CONSERVATION ISSUES

Natural Areas Protection at its Best; Protecting the Tennessee Purple Coneflower (*Echinacea tennesseensis*)

Brian Bowen[1,2]

[1]Tennessee Natural Areas Program
Resource Management Division
Department of Environment and Conservation
7th Floor, L & C Annex
401 Church St
Nashville, TN 37243

[2]Corresponding author:brian.bowen@tn.gov

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ABSTRACT: The delisting of Tennessee purple coneflower (*Echinacea tennesseensis*) from the Federal Endangered Species Act (ESA) marks a major conservation milestone. Its removal from the ESA demonstrates the purpose of the law and how it is intended to work. It is a conservation success story that celebrates the recovery of a species once considered extinct but now protected in 10 Tennessee Designated State Natural Areas and on other conservation lands in Middle Tennessee. The rediscovery of the species and the protection of its five populations is the legacy of many dedicated people over decades. This effort utilized best science practices and important land protection measures in partnership with state and federal government, universities, and The Tennessee Chapter of The Nature Conservancy to accomplish a significant conservation goal. It is a testimony to conservation law that protects species at the federal and state level under the ESA and the Tennessee Natural Areas Preservation Act of 1971.

Index terms: Echinacea tenneesseensis, endangered species, Middle Tennessee cedar glades and barrens, Tennessee purple coneflower

In 2011, the Tennessee Department of Environment and Conservation (TDEC) celebrates two important coinciding events. The first is the 40th anniversary of the passage of the Natural Areas Preservation Act of 1971, which has enabled the protection of 82 designated state natural areas (DSNA) totaling more than 48,583 ha. This legislation subsequently has contributed to the second event, which is a major conservation milestone – the delisting of Tennessee purple coneflower (*Echinacea tennesseensis)* from the Federal Endangered Species Act (ESA).

The delisting was officially announced by Jack Arnold, Deputy Assistant Regional Director, USFWS, on August 4, 2011 at Cedars of Lebanon State Park just outside of Nashville where approximately 100 invited participants gathered (Figure 1). Those attending were scientists, resource managers, and others involved in the species recovery and protection. Its official delisting was published in the Federal Register on August 3rd and became effective on September 2, 2011.

Tennessee purple coneflower (Figure 2) was listed on the ESA on July 6, 1979 (USFWS 1989). It was one of the first plants species listed on the ESA by the U.S. Fish & Wildlife Service (USFWS). Some 32 years later, it has been removed from the ESA because the majority of all known natural colonies of the five extant popula-

Figure 1. Jack Arnold, Deputy Assistant Regional Director, USFWS, speaking to approximately 100 invited participants at the delisting ceremony held at Cedars of Lebanon State Park outside of Nashville, TN, on August 4, 2011.

Figure 2. Tennessee purple coneflower (*Echinacea tennesseensis*) is now protected in 10 Tennessee designated state natural areas. Its protection resulted in its delisting as a Federal Endangered Species. Photo taken by Darel Hess.

tions of Tennessee purple coneflower are protected in perpetuity by TDEC (USFWS 2010) in 10 DSNA. They occur in only three Middle Tennessee counties: Wilson, Davidson, and Rutherford.

The conservation of a species, that in 1961 was considered extinct, is a success story of immeasurable importance for conservation in Tennessee and the United States. It celebrates the legacy of major legislation, both federal and state, the Federal Endangered Species Act, and the Tennessee Natural Areas Preservation Act, which has enabled the recovery of what was once one of the world's most imperiled species.

During this 40th anniversary year, the delisting is a wonderful gift to the citizens of Tennessee and demonstrates to all the intent of the ESA and its purpose as a law that enables us to conserve our most rare and endangered species. This event is actually a textbook example of how the ESA is designed to work. This accomplishment is the fruit of the labor of dozens of dedicated people over the course of many decades. The work to conserve this species actually began long before the enactment of either piece of legislation.

In fact, the story begins in 1878 when Tennessee's first and foremost botanist, Augustin Gattinger, collected Tennessee coneflower at a cedar glade a few miles southeast of Nashville in Lavergne, Tennessee. At the time, Gattinger believed it to be *Brauneria angustifolia*, a species associated with the prairies of Saskatchewan and Manitoba extending down into the Midwestern states of the United States. It was collected again in 1897 by Eggert and in 1898 was described by Beadle as a new distinct coneflower species (*Brauneria tennesseensis*). In 1933, Small had reclassified it to its present nomenclature *Echinacea tennesseensis* (Walck et al. 2002).

