Integration and Synthesis Summary for Reptiles

This Integration and Synthesis Summary includes our jeopardy analysis for reptile species that we or EPA determined would “likely be adversely affected” by the proposed action. Our jeopardy analysis of the proposed action’s impacts to listed species is split into three major factors: vulnerability, exposure, and toxicity. The tables below contain summaries of vulnerability, exposure, and toxicity. Data and information used for each species include environmental baselines, cumulative effects, exposure information, and expected toxic effects for all species, and a template worksheet to show how species were assessed are in Appendix E. Status of the Species for each species can be found in Appendix B.

A number of the reptile species here have low exposure to simazine due to the factors described in the tables or individual rationales below, in combination with reductions in simazine spray drift and runoff resulting from implementation of conservation measures added to the product label (including those developed during this consultation through the Herbicide Strategy[1]; see Conservation Measures section below). We anticipate these measures will reduce exposures in the terrestrial and/or aquatic habitats where these species occur to a level where no more than low level direct and indirect adverse effects are anticipated for many listed reptile species.

Vulnerability

For the reptile species that we or EPA determined are “likely to be adversely affected” by the proposed action, we considered several factors for each listed reptile to determine the current vulnerability of that species to additional stressors. This effort allows us to consider whether a species’ current condition is stable, moving toward recovery, or moving toward further decline. In general, we expect the species’ vulnerability to additional stressors to be higher if they are near extinction, far from recovery, or moving toward further decline than if their condition is stable or improving. We also identify which species are most (and least) susceptible to additional stressors in general based on information from species listing and recovery documents, or other sources as cited and considered in the Status of the Species and Critical Habitat section of this Opinion (Appendix B).

Our assessment of vulnerability focuses on six factors (as currently understood and available): (1) the species listing status and recent 5-year status review recommendation, (2) distribution, (3) number of populations[2], (4) species population trends, (5) if pesticides have been noted as a threat, and (6) current and projected future impacts from activities associated with environmental baseline and cumulative effects. We obtained the information to create the vulnerability

[1] https://www.regulations.gov/docket/EPA-HQ-OPP-2023-0365

[2] The number will vary in value and importance by species and in some cases is unknown. In general, species with a greater number of populations have greater representation, will be more resilient, and when distributed geographically, will have greater redundancy. Conversely, species with fewer populations, in general, have less representation, are less resilient, and have less redundancy.

summary from the Status of the Species accounts (Appendix B), overarching Environmental Baseline section of this Opinion, five-year species status reviews, species recovery plans, species status assessments, range and critical habitat information from our ECOS[3] repository, and other sources containing the best available scientific information for the species.

We scored each of the six vulnerability components with high, medium, or low scores. We assigned a high vulnerability ranking to a species if all vulnerability components were scored as high, a mixture of medium and high, or if a threatened species was recommended for uplisting to endangered status in the most recent 5-year status review or proposed rule. We assigned a medium vulnerability ranking if a species' scores were all medium, a mix of high, medium, and low, or a mix of high and low (unless the species has been recommended for uplisting or delisting). We assigned a low vulnerability ranking to species with only low scores, a mixture of low and medium scores, or if the species was recommended for delisting. Considerations regarding specific aspects of the species' vulnerability or beyond what was included in the vulnerability ranking were applicable in our jeopardy analyses for some species depending on unique aspects of their vulnerability factors, recovery needs, or life history. This information is reflected in the rationales for conclusion below.

Exposure

We anticipate that the main route of exposure for reptiles is dietary, through consumption of contaminated food items either as the result of exposure to pesticide applications on-field or through off-field transport via spray drift or runoff. Simazine is moderately mobile in water and is relatively persistent in the environment relative to other pesticides, indicating that off-site transport, particularly through runoff, may result in exposure to listed species in areas far from use sites.

Exposure to Agricultural Uses

Simazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation). We characterize the expected level of exposure using overlaps between the species' ranges and agricultural areas where simazine is registered for use (i.e., overlap data; including a 305-m off-site transport area adjacent to use sites), past simazine usage data (when available; the amount and location where simazine has been used in the past), any species-specific considerations such as life history information (e.g., habitat preferences, dietary needs, dispersal behavior), and existing protections or conservation actions (e.g., existing label measures, conservation measures from the action agency). Species with greater than 10% overlap between their range and agricultural simazine use sites are assigned a high overlap score, species with 5-10% overlap are assigned a medium overlap score, and species with less than 5% overlap are assigned a low overlap score. In addition to range overlaps with simazine use sites, we considered past simazine usage data within a species' range to determine how much of a species'

[3] https://ecos.fws.gov/ecp/

range we expect to be treated with simazine each year of the proposed action. Except where otherwise noted, usage data is provided by EPA applying data from their National and State Summary Use and Usage Matrix, as described in the Usage Analysis section of this Opinion. Species with usage data that indicate a large portion of their range (>10%) is treated with simazine each year are assigned a high usage score. Species that have a medium portion of their range (5-10%) treated with simazine each year are assigned a medium usage score, and species where data indicate a low portion of their range (<5%) is treated with simazine each year are assigned a low usage score.

We determine the agricultural exposure ranking by qualitatively considering both the total overlap and total usage, as well as any additional exposure considerations that might modify the level of exposure likely to occur. When overlap and usage scores are the same, we assign the agricultural exposure ranking the same score (e.g., if both overlap and usage is high, the agricultural exposure ranking is high). In cases where overlap is high and usage is medium or when overlap is medium and usage is low, we use the overlap score as the agricultural exposure ranking to maintain conservative exposure assumptions. As usage is a subset of overlap, the overlap score will always be greater than the usage score. In cases where overlap is high, but usage is low, we anticipate a moderate portion of the range may be treated over the duration of the proposed action even if only a small portion of the range is treated in any given year (particularly if the areas treated occur in different locations each year), leading to an agricultural exposure ranking of medium. For species where there are additional exposure considerations, we adjust the agricultural exposure ranking to reflect this additional information, as appropriate.

Agricultural uses of simazine include labeled uses for corn, vegetables and ground fruit, other crops, citrus, grapes, Christmas trees, and other orchards only within the conterminous United States.

Exposure to Non-Agricultural Uses

Simazine has several registered non-agricultural uses, including nurseries (only ornamental conifers, deciduous trees and woody ornamental species), ornamental ponds (1,000 gallons or less), lawns, golf courses and other turf. In many cases, data provided by EPA indicate low to high levels of overlap between species' ranges and non-agricultural UDLs. Overall, nurseries (including ornamental plant uses) represent a very small footprint across the action area; across all species in this consultation, the Nurseries UDL overlaps between 0%-0.2% of species' ranges and 0%-5.6% of species' ranges plus a 305-m buffer. For species known to occur near nurseries, we assess nurseries specifically in our assessment. UDLs for non-agricultural uses sites that represent turf tend to be less defined than those for agricultural UDLs and are less likely to accurately represent the actual footprint of these use sites on the landscape. As such, we assess exposure of species to all non-agricultural uses of simazine in a qualitative manner, considering the life history of species, methods of application, simazine usage, and any existing conservation measures to reduce drift and runoff or otherwise limit exposure to species. To facilitate this analysis, for every species in this Appendix, we reviewed species' documents (e.g., Status of the

Species (Appendix B), 5-year reviews, Species Status Assessments, recovery plans, listing rules) to determine if the species could occur on or near non-agricultural simazine use sites (i.e., residential areas where lawns are likely present, golf courses, and nurseries) and the manner in which they may rely on these sites.

Depending on region, cool-season, warm-season, or a combination of turf grass species are managed on golf courses and lawns. Cool-season grasses grow best in cooler conditions, and warm-season grasses thrive in hot, dry weather (USDA, 2004); there is a transition zone across the U.S. where either category of turf grasses may be planted based on microclimate conditions. Exposure to triazines will kill cool-season grasses, but warm-season grasses can tolerate exposure to simazine. As such, EPA estimated where in the U.S. only cool-season grasses are exclusively used in turf based on the U.S. Department of Agriculture's plant hardiness zone map as simazine use is not expected in these areas (USDA, 2023). Because hardiness zones will change over time with environmental conditions, EPA created a static map based on the hardiness zones where they expect warm- and cool-season grasses are grown based on the most recent data mapped (i.e., 1991-2020). EPA determined zones 1a-6a represent cool-season grasses (i.e., white areas) and zones 6b-13b may include warm-season grasses (i.e., black areas) (Figure 1). We expect the cool- and warm-season grass assessment to apply to all turf, including residential, commercial, and golf course turf. We refer to EPA's cool-season map in species assessments where relevant, particularly if a species occurs exclusively in the cool-season zone where we expect simazine will not be used on turf and no exposure will occur from this use.

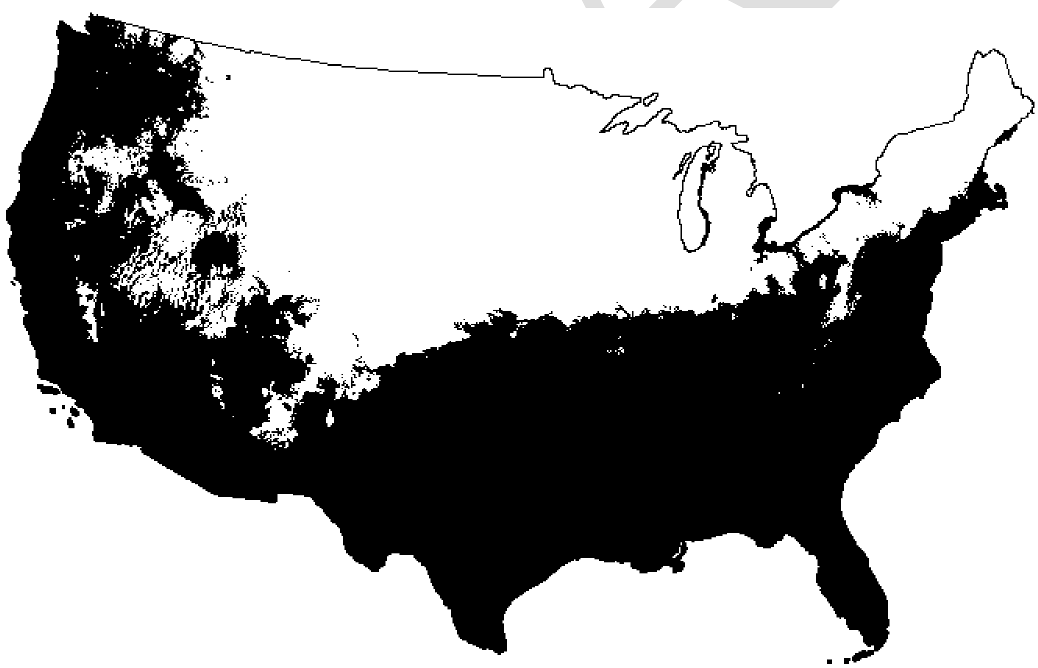

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

Particularly for residential and commercial turf uses, qualitative usage information obtained by EPA from the National Association of Landscape Professionals (NALP) indicate that simazine is no longer commonly used on residential or commercial turf as potential consequences to turf areas related to timing of application has led to preferential use of other herbicides that can be applied more broadly. If simazine were used on residential or commercial turf, it would be applied during the fall and spring as a pre-emergent. In addition, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift.

Particularly for golf course turf uses, we obtained qualitative usage information directly from the Golf Course Superintendents Association of America (GCSAA) and an academic turf scientist that indicate that simazine is used to control winter annual broadleaf and annual bluegrass weeds on golf courses. They are applied as a pre-emergent in early fall and early winter to fairways and roughs, which make up approximately 30% of a golf course's acreage. Triazines are not applied to tee boxes or greens, which make up an additional 6% of golf course acreage. Most applications are made at rates lower than what is on the label (i.e., 1-1.5 lbs a.i./acre). These applications are made only once or twice a year, 45-60 days apart. In general, golf courses typically apply herbicides using dedicated ground equipment with a low boom height (as per the label), and golf course superintendents make use of several tools to monitor soil moisture before any applications are made to help ensure turf and soil conditions do not lead to off-target movement of herbicides. In addition, riparian buffer zones are often used on golf courses between all water features to reduce off target movement (Golf Course Superintendents Association of America [GCSAA], pers. comm., 2025). The no-till methodology and continuous cover of a turf grass area inherent in managing golf course turf are equivalent to additional run-off mitigations (i.e., equivalent to 6 points on EPA's mitigation menu), and we considered them in our assessment.

For most species in this Appendix, we anticipate that non-agricultural uses will not meaningfully add to the overall level of anticipated exposure considered in our analysis of agricultural uses. Due to runoff and spray drift considerations described above, off-site exposure is not expected to result in effects to most species in this Appendix. In addition, we expect most listed species' habitat requirements precludes them from occupying non-agricultural use sites where simazine may be used. For species whose habitat is known or presumed to occur in non-agricultural use sites of simazine, we consider, individually and qualitatively, the extent and manner of non-agricultural simazine usage within the species' range to generally determine whether a small, moderate, or large number of individuals are likely to be exposed and the expected level of adverse effects from non-agricultural exposure of simazine.

References:

GCSAA (Golf Course Superintendents Association of America). 2025. Personal communication with USFWS HQ staff.

USDA. 2004. Comparing warm-season and cool-season grasses for erosion control, water quality, and wildlife habitat. Natural Resources Conservation Service, U.S. Department of Agriculture. 5 pp.

USDA. 2023. Plant Hardiness Zone Map. Agricultural Research Service, U.S. Department of Agriculture. Accessed from https://planthardiness.ars.usda.gov/ on August 20, 2025.

Toxicity

We characterize the expected toxic effect to species based on the anticipated level of direct and indirect[4] adverse effects to individuals. Our analysis of toxicity assumes individuals are exposed to simazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. Direct effects are based on the anticipated level of mortality and sublethal effects (e.g., reduced growth, reproduction, impaired motor activity or behavior) likely to occur in exposed individuals. Indirect effects are based on the impact a listed species is likely to experience when the organisms they rely on, such as those that act as food or habitat resources, are exposed to simazine and experience adverse effects.

