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A Northern Spotted Box Turtle (*Terrapene nelsoni* ssp. *klauberi*), one of the two subspecies of spotted box turtle. Image captured in Sonora, Mexico. Photo © 2019 by gambusino

featured species

Spotted Box Turtle (*Terrapene nelsoni*) Stejneger, 1925

The Sierra Box Turtle

by M. A. Cohen

Endemic to the Sierra Madre Occidental Mountains in Mexico, the spotted box turtle is a cryptic species living in disjunct populations within its mountainous range.

The spotted box turtle is also known as the Sierra box turtle in English. The species has several Spanish common names, including *tortuga de monte* (mountain turtle), *tortuga de bisagra* (hinge turtle), *caja pintada* (spotted turtle), *casco pintada* (spotted casque), and *tortuga de chispitas* (turtle of little sparks) [Villa, 2014].

The spotted box turtle belongs to the *Terrapene* genus of North American box turtles. This genus is a member of the Emydidae, the chelonian family of basking, semi-aquatic turtles. *T. nelsoni* is the least known of the seven species in the *Terrapene* genus.

The Norwegian herpetologist and zoologist Dr. Leonhard Hess Stejneger (1851-1943) described the nominate race, *Terrapene nelsoni* subspecies *nelsoni,* in 1925. Dr. Stejneger named it in honor of the American naturalist Dr.

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Edward William Nelson (1855-1934), who likely collected the first specimen of the spotted box turtle in 1897 during a lengthy expedition to the Mexican Republic (Buskirk & Ponce-Campos, 2011).

In 1943, the American herpetologist Charles Mitchill Bogert (1908-1992) described the other recognized spotted box turtle subspecies, *T. n. klauberi* (Bogert 1943), which he named in honor of another American herpetologist, Laurence Monroe Klauber (1883-1968).

Recent and ongoing studies by wildlife biologists are adding substantially to the body of knowledge about the species, but *T. nelsoni* remains "largely unknown to science" (Butterfield et al., 2021).

Description

The spotted box turtle is a small to medium-sized species with a carapace length of 5.5 to 6 inches (14 to 15 centimeters). Its carapace is moderately domed and slightly flattened on its dorsal scutes. A minimal medial keel may be present.

T. nelsoni is elusive and highly camouflaged in its habitat. The carapace background color varies from yellowish-tan to dark or greenish-brown. Small, scattered yellow spots mark the carapace, although some individuals in either subspecies may lack the characteristic spots.

Plastron view of a Northern spotted box turtle, *T. n. klauberi*, photographed in Sonora, Mexico. Notice the characteristic box turtle hinge between the pectoral and abdominal scutes. **Photo © 2018 by Luis Enrique Vega**

The margins of its bilobed brown plastron are typically yellow, and the dark background may have yellow spots or streaks. The hinge between its pectoral and abdominal scutes lets the turtle withdraw its head, limbs, and tail entirely within its rigid shell. The "box" formed by the closure of the carapace to the plastron provides substantial protection from predators.

The skin of the head, neck, limbs, and tail of the spotted box turtle is yellow or brown flecked with contrasting brown or yellow spots. The toes on its hind feet lack webbing. The head of the male *T. nelsoni* is comparatively large and bulbous with a strongly hooked upper jaw (Duran, 2024).

The plastron of the male spotted box turtle has shallow concavity, and the female plastron is flat or slightly convex. The first toes on the male's hind feet rotate toward the body, as do those of the male *T. ornata*, likely to clasp the female during mating. His tail is longer and thicker than the female's (Terrapene nelsoni, n.d.).

T. nelsoni is closely related to *T. ornata,* the Ornate box turtle. Biologists determined this relationship based on evidence from several scientific disciplines. Scientists speculate that these two species diverged from a common ancestor five to eight million years ago (Villa, 2014).

Subspecies

Southern spotted box turtle

There are two recognized subspecies of spotted box turtle. The Southern spotted box turtle, *Ter-*

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A male spotted box turtle photographed in Sonora, Mexico. Notice its prominent hooked beak. **Photo © 2023 by mata**

rapene nelsoni subspecies *nelsoni* (Stejneger 1925), is the nominate race, and it occurs in the Mexican states of southern Sinaloa, Nayarit, and Jalisco.

