and-comment rulemaking procedures are impracticable, unnecessary, or contrary to the public interest (5 U.S.C. 808(2)). The EPA has made a good cause finding for this rule as discussed in section III of this preamble, including the basis for that finding.

List of Subjects in 40 CFR Part 63

Environmental protection, Administrative practice and procedures, Air pollution control, Hazardous substances, Reporting and recordkeeping requirements.

Lee Zeldin,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency amends part 63 of title 40, chapter I, of the Code of Federal Regulations as follows:

PART 63—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES

■ 1. The authority citation for part 63 continues to read as follows:

Authority: 42 U.S.C. 7401 *et seq.*

Subpart L—National Emission Standards for Coke Oven Batteries

■ 2. Amend § 63.302 by revising paragraphs (a)(4) introductory text and (d) introductory text to read as follows:

§ 63.302 Standards for by-product coke oven batteries.

(a) * * *

(4) On and after July 5, 2027:

* * * * *

(d) Emission limitations and requirements applied to each coke oven battery utilizing a new recovery technology shall be less than the following emission limitations or shall result in an overall annual emissions rate for coke oven emissions for the battery that is lower than that obtained by the following emission limitations on and after July 5, 2027:

* * * * *

■ 3. Amend § 63.303 by revising paragraphs (a)(1)(iii) and (b)(1)(iii) to read as follows:

§ 63.303 Standards for nonrecovery coke oven batteries.

(a) * * *

(1) * * *

(iii) The date for compliance with (a)(1)(i) and (ii) of this section is on and after July 5, 2027.

* * * * *

(b) * * *

(1) * * *

(iii) The date for compliance with (b)(1)(i) and (ii) of this section is on and after July 5, 2027, or upon initial startup, whichever is later.

* * * * *

■ 4. Amend § 63.304 by revising paragraph (b)(8) introductory text to read as follows:

§ 63.304 Standards for compliance date extension.

* * * * *

(b) * * *

(8) On and after July 5, 2027:

* * * * *

■ 5. Amend § 63.311 by revising paragraph (h) to read as follows:

§ 63.311 Reporting and recordkeeping requirements.

* * * * *

(h) *Electronic reporting of compliance certification reports.* Beginning on July 5, 2027, or once the report template for this subpart has been available on the EPA's Compliance and Emissions Data Reporting Interface (CEDRI) website for one year, whichever date is later, submit all subsequent reports to the EPA via the CEDRI according to § 63.9(k) except that confidential business information (CBI) should be submitted according to paragraph (k) of this section.

* * * * *

■ 6. Amend § 63.314 by revising the introductory text to read as follows:

§ 63.314 Fenceline monitoring provisions.

For each by-product coke oven battery facility as defined in § 63.301 of this subpart, beginning no later than July 5, 2027, the owner or operator of a coke manufacturing facility shall conduct sampling along the facility property boundary and analyze the samples in accordance with paragraphs (a) through (g) of this section.

* * * * *

Subpart CCCCC—National Emission Standards for Hazardous Air Pollutants for Coke Ovens: Pushing, Quenching, and Battery Stacks

■ 7. Amend § 63.7283 by revising paragraphs (d)(1) and (2) to read as follows:

§ 63.7283 When do I have to comply with this subpart?

* * * * *

(d) * * *

(1) If you have an existing affected source or a new or reconstructed affected source for which construction or reconstruction commenced on or before August 16, 2023, you must be in compliance no later than July 5, 2027.

(2) If you have a new or reconstructed affected source for which construction or reconstruction commenced after August 16, 2023, you must be in compliance no later than July 5, 2027, or upon startup, whichever is later.

* * * * *

■ 8. Amend § 63.7300 by revising paragraph (c)(4) introductory text to read as follows:

§ 63.7300 What are my operation and maintenance requirements?

* * * * *

(c) * * *

(4) Beginning July 5, 2027, you must identify and implement a set of site-specific good combustion practices for each battery. These good combustion practices should correspond to your standard operating procedures for maintaining the proper and efficient combustion within battery waste heat flues. Good combustion practices include, but are not limited to, the elements listed in paragraphs (c)(4)(i) through (v) of this section.

* * * * *

■ 9. Amend § 63.7341 by revising paragraph (f) to read as follows:

§ 63.7341 What reports must I submit and when?

* * * * *

(f) *Electronic reporting of compliance reports.* Beginning on July 5, 2027, or once the report template for this subpart has been available on the CEDRI website for one year, whichever date is later, submit all subsequent reports to the EPA via the CEDRI according to § 63.9(k) except that confidential business information (CBI) should be submitted according to paragraph (h) of this section.

* * * * *

[FR Doc. 2025–12626 Filed 7–3–25; 8:45 am]

BILLING CODE 6560–50–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2019–0081; FXES11130900000–234–FF09E22000]RIN 1018–BD95

Endangered and Threatened Wildlife and Plants; Removal of the Dwarf-flowered Heartleaf From the List of Endangered and Threatened Plants

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), are removing the dwarf-flowered heartleaf (*Hexastylis naniflora*) from the Federal List of Endangered and Threatened Plants. After a review of the best available scientific and commercial information, we find that delisting the species is warranted. Our review indicates that the threats to the dwarf-flowered heartleaf have been eliminated or reduced to the point that the species no longer meets the definition of an endangered or threatened species under the Endangered Species Act of 1973, as amended (Act). Accordingly, the prohibitions and conservation measures provided by the Act, particularly through sections 4 and 7, will no longer apply to the dwarf-flowered heartleaf.

DATES: This rule is effective August 7, 2025.

ADDRESSES: This final rule is available on the internet at *https://www.regulations.gov.* Comments and materials we received are available for public inspection at *https://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081.

Availability of supporting materials: This rule and supporting documents, including the proposed rule, post-delisting monitoring plan, and the species status assessment (SSA) report, are available at *https://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081.

FOR FURTHER INFORMATION CONTACT: Janet Mizzi, Field Supervisor, U.S. Fish and Wildlife Service, Asheville Ecological Services Field Office; *janet_mizzi@fws.gov;* telephone 828–258–3939. Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of contact in the United States.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species warrants removal from the Federal Lists of Endangered and Threatened Wildlife and Plants if it no longer meets the definition of an endangered species (in danger of extinction throughout all or a significant portion of its range) or a threatened species (likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range). The dwarf-flowered heartleaf is listed as threatened, and we are delisting it because we have determined it does not meet the Act's definition of an endangered or threatened species. Delisting a species can be completed only by issuing a rule through the Administrative Procedure Act rulemaking process (5 U.S.C. 551 *et seq.*).

What this document does. This rule removes the dwarf-flowered heartleaf from the Federal List of Endangered and Threatened Plants based on the species' recovery.

The basis for our action. Under the Act, we may determine that a species is an endangered species or a threatened species because of any of 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. The determination to delist a species must be based on an analysis of the same factors.

Under the Act, we must review the status of all listed species at least once every 5 years. We must delist a species if we determine, on the basis of the best available scientific and commercial data, that the species is neither a threatened species nor an endangered species. Our regulations at 50 CFR 424.11(e) identify four reasons why we might determine a species shall be delisted: (1) The species is extinct, (2) the species has recovered to the point at which it no longer meets the definition of an endangered species or a threatened species, (3) new information that has become available since the original listing decision shows the listed entity does not meet the definition of an endangered species or a threatened species, or (4) new information that has become available since the original listing decision shows the listed entity does not meet the definition of a species. Here, we have determined that the dwarf-flowered heartleaf has recovered to the point at which it no longer meets the definition of an endangered species or a threatened species; therefore, we are delisting it.

