

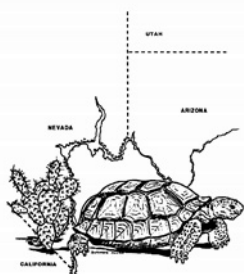
The *Desert Tortoise Council* Newsletter

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(Tortoise) Food for Thought: Can Livestock Grazing and the Desert Tortoise Co-exist?

by Kristen Wasz and Michael Tuma



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A single (albeit incredibly simplified) day in the life of a male desert tortoise: Get warm in the sun. Find some food to munch on. Don't get killed today. Take an afternoon siesta. Find a hot female tortoise and convince her to mate with me. Find more food!

But what's a tortoise to do in a year such as this? The West is undermined with drought with seemingly no reprieve in the near future; annual wildflower blooms have been drastically reduced in recent years; and our surface water features appear to have dried substantially. Moreover, the effects of the extended drought are exacerbated by the threat of grazing by livestock and feral horses and burros. Livestock grazing has been practiced within the desert tortoise's range since European settlers came westward (Oldemeyer 1994), and feral populations of burros and horses have been established in the Mojave Desert since the late 1800s (Weaver 1974). Over the past 20 or so years, careful land management in support of tortoise conservation has eliminated grazing allotments and feral equines from much of the Mojave and western Sonoran

deserts, particularly within desert tortoise critical habitat. Still, there are areas of the desert – both within and outside of critical habitat – where grazing by domesticated and feral ungulates remains a threat to tortoise populations. In severe drought years our thoughts focus on the negative effects of livestock grazing on tortoise populations and habitat in areas that are still affected.

Scientists generally agree that grazing by livestock and feral equines is unlikely to benefit tortoises or their habitats. Livestock have been known to collapse burrows, crush tortoises, and change the density

and structure of perennial shrubs that tortoises depend on for shade and cover (Berry 1978; Coombs 1979; Webb and Steilstra 1979; Nicholson and Humphreys 1981; Avery and Neibergs 1997). The actions of feral burros are damaging both in terms of overlap in forage preferences with tortoises and in effects on cover of perennial shrubs (Berry et al. 2014b). In more rugged terrain, burros seek shade on the slopes of wash banks, and in doing so, trample and damage caliche exposures, rendering them unsuitable for use by desert tortoises (personal observation by MT).

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An Agassiz's desert tortoise peers from beneath a canopy of red brome, a non-native annual grass spread by grazing livestock. Photo by Beth Jackson.

Letter from the Editor

This issue of the Desert Tortoise Council Newsletter features stories about two important threats to desert tortoise populations, including the effects of livestock grazing in desert tortoise habitat and illegal killing/poaching of tortoises by humans. An additional invited story highlights another threat to turtle populations around the world—the threat of traditional Chinese medicine, a pseudoscience that has contributed to the global decimation of tiger, rhinoceros,

and shark populations, as well as many other rare vertebrate species. In other stories, we celebrate the Golden Anniversary of one of our sister organizations—the California Turtle and Tortoise Club, and learn about intelligence and cognitive abilities in tortoises. This issue also features a review of the new book—*Biology and Conservation of North American Tortoises*.

Important announcements in this issue include the 2015

Morafka Award, open registration for the DTC Workshop, and a new position in our organization—Social Media Coordinator. I also introduce a new feature for this and future issues—the Board of Director Spotlight, a column that introduces (or re-introduces) the DTC Board to our membership.

I am seeking help from our membership for producing future newsletters. If you're interested in contributing in any way, please contact me! I'm especially looking for help from authors who want to

contribute stories, and photographers who want to see their tortoise photos published.

- Michael Tuma

mtuma@ecorpconsulting.com



Photo by Heather Parks

Award Announcement

David J. Morafka 2015 Memorial Research Award

In honor and memory of Prof. David J. Morafka, distinguished herpetologist and authority on North American gopher tortoises, the Desert Tortoise Council, with the aid of several donors, has established a monetary award to help support 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. berlandieri*, and *G. flavomarginatus*.

Award Amount: \$2,000 to be awarded at the Desert Tortoise Council's Annual Symposium, depending on the availability of funding and an appropriate recipient.

Eligibility: Applicants must be associated with a recognized institution (e.g., university, museum, government agency, non-governmental organization) and may be graduate students, post-doctoral students, or other researchers. They

must agree to present a report on the results of the research in which award funds were used at a future symposium of the Desert Tortoise Council.

Evaluation Criteria: 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. Important considerations are the significance and originality of the research problem, design of sampling and analysis, preliminary data supporting the feasibility of the research, and the likelihood of successful completion and publication.

Application Procedure:

1. Download and open an application form from the Desert Tortoise Council's website www.deserttortoise.org. The form is electronically interactive.
2. Provide all information

requested on the application, including a description of the research project in no more than 1,200 words.

