47th Annual Gopher Tortoise Council Meeting

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Tall Timbers, Leigh Perkins Conservation and Education Center

Abstracts for Student Oral Presentations

*Denotes presenter

Occurrence and Genetic Insights into the Tick-borne Relapsing Fever Spirochete *Borrelia turicatae* in a Florida Population of Soft Ticks *Ornithodoros turicata americanus*

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In the southwestern United States, the occurrence and potential for disease spread of Tick-Borne Relapsing Fever (TBRF) has been studied extensively. In Florida, the only recorded occurrence of the *Borrelia* pathogens that cause TBRF was in two domestic dogs (*Canis lupus familiaris*) in the 1990s. Florida also boasts a substantial population of soft ticks that are capable of transmitting *Borrelia* and are potential gopher tortoise (*Gopherus polyphemus*) burrow obligates. The goal of our study was to fill the knowledge gaps regarding this disease system in the state. Our objectives were to 1) describe the occurrence and prevalence of *Borrelia* spp. in Florida ticks; 2) phylogenetically describe the pathogen species compared to western isolates of *B. turicatae*. We pooled ticks by sample location and extracted DNA from over 3,000 ticks systematically collected throughout the state. Conventional PCR was used with a genus-wide IGS primer to detect any *Borrelia* spp. present in the ticks. We Sanger sequenced 7 pools (7/580; 1.21%) that were positive for *Borrelia* spp. We created a phylogenetic tree with 6 of the samples that showed clustering into two distinct clades, one that fit with Texas isolates and one that was entirely distinct. Isolation and subsequent admixture events caused by biogeographic and host influences may be the driving force behind the history of *Borrelia turicatae* in Florida. This pathogen is zoonotic and may pose a potential disease threat to humans and domestic animals that come in close contact with tortoise burrows. Future research is needed to improve our understanding of the drivers of pathogen occurrence and to further uncover the phylogeography of this species. By understanding the occurrence and phylogenetics of *Borrelia turicatae* in the state, we can better understand and mitigate the risk of this vector-borne disease for humans and companion animals in Florida.

Reassessment of the Upland Snake Community in the Red Hills Region

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The Red Hills is a region in the southeastern United States just north of Tallahassee, Florida. The area is known for its red clay hills, rolling terrain, and diverse plant and animal communities, which includes the gopher tortoise. Tall Timbers (TT) is in the heart of the Red Hills. The last study of the snake community at TT occurred twenty years ago. Since that time habitats have changed mostly due to hardwood removal and by allowing prescribed fires to burn into bottomlands and naturally extinguish. Using the same methodology and trap locations we are repeating that study. Our research is important for assessing the current status of the upland snake community and understanding how it has responded to changes in habitat over the past 20 years. We are also, for the first time, evaluating disease presence in the snake community at TT. We are swabbing snakes to test for *Cryptosporidium serpentis* (Crypto) and snake fungal disease (SFD). SFD is caused by the fungus *Ophidiomyces ophiodiicola* and is proving detrimental to already declining snake populations. We are also sampling for the invasive pentastome, *Raillietiella orientalis*, which was introduced by Burmese pythons and is an emerging threat to native snake species. Understanding the expanding range of this invasive pentastome and the pathogens impacting native snakes are important for their management and conservation. Preliminary results show evident shifts in community composition, with Florida cottonmouths now being the most abundant species, while species such as banded water snakes and eastern coachwhips appear to have declined. We have detected SFD at low levels, but neither Crypto nor *R. orientalis* were detected in the samples screened to date. These findings will provide valuable baseline data on both community composition and pathogen presence for future monitoring and conservation efforts.

The Effects of First Year Cold-Dormancy on the Phenotypic and Metabolic Responses in Head-Started Gopher Tortoises (*Gopherus polyphemus*)

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Head-starting programs are widely used in reptile conservation to promote rapid growth and improve early survival. In gopher tortoises (*Gopherus polyphemus*), however, head-starting environments often bypass natural first-year cold dormancy. Therefore, there is a significant gap in knowledge regarding how skipping natural cold dormancy early in life impacts essential biological functions including growth trajectories and metabolic processes that may impact fitness. We experimentally tested the effects of bypassing first-year cold dormancy on body size, growth rate, and metabolic biomarkers. Sixty hatchlings (14 clutches) were assigned to two

treatments: (1) constant-warmth raised under standard head-starting conditions without dormancy, and (2) a cold-dormancy that included a simulated winter. We estimated body size from straight carapace length, growth rate from body mass, and quantified plasma glucose, total triglycerides, and acetyl-CoA at four timepoints: before-dormancy (before), during-dormancy (during), 3 weeks post-dormancy (3Wk.Post) and 3 months post-dormancy (3Mo.Post) before released into the wild at 10 months. Upon recapture, body size was measured again at 1.75 years old. Our results indicated during dormancy, plasma glucose was reduced in the cold-dormancy group, while total triglycerides and acetyl-CoA were lower at 3Wk.Post-dormancy but not at 3Mo.Post-dormancy. For body size, we found that cold-dormancy animals were 8.6 mm (8.9%) smaller at 3Mo.Post-dormancy due to significantly lower growth rates during and 3Wk.Post-dormancy. However, by 3Mo.Post and 1.75 years old, growth rates were similar between groups, but cold-dormancy animals remained 9.1 mm (8%) smaller. These results indicate cold dormancy temporarily suppresses growth and metabolism, with effects persisting up to 3Wk.Post-dormancy but not 3Mo.Post-dormancy. Dormancy neither caused catch-up growth, nor a persistent reduction in growth rate. Our findings suggest early-life metabolic responses may influence energetic priorities during recovery from dormancy. For conservation, this suggests that supporting natural physiological rhythms may be important for optimizing growth and metabolic health in reintroduced gopher tortoises.

Life History Traits of Federally Threatened Gopher Tortoises at the Western Edge of Their Range: Insights from Camera Traps and AI

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The gopher tortoise (*Gopherus polyphemus*) is an important keystone species and ecosystem engineer in the Gulf and Atlantic Coastal Plain ecoregions of the southeastern United States. The species federally listed range consists of numerous, small, fragmented populations distributed predominantly across private lands and, to a lesser extent, public lands. In Louisiana, gopher tortoises face a high risk of extirpation due to threats including habitat loss, poor habitat management, an absence of minimum viable populations, limited recruitment, and nest predation. To better understand how low recruitment has limited population growth in Louisiana, we are studying reproduction at two sites: Ben's Creek, a private working forest in Washington Parish, and Sandy Hollow Wildlife Management Area in Tangipahoa Parish, owned by LDWF. We deployed 35 trail cameras between the two sites at gopher tortoise burrows to capture daily activity. Our objectives are to: 1) assess the effectiveness of AI models in sorting images obtained from burrows cameras; 2) examine the number of successful mating events per season; and 3) compare factors influencing nest predation using artificial nests. Our results indicate that there is no significant difference between AI and human sorting abilities and AI has reduced the time spent sorting camera trap images by accurately removing 98% of the blank images and accurately identifying images with reptiles 85% of the time. More mating attempts occurred at

Sandy Hollow WMA than Ben's Creek; and predator activity was highest in longleaf pine stands.