Previous Federal Actions

Please refer to the proposed rule to delist the dwarf-flowered heartleaf published on April 26, 2021 (86 FR 21994), for a detailed description of previous Federal actions concerning this species.

Peer Review

A species status assessment (SSA) team prepared an SSA report for the dwarf-flowered heartleaf. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impact of past, present, and future factors (both negative and beneficial) affecting the species.

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review in listing and recovery actions under the Act, we solicited independent scientific review of the information contained in the dwarf-flowered heartleaf SSA report. As discussed in the proposed rule, we sent the SSA report to seven independent peer reviewers and received no responses.

Summary of Changes from the Proposed Rule

In this final rule, we make no substantive changes to our April 26, 2021 (86 FR 21994), proposed rule. Minor, non-substantive changes have been made throughout this final rule.

Summary of Comments and Recommendations

In the proposed rule published on April 26, 2021 (86 FR 21994), we requested that all interested parties submit written comments on the proposal by June 25, 2021. We also contacted appropriate Federal and State agencies, Tribal entities, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. Newspaper notices inviting general public comment were published in the Charlotte Observer and the Spartanburg Herald Journal. We did not receive any requests for a public hearing. All substantive information received during the comment period has either been incorporated directly into this final determination or is addressed below.

State Agency Comments

(1) *Comment:* The South Carolina Department of Natural Resources (SCDNR) commented that delisting dwarf-flowered heartleaf is premature. The SCDNR found that the SSA report presented: (1) flawed data on the number of populations and range, in part because of ongoing taxonomic research, but also because there are no recent observations of 41 (34 percent) of the reported 119 populations; and (2)

insufficient consideration of future threats in a rapidly growing development area of South Carolina.

Our Response: Based on North Carolina Natural Heritage Program (NCNHP) and South Carolina Heritage Trust Program data, the species consists of 119 populations distributed across 13 counties in North and South Carolina. The total number of populations was derived from element occurrence (E.O.) data from the Natural Heritage Programs (NHP). NHPs collect information on occurrences of rare plants, animals, natural communities, and animal assemblages. Collectively, these are referred to as ''elements of natural diversity'' or simply as ''elements.'' Specific occurrences of the elements are referred to as ''element occurrences''. For our analysis, we used population size as the main driver of population resilience. E.O. data included a wide range of years since the species was last observed at a given location (1964–2017), although recent data and reports indicate the species consists of 119 populations, some of that data is outdated. For the purposes of this analysis, we only used EOs that were observed since 2005. We did this for several reasons. First, we did not want to assume a population was still present if it had not been observed recently. Second, we wanted to be consistent in what we considered ''current'' for both categorizing resilience and use in the habitat model. Third, experts concurred that records as old as 12 years are still likely to persist (number of years between 2005 and the SSA). Finally, there was a natural data break in 2005, coinciding with the year the last 5-year review was initiated. It is important to note that many of the populations that were excluded from the analysis may still persist on the landscape. In fact, many EOs for this species have persisted for decades, despite not having intervening surveys to confirm their persistence. Based on the exclusion of pre-2005 EOs, we considered a conservative estimate of 78 populations distributed across the range of dwarf-flowered heartleaf, although this may be an underestimate as discussed above. We therefore used the best available scientific and commercial data in our analyses.

With regard to any ongoing taxonomic research, any information related to a taxonomic change is unpublished, and a new species has not yet been described. Surveys conducted and reports completed by Appalachian State University, referenced by SCDNR, were considered, and are cited in the SSA report. An update to these studies has not been provided. The Act requires the use of the best available scientific and commercial information, but if that information is not available, it cannot be incorporated into decision analyses or rules.

Our implementing regulations provide further guidance on whether a particular taxon or population is a species or subspecies for the purposes of the Act; under 50 CFR 424.11(a), the Service shall rely on standard taxonomic distinctions and the biological expertise of the Department of the Interior and the scientific community in determining whether a particular taxon or population is a species for the purpose of the Act. For our analysis, we assumed all EOs are dwarf-flowered heartleaf (*Hexastylis naniflora),* which represents the best currently available scientific and commercial data.

In response to the concern about potential future development in South Carolina, our level of analysis for urbanization was consistent throughout the range, and North Carolina and South Carolina were included in the same analysis using the same standard data. We used Slope, Land cover, Exclusion, Urbanization, Transportation, and Hillshade (SLEUTH) data which incorporates the most recently available information. We used three scenarios, projected out to the year 2040, to capture the uncertainty related to the potential impacts to each population's resiliency: status quo, targeted conservation, and high development. Results of future projections within each scenario are focused on current populations and potential habitat identified by the maximum entropy (Maxent) model. Based on the life span of the species, expert input, identification of development as the key risk factor brought forward, uncertainty about future conditions, and lack of knowledge about where additional populations may persist on the landscape, we chose to project populations out to the year 2040 under each scenario. We therefore thoroughly considered future threats of development in our SSA report.

Public Comments

We reviewed all public comments for substantive issues and new information regarding the species. Substantive comments we received during the comment period are addressed below.

(2) *Comment:* One commenter indicated that the dwarf-flowered heartleaf does not compete well with disturbance caused by deforestation and suburbanization, yet many of the known populations are facing encroaching development. Based upon unpublished data, the commenter suggested that the decision to delist dwarf-flowered heartleaf should be postponed for 2 years to allow the biodiversity community to assess current knowledge. The commenter stated that delisting now would increase the likelihood that certain areas would be developed, and these habitats would be lost to any future efforts to conserve the species and their genetic diversity.

Our Response: We are unable to delay our decision for 2 years because we are required to make our determination whether a species meets the definition of an endangered species or a threatened species based on the best scientific and commercial data available at the time of our rulemaking. Delisting a species does not prevent continued research on a species, and all delisted species, including dwarf-flowered heartleaf, are required to have a post-delisting monitoring (PDM) plan. The PDM plan is used to verify that the dwarf-flowered heartleaf remains secure from the risk of extinction after delisting. The PDM plan was developed to ensure consistent reporting and as a coordinating mechanism with conservation land entities.

In response to the commenter's concerns about development, we included our analysis of dwarf-flowered heartleaf viability from the SSA report in the proposed rule. Our analysis included habitat change related to development, and we used projections of urban development to assess this threat. Because impacts of urbanization are multi-faceted and uncertain, we used three future scenarios to capture potential impacts to species resiliency (status quo, targeted conservation, and high development). Results of future projections within each scenario were focused on current populations and potential habitat identified by a Maxent model.

We used SLEUTH models to identify areas of urbanization in 2040. Urban development was predicted to have negative impacts on several current populations under all future scenarios. However, any extirpation or loss of resiliency within individual populations was offset by populations found to persist in the status quo and targeted conservation scenarios. In the high development scenario, there was a predicted loss of 6 populations (78 populations currently compared with 72 populations in 2040), with resiliency loss in several additional populations. Regardless of scenario, the majority of the populations expected to persist on the landscape in 2040 were of at least moderate resiliency. Furthermore, given the relatively high number of

populations in at least moderate resiliency across each scenario, redundancy remained similar to current conditions. Therefore, there appears to be adequate resiliency and redundancy within the range of dwarf-flowered heartleaf to withstand the impacts of urbanization into the foreseeable future.

