Message From a Co-Chair

Jeff Goessling

Dear GTC Members,

Thank you for your prompt and thoughtful responses to the survey we recently sent out regarding the upcoming virtual conference. We have decided that the meeting will be held **online on Friday, November 13th** (detailed meeting access information will be available at a later date). I would like to highlight a few of the take-away messages I gleaned from the survey results:

- We received 99 responses. **THANK YOU** to so many of you who responded!
- 87% of respondents plan to attend our online meeting. This conference must, and will, go on!
- Overall, Friday was the strong preference for the meeting day (72% of respondents selected Friday as their top choice).
- 78% of respondents preferred a meeting that combined multiple presentation types.

In response to the clear trends noted above, I have outlined a plan for this year’s remote meeting. Please bear with the Executive Committee as we work in earnest over the next couple of months to make this meeting come to life. We hope this meeting will be as meaningful as possible while operating under a remote setting.

We will start the meeting with morning talks consistent with a typical GTC conference (regular 15 minute presentation, 5 minutes for questions). We will have a mid-day “lunch” break, following which we will have a brief membership-wide business meeting followed by an afternoon presentation session for 5-minute speed talks; the meeting will end with virtual poster presentations. We will post guidelines for all three presentation types to the GTC meeting website at a later date. In an interest to keep the meeting lively, we will also have an online auction for a few exceptional items to be mailed to the winner.

For this meeting to work, we will continue to need excited participation from our membership! To that end, we will still hold a student presentation competition with cash awards for winning presenters of both regular and speed talks.

The abstract submission deadline is October 15th. Our abstract submission guidelines for this year’s meeting will request that you identify your presentation-type preference (i.e., regular, speed, or poster) and if you will be presenting as a student.

Because this year’s meeting is at a very low cost, the only registration fee for the meeting will be GTC membership dues. Details regarding online meeting access will be available at a later date on the meeting website.

Thank you for your patience with us as we all embark through these uncharted waters together. I look forward to seeing many of you online in a few short months, and I welcome the day when we can all return in person for our annual meeting.

Wishing you peace and health,

Jeff Goessling
ANNOUNCEMENTS

Mark your calendars for the 42nd annual 
and 1st ever virtual meeting of the 
Gopher Tortoise Council 
November 13th, 2020

Stay tuned for more details on our website: www.gophertortoisecouncil.org, or follow us on Facebook.

Abstracts

The deadline for submitting abstracts for virtual presentations is October 15th. Talks will include three virtual presentation types: 1) regular 15-minute talks with 5 minutes for questions, 2) 5-minute speed talks, and 3) poster presentations. Guidelines for all three presentation types will be posted to the GTC meeting website at a later date.

GTC Student Presentation Awards are given for the top three student oral presentations at the annual meeting. This year there will be separate competitions for regular full-length talks and speed talks (that's right, double the number of awards!). Please indicate clearly in your abstract if you are an undergraduate or graduate student so that you can be considered for an award. Contact Betsie Rothermel at brothermel@archbold-station.org if you have any questions.

Annual Meeting T-shirt Fundraiser

The Gopher Tortoise Council is working with an online vendor for this year’s t-shirt fundraiser. The vendor will ship directly to purchasers prior to the meeting; all proceeds will be donated to GTC. Ordering details will be available soon! This year’s theme is “safer in your burrow.”

Keep an eye on the GTC website or follow us on Facebook for updates.

This year, the only meeting registration fee will be membership dues. Renew your membership or become a member of GTC on our website!

See http://www.gophertortoisecouncil.org/support/

“Like” us on Facebook to get more gopher tortoise news and Council updates!
ANNOUNCEMENTS continued...

Call for Nominations for the 2020 Gopher Tortoise Council Service Awards

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

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

**Lifetime Service Award** - presented to individuals who 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. Includes a $250 cash award.

**Auffenberg and Franz Conservation Award** – presented to individuals with lifetime 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).

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.

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

**Deadline for submission of this year’s proposals is September 30th, 2020.** Requirements, instructions, and the application can be found on GTC’s [Grant Program](http://gophertortoisecouncil.org/grant-programs) webpage.

Submit proposals or send questions to Jessica McGuire at jmcguire@quailforever.org.