We consider estimated concentrations of simazine on the landscape or within the environment and effects reported in available toxicity studies to determine the level of direct and indirect adverse effects to listed species or critical habitat. Concentrations of simazine on food items can vary greatly depending on the particular item and where exposure takes place. For instance, exposures on or near use sites are at higher levels than exposures that occur in areas far away from use sites. We anticipate reptiles that primarily forage on simazine use sites will accumulate higher levels of simazine than individuals that forage solely in off-site areas or those that forage between on- and off-site areas. Based on available toxicity data in birds (which we use as a surrogate for reptiles), we anticipate individuals exposed directly on use sites will not die but may experience sublethal adverse effects to growth or reproduction, but only at high exposure concentrations. For instance, a study using bobwhite quail observed a statistically significant reduction in viable 3-week embryos (33% reduction), hatchling survival (33% reduction), and 14-day old chick survival (32% reduction) when parents were exposed at 500 mg simazine/kg-

[4] While our Opinion considers all consequences of the proposed action (per the definition of effects of the action at 50 CFR Part 402.02), the terms "direct" and "indirect" effects were used in EPA's BE, and are used in environmental risk assessment terminology in general, and do not have the same meaning as used in ESA regulations. As used in the effects analysis section, direct effects to species are those caused by the pesticide itself through dietary, dermal, or inhalation routes of exposure. Indirect effects occur when the pesticide acts on elements of the ecosystem that are required by the species, such as alterations to prey or vegetation needed for forage, shelter, or other functions. Thus, in the effects analysis section, we may use these terms to link back to the analysis in EPA's BE.

diet. We do not expect that reptiles exposed to simazine as a result of off-site transport (i.e. spray drift or runoff) will experience direct adverse effects.

We anticipate species that only rely on plant-based resources, such as seeds or leaves for food or vegetation as habitat, are likely to experience indirect adverse effects from simazine exposure. In contrast, species that rely on animal prey for food resources will experience lower levels of indirect adverse effects (if any) as we expect simazine exposure will result in sublethal adverse effects (i.e., reduced growth and reproduction) to some animal prey species at high exposure concentrations, but will not likely impact the abundance and availability of animal prey. While animal prey, particularly mammalian prey species, will experience sublethal adverse effects if they only forage directly in simazine use sites, but we do not anticipate this sublethal effect to prey species will result in significant changes to the overall availability of prey for listed reptiles to forage on. Thus, we anticipate listed reptile species that can rely on animal prey instead of or in addition to plant food resources are less likely to experience indirect adverse effects from simazine use.

Similarly, while many listed reptile species require vegetative structures or plant communities as components of their habitat, we do not anticipate simazine exposure will result in complete mortality of the entire plant community. While we anticipate impacts to growth and survival of sensitive plant species, given that most listed reptiles can rely on a wide variety of species for food or shelter, we expect there will still be sufficient vegetative food resources or complex vegetative structures that provide habitat for individuals with simazine exposure as these general plant resources are likely more robust to changes in plant composition and can endure impacts to sensitive plant species.

We determine the overall toxicity ranking for reptiles by qualitatively assessing both the expected levels of direct adverse effects (e.g., sublethal effects to growth and reproduction) and indirect adverse effects (e.g., prey and vegetation loss).

Conservation Measures

Herbicide Strategy Conservation Measures

As part of the simazine ESA consultation with the Service, EPA is implementing the final Herbicide Strategy to inform and identify any necessary mitigations where EPA's analysis indicated there was a risk of population level effects to listed species. The measures identified by EPA, and committed to by the technical registrants, include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[5] necessary in all areas where simazine is used, as well as additional runoff mitigation points for certain simazine uses limited to certain geographic areas when required to protect specific listed species.

[5] Ecological Mitigation Support Document to Support Endangered Species Strategies

The spray drift buffer will be placed on the general label and will apply to all uses of simazine. EPA's Herbicide Strategy provides applicators with options to reduce the distance of this buffer by using other spray drift reduction strategies that we anticipate will result in an equivalent reduction in spray drift entering non-target habitats as stated buffers. These measures and the degree to which applicators can reduce buffers by employing them are described in EPA's Herbicide Strategy and EPA's Ecological Mitigation Support Document to Support Endangered Species Strategies. These documents are provided in Appendix A-1.

This buffer is in addition to current spray drift mitigations that are already on the label, including:

- Restricting use to a maximum windspeed of 10 miles per hour,
- Prohibiting applications during temperature inversions,
- Applying with a release height of no more than 4 feet above the ground or crop canopy for ground applications,
- Selecting nozzles and pressures that deliver coarse or coarser droplets for all applications,
- Ground application only.

Based on EPA's analyses, the required spray drift conservation measures described above (from the current label and implemented through the Herbicide Strategy) will reduce spray drift from entering species' habitats by >95%. The Service anticipates that this reduction will minimize off-site transport of simazine from spray drift to a level where no more than low levels of effects are likely to occur to birds that rely on plant species through this exposure route.

Additionally, all agricultural labels will include a requirement for applicators to achieve 3 points of runoff mitigation, as described in the Herbicide Strategy, for all agricultural uses. EPA's Herbicide Strategy provides applicators with various options to reduce runoff and erosion and assigns points to each option based on its effectiveness. Applicators must implement sufficient mitigation points to meet the label requirement. Applicators can achieve the required points using the mitigation measures identified on EPA's Mitigation Menu website[6]. The menu provides a suite of options, including relief points for certain field characteristics and likelihood for pesticide transport.

These runoff mitigation points are in addition to runoff mitigations that are already on the label, including:

- Product must not be mixed or loaded within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs.

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[6] Mitigation Menu website: https://www.epa.gov/pesticides/mitigation-menu

- Product must not be applied within 66 feet of points where agricultural field (nurseries, Christmas tree plantings, and turf grasses for sod farms) surface water runoff enters perennial or intermittent streams and rivers or within 200 feet of natural or impounded lakes and reservoirs. If this product is applied to highly erodible land, the 66 foot buffer or setback from runoff entry points must be planted to crop, or seeded with grass or other suitable crop.
- Do not apply within 66 feet of standpipes in tile-outletted terraced fields. - Apply this product to the entire tile-outletted terraced field under a no-till practice only when a high crop residue management practice is practiced. High crop residue management is described as a crop management practice where little or no crop residue is removed from the field during and after crop harvest.

We expect implementation of the runoff and erosion reduction measures as required, to minimize off-site transport of simazine to habitats of listed species. EPA's analyses indicated that the general label requirement of three runoff mitigation points will reduce estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction) (i.e., reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

In cases where EPA has identified additional runoff measures are needed, additional points (up to three, i.e., up to 99% reduction) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific simazine uses through their Bulletins Live! Two online platform, which all applicators are required to check before making pesticide applications. In areas requiring up to six runoff mitigation points total, EPA expects estimated environmental concentrations of simazine will decrease by up to two orders of magnitude (i.e., reduce pesticide loading to one-one hundredth of pre runoff mitigation levels).

For all the species in this document, we expect that the runoff and mitigation measures will reduce exposure concentrations to within one order of magnitude of the exposure level where 95% of plant species are not likely to experience measurable adverse effects, as well as reduce exposure concentrations to levels at which we do not expect direct adverse effects to reptiles exposed from off-site transport.

Summary of Conclusions for Reptile Species

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of the 11 reptile species in this Appendix.

In our analysis below, some species that had the same or very similar rationales for their conclusions were grouped together, to increase efficiency and avoid repetition. Relevant information and data unique to each individual species was considered when assigning species to groups and incorporated into the rationales as appropriate. Species-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) was considered for all species, including those species in the grouped analyses, and are presented in full in Appendices B and E. Species with rationales that did not fit in a group, or warranted a separate rationale because of their life history, conservation status, or other information indicating that effects could be different, have an individual discussion to provide additional explanation. This approach allowed us to streamline our discussion in this Opinion by avoiding repeating our findings when species in the respective groupings would be expected to be affected similarly. The use of these groupings, therefore, does not mean that our evaluation failed to evaluate each individual species. On the contrary, our detailed process for each species-specific analysis remained the same, including for species for which we summarized our findings in tables below.

Species with low exposure informed by low past usage from the California Department of Pesticide Regulation's Pesticide Use Reporting data

The species in Table 1 are grouped together because they all occur completely within California and they all have low exposure determined by low levels of past simazine usage within their ranges (% range treated), as informed by the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR) data. While we present some specific information about the species in Table 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 1. California reptile species with low exposure informed by low past usage from the California Department of Pesticide Regulation's Pesticide Use Reporting data.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Alameda whipsnake (=striped racer)	*Masticophis lateralis euryxanthus*	High	Low	Medium	<0.1	No Jeopardy
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	High	Low	Low	0.0	No Jeopardy

Both species listed in Table 3 have a high vulnerability ranking, indicating that they may not be able to withstand additional stressors in its environment, including mortality of individuals from simazine exposure. The San Francisco garter snake has a low toxicity ranking. EPA's exposure modeling indicates that this species is not likely to be exposed to more than low levels of simazine when exposed from off-site transport from agricultural or non-agricultural uses. While occasionally found on non-agricultural use sites (e.g., develop, open space developed, rights-of-way, and golf course) the exposure on such sites is not anticipated to result in more than low level direct adverse effects (growth) to a small number of individuals. While the Alameda whipsnake has a medium toxicity ranking, the limited exposure and low frequency of occurrences on use sites, where it is known to infrequently use olive orchards, leads us to conclude that encountered simazine concentrations result in more than low level (sublethal) direct adverse effects (growth) to a small number of individuals. Adverse effects to either species to survival or reproduction are not anticipated. We anticipate these species will experience few indirect effects as its preferred reptilian prey (in the case of the Alameda whipsnake) and amphibian and to lesser extent fish or rodents prey species (in the case of the San Francisco garter snake), will also not likely succumb to simazine exposure at anticipated exposure levels and we do not anticipate the species' prey communities will be significantly affected as we understand likely exposure routes and effects to those taxa groups from exposure to simazine. As such, we anticipate there will be very limited effects to the Alameda whipsnake and San

Francisco garter snake due to effects to their preferred prey species like lizards, and California red-legged frogs (*Rana draytonii*) or American bullfrogs (*Lithobates catesbeianus*), respectively.

In addition, while these species may be more vulnerable to adverse effects from pesticides, they also have a low exposure ranking. Mandatory pesticide usage reporting data collected by the state of California indicates very little simazine has been used in the agricultural areas where the species' range occurs, reported as <0.1% and 0% treated annually with simazine from 2013-2022 for the Alameda whipsnake and the San Francisco garter snake, respectively. Given that usage reporting is mandated by the state of California and that these data are provided regularly with relatively high spatial resolution, we have high confidence that only a very small percent of the species' range is likely to be exposed to simazine from the proposed action. As such, we anticipate that only small numbers of individuals, at most, are likely to be exposed to simazine.

In addition to agricultural uses, reptiles may be exposed to simazine through non-agricultural uses. While CalPUR data include all agricultural usage, it is also inclusive of certain non-agricultural uses, such as those performed by professional commercial applicators in areas like rights of way and golf courses. While these data no not capture all non-agricultural usage, such as residential applications by consumers, we do not expect the species to be exposed to simazine from this use. Given our broad understanding of simazine usage, general information on non-agricultural use practices, and existing conservation measures we expect limited exposure from these uses of simazine. As such, we anticipate that non-agricultural uses of simazine are not likely to expose individuals of either species (Table 1).

Given that we anticipate small numbers of individuals are likely to be exposed, if any, and that no exposed individuals are anticipated to experience mortality, limited sublethal adverse effects, or loss of food resources, we expect the proposed action will result in limited sublethal adverse effects to, at most, a very small number of individuals of these species. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Alameda whipsnake or the San Francisco garter snake.

Species with low agricultural exposure achieved through spray drift and runoff conservation measures and low likelihood of non-agricultural exposure

The species in Table 2 were grouped together because we expect low agricultural exposure after incorporating spray drift and runoff conservation measures on the simazine label and low likelihood of non-agricultural exposure. We expect off-site transport to be low, and our concern for adverse effects is low. While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Reptile species with low agricultural exposure due to spray drift and runoff conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Cedar Key mole skink	*Plestiodon egregius insularis*	High	Low	Low	General label measures	No Jeopardy
Giant garter snake	*Thamnophis gigas*	High	Low	Low	General label measures	No Jeopardy
Plymouth redbelly turtle (=Plymouth redbelly cooter)	*Pseudemys rubriventris bangsi*	High	Low	Low	General label measures	No Jeopardy

The species in Table 2 are grouped together because the conservation measures included in the proposed action—including those derived using EPA's Herbicide Strategy—are expected to sufficiently reduce simazine transport to their terrestrial or aquatic habitats such that no more than low levels of adverse effects are anticipated. All species in this group have high vulnerability rankings, reflecting their limited distributions, small or declining populations, and known sensitivity to environmental stressors. These species have low toxicity rankings as we do not expect them to be exposed to simazine on use sites, and do not anticipate any adverse direct effects from off-site exposure. All species in Table 2 have low exposure rankings due to the effectiveness of the conservation measures required under the action.

For all species in this group, EPA's Herbicide Strategy requires a minimum of three runoff mitigation points and implementation of a 15-foot spray drift buffer on all agricultural simazine applications. Applicators must select runoff and erosion control practices from EPA's mitigation menu, which is designed to be flexible while ensuring site-level risk is reduced. These measures are anticipated to reduce pesticide loading into aquatic habitats by up to 90% (one order of magnitude) compared to unmitigated runoff.

Although modeled overlap between species' ranges and simazine use sites is moderate to high for the species in this group, the conservation measures incorporated into the action are expected to reduce the likelihood, magnitude, and frequency of exposure to a level where we expect no more than low level direct or indirect adverse effects. For species that may occur in smaller, low-flow waterbodies where pesticide concentrations could be higher, the combined effect of spray drift and runoff controls is expected to prevent exceedance of toxicity thresholds for both mortality and sublethal effects.

