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California Turtle & Tortoise Club

The Tortuga Gazette

Volume 58, Number 1 • January/February 2022

A northern map turtle, *Graptemys geographica*, photographed in habitat in Shannon County, Missouri. Notice the network of pale yellow "roadmap" lines on its carapace. Photo © 2017 by Paul Paplanus

featured species

Northern Map Turtle, *Graptemys geographica* (LeSeuer, 1817)

The Northern Map Turtle

by M. A. Cohen

The most plentiful species of *Graptemys,* the northern or common map turtle (*G. geographica*) is also the most widely dispersed member of this native North American genus. The common name of the genus, 'map turtle,' derives from the network of lines that appear on its carapace and resemble the graphic markings on a map.

Although the species' common name 'common' map turtle continues to appear in print, Brian Crother and colleagues writing for the Society for the Study of Reptiles and Amphibians in 2008 renamed the species the 'northern' map turtle, "because of the possibility that the word 'common' might be misinterpreted to imply abundance rather than to the fact that it has a broad geographic distribution" (Crother, et. al, 2008). The common name 'northern' is now widely accepted by the scientific community.

First formally described by the French naturalist and explorer Charles Alexandre LeSeuer (1778-1846) in 1817, the northern map turtle is a member of the Emydidae, the chelonian family of semi-aquatic or basking turtles.

The genus name *Graptemys* derives from the Greek word roots *grapho-*, meaning write, and *-emys*, meaning a freshwater turtle. The species name *geographica* also derives from Greek word roots, *geo-*, meaning earth, and again *-grapho*, meaning write.

There are no recognized subspecies of the northern map turtle.

Description

Described as a medium- to large-sized species, the northern map turtle has a distinctively marked carapace from which the genus derives its common name. The carapacial background is typically olive to brown with a network of yellow, orange, or tan markings that resemble

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waterways or highways on a topographic map.

The pigment of the carapace typically becomes darker as the turtle ages and its the comparatively bright markings tend to fade so that any remaining patterning may be visible only when the turtle's shell is wet. Additionally, the markings may also be obscured by the growth of algae on the carapace.

The plastron of the species is usually pale yellow, and often has darker pigment at the seams of the plastral scutes. A younger individual may have additional darker markings on its plastron that tend to fade as the turtle matures. In an older individual, the plastron may be only faintly marked or uniformly yellow in color.

As a hatchling/juvenile, the northern map turtle has a pronounced medial keel on its carapace that becomes somewhat flattened as the turtle matures. The carapace of the adult is comparatively broad and only moderately keeled.

There is considerable sexual dimorphism in both size and shape within *G. geographica*. Substantially larger than the males, the females vary from 7.5 to 10.5 inches (19 to 26.7 centimeters) in carapace length, while the males are generally 3.5 to 6.5 inches (8.9 to 16.5 centimeters) long.

In addition to being much smaller, the male northern map turtle has a more pronounced carapacial keel at maturity, a narrower head, noticeably longer front claws, and a longer, thicker tail than that of the female (Donato, 2000).

Head shot of a male northern map turtle photographed at the Red Cedar River in Ingham County, Michigan.
Photo © 2009 by James Harding

Shape differences between male and female northern map turtles include a comparatively rounded carapace in the female whereas that of the male is more oval. The head of the female is larger and broader than that of the male, enabling her to consume larger hard-shelled prey than the male.

As is typical of many turtle species, the tail of the male northern map turtle is comparatively longer and thicker than that of the female. The claws on his forefeet are longer than those of the female.

Yellow striping on the head, neck, and limbs is the single most common marking found on semi-aquatic turtles worldwide. These light stripes on a darker background provide camouflage in a wetland ecosystem with submerged aquatic vegetation, affording the striped turtle some protection from predators (Gibbons and Greene, 2009).

G. geographica hatches with the stripes on its skin and retains those markings throughout its life. The species has thin yellow, yellow-orange, or yellow-green striping on an olive, brown, or black background on its head, neck, and limbs. With the abundance of aquatic vegetation in its preferred habitats, the yellow striping helps disguise the northern map turtle when it is underwater.

Range and Habitat

Endemic to North America, the upper reaches of the northern map turtle's range are Quebec and Ontario in southern Canada. Alabama and Arkansas, Tennessee, and northern Georgia in the southern United States are the southernmost reaches of the species. The species ranges west throughout the Great Lakes to southern Wisconsin and eastern Minnesota, as well as through Kansas and northern Oklahoma. The species also inhabits the Susquehanna River system in Pennsylvania and Maryland and the Delaware River (Donato, 2000), but is rarely found in the Mississippi River (Partymiller).

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The northern map turtle also inhabits river drainages in the northeastern United States that empty into the Atlantic Ocean as well as drainages in the southeastern United States that empty into the Gulf of Mexico.

Preferring aquatic biomes[1] such as large lakes and rivers with sand- and gravel-covered substrates, the northern map turtle requires basking places such as fallen logs, snags, and rocks. Clear, flowing fresh water, plentiful underwater vegetation, copious food sources, and an abundance of hiding places are the habitat features preferred by the species (Partymiller).