The J. Larry Landers Student Research Grant

The J. Larry Landers Student Research Grant is a GTC competitive grant program for undergraduate and graduate students. Proposals can address research concerning gopher tortoise biology or any other relevant aspect of upland habitat conservation and management. The award amount is typically in the range of $1,000—$1,500. The proposal should be limited to four pages in length and include a description of the project, a concise budget, requested grant amount, 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 **September 30th, 2020.** Proposals should be submitted electronically in a Microsoft Word document to Betsie Rothermel at brothermel@archbold-station.org. For more information, visit the Grant Program page of our website at [http://gophertortoisecouncil.org/grant-programs](http://gophertortoisecouncil.org/grant-programs).
Okeeheelee Nature Center—Heinrich Education Grant Recipients

By Heather Moody

The Okeeheelee Nature Center, through the Friends of ONC, was recently honored to receive a grant from the Gopher Tortoise Council. The Donna J. Heinrich Environmental Education Grant was established to support organizations committed to developing educational projects about the gopher tortoise and the fascinating world in which it lives.

Protecting gopher tortoises, and teaching visitors about them has always been an important part of ONC’s educational mission. Gopher tortoises have been living at Okeeheelee Nature Center since 1985, when 83 tortoises were relocated to the nature center’s pine flatwood forest from a retail construction site. Today, there are 90 to 100 gopher tortoises living in ONC’s preserve, including many of the original tortoises from the 1980s. They are commonly encountered by hikers and other nature center visitors, so education is key to ensuring that the tortoises and their habitat are respected.

Alex Melligon has been an Assistant Naturalist at Okeeheelee Nature Center since February of 2019. Her regular duties include animal care, teaching school and public programs, creating educational content, and interacting with visitors. When asked what she likes best about her job, Alex said, “I like that we can follow our curiosity. If we have an idea for a program or project, we are able to use our talents and creativity to explore, incorporate our interests and reach new audiences.” Since COVID-19 has put ONC’s in-person programming on hiatus and closed the nature center building, special project work has become the focus.

As luck would have it, the proposal for the Gopher Tortoise Council grant included two projects that were planned with Alex’s special talents in mind. You see, in addition to her skills as a naturalist, Alex is also a gifted artist! Since childhood, she has been interested in arts and crafts, including drawing, jewelry making, ceramics, and textiles. Alex explained, “To me, art is a fun way to express myself, and it’s a good feeling to create something with my hands, especially if it’s something useful.”

The first grant-funded project Alex took on was to design an educational gopher tortoise booklet for children. The ONC team helped brainstorm ideas for activities and content, and then Alex researched tortoise facts, wrote the text, and drew all of the pages by hand. Through puzzles, games, reading, and coloring, the booklet helps children learn about the importance of gopher tortoises and how they can help protect them.

When asked what aspect of the project she was most proud of, Alex said, “I think the best part of the activity book is that it gives simple, concrete things for people to do to help tortoises, while also providing the whys behind it, and still being fun and engaging for kids.” The activity book will be available to children visiting the nature center and participating in any special programs that focus on gopher tortoises.

The mural provides a unique glimpse into the underground life of a gopher tortoise and the ecosystem it helps support. Since it is a visual education piece, it will spark curiosity and convey information to all ages and all types of learners. It will be displayed in ONC’s Children’s Discovery Zone, but it will also be mobile so it can be featured during programs and special events.

Alex explains, “Teaching children about nature is important to me because I believe it is our best chance to keep our environment safe and maybe even make it better in the future.” She hopes these gopher tortoise projects inspire the next generation of young artists and conservationists in the same way she was inspired by the murals she saw as a child. Alex brings so much passion for the environment to Okeeheelee Nature Center, whether she is teaching, caring for animals, supporting operations, or contributing through her artistic talents.

All of her coworkers and volunteers feel very fortunate to have her as part of the ONC team!
Catastrophic Losses in Agassiz’s Desert Tortoise Populations

Until 2011, the geographic range of Agassiz’s Desert Tortoise (Gopherus agassizii) extended from southeastern California, southern Nevada, and extreme southwestern Utah south to northern Sinaloa, Mexico. With the growth of DNA research in taxonomy and additional morphometric and physiological information about the populations, sufficient data existed to split the species into two species at the Colorado River in the United States, with Agassiz’s desert tortoise occurring north and west of the Colorado River, and the new species, Gopherus morafkai, present throughout Arizona and into Mexico (Murphy et al. 2011). With that split, Agassiz’s desert tortoise lost about 70% of its geographic range (Berry and Murphy 2019). Now, over 70% of habitat occurs in the Mojave and western Sonoran or Colorado deserts in California.

