U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT
AND LISTING PRIORITY ASSIGNMENT FORM
June 14, 2023

SCIENTIFIC NAME: *Hypericum edisonianum*

COMMON NAME: Edison's Ascyrum

LEAD REGION: Region 4

LEAD REGION CONTACT: Byron Hamilton, 773-848-4642, byron_hamilton@fws.gov

LEAD FIELD OFFICE CONTACT: Florida Ecological Services Field Office, Lourdes Mena, 904-460-4970, lourdes_mena@fws.gov

DATE INFORMATION CURRENT AS OF: June 1, 2023

STATUS/ACTION

___Species petitioned for listing which we have determined is not a listable entity

_X_ Species petitioned for listing which we have determined does not warrant listing (does not meet the definition of a threatened or endangered species)

Petition Information:
___ Non-petitioned
_X_ Petitioned; Date petition received: April 20 2010
90-day "substantial" finding FR publication date; citation: September 27, 2011, (76 FR 59836)

PREVIOUS FEDERAL ACTIONS:
On April 20, 2010, we received a petition from the Center for Biological Diversity, Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands to list 404 aquatic, riparian, and wetland species, including Edison's ascyrum, as an endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding (76 FR 59836) that the petition contained substantial information indicating that listing may be warranted for the species. This document

constitutes our 12-month finding on the April 20, 2010, petition to list Edison's ascyrum under the Act.

PLANT GROUP, ORDER AND FAMILY: Rosanae, Malpighiales, and Hypericaceae

ANALYTICAL FRAMEWORK

To assess the Edison's ascyrum's viability, we conducted a species status assessment (SSA) using the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–311). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years, variation in demographic rates), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt to both near-term and long-term changes in its physical and biological environment (for example, climate change, disease). A species with a high degree of resiliency, representation, and redundancy is better able to adapt to novel changes and to tolerate environmental stochasticity and catastrophes. In general, species viability will increase with increases in resiliency, redundancy, and representation (Smith et al. 2018, p. 306). Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

We used the SSA framework to assemble the best scientific and commercial data available for this species. The SSA framework consists of three sequential stages. During the first stage, we evaluate the species' needs. The next stage involves an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition (i.e., how threats and conservation actions have influenced the species). The final stage of the SSA framework involves assessing the species' plausible range of future responses to positive and negative environmental and anthropogenic influences. The SSA framework uses the best available information to characterize viability as the ability of a species to sustain populations in the wild over time and is used to inform our regulatory decision.

The SSA report does not represent a decision by the Service on whether Edison's ascyrum should or should not be listed under the Act. However, it does provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies. The Species Status Assessment Report for the Edison's ascyrum (*Hypericum edisonianum*) – August 2022, Version 1.2 (SSA Report) is a summary of the information we have assembled and reviewed and incorporates the best scientific and commercial data available for this species. Excerpts of the SSA Report are provided in the sections below. For more detailed information, please refer to the SSA Report (Service 2022, entire).

BIOLOGICAL INFORMATION

Edison's ascyrum is a small, thicket-forming colonial shrub endemic to central peninsular Florida. Edison's ascyrum occurs most abundantly in seasonal ponds (i.e., depression marshes) but also inhabits flatwoods, wet prairies, cutthroat grass (*Panicum abcissum*) seeps, lake margins, and occasionally roadsides and semi-native pastures. The species is a narrow endemic and was historically known from only Highlands and Glades Counties; it currently occurs in abundance in these two counties. It also occurs in DeSoto, Polk, and Collier Counties (Wunderlin et al. 2022). The Florida Natural Areas Inventory (FNAI) database also includes historical records from Charlotte and Sarasota Counties; however, surveyors revisited the Charlotte County occurrence and failed to find the species, and the Sarasota County occurrence may have been misidentified. In a study of south-central Florida dry prairie landscape floristic composition, Edison's ascyrum was not found in the Myakka region, which is where the potential Sarasota County occurrence was located (Orzell and Bridges 2006, p. 69). Although these are potential occurrences, we do not consider them part of the historical or current range of the species.

Species Description

Edison's ascyrum is in the St. John's wort family (Hypericaceae) and can grow to 1.5 m (5 ft) tall. Lower stems are leafless with smooth, pale brown bark and upper stems are leafed and multibranched. Leaves are 1–3 cm (0.4–1.2 in) long, elliptic, sessile, and heavily glaucous above so that the upper surface appears silvery, and have conspicuous red glands at the base. Flowers are yellow with 4 petals, numerous stamens, and 4 total sepals of which 2 are larger and cover the remaining 2 narrow, tapered sepals. The fruit is a small, dark brown, pointed capsule that contains many brown to yellow-brown seeds (Robson 1996, p. 128; Tobe et al. 1998, p. 423; Chafin 2000; Abrahamson and Vander Kloet 2014, p. 170).

Photo copyright Nate Martineau (https://www.inaturalist.org/photos/171695872).

Taxonomy

Edison's ascyrum was first described as *Ascyrum edisonianum* by J. K. Small (1933, p. 868) in 1933 and continued to be classified in this way until 1961 (e.g., Adams 1957, p. 91), when Adams and Robson (1961, entire) suggested that the genera *Ascyrum* and *Crookea* be incorporated into the genus *Hypericum* based on floral anatomy. Further research supported this suggestion (Calie et al. 1983, entire; Robson 1996, pp. 77–78; Nürk et al. 2013, entire), and the name *Hypericum edisonianum* has been used since and is the currently accepted name for the species (Adams 1962, p. 44; Robson 2020; Weakley 2020, p. 852; Wunderlin et al. 2022).