Natural History

An avid but wary basking turtle, *G. geographica* spends much of the day during warm weather out of the water sunbathing on any suitable surface. Naturalists and hikers often observe individuals sunning themselves as well as communally basking in groups of their own species or with sympatric species (other species occurring in the same geographical area).

Diurnal in their activity patterns, meaning they are active during the daylight hours, northern map turtles spend their time during warm weather either foraging for food in morning and late afternoon or basking at midday. The species is shy by nature, and the slightest disturbance or perceived threat will cause the turtle(s) to dive into the water seeking escape and concealment.

Known as brumation, cold weather dormancy is a state of torpor in reptiles that involves reduced metabolic activity, thus conserving energy during periods of lower air temperatures and diminished daylight hours when food is comparatively scarce.

[1]**biome**: according to National Geographic, a biome is a "specific geographical area" that is the plants and animals that live within it. Compare to **ecosystem**, described as the "interaction between the living and non-living things in an environment."

Brumation in *G. geographica* generally occurs from November through March depending on the ambient temperature. In the northerly reaches of its range, brumation commences earlier and lasts longer, while in the southerly portions brumation may begin later and last for a shorter period of time, depending on meteorological factors.

A recently hatched northern map turtle photographed in Ingham County, Michigan. Notice the "egg tooth" (known in biology as a caruncle) on the hatchling's snout. This sharp, keratinous point helps the turtle break its egg shell. Following hatching, the egg tooth falls off the snout within a few days. **Photo © 2009 by James Harding**

Spending the winter months underwater, the northern map turtle brumates on the bottom surface of the waterbody or wedged beneath submerged rocks or logs. During brumation, *G. geographica* does not surface to breathe air and instead absorbs oxygen from the water (Northern Map Turtle).

Feeding and Foods

Northern map turtles always feed in the water. While the species is technically omnivorous, it tends toward carnivorous in its feeding behavior. *G. geographica* as a species consumes a variety of prey items. Vegetation is sometimes consumed deliberately or incidentally in the course of foraging for mollusks and other invertebrate prey.

Because of the differences in the sizes and strength of their jaws, the diets of the male and female turtles vary. The jaws of the female *G. geographica* are much stronger and broader than those of the male and their crushing surfaces enable her to consume hard-shelled mollusks such as large freshwater clams, as well as crustaceans, gastropods (snails, slugs, and whelks), and insects, primarily the larvae. With its smaller, narrower jaws, the male turtle consumes smaller mollusks, gastropods, and insects and their larvae (Northern Map Turtle). Both males and females occasionally consume carrion, mainly dead fish (Donato, 2000; Ernst and Lovich, 2009.).

Northern map turtles will bask on any suitable surface. This turtle is perched on a duck decoy in Peterborough, Ontario, Canada. **Photo © 2021 by sabrinaadam**

Reproduction

As with most chelonian species, the northern map turtle is subject to temperature-dependent sex determination, the specific pattern of which is TSD-1a (Ernst and Lovich, 2000). Warmer

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Northern map turtles communally basking on a rock in Grande Isle County, Vermont. Photo © 2019 by hobiecat

incubation temperatures, 86 to 95 °F (30 to 35 °C), produce females while cooler nest temperatures, 77 °F (25 °C), yield males, and intermediate incubation temperatures bring forth a combination of males and females.

Although mating may occur at any time from spring through fall, most nesting takes place from late May to mid-July. Nests are always close to the water's edge, and females prefer a sandy, sunny location in which to nest. When eggs are laid earlier in the season, hatchlings generally emerge from the nest in late summer (August to September). However, hatchlings that emerge from their eggs later in the year tend to overwinter in the nest until the weather warms up the following spring.

While clutch size estimates differ from one resource to another, most authorities cite clutch sizes somewhere between 6 and 20 eggs with females typically laying 2 or more clutches each year.

Threats

As of 2010, the International Union for the Conservation of Nature (IUCN) assessed *G. geographica* as being a species of "least concern" but added the annotation that this assessment "needs updating."

At the time of assessment, the IUCN deemed the population trend to be "stable" but noted that populations were "severely fragmented" with declines in the number of mature individuals and in the extent and quality of their habitats.

In its assessment, the IUCN cites several types of threat to the species, including water pollution, construction of residential and industrial developments, as well as dams, stream modification and alteration, and other water management practices (van Dijk, 2011, Ernst and Lovich, 2009).

Waterfront land developments continue to destroy breeding sites used by *G. geographica*, and highway traffic kills significant numbers of females as they migrate overland to their breeding sites in spring (Donato, 2000). Boat propeller injuries also pose a threat to the species (Ernst and Lovich, 2009).

In nine states in the US, collecting, keeping, and selling the species is prohibited by Animals in Captivity regulations. While *G. geographica* may be abundant in a few fragmented areas, it is considered endangered in the states of Kansas, Kentucky, and Maryland (Northern Map Turtle).

Vertebrate predators of northern map turtle eggs, hatchlings, and adults include opossums, raccoons, skunks, rats, and coyotes (Ernst and Lovich, 2009).

Conservation Efforts

Many states afford the species some legislative and regulatory protection, and the northern map turtle has been listed as CITES III since 2006. This designation means that international trade in a species is allowed only when accompanied by specific permits or certificates (IUCN).

