BEFORE THE SECRETARY OF THE INTERIOR

Petition to List the Mimic Glass Lizard (*Ophisaurus mimicus*) as Threatened or Endangered Under the Endangered Species Act and to Designate Critical Habitat

Image Credit: Pierson Hill

Submitted by:
Center for Biological Diversity

October 15, 2025

NOTICE OF PETITION

Doug Burgum, Secretary
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Dear Secretary Burgum, Director Nesvik, and Mr. Oetker,

Pursuant to Section 4(b) of the Endangered Species Act (ESA), 16 U.S.C. § 1533(b); section 553(e) of the Administrative Procedure Act (APA), 5 U.S.C. § 553(e); and 50 C.F.R. § 424.14(a), the Center for Biological Diversity hereby petitions the Secretary of the Interior, through the U.S. Fish and Wildlife Service (USFWS), to protect the mimic glass lizard (*Ophisaurus mimicus*) as a threatened or endangered species under the ESA.

This petition requests listing of the mimic glass lizard based on population decline due to habitat destruction, degradation and fragmentation; predation; road mortality; climate change; and inadequate regulatory mechanisms and conservation practices. Petitioners also request that critical habitat be designated concurrently with the listing, pursuant to 16 U.S.C § 1533(a)(3)(A) and 50 C.F.R. § 424.12.

The USFWS has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on USFWS. USFWS must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. § 1533 (b)(3)(A). USFWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition."

The Center for Biological Diversity (Center) is a non-profit, public interest environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law, supported by more than 1.7 million members and online activists. The Center works to secure a future for all species, great or small, hovering on the brink of extinction.

We submit this petition on behalf of ourselves and organizational staff and members who hold an interest in protecting the mimic glass lizard.

Submitted this 15th day of October 2025.

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Executive Summary

The mimic glass lizard (*Ophisaurus mimicus*), described in 1987, is one of four species of glass lizard native to the southeastern United States. All glass lizards lack legs and three of the southeastern U.S. species, including the mimic glass lizard, have long, fragile tails that are prone to fragment. Since the species' discovery, the best available scientific information indicates that the mimic glass lizard is in severe decline. The widespread destruction and degradation of fire-dependent longleaf pine and wiregrass flatwoods and savannas— along with the herbaceous bogs embedded in these habitats—have likely driven this decline.

Today, sightings of these lizards are exceedingly rare, indicating that the species may face extinction without immediate and comprehensive conservation efforts.

The mimic glass lizard faces a number of threats; the most notable of which is past and ongoing habitat destruction, degradation, and fragmentation. Because of this, the lizard's current distribution is highly fragmented and restricted to small areas of seven public lands where active prescribed fire management occurs. In addition to the loss of substantial areas of suitable habitat, mimic glass lizards are also threatened by predation, road mortality, and the multifaceted effects of global climate change. Because these lizards are habitat specialists and exist only in small, isolated populations scattered across a small current range, they are exceedingly vulnerable to current and future threats. Unfortunately, to date, existing regulations and conservation activities have been insufficient to slow or reverse the mimic glass lizard's decline.

The ESA requires USFWS to protect species by listing them if they are endangered or threatened.[1] 16 U.S.C. § 1533(a)(1). A species is endangered if it is at risk of extinction in all or a significant portion of its range. *Id.* § 1531(6). A species is threatened if it is at risk of becoming endangered in the foreseeable future in all or a significant portion of its range. *Id.* § 1531(20). USFWS must make its listing determination based solely on the following five factors:

- (A) the present or threatened destruction, modification, or curtailment of [a species'] habitat or range;
- (B) overutilization for commercial, recreational, scientific, or educational purposes;
- (C) disease or predation;
- (D) the inadequacy of existing regulatory mechanisms; or
- (E) other natural or manmade factors affecting its continued existence.

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[1] The ESA defines "species" to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." 16 U.S.C. § 1532(16).

Id. § 1533(a)(1). To be listed as endangered or threatened, a species need only face a sufficient threat under one of these five factors. *See Humane Soc'y of the U.S. v. Pritzker*, 75 F. Supp. 3d 1, 7 (D.D.C. 2014) (citing *Sw. Ctr. For Biological Diversity v. Babbitt*, 215 F.3d 58, 60 (D.C. Cir. 2000)). Any combination of threats, considered cumulatively under multiple factors, will also support listing.

As detailed in this petition, the best available scientific information indicates that the mimic glass lizard warrants listing under the ESA because of past, ongoing, and imminent habitat destruction and degradation, predation, road mortality, impacts from climate change, and inadequate regulatory mechanisms to protect them. Because the mimic glass lizard is already rare and restricted to a narrow range, it is exceedingly vulnerable to threats, including catastrophic events such as severe weather. ESA protections—including designated critical habitat—would ensure the mimic glass lizard's survival and recovery by officially acknowledging its vulnerability to extinction, intentionally designating its most important habitat, and comprehensively planning for current and future threats.

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Introduction

The mimic glass lizard (*Ophisaurus mimicus*) is the smallest of the four glass lizard species native to the southeastern United States (Stevenson et al. 2023, p. 254). Glass lizards are legless and known for their propensity to break their tails when attacked by predators (or handled by humans), leading to local names like "glass snakes" and "joint snakes." The mimic glass lizard is named for its close resemblance to the eastern slender glass lizard (*Ophisaurus attenuatus longicaudus*), and it can be distinguished with a practiced eye and close observation of its size, scales, and coloring (Stevenson et al. 2023, p. 254).

Although glass lizards are still relatively under-studied (Stevenson 2023, entire), the best available scientific information indicates that the mimic glass lizard is imperiled and—because of extensive population declines over much of its historical range—currently persists in a highly fragmented distribution (Severson et al. 2023, pp. 262-263). The mimic glass lizard's fragmented range is restricted to seven public lands, all of which have been actively managed for conservation for a long time (Stevenson et al. 2023, pp. 262–263). These areas are a mere fraction of the species' historical range (Stevenson et al. 2023, p. 263). Furthermore, declines attributable to extinction debt may threaten the species' future viability (Stevenson et al. 2023, p. 263; Semlitsch et al. 2017, entire).

The mimic glass lizard faces a number of threats; most notably, past and ongoing habitat destruction, degradation, and fragmentation (Stevenson et al. 2023, entire). In addition to the loss of substantial areas of suitable habitat, mimic glass lizards are also threatened by predation, road mortality, and the multifaceted effects of global climate change. Because these lizards are habitat specialists and exist in small, isolated populations scattered across a small current range, they are exceedingly vulnerable to current and future threats. Unfortunately, to date, existing regulations and conservation activities have been insufficient to slow or reverse the mimic glass lizard's decline.

Accordingly, following a status review, Stevenston et al. (2023) recommend that "the mimic glass lizard warrants immediate conservation attention from both state and federal agencies, and a federal species status review should be conducted as the first step for consideration of listing under the Endangered Species Act" (Stevenson et al. 2023, p. 263). This petition presents scientific information indicating that protecting the mimic glass lizard under the Endangered Species Act is not only warranted but necessary to ensure the species' future.

I. Natural History, Ecology, and Biology of the Mimic Glass Lizard

a. Taxonomy

Kingdom	*Animalia*
Phylum	*Chordata*
Class	*Reptilia*
Order	*Squamata*
Family	*Anguidae*
Genus	*Ophisaurus*
Species	*Mimicus*

(Palmer 1987, entire; NatureServe 2024, entire; Crother 2017, p. 47).

b. Species Description

The mimic glass lizard is a small-to-medium sized, shiny, tan to yellowish-brown legless lizard possessing prominent dark stripes (Palmer 1987, 421–422; Palmer 1992, p. 43.2; Powell et al. 2016, p. 256). The smallest known mature specimen measured 125 millimeters from snout to vent (the opening of its cloaca) and maximum size documented for the species is 203 millimeters (8 inches) from snout to vent and 657 millimeters in total length (Palmer 1992, p. 543.2; Stevenson et al. 2023, p. 259). The mimic glass lizard, like all glass lizards, has eyelids, ear canals, bony plates beneath the scales called osteoderms, and noticeable folds of skin running along each side of the body (called “lateral grooves” or “lateral folds”)—all features which distinguish the mimic glass lizard from snakes (Palmer 1992, p. 43.2; Reptiles and Amphibians of Mississippi 2024, entire).

The mimic glass lizard generally has a dark, middorsal stripe and several longitudinal dark brown or black lateral stripes or spots, bordered by pale stripes, down its body and most of its tail (Palmer 1987, entire; Palmer 1992, p. 43.2). Adult males may also have freckling or weak rows of spots or dashes below the lateral fold, and irregular or indistinct pale bars on the sides of its head and neck (Palmer 1987, entire; Palmer 1992, p. 43.2).

The mimic glass lizard also has a relatively long tail (Palmer 1992, p. 543.2). Like other species of glass lizards, the mimic glass lizard can regenerate its tail from a fracture plane in the caudal vertebrae (Stevenson 2022, p. 5; Palmer 1992, p. 543.2). Its unregenerated tail usually constitutes ~72–75% of the lizard’s total length (Palmer 1992, p. 543.2).

The mimic glass lizard has 86–95 scales along the lateral fold, and 100–108 scales in the middorsal row on the body (Palmer 1992, p. 543.2). Scale rows around the tail at the 5th subcaudal number 18–22 (Palmer 1992, p. 543.2). The frontonasal scale usually is divided, or the anterior scale is variously fused with one or both post-internasals (Palmer 1992, p. 543.2). One or more supralabial scales usually enter the orbit or are separated from it only by small subocular scales (Palmer 1992, p. 543.2).

Figure 1: Male (A), female (B), and juvenile (C) mimic glass lizards from Apalachicola National Forest, Liberty County, Florida (credit: Pierson Hill) (Stevenson et al. 2023, p. 257).

The four species of glass lizard found in the southeastern United States are remarkably similar (Stevenson 2022, p. 4). Indeed, as noted by Palmer (1992), "[m]uch of the historical literature which may deal with *O. mimicus* is hopelessly entangled with that of other North American congeners," as mimic glass lizards were once considered "atypical" or "aberrant" slender glass lizards (Palmer 1992, p. 543.2). The mimic glass lizard may be distinguished by its markedly smaller size, fewer scale rows along the lateral fold, lack of longitudinal black lines below the lateral fold, and relatively larger dorsal scales (Stevenson et al. 2023, p. 254; Palmer 1992, p. 543.2).

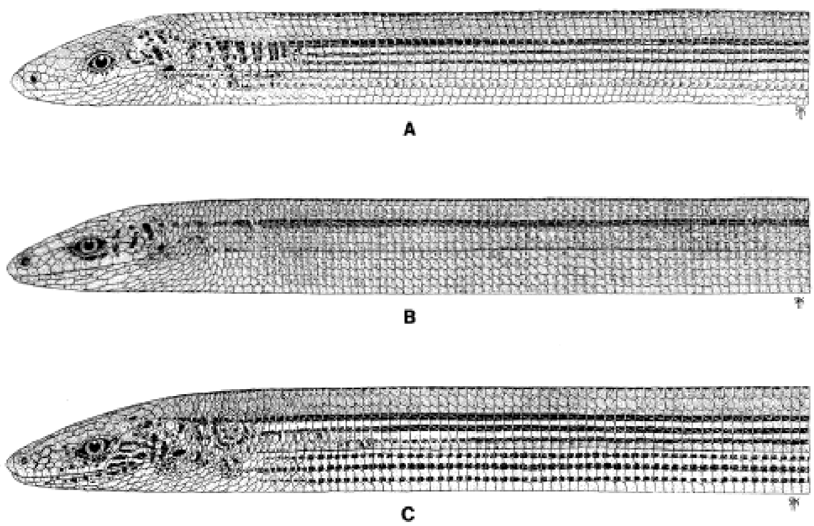

Figure 2: Comparative illustrations of adult female specimens of O. mimicus, O. compressus, and O. attenuatus (Palmer 1987, p. 416; see also *Palmer 1992, p. 543.2)*

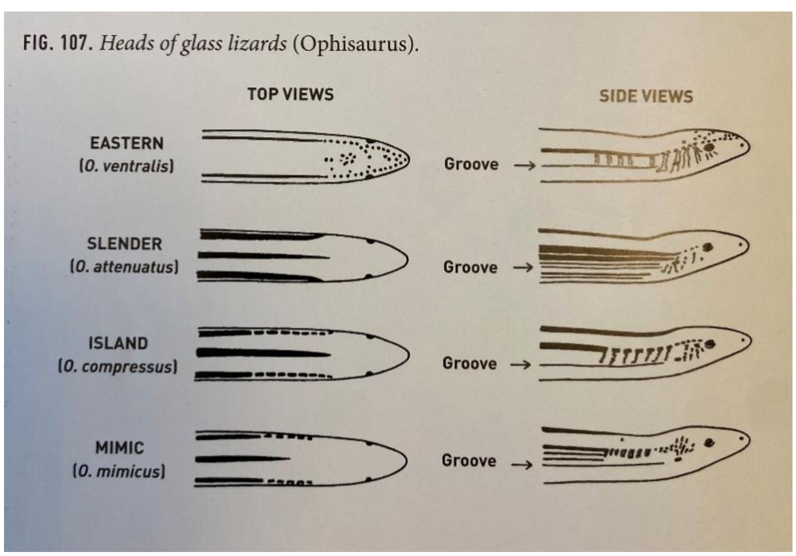

Figure 3: Comparative illustrations of glass lizard head markings (Powell et al. 2016, p. 236)

In a study of vertebral comparative anatomy in Anguine lizards, Čerňanský et al. (2019) found that the mimic glass lizard had a distinct axis vertebra from other related lizards, which could indicate a special ecological adaptation related to fossoriality, feeding, and/or combat behavior, in which head/neck mobility is of particular importance (Čerňanský et al. 2019, p. 256).

c. Biology

Species in the genus *Ophisaurus*, including the mimic glass lizard, are elusive, semifossorial, and cryptic, with seasonal activity tied closely to local weather conditions (Fitch 1989, p. 2; Stevenson et al. 2023, p. 261). Because of these characteristics, the mimic glass lizard is infrequently observed, and published information about its natural history and behavior is limited (Stevenson et al. 2023, p. 261). However, some information can be deduced from observations to date.

Observations indicate that the mimic glass lizard exhibits diurnal, crepuscular, and nocturnal activity (Stevenson et al. 2023, pp. 260–261). At least seven live specimens have been found after dark, with the latest observed just after midnight, and others have been encountered at dusk (Stevenson et al. 2023, p. 261).

Mimic glass lizards have been observed between late March and mid-November, with the majority of observations occurring from April to June, suggesting a pulse of surface activity during the spring and early summer that may coincide with the species' breeding season (Stevenson et al. 2023, pp. 260–261). Other species of *Ophisaurus* lay eggs in June and July (Stevenson et al. 2023, p. 261). Male mimic glass lizards may have greater surface activity than females, as indicated by significantly more observations of males than females (Stevenson et al. 2023, p. 260). And this increased male activity may suggest they are actively searching for females (Stevenson et al. 2023, p. 261).