Habitat/Life History

Edison's ascyrum can flower year-round but usually reproduces via clonal propagation (Adams 1957, p. 91; Adams 1962, p. 45; Kral 1983, p. 749; van de Kerckhove 2002, pp. 12–13; Coile and Garland 2003, p. 28; Abrahamson and Vander Kloet 2014, p. 168). Mature seed capsules dehisce septicidally (bursting open lengthwise along a septum) and seeds spill to the ground; as such, seeds are mostly gravity dispersed but may occasionally be dispersed by wind or water sheet flow. Although Edison's ascyrum can form persistent seed banks (e.g., Maliakal et al. 2000, p. 132), most viable seeds are found near parent plants (Abrahamson and Vander Kloet 2014, p. 177). Additionally, Edison's ascyrum is likely self-incompatible (unable to be fertilized by its own pollen) (Abrahamson and Vander Kloet 2014, p. 173).

As mentioned above, Edison's ascyrum mainly reproduces through clonal propagation. Genets (genetically distinct individuals) are usually composed of several ramets that sprout from underground rhizomes. Edison's ascyrum is able to rapidly regenerate ramets following disturbances such as fire and prolonged inundation, which likely enhances both genet fitness and persistence (Abrahamson and Vander Kloet 2014, p. 177). Following fire, ramet density is high and then declines as aboveground biomass increases (Abrahamson 1984, p. 39; Abrahamson and Vander Kloet 2014, p. 176).

Historical and Current Range/Distribution

Edison's ascyrum is confined mostly to the southern Lake Wales Ridge in central peninsular Florida (Figure 1). The Lake Wales Ridge is a 186 km (116 mi.) long major geomorphological feature stretching from just south of Lake Harris in Lake County to near the Highlands/Glades County line (Weekley et al. 2008, p. 52). The species was historically known from only Highlands and Glades Counties, and it currently occurs in abundance in these two counties (A. David, pers. comm.; T. Mecklenborg 2023, pers. comm.). Edison's ascyrum is known to occur on Archbold Biological Station (ABS), a world-renowned nonprofit ecological research station, that occurs within Highlands County. In fact, the species is so abundant on ABS that population numbers are not tracked (Aaron David 2022, pers. comm.) More recently, it has been found in DeSoto, Polk and Collier Counties.

For additional information on the species description, taxonomy, habitat/life history, historical and current range/distribution, please refer to pp. 3-8 of the SSA report (Service 2022).

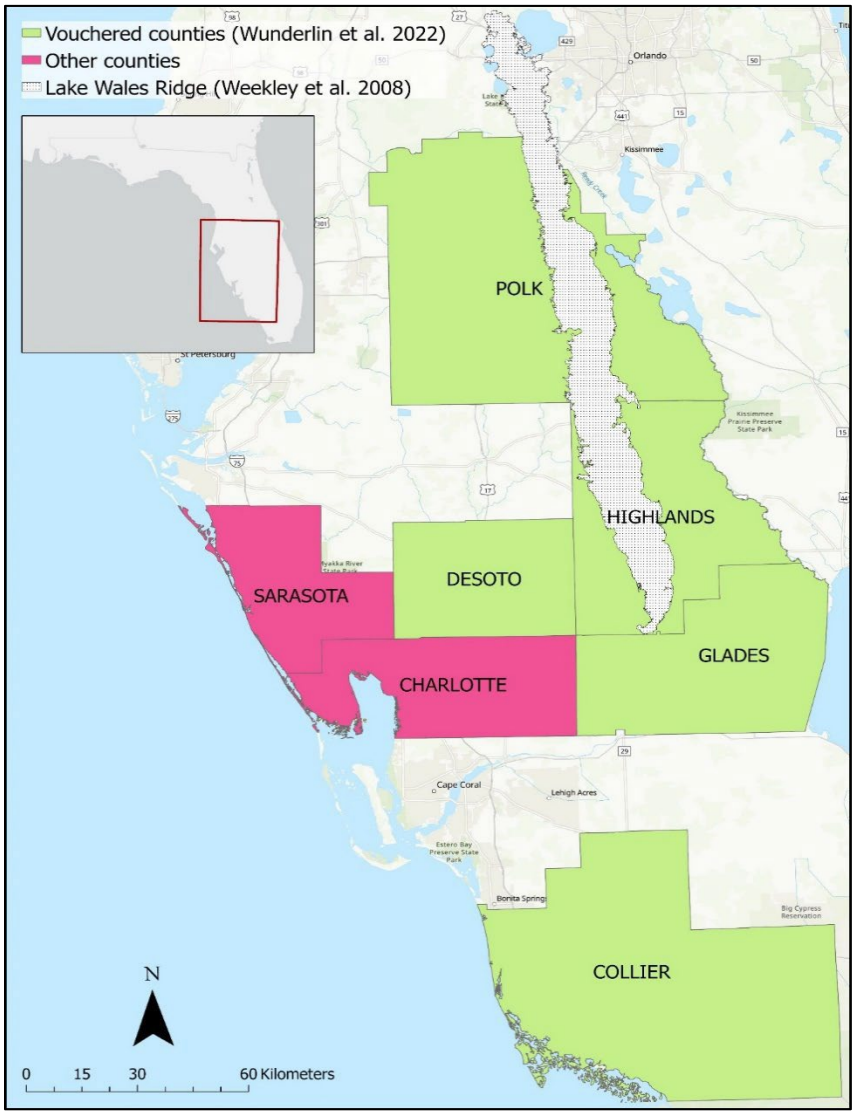

Figure 1. Potential range of Edison's ascyrum (*Hypericum edisonianum*) by county and location of the Lake Wales Ridge in central peninsular Florida. Green counties are the current range, while pink counties indicate potential occurrence records but not included in the current range.

