

Newsletter of The Gopher Tortoise Council

Message From a Co-Chair

Jessica McGuire



In This Issue:

Message from a Co-Chair

Announcements

2015 Annual GTC Meeting

- Registration
- Call for Abstracts
- Student Travel Awards

Nominations for 2015 GTC Awards

Proposal Solicitations:

- J. Larry Landers Student Research Award
- Donna J. Heinrich Environmental Education Grant

Feature Articles

- Chris Catano- Functional Relationships and Variation in Keystone Effects-Gopher Tortoises
- DJH Environmental Education Grant Recipient:
Book Distribution-At Home with the Gopher Tortoise
- Student Spotlight:
Bradley O'Hanlon-Eastern Diamondback Response to Habitat Fragmentation

Hello Gopher Tortoise Council Members! Welcome to another edition of "The Tortoise Burrow." This edition is always my favorite because it is the newsletter before the annual meeting! Hopefully you already know that this year's meeting will be October 16-18 in Covington, Louisiana. As usual we are anticipating a great range of talks that covers the gopher tortoise, other upland inhabitants, and relevant conservation and management issues. Registration and abstract submission guidelines are on our website at www.gophertortoiseCouncil.com/annual-meeting/. Abstracts are due September 1st and early registration ends September 28th. More information is included in the newsletter and on the website. We can't wait to see you at the meeting-get ready for Cajun hospitality! Don't forget to bring items for the silent auction!

There is a lot to be done for the conservation of the gopher tortoise and its habitat. WE NEED YOU! We not only need membership renewals, we need you to be active! One of the important purposes of GTC is education and outreach (including the website and social media) in addition to the grants program and annual meeting. The Public Information and Education Committee has a new chair, Ericha Shelton-Nix. There are a number of new projects in the works. We hope to have new materials for public events soon and have been working hard to resupply our informational pamphlets thanks to a number of generous donations (Thank you donors!). Please consider volunteering your time and talents to the education committee. Ericha can be contacted at Ericha.Shelton-Nix@dcnr.alabama.gov.

We also need your help in spreading the word on our grant opportunities-the J. Larry Landers Student Research Award and the Donna J. Heinrich Environmental Education Grant. As a past recipient, I will forever be grateful to GTC and the Student Research Award program. The award really gave me the boost my dissertation needed and as a result I became even more involved in GTC. Spread the word to students you know working in upland ecosystems! Information on both of these grants is on the website and in this newsletter. Deadlines are approaching fast!

To close, I would like to thank everyone for allowing me to be a co-chair for the last couple of years. This brief newsletter address is my sign-off as co-chair. I would like to encourage leaders in our membership to step up and volunteer as co-chair in the future. Planning the Annual Meeting is the biggest task, but extremely rewarding. In addition, not only do you get to work with a passionate group of people-you are actively participating in the conservation of the gopher tortoise!

I hope to see a good crowd at the annual meeting this year! Did someone say "shrimp boil"? See you in October!

ANNOUNCEMENTS

2015 Gopher Tortoise Council Annual Meeting



Registration is now open for the Annual Meeting to be held October 16-18, 2015, in Covington, LA!

Please register at our website at <http://www.gophertortoisecouncil.org/annual-meeting>

Registration options*

Student-\$95 early-bird registration/\$110 (early-bird+membership dues) OR
\$110 (regular registration-after Sept. 28)/\$125 (regular+membership)

Professional-\$145 (early-bird)/\$170 (early-bird+membership) OR
\$165 (regular-after Sept. 28)/\$190 (regular+membership)

T-shirts will again be available for a suggested donation of \$20

*Early-bird registration rate deadline is **September 28, 2015**. Registration costs include on-site beverages and breakfast, lunch, and dinner on Friday and Saturday.

Social activities include a *shrimp boil, Zydeco and Cajun music, an award ceremony, and a silent auction!* The meeting provides an excellent opportunity for students and professionals to present their work, share ideas, and collaborate on projects.