Monitoring, Mortality, and Management of Gopher Tortoises (*Gopherus polyphemus*) on Florida's Roadsides: Project Update

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Turtles are among the most threatened taxa on earth, with roadways increasing the threat of mortality. In the present study, the road ecology of *G. polyphemus* is examined by documenting tortoise colonies along roadsides across seven counties in central Florida. The objectives are to (1) establish the relative abundance of tortoises along various-sized roads, serving as a population baseline for future studies; (2) compare the habitat quality on roadside edges, their adjacent habitats, and managed habitats with tortoise populations by quantifying canopy openness; and (3) determine if roadside tortoise populations incur considerable road mortality. These objectives test the hypothesis that tortoises are marginalized to reside on roadside edges due to either being pushed from unsuitable habitats (i.e., fire-suppressed, closed-canopy habitats, or residential areas) or the alternative hypothesis that colonies reflect spillover from adjacent populations with suitable habitats. We utilized a mix of vehicle and foot transects to collect survey data, which included burrow width, burrow distance from the road and treeline, and the burrow activity classification (active, inactive, abandoned). Thus far, over 1400 burrows and 90 deceased individuals have been identified along six roadways. When the field data have been recorded and analyzed, management suggestions will be made to help protect roadside tortoise populations. Finally, population metrics will be published alongside standard procedures to establish a baseline for future monitoring to determine if roadways act as population sinks.

Preliminary Insights into Gopher Tortoise Movement Ecology using GPS Technology

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Animal movement data can be used to identify patterns of resource use, elucidate animal behavior, quantify spatial requirements, as well as monitor responses to events. However, the questions that we can answer using animal movement data can be limited by the methods we use

to collect movement data. Gopher tortoises have been the focus of numerous radio-tracking studies. However, a major limiting factor in data collection for radio-tracking studies is the amount of labor required to collect individual movement data as these data are often collected on foot. This often results in coarser data resolution, and the presence of an observer may also influence the natural behavior of tracked animals. With advancements in tracking technology, scientists are now able to affix GPS loggers or transmitters to their study animals to collect movement data in their absence. In this research, I use GPS loggers to track and record the movements of adult gopher tortoises in longleaf pine in southwestern Georgia. My work describes preliminary findings of gopher tortoise movement ecology using GPS loggers and current analytical techniques (i.e., dynamic Brownian Bridge Movement Models and autocorrelated Kernel Density Estimates). I will demonstrate ways that we can leverage GPS tracking data to further investigate gopher tortoise ecology, such as duration and frequency of burrow usage, and spatio-temporal overlap with conspecifics. Furthermore, I will demonstrate some possible ways to overcome challenges associated with using GPS loggers on a burrowing species, for example, using GPS metrics like horizontal dilution of precision (HDOP) and the number of satellites visible to help distinguish points collected from the mouth of the burrow versus those collected outside of the burrow. Ideally, these preliminary results will improve our ability to gather and apply gopher tortoise movement data for science-based management.

Reproductive Season and Fecundity Reassessment of Gopher Tortoises (*Gopherus polyphemus*) in Southeastern Florida

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Gopher tortoise (*Gopherus polyphemus*) breeding season takes place throughout spring and early summer, beginning in April and lasting until July. However, recent research shows that the gopher tortoises of southeastern Florida mate throughout the fall and winter months as well. This suggests an extended, and possibly year-round, reproductive season for gopher tortoises in southeastern Florida. This may be due to the extreme climate conditions of south Florida. This project will evaluate to what extent gopher tortoises have an extended reproductive season in southeastern Florida and assess the fecundity of females. The study will be conducted at two locations in south Florida: one in Jupiter, FL known as the Abacoa Greenway, and another in Boca Raton, FL on the FAU campus. Field ultrasound equipment and radiographs will be used to identify gravid females in the fall and winter months. The preliminary data collected points to the possibility of an extended and possibly year-round reproductive season at the site in Jupiter, FL. The ultrasounds and subsequent radiographs provide evidence for a much earlier start to egg development and nesting with gravid females being seen in February and March. The radiographs also show evidence of a larger clutch size than the typical population of *G. polyphemus* (the mean clutch size of this data is 9.6 eggs). All these data act as evidence towards an extended reproductive season of the *Gopherus polyphemus* populations of this part of their range and the possibility of their use of this as a survival strategy in the warmer climate of southeastern Florida.

Abstracts for Student Posters

Effect of Simulated Cold Dormancy versus Constant Growth on Mitochondria Density and Telomere Length in Head-started Gopher Tortoises

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Head-starting is a conservation method used to give threatened species a needed advantage to survive early-life high mortality. Head-started organisms are raised in a safe, controlled environment and are not subjected to the natural conditions they would otherwise experience. Though this boosts survival rates, further investigation is needed to assess the molecular effects of bypassing early life environmental cues. Telomere length and mitochondrial density are used as proxies for genome integrity and metabolic capacity (respectively) and are thus metrics that may shed light on organismal functionality. The threatened species *Gopherus polyphemus* is studied here due to their significance as a keystone species. Gopher tortoises are typically head-started in a constant warm environment to maximize rapid growth, and therefore bypassing a natural cold dormancy phase. For this study, we split a cohort into two treatment groups, 1) constant warmth throughout the head-start program, and 2) cold dormancy that includes the seasonal change in temperature and light cycle in the first year of life. We used qPCR to quantify blood telomere length and mitochondrial density between treatment groups. This study found that the treatment did not have an effect on telomere length, but mitochondrial density was lower in cold dormancy group relative to the constant warmth group at 3-weeks after the cold dormancy period. Understanding the physiological responses to temperature differences can inform head-starting protocols and ultimately contribute to the conservation of the species.

Do Substrate Transitions Affect Locomotor Performance and Escape Behavior of Florida Scrub Lizards?

