

STATE WILDLIFE GRANT PRE-PROPOSAL

PROJECT TITLE: Glade Restoration and Conservation of Ozark-Highland Species of Greatest Conservation Need in Northern Arkansas.

PROJECT SUMMARY:

The goal of this project is to improve habitat quality, population diversity and SGCN stability in multiple glades within McIlroy Madison Co. –Wildlife Management Area and Lake Leatherwood City Park. Project objectives include a) habitat restoration (cedar removal of 200+ acres and Rx fire of 3,000+ acres), b) population management of a pivotal glade predator (*Crotaphytus collaris*), c) population monitoring of several glade SGCN and glade pollinators, and d) public education (interpretive signage). Project efforts will improve glade ecosystem stability, increase the number of *C. collaris* populations in the region, and foster greater public awareness of glade conservation and biodiversity.

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PROJECT BUDGET:

Total Project Cost: \$162,880
Total SWG Amount: \$94,851 (58%)
Matching Funds: \$68,029 (42%)



NEED

RFP Priorities—Our project addresses multiple priorities listed in the AWAP and the SWG 2018 RFP. 1) Habitat management (habitat restoration and fire management) to increase or improve habitat quality, 2) population management of a key SGCN associated with those habitats (Eastern Collared Lizard), 3) public relations and education, and 4) population monitoring of SGCN and key glade pollinators.

Background— A growing number of glade species are becoming imperiled in the state (AWAP). One of the most pivotal glade endemics is the Eastern Collared Lizard (*Crotaphytus collaris*). A key predator in glade habitats^{1, 2}, *C. collaris* plays an important role in stabilizing species richness of insect communities in Ozark glades³ many of which are glade endemics and SGCN (Table 1). Additionally, insects are one of the greatest consumers of plant biomass in Ozark glades⁴. Thus, *C. collaris* appears to have important impacts on at least two trophic levels (primary glade herbivores and glade plants). Furthermore, *C. collaris* is an important prey species to other glade predators, including several birds of prey, snakes and road runners⁵. Therefore, glade conservation and management that includes efforts that specifically benefit *C. collaris*, will in turn benefit SGCN at multiple trophic levels.

In the past decade, several state and federal agencies in Arkansas have begun to increase efforts to restore glade habitats. Although glade habitat management is still the MOST critical component to conservation of glade SGCN, the majority of glades in Arkansas currently do not support *C. collaris* populations. Thus, many of the glade sites that have been or are in the process of being restored are missing one of most important glade species at those sites. Additionally, recent genetic data analyzed at the University of Arkansas suggest that many remaining populations have low genetic diversity⁶. A major step to improving glade habitats and associated plant and animal communities requires population management of *C. collaris* (restocking extirpated sites or supplementing sites that have low genetic diversity).

LOCALITY SPECIFIC NEEDS

Lake Leatherwood City Park (LLCP)—The glades at LLCP consist of over 150 acres of glade habitat with frequently used public hiking trails through much of the habitat. Fire has been suppressed at the site since lake construction in the 1930's, and most of the glade habitat is heavily encroached by cedar. Although data collected by C.LB. over the past five years suggest that the *C. collaris* populations are moderately stable at LLCP, genetic data suggest lower than expected connectivity among populations, and high inbreeding coefficients. Thus, it is vital that this site receives habitat restoration (cedar removal and R_x fire) and *C. collaris* population management (supplementation). Furthermore, this site has great public relations/education potential with its highly used trails. By adding signage with information about glade ecology, associated SGCN and current habitat restoration efforts, this site could represent one of the most “publicly viewable” glade sites in the state.

McIlroy, Madison Co. WMA (MM-WMA)— Our project also focuses on three glade sites within MM-WMA that include over 80 acres of glade habitat. The AGFC at MM-WMA has already started habitat restoration (cedar removal) at one of the glades. The other two glade sites are still encroached by cedar, and will need R_x fire and cedar removal. *Crotaphytus collaris* has not been documented in the area in over 50 years, and known remnant *C. collaris* populations in this region are a substantial distance from the WMA.

Thus, without restocking, the odds that *C. collaris* will recolonize these glades after restoration are extremely low. Furthermore, the WMA is scattered with several other glade-habitat pockets that, as the WMA continues habitat management in the future, could be easily colonized from the three glade sites on which this project is focused.

Flippin Rock Quarry (FRQ)—Probably the largest *C. collaris* population in the state (40-60 adults) is at a privately owned (and inactive) rock quarry in Flippin AR. As glade habitat restoration continues in the state, the population at this site will become vital to restocking *C. collaris* to restored habitats. Although most of the habitat at this site consist of open areas with exposed bedrock, boulders and gravel substrates, substantial portions of the quarry have become encroached by cedar. Thus, to maintain this critical restocking site, cedar removal is necessary.

