

## DESERT TORTOISE COUNCIL

## NEWSLETTER

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## Conservation Tools Highlight: Giving Desert Tortoises a Head-start in Life

By J. Mark Peadar and Ken Nagy

Throughout the Mojave Desert of the southwest, populations of Agassizi's desert tortoise continue to decline in four of their five recovery units. Like many turtle and tortoise species, desert tortoises confront a myriad of threats, including habitat loss, road mortality, subsidized predators, diseases, and a changing climate, all of which may act independently or in concert. These threats have caused severe population declines, leading researchers, policy makers, conservationists, and groups such as the Desert Tortoise Council to deploy multiple strategies to curb these declines and help recover this species. Currently, techniques such as habitat restoration, translocation of displaced

wild individuals, and fencing of roadways are efforts applied to prevent the continued decline of the iconic desert tortoise. While these efforts are used to stabilize the population, there is another tool specifically employed to augment these depleted populations.

Head-starting is a management strategy through which juvenile survival is improved by protection from predation and accelerating growth to increase the body size of juveniles prior to release. Turtles and tortoises are prime candidates for head-starting. Chelonians typically follow a pattern of high adult survivorship, slow growth, delayed sexual maturity, and low juvenile survival and re-



*Head-start tortoise basks in the sun near a provided burrow at the Ivanpah Desert Tortoise Research Facility.*

cruitment. In the wild, survivorship of hatchling and juvenile tortoises is bleak, with annual survival rates ranging from 30-65%. While just about any desert tortoise biologist will tell you how cryptic juvenile tortoises can be to humans

and presumably predators, their small size and soft shells still lead to heavy predation on this age-class. With head-starting, the goal is to shepherd hatchling tortoises from their most vulnerable stages into

*continued on Page 3*

## Letter from the Chair

I am pleased to be turning over the duties of Newsletter Editor to Halle Kohn, one of our newest Board members. Since stepping into the role of Chair of the Board of Directors in February, my workload in conducting Council business has increased substantially, and I'm both happy to pass production of the Newsletter to Halle and excited to see what she'll do in the coming years.

I'm also very excited to report

that the Board of Directors has been busy carrying out an abundance of Council activities, including a revamp of our website, renewed vigor and interest in our social media postings, a flurry of activity by our Ecosystems Advisory Committee, funding of projects through our Grants Committee, and attendance at recent events led by our new Education & Outreach Committee, to name a few. We're also very

excited to be returning to Tucson for our 2019 Annual Symposium, and we've been very busy planning for it. I'm looking forward to seeing everyone there!

In the meantime, if you have ideas or suggestions for any Council activities, please don't hesitate to contact me or any of the other Board members.



Michael Tuma

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Photo by Heather Parks

## Letter from the Editor

Included in the Fall 2018 issue of the Desert Tortoise Council Newsletter (my first issue as editor!) are articles outlining the history of chelonian head-starting, the flagship role of Agassiz's tortoise, and a recap of last year's Symposium and recent Council activities. Also included are announcements regarding the 2019 Symposium, synopses of the latest grants awarded (plus upcoming grant

due dates), and a list of relevant literature that has been published since Issue 42[1]. This edition also recognizes the important work of Dr. Peter Brussard, who was one of the founders of Conservation Biology and a Desert Tortoise Council Awardee. Finally, our Board of Directors Spotlight details the crucial roles of Chairperson Michael Tuma and Education & Outreach

Committee Chair Maggie Fusari.

Remember to follow us on social media to stay up to date on all things desert tortoise, including Council actions, courses offered, annual symposia, recovery efforts, and more!



Halle Kohn

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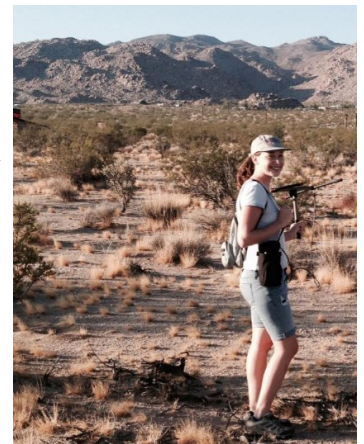


Photo by Paul Delaney

## *A Recap of the 43rd Annual Desert Tortoise Symposium: Diversifying Sessions, Broadening Our Audience*

The smell of coffee permeated the air the morning of Friday the 23<sup>rd</sup>, with herpetologists, biologists, environmental consultants and desert tortoise aficionados of all walks of life slipping in to the registration room before 9:30AM. The weekend would be filled with a flood of activities, from intriguing sessions and panels on translocation, genetics, recovery efforts, health and disease management, and more, to a field trip with Peter Woodman, DTC Board Member. The

2018 Desert Tortoise Symposium was held at Sam's Town Hotel & Gambling Hall in Las Vegas, Nevada from February 23<sup>rd</sup> to February 25<sup>th</sup>. The Symposium began with an evening mixer on Thursday the 22<sup>nd</sup>, where chelonian enthusiasts from around the country were able to participate in stimulating conversation and enjoy good company thanks to the generous sponsorship of SNEI. After registration and once attendee's coffee levels reached a peak on Friday

morning, Chairperson Bruce Palmer welcomed the Council's members and guests, outlining what was to come and what the Board had been up to since the 2017 Symposium.

Session one revealed the winners of the Robert C. Stebbins Research Award, including Kevin P. Mulder, who co-authored "No Paternal Genetic Integration in Agassiz Desert Tortoises Following Translocation into an Existing Population." The session that followed stuck with the same

major theme, translocation, and included such focuses as survival rates and monitoring, as well as the impacts of predation and invasive plants on translocation outcomes. After lunch, session three featured recovery actions by federal and state agencies: recent and future. Some challenges discussed were management of OHV routes, raven populations, and particularly high juvenile tortoise mortality rates. Potential solutions offered

