988) occurred at the end of a severe drought. However, survival rates at Sites A, B, and C in 1989 were 80, 75, and 80 % (Table 1). All populations appeared to be doing well until 1990 when the Site B population declined greatly (Figure 1.). Site C followed the same pattern in 1991 and plant loss

continued at both sites through 1992 and 1993. No plants could be found at either location in 1994 (Table 1, Figure 1).

Seedlings were not reported at MPNP by researchers until 1991. Apparently no other seedlings were observed during the remainder of the study. This contrasts with Lockport Prairie, one of the other Illinois reintroduction sites, where seedlings were reported the year following reintroduction (DeMauro 1994).

The Site A population survived and has ranged from a low of 72 individuals in 1994 to a high of 189 individuals in 2002 (Table 1). However, this population declined to one flowering and 63 non-flowering individuals in 2003, making it the lowest number of flowering plants in the 15-year history of the reintroduction efforts (Table 1, Figure 1).

Sites D, E, F and G, where seeds were introduced in 1994 and plants were added in 1995 had no surviving plants by 1997. These losses, combined with the loss of the Site B and C populations left Site A as the only surviving population of Lakeside daisy at MPNP.

DISCUSSION

The causes for the failure of the reintroduction efforts at MPNP are not well understood. Drought could have affected success because 1988, the year of the first plantings, was one of the worst drought years in recent history. The very dry conditions could have weakened and stressed the plants. Though survival was good in 1989, Site B and Site C populations declined in 1990 and 1991 (Table 1, Figure 1).

MPNP was also considered the least suitable of the three Illinois reintroduction sites based on the dense cover of native vegetation and the moderate to severe woody encroachment (DeMauro 1994). Recent studies at MPNP suggest that the habitat is changing. Since the 1980s, six native plant species have been extirpated from the site, and the state endangered *Besseya bullii* (Eat.) Rydb. (kittentails) has been reduced to two small colonies (McFall 1984, McClain et al. 2004).

Recovery plans for endangered species also recommend a minimum of 500 plants per site to re-establish rare plant populations (Morris et al. 1999). Lakeside daisy reintroduction efforts at MPNP began with 330 plants and 90 seeds. Two hundred plants were lost in less than five years following planting, leaving just the Site A population. The loss of the Site B and C populations eliminated the potential for achieving two goals of the reintroduction efforts: (1) minimizing inbreeding, and (2) periodic gene flow between populations. Failing to achieve these goals at MPNP would negatively impact the long-term survival of Lakeside daisy at MPNP (De Mauro 1993, Morris et al. 1999). The loss of these populations, which included an assortment of mating types, reduced the potential for seed production and the establishment of new plants.

The reintroduction of Lakeside daisy at MPNP demonstrates the difficulty of managing isolated populations of rare plants in an increasingly urban environment. Housing developments north of the preserve plus those along the nearby Illinois Route 29 are concerns when prescribed burns are conducted due to potential health or traffic problems due to smoke. Infrequent prescribed burns make it difficult to control woody vegetation that has

been a major management problem at MPNP for the last twenty-five years. Thus, it may no longer be possible to maintain a habitat favorable for the growth of Lakeside daisy at MPNP. Based upon the success of the reintroduction efforts and the complex management problems, it is doubtful that Lakeside daisy will continue to survive at MPNP.

ACKNOWLEDGMENTS

The authors would like to thank the numerous Natural Heritage Biologists and other staff of the Illinois Department of Natural Resources for monitoring Lakeside daisy populations at Manito Prairie Nature Preserve.

LITERATURE CITED

- Cusick, A. W. 1991. *Hymenoxys herbacea* (Asteraceae): An endemic species of the Great Lakes Region. *Rhodora* 93:238-241.
- DeMauro, M. 1990. Recovery Plan for the Lakeside Daisy (*Hymenoxys acaulis* var. *glabra*). U. S. Fish and Wildlife Service, Region 3. Twin Cities, Minnesota 82 pp.
- DeMauro, M. 1993. Relationship of Breeding System to Rarity in Lakeside Daisy (*Hymenoxys acaulis* var. *glabra*). *Conservation Biology* 7:542-550.
- DeMauro, M. 1994. Development and implementation of a recovery program for the federally threatened Lakeside daisy (*Hymenoxys acaulis* var. *glabra*). Pages 298-321 *In* Bowles, M. L., and C. J. Whelen. *Restoration of Endangered Species*. Cambridge University Press. Cambridge, England 394 pp.
- Gleason, H.A., and A. Cronquist. 1991. *Manual of the vascular flora of northeastern United States and adjacent Canada*. Second Edition. The New York Botanical Garden, Bronx, NY. lxxv + 910 pp.
- Herkert, J.R. and J.E. Ebinger. 2002. Editors. *Endangered and threatened species of Illinois: Status and distribution*. Volume 1. Plants. Illinois Endangered Species Protection Board, Springfield, Illinois. 161 pp.
- Hunter, R. E. 1966. Sand and gravel resources of Tazewell County, Illinois. *State Geological Circular* 399. 22 pp.
- McClain, W. E., L. R. Phillippe, and J. E. Ebinger. 2004. Vascular flora of Manito Prairie Nature Preserve, Tazewell County, Illinois. *Transactions of the Illinois State Academy of Science* 97:83-94.
- McFall, D. W. 1984. Vascular Plants of the Manito Gravel Prairie, Tazewell County, Illinois. *Transactions of the Illinois State Academy of Science* 77:9-14.
- McFall, D.W. and J. Karnes. Editors. 1995. *A directory of Illinois Nature Preserves, Volume 2. Northwestern, Central and southern Illinois*. Illinois Department of Natural Resources, Springfield, Illinois. 327 pp.
- Mohlenbrock, R. H. 2002. *Vascular Flora of Illinois*. Southern Illinois University Press. Carbondale. 490 pp.
- Morris, W., D. Doak, M. Groom, P. Kareiva, J. Fieberg, L. Gerber, P. Murphy, and D. Thomson. 1999. *A Practical Handbook for Population Viability Analysis*. The Nature Conservancy. Washington, D. C. 80 pp.
- Pepoon, H. S. 1927. *Flora of the Chicago Region*. Chicago Academy of Sciences. Chicago, Illinois.
- Schwegman, J., G. B. Fell, M. Hutchison, W. M. Shepherd, and J. White. 1973. *Comprehensive plan for the Illinois Nature Preserves System. Part 2. The natural divisions of Illinois*. Illinois Nature Preserves Commission. Rockford, Illinois. 32 p + map.
- White, J. 1978. *Illinois Natural Areas Inventory Technical Report*. Illinois Natural Areas Inventory. Urbana, Illinois. 426 pp.
- Willman, H. B. and J. C. Frye. 1970. Pleistocene stratigraphy of Illinois. *Illinois State Geological Survey Bulletin* 94:1-204.
- Wunderlin, R. P. 1971. Contributions to an Illinois Flora. No. 4. *Transactions of the Illinois State Academy of Science* 64:317-327.

Figure 1. Lakeside daisy populations at Manito Prairie Nature Preserve, 1988-2003, Tazewell County, Illinois.



