BEFORE THE SECRETARY OF THE INTERIOR

Petition to List Jobé Bluecurls (*Trichostema hobe*) as Threatened or Endangered Under the Endangered Species Act and to Designate Critical Habitat

Credit: Kevan Schoonover McClelland

Submitted by:
Center for Biological Diversity
Kevan Schoonover McClelland, PhD

December 5, 2024

NOTICE OF PETITION

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Dear Secretary Haaland,

Pursuant to Section 4(b) of the Endangered Species Act (ESA), 16 U.S.C. § 1533(b); section 553(e) of the Administrative Procedure Act (APA), 5 U.S.C. § 553(e); and 50 C.F.R. § 424.14(a), the Center for Biological Diversity and Dr. Kevan Schoonover McClelland hereby petition the Secretary of the Interior, through the U.S. Fish and Wildlife Service (USFWS), to protect Jobé bluecurls (*Trichostema hobe*) as a threatened or endangered species under the ESA.

This petition requests listing of Jobé bluecurls based on historical, current, and imminent threats from habitat destruction, degradation, and fragmentation; invasive species; pollinator declines; climate change; inherent vulnerability from being a narrow-ranging endemic species; and inadequate regulatory measures to address these mounting threats and vulnerabilities. Petitioners also request that

critical habitat be designated concurrently with the listing, pursuant to 16 U.S.C § 1533(a)(3)(A) and 50 C.F.R. § 424.12.

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

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

Dr. Kevan Schoonover McClelland has a Ph.D. in Biology with a focus on Evolution, Ecology, and Organismal Biology. His research topics focused on plant nomenclature, taxonomy, phylogenetics, ecology, and biogeography. He co-authored research establishing seven new species of *Trichostema*, including *Trichostema hobe*.

We submit this petition on behalf of our staff and members who hold an interest in protecting Jobé bluecurls.

Submitted this 5th day of December, 2024.

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Executive Summary

Named in part for the native people who once shared their endemic range and in part for their striking blue-violet blooms with deeply curled stamen, Jobé bluecurls are perennial plants found only in an exceedingly small area of coastal scrub habitat on the Jupiter Ridge in Martin County, Florida. Only recently identified as a distinct species in 2023, this rare flower is known to occur in less than 20 existing populations. These few populations are at risk of extinction because of historical habitat destruction, ongoing and imminent threats of more habitat destruction for development, habitat degradation from lack of fire, invasive species, and climate change.

Existing regulatory mechanisms are insufficient to protect Jobé bluecurls from the individual, cumulative, and synergistic effects of these threats. Notably, more than two-thirds of the known bluecurls populations have been under a reoccurring threat of destruction to make way for a golf course development—despite their existence on public conservation land in a Florida State Park unit. While massive public opposition has paused the development plans, there is no assurance this existential threat will not resurface. Existing regulatory mechanisms have also failed to counteract habitat degradation from invasive species and lack of properly timed fire, which are both likely to worsen with the effects of global climate change, yet another threat that is unabated by existing regulatory mechanisms.

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

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

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

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

As detailed in this petition, Jobé bluecurls warrant listing under the ESA because of their inherent vulnerability due to their extremely small range and limited suitable habitat, and unabated threats from habitat destruction, degradation, and fragmentation; invasive species; and climate change. ESA protections—including designated critical habitat—would ensure Jobé bluecurls' survival and recovery by officially acknowledging the species' vulnerability to extinction, intentionally designating the species' most important habitat, and comprehensively planning for increasing threats from invasive species, lack of prescribed fire, and climate change.

Introduction

Jobé bluecurls are bushy, flowering perennial plants with royal blue blooms that feature deeply curved, blue-stalked stamens and a mostly white lower petal bedecked with dark blue spots. The species' Latin name *hobe* (pronounced hoe-BAY) refers to Hobe Mountain and Hobe Sound, which are anglicized names derived from the village Jobé of the Jeaga, and later the Jobé, Indians who inhabited the plant's endemic area (McClelland et al. 2023, p. 123).

Exceedingly rare, Jobé bluecurls grow only on the Jupiter Ridge in Martin County, Florida. Nearly the entire known range of the species can be seen from the summit of Hobe Mountain (McClelland et al. 2023, p. 123). Because of the species' exceedingly small range, and that only 20 occurrences are known, Jobé bluecurls face a significant risk of extinction—most notably from habitat destruction and degradation.

Although the species exists on public lands, this alone is not sufficient to protect it. Notably, the majority of populations, which grow in Jonathan Dickinson State Park, have been under consistent threat from golf course developments, with the most recent proposal in August 2024 (FDEP 2024, entire). Until USFWS lists Jobé bluecurls under the ESA and concurrently designates critical habitat, it is likely that the species will continue to be threatened by incompatible management decisions that threaten to degrade or destroy their habitat.

I. Natural History and Biology of Jobé Bluecurls

a. Taxonomy

Kingdom	*Plantae*
Phylum	*Anthophyta*
Class	*Dicotyledoneae*
Order	*Lamiales*
Family	*Lamiaceae*
Genus	*Trichostema*
Species	*Hobe*

Jobé bluecurls (*Trichostema hobe* K. S. McClell.) are in the mint family (*Lamiaceae*); specifically, a genus of mints (*Trichostema*) endemic to North America (McClelland et al. 2023, p. 95). First described in 2023, the species was separated from the Florida scrub bluecurls (*T. suffrutescens*) based on genetic, as well as morphological and geographic, distinctions (McClelland et al. 2023, pp. 122–126;

NatureServe 2024, entire).[2] *T. hobe* differs from *T. suffrutescens* by its bushier (extensively and repeatedly branched) habit (*vs*. virgate), later flowering time of mid-October–mid-January (*vs*. August–early November), and a geographic restriction to the Jupiter Ridge (*vs*. a geographic restriction to the main central ridge systems) (McClelland et al. 2023, p. 122).

Jobé bluecurls are one of 10 unique species of bluecurls that can be found in Florida (McClelland et al. 2023, pp. 129–130). Shaped by millions of years of dynamic geologic change, Florida's xeric landscapes support a high number of endemic taxa and exhibit distinct biogeographic patterns that are observed in few other areas of the world with similar geological and climatic conditions (McClelland et al. 2023, p. 95). In particular, the ridge systems of peninsular Florida have provided isolated xeric habitats where speciation has occurred, notably in the genus of North American mints, *Trichostema*, which includes morphologically and ecologically distinct entities that occur on various xeric ridges of Florida's peninsula and barrier island chains (McClelland et al. 2023, p. 95). In addition to Jobé bluecurls, the other species of bluecurls found in Florida are: *T. dichotomum* (forked bluecurls), *T. setaceum* (narrow-leaf bluecurls), *T. suffrutescens* (Florida scrub bluecurls), *T. floridanum* (Florida coastal bluecurls), *T. fruticosum* (bushy bluecurls), *T. latens* (hidden bluecurls), *T. bridgesii-orzellii* (Bridge's and Orzell's bluecurls), *T. gracile* (flatwoods bluecurls), *T. microphyllum* (small-leaved bluecurls) (McClelland et al. 2023, pp. 129–130).

b. Species Description

Jobé bluecurls are partially woody, branching, bushy perennial plants that grow up to 60 centimeters tall (McClelland et al. 2023, p.123). Their buds are purple-black to dark blue-purple (McClelland et al. 2023, p.123). Blooms are striking, vivid blue-violet with five petals, the lower and largest of which has a white patch with dark purple spots (though some flowers also have spots on the upper petals), and long, purple, deeply curled stamen (McClelland et al. 2023, p.123; McClelland 2021, at 43:11–43:49). Their stems have tiny, short, down-curved hairs, and their leaves are narrow, elliptical, and typically widest toward the tip (obovate) or near the middle (McClelland et al. 2023, p.123). They also produce very small fruits, called nutlets, with large ridges (McClelland et al. 2023, p.123). Jobé bluecurls have both fragrant flowers and aromatic foliage that effuse gentle, sweet, minty scent.

[2] Building upon whole-genus studies of *Trichostema* by Lewis (1945, 1960) and Huang et al. (2008), McClelland et al. (2023) used a multi-pronged approach assessing morphological, ecological, cytological, and genetic diversity, resulting in the identification of seven new species (McClelland et al. 2023, entire).

McClelland et al. (2023) provide a detailed description:

> Suffrutescent to bushy perennial to 60 cm tall; branching throughout the plant; stem hairs downwardly curved to two, rarely to three, cells long . . . , with sessile glands; node hairs downwardly curved, to two, rarely to three, cells long . . . ; leaves widest towards the tip or near the middle, occasionally widest towards the base, (0.99–)1.29–1.55(–1.7) × (0.33–)0.45–0.6(–0.69), average of 1.42 × 0.53, cm, (2.03–)2.46–2.98(–3.33), average of 2.72, times long as wide, base cuneate to attenuate, margin entire, apex rounded, rarely emarginate; inflorescence hairs spreading to downwardly curved, rarely upwardly curved, to two, rarely to three, cells long, with sessile and spreading glands to two cells long (including gland); bracts widest towards the tip, (2.5–)3.49–4.89(–5.5) × (0.7–)1.17–1.73(–2), average of 4.19 × 1.45, mm, (1.67–)2.34–3.61(–4.58), average of 2.97, times long as wide, base cuneate to attenuate, margin entire, apex rounded, rarely acute to ±90°; fruiting calyx (4.8–)4.85–5.45(–5.9), average of 5.15, mm long; buds purple-black to dark blue-purple, corolla dark blue or blue-purple to blue or blue-purple; anthers dark blue or blue-purple to blue or blue-purple; style bifid, the longer arm 2.5–3.5, rarely as little as 2, times as long as the shorter; mature nutlets alveolate, (1.5–)1.53–1.68(–1.8), average of 1.6, mm long, hilum (0.5–)0.56–0.71(–0.8), average of 0.63, mm long, (0.29–)0.34–0.45(–0.47), average of 0.4, times the length of the nutlet alveoli small, ridges mid-sized to short . . . .