Population/Species Needs

We did not define populations as true biological populations since we do not currently have that information, but rather as analysis units. There are a total of 22 analysis units. Each of these analysis units requires appropriate hydrology and fire conditions for viability.

Hydrology - Edison's ascyrum requires a balance between wet and dry conditions to survive. High water levels are needed occasionally to suppress woody encroachment (Abrahamson 1991, p. 82), but prolonged inundation can cause ramet (clone) mortality and may waterlog seeds (Abrahamson and Vander Kloet 2014, pp. 174, 176). Conversely, prolonged dry periods (i.e., droughts) also cause ramet mortality (van de Kerckhove 2002, p. 104) and delay ramet regeneration following fire (Abrahamson et al. 1984, p. 242; see also Kominoski et al. 2022, entire).

Fire —Edison's ascyrum needs fire at regular return intervals to reduce competition from woody vegetation. Without occasional fire, woody and litter cover increase and herbaceous cover decreases (Peroni and Abrahamson 1986, p. 176; USFWS 1999, pp. 3-367–3-368; Maliakal et al. 2000, p. 125; Yahr et al. 2000, p. 3). Additionally, fire may facilitate the dispersal of Edison's ascyrum, as ramets have been observed in new locations following fire. Fire may also keep the incidence of disease at a minimum (Kerckhove 2002, p. 105). The habitats that Edison's ascyrum occur in are usually part of a mosaic scrub landscape with different fire return intervals, depending upon vegetation associations (Abrahamson et al. 1984, pp. 239–244). The Archbold Biological Station Fire Management Plan lists a fire return interval of 6–9 years for seasonal ponds and flatwoods (Main and Menges 1997, p. 28). For wiregrass flatwoods and cutthroat grass seeps, 10 years has been suggested (USFWS 1999, pp. 3-367–3-368; Maliakal et al. 2000, p. 134).

FACTORS INFLUENCING THE STATUS

The Act directs us to determine whether any species is an endangered species or a threatened species because of any factors (or threats) affecting its continued existence (i.e., whether it meets the definition of a threatened species or an endangered species). We use the term "threat" to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term "threat" includes actions or conditions that have a direct impact on individuals, as well as those that affect individuals through alteration of their habitat or required resources. The term "threat" may encompass—either together or separately—the source of the action or condition, or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an "endangered species" or a "threatened species." In determining whether a species meets either definition, we must evaluate all identified threats by considering the expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Secretary

determines whether the species meets the definition of an "endangered species" or a "threatened species" only after conducting this cumulative analysis and describing the expected effect on the species now and (if evaluating whether a species is a threatened species) in the foreseeable future.

Threats, Conservation Measures, and Existing Regulatory Mechanisms

Development is the primary threat to Edison's ascyrum through direct habitat loss as well as indirect effects of altered hydrology and altered fire patterns. Other identified threats include invasive species, climate change, and disease, however these are not currently having species-level impacts. For additional information on factors influencing viability, please refer to pp. 9-11 of the SSA report.

Development

In addition to directly impacting Edison's ascyrum by reducing available habitat, urban and agricultural development indirectly impact the species through alteration of natural hydrology and fire patterns. Much of the Lake Wales Ridge and surrounding areas have been developed (Weekley et al. 2008, p. 55), leading to changes in vegetative communities due to drainage and fire exclusion (Peroni and Abrahamson 1986, entire; Landman and Menges 1999, entire; Malikal et al. 2000, entire; Yahr et al. 2000, entire; Ficken and Menges 2013, entire).

Altered Hydrology — Edison's ascyrum requires a balance between wet and dry conditions to survive. High water levels are needed occasionally to suppress woody encroachment (Abrahamson 1991, p. 82), but prolonged inundation can cause ramet mortality and may waterlog seeds (Abrahamson and Vander Kloet 2014, pp. 174, 176). Prolonged dry periods (i.e., droughts) also cause ramet mortality (van de Kerckhove 2002, p. 104) and delay ramet regeneration following fire (Abrahamson et al. 1984, p. 242; see also Kominoski et al. 2022). Through clonal propagation, Edison's ascyrum survives and thrives under natural hydrological fluctuations, but alterations to these natural cycles, such as from climate change (see below) and drainage ditching related to development, can negatively impact the species.

Altered Fire Patterns — Development may indirectly affect Edison's ascyrum by making it more difficult to conduct prescribed fires and also engender more prompt fire suppression of wildfires, leading to increased woody vegetation encroachment. The habitats that Edison's ascyrum occur in are usually part of a mosaic scrub landscape with different fire return intervals, depending upon vegetation associations (Abrahamson et al. 1984, pp. 239–244). The ABS Fire Management Plan lists a fire return interval of 6–9 years for seasonal ponds and flatwoods (Main and Menges 1997, p. 28). For wiregrass flatwoods and cutthroat grass seeps, 10 years has been suggested (USFWS 1999, pp. 3-367–3-368; Maliakal et al. 2000, p. 134).