The carapace of *T. n. nelsoni* may be straw-colored, tan, or dark brown with pale spots that are fewer and larger than the northern subspecies.

Northern spotted box turtle

Researchers have recorded the other subspecies, the Northern spotted box turtle, *T. n.* ssp. *klauberi* (Bogert 1943), in the states of Sonora, southwestern Chihuahua, and northern Sinaloa.

The carapace of the *T. n. klauberi* may be tan, dark brown, or greenish-brown with pale spots that are smaller and more abundant than those of the southern subspecies (Terrapene nelsoni, n.d.).

Range and Habitat

Terrapene nelsoni primarily inhabits the Pacific slopes of the Sierra Madre Occidental mountain chain, which spans the Mexican states from Sonora in the north to Jalisco in the south.

The Sierra Madre Occidental is a significant mountain range system running approximately 700 miles (1,127 kilometers) from northwest to southeast in northwestern and western Mexico along the Gulf of California.

The spotted box turtle inhabits the remote, densely vegetated hill country on the western slopes that is difficult to access. The species' habitats include ecosystems described as "Foothills Thornscrub, Tropical Deciduous Forest, Oak Woodland, Pine-oak Woodland, and Mixed Conifer Forest" from 1476 to 7005 feet (450 to 2135 meters) of elevation (Buskirk & Ponce-Campos, 2011; Loc-Barragan, et al., 2022).

The results of an in-depth natural history study of *T. n. klauberi*, the northern spotted box turtle, in the Monte Mojino reserve in southeastern Sonora, Mexico, were published in 2021.

Butterfield and his team conducted their research in the Monte Mojino reserve, part of the Sierra de Alamos–Río Cuchujaqui, a federally protected area on the western slopes in southern Sonora. Monte Mojino represents the types of ecosystems occupied by *T. nelsoni* at elevations of 984 to 4,265 feet (300 to 1,300 meters) above sea level. These microhabitats include tropical dry forests, grassland savannahs, and pine-oak forests.

The species is primarily active only during the summer monsoon season, typically from June to September, especially after drenching rainstorms. The microhabitats studied in Monte Mojino receive 12 to 47 inches (300 to 1,200 millimeters) per year (Butterfield et al., 2021).

The species aestivates during the long dry season, meaning it enters a state of dormancy or torpor during the heat and drought.

It is worth noting that Butterfield and his team deliberately omitted global positioning system information about the spotted box turtles' precise locations from their published study to protect the species from the threat of illegal poaching.

A Southern spotted box turtle, *T. n. nelsoni*, photographed in Sinaloa, Mexico. Notice the crimson tint on its beak. This indicates that the turtle was probably eating prickly pear (*Opuntia)* or organ pipe (*Stenocereus*) cactus fruit. **Photo © 2015 by Eduardo Quintero**

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Plastron view of a Southern spotted box turtle, *T. n. nelsoni*. **Photo © 2007 by conanpsursinaloa**

Diet

Like other *Terrapene* species, the spotted box turtle is an omnivore that consumes numerous types of food. As an opportunistic feeder, *T. nelsoni* will ingest food items ranging from invertebrates to mushrooms to carrion.

Butterfield and his team observed *T. nelsoni* foraging in the manure of cows and horses. However, the turtles appeared to be foraging on several species of dung beetles processing the manure rather than the droppings. The team also observed the turtles foraging on the beetle species found in the middens (waste piles) of leaf-cutter ants.

The spotted box turtle consumes mushrooms, the fruits of columnar cacti (*pitahaya*, a.k.a. dragon fruit), prickly pears (*túnas*, *Opuntia* species), grasses, wildflowers, and other herbaceous vegetation (Villa, 2014; Butterfield et al., 2021).

Threats

Despite the comparatively isolated range of *T. nelsoni*, "deforestation, climate change, and illegal trafficking are serious threats throughout the Sierra Madre Occidental mountain chain."

The tropical dry forest (TDF) regions are disappearing at an alarming rate, and less than 2% of the TDF are within legally protected areas. Moreover, computerized climate models predict that "the forests of the Sierra Madre Occidental will be significantly reduced by year 2070" (Butterfield et al., 2021).

Slash-and-burn agriculture has altered much of the natural landscape in Sonora, posing a threat to *T. nelsoni* by displacing nutritious native plants with the highly invasive, non-native buffel grass (*Pennisetum ciliare, Cenchrus ciliaris*) that ranchers plant as forage for cattle (Villa, 2014).