Figures 1–3, below, present images of Jobé bluecurls.

Figure 1: Suffrutescent to bushy growth of Jobé bluecurls (credit: Kevan Schoonover McClelland)

Figure 2: Blue-violet blooms of Jobé bluecurls (credit: Kevan Schoonover McClelland)

Figure 3: Stem and node hairs of Jobé bluecurls (credit: Kevan Schoonover McClelland)

c. Life History

Jobé bluecurls are perennial, which means they can persist for several years (McClelland et al. 2023, p.122). The species flowers and fruits (called "nutlets") October to January, though some plants will have a small number of Flowers in spring (McClelland et al. 2023, p.123).

Bluecurls are a nectar source for a variety of insects (butterflies, hoverflies, small bees, ants), but pollination is solely by bees (McClelland 2021, at 5:56–6:16; FNPS undated, entire). When a bee lands on the flower, it bends the flower, which brushes the stamen on the back of the bee, depositing pollen, which can then be picked up by the stigma of the next flower (McClelland 2021, 6:39–7:06). Forked bluecurls (*T. dichotomum*), which are in the same genus as Jobé bluecurls, have been documented to attract *Caupolicana electa* (a species of plasterer bee) and *Dialictus placidensis* (a species of sweat bee) (Deyrup et al. 2002), as well as bumblebees (McClelland 2021, at 6:16–6:38).

d. Habitat Requirements

Jobé bluecurls live in very dry coastal scrub environments (McClelland et al. 2023, p. 124). Scrub communities are found on dry, infertile, sandy ridges and are characterized by evergreen shrubs, with or without a canopy of pines (FNAI 2010, p. 49). Scrub dominated by a sand pine canopy is usually found on the highest sandy ridgelines and have an understory of scrub oaks or Florida rosemary (FNAI 2010, p. 50). Scrub occurs on either white (St. Lucie, Archbold) or yellow (Astatula, Paola), low-nutrient, acid sands with little organic matter (FNAI 2010, p. 50). Scrub is located on dry, infertile, sandy ridges that often mark the location of former Plio-Pleistocene shorelines (FNAI 2010, p. 50). Scrub is a fire-maintained community; however, it is not easily ignited, which suggests that it burns less frequently than other communities (FNAI 2010, p. 50).

More research is needed on optimal habitat conditions and how this species responds to fire (NatureServe 2024, entire).However, information is available about habitat conditions in communities where the species persists.

Based on field-observations, Jobé bluecurls are typically sandy opening specialists and do not take competition for space and light well (McClelland 2024, pers. comm.). More sun exposure yields more flowers (McClelland 2024, pers. comm.). Accordingly, exposure to periodic fire likely benefits the species by maintaining open conditions. In related species, smoke exposure was also observed to increase germination rate (McClelland 2022, p. 299–317). One of the largest populations ever observed was along a main fire lane near the entrance of Seabranch Preserve State Park in an area that had been burned recently (McClelland 2024, pers. comm.).

In Seabranch Preserve State Park, Jobé bluecurls have been observed on Paola and St. Lucie Sand, 0 to 8 percent slopes, in scrub communities (FDEP 2014, pp. 17, 21).The scrub community in the preserve is dominated by sand pines, with several species of scrub oaks, hickory, saw palmetto, open patches of sand, and herbaceous plants forming the understory (FDEP 2014, p. 20). The scrub has been treated with prescribed fire (FDEP 2014, p. 23). Managers have concluded that prescribed fire is an important tool to achieve pyrodiversity and optimal habitat conditions (FDEP 2014, p. 23). Managers' future desired condition of the scrub includes an oak-dominant canopy of varying height with scattered openings and bare patches of sand that support imperiled and endemic plant species (FDEP 2014, pp. 20–21). Sand pine, where present, would not be dominant (FDEP 2014, p. 20). The current optimal fire return interval target for the preserve is 8–15 years to achieve a mosaic of burned and unburned areas (FDEP 2014, p. 20).

In Jonathan Dickinson State Park, Jobé bluecurls have been observed in scrub communities with Paola and St. Lucie sands, 0–8 and 8–20 percent slopes, and Archbold sand (FDEP 2012, pp. 18, 21, 31). Soil types in these areas are generally very sterile and dry (FDEP 2012, pp. 18). Managers' future desired condition of the scrub includes an oak-dominant canopy of varying height with scattered openings and bare patches of sand that support imperiled and endemic plant species (FDEP 2012, pp. 34–35). Sand pine, where present, would not be dominant (FDEP 2012, p. 34). The current optimal fire return interval target for the preserve is 5–20 years to achieve a mosaic of burned and unburned areas (FDEP 2012, p. 34).

e. Current and Historical Range

Jobé bluecurls are endemic only to the Jupiter Ridge in Martin County, Florida (McClelland et al. 2023, p.122, 124). Their historical range includes a narrow strip of scrub along part of the Indian River from Seabranch State Preserve to Jonathan Dickinson State Park, 5–19 meters in elevation (McClelland et al. 2023, pp.124–26) (see Figure 4, below). The current range is significantly smaller than the historical range due to habitat destruction and fragmentation from urban development (McClelland 2021, at 42:30–42:51). The calculated range extent is approximately 40 km^2,[3] with a smaller area of occupancy (McClelland 2024, pers. comm.; NatureServe 2024, entire). When comparing the historical range (~9,701 acres) with remaining habitat patches within the range (~4,001 acres), only 41.2% of Jobé bluecurls' historical range still contains suitable habitat for the species (see Figures 5 and 6, below).

The species has only been documented at Jonathan Dickinson State Park (around Hobe Mountain), Seabranch Preserve State Park, and Hobe Sound National Wildlife

[3] This range is likely an overestimate, as it does not account for every area of unsuitable habitat, like depression ponds, within the range (McClelland 2024, pers. comm.).

Refuge (McClelland et al. 2023, p.126; McClelland 2021, at 44:28–44:46). The species potentially occurs in preserves in Palm Beach County in the Jupiter area; however, this has not been verified (McClelland et al. 2023, p.123).

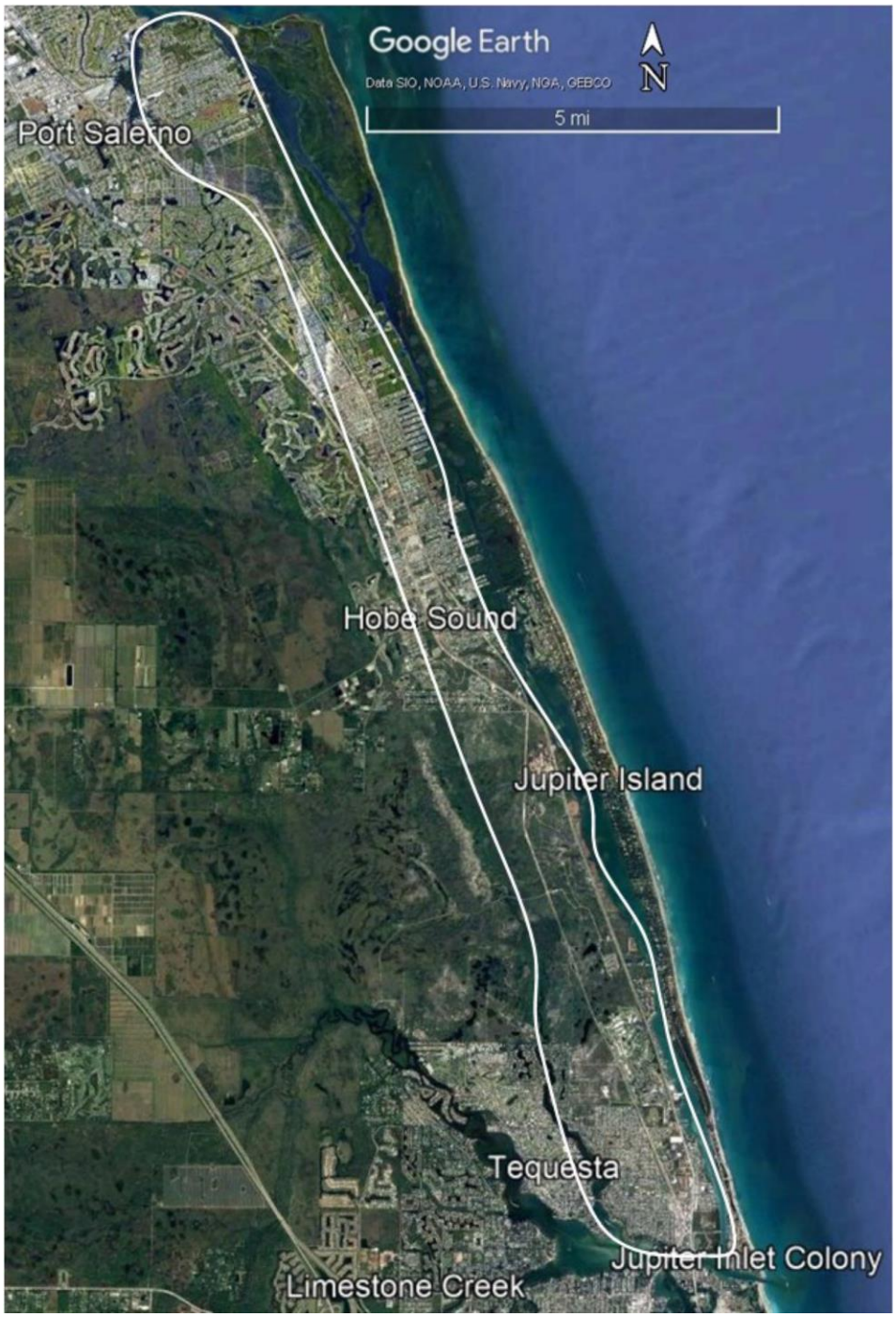

Figure 4: Approximate historical range of *Trichostema hobe* based on field data and herbarium records (McClelland et al. 2023, p. 125).