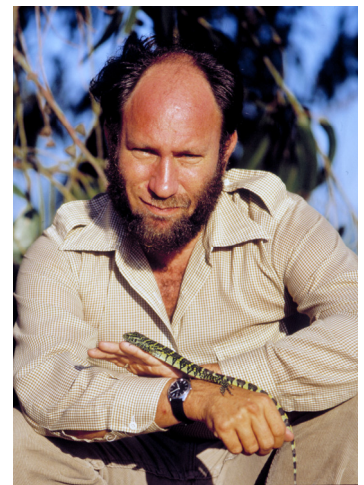
3. Submit the completed application to grstewart@csupomona.edu as a pdf document.

4. Applications must be supported by the applicant's CV and three letters of recommendation, one of which must be from the applicant's research advisor, supervisor, or a knowledgeable colleague. Instruct the recommenders to submit their letters to grstewart@csupomona.edu as pdf documents.

5. All application materials and letters of recommendation must be received by **December 1, 2014**. They will be evaluated by a committee of gopher tortoise biologists appointed by the Desert Tortoise Council Board of Directors.

6. The research award recipient will be notified of his/her

selection by **January 19, 2015** and the award will be presented at the 2015 Desert Tortoise Council Symposium, February 20-22, 2015.



*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 (*Gopherus flavomarginatus*) and Agassiz's desert tortoise (*Gopherus agassizii*), as well as the ecogeography of the Chihuahuan Desert and neonatology of tortoises.*

Livestock Grazing (continued)

One of the most obvious effects of grazing is the removal of native desert annual vegetation and replacement by invasive, non-native plant species, which can significantly change the composition of vegetation within heavily grazed areas. The compaction, erosion, and other disturbances that grazing ungulates cause to soils further increase the spread of non-

fortii), redstem filaree (*Erodium cicutarium*), and the list goes on. Exotic plant species have become far more abundant in the desert ecosystem in recent times, in part due to livestock grazing. Their hardiness and ability to withstand the heavy demands of grazing has facilitated their spread and persistence in desert ecosystems (Oldemeyer 1994). Even long

tary overlap between range cattle and desert tortoises can range from 40% of plant species consumed during dry years to 61% in wet years (Avery and Neibergs 1997). With a very short window of foraging opportunity (anywhere from six weeks to three months; Berry 1978), this could create a shortage of forage for tortoises during a critical time of resource acquisition. Woodbury and Hardy (1948) in their early classic paper on desert tortoises in southwestern Utah perhaps stated it best with the following observation at their study site:

"[Sheep] frequently denude the annual plant cover by grazing and trampling. Often the only annuals and grasses remaining are those which grow about the base of and up through the perennial shrubs and cactuses. The degree of denudation varies somewhat from year to year... The lush carpet of annuals that usually fills up the spaces between the bushes in early spring and sometimes in fall... is normally limited to a 30 to 40 day period in spring and in fall but when the sheep herds sweep the carpet clean the tortoise access to the fresh green vegetation is limited to a few days."

Perhaps the most troubling implications of the effects of grazing ungulates in desert tortoise habitat is that of compromised tortoise nutrition. Tortoises require native annual plants that provide a high nitrogen to potassium (N:K) ratio (Ofstedal and Allen 1996; Ofstedal 2002; Ofstedal et al. 2002), and they seek out these plants, such as desert dandelion (*Malacothrix glabrata*), in areas not affected by grazing

(Avery 1998). In heavily grazed areas, tortoises may only be left with non-native species such as common Mediterranean grass, which has been shown to deplete nitrogen, phosphorus, and water, and cause weight loss in tortoises (Avery 1998; Nagy et al. 1998; Hazard et al. 2010). Thus, changes in the abundance and diversity of native plant species within desert tortoise habitat can contribute to serious nutritional deficiencies in desert tortoises, leading to starvation and reduced fertility in females (Avery and Neibergs 1997).

Finally, we know from survey data that desert tortoise populations do not respond well to the presence of grazing ungulates. Surveys conducted by Keith et al. (2008) showed a negative relationship between tortoise occurrence (sign) and intensity of grazing (cow scat counts). Likewise, Berry et al. (2014b) determined a negative relationship between tortoise occurrence and intensity of sheep grazing. The desert tortoise, as well as native annual and perennial plants in desert communities, did not evolve to compensate for or adapt to coexisting with a high density of large, grazing ungulates (Oldemeyer 1994) and, therefore, are ill-equipped to cope with the significant ecological changes that they create. Can we blame livestock and feral equine grazing for single-handedly causing the decline of desert tortoise populations across its range? Doubtful. Like many other federally listed species, the reasons for population decline are complicated

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A herd of trespass cattle in the Gold Butte-Pakoon desert tortoise Critical Habitat Unit in southern Nevada. Photo by Michael Tuma.

native weed seeds and impede the ability of native vegetation to compete (Belsky and Gelbard 2000). Watering features provided by ranchers to their livestock are particularly detrimental in the spread of invasive plants (Brooks et al. 2006). Once established, exotic plants may dominate annual plant biomass, especially during drought years and particularly where soil disturbances occur (Brooks and Berry 2006). We are all too familiar with some of the common culprits: Mediterranean grass (*Schismus* spp.), red brome (*Bromus madritensis*), Sahara mustard (*Brassica tourne-*

after grazing ungulates are removed from desert tortoise habitat, the presence of established populations of exotic annual plant species threatens the health of desert ecosystems.

