

TABLE 2.—BENEFICIAL ACTIVITIES TO ENHANCE MISSOURI BLADDERPOD SITES UNDER PUBLIC OWNERSHIP OR A LONG-TERM EASEMENT AGREEMENT

Site	Managing agency	Acreage	Management activities	Other conservation activities
Wilson's Creek National Battlefield.	National Park Service.	4 sites, ~29 acres.	Control of woody vegetation, exotic grasses, and sericea lespedeza using a variety of methods, including prescribed burning, mechanical removal, and reducing foot traffic impacts.	Ongoing monitoring and demographics; life history and micro-habitat studies; public outreach and education.
Rocky Barrens Conservation Area.	Missouri Department of Conservation.	191 acres	Control of woody vegetation and exotic grasses using prescribed burning and mechanical removal.	Ongoing monitoring; public outreach and education; support of various research projects.
Rocky Barrens	The Nature Conservancy.	90 acres ...	Control of woody vegetation and exotic grasses using prescribed burning and mechanical removal.	Ongoing monitoring; public outreach and education; support of various research projects.
Bois D'Arc Conservation Area.	Missouri Department of Conservation.	40 acres ...	Control of woody vegetation and exotic grasses using prescribed burning and mechanical removal.	Ongoing monitoring; public outreach and education.
Nathan Boone State Historic Site.	Missouri Department of Natural Resources.	3 acres	Control of woody vegetation and exotic grasses using prescribed burning; fencing to eliminate cattle from occupied habitat.	Ongoing monitoring; planned development of interpretative program.
South Greenfield	The Nature Conservancy.	47 acres ...	Control of woody vegetation and exotic grasses using prescribed burning and mechanical removal.	Ongoing monitoring and floristic inventories of associated species.

The MDNR, MDC, TNC, and Wilson's Creek National Battlefield have undertaken various management activities to further the conservation of the species (Table 2). Management techniques that have been effective in enhancing bladderpod habitat include prescribed burning, chainsawing, and bulldozing to control the encroachment of woody vegetation such as red cedar (*Juniperus virginiana*) and exotic plants such as annual brome grasses (*Bromus* spp.) and sericea lespedeza (*Lespedeza cuneata*), rerouting hiking trails to reduce potential impact from foot traffic, and installing fencing to exclude cattle from occupied habitat (Table 2).

In particular, prescribed burning is a highly beneficial technique to improve bladderpod habitat. In 1988, an estimated 1,500 plants were counted at Rocky Barrens Conservation Area (Hickey 1988), and 2,000 plants were determined to occur on the same site in 1992 (MDC 2002a). In August 1993, MDC conducted a controlled burn on the area (Figg and Priddy 1994), and over 50,000 plants were estimated in May 1994 (MDC 2002a). The species responded similarly at the same site in the spring of 1997 and 1998, following controlled burns in August 1996 (Figg and Davit 1997) and 1997. MDC botanist Tim Smith estimated that the population at the site in May 1998 contained "tens of thousands" of plants (MDC 2002a).

Additional protection and management of bladderpod habitat has occurred through TNC's Registry

Program. Between 1986 and 1996, nine sites in Christian, Dade, and Greene Counties were added to the organization's Registry Program. Under this program, private landowners have an agreement with TNC to protect Missouri bladderpod sites to the best of their ability and to notify TNC regarding any new threats to the species or its habitat or if the landowner plans to sell the property. Additionally, TNC personnel assist private landowners by providing management suggestions, including the development of site-specific plans, and by notifying them of various landowner incentive programs that promote Best Management Practices. Best Management Practices developed by MDC (2000) include surveys for bladderpod and bladderpod habitat, controlling the encroachment of eastern red cedars and exotic species onto glade habitat through mechanical cutting and prescribed fire, avoiding the use of nonspecific herbicides between October and July in occupied bladderpod habitat, and avoiding heavy grazing or grazing during flowering and fruiting periods (March-July) (Susanne Greenlee, TNC, pers. comm. 1998).

In 1998, the Service provided funding to TNC to enhance 90 acres of degraded bladderpod habitat on Rocky Barrens Conservation Area in Greene County. Missouri bladderpod habitat was improved by prescribed fire and cutting of invasive eastern red cedar trees. Although a thorough estimate of Missouri bladderpod plants has not yet been possible on the managed area since

these restoration efforts were conducted in 1998, flowering plants were observed at the location in 1999 (Doug Ladd, TNC, pers. comm. 2000).

Potential impacts to populations of *Lesquerella filiformis* on rights-of-way maintained by the Missouri Department of Transportation (MODOT) was another threat identified at the time of listing (52 FR 679, January 8, 1987) and also when the Recovery Plan was completed for the species (U.S. Fish and Wildlife Service 1988). Education programs within the MODOT have significantly reduced the potential impact of mowing or chemical treatment of highway rights-of-way. Maintenance supervisors who work within the range of Missouri bladderpod in Missouri have been alerted to the location of extant populations and have been trained in the identification and habitat needs of the species. Consequently, most maintenance activities that may impact the species are avoided. In situations where potential impacts are unavoidable, MODOT, as a designated representative for the Federal Highway Administration, initiates consultation with the Service and further discusses such activities with the MDC to minimize these impacts (Gene Gardner, MODOT, pers. comm. 2000).

The expansion of the exotic brome grasses *Bromus tectorum* L. and *B. sterilis* L. has been identified by some as a potential threat to the Missouri bladderpod (The Nature Conservancy 2002; Hickey 1988; U.S. Fish and Wildlife Service 1988; Thomas and