As if the loss of geographic range were not enough for this species, several populations have experienced declines. In 1980, the Beaver Dam Slope population in southwestern Utah was federally listed by the U.S. Fish and Wildlife Service (USFWS) as threatened. Ten years later, in 1990, the USFWS listed populations north and west of the Colorado River as threatened. Since that time, adult populations in California and parts of Nevada have experienced catastrophic declines over 10-year periods in critical habitat (USFWS 2015). Catastrophic is a strong word and fits well with what has occurred for many species of turtles and tortoises. Scientists have defined a catastrophic loss as a short-term decline of over 50% of a population (Keevil et al. 2018). Such declines have occurred in adult populations in many critical habitat units in California and some parts of Nevada from 2004 to 2014 and are continuing (Berry and Murphy 2019; USFWS 2015). In California, for example, declines in adult populations in that 10-year period ranged from 50.6 to 61.5% in the western Mojave Desert, 67.3% in the eastern Mojave Desert of California and Nevada, and from 29.8 to 64.7% in the Colorado or western Sonoran Desert. The USFWS has defined a viable desert tortoise population as containing 10 adult tortoises/mile², and now most critical habitat units are below viability across the geographic range (Berry and Murphy 2019; USFWS 2015).

Causes of losses in desert tortoise populations are numerous, vary by desert region, and some are well documented (summarized in Berry and Murphy 2019). Four drivers of declines were identified in a recently published long-term research project centered on the interpretive kiosk and trails at the Desert Tortoise Research Natural Area in California (Berry et al. 2020). The large study area (3 miles²) was designed to include populations inside and outside the protective fence. Two of the four drivers of population declines were activities that could be excluded by the fence while the two others were common regionally or present throughout the geographic range. Drivers associated with the fence were loss of tortoises from collecting, vandalism (including gunshot deaths) and vehicle kills, and habitat degradation (including sheep grazing and intensive off-highway vehicle use). The two drivers acting at a landscape level were upper respiratory tract disease caused by *Mycoplasma agassizii* and *M. testudinum* and hyperpredation by common ravens. Recovery measures have been underway since 1990, but efforts have not reduced or ended declines, especially in populations below viability.

References to all topics discussed herein are in:


FEATURE ARTICLE

An Interview with a Herpetologist featuring Cristina Jones

Cristina Jones is the Turtle Projects Coordinator for the Arizona Game and Fish Department and has been with the agency for 14 years. Cristina holds a bachelor's in Wildlife Science and a master's in Wildlife Ecology from the University of Arizona. Cristina is a Board Member at Large for the Desert Tortoise Council, co-chair for Southwest Partners in Amphibian and Reptile Conservation (PARC), co-founder and co-chair for PARC Turtle Networking Team, and member of the Board of Directors for the Turtle Survival Alliance.

Gopher Tortoise Council (GTC): Unfortunately, there have been many large wildfires in Arizona this summer. What is the role of fire in Arizona’s landscapes, and how does fire impact the state’s reptiles and amphibians?

Cristina Jones (CJ): Wildfire has long influenced landscapes across the Southeast, as such many plant and animal species have not only adapted to fire but require frequent fire for continued survival. Quite the opposite holds true for the warm deserts of the southwestern United States, and our native plants (cacti, trees, and shrubs) are ill-adapted to fire and fare poorly in response to burns. Until recently wildfires were not only infrequent, but they were also unable to carry over large areas due to the extent of bare ground between patches of vegetation. All this changed in the last few decades due to the invasion of nonnative grasses (such as red brome) which have been able to establish fuel loads capable of sustaining more frequent, large-scale wildfires, especially following years of high rainfall. Direct, long-term effects of wildfire on Sonoran desert tortoise habitat can impact food availability, greatly reducing or eliminating paloverde and shrubs used for thermal refugia and protection from predation for Sonoran desert tortoises and other wildlife.

GTC: As the Turtles Project Coordinator for Arizona Game and Fish Department, what do you consider the main conservation challenges facing Arizona’s turtles?

