

GRANTS

Research

RESEARCH PROPOSAL TO WESTERN NATIONAL PARKS ASSOCIATION

ALL PROPOSALS MUST FOLLOW THIS FORMAT. THE INFORMATION REQUESTED MUST BE LIMITED TO THE SPACE PROVIDED AND MUST BE SUBMITTED ON THESE FORMS. PROPOSALS RECEIVED IN ANY OTHER FORMAT WILL BE RETURNED. NO ADDITIONAL ATTACHMENTS ARE PERMITTED. DO NOT USE TYPE SMALLER THAN 10 POINT.

This is 10-point type.

Park(s) in which research is to be conducted: Casa Grande Ruins National Monument	
Title of project: Ecology of Round-tailed Ground Squirrels at Casa Grande Ruins National Monument	
Name, address and phone number of principal investigator(s): John L. Koprowski Wildlife and Fisheries Science School of Renewable Natural Resources University of Arizona Tucson, AZ 85721 USA (520) 624-6439	If grant is to be paid to PI(s), enter Soc. Sec. #s here. If grant is not to be paid to PI(s), enter name and address of payee here: University of Arizona 888 N. Euclid #510 Tucson, AZ 85722
Amount desired: \$7500	Desired start date: 15 January 2004 NOTE: Not prior to 12/1
Project duration 3 year Project completion date (see Research Guidelines) 15 December 2006	Will you be requesting subsequent year funding For this project? YES ☒ NO ☐ (see Research Guidelines)
Name(s) of research participant(s) who will acquire advanced degree(s) as a result of working on this project, if any: Karen Munroe, Doctoral Student, University of Arizona	Format of final report, i.e., technical report, checklist, map, manuscript, etc.: Manuscript

Abstract (To be provided by PI(s). Do not exceed space provided below. Use 10 point type or larger.):

National Parks and Monuments often serve as valuable sanctuaries for the conservation of biodiversity within a region. The round-tailed ground squirrel (*Spermophilus tereticaudus*) is a common resident of natural areas in the Sonoran Desert of Arizona and Sonora. This small bodied ground squirrel lives in colonies and is diurnal during the active season that ranges from late winter until late summer. Because of these habits, round-tailed ground squirrels are conspicuous members of the mammalian fauna throughout much of the Sonoran desert that includes several National Parks and Monuments. Despite their conspicuous nature, round-tailed ground squirrels are among the least studied species of mammal and many of the details of the most basic aspects of their biology are poorly understood. Round-tailed ground squirrels show great promise as a focal species for interpretive efforts to educate park visitors for they are common, highly visible, live in large groups, and are well adapted to desert life. Furthermore, round-tailed ground squirrels possess great scientific value for studies of basic and applied significance. Most mammals are solitary yet the colonial round-tailed ground squirrels provide an excellent model system for the study of the pressures that result in group living amongst mammals. From an applied standpoint, the species often is found burrowing under roads and building and amongst ruins. Herein, I propose an intensive live trapping and observational study of the movement, social structure, and ecology of round-tailed ground squirrels in the Casa Grande Ruins National Monument where the species is a common inhabitant of the prehistoric ruins and surrounding grounds.

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(1) JUSTIFICATION (TO BE PROVIDED BY SUBMITTING PARK) LIMIT TO SPACE BELOW. USE 10 PT. TYPE OR LARGER. SPECIFY THAT NPS-APPROPRIATED FUNDS ARE NOT AVAILABLE. WHERE DOES THIS PROJECT APPEAR ON NPS RESEARCH PRIORITIES? SPECIFY IF THIS PROPOSAL WAS SOLICITED BY THE PARK. HOW WILL THIS RESEARCH ENRICH ONE'S UNDERSTANDING OF THE PARK AND/OR AUGMENT INTERPRETATION OF THE PARK? WHAT IF ANY ARE THE IMPLICATIONS FOR RESOURCES MANAGEMENT?

Although not solicited by the park, "The Ecology of Round-tailed Ground Squirrels at Casa Grande Ruins National Monument Study" will fulfill one of the top five research priorities for the Monument. Unfortunately, National Park Service funding is not available at this time.

Most mammals in the Sonoran Desert are nocturnal and are rarely seen by visitors. In contrast, round-tailed ground squirrels are highly visible at the visitor center, as well as in Compound A. Many visitors are curious about these animals, but because of the lack of research, there is limited information we can give. This study will provide information about population, breeding habits, and distribution. The data will enhance our ability to interpret the implications of a large rodent population, minimal numbers of predators, and the local environment.

In addition, Park Service management has safety concerns with cave-ins along the extensive tunnel network of the ground squirrels, possible transmittal of disease and the potential for bites. Tunneling within archaeological sites has a detrimental effect on cultural resources. This study will provide critical information to help management make decisions about visitor safety and the preservation and protection of cultural and natural resources.