Although there are no action recovery plans devoted specifically to the dwindling populations of northern map turtle, the species does inhabit a number of protected areas in its range, affording all the wildlife therein a measure of safety.

Northern map turtle photographed in Gatineau, Quebec, Canada. Photo © 2008 by D. Gordon E. Robertson

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The Radiated Tortoise *(Astrochelys radiata)* is the 6th rarest tortoise in the world, and the heroes at Turtle Survival Alliance (TSA) are fighting for its future. As a non-profit, the TSA relies on support from the community. Zoo Med has pledged to donate pallets of their Natural Grassland Tortoise Food to TSA's Madagascar location 3 times a year. This food prevents shell and spinal growth deformities by matching the nutrient profile and high fiber content of a wild tortoise diet.

Join Zoo Med in supporting the TSA's conservation efforts; visit their website to learn more and how to contribute: turtlesurvival.org

TSA
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In Memoriam
Bob Thomas

18 October 2021 — The CTTC TOO SLO Chapter has lost a great member and dedicated reptile conservationist today. For our members who have been a part of the chapter over the years, you will recall Bob Thomas was one of the key members who helped to grow the TOO SLO chapter by being the President for 14 years, started TOO SLO's Annual Reptile Show at the San Luis Obispo Vet's Hall, and founded as well as managed the Turtle & Tortoise Rescue of Arroyo Grande for over 20 years. These are just some of the accomplishments that Bob achieved over his life.

He was an invaluable member who served to help the local reptile community through education and adoptions. He will be truly missed by myself, the TOO SLO officers and members. Rest in Peace Bob Thomas.

— Tribute prepared by TOO SLO President Brandon Froelicher and reprinted with his permission.

In Memoriam
Felice Rood
1932 – 2021

Born in the Bronx, New York, Felice Rood and her husband Bill moved to Sacramento, California in 1971. In 1981, she founded the Sacramento Turtle and Tortoise Club and became known locally as "The Turtle Lady" who provided the public with care and adoption information.

She published a quarterly newsletter, and organized Club meetings and events such as an annual "Turtlerama." The Turtle Bunker, the website Felice developed, continues to provide useful information and links to her videos on turtle and tortoise care.

She is survived by four sons and four grandchildren.

Photo of the CTTC members attending an Executive Board meeting in 2011. As we pay tribute to Bob Thomas and Dave Friend, let us also remember Lynda Bagley and Wes Shipway, two more fellow members who are gone but never forgotten. Thanks to Anita De Leon for providing the photo.

Photo submitted by Abigail DeSesa.

In Memoriam
Dave Friend
1940 - 2021

Tribute prepared by Abigail DeSesa

The chelonian world suffered a loss that created a vast cavern in many hearts around the globe. It is with a very heavy and tearful heart we share the loss of Dave Friend. Dave had battled health issues for many years, but his determination and fighting spirit were not enough on November 8, 2021, when his body set his spirit free.

Dave, a devoted family man, leaves behind a loving wife, Maree, of more than 57 years, three grown children and seven cherished grandchildren. Among his many talents and interests, Dave had a special passion that stood out, African Sulcata Tortoises. With the support of his wife, Dave created a sanctuary, the Ojai Sulcata Project (OSP).

As the founder and CEO, Dave dedicated many years to Sulcata captive care research and helping to educate the public about these wonderful tortoises. It is impossible to know just how many Sulcatas Dave rescued over the years, or the many Sulcata lives he improved with the vast knowledge he was always willing to share with those needing help with their pets. Dave gave numerous presentations and many private tours at Ojai Sulcata Project and hosted various meetings and field trips. Dave's dream, the Sulcata sanctuary, is being kept alive by his son, Brandon with the support of the rest of the Friend family. Dave will always be the "Sulcata Man."

Dave giving a talk during the Valley chapter field trip to OSP in 2013.

It would seem to most that his plate was very full, but he continued to generously add to it with his volunteer time and leadership. Dave was a long-time member of the California Turtle & Tortoise Club, and served his local Chapter, Santa Barbara / Ventura, as Vice President and President for many years. Additionally, Dave served on the Executive Board as the Chair from 2009 to 2010 and returned to that position from 2012 to 2014, which included ushering in the California Turtle & Tortoise Club's 50th Anniversary in 2014.

In Dave's own words, quoting from Ojai Sulcata Project's website, "It is my great desire that we keep learning and mutually share our acquired knowledge, so these awesome creatures will grow as they were intended to, living in harmony with nature, not living as caged pets." (Friend, 2011) It is comforting imagining Dave's spirit in harmony with nature and now as free as he desired for his beloved Sulcatas.

§ § §

The following are thoughts and feelings about Dave shared by several colleagues and friends for this memorial tribute.

"Dave was a CTTC leader on multiple levels. I had the honor and pleasure of serving on the Executive Board as his Vice Chair/Treasurer, including the year of CTTC's 50th anniversary milestone. He was thoughtful and kind as a leader, and no-nonsense when it was needed. He graciously shared his considerable knowledge with members, which helped me to educate prospective Sulcata adopters about the "personal Sherman Tank", as he would humorously, yet lovingly, refer to them. The abused and poorly cared-for tortoises that came to their forever home at Ojai Sulcata Project found peace and love in his care. If "All Dogs Go to Heaven", then why not Sulcatas…? Their most ardent supporter is there with them now, having left a loving, indelible imprint on CTTC, on me, and I will miss him. See you on the other side, Dave."