Poaching for the exotic pet trade also poses a threat to the species. Permits to capture *T. nelsoni* are simple to obtain because so little is known about their natural history. More knowledge is required to adequately protect the species (Butterfield et al., 2021).

Conservation

The International Union for the Conservation of Nature's Red List of Threatened Species evaluated *T. nelsoni* in 1996 and declared its category to be "Data Deficient," meaning that the facts available at the time of evaluation were insufficient to accurately categorize its status. A notation in the entry indicates that a re-evaluation is needed.

The Convention on International Trade in Endangered Species (CITES) lists all Mexican box turtles as CITES II, affording the species some legal protection with regard to international trade. The range of the species is vast, and legal protections exist in two large and two small areas within the range (Buskirk & Ponce-Campos, 2011).

However, enforcement of local laws protecting *Terrapene* species is uneven at best. Field biologists are conducting long-term studies of the species that will enhance the body of knowledge regarding *T. nelsoni*. Better understanding of the natural history of the spotted box turtle should result in more effective regulations protecting the species. Ω

A Northern spotted box turtle, *T. n. klauberi*, photographed in Sonora, Mexico. **Photo © 2019 by gambusino**

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Pearl River Map Turtles Finally Protected in Mississippi, Louisiana

—Center for Biological Diversity press release

Jackson, Mississippi—9 July 2024—In response to a 2010 petition from the Center for Biological Diversity, the U.S. Fish and Wildlife Service issued a final rule today protecting the Pearl River map turtle (*Graptemys pearlensis*) as threatened under the Endangered Species Act. The final rule delays designating protections for the places the turtles live for one year.

The Pearl River Map Turtle photographed by Cris Hagen, University of Georgia, Savannah River Ecology Laboratory / Courtesy of USGS. Public domain.

The Center sued in 2022 after the Service missed its deadline to finalize the protections it had proposed for the turtle in 2021.

"We're disappointed that the Service didn't designate critical habitat for the Pearl River map turtles, but these protections couldn't have come at a more important time," said Lindsay Reeves, a senior attorney at the Center. "The Army Corps of Engineers is considering a plan to dam the Pearl River, which is the only place on Earth where these turtles live."

Pearl River map turtles are beautifully patterned freshwater turtles that are endemic to the Pearl River in Mississippi and Louisiana. These turtles depend on the river's flowing freshwater to find food and shelter, and they need its sandy beaches to build their nests. Map turtles get their names from the patterns on their backs that resemble topographical maps.

The project proposed by the Corps would dredge out the sandy banks of the Pearl River and build a dam to create an enormous 2,562-acre lake. The Corps' proposal is especially worrisome because Pearl River map turtles can't survive in lakes and construction of the dam would flood their nesting sites.

These dam-building activities aren't exempted in the turtle's new protections, meaning the Corps would have to consult with the Service before beginning any construction. Public participation in the rulemaking process was critical to eliminating these harmful exceptions from the final rule.

The final rule also bolsters protection for the turtles from poaching and persecution, including being illegally shot.

Like many freshwater species, Pearl River map turtles are also threatened by climate change. Protecting the places they live will help ensure a healthier future for people, too. Ω

The Pearl River, Alabama, Barbour's, Escambia, and Pascagoula Map Turtles are ***all*** included in this listing. See **Federal Register document** for the official paper.

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2024 Valley Chapter Annual Show

Story by Karen Berry and photo by Cristina Perovich, Valley Chapter

CTTC Valley Chapter held its annual education and fundraising show on May 18, 2024, which is also the celebration of Armed Forces Day. As part of our continued respect and gratitude for our military and first responders, the Chapter again extended to them free admission to the show.

▲ Our beautiful spring weather brought a lot of people out for the 2024 annual show.

▲ Carlo (left) and Jodi (right) Inzerella. Jodi, our 91-years-young active member and her son Carlo staffed the front desk.

In addition to Valley's veterans and newly participating members, CTTC's Santa Barbara/Ventura (www.tortoise.org/santabarbara) and Santa Clarita (www.tortoise.org/santaclarita) Chapters participated in our show.

In addition to fulfilling the educational mission of CTTC, the annual show also benefits the "sick and injured" fund that assists with the medical expenses of those turtles and tortoises that come in ill, with serious injuries, or need long term care.