The diets of grazing ungulates overlap considerably with desert tortoises, the degree to which depends on the amount of rainfall in a given year. Typically, this overlap is most obvious in spring, when annual biomass is at its peak. Both tortoises and ungulates primarily feed on forbs and grasses (Avery and Neibergs 1997; Germano et al. 1994), and die-

Event Announcements

Registration Remains Open for 2014 DTC Workshop

Registration remains open for the 24th Annual DTC Workshop, Introduction to Desert Tortoises and Field Techniques, will be held in Ridgecrest, California. There will be two identical sessions to choose from—the first on November 1 and 2 (Sat-Sun) and the second on November 3 and 4 (Mon-Tue), 2014. Information for the workshop is available on the DTC website (<http://www.deserttortoise.org/workshop.html>).

The workshop is designed es-

pecially for entry-level field biologists with a solid understanding of vertebrate biology and ecology, and is structured to provide information on the biology of Agassiz's desert tortoise and the field techniques of monitoring and surveying, including:

- ◆ hands-on exercises in monitoring and surveying techniques for desert tortoises;
- ◆ authorized demonstrations of egg handling and burrow construction; and

- ◆ classroom overviews of the desert tortoise and threats to its survival.

The workshop consists of morning lectures by experienced tortoise biologists and field workers and afternoons of field experience locating tortoises.

This DTC Workshop is recognized as valuable training course by the U.S. Fish and Wildlife Service, but a letter certifying course completion (including attendance and completing the on line test), does not guarantee that the Service

or any other agency will permit or authorize you to handle tortoises, move eggs, construct burrows, collect survey data, etc. However, completion of the workshop may be an important aspect in gaining agency permission/authorization.



The DTC Workshop is well-attended each year. Reserve your spot now!

Gopher Tortoise Council 36th Annual Meeting

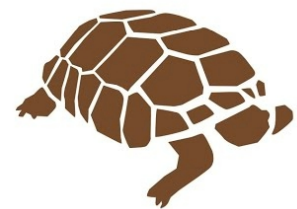
The 36th Annual Gopher Tortoise Council Meeting will be held on October 16-18, 2014 at the Creekside Center in Chehaw Park, located in Albany, Georgia. This meeting provides an excellent opportunity for students and professionals to present their work, share ideas, and collaborate on projects. However, topics are not

limited to gopher tortoises and can include a number of topics related to upland habitat and associated species.

Student Travel awards will be available, as well as awards for best Student Presentation and Poster. Friday afternoon will feature.

The agenda, which can be found on the Gopher Tortoise

Council website (<http://www.gophertortoisecouncil.org/annual-meeting/>), will feature a Tortoise Health Working Group on Thursday, a session on Land Management and Priority Species Conservation in the Southeast on Friday morning, a field visit to a nearby site to observe ongoing gopher tortoise habitat man-



agement actions on Friday afternoon, and contributed paper sessions on Saturday.

Annual DTC Symposium Approaches

The 40th Annual Meeting and Symposium of the Desert Tortoise Council are less than 6 months away and it is time to reserve February 20-22, 2015 on your calendars for the celebration. The program will feature some long-term supporters and friends as well as new and exciting featured speakers. David Rostal, the senior editors of the newly published book, *Biology and Conservation of*

North American Tortoises, will be with us to talk about this multi-authored book. The Council will be selling the book at a special low rate and there will be a book signing. Many of the book authors are expected to attend. One featured session will summarize a 15-year research study of *Gopherus morafkai* in Mexico, organized by Mercy Vaughn. Cristina Jones has several speakers lined up

for a companion session on *Gopherus morafkai* in Arizona. The Saturday morning session will feature presentations on the common raven. Pete Coates who has published several papers on this species and has research projects underway in the Great Basin on common ravens and sage grouse, is chairing this session. Several other people have already made arrangements to speak.

Papers summarizing a substantial body of work, new scientific findings, and opinion pieces are welcome. Abstracts are due by December 1 to Program Chair, Kristin Berry, at kristin_berry@usgs.gov. If your abstract cannot be finalized by December 1 and you wish to reserve a speaking slot early, please contact the Program Chair.

CTTC Celebrates 50 Years

by M. A. Cohen

On Saturday, July 12, 2014 at Ayres Hall on the grounds of the Los Angeles Arboretum, members of the California Turtle & Tortoise Club and honored guests gathered to celebrate the golden anniversary of the Club. CTTC Executive Board Vice-chair Robin Robb and her event-planning team created a memorable affair that was enjoyed by all in



Executive Board Chair Dave Friend at the podium. Photo by Kenneth Tang.

attendance. Upon arrival, attendees were greeted by a breakfast spread of fresh fruit platters and an array of delectable baked treats provided by caterer Genevieve Rheume.