The overwhelming majority of dwarf-flowered heartleaf populations have been discovered as a direct result of surveys conducted to ensure compliance with the Act. We prepared the PDM plan, with input from the NCNHP and the North Carolina Department of Transportation (NCDOT), based largely on monitoring methods developed in March 2012 during a field coordination meeting (Robinson and Padgett 2016, entire). This plan is designed to detect substantial declines in dwarf-flowered heartleaf occurrences with reasonable certainty and precision. Dwarf-flowered heartleaf occurs mainly on private lands with a few populations on public lands. NCNHP and NCDOT have monitored 25 of the largest populations for at least 5 years to collect baseline data (Service 2019, entire). As staff resources and funding allow, we expect that current efforts to monitor and manage lands containing populations of dwarf-flowered heartleaf will continue. The final PDM plan for the species can be found at *https://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081.

(3) *Comment:* One commenter stated the Service should not delist the dwarf-flowered heartleaf because it is a narrow endemic species found only on a few soil types, soils that occur along streams, in bogs, and on low bluffs.

Our Response: Narrow endemism, by itself, is not a basis for determining that a species meets the definition of an endangered species or a threatened species. Our analysis of the best available scientific and commercial data indicate that the dwarf-flowered heartleaf does not meet the definition of either an endangered species or a threatened species. There has been a nearly four-fold increase in the number of known populations since listing and the two prominent threats identified—invasive, exotic species and habitat loss or destruction—are not as significant as originally thought. Despite the limited range of this species, threats have been eliminated or reduced to the point that the dwarf-flowered heartleaf no longer meets the definition of a threatened species or endangered species under the Act.

(4) *Comment:* One commenter indicated that there have been suggestions that this species should be lumped with *Hexastylis heterophylla* and perhaps *H. virginiana.* This classification would artificially broaden its range while dismissing population differences. It would make this species appear to be no longer threatened. The cluster of closely related species is what would be expected when populations have been isolated into groupings that no longer share a gene pool. In this isolation, populations mutate, and a process of speciation begins. It is the commenter's understanding that a recent study has indicated that *Hexastylis naniflora* is in fact limited in range to South Carolina and a southern portion of North Carolina and that the plants in other North Carolina counties are in fact a different species. The delisting proposal relies heavily upon the existence of populations of the other species and protected populations of the other species.

Our Response: Dwarf-flowered heartleaf was described by Blomquist (1957, entire) in his revision of the North American members of the genus *Hexastylis.* The dwarf-flowered heartleaf has been recognized as part of the Virginica group, and this group was further subdivided into three subgroups or complexes: Virginica, Shuttleworthii, and Heterophylla (Blomquist 1957, pp. 8:255–281; Whittemore and Gaddy 1997, pp. 3:54–58). Three species have been recognized in the Heterophylla complex, *Hexastylis naniflora, H. heterophylla,* and *H. minor;* and field biologists have generally recognized that considerable morphological overlap occurs (Murrell et al. 2007, entire). Our analysis only included EOs identified as *H. naniflora* and did not consider grouping the species with any others in the Virginica group, subgroups, or complexes. Thus, contrary to the commenter's statement, our determination to delist the species was based only on EOs identified as *H. naniflora.* Analyses on ecology, morphology, soil chemistry, pollen, and molecular genetics have been evaluated for *Hexastylis naniflora* to determine the boundaries within the Heterophylla complex (Murrell 2015, entire; Wagner 2013, entire; Niedenberger 2010, entire; Service 2010 p. 10; Murrell et al. 2007, entire; Padgett 2004, entire). These analyses support the continued recognition of these taxa as well-defined, discrete species. The Service relies on standard taxonomic distinctions and the scientific community in determining whether a particular taxon or population is a species of the Act.

(5) *Comment:* One commenter stated that delisting this species is contrary to the Act, does not acknowledge the substantial threats to the continued existence of this species, ignores existing science, and fails to obtain additional evidence needed to determine what action should be taken with respect to the listing of the species. This commenter further stated that contrary to the clear requirements of the Act, it appears that the proposal to delist dwarf-flowered heartleaf was the result of the U.S. Fish and Wildlife Service Southeast Region emphasis on removal of protections for the species. This commenter referred to a 2017 Southeast Region goal to delist, downlist, or preclude the need for listing of 30 species per year as a quota system that incentivizes decisions on species status based on meeting arbitrary objectives, rather than evaluating a species' status based on the best available science as required under the Act. This commenter also stated that the best available scientific evidence is not a part of the Service's analysis or proposal, and that the Service has not initiated studies to determine the genetics of the populations.

Our Response: The NCNHP assessed threats to populations of dwarf-flowered heartleaf they monitored from 2012–2016 (Robinson and Padgett 2016, pp. 7–8, 17–20). Threats that were observed, inferred, or suspected to have an impact on populations were recorded and assigned a ranking based on their severity, scope, and immediacy from field observations. The rank (A to G) for each threat factor determined an overall value for each threat observed at each population. Threats observed during these years included development, incompatible forestry practices, agriculture, trampling, invasive exotic species, sedimentation, erosion, and road construction. Despite threats observed in many of the populations surveyed, several of the populations appeared to be stable during the 5-year survey period and no significant changes in threats within populations were noted between 2012 and 2016. The SSA incorporated the best available scientific and commercial data to characterize viability as the ability of a species to sustain populations in the wild over time. We utilized this information to inform our decision in the proposed rule and in this final rule.

Since 2012, when our Ecological Services program in the Southeast Region initiated its At-Risk Species initiative, we have placed an increased emphasis on recovering species listed as threatened and endangered under the Act and preventing the need to list at-risk species through collaborative conservation. Our goal was to conserve 30 species by implementing proactive conservation actions that result in

downlisting or delisting species under the Act or precluding the need to list these species under the Act. While the Southeast Region no longer uses this specific metric as its goal, we continue to work cooperatively with partners to recover species. In accordance with the Act, all of our decisions are based on the best available scientific and commercial data.

The determination to delist the dwarf-flowered heartleaf is based on a thorough review of the best available scientific and commercial data, which indicate that the threats to the species have been eliminated or reduced to the point that the species no longer meets the definition of a threatened species or endangered species under the Act.

(6) *Comment:* One commenter stated that removing dwarf-flowered heartleaf from the protections of the Act will have an increased impact on the plant in Greenville County, South Carolina. This commenter stated that currently, under Greenville County's land development regulations, the County Planning Commission and its staff reject or require modifications of subdivision plans that impact rare plants and their habitat. Last year, the commission rejected a proposed development on Enoree Road in Travelers Rest which would have been built over dwarf-flowered heartleaf and its habitat. They noted that listing of this species was essential to protecting those plants.

Our Response: In the SSA report, urban development was predicted to have negative impacts on several of the current populations under all of our future scenarios. However, this loss of resilience and extirpation of several populations was offset by the fact that several populations were found to persist in the status quo and targeted conservation scenarios. In the high development scenario, there was a predicted loss of six populations, with loss of resilience in several additional populations. Regardless of the scenario, the majority of the populations on the landscape in 2040 exhibit high or moderate resilience.

