Bartram's Scrub-Hairstreak Butterfly

(Strymon acis bartrami)

5-Year Status Review:

Summary and Evaluation

Photo credit: H.L. Salvato

U.S. Fish and Wildlife Service
Southeast Region
Florida Ecological Services Field Office
Vero Beach, Florida
July 2024

STATUS REVIEW
Bartram's scrub-hairstreak butterfly (*Strymon acis bartrami*)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: Florida Ecological Services Field Office

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Date of original listing: September 11, 2014 (79 FR 47222; August 12, 2014) and correction published on August 19, 2014 (79 FR 49023)

Critical Habitat/4(d) rule:
Critical Habitat final rule: September 11, 2014 (79 FR 47180; August 12, 2014)

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the Bartram's scrub-hairstreak to inform this status review. A notice of the initiation of this 5-year review was published by the Service in the Federal Register on June 20, 2019 (84 FR 28850) with a 60-day comment period and received no comments.

In conducting this 5-year review, the Service relied on the best available information pertaining to historical and current distributions, life history, ecology, and habitat of this species. The primary sources of information used in this review were the proposed and final listing rules (78 FR 49878 and 79 FR 47221, respectively), published survey data and reports, an unpublished Species Status Assessment, personal communication with recognized experts. Because we have not received significant new information since the listing rule was written and the level of public interest is low and non-controversial, no peer review on this 5-year review was conducted.

FR Notice citation announcing the species is under active review:
June 20, 2019 (84 FR 28850)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 3C, indicating that the listed entity is a subspecies, with a high degree of threat, and a high recovery potential. The "c" indicates that the species recovery is, or may be, in conflict with construction or other development projects or other forms of economic activity.

Review History: This is the first 5-year status review for this species.

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature: The Integrated Taxonomic Information System (ITIS) uses the name Bartram's scrub-hairstreak butterfly (*Strymon acis bartrami*) which was first described by Comstock and Huntington in 1943 (ITIS 2022) and indicates that the taxonomy for the species is still valid. We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service.

Distinct Population Segment (DPS)
The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing of a DPS to only vertebrate species. Because the species under review is not a vertebrate, the DPS policy is not applicable.

Recovery Criteria

Recovery Plan or Outline:
At the time of this review, there is no recovery plan with recovery criteria for this species. However, there is a recovery outline (Service 2014a) that describes a preliminary recovery strategy.

Biology and Habitat Summary

A detailed review of the species biology and habitat information can be found in the final listing rule (Service 2014b).

Range and distribution: The Bartram's scrub-hairstreak butterfly is endemic to south Florida, specifically pine rockland habitat where pineland croton *(Croton linearis;* the butterfly's larval foodplant) occurs. The butterfly's historical range included pine rockland habitat in Miami-Dade and Monroe Counties, however, the butterfly is presumed extirpated from Big Pine Key (Monroe County; Daniels pers. comm. 2023; Henry pers. comm. 2023). Due to development and fragmentation of pine rockland habitat in South Florida, its range is now restricted to two populations in isolated remnants of pine rockland habitat in Miami-Dade County (Figure 1), including in the Long Pine Key Region of Everglades National Park and a few sites in Miami-Dade County, particularly areas east of the National Park (i.e., Navy Wells Pineland and areas

within the Richmond Pine Rocklands; Salvato 1999, 2001, 2003; Salvato and Hennessey 2004; Salvato and Salvato 2010a; Possley et al. 2016)