Edison's ascyrum needs fire at regular return intervals to reduce competition from woody vegetation. Without occasional fire, woody and litter cover increase and herbaceous cover decreases (Peroni and Abrahamson 1986, p. 176; USFWS 1999, pp. 3-367–3-368; Maliakal et al.

2000, p. 125; Yahr et al. 2000, p. 3). Additionally, fire may facilitate the dispersal of Edison's ascyrum, as Abrahamson and Vander Kloet (2014, p. 176) observed ramets in new locations following fire. Fire may also keep the incidence of disease at a minimum (Kerckhove 2002, p. 105).

Invasive Plant and Animal Species
Invasive species such as torpedograss (*Panicum repens)*, Peruvian primrose (*Ludwigia peruviana)*, common water hyacinth (*Eichhornia crassipes)*, Brazilian peppertree (*Schinus terebinthifolius)*, West Indian marsh grass (*Hymenachne amplexicaulis)*, and feral hogs (*Sus scrofa*) occur in depression marsh communities (FNAI 2010, p. 131), and have the potential to impact Edison's ascyrum through competitive exclusion. Habitat disturbance from feral hogs alters plant communities and soil chemistry (Winchester et al. 1985, p. 116; Arrington et al. 1999, p. 535; Bankovich et al. 2016, p. 45; Gray et al. 2020, p. 739), and could facilitate the establishment of invasive plants along with other disturbances. The best available information does not indicate that invasive species are impacting Edison's ascyrum at the species-level currently.

Climate Change
Climatic changes, such as shifts in seasonal precipitation, temperature, and storm cycles, are projected to impact the southeastern United States over the next century. Temperatures are expected to increase (Carter et al. 2018, pp. 751–752), and climate change is expected to intensify the hydrologic cycle and increase the frequency and severity of extreme events like drought and heavy rainfall (Carter et al. 2018, p. 775). Increases in evaporation of moisture from soils and loss of water by plants in response to warmer temperatures are expected to contribute to increased frequency, duration, and intensity of droughts. Because Edison's ascyrum requires a balance between wet and dry conditions, future climatic changes could negatively impact the species depending upon how extreme droughts and heavy rainfall events become. However, the best available information does not indicate the extent to which this will impact the species.

Disease and Predation
The SSA report describes a fungal pathogen and a leaf miner moth as potentially damaging individual Edison's ascyrum, but neither are having population or species-level impacts.

<u>Conservation Measures and Existing Regulatory Mechanisms</u>
Edison's ascyrum is listed on the State of Florida's Regulated Plant Index as endangered under Chapter 5B-40, Florida Administrative Code, and this species was added to the list prior to 1993. This listing provides little or no habitat protection beyond the state's Development of Regional Impact process, which discloses impacts from projects, but provides no regulatory protection for state-listed plants on private lands. Edison's ascyrum is ranked as G2G3 (Rounded to G2) by FNAI, meaning that it is "Imperiled" (NatureServe 2022).

Edison's ascyrum is known to occur on lands owned or managed by the U.S. Department of

Defense (Avon Park Air Force Range), the State of Florida (Fisheating Creek Wildlife Management Area), the University of Florida, and ABS. It also occurs on private conservation easements and Buck Island Ranch, an agro-ecological research ranch owned by ABS. Efforts to acquire undeveloped land on the Lake Wales Ridge have been extensive, resulting in a substantial increase in the number of protected occurrences (Turner et al. 2006, p. 1663). In total, approximately 77% of element occurrences are on conservation lands, where threats are managed with fire plans so that Edison's ascyrum will be protected in perpetuity.

Cumulative Effects

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have analyzed the cumulative effects of identified threats and conservation actions on the species. To assess the current and future condition of the species, we evaluate the effects of all the relevant factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative-effects analysis.

ANALYSIS

We assessed the resiliency, redundancy, and representation of the Edison's ascyrum to determine current and future condition.

Delineating Populations

We used element occurrence records from Florida Natural Areas Inventory (FNAI) as well as the boundary of ABS as the basis for delineating populations (i.e., analysis units) of Edison's ascyrum. Element occurrences are areas in which a species or ecological community is or was present, and records of each are maintained by state natural heritage programs. Element occurrence records are oftentimes the best data available for rare plant species, as is the case for Edison's ascyrum, which is a narrow endemic that is considered rare across the landscape but can be locally abundant where found. However, because the species occurs in high abundance at ABS and is not tracked there, we also included the boundary of ABS in our analyses. Additionally, it must be acknowledged that element occurrence records usually do not represent the full extent of a species, and in this case do not even represent all known populations. However, element occurrence records are the best scientific data available for Edison's ascyrum and provide a sound foundation for assessing the status of the species.

For the purposes of the SSA, we did not define populations as true biological populations since we do not currently have that information, but rather as units of analysis delineated using the following methodology. FNAI elemental occurrences were used to identify populations and a 1-km buffer was placed are around each of those. We used a 1-km buffer based on FNAI-defined separation distances. Where buffers overlapped, we grouped the associated features into a single analysis unit, which translated to features within 2 km of each other being grouped into the same analysis unit. For the ABS analysis unit, we merged element occurrence records with the ABS

boundary and applied a 1 km boundary. This resulted in a total of 22 analysis units (Figure 2). Each analysis unit consists of the grouped features plus a 1-km buffer.