(7) *Comment:* The commenter expressed concern about the growing impacts of climate change. These plants are in wet forests, near waterbodies, and sometimes at the base of mature trees. The commenter noted that changing climate will affect rain patterns, hydrology, and forests. The commenter expressed concern that dwarf-flowered heartleaf does not spread rapidly or grow rapidly, and are not well suited to deal with changes in their environment or their forests. The commenter further noted recent extended droughts, and a bad drought across the region would have very negative consequences for this species.

Our Response: We considered the effects of increased drought in our future scenarios, and the SSA identified the effects are likely related to changes in soil moisture associated with potential increases in drought. The broadened range (from 8 to 13 counties) and significantly increased numbers of populations (24 to 78) since listing in 1989 contribute to the species' redundancy and resiliency that we find to be sufficient to withstand perturbations from the potential increases in drought in the foreseeable future.

Background

A thorough review of the taxonomy, life history, ecology, and overall viability of the dwarf-flowered heartleaf is presented in the SSA report on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081. A summary of that information is presented here.

Dwarf-flowered heartleaf is a plant species endemic to the upper Piedmont region of western North Carolina and upstate South Carolina. It is a low-growing herbaceous plant in the birthwort family (Aristolochiaceae). Although dwarf-flowered heartleaf is restricted in range, it is not as rare as once thought (Service 2010, p. 15; NCNHP 2016, p. 4). When dwarf-flowered heartleaf was federally listed in 1989, the listing rule described 24 extant populations (and 1 extirpated population) distributed across 8 counties in the upper Piedmont region of North and South Carolina. By 2018, the distribution of this species may have been as high as 119 populations distributed across 13 counties in both states. In North Carolina, it is found in Alexander, Burke, Caldwell, Catawba, Cleveland, Gaston, Iredell, Lincoln, Polk, and Rutherford Counties. In South Carolina, it is found in Cherokee, Greenville, and Spartanburg Counties.

Dwarf-flowered heartleaf is historically known to have a restricted range due to its habitat requirements. The habitat where dwarf-flowered heartleaf exists is limited in size and scope due to a multitude of factors including soil type, moisture availability, and slope aspect (Padgett 2004, p. 81). This unique combination of factors limits not only the range of dwarf-flowered heartleaf, but also the size of any population.

Dwarf-flowered heartleaf occurs in Piedmont uplands on acidic sandy-loam soils that are very deep and moderately permeable (Gaddy 1981, p. 7; 1987, pp. 186–196). Typical habitats for this species include mesic to dry bluffs, slopes, or ravines in deciduous forests that are frequently associated with mountain laurel (*Kalmia latifolia*) (Padgett 2004, p. 114; Weakley 2015, p. 129; Service 2015, entire), or in moist soils adjacent to creeks or streamheads, or along lakes and rivers. Plants grow larger and have more frequent flowering in floodplains along rivers, lakes, and streams (Newberry 1993, entire). In 2013, a habitat suitability study was conducted to quantify the habitat requirements for dwarf-flowered heartleaf, which may be used to help identify the species when not in flower (relative to other *Hexastylis* species' habitat preferences), find new populations, or identify suitable sites for transplants (Wagner 2013, pp. 30–32). The unit of measurement for population size in this species is a ''clump'' (rosette).

Recovery Criteria

A recovery plan for the dwarf-flowered heartleaf was not prepared; therefore, specific delisting criteria were not developed for the species. The North Carolina Plant Conservation and Protection Act (NC Gen Stat section 106–202.12 (2022)) provides limited protection from unauthorized collection and trade of plants listed under that statute. However, this statute does not protect the species or its habitat from destruction in conjunction with development projects or otherwise legal activities. In South Carolina, plants are protected only from disturbance where they occur on those properties owned by the State and specifically managed as South Carolina Heritage Preserves (SC Code section 51–17–80 (2023)). There are no other Federal or State statutes that afford significant protections to dwarf-flowered heartleaf.

The majority of sites that have the potential to afford long-term protection to the species have been protected as a direct result of the provisions of section 7 of the Act. Through section 7 and voluntary conservation actions, approximately 24 of the 78 populations are permanently protected, and another 18 populations are partially protected, greatly minimizing the likelihood of impacts due to development. Additionally, tens of thousands of dwarf-flowered heartleaf plants are conserved through a voluntary agreement with Duke Energy along the Broad River. Another population is conserved at Cowpens National Battlefield, managed by the U.S. National Park Service, in upstate South Carolina. A third population is part of the Broad River Greenway, a local park in North Carolina's Cleveland County.

Furthermore, Foothills Conservancy, Catawba Lands Conservancy, and The Nature Conservancy all protect sites with dwarf-flowered heartleaf plants. The NCDOT is one of the greatest contributors to conservation of the species, acquiring land and conserving multiple populations over the years, including the land that became part of Cleveland County's Broad River Greenway.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in title 50 of the Code of Federal Regulations set forth the procedures for determining whether a species is an endangered species or a threatened species, issuing protective regulations for threatened species, and designating critical habitat for endangered and threatened species. On April 5, 2024, jointly with the National Marine Fisheries Service, the Service issued a final rule that revised the regulations in 50 CFR part 424 regarding how we add, remove, and reclassify endangered and threatened species and what criteria we apply when designating listed species' critical habitat (89 FR 23919). This final rule is now in effect and is incorporated into the current regulations. Our analysis for this decision applied our current regulations. Given that we proposed delisting this species under our prior regulations (revised in 2019), we have also undertaken an analysis of whether the decision would be different if we had continued to apply the 2019 regulations and we concluded that the decision would be the same. The analyses under both the regulations currently in effect and the 2019 regulations are available on *https://www.regulations.gov.*

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 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 determination to delist a species must be based on an analysis of the same five factors.

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 (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). 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 species' expected response 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.

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) set forth a framework for evaluating the foreseeable future on a case-by-case basis which is further described in the 2009 Memorandum Opinion on the foreseeable future from the Department of the Interior, Office of the Solicitor (M–37021, January 16, 2009; ''M-Opinion,'' available online at *https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/M-37021.pdf*). The foreseeable future extends as far into the future as the U.S. Fish and Wildlife Service and National Marine Fisheries Service can make reasonably reliable predictions about the threats to the species and the species' responses to those threats. We need not identify the foreseeable future in terms of a specific period of time. We will describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species' life-history characteristics, threat-projection timeframes, and environmental variability. In other words, the foreseeable future is the period of time over which we can make reasonably reliable predictions. ''Reliable'' does not mean ''certain''; it means sufficient to provide a reasonable degree of confidence in the prediction, in light of the conservation purposes of the Act.

Analytical Framework

The SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of the potential threats to the species. The SSA report does not represent our decision on whether the species should be delisted. 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.

To assess dwarf-flowered heartleaf viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency is the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years); redundancy is the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation is the ability of the species to adapt to both near-term and long-term changes in its physical and biological environment (for example, climate conditions, pathogen). 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.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated individual species' life-history needs. The next stage involved 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. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time, which we then used to inform our regulatory decision.

The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at Docket No. FWS–R4–ES–2019–0018 on *https://www.regulations.gov.*

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the species and its resources, and the threats that influence the species' current and future condition, in order to assess the species' overall viability and the risks to that viability. In addition, the SSA report (Service 2018, entire) documents our comprehensive biological status review for the species, including an assessment of the potential threats to the species.