Mimic glass lizards likely become sexually mature around 3 years, similar to other *Ophisaurus* species (Stevenson et al. 2023, p. 261).

The mimic glass lizard's diet is poorly known but is likely comprised of a variety of arthropods, especially insects and spiders, and possibly small amphibians and reptiles (Moler 2019, p. 320). Orthopterans (grasshoppers, crickets) have been recovered from the stomachs of specimens found dead-on-roads, and captives have fed on these insects and on earthworms (Palmer 1987, p. 104; D. Stevenson, J. Beane, unpubl. data). Unlike snakes, glass lizards have rigid jaw bones and thus are unable to eat meals larger than the size of their head (SREL undated, entire).

The mimic glass lizard may use burrows of burrowing crayfish to take shelter from fire, drought, and predators (Stevenson et al. 2023, p. 261). Several species of reptiles take shelter in these burrows, and Pierson Hill has observed an adult mimic glass lizard attempt to escape into an abandoned seepage crayfish (*Procambarus rogersi*) burrow at a recently burned wet prairie site in Apalachicola National Forest (Stevenson et al. 2023, p. 261). Other species of burrowing crayfish that are often abundant in herb bog, seepage slope, and mesic-wet pine flatwoods communities include the Lavender Burrowing Crayfish (*Creaserinus byersi*) of western Florida and southern Alabama, the Burrowing Bog Crayfish (*C. burrisi*) of southern Alabama, and the Vidalia Crayfish (*P. advena*) of southeastern Georgia (Stevenson et al. 2023, p. 261). Biologists working in Blackwater River State Forest in Florida have trapped the Ambiguous Crayfish (*Cambarus striatus*) alongside mimic glass lizards (E.P. Hill, pers. comm. 2024).

Although mimic glass lizards have fracture planes in the caudal vertebrae, allowing them to disengage their tails, mimic glass lizards' tails may be less frangible than are the tails of eastern slender glass lizards and eastern glass lizards (Stevenson et al. 2023, p. 261). Stevenson and others (2023) found that 55% of 83 mimic glass lizards examined had complete tails, whereas Palmer and Braswell (1995, p. 103) found that 48% of 25 North Carolina specimens had complete tails (see also Stevenson et al. 2023, p. 261).

d. Habitat Requirements

A comprehensive, range-wide review of habitat types confirmed that the mimic glass lizard is a longleaf pine ecosystem endemic that requires hydric-mesic, savanna-like habitats characterized by extensive graminaceous (grassy) vegetation (Stevenson et al. 2023, p. 261; Palmer 1987, p. 421; Guyer and Bailey 1993, p. 151; Means 2006, p. 168). The lizard is typically found in mesic to wet flatwoods and savannas, but infrequently in more xeric communities such as sandhill and upland pine (Stevenson et al. 2023, pp. 254, 259; NatureServe 2024, p. 7). The canopy is generally open, and there is little midstory (Stevenson et al. 2023, pp. 259; NatureServe 2024, p. 7). The species is sometimes found in hillside seepage bogs, the edges of dome swamps, and wet prairies where these communities are closely associated with pine uplands (Stevenson et al. 2023, pp. 256, 259, 262; Enge 2002, pp. 73, 75; NatureServe 2024, p. 7).

Figure 4: Habitats where mimic glass lizards have been found, including: (A) Open Bog, seepage slope in Blackwater River State Forest, Okaloosa County, Florida, USA; (B) Crawford Bog, seepage slope in Conecuh National Forest, Covington County, Alabama, USA; (C) wet prairie in Apalachicola National Forest, Liberty County, Florida; (D) Shoestring Savannah, mesic pine flatwoods in Green Swamp Preserve, Brunswick County, North Carolina, USA (Stevenson et al. 2023, p. 256). (Photo credits: Kevin Enge (A), Dirk Stevenson (B & D), and Pierson Hill (C))

Palmer (1987) described the habitat for North Carolina as open, park-like, and recently burned longleaf pine savannas and sandy longleaf pine flatwoods with an open understory of scattered Turkey Oaks (*Quercus laevis*) and ericaceous shrubs with wiregrass as the dominant ground cover (Stevenson et al. 2023, p. 261). Several mimic glass lizard records are known from sandhills and upland pine forests, which have well-drained, sandy or loamy clay soils that often support gopher tortoises (*Gopherus polyphemus*) in the southern part of the range of the species (Stevenson et al. 2023, p. 261). However, experts suspect that mimic glass lizard observations in sandhill or upland pine forests are exceptional cases, resulting when individuals traverse these habitats (Stevenson et al. 2023, p. 261). Sandhill records from sites in Apalachicola National Forest, Eglin Air Force Base, and Croatan National Forest are from landscapes where low sand ridges occur within or proximal to extensive areas of pine flatwoods and/or wet prairie habitats (Stevenson et al. 2023, p. 261). The available upland pine forest records for

Blackwater River State Forest are mostly along or near ecotones with seepage slope bog habitats (Stevenson et al. 2023, p. 261). Similarly, records from Conecuh National Forest are from seepage slope bogs at the base of upland pine forest communities (Stevenson et al. 2023, p. 261). In the lower Coastal Plain, where slight changes in elevation often correspond to different soil types, the upland (mesic and wet pine flatwoods) and wetland (wet prairie, seepage slope) habitats used by mimic glass lizards typically grade into one another and into other habitats (e.g., sandhills, cypress ponds, pocosins) over short distances (Stevenson et al. 2023, p. 261). The importance of linkages between forest and embedded habitats like isolated wetlands cannot be overemphasized in gauging the value of forests to reptiles like the mimic glass lizard (Gibbons and Buhlmann 2001, p. 379).

Given the natural community types inhabited, appropriately timed fire events are a habitat requirement for the mimic glass lizard. It is thought that the integrity of mimic glass lizard habitat historically depended on lightning-ignited fires that primarily occurred in late spring or early summer (Stevenson et al. 2023, p. 261; Noss et al. 2015, p. 241). Because the mimic glass lizard lives in fire-dependent habitats, it likely possesses behavioral adaptations to avoid growing-season fires, but survival may vary depending on season or intensity of burns (Stevenson et al. 2023, p. 261). For example, fire is a documented source of mortality for the closely related eastern glass lizard (Stevenson et al. 2023, p. 261).

The mimic glass lizard may also require habitat with crayfish burrows. Stevenson et al. (2024) noted that several reptile species shelter in the burrows of burrowing crayfishes, and these burrows could provide mimic glass lizards shelter from fire, drought, and predators (Stevenson et al. 2023, p. 261). An adult mimic glass lizard has been observed escaping into a Seepage Crayfish (*Procambarus rogersi*) burrow at a recently burned wet prairie site in Apalachicola National Forest (Stevenson et al. 2023, p. 261).

e. Current and Historical Range

The historical range of the mimic glass lizard likely formed a thin band across the U.S. Coastal Plain (both Gulf and Atlantic), extending from southern Mississippi to the Florida Panhandle and northward from southern Georgia to southeastern North Carolina (Powell et al. 2016, p. 256; Moler 2019, p. 320; Hammerson 2007, p. 2).[2] Although the full extent of the historical range is unknown, a good surrogate may be the total historical extent of wet savanna and seepage bog habitats (E.P. Hill, pers. comm. 2024).

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[2] Powell et al. (2016) erroneously included southeastern Louisiana within the range of the species (Stevenson et al. 2023, p. 254). Stevenson et al. (2023) provide a more accurate current estimated range for the species (see, e.g., Stevenson et al. 2023, p. 258).

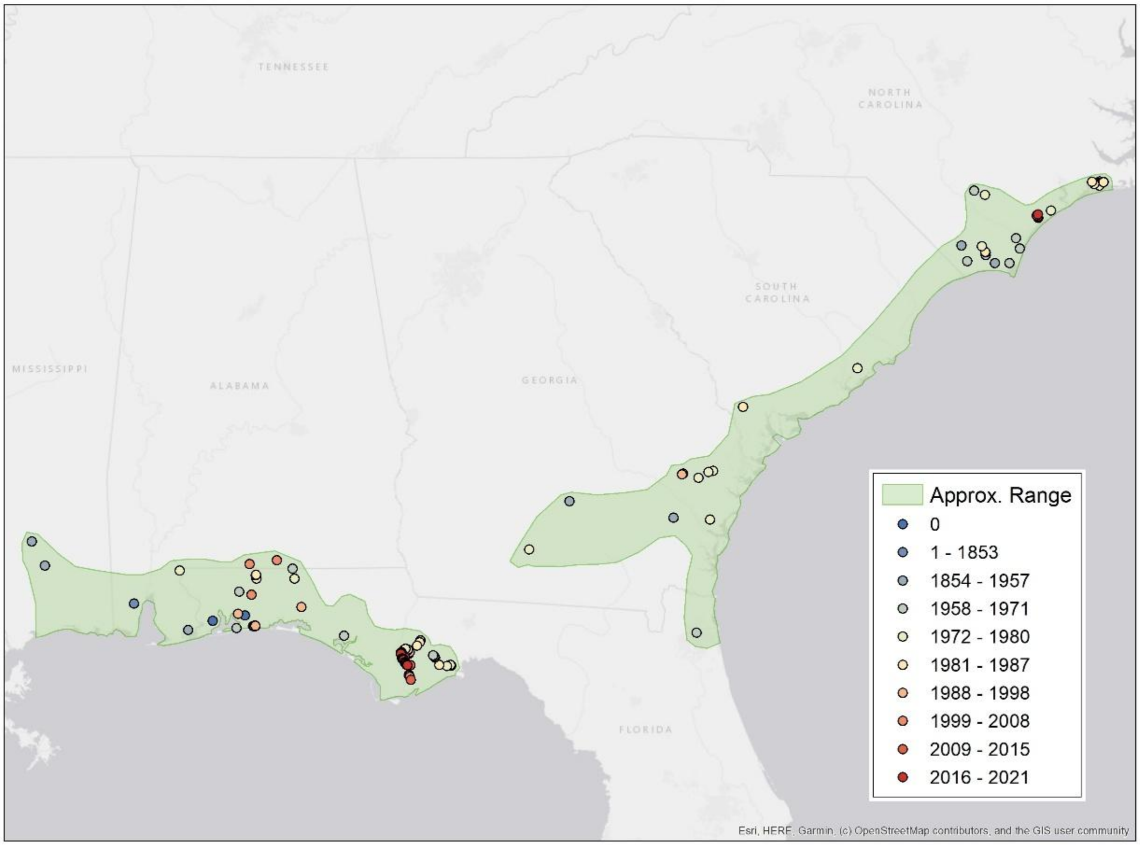

Figure 5: Estimated historical range of the mimic glass lizard (courtesy of Pierson Hill). The range map is refined based on a general understanding of the historical distribution of wet prairies and seepage slopes in the lower terraces of the Southeastern Coastal Plain.

The current range is likely significantly reduced because of habitat destruction and degradation, as indicated by recent documented records of this species, which are extremely limited to a few select regions (Stevenson et al. 2023, p. 262). The lizard's range is also highly fragmented, with recent occurrences restricted to conservation lands in the Florida Panhandle (4 records), southern Alabama (1 record), and near the coast in southeastern North Carolina (2 records) (see Figure 6, below) (Stevenson et al. 2023, entire). These sites are Conecuh National Forest in Alabama; Apalachicola National Forest, Eglin Air Force Base, and Blackwater River State Forest in Florida;[3] and Croatan National Forest and Holly Shelter Game Lands in North Carolina (Stevenson et al. 2023, p. 258).

[3] Florida Fish and Wildlife Conservation Commission biologists have ongoing research in Blackwater River State Forest, and these efforts have yielded the best available data set related to habitat use, patch size, seasonal movements, and more (E.P. Hill, pers. comm. 2025).

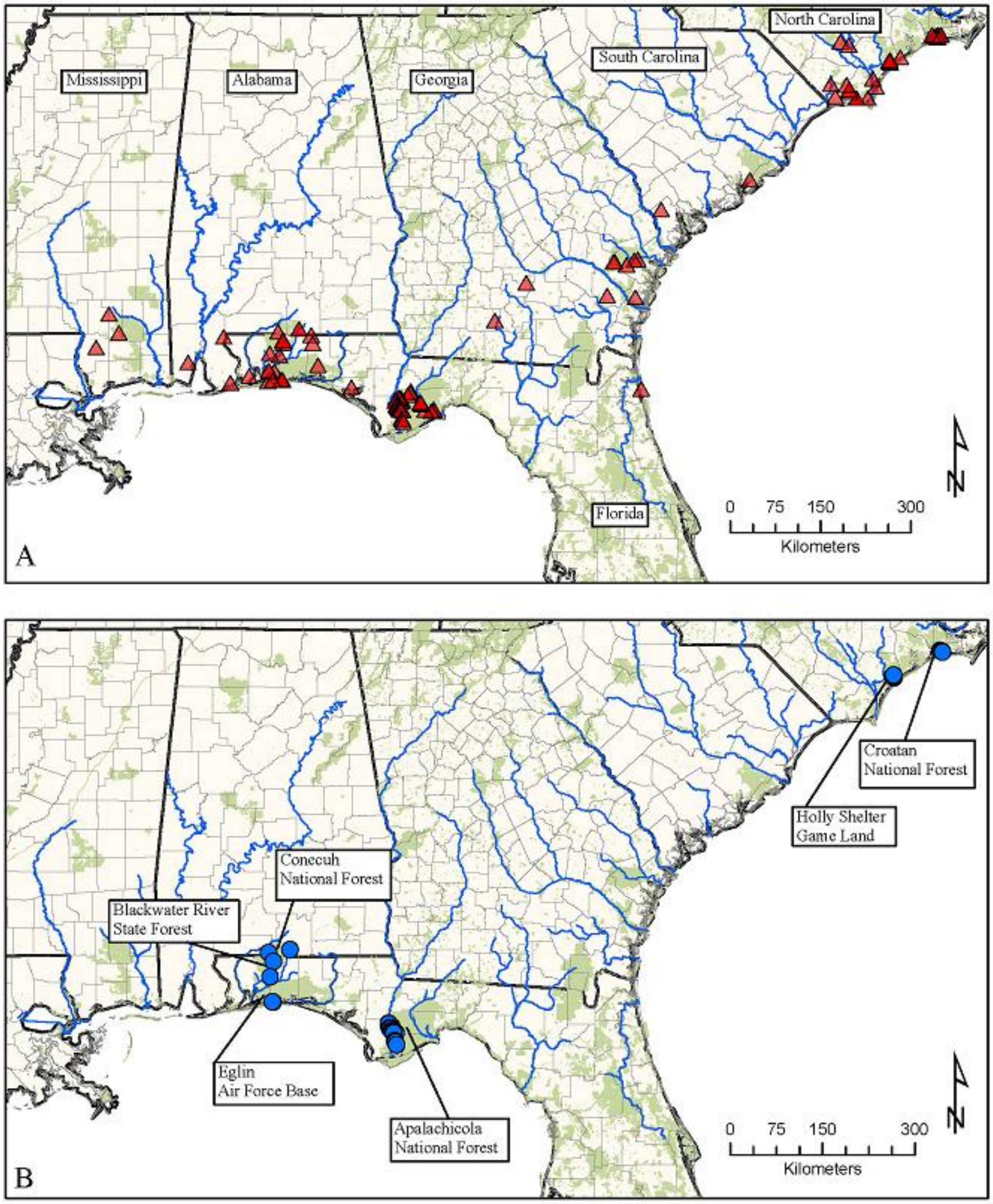

Figure 6: Maps of the Southeastern United States showing (A) all records and (B) recent records (2000–2022) of the mimic glass lizard.

f. Population Status

In a recent study of the mimic glass lizard's status, distribution, and ecology, experts determined that the mimic glass lizard is at imminent risk of extinction because of a number of threats; primarily, habitat destruction, degradation, and fragmentation (Stevenson et al. 2023, pp. 261, 263). They concluded:

> Our study results indicate that the Mimic Glass Lizard is imperiled and has experienced population decline over much of its historical range; it currently occurs in a few scattered locations. Declines attributable to what is called extinction debt may threaten the future health of currently extant Mimic Glass Lizard populations (Semlitsch et al. 2017). The status of the Mimic Glass Lizard warrants immediate conservation attention from both state and federal agencies, and a federal species status review should be conducted as the first step for consideration of listing under the Endangered Species Act.