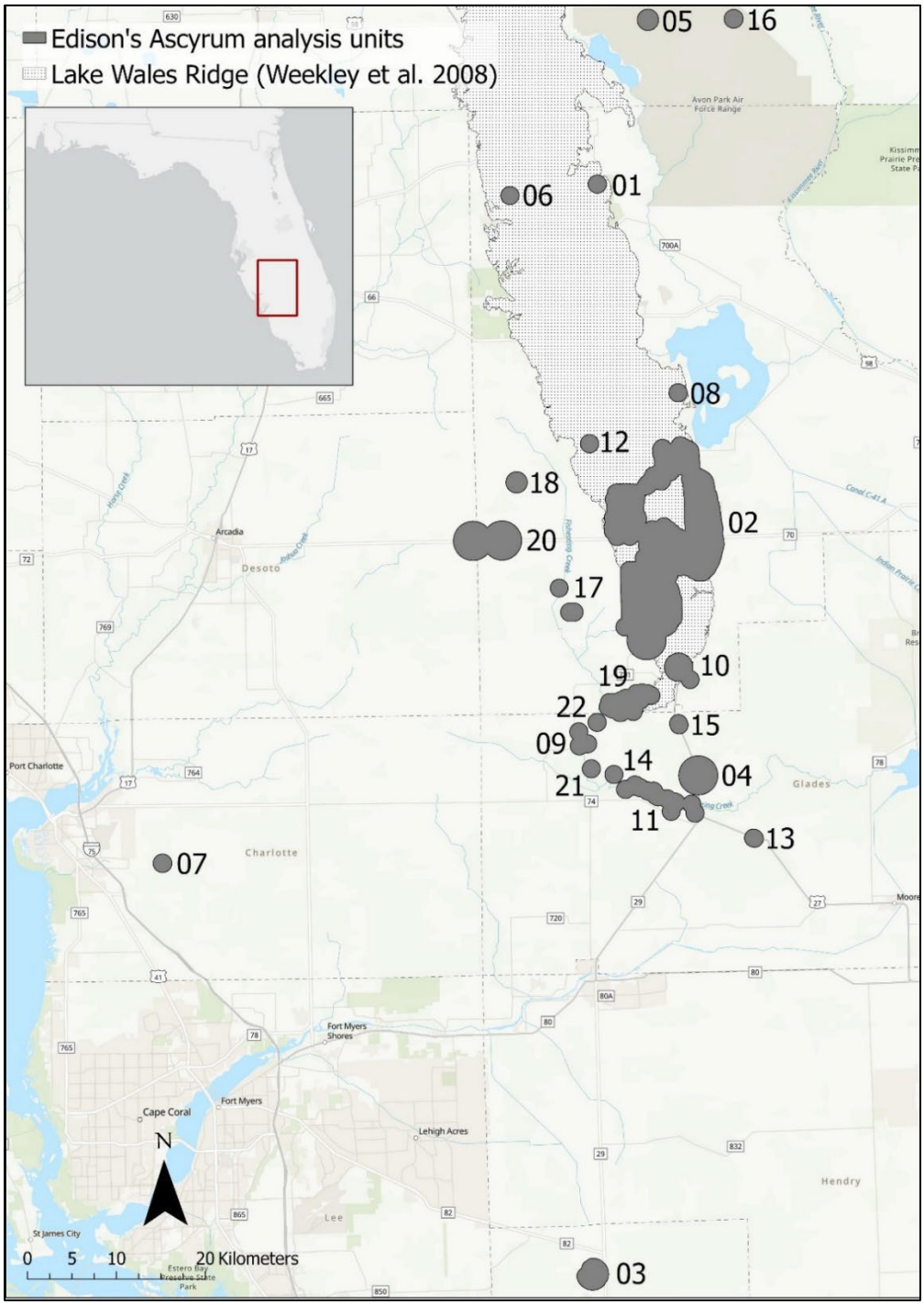

Figure 2. Edison's ascyrum (*Hypericum edisonianum*) analysis units.

CURRENT CONDITION

Of these 22 analysis units, we considered resiliency to be unknown in analysis units with element occurrences that had not been surveyed since 2000 or were not found during 2020 survey efforts. Since recent estimates of population size were not available for most occurrence records, we used a habitat-based approach to assess the resiliency of each analysis unit. Using qualitative definitions of resiliency based on the amount of available habitat (i.e., acreage of habitat within an analysis unit that is considered suitable for Edison's ascyrum), incompatible land use (i.e., percent developed or cultivated cropland), habitat management (i.e., percent recently burned), and habitat protection (percent land under conservation), 2 analysis units ranked high resiliency, 2 ranked high-moderate, 1 ranked moderate-high, 8 ranked moderate, 3 ranked low-moderate, 1 ranked very low, and 5 were unknown (Table 1; Service 2022, p. 14). Redundancy for Edison's ascyrum is inherently low due to its restricted distribution. However, the four analysis units that ranked high or high-moderate resiliency are spread across the known range of the species; this distribution may minimize the likelihood a catastrophic event affecting all of these units. Furthermore, only four analysis units ranked very low or low-moderate resiliency.