— Karen Berry, Valley Chapter

"It is sad to see another member gone. I enjoyed working with and seeing Dave at our quarterly meetings. Dave was Mr. Sulcata. He was always helpful, enjoyable to talk to, and will be greatly missed. Best wishes to his family and all CTTC members."

— Dave Zantiny, High Desert Chapter

Members of the CTTC Inland Empire chapter on a field trip to the Ojai Sulcata Project in 2013.

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Photo by Julie Gary Maguire

"Dave was my mentor. He taught me what it meant to be a professional volunteer. It was always for the animals, but it was also a lesson in taking pride in the work you do. He led by example. Being his Gal Friday while he was Chair remains the best and happiest time with the CTTC for me. Never said it enough – thank you Dave! Goodbye for now my friend as I pray God blesses me with the opportunity to meet up with you again."

— Abigail DeSesa, Santa Clarita Valley Chapter

"Oh, this makes my heart hurt. He was such a wonderful man. I enjoyed the time I spent with him when I was in Ojai." 5

— Christine Light, Neighbor

"Not only did he run an amazing sanctuary, the Ojai Sulcata Project, he was also quite an artist. He gifted me this beautiful blown glass bowl he made ten years ago. He sent one for the raffle and one for me to keep. It always reminds me of our dear friend and the chats we used to have. I will always cherish this piece of art and I'm so glad I have this wonderful reminder of such a kind, gentle, generous soul. RIP Dave."

— Julie Gary Maguire, Turtle Rescue of Long Island

"Goodbye my dear friend. Since our original meeting at CTTC Executive Board 2001 I will always remember and thank you for the 20 years and thousands of hours of cooperative research we have undergone together for the animals. From dietary studies, burrow temperature / humidity research measurements, growth and disease issues to parasite growths that we utilized to formulate our individual websites on the *Sulcata* and *Gopherus* species I vow to always continue to endeavor to expand our work and continue to attempt to educate the general public and others on the best, most up to date available data possible. Remembering our mantra "**this is all about the animals**". I will miss you terribly my "little brother", may your soul rest in peace until we meet again. With extreme sorrow, your bigger (yet younger) brother."

— Don Williams, Santa Barbara/Ventura Chapter

Don Williams (left) with Dave at OSP. Photo submitted by Don Williams.

Dave giving information to OSP visitors.

Tomas Diagne, co-founder of the *Village des Tortues* (Tortoise Village) in Noflaye, Senegal, was a guest speaker at OSP in 2012

Dave participating in one of many community outreach events, educating the public about the proper care of turtles in general and sulcata tortoises in particular.

Live long and prosper: Study examines genetic gems in Galápagos giant tortoise genomes

These big turtles have extra copies of genes that may help them age well and evade cancer, and the creatures' cells respond to stress in ways that may help to prevent disease, scientists conclude

News release written by Charlotte Hsu, University of Buffalo

Two Galápagos tortoises. Photo by Ylenia Chiari. Image provided for media use.

Buffalo, N.Y. — 19 November 2021 — Galápagos giant tortoises can weigh well over 300 pounds and often live over 100 years. So what's the secret to their evolutionary success?

A new study concludes that compared with other turtles, these animals evolved to have extra copies of genes — called duplications — that may protect against the ravages of aging, including cancer.

Laboratory tests on Galápagos giant tortoise cells corroborate the idea that the animals have developed such defenses, says Vincent Lynch, an evolutionary biologist at the University at Buffalo.

Specifically, experiments showed that the creatures' cells are super sensitive to certain types of stress relating to damaged proteins. When exposed to these pressures, the cells self-destruct much more readily than other turtle cells through a process called apoptosis, the research found. Destroying glitchy cells before they have the chance to form tumors could help the tortoises evade cancer, Lynch says.

"In the lab, we can stress the cells out in ways that are associated with aging and see how well they resist that distress. And it turns out that the Galápagos tortoise cells are really, really good at killing themselves before that stress has a chance to cause diseases like cancer," says Lynch, PhD, associate professor of biological sciences in the University of Buffalo College of Arts and Sciences.

The study was published on Nov. 18 in *Genome Biology and Evolution*. The findings both confirm and build on results of past research, such as a 2018 study by another team that also used genetic analyses to explore longevity and age-related disease in giant tortoises.

Authors of the new paper in Genome Biology and Evolution include Lynch; Galápagos giant tortoise experts Scott Glaberman, PhD, and Ylenia Chiari, PhD, at George Mason University; Stephanie Bulls at the University of South Alabama, now at George Mason University; and Juan Manuel Vazquez, PhD, at the University of California, Berkeley.

The findings are particularly intriguing because — all things being equal — huge animals that live for a long time should have the highest cancer rates. That's because big, long-lived things have many more cells, and the more cells a body has, the more opportunities there are for cancerous mutations to arise.

One major focus of Lynch's work is understanding the biological mechanisms that help big animals like Galápagos tortoises live long and prosper. (His team explored this question in elephants in a 2021 study). The research is driven by simple curiosity. But the findings could have practical implications, too.