Several other conservation and wildlife organizations joined us for the fun, and they helped "get the word out" about other animals that need the support of the public.

❖ **Friends of California Condors Wild and Free**, affiliated with U.S. Fish & Wildlife, teaches people about the preservation of these magnificent birds, and assists in efforts to increase their numbers in the wild.
www.friendsofcondors.org

❖ **Southwestern Herpetologists Society** is dedicated to education regarding reptiles and amphibians, their preservation and rescue, and members brought an assortment of snakes, lizards, and amphibians for all to see.
https://www.swhs.org/

▲ Friends of California Condors Wild and Free, teaches people about the preservation of these magnificent birds, and assists in efforts to increase their numbers in the wild.

▲ Members of the Southwestern Herpetologists Society brought various amphibians, lizards, and snakes, helping to educate our visitors about the care of exotics.

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▲ Ghost Cat Publications and Sherry Mangel-Ferber heighten awareness of coexistence with wildlife, raising money for the 101 freeway wild animal crossing which is under construction.

❖ **Ghost Cat Publications** raises awareness of coexistence with wildlife and raises money through the sale of books about the local wildlife, especially mountain lions, including the late P-22, the most famous among them. The books are helping to raise money for the wild animal crossing over the 101 freeway in the Calabasas/Agoura area, which is currently under construction. https://www.facebook.com/GhostCatPublications/

It wouldn't be a Valley show without our raffle that featured a nice selection of prizes and the Tortuga Gift Shop, which had a lot of turtle-themed jewelry, knick knacks, and other items.

Putting together our show and having good results takes a lot of planning, but it can't be a success without the hard work of both veteran and newer members. And, of course, without the turtles and tortoises, there wouldn't be a show.

Thanks to all of the members who worked the specialty areas, set up and clean up, and for the exhibitors who gave our visitors an opportunity to see living dinosaurs up close, and maybe even fall in love with them…!!

▲ Barbara Devries, show veteran, and Cathy Carpenter, first time show participant, handled a successful sales day at the Tortuga Gift Shop.

▲ Rick Meyer, a first time exhibitor, and his female desert tortoise named Mo.

▶ First time exhibitor Kambria McGrath and her daughter Brooklyn, with one of their desert tortoises, "Tuckker."

▲ Bubba, Kirk Weber's Sulcata tortoise, is the official greeter for the Valley Chapter show.

▲ Show veteran Kirk Weber and some of his more exotic tortoises: a Radiated, a Star, and a Leopard.

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2024 Valley Chapter Annual Show, continued

▲ Bob Hazard, Valley Chapter President, aka "Bob the Builder," shows people various types of more natural tortoise housing.

▲ Show veterans Maria Kennedy (left) and Maggie Elliott (right), with young desert tortoises and Russian tortoises.

▲ Tim Perovich and Monica Haynes, both show raffle veterans, have a lot to smile about with another successful raffle

▶ Members Susan Alvarez (left), Wendy Dasgupta (right), and "Abrams" the tortoise, from CTTC Santa Barbara/Ventura Chapter enjoying the day.

▲ Jacob Vignale, Valley's official "Sea Turtle", visited with attendees, and also was out on the sidewalk, bringing attention to the show

▲ Frankie Vignale Jr., at his second show, with "Reaper" the desert tortoise.

▲ Frank Kaufman exhibits some of his juvenile desert tortoises.

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▲Sioux Ratkovic, show veteran, brings juvenile and hatchling desert tortoises. Her display is one of the most popular booths at the show.

▲Big Daddy, who is over 70 years old, is a Radiated Tortoise that belongs to Abigail DeSesa from CTTC Santa Clarita Chapter. He's grabbing a quick bite and having a good time at the show.

The next turtle and tortoise show sponsored by the CTTC Valley Chapter will take place in May 2025 at a date and time to be announced. We look forward to seeing you then! Ω

▲A guest picking up information about the Valley Chapter at the Adoptions and Membership Applications Table.

▲Snakes are not just for boys ...

This set of 'Forever' stamps depicts the six species of marine turtles found in U.S. coastal waters. The stamps are offered for sale by the U.S. Post Office, having been released in June 2024.

"The sea, the great unifier, is man's only hope. Now, as never before, the old phrase has a literal meaning: we are all in the same boat."