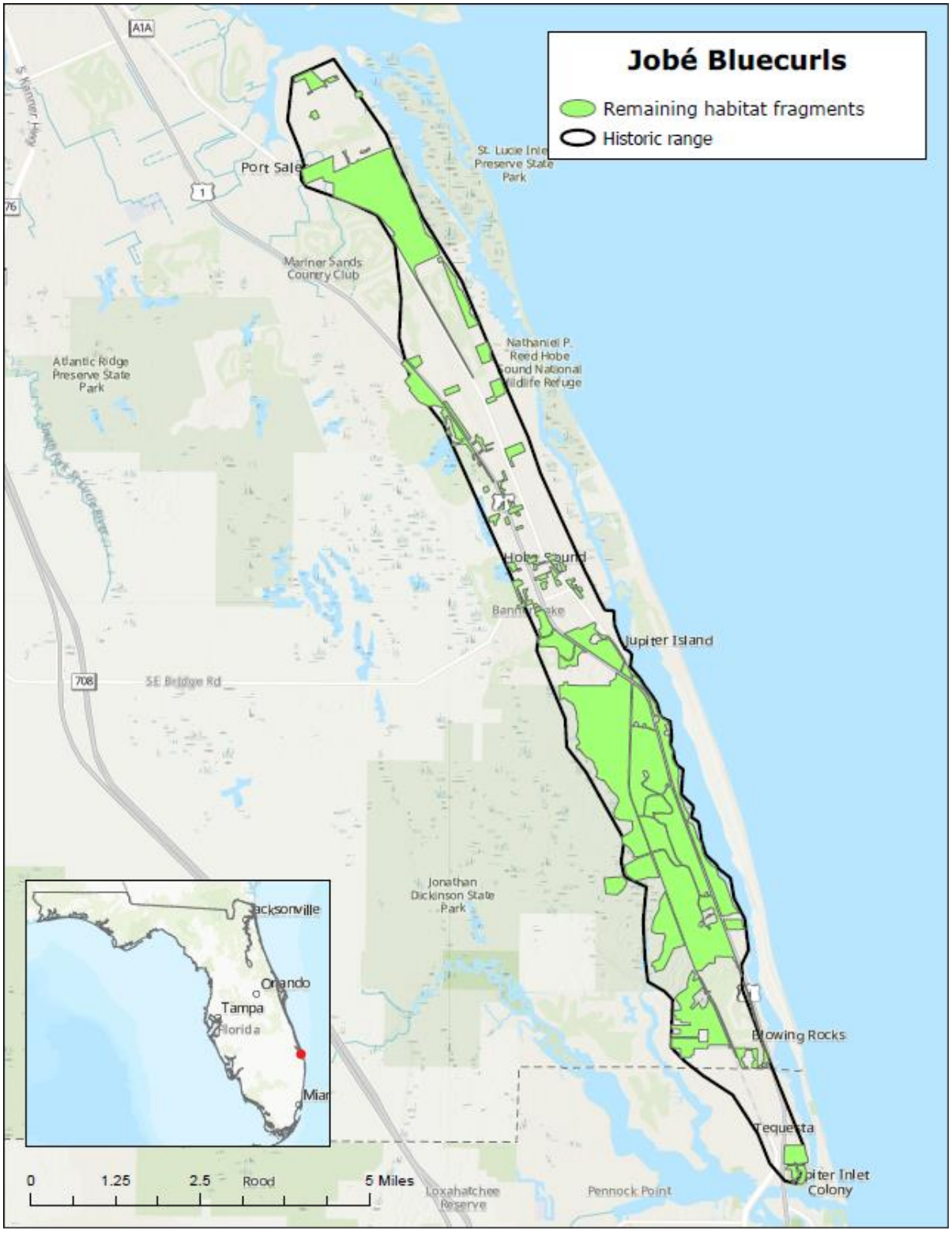

Figure 5: Comparison of historical range and current extent of suitable habitat (Map credit: Curt Bradley, Center for Biological Diversity; shapefiles provided by McClelland 2024, pers. comm.)

Figure 6: Comparison of historical range and current extent of suitable habitat with aerial images (McClelland 2024, pers. comm.)

f. Population status

There are less than 20 known occurrences of Jobé bluecurls. The species likely suffered historical declines from habitat loss caused by development (NatureServe 2024, entire; McClelland 2021, at 42:30–42:51).

The populations occur on conservation lands and are presumed to have good viability (NatureServe 2024, entire), and existing populations have large numbers of plants (McClelland 2021, at 43:00–43:07). However, short-term trends are unknown (NatureServe 2024, entire), and the species' extremely small range makes it inherently vulnerable to current and future threats described below (NatureServe 2024, entire).

Jobé bluecurls have a NatureServe status of G2 (Imperiled) because of their small endemic range (~47 km^2) and because of the small number (<20) of known occurrences (NatureServe 2024, entire). Additionally, the species is a habitat specialist restricted to coastal scrub in Martin County, Florida, whose key requirements are scarce (NatureServe 2024, entire).

II. Threats to Jobé Bluecurls (Five ESA Listing Factors)

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

Jobé bluecurls are threatened by past, present, and threatened destruction, degradation, and fragmentation of its habitat, leading to curtailment of its historical range.

Habitat Destruction

Jobé bluecurls range and habitat have been significantly impacted by historical habitat destruction for urban development (McClelland 2021, at 42:30–42:51). Only 41.2% (~4,001 acres) of Jobé bluecurls' historical range (~9,701 acres) still contains suitable habitat for the species (see Figures 5 and 6, above).

Even though all known occurrences of Jobé bluecurls are on public conservation lands, a large number of populations remain at risk from ongoing development proposals. For example, there have been multiple proposals to develop a golf course in Jonathan Dickinson State Park. In 2011, Florida Sen. John Thrasher and Rep. Patrick Rooney Jr. introduced a pair of bills (SB 1846 and HB 1239) that would have required state park officials to hire golfer Jack Nicklaus's design firm to build golf courses in state parks in every region of the state (Pittman 2011, entire). HB 1339 (2011) specifically pinpointed Jonathan Dickinson State Park as a proposed development location, stating that the state "shall establish and supervise the

development and operation of the Jack Nicklaus Golf Trail of Florida . . . within each of the five park regions . . . , including one such facility at Jonathan Dickinson State Park in Martin County."[4] Fla. HB 1239 (2011). The potential impacts were substantial, with the bill requiring that "[e]ach public golf facility shall include, at a minimum, an 18-hole public golf course, a practice area, a clubhouse with limited food service and parking, and a golf course maintenance building," and allowing that such facilities "may include a hotel." *Id.* Following significant public backlash to the proposal, the bills were withdrawn (Pittman 2011, entire).

Yet again in August 2024, the Florida Department of Environmental Protection (FDEP), which oversees and manages Florida's state parks, proposed a golf course development in Jonathan Dickinson State Park, along with developments in eight other state parks (FDEP 2024a, entire; FDEP 2024b, entire). The proposed plan amendment for Jonathan Dickinson State Park included "construction of public golf courses and associated facilities," which would also "necessitate the relocation of existing park entrance, management office complex, staff residences, and other ancillary facilities" to "other park areas" (FDEP 2024c, entire). Notably, the conceptual land use map for the proposal (Figure 7, below) shows the footprint of the proposed golf facilities directly overlapping with Hobe Mountain (FDEP 2024d, entire), which is where Jobé bluecurls are known to occur (McClelland 2021, at 44:30–44:34).[5] A comparison of the proposed golf-course footprint and the bluecurls' remaining habitat patches demonstrates that the proposed golf course would destroy ~848 acres of habitat, which is ~21% of all remaining habitat for the species, and it would impact at least 7 bluecurls observation locations (McClelland 2024, pers. comm.; Figure 8, below).

[4] The house bill required that a golf course be developed in Jonathan Dickinson State Park despite the fact that there was already a private golf course, the Jupiter Island Club, just two miles away (Pittman 2011, entire).

[5] This location amidst scrub habitat in the park was proposed despite FDEP's claim that "[a]voidance of sensitive habitat will be a priority in the design of the proposed facilities." (FDEP 2024c, entire).