CJ: While data analyses have shown that our Sonoran desert tortoise population is stable, and that mud turtles are still common within their habitat, turtle populations in Arizona do face a number of potentially serious threats, including those associated directly or indirectly with increased habitat destruction, fragmentation, and degradation caused by invasive nonnative plant establishment, an altered fire regime, urbanization and development, and human-constructed barriers to movement. For the Sonoran desert tortoise, these threats led the Arizona Game and Fish Department to work with partners in the Arizona Interagency Desert Tortoise Team to complete a Candidate Conservation Agreement (CCA) for the Sonoran desert tortoise in 2015. This CCA identifies existing conservation measures, provides a comprehensive statewide conservation framework, and the collective knowledge and funding to implement proactive conservation measures in Arizona.

GTC: You are involved in lots of anti-turtle poaching initiatives, what can the general public do to help reduce this threat to our native turtles?

CJ: As a turtle biologist, I have certainly been – at least peripherally – aware of news headlines of individuals caught trying to smuggle turtles out of the U.S. I fear my laser like focus on desert tortoises, and the mud, box turtles I work with in Arizona, kept me from calculating the number of turtles that were being unlawfully collected for the meat, medicine, and pet trade. It was through participation in the Trinational Trade and Enforcement Training Workshop in October 2018, and a subsequent trip to Cambodia to work with the Turtle Survival Alliance and Wildlife Conservation Society on a critically endangered
An Interview with a Herpetologist continued...

southern river terrapin (*Batagur affinis*), that I was made woefully aware of the global plight of chelonians, with almost 40% of U.S. turtle species considered threatened. Armed with this knowledge, I have made it my personal and professional goal to bring to light the impacts of the illegal turtle trade. I have since chaired a special session on illegal turtle trade at the 45th Annual Desert Tortoise Council Symposium, hosted a workshop at the Western Association of Fish and Wildlife Agencies summer 2020 meeting, and co-founded the Partners in Amphibian and Reptile Conservation (PARC) Turtle Networking Team. The current focus through the PARC TNT is to raise awareness about the issue of illegal collection, create a forum that bolsters communication between state and federal law enforcement officers and biologists, and identify actions that will help recognize and control the illegal trade in western North America. With that being said, there are so many ways that members of the general public can help conserve turtles. Some are as simple as helping a turtle cross a road, creating a backyard habitat – if you are lucking enough to live in an area with native turtle populations, getting informed, and sharing your passion. And if you are interested in sharing your backyard with a turtle, look to your local reptile rescue and adopt a turtle that cannot be returned to the wild. You can also sign the *Call to Action* letter authored by a partnership of state, federal, academic, and nonprofit conservation professionals to galvanize support for coordinated efforts to address this threat within the conservation community.

GTC: A typical day working with gopher tortoises could lead to finding dozens of burrows, many tortoises, several commensal species within those burrows, and even a few tortoises above ground. What does a typical day with desert tortoises look like for biologists out West?

CJ: A typical day working with Sonoran desert tortoises will take place during the monsoon season and always leads to finding dozens of shelter sites and a dozen (or more) tortoises above ground. While there have been days where only three tortoises were encountered, I had one day, when working with a team of volunteers on my master’s research project (on prevalence of upper respiratory tract disease in captive and wild Sonoran desert tortoises in Arizona), that we found 24 tortoises! This included 2 hatchlings, as well as 6 juvenile tortoises. They seemed to be everywhere you looked – under shrubs along the hiking trail, out in the open munching on plants, mating. We returned to our vehicles only to find two taking advantage of the shade. That was a truly fabulous tortoise day. Honestly, even a 1-tortoise-day is pretty fabulous, especially if it includes a 1-Gila-monster-day and 1-rattlesnake-day (the trifecta of a desert tortoise biologist).

GTC: What are the most important habitats and landscape features for desert tortoises?

CJ: Sonoran desert tortoises primarily inhabit rocky, steep slopes and bajadas of Mojave DesertsCrub and the Arizona Upland and Lower Colorado River subdivisions of Sonoran DesertsCrub at elevations up to 4,200 feet. Studies have found that adequate shelter is one of the most important habitat features for tortoises and is correlated with population densities (the more shelters, the higher the density of tortoises). Shelters stay cooler in the summer and warmer in the winter than outside temperatures, providing opportunity for tortoises to escape temperature extremes. Shelters are also used for nesting and protection from predators. Tortoises may excavate an area in loose soil below rocks and boulders, beneath vegetation, on semi-open slopes, or take refuge within caliche caves of washes or rocky crevices.