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Substrate type has been demonstrated to influence the locomotor performance of various lizards. However, habitats are often composed of a mosaic of substrates, and few studies have quantified how transitioning between substrates affects escape behavior or locomotor performance. In this study, male Florida scrub lizards (*Sceloporus woodi*) were collected from several sites in the Ocala National Forest from longleaf pine forests and Florida scrub. Lizards were transported back to the lab and were randomly assigned to one of three substrates (sand, mixed leaf litter, or

a transition from sand to litter). Lizards were sprinted down a 2 m racetrack with the assigned treatment type and filmed using high-speed video cameras. Videos are currently being analyzed to measure sprint speed, acceleration, and variation in escape behaviors such as intermittent locomotion, bipedal locomotion, and reversals. Trials were also digitized and used to calculate maximum sprint speed and acceleration to determine on which substrate the lizards achieved their best locomotor performance. More data will be collected during the summer of 2026. Preliminary results will be presented comparing locomotor performance and escape behaviors across substrates and comparing them between habitat types. This information can be used to help landowners better manage for this near-threatened species as prescribed burning can impact the amount of leaf litter, and it may help explain differences in predation attempts across habitat types.

Learning and Memory Retention in the Gopher Tortoise

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Gopher tortoises (*Gopherus polyphemus*), like other Chelonia, have long life spans. Therefore, long-term memory is likely beneficial for these animals as they interact with their environment and conspecifics, as well as navigate between multiple burrows and foraging sites. Despite this, the long-term memory capabilities of this species have not yet been tested. In this study, six gopher tortoises were trained on a visual discrimination task in which they needed to discriminate between stimuli which varied in shape and color. The animals successfully learned the task, and testing indicated that they predominantly relied on color when making their discriminations. After approximately six months, one year, and two years, the tortoises were given memory tests to assess their ability to retain this information over lengthening periods of time. In both the six-month and one-year tests, all animals retained the information, continuing to preferentially choose their positive stimuli. Additionally, re-training times were significantly shorter than during initial training. These findings suggest that visual cues are likely significant for this species when making decisions, and that this information can be retained over extended periods, potentially offering valuable insights for conservation efforts targeting this species. Results from the two-year test, which is currently ongoing, will be discussed when the poster is presented.

Bridging Diverse Perspectives in Gopher Tortoise Conservation: Insights from Stakeholder Interviews

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This research explores the dynamic and often unseen social, political, and ecological forces shaping wildlife conservation, with a focus on gopher tortoise conservation in the southeastern United States. This poster presents a synthesis of perspectives shared by a range of individuals involved in different facets of gopher tortoise conservation during semi-structured interviews held between 2023 and 2024 as part of my dissertation research. Participants ranged from researchers, land managers, authorized agents and environmental consultants, to former/state employees, and other stakeholders involved in gopher tortoise conservation. Interview questions asked participants to reflect on the shifts in gopher tortoise conservation policy, the role and effectiveness of gopher tortoise relocation and recipient site programs, and emerging needs in tortoise research and policy in Florida. The conversations within these interviews unearthed both structural and relational social, political, and economic dynamics that are often obscured in gopher tortoise conservation research. Findings from interviews revealed shared perspectives among the stakeholders, as well as the tensions and gaps that exist in gopher tortoise conservation policy. Identifying these gaps calls on us to recognize these nuanced relationships and work toward collaborative conservation strategies that center the tortoise. This research suggests that utilizing qualitative methods to understand and bridge diverse perspectives in conservation can provide insights into areas of future policy intervention. These insights may enhance the long-term success of gopher tortoise conservation and support multispecies coexistence and broader conservation efforts.

Analyzing Size Distribution and Body Composition of Egmont Key and Nearby Mainland Gopher Tortoises (*Gopherus polyphemus*) to Establish Baselines for Future Hurricane Effects

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Coastal populations of gopher tortoises (*Gopherus polyphemus*) are susceptible to negative impacts of increasingly severe tropical weather. Egmont Key is an island state park and wildlife refuge located at the mouth of Tampa Bay with a historically dense population of gopher tortoises studied over several previous decades. To understand the effects of an active 2024 hurricane season on Egmont Key, a study was conducted in summer 2025 to assess changes in population structure and body condition of gopher tortoises as compared to a nearby mainland reference population (Boyd Hill) and data from before the 2024 hurricane impacts. We report on changes in body condition index and population structure between the sites across a multi-decadal period. On Egmont Key, during summer 2025, we collected data from a total of 136 individuals with 79 being previously unmarked. Size distributions of Egmont Key tortoises in 2025 were different to the 136 previously sampled individuals taken before the hurricane. Post-hurricane size distribution showed an increase in juvenile population mimicking historical distribution at Boyd Hill. Egmont Key tortoises showed a reduced body condition as compared to Boyd Hill overall, however, there was no difference pre and post hurricane. Population data from 2025 indicated that island gopher tortoise populations can continue to thrive following

intensive natural disasters like hurricanes. This 2025 population study allows for the establishment of morphometrical data for the Egmont Key tortoise population for future hurricane impacts to be better quantified.

Green Iguana and Gopher Tortoise Interactions

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The introduction of the green iguana (*Iguana iguana*) to South Florida has created potential competition with native burrow-using species. Gopher tortoises (*Gopherus polyphemus*), a keystone species, rely on extensive burrow systems that provide shelter for more than 300 commensal species. Green iguanas, first reported in Florida in the 1960s, are now widespread and known to occupy or alter burrows in natural areas. However, the extent to which iguanas compete with gopher tortoises for burrow access and modify burrow structure remains poorly understood. We tested three hypotheses: (1) green iguanas compete with gopher tortoises for burrow use as a means of conserving energy, (2) iguanas exhibit aggressive behaviors and exclude tortoises from burrows since they do not typically share burrows with other species in their native range, and (3) iguanas reconstruct burrows to accommodate their larger body size. Field data were collected using Moultrie cameras set one meter from burrow entrances at three sites: Florida Atlantic University Preserve, Pondhawk Natural Area, and Hugh Taylor Birch State Park. Cameras recorded 15-second video clips whenever motion was detected, capturing interactions of iguanas, tortoises, or both. We expect to document evidence of competitive interactions, including aggressive exclusion of tortoises by iguanas and possible burrow modification by iguanas. Findings will clarify whether invasive iguanas threaten gopher tortoise populations through direct competition for shelter. By better understanding these interactions, managers can anticipate potential declines in burrow availability and design conservation strategies to support gopher tortoises and the diverse species that depend on their burrows.