[GTC Business Meeting](#)

The GTC Business Meeting will be held on October 15, 2015, at 6 pm at the Abita Brew Pub in Abita Springs, LA at 72011 Holly Street. Please RSVP to Keri Landry at klandry@wlf.la.gov in advance if you plan to attend.

[Silent Auction](#)

We greatly appreciate any items or donations to fund our GTC Environmental Education Grants. Please consider bringing silent auction items with you to the meeting. If you can't attend or prefer to send by mail, please send to Keri Landry, LA Natural Heritage Program, 2000 Quail Drive, Rm. 224, Baton Rouge, LA 70808.

[GTC Membership](#)

Please don't forget to renew your membership or become a member of GTC. We've made it easier to join/renew when you register for the meeting or you can do so via PayPal on our website at www.gophertortoisecouncil.org/membership.

[More important details on page 3](#)

ANNOUNCEMENTS continued

Louisiana-bound? More Annual Meeting Info below!

Conference Venue and Hotel Accommodations

The conference will be held at the Clarion Inn and Suites located at 501 North Hwy. 190 in Covington, Louisiana. Please contact the hotel directly for reservations by phoning 985-893-3580. Don't forget to ask for the **Gopher Tortoise Council discounted rate** at \$88/night plus tax. This block room rate will be honored until **September 14, 2015**.

For more information please check out the website below-

<https://www.choicehotels.com/louisiana/covington/clarion-hotels/la269>

Check our website for additional annual meeting details at www.gophertortoisecouncil.org!



Call for Oral and Poster Presentation Abstracts

37th Annual Gopher Tortoise Council Meeting in Covington, LA

Topics include, but are not limited to, Conservation, Commensal Species, Habitat Management and Restoration, Policy, Regulation, Monitoring and Field Techniques, Economics, General Ecology, and Interdisciplinary Projects.

Instructions for Submitting Abstracts (Papers and Posters):

The deadline for submitting abstracts is **September 1, 2015**. Abstracts should be 300 words or less and conform to the general style of the Journal of Wildlife Management abstract format. The name, affiliation, address, email and phone number of the corresponding author should be provided with the abstract. Student abstracts should be clearly identified as such. Abstracts must be submitted in MS Word. Please submit abstracts via email to klandry@wlf.la.gov AND gtcabstracts@gmail.com. See [GTC website](http://www.gophertortoisecouncil.org) for additional info!

Guidelines for Oral and Poster Presentations:

Presentations will be strictly limited to 15 minutes, including 3-5 minutes for questions. LCD projectors will be provided. Overheads and slides are not acceptable. Posters should be set up Friday morning during registration and first break.

Students! Travel awards will be available to two students presenting a paper or poster at this year's meeting. Awards available in the amount of \$100/student. Notify Jess McGuire at jgonynor@gmail.com if you're interested! Please include current university affiliation.

NOMINATIONS FOR 2015 GTC AWARDS

Every year, the GTC board recognizes significant contributions of those within the Council and larger community for contributions to our mission of education and conservation of gopher tortoises and their upland habitat through special awards (described below) presented at our annual meeting. Please send nominations for 2015 awards to lora.smith@jonesctr.org. We ask that you provide a little background as to why you think this individual is deserving of a particular award along with your nomination. Thank you for your help!

Gopher Tortoise Council Awards

Distinguished Service Award- presented to those who have consistently offered years of service to the Council.

Lifetime Service Award- presented to individuals whose have devoted a career to service of the Council.

Special Project(s) Award- presented to individuals who have taken the lead or played a major role in special GTC projects.

Conservation Education Award- given to individuals who have contributed to significant education and outreach activities relevant to conservation of tortoises and upland habitats. Candidates may be outside the realm of GTC.

Auffenberg and Franz Conservation Award – presented to individuals with life-time accomplishments and organizations with long-term efforts in conserving gopher tortoises and upland ecosystems. We should think broadly in choosing recipients for this award. The first recipients for this award were Walter Auffenberg and Dick Franz, presented at the 2003 Annual meeting (our 25th meeting).