(Stevenson et a. 2023, p. 263). Put another way, the now highly fragmented range of the mimic glass lizard has isolated those remaining extant populations, making them increasingly susceptible to decline and extirpation in the future—similar to habitat losses that have led to the endangered status of other endemic/ characteristic longleaf pine species like the flatwoods salamanders (*Ambystoma bishopi* and *A. cingulatum*). The impacts of historical and current threats may have already committed the mimic glass lizard to extinction. Therefore, immediate conservation attention is necessary to address ongoing threats to the species and its habitat.

The mimic glass lizard has a NatureServe status of G2 (Imperiled) because a comparison of historical records with those since 2000 indicate a substantial decline in occupied portions of the range (NatureServe 2024, entire). The species has a state conservation status of S1 (Critically Imperiled) in North Carolina, South Carolina, Georgia, Florida, and Alabama, and a state conservation status of SH (Possibly Extirpated) in Mississippi (NatureServe 2024, entire). Although the species is designated as Least Concern on the IUCN Red List, its status was last updated more than 15 years ago in 2007 and thus does not account for the recent status assessment published in Stevenson et al. 2023 (Hammerson 2007, entire).

As of January 2022, the mimic glass lizard was considered extirpated in Mississippi, listed as Endangered in North Carolina, and listed as Rare in Georgia (Stevenson et al. 2023, p. 255). The lizard is not ranked by South Carolina's heritage program because of a lack of data or survey effort (Stevenson et al. 2023, p. 255). The mimic glass lizard is classified as of Highest Conservation Concern in Alabama's 2012 State Wildlife Action Plan (SWAP), making it illegal to possess without a special permit (Stevenson et al. 2023, p. 255). It is also classified as a priority species in the

SWAPs of all other states within its range except for Florida, where the state wildlife agency has recently identified determining its status and distribution as a medium-priority research information need (Stevenson et al. 2023, p. 255).

II. Threats to the Mimic Glass Lizard

The mimic glass lizard faces threats from present or threatened destruction, curtailment, or modification of its habitat or range (Factor A), predation (Factor C), inadequate regulatory mechanisms (Factor D), and other natural or humanmade threats including road mortality, climate change, and the inherent vulnerability of being a habitat specialist that exists in small, isolated populations across a relatively small range (Factor E). Each of these threats is described in detail below.

a. Present or threatened destruction, curtailment, or modification of habitat or range

As with many longleaf pine ecosystem specialists, mimic glass lizard populations have probably declined because of habitat loss and fragmentation, and degradation of habitat quality particularly from fire suppression or burning during inappropriate seasons (Stevenson et al. 2023, p. 261; NatureServe 2024, p. 3; Means 2006, pp. 157–158; Gibbons and Buhlmann 2001, p. 382). The impacts of habitat destruction, degradation, and fragmentation are discussed in detail below.

i. Habitat destruction

Although they once covered much of the southeastern Coastal Plain of the United States, longleaf pine savannas currently occupy less than 3% of their original area because of human land use and fire suppression (Stevenson et al. 2023, p. 254; Oswalt et al. 2012, p. 10). Conversion for urban development, farming, and pine plantations has driven the permanent destruction of millions of acres of longleaf pine habitat (NatureServe 2024, p. 5; Oswalt et al. 2012, p. 10; Gilliam and Platt 2006, entire).

Further, as discussed in more detail below, much of this habitat is considered to be of poor or degraded quality, as assessed by Forest Inventory Analysis data (Hutchens 2023, p. 6; Oswalt et al. 2012, entire). According to Means (2006), no “truly pristine, unaltered longleaf pine ecosystems . . . are left and probably haven’t been since about the 1920s. What remains (less than a million acres) is a small amount of second-growth longleaf pine ecosystems mostly on publicly owned lands” (Means 2006, p. 158).

The loss of significant areas of fire-maintained longleaf pine communities, which once dominated much of the Coastal Plain, to agricultural or urban uses has impacted—and likely will continue to impact—herpetofauna in the region (Gibbons and Buhlmann 2001, p. 382). The destruction or severe alteration of forest wetlands has presumably had a major negative impact on populations of the majority of reptile and amphibian species indigenous to the Southeast (Gibbons and Buhlmann 2001, p. 382). Indeed, extensive habitat loss and alteration have already led to the extirpation of many historical populations of mimic glass lizard (NatureServe 2024, p. 5; Stevenson et al. 2023, entire).

Many species are already protected under the Endangered Species Act because of the decline of longleaf pine and similar ecosystems, including the red-cockaded woodpecker,[4] black pinesnake,[5] Louisiana pinesnake,[6] eastern indigo snake,[7] frosted flatwoods salamander,[8] and the reticulated flatwoods salamander.[9] In fact, the continued decline of longleaf pine and similar ecosystems has caused USFWS to propose uplisting the frosted flatwoods salamander from threatened to endangered because of the increased extinction risk due to habitat loss and degradation (USFWS 2019, p. 22).

ii. Habitat degradation

Much of the existing habitat for the mimic glass lizard is degraded because of current land uses, suppression of natural fire regimes, invasive species impacts, and climate change (Stevenson et al. 2023, p. 254; NatureServe 2024, p. 6; Costanza et al. 2015, entire). Many ecologists consider altered or disrupted fire patterns (e.g. fire suppression) to be the primary reason for the degradation of remaining longleaf pine forests (USFWS 2020, p. 36). And Stevenson et al. attribute mimic glass lizard declines particularly to degradation of habitat quality from fire suppression or burning during inappropriate seasons (Stevenson et al. 2023, p. 261; Means 2006, p. 157–158). This disruption of the natural fire cycle in pine forests has resulted in an increase in hardwood midstory and understory and a decrease in herbaceous ground cover, and exclusion of fire in seasonal wetlands is more severe (USFWS 2020, p. 36).

Despite a general recognition among land managers of the role fire plays in maintaining longleaf pine ecosystems, much of the longleaf pine acreage remains unburned, particularly on private lands (Hutchens 2023, p. 6; Costanza et al. 2013, entire). Current prescribed burning management practices do not implement enough burning to accomplish adequate restoration of longleaf pine habitat (Costanza et al. 2015, p. 187). Additionally, prescribed fires are overwhelmingly implemented during the cooler wetter conditions of winter and early spring (the dormant season) when they are easier to control rather than during the lightning season (May–August) when they will have the broadest range of ecological benefits

[4] 35 Fed. Reg. 16047 (Oct. 13, 1970); 89 Fed. Reg. 85338 (Oct. 25, 2024).
[5] 80 Fed. Reg. 60467 (Oct. 6, 2015).
[6] 83 Fed. Reg. 14958 (Apr. 6, 2018).
[7] 43 Fed. Reg. 4026 (Jan. 31, 1978).
[8] 64 Fed. Reg. 15691 (Apr. 1, 1999).
[9] *Id.*

(USFWS 2020, pp. 36–37). Broad application of fire during the dormant season can also have negative effects on species and the habitat (USFWS 2020, pp. 36–37). Due to infrequent dormant season prescribed fire, the Apalachicola National Forest has lost over 32,000 ha (80,000 acres) of pine grasslands to shrubby invasion since 1937 (Hess 2014, entire; Trager et al. 2018, pp. 306–307). The absence of frequent, ecologically appropriately timed fire is in part due to a shortage of prescribed burn practitioners, narrow prescription parameters, and high-risk avoidance (Hutchens 2023, p. 6; Costanza et al. 2013, entire; E.P. Hill, pers. comm. 2024).

Other activities that degrade habitat include large-scale forest clearing with heavy soil impact (i.e., disking, windrowing, chopping), which can be presumed to reduce mimic glass lizard population sizes at some level (Gibbons and Buhlmann 2001, p. 385). Forestry management, which includes intensive site preparation, may adversely affect mimic glass lizards both directly and indirectly (USFWS 2020, p. 38). Bedding (a technique in which a small ridge of surface soil is elevated as a planting bed) alters the surface soil layers, disrupts the site hydrology and often eliminates the native herbaceous groundcover (USFWS 2020, p. 38). Intensive site preparation also negatively impacts subterranean voids such as crayfish burrows and root channels that are the probable fossorial refugia of mimic glass lizards and may result in entombing, injuring, or crushing individuals (USFWS 2020, p. 38; Stevenson et al. 2023, p. 261).

Nonnative species like feral pigs (*Sus scrofa*) also significantly degrade habitat, causing structural changes with their rooting and wallowing behaviors (McDonough et al. 2022, pp. 286–287; NatureServe 2024, p. 6).

Habitat degradation is a pervasive threat across the mimic glass lizard's range. For example, Stevenson et al. (2023) visited a historical site on private land in Alabama and found it was fire-suppressed and in poor condition, with some characteristic herb bog vegetation still present in a roadside ditch (Stevenson et al. 2023, p. 257). Likewise, they found that wiregrass habitats near historical collection sites in Wayne and McIntosh counties, Georgia, now consist of bedded, fire-suppressed Slash Pine (*Pinus elliottii*) and Loblolly Pine (*P. taeda*) plantations, and they concluded that it was "extremely unlikely that populations persist in these areas" (Stevenson et al. 2023, p. 259).

Habitat and ecological specializations of the mimic glass lizard mirror those of the two flatwoods salamander species to a significant extent, and the species are known from many of the same sites at Eglin Air Force Base and Apalachicola National Forest in the Florida panhandle (Stevenson et al. 2023, p. 262). Accordingly, experts expect that the species are on a similar downward trajectory (Stevenson et al. 2023, p. 262). USFWS recently proposed increasing protections for the frosted flatwoods salamander from threatened to endangered, in part, because longleaf pine habitat "continues to be lost, degraded or altered by conversion for agriculture, silviculture, or commercial/residential development; strip mining; drainage or enlargement . . . of breeding wetlands; and alteration of terrestrial and wetland habitat resulting from fire suppression or alteration of natural fire regimes" (USFWS 2020, p. 35). Because the mimic glass lizard shares habitat with the frosted flatwoods salamander, it faces habitat threats of the same magnitude.

Habitat degradation is likely to worsen as climate change progresses, further threatening the mimic glass lizard. Fire managers anticipate that opportunities for prescribed burns will be reduced over the next 30 years because of changes in climate and land use (Kupfer et al. 2022, pp. 3, 11).

iii. Habitat fragmentation

The mimic glass lizard's habitat has also been fragmented across the range (Stevenson et al. 2023, p. 261). Large tracts of intact longleaf pine flatwoods habitat are fragmented by roads and commercial pine plantations (USFWS 2020, p. 37). Most mimic glass lizard populations are widely separated from each other by vast areas of unsuitable habitat (Stevenson et al. 2023, p. 258). For example, Stevenson and others (2023) explain that "[t]he likely former range of this species in Alabama has been grossly dissected by development and habitat conversion and degradation from agriculture and commercial forestry practices" (Stevenson et al. 2023, pp. 261–262 (citing Guyer et al. 2019)). Roads also contribute to habitat fragmentation by isolating blocks of remaining contiguous habitat (USFWS 2020, p. 38). They may disrupt migration routes and dispersal of individuals between populations (USFWS 2020, p. 38).

Fragmentation and isolation of habitats may preclude or limit dispersal and migratory movements (Gibbons and Buhlmann 2001, p. 385; Noss 1987, entirely). Reducing functional habitat also creates smaller habitats that support fewer species (Gibbons and Buhlmann 2001, p. 385). And while natural stochastic events cause extirpation of local populations, they may later become reestablished by dispersing individuals that emigrate from source populations. However, this is only possible if appropriate landscape connections to other source habitats are left unfragmented (Gibbons and Buhlmann 2001, p. 385). Small, fossorial species like the mimic glass lizard likely cannot move through a large, deforested area to reach other suitable forest habitat (Gibbons and Buhlmann 2001, p. 385). Low population sizes would be prolonged through habitat fragmentation, and if declines or extirpation occur, population sizes will not be rebuilt quickly in a fragmented landscape (Gibbons and Buhlmann 2001, p. 385).

b. Overutilization for commercial, recreational, scientific, or educational purposes

Overutilization is not presently known to threaten the mimic glass lizard.

c. Disease or predation

Disease is not presently known to threaten the mimic glass lizard.

Predation by nonnative species is likely a threat. Generally, the eggs and hatchlings of oviparous reptiles like the mimic glass lizard seem to be vulnerable to red imported fire ant (*Solenopsis invicta*) predation (NatureServe 2024, pp. 3, 6). Fire ants have been implicated in the reduction in numbers of terrestrial egg-laying reptiles (Gibbons and Buhlmann 2001, p. 386; Allen et al. 2004, pp. 90–92). They have been implicated in the decline of the Texas horned lizard (*Phrynosoma cornutum*), the southern hognose snake (*Heterodon simus*), and the peninsular intergrade kingsnake (*Lampropeltis getula floridanus*) because declines coincided with the invasion of fire ants (Allen et al. 2004, p. 92).