Abstracts for Professional Oral Presentations

Restoring a Pleistocene Relict: How Wild Bolson Tortoises (Gopherus flavomarginatus) Returned to the Northern Chihuahuan Desert

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The IUCN Red List's "Critically Endangered" Bolson tortoise (Gopherus flavomarginatus) is the closest relative of the gopher tortoise. Its Pleistocene range is thought to have extended from Aguascalientes, MX, in the south to New Mexico and northern Oklahoma and in the north, and from West Texas in the east to southeastern Arizona in the West. Today, the remnant bolson tortoise population in north-central Mexico consists of ~2,500 adults that occupy a small area of the 'Mapimi' region of the Chihuahuan Desert (which extends into southern NM and southeastern AZ). Starting in the fall of 2006 with 30 captive adult/sub-adult and 7 hatchling Bolson tortoises, biologists with the Turner Endangered Species Fund (TESF) have spearheaded a project that includes establishing a robust captive breeding and head-starting program located in suitable Chihuahuan Desert habitat on media mogul Ted Turner's southern NM ranches. Since then, the Bolson tortoise project has produced over 700 juvenile tortoises that range in age from 0-19 years old. Regular, long-term monitoring of marked individuals makes it possible to determine parameters such as typical growth rates, survivorship, genetics, kinship, predation pressures, time to sexual maturity, etc. For example, we are beginning to gather evidence that bolson tortoise females need to be both >15 year old and have a shell >300 mm in length to produce eggs. TESF's ultimate goal is to establish free-living, minimally managed Bolson tortoise populations in the northern Chihuahuan Desert. In 2021, we began releasing captive-reared juvenile tortoises in suitable habitat on the Turner Ranches (and, more recently, on public lands) to begin establishing new populations that will contribute to recovery of the species. We are following these ~200 individuals regularly to assess growth and survivorship, health, site fidelity, and movement patterns.

Restoring Gopher Tortoises and Building a Research Program at the Avalon Rosewood Long-Term Protected Recipient Site

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The Avalon Plantation in Jefferson County, FL encompasses over 14,000 acres of suitable gopher
tortoise soils, and quail-oriented property management maintains abundant habitat conducive to tortoise occupancy. However, the natal gopher tortoise population at Avalon has remained small, fragmented, and at low density for decades. Our goal is to restore a viable gopher tortoise population at Avalon through translocations of animals displaced by development, while promoting actionable science that informs gopher tortoise conservation management and effective translocation practices. In early 2025, we established an initial 260-acre Long-Term Protected (LTP) recipient site and have rehomed 37 individuals to date. We have developed an innovative approach to transporting tortoises between the donor and recipient site in an effort to reduce stress associated with transport. In addition, we are developing a low-cost LoRa-based GPS tracking system to monitor the population dynamics, habitat use, and movement patterns of large numbers of Avalon's resident and translocated LTP tortoises to advance an understanding of gopher tortoise ecology, evaluate translocation success, and inform management strategies and
LTP program protocols.

Pathogens and genetic diversity in Florida gopher tortoise translocations: a preliminary report from Nokuse

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Gopher tortoises are currently experiencing mitigation translocation at a tremendous scale in Florida. Research that identifies features associated with mortality or reduced fitness after translocation could improve translocation outcomes if vulnerable populations or individuals are identified and protected. In this talk, we provide a project overview and report on preliminary results from a large study of blood and oral/cloacal pathogen swab samples collected between 2017 and 2024 at Nokuse, a large translocation recipient site in the Florida Panhandle. We plan to combine these data with post-release survival and body condition data, with the goal of understanding the roles of pathogen presence and individual genetic diversity in the translocation

process. In Aim 1, we will identify geographic and landcover features of source sites that could predict pathogen presence in translocated individuals. In Aim 2, we will use a similar approach for individual genetic diversity, which may be reduced due to inbreeding at isolated source sites with smaller population sizes. In Aim 3, we will examine how pathogen presence and genetic diversity at time of release predict post-translocation outcomes (mortality and body condition upon recapture and pathogen presence upon recapture). We have currently completed pathogen screening of 517 pathogen swabs, including 77 individuals sampled both at release and again after recapture within 3 years. Of sixteen common pathogens in the screen, we detected four: Helicobacter sp., Emydomyces sp., Mycoplasma agassizii and M. testudinum. Two pathogens, M. agassizii and Emydomyces sp., were detected significantly more frequently in recaptured individuals than in individuals sampled at intake, a pattern supported both by overall frequencies and by repeated sampling of individuals. We discuss the implications of these preliminary findings and next steps for the project.

Restoration of a Longleaf Pine Ecosystem Supporting Critical Wildlife Species: Aiken Gopher Tortoise Heritage Preserve

Hunter Young[1] (Wildlife Biologist/Property Manager), Andrew Grosse[2] (State Herpetologist), Barry Kesler[3] (Regional Wildlife Coordinator/Previous Property Manager), Dr. Tracey Tuberville[4] (Senior Research Scientist), & Dr. Kurt Buhlmann[5] (Senior Research Associate)

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Once hidden within the dense hardwood understory of a long-unmanaged upland sandhill habitat, a small population of gopher tortoises (*Gopherus polyphemus*) was discovered in what would become the Aiken Gopher Tortoise Heritage Preserve. Originally a 365-acre tract, the preserve has since expanded to 1,675 acres, evolving into a model of successful habitat restoration. Acquired by the state in the early 2000s, the preserve—located in Windsor, South Carolina—has been actively managed to restore the longleaf pine (*Pinus palustris*) ecosystem. Core management strategies include prescribed fire, mechanical vegetation control, and targeted chemical applications, all implemented in coordination alongside work being done with partner agencies and organizations. Through these ongoing efforts, the Aiken Gopher Tortoise Heritage Preserve stands as a leading example of long-term restoration success, enhancing biodiversity

and reestablishing a thriving longleaf pine savanna that supports the gopher tortoise and many other native species.

Avian Response to Pine Savanna Restoration: Recovery of Open Forest Birds to Nokuse

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The pine savanna ecosystem, once widespread in the southeastern United States and historically dominated by Longleaf Pine (*Pinus palustris*), has been severely reduced due to silviculture and land development. Restoration efforts at Nokuse, a 55,000-acre privately owned conservation preserve in the Florida Panhandle, aim to recreate the open-canopy, fire-maintained pine savanna conditions that support open forest bird species. This observational study looked at the abundance and distribution of avian species typical of pine savannas in areas undergoing long-term ecological restoration. Using passive acoustic monitoring with autonomous recording units (ARUs) and point count surveys, we assessed bird community composition in relation to restoration progress. Our findings showed an increase in detections of species such as Bachman's Sparrow (*Peucaea aestivalis*), Brown-headed Nuthatch (*Sitta pusilla*), and the Northern Bobwhite (*Colinus virginianus*). Detection of these species was associated with conditions featuring an open canopy, sparse midstory, and diverse herbaceous groundcover. These results demonstrate that, over time, lands degraded by decades of intensive commercial silviculture can be effectively rehabilitated to support avifauna characteristic of the pine savanna.