In addition, while the giant garter snake is known from the dense agriculture land uses of California's Central Valley, preferentially inhabits aquatic sites, including agricultural wetlands, irrigation and drainage canals and adjacent uplands, and may be more vulnerable to adverse effects from pesticides, this species has a low exposure ranking. Mandatory pesticide usage reporting data collected by the state of California indicates very little simazine has been used in the agricultural areas where this species occurs, reported as 0.7% of its range treated annually with simazine from 2013-2022. Given that usage reporting is mandated by the state of California and that these data are provided regularly with relatively high spatial resolution, we have high confidence that only a small percent of the species' range is likely to be exposed to simazine from the proposed action. As such, we anticipate that only small numbers of individuals, at most, are likely to be exposed to simazine.

Given the low exposure we expect from the implementation of the conservation measures and the low toxicity rankings of the species in this group, we anticipate that adverse effects, if they occur, will be limited to a small number of individuals. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the reptiles in Table 2.

References

U.S. Fish and Wildlife Service. 2018. Species status assessment report for the Cedar Key mole skink (*Plestiodon egregius insularis*). Version 1.2. April 2018. Atlanta, GA.

Species with Individual Integration and Synthesis Summaries

The species in Table 3 have individual Integration and Synthesis summaries. We expect Herbicide Strategy conservation measures to reduce pesticide loading into aquatic habitats by 90-99% (i.e., one to two orders of magnitude) compared to unmitigated runoff and reduce spray drift from entering species' terrestrial habitats by >95%. We anticipate that this reduction will minimize off-site transport and reduce the likelihood, magnitude, and frequency of exposure of simazine to a level where no more than low levels of adverse effects are likely to occur to plants through this exposure route. While the conservation measures are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these species. They may occur on simazine use sites, either agricultural or non-agricultural. For each species, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 3. Species with individual integration and synthesis summaries.

Common Name	Scientific Name	Determination
Desert tortoise	*Gopherus agassizii*	No Jeopardy
Eastern indigo snake	*Drymarchon couperi*	No Jeopardy
Florida Keys mole skink	*Plestiodon egregius egregius*	No Jeopardy
Gopher tortoise	*Gopherus polyphemus*	No Jeopardy
Sand skink	*Neoseps reynoldsi*	No Jeopardy
Short-tailed snake	*Stilosoma extenuatum*	No Jeopardy

Integration and Synthesis Summary: Desert tortoise

Scientific Name:	Common Name:	Entity ID:
Gopherus agassizii	Desert tortoise	185

Conclusion: No Jeopardy

Species Range

Based on range map dated: 11/5/2020; Wherever found, except AZ south and east of Colorado R., and Mexico; *States within the range:* AZ, CA, NV, UT

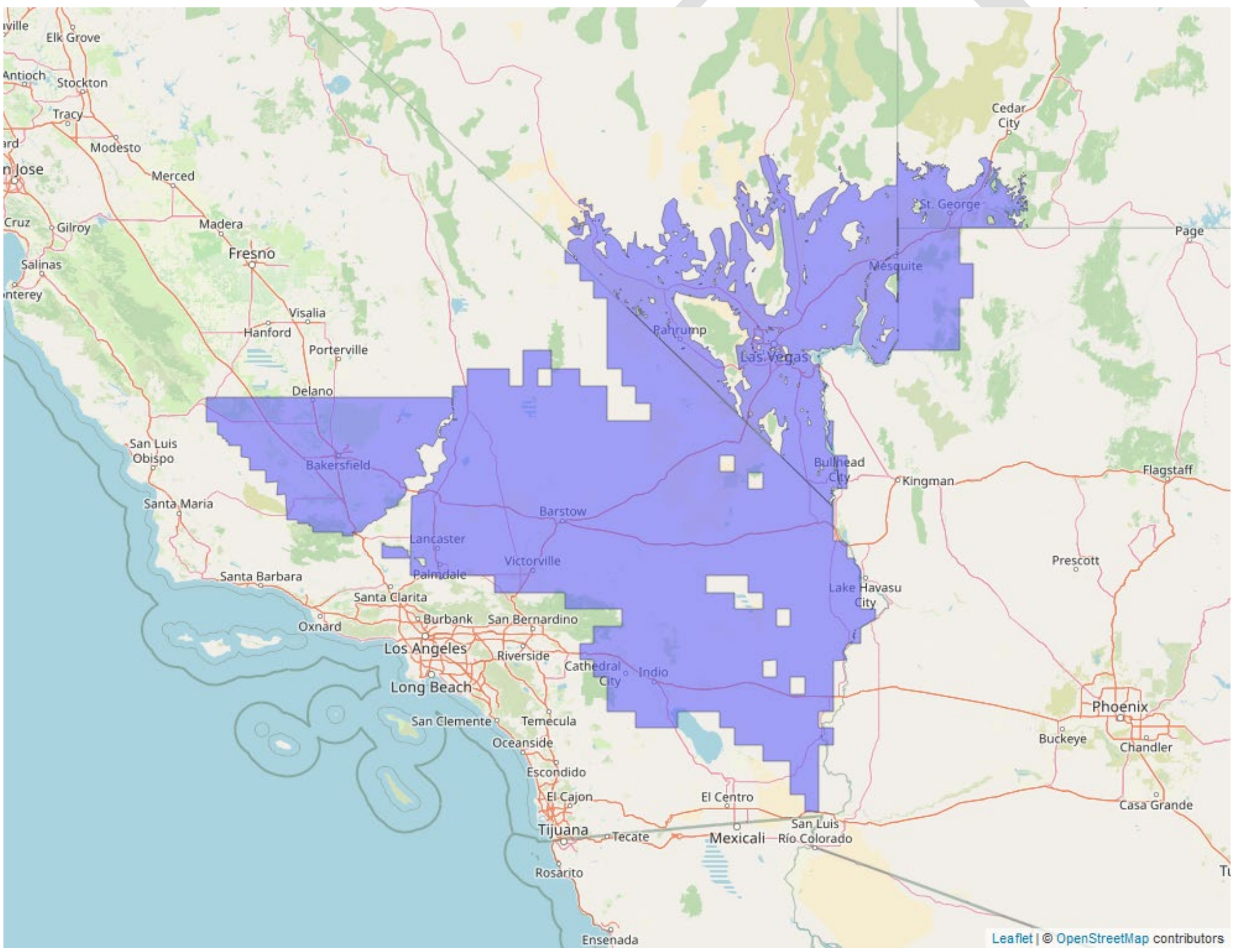

Figure 2. Range map of desert tortoise (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4481.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in Status

Most recently completed 5-year review: 5/20/2022

Distribution: Species/Populations neither constrained nor widespread

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The desert tortoise is a large, herbivorous reptile that occurs in the Mojave and Sonoran deserts. They are found in flats and slopes characterized by creosote bush scrub (*Larrea tridentata* and *Ambrosia dumosa*) at lower elevations and rocky slopes in blackbrush scrub and juniper woodland ecotones to higher elevations. They eat winter annuals, perennial grasses, woody perennials, cacti, and some non-native plants. Listed desert tortoises occur north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, and southwestern Utah and the Sonoran desert in California. Scattered subpopulations remain in undeveloped portions of Antelope, Indian Wells, and Searles Valleys. Desert tortoises also occur in the lower Colorado River Valley, Arizona uplands, plains of Sonora, and the central Gulf Coast (USFWS 2011). The range-wide population is still estimated to include hundreds of thousands of individuals, but most populations within Turtle Conservation Areas continued to decline between 2004-2014, with an estimated range-wide decline of 37%. The Northeastern Mojave recovery unit is the only area that increased in tortoise numbers during this time, from about 12,610 to 46,701 tortoises (USFWS 2022).

The primary threats to desert tortoises include habitat loss and conversion from renewable energy development, military training, invasive species, and wildfire. Desert tortoises are essentially absent from habitat within 1 km of areas with >10% development, but at least 39% of tortoise habitat in each recovery unit has nearly no development within 1 km. However, solar energy development is likely to cause more desert habitat loss in the future; to minimize impacts of development, projects in NV increasingly have allowed native vegetation to regrow and desert tortoises to reoccupy sites (about 13,000 acres), but the success of allowing native flora and fauna to recolonize developed areas is uncertain. Military training land expansions have occurred or approved; about 1,650 adult desert tortoises had to be translocated due to Army and Navy training operations. Invasive grasses fuel wildfires that cause mortality and habitat effects to desert tortoises. Desert tortoises are also threatened by disease (upper respiratory tract disease, *Mycoplasma agassizii*), predation (e.g., badgers, coyotes, kit foxes, ravens, dogs, red-tailed hawks), and habitat loss and fragmentation from urbanization, roads and highways, off-highway vehicle use, and grazing. Many areas of the Mojave desert are being destroyed by cannabis farms, including bulldozing, water theft, and construction of greenhouses. Effects of global climate change have also become an important consideration for desert tortoises, particularly as they relate to drought and habitat shifts (USFWS 2022).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 4.2% of the species' range overlaps with agricultural use sites and 14.7% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 18.9% overlap between the species' range and the agricultural footprint of simazine use sites (Table 4).

Table 4. Agricultural use overlap and annual usage data (% Range Treated) for the desert tortoise.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	0.4	3.1	3.4	<0.1	<0.1	<0.1
Corn	0.3	2.4	2.7	<0.1	0.4	0.4
Grapes	0.4	1.8	2.2	0.4	1.8	2.2
Other Crops	1.4	5.3	6.7	<0.1	<0.1	<0.1
Other Orchards	2	3.6	5.6	0.9	1.7	2.6

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Vegetables and Ground Fruit	0.5	3.4	3.9	<0.1	<0.1	<0.1
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**4.2**	**14.7**	**18.9**	**0.9**	**2.2**	**3.1**

Usage

Past usage data indicate that up to 3.1% of the species' range has been treated with simazine annually from agricultural uses, with 0.9% occurring on agricultural fields and 2.2% resulting from off-site transport (Table 7).

Additional Exposure Considerations

While the desert tortoise typically inhabits creosote bush scrub at lower elevations and rocky slopes in blackbrush scrub and juniper woodland ecotones at higher elevations, information provided by Service species experts indicate that individuals may travel through and forage on agricultural areas if the appropriate vegetation is available, which potentially include simazine use sites. Thus, we anticipate individuals can potentially be exposed to simazine directly on agricultural use sites.

Exposure from Non-Agricultural Uses

Information provided by Service species experts indicate that, while not likely preferred habitat, individual desert tortoises may travel through and forage on potential non-agricultural simazine use sites in developed and open space developed areas if the appropriate vegetation is available for forage and shelter. Thus, we anticipate individuals can potentially be exposed to simazine directly on non-agricultural use sites. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of the desert tortoise to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals. The desert tortoise is an herbivorous reptile. We expect consumption of food items in and around simazine use sites to be the primary route of simazine exposure to desert tortoises. We do not expect desert tortoises that are exposed to simazine as a result of off-site transport will experience adverse effects and thus focus our analysis to effects on use sites within the range.

We expect that if desert tortoises forage on grass or other plants exposed on simazine use sites, concentrations of simazine can reach levels associated with reproductive effects such as reduction in in number of eggs laid, viable 3-week embryos, hatchling survival, and 4-day old survival. However, we expect a range of concentrations to be associated with contaminated food resources, and we only anticipate these effects if individuals forage on plants with maximum estimated concentrations of simazine on recently treated fields. We anticipate this will occur infrequently, as agricultural fields and managed turf are not typical foraging areas of the desert tortoise and most are not likely to contain suitable foraging habitat at the time of treatment. However, an individual desert tortoise feeding exclusively on treated use sites even a short period of time, such as a single day, may still accumulate a significant body burden of pesticide.

Indirect Effects

While we anticipate off-site transport of simazine can negatively impact the growth and survival of sensitive plant species, we do not anticipate spray drift of runoff of simazine will destroy or limit the availability of complex vegetative structure (e.g., creosote bush scrub, blackbush scrub, or juniper woodland communities) that the species requires for its habitat. Similarly, while the desert tortoise relies on plant material for food, including species that might be sensitive to simazine, we anticipate the required conservation measures on product labels (including mandatory spray drift buffers and three points of runoff mitigations) will minimize impacts to the habitat and food resources of the species.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a small percentage of the species' range will be treated with simazine on agricultural fields annually. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. While 4.2% of the range overlaps with agricultural use sites of simazine, we expect simazine applications to occur on-field in just 0.9% of the species' range. While agricultural areas do not represent typical foraging areas for desert tortoises, some individuals may travel through these areas and forage where suitable habitat exists. Desert tortoises may similarly be exposed in non-agricultural uses sites where simazine has been applied, such as turf or golf courses, though we expect this to occur infrequently, as this does not represent preferred habitat and simazine usage on these sites is expected to be low.

We expect individuals that exclusively forage on use sites recently treated with simazine will experience reproductive effects. However, given the small extent of overlap with simazine use sites within the range of the desert tortoise, the limited extent of usage on these sites, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on plants with maximum estimated simazine residues from recently treated use sites), we anticipate that few individuals will experience reproductive effects from simazine use.

While we anticipate simazine use can impact the growth and survival of sensitive plant species, with implementation of required mitigations on product labels, we anticipate there will be no more than low levels of indirect adverse effects to vegetative resources the tortoise relies on.

Thus, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

The desert tortoise is a largely terrestrial herbivorous reptile that utilizes xeric and largely undeveloped habitats across the desert southwest. While still widely distributed and numbering in the hundreds of thousands range-wide, recent estimates assess range-wide decadal declines of 37%. The desert tortoise has a medium vulnerability based on its status, distribution, and trends. Anticipated exposure, where it occurs, is through direct dietary uptake on recently treated agricultural sites resulting in sub-lethal effects to growth and reproduction.