For the dwarf-flowered heartleaf to maintain viability, its populations or some portion thereof must be resilient. Stochastic factors that have the potential to affect dwarf-flowered heartleaf include impacts to its habitat, particularly human development pressures, but also changes in soil moisture associated with potential increases in drought and presence of invasive species. Other factors that influence the resiliency of dwarf-flowered heartleaf populations include abundance within populations, and habitat factors such as soil type, aspect, elevation, and land use. Influencing those factors are elements of dwarf-flowered heartleaf ecology that determine whether populations can grow to maximize habitat occupancy, thereby increasing resiliency of populations. The following is a summary of this status review and the best available scientific and commercial information gathered since that time that have informed this decision.

The North Carolina Natural Heritage Program (NCNHP) assessed threats in the populations of dwarf-flowered heartleaf they monitored from 2012 through 2016 (Robinson and Padgett 2016, pp. 7–8, 17–20). Threats that were observed, inferred, or suspected to have an impact on populations were recorded and assigned a ranking based on field observations of severity, scope, and immediacy. The rank (A through G) for each threat factor determined an overall value for each threat observed at each population. Threats observed during these years included development; incompatible forestry practices; agriculture; trampling; invasive, exotic species; sedimentation; erosion; and road construction. In this final rule, we discuss the major threats affecting the species, which include development, effects of increased drought and invasive, exotic species. For a detailed discussion of all threats affecting the species, see the SSA report available on *https://www.regulations.gov* at Docket No. FWS–R4–ES–2019–0018.

Development

Dwarf-flowered heartleaf populations occur in rapidly growing urban areas within numerous counties in North and South Carolina. At the time of listing, the species was determined to be most threatened by habitat loss due to the conversion of land to residential, commercial, and industrial use in these areas. Populations occurring in more rural areas are also threatened by habitat alteration or loss from land conversion to pasture or other agricultural uses, cattle grazing, intensive timber harvesting, residential construction, and construction of small ponds (Robinson 2016, p. 10; Robinson and Padgett 2016, p. 5).

The recent 5-year review for the species identified the most recurrent source of habitat destruction as road and bridge improvement projects, which is also the most common trigger for consultations under section 7 of the Act involving dwarf-flowered heartleaf. Ten of the 27 largest populations (containing more than 1,000 rosettes) have been the subject of section 7 consultations. Collectively, these projects have adversely affected or were expected to affect approximately 22,135 rosettes (Service 2018, p. 31). In most cases, the section 7 process resulted in avoidance or minimization of adverse effects through relocation of plants and/or commitments of on-site protection. Significant portions of other populations are located on properties that have been purchased by NCDOT as off-site conservation measures in association with these consultations. The purpose of these purchases is to protect the dwarf-flowered heartleaf.

Other forms of economic development have also resulted in the destruction or modification of habitats occupied by dwarf-flowered heartleaf; in many cases, these activities also required section 7 consultations with the Service. Examples include the maintenance or expansion of hydroelectric and drinking water reservoirs, construction of an industrial development complex, and maintenance activities at a regional airport. Collectively, these activities involved the loss or relocation of several thousand rosettes.

Development was identified as a threat at 5 of 10 North Carolina populations monitored by NCNHP (Robinson and Padgett 2016, pp. 17–19). These 5 populations include 2 stand-alone EOs and 3 parent EOs with 18 sub-EOs. Of the 2 stand-alone EOs, 1 has a development threat rank of A (moderate to severe, imminent threat for most (more than 60 percent) of population, occurrences, or area) and 1 has a rank of B (moderate to severe, imminent threat for a significant portion (20–60 percent) of the population, occurrences, or area). Of the 18 sub-EOs, 9 have development identified as a threat. Of the nine sub-EOs, one has a development threat rank of A, one has a rank of B, one has a rank of E (moderate to severe threat for a small proportion of population, occurrences, or area), and six have a rank of F (low severity threat for most or a significant proportion of population, occurrences, or area). The two stand-alone EOs and two sub-EOs with the highest threat ranks (A and B) are located in four populations. Based on the most recent monitoring data, one is increasing, two are stable, and one is decreasing (Robinson and Padgett 2016, p. 11). Even where development is ranked as a high threat, impacts to dwarf-flowered heartleaf have not been shown to be significant.

Development was identified as a threat at one of three South Carolina populations monitored by NCNHP, and that population has a development threat rank of E (Robinson and Padgett 2016, p. 20). Based on the most recent monitoring data, this population is stable (Robinson and Padgett 2016, p. 11).

The data therefore indicate that most dwarf-flowered heartleaf populations have either remained stable or increased in the presence of development. From 2012 to 2016, there were insignificant changes in the severity of the threat of development observed in the field (NCNHP 2016, p. 8).

The North Carolina Plant Protection and Conservation Act (NC Gen Stat section 106–202.12 (2022)) lists native

plants as threatened, endangered, or species of concern, and provides limited protection from collection and trade of listed plants. However, this statute does not protect the species or its habitat from destruction in conjunction with development projects or otherwise legal activities. In North Carolina, the NCNHP designates ''natural areas'', which are sites with biological diversity significance due to the presence of rare species or unique natural communities. The NCNHP works with many conservation partners (State and Federal agencies, conservation organization, land trusts, etc.) to implement voluntary protection. Through partnerships, the most important natural areas are purchased for permanent conservation. If a natural area is not available for purchase, ecological significance can be recognized by a voluntary registry agreement. Registry agreements consist of registered heritage areas, which are voluntary conservation agreements between the landowner and NCNHP to preserve the natural area and biological diversity of the property. The NCNHP has four registry agreements that include dwarf-flowered heartleaf.

In South Carolina, plants are protected only from disturbance where they occur on those properties owned by the State and specifically managed as South Carolina Heritage Preserves (SC Code section 51–17–80 (2023)). Heritage Preserves are protected areas that play a critical role in conserving rare species and natural habitats. There is one Heritage Preserve in South Carolina, which protects one population of the dwarf-flowered heartleaf.

The overwhelming majority of dwarf-flowered heartleaf populations have been discovered as a direct result of surveys conducted to ensure compliance with the Act. The majority of sites that have the potential to afford long-term protection to the species have been protected as a result of consultations under section 7 of the Act, which directs Federal agencies to avoid and minimize adverse effects to federally listed species. Through section 7 and other voluntary conservation actions, approximately 24 (31 percent) of the 78 current populations are permanently protected, and another 18 populations (23 percent) are partially protected, greatly minimizing the likelihood of impacts due to development. Over 50 percent of dwarf-flowered heartleaf populations will therefore remain under some form of protective mechanism from the threat of development in the absence of the Act's protections.

Invasive, Exotic Species

Invasive, exotic plant species occur across the range of this species. Plants such as English ivy (*Hedera helix*), Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and Japanese stiltgrass (*Microstegium vimineum*) are known at several sites that contain dwarf-flowered heartleaf (Service 2019 p. 15). Invasive, exotic species were identified as a threat at 8 of 10 North Carolina populations monitored by NCNHP (Robinson and Padgett 2016, pp. 17–19). The 8 populations include 4 stand-alone EOs and 4 parent EOs with 19 sub-EOs. Of the 4 stand-alone EOs, 1 has an invasive threat rank of B (moderate to severe, imminent threat for a significant portion (20–60 percent) of the population, occurrences, or area), 2 have a rank of F (low severity threat for most or a significant proportion of population, occurrences, or area), and 1 has a rank of G (low severity threat for a small proportion of population, occurrences, or area). Of the 19 sub-EOs, 9 have invasive, exotic species identified as a threat. Of these 9 sub-EOs, 1 has an invasive threat rank of A (moderate to severe, imminent threat for most (more than 60 percent) of population, occurrences, or area), 4 have a rank of B, 2 have a rank of E (moderate to severe threat for a small proportion of population, occurrences, or area), and 2 have a rank of G. The one stand-alone EO and five sub-EOs with the highest threat ranks (A and B) are located in three populations. Based on the most recent monitoring data, one EO is increasing, one is stable, and one is decreasing (Robinson and Padgett 2016, p. 11). Even where invasive, exotic species are ranked as a high threat, impacts to dwarf-flowered heartleaf have not been shown to be significant.