Wild pigs (*Sus scrofa*) are also a well-known threat to native herpetofauna populations, including herpetofauna in the mimic glass lizard's range (Jolley et al. 2010, entire; Jolley 2007, entire; McDonough et al. 2022, pp. 285–287; Ditchkoff and Mayer 2009, p. 110).

d. Inadequacy of existing regulatory mechanisms

Existing regulatory mechanisms are inadequate to protect the mimic glass lizard from existing threats.

i. State Regulatory Mechanisms

The mimic lizard is not adequately protected by state wildlife laws. As of January 2022, the mimic glass lizard was considered extirpated in Mississippi, listed as Endangered in North Carolina, and listed as Rare in Georgia (Stevenson et al. 2023, p. 255). The lizard is not ranked by South Carolina's heritage program because of a lack of data or survey effort (Stevenson et al. 2023, p. 255). The mimic glass lizard is classified as of Highest Conservation Concern in Alabama's 2012 State Wildlife Action Plan (SWAP), making it illegal to possess without a special permit (Stevenson et al. 2023, p. 255). It is also classified as a priority species in the SWAPs of all other states within its range except for Florida, where the state wildlife agency has recently identified determining its status and distribution as a medium-priority research information need (Stevenson et al. 2023, p. 255).

ii. Federal Regulatory Mechanisms

Federal Conservation Laws

Because habitat and ecological specializations of the mimic glass lizard mirror those of the two flatwoods salamander species to a significant extent (Stevenson et al. 2023, p. 262), it is instructive to look to USFWS's summary of regulatory mechanisms for the frosted flatwoods salamander:

> There are no existing regulatory mechanisms for the protection of the upland habitats where frosted flatwoods salamanders spend most of their lives. Section 404 of the Clean Water Act is the primary Federal law that has the potential to provide some protection for the wetland breeding sites of the frosted flatwoods salamander. However, due to case law (*Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers* 2001; *Rapanos v. U.S.* 2006) and current practice, isolated wetlands are no longer considered to be under Federal jurisdiction (not regulatory wetlands). Wetlands are only considered to be under the jurisdiction of the Corps if a ''significant nexus'' exists to a navigable waterway or its tributaries.
>
> Currently, some Corps Districts do not coordinate with the Service on flatwoods salamanders and, because isolated wetlands are not considered under their jurisdiction, they are often not included on maps in permit applications (Leibowitz and Brooks 2008). We are aware of two isolated wetlands that supported flatwoods salamander populations that have been lost since 2006 under this scenario.

(USFWS 2020, p. 29).

Consequently, Section 404 of the Clean Water Act fails to adequately protect the mimic glass lizard's ephemeral wetland habitat from destruction. Moreover, since USFWS published the above referenced summary, the U.S. Supreme Court decided *Sackett v. EPA*, 598 U.S. 651 (2023), which further narrowed federal jurisdiction under the Clean Water Act to wetlands that have a "continuous surface connection" to federally protected waters (Congressional Resource Service 2023, entire). Though the extent that this decision will impact wetlands is still not clear, it unquestionably limits Clean Water Act protections over wetlands. Using wetland flooding frequency as a proxy for the new legal standard, Gold (2024) predicts that as much as 91% of non-tidal wetlands within the conterminous United States are potentially without federal protections previously afforded by Section 404 jurisdiction (Gold 2024, p. 3).[10] The Gulf and Atlantic Coasts, regions comprising the lizard's historic range, are specifically recognized as "hotspots of at-risk wetlands" (Gold 2024, p. 3–4). This elevated risk following *Sackett* is a product of the regions' large quantity of non-tidal wetlands compounded by the notable absence of state protections for non-jurisdictional wetlands in North Carolina, South Carolina,

[10] Gold recognizes that the percentage of non-tidal wetlands outside of Section 404 jurisdiction may be higher than 91% but not less than 19%. Efforts to definitively quantify non-tidal wetlands currently without federal protection are hindered by the Court's non-scientific, poorly defined characterization of waters "indistinguishable" from WOTUS (Gold 2024, p. 1).

Georgia, Alabama, and Mississippi (Gold 2024, p. 3–5). Absent Section 404 jurisdiction or designation under the ESA, activities impacting the mimic glass lizard's wetland habitats will elude critical regulatory safeguards—inevitably harming the mimic glass lizard's survival and recovery (Patricio Sullivan 2024, pp. 110–111).

The mimic glass lizard does not receive any species-specific protection under federal law and is not listed as threatened or endangered under the ESA. Accordingly, the mimic glass lizard's habitat also does not receive direct federal protection. USFWS had added the lizard to the ESA candidate list as a Category 2 species (with population status described as declining) in 1994, 59 Fed. Reg. 58982 (Nov. 15, 1994); however, the listing classification system was discontinued in 1996 without the species receiving protection. 61 Fed. Reg. 64481 (Dec. 5, 1996).

To the extent the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321, *et seq.*, may govern federal actions affecting the mimic glass lizard, it is inadequate to protect the species from the threats it faces. Although NEPA requires federal agencies to consider the environmental impacts of their actions, they are unlikely to specifically consider mimic glass lizard because they are not federally listed and have varying levels of conservation status by state. Furthermore, given the United States Supreme Court's recent decision in *Seven County Infrastructure v. Eagle County*, 145 S. Ct. 1497 (2025), which affords substantial judicial deference to agency determinations regarding the scope and effects that must be analyzed in an environmental impact statement to comply with NEPA, it is unclear whether NEPA review would benefit or even contemplate the mimic glass lizard. Since that decision, the Trump administration has rescinded the Council on Environmental Quality's longstanding NEPA implementing regulations, 90 Fed. Reg. 11221 (Mar. 5, 2025) (removing and reversing 40 CFR 1500-08), and many federal agencies, including the U.S. Forest Service and U.S. Army Corps of Engineers, have adopted interim final rules that limit the scope of analysis the agency is required to undertake, 90 Fed. Fed. Reg. 29632 (Jul. 3, 2025) (to be codified at 7 C.F.R. 1, 36 C.F.R. 220); 90 Fed. Reg. 29461 (Jul. 3, 2025); 90 Fed. Reg. 29465 (Jul. 3, 2025) (to be codified at 33 CFR Parts 320, 325, and 333). Ultimately, NEPA confers no substantive protections because it does not require any particular outcome, *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332 (1989).

With regard to federal climate change policy—the USFWS has repeatedly acknowledged in species status assessments for other Southeast species that currently, there are no regulatory mechanisms or conservation measures that address the impacts of climate change, including shifting seasonal patterns of rainfall and temperature, sea level rise, and storms of increasing intensity (e.g., USFWS 2021, p. 18; USFWS 2020, p. 33).

The U.S. has made small but insufficient reductions in fossil fuel emissions, remaining far behind the cuts needed to meet national and international climate pledges (UNEP 2024, entire). Even before the United States' withdrawal from the Paris Climate Agreement under Trump administration (U.S. President, 2025), U.S. climate policy was inadequate to meet the international Paris Climate Agreement 1.5°C climate limit and avoid the worst damages of the climate crisis. The U.S. is the world's biggest cumulative emitter of greenhouse gas pollution, responsible for 25% of cumulative global CO_2 emissions since 1870 (Global Carbon Project 2021, p. 85), and it is the world's second highest emitter on an annual basis and highest emitter on a per capita basis (Global Carbon Budget 2021, p. 19–20). Estimates of an equitable U.S. "fair share" of emissions reductions needed to meet a 1.5°C climate limit equate to cutting U.S. domestic emissions by at least 70% below 2005 levels by 2030 and reaching near zero emissions by 2040, paired with financial and technological support for large-scale emissions reductions internationally (Muttitt 2020, entire; U.S. Climate Action Network 2020, entire; ActionAid USA et al. 2021, entire).

Yet U.S. policy is significantly off-track to limit warming to 1.5°C or even 2°C and must greatly accelerate greenhouse gas emissions reductions (Climate Action Tracker 2023, entire; UNEP 2021, p. 15; UNEP 2024, entire). As summarized by the Fifth National Climate Assessment,

> While U.S. greenhouse gas emissions are falling, the current rate of decline is not sufficient to meet national and international climate commitments and goals. U.S. net greenhouse gas emissions remain substantial and would have to decline by more than 6% per year on average, reaching net-zero emissions around midcentury, to meet current national mitigation targets and international temperature goals; by comparison, US greenhouse gas emissions decreased by less than 1% per year on average between 2005 and 2019.

(Jay et al. 2023, pp. 1–15; Davis et al. 2023, entire). Even if the United States sought to meet the 1.5 °C limit almost U.S. and global fossil fuels must remain undeveloped including an immediate halt to new fossil fuel production and infrastructure, paired with a phase-out of existing production and infrastructure within the next several decades (IPCC 2018, entire; Oil Change International 2019, entire).

U.S. policies that promote fossil fuel production and infrastructure include enabling fracking by exempting it from the Safe Drinking Water Act, lifting the crude oil export ban, and providing billions in government subsidies to the fossil fuel industry (Erickson et al. 2017, entire; Oil Change International and Greenpeace 2020, entire; Stockholm Environment Institute, IISD, ODI, E3G and UNEP 2021, at 39). For example, after Congress lifted the 40-year-old crude oil export ban in December

2015, U.S. crude oil exports increased by 750% so that by 2019, one quarter of all U.S. oil production was exported (Oil Change International and Greenpeace 2020, entire). Exports continue to average more than four million barrels per day (USEIA 2024a, entire).

Little progress was made under the previous administration. Although President Biden committed to tackling the climate crisis upon taking office (White House 2021, entire), in practice, the administration failed to take the necessarily ambitious actions needed to combat the climate crisis, and his administration promoted fossil fuel production that undercut his plans to deploy renewable energy and secure environmental justice. For example, in his first year in office, President Biden approved more oil and gas drilling permits on public lands than President Trump, approving about 3,700 drilling permits through November 2021, 35% more than the Trump administration approved in its first year in office (Public Citizen 2021, entire). In 2022, the US continued to reach record highs in oil and gas production and exports, and it is planning to increase its LNG export capacity by more than 40% by 2026 (Climate Action Tracker 2023, entire). Despite campaign promises to halt new oil and gas drilling on public lands and waters, in March 2023, the Biden administration approved a major oil drilling project on federal land (the Willow project in Alaska) (Climate Action Tracker 2023, entire). In July 2023, the Supreme Court authorized the construction of the Mountain Valley Pipeline – a 500-km-long project to transport gas from West Virginia to Virginia (Climate Action Tracker 2023, entire).

Under the current Trump administration, greater U.S. domestic production of oil and gas is expected, as evidenced by the President's executive orders signed on January 20, 2025, and April 8, 2025, and titled respectively, "Unleashing American Energy" and "Protecting American Energy from State Overreach"(U.S. President, 2025). It is the current administration's goal to: (1) increase and expedite the permitting, development, and use of domestic energy sources, including greenhouse gas-producing sources such as oil, coal, and natural gas; and (2) restrict states' authority to pass climate-related policies intended to mitigate greenhouse gas emissions. (U.S. President, 2025). Should the administration succeed in its goals, including opening public lands and the outer continental shelf to new energy production, threats to the mimic glass lizard resulting from climate change would reach an unprecedented level. The impact of greater oil production will be compounded by the Trump administration's recent proposed rule to reconsider the 2009 endangerment finding regarding greenhouse gasses and to repeal regulations of certain greenhouse gas sources under the Clean Air Act, 90 Fed. Reg. 36288 (Aug. 1, 2025) (to be codified at 40 C.F.R. Parts 85, 86, 600, 1036, 1037, and 1039)). Inevitably, the federal government's domestic policy agenda will contribute to greenhouse gas emissions that undercut previous efforts to meet the international Paris Agreement 1.5°C climate limit and avoid the worst damages of the climate crisis.[11]

To date, the U.S. government has failed to use its existing authority to stop new fossil fuel projects or phase out existing projects. The U.S. is currently the world's top oil and gas producer. The U.S. has produced more crude oil than any nation in history for the past six years. The U.S. is now the world's largest exporter of petroleum products and fossil gas, with the largest planned expansion of oil and gas extraction (USEIA 2025, entire; USEIA 2024a, entire; Stockholm Environment Institute 2023, entire; USEIA 2023b, entire; Oil Change International 2023, entire; Center for Biological Diversity 2019, entire).

In addition to increased energy production, the Federal Government is pursuing policy changes and funding cuts that are certain to hinder regulatory mechanisms that could otherwise mitigate the negative impacts of climate change on the mimic glass lizard. For example, on June 11, 2025, EPA Administrator Lee Zeldin announced the agency is seeking to repeal Biden-era regulations that set greenhouse gas emission guidelines for existing power plants and standards for carbon-capture and sequestration/storage (USEPA 2025, entire). This rollback aligns with the administration's efforts to eliminate consideration of greenhouse gas emissions in federal agency permitting processes, including its disbandment of the Interagency Working Group on the Social Cost of Greenhouse Gases and withdrawal of the group's publications (U.S. President 2025). The EPA is also seeking to claw back $20 billion of congressionally appropriated funding for climate change-related grants, while Congress simultaneously is seeking to repeal and rescind funding for climate resilience, greenhouse gas reduction, and climate data collection. *See Climate United Fund v. Citibank, N.A.,* No. 25-5122, 2025 U.S. App. LEXIS 9089 (D.C. Cir. Apr. 16, 2025); One Big Beautiful Bill Act, 2025, p. 266, 271–72, 591, 615. The compounding effects of these changes to the federal climate policy agenda leave species that are already vulnerable to the effects of climate change, including the mimic glass lizard, with inadequate protection and without the necessary regulatory mechanisms to prevent further decline.

Federal Public Lands

The mimic glass lizard and its habitat are found on federal lands; however, to date, federal management of lands that support the lizard has been inadequate to stem the species' decline. According to the United States Forest Service (USFS), longleaf

[11] To meet the Paris Agreement target, the US needs to average a 6.9% emissions reduction every year from 2024 through 2030—more than triple the 1.9% drop in 2023" (King et al. 2024, entire). Scientific assessments (e.g., IPCC, International Energy Agency, United Nations) make clear that to meet the 1.5°C Paris climate benchmark, governments must immediately stop approving new fossil fuel extraction and infrastructure projects and phase out existing fossil fuel development (IPCC 2023, entire; Tong et al. 2019, entire; Stockholm Environment Institute 2019, entire; International Energy Agency 2021, entire; Trout et al. 2022, entire; International Energy Agency 2023).

pine forests once covered 90 million acres of the Southeast United States, including throughout the mimic glass lizard's natural range (Natural Resources Conservation Service, n.d.). Yet, the longleaf pine habitat itself is now endangered after having been reduced to just over 3% of its previous range (Brockway et al. 2005; USDA NRCS n.d.). As USFWS explained for the frosted flatwoods salamander, and equally applies to mimic glass lizard:

> Longleaf pine habitat management plans have been written for public lands occupied by the frosted flatwoods salamander. They include management plans for State owned lands and integrated natural resource management plans (INRMPs) for Department of Defense lands. Most of the plans contain specific goals and objectives regarding habitat management that would benefit frosted flatwoods salamanders including prescribed burning. However, because multiple-use is the guiding principle on most public land, protection of the flatwoods salamander may be just one of many management goals including timber production and military and recreational use. Implementation of the plans has often been problematic due to financial and logistic constraints. In addition, the plans do not provide assured protection from habitat destruction or degradation from land use changes (e.g., the proposed road on Eglin AFB and Hurlburt Field where A. bishopi is located), although ESA section 7 rules still apply (USFWS & NMFS 1998).