I have read and agree to abide by the research guidelines in effect at the time of this application.

John L. Kosiowski
SIGNATURE OF PRINCIPAL INVESTIGATOR(s)

15 Aug 03
DATE

SIGNATURE OF PARK SUPERINTENDENT

DATE

FOR WNPA USE ONLY

BOARD OF DIRECTORS REVIEW: ACTION AND DATE

AMOUNT GRANTED:

DATE: 1 MAY, 2000

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(2) CONCISE STATEMENT OF RESEARCH OBJECTIVES, DESIGN, AND METHODOLOGY Include facilities and sites to be used. Limit to two pages, single spaced. USE 10 PT. TYPE OR LARGER.

Our National Parks and Monuments often serve as valuable sanctuaries for the conservation of biodiversity within a region (Halvorson and Davis 1996). Often the species most sought after are large-bodied but secretive mammals that are charismatic; however, great scientific, aesthetic, and educational value can be ascribed to species that are highly visible and can be indicative of a region's biota. One such species is the round-tailed ground squirrel (*Spermophilus tereticaudus*) that is a common resident of natural areas in the Sonoran Desert of Arizona and Sonora (Hall 1981). This small bodied ground squirrel lives in colonies of at least several adult animals (Dunford 1977) and is diurnal during the active season that ranges from late winter until late summer (Hoffmeister 1986). Because of these habits, round-tailed ground squirrels are conspicuous members of the mammalian fauna throughout much of the Sonoran desert that includes several National Parks and Monuments (Hoffmeister 1986, Olin 1982). Despite their conspicuous nature, round-tailed ground squirrels are among the least studied species of mammal in the Sonoran Desert and many of the details of the most basic aspects of their biology are poorly understood (Hoffmeister 1986). Round-tailed ground squirrels show great promise as a focal species for interpretive efforts to educate park visitors for they are common, highly visible, live in large groups, and are well adapted to desert life. Furthermore, round-tailed ground squirrels possess great scientific value for studies of basic and applied significance. Most mammals are solitary yet the colonial round-tailed ground squirrels provide an excellent model system for the study of the pressures that result in group living amongst mammals. From an applied standpoint, the species often is found burrowing under roads and building and amongst ruins. As a result, I propose a study of the movement, social structure, and ecology of round-tailed ground squirrels in the Casa Grande Ruins National Monument where the species is a common inhabitant of the prehistoric ruins and surrounding grounds.

Objectives

The specific objectives of this research are to:

- 1.) To determine the movement patterns of round-tailed ground squirrels at Casa Grande Ruins National Monument
- 2.) To assess the distribution of amicable and agonistic interactions within a population of round-tailed ground squirrels and define the social system of round-tailed ground squirrels
- 3.) To delineate periods of aboveground activity of various age and sex classes of round-tailed ground squirrels
- 4.) To collaborate with the staff of Casa Grande Ruins National Monument to develop interpretive materials that highlight the ecology of round-tailed ground squirrels

Methods

Study Area. The study will be conducted at Casa Grande Ruins National Monument, Arizona. Round-tailed ground squirrels are found throughout the open Sonoran Desert vegetation within the park and all animals within a 200 m x 200 m study area will be studied. A 5 m x 5 m grid will be established to enable the delineation of animal locations. All burrow sites and key vegetation, rocks, and ruins will be mapped.

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Live Trapping, Marking, and Observations. Round-tailed ground squirrels will be studied with standard methods of capture, handling, marking and observation approved by the American Society of Mammalogists and the Animal Behavior Society. Squirrels are live trapped in shade covered, Sherman and Tomahawk box traps baited with rolled oats and peanut butter and checked hourly during early morning and evening hours dependent on temperature conditions. Captured individuals are transferred to a cloth-handling cone with velcro portals permitting the handler access to animals (Koprowski 2002). Animals are ear-tagged with small, uniquely numbered monel steel tags (National Band and Tag Co., Newport, KY) permitting identification of animals in hand. Each round-tailed ground squirrel is also provided a unique pattern of black hair dye enabling identification of individuals at a distance during behavioral observations. Animals are weighed (± 5 g) and the age class (Adult, Subadult, Juvenile), sex class, reproductive condition (Males: Scrotal, Abdominal; Females: Primiparous, Past Lactation, Pregnant, Lactating, Pubic Symphysis Open or Closed), hind foot length, shin length, and parasite load determined. All individuals are released at the point of capture. Individuals will be observed during periods of aboveground activity using scan sampling at 20-min intervals; the location, behavior, and distance to nearest neighbor of all animals will be recorded. Home ranges will be defined and overlaps between different sex and age classes calculated using ArcView and Ranges V software. These data will permit determination of patterns of association within the population of round-tailed ground squirrels and enable the influence of habitat features and kinship on space use to be examined. Dispersal patterns of marked juveniles will also be assessed through standardized surveys of the surrounding areas for evidence of juveniles marked on the study site.

