

**RESTORING GLADE, WOODLAND, AND SAVANNA HABITAT TO
BENEFIT THE COLLARED LIZARD AND OTHER SPECIES OF GREATEST
CONSERVATION NEED**

Project Summary

Glade, woodland, and savanna habitat at Devil's Eyebrow Natural Area and the Rob Walton Nature Preserve will be restored through control of non-native invasive plants, the removal of woody encroachment, and prescribed fire implementation. Feral hogs, an invasive species that interrupts food webs by damaging native ground flora, will be trapped and reduced in number. These restoration actions will create additional high-quality habitat, provide connectivity to previously restored high-quality habitat, and revitalize a large landscape of priority habitat, thereby addressing three funding priorities and benefiting at least eight species of greatest conservation need (SGCN), notably including the collared lizard.

Project Leader

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Devil's Eyebrow Natural Area:
*Cedar encroachment in glades has reduced habitat
for the collared lizard and other SGCN.*

SWG Funding Requested: \$72,000 (60%)

Amount and Source of Matching Funds: \$48,000 (40%)
will be provided from the Arkansas Natural Heritage
Commission, The Nature Conservancy, and the Arkansas
Game and Fish Commission

Total Project Costs: \$120,000

NEED: Glades are open, rocky areas dominated by forbs and warm-season grasses. Like many grass-dominated ecosystems, glades and associated woodlands and savannas in the Ozark Mountains ecoregion have undergone fire suppression in the past century. As a result, glade openings in this ecoregion have declined in both size and diversity due to encroaching woody vegetation, especially eastern red cedar. Herbaceous species diversity is lower under the shade of surrounding woody plants. Historical fire suppression has also facilitated woody succession in glade-associated woodlands, which become dense with a minimal herbaceous understory. Ultimately, conversion to a closed canopy adversely affects animal species dependent on open stand structure and its associated plant composition. Additionally, a lack of fire has spurred the growth of non-native invasive plant species in glade-associated savannas. Livestock grazing and severe, localized feral hog activity have also harmed glade ecosystems in the Ozark Mountains, but fire suppression has had the largest negative effect.

Devil's Eyebrow Natural Area (DENA), part of Beaver Lake Wildlife Management Area in the Ozark Mountains, encompasses a 2,502-acre mosaic of high-quality glades, woodlands, savannas, bluffs, rich hardwood forests, and riparian forests. Located at the northern end of Beaver Lake along Indian Creek and its tributaries, this natural area exhibits rugged and steep terrain comprising deep bluff-lined hollows separated by steep ridges. Much of the natural area is underlain by alternating layers of chert and limestone that include caves and many springs. DENA supports one of the highest concentrations of rare plant species in Arkansas with several species typically found far to the north and others that are restricted in distribution and considered globally rare. The Rob Walton Nature Preserve (RWNP) is adjacent to DENA and protects 440 acres of the same communities.

Glades within DENA support an isolated remnant collared lizard population, the size of which is currently unknown and requires assessment. The collared lizard is a keystone predator of glade communities and a species of greatest conservation need (SGCN). Another SGCN, the Diana fritillary is known from within one mile of and likely occurs at DENA in glade complexes; adults feed on nectar-producing plants in the glade openings and woodlands, and caterpillars feed on woodland violets, the host plant.

Fire is the most important ecological process maintaining the distribution, composition, and diversity of glade and associated woodland and savanna communities. Unfortunately, decades of fire suppression prior to state and private conservation ownership at DENA and the RWNP have altered these sites' species composition and structure, resulting in densification to forested stands. Additionally, much of both sites was converted from an open to a closed canopy structure, and feral hogs are interrupting food webs by damaging native ground flora. Further, the encroachment of non-native invasive plant species threatens the diversity of these habitats. Thus, the restoration of glade, woodland, and savanna community structure, re-establishment of fire, and feral-hog-control measures are needed if SGCN preferring these habitats are to increase or even persist. Restoration of glade, woodland, and savanna habitat at two priority sites in northwest Arkansas will create additional high-quality habitat and increase the scale of managed land, thereby providing a larger landscape for at least eight SGCN.