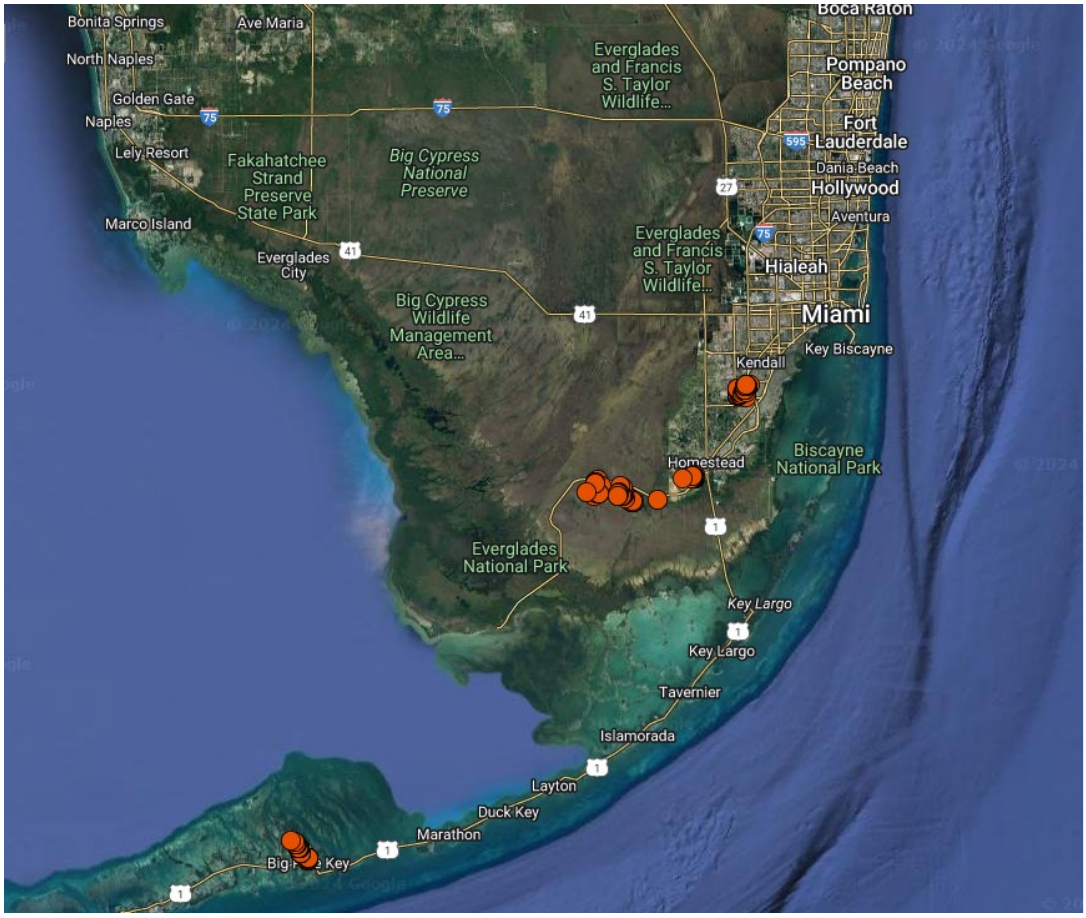

Figure 1: Distribution of recent (2007 – present) sightings of Bartram's scrub-hairstreak butterfly as denoted with purple points. Note that the population mapped on Big Pine Key (the circles in the southernmost portion of the map) has not been detected since 2017 and is presumed extirpated (provided within Daniels pers. comm. 2023).

Habitat: Bartram's scrub-hairstreak populations are found exclusively within pine rockland ecosystems in south Florida that support its sole larval host plant, the pineland croton. Adult Bartram's scrub-hairstreak butterflies will make use of rockland hammock and hydric pine flatwood within and between occurrences of pine croton but cannot complete their life cycle without pine croton. Pineland croton is a small shrub that depends on regular disturbances, particularly fire, to keep the scrub habitat free from woody encroachment that could outcompete the croton. Nearly all (approximately 90%) of the plant's and butterfly's suitable habitat has been lost to clearing and fire suppression over the last century (Anderson and Henry 2015). See additional discussions under Factor A, below.

Life History: The Bartram's scrub-hairstreak relies primarily on the pineland croton (*Croton linearis*) to complete the larval stage of its life cycle; adults have been seen feeding on nectar of other flowering plant species (Worth et al. 1996; Calhoun et al. 2000; Salvato and Hennessey 2004; Salvato and Salvato 2008).

The butterfly is rarely encountered more than 5 m (16.4 ft) from its host plant, within and immediately surrounding pine rockland habitat (Schwartz 1987; Worth et al. 1996; Salvato and Salvato 2008). Female adult butterflies oviposit on the flowers of the pineland croton, the larvae feed on the leaves and flowers. Adult butterflies can be seen throughout the year, but the species is most abundant during the spring and the early summer (Salvato and Salvato 2010a). Likely because of their small size, Bartram's scrub-hairstreak butterflies have an extremely limited dispersal capacity. This limits the capacity of the taxon to colonize uninhabited pine rockland fragments and restricts gene flow between populations.

Threats Analysis (Five-Factor Analysis)

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act. The five factors attributing to the species status are detailed below. Additional details of threats can also be found in the final listing rule (Service 2014b).