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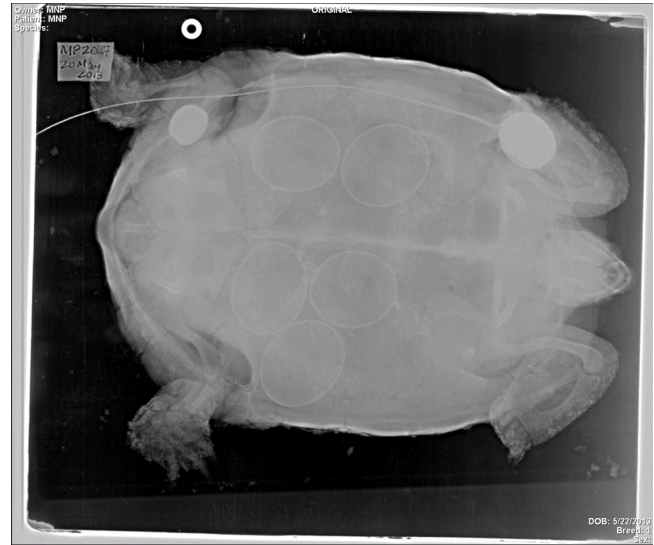
## Conservation Tools Highlight: Giving Desert Tortoises a Head-start in Life (continued)

larger sizes where survival rates after release are expected to be greatly increased. By incorporating head-starting, a tool concentrated on this naturally at-risk age class, we can both supplement the population and increase opportunities for future recruitment into the population as these released juveniles mature and hopefully reproduce.

While head-starting is currently underway for desert tortoises, the techniques, methods, and ideas first originated from research on other turtle species. In the early 1960s, researcher Dr. Archie Carr began one of the first head-starting projects named "Operation Green Turtle." His work predicated on collecting and protecting eggs of green sea turtles (*Chelonia mydas*). Upon hatching, his group released nearly 2,000 neonates back to nesting beaches along the Gulf of Mexico. While the term "head-starting" had not been coined yet and the successes or failures of this recovery attempt would take years to unfold, it was the work of Dr. Carr that sparked a conservation movement to protect valuable eggs

and hatchlings of threatened turtles and tortoises.

In the 1980s, the first head-starting work on a *Gopherus* species was done by Dr. David Morafka and colleagues. At the Mapimi Reserve in Mexico's central Chihuahuan Desert, Dr. Morafka began the initial work on the bolson tortoise (*Gopherus flavomarginatus*), a similar species to the desert tortoise. The "program of husbandry," or what we know as head-starting today, was originally created to provide needed data on the life history of this species and as an attempt to increase recruitment into the bolson tortoise population. This particular project was a joint effort between dedicated local residents and international experts. During the initial stages of the project, biologists began to notice signs of pyramiding (a growth deficiency), which led them to further investigate the optimal diet for bolson tortoises. Their findings indicated a surplus of protein in the provided forage when compared to a wild diet. With these findings, biologists quickly implemented a dietary change and native forage was



Radiograph from a female desert tortoise with 5 eggs present. Also present is a VHF transmitter (towards front of tortoise), and a small temperature logger (near rear of tortoise).

made available for tortoises reared within outdoor enclosures. During this project, researchers learned the critical role that proper diet plays on both the growth rate and the shell health and hardness of juvenile tortoises.

In the 1990s, Dr. Morafka carried over his experience with the bolson tortoise and began the first stages of head-starting Agassiz's desert tortoise (*Gopherus agassizii*) at the Army's Fort Irwin National Training Center, also known as the Fort Irwin Study Site (FISS). While Dr. Morafka was able to acquire funding with the support and encouragement of Mickey Quillman and Stephen Ahmann at Fort Irwin, head-starting had not been popularized yet. Dr. Morafka faced an uphill battle to justify the spending of finite conservation resources and funding

on a technique with little proven success, especially with new enclosure designs 60 times larger than those previously used to head-start bolson tortoises. These large enclosures were fenced and netted to protect tortoises from terrestrial and avian predators, while maintaining native vegetation for natural forage. After the pens were constructed (with much help from volunteer Army soldiers), adult female tortoises living nearby were moved inside the predator proof pens to lay a clutch of eggs before being returned to their point of capture. Once the FISS enclosures had been stocked with hatchlings, Dr. Morafka swiftly began 'recruiting' other tortoise biologists, with the hopes of sharing both the research opportunities and the responsibilities of ad-



Dr. Archie Carr (left) and Dr. David J. Morafka (right)

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# *A Recap of the 43rd Annual Desert Tortoise Symposium: Diversifying Sessions, Broadening Our Audience (continued)*

were the oiling of raven nests, citizen science, and habitat conservation plans. Later in the afternoon, session four covered the tortoise and habitat recovery efforts of nonprofits. Papers in this session looked at land acquisition, DRECP meetings, inclusion fencing (allowing for habitat connectivity), and the power of volunteer recruitment. Friday's activities concluded with a mixer and buffet dinner, presentation of awards, and a poster session that included the research of Kristy Cummings et al. and Kristen McCarty et al.

Saturday began much like Friday, but with a buffet breakfast offered; and, with registration of members and guests mostly finished, people trickled into the Virginia City Room more intermittently. Session five seized the day with several papers on at-risk species occurring in the desert tortoise's range, including Gila monsters (*Heloderma suspectum*), Western burrowing owls (*Athene cunicularia hypugaea*), other Aridland bird species, and the Mohave ground squirrel (*Xerospermophilus mohavensis*). Session six was a short but sweet session focusing on drought and fire effects on a Southern California population of pond turtles (*Actinemys pallida*), with the paper having been authored by Lovich, et al. Saturday afternoon kicked off with lunch-filled bellies, and a session examining health and disease of desert tortoises along with associated management issues. This session included papers by two students: Molly Bechtel of Northern

Arizona University who presented on ticks and tick-borne pathogens of Agassiz's tortoise, and Alexandra Burne from University of Florida who presented on the challenges of virulence testing in reptilian mycoplasmas.

The session that followed was the first of its kind for the Council—a session dedicated to education, chaired by Maggie Fusari (Editor's note: see our feature on the new Education & Outreach Committee on page 9). This session included a presentation about the power of collaboration by Chris Noddings, a detailing of a desert biome student project presented by a teacher at Lancaster High School in California, and a student paper analyzing the socio-political role of the desert tortoise through narrative inquiry. The Council is excited about expanding and encouraging research on these educational dimensions of tortoise conservation, as highlighted by the 2018 Best Student Paper being from this session. Session nine was another short but sweet session, including one paper by Kepner, Boykin, McKerrow, and Neale looking at the diversity of reptiles and amphibians in the Mojave Desert. The evening came to a close with a mixer, dinner, an announcement of photo contest awardees, a banquet address by James Andre, and a competitive auction and raffle. Andre presented his research on native arid plants and their respective diversity, discovery, and rarity in the range of the desert tortoise.