FUNDING PRIORITIES: This project addresses three 2016 Arkansas Wildlife Action Plan funding priorities for:

1. Woodlands, Savanna, Glades, and Upland Hardwood Forest Grassland Birds – implementation and/or evaluation of habitat restoration and management for woodlands and savanna, glades, and upland hardwood forest grasslands
2. Collared Lizard – habitat improvement/restoration, fire management
3. Woodlands, Savannas, and Glades Habitat – habitat management to maintain or increase habitat quality or increase patch size for SGCN

PURPOSE AND OBJECTIVES: The primary goal of this project is to restore and improve the quality of glade, woodland, and savanna habitat at two locations in northwest Arkansas by reducing woody encroachment and invasive plant species on 875 total acres using prescribed fire and mechanical and chemical methods, as well as by implementing feral-hog-control measures, thereby increasing viability of SGCN. Project completion will take two years; proposal objectives are:

1. Increase the scale of high-quality glade, woodland, and savanna habitat to benefit SGCN
2. Restore and maintain important native groundcovers by removing feral hogs
3. Measure progress toward desired ecological conditions by monitoring habitat response and response of collared lizards

LOCATION OF WORK: Project activities will improve glade, woodland, and savanna habitat for SGCN in the Ozark Mountains ecoregion, specifically at DENA and the RWNP in Benton and Carroll counties (Figure 1).

APPROACH:

Objective 1 will be addressed in both years of the project. A total of 875 acres of glade, woodland, and savanna habitat will be restored using prescribed fire, mechanical treatments, and herbicide applications.

Eastern red cedar will be treated at DENA and the RWNP over 45 acres using two techniques: felling rows and girdling in rows not felled, and felling using the cut-and-lay method. Other woody invasive species will be mechanically removed. Follow-up herbicide treatments will be used as necessary.

To restore 30 acres of old pasture at DENA, fescue will be treated using prescribed fire and mechanical and chemical methods. Following these treatments, the pasture will be planted in local genotype native warm-season grasses.

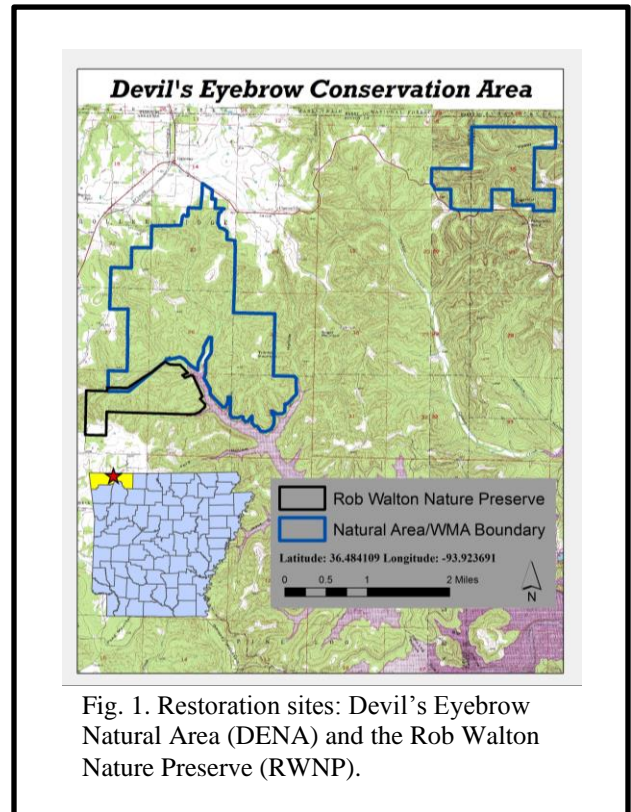


Fig. 1. Restoration sites: Devil's Eyebrow Natural Area (DENA) and the Rob Walton Nature Preserve (RWNP).

The Arkansas Natural Heritage Commission (ANHC) and The Nature Conservancy (TNC) will conduct prescribed-fire implementation across 800 acres at DENA and the RWNP, which will decrease the large woody component of the glades, reduce eastern red cedar, reduce the abundance of non-native plant species, favor native warm-season grasses, reinvigorate native shrubs, increase the size and connectedness of the glade openings, restore structure to the adjacent woodlands, and reinvigorate the woodland herbaceous layer and glade/woodland ecotone.

Objective 2 will be addressed in both years of the project. The Arkansas Game and Fish Commission (AGFC) will acquire feral hog traps for use at DENA; these will use remote monitoring and gate-management devices.

Objective 3 will be addressed in both years of the project. Response of habitat and collared lizards to restoration activities will be assessed by conducting pre-treatment (baseline) and post-treatment monitoring surveys. Habitat response to restoration activities will be monitored by measuring changes in plant community structure and composition using transects and documenting changes visually using photopoints. A herpetologist will conduct presence/absence surveys for collared lizards at DENA and assess responses based on individual- and population-level demographic parameters.