Gopher Tortoise Council's 2015 Donna J. Heinrich Environmental Education Grant

The GTC Environmental Education Grant was established to support educators and organizations committed to developing educational projects about the gopher tortoise and the fascinating world in which it lives. The grant also honors Donna June Heinrich, an environmental educator, whose life was dedicated to conserving wildlife and their associated habitats.

Deadline for submission of this year's proposals is August 31st, 2015. Applications may be downloaded from our web site (www.gophertortoiseCouncil.org). On the left hand side of the page click "Grants Program" and scroll down after the grants page loads. Applications which contain the following will be given preference:

- Projects that reach diverse and new audiences.
- Projects that focus on the importance of the conservation of intact upland ecosystems.
- Projects that encourage community involvement.
- Projects that have matching funds.

Please follow the instructions on the grants program page noting the requirements. For questions contact Cyndi Gates at cyndi@fgates.com. Proposals should be submitted to the same email address.

ANNOUNCEMENTS continued

The J. Larry Landers Student Research Award

The **J. Larry Landers Student Research Award** is a Gopher Tortoise Council competitive grant program for undergraduate and graduate college students. Proposals can address research concerning gopher tortoise biology or any other relevant aspect of upland habitat conservation and management. The amount of the award is variable, but has averaged \$1,000 over the last few years.

The proposal should be limited to four pages in length and should include a description of the project, a concise budget, and a brief resume of the student.

This is an excellent opportunity for undergraduate and graduate students to access funding for their projects.

The deadline for grant proposals each year is the 15th of September. Proposals should be submitted electronically in Word, if possible, and sent to bob.herrington@gsw.edu.

The Gopher Tortoise Loses a Friend...

With sadness we note the passing of Mr. M. C. Davis, founder of the E.O. Wilson Biophilia Center. He passed away on Saturday, July 11, after a battle with cancer. M. C. bought and preserved Nokuse Plantation as an important site for restoration of the longleaf pine ecosystem and a corridor for wildlife including the black bear. M.C. was a generous supporter of the Gopher Tortoise Council and efforts to protect the gopher tortoise. He will be sorely missed by the conservation community.

GTC Needs You!

Volunteers for Public Information and Education Committee

Outreach and education concerning the gopher tortoise and upland conservation are essential to GTC's mission. Please consider serving on the Public Information and Education Committee-you can play a role in developing and distributing educational materials, representing GTC at various events and festivals, and helping disseminate information on projects throughout the gopher tortoise's range including the environmental education grant program.

A big thank you to our current and new volunteers. Don't worry-we haven't forgotten about you! As the education committee reorganizes under new leadership you will be contacted soon.

Please contact our new education chair, Ericha Shelton-Nix, at ericha.shelton-nix@dcnr.alabama.gov for more information.

We look forward to hearing from you!

FEATURE ARTICLE

Functional Relationships Reveal Variation in Keystone Effects of the Gopher Tortoise

by Chris Catano

The gopher tortoise (*Gopherus polyphemus*) is routinely considered a keystone species promoting animal diversity throughout its range in the Southeastern Coastal Plain of North America. The Southeastern Coastal Plain has recently been recognized as a global biodiversity hotspot and conservation priority because of the unusually high levels of endemism, organismal diversity, and habitat loss across the region (Noss *et al.* 2014). Furthermore, the gopher tortoise has suffered massive population declines across its range through a combination of factors that include historical overexploitation, habitat loss, fire suppression, and disease. The potential threat of losing the keystone function provided by the gopher tortoise in this biodiversity hotspot makes this species a necessary focal point for conservation and ecological restoration in the Southeastern United States. But despite decades of research, the ability to predict cascading changes in animal communities dependent on gopher tortoises remains limited because we don't yet know how their importance varies with their densities or under diverse ecological conditions. As a first step in this direction, Jack Stout and I recently published a study in *Biodiversity and Conservation* (Catano & Stout 2015) that demonstrates the functional relationship between variation in gopher tortoise burrow densities and vertebrate animal diversity in a longleaf pine savanna.