Because of the declines in and fragmentation of habitat, the species' limited dispersal abilities, and the overall decline in number of populations of the species, Bartram's scrub hairstreak is at high risk of extirpation from catastrophic events and has limited ability to recolonize after extirpation events. Catastrophic events (e.g., hurricanes) are likely to impact the entire extant range of the taxon; widespread extirpation due to this kind of event could result in extinction.

Present or threatened destruction, modification or curtailment of its habitat or range (Factor A):

Habitat loss: Pine rockland, the habitat for the Bartram's scrub-hairstreak and its larval food plant, covers a small fraction of its historical extent (Florida Natural Areas Inventory (FNAI) 2010, 2019); at least 90% of the native habitat in Miami-Dade County no longer exists. Habitat degradation further reduces habitat amount and quality and is driven by the increasing development of areas like the Miami Rock Ridge and Richmond Pine Rocklands, which, despite having some dedicated conservation areas, have large tracts of unprotected lands that suffer from lack of adequate management. In areas within the Richmond Pine Rocklands, signs of croton recruitment have been observed where restoration has been implemented, and observations of Bartram's scrub-hairstreaks have followed. Additional development of unprotected areas in the Florida Keys will further reduce suitable habitat (Zwick and Carr 2006). A discussion of habitat loss related to sea level rise is discussed under Factor E, below, with other topics related to changes in climate and climate variations impacting the species, its habitat, and pineland croton.

Fire management: Much existing pine rockland habitat has received inadequate fire management, resulting in dense overgrowth of plant species that outcompete pineland croton, thus reducing habitat quality for the Bartram's scrub-hairstreak (Salvato and Salvato 2010a).

When left unburned, pine rockland habitats will succeed into hardwood hammock that cannot support pineland croton or the Bartram's scrub-hairstreak butterfly (Loope and Dunevitz 1981, Olson and Platt 1995, Slocum et al. 2003, Snyder et al. 2005). The pine rockland habitat, and therefore Bartram's scrub-hairstreak butterfly, require mosaic burning regimens to ensure that fire clears any woody encroachment and so that butterflies can move out of the path of fire and into adjacent areas not impacted by fire (Salvato and Salvato 2008, 2010a, 2019). Large-scale burns limit areas for adults to escape into and likely increase adult mortality and reduce recolonization of burned patches. Mechanical treatments may be used in place of fire, but their effectiveness is questionable.

Hydrology and Everglades Restoration: Hydrology is a key ecosystem component that affects plant distribution and viability (Gann et al. 2006), including pineland croton. While projects designed to restore the historical hydrology of the Everglades and other natural systems in southern Florida, such as the Comprehensive Everglades Restoration Plan, are beneficial to the Everglades ecosystem, some may produce collateral impacts to extant pine rockland and associated habitats within the region through inundation or increased hydroperiods. The effects of changes in regional hydrology through restoration may have impacts on pine rocklands. Sadle (pers. comm. 2012) suggested various Everglades Restoration projects (such as C-111 spreader canal; L-31N seepage barrier), specifically the operation of pumps and associated water detention areas along the Everglades National Park boundary, may influence (through excessive water discharges) select portions of eastern Long Pine Key. Increased and longer-duration hydroperiods within the pine rockland habitats where the Bartram's scrub-hairstreak occurs may lead to a reduction in the amount of suitable habitat, a potential reduction in the area occupied, and a reduction in the number of individuals found in the National Park. It is unclear to what extent changes in hydrology related to restoration efforts may impact the species in the future.

Overutilization for commercial, recreational, scientific, or educational purposes (Factor B):

Collection: The collection of rare and endangered butterflies occurs often, with or without regulatory protection, and threatens the Bartram's scrub-hairstreak (Mattoni 1992; Seidl 1999). There have been several requests made to Salvato (pers. comm. 2019) for Bartram's scrub-hairstreak specimens as well as information regarding field locations for collection. Multiple websites propose or have proposed the sale of southern Florida butterflies listed under the Act (Service 2014b), including the Bartram's scrub-hairstreak.

In 2005 Salvato (2019) observed several individuals collecting butterflies at Navy Wells, including at times when the Bartram's scrub-hairstreak was present at the site. Currently, the Bartram's scrub-hairstreak is restricted to conservation lands, in which poaching of these butterflies is still a possibility but is less likely to occur than on private lands. Given the small number of populations and individuals, any unauthorized collection of this butterfly from the wild could be deleterious to its continued survival.