(USFWS 2020, p. 30).

The challenges described by the USFWS above are illustrated in the Resource Management Plan for Conecuh National Forest, the first goal of which is to restore and maintain 17,000 acres of longleaf pine habitat (U.S. Forest Service, Southern Region, 2004, p. 2-9). The plan includes 48 other unconnected goals, however, ranging from conservation of paleontological resources to creation of recreational opportunities. In line with the multiple-use guideline, the USFS recognizes that "National Forests in Alabama will be increasingly important as urban escapes and at the same time, they will continue to be backyard playgrounds for nearby rural residents." (U.S. Forest Service, Southern Region, 2004, pp. 2-9 – 2-73). Thus, longleaf pine restoration is not reliably prioritized to the level necessary to sufficiently restore mimic glass lizard habitat on public lands.

Similarly, policies to control and mitigate air pollution have limited prescribed burning, which the longleaf pine habitat relies on. Federal and state level air quality standards prevent prescribed burning from occurring at the frequency necessary to retore and sustain the habitat and often result in winter burning that is less productive for restoration (Brockway et al. 2005, p. 12; Trager et al. 2018, p. 3). Failure to adequately treat the habitat with prescribed burns "increase[s] the likelihood that these ecosystems will be lost as a result of catastrophic wildfire and invasion by aggressive pines and hardwoods" (Brockway et al. 2005, p. 17; USDA NRCS, 2004, p. 14).

In Florida, Apalachicola National Forest, Elgin Air Force Base, and Blackwater River State Forest are "protected sites with a long history of fire management, considered a stronghold for the species" (Stevenson et al. 2023, p.257). Together, these locations comprise at least 88% of recent recorded mimic glass lizard sitings within the state. (Stevenson et al. 2023, p.257). In fact, the value of the Florida panhandle's longleaf pine habitat was recently indicated to be of the highest importance for wildlife amongst all the Southeast's longleaf pine habitats (Knight et al. 2023, pp. 22-23).[12] Croatan National Forest in North Carolina has also proven to be a valuable habitat for mimic glass lizards as the only location of recent sitings within the state (Stevenson et al. 2023, p. 259). Throughout the remaining portion of the lizard's range, recent drift-fence surveys in suitable habitat at historical mimic glass lizard observation sites have failed to detect the species (Stevenson et al. 2023, pp. 257-259). For example, recent surveys in De Soto National Forest (Mississippi) and Francis Marion National Forest (South Carolina) failed to detect any mimic glass lizards (Stevenson et al. 2023, pp. 258–259). In Georgia, surveys have failed to detect mimic glass lizards since the last siting of a single specimen at Fort Stewart Military Installation between 1992 and 2007. (Stevenson et al. 2023, pp. 257-258).

As evidenced by the decline in mimic glass lizard observations, public lands are pivotal but currently insufficiently managed for the species' recovery and survival. For example, this year, budget cuts have reduced necessary prescribed fire in Apalachicola National Forest, with only two prescribed fires totaling 5,163 acres, which is roughly 3% of the 186,000-acre annual target set forth in the forest plan (E.P. Hill, pers. comm. 2025). By comparison, approximately 170,000 acres were burned in 2023 and 222,000 acres in 2024 (E.P. Hill, pers. comm. 2025). Federal agency restructuring, reductions in force, budget cuts, and mission reprioritization are pointing to an increasingly uncertain future for the use of ecological prescribed fire for managing endangered species in Apalachicola National Forest and other federal lands.

Despite efforts by the federal government to encourage longleaf pine plantings and conservation, the USFS predicts that the habitat will continue to decline throughout the Southeast due to regional population growth and industrial timber plantations (Brockway et al. 2005, p. 8). Without protections and active management of longleaf pine habitat on federal public lands, "reliance on natural processes may require

[12] While this study did not specifically consider the mimic glass lizard due to unavailability of date, the frosted flatwoods salamander was analyzed to determine the significance of longleaf pine habitat for wildlife.

decades or even centuries to restore degraded [longleaf pine] ecosystems" that the mimic glass lizard relies on (Brockway et al. 2005, p. 14).

e. Other natural or manmade factors affecting the continued existence of the species

As explained below, the mimic glass lizard is also threatened by road mortality and related threats, climate change, and the inherent vulnerability associated with being a habitat specialist and existing in small, isolated populations across a small range.

i. Road Mortality and Related Threats

Road mortality also threatens the mimic glass lizard (NatureServe 2024, pp. 3, 5). Roadways are a pervasive part of urban development, generally and within the mimic glass lizard's range in the Southeast, and though they have a relatively small footprint, their impacts are devastating and far-reaching (Andrews et al. 2006, entire; Andrews et al. 2008, entire; Clark et al. 2010, entire). Roads directly kill wildlife through road fatalities and indirectly through habitat fragmentation, genetic isolation, pollution, and a host of other impacts. As the already extensive urban and exurban transportation network expands (see Figure 7, below), so does the number of animal fatalities on roads, with estimates as high as 1 million direct vertebrate fatalities along America's roadways each day (Andrews et al. 2006). Likewise, tens to hundreds of millions of snakes are killed annually by vehicles on roads in the United States (DeGregorio et al. 2010, at 441). Enge and Wood (2002) estimate that approximately 1.4 million snakes are killed annually in Florida alone, though the indicate that estimate is likely low (Enge and Wood 2002, at 376).

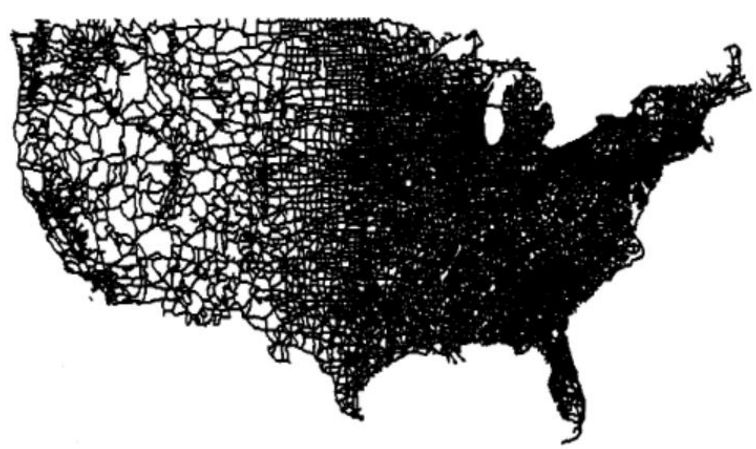

Fig. 1. Major roads and trails in the United States from data available as a Geological Information System (GIS) shapefile at www.geocomm.com created with ESRI ARC/INFO (version 7.0.4) published by the U.S. Geological Survey, Reston, VA, 1997. This shapefile was originally digitized by the National Mapping Division based on the sectional maps contained in "The National Atlas of the United States of America" published by the USGS in 1970, with updates based on the National Highway Planning Network database published by the Federal Highway Administration. Contact person: Bruce Wright, U.S. Geological Survey, 521 National Center, Reston, VA 20192.

Figure 7: Map of major roads and trails in the United States (Andrews et al. 2008, p. 122).

Herpetologists have long recognized the "irreparable landscape alteration from the nation's transportation infrastructure" (Andrews and Gibbons 2005) and studied the physical and behavioral traits of reptiles and amphibians that make them particularly susceptible to road mortality (Andrews et al. 2006, entire). Most mimic glass lizards have been found on roads, with many of these individuals found dead-on-roads (Stevenson et al. 2023, p. 261), underscoring that the species interacts with and is frequently killed on roadways. Poor mobility on road surfaces leaves glass lizards vulnerable to fatal strikes from vehicles (NatureServe 2024, p. 6).

Impacts from road mortality are compounded by other road-related impacts that are less direct or readily measurable but still significant (Andrews et al. 2006, at 4). For instance, the isolating effects of roads can lead to population-level impacts, such as skewed population structure via altered sex ratios and composition of age classes and restricted gene flow that results in decreased genetic diversity (Andrews et al. 2008, at 131; Clark et al. 2010, entire).

ii. Climate Change

Climate change and associated changes in temperature, precipitation, sea level, and storm intensity may also threaten the mimic glass lizard (Karl et al. 2009, entire). predict that as climate change affects southeastern environments, "[e]cological thresholds are expected to be crossed throughout the region, causing major disruptions to ecosystems" (Karl et al. 2009, p. 115). The warming climate will likely cause ecological zones to shift upward in latitude and altitude—and species' persistence will depend upon, among other factors, their ability to disperse to suitable habitat (Peters & Darling 1985, pp. 709–712). For the mimic glass lizard, adapting to or dispersing as a result of climate change may prove difficult—if not impossible—without human assistance.

Climate change is expected to affect reptiles at the individual and population levels through a number of pathways, including: shifts in phenology and range; habitat alterations including changes in hydrology, vegetation, and soil; changes in pathogen-host dynamics, predator-prey relationships and competitive interactions which can alter community structure; and interactions with other stressors such as contaminants and invasive species, all of which can affect survival, growth, reproduction and dispersal capabilities (Gibbons et al. 2000, p.658; Blaustein et al. 2010, p.285; Reading et al. 2010, p.1; Lawing and Polly, 2011, p.1; George et al. 2015, p.1256; Wright et al. 2015, p.588; Boyle et al. 2016; Wang, 2016, p.1; Capula et al. 2016, p.50–53).

Global declines in reptile populations can be contributed to a variety of threats, chief among them anthropogenic climate change and associated physiological effects and habitat loss/degradation (Gibbons et al. 2000, p.660). As ectothermic and specialized animals, the external environment, particularly temperature and habitat, influences all aspects of reptile life history (Tuberville et al. 2015, p.2; Sears et al. 2016, p.3; Wiens, 2016, p.10).

As the effects of global climate change advance, the mimic glass lizard will likely face increasing threats from rising local temperatures, changes in precipitation, sea level rise, and storms of increasing intensity. These threats will act individually and synergistically, threatening both the species and its limited remaining habitat.

Rising Temperatures

Global average surface temperature rose by 2°F (1.09°C) between 1850–1900 and 2011–2020, with larger increases over land than over the ocean (IPCC 2021, at SPM-5 and SPM-6). Each of the last four decades has been successively hotter than any preceding decades since 1850 (IPCC 2021, at SPM-5 and SPM-6). Global temperatures of the last decade are likely the hottest it has been on Earth in 125,000 years (IPCC 2021, at SPM-9).

In the United States, average temperatures rose by 1.8 °F (1.0°C) between 1901 and 2016, with the most rapid heating occurring after 1979 (Hayhoe et al. 2018, p. 76). U.S. temperatures are expected to rise by an additional 2.5 °F (1.4 °C), on average, by mid-century relative to 1976-2005, and record-setting hot years will become commonplace (USGCRP 2017, p. 11). By late century, much greater heating is projected, ranging from 2.8 to 7.3°F (1.6 to 4.1°C) under a lower emissions scenario and 5.8 to 11.9 °F (3.2 to 6.6 °C) under a higher emissions scenario (USGCRP 2017, p. 17 and 136). Even if there was an immediate and aggressive reduction in human produced GHG emissions, there would still be expected continued increases in surface air temperature (IPCC 2018, pp. 1–11).

Finally, as noted above, changing temperatures could drive changing ecological conditions, potentially causing what is now existing habitat for species like the mimic glass lizard to become unsuitable (Peters & Darling 1985, pp. 709–712). Many studies have linked climate change to reptile range shifts, losses, (e.g., Moreno-Rueda et al. 2011; Hatten et al 2016, p.26; Wu, 2016, p.1) and population extirpations (Whitfield et al. 2007, Sinervo et al. 2010; Wiens, 2016). Some models also predict that changes in ambient temperatures, growing seasons, and phenologies associated with climate change may shift the distribution of longleaf pine out of its current extent in Florida (Hansen et al., 2001; Gilliam, 2016).

Changes in Precipitation

Climate change is increasing the frequency and intensity of extreme weather events, particularly heat waves and heavy precipitation events (Herring et al. 2017, pp. S1–S3; USGCRP 2017, pp. 18–20; IPCC 2021, p. SPM-10). In the southeast, climate change will increase the incidence and severity of both drought and major storm events (Karl et al. 2009, pp. 33–36).

The percentage of the southeast region experiencing moderate to severe drought has already increased over the past three decades. Since the mid- 1970s, the area of moderate to severe spring and summer drought has increased by 12 percent and 14 percent, respectively. Fall precipitation tended to increase in most of the southeast, but the extent of region-wide drought still increased by nine percent (Karl et al. 2009, p. 111).

Precipitation patterns are also changing. Annual average precipitation has increased by 4 percent since 1901 across the entire United States (USGCRP 2018, pp. 745–808; Hoffman et al. 2023, pp. 22–11, 22–38). Shifts in seasonal rainfall events as well as increases in average precipitation are currently being documented (USGCRP 2018, pp. 745– 808).

Sea Level Rise

Global average sea level rose by roughly eight inches between 1901 and 2018, as the oceans have warmed and land-based ice has melted (IPCC 2021, p. 5). Sea level rise is accelerating in pace with almost half of recorded sea level rise occurring since 1993. The Fourth National Climate Assessment estimated that global sea level is very likely to rise by 0.3-0.6 feet by 2030, 0.5-1.2 feet by 2050, and 1.0-4.0 feet by the end of the century relative to the year 2000, with sea level rise in excess of 8 feet possible (Hayhoe et al. 2018, p. 84–86).

NOAA's 2022 Sea Level Rise Technical Report (Sweet et al. 2022), a result of a multi-agency effort with contributions from eight different federal agencies, presents five sea-level-rise scenarios (low, intermediate-low, intermediate, intermediate-high, and high) and includes estimates for the probability that the sea levels for those scenarios will be exceeded under various emissions scenarios associated with the Shared Socioeconomic Pathways (SSPs) described in the Sixth Assessment Report on climate change produced by the International Panel on Climate Change (IPCC) (Collini et al. 2022, entire). Under even the lowest emissions scenarios, there is a 92% probability that the "low" sea-level-rise scenario will be exceeded. And under all other emissions scenarios, there is over a 99% probability that the "low" sea-level-rise scenario will be exceeded (Collini et al. 2022, p. 25). Thus, it is not merely likely, but highly certain that sea levels will exceed the "low" scenario. Similarly, it is highly likely that sea-level-rise will also exceed the "intermediate-low" scenario; under all emissions scenarios except for the "Low Emissions" scenarios, the probability of exceeding the "intermediate-low" SLR projections is 82% or more (Collini et al. 2022, p. 25). Even under the "Low Emissions" scenarios, there is a substantial probability of exceeding the "intermediate-low" sea level rise projections (Collini et al. 2022, p. 25). Moreover, since the "Low Emissions" scenarios assume implementation of emissions reductions for which there are currently no plans or regulatory mechanisms in place, and the emissions associated with a 3°C increase are indicated based on current policies, it is therefore highly certain that the "intermediate-low" SLR scenario will also be exceeded (IPCC 2022, at SPM-15, SPM-2; Hausfather & Peters 2020, p. 619). Thus, based on the 2022 NOAA report, it is highly certain that SLR will be greater than the "intermediate-low scenario."