GTC: What advice do you have for students who are considering a career in wildlife conservation?

CJ: There are so many different jobs within wildlife conservation – habitat, terrestrial species, aquatic species, invasive species, GIS, to name a few. The best way to figure out where you want to be is to volunteer. As an undergrad, on my first day starting the Wildlife Science program at University of Arizona, I saw a flyer in the hallway: a graduate student was seeking volunteers to survey for Gila monsters. I called the number and started surveys two days later. There I met another graduate student who hired me to assist with a tiger rattlesnake study. This rattlesnake study brought me into the lab of Cecil Schwalbe, PhD, who hired me a year later for a Sonoran desert tortoise study. Cecil later became my Continued on next page
An Interview with a Herpetologist continued…

major advisor for my master’s research. During my thesis research, I got to know the desert tortoise biologists at the Arizona Game and Fish Department, and, when the position of Turtles Project Coordinator opened, I was invited to apply.

Even though I have been pretty set on working with reptiles since I found my first Gila monster when I was four years old, I also made the time to volunteer for a bat foraging study with Bureau of Land Management and The Nature Conservancy; salamander, quail, and deer surveys with the Arizona Game and Fish Department and US Fish and Wildlife Service; and volunteered as an assistant herpetology keeper for the Arizona-Sonora Desert Museum (for 8 years because it is truly an amazing place with truly exceptional staff). Through these experiences, I learned that I did not want to be an animal keeper, or stay up all night watching bats, or chase deer. I also made acquaintance with a number of people that I work with to this day. So gain some experience and try out the various fields available in this career.

FEATURE ARTICLE

By Kirsten Dutcher, Amy Vandergast, Todd Esque, Anna Mitelberg, Marjorie Matocq, Jill Heaton, and Ken Nussear

Can the tortoise still cross the road? The influence of landscape on Mojave Desert tortoise genetic connectivity

The Mojave Desert of northwestern Arizona and the southern sections of Utah, Nevada, and California is home to an endemic tortoise species in the same genus as the gopher tortoise found in the southeastern United States (Fig. 1). The Mojave desert tortoise (Gopherus agassizii) is adapted to an incredibly arid environment, where temperatures range from below 0 to over 46 °C and rainfall is between 46 and 253 mm annually (Turner 1994). Historically, this desert has been ecologically contiguous, and the tortoise has experienced relatively frequent unrestricted movement and gene flow between populations (Hagerty & Tracy 2010). However, as human presence in North American deserts has increased, so has urban expansion. Reductions in tortoise habitat and population density led to federal listing as threatened in 1990 (USFWS 1994). Since listing, development has continued in tortoise habitat, and population declines of roughly 1/3 in the last decade have been documented (Allison & McLuckie 2018). While habitat loss and fragmentation can significantly increase the risk of extinction by altering natural movement patterns and landscape use, maintaining or increasing habitat connectivity for native species can improve population size and persistence (Haddad et al. 2015). To evaluate connectivity for the tortoise we quantified genetic connectivity across the landscape and identified a reduction in gene flow as the result of habitat disturbance.

We focused our study in the Ivanpah Valley area, which sits along the California/Nevada border. We collected data from ten 1 km$^2$ study plots, plus an additional location where data were previously collected (Fig. 2). Typical of the Mojave Desert, the Ivanpah Valley area has broad interconnected valleys flanked by bajadas rising up to meet rugged mountains. Vegetation communities are dominated by mixed desert scrub species like creosotebush, bursage, Mormon tea, succulents, and ephemeral annuals (Turner 1994; Fig. 3). Natural features in the Ivanpah Valley area may restrict gene flow (high mountains and dry lakes) or facilitate gene flow (large open bajadas) for tortoises. Like many valleys in the Mojave Desert, Ivanpah is increasingly experiencing habitat disturbance as the result of recent and ongoing developments that may reduce genetic connectivity. This disturbance was initially related to mining and ranching, but urbanization accelerated in the 1940s to a current estimate of over 2 million people living in the region. The growth of Las Vegas, now a major metropolitan area roughly 65 km from Ivanpah Valley where little connective tortoise habitat remains, has led to calls for preserving connectivity in adjacent valleys. The Southern Pacific Railroad was built in the mid-1880s as the railroad industry spread across the United States. An interstate highway (I-15) can be traced to the early 1900s, with the interstate we know today largely defined by the mid-twentieth century. Most recently, federal and state goals for renewable energy have focused on large scale solar development toward public lands in previously undeveloped tortoise habitat, increasing markedly since 2010 (Fig. 4).
Can the tortoise still cross the road? The influence of landscape on Mojave Desert tortoise genetic connectivity continued...