Disease or predation (Factor C):

Predation: Nonnative Cuban anoles (*Anolis equestris*) occur in the range of scrub-hairstreak butterflies. Although not specifically seen consuming this species, Anderson (pers. comm. 2013) has observed anoles preying on adult butterflies and suggests the anoles likely also consume

larvae. Other predators, such as orb weavers, ants, and crab spiders have been observed on pineland croton during monitoring surveys and are thought to prey on Bartram's scrub-hairstreak adults and larvae (Salvato and Hennessey 2004). Predation on both adult and immature Bartram's scrub-hairstreaks occurs in the wild, however, we have no reason to believe these events rise to a significant level of threat.

Parasitism: Erythraeid larval mite parasites were observed on an adult scrub-hairstreak butterfly in Long Key Pine (Salvato and Salvato 2010b). Parasitism on butterflies by mites is rarely fatal (Treat 1975), but more research is needed into the impact of parasitism on Bartram's scrub-hairstreak butterflies (Service 2014b). A single braconid wasp was observed emerging during pupation of a scrub-hairstreak larva on Big Key Pine (Hennessey and Habeck 1991). The trichogrammid wasp has also been observed parasitizing on Bartram's scrub-hairstreaks and other endangered butterfly eggs in the Everglades and lower Florida Keys (Salvato and Hennessey 2004, Salvato et al. 2018), suggesting "these wasps represent a consistent parasitoid for the subspecies throughout the pine rocklands" (Service 2014b). The only known record of a larval parasitoid on the Bartram's scrub-hairstreak butterfly is from Long Pine Key, where a Bartram's scrub-hairstreak larva was found to be parasitized by *Crematogaster scutellaris* (Salvato et al. 2012). While parasitism is natural in the environment, additional research is needed to determine how significant this potential threat may be to the species.

Inadequacy of existing regulatory mechanisms (Factor D):

While certain regulatory mechanisms (listed below) exist to protect Bartram's scrub-hairstreaks, butterfly populations are in decline. Existing regulatory mechanisms are inadequate to properly address threats to the butterfly throughout its entire range. These regulations may protect some individuals; however, poaching may be undetected given the remote locations of the species.

Federal: The few existing Federal regulatory mechanisms to protect the Bartram's scrub-hairstreak outside of the protections of the Act include: "(1) the National Park Service Organic Act and its implementing regulations; (2) the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd–ee) as amended, and the Refuge Recreation Act (16 U.S. C. 460k–460k-4) and their implementing regulations" (Service 2014b).

The National Park Service does implement regulations at 36 CFR 2.1 and 2.2 that prohibit visitors from removing or harming wildlife, listed or otherwise, from the National Park. The organization's other regulation, 36 CFR 2.5, prohibits any visitor from collecting the butterfly and conducting research without a permit. However, insufficient implementation or enforcement of the regulations is a potential threat to the butterfly.

Although the species is currently considered extirpated in National Wildlife Refuge lands where historical populations occurred (e.g., National Key Deer Refuge), there are protections in place on Refuge lands to protect federally listed species. Special Use Permits are issued by the Refuges as authorized by the National Wildlife Refuge System Administration Act (16 U.S. C. 668dd–ee) as amended, and the Refuge Recreation Act (Service 2014b).

State: The butterfly is listed as a protected species by the State of Florida under Chapter 68A-27, Rules Relating to Endangered or Threatened Species. Additionally, all State-owned property and

resources are generally protected from harm in Chapter 62D–2.013(2), and animals are specifically protected from unauthorized collection in Chapter 62D–2.013(5) of the Florida Statutes.

Local: Under the Miami-Dade County ordinance "Parks and Recreation Department Rules and Regulations" (Chapter 26, Section 1), Rule 9 requires a permit to conduct scientific research on county environmental lands and Rule 8 provides for habitat preservation within county parks or areas operated by the Parks and Recreation Department. No other counties within the butterfly's range have regulatory mechanisms in place to protect the species or to maintain habitat.

Other natural or manmade factors affecting its continued existence (Factor E):

Effects of Few, Small Populations and Isolation: The Bartram's scrub-hairstreak's severely reduced range, reduced population size, lack of metapopulation structure, few remaining populations, and relative isolation of those populations result in a high vulnerability to extinction. Loss of genetic diversity in Bartram scrub-hairstreak populations may have already occurred (Salvato 2019). Exchange of genetic information between existing populations is highly unlikely, due to the distance between the sites (Worth et al. 1996; Salvato and Hennessey 2004), their fragmentation, and the Bartram's scrub-hairstreak's extremely limited dispersal capabilities.