By 1961, McGregor concluded that it was likely extinct, having not found it during his field surveys from 1959-1961 (Walck et al. 2002). McGregor considered it extinct until it was rediscovered along Mount View Road in Nashville in 1968 by Dr. Elsie Quarterman and Jerry and Carol Baskin (Baskin et al. 1968; Somers 1971). Curiously, Dr. Hal DeSelm, University of Tennessee, collected it in 1963 along Mount View Road, a record that McGregor annotated in 1970. It was also collected in 1967 by Dr. Robert Kral, Vanderbilt University, at Lavergne, Tennessee (USFWS 1989).

Its rediscovery coincides with the work Dr. Elise Quarterman began in the late 1950s (Figure 3), which also led to her lifelong advocacy for natural areas protection. Among many of her accomplishments, she was a pioneer of cedar glade ecology at

Figure 3. Dr. Quarterman (1948) was a pioneer of cedar glade ecology, which led to the rediscovery of Tennessee purple coneflower.

Vanderbilt University where she trained a cadre of graduate students, some becoming cedar glade experts, including Carol and Jerry Baskin at the University of Kentucky and Thomas Hemmerly at Middle Tennessee State University. They began to discover the locations of the globally rare cedar glades of Middle Tennessee where they conducted extensive ecological research. ***It is duly noted that in 2008, Dr. Quarterman and Dr. Hal DeSelm were co-recipients of the Natural Areas Association George Fell Lifetime Achievement Award (Figure 4).***

It was the work at universities, particularly Dr. Quarterman's research that gave rise to the rediscovery of Tennessee coneflower. The Tennessee coneflower site Dr. Kral discovered in Lavergne in 1967 was destroyed by the construction of a trailer park in 1970 (USFWS 1989). Ironically, this particular site may have been the type locality for the species (Somers 1971). By 1968, two new populations were discovered, and then another was discovered in 1970, and two more in 1972. The sites discovered in 1972 were later destroyed by residential housing developments (USFWS 1989). Other occurrences of Tennessee coneflower were likely extirpated in the late 1960s with the construction of the J. Percy Priest Reservoir, located in the centrum of Tennessee coneflower populations.

While there has been historic loss due to human activity, Tennessee purple coneflower is considered to have always been rare in its geographic distribution, even within the limited range of the Middle Tennessee cedar glade complex. It is one of 23 cedar glade endemics that adapted and evolved as a unique species within the harsh cedar glade environment. There are also two other federally endangered plant species associated with the cedar glades, Pyne's ground plum (*Astragalus bibullatus)* and Leafy prairie clover (*Dalea foliosa*). Tennessee purple coneflower's progenitor was probably similar to *Echinacea angustifolia*, migrating into Middle Tennessee with many other prairie species between 5000 and 8000 years ago when the climate was extremely hot and dry at the end of the Hypsithermal Period (Delcourt et al. 1986).

The Middle Tennessee cedar glades are associated with karst topography, mostly occurring on the Lebanon limestone formation of Ordovician origin. They are open areas of limestone bedrock or gravel with shallow soil (less than 25 cm deep) that remains barren or sparsely vegetated mostly by annual species like prairie dropseed (*Sporobolus vaginiflorus)*. Glades in association with barrens form a glade/barrens complex as soil depths increase supporting perennial species like the little bluestem (*Schizachyrium scoparium*). This complex is typically within openings of oak (*Quercus*)/hickory (Carya) or mixed red cedar (*Juniperus*)/oak forests. This Middle Tennessee cedar glade/barrens community is ranked by NatureServe as a (G1) globally rare element.

The most abundant area where Tennessee coneflower grows is in the ecotone of the glade/barrens complex in soils depths be-

Figure 4. Dr. Quarterman was recognized by the Natural Areas Association in 2008 when she was awarded the George Fell Lifetime Achievement Award. Photo taken by Lisa Smith.

tween 5 cm and 12 cm (Hemmerly 1976; Drew1991). It is less abundant in the shallowest of glade soils and in the deepest barren soils where it has to compete for sun with tall perennials and woody species. It is not a shade tolerant species. Tennessee coneflower benefits from barrens management in the deeper soils to reduce competition. This may include prescribed burning, bush-hogging, and invasive species control.