—Jacques-Yves Cousteau
(1910-1997)
French oceanographer

the Turtle's Garden
planting for chelonians
by M A Cohen

Plantago ovata Desert Plantain

Desert plantain, *Plantago ovata,* in full bloom photographed in Imperial County, CA. Photo © 2023 by Fred Melgert / Carla Hoegen

Desert plantain, also known by various common names, including desert Indianwheat, blond psyllium, Indian plantago, sand plantain, woolly plantain, and ispaghula, is an herbaceous annual plant native to the Mediterranean, Middle East, and Asia.

The California Native Plant Society's website, Calscape, states the following: "According to a molecular clock analysis* by Stephen C. Meyers and Aaron Liston, (*Plantago ovata*) was introduced to California 200,000 to 650,000 years ago, so by now can also be safely called a California native" (Woolly Plantain n.d.).

Desert plantain occurs in Arizona, California, Nevada, Texas, and Utah. It is also present in the Channel Islands off California, Baja California, and northwestern Mexico.

Desert plantain is a member of the Plantaginaceae, the plantain family. However, it is ***not*** related to the starchy, banana-like tropical fruit, also called a plantain, that is eaten cooked in savory dishes and belongs to an entirely different genus, *Musa,* in the family Musaceae.

* **molecular clock analysis:** the molecular clock is a tool used in evolutionary biology to estimate the rate of divergence from a common ancestor. In theory, this rate of divergence between two organisms is relatively constant.

Description

A small, upright winter annual that grows from 2 to 10 inches (5 to 25 centimeters) tall in a rosette form. It may grow taller in some locations. Its leaves are 1 to 7 inches (2.5 to 18 centimeters) long and "covered with silky, flattened hairs," hence the common name woolly plantain (MacKay 2013). The leaf margins (edges) may be smooth or have a few small teeth (Sturla 2017).

Desert plantain bears numerous white, papery flowers on a woolly, leafless spike. Botanists call this type of flower arrangement an inflorescence. In general, the desert plantain blooming season is from January to June. In the Mojave Desert, it blooms from March to April. With enough summer monsoon rainfall, *P. ovata* may flower again in the fall (MacKay 2013; Sturla 2017).

Seed capsules of desert plantain. Photo © 2012 by Danny Steven S

After flowering, small, oval fruits, about 0.3 inch (7 millimeters) long, form. The fruits contain boat-shaped seeds 0.06 x 0.1 inch (1.5 x 2.5 millimeters) that are glossy and yellowish-red (Botany Today 2018; Rubis & Massman n.d.; MacKay 2013).

The husks of the seeds are white, high in dietary fiber, and are known commercially as psyllium. The seed husk or seed coat is the outer layer of tissue on the seed that contains 30% mucilage, defined as an edible adhesive material (Rubis &

Massman n.d.). Mucilage forms the basis of over-the-counter dietary fiber supplements like Metamucil®.

The soluble fiber in the seed husks has been used medicinally to relieve constipation and lower cholesterol and blood pressure since ancient times, and it is still used for these purposes today.

Range and Habitat

In the wild, desert plantain grows in sandy, gravelly, or rocky flatlands and slopes from sea level to 4,000 feet (1,219 meters) of elevation.

While it occasionally grows in wetland areas, desert plantain generally favors dry plains and mesas within its range (Sturla 2017). *P. ovata* occurs in several plant communities, including coastal strand, coastal sage scrub, creosote bush scrub, and Joshua tree woodlands in the Mojave Desert (MacKay 2013).

Close-up of *a Plantago ovata* flower spike photographed in Nevada. **Photo © 2005 by Stan Shebs**

Cultivation

Desert plantain is tolerant of most soil types as long as there is good drainage, but prefers a sandy or loamy, fast-draining soil.

In most landscapes, *P. ovata* requires full sun, but the species may tolerate partial shade in some locations.

Starting seeds of desert plantain is the best way to introduce the species to the landscape. The seedlings require regular watering during establishment, after which the plants become drought-tolerant and only need minimal irrigation.

Desert plantain is comparatively pest-free, but it does not tolerate freezing temperatures and is subject to root rot if the soil stays too wet for too long.

P. ovata does not behave like a weed, meaning it is not invasive and does not attempt to compete for space and nutrients with other plants in the landscape.