Pesticides: With the increase of human activity and population in South Florida, the efforts to control salt marsh mosquitoes (*Aedes taeniorhynchus*), among others, has also increased. The mosquito control districts control mosquito populations throughout Florida by using second-generation organophosphate (naled) and pyrethroid (permethrin) adulticides, which are applied using aerial and ground-based methods. Non-target insects, including the Bartram's scrub-hairstreak, can be killed from direct exposure of mosquito control pesticides to adult and larval butterflies or secondary exposure through larval host plants and adult nectar sources.

Long Key Pine in Everglades National Park is not treated with mosquito control pesticides. In Miami-Dade County, mosquito control pesticides are limited within the pine rockland habitats, however, the occupied butterfly habitat in Miami-Dade County remains vulnerable to the effects of adulticide applications. Salvato (2001) and Hennessey et al. (1992) suggested that the decline in Bartram's scrub-hairstreak populations was due in part to chemical mosquito control application, especially because of their tendency to roost in low vegetation (including along roadsides), an area with maximum exposure to ground-based application. No-spray zones and buffer zones have been established around designated critical habitat for the Bartram's scrub-hairstreak, including Big Pine Key and throughout Miami-Dade County. Continued coordination with Mosquito Control Districts is important for reducing threats to the species.

Climate Change and Sea Level Rise: Climatic changes, including sea level rise and shifts in seasonal precipitation, temperature, and storm cycles, are major threats to south Florida Bartram's scrub-hairstreaks and pine rocklands. Studies by the National Oceanographic and Atmospheric Administration (Sweet et al. 2022) and others (Vargas-Moreno and Flaxman 2010, The Nature Conservancy 2011, Zhang et al. 2011, Park and Sweet 2015, Rahmstorf et al. 2015, University of Florida Geoplan 2015) have developed scenarios that range from 1 foot to 8 feet of sea level rise by 2100. Based on this, areas supporting Bartram's scrub-hairstreaks will become partially or completely inundated (i.e., under water) at some point during this century. For

example, approximately 75 percent of land mass in the Florida Keys is predicted to be inundated at 1.9 ft (0.59 m) of sea level rise (The Nature Conservancy 2011) and 94 percent of the Keys would be inundated at 5.9 ft (1.8 m) of sea level rise (Zhang et al. 2011).

Benedict et al. (2018) conducted an interagency evaluation of the influence of sea level rise and climate change to listed species and habitats throughout the Florida Keys, including Bartram's scrub-hairstreaks. Benedict et al. (2018) concluded the Bartram's scrub-hairstreaks and pine rockland habitats would be lost from Big Pine, No Name, and Little Pine Keys, at 2-feet of sea level rise, e.g., in the next 40-50 years (Benedict et al. 2018). However, decades prior to surface inundation, sea level rise will impact pine rocklands through vegetation shifts triggered by changes to hydrology (wetter), salinity (higher), and more frequent storm surge and king tide events (pulse events causing massive erosion and salinization of soils) (Saha et al. 2011, Bradley et al. 2013). In other words, pine rocklands will convert to mangroves earlier than expected due to root zone inundation from salt water.

More frequent storms and king tides will further threaten the species' habitat (Saha et al. 2011). The decrease of pineland croton in the Florida Keys can be, in part, attributed to storms (i.e., high wind events and other habitat impacts caused by hurricanes and tropical storms) and sea level rise (Saha et al. 2011), and we expect this trend to continue. Proper management is required to protect this habitat from increases in storms; Henry et al. (2020) found that actively managed plots of land showed greater survival of pineland croton against hurricanes. Pineland croton has not returned to historic abundance despite regular fire management in areas on Big Pine and other coastal areas (Dickson 1955, Hennessey and Habeck 1991, Emmel et al. 1995). Salvato (pers. comm. 2019) indicated that despite habitat management, restoration of croton may be limited due to a dilution of the freshwater lens resulting in a change in the plant community.

The Bartram's scrub-hairstreak is adapted to the influence of tropical storms and other adverse weather conditions. However, due to the significant reduction of the Bartram's scrub-hairstreak's distribution over the last 50 years, the threat and impact of tropical storms and hurricanes is much higher because a single severe event could eliminate an entire extant population. This likely occurred with Hurricane Irma in 2017, after which no butterflies have been found on Big Pine Key (Henry et al. 2020).