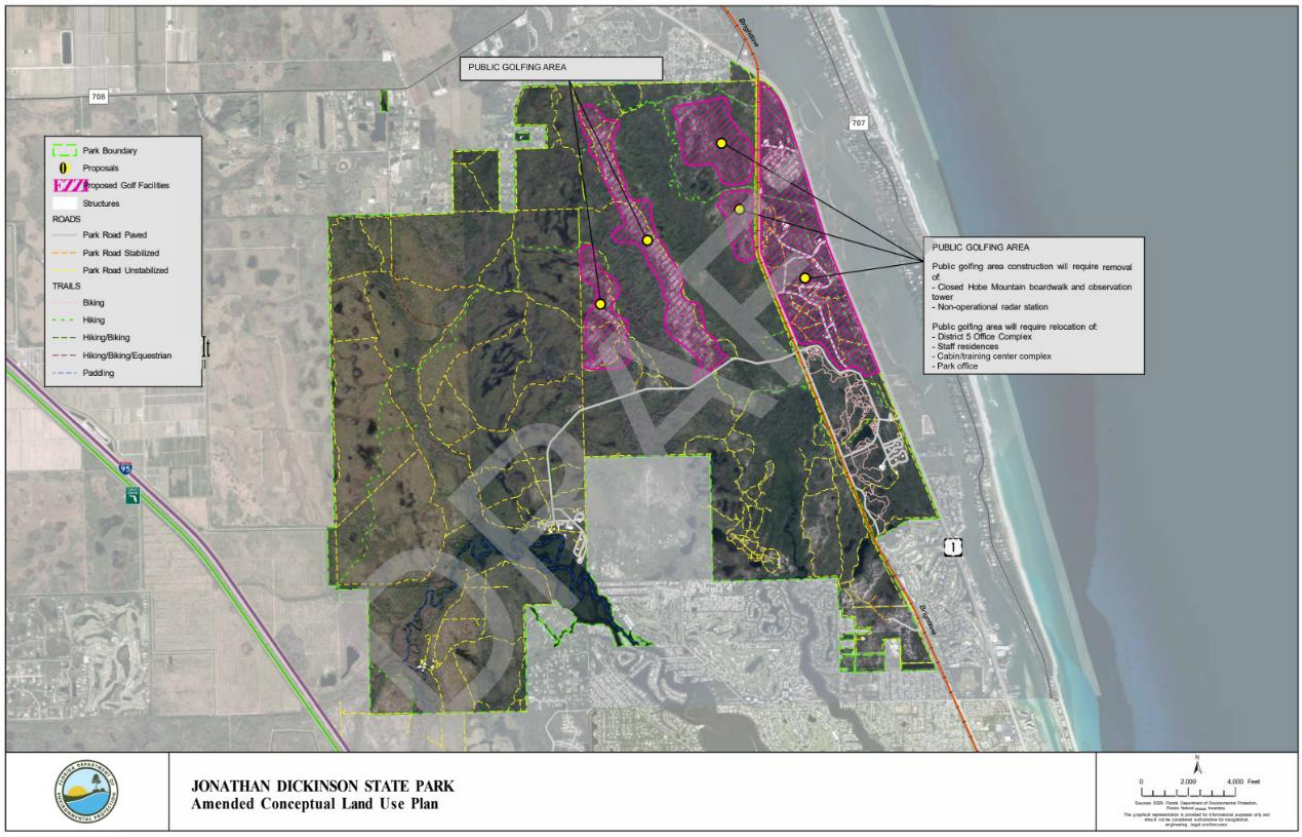

Figure 7: Jonathan Dickinson State Park Amended Conceptual Use Plan (FDEP 2024d)

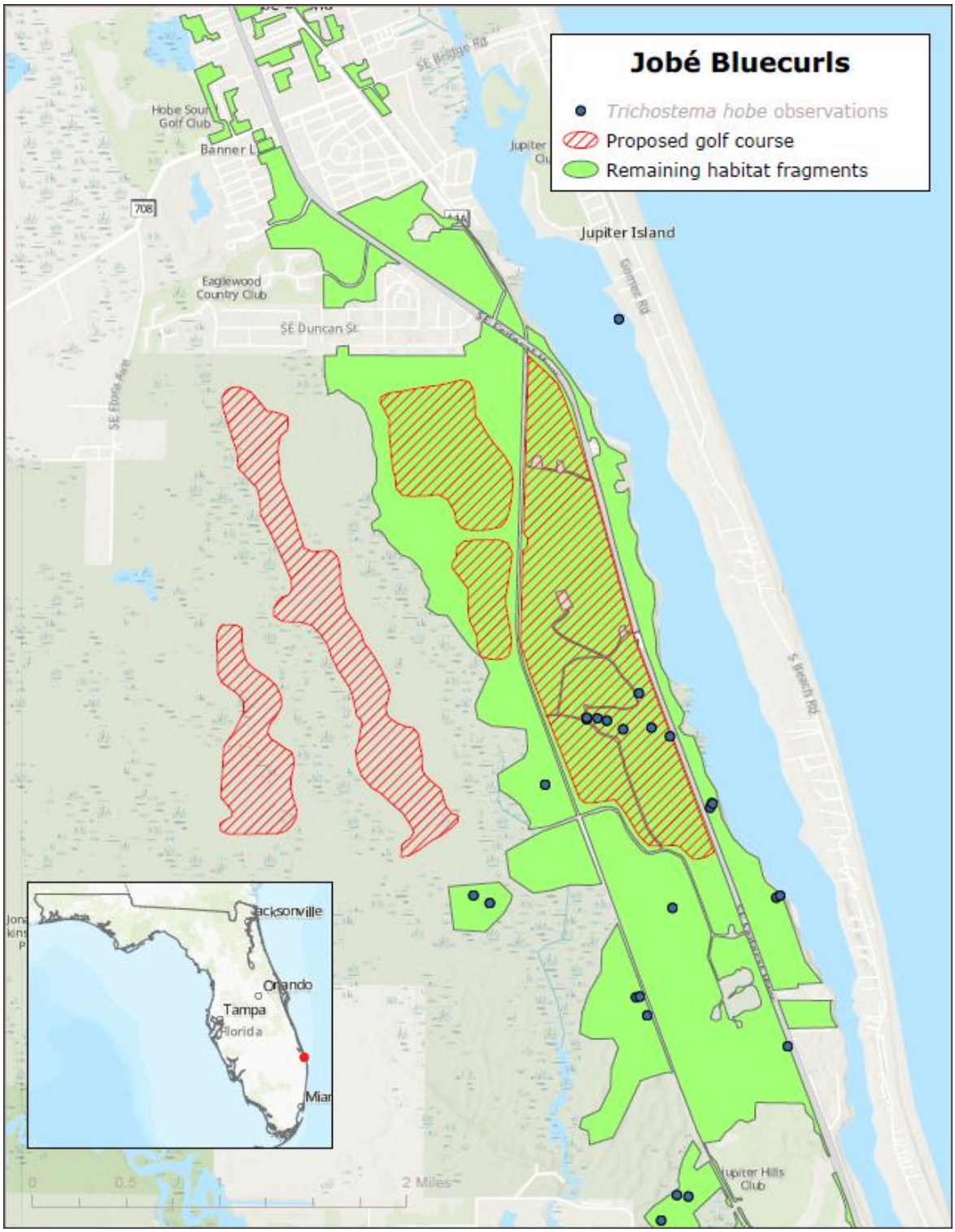

Figure 8: Map comparing footprint of proposed golf course (red hash polygons) with remaining habitat fragments for Jobé bluecurls (green polygons) and Jobé bluecurls observations (blue points) (map by Curt Bradley, Center for Biological Diversity; habitat shapefile and observation points provided by McClelland 2024, pers. comm.; golf course shapefile prepared from FDEP map)

Although the 2024 proposals, including the golf course proposal in Jonathan Dickinson State Park, have been withdrawn following widespread public condemnation (FDEP 2024b, entire), Governor Ron DeSantis stated in a press conference that the agency is merely postponing the proposals to "go[] back to the drawing board" (News4Jax 2024, at 0:20–0:40; Chesnes & Mahoney 2024, entire). While the governor indicated FDEP is "not doing anything this year," he did not affirmatively rule out future park development plans (News4Jax 2024, entire).

Habitat destruction has been driven by development for growing human populations, which continue to grow. Florida is the third most populous state in the United States (Wilder & Mackun 2024, entire). In recent years, Florida's metro areas have experienced massive population growth, reflecting continued population growth across the South, which was the nation's fastest-growing region from 2022–2023 (Wilder & Mackun 2024, entire). The population of the Port St. Lucie Metropolitan Statistical Area, which encompasses the bluecurls' range, was the fifth fastest-growing metro area in the nation, increasing by more than 3% to 536,901(See Figure 9 and Table 1, below) (Wilder & Mackun 2024, entire).

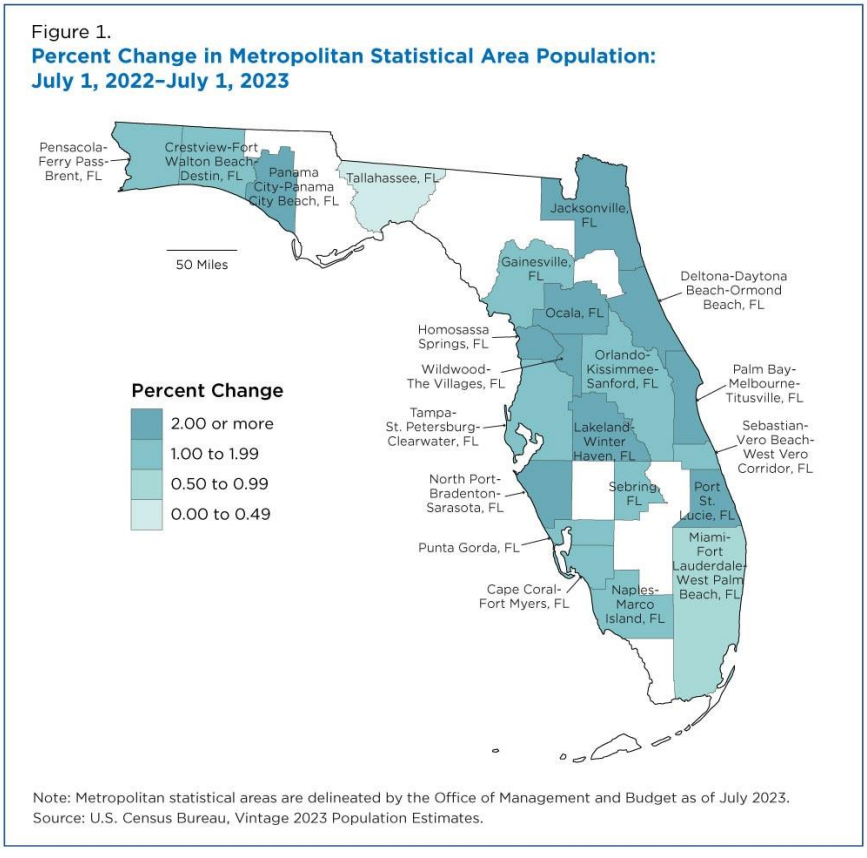

Figure 9: Florida's fastest-growing metropolitan areas between July 2022 and July 2023