Wildlife

P. ovata attracts numerous types of pollinators, including bees, birds, and *Lepidoptera* species (butterflies, moths, and their caterpillars).

In a study conducted by Olav Oftedal and his colleagues at the Fort Irwin Study Site in California, Mojave desert tortoises sought out and consumed the leaves and immature fruits of desert plantain, a plant with high potassium excretion potential, at substantial rates during their foraging even though the species is comparatively rare in their ecosystem (Oftedal et al. 2002).

A slope in Inyo County, California, clothed in desert plantain. **Photo © 2005 by Steve Matson**

Edibility

The young, tender leaves of *P. ovata* are eaten raw in salads or cooked as potherbs. Its sprouted seeds are nutritious in salads. Ω

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Stenocereus thurberi, the Organ Pipe cactus, photographed in Sonora, Mexico. This cactus, which is native to Mexico and the United States, bears the *pitaya* fruit consumed by many animals including the spotted box turtle and people. It is locally known as *pitaya dulce*, meaning "sweet pitaya," referring to the sweetness of the cactus fruit.

The organ pipe cactus is a tree cactus that grows slowly to 23-26 feet (7-8 meters). Older plants produce 3-inch (8 centimeter) white flowers that open at night and close during the day. The flowers then give rise to the sweet fruits. **Image copyright © 2014 by Sue Carnahan**

If the sky is indeed falling, maybe we should at least have the faith of turtles and other living things who become displaced, persecuted, and sense global climate shifts far more than we do, and yet carry on in the face of whatever life offers.

—Robert Anthony Villa, American field biologist

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A CRITICALLY ENDANGERED TORTOISE ENJOYS ZOO MED GRASSLAND TORTOISE FOOD

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
turtle survival alliance

USF&WS Lists Suwannee Alligator Snapping Turtle as Threatened Under the Endangered Species Act — *US Fish & Wildlife Service press release*

26 June 2024—The Suwannee alligator snapping turtle (*Macrochelys suwanniensis*), often considered the dinosaur of the turtle world, is on the decline. That's why the U.S. Fish and Wildlife Service is listing it as a threatened species under the Endangered Species Act (ESA) with a 4(d) rule that tailors protections to support its conservation needs. The Service decided not to designate critical habitat for the turtle because it could increase poaching.

"This listing will further unite the Service and our partners in conserving this iconic species while ensuring those that rely on the outdoors for their recreation and livelihoods can continue their pursuits," said Mike Oetker, Southeast Regional Director. "Comments and information received on the proposed listing and 4(d) rule helped to inform our final rule and we are thankful for the public and our partners' involvement in this process," he added.

Alligator snapping turtles are the largest freshwater turtles in North America, with males weighing more than 200 pounds. Rough, spiked brown shells resemble alligator skin with ridges running the length of the upper shell that end in a tail nearly as long as the body. A huge, wedged head supports massive jaws ending in hooked beaks. A worm-like appendage on a long narrow tongue attracts prey consisting of fish, frogs, snakes, waterfowl, small mammals, and other turtles.

A Suwannee alligator snapping turtle photographed in Florida. **Photo © 2023 by John Serrao**

The Suwannee alligator snapping turtle is only found in the Suwannee River basin of Georgia and Florida. Illegal harvest and collection, hook ingestion and entanglement from recreational and commercial fishing, and nest predation are threatening the sole population, which currently has about 2,000 individuals throughout its range.

The Suwannee alligator snapping turtle is listed as a state-designated threatened species in Florida and Georgia. In Florida, it is illegal to take, possess, or sell. In Georgia, is illegal to harass, capture, kill, sell, or purchase the species. Georgia law also prohibits the destruction of the species' habitat on public lands.

Under the ESA's Section 4(d) rule that tailors prohibitions to provide conservation benefits for the species, the Service will make exceptions to incidental take resulting from forest management activities that apply state-approved best management practices.

The rule, comments, economic analysis, and supporting documents are available at **https://www.regulations.gov/document/FWS-R4-ES-2021-0007-0041** Ω

Scientific Review Shows Gopher Tortoises at Risk of Extinction

—Federal Decision to Deny Protections Should Be Reexamined—Center for Biological Diversity press release

St. Petersburg, Florida—16 July 2024—In a formal peer-reviewed letter published today in *Global Ecology and Conservation*, experts in modeling and turtle biology detailed several errors in a population viability model that led to a significant overestimate of future gopher tortoise (*Gopherus polyphemus*) populations. The flawed model was used by the U.S. Fish and Wildlife Service to deny federal Endangered Species Act protections to the tortoises across most of their range in 2022.