*Auction items from the 2018 Symposium.*

Sunday had one more breakfast in store for early-rising attendees, and a final handful of thought-invoking sessions. Session 10 featured various methods and techniques associated with conservation of desert tortoises and other animals, including gopher tortoises (*Gopherus polyphemus*). Methods discussed included drone use, modified GPS loggers, and road fencing. Session 11 featured the most recent literature on genetics and genomics for *Gopherus agassizii* and *Gopherus morafkai*, with papers by Greer Dolby et al., Timothy Webster et al., and Santiago Sanchez-Ramirez, et al. Session 12,

chaired by Cristina Jones, featured research on demography and applied sciences for Agassiz's and the Sonoran Desert Tortoise. Finally, session 13 closed out the Symposium with the latest information on head-starting, featuring research by Chairperson Michael Tuma and Mark Peaden.

See [our website](#) for information on photo contest winners, abstracts, awardees, and other details regarding the 43rd Desert Tortoise Symposium. For our 2019 Symposium announcement, see page 11.



## *Conservation Tools Highlight: Giving Desert Tortoises a Head-start in Life (continued)*



*Current pen design at Ivanpah Desert Tortoise Research Facility. Sprinklers providing additional drinking opportunities for tortoises in addition to stimulating native vegetation growth for foraging.*



*Fort Irwin Study Site (FISS) head-start enclosure, the first one of three now there, this one built mainly by volunteer soldiers on weekends.*

vocating for the potential of head-starting. Dr. Morafka's efforts in acquiring funding, executing the research, and answering fundamental questions brought head-starting forward to desert tortoise biologists, land managers, and policy makers.

Drawing from the knowledge and successes gained at FISS, another rearing facility was constructed at Edwards Air

Force Base. At that facility, researchers were able to more finely tune pen design, experimentally supplement natural rainfall, and ultimately further investigate what factors are key to juvenile desert tortoise survival. With two head-start projects in full swing, researchers were now able to focus their questions on determining the viability of outdoor rearing of tortoises for population augmentation, as well as assessing

the effects of supplemental rain on growth and survivorship of head-started tortoises. From these initial studies focused on head-starting desert tortoises, we have learned that nest, hatchling and small juvenile survivorships are very high (>90%) while in predator-proof pens, supplemental rainfall increases the growth rate of juvenile tortoises, and increased size may lead to decreased predation pressure after release. These initial results were not only promising in showing the feasibility of rearing desert tortoises, but primarily in suggesting that head-starting may be a viable tool for population recovery.

Currently, the initial concept of head-starting continues to be evaluated at the Edwards AFB site by the U.S. Geological Survey biologists and at a site on the Twentynine Palms Marine Base by lead researchers from University of California, Los Angeles. Additionally, head-starting is being further refined by joint collaboration

between researchers from the University of California, Davis and the University of Georgia as well as research groups at the San Diego Zoo and the U. S. Geological Survey. Between these four projects, we are learning more than ever about juvenile desert tortoises and their habitat. As these head-starting projects continue, researchers are not only refining the techniques, but also gathering highly valuable information on survivorship, movement, habitat requirements, behavior, physiology, and health of this highly cryptic and secretive age-class. The ultimate goal of head-starting is to foster self-sustaining wild populations through this short-term population augmentation technique. With commitment from groups such as The Desert Tortoise Council, knowledge we have gained, and the resources to pursue recovery actions, this iconic species of the desert southwest may yet have the potential for recovery.



*Baby tortoise head-started at the Tortoise Research and Captive Rearing Site (TRACRS) on the Twentynine Palms Marine Base.*

# Why Desert Conservationists Care So Deeply About the Desert Tortoise

by Halle Kohn

There are several reasons that the desert tortoise is important to desert conservation. Some of these reasons are ecological, some are cultural, and some are political. Ecologically, the tortoise fulfills the roles of being a keystone modifier species, an indicator species, and an umbrella species. The tortoise's fulfilling of these environmental roles, coupled with its historical decline and the listing of Agassiz's (colloquially the Mojave Desert Tortoise) under California state and federal Endangered Species Acts, has made the animal an integral part of desert conservation. There is evidence that desert tortoises have inhabited their historical range for millions of years, and that the species has been culturally significant to desert inhabitants for several thousand years. Ultimately, these roles contribute to the tortoise being recognized as a culturally significant flagship species. Although a beloved representative of the desert landscape, threats facing the tortoise continue to contribute to significant population decline, and the species has recently been recognized as being critically endangered.

**The desert tortoise functions as a keystone species.** Keystone species are animals that are ecologically necessary to the healthy functioning of a given ecosystem. The desert tortoise acts as a particular kind of keystone species: a keystone modifier. The tortoise is a keystone modifier since its burrows provide significant alterations to the landscape that are

utilized by numerous other animals. Other examples of keystone modifiers are beavers and sea otters.

**The desert tortoise functions as an indicator species.** Indicator species are species that demonstrate how human disturbances have affected an ecosystem or a community. Some indicator species can signal a change in habitat quality that may be due to human impacts, like an early warning system, since they are more sensitive to environmental disturbance. One commonly invoked narrative about this type of animal is the story of a canary in the coalmine, as canaries are more sensitive to carbon monoxide than humans. The birds' demise would indicate imminent danger to miners. Similarly, the decline of desert tortoises signals a change in the habitat quality of the Desert Southwest. Examples of other indicator species include crayfish and corals.

**The desert tortoise functions as an umbrella species.** Umbrella species are species with distributions that cover sufficient home ranges of individuals of other species. This means that by protecting land for an umbrella species, you also protect land for other animals. The desert tortoise has a large historical range that they share with many other diverse flora and fauna, which means that by promoting tortoise habitat conservation, we promote conservation of habitat for many desert species. Other examples of umbrella species

are grizzly bears and mountain lions.