Gopher Tortoise Research Needs: An Overview of Florida's 2024 Gopher Tortoise Management Plan and the Call for Research and Outreach Proposals Program

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The Gopher Tortoise (*Gopherus polyphemus*) was listed as a State-designated Threatened species in Florida in 2007, and the Florida Fish and Wildlife Conservation Commission (FWC) created its first Gopher Tortoise Management Plan in concert with this listing decision. The most recent version, effective as of April 2025, identifies 63 conservation actions, 10 of which are focused on research needs. One of the primary themes of these research actions is improving translocation and relocation methodologies and evaluating their outcomes. Additional research

priorities include assessing the compatibility of solar energy installations with tortoise conservation, evaluating the effectiveness of agricultural and silvicultural best management practices, and increasing understanding of disease dynamics and toxin exposure in tortoise populations. To support research efforts, the FWC established the Call for Research and Outreach Proposals Program in 2021. This program funds actionable science and outreach initiatives using gopher tortoise mitigation contributions. Since the establishment of this program, the FWC has funded 14 projects for a total of over $480,000 with topics ranging from evaluating survey methodology, improving our understanding of translocation outcomes, creating updated predictive population models, and building upon our knowledge of disease detection and predictability. For the upcoming funding cycle, the FWC's Call for Proposals Program will continue to prioritize projects aligned with conservation actions identified in the management plan, with a particular focus on improving the success of translocation and relocation practices to enhance conservation outcomes for the species in Florida.

Digging into Restoration: Projects from Barfield Burrows Preserve

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Barfield Burrows Preserve is a 2.15-acre conservation area on Marco Island, Collier County, Florida. Acquired by Conservation Collier in January 2024 for $3.1 million, the preserve supports over 150 active gopher tortoise (*Gopherus polyphemus*) burrows, a nesting pair of bald eagles (*Haliaeetus leucocephalus*), and resident burrowing owls (*Athene cunicularia*). Since acquisition, management efforts have focused on habitat restoration and enhancement for these protected species. Initial actions included large-scale removal of Brazilian pepper (*Schinus terebinthifolia*), Australian pine (*Casuarina equisetifolia*), tropical almond (*Terminalia catappa*), and carrotwood (*Cupaniopsis anacardioides*), followed by manual debris removal and targeted hand removal of secondary invasive species such as guinea grass (*Megathyrsus maximus*) and Durban crowfoot grass (*Dactyloctenium aegyptium*). Vegetation management employed strategic mowing with minimal herbicide use to reduce impacts on native flora and fauna. Approximately 50 native plants were installed to promote habitat structure and diversity. Additionally, in partnership with the Florida Fish and Wildlife Conservation Commission (FWC), Conservation Collier installed protective fencing to safeguard gopher tortoises from road-related mortality along the preserve boundary.

Future efforts will focus on continued invasive control, expansion of native plantings, and habitat improvements compatible with the nesting schedule of bald eagles. Restoration goals include transitioning the site toward a mosaic of coastal dune/scrub and maritime hammock habitat. Key challenges include coordinating management within eagle nesting constraints, balancing community aesthetic concerns, and limiting herbicide use while effectively controlling invasives.

Through adaptive management and interagency collaboration, Conservation Collier aims to enhance long-term habitat quality for gopher tortoises, burrowing owls, and bald eagles within this unique coastal preserve.

Observed Physical and Behavioral Traits in Gopher Tortoises (*Gopherus polyphemus*) that Test Positive for Heavy Metals.

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Gopher tortoises (*Gopherus polyphemus*) have been monitored and studied on our urban site since 2009. It is not a controlled study site as hatchlings are able to leave the property and beginning in 2013, gray fox occupied this site followed by visits from raccoons and coyotes. Each tortoise is marked with an identification number, weighed, measured (straight carapace length and the width), photographed, and behaviors are noted. The first signs of a possible problem appeared in a few tortoises that had hatched in 2015. There was a decrease in their growth rate, the carapace was thin, and the plastron was soft. With each successive hatch year, an increasing number of tortoises displayed these traits. In 2023, Kim Titterington (RRRCORA) tested a sampling of our tortoises for lead. Results were positive for all. The highest levels of lead were found in tortoises that had a slowed growth rate, thin carapace, and soft shell.

Saving and Restoring Gopher Tortoise Habitat: A Primer in Private Land Conservation

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Private lands comprise the majority of land and, therefore, habitat conservation opportunities within the range of the gopher tortoise. Conserving these lands permanently often requires the use of conservation easements, and subsequent stewardship efforts are usually needed to restore, maintain, or enhance the conservation values of the given piece of property. Peter and Ryne will use specific case studies to offer insights into the mechanics of protecting and stewarding private lands for the benefit of gopher tortoises and their commensals. A better understanding of how private land conservation works will help better equip those working to advance gopher tortoise science and recovery to identify, and act upon, opportunities to make advances in the protection of gopher tortoises, their commensals, and their habitats.

A decade of Georgia's Gopher Tortoise Conservation Initiative

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Since 2015, Georgia's Gopher Tortoise Conservation Initiative has worked to protect 65 viable populations (MVP's) of gopher tortoises (*Gopherus polyphemus*) across their range in the state. This began as an effort to help preclude the need for federal listing of the species in the Eastern Distinct Population Segment through a combination of perpetual conservation easements and fee simple acquisitions. At the time Georgia had only 38 permanently protected MVP's. As the Initiative grew, The Jones Center at Ichauway, Tall Timbers Research Station, and GA DNR surveyed Georgia populations and in 2021, the first Gopher Tortoise Fire Crew was hired so that more prescribed fire and habitat work could be targeted at newly acquired, high-priority gopher tortoise habitat. This year, the 65th population was officially protected. Additionally, 124 individual sites have been surveyed, 19 have been resurveyed, and more than 30,000 acres of prescribed fire have been applied by the fire crew to improve and maintain gopher tortoise habitat in Georgia. This Initiative's success is due to the many public and private partnerships that coalesced to protect sensitive habitats and species and support from State Wildlife Grants that has funded habitat restoration efforts on many of these tracts.