Fastest-Growing U.S. Metro Areas: July 1, 2022–July 1, 2023

Rank	Metro area	Percent change
1	Wildwood-The Villages, FL	4.7
2	Lakeland-Winter Haven, FL	3.8
3	Myrtle Beach-Conway-North Myrtle Beach, SC	3.7
4	Ocala, FL	3.4
5	Port St. Lucie, FL	3.1
6	Hinesville, GA	2.9
7	Midland, TX	2.9
8	Spartanburg, SC	2.9
9	Wilmington, NC	2.8
10	Daphne-Fairhope-Foley, AL	2.8

Source: U.S. Census Bureau, Vintage 2023 Population Estimates.

Table 1: Top ten fastest-growing U.S. metro areas, showing the Port St. Lucie metro area as the fifth fastest-growing in the nation (Wilder & Mackun 2024, entire).

A swiftly growing human population around Jobé bluecurls' limited existing habitat, along with recurring plans to develop golf courses, lodging, and other recreational facilities within Florida State Parks—specifically within Jonathan Dickinson State Park—underscore that habitat destruction from development remains an ongoing threat despite Jobé bluecurls' occurrences on public lands.

Habitat Fragmentation

Jobé bluecurls are also threatened by habitat fragmentation (McClelland 2021, at 42:30–42:51). Habitat fragmentation has an overall large and negative effect on plant pollination and plant reproduction (Aguilar et al. 2006, entire).

Habitat degradation

Jobé bluecurls are also threatened by habitat degradation resulting from fire suppression, which leads to increased fire intensity (NatureServe 2024, entire). Historical fire suppression has changed the natural processes and composition of many fragments of Florida scrub (MacAllister & Harper, p. 4). Existing urban development around existing scrub within the bluecurls' limited range makes necessary prescribed fire application more difficult (FDEP 2014, p. 20, 23; USFWS 2006, p. 25; *see* Kupfer et al. 2022, p. 4 (describing constraints on prescribed burning in longleaf pine ecosystems, including public concern and nearby development).

A number of rare plants in scrub ecosystems require the structure of open patches of sand and vegetation that are created under a natural fire regime (MacAllister & Harper, p. 4). Therefore, available literature suggests that prescribed burning that

mimics natural burn patterns is necessary to maintain most of Florida's scrub communities (MacAllister & Harper, p. 4). While scrub is a fire-maintained community, it is not easily ignited, suggesting that scrub naturally burned less frequently than communities with a more easily ignited grassy groundcover, such as sandhill and mesic flatwoods (FNAI 2010, p. 50). In coastal scrub habitat, prescribed fire should occur during the growing season every 10–25 years (NatureServe 2024, entire; *see also* FNAI 2010, pp. 49–53).

Management with prescribed fire has proven difficult within the bluecurls' limited range, which is significantly hemmed in between urban development and the Atlantic coast. For example, although prescribed fire is part of the unit management plan for Jonathan Dickinson State Park, FDEP noted that "[t]he park's general burning program needs to continue to grow in both sophistication and implementation due to smoke-management problems and designated-species considerations. Most importantly, the burn program needs to be consistent year to year in terms of acreage burned and number of prescribed fires executed in a year" (FDEP 2012, p. 83). Seabranch Preserve State Park also implements prescribed burning; however, the unit management plan has identified significant "obstacles," noting that "[b]ased on the suburban nature of the park, its proximity to the Atlantic Ocean, critical smoke areas, increased fuel loads and the sea breeze, needed burn windows can be hard to come by" (FDEP 2014, p. 20). These obstacles have resulted in management zones that were considered to be "in poor condition" and deemed nearly "impossible" (FDEP 2014, p. 23). Likewise, USFWS has described attempts at prescribed burning on Hobe Sound National Wildlife Refuge as "extremely difficult due to the very restrictive weather conditions associated with the refuge's proximity to a federal highway" (USFWS 2006, p. 25).

b. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization is not known threaten Jobé bluecurls. However, given the species' limited range and small number of populations, collection activities could present a significant threat.

c. Disease or Predation

Disease and predation are not known to threaten Jobé bluecurls.

d. Inadequacy of Existing Regulatory Mechanisms

Existing federal, state, and local regulatory mechanisms are inadequate to protect against threats to Jobé bluecurls, which include habitat destruction, degradation, and fragmentation; invasive species; and climate change. Existing mechanisms have not prevented the loss of suitable habitat within the bluecurls' historical range

and cannot prevent recurring attempts to develop projects that would destroy critically important habitat in the species' highly limited range.

All known occurrences of Jobé bluecurls are found on public conservation lands: Jonathan Dickinson State Park, Seabranch Preserve State Park, and Hobe Sound National Wildlife Refuge. However, existing regulations are insufficient to ensure their habitat is protected across much of their known occupied range. Bluecurls on state park lands are vulnerable to direct impacts from park management activities. They are also vulnerable to indirect impacts from surrounding development, as well as impacts from climate change. Other existing state and federal regulatory mechanisms have been insufficient to curb major threats to the species.

State Regulatory Mechanisms

State Native Plant Protection Laws

State native plant protection laws and associated regulations do not adequately protect Jobé bluecurls. The Preservation of Native Flora of Florida statute (PNFFS), Fla. Stat. § 581.185 (2024), and the related Endangered Plant Advisory Committee statute (EPACS), *id.* § 581.186, provide state legal protections for rare plants in Florida (Regan 2003, pp. 72–73; Regan 2004, p .125). These statutes regulate the "harvesting"[6] and commercial exploitation of listed, protected plant species (Regan 2004, at 143).

The PNFFS was intended to "provide recognition of those plant species native to the state that are endangered, threatened, or commercially exploited." Fla. Stat. § 581.185(1). The statute provides for the goal of protecting native flora from unlawful harvesting on both public and privately owned lands. It also establishes a permitting system in an effort to "provide an orderly and controlled procedure for restricted harvesting of native flora from the wild, thus preventing wanton exploitation of native species of flora." *Id.* The Florida Department of Agriculture and Consumer Services (FDACS) administers the PNFFS. PNFFS authorizes FDACS to adopt rules relating to the "listing, delisting, and changing from one category to another category any plant on the Regulated Plant Index." *Id.* § 581.185(4). The Regulated Plant Index[7] is the list of plant species that FDACS designates as

[6] Under the PNFFS, "harvest" means "to dig up, remove, or cut and remove from the place where grown." Fla. Stat. § 581.185(2)(c).

[7] The list of protected plants can be accessed at Florida Administrative Code Rule 5B-40.0055 (2020)

"endangered,"[8] "threatened,"[9] or "commercially exploited."[10]

The Endangered Plant Advisory Council, a committee created by the EPACS, consists of seven members and has specified duties. *Id*. § 581.186. These duties include advising the department about proposals for revising the two statutes, reviewing the species on the Regulated Plant Index, and considering native plants proposed for inclusion. *Id*. § 581.186(3). The council considers a number of factors including occurrences, abundance, range, existing protections (if any), degree of threat, and special considerations like endemism or rarity of pollinators (FDACS Division of Plant Industry (undated), entire; Anderson 2021, 11:03–18:24).

The PNFFS makes it unlawful for any person to willfully destroy or harvest any plant that is listed as endangered on the Regulated Plant Index from private or public land without first: obtaining written permission from the landowner or legal representative of the landowner *and* obtaining a permit from FDACS.[11] *Id*. § 581.185(3)(a). However, PNFFS does not prohibit landowners from destroying endangered plants on their own property. *Id*. Species listed as threatened on the Regulated Plant Index have reduced protection than species listed as endangered, as no permit is required to destroy or harvest them. *Id*. § 581.185(3)(b). For species listed as commercially exploited on the Regulated Plant Index, permission from the landowner is required to destroy or harvest any plants, but a permit is only required if three or more plants are destroyed or harvested. *Id*. § 581.185(3)(c). The PNFFS also makes it unlawful to sell, offer to sell, or transport to sell plants listed on the Regulated Plant Index, except for species listed as threatened, even if a private landowner obtained the plants from their own land. *Id*. § 581.185(3)(d).