Current Chair of the Executive Board and Master of Ceremonies Dave Friend opened the festivities by welcoming the assembled guests. Following his opening remarks, Dr. Michael J. Connor, the California Director for the Western Watersheds Project, former editor of the Tortuga Gazette, developer and webmaster of the CTTC web site, and former Chair of the CTTC Executive Board, provided an entertaining history of the Club. Dr. Connor's presentation was followed by a musical perfor-

mance by CTTC Foothill Chapter's Sharon Uretz, who led the guests in a 50th Anniversary song, the lyrics of which she composed.

Dr. Fred Caporaso from Chapman University in Orange, California spoke about his experiences during 22 trips to the Galápagos Islands. His presentation was titled "Galápagos Tortoise Update: Lonesome George is Gone, but Sound Science and Serendipity May Spell Recovery for these Gentle Giants!" Dr. Caporaso talked about the remarkable work the Conservancy does to preserve the global treasure known as the Galápagos Islands, and provided copies of the latest newsletter from the Galápagos Conservancy.

The luncheon buffet, a variety of appetizing fare, was catered by the Stonefire Grill. Desserts included a custom CTTC-themed cake provided by Executive Board Secretary Lisa Winn. During the luncheon, Jim Misiak, President of Chino Chapter, gave a PowerPoint presentation that documented the history of CTTC.



Dr. Caporaso giving his presentation on the Galápagos Islands, with special emphasis on the native tortoises. Photo by Kenneth Tang.



Dr. Marc Graff, past Chair of the CTTC Executive Board, receiving an award from Robin Robb. Photo by Kenneth Tang.

Following lunch, Michael Tuma, PhD Candidate at the University of Southern California and Desert Tortoise Council Board member, gave a presentation entitled "Tortoises Through the Eyes of a Biologist: What Can Wild Tortoises Tell Us about our Pets?" He spoke about the evolution, life history, physiology, and behaviors of wild tortoises, and how such knowledge can be adapted to our keeping and interacting with our pets. After Mr. Tuma's presentation, Ed LaRue, member of the Desert Tortoise Council Board of Directors, DTC recording secretary, and chair of the DTC Ecosystem Advisory Committee, spoke about the activities of the DTC over the previous year.

Following the conclusion of the presentations, Robin Robb awarded plaques to a number of CTTC members, honoring them for their dedication and leadership in service to the Club. She also distributed gift bags to each of the event planning team members, whose collective effort made the day so memorable. The awards and gifts were followed by a raffle



drawing and silent auction, which was coordinated by event planning team member Abigail DeSesa, and the winners claimed an appealing assortment of prizes. Master of Ceremonies Dave Friend closed the celebration festivities with inspiring remarks about his term as Chair of the Executive Board and his membership in the Club. As the event concluded, each attendee was presented with a souvenir of the celebration: a commemorative 50th Anniversary wine glass complemented by chocolates.



Executive Board Vice-chair Robin Robb presents an award to Peggy Nichols, one of the founders of CTTC. Photo by Kenneth Tang.

Board of Directors Spotlight

Ed LaRue

Having propagated whooping cranes and Andean condors for USFWS 1978-1982, received his B.S. from Virginia Tech in 1982, worked on the Puerto Rican parrot project 1983-1986, received his M.S. from Ohio State in 1987, and worked for New York Chapter of The Nature Conservancy in 1988, Ed arrived in the Mojave Desert in December 1988. In 1989 he joined Larry LaPré at Tierra Madre Consultants, Inc., and since 1994 has drafted more than 750 tortoise reports with partner Sharon Dougherty

at Circle Mountain Biological Consultants, Inc.

In November 1991, Ed joined the Desert Tortoise Council as a Board Member, serving as Recording Secretary 1993-2004, Corresponding Secretary 1997-2004, and as a Desert Tortoise Preserve Committee Board Member 1994-1996. In 1994, he drafted the "Guidelines for Handling Desert Tortoises during Construction Projects," and served as a BLM biologist drafting the West Mojave Plan 1998-2004.

Ed served as emcee for the Council's Techniques Workshop 1993-2013, and has been an instructor since 2011. Between 1992 and 1997, Ed drafted the federal Habitat Conservation Plans for the 1st, 2nd, and 7th 10(a)(1)(B) tortoise permits in California. Ed rejoined the Council Board in 2011 where he serves as the Ecosystems Advisory Committee Chair and Recording Secretary.



Peter Woodman

Born and raised in China Lake, California, Peter counts, in addition to his parents, three mentors who greatly shaped his life: Dr. Carl Heller with the China Lake Mountain Rescue Group, Don Moore for broadening his view of natural history, and Dr. Kristin Berry for an introduction to the scientific method via desert tortoise research. Peter was in high school when he received his first opportunity to work with desert tortoises, serving as a volunteer field assistant for Dr. Berry, who received her first contract to conduct desert tortoise studies on the China Lake ranges in the early 1970s.