The relationship between vegetation community structure and gopher tortoise burrow site selection on reclaimed heavy mineral surface mine lands

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The gopher tortoise (*Gopherus polyphemus*) is an herbivorous species native to upland sandhills in the southeastern United States. Upland sandhills can be rich in critical mineral deposits that are necessary for the nation's economy and security, sometimes resulting in land-use conflicts with natural resource conservation. Reclaimed mine lands may serve as potential recipient sites for relocated tortoises, providing an alternative to translocations and maintaining genetic representation within the population and landscape. However, their ecological suitability for

sustaining tortoise populations was uncertain. This study evaluated vegetation community structure and its influence on relocated tortoise burrow site selection within a reclaimed mine site in Charlton County, Georgia. From 2021 to 2023, we conducted quarterly vegetation surveys across 60 plots associated with occupied burrows (n = 15), abandoned burrows (n = 15), and randomly selected plots that contained no burrow (n = 30). Vegetation was classified into cover categories with particular focus on forage diversity, ground cover, hardwood shrubs, and pine tree strata. Our objectives were to determine if vegetation composition and structure differed (1) between plots that contained a tortoise burrow (active and abandoned) and random plots that contained no burrow, and (2) between plots containing occupied burrows and plots containing abandoned burrows. Gopher tortoise burrow presence and occupancy were positively associated with bare soil, dogfennel, blackberry, and hairy indigo, and negatively associated with pine presence, indicating that open-ground and specific understory vegetation promote both burrow establishment and continued occupancy. By linking vegetation dynamics with burrow selection, this research provides insight into the viability of reclaimed mine lands as long-term recipient sites for relocated gopher tortoises. Science-based recommendations for beneficial naturally recovering plant species and groups will inform how we can improve the success of reclaimed lands as tortoise habitat.

Patterns of Home Range and Core Area Use of Relocated Gopher Tortoises: Insights into Spatial Ecology on Reclaimed Recipient Sites

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Relocation of gopher tortoises (*Gopherus polyphemus*) is a conservation strategy used across a wide variety of development sites. Understanding how biological and environmental factors influence tortoise behavior and movement is critical to improving relocation success while minimizing stress on the animals. In an effort to address this need, movements of relocated gopher tortoises were monitored on a reclaimed site, previously used for heavy mineral surface mining in southeast Georgia. The reclaimed site was located within the original population range of the relocated individuals, allowing for relocation within their natural area of occurrence. Using GPS loggers, the goal was to assess how home range and core use areas of relocated tortoises vary by sex, season, and pre- versus post-removal of recipient pen fencing. Adaptive local convex hull modeling was used to quantify individual tortoise home ranges (95%) and core areas (50%), while mixed-effect modeling was used to identify patterns of spatial use. The results revealed that home ranges were primarily influenced by fence presence, with significantly larger ranges observed when fencing remained in place, especially during the hatch season. Neither sex nor season alone had significant impacts on home range size. In contrast, core areas varied significantly with sex and fence condition, with additional effects driven by interactions among these factors and season. This study reveals how both biological and environmental

factors involved with relocation practices can interact to shape tortoise movement, offering insights into how gopher tortoises adapt to novel and reclaimed habitats.

A look at interspecific nest cavity competition in an upland species of a pyric landscape

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The brown-headed nuthatch (*Sitta pusilla*; BHNU) is a cavity nesting species found in southeastern fire-maintained pine habitat. In properties managed for gamebird hunting, prescribed burn season begins soon after nesting season initiates for the BHNU and other heterospecific avian species that compete for the same nest cavities. The overlap between fire and nesting season may influence cavity selection and have important implications for nest cavity competition. Foraging habitat quality is an important determinant of cavity selection, and arthropod diversity is shown to decline immediately after a burn. As an important prey item for nest provisioning, a change in arthropod availability could reduce foraging efficiency if distance to foraging opportunities from the nest increases. The reduction in vegetative cover after a burn may also heighten the perception of predation risk in recently burned habitat. If a recent burn degrades foraging habitat quality and increases perception of predation risk, it may also affect interspecific competition for a cavity within recently burned habitat. Here we use camera traps to examine whether recent fire within a 100-meter radius of a nest influences interspecific interactions at artificial nest cavities defended by BHNU and account for the local availability of snags with natural cavities. We predict that the number of heterospecific cavity-nesting species observed at the nest cavity will change inversely with extent of burned habitat regardless of the local availability of snags with natural cavities. While our results are still preliminary nature, we offer initial insights and accounts of heterospecific interactions with BHNU.

Abstracts for Professional Posters

On the Importance of Gopher Tortoise Burrows to Amphibians and other Reptiles

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Gopher Tortoises (*Gopherus polyphemus*) are a keystone species in the southeastern United States because of the long burrow system they excavate. Their long subterranean burrows not only serve as a sanctuary for the tortoises, but many other amphibians and reptiles also use them for shelter. At least 3 species of amphibians, 2 species of lizards, and 7 species of snakes have been observed using the aprons, sand fans, and subterranean burrows of Gopher Tortoises. Some rare snake species such as the Eastern Indigo Snake (*Drymarchon couperi*), Florida Pine Snake (*Pituophis melanoleucus mugitus*), and Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) even hibernate in these Gopher Tortoise burrows. Data is presented on the various types of behaviors and use of tortoise burrows by several snake species including Southern Hognose Snakes (*Heterodon simus*). During cold winter weather, Gopher Tortoises and other amphibians and reptiles retreat into the depth of the burrows. The terminus chamber is at a depth ranging from 3 to 6 feet below the ground surface, where the temperature ranges between 60 and 70 degrees F. There they are safe from cold wind and lethal winter temperatures. Emphasis will be given on Eastern Indigo Snake observations in and around Gopher Tortoise burrows made in Citrus and Marion Counties, Florida between 2004 and 2009.

Bolson Tortoise (Gopherus flavomarginatus) Reproduction and Nest Site Location in a 7.7 hectare (19 acre) Enclosure in New Mexico

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The Bolson tortoise (Gopherus flavomarginatus; listed as “Endangered” by the USFWS and as “Critically Endangered” on the IUCN Red List) is endemic to the Chihuahuan Desert, the northern tip of which extends into southern New Mexico, USA. Starting with 30 captive adult and sub-adult Bolson tortoises in the fall of 2006, the Turner Endangered Species Fund (TESF) spearheads a unique Bolson tortoise breeding and head-starting project that has produced over 700 juvenile bolson tortoises ranging in age from 0-19 years in 2025. Thus far, only three of the female offspring (either 17 or 18 years old in 2025) have shown signs of reaching reproductive maturity. Two have produce eggs and offspring. The third should produce eggs in 2026.