The primary threats to desert tortoises include habitat loss and conversion from renewable energy development, military training, invasive species, and wildfire. While these threats appear to represent the most significant risks to the species, the desert tortoise also occurs at low frequency on-field and in habitats adjacent to agricultural and non-agricultural use sites where simazine could be used, and direct dietary exposure is likely for a low number of individuals. While simazine exposure is anticipated at low levels or non-existent generally due to the limited amounts of agricultural and non-agricultural sites in the species' primarily desert habitat and low levels of residual runoff in streams and rivers adjacent to non-agricultural sources (e.g., golf courses) we expect a low number of individuals will be exposed to higher levels of simazine in on-field exposures that will cause measurable effects to reproduction. For the great majority of individuals and populations, effects to reproduction are not anticipated because of the limited likelihood of exposure in desert habitats and due to the limitations on use (spray drift reduction measures cited above) and buffers already on the label reduce those exposures to levels below which we would observe these effects. For agricultural uses, the anticipated levels of exposure from runoff are not anticipated to result in measurable adverse effects from direct exposure and with low level adverse effects from indirect effects to dietary vegetation.

Thus, we anticipate a low number of individuals of this species and their food resources will experience direct exposure over the duration of the action. We do not expect mortality of individual desert tortoises, but do anticipate low levels of direct adverse effects to growth and reproduction from agricultural exposure to recently treated food items on-field. We anticipate the reduction of growth and reproduction in a small number of individuals will not result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the desert tortoise.

References

U.S. Fish and Wildlife Service. 2022. Mojave Desert Tortoise (*Gopherus agassizii*) 5-Year Review: Summary and Evaluation. Las Vegas, Nevada. 55 pp.

U.S. Fish and Wildlife Service. 2011. Revised Recovery Plan for the Mojave Population of the Desert Tortoise (*Gopherus agassizii*). Sacramento, California. 246 pp.

Integration and Synthesis Summary: Eastern indigo snake

Scientific Name:	Common Name:	Entity ID:
Drymarchon couperi	Eastern indigo snake	173

Conclusion: No Jeopardy

Species Range

Based on range map dated: 2/3/2022; Wherever found; *States within the range:* AL, FL, GA, MS

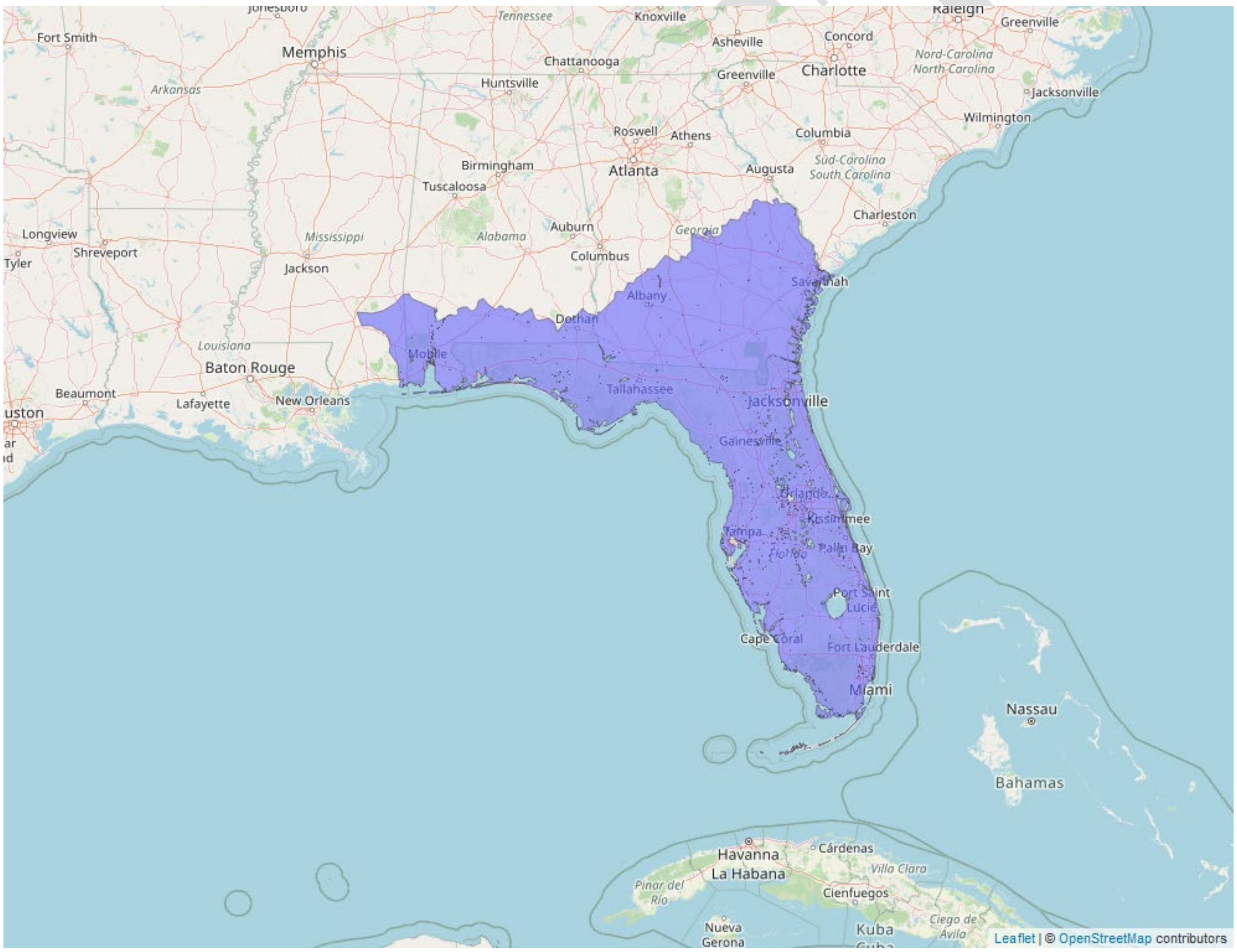

Figure 3. Range map of eastern indigo snake (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/646.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in Status

Most recently completed 5-year review: 8/28/2024

Distribution: Population size/Location(s) unknown

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Eastern indigo snakes are diurnal (i.e., active during the day) snakes that breed during autumn and winter. The few observed nests have been in open-canopied sandy habitats associated with gopher tortoise burrows. They are active foragers that consume a wide variety of animals, primarily rodents, anurans, snakes, and small turtles. More than half of the diet in one study was snakes. They are dependent on gopher tortoises for their burrows. Historically, the eastern indigo snake occurred throughout Florida and in the coastal plain of Georgia, Alabama, and Mississippi. The eastern indigo snake has been extirpated in Alabama and Mississippi and, and its distribution has further contracted in other areas, particularly in the Florida Panhandle, due to the decline of gopher tortoise populations. In 2019, population resilience was classified based primarily on habitat conditions as very low to medium-low for most populations. Thirteen populations were medium to medium-highly resilient and four were high (USFWS 2019a). Fifty-one potential populations were estimated in 2024. Thirty populations are extirpated across the species' range (USFWS 2024). Population growth rates are unknown due to the lack of data on this cryptic species. The contemporary distribution of the eastern indigo snake represents the species' known ecological and genetic diversity, but the redundancy of populations has decreased. Most notable are the loss of populations in the Panhandle region (includes parts of Alabama, Florida, Georgia, and Mississippi) and a contraction of the distribution in the southern extent of the Peninsular Florida region, including the Florida Keys. The Panhandle and North

Florida regions have zero highly resilient populations, thus limiting overall redundancy (USFWS 2019a, 2019b).

Wild collection of eastern indigo snakes for the pet trade and gassing of gopher tortoise burrows are no longer considered to be substantial threats although they still occur to some extent. Today, the primary threats to the long-term viability of the species are from habitat fragmentation and loss due to land use changes, especially urbanization. Urbanization includes a variety of negative impacts that remove or alter available habitat or impact snakes directly including: residential and commercial development, road construction and expansion, direct mortality (e.g., road mortality, human persecution, domestic pets), invasive species, predation and inadequate fire management. Habitat loss for coastal populations due to sea level rise is also an increasing risk. Snake fungal disease has emerged as an additional negative factor, but impacts to long-term viability remains uncertain, and research is on-going. Pesticides, especially those that bioaccumulate through the food chain, may present a hazard to eastern indigo snakes, but there have been no documented cases of mortality from pesticide use (USFWS 2019a).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 7.3% of the species' range overlaps with agricultural use sites and 92.7% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[7] between the species' range and the agricultural footprint of simazine use sites (Table 5).

Table 5. Agricultural use overlap and annual usage data (% Range Treated) for the eastern indigo snake.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	1.8	12	13.8	0.3	1.7	1.9
Corn	2.8	29.4	32.2	0.5	7.8	8.3
Grapes	<0.1	1.9	1.9	<0.1	1.4	1.4
Other Crops	2	28.5	30.5	<0.1	<0.1	<0.1

[7] Total overlap is capped at 100%.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Other Orchards	1	22.4	23.4	0.3	6.7	7
Vegetables and Ground Fruit	0.7	18.6	19.3	<0.1	0.6	0.6
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**7.3**	**92.7**	**100**[7]	**0.8**	**15.1**	**15.9**

Usage

Past usage data indicate that up to 15.9% of the species' range has been treated with simazine annually from agricultural uses, with 0.8% occurring on agricultural fields and 15.1% resulting from off-site transport (Table 8).

Additional Exposure Considerations

Eastern indigo snakes primarily occur in upland habitat but are also known to utilize human-altered habitats. In Florida, agricultural sites, such as sugar cane fields, improved pasture sites, citrus groves, and canal banks created in drained wetland areas are sometimes occupied by eastern indigo snakes (USFWS 2019).

Exposure from Non-Agricultural Uses

While non-agricultural simazine use sites do not represent preferred habitat for the eastern indigo snake, available information on the species indicate that individuals may occupy areas of low density residential housing. Thus, we anticipate individuals may be exposed to simazine through non-agricultural uses, such as applications to residential lawns, turf, and ornamental plants. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of the eastern indigo snake to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

We expect consumption of food items in and around simazine use sites to be the primary route of simazine exposure to eastern indigo snakes. The eastern indigo snake consumes a wide variety of animals, but the primary prey are rodents, anurans, snakes and small turtles. We do not expect eastern indigo snakes that are exposed to simazine on prey items as a result of off-site transport will experience adverse effects and thus focus our analysis to effects on use sites within the range.

We expect that if eastern indigo snakes forage on prey items such as small birds, reptiles, or mammals that have been exposed on use sites, concentrations of simazine can reach levels associated with reproductive effects such as reduction in in number of eggs laid, viable 3-week embryos, hatchling survival, and 4-day old survival. However, we expect a range of concentrations to be associated with contaminated prey species, and we only anticipate these effects if individuals forage on prey with maximum estimated concentrations of simazine on recently treated fields. We anticipated this will be a rare occurrence, as eastern indigo snake are expected to consume a varied diet that will also include resources off treated fields. However, an individual eastern indigo snake feeding exclusively on prey exposed on treated use sites even a short period of time, such as a single day, may still accumulate a significant body burden of pesticides, despite this species having a generally varied diet.

Indirect Effects

Available toxicity data suggests that prey items of the eastern indigo snake are not likely to die from exposure to simazine. While individual terrestrial vertebrates may experience growth or reproductive effects if exposed to simazine on use sites, we anticipate the required conservation measures on product labels (including mandatory spray drift buffers and three points of runoff mitigation) will preclude off-site concentrations of simazine from reaching levels where we expect effects to occur. In addition, we anticipate off-site transport of simazine can negatively impact the growth and survival of sensitive plant species, though we do not anticipate spray drift or runoff of simazine will destroy or limit the availability of complex vegetative structure (e.g., upland vegetative community) that the species requires for its habitat. We anticipate the required mitigation measures on product labels will further minimize impacts to the species' necessary plant resources. As such, we do not anticipate the proposed action will result in measurable levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a large percentage of the species' range will be treated with simazine on agricultural fields annually. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. While 7.3% of the range overlaps with agricultural use sites of simazine, we expect simazine applications to occur on-field in just 0.8% of the species' range. We expect that some individuals are likely to be exposed to contaminated food resources as the species is known to forage in simazine use sites. While prey species of the eastern indigo snake may be exposed to simazine in non-agricultural use areas, we expect non-agricultural usage of simazine within the range of the species to be low.

We expect individuals that exclusively eat prey contaminated on use sites recently treated with simazine will experience reproductive effects. However, given the limited extent of simazine usage on agricultural and non-agricultural use sites within the species' range, the variable diet of the eastern indigo snake, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals will experience reproductive effects from simazine use.

In addition, with implementation of required mitigations on product labels, we do not anticipate simazine use is likely to reduce the availability or abundance prey that the eastern indigo snake relies on as food resources, or result in appreciable impacts to any vegetative habitat resources for the species.

Thus, we conclude the overall risk of adverse effects to the eastern indigo snake is low.

Species Conclusion

The eastern indigo snake prefers upland habitat types (e.g. longleaf pine sandhills, scrub, pine flatwoods, tropical hardwood hammocks, and coastal dunes), but also uses a variety of lowland and human-altered habitats. As a primarily terrestrial reptile that utilizes the burrows of gopher tortoises for shelter and overwintering, the species is an active forager that consume a wide variety of animals, primarily rodents, anurans, snakes, and small turtles. The contemporary distribution of the eastern indigo snake represents the species' known ecological and genetic diversity, but the redundancy of populations has decreased, and the species is believed to be extirpated from its historic distribution in Alabama and Mississippi. The eastern indigo snake has a high vulnerability based on its status, distribution, and trends. Anticipated exposure is through direct dietary uptake on recently treated agricultural sites resulting in sub-lethal effects to reproduction.