Synthesis

The Bartram's scrub-hairstreak butterfly is a small butterfly currently restricted to the Long Pine Key region of Everglades National Park and a few pine rockland habitat fragments in urban Miami-Dade County in south Florida. The species occurs within pine rockland habitat that contains its only known host plant, pineland croton. No Bartram's scrub-hairstreaks have been observed on Big Pine Key since 2017, so the butterfly is presumed extirpated from the Florida Keys. Bartram's scrub-hairstreak faces many threats across its range that are expected to continue. These include habitat degradation and fragmentation, poaching, predation, parasitism, disease, small, isolated populations, and pesticide use. Due to the subspecies' restricted range and reliance on pineland croton to complete its life cycle, habitat loss and degradation pose the greatest threat to the persistence of the species. Habitat changes resulting from development, sea level rise, stochastic weather events, and inadequate fire management result in changes to the habitat that will eliminate the ability of pineland croton to grow and Bartram's scrub-hairstreak

to persist. These changes are more likely to occur outside of Everglades National Park where increased urbanization and development, along with lack of habitat management, are expected to further fragment remaining suitable habitat. Sea level rise is expected to impact all known populations within the Everglades and the lower Florida Keys in the next 40-50 years. Some efforts to reduce the impact, timing, and frequency of the threats have been successful, but none of the threats have been eliminated and all still negatively impact the species. Therefore, we recommend that the Bartram's scrub-hairstreak butterfly continues to meet the definition of endangered.

RECOMMENDED FUTURE ACTIVITIES

Recovery Activities

This species does not have a final recovery plan. During this status review, we have identified the following potential recovery activities which are included below.

- Protect, restore, and manage remnant pine rocklands and associated habitats to increase functionality and connectivity throughout the Bartram's scrub-hairstreak's range to aid in butterfly dispersal between larger occupied fragments and conservation lands in Florida.
- Acquire, protect, and restore tracts of degraded or historical pine rocklands.
- Promote adequate fire management (such as prescribed burning) within pine rocklands to mitigate the negative effects of habitat loss and degradation on Bartram's scrub-hairstreak population viability.
- Limit the application of mosquito control pesticides on and around Bartram's scrub-hairstreak habitat, particularly in sites where the butterfly is known to occur.
- Conduct invasive species removal efforts to target predators and parasites of Bartram's scrub-hairstreaks.
- Conduct greater enforcement of poaching laws to limit illegal collection of the species.
- Develop captive propagation and reintroduction plans.

Monitoring / Research Activities

- Continue to monitor existing populations and suitable habitat patches for presence/abundance of the butterfly.
- Work with partners to continue to:
    - Evaluate the genetic viability of the Bartram's scrub-hairstreak, as well as that of pineland croton throughout Miami-Dade and Monroe Counties.
    - Conduct research on Bartram's scrub-hairstreak ecology and habitat requirements to inform future recovery actions, including reintroduction protocols.
    - Evaluate the potential effects towards the pine rocklands and listed species within resulting from changes in regional hydrology from Everglades restoration in Everglades National Park.

- Study the predicted effects of sea level rise, other climate change induced weather events (e.g., hurricanes and droughts) and temperature increases, and increased development on pine rockland habitat and the species.
- Study how extent of pineland croton will change under sea level rise and climate change scenarios to best plan for where Bartram's scrub-hairstreak can occur in the future.

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RESULTS

U.S. FISH AND WILDLIFE SERVICE
Status Review of Bartram's scrub-hairstreak

Status Recommendation:
On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist:
____ *The species is extinct*
____ *The species does not meet the definition of an endangered or threatened species.*
____ *The listed entity does not meet the statutory definition of a species.*
_x__ No change needed

FIELD OFFICE APPROVAL:

Acting for **Division Manager, Florida Ecological Services Field Office, Fish and Wildlife Service**

Approve NICOLE COLANGELO Digitally signed by NICOLE COLANGELO Date: 2024.07.09 10:05:26 -04'00'

LEAD REGIONAL OFFICE APPROVAL:

Acting for **Assistant Regional Director – Ecological Services, Fish and Wildlife Service**

Approve AARON VALENTA Digitally signed by AARON VALENTA Date: 2024.07.09 12:50:51 -04'00'