Preliminary results suggest that females require at least 17 years to reach an average minimum reproductive size of ~300 mm straight-line shell length to produce hatchlings. Nearly two decades of monitoring individual adult females for reproductive output and hatching success rates show that in northern Chihuahuan Desert habitats, the average clutch size is 5.1, all tortoises appear to produce at least one clutch every year, and some tortoises lay up to three clutches in a year between the end of April and the end of July. Most of the nests (80%) are not associated with a tortoise burrow. Hatchlings emerge after ~ 4 months (100-120 days). Hatching success varies from female to female and from year to year, but the overall average hatching success rate is ~ 60%. Predation by skunks was documented during two recent years and was the major factor in nest failure those years. Like other Gopherus species, Bolson tortoises exhibit temperature-dependent sex determination, and cooler incubation temperatures produce males while warmer temperatures produce females.

GT Recipient Site Economics

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Florida's rapid urbanization significantly impacts native upland habitats—critical for the State Threatened gopher tortoise (Gopherus polyphemus)—and habitat loss continues to fragment existing populations of upland species. In 2008, the Florida Fish and Wildlife Conservation Commission adopted permitting guidelines that protect tortoises and their burrows and established a regulated relocation program to relocate tortoises to permitted recipient sites. This presentation illustrates recipient site cost estimates that are derived from industry experiences. Costs discussed include permitting, habitat restoration, ongoing habitat management efforts, site operations, and compliance monitoring. We examine how costs scale, according to recipient site tier. Our objective is to provide realistic economic parameters to inform stakeholders and decision makers about the practical and financial challenges of maintaining gopher tortoise recipient sites. These insights can help inform policy decisions, permit requirements, and conservation planning to ensure recipient sites are sustainable and effective.

Mimic Glass Lizard (*Ophisaurus mimicus*): Status Distribution and Ecology

Pierson Hill

FWC-Fish & Wildlife Research Institute

The Mimic Glass Lizard (*Ophisaurus mimicus*) is endemic to the Coastal Plain of the southeastern U.S. To assess its current status and distribution, we compiled 84 historical (pre-2000) and 45 recent (2000–2022) records by searching museum collections, databases, and the

literature. We conducted field visits to 38 recent and 40 historical Mimic Glass Lizard sites to evaluate habitat type and condition. Most records are from open-canopied, hydric–mesic, fire-managed Longleaf Pine (Pinus palustris) habitats with grassy ground cover, including mesic and wet pine flatwoods (61 sites, 78.2%), wet prairie (13 sites, 16.6%), and seepage slope (five sites, 6.4%) communities. The range of the species is now highly fragmented, with recent records restricted to conservation lands in the Florida Panhandle (n = 4) and adjacent southern Alabama (n = 1), and near the coast in southeastern North Carolina (n = 2). Specimens are seldom collected in the field but have been found on roads and in funnel traps along drift fences. We summarized size data, survey methods, and activity of this poorly known species. Given the evidence of range-wide population declines, few recent records, and few known sites for Mimic Glass Lizards, we recommend immediate conservation attention by state and federal agencies, including a species status review for listing under the Endangered Species Act.

Status and Distribution of the Escambia Map Turtle (*Graptemys ernsti*) in Florida

Pierson Hill

FWC-Fish & Wildlife Research Institute

The Escambia map turtle (*Graptemys ernsti*) is endemic to the Florida panhandle and southern Alabama, where it is found in the Choctawhatchee-Pea, Yellow-Shoal, and Conecuh-Escambia River drainages. In 2021, it was listed as federally threatened due to similarity of appearance to the Pearl River map turtle (*G. pearlensis*) which was concurrently listed as federally threatened. Relatively little information exists for the status and distribution of Escambia map turtles in Florida, making its conservation status uncertain. We conducted distributional surveys in spring-summer 2022-2024 via standardized single-pass basking surveys of occupied watersheds. Multiple-pass basking surveys and N-mixture modeling were used on representative sub-sections of the Escambia and Yellow Rivers to estimate detectability and abundance. A total of 1,507 *G. ernsti* were observed during single-pass distributional surveys along 250 river kilometers (rkm) out of a total of 2,322 turtle observations, making them the most abundantly observed species (65%). The present study is the most comprehensive distributional surveys for *G. ernsti* to date. Populations in Florida appear secure but will remain vulnerable to threats due to their limited distribution and reliance on clean waterways with abundant molluscan prey.

Gopher Tortoise Management Plan: 10-Year Progress Report and 2024 Management Plan Highlights

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The Florida Fish and Wildlife Conservation Commission (FWC) published its first Gopher Tortoise (*Gopherus polyphemus*) Management Plan (Management Plan) in 2007 following its reclassification from a Species of Special Concern to a State-designated as Threatened species. In 2012, the FWC worked with stakeholders to adapt and improve the original Management Plan based on new information. This 2012 Management Plan's goal was to restore and maintain secure, viable populations of gopher tortoises throughout Florida, so the species no longer warrants state listing. The 2012 Management Plan consisted of strategies and actions to guide conservation efforts for achieving four primary objectives for gopher tortoises: (1) minimize loss, (2) increase and improve habitat, (3) enhance and restore populations, and (4) maintain the tortoise's function as a keystone species. Over the last 10 years, progress has been made on the 62 actions under the 2012 Management Plan. Of these, 40% of actions have been completed, 42% are considered ongoing, and 18% have not been started. Progress on actions has been achieved through the acquisition of suitable tortoise habitat, the creation of permitting guidelines, establishment and permitting of recipient sites, outreach and education, and funding research. The Management Plan was revised and approved in December of 2024. Major revisions to the 2024 Management Plan include: (1) streamlining and organization alignment with other FWC species management plans, (2) removal of unnecessary material, and (3) updates to the goal, objectives, and actions. This presentation will highlight conservation progress of tortoise management in Florida and share future directions of adaptive management.