During the course of the study Peter and two other high school recruits were picked up by Kristin in her VW Bug after school and on weekends, and assisted her with population assessments, behavioral observations, or tracking their movements (using only their footprints). Since his graduation from CSU Fresno in 1978, Peter has spent thousands of days on a wide variety of desert tortoise projects from the tropical deciduous forest of northern Sinaloa, Mexico to the Mojave and Sonoran deserts of the U.S. and Mexico. His work has included a mix of research-oriented studies, population

monitoring assessments, and construction monitoring projects. He has conducted surveys on most of the 30 tortoise population trend plots in Arizona and California, line distance transect surveys in support of range-wide population monitoring, and assessments of tortoise translocation efforts. Peter has emulated Dr. Berry's practice of teaching throughout his career, and has

trained hundreds of tortoise biologists over the years. He has been an integral part of DTC field techniques workshops since their inception.



DTC Board of Directors

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The Threat of Traditional Medicine: China's Boom May Mean Doom for Turtles

by Erin Crandall

For thousands of years turtles have been used in Chinese traditional medicine to treat a wide variety of ailments and diseases. Originally published in the journal *Radiata* and recently republished *HerpDigest* David S. Lee and Liao Shi Kun write, “[In Chinese culture] turtles are symbolic of long life, personal wealth, fertility, strength, and happy households.”

Despite a lack of scientific evidence demonstrating a causative link between turtle consumption and medicinal benefits, many people in China believe they provide benefits such

“Approximately 90 percent of China’s modern day society believes that traditional Chinese medicines work, and are supportive of the exploitation of wildlife for their use.”

as maintaining youthful beauty in women and improving sexual function in men. Because of these beliefs and their symbolic importance, turtles have been highly sought after for more than 3,000 years. However, in recent years, China’s economy has changed in a way that has become increasingly threatening to the country’s wild turtle populations.

The most common species used are the yellow pond turtle (*Mauremys mutica*), the Chinese three-striped box turtle (*Cuora*

trifasciata), the yellow-margined box turtle (*Cuora flavomarginata*), the Chinese big-headed turtle (*Platysternon megacephalum*), Reeves’ turtle (*Mauremys reevesii*), the red-eared slider (*Trachemys scripta elegans*) and Chinese soft-shell turtle (*Pelodiscus sinensis*). Many of these species—including the Chinese three-striped and yellow margined box turtle and the Chinese big-headed turtle—are either extinct or are dangerously close to it in the wild.

In traditional medicine, every last part of the turtle is consumed, including their turtle meat, as well as their skin, heads, eggs, shells and even their blood, urine, and bile. The eggs, blood and bile are all added to wine to provide particular cures, whereas the skin and head are eaten alone. The shell can either be ground into powder or boiled in water, and the urine is used as drops in the ear or consumed as a beverage.

These various concoctions are believed to cure coughs, prolapse of the rectum, deafness, cancer and everything in between. The wide variety of uses as well as the simple fact that they can be transported and kept alive for long periods of time post-capture has made turtles highly desirable ingredients for traditional medicine.

As previously mentioned, turtles have been consumed this way for thousands of years. So why are there suddenly growing conservation concerns when there never were in the

past? The problem lies with China’s booming population coupled with a traditional mindset when it comes to medicine.

“Approximately 90 percent of China’s modern day society believes that traditional Chinese medicines work, and are supportive of the exploitation of wildlife for their use,” write the authors.

With China’s population at 1.3 billion and growing, demand for turtles is also increasing. On top of population growth, China’s economy has improved greatly in recent years and more families are able to afford turtles, further increasing the demand. In addition to direct harvesting, economic growth has led to urban expansion and consequential destruction of aquatic wildlife habitat and heavy pollution of what remains nearby.

Many commercial turtle farms have been started in an attempt to meet the demand for turtles. But rather than alleviate pressure on wild populations, commercial farming has actually increased it. According to the authors, because of the inherent health issues involved in commercial farming such as the use of hormones and antibiotics, along with the belief that wild-caught and native turtles have the greatest medical benefits, the presence of commercial turtle farms has actually resulted in further exploitation of wild populations.

Because of entrenched cultural and economic factors, the au-



Turtles offered for sale in a market in Yangzhou, China. Photo by Vladimir Menkov.

thors believe the exploitation of turtles is not likely to change substantially even in the distant future unless large-scale shifts occur. They speculate that technological and social advancements, along with government intervention, could offer some relief.

“China represents a vast untapped market for prescription drugs and other tested modern medicines,” the authors write. “Perhaps profit driven investments by the pharmaceutical industry will one day result in indirect long-term benefits to the Chinese people as well as turtle conservation. The wide spread use of the Internet presents the opportunity to educate the general populace about modern medicines as well the growing conservation needs of the country’s indigenous iconic fauna.

“With the right level of private sector and government dedication this could all be turned about rather quickly.”