Jobé bluecurls are not on Florida's Endangered Plant List, Threatened Plant List, or Commercially Exploited Plant List. 5B-40.0055 F.A.C. (2020). Even if they were, the PNFFS does not adequately protect them against habitat destruction and degradation. The PNFFS states that the regulated plant index is "not to be used to regulate construction or other land alteration activities on any property," Fla. Stat. § 581.185(12), which is a significant threat to the bluecurls and their habitat. The statute specifically exempts "clearing or other disturbance of land for agricultural

[8] Endangered plants are "species of plants native to the state that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue." Fla. Stat. § 581.185(2)(b). This definition also includes ESA-listed species. *Id*.
[9] Threatened plants are "species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered." *Id*. § 581.185(2)(h)
[10] Commercially exploited plants are "species native to the state which are subject to being removed in significant numbers from native habitats in the state and sold or transported for sale." *Id*. § 581.185(2)(a).
[11] If a species is federally protected under the ESA, activities must be consistent with federal law. *Id*. § 581.185(3)(a).

purposes, fire control measures, or required mining assessment work," "clearing or removal of regulated plants from a canal, ditch, survey line, building site, or road or other right-of-way by the landowner or his or her agent," and "the clearing of land by a public agency or a publicly or privately owned public utility when acting in the performance of its obligation to provide service to the public." Fla. Stat. § 581.185(8)(a)–(c). Therefore, the statute provides no protection from the activities that destroy habitat and individual bluecurls (Regan 2003, entire). A significant limitation of Florida's rare plant protection statutes is that they only attempt to regulate the harvesting and commercial exploitation of rare plants as opposed to providing comprehensive protection for rare plant species and their habitats (Regan 2003, entire). The protected status afforded to plants listed on the regulated plant index can only be used for regulating the harvesting of plants.

Furthermore, the PNFFS limits use of the Regulated Plant Index to its own uses, and other agencies may not use it regulatory or conservation purposes (Regan 2003, entire). As the EPACS explains:

> The regulated plant index must be used *solely for the purposes specified in § 581.185 and may not be used for regulatory purposes by other agencies*. However, this section does not preclude another agency authorized to protect endangered plants from including one or more species listed on the regulated plant index on a list developed by that agency under its own regulatory authority.

Id. § 581.186(3) (emphasis added). Florida agencies engaged in conservation do not have the authority to list plant species; therefore, they cannot use the Regulated Plant Index as a basis for decision-making or conservation programs, including review of projects that may destroy listed plants' habitat (Regan 2003, entire). Although the PNFFS allows for cooperation between conservation agencies and the Endangered Plant Advisory Council, *id*. § 581.186(4), the extent of cooperation has reportedly been limited (Regan 2003, entire).

In conclusion, Jobé bluecurls are not protected on Florida's Endangered Plant List, Threatened Plant List, or Commercially Exploited Plant List, 5B-40.0055 F.A.C., and even if they were, these state law protections do not protect the bluecurls from past, ongoing, and future threats to individual plants and their habitat.

State Public Lands

Although Jobé bluecurls are present in Florida State Park units—Jonathan Dickinson State Park and Seabranch Preserve State Park —the laws and regulations governing the Florida State Park system are insufficient to protect the bluecurls from threats from habitat destruction, degradation, and fragmentation, and from invasive species and climate change. Under Florida Statutes, the Florida Department of

Environmental Protection's Division of Recreation and Parks is tasked with supervising, preserving, and managing Florida's public parks. Fla. Stat. § 258.004(1)–(2). It is the policy of the Division of Recreation and Parks to, first and foremost, "promote the state park system for the use, enjoyment, and benefit of the people of Florida and visitors," as well as to "conserve [the state's] natural values for all time" and "administer the development, use and maintenance of these lands and render such public service in so doing, in such a manner as to enable the people of Florida and visitors to enjoy these values without depleting them," and "to contribute to the tourist appeal of Florida." *Id.* § 258.037. The Division of Recreation and Parks explains its objective for park planning as "to achieve an equitable balance between preserving natural resources and providing public access for outdoor recreation" (FDEP 2024e, entire). There is an inherent opportunity for conflict between these management goals, which has borne out in management decisions that are adverse to conservation of native species including Jobé bluecurls. As explained above, the Florida State Parks system is vulnerable to legislation and state agency management decisions that are contrary to the conservation of the bluecurls' habitat, including the development of golf and other recreational facilities.

Federal Regulatory Mechanisms

Federal Conservation Laws

Jobé bluecurls are not currently protected under the ESA, which is designed to "halt and reverse the trend toward species extinction, whatever the cost." *Tenn. Valley Authority v. Hill*, 437 U.S. 153, 180, 184 (1978). There are no other federal laws with the explicit purpose to protect endangered or threatened native plants from the type of threats the bluecurls face.

To the extent the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321, *et seq.*, may govern federal actions affecting Jobé bluecurls, it is inadequate to protect the species from the threats they face. Although NEPA requires federal agencies to consider the environmental impacts of their actions, they are unlikely to specifically consider Jobé bluecurls because they are not designated on Florida's Regulated Plant Index or listed under the federal ESA. Furthermore, NEPA confers no substantive protections because it does not require any particular outcome. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332 (1989).

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

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

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

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

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

U.S. policies that promote fossil fuel production and infrastructure include enabling fracking by exempting it from the Safe Drinking Water Act, lifting the crude oil export ban, and providing billions in government subsidies to the fossil fuel industry (Erickson et al. 2017, entire; Oil Change International and Greenpeace 2020, entire; SEI, IISD, ODI, E3G and UNEP 2021, at 39). For example, after Congress lifted the 40-year-old crude oil export ban in December 2015, U.S. crude oil exports increased by 750% so that by 2019, one quarter of all U.S. oil production was exported (Oil Change International and Greenpeace 2020, entire). Exports continue to average

more than four million barrels per day (U.S. Energy Information Administration, 2024, entire).

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

Greater U.S. domestic production of oil and gas, facilitated through various domestic policies, will contribute greenhouse gas emissions that undercut efforts to meet the international Paris Agreement 1.5°C climate limit and avoid the worst damages of the climate crisis.
To meet the Paris Agreement target, the US needs to average a 6.9% emissions reduction every year from 2024 through 2030—more than triple the 1.9% drop in 2023" (King et al. 2024, entire). Scientific assessments (e.g., IPCC, International Energy Agency, United Nations) make clear that to meet the 1.5°C Paris climate benchmark, governments must immediately stop approving new fossil fuel extraction and infrastructure projects and phase out existing fossil fuel development (IPCC 2023, entire; Tong et al. 2019, entire; Stockholm Environment Institute 2019, entire; International Energy Agency 2021, entire; Trout et al. 2022, entire; International Energy Agency 2023). Yet the U.S. government has failed to use its existing authority to stop new fossil fuel projects or phase out existing projects. The U.S. is currently the world's top oil and gas producer. The U.S. has produced more crude oil than any nation in history for the past six years. The U.S. is now the world's largest exporter of petroleum products and fossil gas, with the largest planned expansion of oil and gas extraction (U.S. Energy Information Administration 2024a, entire; Stockholm Environment Institute 2023, entire; U.S. Energy Information Administration 2023b, entire; Oil Change International 2023, entire; Center for Biological Diversity 2019, entire).

In September 2023, President-elect Donald Trump has pledged to "unleash American oil and natural gas production," speeding federal drilling permits and "remov[ing] all red tape" delaying oil and natural gas projects, including speeding up approval of natural gas pipelines into the Marcellus Shale in Pennsylvania, West Virginia, and New York (Donald J Trump for President 2024, entire). He has also pledged to exit the Paris Climate Accords and oppose existing climate policies (Donald J Trump for President 2024, entire).

Federal Public Lands

The existence of Jobé bluecurls on federal public lands is not adequate to protect the species from existing threats. Some known occurrences of Jobé bluecurls exist in Nathaniel P. Reed Hobe Sound National Wildlife Refuge (Hobe Sound NWR).

Hobe Sound NWR is part of the National Wildlife Refuge System, which is managed by the U.S. Fish and Wildlife Service "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States." 16 U.S.C. § 668dd(a)(2). Management of national wildlife refuge units is governed by the National Wildlife Refuge System Administration Act of 1996, as amended by the National Wildlife Refuge Improvement Act of 1977 (NWRIA). *Id.* § 668dd. The NWRIA establishes wildlife conservation as the primary mission of the refuge system, and individual refuges are to be managed to fulfill the mission of the refuge system as a whole, the individual purpose of the refuge, and to maintain the biological integrity, diversity, and environmental health of the system (USFWS 2006, p. 4). *Id.* § 668dd(a)(4)(A)–(B). To ensure conservation goals are met, the NWRIA requires USFWS to propose and finalize a conservation plan (called a "comprehensive conservation plan" or "CCP") for each refuge unit. *Id.* § 668dd(e)(1)(A)(i), (iii). The CCP must be consistent with the purpose of the Refuge System and the specific refuge's purposes. If an apparent conflict exists between the purposes of an individual refuge and the mission of the System, "the conflict shall be resolved in a manner that *first protects the purposes of the refuge*, and, to the extent practicable, that also achieves the mission of the system." *Id.* § 668dd(a)(4)(D). All recreational uses of a refuge must also be "compatible" with the mission of the Refuge System and the individual refuge, as determined in the land manager's "sound professional judgment."[12] *Id.* § 668dd(a)(3)(B); 603 FW 2.6B.

Hobe Sound NWR was established to conserve threatened and endangered fish, wildlife, and plants (USFWS 2006, p. 7). To that end, refuge management goals for

[12] A resource manager's "sound professional judgment" includes consideration of the use's impacts on fish and wildlife management, as well as consideration of the availability of resources like funding, personnel, and facilities needed to manage and maintain the proposed use in a compatible manner. 603 FW 2.11A(1)–(2).

Hobe Sound NWR include wildlife habitat and population management and resource protection, as well as wildlife-dependent recreation and wildlife education (USFWS 2006, p. 66).