Connectivity is often measured by the movement of individuals over long time periods, but can be difficult to record; therefore, we used genetic methods to evaluate connectivity. We collected blood samples from 299 tortoises and genotyped individuals at 20 microsatellite loci (locations of repetitive DNA where mutation rates are expected to be high). We quantified recent gene flow by determining first order relatives (e.g., parent/child) and second order relatives (e.g., grandparent/grandchild) to better understand movement and dispersal. We also investigated effects of landscape features like I-15 and the Southern Pacific Railroad on genetic structure within the context of suitable habitat areas. Our results showed second order relatives up to 60 km apart, suggesting a greater range of interactions and inter-relatedness than previously known. Of the 110 unique second order relationships found, 51 were between plots, signifying the importance of mobility across the landscape on a multi-generational time scale. Our results also revealed reduced genetic connectivity across the combined features of the railway and I-15 which parallel one another. These findings stress the significance of historically connected habitats, like those in the Ivanpah Valley, to tortoise connectivity.

With a tortoise generation estimated at 20 – 25 years (USFWS 1994), I-15 and the railway have been on the landscape four to seven tortoise generations. On the other hand, the genetic effects that may result from more recent developments in tortoise habitat (i.e., urbanization or renewable energy installations), many of which have been on the landscape for less than one tortoise generation, may only be observable after a substantial time lag (Landguth et al. 2010). Therefore, recent developments in the Mojave Desert have the potential to continue to disrupt genetic connectivity within existing tortoise populations into the future. The ability of disturbance to negatively impact connectivity is related to the amount and configuration of habitat lost in areas that once supported continuous populations. Existing connected tracts of habitat across the landscape may greatly benefit species recovery by reducing future impacts, given that populations in large connected networks are less threatened by extinction (Haddad et al. 2015). These conservation measures may also benefit other desert species as the Ivanpah Valley is an evolutionary hotspot with high levels of genetic biodiversity for tortoises, desert night lizards, western shovel-nosed snakes, and desert bighorn sheep (Vandergast et al. 2013). Although we detected a genetic signal of fragmentation as the result of anthropogenic disturbance, we also found that the Ivanpah Valley was not genetically or geographically isolated in the recent past. Our results highlight the importance of informing management decisions that could affect habitat connectivity and preserving the connectivity that remains across the Mojave Desert.
Can the tortoise still cross the road? The influence of landscape on Mojave Desert tortoise genetic connectivity continued...

If you are interested in this topic, check out our publication titled GENES IN SPACE: WHAT MOJAVE DESERT TORTOISE GENETICS CAN TELL US ABOUT LANDSCAPE CONNECTIVITY in Conservation Biology. https://doi.org/10.1007/s10592-020-01251-z

Figure 4. Large scale solar photovoltaic facility on the east side of the Ivanpah Valley, development began in 2010 on 14 km² of previously undeveloped tortoise habitat. The town of Primm, Nevada can be seen in the background. Photo by K. Dutcher (UNR/USGS).

References


Recent Research Citations

Below are a few recently published articles pertaining to gopher tortoises and upland communities in the Southeast! Check out GTC’s Education & Outreach section of our website for tortoise and snake bibliographies for more interesting reads.


Directory of 2019-2020 Gopher Tortoise Council Officers, Committee Chairs, and State Representatives. Please view the GTC website for contact information.

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**The Tortoise Burrow**
http://www.gophertortoisecouncil.org

*The Tortoise Burrow* is published in Spring, Summer, and Winter. Interested in submitting an article? Contact the Newsletter Editor for information:

**Erin Cork**
erin.cork@gmail.com

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