EXPECTED RESULTS AND BENEFITS: Restoring degraded glade, woodland, and savanna habitat at DENA and the RWNP will (1) create additional high-quality habitat for glade, woodland, and savanna SGCN, (2) help restore an ecological fire regime that is necessary to maintain this system, (3) provide connectivity by restoring degraded habitat adjacent to existing high-quality habitat and in newly acquired areas, and (4) increase the scale of managed land, thereby providing a larger landscape that we will maintain in future years to benefit SGCN and other wildlife. This project will benefit eight SGCN at DENA and the RWNP (Table 1).

<i>Table 1: SGCN that will benefit from this project (8). Species known from within one mile of DENA in similar habitat are in bold.</i>	
Blue-winged warbler	Prairie warbler
Chuck-will's widow	Red-headed woodpecker
Collared lizard	Whip-poor-will
Diana fritillary	Yellow-billed cuckoo

BUDGET 40 - 60% Cost Share: The ANHC, TNC, and AGFC will provide non-federal match.

Category	Total	Match ANHC	Grant ANHC	Match TNC	Grant TNC	Match AGFC	Grant AGFC
Salary/benefits	\$ 32,846	\$ 0	\$13,000	\$ 8,216	\$3,130	\$ 8,500	\$ 0
Contracts	65,750	15,000	46,750	0	0	4,000	0
Equip./supplies	12,671	0	0	1,778	393	5,500	5,000
Travel	5,153	0	2,250	2,321	582	0	0
Indirect costs*	3,580	0	0	2,685	895	0	0
Grand Total	\$120,000	\$15,000	\$62,000	\$15,000	\$5,000	\$18,000	\$5,000

*TNC's indirect cost rate in its FY16 NICRA is 21.8%. TNC's indirect rate is negotiated annually, and TNC will charge indirect at the federally approved rate each year.

ORGANIZATION AND STAFF QUALIFICATIONS:

The Arkansas Natural Heritage Commission and The Nature Conservancy have successful experience restoring and protecting glade, woodland, and savanna communities. They have worked together and with other partners to develop a broad understanding of this at-risk ecosystem through years of scientific observation and the use of adaptive management in implementation of restoration and conservation techniques. Each agency protects and maintains glade remnants in Arkansas.

Project Leader: **Bryan Rupar** is the Chief of Land Acquisition and Stewardship for the Arkansas Natural Heritage Commission. Rupar received a B.S. in Natural Resource Management from Grand Valley State University and an M.S. in Forest Resource Management from the University of Arkansas at Monticello. Rupar previously worked for the U.S. Forest Service in Michigan and private forestry firms in southern Arkansas. Rupar oversees all acquisition, stewardship, and restoration projects for the 62,000-acre System of Natural Areas.

Douglas Zollner is the Director of Conservation Science for The Nature Conservancy, Arkansas Field Office. He has been working with the Conservancy for 20 years. Zollner also serves as the Conservancy's National Fire Restoration Coordinator, coordinating Conservancy efforts to reduce the threat of altered fire regimes to biodiversity across ownerships at landscapes in the U.S. and Mexico. Zollner has over 30 years of working experience with ecological assessments and conservation planning, woodland and watershed restoration, fire ecology, ecological modeling, and developing and implementing measures of conservation success in an adaptive management context. He received a B.S. from the University of Arizona in Watershed Management and an M.S. from Texas Tech University in the Ecology of Arid Lands.

Mark Hutchings is the Arkansas Game and Fish Commission Northwest Region Supervisor for the Wildlife Management Division. Mark received a B.S. in Wildlife Conservation and Management from Missouri State University. Mark previously worked for the Missouri Department of Conservation for 31 years: 23 years with Wildlife Division and eight years with the Private Land Services Division. He came to the Arkansas Game and Fish Commission in March 2013 as a biologist and then became supervisor for the Northwest Region in July 2014.

Casey Brewster is a current Ph.D. graduate student at the University of Arkansas and Pat Tillman Military Scholar. He has studied collared lizards for over six years and is currently working with the Ozark-St. Francis National Forest and Arkansas Game and Fish Commission to re-establish collared lizards to restored habitat localities in the Sylamore Ranger District. Brewster has an M.S. in Biology from the University of Arkansas at Little Rock.