We conducted our study at Wekiwa Springs State Park (WSSP) in central Florida. WSSP boasts approximately 600 hectares (~ 1,500 acres) of xeric longleaf pine sandhill habitat. The vegetation composition is dominated by an understory of wiregrass (*Aristida stricta*) and an overstory of longleaf pine (*Pinus palustris*) and infrequent oak species, primarily turkey oak (*Quercus laevis*) (Figure 1). Active management and spring/summer prescribed fire treatments have been implemented for over three decades making WSSP one of relatively few remaining intact protected sandhill sites approximating historical natural conditions in the region. Spatial variation in historical disease incidence among tortoise populations throughout the landscape has created variation in tortoise abundances not confounded by habitat or environmental conditions. Thus, we exploited this natural experiment to assess how variation in tortoise activity and burrow density drives vertebrate diversity patterns. Additionally, we were able to replicate this study across fire disturbance regimes (< 3 years and 4-7 years) to assess to what extent disturbance impacts the nature of tortoise-diversity relationships. We used a sampling array consisting of drift fences, pitfall traps, double-opening funnel traps, and Sherman traps to repeatedly sample reptiles, amphibians, and small mammals at 16 locations throughout the landscape (Figure 2).



Figure 1. Longleaf pine sandhill habitat at Wekiwa Springs State Park

Continued on next page...

Functional Relationships of a Keystone Species...continued



Figure 2. Drift fence with 8-meter arms, funnel traps, and pitfall traps

Our results demonstrate for the first time the relationships between gopher tortoise burrow density and species diversity, richness, and evenness. Tortoise burrow density was associated with an increase in diversity (Figure 3). The positive influence on local diversity was most strongly linked to increased evenness of species' relative abundances, but not species richness. The 'habitat heterogeneity hypothesis' posits that diversity increases because heterogeneity promotes species coexistence as niche opportunities increase. Therefore, it is likely that increased habitat complexity from tortoise burrows and the use of burrows by commensal species for refugia, nesting, foraging, and breeding sites may alter species interactions and their relative abundances thus contributing to the increased evenness and diversity we observed. Small mammals, especially the Florida mouse (*Peromyscus floridanus*) (Figure 4) – a known obligate commensal, were among the taxa most consistently positively associated with increased burrow density. Other known burrow associates, such as the eastern coachwhip (*Coluber flagellum flagellum*) (Figure 5) also displayed positive associations, but overall reptile and amphibian responses were

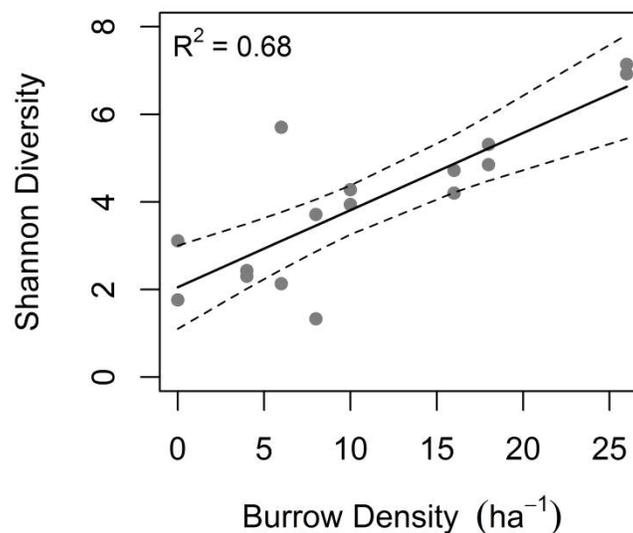


Figure 3. Regression of species diversity versus burrow density: gray dots are diversity estimates, solid line is the mean predicted function, and dotted lines are 95 % confidence intervals.