Table 1. Current resiliency of Edison's ascyrum analysis units

Analysis Unit	Available Habitat (ac)	Incompatible Land Use (%)	Habitat Protection (%)	Habitat Management (%)	Overall Resiliency
1	83.6	23.5	44.5	19.4	Unknown
2	5135.4	40.6	32.7	16.6	Moderate
3	331.5	42.2	0	5.0	Unknown
4	169.0	15.1	0	1.9	Unknown
5	375.1	3.6	100	62.0	High
6	90.8	61.7	19.3	18.1	Very low
7	828.4	0	100	36.7	Unknown
8	412.6	18.2	64.3	27.1	Moderate
9	389.5	4.5	66.0	16.6	Moderate
10	620.6	25.7	39.9	23.1	Moderate
11	66.5	5.4	84.5	23.2	Moderate-high
12	165.7	82.3	45.4	8.6	Low-moderate
13	9.2	5.2	0	20.4	Low-moderate
14	57.9	0	100	5.9	Moderate
15	8.1	6.4	0	14.5	Low-moderate
16	525.9	3.0	100	82.1	High

17	646.4	0.7	0	34.1	Moderate
18	0.2	3.4	100	80.3	High-moderate
19	2405.6	2.1	43.2	27.0	High-moderate
20	308.7	11.3	33.1	44.3	Unknown
21	3.5	0	95.2	1.1	Moderate
22	24.3	3.3	100	13.3	Moderate

To assess current representation of Edison's ascyrum, we used the best available science of the species' known life-history attributes and assessed the species' ability to respond to near and long-term changes in its environment (Thurman et al. 2020, entire). We evaluated the 12 core attributes (Service 2022, pp. 27-28) represented in the "adaptive capacity wheel" per the methodology outlined in Thurman et al. (2020, entire). Five core attributes were assessed as low, one as moderately low, five as moderate, and one as not applicable. The only core attribute related to ecological role, diet breadth, is not applicable to plant species. The core attributes that reflect Edison's ascyrum's ability to shift-in-space were assessed as being moderate (habitat specialization and commensalism with humans) and low (extent of occurrence and dispersal distance). The remaining core attributes were assessed as moderate (genetic diversity) and low (physiological tolerances, climatic niche breadth, and population size). According to species experts, while Edison's ascyrum has a high local abundance with many ramets per stand, the number of genets (genetically distinct individuals) may be low in comparison (population size); despite this, genetic diversity may be higher than expected for a clonal species due to accumulated mutations (genetic diversity) (Service 2022, pp. 5-6). Experts described Edison's ascyrum's climatic niche breadth and physiological tolerances as largely limited by narrow hardiness zones and associated soil moisture, although the species has been reported to endure some frost and survive (S. Martinez 2022, pers. comm.).

In summary, despite inherently low redundancy and representation due to having a narrow range, Edison's ascyrum has multiple moderate, moderately-high, and high resiliency analysis units distributed across its known range. Thus, the species currently has the ability to withstand stochastic and catastrophic events. Our current condition analysis indicates that Edison's ascyrum has sufficient resiliency, redundancy, and representation to sustain the species' viability.

FUTURE CONDITION

The best available science indicates the primary driver of viability in the future will be direct and indirect impacts of urban and agricultural development. While other factors were identified as potential threats (climate change, invasive species), the best available science does not indicate these are threats to Edison's ascyrum at the species level. Accordingly, we developed two future scenarios representing a higher development- and lower development outcome based on our

analysis of future urban and agricultural development, using forecasting scenarios of land-use change (FORE-SCE) model (Sohl et al. 2014, entire; Sohl et al. 2018, entire). We projected out to 2040 and 2070 for both scenarios, based on available land use data as well as the ability of the species to respond to changes over a 50-year timeframe. Under Scenario 1 (higher development), resiliency is expected to decrease in 8 of the 22 analysis units by 2040, and in 12 analysis units by 2070 (Table 2). Under Scenario 2 (lower development), overall results were the same for 2040 and 2070, with resiliency expected to decrease in 5 analysis units. We provided qualitative definitions of each resiliency rank, as described above in Current Condition. While resiliency is expected to decrease for some populations, we did not project a decrease from one resiliency category to another. In the future under both scenarios and time steps, at least 7 populations are projected to maintain the same level of moderate to high resiliency while 3 analysis units are projected to remain in the same low or unknown condition, primarily because land use is not expected to change enough to affect resiliency. Under Scenario 1, 11 populations are projected to maintain moderate to high resiliency at 2040 while 7 are projected to maintain that level of resiliency at 2070. Under Scenario 2, 13 populations are projected to maintain moderate to high resiliency at 2040 and 2070. Redundancy is expected to decrease under both scenarios and timesteps when compared with current condition, but only marginally under Scenario 2, as only one moderate unit is expected to have decreased resiliency and all the remaining moderate to high resiliency units are not expected to change resiliency. The future distribution of units that may experience declines in resiliency are scattered across the range; similarly, units that are expected to retain resiliency are also distributed throughout the known range. For representation, the core attributes relating the species' ability to persist in place were assessed as moderate to moderately low, while those related to its ability to shift in space were assessed as moderate to low. These results suggest that Edison's ascyrum may be better equipped to persist-in-place than shift-in-space. As such, its future viability may depend on how well it is able to persist-in-place in a changing climate.