Tennessee coneflower was found to be associated with six plant communities within this gradient according to Drew and Clebsch (1995). They conducted the first monitoring assessment between 1987 and 1989 through a contract between TDEC's Natural Heritage Program (TN NHP) and the University of Tennessee, which resulted in capturing essential baseline data for the five Tennessee coneflower populations. The TN NHP then conducted more assessments using a similar but modified monitoring protocol starting in 1996 (Bishop and Hogan 1996). This science provided the data to support the decision to delist the species from the ESA.

Today it is estimated that there are about 920,279 Tennessee coneflower plants, 78% are natural populations comprised of 15 colonies (subpopulations) and 20 are introduced colonies that have been propagated from natural populations (USFWS 2010). Introduced colonies were established from seed from natural populations or seedlings grown ex situ at the Missouri Botanical Garden and plant nurseries and then transplanted on conservation lands. This is part of the recovery strategy to compensate for the historic loss of the species (USFWS 1989). In fact, one of the five natural populations, Allvan, was on private property and has recently been destroyed. However, the population remains sustainable because seeds were collected and propagated before it was destroyed and were then introduced to the Elsie Quarterman DSNA where it flourishes.

The five populations are named for the locations where they were discovered. Four of the five natural populations, Mount View, Couchville, Vine, and Vesta, are locations of four of the 10 DSNA where Tennessee coneflower is protected. John and Hester Lane Cedar Glade DSNA and Gattinger Cedar Glade and Barrens DSNA also support natural colonies.

Introduced colonies occur at Cedars of Lebanon State Forest DSNA, Fate Sanders DSNA, and at Stones River Cedar Glade DSNA. The latter is regarded by USFWS as a sixth population because of the mixing of three subpopulations (USFWS 2010). Other protected introduced colonies occur at Long Hunter State Park, Cedars of Lebanon State Park, and at U.S. Army Corps of Engineer (USCOE) sites.

Ensuring the protection of Tennessee coneflower in the 10 DSNA, and on other conservation lands, is a significant reason for the delisting. An aggressive campaign to acquire Tennessee purple coneflower sites began in the early to mid 1990s as a partnership between the TDEC Tennessee Natural Areas Program (TNAP) and the Tennessee Chapter of The Nature Conservancy (TNC). This led to the purchase of Mt. View DSNA, Couchvile DSNA, and Vesta DSNA. TNC enlisted the help of American Airlines and Bell South in this effort. Tennessee coneflower was the full cover photo on the Davidson County phone book in 1993-1994 (Figure 5).

In 2003, the Nashville Super Speedway Inc.

Figure 5. Cover of the 1993-1994 Bell South Davidson County Phone Book.

provided TNAP a conservation easement to protect Gattinger's Cedar Glade and Barrens DSNA. In 2009, TNAP acquired the John and Hester Lane Cedar Glade DSNA with money made available through the USFWS Recovery Land Fund (a tract at Couchville had also been purchased with this fund). While most of the Tennessee coneflower sites are owned and managed by TDEC (TNAP), there is coordination with USCOE, the National Park Service (NPS), and Tennessee Division of Forestry to manage and monitor Tennessee coneflower on these public lands that are also DSNAs.

The future of Tennessee coneflower is promising. With the support of USFWS funding, maintaining the health of the species will be ongoing. TN NHP will continue to monitor the plant populations while TNAP will manage the glades and barrens conducting prescribed burns, bush-hogging, and controlling invasive species. There are contingencies for relisting the species (USFWS 2010) in the event of a population crash, but based on all indicators, it is expected that the five populations secured and protected in DSNAs will continue to flourish as a sustainable species.

The delisting of Tennessee coneflower is a success story that has come together during the 40th anniversary of the Tennessee Natural Areas Preservation Act. It celebrates how both natural areas and the ESA provide a framework for the conservation of the most imperiled species. It also is a story of much work and dedication, which has resulted in the preservation of a species that was once considered extinct.

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Brian Bowen is Administrator for the Tennessee Department of Environment and Conservation Natural Areas Program and has served in this position since 1994. As part of his statewide responsibilities, he works in the Middle Tennessee Cedar Glades and Barrens and is involved with the management decisions related to glade and barren communities and its many rare species, including Tennessee coneflower.

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