Invasive, exotic species were identified as a threat at all (three) South Carolina populations monitored by NCNHP, and all sites had an invasive threat rank of F (Robinson and Padgett 2016, p. 20). Based on the most recent monitoring data, all populations are stable (Robinson and Padgett 2016, p. 11).

In short, the data indicate that most dwarf-flowered heartleaf populations have remained stable or increased in the presence of invasive, exotic species. Despite the long-term presence of invasive, exotic plants, from 2012 to 2016, there were no changes in the severity of threats observed in the field significant enough to elevate the threat ranks of the evaluated dwarf-flowered heartleaf populations (NCNHP 2016, p. 8).

Climate

Accelerated changes in the environment is expected to increase the frequency and extent of drought conditions across the southeastern United States (Karl et al. 2009, entire). Increased frequency of severe storms could lead to impacts if flooding duration or intensity increased as a result. Increased flooding could decrease habitat suitability through scouring and changes in soil moisture or wash plants away. Warming in the Southeast is expected to be greatest in the summer (National Climate Change Viewer (NCCV) 2016, unpaginated), which is predicted to increase drought frequency, while annual mean precipitation is expected to increase slightly, leading to increased flooding events (Intergovernmental Panel on Climate Change (IPCC) 2013, p. 7; NCCV 2016, unpaginated). Changes in climate may affect ecosystem processes and communities by altering the abiotic conditions experienced by biotic assemblages, resulting in potential effects on community composition and individual species interactions (DeWan et al. 2010, p. 7).

In recent years, the Southeast has experienced moderate to severe droughts, which many observers have implicated in population declines and poor transplant survivorship (NCNHP 2016, entire). A wildfire burned portions of one of the largest known populations in 2009 (Foothills Landfill in Caldwell County, NC; Golder and Associates, 2009, entire). However, observation suggests that the species was not appreciably harmed by this fire (Service 2019 p. 33). Additionally, the National Park Service (NPS) uses prescribed fire as a vegetation management tool at Cowpens National Battlefield. The NPS's prescribed burning activity includes the majority of the dwarf-flowered heartleaf population on site and burning appears to have had no adverse effects upon growth or flowering (Walker et al. 2009, p. 14).

Current Condition

Resiliency

For dwarf-flowered heartleaf to maintain viability, its populations, or some portion thereof, must be resilient. Resiliency is assessed at the level of populations and reflects a species' ability to withstand stochastic events (events arising from random factors). Resilient populations are better able to withstand disturbances such as random fluctuations in reproductive rates and fecundity (demographic stochasticity), variations in rainfall (environmental stochasticity), and the effects of

anthropogenic activities. Stochastic factors that have the potential to affect dwarf-flowered heartleaf include habitat impacts; increased drought; and exotic, invasive species. Factors influencing the resiliency of dwarf-flowered heartleaf populations include population size, available habitat, and elements of dwarf-flowered heartleaf ecology that determine whether populations can maximize habitat occupancy.

The Natural Heritage Programs (NHP) collect information on occurrences of rare plants, animals, natural communities, and animal assemblages. Collectively, these are referred to as ''elements of natural diversity'' or simply as ''elements.'' In recent years, NatureServe and its member NHPs have devised mapping standards to balance the need for fine-scale, highly site-specific element occurrence (EO) records (required for monitoring and management) with the need to aggregate these records in meaningful units of conservation interest that may approximate biological populations (NatureServe 2002 unpaginated). We regard the NHP databases as the best repository for known locations of the dwarf-flowered heartleaf (Service 2010, p. 41). Populations are composed of both multiple sub-EOs and stand-alone EO records. For the purpose of assessing resiliency, 78 populations observed since 2005 were assessed due to the high confidence in their persistence. These new populations observed are the result of additional survey efforts.

To determine overall resiliency for populations, we used EO viability ranks and expert opinion to bin population size classes into corresponding resiliency categories. EO viability ranks for the species include the following categories: excellent, good, fair, poor, extant, historical, and failed to find. The primary factor in determining these ranks is EO size (as quantified by number of clumps). Condition of habitat (vegetation community and structure) and landscape context (extent of suitable habitat and physical factors) are incorporated secondarily. Recent reports (Robinson 2016, p. 7; Robinson and Padgett 2016, p. 4) focus monitoring studies on populations with greater than 1,000 individuals (assumed to be very viable). Because we do not have habitat-level information for every population we assessed, we synthesized available population size information and created four resiliency categories as follows:

- Very high—populations with more than 1,000 individuals; very high probability of persistence for 20 to 30 years at or above the current population size.
- High—populations with 500 to 1,000 individuals; moderately high probability of persistence for 20 to 30 years at or above the current population size.
- Moderate—populations with 100 to 500 individuals; low probability of persistence for 20 to 30 years at or above the current population size.
- Low—populations with fewer than 100 individuals; low probability of persistence for 20 to 30 years at or above the current population size, and moderately high probability of extirpation.

Of the 78 populations assessed, 28 have very high resiliency, 5 have high resiliency, 26 have moderate resiliency, and 19 have low resiliency.

Redundancy

Redundancy is also assessed at the species level and reflects a species' ability to withstand catastrophic events (such as a rare destructive natural event or episode involving many populations) by spreading the risk of such an event across multiple, resilient populations. We measured redundancy for dwarf-flowered heartleaf by the number and distribution of resilient populations across the range of the species. It is important to note that dwarf-flowered heartleaf has a naturally limited range, so measures of redundancy reflect the distribution within a relatively small area. Redundancy for dwarf-flowered heartleaf is the total number and resiliency of population segments and their distribution across the species' range.

We consider a catastrophe to be any population-level disturbance with the potential to negatively influence population resiliency outside of normal environmental and demographic stochasticity. Disturbances often act quickly and often with devastating effects; however, they can occur over long periods of time. A disturbance that occurs as a relatively discrete event in time, such as a hurricane, is referred to as a ''pulse'' disturbance, while more gradual or cumulative pressures on a system are referred to as ''press'' disturbances. Both types of disturbances are part of the natural variability of dwarf-flowered heartleaf ecological systems, and must be considered when assessing redundancy. While there is certainly a variety of potential pulse disturbances for the species (timber harvest, hydrological alterations, road and right-of-way construction), the primary potential catastrophic disturbances are press disturbances from increased drought. These press disturbances have great potential to affect ecosystem processes and communities by altering the underlying abiotic conditions such as temperature and precipitation changes (DeWan et al. 2010, pp. 7–10).