Continued on page 8

Functional relationships of a keystone species...continued

idiosyncratic. Furthermore, the relationship between tortoise burrow density and animal diversity was consistent in both the frequent and intermediate fire regimes, indicating their keystone effect is robust to fire disturbance frequencies observed in our study. Finally, after burrow density, animal diversity was most strongly influenced by fire frequency and the amount of coarse woody debris, such as downed trees.



Figure 4. Florida mouse caught in Sherman live trap

Figure 5. Eastern coachwhip snake in gopher tortoise burrow



Our study highlights broad patterns of community change that could emerge from complex direct and indirect interactions cascading from tortoise impacts. Future studies would benefit from experimental approaches to determine the direct and indirect effects of gopher tortoises on variation in species' relative abundances. Reintroduction (restocking) of tortoises is a management approach that offers a relatively natural experiment to follow the temporal response of diversity to burrow dynamics. Ultimately, investigations of keystone species like the gopher tortoise benefit from developing functional relationships to understand variation in the effects they exert on their communities. Parameters derived from functional relationships are necessary to build predictive models that can be used in various approaches to forecast ecological change and develop management strategies. We demonstrated in this study that applying such an approach to evaluate keystone effects of the gopher tortoise uncovered the magnitude and functional form of their effect on diversity, and the relative contribution of this effect compared to other local diversity structuring mechanisms. We urge that more studies be undertaken to expand the scope of these inferences to different habitats, spatial scales, and ecological conditions to more fully understand the keystone role of the gopher tortoise at different stages of community disassembly and reassembly.

References:

- Catano, C.P. & Stout, I.J. (2015). Functional relationships reveal keystone effects of the gopher tortoise on vertebrate diversity in a longleaf pine savanna. *Biodivers. Conserv.* 24(8): 1957-1974.
- Noss, R.F., Platt, W.J., Sorrie, B. a., Weakley, A.S., Means, D.B., Costanza, J., et al. (2014). How global biodiversity hotspots may go unrecognized: lessons from the North American Coastal Plain. *Divers. Distrib.* 21: 236-244.

Chris completed this research for his M.S. thesis with Dr. Jack Stout at the University of Central Florida. He is currently a Ph.D. student in the division of Evolution, Ecology and Population Biology at Washington University in St. Louis, MO.

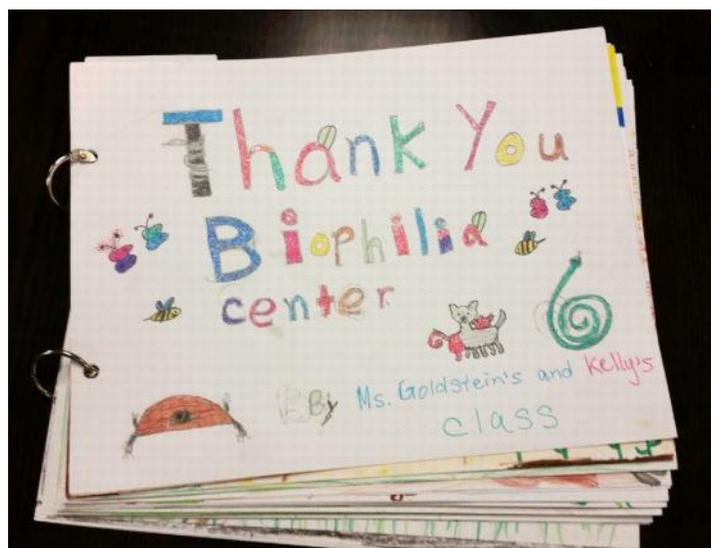
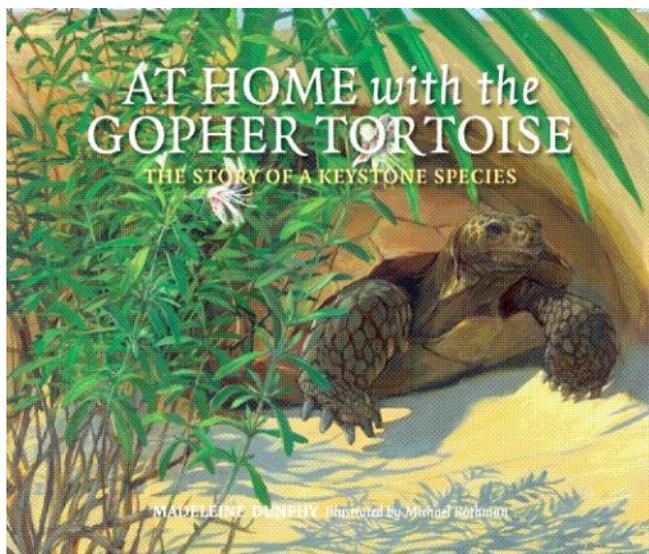
FEATURE ARTICLES