Projections between the intermediate-low and intermediate scenarios are consistent with the current observed acceleration of global sea level rise, which, if extrapolated, would yield about 0.24 meters (0.8 feet) by 2050 and 0.69 meters (2.3 feet) by 2100 (Sweet et al. 2022, p.21). The NOAA intermediate, intermediate-high, and high scenarios also include the added dynamics of rapid ice melt (Sweet et al. 2022, p.31). In particular, the "Intermediate-High and High scenarios represent potential futures in which these deeply uncertain ice-sheet processes play important roles in the late 21st century and beyond" (Sweet et al. 2022, p.21). So, although this ice melt component is currently considered "low confidence" (though it is an area of substantial scientific attention), it is a component that could significantly increase total future rates of sea level rise across the globe. Projections that include these processes could give rise to significantly higher projections (Sweet et al. 2022, p. 21). Regardless of the precise scenario, the impacts of sea level rise will be long-lived: under all emissions scenarios, sea levels will continue to rise for many centuries and many changes will be "irreversible" for centuries to millennia (IPCC 2022, p. 18; IPCC 2021, p. 21; Hayhoe et al. 2018, pp. 84–86, 102).

Recent NOAA analyses indicate an accelerated rate of sea level rise above the global range for the contiguous United States and eastern United States (Sweet et al. 2022, pp. 20, 23; Sweet et al. 2017, p. 25; Carter et al. 2014, pp. 401–403; Park and Sweet 2015, entire). For the contiguous United States, NOAA projects a rise between 0.6–2.2 meters (3.9–7.2 feet) above the 2000 baseline by 2100 under the full range of scenarios (Sweet et al. 2022, p. 20). Similarly, for the Southeast, NOAA projects sea level could increase by between 0.5–2.1 meters (1.6–6.9 feet) by 2100 (Sweet et al. 2022, pp. 20–21, 23). And for the Eastern Gulf of Mexico, NOAA projects sea level could increase by between 0.6–2.2 meters (1.96–7.22 feet) by 2100 under the full range of scenarios (Sweet et al 2022, pp. 20–21, 23). Of further particular note, extrapolating out the observed data of sea level rise in the Eastern Gulf suggests the region is and may continue to track along between NOAA's intermediate-high and high scenarios, which is higher than other US regions (Collini et al. 2022, p. 12; Sweet et al. 2022, p. 22). This could result in between 0.45–0.51 meters (1.47–1.67 feet) of sea level rise relative to the baseline of 2000 by 2050 (Sweet et al. 2022, p. 19). And for the eastern Gulf, NOAA projects sea level could increase by between 0.6–2.2 meters (1.96–7.22 feet) by 2100 under the full range of scenarios (Sweet et al 2022, pp. 20–21, 23). NOAA notes that *"[h]igher global temperatures increase the chances of higher sea level by the end of the century and beyond*" (Sweet et al. 2022, p. xiii (emphasis added)).

As sea level rises, tides, storm surge heights, and coastal flooding will also increase (Sweet et al. 2022, p. 60). Because of sea level rise, coastal areas are increasingly more vulnerable to high tide flooding which is rapidly increasing in frequency, depth, and extent (Sweet et al. 2018, p. 3). Sea level rise may affect pine forests near the coasts through changes in soil salinity driven by saltwater intrusion and flooding, which can alter distribution of habitat and fire regime (FWC 2016, p. 6-34–6-41; Ward et al. 2019, entire). There is already evidence that sea-level rise has contributed to the conversion and loss of pine forest habitat in the Florida Keys to more halophilic (salt-loving) vegetation (Ross et al. 1994, pp. 152–154; Ogurcak 2016, entire).

Sea level rise also puts habitat on private lands within the mimic glass lizard’s range at risk from future development as people migrate out of more vulnerable waterfront areas and into higher-elevation areas with lower perceived flood risk (Keenan et al. 2018, pp. 9–10; USFWS 2022, p. 66).

Increased storm Intensity

The International Panel on Climate Change (IPCC) predicts with “high confidence” that stronger storms driven by climate change will increase at the global scale, including in the North Atlantic (IPCC 2021, p. 16; Knutson 2024, p. 1). Tropical storms and hurricanes are projected to be similar or fewer in number but stronger in force, with more Category 4 and 5 hurricanes (Knutson 2024, p. 1; Balaguru et al. 2022, entire; Bhatia et al. 2019, entire). Current empirical evidence indicates that tropical storms no longer occur within the constraints of “natural disturbance” models based on historical roles of storms in the natural physiognomy of longleaf pine ecosystems (Gang et al. 2020, entire; Zampieri et al. 2020, entire; Gilliam et al. 2006, entire).

Increasingly intense storms can have impacts on ecosystem structure and functioning in longleaf pine ecosystems on which the mimic glass lizard depends (Zampieri et al. 2020, p. 1). Florida, and specifically the Florida Panhandle, is one of the most important strongholds of endangered longleaf pine habitat, containing 50% and 28%, respectively, of all the remaining longleaf pine ecosystem (Zampieri et al. 2020, p. 1). Florida, and more broadly the North American Coastal Plain, borders the Gulf and Atlantic coast, and is subject to frequent storm events (Zampieri et al. 2020, p. 1). Although these systems have evolved to periodic hurricanes, hurricanes that increase in strength outside of the system’s historic norms can contribute to the loss of mature trees, causing large canopy gaps and severe damage to the understory, which can have negative effects on numerous species that depend on mature trees, impede natural regeneration, alter the fire regime, increase the chance of invasive species establishment, and provide favorable conditions for insect outbreaks (Zampieri et al. 2020, p. 2). There is also some indication that more mesic longleaf woodlands may be under a greater threat from severe hurricanes; however, additional studies are needed across the distributional range of longleaf (Kenney et al. 2021, p. 14).

In a study of the impacts from Major Hurricane Michael (a category 5 hurricane) on the Florida Panhandle, Zampieri et al. (2020) found varying rates of mortality on longleaf pines, with the most severe impact highly localized to the center of the storm and resulting in catastrophic losses of mature canopy trees (up to 98%) (Zampieri et al. 2020, p. 7). Although the study focused on impacts in Florida, the storm impacted most states within the Coastal Plain that contain longleaf pine (Zampieri et al. 2020, p. 7). The authors recommended updating restoration and management plans for critical habitats in the face of increasing frequency of extreme storms and also underscored the importance of conserving large and connected areas since varying tree mortality, degrees of habitat integrity, and vulnerability to storm damage exist across the range (Zampieri et al. 2020, pp. 4, 7; *see also* Rutledge et al. 2021, p. 10–11). Importantly, the mimic glass lizard's small, occupied range is within a small fragment of longleaf pine ecosystems, and thus it is even more vulnerable to range-wide negative effects from increasingly intense storms (Shaffer & Stein 2000, p. 307; Wolf et al. 2015, p. 5).

iii. Inherent Vulnerability of Habitat Specialists

The mimic glass lizard is a habitat specialist with very narrow environmental specificity (NatureServe 2024, p. 6; Stevenson et al. 2023, p. 261). As a longleaf pine ecosystem specialist, the lizard has likely declined coincidentally with habitat loss, fragmentation, and degradation of these increasingly rare systems (Stevenson et al. 2023, p. 261). Specialization is understood to contribute strongly to species extinction risk (Colles et al. 2009, p. 849). Range-restricted specialists with relatively low vagility like the lizard are particularly vulnerable to habitat fragmentation (Stevenson et al. 2023, p. 261; Henle et al. 2004, pp. 222, 227–231; Charrette et al. 2006, entire; Crooks et al. 2017, p. 7636). Habitat specialists will also likely be some of the greatest affected by the combined effects of habitat loss and climate change (DeWan et al. 2010, p. 101).

iv. Inherent Vulnerability of Small Populations in Small Geographic Areas

Experts believe that the mimic glass lizard likely exists in small, fragmented, and isolated populations (Stevenson et al. 2023, entire). Because of the lizard's limited range and probably small populations, it is extremely vulnerable to extinction. Generally, species with smaller or fewer populations are more likely to become extinct (Shaffer & Stein 2000, p. 307; Wolf et al. 2015, p. 5). For a species to be viable, it should have stable population sizes and growth rates (resiliency), a number of resilient populations over a broad geographic range (redundancy), and diverse populations of adequate size (representation) (USFWS 2016, p. 6). The mimic glass lizard's apparently small populations scattered across a diminishing area of occupied habitat indicate low resiliency, redundancy, and representation, which in turn makes the lizard more vulnerable to extinction (Shaffer & Stein 2000, p. 307; Wolf et al. 2015, p. 5). For instance, the species may be more susceptible to stochastic or genetic population declines or local extirpations. Species with restricted ranges will also likely be some of the greatest affected by the combined effects of habitat loss and climate change (DeWan et al. 2010, p. 101).

III. Request for Critical Habitat

Petitioners request that USFWS designate critical habitat for the mimic glass lizard concurrently with listing, as required by the ESA. 16 U.S.C. § 1533(b)(6)(C). We request that USFWS designate critical habitat for the mimic glass lizard in all areas where it is currently located, as well as areas of suitable habitat—whether occupied or unoccupied—deemed essential to ensure the survival and recovery of this species.

Federally listed species with designated critical habitat are more likely to make progress toward recovery than species lacking it (Taylor et al. 2005, pp. 361–63). This is particularly true for species—like the mimic glass lizard—that are threatened by habitat destruction and degradation. Critical habitat designation provides the most effective means of ensuring that a listed species' habitat is managed to ensure the species' survival and recovery.

The ESA requires USFWS to designate critical habitat concurrent with a determination that a species is endangered or threatened. 16 U.S.C. § 1533(a)(3)(A). Critical habitat is defined as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed . . . , on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed . . . , upon a determination by the Secretary that such areas are essential for the conservation of the species.

Id. § 1532(5). The designation and protection of critical habitat is one of the primary ways to achieve the fundamental purpose of the ESA, "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." *Id.* § 1531(b).

The mimic glass lizard will benefit from the designation of critical habitat. The added layer of protection provided by critical habitat will allow USFWS to mandate reasonable and prudent alternatives to federal activities that would destroy or adversely modify habitat that is necessary for the conservation—survival *and* recovery—of the species. For these reasons, we request that USFWS designate critical habitat concurrent with listing the species.

IV. Conclusion

For the foregoing reasons, the Center petitions USFWS to list the mimic glass lizard as an endangered or threatened species under the ESA. Listing is warranted because of its rarity and its apparently diminished range, which make it vulnerable to ongoing threats. The lizard is at risk of extinction because of at least four of the five ESA listing factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (C) predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Petitioners also request that USFWS designate critical habitat for the mimic glass lizard, in both occupied and unoccupied suitable habitat, concurrently with listing the species. Designating critical habitat for the lizard will support the species' survival and recovery in the face of significant threats to its quickly diminishing habitat.

LITERATURE CITED

ActionAid USA et al. 2021. United States of America: Fair Shares Nationally Determined Contribution (April 2021). https://foe.org/usa-fair-shares-ndc.

Allen, C. R., Epperson, D. M., and Garmestani, A. S. 2004. Red Imported Fire Ant Impacts on Wildlife: A Decade of Research. Nebraska Cooperative Fish & Wildlife Research Unit -- Staff Publications. 154. http://digitalcommons.unl.edu/ncfwrustaff/154.

Andrews, K.M. and. Gibbons, J.W. 2005. How Do Highways Influence Snake Movement? Behavioral Responses to Roads and Vehicles. Copeia 2005(4): 772–782.

Andrews, K. M., Gibbons, J. W., and Jochimsen, D. M. 2006. Literature Synthesis of the Effects of Roads and Vehicles on Amphibians and Reptiles. Federal Highway Administration (FHWA), U.S. Department of Transportation, Report No. FHWA-HEP-08-005. Washington, D.C. 151 pp.

Andrews, K.M., Gibbons, J.W., and Jochimsen, D.M. 2008. Ecological effects of roads on amphibians and reptiles: a literature review. In *Urban herpetology. Herpetological Conservation*. Vol. 3. Jung, R.E. & Mitchell, J.C. (Eds). Salt Lake City, UT: Society for the Study of Amphibians and Reptiles.

Balaguru, K., Foltz, G.R., Leung, W. Xu, D. Kim, H. Lopez, and R. West, 2022: Increasing hurricane intensification rate near the US Atlantic coast. Geophysical Research Letters, 49 (20), e2022GL099793. https://doi. org/10.1029/2022gl099793.

Bhatia, K.T., Vecchi, G.A., Knutson, T.R., Murakami, H., Kossin, J., Dixon, K.W., and Whitlock, C.E. 2019. Recent increases in tropical cyclone intensification rates. Nature Communications, 10 (1), 635. https://doi.org/10.1038/ s41467-019-08471-z 99.

Blaustein, A.R., Walls S.C., Bancroft, B.A., Lawler, J.J., Searle, C.L., and Gervasi, S.S. 2010. Direct and indirect effects of climate change on amphibian populations. Diversity 2:281-313.

Boyle, M., Schwanz, L., Hone, J., Georges, A. 2016. Dispersal and climate warming determine range shift in model reptile populations. Ecological Modelling 328: 34-43.

Brockway D.G., Outcalt, K.W., Tomczak, D. J., Johnson, E. E.2005. Restoration of Longleaf Pine Ecosystems. Gen. Tech. Rep. SRS-83. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. p. 34. https://doi.org/10.2737/SRS-GTR-83

Capula, M., Rugiero, L., Capizzi, D., Franco, D., Milana, G. and Luiselli, L., 2016. Long-term, climate-change-related shifts in feeding frequencies of a Mediterranean snake population. Ecological research, 31(1), pp.49-55.

Carter, L.M., Jones, J.W., Berry, L., Burkett, V., Murley J.F., Obeysekera, J., Schramm, P.J., and Wear, D. 2014. Pages 396–417 in J.M. Melillo, T. Richmond, and G.W. Yohe, editors. Southeast and the Caribbean. Climate Change Impacts in the United States: The Third National Climate Assessment, U.S. Global Change Research Program doi:10.7930/J0NP22CB.

Center for Biological Diversity. 2019. Legal authority for presidential executive action on climate, https://www.climatepresident.org/Legal-Authority-for-Presidential-Climate-Action.pdf.