Health Assessment of Translocated and Resident Gopher Tortoises (*Gopherus polyphemus*) at a Long-term Protected Recipient Site in Southern Florida

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Pathogen spread and enhanced disease risk are large concerns in animal translocation programs. Development-driven habitat loss in Florida has led to extensive translocations of Gopher Tortoises (*Gopherus polyphemus*) to dozens of State-permitted recipient sites, with ~10,000 tortoises currently being moved annually. Yet health assessments have occurred at only one translocated population (Nokuse Plantation), following a mortality event there in 2013-2015. During a 2022 population survey of the Fort Basinger recipient site (Highlands Co.), we recaptured 42 of 65 tortoises released since 2018 and captured 100 resident, non-translocated tortoises. We examined tortoises for clinical signs of respiratory or other disease (e.g., eye or nasal discharge, misshapen nares, abnormal breathing). We also collected oral-cloacal swabs from a representative subsample (n = 45) for qPCR screening for 23 pathogens. Over half (59%) of translocated tortoises and 36% of residents exhibited one or more clinical signs. Ten of 45 tortoises tested by qPCR were positive for at least one pathogen (*Mycoplasmopsis agassizii*, Tortoise *Helicobacter* sp., and/or Human-pathogenic *Leptospira* spp.). Male tortoises were more likely to be positive for *M. agassizii* (Fisher's exact test, $P = 0.046$). Neither infection status nor presence of clinical signs was associated with whether a tortoise was translocated or resident. As in other studies, we found non-concordance between presence of clinical signs and PCR results. Although we did not observe excessive mortality, this population's long-term viability is uncertain. Population monitoring and disease surveillance of more recipient sites is urgently needed to understand how disease may be affecting translocation outcomes for this declining species.

Burrows Don't Lie… Or Do They? Apparent Growth in a Remnant Gopher Tortoise Population

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Gopher tortoises have declined across their range over the past several decades, primarily due to urbanization, which often fragments habitat into isolated "islands." These confined populations lose natural wildfire management, leading to degraded habitats. Effective conservation in rapidly developing regions requires understanding population size and structure in such restricted and altered environments.

Here, we report on a gopher tortoise population within a confined, degraded ecosystem on the Florida Atlantic University campus in Boca Raton, Florida. From 2010 to 2024, we conducted comprehensive burrow surveys using belt transects, measured burrow openings, and performed

vegetation assessments. Population size and structure were evaluated indirectly through burrow surveys and burrow dimensions, respectively.
Tortoises were concentrated in areas of low vegetation and avoided closed-canopy areas, which increased from ca. 15% of the habitat in 2011 to ca. 36% in 2024. Over the 15-year study period, active burrows increased by ca. 50, the ratio of active to abandoned burrows rose, and juveniles became proportionally more abundant according to standard burrow survey methods. These trends coincided with the arrival of the invasive burrowing green iguana around 2012 and are therefore likely unreliable, highlighting the need for revised burrow monitoring practices in South Florida.

The Gopher Tortoise Probability Index: A Mapping Tool to Improve Gopher Tortoise Relocation Outcomes

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The gopher tortoise (*Gopherus polyphemus*) is protected as a threatened species in Florida. Relocation permits are required by the Florida Fish and Wildlife Conservation Commission (FWC) when ground-disturbing activities come within 25 feet of a potentially occupied gopher tortoise burrow. When such activities commence without first obtaining a relocation permit, a disturbed site permit is issued. This significantly delays development projects and directly increases mitigation contributions required by FWC. Moreover, the proportion of relocation permits issued for disturbed sites has been increasing over time. Although many factors are involved in the issuance of disturbed site permits, failure to anticipate the presence of gopher tortoises on a project site contributes to this trend. We developed the “Gopher Tortoise Probability Index” model as a tool to help anticipate where gopher tortoises might potentially occur prior to development activities. This model was constructed by using the locations from 18,623 relocation permits to assess the proportion of permits within habitat identified by three pre-existing statewide models, then building an additional model of potential habitat to improve the coverage of permit location data. The initial model identified the locations of 60% (11,170) of permits as occurring within potential tortoise habitat. Wildlands used statewide land cover and soils data to build an additional layer that increased the coverage of permit location data to 97% (18,121 permits) in the final model. The Gopher Tortoise Probability Index indicates the level of agreement among the four input models as potential gopher tortoise habitat for any specific area, ranging from a value of 0 (no models identify a location as potential habitat) to a maximum of 4 (a location identified as potential habitat by all four models). This resource is now freely available to the public from the Florida Geographic Data Library (FGDL; https://fgdl.org/).

Assessing Invertebrate Biodiversity at Chemours Mine and Gopher Tortoise (*Gopherus polyphemus*) Recipient Sites: A Pilot Study

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Invertebrates are essential components of terrestrial ecosystems and serve as important indicators of ecological health, yet their roles in post-mining landscapes remain poorly understood. In particular, invertebrate presence remains largely underexplored within reclaimed sandhill habitats that serve as recipient sites for gopher tortoises (*Gopherus polyphemus*). This study aimed to assess invertebrate biodiversity at Chemours' Mission Mine in southeastern Georgia by comparing terrestrial invertebrate community composition, species richness, and spatial distribution between an unmined commercial silviculture parcel and a nearby reclaimed surface mine site. Both sites support populations of *G. polyphemus*, with the unmined silviculture parcel hosting a low-density, naturally occurring population, and the reclaimed site serving as a recipient area for a larger, relocated tortoise population. Surveys were conducted biweekly from May to October 2025 using standardized methods – including hand netting, pitfall traps, sweep netting, and lighted sheets - to assess invertebrate presence across multiple taxa with varying seasonal activity, habitat use, and diel behavior. For each specimen collected, data recorded included the time and location of collection, spatial coordinates, collection method, invertebrate activity at the time of collection, weather variables, and provisional identification. Preliminary results from collections conducted between early spring and early fall 2025 reveal differences in invertebrate community composition at the Order level between the unmined and reclaimed sites. This ongoing study offers early insights into how surface mining and reclamation affect invertebrate community structure within microhabitats associated with gopher tortoise burrows, providing a more nuanced understanding of habitat quality. Incorporating lower trophic levels into reclamation monitoring addresses a critical gap in our understanding of ecological recovery on post-mining lands. Ultimately, this work supports a more holistic approach to reclamation success, with implications for ecosystem monitoring, conservation planning, and gopher tortoise habitat restoration.

Mother Knows Best: Birth-Site Videography Reveals Maternal Defense in Eastern Diamondback Rattlesnakes (*Crotalus adamanteus*)

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All North American pitvipers express maternal attendance, whereby post-parturient females stay with their offspring until the natal shed. The nature of maternal attendance has been long debated; the advantage to progeny is often considered passive protection, despite some evidence of maternal defense from *ex situ* research. In August–September of 2022 and 2024, we placed timelapse cameras at eastern diamondback rattlesnake (*Crotalus adamanteus*; EDB) birth sites (n=29) to evaluate behaviors of post-parturient females and neonatal offspring. Preliminary results provide observations of attending females engaging in defense of young. To our knowledge, we report the first field-based evidence of active maternal care in a live-bearing pitviper.