Check out this article submitted by one of the winners of last year's Donna J. Heinrich Environmental Education Grant ...

500 copies of *At Home with the Gopher Tortoise* distributed throughout Georgia and Florida-by Madeleine Dunphy

I first learned about the gopher tortoise when writing curriculum about endangered species for the California Academy of Sciences nearly 20 years ago. I remember being utterly fascinated when I learned that a tortoise's burrow could provide food, shelter, and nesting habitat for more than 300 species. I found it so amazing that I wanted to tell as many people as I could! Fifteen years later I finally got around to doing this by writing and publishing the children's book, *At Home with the Gopher Tortoise: The Story of a Keystone Species*.

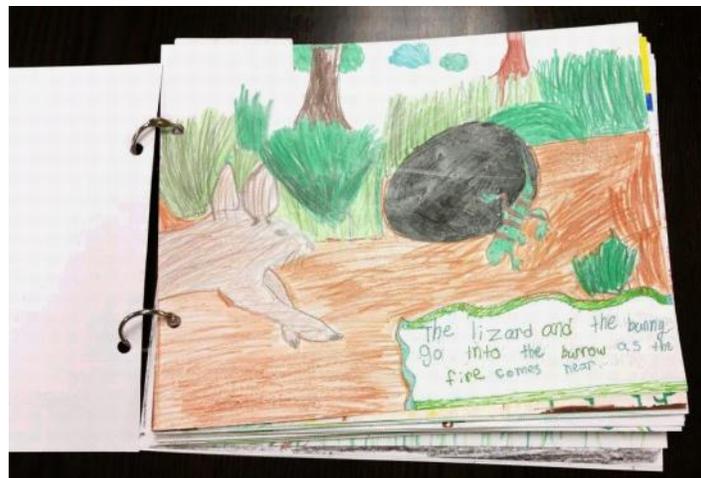
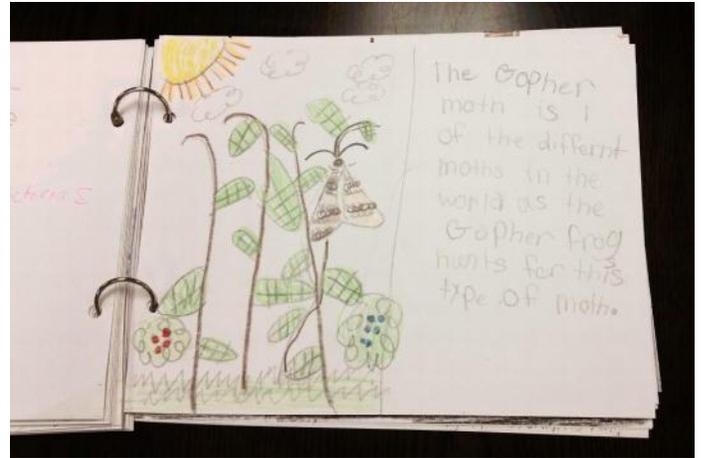
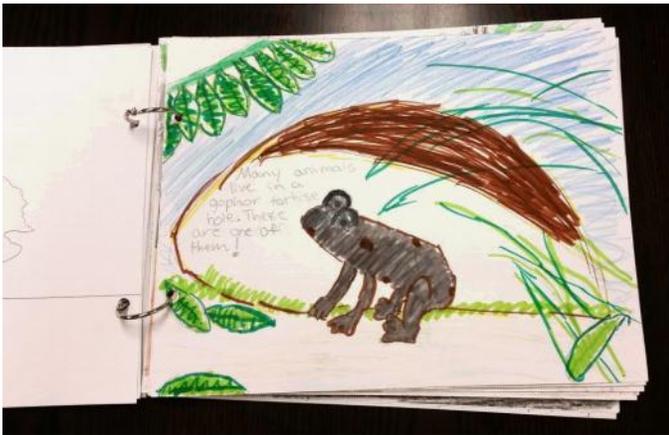
More than anything, I wanted this book to get into the hands of children who live in the same regions as the gopher tortoise—to educate and inform people about this extraordinary creature and to inspire them to take action to help protect it. One of the ways I was able to do this was by collaborating with three organizations located in areas where the gopher tortoise resides: the Arrowhead Environmental Education Center in Armuchee, Georgia, the E.O. Wilson Biophilia Center in Freeport, Florida, and the Enchanted Forest Sanctuary in Titusville, Florida. I picked these three organizations because they each have active educational programs designed to protect the gopher tortoise and because they are located in geographically distinct locations.