Using a corrected model, the experts predict that less than 1% of tortoises will persist by the year 2100. By comparison, the flawed model the Service relied on to deny protections predicted roughly 67% would persist in the same time period.

"The previous model was far

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too flawed to use as a basis for decision making," said Kevin Shoemaker, Ph.D., a professor of population ecology with expertise in using conservation simulation models and co-author of the letter. "I hope the Service does the right thing and re-evaluates their decision. In the meantime, researchers should move quickly to develop a more realistic model to support conservation decisions for this ecologically important species."

"When we examined the simulated metapopulations one at a time, we realized that some of them were growing at a completely unrealistic rate," said Kevin Loope, Ph.D., a research scientist who studies the conservation biology of gopher tortoises and co-author of the letter. "Hopefully the Service will re-evaluate their decision in light of predictions from an updated model. This case highlights the critical need for greater scrutiny of complex models when they are applied to important conservation decisions. The standard peer review process may not be sufficient in such cases, and small errors can have large effects."

The publication explains that errors in the original gopher tortoise model led to much larger projected population sizes and lower risk of local extinctions in the future. Wildlife officials relied on the model's mistaken overestimate when they decided gopher tortoises would be safe from extinction.

The letter also explains that an error in the way the model accounted for movement of gopher tortoises among habitat patches produced an inadvertent positive feedback loop, meaning that some simulated populations grew much faster than is biologically possible. Another error in the model inadvertently accelerated the rate of sexual maturation of juvenile gopher tortoises, which further contributed to the inflated population growth predictions.

"Given this model's serious errors there's no question that the Fish and Wildlife Service has to reconsider its decision to deny gopher tortoises endangered species protections," said Ragan Whitlock, a Florida-based attorney at the Center for Biological Diversity.

A gopher tortoise photographed at San Felasco Hammock Preserve State Park in Gainesville, Florida. Photo by Renee Bodine/ USFWS. Used with permission.

"The Endangered Species Act is so successful at recovering species because it requires wildlife officials to base decisions on the best science. There's no exception for the gopher tortoise."

"Demographic models are powerful predictive tools for wildlife management decisions, but it's critical that they be constructed correctly and that the parameters are based on sound scientific data. Unfortunately, the original model that was used to predict the future survival of gopher tortoise populations was significantly flawed and resulted in an erroneous decision by the Service," said Matthew Aresco, Ph.D., biologist and board member at Nokuse Education, Inc. "The Service should now re-evaluate its listing decision. Clearly, the corrected model results demonstrate that gopher tortoise populations are in deep trouble and warrant federal protection."

In 2022 the Service denied federal Endangered Species Act protections to the eastern population of gopher tortoises in Florida, Georgia, South Carolina and most of Alabama. In 2023 the Center and Nokuse Education, Inc., sued the Service, arguing that the decision was arbitrary and departed from the best available science about the gopher tortoise's status and threats. In the lawsuit, the conservation organizations highlighted significant flaws in the gopher tortoise population model that the Service relied upon.

Gopher tortoises in limited parts of Louisiana, Mississippi and western Alabama remained protected under the federal Endangered Species Act. Those in the eastern portion of their range have needed and been waiting for federal protection since 1982.

Gopher tortoises have shovel-like front legs and strong, thick back legs that help them dig deep burrows that more than 360 other species use. Gopher tortoise burrows are considered key features in the large, unfragmented upland ecosystems these communities of wild animals need to survive. Ω

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Check your chapter website for program information.

Chino Valley
September 20; October 18

Foothill
September 27; October 25

High Desert
September 9; October 14

Inland Empire
September 6; October 4

Kern County
September 9; October 14

Low Desert
Meeting information to be announced.

Orange County
September 6; October 4

Ridgecrest
September 9; October 14

Santa Barbara-Ventura
Meeting information to be announced.

Santa Clarita
Meeting information to be announced.

TOOSLO (San Luis Obispo)
September 24

TTCS (Long Beach)
September 21; October 19

Valley
September 20; October 18

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