Although the refuge likely provides some conservation benefit to Jobé bluecurls, it is not sufficient to protect the species from existing threats. Because Jobé bluecurls are only recently described, Hobe Sound NWR's Comprehensive Conservation Plan does not provide specific management goals, objectives, and strategies for the species (USFWS 2006, entire). Likewise, it does not account for any management activities that may harm the bluecurls (USFWS 2006, entire). Moreover, the Comprehensive Conservation Plan is nearly three years out of date and therefore does not present a conservation plan that accounts for contemporary threats.[13] 16 U.S.C. § 668dd(e)(1)(A)(iv) (requiring that UFWS "shall . . . not less frequently than 15 years after the date of issuance of a conservation plan . . . and every 15 years thereafter, revise the conservation plan as may be necessary"). Finally, the entire National Wildlife Refuge System is facing an insufficient and declining budget and corresponding staffing crisis that threaten USFWS's ability to carry out the conservation and biodiversity protection goals for refuges in the system, including Hobe Sound NWR (NWRA 2024, entire). In any event, the NWRIA, corresponding regulations, and the Hobe Sound NWR CCP cannot halt and reverse climate change, nor adequately mitigate threats driven by climate change.

e. Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Jobé bluecurls are also threatened by invasive species, pollinator declines, climate change, and the inherent vulnerability of being a narrow-ranging endemic species.

i. Invasive Species

Exotic and invasive species are a significant threat to biodiversity worldwide, including in Jobé bluecurls' scrub habitat. Invasive exotic species can out-compete, displace, or destroy native species and their habitats, often because they have been released from the natural controls of their native range (FDEP 2012, p. 55). If left unchecked, invasive exotic plants alter the character, productivity, and conservation values of the natural areas they invade (FDEP 2012, p. 55).

According to FDEP's management plan for Jonathan Dickinson State Park, the largest invasive plant threat in the bluecurls' scrub habitat in the park is natal grass (*Melinis repens*), which is a very prolific plant that requires continued treatment to

[13] Having been published in December 2006, the comprehensive conservation plan was due for an update in December 2021. The 2006 plan specifies that it "articulates the Service's management direction (goals, objectives, and strategies) *for the next 15 years*" (USFWS 2006, p. 2) (emphasis added).

control it (FDEP 2012, p. 36). Other exotic plants in the park include Brazilian pepper (*Schinus terebinthifolia*), Madagascar periwinkle (*Catharanthus roseus*), rosary pea (*Abrus precatorius*) and Australian pine (*Casuarina equisetifolia*), which provide more localized threats to the overall health of this community than Natal grass (FDEP 2012, p. 36). Natal grass and rosary pea are relatively newer invasive species that have been slowly spreading throughout the park (FDEP 2012, p. 56). Natal grass is extremely fecund and potentially the worst invader of the scrub, meaning treatment efforts may be relatively challenging (FDEP 2012, p. 56).

In Seabranch Preserve State Park, infestations of herbaceous exotics such as rose natal grass and Madagascar periwinkle are found mainly along road and trail edges but have the potential to spread into critical open areas and out-compete native species (FDEP 2014, p. 23). Likewise, "[m]ajor issues" facing conservation of the bluecurls' habitat in Hobe Sound NWR include the "[e]ver-present threat of invasion by exotic species," which USFWS notes, "compete with native species for space" and "lacking natural predators to keep them in check, rapidly expand, forming dense, monotypic forest s and thickets" (USFWS 2006, pp. 1, 52). For example, Brazilian pepper is known to invade scrub habitat in the refuge (USFWS 2006, p. 52).

ii. Pollinator Declines

Documented declines in native pollinators—specifically, insects— also threaten Jobé bluecurls because the species is pollinated by native bees. There is growing evidence of global declines in both wild and domesticated pollinators, as well as corresponding declines in plants that rely on them (IPBES 2016, entire; Potts et al. 2010, entire; Biesmeijer et al. 2006, entire). The most comprehensive global report thus far on the status of pollinators found that more than 40 percent of them, mostly bees, are facing extinction (IPBES 2016, entire). A systematic review of the status of 4,337 North American and Hawaiian native bees concluded that, among native bees with sufficient data to assess, more than half (749 species) are declining, and nearly 1 in 4 (347 species) is imperiled and at increasing risk of extinction (Kopec & Burd 2017, entire). For many of the bee species lacking sufficient population data, it is likely they are also declining or at risk of extinction (Kopec & Burd 2017, entire). In forests in the southeastern United States, declines in pollinators were detected over a 15-year period from 2007–2022 (Ulyshen & Horn 2023, entire). Researchers observed and documented declines in the richness and abundance of bees, as well as the abundance of butterflies (Ulyshen & Horn 2023, entire). These findings suggest that pollinator declines may be occurring even in areas with relatively undisturbed habitat (Ulyshen & Horn 2023, entire). Relatedly, plant-pollinator coextinctions are projected to become more frequent as habitat alteration and climate change continue to threaten pollinators (Vieira et al. 2013, entire). Because Jobé bluecurls depend on native pollinators to reproduce, ongoing and projected pollinator extinctions threaten their existence.

iii. Climate Change

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

Indeed, while habitat destruction has been widely considered the greatest threat to plant species worldwide, experts believe the impacts of climate change have been underestimated (Silva et al. 2019, p. 3). Local extinctions of plant species are likely already widespread and presumably will become more prevalent as global climate change increases (Wiens 2016, entire). As climate change advances, Jobé bluecurls will face increasing threats from rising local temperatures, changes in precipitation, sea level rise, and storms of increasing intensity. These threats will act individually and synergistically, threatening both the species and its limited remaining habitat.

Rising Temperatures

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

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

In Florida's scrub ecosystems, increased average summer temperatures are projected to cause an increased risk of wildfires, increased frequency and intensity

of wildfires, and reduced opportunities for prescribed fire (FWC 2016, p. 6-30). Increased temperatures, along with extreme events (e.g., flood, drought, fires) will also work synergistically to enhance invasive species processes, from introduction through establishment and expansion (Ward et al. 2019, entire). Finally, as noted above, changing temperatures could drive changing ecological conditions which make Jobé bluecurls' existing habitat unsuitable (Peters & Darling 1985, pp. 709–712).

Changes in Precipitation

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

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

Precipitation patterns are also changing. Annual average precipitation has increased by 4 percent since 1901 across the entire United States (USGCRP 2018, pp. 745–808; Hoffman et al. 2023, pp. 22–11, 22–38) and 5 to 10 percent since 1900 in south Florida (USFWS 2017, p. 4). Shifts in seasonal rainfall events as well as increases in average precipitation are currently being documented (USGCRP 2018, pp. 745– 808). The south Florida dry season (November through April) has become wetter, the rainy season (May through October) has become drier, and current projections show that this trend will continue.

These projected changes in precipitation threaten Jobé bluecurls' coastal scrub habitat. Increased rainfall is expected to cause increased above-ground biomass, altered community structure or composition, and increased flooding and flash flooding in Florida's scrub ecosystems (FWC 2016, pp. 6–30). Decreased rainfall or drought is expected to cause increased wildfires, reduced opportunities for prescribed fire, and altered species ranges and extents of occurrence in scrub habitat (FWC 2016, pp. 6-30).

Scrub systems typically don't flood or stay flooded for a long period of time; however, if precipitation and/or extreme events (e.g., storms, floods) increase, this community may experience saturated soils or flood conditions (Ward et al. 2019, entire). This could lead to a change in plants species as those that have a low

tolerance to more hydric conditions are replaced by those that can withstand wetter conditions (Ward et al. 2019, entire).

Sea Level Rise

Global average sea level rose by roughly eight inches between 1901 and 2018, as the oceans have warmed and land-based ice has melted (IPCC 2021, p. 5). Sea level rise is accelerating in pace with almost half of recorded sea level rise occurring since 1993. The Fourth National Climate Assessment estimated that global sea level is very likely to rise by 0.3–0.6 feet by 2030, 0.5–1.2 feet by 2050, and 1.0–4.0 feet by the end of the century relative to the year 2000, with sea level rise in excess of 8 feet possible (Hayhoe et al. 2018, p. 84–86). The National Oceanic and Atmospheric Administration (NOAA) projects low to high scenarios ranging from 0.3–2.0 meters of global mean sea level rise by 2100 (Sweet et al. 2022, p. 20). Projections between the intermediate-low and intermediate scenarios are consistent with the current observed acceleration of sea level rise, which, if extrapolated, would yield about 0.24 meters (0.8 feet) by 2050 and 0.69 meters (2.3 feet) by 2100 (Sweet et al. 2022, p. 20–21). However, these projections include only physical processes in which there is at least medium confidence in the current scientific understanding, and therefore they do not include the largest potential contributions to long-term global mean sea level rise from ice-sheet processes in which there is currently low confidence (Sweet et al. 2022, p. 21). Projections that include these processes could give rise to significantly higher projections (Sweet et al. 2022, p. 21). Regardless of the precise scenario considered, the impacts of sea level rise will be long-lived: under all emissions scenarios, sea levels will continue to rise for many centuries and many changes will be "irreversible" for centuries to millennia (IPCC 2021, p. 21; Hayhoe et al. 2018, pp. 84–86, 102).

Recent NOAA analyses indicate an accelerated rate of sea level rise above the global range for the contiguous United States and eastern United States (Sweet et al. 2022, pp. 20, 23; Sweet et al. 2017, p. 25; Carter et al. 2014, pp. 401–403; Park and Sweet 2015, entire). For the contiguous United States, NOAA projects a rise between 0.6–2.2 meters (3.9–7.2 feet) above the 2000 baseline by 2100 under the full range of scenarios (Sweet et al. 2022, p. 20). Similarly, for the Southeast, NOAA projects sea level could increase by between 0.5–2.1 meters (1.6–6.9 feet) by 2100 (Sweet et al. 2022, pp. 20–21, 23). NOAA notes that "[h]igher global temperatures increase the chances of higher sea level by the end of the century and beyond" (Sweet et al. 2022, p. xiii).