One major focus of Lynch's work is understanding the biological mechanisms that help big animals like Galápagos tortoises live long and prosper. (His team explored this question in elephants in a 2021 study). The research is driven by simple curiosity. But the findings could have practical implications, too.

"If you can identify the way nature has done something — the way certain species have evolved protections — maybe you can find a way to translate those discoveries into something that benefits human health and disease," Lynch says. "We're not going to go treating humans with Galápagos tortoise genes, but maybe we can find a drug that mimics certain important functions."

Research of this kind also underscores the value of conservation.

"Studies like this demonstrate why preserving biodiversity is so important," says Glaberman, the paper's first author and an assistant professor of environmental science and policy at George Mason University. "Extreme species like Galápagos giant tortoises probably hold many secrets for dealing with major human challenges like aging and cancer, and even climate change. Our study also shows that even within turtles, different species look, act and function differently, and losing any species to extinction means that a piece of unique biology will be lost to the world forever."

— News release originally published on the website Eurekalert.org

A preprint PDF of the *Genome Biology and Evolution* article is available free of charge by clicking this link: **Concurrent evolution of anti-aging gene duplications and cellular phenotypes in long-lived turtles**

My Tortoise is a Junk Food Junkie

By Abigail DeSesa, CTTC Santa Clarita Chapter and Karen Berry, CTTC Valley Chapter

This subject has been a popular online discussion topic among tortoise keepers, and many worry that it may be too late to change their tortoise's eating habits. This article will concentrate more on the more common arid-region, grassland species, desert tortoises (*Gopherus agassizii*) and African sulcatas (*Centrochelys sulcata*), but you can apply some of the tips here to other species, as well, coordinated with their correct diet.

Both the Sulcata and Desert Tortoise have high fiber, lower protein, and low sugar diet requirements. Many people were unaware of the proper diet for either species, especially when they were first introduced as pets. Since they are thought of as vegetarians, the assumption is that any vegetable or fruit is acceptable. Technically, they are herbivores. This has led to many "junk food junkies" of both species, resulting in a lot of health issues for them.

The answer is, "No, it's not too late.!"

First, we'll deal with the Desert Tortoise. While you can do this at any time, the best time to do a diet change can be when the tortoise awakens from brumation. This winter "nap" is reset time for them and while they are still acclimating to being awake, it can be a great chance to slip in the new and more nutritious foods. Do NOT offer any straight grocery greens, vegetables, or fruit. If you have grasses, forbs, and weeds growing in your yard, you can STOP here. You have nothing additional to do.

Let the tortoise rediscover Mother Nature's smorgasbord, open its mouth, and graze naturally. This is a deeply imbedded behavior. Make sure the tortoise sees and smells the grass, weeds, and other plants. If he or she emerges hungry, this could be a very easy transition. The smell may entice immediate tasting, and hunger will take over. If the tortoise just sniffs it and won't eat, don't feed anything else, and don't be concerned. Keep in mind, it is very common for a desert tortoise not eat for up to a week upon emerging from brumation. Longer than that, and you may want to consult your vet. Water and warmth are more vital than food to survival after "wake-up". Many experts have said that "NO healthy tortoise will willingly starve itself."

Desert tortoise eating a salad of garden flowers and leaves. Photo by Abigail DeSesa.

We humans need treats, but tortoises do **not**, and feeding treats daily or weekly, especially the "people food" type, can be the slippery slope that creates a picky eater. They do eat flowers in the wild, but not a pile at a time. With most flowers being annuals in the desert, the climate itself eliminates the potential for eating too many and in the wrong season. Be strong and don't give in.

Let's now address the Sulcata, which is not a brumating species, but usually has a very healthy appetite, and often will eat just about anything. Many of you may have a story about your Sulcata's "adventurous eating" and perhaps a vet bill to go along with it. You may have a Desert Tortoise that isn't brumating (possibly due to the tortoise living in a climate that is too warm and bright, or the tortoise may have medical issues).

We know that tortoises in general are very "determined," so how do you get a very stubborn one to accept a better diet? There are different ways to accomplish this, and you need to accept that the longer the tortoise has eaten an improper diet, the more challenging it may be to change its eating habits. Here's where the patience on your part comes in.

The first thing you can try with any tortoise is a bit of "tough love." Many Sulcata will eat almost anything, and, if hungry, should turn to the grass and weeds and start eating. Don't provide any of the foods from its previous, less-healthy diet. This is also the time to see if he or she will eat hay. Where many Sulcata will eat it, a lot of desert tortoises will not, but it's worth a try. Put a small pile where the tortoise can eat it at will and see what happens. You can also introduce it with other foods as described in the next section. Often after a couple of days with only the food you want the tortoise to eat available, it should start to eat it, unless yours is especially set in its ways.

There are tricks rehab people have been successfully using for years. Many of our adoption teams have had to change the diets of animals turned in for adoption, or "rescued" from bad situations.

Has your grassland tortoise been eating fruit? If so, the following technique may be helpful.

- Finely chop the healthier foods so it is harder for the tortoise to pick out only what it wants to eat, and make sure it's all mixed up well with a small amount of the food from the previous diet.

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If you have been feeding grocery greens or veggies, cut everything up into tiny pieces and do some mushing of the vegetables. New healthier items **must** be able to stick to the mixture. If everything isn't sticking, keep mushing until it does.