Interpretive Materials and Reports. I will work closely with Casa Grande Ruins National Monument staff to inform them on the progress and findings of the study. I will also collaborate with staff members to produce materials that maximize the educational value of round-tailed ground squirrels at Casa Grande Ruins National Monument. Biennial reports as required by WNPA will be submitted in a timely manner and a final report with lay report will be submitted within a year of project completion.

Significance of Work

The results of this research promise to capitalize on the scientific and interpretive value of these excellent model organisms. Significant insight into the ecology of these poorly known desert dwellers will be obtained. These insights will then be shared with the visiting public through quality interpretive materials in an attempt to enrich their understanding of the biota of the Sonoran Desert.

Literature Cited

- Dunford, CC. 1977. Social system of round-tailed ground squirrels. *Animal Behaviour* 25: 885-906.
 Hall, ER. 1981. *Mammals of North America*. Wiley, New York.
 Halvorson, WH and GE Davis. 1996. *Science and ecosystem management in the national parks*. Univ of Arizona Press, Tucson.
 Hoffmeister, DF. 1986. *Mammals of Arizona*. Univ of Arizona Press, Tucson.
 Koprowski, JL. 2002. Handling tree squirrels with a safe and efficient restraint. *Wildlife Society Bulletin* 30:101-103.
 Olin, G. 1982. *Mammals of the Southwest Deserts*. Southwest Parks and Monuments Association, Tucson.

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(3) QUALIFICATIONS OF THE INVESTIGATOR(S) TO CONDUCT THE RESEARCH

USE THIS PAGE ONLY. DO NOT ATTACH A VITA. LIST ONLY THOSE QUALIFICATIONS DIRECTLY RELATED TO THIS GRANT REQUEST.
 INCLUDE A CONCISE LIST OF OTHER WNP-FUNDED RESEARCH CONDUCTED BY THIS PI.

1991	Ph.D. with Honors (Biology)	University of Kansas
1985	M.A. (Zoology)	Southern Illinois University
1983	B.S. (Zoology)	Ohio State University

I am a tenured Associate Professor of Wildlife and Fisheries Science at the University of Arizona where I teach courses in Ecology and Conservation of the Sky Islands in addition to conducting research on the behavior, ecology, and conservation of mammals. I recently joined the Univ of Arizona as a faculty member and director of the Desert Southwest Cooperative Ecosystems Studies Unit after 8 years on the faculty at Willamette University in Salem, OR. I began researching squirrels as an undergraduate in 1981. I continued my studies on behavioral and population ecology of squirrels throughout my graduate studies generating a Master's thesis on the population dynamics of the fox squirrel in an isolated woodlot entitled 'Fox squirrel population trends and regulation in a southern Illinois woodlot' and completed my dissertation research on the behavioral ecology and social organization of two species of squirrel, eastern gray squirrels and fox squirrels. My dissertation entitled 'The evolution of sociality in tree squirrels: the comparative behavioral ecology of fox squirrels and eastern gray squirrels' received the Graduate School's award for outstanding dissertation in 1991. During 1994, 1995, & 1999, I researched the ecology of the Chiricahua Fox Squirrel at Chiricahua National Monument for which I was fortunate to attract grants from WNP (nee SPMA), National Geographic Society, and the Atkinson Fund. Presently I have graduate students involved in research projects on Abert's squirrels, sensitive Arizona Gray Squirrels, sensitive Mexican Fox Squirrels, endangered Mt. Graham red squirrels, and a candidate species, the black-tailed prairie dog. My research efforts have resulted in over 35 published articles or accepted manuscripts in peer-reviewed journals on squirrel ecology and a book entitled *North American Tree Squirrels* that I coauthored with Dr. M.A. Steele for the Smithsonian Institution Press. Selected titles include:

- Hutton, K., J. Koprowski, V. Greer, C. Schauffert, M. Alanen, P. Young. Use of spruce-fir forest by introduced Abert's squirrels. *Southwestern Naturalist*, 48:257-260.
- Steele, M.A., and J.L. Koprowski. 2001. *North American Tree Squirrels*. Smithsonian Institution Press. 224 pp.
- Koprowski, J.L. and M.C. Corse*. 2001. Food habits of Chiricahua Fox Squirrels (*Sciurus nayaritensis chiricahuae*). *Southwestern Naturalist*, 46:62-65.
- Koprowski, J.L. 1998. Conflict between the sexes: a review of social and mating systems of the tree squirrels. Pp. 33-41 in M.A. Steele, J.F. Merritt, D.A. Zegers (eds.), *Ecology and Evolutionary Biology of Tree Squirrels*, Special Publication 6, Virginia Museum of Natural History. 310 pp.
- Koprowski, J.L. and M.A. Steele. 1998. Future directions: Research on the ecology of tree squirrels. Pp. 309-310 in M.A. Steele, J.F. Merritt, D.A. Zegers (eds.), *Ecology and Evolutionary Biology of Tree Squirrels*.
- Koprowski, J.L. 1996. Natal philopatry, communal nesting, and kinship in fox squirrels and eastern gray squirrels. *Journal of Mammalogy*, 77: 1006-1016.

8 Previous Grants from SPMA:

- 1994, 1995, 1999: Ecology of Chiricahua Fox Squirrels, 1995: Ecology of Collared Peccaries,
 1996 and 1998: Social ecology of Coatis, 2000: Carnivore Diversity (final report due Fall 2003)
 2002: Ecological Impact of the Introduced Abert's Squirrel (ongoing)

I am an active member of a number of scientific organizations including the American Society of Mammalogists, The Wildlife Society, and Society for Conservation Biology. Furthermore, I enjoy disseminating my research to professional (14 presentations in the last 5 years) and lay (5 presentations in the last 5 years) audiences. I enjoy collaborating with the NPS staff to develop interpretive programs and management plans and on previous projects at CHIR, I have presented 5 campfire talks and worked closely with park staff. I believe that I am well qualified to investigate the ecology of squirrels in the Casa Grande Ruins National Monument. My 9 years of previous research experience in the southwest will provide a very helpful foundation and convince me that the project will be of value to the park staff, the scientific community, and the visitors to Casa Grande Ruins National Monument.

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BUDGET FOR RESEARCH PROPOSAL

PERSONNEL

SENIOR PERSONNEL	FUNDS PROVIDED BY WNPA	CASH OR IN-KIND CONTRIBUTION (Please specify which and source.)
1. John L. Koprowski, Associate Professor	0	
2.		
3.		

OTHER PERSONNEL (Specify number in brackets. Specify duties to be performed to earn funds on next page.)

1. [] Other professionals (technicians, programmers, etc.)	-	
2. [1] Graduate students: Karen Munroe	0	
3. [2-3] Undergraduate students	\$ 4,200.00	
4. [] Secretarial/clerical	-	
5. [] Other	-	

Total PERSONNEL costs

EQUIPMENT COSTS (List item and dollar amounts for those items costing in excess of \$50 each on next page.)

\$ 1,000	\$ 2,000 (in-kind, PI)
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TRAVEL AND SUBSISTENCE (Itemize on next page.)

\$ 1,500	\$ 1,500 (currently seeking these funds)
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OTHER COSTS

1. Supplies and materials	\$ 800	
2. Consulting services	-	
3. Computer services	0	\$ 1,000 (laptop in-kind, PI)
4. Subcontracts (Itemize on next page.)	-	
5. Indirect Cost Waiver	-	\$ 1,875 (in-kind, UA)

Total OTHER COSTS

TOTAL PROJECT COSTS

\$ 7,500	\$ 6,375 (\$1,500 outstanding)
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COSTS (Cont'd) (Note: Be sure to explain here the duties that will be performed by any funded individuals to earn those funds.)

2. Ms. Karen Munroe, a doctoral student in Wildlife and Fisheries Science at the University of Arizona, will be primary researcher in the field conducting the majority of live-trapping, marking and observations in which she has considerable experience. She will also train and supervise the undergraduate field assistants. Karen is supported as a graduate teaching assistant at the University of Arizona as well as an adjunct lecturer at Pima Community College Northwest.

3. Two or three undergraduate field assistants will be hired to assist with various field tasks including the checking of live traps, mapping, observations, and data entry.

Funds are requested to defray the costs of travel to the field site, purchase of small equipment and supplies, and the hire of undergraduate student field assistants for the labor and time intensive field studies. Itemized anticipated expenses are as follows:

50	Sherman live traps @ \$20/trap	\$ 1,000
	Miscellaneous trapping & handling equipment	\$ 550
	Bait	\$ 250
	Mileage Reimbursement	\$ 1,500

The normal 25% indirect cost rate requested by the University of Arizona that is not paid by Western National Parks Association serves as an additional matching component in the amount of \$ 1,875. One-Hundred live traps and a laptop computer already owned by the PI will be provided to the project with an estimated value of \$ 1,000 each (\$2,000 total). Additional funds will be sought to cover remaining travel expenses through various grants available to graduate students.