Continued on page 10

At Home with the Gopher Tortoise...continued

With the help of the Gopher Tortoise Council's Donna J. Heinrich Environmental Education Grant, I was able to give 500 hardcover copies of *At Home with the Gopher Tortoise* (with accompanying curriculum) to these three organizations which then distributed the books to teachers, schools, librarians, families, and children in the area. Recipients of the books were carefully vetted by the organizations that made sure the books got into the hands of the people who would actively use them to educate children about the gopher tortoise and the vital necessity to protect this magnificent creature. Although the books have now been distributed, I consider this project to be ongoing since the majority of the books were placed with teachers and librarians who will continue to use them for years to come. Thank you Gopher Tortoise Council for making this project possible!



Madeleine Dunphy is a children's book author. Her books have been published by Hyperion Books for Children, Millbrook Press and her own publishing company, Web of Life Children's Books

Keep track of Gopher Tortoise news and Council updates!

Find us on-

facebook

Student Spotlight

Bradley O'Hanlon

Eastern Diamondback Rattlesnake Response to Highly Fragmented Coastal Island Habitat

The eastern diamondback rattlesnake (*Crotalus adamanteus*) is one of three species of rattlesnake within the longleaf pine (*Pinus palustris*) ecosystem. They elicit an emotional response from outdoor enthusiasts and scientists alike. They are long-lived, sit-and-wait ambush predators that prey on rabbits and small rodents. Throughout the range their populations are in decline due to habitat loss, forest fragmentation, collection for the pet trade, and human persecution. These pressures have resulted in a petition to federally list the eastern diamondback rattlesnake under the Endangered Species Act.

Conflicts associated with habitat fragmentation create many conservation concerns including loss of biodiversity, introduction of exotic species, and alterations in habitat structure; these factors can affect population viability and animal behavior. Current trends of increased habitat fragmentation within coastal ranges have also increased conservation and land management challenges along wildland-urban interfaces and created a unique environment to study eastern diamondback rattlesnake behavior.

To better understand these effects, I am comparing the behavioral (e.g., time spent in ambush, time spent basking (Figures 1 and 2, respectively), and refugia use), spatial, and temporal responses of eastern diamondback rattlesnakes at a highly fragmented coastal island in southeastern South Carolina to snakes on a private game plantation with a small human footprint. I expected that animals would show altered behavioral responses to fragmented landscapes, such as less frequent and shorter movements within fragmented landscapes, and that human activity patterns would affect the timing of rattlesnake movement.