• Chop or mash a piece of your tortoise's favorite fruit and use the juice that comes from it. You may need a second piece of fruit to get enough juice. Moisten the healthy food/old food combination with the fruit mash and juice, but don't make it too soggy.

• If the tortoise can pick out the fruit and leave the rest, that means you didn't coat it well enough, or there is too much "chunk" left to the fruit. Juice soaking is better, but depending on which fruit item you have been feeding, that may not be possible.

As the days progress, your tortoise should begin to get used to the healthier food being there, and after a while (wait about a week) you can start to gradually remove the food from the old diet and lessen the fruit smear/juice used to encourage the tortoise to eat the new food mixture.

In time, there will be no fruit, just the healthier items. Sometimes you can just finely chop the new food, add the fruit mash/pieces and the juice, then gradually back off the fruit/juice. The process works if you don't fold and give in to the tortoise. Those eyes staring at you can bring on a good guilt trip, but their long-term health is more important. You can do this for their well-being, and if unsure of your tortoise's health status, see a veterinarian before you start your changes or that "tough love" program.

A major life change, like a new home or new pen can be an ideal time to a do a diet change, depending on your tortoise's personality and how it deals with changes in its routine. Some don't react well, and they get stressed, so you may have to limit them to changing one thing at a time.

Survival is instinctive, and, as has been mentioned, a healthy tortoise won't be willing to starve itself (say it over and over again). You can do this and take the journey with your tortoise to extend its life with a healthier and more natural diet. You can help your tortoise transition to a better diet for a longer, healthier life, although it may take patience on your part to get him or her to make the changes.

Federal agencies partner to conserve Mojave desert tortoises

News Release by Jessica D'ambrosio, Public Affairs Specialist, US Fish & Wildlife Service, Carlsbad, CA

San Bernardino County, California — 15 December 2021 — The U.S. Fish and Wildlife Service and U.S. Army have consulted on a process for implementing effective ecosystem and conservation actions benefiting the federally threatened Mojave desert tortoise in the western Mojave Desert.

The consultation, conducted under section 7(a)(2) of the Endangered Species Act, provides additional flexibility for military training within the Army's National Training Center and Fort Irwin. The Army will fund recovery actions for the desert tortoise within areas of critical environmental concern managed by the Bureau of Land Management (BLM). Additionally, the Service, Army, and Bureau will work with other partners, such as the National Fish and Wildlife Foundation and local conservation groups that manage desert tortoise habitat, to implement specific recovery actions for the species.

"We are excited to announce this initiative that balances military readiness and species recovery," said Scott Sobiech, Carlsbad Fish and Wildlife Office Field Supervisor. "Fort Irwin has historically worked to protect sensitive species and their habitat, and we are grateful for their continued commitment to conservation."

"The U.S. Army and the Fish and Wildlife Service continue to collaborate via the Installation Commander 's Comprehensive Integrated Plan for the conservation and management of natural resources," said David Davis, Fort Irwin Wildlife Biologist. "This plan focuses on ecosystem-based management that shows the interrelationships of individual components of natural resource management to mission requirements affecting Fort Irwin's natural resources. Because wildlife do not read boundary signs it is vital that we develop working partnerships with the Service, BLM, and other Department of Defense installations."

Proposed recovery actions include improving desert tortoise populations through habitat restoration, improved management of threats within critical habitat, reduction of other mortality sources like roadkill, and strategic use of population augmentation.

"The BLM is pleased to be actively involved in the Desert Tortoise Recovery Partnership to achieve targeted conservation goals," said Field Manager Katrina Symons, Bureau of Land Management, Barstow Field Office. "This partnership will implement desert tortoise recovery actions, such as habitat restoration, at a larger scale than what any agency can do alone."

The desert tortoise lives in a variety of habitats from sandy flats to rocky foothills, including alluvial fans, washes and canyons. It was listed as threatened under the Endangered Species Act in 1980 due to high rates of mortality, and fragmentation, degradation, and loss of its habitat.

The Desert Tortoise Habitat at the Maturango Museum

Story and Photographs by Robert Parker, CTTC Ridgecrest Chapter

Trenching in preparation for the concrete foundation of the habitat. The Maturango Museum building is in the background of the photo.

In the spring of 2016 the desert tortoise habitat was completed at the Maturango Museum in Ridgecrest, California. Eagle Scout Zach Burns worked with the Museum and the Ridgecrest Chapter of the California Turtle & Tortoise Club (CTTC) to design the project.

The building materials ready for the construction of the desert tortoise habitat.

Planning the Project

We decided on a brick base about 24 inches high with a chain-link fence above this. The wall has a concrete foundation between 8 to 12 inches deep to prevent tortoises digging under the wall. The 40' x 20' habitat has a lockable gate and a brick wall down the middle, splitting the habitat in two.

Zach raised about $10,000 and obtained donations in materials from businesses such as Home Depot. Two signs were built by local businessmen, one of which subsequently blew down in one of Ridgecrest's wind storms.

The Resident Tortoises

The Museum held a contest to name the 4 tortoises placed in the enclosure. Children came up with the names Starful, Peaches, Dash and Shlo-mo. Initially we had 2 females on one side and a male and a sub-adult on the other.