This article was reprinted with the permission of Mongabay.com. The original story may be found at <http://news.mongabay.com/2014/0808-crandall-turtles-traditional-medicine.html>

Livestock Grazing (continued)

and can be related to a jigsaw puzzle; one threat leads to another, which exacerbates another, which creates another, and so on and so forth. Nonetheless, the effects of grazing ungulates are a real threat to tortoises, and importantly, are widespread where they occur. Fortunately, this threat is one that can be (at least in theory) easily managed. Grazing allotments can be retired, trespass cattle can be removed, and feral horses and burros can be rounded up. Much has already been done to remove the threat of grazing ungulates from desert tortoise habitat. In 1990, the year the desert tortoise was federally listed, the BLM in California closed sheep grazing in what was to become critical habitat. In the late 1990s, at the request of the BLM, the Desert Tortoise Preserve Committee, Inc. and the Wildlands Conservancy purchased 1,360 acres of the Blackwater Well Ranch (Pilot Knob allotment) on lands that were subsequently designated critical habitat. In Nevada, many grazing allot-

ments have been purchased through implementation of the Clark County Multiple Species Habitat Conservation Plan grazing. Several grazing allotments were purchased and closed as part of mitigation for the Fort Irwin Land Expansion Project. Despite these successes and others, much remains to be accomplished to completely remove the threat of grazing livestock and feral horses and burros from desert tortoise habitat. There are critical habitat units where grazing allotments remain open and areas where illegal trespassing by livestock is allowed to continue. Thriving populations of feral burros and horses still persist in many areas designated as desert tortoise critical habitat. Outside of critical habitat, there are many opportunities to remove grazing ungulates from important areas that support viable desert tortoise populations and dispersal corridors between them.

With a continued focus on scientific studies into the ef-

fects of grazing on desert tortoise populations and their habitat, increased public awareness of the problem, and decisions by policy makers and public land management agencies to reduce and/or eliminate ungulate grazing in tortoise habitat altogether, we can be confident that desert tortoise populations will continue to recover in the face of this threat.

Now for that desert dandelion feast...

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Livestock grazing has a long history in the Mojave Desert, as evidenced by this historic cattle pen in the Gold Butte Critical Habitat Unit in southern Nevada. Photo by Michael Tuma.

Tortoises Show Off Smarts by Mastering Touch-Screen Tech

by Laura Geggel

Touch-screen technology has ventured into the world of reptiles. Red-footed tortoises have learned how to use the device in exchange for a strawberry, a new study reports.

Researchers taught the tortoises a few touch-screen basics in order to learn about the animals' navigational techniques. The tortoises not only mastered the task in exchange for strawberries, but the animals also transferred their knowledge to a real-life setting.

"Generally people see reptiles as inert, stupid and unresponsive," said Anna Wilkinson, one of the study's lead researchers and a senior lecturer of animal cognition at the University of Lincoln in England. "I would like people to see that there is something much more complex going on."

Red-footed tortoises are inquisitive and eager to eat treats, making them good test subjects, Wilkinson said. The tortoises, which are native to Central and South America, don't have a hippocampus, an area of the brain associated with learning, memory and spatial

navigation, Wilkinson said. Instead, red-footed tortoises may rely on an area of the brain called the medial cortex, an area associated with complex cognitive behavior and decision making in people. To understand how tortoises learn, the researchers tested how the reptiles relied on cues to get around.

Wilkinson's colleagues at the University of Vienna gave the tortoises treats when the reptiles looked at, approached and then pecked on the screen.

The four red-footed tortoises in the study learned how to use touch screens fairly quickly, Wilkinson said.

"It's comparable to the speed with which the pigeons and rats do it," Wilkinson told Live Science. "I've trained dogs to use a touch screen and I'd say the tortoises are faster."

Their speedy learning is in line with the fact that tortoise hatchlings don't receive parental care, so they have to learn how to make decisions about food and shelter for themselves from the moment they hatch, she added.

In the main experiment, the tortoises pecked a red triangle in the center of the touch screen. When two blue circles flashed, they had to consistently peck either the circle on the right or the one on the left to get a treat.

All four of the tortoises mastered the touch-screen task, but two eventually stopped cooperating, possibly because they

were too small to properly reach the screen, Wilkinson said.

The remaining two tortoises applied their knowledge to a real-life situation in the next part of the experiment, Wilkinson said. The researchers placed them in an arena with two blue empty food bowls that looked like the blue circles on the touch screen. The tortoises went to the bowl on the same side as the circles they were trained to peck on the screen.

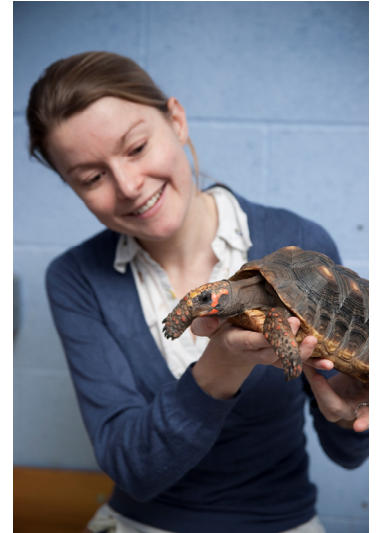
However, it's possible that the tortoises weren't transferring knowledge, but simply had a preferred side, said Jennifer Vonk, an associate professor of psychology at Oakland University in Michigan, who was not involved with the study.