In summary, inherently low redundancy and representation due to constraints from a narrow range will continue in the future. However, Edison's ascyrum is expected to maintain multiple moderate to high resiliency analysis units distributed across its known range 50 years into the future. Thus, the species will maintain the ability to withstand stochastic and catastrophic events in the future. Our future condition analysis indicates that Edison's ascyrum has sufficient resiliency, redundancy, and representation to sustain the species' viability into the future.

Table 2. Current and projected change in resiliency of Edison's ascyrum analysis units under higher development (Scenario 1)- and lower development (Scenario 2) scenarios for 2040 and 2070. Arrows are indicative of change, with double arrows reflecting more of a change than single arrows.

Analysis Unit	Current Resiliency	Resiliency Trend

		2040		2070	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
1	Unknown	↓	↓	↓	↓
2	Moderate	↓	↓	↓	↓
3	Unknown	↓	↓	↓	↓
4	Unknown	↓	↓	↓	↓
5	High	No change	No change	No change	No change
6	Very low	No change	No change	No change	No change
7	Unknown	No change	No change	No change	No change
8	Moderate	No change	No change	No change	No change
9	Moderate	No change	No change	↓	No change
10	Moderate	No change	No change	↓	No change
11	Moderate-high	No change	No change	No change	No change
12	Low-moderate	No change	No change	No change	No change
13	Low-moderate	↓	No change	↓↓	No change
14	Moderate	↓	No change	↓	No change
15	Low-moderate	↓↓	↓↓	↓↓	↓↓
16	High	No change	No change	No change	No change
17	Moderate	No change	No change	No change	No change
18	High-moderate	No change	No change	↓	No change
19	High-moderate	No change	No change	No change	No change
20	Unknown	↓	No change	↓	No change
21	Moderate	No change	No change	No change	No change
22	Moderate	No change	No change	↓	No change

FINDING

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species is an "endangered species" or a "threatened species." The Act defines an endangered species as a species that is "in danger of extinction throughout all or a significant portion of its range," and a threatened species as a

species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether any species is an "endangered species" or a "threatened species" because of any one or a combination of the following 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.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species' continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

The Act does not define the term "foreseeable future, which appears in the statutory definition of "threatened species." Our implementing regulations at 50 CFR 424.11(d), as revised in 2019, set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term "foreseeable future" extends only so far into the future as we can reasonably determine that both the future threats and the species' responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. "Reliable" does not mean "certain"; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define the foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species' likely responses to those threats in view of its life-history characteristics. Data that are typically relevant to assessing the species' biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

Status Assessment

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we assessed Edison's ascyrum to determine if it meets the definition of an endangered species or threatened species. Edison's ascyrum is a localized narrow endemic species with approximately 77% of the element occurrences on conservation lands. It is

considered locally abundant, but rare rangewide (i.e., narrow endemic). Thirteen of the 22 analysis units (60%) identified throughout the species range currently have moderate to high resiliency. There is some risk from development, altered hydrology, and altered fire patterns due to the localized nature of the species' range; however, the species seems to be thriving in several areas with the majority of occurrences under long-term protection and management. Although it has a small range with inherently low redundancy, the species has four analysis units in high-moderate to high resiliency distributed from north to south across its range in Avon Park Air Force Range, Archbold Biological Station, and Fisheating Creek Wildlife Management Area. Analysis units that exhibit a moderate or high rank resiliency are also distributed throughout the range of the species. Resiliency is moderate to high in most of the analysis units, which means the species can withstand stochastic events such as periodic flooding and droughts. These moderate to high resiliency units are distributed throughout the range, and located on protected lands, contributing to the species' ability to withstand catastrophes. Representation may be limited, but the species may have high genetic diversity for a clonal species, contributing to its ability to adapt to changing conditions. For all these reason, Edison's ascyrum is not in danger of extinction throughout its range.

We then considered whether the species is likely to become an endangered species throughout its range in the foreseeable future. We projected out to 2040 and 2070 for the foreseeable future under both scenarios, considering those threats and species' responses that we could reliably predict. It is reasonable to rely on these timeframes because they correspond to the range of available urbanization and land use change model forecasts. Furthermore, approximately 20 and 50 years represent time frames for which we can reasonably predict the species response to potential changes on the landscape. Habitat loss and degradation, fire pattern changes, and hydrological changes resulting from development (urban and agricultural) are the biggest threats to the species in the future. Habitat loss and degradation in the future are expected to be driven by development, which along with climate change will potentially affect hydrological changes. Though some populations may experience declines in resiliency, the species is projected to be represented throughout its range, and the distribution of moderate to high resiliency populations across the range on protected lands is expected to minimize the likelihood of a catastrophic event affecting the species rangewide. Additionally, under both scenarios and for both timesteps, analysis units that are not expected to decrease in resiliency remain spread across the range of the species. Under Scenario 1, resiliency is projected to decrease in 8 AUs by 2040 and 12 AUs by 2070. Under Scenario 2, resiliency is projected to decrease in 5 AUs at both 2040 and 2070. However, in the future under both scenarios and time steps, at least 7 populations are projected to maintain the same level of moderate to high resiliency while 3 analysis units are projected to remain in the same low or unknown condition. Both future scenarios and timesteps project that multiple populations will have no change from the current resiliency category by 2040 or 2070. Lastly, 77% of the element occurrences are on well-managed and protected lands evenly distributed throughout the range of the species. Thus, after assessing the best available information, we conclude that Edison's ascyrum is not in danger of extinction throughout all of its range now, or in the foreseeable future.