Landscaping and Burrows

The CTTC put in a drip system and planted creosote shrubs, cactus, and desert grasses for cover. Members of the chapter dug the burrows under the supervision of local biologist Peter Woodman. The tortoises themselves eventually deepened the burrows considerably and built new ones.

Volunteers signed up to feed the tortoises as there was not sufficient forage inside the enclosure.

The CTTC monitors the enclosure and works with the museum to ensure that museum visitors don't feed the tortoises the wrong kinds of food.

I mentioned before that the large informational sign had blown down in a windstorm. Rather than put it back up only to possibly blow down again, we decided to replace it with 3 smaller signs with the same information. One sign has Natural History Information, another one has information on the CTTC along with rules and regulations, adoptions, care and similar information, while the third lists all those responsible for the project.

A local squirrel surveying the progress of the habitat construction.

The project had been delayed due to Covid, but finally Museum Volunteer Peter Wiley and a crew installed the signs two weeks before Christmas 2021.

The completed fencing of the desert tortoise habitat with its informational signage in place.

Mike's Turtle Net Picks by Michael J. Connor, Ph.D.

A varied selection of recent articles, stories and sites on the Web that some of you may find as interesting as I did. This list is also posted at tortoise.org/turtlenetpicks/turtlenetpicks.html

Differential Predation on Translocated Juvenile Desert Tortoises
Study reports that coyote and kit fox predation accounted for 24 of 31 deaths among 59 translocated juvenile desert tortoises, with 71% (17) of the females being taken compared to 29% (7) of the males.

Pancake Tortoise Threatened by Trade and Habitat Loss
AP video on Kenya's pancake tortoises, *Malacochersus tornieri* (and a few leopard tortoises).

Aldabra Giant Tortoises Released on Desroches Island
Twenty-seven captive-raised Aldabra giant tortoises were released by the Island Conservation Society the Seychelles island of Desroches.

The Art of Studying Giant Tortoise Scat
Interview with Marco Antonio Jiménez Aguaisa, a graduate student working on the diets and movement of Galapagos giant tortoises by studying their droppings.

What Do 1,364 Star Tortoises Look Like?
Sickening video of the 1,364 star tortoises seized January 4 at Chennai (Madras) Airport.

Western Pond Turtle Census at Berkeley's Jewel Lake
Video of wildlife experts checking the health of Western pond turtles living in Jewel Lake, Tilden Regional Park.

Climate Change Effects Western Pond Turtle Habitat in Southern California
Video of Rosi Dagit reviewing the effects of climate change on the Santa Monica Mountain habitat of Western pond turtles.

Hidden World of Turtle Mating Behavior
Canadian biologists study turtle mating behavior in Ottawa.

Perth Zoo Has Record Year for Western Swamp Turtle Hatchlings
Perth Zoo successfully bred 65 hatchlings in the latest season, the program's highest on record.

Thousands of Hatchling Yellow-spotted Amazon Turtles Released in Peru
Video of the release of 3,000 hatchling yellow-spotted turtles, *Podocnemis unifilis*, or *taricayas* as the Peruvians call them.

Trinidad's Mysterious Gibba Turtles
The gibba turtle, *Mesoclemmys gibba*, is the most rarely seen of Trinidad's three native species of freshwater turtle.

California Leatherbacks Endangered Due to Human Impacts
"Let's face it: This is an animal that's been around for 80 million years. You could not argue it's poorly adapted," he said. "It's been able to survive just about anything, but it seems to be having a hard time handling us." Scott Benson, NOAA biologist.

Good News for Florida Leatherbacks
Leatherback sea turtle nest numbers for 2021 in south Florida were double the previous record set in 2012.

Padre Island National Seashore Controversy
Padre Island National Seashore volunteers rally behind sea turtle biologist Donna Shaver.

Cape Verde Sees Boom in Sea Turtle Nests
The number of sea turtle nests in the Cape Verde archipelago rose to almost 200,000 in 2021.

Marine Turtle Newsletter
Latest (October 2021) Marine Turtle Newsletter is available.

African Sea Turtle Newsletter
African Sea Turtle Newsletter #17 is available.

Fossil Pig-nosed Turtle Found at a Melbourne Beach
Five million-year-old pig-nosed turtle fossil found in Beaumaris is raising new questions about where these turtles evolved.

CTTC's Turtle And Tortoise Listserve
To talk with other turtle and tortoise fans in a friendly atmosphere join **CTTC's Turtle and Tortoise list** or send an email to: <CTTC-TurtleAndTortoise-list+-subscribe@groups.io>.

CTTC On Facebook
For breaking news updates follow CTTC on Facebook!

Pearl River Map Turtles Proposed for Endangered Species Act Protection in Mississippi, Louisiana

Four Similar Southeastern Turtle Species Proposed for Protection From Poaching, Trade

New Orleans, Louisiana— 22 November 2021 — As the result of a lawsuit by the Center for Biological Diversity and Healthy Gulf, the U.S. Fish and Wildlife Service today proposed to protect Pearl River map turtles (*Graptemys pearlensis*) as a threatened species under the federal Endangered Species Act.