Representation

Because we lack genetic and ecological diversity data to characterize representation for dwarf-flowered heartleaf, we decided delineating representative units was not appropriate for this species. However, in the absence of species-specific genetic and ecological diversity information, we evaluated representation based on the extent and variability of habitat characteristics across the geographical range. Dwarf-flowered heartleaf occurs in two types of habitats throughout the range. Typical habitats for this species include mesic to dry bluffs, slopes, or ravines in deciduous forests that are frequently associated with mountain laurel (Padgett 2004, entire; Weakley 2015, entire; Service 2015, entire), or moist soils adjacent to creeks, streamheads, or along lakes and rivers. This variation in habitat type provides species representation in drier and wetter habitats, demonstrating the species' ability to adapt to changing environmental conditions.

Future Condition

Our analysis of the past, current, and future influences on dwarf-flowered heartleaf revealed that there are several influences that may pose risks to the future viability of the species. We assessed the species future viability over a timeframe of 20 to 25 years, which incorporates the relevant threats to the species and the species' likely response to those threats. The current and ongoing threats assessed in our analysis include the negative impacts of invasive species, increased drought, and habitat changes resulting from development. We selected this timeframe because it gives us the ability to reliably predict into the future and to capture the uncertainty related to the potential impacts to each population's resiliency. As also described above, the term ''foreseeable future'' extends only so far into the future as the Service can reasonably determine that both the future threats and the species' responses to those threats are likely. 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. Where we had data over longer time frames, we analyzed those data (*e.g.,* climate data); however, for the factors most influential in affecting the status of the dwarf-

flowered heartleaf, such as development and invasive species, we could only reliably predict the magnitude of the primary threats and the subsequent effects on dwarf-flowered heartleaf over a time frame of 20–25 years. This provides a timeframe of reference observations that enables the Service to predict future management scenarios for the species and the species' response to threats and management actions. Prior dwarf-flowered heartleaf conservation experience indicates that this timeframe is the expected period over which implementation of management practices (such as invasive species management) by conservation partners and tracking of the species' response to managed habitat improvement is reliable. Further, this time period coincides with the SLEUTH urban growth models, allowing us to make reliable predictions with respect to the threat of development. Therefore, we used the 20–25 year timeframe in developing our projections of future conditions for dwarf-flowered heartleaf.

Invasive, Exotic Species

As discussed above, invasive, exotic plants were identified as a threat at the time of listing; however, this threat may not be as significant as once thought. The NCNHP monitored 13 populations of dwarf-flowered heartleaf and assessed threats at each population. Of the monitored sites, only 9 percent of populations (1 of 11) where invasive, exotic species are present are also in decline, indicating the species has at least some capacity to withstand the presence of invasive, exotic species. The number of known populations has increased dramatically since listing as a result of increased survey effort, and the invasive, exotic plant threat to many of the largest populations has been observed to be low (NCNHP 2016, pp. 8, 17–20). Additionally, and as noted above, the number of populations managed under conservation ownership has increased. Therefore, we determine that competition from invasive, exotic species will not be a significant threat to dwarf-flowered heartleaf in the foreseeable future.

Climate

Our analysis under the Act includes consideration of ongoing and projected changes in climate. The term ''climate'' is defined as the long-term pattern of weather in a particular area. Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (*e.g.,* habitat fragmentation) (IPCC 2014, entire). In our analyses, we use the judgment of the experts to weigh relevant information, including uncertainty, in our consideration of various aspects of increases in drought.

As part of the current, worldwide collaboration in climate modelling under the IPCC, climate assessments of the full dataset of 30 climate models for historical and 21st century comparisons provide predictions at scales ranging from global to county-level in the United States (NCCV 2016 unpaginated). This global climate information has been downscaled by the National Aeronautics and Space Administration to scales relevant to our region of interest, and projected into the future under two different scenarios of plausible emissions of greenhouse gases (Alder and Hostetler 2017, p. 3). Using the NCCV and assuming the representative concentration pathways (RCP) greenhouse gas emission scenario RCP 8.5, we calculated projected annual mean changes from 1981–2010 to those projected for 2025–2049 for maximum temperature (+2.9 to 3.1 degrees Fahrenheit (°F) (+1.611 to 1.722 degrees Celsius (°C)) in NC and +2.9 °F +1.611 °C in SC), precipitation (+0.2 inches (in) (5.08 meters (mm)) per month for NC and SC), soil storage (−0.1 to −0.2 in (−2.54 to −5.08 mm) for NC and −0.1 in (2.54 mm) SC), and evaporative deficit (no change for NC or SC) in all counties where dwarf-flowered heartleaf occurs (Adler and Hostetler 2017, entire). We also calculated projected annual mean changes for the RCP 4.5 scenario using the same timeframes for maximum temperature (+2.5 to 2.7 °F (+1.388 to 1.5 °C) in NC and SC), precipitation (+0.01 in (0.254 mm) per month for NC and SC), soil storage (−0.1 to −0.2 in (−2.54 to −5.08 mm) for NC and −0.1 in (−2.54 mm) for SC), and evaporative deficit (no change for NC or SC) in all counties where dwarf-flowered heartleaf occurs (Adler and Hostetler 2017, entire). Based on these results, all 13 counties within the range of dwarf-flowered heartleaf will be subjected to higher temperatures (annual mean increase of 2.6 °F (1.44 °C) (RCP 4.5) or 2.9 °F (1.611 °C) (RCP 8.5)) and slightly higher precipitation (annual mean increase of 0.1 in (2.54 mm) per month (RCP 4.5) or 0.2 in (5.08 mm) per month (RCP 8.5)) in 2025–2049 relative to the period of 1981–2010. Because the average annual increase in precipitation is predicted to be only slight, the loss in soil storage is likely primarily the result of higher predicted temperatures.

Dwarf-flowered heartleaf is a long-lived perennial species. Several populations have been revisited after decades and the species was still stable. For example, one population in Rutherford County was first observed in 1957, and was still extant when next observed in 2001 (NCNHP 2018, unpaginated). In their analyses of life-history traits in relation to potential vulnerability to variability in demographic vital rates caused by increased variability in climatic patterns, researchers concluded that longer-lived species should be less influenced by climate-driven increases in demographic variability (Morris et al. 2008, p. 22; Dalgleish et al. 2010, p. 216).

Within the family Aristolochiaeae, more than 50 percent of the plant lineage is myrmecochorous (seed dispersal by ants) (Lengyel et al. 2010, p. 49). Likewise, dwarf-flowered heartleaf employs myrmecochory as a method for seed dispersal (Gaddy 1986, entire). While species with ant-dispersed seeds have slower migration rates than species with seeds that are adhesive or ingested (Brunet and Von Oheimb 1998, p. 429), myrmecochory provides for multiple adaptive advantages for plants. Ants can disperse seeds to sites that might be nutrient-enhanced or where plant fitness will be higher. Additionally, ants bury seeds, which may protect them from fire and drought (Boyd 2001, p. 235), two conditions exacerbated by increases drought (Karl et al. 2009, entire).

Populations of dwarf-flowered heartleaf are located within various ecological settings within the species' range. Dwarf-flowered heartleaf occurs on Piedmont uplands on acidic sandy-loam soils that are very deep and moderately permeable (Gaddy 1981, p. 7; 1987, pp. 186–196). Typical habitats for this species include mesic to dry bluffs, slopes, or ravines in deciduous forests that are frequently associated with mountain laurel (Padgett 2004, p. 114; Weakley 2015, p. 129), or moist soils adjacent to creeks or streamheads, or along lakes and rivers. This variation in habitat type provides species representation in drier and wetter habitats, demonstrating the species' ability to adapt to different environmental conditions that could be brought on by changing climate.