The primary threats to eastern indigo snakes include habitat loss, primarily from residential and commercial development, road construction and expansion, and from direct mortality (e.g., road mortality, human persecution, domestic pets), invasive species, predation and inadequate fire management. While these threats appear to represent the most significant risks to the species, the eastern indigo snake also occurs in agricultural use sites, including on-field in sugarcane fields, citrus groves and in improved pastures and farmed wetlands and in habitats adjacent to agricultural and non-agricultural use sites where simazine could be used. As detailed above, 7.3% of the range overlaps with agricultural use sites of simazine, but we expect simazine applications to occur on-field in just 0.8% of the species' range. While simazine exposure is anticipated at low levels, the species and its prey are known to use agricultural and non-agricultural sites. Direct dietary exposure from consumption of affected prey exposed to recent on-field concentrations of simazine is anticipated to be the most likely, and likely lone, adverse effect to the species, affecting a low number of individuals that encounter this scenario. We do not anticipate exposure of prey items from agricultural runoff or from residual runoff in streams and rivers adjacent to non-agricultural sources (e.g., golf courses) at sufficient levels to measurably affect eastern indigo snake reproduction. Likewise, low usage and limitations on use (spray drift reduction measures cited above) and buffers already on the label are anticipated to mitigate off-field exposures to levels below which we would observe reproductive effects. Thus, given the limited extent of simazine usage on agricultural and non-agricultural use sites within the species' range, the variable diet of the eastern indigo snake, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals will experience reproductive effects from simazine use.

Thus, we anticipate a low number of individuals of this species and their prey resources will experience direct exposure over the duration of the action. We do not expect mortality of individual eastern indigo snakes, but do anticipate low levels of direct adverse effects to reproduction from agricultural exposure to recently treated prey items on-field. We anticipate the reproductive effects in a small number of individuals will not result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the eastern indigo snake.

References

U.S. Fish and Wildlife Service. 2024. Eastern Indigo Snake (*Drymarchon corais couperi*) 5-Year Review: Summary and Evaluation. Athens, Georgia. 23 pp.

U.S. Fish and Wildlife Service. 2019a. Eastern Indigo Snake (*Drymarchon corais couperi*) 5-Year Review: Summary and Evaluation. Athens, Georgia. 51 pp.

U.S. Fish and Wildlife Service. 2019b. Species Status Assessment (SSA) Report for the Eastern Indigo Snake (*Drymarchon couperi*). Version 1.1. Athens, Georgia. 160 pp.

Integration and Synthesis Summary: Florida Keys mole skink

Scientific Name:	Common Name:	Entity ID:
Plestiodon egregius egregius	Florida Keys mole skink	2238

Conclusion: No Jeopardy

Species Range

Based on range map dated: 9/23/2024; Wherever found; *States within the range:* FL

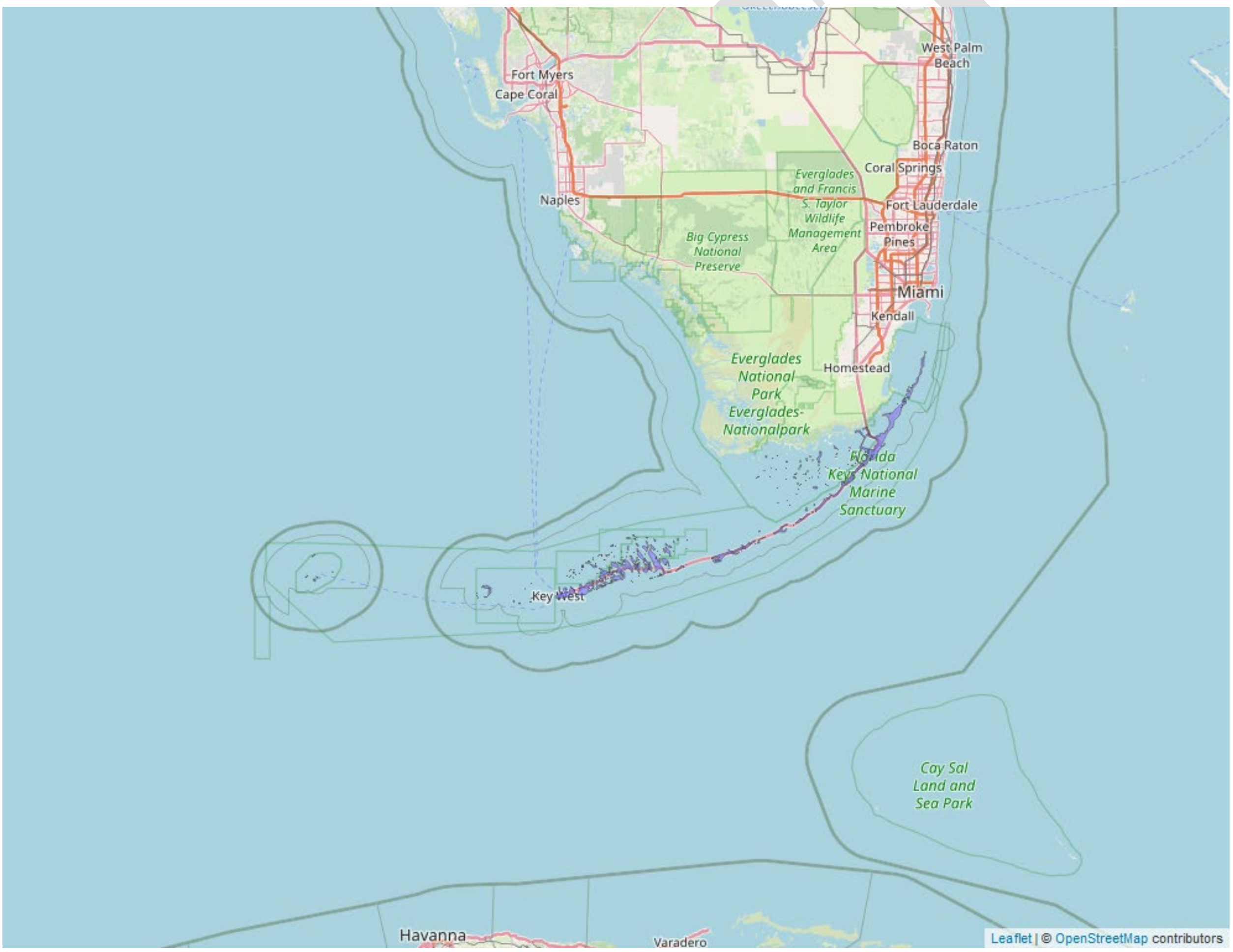

Figure 4. Range map of Florida Keys mole skink (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4480.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Proposed Threatened

Most recent 5-year review recommendation: N/A

Most recently completed 5-year review: None available for this species

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (few)

Species trends: Unknown population trends

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Florida Keys mole skink (*Plestiodon egregius egregius*) is a small lizard known to occur only on islands in the Florida Keys. This species is semi-fossorial (adapted to digging and living underground) and cryptic in nature. While it can run, it more often utilizes “swimming” as a method to move through loose substrate. Soil and moisture conditions help define habitat, as skinks are seldom encountered where the soil is not well drained and friable. The Florida Keys mole skink has been found in wavewashed wrack above the intertidal zone of beaches, in debris, and in piles of rocks, as well as in other inland areas of suitable soils within other habitat types. The predominant threats currently affecting the Florida Keys mole skink and its habitat are sea level rise , more numerous high tide flooding events (the very highest tides), increased storm surges, and shifts in seasonal patterns of rainfall and temperature, all of which are predicted by climate change models. Because the Florida Keys mole skink inhabits and utilizes the transitional zone (50 centimeters [cm] to 80 cm [20 inches [in] to 31 in] above sea level) beach berm habitat and the coastal hammock habitat during all of its life stages, the species is especially vulnerable to sea level rise across its entire range. The Florida Keys are low-lying (average elevation is less than 1 meter [m] or 3.2 feet [ft]) the area is highly susceptible to flooding, and land further inland is at risk of inundation and saltwater intrusion from high tide flooding. Florida Keys mole skink habitat is also at risk of loss and degradation due to land uses and human activities, such as land development, human population increase and the resulting habitat disturbance, and beach erosion. The Florida Keys mole skink has been found in small numbers across the range of the Florida Keys (including the Distal Sand Keys region, consisting of the islands west of Key Wet to the Dry Tortugas). The majority of islands with any past or current detections occur within the Lower Keys, with the largest numbers of detections from Long Beach on Big Pine Key. Using individual islands as our potential populations (or analysis units, as these may not be biologically meaningful populations), we define 15 current, 5 recent, and 4 historical populations of the Florida Keys mole skink.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that <0.1% of the species' range overlaps with agricultural use sites and 6.4% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 6.4% overlap between the species' range and the agricultural footprint of simazine use sites (Table 6).

Table 6. Agricultural use overlap and annual usage data (% Range Treated) for the Florida Keys mole skink.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	1.3	1.3	<0.1	1.3	1.3
Corn	<0.1	0.2	0.2	<0.1	0.2	0.2
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	<0.1	1.5	1.5	<0.1	<0.1	<0.1
Other Orchards	<0.1	4.7	4.7	<0.1	4.7	4.7
Vegetables and Ground Fruit	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**<0.1**	**6.4**	**6.4**	**<0.1**	**4.9**	**4.9**

Usage

Past usage data indicate that up to 4.9% of the species' range has been treated with simazine annually from agricultural uses, with <0.1% occurring on agricultural fields and 4.9% resulting from off-site transport (Table 9).

Additional Exposure Considerations

The Florida Keys mole skink largely associated with beach berm zones and coastal hammock habitats. Given the loose soil required by the species, we do not anticipate individuals are likely to occur in agricultural simazine use sites given that these soil characteristics are not compatible with agriculture. Thus, we anticipate individuals will only be exposed to agricultural uses of simazine through spray drift or runoff.

Exposure from Non-Agricultural Uses

While the Florida Keys mole skink is primarily associated with beach berms habitat and adjacent dunes, individuals have been detected in developed areas of Key West, Big Pine Key, and Key Vaca and within pine rockland habitat on Big Pine Key. As such, we anticipate individuals may be exposed to simazine through non-agricultural uses of simazine, such as in residential areas. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of the Florida Keys mole skink to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

We expect consumption of food items in and around simazine use sites to be the primary route of simazine exposure to mole skinks. The Florida Keys mole skink preys on a variety of small insects with a generalist and opportunistic (i.e., preying on those insects that are present and are of a size that the skink can ingest) feeding behavior within their ground cover habitat. We do not expect Florida Keys mole skinks that are exposed to simazine as a result of off-site transport will experience adverse effects and thus focus our analysis to effects on use sites within the range.

We expect that if Florida Keys mole skinks forage on insects exposed to simazine use sites, concentrations of simazine can reach levels associated with reproductive effects such as reduction in in number of eggs laid, viable 3-week embryos, hatchling survival, and 4-day old survival. However, we expect a range of concentrations to be associated with contaminated food resources, and we only anticipate these effects if individuals forage on insects with maximum estimated concentrations of simazine on recently treated fields or turf. We anticipate this will occur infrequently, as managed turf is not the typical foraging areas of the Florida Keys mole skink. However, an individual Florida Keys mole skink feeding exclusively on insects exposed to simazine on treated use sites even a short period of time, such as a single day, may still accumulate a significant body burden of pesticide.

Indirect Effects

Available toxicity data suggests that arthropod prey are not likely to experience any mortality with simazine exposure. As such, we do not anticipate simazine use will reduce the availability or abundance of prey species for individuals. While we anticipate off-site transport of simazine can negatively impact the growth and survival of sensitive plant species, we do not anticipate spray drift of runoff of simazine will destroy or limit the availability of complex vegetative structure (e.g., beach berm, sand dune, and coastal hammock ecosystems) that the species requires for its habitat. Furthermore, we anticipate the required conservation measures on product labels (including mandatory spray drift buffers and three points of runoff mitigation) will further minimize impacts to the species' necessary plant resources. As such, we do not anticipate the proposed action will result in measurable levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a moderate extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a moderate percentage of the species' range will be treated with simazine on agricultural fields annually. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. We do not expect the Florida Keys mole skink to occur on agricultural use sites. Florida Keys mole skinks may be exposed in non-agricultural uses sites where simazine has been applied, such as turf or golf courses, though we expect this to occur infrequently, as this does not represent preferred habitat and simazine usage on these sites is expected to be low.

We expect individuals that exclusively forage on non-agricultural use sites recently treated with simazine will experience reproductive effects. However, given the small extent of simazine usage on these sites, the limited use of these sites by individuals, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on insects with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals will experience reproductive effects from simazine use.

We do not expect effects to insects, and while we anticipate simazine use can impact the growth and survival of sensitive plant species, with implementation of required conservation measures on product labels, we anticipate there will be no more than low levels of indirect adverse effects to vegetative resources the skink relies on.

Thus, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

The Florida Keys mole skink is a small lizard inhabiting loose friable sands on islands in the Florida Keys. Known primarily from beach berm and sand dunes they have also been found in wave-washed wrack, debris, and piles of rocks. They prey on a variety of small insects and their diets have been shown to shift seasonally with prey abundance, which can include ants, spiders, crickets, beetles, termites, small bugs, mites, butterfly larva, pseudoscorpion, and fungus. The Florida Keys mole skink has been found in small numbers across the range of the Florida Keys (including the Distal Sand Keys region, consisting of the islands west of Key Wet to the Dry Tortugas). The majority of islands with any past or current detections occur within the Lower Keys, with the largest numbers of detections from Long Beach on Big Pine Key. The Florida Keys mole skink has a high vulnerability based on its status, distribution, and trends. Anticipated exposure is through direct dietary uptake on recently treated agricultural sites resulting in sub-lethal effects to reproduction.

The primary threats to Florida Keys mole skink include habitat loss, primarily from sea level rise, more numerous high tide flooding events, increased storm surges, and shifts in seasonal patterns of rainfall and temperature, all of which are predicted by climate change models. While these threats appear to represent the most significant risks to the species, the Florida Keys mole skink can also occur rarely (<0.1%) on agricultural use sites, including habitats adjacent to agricultural and non-agricultural use sites where simazine could be used (6.4%). Thus, simazine exposure is anticipated at low levels. Direct dietary exposure from consumption of affected prey exposed to recent on-field concentrations of simazine is anticipated to be the most likely, and likely lone, adverse effect to the species, affecting a low number of individuals that encounter this scenario. We do not anticipate exposure of prey items from agricultural runoff or from residual runoff in streams and rivers adjacent to non-agricultural sources (e.g., golf courses) at sufficient levels to measurably affect Florida Keys mole skink reproduction. Likewise, low usage and limitations on use (spray drift reduction measures cited above) and buffers already on the label are anticipated to mitigate off-field exposures to levels below which we would observe reproductive effects. Thus, given the limited extent of simazine usage on agricultural and non-agricultural use sites within the species' range, the variable diet of the Florida Keys mole skink, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals will experience reproductive effects from simazine use.