The researchers trained the tortoises to go to the opposite bowl in the arena to see how flexible they were, but once reintroduced to the touch screens three months later, the tortoises immediately began pecking on the same side as before.

This behavior shouldn't come as a surprise, said Vonk, who has trained orangutans, gorillas, chimpanzees and black bears to use touch screens.

"Side biases on touch screens are pretty strong," Vonk told Live Science. "As an animal gets used to responding to a stimulus on one side, it can be pretty hard to break."

The new findings will help researchers compare the per-



One of the study's authors, Anna Wilkinson, with Moses, a test subject in the study examining mechanisms underlying tortoise spatial navigation.

ceptual and cognitive abilities of tortoises to other animals that can perform the same tasks, Vonk said. The experiment also reinforces other findings that tortoises are intelligent creatures.

"If you are taking on a reptile, you do need to consider their cognitive enrichment," Wilkinson said.

The study was published in the July issue of the journal *Behavioral Processes*.

Mueller-Paul, J., A. Wilkinson, U. Aust, M. Steurer, G. Hall, and L. Huber. 2014. Touchscreen performance and knowledge transfer in the red-footed tortoise (*Chelonoidis carbonaria*). *Behavioural Processes* 106:187–192.

This article was reprinted with permission from LiveScience.com. The original story may be found at: <http://www.livescience.com/47155-tortoise-touchscreen-learning.html>.



The study's authors assessed whether red-footed tortoises (*Chelonoidis carbonarius*) could master touchscreen technology and transfer that knowledge to a spatial arena.

Book Review

Biology and Conservation of North American Tortoises

by Margaret Fusari

Edited by 3 tortoise researchers and authored by 33 this book is a valued reference for anyone who wants to review North American tortoise systematics, taxonomy, phylogeny, genetics, morphology, paleontology, physiology, behavior, reproduction, diet, growth, health, ecology, biology, distribution, and perhaps most important—conservation status and issues.

The (current) five species; *Gopherus agassizii*, *G. morafkai*, *G. berlandieri*, *G. flavomarginatus*, and *G. polyphemus* are all in need of protection based on sound science and its interpretation. This volume will help readers understand tortoises better and help a lot of new researchers locate references because of the extensive bibliography.

Reading the Preface one is struck by what the book could not do; come to an agreement as to what to call the tortoises. *Gopherus* or *Xerobates*, Agassiz's or Mojave, Morafka's or Sonoran, Mojave or Mohave? But rather than be disappointed I am impressed that we begin by realizing that we do not know it all yet; that more work does need to be done.

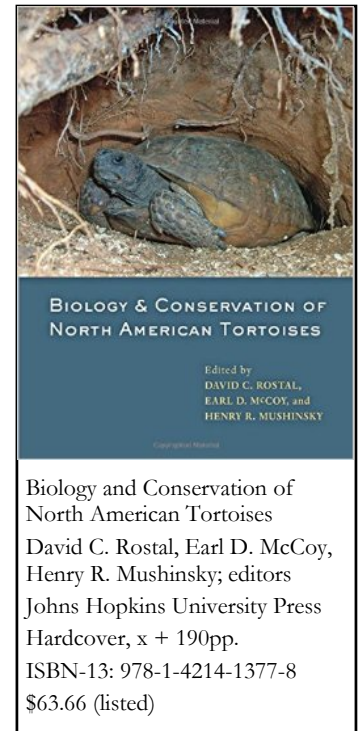
The word "variable" appears frequently throughout the book. Each group of chapter authors has gathered the references that exist and presented a synopsis of what is known. Because of variable methods used by the various researchers

and by the differences among populations, species, geographies, recent climate histories, and seasons, the data we have show high variability. Beyond the variability in the references is that of the tortoises themselves in foraging and diet, habitat use, reproductive strategy, social interaction, and the overall opportunism that both desert and mesic species must show to survive.

Here are a few stand out conclusions coming from multiple chapters:

- There are two major lineages with further speciation events on each. The first chapter presents the anatomical evidence, the third the genetic evidence and the second an overview of the fossil record.
- There is high variation in forage species composition and use due to geography, recent climate/weather, fire, grazing, and weed invasions. Understanding regionally important forage potential helps to identify long term habitat and/or restoration needs.
- Tortoises are ectotherms with a microenvironment awareness superior to that of us endotherms. The potential impacts of climate change become clear because the local thermal (as well as nutritional and reproductive) environments are going to change out of the adaptive range of the local tortoises.
- In terms of tortoise reproduction the temperature dependent sex determination is important in any discussion of climate change impacts; growth patterns depend on resource availability and quality; and tortoises are social! They live in groups, they know each other (male-male and female-female), and they can reestablish their social structure as changes occur given appropriate opportunities. (In other words moving tortoises around has to be done carefully and with patience.)
- There is a comprehensive introduction to the multiple diseases the tortoises face with a glossary to help with the complex concepts. The warning that stress can exacerbate disease and the reference to the changing frequency of epizootic episodes is worth a lot of attention as human impacts change the way diseases affect the mortality of tortoises in the field.
- In Chapter 17, the names Cracker chicken and Hoover chicken cleverly explain one change in why people needed to eat wild tortoises. Many people used to eat tortoises and moved them around a lot over many decades or centuries, a fact we need to remember in geographic analysis and conservation strategy.
- Chapter 18 on threats and conservation is a must read for the complexity of the issues that tortoises face and to see possibilities for better focus and cooperation in supporting the future of tortoises and habitat.