Čerňanský, A., Yaryhin, O., Ciceková, J., Werneburg, I., Hain, M. and Klembara, J. 2019. Vertebral comparative anatomy and morphological differences in anguine lizards with a special reference to Pseudopus apodus. *The Anatomical Record*, *302*(2), pp.232–257.

Charrette, N.A., Cleary, D.F.R., and Mooers, A.O. 2006. Range-restricted, specialist Bornean butterflies are less likely to recover from ENSO-induced disturbance. Ecology 87: 2330–2337.

Clark, R.W., Brown, W.S., Stechert, R., and Zamudio, K.R. 2010. Roads, Interrupted Dispersal, and Genetic Diversity in Timber Rattlesnakes. Conservation Biology 24(4):1059–1069.

Climate Action Tracker, USA Assessment (November 4, 2023), (entire) https://climateactiontracker.org/countries/usa/.

Colles A., Liow, L.H., and Prinzing, A. 2009. Are specialists at risk under environmental change? Neoecological, paleoecological and phylogenetic approaches. Ecological Letters 12: 849–863.

Collini, R.C., Carter, J., Auermuller, L., Engeman, L., Hintzen, K., Gambill, J., Johnson, R.E., Miller, I., Schafer, C., and Stiller, H. 2022. Application Guide for the 2022 Sea Level Rise Technical Report. National Oceanic and Atmospheric Administration Office for Coastal Management, Mississippi–Alabama Sea Grant Consortium (MASGP-22-028), and Florida Sea Grant (SGEB 88), at 25 (Table 1) *available at* https://oceanservice.noaa.gov/hazards/sealevelrise/noaa-nos-techrpt02-global-regional-SLR-scenarios-US-application-guide.pdf.

Congressional Research Service. 2023. Supreme Court Narrows Federal Jurisdiction Under Clean Water Act, https://crsreports.congress.gov/product/pdf/LSB/LSB10981.

Costanza, J. K., Weiss, J., and Moody, A. 2013. Examining the knowing-doing gap in the conservation of a fire-dependent ecosystem. Biological Conservation, 158, 107–115. https://doi.org/10.1016/j.biocon.2012.08.025

Costanza, J.K., Terando, A.J., McKerrow, A.J. and Collazo, J.A., 2015. Modeling climate change, urbanization, and fire effects on Pinus palustris ecosystems of the southeastern US. *Journal of Environmental management*, *151*, pp.186–199.

Crooks, K.R., Burdett, C.L., Theobald, D.M., King, S.R.B., Di Marco, M., Rondinini, C., and Boitani, L. 2017. Quantification of habitat fragmentation reveals extinction risk in terrestrial animals. PNAS 114(29): 7635–7640.

Crother, B. I. (editor). 2017. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. 8th edition. SSAR Herpetological Circular 43:1–104.

Davis, S.J., Dodder, R.S., Turner, D.D., Azevedo, I.M.L., Bazilian, M., Bistline, J., Carley, S., Clack, C.T.M., Fargione, J.E., Grubert, E., Hill, J., Hollis, A.L., Jenn, A., Jones, R.A., Masanet, E., Mayfield, E.N., Muratori, M., Peng, W., and Sellers, B.C. 2023. Ch. 32. Mitigation. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023.CH32.

DeGregorio, B.A., Nordberg, E.J., Stepanoff, K.E., and Hill, J.E. 2010. Patterns of Snake Road Mortality on an Isolated Barrier Island. Herpetological Conservation and Biology 5(3):441–448.

DeWan, A., Dubois, N., Theoharides, K., and Boshoven, J. 2010. Understanding the impacts of climate change on fish and wildlife in North Carolina. Defenders of Wildlife, Washington, DC.

Ditchkoff, S.S. and Mayer, J.J. 2009. Wild pig food habits. *Wild pigs: biology, damage, control techniques, and management. Savanna River National Laboratory, Aiken, SC*, pp.105–143.

Donald J Trump for President. 2024. Agenda47: America Must Have the #1 Lowest Cost Energy and Electricity on Earth, https://www.donaldjtrump.com/agenda47/agenda47-america-must-have-the-1-lowest-cost-energy-and-electricity-on-earth.

Enge, K.M. 2002. Herpetofaunal drift-fence survey of two seepage bogs in Okaloosa County, Florida. *Florida Scientist*, pp.67–82.

Enge, K.M., and Wood, K.N. 2002. A Pedestrian Road Survey of an Upland Snake Community in Florida. Southeastern Naturalist 1(4):365–380.

Erickson, P. et al. 2017. Effect of subsidies to fossil fuel companies on united states crude oil production, Nature Energy 2:891.

Fitch, H.S. 1989. A field study of the Slender Glass Lizard, *Ophisaurus attenuatus*, in northeastern Kansas. Occasional Papers of the University of Kansas Museum of Natural History 125:1−50.

Ford, K.M. Undated. eastern glass lizard (Ophisaurus ventralis), Savannah River Ecology Lab, https://srelherp.uga.edu/lizards/eastern-glass-lizard/.

[FWC] Florida Fish and Wildlife Conservation Commission. 2016. A guide to climate change adaptation for conservation- Version 1. Tallahassee, Florida. 295 p. Available at https://myfwc.com/media/5864/adaptation-guide.pdf.

Gang, C., Pan, S., Tian, H., Wang, Z., Xu, R., Bian, Z., et al. 2020. Satellite observations of forest resilience to hurricanes along the northern Gulf of Mexico. For. Ecol. Manage. 472:118243. doi: 10.1016/j.foreco.2020.11 8243.

George, A.D., Thompson, F.R. and Faaborg, J., 2015. Isolating weather effects from seasonal activity patterns of a temperate North American Colubrid. *Oecologia*, *178*(4), pp.1251-1259.

Gibbons, J.W. and Buhlmann, K.A. 2001. Chapter 28. Reptiles and amphibians. Wildlife of Southern Forests: Habitat and Management, James G. Dickson, Compilation and Editor. Surrey, British Columbia and Blaine, WA, Hancock House Publishers: 372–390.

Gibbons, J, W., Scott, D. E., Ryan, T. J., Buhlmann, K. A., Tuberville, T. D., Metts, B. S., Greene, J L., Mills, T., Leiden, Y., Poppy, S., Winnie, C. T. 2000. The Global Decline of Reptiles, Déjà Vu Amphibians. Bio Science. Volume: 50. No. 8.

Gilliam, F. S. 2016. Forest ecosystems of temperate climatic regions: from ancient use to climate change. New Phytol. 212, 871–887. doi: 10.1111/nph.14255

Gilliam, F.S. and Platt, W.J. 2006. Conservation and restoration of the Pinus palustris ecosystem. *Applied Vegetation Science*, *9*(1), pp.7–10.

Global Carbon Project. 2021. Global Carbon Budget 2021. https://www.globalcarbonproject.org/carbonbudget/21/files/GCP_CarbonBudget_2021.pdf.

Gold, A.C. 2024. How wet must a wetland be to have federal protections in post-Sackett US?. Science 385,1450-1453(2024). DOI:10.1126/science.adp3222.

Guyer, C. and Bailey, M.A. 1993, May. Amphibians and reptiles of longleaf pine communities. In *Proceedings of the tall timbers fire ecology conference* (Vol. 18, pp. 139-158).

Guyer, C., Bailey, M.A., and Mount, R.H. 2019. Lizards and Snakes of Alabama. University of Alabama Press, Tuscaloosa, Alabama, USA.

Hammerson, G.A. 2007. *Ophisaurus mimicus*. *The IUCN Red List of Threatened Species* 2007: e.T63720A12709987. https://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T63720A12709987.en. Accessed on 30 November 2024.

Hansen, A.J., Neilson, R.P., Dale, V.H., Flather, C.H., Iverson, L.R., Currie, D.J., Shafer, S., Cook, R. and Bartlein, P.J. 2001. Global change in forests: responses of species, communities, and biomes: interactions between climate change and land use are projected to cause large shifts in biodiversity. *BioScience*, *51*(9), pp.765-779.

Hatten, J.R., Giermakowski, J.T., Holmes, J.A., Nowak, E.M., Johnson, M.J., Ironside, K.E., van Ripper III, C., Peters, M., Truettner, C., Cole, K. L. 2016. Identifying Bird and Reptile Vulnerabilities to Climate Change in the Southwestern United States. U.S. Geological Survey. Open-File Report 2016–1085.

Hausfather, Z. and Peters, G.P., 2020. Emissions–the 'business as usual' story is misleading. *Nature*, *577*(7792), pp.618-620.

Hayhoe, K., et al. 2018. Our changing climate. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 72–144. Doi: 10.7930/NCA4.2018.CH2.

Henle, K., Davies, K.F., Kleyer, M., Margules, C., and Settele, J. 2004. Predictors of species sensitivity to fragmentation. Biodiversity Conservation. 13: 207–251.

Herring, Stephanie C. et al. 2017. Explaining extreme events of 2016 from a climate perspective, 99 Bulletin of the American Meteorological Society. Available at https://journals.ametsoc.org/view/journals/bams/99/1/bamsexplainingextremeevents2016.1.xml.

Hess, C.A. 2014. Restoration of longleaf pine in slash pine plantations: Using fire to avoid the landscape trap. Doctoral dissertation, Department of Biology, Florida State University. 112 p.

Hoffman, J.S., McNulty, S.G., Brown, C., Dello, K.D., Knox, P.N., Lascurain, A., Mickalonis, C., Mitchum, G.T., Rivers, L. III, Schaefer, M., Smith, G.P., Camp, J.S., and Wood, K.M. 2023. Ch. 22. Southeast. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA.

Hutchens, L. G. (2023). Projecting the Effects of Climate Change and Urbanization on Longleaf Pine Stands in the Florida Flatwoods. (Master's thesis). Retrieved from https://scholarcommons.sc.edu/etd/7244.

International Energy Agency. 2023. Net Zero Roadmap: A Global Pathway to Keep the 1.5°C Goal in Reach, https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-c-goal-in-reach.

International Energy Agency. 2021. Net Zero by 2050. Paris, https://www.iea.org/reports/net-zero-by-2050.

Intergovernmental Panel on Climate Change. 2018. Summary for policymakers. In Global warming of 1.5°C. An IPCC Special Report MassonDelmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield, (editors). World Meteorological Organization; Geneva, Switzerland.

Intergovernmental Panel on Climate Change. 2021. Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, 44 S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3–32, doi:10.1017/9781009157896.001. Available at https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/.

Intergovernmental Panel on Climate Change. 2022. Summary for Policymakers. H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.). In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.). Cambridge University Press, *available at* https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf.

Intergovernmental Panel on Climate Change. Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, https://www.ipcc.ch/report/sixth-assessment-report-cycle/.

Jay, A.K., Crimmins, A.R., Avery, C.W., Dahl, T.A., Dodder, R.S., Hamlington, B.D., Lustig, A., Marvel, K., Méndez-Lazaro, P.A., Osler, M.S., Terando, A., Weeks, E.S., and Zycherman, A. 2023. Ch. 1. Overview: Understanding risks, impacts, and responses. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA.

Jolley, D.B., 2007. Reproduction and herpetofauna depredation of feral pigs at Fort Benning, Georgia. *Master of Science Thesis, Auburn University, Auburn, Georgia, USA*.

Jolley, D.B., Ditchkoff, S.S., Sparklin, B.D., Hanson, L.B., Mitchell, M.S. and Grand, J.B., 2010. Estimate of herpetofauna depredation by a population of wild pigs. *Journal of Mammalogy*, *91*(2), pp.519–524.

Karl, T.R., Melillo, J.M., and Peterson, T.C. 2009. Global Climate Change Impacts in the United States. Global Change Research Program. New York: Cambridge University Press.

Keenan, J.M., Hill, T., Gumber, A., 2018. Climate gentrification: from theory to empiricism in Miami-Dade County, Florida. Environ. Res. Lett. 13, 054001 https://doi.org/10.1088/1748-9326/aabb32.

Kenney, G., Staudhammer, C. L., Wiesner, S., Brantley, S. T., Bigelow, S. W., & Starr, G. 2021. Hurricane Michael altered the structure and function of longleaf pine woodlands. *Journal of Geophysical Research: Biogeosciences*, 126, e2021JG006452. https://doi.org/10.1029/2021JG006452.

King, B., Gaffney, M., and Rivera, A. 2024. Preliminary US Greenhouse Gas Emissions Estimates for 2023, https://rhg.com/research/us-greenhouse-gas-emissions-2023/.

Knight, A., Voight, C., Oetting, J., et al. (2023). Landscape Scale Assessment (LSA) version 1: Technical report. *Florida Natural Areas Inventory*. https://www.fnai.org/PDFs/LSA_v1_Technical_Report_20230815.pdf.

Knutson, T. 2024. Global Warming and Hurricanes: An Overview of Current Research Results. https://www.gfdl.noaa.gov/global-warming-andhurricanes/#summary-statement. Accessed September 9, 2024.

Kupfer, J.A., Lackstrom, K., Grego, J.M. *et al.* 2022. Prescribed fire in longleaf pine ecosystems: fire managers' perspectives on priorities, constraints, and future prospects. *fire ecol* 18, 27. https://doi.org/10.1186/s42408-022-00151-6.

Lawing, A.M. and Polly, P.D., 2011. Pleistocene climate, phylogeny, and climate envelope models: an integrative approach to better understand species' response to climate change. *PloS one*, *6*(12), p.e28554.McDonough, M.T., Ditchkoff, S.S., Smith, M.D. and Vercauteren, K.C., 2022. A review of the impacts of invasive wild pigs on native vertebrates. *Mammalian Biology*, *102*(2), pp.279–290.

Means, D. B. 2006. Vertebrate faunal diversity in Longleaf Pine savannas. Pp. 155−213 *In* Longleaf Pine Ecosystems: Ecology, Management, and Restoration. Jose, S., E.J. Jokela, and D.L. Miller (Eds.). Springer, New York, New York, USA.

Moler, P.E. 2019. *Ophisaurus mimicus* Palmer (Mimic Glass Lizard). Pp. 319−321 *In* Amphibians and Reptiles of Florida. Krysko, K.L., K.M. Enge, and P.E. Moler (Eds.). University of Florida Press, Gainesville, Florida, USA.

Moreno-Rueda, G., Pleguezuelos, J. M., Pizarro, M., Montori, A. 2011. Northward Shifts of the Distributions of Spanish Reptiles in Association with Climate Change. Conservation Biology. Volume 26, No. 2, 278–283.

Muttitt, G, and Kartha, S. 2020. Equity, climate justice and fossil fuel extraction: principles for a managed phase out, 20 Climate Policy 1024.

NatureServe. 2024. *Ophisaurus mimicus*, Mimic Glass Lizard, accessed through NatureServe Explorer. NatureServe, Arlington, Virginia. Available https://explorer.natureserve.org/. (Accessed: November 30, 2024).