Thus, we anticipate a low number of individuals of this species and their prey resources will experience direct exposure over the duration of the action. We do not expect mortality of individual Florida Keys mole skinks, but do anticipate low levels of direct adverse effects to reproduction from agricultural exposure to recently treated prey items on-field. We anticipate the reproductive effects in a small number of individuals will not result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida Keys mole skink.

References

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, Georgia.

Integration and Synthesis Summary: Gopher tortoise

Scientific Name:	Common Name:	Entity ID:
Gopherus polyphemus	Gopher tortoise	181

Conclusion: No Jeopardy

Species Range

Based on range map dated: 1/16/2025; Western DPS; *States within the range:* AL, LA, MS

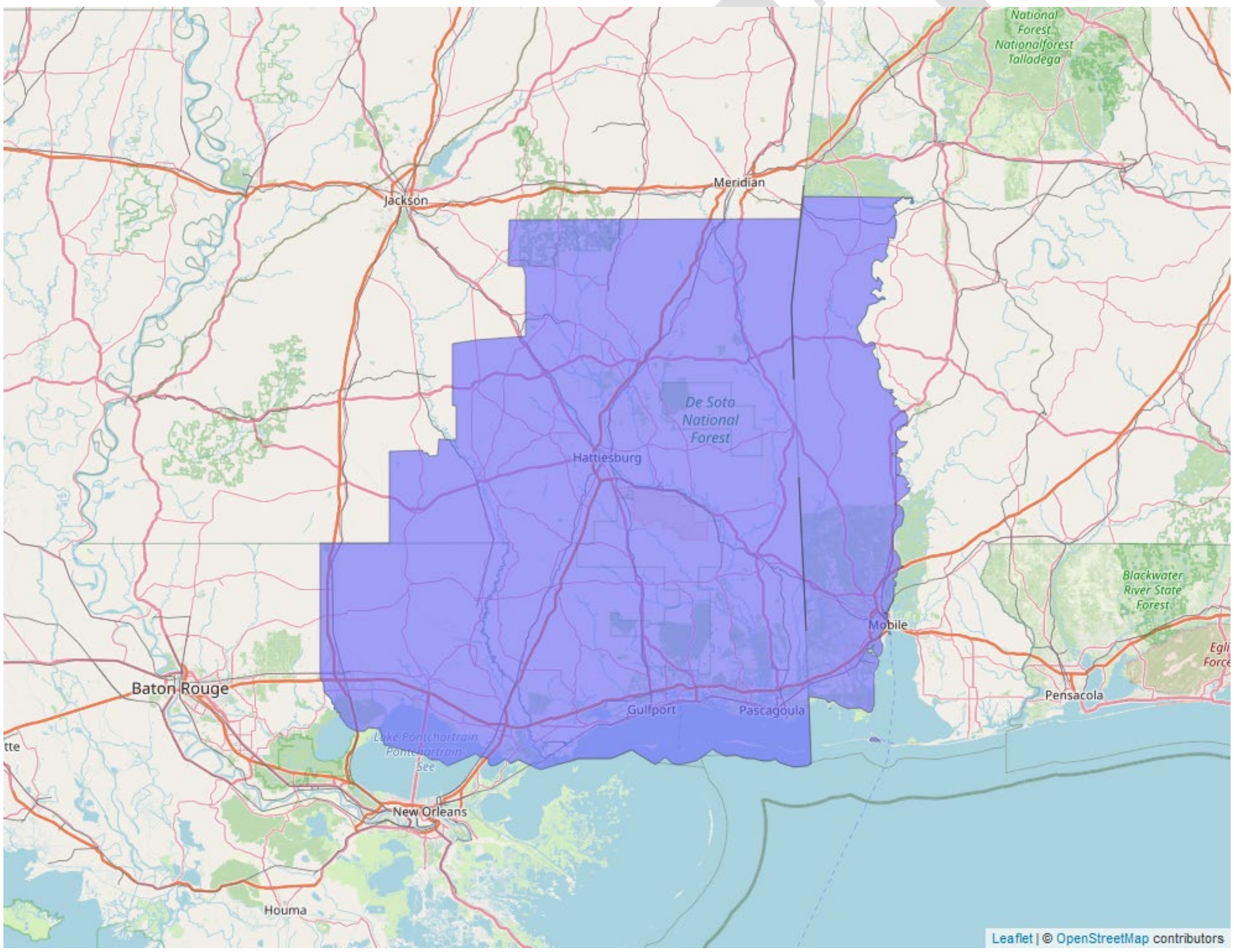

Figure 5. Range map of gopher tortoise (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6994.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in Status

Most recently completed 5-year review: 10/12/2022 (Notification of findings)

Distribution: Species/Populations neither constrained nor widespread

Number of populations: Multiple populations (numerous)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes, herbicides only

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The gopher tortoise is a fossorial, burrowing reptile. They are found in sandhills, pine-scrub oak uplands, and pine flatwoods associated with longleaf pine ecosystems (e.g., *Pinus palustris*, *P. taeda*, and *P. elliottii*) in the southeastern Atlantic and Gulf Coast Plains. Their habitat includes open canopies with diverse herbaceous vegetation on well-drained xeric soils with widely spaces trees and shrubs that depend on frequent disturbance (e.g., fire) for maintenance and perpetuation of species composition and structure. They develop burrows underground that are used by many other wildlife species, including the threatened eastern indigo snake. They eat foliage, seeds, and fruits of grasses and forbs near their burrows. They are found from southeastern South Carolina, west through Georgia, the Florida panhandle and peninsula, Alabama, and Mississippi to extreme southeastern Louisiana. Historically, the western population was found in the longleaf pine hills west of the Tombigbee River in Alabama, Mississippi, and Louisiana. Only the western population in Louisiana, Mississippi, and far western Alabama is listed. As of the 2019 SSA, there were an estimated 149,152 gopher tortoises from 656 local populations across the species range, including both eastern and western populations. Over half of the populations (n=360) are considered to have low resiliency, 169 had moderate resiliency, and 127 had high resiliency. The western population (and listed entity) has 2% of the range-wide population total and 107 out of 123 sites have low resiliency (87%) (USFWS 2021).

The gopher tortoise is threatened by habitat loss, degradation, and fragmentation due to land use changes from urbanization, solar farms, climate change, and insufficient or incompatible habitat management. Gopher tortoises will be affected by climate change through sea level rise and habitat loss, changes in sex of young (1:1 sex ratio observed at 29.3°C), and mortality or displacement after more frequent and intense hurricanes. Effects of nonnative invasive species (e.g., kudzu, Chinese privet, Callery pear, natal grass, and Japanese climbing fern) on gopher tortoise habitat also negatively influence gopher tortoise viability. Herbicides may affect gopher tortoises if they impact herbaceous vegetation composition and are less likely to directly impact gopher tortoises if applied on target plants (as opposed to broadcast spraying) and according to the product label. Predation by red imported fire ants, raccoons, gray foxes, striped skunks, Virginia opossums, coyotes, nine-banded armadillos, multiple snake species, and red-tailed hawks impacts some populations (USFWS 2021). Upper respiratory tract disease and other viral, bacterial, fungal, and parasitic infections affect individual gopher tortoises and can have localized effects, but these threats do not appear to have species-level impacts (USFWS 2022).

We expect gopher tortoises to be significantly affected by climate warming, sea-level rise, urbanization, and habitat management in the future. About 80% of potential gopher tortoise habitat occurs on private lands, where we expect these threats to be greatest. Development and urbanization can impact gopher tortoise populations on conservation lands (lands in public or private ownership managed for conservation under a management plan) by disrupting habitat connectivity across the landscape and disrupting habitat management activities on conservation lands, particularly through the reduction of prescribed fire activities.

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.8% of the species' range overlaps with agricultural use sites and 34.5% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 35.3% overlap between the species' range and the agricultural footprint of simazine use sites (Table 7).

Table 7. Agricultural use overlap and annual usage data (% Range Treated) for the gopher tortoise.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	0.1	0.1	<0.1	<0.1	<0.1

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	0.4	17.8	18.2	0.4	17.8	18.2
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	0.3	11.7	12	<0.1	<0.1	<0.1
Other Orchards	<0.1	1.7	1.7	<0.1	1.4	1.4
Vegetables and Ground Fruit	<0.1	3.3	3.3	<0.1	1.9	1.9
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**0.8**	**34.5**	**35.3**	**0.5**	**21.1**	**21.5**

Usage

Past usage data indicate that up to 21.5% of the species' range has been treated with simazine annually from agricultural uses, with 0.5% occurring on agricultural fields and 21.1% resulting from off-site transport (Table 10)

Additional Exposure Considerations

Available species information indicate that agricultural fields are not inhabited by gopher tortoises, indicating that on-field exposure to agricultural simazine use is not likely to occur.

Exposure from Non-Agricultural Uses

While gopher tortoises typically inhabit areas of open pine or other upland areas, individuals can occur in residential areas despite the fact that these areas are of lower quality for the species. As such, we anticipate individuals may be exposed to simazine through non-agricultural uses, such as through use on residential lawns and ornamental plants. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of the gopher tortoise to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

While we anticipate simazine use can impact the growth and survival of sensitive plant species, with implementation of required mitigations on product labels, we anticipate there will be no more than low levels of indirect adverse effects to vegetative resources the tortoise relies on. For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

We expect consumption of food items in and around simazine use sites to be the primary route of simazine exposure to desert tortoises. Gopher tortoises mostly forage on foliage, seeds, and fruits of grasses and forbs. We do not expect gopher tortoises that are exposed to simazine as a result of off-site transport will experience adverse effects and thus focus our analysis to effects on use sites within the range.

We expect that if gopher tortoises forage on grass or other plants exposed on simazine use sites, concentrations of simazine can reach levels associated with reproductive effects such as reduction in in number of eggs laid, viable 3-week embryos, hatchling survival, and 4-day old survival. However, we expect a range of concentrations to be associated with contaminated food resources, and we only anticipate these effects if individuals forage on plants with maximum estimated concentrations of simazine on recently treated fields. We anticipate this will occur infrequently, as managed turf is not the typical foraging areas of the gopher tortoise. However, an individual gopher tortoise feeding exclusively on treated use sites even a short period of time, such as a single day, may still accumulate a significant body burden of pesticide.

Indirect Effects

While we anticipate off-site transport of simazine can negatively impact the growth and survival of sensitive plant species, we do not anticipate spray drift of runoff of simazine will destroy or limit the availability of complex vegetative structure (e.g., open pine and upland vegetative communities) that the species requires for its habitat. Similarly, while the gopher tortoise relies on plant material for food, including species that might be sensitive to simazine, we anticipate the required conservation measures on product labels (including mandatory spray drift buffers and three points of runoff mitigations) will minimize impacts to the gopher tortoises' habitat and food resources.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a large percentage of the species' range will be treated with simazine on agricultural fields annually. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. We do not expect the gopher tortoise to occur on agricultural use sites. Gopher tortoises may be exposed in non-agricultural uses sites where simazine has been applied, such as turf or golf courses, though we expect this to occur infrequently, as this does not represent preferred habitat and simazine usage on these sites is expected to be low.

We expect individuals that exclusively forage on non-agricultural use sites recently treated with simazine will experience reproductive effects. However, given the small extent of simazine usage on these sites, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on plants with maximum estimated simazine residues from recently treated use sites), we anticipate that few individuals will experience reproductive effects from simazine use.

While we anticipate simazine use can impact the growth and survival of sensitive plant species, with implementation of required mitigations on product labels, we anticipate there will be no more than low levels of indirect adverse effects to vegetative resources the tortoise relies on.

Thus, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

The gopher tortoise is a large fossorial burrowing reptile are found in sandhills, pine-scrub oak uplands, and pine flatwoods associated with longleaf pine ecosystems (e.g., *Pinus palustris*, *P. taeda*, and *P. elliottii*) in the southeastern Atlantic and Gulf Coast Plains. Gopher tortoises develop burrows underground that are used by many other wildlife species, including the threatened eastern indigo snake. They eat foliage, seeds, and fruits of grasses and forbs near their burrows. They are found from southeastern South Carolina, west through Georgia, the Florida panhandle and peninsula, Alabama, and Mississippi to extreme southeastern Louisiana. While still widely distributed only the western population in Louisiana, Mississippi, and far western Alabama is listed. and while the range-wide population estimate is approximately a hundred and fifty thousand, the western DPS is believed to support only about 2% of this number. The gopher tortoise has a medium vulnerability based on its status, distribution, and trends. Anticipated exposure is through direct dietary uptake on recently treated agricultural sites resulting in sub-lethal effects to growth and reproduction.

The primary threats to gopher tortoises include habitat loss, degradation, and fragmentation due to land use changes from urbanization, solar farms, climate change, and insufficient or incompatible habitat management. While these threats appear to represent the most significant risks to the species, there is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a large percentage of the species' range will be treated with simazine on agricultural fields annually. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. While we do not expect the gopher tortoise to occur on agricultural use sites, gopher tortoises may be exposed in non-agricultural use sites where simazine has been applied, such as turf or golf courses, though we expect this to occur infrequently, as this does not represent preferred habitat and simazine usage on these sites is expected to be low. We expect individuals that exclusively forage on non-agricultural use sites recently treated with simazine will experience reproductive effects. However, given the small extent of simazine usage on these sites, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on plants with maximum estimated simazine residues from recently treated use sites), we anticipate that few individuals will experience reproductive effects from simazine use.