New Restocking Source sites (NRS)—A key component to our ability to restock or supplement restored glade habitats in Arkansas with *C. collaris* is to have access to sites with adequate population sizes (>30) to acquire lizards for restocking. Translocating a large number of lizards from existing natural sites could result in negative impacts to those populations. Thus, rock quarries and road-side boulder fields make excellent new restocking source sites because: 1) these sites are “unnatural” (man-made) habitats, and 2) densities at these sites are typically much greater than in natural glade sites⁷. Currently, we have only two viable restocking source sites in the state to translocate lizards from (FRQ and another privately owned rock quarry). By seeding three additional NRS populations, we greatly increase the number of lizards that can be relocated to restored habitats. AGFC will be given full access rights to lizards at NRSs.

Population Monitoring—Successful glade-restoration and *C. collaris* population management will result in improvements that benefit several other glade SGCN. Thus, this project will sample population impacts of project efforts on several glade-SGCN (Table 1), including six SGCN pollinators.

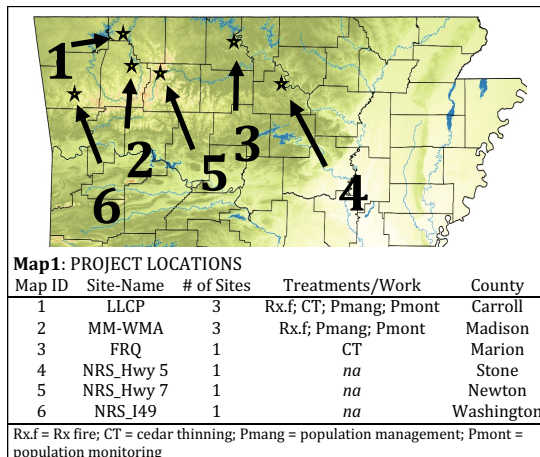
PURPOSE AND OBJECTIVES

The purpose of this project is to make a broad-scale and comprehensive improvement in glade, barren and savanna habitat quality for key SGCN through habitat restoration, fire management, population management, population monitoring and public relations/education.

Quantifiable Objectives: 1) Habitat restoration through cedar thinning and treatment of invasive plants at seven glades (over 200 acres); 2) Prescribed fires at six glades (over 3000 acres); 3) population management through restocking of three glades (MM-WMA) and supplementation at three glades (LLCP); 4) population sampling of key glade SGCN (Table 1) at six glades; 5) public relations/education by adding interpretive signs at LLCP; 6) establish three NRSs in the state.

LOCATIONS

All sites (Map 1) are within the Ozark Highlands ecoregion. LLCP and MM-WMA sites are naturally occurring, Interior Highland Glade and Barren habitats, within a



savanna/woodland matrix. *FRQ* and *NRS* Hwy 5 are inactive quarries in the center of historic Interior Highland Glade and Barren habitats. *NRS* on Hwy 7 and I49 are road-side boulder fields surrounded by exposed bedrock, prairie grasses and cedar/scrub oak woodlands.

APPROACH

The project leader (CLB) will complete pre-treatment habitat and SGCN population sampling (including habitat photo-points) by Fall 2018, and post-treatment sampling by Fall 2020. Chainsaw crews from TNC, *LLCP* and AGFC (and CLB) will begin thinning cedar at *LLCP* and *MM-WMA* (South Bluff and Rock House Creek only) Fall 2018, and finish thinning by Spring 2019. Fire lines will be cut in by chainsaw crews from TNC beginning Fall 2018, and finish by Spring 2019. Chainsaw crews from *LLCP* will complete thinning of cedar at *FRQ* in Fall 2019. R_x fires will be scheduled for Fall 2019. Signage that discuss the importance of glade habitat restoration, cedar removal and R_x fire will be posted at *LLCP* Fall, 2018, and signs discussing glade ecology, conservation and occurring SGCN will be posted upon completion of restoration. *NRSs* will be populated Spring 2019 by translocating an admixture of lizards from the two current restocking sites (*FRQ* and Schwartz quarry). Lizards will be translocated to *LLCP* (for genetic supplementation) and *MM-WMA* (restocking) from an admixture of restocking sites upon completion of habitat restoration.