Hopefully the book will be updated as more information becomes available. There are a few references missing. Some chapters contain highly technical terms that will send readers to a scientific dictionary. There is no warning that to handle tortoises almost always requires permits and training. But overall this book is well worth having.



Editor's Note: Copies of Biology and Conservation of North American Tortoises are now available from the Desert Tortoise Council at a hugely discounted rate: \$45.00 for members and \$50 for non-members. Copies will be available for purchase at the Council's Desert Tortoises and Field Techniques workshop in Ridgecrest, California in November, as well as the Annual Symposium in Las Vegas in February.

Long-term AZGFD Study Compromised by Tortoise Shooting

By L. Lambert

The Arizona Game and Fish Department is asking for the public's help in solving a case involving the unlawful killing of a Morafka's desert tortoise near the Beeline Highway, about 15 miles north of Fountain Hills in Game Management Unit 22.

The juvenile tortoise, which had a transmitter affixed in 2010, was observed alive on August 18th during routine monitoring by the department's nongame biologists, but was found dead by the biologists on August 25th. Investigators believe the tortoise was killed around August 20th. The tortoise had apparently succumbed to several gunshots.

"The illegal killing of wildlife is always a concern, especially when that animal is non-threatening like the tortoise and it's part of a long-running research study," said Josh Hurst, the Operation Game Thief coordinator for Game and Fish. "The department has been conducting research for years to monitor and conserve desert tortoises – a protected species – in an effort to help keep them off the federal Endangered Species List. Now the study has one less animal and years of study data is compromised."

The tortoise was also part of Game and Fish's Sponsor-A-Turtle Program. A member of the public had been sponsoring this tortoise as a means of supporting the on-going research effort.

The tortoise, numbered 679 in the long-term research study, was the second tortoise to have a transmitter affixed and had provided some of the longest-running data to the study. Biologists began tracking the female in 2010 and have since located her nearly 300 times. A total of 15 juvenile tortoises have transmitters and this was the first mortality among the

"Tortoise 679 was the second tortoise in the long-term study to have a transmitter affixed and had provided some of the longest-running data."

group.

The study is the first of its kind for juvenile tortoises because



Tortoise 679 was part of a long-running research study.



Carcass of Tortoise 679. Investigators believe the tortoise was killed on or around Aug. 20 2014.

they are very difficult to find due to their small size and cryptic nature. So far, it has revealed that even juvenile tortoises make long-distance movements to set up new home ranges, a pattern previously thought to occur only in adults.

Public interest in the incident has raised the reward being offered for information that leads to the case being solved. In addition to the \$500 being offered through the Arizona Game and Fish Department's Operation Game Thief, private individuals and organizations including the Arizona Herpetological Association, Desert Tortoise Council, Phoenix Herpetological Society, Sierra Club, Tucson Herpetological Society and Turtle and Tortoise Preservation Group have pledged and will reward an additional \$1,850 in the event of a conviction.

"The public outcry over this case is exactly what you'd expect when a non-threatening animal like a tortoise is shot multiple times and killed," said Hurst.

Anyone with information about this killing can call the department's Operation Game Thief hotline toll-free at (800) 352-0700 or visit www.azgfd.gov/thief and refer to case #14-002388. Callers may be eligible for a reward from the various entities that have pledged reward money in this case. All calls may remain confidential upon request.

Special Announcements

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 mem-

bers, and available for free download from our website (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 Michael Tuma at mtuma@ecorpconsulting.com.

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Position Announcement: DTC Social Media Coordinator

The Desert Tortoise Council, a non-profit organization with a mission of promoting the conservation of wild desert tortoise populations and their habitats, is seeking a Social Media Coordinator who will assist in the development and maintenance of the Council's

presence and message on various social media platforms. This is a volunteer position. The ideal candidate would be an existing member of the Desert Tortoise Council who is social media savvy, and who wishes to become more involved in the mission of the

Desert Tortoise Council. If you are interested learning more about the Social Media Coordinator position, please contact Chris Noddings at chris.noddings@cardnogs.com and enter "DTC Social Media Coordinator" in the subject line.



Photo Gallery



Agassiz's Desert Tortoise

Photo by Robb Hannawacker



Gopher Tortoise

Photo by Jay Williams



Texas Tortoise

Photo by Clinton & Charles Robertson

*The Desert Tortoise Council was established in 1976 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* and *Gopherus morafkai*.*