Thus, we anticipate a low number of individuals of this species and their food resources will experience direct exposure over the duration of the action. We do not expect mortality of individual gopher tortoises, but do anticipate low levels of direct adverse effects to reproduction from non-agricultural exposure to recently treated food items. We anticipate the reduction of reproductive success in a small number of individuals will not result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gopher tortoise.

References

U.S. Fish and Wildlife Service. 2021. Species Status Assessment Report for the Gopher Tortoise (*Gopherus polyphemus*). Version 0.4. Atlanta, Georgia. 288 pp.

U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Finding for the Gopher Tortoise Eastern and Western Distinct Population Segments. Federal Register 87(196):61834-61868.

Integration and Synthesis Summary: Sand skink

Scientific Name:	Common Name:	Entity ID:
Neoseps reynoldsi	Sand skink	179

Conclusion: No Jeopardy

Species Range

Based on range map dated: 3/02/2022; Wherever found; *States within the range:* FL

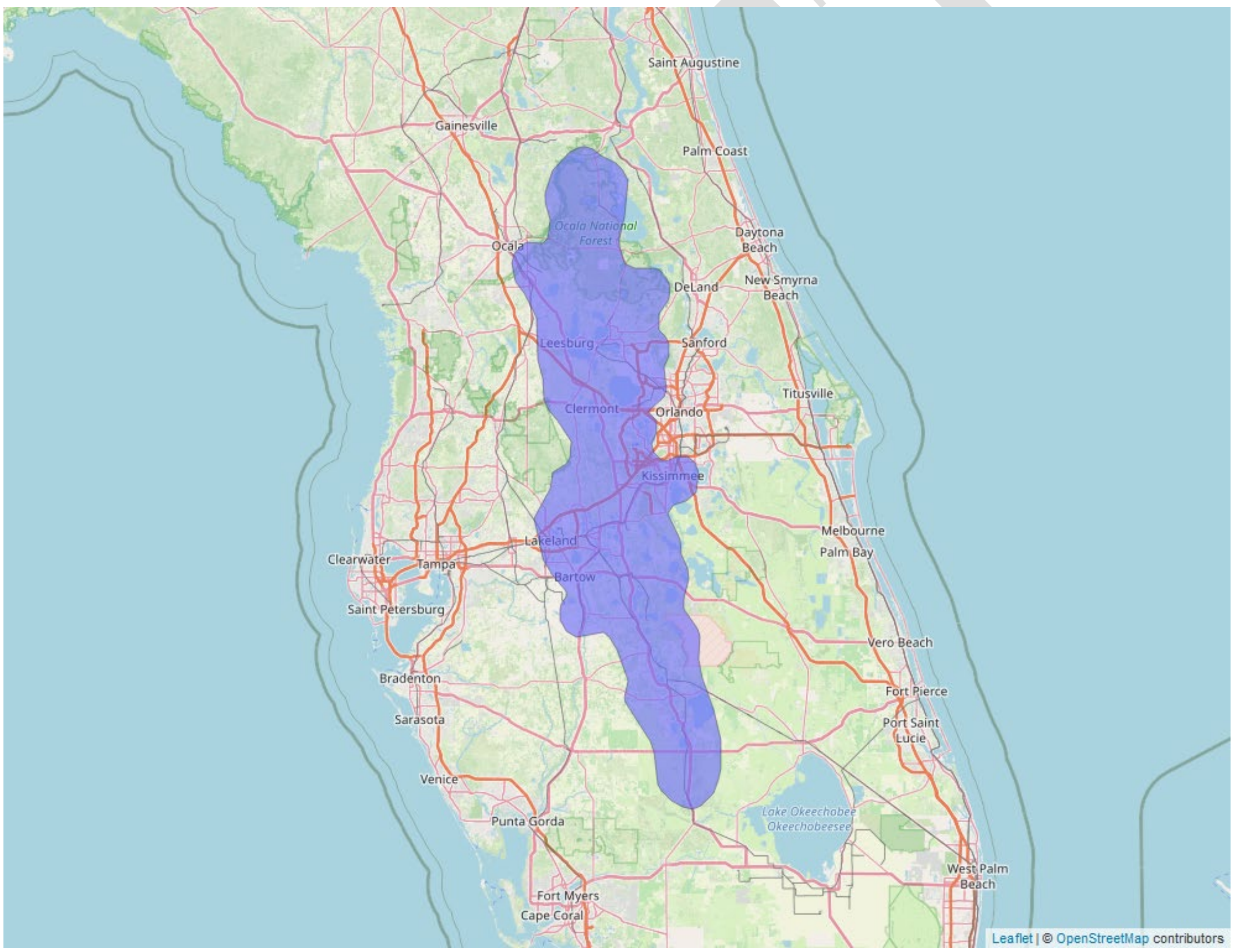

Figure 6. Range map of sand skink (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4094.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: Delist, the species does not meet the definition of an endangered species or a threatened species

Most recently completed 5-year review: 11/1/2023

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (numerous)

Species trends: Unknown population trends

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

The sand skink is endemic to the sandy ridges of central Florida and occurs on the Lake Wales, Winter Haven, and Mt. Dora Ridges in Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam Counties. They are fossorial and use xeric upland habitat with sandy substrate like scrub, scrubby flatwoods, and sandhills. They prefer areas with heterogenous habitat patches that are necessary for thermoregulation. Sand skinks feed on a variety of hard- and soft-bodied arthropods that occur below the ground surface (e.g., beetle larvae, termites, spiders, larval ant lions, lepidopteran larvae, ants, roaches, and adult beetles) (USFWS 2023a). They are found on 43.9% of their historical distribution, though some historically occupied areas have not been recently surveyed. Three occupied areas (Mt. Dora Ridge, Central Lake Wales Ridge, and Southern Lake Wales Ridge) exhibit very high resiliency because they have large areas of primary habitat, greater than a third of the primary habitat is protected and managed in a manner that is beneficial to sand skinks, and habitat fragmentation is moderate to low. There are 124 populations of sand skinks range-wide, though many of them are small and isolated due to fragmentation. Abundance and trends information is not available, but the Service recommended the species for delisting due to recovery in 2023 (USFWS 2023b).

Sand skinks are threatened primarily by habitat loss, fragmentation, and changes in land use. Additional threats to sand skinks include habitat modification by invasive species and genetic diversity loss from small population sizes. Collection and disease are not known to be threats to the species (USFWS 2023). By 2006, approximately 85% of the historical scrub and sandhill habitats on Lake Wales Ridge was converted to urban and residential development and agriculture. Isolated habitat fragments surrounded by human land uses are more difficult to manage with tools like fire, which has led to habitat degradation at some of these sites as they become overgrown above and below the soil surface and therefore unsuitable for sand skinks. As of 2023, about 60% of the remaining species habitat is protected from development and managed for conservation, but additional habitat loss and fragmentation is expected on private lands because of anticipated increases in Florida's human population by 2060 (USFWS 2023).

Overall Vulnerability: Low

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 11.0% of the species' range overlaps with agricultural use sites and 79.1% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[8] between the species' range and the agricultural footprint of simazine use sites (Table 8).

Table 8. Agricultural use overlap and annual usage data (% Range Treated) for the sand skink.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	9.4	47.7	57.1	4.7	24.0	28.7
Corn	<0.1	2.1	2.1	<0.1	2.1	2.1
Grapes	0.1	5.8	5.9	0.1	5.8	5.9
Other Crops	1.0	39.3	40.3	0	0	0
Other Orchards	0.3	10.4	10.7	0.3	10.4	10.7
Vegetables and Ground Fruit	0.2	21.5	21.7	<0.1	2.5	2.5

[8] Total overlap is capped at 100%.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Christmas Trees	0	0	0	0	0	0
Total	**11.0**	**100[8]**	**100[8]**	**5.1**	**44.8**	**49.9**

Usage

Past usage data indicate that up to 49.9% of the species' range has been treated with simazine annually from agricultural uses, with 5.1% occurring on agricultural fields and 20.8% resulting from off-site transport (Table 11).

Additional Exposure Considerations

Sand skinks use citrus fields (active and fallow), tree plantations, and likely other agricultural lands if suitable habitat conditions exist and are subject to on-field exposure to agricultural uses of simazine.

Exposure from Non-Agricultural Uses

Sand skinks use developed and open-space developed areas if suitable habitat conditions exist and may be exposed to non-agricultural uses of simazine. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of the sand skink to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

In addition to label measures, the sand skink is in a Pesticide Use Limitation Area (PULA) that requires an additional three runoff mitigation points (i.e., six points total) for Florida citrus only. We anticipate these additional runoff points will further reduce simazine residues in runoff by another order of magnitude (i.e., up to 99% reduction in simazine runoff residues in total).

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

We expect consumption of food items in and around simazine use sites to be the primary route of simazine exposure to sand skinks. Sand skinks feed on a variety of hard- and soft-bodied arthropods that occur below the ground surface. We do not expect sand skinks that are exposed to simazine on prey items as a result of off-site transport will experience adverse effects and thus focus our analysis to effects on use sites within the range.

We expect that if sand skinks forage on arthropods that have been exposed on use sites, concentrations of simazine can reach levels associated with reproductive effects such as reduction in in number of eggs laid, viable 3-week embryos, hatchling survival, and 4-day old survival. However, we expect a range of concentrations to be associated with contaminated prey species, and we only anticipate these effects if individuals forage on prey with maximum estimated concentrations of simazine on recently treated fields. We anticipate this will be a rare occurrence, as sand skinks consume arthropods that occur below the ground surface where simazine exposure is not likely to reach maximum residues, and are also expected to consume resources off treated fields.

Indirect Effects

Available toxicity data suggests that arthropod prey are not likely to experience any mortality with simazine exposure. As such, we do not anticipate simazine use will reduce the availability or abundance of prey species for individuals. While we anticipate off-site transport of simazine can negatively impact the growth and survival of sensitive plant species, we do not anticipate spray drift of runoff of simazine will destroy or limit the availability of complex vegetative structure that the species requires for its habitat. Furthermore, we anticipate the required conservation measures on product labels (including mandatory spray drift buffers and three points of runoff mitigation) will further minimize impacts to the species' necessary plant resources. As such, we do not anticipate the proposed action will result in measurable levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a large percentage of the species' range will be treated with simazine on agricultural fields annually. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. While 11% of the range overlaps with agricultural use sites of simazine, we expect simazine applications to occur on-field in 5.1% of the species' range. We expect that some individuals are likely to be exposed to contaminated food resources as the species is known to forage in simazine use sites. While sand skinks may be exposed to simazine in non-agricultural use areas, we expect non-agricultural usage of simazine within the range of the species to be low.

We expect individuals that exclusively eat arthropods contaminated on use sites recently treated with simazine will experience reproductive effects. However, while sand skinks are known to occur on simazine use sites, they primarily feed on arthropods that occur below the ground surface and are not likely to contain high levels of simazine. In addition, given the limited usage on agricultural and non-agricultural use sites within the species' range, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals, if any, will experience reproductive effects from simazine use.

In addition, with implementation of required mitigations on product labels, we do not anticipate simazine use is likely to reduce the availability or abundance of insects that the sand skink relies on as food resources, or result in appreciable impacts to any vegetative habitat resources for the species.

Thus, we conclude the overall risk of adverse effects to the sand skink is low.

Species Conclusion

The sand skink is a fossorial lizard, inhabiting scrub ridges and sandy substrates in the Florida interior highlands and is widespread in these xeric uplands. Sand skinks are known primarily from Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam counties in Florida. They prey on a variety of hard and soft bodied arthropods, including primarily beetle larvae and termites though spiders, ants, roaches, adult beetles and others are also eaten. The sand skink has a low vulnerability based on its status, distribution, and trends. Anticipated exposure is through direct dietary uptake on recently treated agricultural sites resulting in sub-lethal effects to reproduction. Though abundance and trends information is not available, but the Service recommended the species for delisting due to recovery in 2023 (USFWS 2023b).

The primary threats to sand skink include habitat loss, primarily from agricultural conversion and increasingly urbanization as the human population in Florida is expected to double, from 18 million in 2005, to 36 million in 2060. While these threats appear to represent the ongoing threats to the species, the sand skink is also known from agricultural use sites (primarily citrus) where it is anticipated that up to 11% of the species habitat overlaps with these sites. We expect simazine applications to occur on-field in 5.1% of the species' range. Thus, direct dietary exposure from consumption of affected prey exposed to recent on-field concentrations of simazine is anticipated to be the most likely, and likely lone, adverse effect to the species, affecting a low number of individuals that encounter this scenario. We do not anticipate exposure of prey items from agricultural runoff or from residual runoff in streams and rivers adjacent to non-agricultural sources (e.g., golf courses) at sufficient levels to measurably affect Florida Keys mole skink reproduction. Likewise, low usage and limitations on use (spray drift reduction measures cited above) and buffers already on the label are anticipated to mitigate off-field exposures to levels below which we would observe reproductive effects to the sand skink. Thus, given the extent of simazine usage on agricultural and non-agricultural use sites within the species' range, the variable diet of the Florida Keys mole skink, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals will experience reproductive effects from simazine use.

Thus, we anticipate a low number of individuals of this species and their prey resources will experience direct exposure over the duration of the action. We do not expect mortality of individual sand skinks, but do anticipate low levels of direct adverse effects to reproduction from agricultural exposure from ingestion of recently treated prey items on-field. We anticipate reproductive effects in a small number of individuals will not result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the sand skink.

References

U.S. Fish and Wildlife Service. 2023a. Species Status Assessment Report for the Sand Skink (*Neoseps reynoldsi*). Version 1.0. Atlanta, Georgia. 102 pp.

U.S. Fish and Wildlife Service. 2023b. Sand Skink (*Neoseps reynoldsi*) 5-Year Review: Summary and Evaluation. Gainesville, Florida. 15 pp.