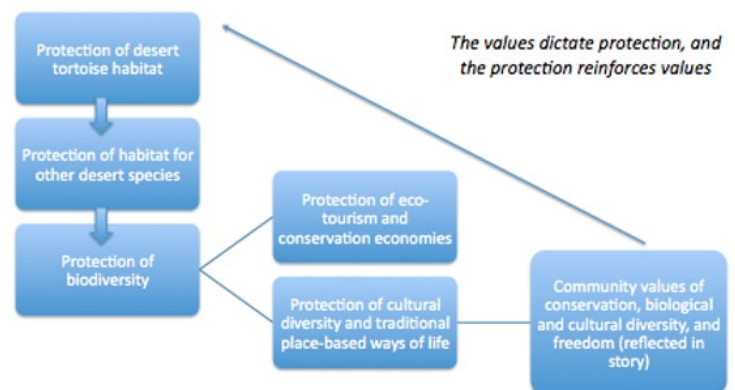
**The desert tortoise functions as a flagship species.** A flagship species is a popular, charismatic animal used to inspire public interest. The desert tortoise has been deployed politically as an animal representative for the Desert Southwest since its original listing under both state (California) and federal Endangered Species Acts in 1989 and 1990. In 1989, baby tortoises were taken to Washington, D.C. to help rally support for passage of the 1994 California Desert Protection Act. Since then, protection of the species has been used as rationale for protecting much of the desert landscape. The desert tortoise's popularity is also reflected in its designation as both California and Nevada's state reptile. Some other examples of flagship species include polar bears in the Arctic and lions in Africa.

**Agassiz's tortoise—The Mojave Desert Tortoise (*Gopherus agassizii*)—is now critically endangered.**

In a recent publication by the

Turtle Conservation Coalition (2018), the Mojave Desert Tortoise was recognized as being critically endangered and ranked in the top 50 in the list of The World's 25+ Most Endangered Tortoises and Freshwater Turtles. The IUCN/SSC Tortoise and Freshwater Turtle Specialist Group cites "disease, severe climatic conditions, loss and degradation of habitat, increased levels of mortality associated with urban growth throughout the desert, and the inability of regulatory and management agencies to protect the Desert Tortoise and its habitat" as reasons for the animal's continuous decline.

Individuals who work with the desert tortoise are familiar with its importance to the desert landscape, ecology, and culture. The decline of the totem tortoise symbolizes not only a loss of environmental resources, but also of cultural resources and socio-cultural connections. As [evidenced by the roles tortoises fulfill](#), it is important to protect the tortoise if we seek to protect our deserts, their diverse ecology, and their diverse human communities.





# The Legacy of Dr. Peter F. Brussard: Conservation Biology Pioneer

by Judy Hobman and Kristin Berry

## In Memoriam

Peter F. Brussard was born (1938) and raised in Reno, left when he joined the Navy, returned to Reno where he was a banker, then left for college. He attended Stanford University for his undergraduate degree in history, returned to Reno for his M.S. in zoology at the University of Nevada, and went back to Stanford for his Ph.D. in biology under Paul Ehrlich. These life experiences and training laid the foundation for him to become a co-founder of the discipline of conservation biology (see below) and a founding member and past president of the Society for Conservation Biology.

Peter is an Emeritus Professor from the University of Nevada's Biology Department in Reno. Prior to this position, he was also a professor at Stanford University, Cornell University, and Montana State University.

In 1991, he was invited by the U.S. Fish and Wildlife Service to lead the Desert Tortoise Recovery Team, whose purpose was to develop and write a recovery plan for the recently listed desert tortoise. He accepted; this began a three-year voluntary effort by him to lead an 8-member team of scientists with expertise in desert tortoise biology, conservation biology, epidemiology, population dynamics, and desert plant communities. Peter was the consummate, ideal leader for the task and the result was a plan drawing on the latest information in conservation biology and reserve design, analysis of population viability, and known threats to the tortoise in the 1990s. The Plan identified Desert Wildlife Management Areas, which became the foundation for designating critical habitat for the tortoise.

In 1995, the Desert Tortoise Council awarded Peter and the

other members of the Desert Tortoise Recovery Team its Conservation Award for completing the Recovery Plan for the Desert Tortoise. The Council expressed its thanks to the Recovery Team for preparing the way for the tortoise's recovery in the 21<sup>st</sup> century.

He was a positive force. As one of the founders of the discipline of conservation biology, he was passionate about the science, about helping people learn conservation biology, and about using it to help living things. His leadership was instrumental in getting the recovery plan completed when there were 8 recovery team members with different interests and frequently different ideas.

Among his many honors and achievements, the American Association for the Advancement of Science Fellow was awarded to Peter in recognition of individual contributions to the sciences. Recipients of this

honor are chosen for their outstanding leadership, public service, research achievements, and academic activity.

"Pete reminded all of us that so-called sophisticated analyses might complement, but never substitute for, a deep understanding and appreciation of nature. He valued reading and writing and the visual and performing arts in their own right and as essential to being a complete ecologist and citizen. Pete listened to and engaged with diverse stakeholders before "stakeholders" became a buzzword" (Erica Fleishman, former editor of Conservation Biology).

Peter died at home on May 20th, surrounded by family, friends and faithful Labradors. The Desert Tortoise Council will miss his interest and enthusiasm for the conservation of the desert tortoise, his passion for scientific discussion, and his humor.



*Photo from the Great Basin Bird Observatory where Peter served as a board member.*

**Conservation Biology:** The beginning of the Society for Conservation Biology was May 8, 1985 at Ann Arbor, Michigan where scientists, alarmed by the biological diversity crisis, passed an informal motion to organize the Society for Conservation Biology. The motion followed reports by Peter Brussard and Jared Diamond who met during the meeting to discuss the need for a multidisciplinary, mission-oriented professional society and a journal to help develop the scientific and technical means for the protection, maintenance, and restoration of biodiversity. Less than one year later, SCB was incorporated in California.

Conservation biology focuses on how to protect and restore biodiversity, or the diversity of life on Earth. Conservation biology addresses issues where quick action is critical and the consequences of failure are great. To preserve biodiversity, scientists must answer three general questions.

1. How is the diversity of life distributed around the planet?
2. What threats does this diversity face?
3. What can people do to reduce or eliminate these threats and, when possible, restore biological diversity and ecosystem health?