Figure 1. Eastern diamondback in ambush position



Figure 2. Eastern diamondback basking

Eastern diamondback response to habitat fragmentation...continued

During the spring and summer of 2014, I used radio-telemetry to monitor eastern diamondback rattlesnakes at two scales. I tracked individual snakes several times weekly to observe behavior and quantify movement rate on a spatial scale. Investigating the temporal scale of movements required 24-hour monitoring. To accomplish this I broke the day into six 4-hour blocks that were associated with peaks in human activity (e.g., rush hour from 6:00 - 10:00 AM) and used triangulation to determine if an animal had moved between time periods. Preliminary results have supported that eastern diamondback rattlesnakes may be spatially confined by high levels of human activity. My research efforts to identify spatial and temporal use patterns will help land managers develop strategies to conserve, protect, and better understand the ecology of this imperiled reptile. Management strategies should incorporate several mechanisms in an effort to increase rattlesnake conservation including land management, game management, and educational outreach.



Bradley O'Hanlon is a M.S. candidate at Marshall University in West Virginia and a recipient of the 2013 Larry J. Landers Student Research Award. His advisor is Dr. Jayme Waldron. Bradley received his Bachelor's degree from the State University of New York at Cobleskill in 2010. This project is being conducted with the support of the Natural Resources and Environmental Office at Marine Corps Recruit Depot, Parris Island, SC.

Recent Publications

Yuan, M.L., S.H. Dean, A.V. Longo, B.B. Rothermel, T.D. Tuberville and K.R. Zamudio. 2015. Kinship, inbreeding, and fine-scale spatial structure influence gut microbiota in a hindgut-fermenting tortoise. *Molecular Ecology* 24(10). DOI:10.1111/mec.13169.

Howze, J.M., and L. L. Smith. 2015. Spatial ecology and habitat use of the coachwhip in a longleaf pine forest. *Southeastern Naturalist* 14(2).

Margres, M.J. K.P. Wray, M. Seavy, J. McGivern, D. Sanader and D. R. Rokyta. Phenotypic integration in the feeding system of the eastern diamondback rattlesnake (*Crotalus adamanteus*). *Molecular Ecology* 24 (13) DOI: 10.1111/mec.13240

Graham, S. P., D. A. Steen and D. J. Printiss. 2015. *Gopherus polyphemus* (gopher tortoise) burrow associate. *Herpetological Review*. 46 (2): 244.

Newsletter of The Gopher Tortoise Council

Directory of 2015 Gopher Tortoise Council Officers,
Committee Chairs, and State Representatives
Please view the GTC website (below) for contact information

Co-chairs

Jess Gonynor McGuire

Keri Landry

Secretary

Connie Henderson

Membership Secretary

Will Knox

Treasurer

Don Stillwaugh

Newsletter Editor

Cyndi Gates

Website Manager

Jessica Gonynor McGuire

Standing Committee Chairs

Nominating Committee

Sharon Hermann

Public Information and Education Committee

Ericha Shelton-Nix

Upland Snake Conservation Committee

Jen Howze

Research Advisory Committee

Bob Herrington

Return Address:

Joseph W. Jones Ecological Research Center
3988 Jones Center Drive
Newton GA 39870

State Representatives

Alabama

Ericha Shelton-Nix

Florida

Deborah Burr

Georgia

Jen Howze

Louisiana

Keri Landry

Mississippi

Tom Mann

South Carolina

Will Dillman

The Tortoise Burrow

<http://www.gophertortoisecouncil.org>

The Tortoise Burrow is published in April, August, and December. Deadlines for submission of announcements and articles are the 10th of the preceding month. Send materials to the editor:

Cyndi Gates

cyndi@fgates.com

Decisions concerning publication of submitted material rest with the editor and co-chairs.

Reprint Policy: Articles, photographs or opinions that appear in *The Tortoise Burrow* may be reprinted with the written consent of the editor and GTC Co-chairs.

The GTC reserves the right to approve editorial changes prior to reprinting and requests that reprints credit *The Tortoise Burrow, Newsletter of the Gopher Tortoise Council*.

© Gopher Tortoise Council 2015