Pearl River map turtle, *Graptemys pearlensis*, photographed by Cris Hagen of the Savannah River Ecological Laboratory, University of Georgia. Public domain.

In the case of Pascagoula River map turtles (*G. gibbonsi*), which the Center also sued to protect, the agency declined to give them the full protection of the Act, which would have provided protections for their habitat. Instead, it gave them weaker protections, along with three other species of map turtles — Alabama, Escambia and Barbour's (*G. pulchra, G. ernsti, G. barbouri*)— from poaching and commercial harvest due to their "similarity of appearance" to Pearl River turtles.

The turtles are found in Mississippi, Louisiana, Alabama, the Florida panhandle and southern Georgia.

In July 2020 the Service agreed to decide on federal protection for Pearl River and Pascagoula turtles by Oct. 29, 2021. That agreement resolved a January 2020 suit that challenged the agency's failure to make a timely initial finding on the Center's 2010 petition to protect the turtles under the Endangered Species Act.

"Federal protection for the beautiful Pearl River map turtle is long overdue," said Jason Totoiu, a senior attorney at the Center. "After a decade of inaction by the Fish and Wildlife Service, these turtles have managed to hang on in just a fraction of their historic range. While it's disappointing the Service isn't proposing endangered species protections for both species, I'm hopeful that we can finally turn a corner and begin to recover these lovely turtles and the waterways they once thrived in."

Map turtles serve as indicators of river health; poor water quality can devastate their populations. In addition to habitat loss and degradation from dams, floodplain clearing and river channelization, other threats include the harvest of turtles for sale in food and medicinal markets and collection for the pet trade. The Pearl River map turtle is particularly threatened by a proposal to build a new dam above Jackson, Mississippi called the One Lake Project.

"We're glad that the Fish and Wildlife Service is finally moving to protect these two handsome turtles," said Cynthia Sarthou, executive director of Healthy Gulf. "These turtles are barely hanging on in waterways that are very degraded. Without federal protection they might not survive."

Map turtles are often called "sawbacks" for the ridges along their backs that can form small spikes. Pearl River map turtles can live up to 30 years in the wild and used to be considered the same species as Pascagoula map turtles; recently scientists have determined the two are separate species. The Pearl River map turtle is only found in creeks and rivers within the Pearl River drainage in Mississippi and Louisiana, while the Pascagoula has a relatively small range in its namesake river system in Mississippi.

Today's announcement follows similar proposals made this year to protect two species of alligator snapping turtles native to the Southeast.

Earlier this month the Service proposed to protect alligator snapping turtles (*Macrochelys temminckii*) as threatened under the Endangered Species Act. That turtle has a broader range and a larger population, though, like the Pearl River map turtle, it faces serious threats from river degradation, poaching and climate change.

"Given the small range and population numbers of the Pearl River map turtle, it probably should have been proposed for endangered status," said Totoiu. "We'll watch the process closely and fight to ensure the species has all the protection it needs."

— Center for Biological Diversity press release

Pascagoula River map turtle, *Graptemys gibbonsi*, photographed in Mississippi. Photo © 2017 by Grover Brown

Meeting Schedule: January/February 2022

Click on your Chapter's website link for program information which is posted as it becomes available.

Chino Valley
21 January; 18 February

Foothill
Contact the chapter for meeting information.

High Desert
10 January; 14 February

Inland Empire
7 January; 4 February

Kern County
10 January; 14 February

Low Desert
Contact the chapter for meeting information.

Orange County
7 January; 4 February

Ridgecrest
10 January; 14 February

Santa Barbara-Ventura
Contact the chapter for meeting information.

Santa Clarita
Contact the chapter for meeting information.

TOOSLO (San Luis Obispo)
Contact the chapter for meeting information.

TTCS (Long Beach)
22 January; 19 February

Valley
21 January; 18 February

"There's one issue that will define the contours of this century more dramatically than any other, and that is the urgent threat of a changing climate."

— Barack Obama (b. 1961)
44th President of the United States

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Membership in the CTTC and subscriptions to the *Tortuga Gazette* are handled through the CTTC Chapters. The Chapters also manage membership renewals (see postal addresses below).

Many members choose to join a nearby Chapter to participate in Chapter meetings and other activities. Print membership forms from the CTTC website.

Your Chapter and your renewal date (month/year) are displayed on your newsletter notification. Mail your new or renewal membership/subscription to the Chapter of your choice.

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- Student membership 15^{00}
- Individual membership 25^{00}
- Family membership 35^{00}
- Life membership 500^{00}

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Inland Empire Chapter: P.O. Box 2371, San Bernardino, CA 92406-2371

Kern County Chapter: P.O. Box 81772, Bakersfield, CA 93380-1772

Low Desert Chapter: P.O. Box 4156, Palm Desert, CA 92261

Orange County Chapter: P.O. Box 11124, Santa Ana, CA 92711

Ridgecrest Chapter: P. O. Box 1272, Ridgecrest, CA 93555

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Santa Clarita Chapter: P.O. Box 4012, Castaic, CA 91310

TOOSLO Chapter: P.O. Box 763, Grover Beach, CA 93483

Turtle & Tortoise Care Society Chapter: P O Box 15952, Long Beach, CA 90815

Valley Chapter: P.O. Box 7364, Van Nuys, CA 91409-7364

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