Noss, R.F., 1987. Corridors in real landscapes: a reply to Simberloff and Cox. *Conservation biology*, *1*(2), pp.159–164.

Noss, R.F., Platt, W.J., Sorrie, B.A., Weakley, A.S., Means, D.B., Constanza, J., and Peet, R.J. 2015. How global biodiversity hotspots may go unrecognized: lessons from the North American Coastal Plain. Diversity and Distributions 21:236−244.

Ogurcak, D. E. 2016. The effect of disturbance and freshwater availability on Lower Florida Keys' Coastal Forest Dynamics. [A PhD dissertation]. Florida International University.

Oil Change International. 2019. Drilling Toward Disaster: Why U.S. Oil and Gas Expansion Is Incompatible with Climate Limits, http://priceofoil.org/2019/01/16/report-drilling-towards-disaster/.

Oil Change International and Greenpeace. 2020. Policy Briefing: Carbon Impacts of Reinstation the U.S. Crude Export Ban http://priceofoil.org/2020/01/28/crudeexport-ban-carbon.

Oil Change International. 2023. Planet Wreckers: How Countries' Oil and Gas Extraction Plans Risk Locking in Climate Chaos. https://oilchange.org/publications/planet-wreckers-how-20-countries-oil-and-gas-extraction-plans-risk-locking-in-climate-chaos/.

One Big Beautiful Bill Act, H.R. 1, 119th Cong. 2025. https://www.congress.gov/bill/119th-congress/house-bill/1/text.

Oswalt, C.M., Cooper, J.A., Brockway, D.G., Brooks, H.W., Walker, J.L., Connor, K.F., Oswalt, S.N. and Conner, R.C., 2012. History and current condition of longleaf pine in the southern United States.

Palmer, W. M. 1987. A New Species of Glass Lizard (Anguidae: Ophisaurus) from the Southeastern United States. *Herpetologica*, *43*(4), 415–423. http://www.jstor.org/stable/3892144.

Palmer, W.M., and Braswell, A.L. 1992. Reptiles of North Carolina. University of North Carolina Press. Chapel Hill, North Carolina, USA. 412 p.

Park, J. and Sweet, W. 2015. Accelerated sea level rise and Florida Current transport. Ocean Science 11:607–615.

Peters, R.L. and Darling, J.D.S. 1985. The greenhouse effect and nature reserves. Bioscience 35(11):707–717.

Powell, R., Conant, R., and Collins, J.T. 2016. Peterson Field Guide to the Reptiles and Amphibians of Eastern and Central North America. 4th Edition. Houghton Mifflin Harcourt, Boston, Massachusetts, USA.

Public Citizen, Biden's Oil Letdown (December 6, 2021), (entire) https://www.citizen.org/wp-content/uploads/bidenoil-final.pdf.

Reading, C.J., Luiselli, L.M., Akani, G.C., Bonnet, X., Amori, G., Ballouard, J.M., Filippi, E., Naulleau, G., Pearson, D. and Rugiero, L., 2010. Are snake populations in widespread decline?. *Biology letters*, *6*(6), pp.777–780.

Reptiles and Amphibians of Mississippi. 2024. https://msherps.com/lizards/mimic-glass-lizard/.

Ross, M., O'Brien, J., and da Silveira Lobo Sternberg, L. 1994. Sea-level rise and the reduction in pine forests in the Florida Keys. Ecological Applications. 4: 144–156.

Rutledge, B.T., Cannon, J.B., McIntyre, R.K., Holland, A.M. and Jack, S.B., 2021. Tree, stand, and landscape factors contributing to hurricane damage in a coastal plain forest: Post-hurricane assessment in a longleaf pine landscape. *Forest Ecology and Management*, *481*, p.118724.

Sears, M. W., Angilletta, M. J., Schuler, M. S., Borchert, J., Dillipane, K. F., Stegman, M., Rusch, T. W., Mitchell, W.A. 2016. Configuration of the thermal landscape determines thermoregulatory performance of ectotherms. Proceedings of the National Academy of Sciences of the United States of America. PNAS Early Edition. doi:10.1073/pnas.1604824113/-/DCSupplemental.

Semlitsch, R.D., Walls, S.C., Barichivich, W.J., and O'Donnell, K.M. 2017. Extinction debt as a driver of amphibian declines: an example with imperiled flatwoods salamanders. Journal of Herpetology 51:12−18.

Shaffer, M.L. and Stein, B. 2000. Safeguarding our precious heritage. Pages 301–322 in Stein BA, Kutner LS, Adams JS, eds. Precious Heritage: The Status of Biodiversity in the United States. Oxford University Press.

Sinervo B, Méndez-de-la-Cruz, F., Miles, D.B., Heulin, B., Bastiaans, E., Cruz, M.V.S., et al. 2010. Erosion of Lizard Diversity by Climate Change and Altered Thermal Niches. Science. May 14;328(5980):894–9.

[SREL] Savannah River Ecology Lab. Undated. Slender Glass Lizard (Ophisaurus attenuatus), https://srelherp.uga.edu/lizards/slender-glass-lizard/.

Stevenson, D.J. 2022. Some Folks Call 'em Joint Snakes, *Gopher Tortoise Council Newsletter* 42(2), https://gophertortoisecouncil.org/gtc-newsletter/42-volume-42-number-2/182-some-folks-call-em-joint-snakes.

Stevenson, D.J., Enge, K.M., Beane, J.C., Hill, E.P., Coppola, C.J. and Hall, J.G. 2023. Status, Distribution, and Ecology of the Mimic Glass Lizard (*Ophisaurus mimicus*). *Herpetological Conservation and Biology*, *18*(2), pp.254–266.

Stockholm Environment Institute (SEI), IISD, ODI et al. 2019. The Production Gap: The Discrepancy between Countries' Planned Fossil Fuel Production and Global Production Levels Consistent with Limiting Warming to 1.5°C or 2°C, https://productiongap.org/.

Sulliván, S. M. P. 2023. Testimony for the U.S. Senate Committee on Environment and Public Works: Examining the Implications of Sackett v. U.S. Environmental Protection Agency for Clean Water Act Protections of Wetlands and Streams. 14p. Available at https://www.epw.senate.gov/public/_cache/files/c/2/c2e250dc-f65e-49ed-9a12-0440ca52209a/ABA6964E97FE85F628FEB4A43B46657B.10-18-2023-sulliv-n-testimony.pdf.

Sweet, W.V., Kopp, R.E., Weaver, C.P., Obeysekera, J., Horton, R.M., Thieler, E.R., and Zervas, C. 2017. Global and Regional Sea Level Rise Scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. NOAA/NOS Center for Operational Oceanographic Products and Services. https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Sce narios_for_the_US_final.pdf.

Sweet, W.V., Dusek, G., Obeysekera, J., and Marra, J.J. 2018. Patterns and projections of high tide flooding along the U.S. coastline using a common impact threshold. NOAA Technical Report NOS CO-OPS 086. National Oceanic and Atmospheric Administration; Center for Operational Oceanographic Products and Services; Silver Springs, Maryland.

Sweet, W.V., Hamlington, B.D., Kopp, R.E., Weaver, C.P., Barnard, P.L., Bekaert, D., Brooks, W., Craghan, M., Dusek, G., Frederikse, T., Garner, G., Genz, A.S., Krasting, J.P., Larour, E., Marcy, D., Marra, J.J., Obeysekera, J., Osler, M., Pendleton, M., Roman, D., Schmied, L., Veatch, W., White, K.D., and Zuzak, C. 2022. Global and Regional Sea Level Rise Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines. NOAA Technical Report NOS 01. National Oceanic and Atmospheric Administration, National Ocean Service, Silver Spring, MD, 111 pp. Available at https://oceanservice.noaa.gov/hazards/sealevelrise/noaanos-techrpt01-global-regional-SLR-scenarios-US.pdf.

Taylor, M.F.J., Suckling, K.F., Rachlinski, J.J., (2005). The Effectiveness of the Endangered Species Act: A Quantitative Analysis. *BioScience* 55:360–367.

Tong, D., Zhang, Q., Zheng, Y. et al. 2020. Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. Nature 2019; 572:373–7, https://www.nature.com/articles/s41586-019-1364-3.

Trager, M.D., Drake, D.B., Jenkins, A.M., Petrick, C.J. (2018). Mapping and Modeling Ecological Conditions of Longleaf Pine Habitats in the Apalachicola National Forest. *Journal of Forestry,* Volume 116, Issue 3, May 2018, Pages 304–311, https://doi.org/10.1093/jofore/fvx017.

Trout, K., Muttitt, G., Lafleur, D., Van de Graaf, T., Mendelevitch, R., Mei, L., Meinschausen, M. 2022. Existing fossil fuel extraction would warm the world beyond 1.5 °C. Environmental Research Letters 17:064010, https://iopscience.iop.org/article/10.1088/1748-9326/ac6228.

Tuberville, T. D., Andrews, K. M.,Sperry, J. H., Grosse, A. M. 2015. Use of the NatureServe Climate Change Vulnerability Index as an Assessment Tool for Reptiles and Amphibians: Lessons Learned. Environmental Management. Vol 55. Number 5. doi:10.1007/s00267-015-0537-6.

[UNEP] United Nations Environment Programme (UNEP), Emissions Gap Report 2021: The Heat Is On – A World of Climate Promises Not Yet Delivered, Nairobi (2021), at 15, https://www.unep.org/resources/emissions-gap-report-2021.

[USDA NRCS] U.S. Department of Agriculture, Natural Resources Conservation Service. (n.d.). Longleaf Pine Initiative. https://www.nrcs.usda.gov/programs-initiatives/longleaf-pine-initiative.

[USEIA] U.S. Energy Information Administration. 2024a. United States Produces More Crude Oil than Any Country, Ever, https://www.eia.gov/todayinenergy/detail.php?id=61545.

[USEIA] U.S. Energy Information Administration. 2024b. The United States was the world's largest liquefied natural gas exporter in 2023, https://www.eia.gov/todayinenergy/detail.php?id=61683.

[USEIA] U.S. Energy Information Administration. 2025. *Electricity use for commercial computing could surpass space cooling, ventilation*. Today in Energy. https://www.eia.gov/todayinenergy/detail.php?id=65445.

[UESEPA] U.S. Environmental Protection Agency. (2025). *EPA proposes repeal of Biden-Harris EPA regulations for power plants, which, if finalized, would save Americans more than a billion dollars a year*. https://www.epa.gov/newsreleases/epa-proposes-repeal-biden-harris-epa-regulations-power-plants-which-if-finalized-would.

U.S. Forest Service, Southern Region. 2004. Revised Land and Resource Management Plan: National Forests in Alabama. https://www.fs.usda.gov/sites/nfs/files/r08/alabama/publication/Revised%20Land%20and%20Resource%20Management%20Plan-National%20Forests%20in%20Alabama_1.pdf.

U.S. Forest Service, Southern Research Station. 2012. History and Current Condition of Longleaf Pine in the Southern United States. https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs166.pdf.

[USFWS] U.S. Fish and Wildlife Service. 2016. USFWS Species Status Assessment Framework: an integrated analytical framework for conservation. Version 3.4 dated August 2016.

[USFWS] U.S. Fish and Wildlife Service. 2019. Frosted flatwoods salamander (*Ambystoma cingulatum*) 5-Year Review: Summary and Evaluation. Panama City, Florida.

[USFWS] U.S. Fish and Wildlife Service. 2020. Species status assessment report for the Rim rock crowned snake (*Tantilla oolitica*). February 11, 2020. Vero Beach, Florida.

[USFWS] U.S. Fish and Wildlife Service. 2020. Species Status Assessment for the Frosted Flatwoods Salamander (*Ambystoma cingulatum*) Version 1.0, Panama City, Florida.

[USFWS] U.S. Fish and Wildlife Service. 2021. Species status assessment report for the Key ring-necked snake (*Diadophis punctatus acricus*). February 11, 2021. Vero Beach, Florida.

[USFWS] U.S. Fish and Wildlife Service. 2022. Species status assessment report for the Florida Keys mole skink (*Plestiodon egregius egregius*). Version 2.0. April 2022. Atlanta, GA.

[USGCRP] U.S. Global Change Research Program. 2017. Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp., doi: 10.7930/J0J964J6.

[USGCRP] U.S. Global Change Research Program. 2018. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II. nca2018.globalchange.gov/.

U.S. President. 2021, Jan. 27. Tackling the Climate Crisis at Home and Abroad, Exec. Order No. 14,008, 86 Fed. Reg. 7619, https://www.whitehouse.gov/briefingroom/presidential-actions/2021/01/27/executive-order-on-tackling-the-climatecrisis-at-home-and-abroad.

U.S. President. 2025, January 20. *Executive Order 14162: Putting America first in international environmental agreements*. The White House. www.whitehouse.gov/presidential-actions/2025/01/putting-america-first-in-international-environmental-agreements/.

U.S. President. 2025, January 20. *Unleashing American Energy*. The White House. www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/.

U.S. President. 2025, April 8. *Protecting American Energy from State Overreach*. The White House. www.whitehouse.gov/presidential-actions/2025/04/protecting-american-energy-from-state-overreach/.

Ward, B. C., Stys, S., Becker, L. S. & Keller, C. 2019. Climate Adaptation Explorer for Florida, Terrestrial Ecosystems, Mesic Flatwoods. Conservation Biology Institute, Peninsular Florida Landscape Conservation Initiative / Florida Fish and Wildlife Conservation Commission, https://climateadaptationexplorer.org/habitats/terrestrial/1311.

Whitfield, S. M., Bell, K. E., Philippi, T., Sasa, M., Bolaños, F., Chavez, G., Savage, J. M, Donnelly, M, A. 2007. Amphibian and reptile declines over 35 years at La Selva, Costa Rica. Proceedings of the National Academy of Sciences; volume 104. No. 20 8352-8356.

Wiens, J. J.2016. Climate-Related Local Extinctions Are Already Widespread among Plant and Animal Species. PLoS Biol 14(12): e2001104. doi:10.1371/journal.pbio.2001104.

Wolf, S., Hartl, B., Carroll, C., Neel, M.C. and Greenwald, D.N. 2015. Beyond PVA: why recovery under the Endangered Species Act is more than population viability. BioScience 65:200–207.

Wright, A. N., Schwartz, M. W., Hijmans, R. J., Shaffer, H. B. 2015. Advances in climate models from CMIP3 to CMIP5 do not change predictions of future habitat suitability for California reptiles and amphibians. Climate Change. 134:579–591 doi:10.1007/s10584-015-1552-6.

Wu, J. 2015. Detecting and Attributing the Effects of Climate Change on the Distributions of Snake Species Over the Past 50 Years. Environmental Management. doi:10.1007/s00267-015-0600-3.

Zampieri, N.E., Pau, S. and Okamoto, D.K., 2020. The impact of Hurricane Michael on longleaf pine habitats in Florida. *Scientific Reports*, *10*(1), p.8483.