EXPECTED RESULTS AND BENEFITS

Table 1 lists the primary SGCN impacted by the project, including SGCN populations that will be monitored (pop. sampling). Habitat restoration efforts will decrease woody vegetation encroachment⁸ and increase density and diversity of grasses and glade plants⁹. Habitat restoration and conservation efforts will result in increased numbers of *C. collaris* populations, enhance glade SGCN diversity and stabilize glade communities in the state. Population monitoring will quantify improvements to glade communities, and signage at *LLCP* will foster greater public awareness of the importance of conserving natural diversity within the state. Establishing *NRSs* will allow AGFC to translocate a greater number of *C. collaris* to restored glade habitats.

Table 1: Impacted SGCN at MM-WMA & LLC		Taxa	Popultaion	Localy
Common Name	Scientific Name	Group	Sampling	Known
Eastern Collared Lizard	<i>Crotaphytus collaris</i>	Reptile	Yes	Yes
Groundsnake	<i>Sonora semiannulata</i>	Reptile	Yes	No
Great Plains Skink	<i>Plestiodon obsoletus</i>	Reptile	Yes	Yes
Slender Glass Lizard	<i>Ophisaurus attenuatus</i>	Reptile	Yes	No
Northern Metalmark	<i>Calephelis boralis</i>	Insect	Yes	Yes
Baltimore Checkerspot	<i>Euphydryas phaeton</i>	Insect	Yes	No
Scrubland Tiger Beetle	<i>Cicindela obsoleta</i>	Insect	Yes	No
Otis Skipper	<i>Cogia outis</i>	Insect	Yes	No
Monarch	<i>Danaus plexippus</i>	Insect	Yes	No
Cobweb Skipper	<i>Hesperia metea</i>	Insect	Yes	No
Diana	<i>Speyeria diana</i>	Insect	Yes	No
Northern Bobwhite	<i>Colinus virginianus</i>	Bird	No	Yes
Common Nighthawk	<i>Chordeiles minor</i>	Bird	No	Yes
Purple Finch	<i>Haemorhous purpureus</i>	Bird	No	Yes

Budget Table					Match				
Item	Site	Agency	Description	Cost	Item	Site	Agency	Description	Cost
Salary	All	CLB	21 months	58,800.0	Salary	All	CLB	3 months	8,400.0
Travel	All	CLB	Mileage/Conf.	8,000.0	Unrecovered	na	UofA	39%	33,628.9
Equip/Supp	All	CLB	Chainsaw/PPE	1,500.0	Work	WMA	AGFC	Fire/Fire Lines	10,000.0
Fringe	na		6%	3,528.0	Work/Contract	LLCP	LLCP	Fire/Thinning	16,000.0
Contracts	WMA	TNC	Fire/Thinning	12,000.0				Match	68,028.9
Contracts	LLCP	TNC	Signage	2,400.0				Match %	41.8
Direct				86,228.0				SWG	94,850.8
Indirect			10%	8,622.8				Total Project	162,879.7

QUALIFICATIONS

Casey L. Brewster: M.S. 2012. UALR. Pat Tillman Military Scholar and PhD candidate at the University of Arkansas (UA). He is the project leader on a previous glade habitat and *C. collaris* SWG project (AR-T-56) and a partner in a similar glade project with the ANHC. He is currently working with the USFS and AGFC to re-establish *C. collaris* to restored habitat localities in AR. He will graduate UA Fall 2018 and will be devoted full time as the Project Leader of this project.

Kelly J. Irwin: M.S. 1997. Wildlife & Fisheries Science, Texas A&M University. He has worked on amphibian and reptile conservation and management projects as AGFC herpetologist for 15 years.

McRee Anderson: 14 years of fire management experience. Director, Fire Restoration Program AR Chapter of The Nature Conservancy (TNC). He is currently a National Wildfire Coordinating Group (NWCG) certified RXB2 Burn Boss. McRee co-leads TNC's Prescribed Fire Program.

Steven J. Beaupre: Associate Dean of Fulbright College of Arts and Sciences and Professor in the Department of Biological Sciences at the UA. He joined UA faculty in Fall of 1995, and focuses on physiological ecology of reptiles, specializing on environmental influences on bioenergetics, life-histories, and population biology.

Matthew Gifford: Assistant Professor, University of Central Arkansas. His research focuses on the influence of environmental variation on physiological and ecological processes in reptiles and amphibians. Much of his research focuses on the influence of temperature on physiological function, life history and fitness in lizards.

Marlis Douglas: Endowed Professor in Biological Sciences at UA. She co-directs the Arkansas Conservation and Molecular Laboratory (aCaMEL) at UA. Her research focuses on conservation genetics/genomics of small, isolated populations, with primary focus on fishes and reptiles.

Theo Witsell: Senior Botanist/Ecologist, Arkansas Natural Heritage Commission. He is an expert on the flora of Arkansas and has 20+ years of experience in monitoring, restoring, and managing natural areas throughout Arkansas and across the region.

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