To answer the third question, an understanding of human behavior is required and a multi-disciplinary approach is needed. The discipline of conservation biology thus includes--in addition to biological sciences--economics, anthropology, psychology, and history. Peter had training in and a love of these disciplines. His unique combination of knowledge and skills in, and passion for these disciplines coupled with his people skills enabled him to help create and advance the Society for Conservation Biology, and use these disciplines to create (with the first Desert Tortoise Recovery Team) a recipe for the recovery of the Mojave desert tortoise.

# What's New? Our Recent Efforts to Support Chelonian Conservation Worldwide

## *DTC Attends TSA Symposium in Fort Worth, TX*

Desert Tortoise Council Board of Directors Chairperson Michael Tuma, and Board Members Cristina Jones and Halle Kohn, attended the 2018 Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles in Fort Worth, Texas on August 12-15, held by the Turtle Survival Alliance (TSA). The symposium was an engaging and delightful gathering of chelonian experts from around the world, with presentations about turtle and tortoise conservation and research projects, and events that facilitated networking among the attendees. Cristina Jones served on the Conference Planning Committee for

the event, and Michael Tuma gave an insightful presentation about the Council's 40+ year history of conservation. Halle Kohn attended to the vendor table, which was stocked with an array of Desert Tortoise Council swag. The Desert Tortoise Council was also a sponsor of the symposium, and provided travel funds for international students and researchers attending the symposium.

Chairperson Michael Tuma's presentation described the history of the Desert Tortoise Council's efforts in engaging agencies and influencing conservation policies that affect desert tortoises. He emphasized the Council's focus on

using science to achieve its goals and objectives and provided a blueprint for other conservation organizations who wish to influence conservation policy and law.

The Desert Tortoise Council's vendor table at the event, pictured right, was a success with \$950 worth of swag sold to symposium goers. At the table, Halle Kohn informed attendees about the Council's mission.

In May 2018, The Desert Tortoise Council also supported TSA in their mission to rescue and recover thousands of radiated tortoises (*Astrochelys radiata*) in Madagascar, providing a

grant to TSA to help fund their efforts to ultimately release as many of these animals back into the wild as possible.



*Photo of DTC's vendor table at TSA 2018*

## *Ecosystems Advisory Committee Chair Goes to Washington, DC*

The Council's Ecosystems Advisory Committee (EAC) Chair, Ed LaRue, visited Washington, D.C. in early September with representatives from several other organizations to oppose the development of the Northern Corridor through the Red Cliffs Desert Reserve in Washington County, Utah. In meetings with two Congressmen, three staff members of Congressmen/women and three Senators, Ed conveyed the significance of the biological and political impacts to Agassiz's desert tortoise if development plans are to materi-

alize. Ed explained that the Red Cliffs Desert Reserve is the primary component of the Upper Virgin River Critical Habitat Unit and Recovery Unit, and is by far the smallest of the five recovery units at 0.45% of the whole in which a positive trend in tortoise populations must be attained to delist the tortoise. Whereas the Northeastern Mojave Recovery Unit is the only one of the five units showing an increase in tortoise numbers, among the other four units, the Upper Virgin River Unit has shown the least decline and most of

the decline can be attributed to fires in 2005 and 2006. Among the five recovery units, at 15.3 tortoises/square kilometer, this unit is by far the most densely populated, with the Northeastern Mojave Recovery Unit being the next highest at 4.5 tortoises/square kilometer. The EAC has written [comment letters](#) addressing potential impacts such a road would have on the Reserve area, and has expressed concern that the road would undermine conservation.



*Left to right: Glenn Rogers (Shivwits band of Paiutes), Ed LaRue, Congressman Alan Lowenthal, Tom Butine (Conserve Southwest Utah), Freddy Dunn (Back Country Horsemen of America), David Feinman and Charlotte Overby (Conservation Lands Foundation)*



# What's New? (Continued)

## ***DTC Education & Outreach Committee***

by Maggie Fusari

The Council is excited to announce the addition of a new committee, the Education and Outreach Committee, to our roster of board committees. The Committee is intended to develop projects that will provide information and education to specific and general audiences about desert tortoises, their habitats, and conservation actions The DTC supports. Committee members will attend organizational and public meetings to present information about the desert tortoise species and challenges surrounding their conservation. Along with developing teaching materials to use in classrooms throughout the Desert Southwest, the Committee has already designed information cards, a banner, and a brochure explaining the goals and objectives of the Desert Tortoise Council and what we do to advance those goals and objectives.

The Education and Outreach Committee provides information to other groups, organizations, and the public at large. Several board members have been serving the Board in an outreach capacity for some time. Examples include the following:

- DTC representation by Board Member Mari Quillman at The Wildlife Society meeting in Albuquerque in 2017;
- Board Members Becky Jones and Joe Probst ex-

hibiting DTC swag and informational materials at a table at the [Kernville Eco-festival](#) in 2018;

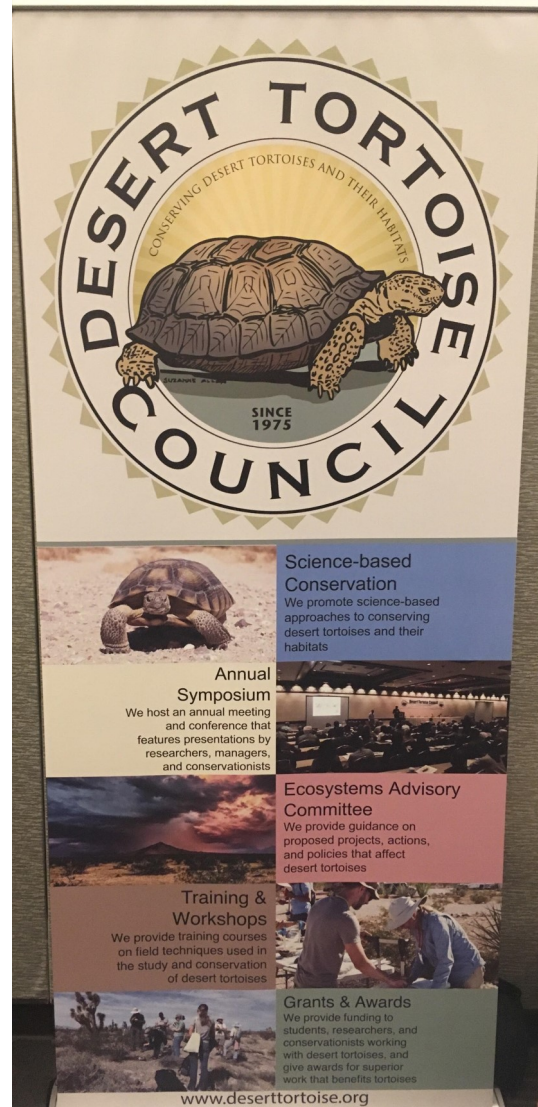
- Chairperson Michael Tuma and Board Member Halle Kohn's attendance and presentation at the Turtle Survival Alliance Conference in Fort Worth, Texas in 2018;
- Co-founder Kristin Berry's regular communication of her work for the U.S. Geological Survey, along with papers of interest published by colleagues;
- Presentations about the DTC by Ed LaRue and Michael Tuma at several California Turtle and Tortoise Club chapter meetings in 2018 (Inland Empire, Foothill, and Long Beach Chapters).