Status Throughout a Significant Portion of Its Range
Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Having determined that the Edison's ascyrum is not in danger of extinction or likely to become so in the foreseeable future throughout all of its range, we now consider whether it may be in danger of extinction or likely to become so in the foreseeable future in a significant portion of its range—that is, whether there is any portion of the species' range for which it is true that both (1) the portion is significant; and (2) the species is in danger of extinction now or likely to become so in the foreseeable future in that portion. Depending on the case, it might be more efficient for us to address the "significance" question or the "status" question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

In undertaking this analysis for Edison's ascyrum, we chose to address the status question first. We began by identifying portions of the range where the biological status of the species may be different from its biological status elsewhere in its range. For this purpose, we considered information pertaining to the geographic distribution of (a) individuals of the species, (b) the threats that the species faces, and (c) the resiliency condition of populations.

We evaluated the range of the Edison's ascyrum to determine if the species is in danger of extinction now or likely to become so in the foreseeable future in any portion of its range. The Edison's ascyrum is a localized narrow endemic in central peninsular Florida. Because the range of a species can theoretically be divided into portions in an infinite number of ways, we focused our analysis on portions of the species' range that may meet the definition of an endangered species or a threatened species. For Edison's ascyrum, we considered whether the threats or their effects on the species are greater in any biologically meaningful portion of the species' range than in other portions such that the species is in danger of extinction now or likely to become so in the foreseeable future in that portion. We examined the direct and indirect impacts of development by reducing available habitat. We considered if any portions of the range may have a different status. While resiliency varies across the range, multiple analysis units with moderate to high resiliency are also well distributed across the range and most of the analysis units occur on conservation lands. However, currently, there is one analysis unit with very low resiliency (Unit 6) and three analysis units with low-moderate resiliency (Units 12, 13, and 15) with the remaining units having higher or unknown levels of resiliency. Based on the lower condition of these units, the species could have a different status in that portion than the rest of the range.

Because we identified the portion of analysis units 6, 12, 13, and 15 as possibly having a different status than the rest of the range, we next considered whether this portion (analysis units 6, 12, 13, and 15) may be significant. We determined this portion comprises a small portion (273 acres/2 percent of the habitat) of the total range (12,685.5 acres) of the species. Habitat is similar

throughout the range, therefore this portion does not contain high or unique value habitat for the species. In addition, this portion does not constitute an area of habitat that is essential to a specific life-history function for the species that is not found in the remainder of the species' range. Overall, the best available information does not indicate this portion of the range is significant. Accordingly, we did not find a significant portion of the range where the species is in danger of extinction.

We then considered whether there is a significant portion of the range where the species is likely to become an endangered species in the foreseeable future. Resiliency is expected to decrease in some units under both future condition scenarios. Units 6, 12, 13, and 15 are projected to be in low condition, thus these lower resiliency units could be considered a portion with a different status than rangewide in the foreseeable future. Similar to the analysis above, because we identified the portion of analysis units 6, 12, 13, and 15 as possibly having a different status than the rest of the range in the foreseeable future, we next considered whether this portion (analysis units 6, 12, 13, and 15) may be significant. The portion comprises a small part (273 acres/2 percent of the habitat) of the total range (12,685.5 acres) of the species. Habitat is similar throughout the range, therefore this portion does not contain high or unique value habitat for the species. In addition, this portion does not constitute an area of habitat that is essential to a specific life-history function for the species that is not found in the remainder of the species' range. Overall, the best available information does not indicate this portion of the range is significant. Accordingly, we did not find a significant portion of the range where the species is in danger of extinction in the foreseeable future.

As a result, there are no portions of the species' range where the species has a different biological status from its rangewide biological status. Therefore, we conclude that there are no portions of the species' range that warrant further consideration, and the species is not in danger of extinction or likely to become so in the foreseeable future in any significant portion of its range. This does not conflict with the courts' holdings in *Desert Survivors* v. *U.S. Department of the Interior*, 321 F. Supp. 3d 1011, 1070-74 (N.D. Cal. 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d. 946, 959 (D. Ariz. 2017) because, in reaching this conclusion, we did not apply the aspects of the Final Policy on Interpretation of the Phrase "Significant Portion of Its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species" (79 FR 37578; July 1, 2014), including the definition of "significant" that those court decisions held to be invalid.

Determination of Status

Our review of the best available scientific and commercial information indicates that the Edison's ascyrum does not meet the definition of an endangered species or a threatened species in accordance with sections 3(6) and 3(20) of the Act. Therefore, we find that listing the Edison's ascyrum is not warranted at this time.

COORDINATION WITH STATES

In preparing the finding for the Edison's ascyrum, we closely coordinated with State agencies in Florida throughout the SSA process. Specifically, we contacted all relevant State agencies (Florida /Dept. of Agriculture and Consumer Services & Florida Dept. of Environmental Protections) to request information and provide technical review of the threats assessment and analytical framework. We also included biologists with expertise in the species, its habitat and relevant threats in our partner review of the SSA report. The information, feedback, and comments received through these coordination efforts were incorporated in the SSA report, where appropriate. We continue to coordinate with State agencies on conservation of Edison's ascyrum.

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Date: 11/15/2023

Martha Williams,
Director,
U.S. Fish and Wildlife Service