Integration and Synthesis Summary: Short-tailed snake

Scientific Name:	Common Name:	Entity ID:
Lampropeltis extenuata	Short-tailed snake	10253

Conclusion: No Jeopardy

Species Range

Based on range map dated: 07/11/2025; Wherever found; *States within the range:* FL

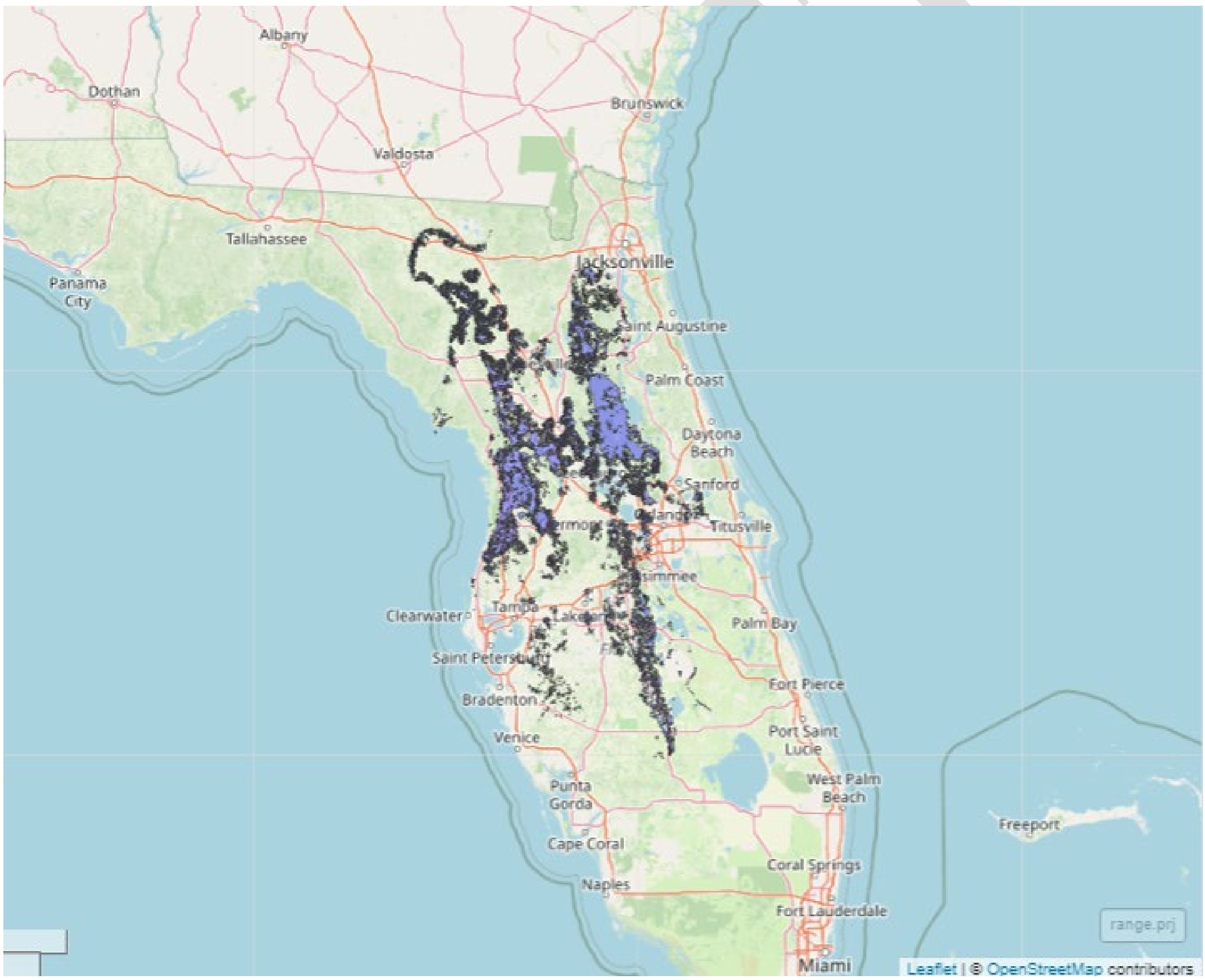

Figure 7. Range map of short-tailed snake (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/9266.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Proposed Threatened

Most recent 5-year review recommendation: N/A

Most recently completed 5-year review: None available for this species

Distribution: Species/Populations neither constrained nor widespread

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes, herbicides only

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

The short-tailed snake is primarily a fossorial colubrid snake generally found in longleaf pine (*Pinus palustris*)/xeric oak sandhills, but also scrub and xeric hammock habitats in peninsular Florida from the central ridges west to the Gulf Coast. In general, the short-tailed snake requires well-drained sandy soils associated with xeric uplands that include an open canopy of widely spaced trees and shrubs with ample areas of exposed soils, sufficient prey that includes small snakes such as the Florida crowned snake (*Tantilla relicta*), and connectivity within and between populations. Primary threats to the viability of the short-tailed snake include habitat loss, degradation, and fragmentation due to urbanization and land conversion to agriculture and mining uses.

The species appears to be diurnally active on the surface in cooler months, but may shift towards nocturnal activity in warmer months. It is uncertain if short-tailed snake exhibits a dormancy period in the winter (brumation) or summer rainy season. Short-tailed snakes apparently spend most of their lives beneath sandy soil and likely lay eggs underground. All snakes in the genus *Lampropeltis* are nonvenomous and are considered ophiophagous (to primarily consume other snakes) though other prey items such as lizards may also be consumed. Our understanding of the short-tailed snake diet is based almost entirely on observations of captive snakes.

Threats to short-tailed snakes include habitat loss, degradation and fragmentation, including urbanization, road construction, conversion to agriculture and to a more limited extent, surface mining. Additional threats to the short-tailed snake include habitat management, fire suppression, herbicide use, climate change, invasive species and disease. Compared to historical conditions, Florida's xeric upland natural communities are extensively reduced, altered, and in many areas, isolated. This is particularly evident in longleaf pine-dominated sandhills and scrub communities on the ridges of central Florida and the Gulf Coast of Florida. Sandhills covered approximately 2.4% of Florida in 1987, an 88% loss from an estimated coverage of in 1936 and scrub communities declined 59% in coverage during the same period. In a 14-year period from 1989 to 2003, 11% of sandhill and 10% of scrub natural communities were lost to urbanization or other land uses, with 4% of each of these respective habitats lost specifically to agriculture. Future losses of sandhill and scrub habitats are expected as Florida's human population continues to increase, and development expands. Research is lacking to quantify the effects of urbanization on short-tailed snake survival, recruitment, health, or long-term viability. While urbanized areas are not likely to support viable populations of short-tailed snake, this species has been observed in subdivisions within xeric uplands that retain some natural ground cover components that also likely support populations of prey species such as the Florida crowned snake. Short-tailed snakes appear to be tolerant of some degree of urbanization where sufficient and connected habitat persists, though long-term survival in these areas has not been demonstrated.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

The continued conversion of short-tailed snake habitat to intensive agricultural land uses such as row cropping or hay production would likely eliminate important habitat features (e.g., open sandy soil and native groundcover vegetation) in favor of maximizing crop yields; row crops such as cotton and corn involve considerable soil disturbance through seasonal plowing. Short-tailed snakes are unlikely to persist in areas affected by the removal of native landcover, reduction of prey, and the alteration of soil characteristics (e.g., loose, sandy soil) required for sand-swimming species. However, it is possible that short-tailed snake may persist in citrus groves where pockets of natural cover and soil conditions are present or where higher quality habitat is adjacent. Within the range of short-tailed snake, approximately 648,000 acres of citrus are identified.

Usage

Based on past usage data in Florida provided by EPA, we expect that citrus groves within the range of the short-tailed snake are likely to be treated with simazine.

Additional Exposure Considerations

Short-tailed snakes predominantly consume small snakes, particularly Florida crowned snakes. Florida crowned snakes are often hidden beneath leaf litter, logs, rocks, or other surface cover; they can occur even within suburban neighborhoods where development encroaches into favorable upland habitats. Short-tailed snakes also consume worm lizards which often located just beneath a leaf-mold layer in well-drained sandy soil. Due to the tendency of prey species to occur under cover of leaves, logs, or other substrate, exposure to simazine via spray drift or direct contact is expected to be lower than species that are primarily found above ground.

Exposure from Non-Agricultural Uses

While urbanized areas are not likely to support viable populations of short-tailed snake, they may persist in developed areas, particularly in subdivisions containing some natural ground cover that also likely support populations of prey species such as the Florida crowned snake. There are records of short-tailed snake observations from roadways, carports, woodsheds, foundation excavations, driveways, yards (e.g., pool), and within a home in developed areas. As such, we anticipate individuals may be exposed to simazine through non-agricultural uses, such as through use on residential lawns and ornamental plants. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of the short-tailed snake to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

We expect consumption of food items in and around simazine use sites to be the primary route of simazine exposure to short-tailed snakes. The short-tailed snake mainly consumes other small snakes, particularly the Florida crowned snakes, and may also prey upon lizards. We do not expect short-tailed snakes that are exposed to simazine on prey items as a result of off-site transport will experience adverse effects and thus focus our analysis to effects on use sites within the range.

We expect that if short-tailed snakes forage on prey items such as snakes or lizards that have been exposed on use sites, concentrations of simazine can reach levels associated with reproductive effects such as reduction in in number of eggs laid, viable 3-week embryos, hatchling survival, and 4-day old survival. However, we expect a range of concentrations to be associated with contaminated prey species, and we only anticipate these effects if individuals forage on prey with maximum estimated concentrations of simazine on recently treated fields. We anticipate this will be a rare occurrence, as short-tailed snakes preferentially consume prey species that found under cover of leaves, logs, and other substrate where simazine exposure is not likely to reach maximum residues, and are also expected to consume resources off treated fields.

Indirect Effects

Available toxicity data suggests that prey items of the short-tailed snakes are not likely to die from exposure to simazine. While individual terrestrial vertebrates may experience growth or reproductive effects if exposed to simazine on use sites, we anticipate the required mitigation measures on product labels (i.e., mandatory spray drift buffers and three points of runoff mitigation) will preclude off-site concentrations of simazine from reaching levels where we expect effects to occur. In addition, we anticipate off-site transport of simazine can negatively impact the growth and survival of sensitive plant species, though we do not anticipate spray drift or runoff of simazine will destroy or limit the availability of complex vegetative structure (e.g., upland vegetative community) that the species requires for its habitat. We anticipate the required mitigation measures on product labels will further minimize impacts to the species' necessary plant resources. As such, we do not anticipate the proposed action will result in measurable levels of indirect adverse effects to the species.

Effects of the Action Summary

We expect agriculture, particularly citrus groves, to occur broadly within the range of the short-tailed snake, and that simazine will be applied to these areas over the course of the action. However, we only expect individuals exposed directly on simazine use sites will accumulate high enough levels of simazine to cause direct adverse effects to reproduction. We expect that some individuals are likely to be exposed to contaminated food resources as the species is known to forage in simazine use sites. While prey species of the short-tailed snake may be exposed to simazine in non-agricultural use areas, we expect non-agricultural usage of simazine within the range of the species to be low.

We expect individuals that exclusively eat prey contaminated on use sites recently treated with simazine will experience reproductive effects. However, given that the habits of prey species are unlikely to lead to high levels of simazine exposure, the limited extent of simazine usage on non-agricultural use sites within the species', and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals, if any, will experience reproductive effects from simazine use.

In addition, with implementation of required mitigations on product labels, we do not anticipate simazine use is likely to reduce the availability or abundance prey that the short-tailed snake relies on as food resources, or result in appreciable impacts to any vegetative habitat resources for the species.

Thus, we conclude the overall risk of adverse effects to the short-tailed snakes is low.

Species Conclusion

The short-tailed snake is a fossorial reptile, found in longleaf pine (*Pinus palustris*)/xeric oak sandhills, but also scrub and xeric hammock habitats in peninsular Florida from the central ridges west to the Gulf Coast. All snakes in the genus Lampropeltis are nonvenomous and are considered ophiophagous (to primarily consume other snakes) though other prey items such as lizards may also be consumed. The short-tailed snake has a high vulnerability based on its status, distribution, and trends. Anticipated exposure is through direct dietary uptake on recently treated agricultural sites resulting in sub-lethal effects to reproduction.

The primary threats to short-tailed snake include habitat loss, primarily from agricultural conversion and increasingly urbanization as the human population in Florida is expected to double, from 18 million in 2005, to 36 million in 2060. While these threats appear to represent the ongoing threats to the species, the short-tailed snake is also known from agricultural use sites (primarily citrus) where it is anticipated that simazine will be applied to these areas over the course of the action. Thus, direct dietary exposure from consumption of affected prey exposed to recent on-field concentrations of simazine is anticipated to be the most likely, and likely lone, adverse effect to the species, affecting a low number of individuals that encounter this scenario. We do not anticipate exposure of prey items from agricultural runoff or from residual runoff in streams and rivers adjacent to non-agricultural sources (e.g., golf courses) at sufficient levels to measurably affect short-tailed snake reproduction. Likewise, low usage and limitations on use (spray drift reduction measures cited above) and buffers already on the label are anticipated to mitigate off-field exposures to levels below which we would observe reproductive effects to the short-tailed snake. Thus, given the extent of simazine usage on agricultural and non-agricultural use sites within the species' range, the ophiophagous (primarily consuming other snakes) diet of the short-tailed snake, and the limited scenarios that we expect to result in adverse effects (i.e., foraging exclusively on prey with maximum estimated simazine residues from recently treated use sites), we anticipate that very few individuals will experience reproductive effects from simazine use.

Thus, we anticipate a low number of individuals of this species and their prey resources will experience direct exposure over the duration of the action. We do not expect mortality of individual short-tailed snakes but do anticipate low levels of direct adverse effects to reproduction from agricultural exposure from ingestion of recently treated prey items on-field. We anticipate reproductive effects in a small number of individuals will not result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the short-tailed snake.

References

U.S. Fish and Wildlife Service. 2022. Species Status Assessment Report for the Short-tailed Snake. Version 1.0. Atlanta, Georgia. 56 pp.

U.S. Fish and Wildlife Service. 2023a. Species Status Assessment Report for the Sand Skink (*Neoseps reynoldsi*). Version 1.0. Atlanta, Georgia. 102 pp.