Along with the work that has already been accomplished, the Committee will develop outreach projects to familiarize schools, teachers and students with the plight of the desert tortoises. We plan to create a database of schools and teachers that would be interested in using the desert tortoises and their desert habitats as a teaching tool in their classes. Julie Bookman and Peter Coddington, two California high school teachers, and DTC Chairperson Michael Tuma are planning to present at the California Science Teacher Conference in November 2018. Julie and Peter have developed a teaching module using the tortoise to

teach desert ecology and conservation. We are also offering places for regional teachers to audit our Introductory Course in early November 2018.

The Committee is chaired by Maggie Fusari, and she welcomes input and ideas from people who want to collaborate with the DTC on outreach projects. Individuals or

organizations who have a project they would like to develop and present, or who would like to participate in ongoing projects, attend meetings on behalf of the DTC, or otherwise support the Committee's work, are encouraged to contact Maggie at [outreach@deserttortoise.org](mailto:outreach@deserttortoise.org).



## *2018 Lockheed Martin Diversity Grant Awardee, Camille Traylor*

The Grants Committee of the Desert Tortoise Council is very pleased to announce the winner of our first Diversity Grant offering, a student award funded by Lockheed Martin. The grant was established in 2018 to fund research by minority and international students into desert tortoises and their habitats, as well as other imperiled chelonians. The 2018 recipient of the award is Camille Traylor, a Master's Degree student



at University of Nevada, Las Vegas.

After receiving her Bachelor's degree in Chemistry from the University of San Francisco, Camille decided to pursue a Master's degree in Biology at University of Nevada, Las Vegas (UNLV). As a biology graduate student, she is currently studying plants and the environment. Camille believes in the importance of furthering our understanding of the effect that humans have on our natural habitats and how we can work cooperatively to reduce negative impacts on plant and animal communities.

Camille's research at UNLV focuses on the development of "fertile islands." Fertile islands are areas in the desert that contain concentrated soil nutrients, usually below perennial

shrubs. These nutrient-rich "islands" are often places that native plants flourish in an otherwise challenging desert environment. This research specifically looks at areas in the desert where soil has been displaced due to human caused disturbances (e.g., road construction). When the soil is altered from such a disturbance the quality of the fertile island may be degraded and dominated by invasive species.

Not only can these disturbances have a physical impact on the desert tortoise, but invasive plants are also often nutrient poor and undesirable for animal forage. Promoting native plant growth, however, is a priority in desert tortoise habitats due to the variety of nutrients contained in native plants.

Camille's research takes place in Lake Mead National Recreation Area, where she is measuring native and invasive plant cover in areas that have been disturbed due to road construction. Some areas have also been restored with various restoration techniques. The goal of her research is to determine how each of these techniques affects the native plant community, soil nutrient distribution, and the soil seed bank.

The Desert Tortoise Council's Board of Directors congratulates Camille and looks forward to hearing more about her research.

## Symposium Announcement

### *2019 Annual Symposium Announced*

The Desert Tortoise Council recently announced plans and a call for papers for the 2019 Annual Symposium, to be held February 21-23, 2019 at the Westward Look Wyndham Grand Resort & Spa in Tucson, Arizona. The call for Papers is on the [Desert Tortoise Council website](http://www.deserttortoise.org).

The Program for the 2019 Symposium includes a special session on Gila monsters and a pre-conference field trip to

sites with known populations of the amazing species. Several new featured speakers and sessions representing a North American approach to conservation will also be included in the Program for the Tucson meeting. Mercy Vaughn has assembled a spectacular team of experts for a session on land conservation efforts by private organizations for the Agassiz's Desert Tortoise, the Sonoran Desert Tortoise, the Thornscrub Tortoise, and the

Bolson Tortoise. More information about the Annual Symposium, including registration

and hotel information, may be found on the [Desert Tortoise Council website](http://www.deserttortoise.org).