As sea level rises, tides, storm surge heights, and coastal flooding will also increase (Sweet et al. 2022, p. 60). Because of sea level rise, coastal areas are increasingly more vulnerable to high tide flooding which is rapidly increasing in frequency, depth, and extent (Sweet et al. 2018, p. 3).

The Florida Fish and Wildlife Conservation Commission projects that Florida will experience significant declines in scrub habitat due to sea level rise, with as much as 38,161 acres (~10 of the total area of scrub habitat) projected to be lost with 3 meters of sea level rise (FWC 2016, pp. 6–28; Ward et al. 2019, entire). Sea-level rise is projected to inundate coastal scrub, causing habitat loss and fragmentation, altered distribution of habitat, and altered range extent or occurrence of species (FWC 2016, pp. 6–28). The Climate Adaptation Explorer *for Florida* provides an interactive map that shows losses of coastal scrub habitat at 1 meter and 3 meters of sea level rise across Jobé bluecurls' range, including losses in Hobe Sound NWR, Jonathan Dickinson State Park, and Seabranch Preserve State Park (see Figures 10 and 11, below) (Ward et al. 2019, at https://climateadaptationexplorer.org/habitats/terrestrial/1210/map).

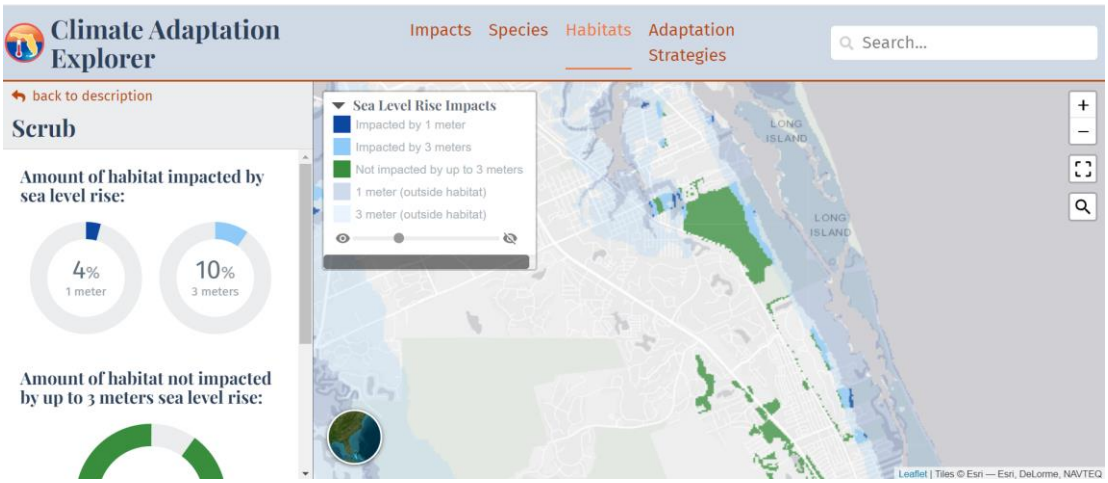

Figure 10: Projected loss of coastal scrub habitat in the northern part of Jobé bluecurls' range, including in Seabranch Preserve State Park

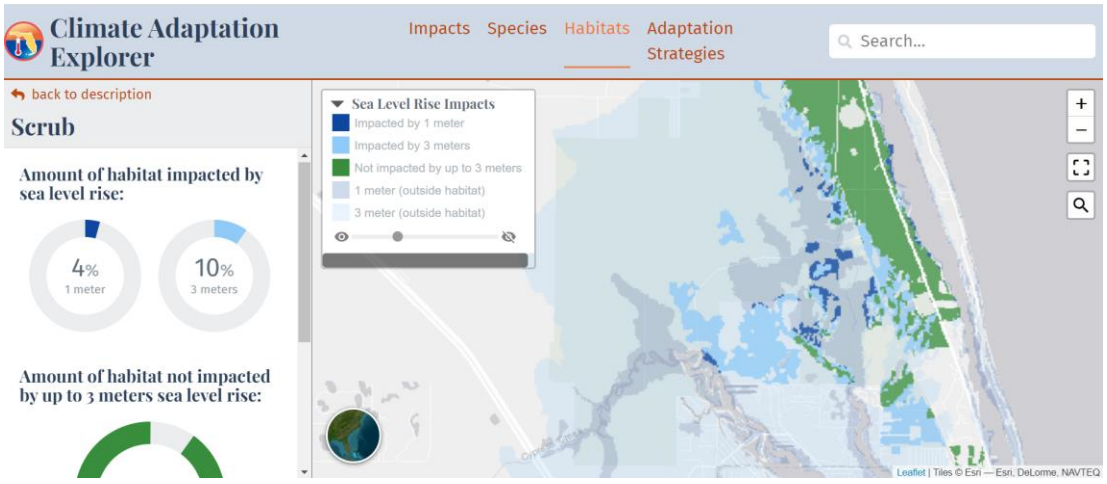

Figure 11: Projected loss of coastal scrub habitat in the southern part of Jobé bluecurls' range, including in Jonathan Dickinson State Park and Hobe Sound NWR

Sea level rise will also affect coastal scrub through changes in soil salinity driven by saltwater intrusion and flooding, which will alter distribution of habitat and fire regime (FWC 2016, pp. 6–30; Ward et al. 2019, entire). There is already evidence that sea-level rise has contributed to the conversion and loss of pine forest habitat in Florida to more halophilic (salt-loving) vegetation (Ross et al. 1994, pp. 152–154; Ogurcak 2016, entire). It is likely that Jobé bluecurls cannot tolerate increased soil salinity (McClelland 2024, pers. comm.). A related species, Florida coastal bluecurls (*T. floridanum*), can tolerate moderate amounts of salt wind without significant injury, but not long-term flooding by salt or brackish water (McClelland 2024, pers. comm.; Gann et al. 2005–2016, entire). Another related species, forked bluecurls (*T. dichotomum*) are not salt tolerant (McClelland 2024, pers. comm.).

Sea level rise also puts coastal scrub in Jobé bluecurls' range at risk from future development as people migrate out of more vulnerable waterfront areas and into higher-elevation areas with lower perceived flood risk (Ward et al. 2019, entire; Keenan et al. 2018, pp. 9–10; USFWS 2022, p. 66).

Increased storm intensity

The International Panel on Climate Change (IPCC) predicts with "high confidence" that stronger storms driven by climate change will increase at the global scale, including in the North Atlantic (IPCC 2021, p. 16; Knutson 2024, p. 1). Tropical storms and hurricanes are projected to be similar or fewer in number but stronger in force, with more Category 4 and 5 hurricanes (Knutson 2024, p. 1; Balaguru et al. 2022, entire; Bhatia et al. 2019, entire). Increased intensity and/or frequency of storms, along with sea level rise and changes in soil salinity, will cause habitat degradation, fragmentation and loss in Florida's coastal scrub (Ward et al. 2019, entire). Because Jobé bluecurls have an exceptionally small, occupied range within coastal scrub in Martin County, any degradation of that habitat is likely to further threaten the species' existence by reducing available habitat. Additionally, the species' small occupied range is vulnerable to range-wide negative effects from increasingly intense storms.

iv. Inherent Vulnerability of Narrow-ranged Species

In general, narrow-ranged plant species face the greatest risks of extinction from multiple threats (Nic Lughadha et al. 2020, pp. 397–98; Newbold et al. 2018, entire; Enquist et al. 2019, p. 2, 9; Staude, Navarro & Pereira 2020, entire; Silva et al. 2019, p. 2). Plant species with narrow ranges, like Jobé bluecurls, are at greater risk of extinction because it is more likely that threats like habitat destruction and degradation will affect their entire range (Newbold et al. 2018, entire; Staude, Navarro & Pereira 2020, entire). For this reason, a species' small range size can be a predictor of higher vulnerability to extinction driven by habitat loss (Staude, Navarro & Pereira 2020, p. 22). Narrowly distributed species can also have smaller

populations, making them more susceptible to genetic drift and inbreeding, as well as narrower habitat tolerance and higher sensitivity to disturbance, which makes their survival highly dependent on habitat integrity (Silva et al. 2019, p. 2).

Generally, species with smaller or fewer populations are more likely to become extinct (Shaffer and Stein 2000, at 307; Wolf et al. 2015, at 5). For a species to be viable, it should have stable population sizes and growth rates (resiliency), a number of resilient populations over a broad geographic range (redundancy), and diverse populations of adequate size (representation) (USFWS 2016, at 6). Jobé bluecurls are found across approximately 40 km^2 in fewer than 20 known populations (NatureServe 2024, entire; McClelland 2021, at 42:30–42:51). This small number of populations over a small range reflects low resiliency, redundancy, and representation, which in turn makes the bluecurls more vulnerable to extinction driven by existing and future threats (Shaffer and Stein 2000, at 307; Wolf et al. 2015, at 5). For example, because of their small range and clumped distribution, the bluecurls are more susceptible to extreme weather events or harmful activities that could cause population declines or local extirpations.

III. Request for Critical Habitat

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

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

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

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

(ii) specific areas outside the geographical area occupied by the species at the time it is listed . . . , upon a determination by the Secretary that such areas are essential for the conservation of the species.

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

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

IV. Conclusion

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

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