## Recent Publications

- Aiello, C. M., T. C. Esque, K. E. Nussear, P. G. Emblidge, and P. J. Hudson. 2018. The slow dynamics of mycoplasma infections in a tortoise host reveal heterogeneity pertinent to pathogen transmission and monitoring. *Epidemiology and Infection*:1–10. DOI:10.1017/S0950268818002613
- Aiello, C. M., T.C. Esque, K.E. Nussear, P.G. Emblidge, and P.J. Hudson. 2018. Associating sex-biased and seasonal behaviour with contact patterns and transmission risk in *Gopherus agassizii*. *Behaviour*. DOI: 10.1163/1568539X-00003477
- Allison, Linda J., and Ann M. McLuckie. 2018. Population trends in Mojave desert tortoises (*Gopherus agassizii*). *Herpetological Conservation and Biology* 13(2):433–452.
- Alvarez-Ponce, David, Chava L. Weitzman, Richard L. Tillett, Franziska C. Sandmeier and C. Richard Tracy. 2018. High quality draft genome sequences of *Mycoplasma agassizii* strains PS6T and 723 isolated from *Gopherus* tortoises with upper respiratory tract disease. *Standards in Genomic Sciences* 13:12. <https://doi.org/10.1186/s40793-018-0315-1>
- Campbell, Steven P., Erin R. Zylstra, Catherine R. Darst, Roy C. Averill-Murray, and Robert J. Steidl. 2018. A spatially explicit hierarchical model to characterize population viability. *Ecological Applications*. <https://doi.org/10.1002/eap.1794>
- Field, Kimberleigh J., Jay D. Johnson, and Nadine Lamberski. 2018. Nasal-oral water administration for rehydration of juvenile Mohave desert tortoises. *Journal of Fish and Wildlife Management* In-Press. <https://doi.org/10.3996/042017-JFWM-034>
- Lovich, Jeffrey, Roy Averill-Murray, Mickey Agha, Joshua Ennen, and Meaghan Austin. 2017. Variation in annual clutch phenology of Sonoran desert tortoises (*Gopherus morafkai*) in central Arizona. *Herpetologica* 73(4):313-22.
- Lovich, Jeffrey E. E., Shellie R. R. Puffer, Laura A. A. Tennant, Terence R. L. Arundel, Mickey D. Agha, Joshua R. S. Ennen, Kathie Meyer-Wilkins, Amanda L. Smith, Kathleen D. Brundige, and Michael S. Vamstad. 2018. Reproductive output and clutch phenology of female Agassiz's desert tortoises (*Gopherus agassizii*) in the Sonoran desert region of Joshua Tree National Park. *Current Herpetology* 37(1): 40-57. <https://doi.org/10.5358/hsj.37.40>
- Mack, Jeremy S., Heather E. Schneider, and Kristin H. Berry. 2018. Crowding affects health, growth, and behavior in head-start pens for Agassiz's desert tortoise. *Chelonian Conservation and Biology* 17(1):14-26. DOI:10.2744/CCB-1248.1
- Nafus, Melia G., Jennifer M. Germano, and Ronald R. Swaisgood. 2017. Cues from a common predator cause survival-linked behavioral adjustments in Mojave Desert tortoises (*Gopherus agassizii*). *Behavioral Ecology and Sociobiology* 71:158. <https://doi.org/10.1007/s00265-017-2387-0>
- Sánchez-Ramírez, Santiago, Yessica Rico, Kristin H. Berry, Taylor Edwards, Alice E. Karl, Brian T. Henen, and Robert W. Murphy. 2018. Landscape limits gene flow and drives population structure in Agassiz's desert tortoise (*Gopherus agassizii*). *Scientific Reports* 8:11231. DOI:10.1038/s41598-018-29395-6
- Sandmeier, Franziska C., K. Nichole Maloney, C. Richard Tracy, David Hyde, Hamid Mohammadpour, Ron Marlow, Sally DuPré, and Kenneth Hunter. 2017. Chronic disease in the Mojave desert tortoise: Host physiology and recrudescence obscure patterns of pathogen transmission. *Ecology and Evolution* 7:10616-10629. <https://doi.org/10.1002/ece3.3480>
- Sandmeier, Franziska C., Chava L. Weitzman, and C. Richard Tracy. 2018. An ecoimmunological approach to disease in tortoises reveals the importance of lymphocytes. *Ecosphere* 9(9):1-12. <https://doi.org/10.1002/ecs2.2427>
- Stager, Robert D. , Elno Roundy, Gary Brackley, Steve Leonard, and Leon Lato. 2017. Case study: Using soil survey to help predict Sonoran desert tortoise population distribution and densities. *Rangelands* 39(3-4):97-111. <https://doi.org/10.1016/j.rala.2017.06.002>
- Weitzman, Chava L., Richard L. Tillett, Franziska C. Sandmeier, C. Richard Tracy and David Alvarez-Ponce. 2018. High quality draft genome sequence of *Mycoplasma testudineum* strain BH29T, isolated from the respiratory tract of a desert tortoise. *Standards in Genomic Sciences* 13(9): 1-9. <https://doi.org/10.1186/s40793-018-0309-z>

# Grant & Award Announcements

## 2019 Lockheed Martin Diversity Grant

The Desert Tortoise Council's Grant Committee is offering, with funding from Lockheed Martin and the Desert Tortoise Council, the 2019 Diversity Grant. This grant was estab-

lished in 2018 to fund research by minority and international students. While the Council favors grant applications for research that contributes to the understanding, management and conservation of tortoises

of the genus *Gopherus* in the southwestern United States and Mexico (*G. agassizii*, *G. morafkai*, *G. ergoodei*, *G. berlandieri*, and *G. flavomarginatus*), the Council will consider proposals for similar research on other

imperiled chelonian species across the globe. Grant applications are due December 1, 2018. Details of the grant, including application, are located on the [Desert Tortoise Council website](#).

## 2019 Morafka Memorial Research Award

The Desert Tortoise Council is now accepting applications for the 2019 David J. Morafka Memorial Research Award. The award was established, with the aid of several donors, to help support research that contributes to the understanding, management and conservation of tortoises of the genus *Gopherus* (*G. agassizii*, *G. morafkai*, *G. ergoodei*, *G. berlandieri*, and *G. flavomarginatus*) in the southwestern United States and Mexico. Applicants must be associated with a recognized institution (e.g., university, museum, government agency, non-governmental organization) and may be graduate stu-

dents, post-doctoral students, or other researchers. Applications will be evaluated on the basis of the potential of the research to contribute to the biological knowledge of one or more of the above gopher tortoise species, and to their management and conservation. The \$2,000 award will be presented to the winning applicant at the Desert Tortoise Council's Annual Symposium in February 2019. Applications are due December 1, 2018.

Please visit the [Desert Tortoise Council website](#) for full information about the award, as well as application procedures and documents.



David J. Morafka was a graduate of the University of Southern California and a professor at California State University, Dominguez Hills. His research interests included evolutionary biology, biogeography, and herpetology. He was an expert in the biology of the bolsón tortoise and Agassiz's desert tortoise, as well as the ecogeography of the Chihuahuan Desert and neonatology of tortoises.

## 2019 Glenn R. Stewart Student Travel Fund

The Desert Tortoise Council is now accepting applications for the Glenn R. Stewart Student Travel Fund. This fund was established to support students working with North American *Gopherus* tortoises by assisting with their travel costs to attend and participate at the 2019 Desert Tortoise Council Symposium. The fund will support up to \$500 (each) in travel costs for up to two students. Applicants must be enrolled in a recognized educa-

tional institution and may be a high school, undergraduate, graduate, or post-doctoral student. The student applicant must be a member of the Desert Tortoise Council, must present an oral presentation or poster at the 2019 Symposium. Applications are due November 17, 2018.

Please visit the [Desert Tortoise Council website](#) for full information about the fund, as well as application procedures and documents.



The Glenn R. Stewart Student Travel Fund was established to honor Dr. Glenn R. Stewart, co-founder of the Desert Tortoise Council, and tireless supporter of students.



## *Board of Directors Spotlight*

### Maggie Fusari

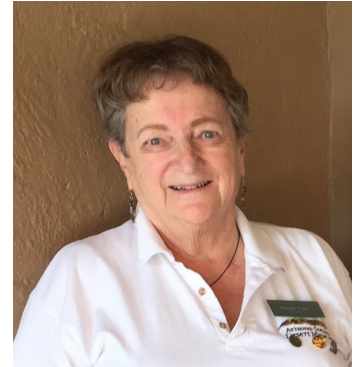
Margaret (Maggie) Fusari is retired from the University of California at Santa Cruz where she was Director of the UCSC Natural Reserves and a lecturer in Environmental Studies and Biology. Born and raised in Connecticut, Maggie came west in 1965. She received her PhD from UCLA in biology working on the California Legless Lizard as an ecologist and environmental physiologist. After her daughter was born in Virginia, Maggie returned to the Southwest where she did field surveys in Arizona and California including tortoise surveys in the Eastern Mojave

in support of the original Desert Plan. She was privileged to work with Glenn Stewart, a co-founder of the Desert Tortoise Council, and Jack Edell of Caltrans on a preliminary study of tortoise-road-fence interactions that was completed in 1981.

Maggie fell in love with the desert soon after arriving in California. She has a particular fondness for her favorite place, the Granite Mountain Bunny Club, which was built by Dr. Ken Norris, his family, and his students, including Maggie. Most of her career and current pursuits support and demon-

strate her passion for conservation and education, specifically in relation to our deserts. Maggie has a strong conviction that the desert ecosystems of the Southwest and their abundant wildlife need and deserve our protection. She currently serves as a Docent at the Arizona Sonora Desert Museum in Tucson and as Treasurer of the Tucson Herpetological Society.

Maggie has been a member of the Desert Tortoise Council since it's early days, with a hiatus to serve in Peace Corps Mexico after retiring from UCSC. She has been board



chair and currently is a board member at large, the Chair of the Education and Outreach committee, and organizer of the Council's Introductory Course.

### Michael Tuma

Michael Tuma is currently an Ecologist in the U.S. Geological Survey's Western Ecology Research Center, where he is squarely focused on the ecology of Agassiz's desert tortoise, including long-term survival monitoring of tortoise populations and head start research. Michael has been at this position for nearly two years, and

he previously worked as an environmental consultant for about 20 years. He has had various other jobs, with one of his favorites being a Gopher Tortoise Biologist in southern Mississippi for two years in the mid-1990s.

Michael is originally from Peru, Illinois, a small town on the Illinois River in north-central Illinois, where he grew up chasing herps in and near the many forests, streams, backwaters, and canals associated with the river, and developed a life-long love of reptiles and amphibians. He stayed in the Midwest for college (B.S. at Truman State and M.S. at Eastern Illinois University) where he had opportunities to study

yellow mud turtles, an endangered species in Missouri and Illinois. From there, Michael went south to pursue research with gopher tortoises in southern Mississippi, demonstrative of his history of making long-distance moves to chase turtles and tortoises. It's the desert tortoise that brought him to the Mojave Desert. Every day Michael spends in the desert, he is reminded of how vastly different it is than the far more mesic woodlands and prairies back East. He has grown to appreciate and love the desert ecosystems.

Michael's passion for chelonians and their conservation, and scientific research, brought him to the Desert Tortoise Council.

He has been a member since 2003, attended every Annual Symposia since 2005, and was invited to the Board of Directors in 2014. He served as the Newsletter Editor between 2014 and 2017, as Grants Committee Chair since 2016, and as the Media Committee Chair since 2018. He also served as Chair Elect and Chair of the Nominations Committee between 2016 and 2018 before taking the role of Chair of the Board of Directors in February 2018.



## Back Page Announcements

### *A Fresh Look: DTC Website Makeover*

The Desert Tortoise Council has a new website and a new webmaster! Sky Esser's company Good Web Works specializes in web design and development for nonprofits and

organizations focused on positive change. For more about his work, visit [goodwebworks.com](http://goodwebworks.com).

We want to thank our friend and webmaster for many years,

Mary Cohen, for her service and dedication to the Council.

If you have suggestions or questions about our website, our webmaster can be reached at [webmas-](mailto:webmaster@deserttortoise.org)

[ter@deserttortoise.org](mailto:ter@deserttortoise.org).

Head over to [deserttortoise.org](http://deserttortoise.org) and check out our new website!

### *Sponsors Sought for DTC Newsletter*

Interested in getting more exposure for your organization by sponsoring a non-profit? Consider advertising in the next issue of the Desert Tortoise Council Newsletter! The Council is currently seeking sponsors for upcoming issues

of the Newsletter, which is published quarterly, distributed via email to more than 500 of our members and past members, and available for free download from our website ([www.deserttortoise.org/newsletter.html](http://www.deserttortoise.org/newsletter.html)).

We are offering the following sponsorship levels:

**Silver:** Your organization's name mentioned in the sponsorship section of the Newsletter for 4 issues (\$100).

**Gold:** Your organization's logo

presented in the sponsorship section of the Newsletter for 4 issues (\$250).

For more information on becoming a sponsor of the Desert Tortoise Council Newsletter, please contact [newsletter@deserttortoise.org](mailto:newsletter@deserttortoise.org).

## Follow the Desert Tortoise Council:



### *Council Mission*

*The Desert Tortoise Council was established in 1975 to promote conservation of the desert tortoise in the deserts of the southwestern United States and Mexico. The Council is a private, non-profit organization comprised of hundreds of professionals and laypersons who share a common concern for desert tortoises in the wild and a commitment to advancing the public's understanding of the species. For the purposes of the Council, desert tortoise includes the species complex in the southwestern United States and in Mexico, currently referred to as Gopherus agassizii, Gopherus morafkai, and Gopherus evgoodei.*

### *Board of Directors & Staff*

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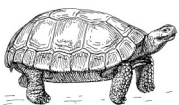
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#### **Webmaster**

Sky Esser



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