Development

As discussed above, development was identified as a threat at the time of listing; however, the threat is not as significant as once thought. The NCNHP monitored 13 populations of dwarf-flowered heartleaf and assessed threats

at each population. In 8 of the 13 monitored populations, development is identified as a threat. Of those 8 sites, only 12 percent of populations are also in decline, indicating the species has at least some capacity to withstand the threat of development. The number of known populations has increased dramatically since listing and the development threat posed at many of the largest populations is expected to remain low (NCNHP 2016, pp. 8, 17–20).

We assessed three plausible future scenarios encompassing varying levels of threats under status quo, targeted conservation, and high development. Based on the life span of the species, expert input, and uncertainty about future conditions, we projected population conditions in 2040 under each scenario as described in the SSA report (Service 2018, p. 34). Results of future projections within each scenario are focused on current populations and potential habitat identified by the Maxent model as described below.

In constructing our scenarios, we considered two main influences by which species viability projections could be affected: location of additional populations (positive influence) and habitat loss and fragmentation due to urban development (negative influence). Habitat quantity can be negatively impacted by development or land use change (particularly on private lands) or positively impacted by land acquisition, restoration, and/or introductions into unoccupied sites with existing suitable habitat.

We use the SLEUTH model to determine areas predicted to be urbanized by 2040, a time period for which the models provide reliable data. The SLEUTH model has been successfully applied worldwide over the last 15 years to simulate land use change, including urbanization (Clarke 1995, entire). The SLEUTH model predictions are broken down by probabilities of urbanization, ranging from 0 to 100 percent. We chose 80 percent probability as our cutoff, as this cutoff has been used by the U.S. Geological Survey and by us in other SSAs, and this threshold represents a highly likely outlook for urbanization of the landscape. To forecast viability using urban development projections, we assessed the following:

- Percent increase in projected development within the range of current populations; and
- Percent increase in projected development within areas delineated as potential habitat by the Maxent habitat model.

We know that certain dwarf-flowered heartleaf populations have been extirpated as the result of urban development in the past through loss of habitat. However, there are no data available on the relationships between urbanization and indirect impacts to dwarf-flowered heartleaf. Because of this unknown, we attempted to capture potential impacts in two ways. Our scenarios reflect a range of potential impacts from nearby urban development. Also, we used two thresholds for percent increase in urban development to capture potential deleterious effects: 25 percent and 50 percent. Our assumptions were that very small increases in development are unlikely to negatively impact populations; development increase of at least 25 percent of the area of current populations was likely to have some negative impacts; and development increase of at least 50 percent was likely to have significant impacts to populations (Service 2018, p. 36).

We also assessed potential positive effects by integrating the potential identification or rediscovery of additional populations throughout the range into two of our scenarios (targeted conservation and status quo). This is appropriate for several reasons. First, discovery of new EOs is common; many of the populations we consider under Current Condition, above, include detections that have occurred within the last few years. Second, we did not include many older detections (*i.e.,* we only included detections since 2005), although many of those detections are likely to persist. Several EOs have been revisited after more than 10 years, and the species was still present. For example, one such E.O. was first observed in 1957, next observed in 2001, and last observed in 2017. Based on the species' life history as a long-lived perennial species, and confirmed by such observations, it is reasonable to assume that populations will remain extant as long as suitable habitat is present. Finally, there are many predicted suitable habitat present within older EOs based on the Maxent model predictions that were not included as current populations due to the relatively long time since last observation.

The first step in identifying additional areas where dwarf-flowered heartleaf is likely to be found in the future was to identify EOs from populations that were last observed prior to 2005 (*i.e.,* we define current populations as those observed between 2005 and present day). Although our focus is on pre-2005 EOs, where dwarf-flowered heartleaf is likely to persist into the future, we also included current EOs (2005–current day) in our analysis because we were interested in how the pre-2005 EOs compared to those known to be persisting on the landscape since 2005. Also, by including pre-2005 EOs that are within current delineated populations, we can investigate whether current populations might be predicted to contain more plants than the most recent abundance estimate.

Once pre-2005 EOs were identified, we created a 1,000-m (3280.84 feet (ft)) buffer around the population and calculated a number of useful metrics, including resiliency category based on the last known abundance estimate, Maxent habitat model metrics, and the results of the SLEUTH model to further refine a list of potential sites where the species would likely occur within our 20–25-year projection window. Resiliency categories were assessed using last known abundance in the same way as populations assessed under Current Condition, above (*i.e.,* low = fewer than 100 individuals; moderate = 100–500 individuals; high = 500–1,000 individuals; very high = greater than 1,000 individuals). We assessed two habitat metrics for pre-2005 EOs: average Maxent score and percent Maxent classified as 0.8–1.0 score. Average Maxent score indicates habitat suitability, where in general, the higher the score, the higher quality the habitat, and was calculated by taking the mean Maxent score of all potential habitat within the 1,000-m (3280.84 ft) buffer. The percent Maxent classified as 0.8–1.0 represents the percentage of all potential habitat within the 1,000-m buffer that falls within the highest suitability habitat class. Together, these habitat metrics give general estimates of habitat quantity and quality. Finally, we calculated the total percentage of the 1,000-m buffer around each E.O. that is projected to be urbanized in the year 2040, in order to capture the primary risk factor of development when assessing the areas where dwarf-flowered heartleaf is likely to persist.

Status Quo Scenario

Under the status quo scenario, we estimate that 75 populations will persist throughout the range, and that there will be a range of impacts from urbanization that are related to the percentage increase in urban development and whether a population is protected or not. We assessed population resiliency under the following assumptions:

- Two additional populations are identified as persisting based on Maxent model metrics, last known abundance category, and total predicted urbanization from SLEUTH modelling.

Six additional EOs within currently delineated populations not included under Current Condition, above, are predicted to persist based on the same metrics.

- Potential impacts of urban development based on SLEUTH model projections focused on current delineated populations:
  - Protected areas:
    - Protected in perpetuity—no negative impacts from urbanization; and
    - Voluntary protection/non-perpetuity—population drops one resilience rank if percent increase in urbanization exceeds 50 percent threshold.
  - Unprotected areas—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold.

High Development Scenario

Under the high development scenario, we estimate no additional populations will persist throughout the range, and that impacts from urbanization are relatively high, and are also affected by whether a population is protected or not. We assessed population resiliency under the following assumptions:

- No additional populations are identified as persisting.
- Potential impacts of urban development based on SLEUTH model projections focused on current delineated populations:
  - Protected areas:
    - Protected in perpetuity—population drops one resilience rank if percent increase in urbanization exceeds 50 percent threshold; and
    - Voluntary protection/non-perpetuity—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold.
  - Unprotected areas—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold; extirpation of populations if percent increase in urbanization exceeds 90 percent threshold.

Targeted Conservation Scenario

Under the targeted conservation scenario, we estimate it is likely that several additional populations (*i.e.,* more than in the status quo scenario) will persist throughout the range. This scenario accounts for resilience (which is linked to abundance), habitat suitability (as predicted by the model), projected urban development (from SLEUTH), and protection status. In this scenario, conservation is happening through various partners (*e.g.,* State agencies, land trusts or other non-profits, private individuals). The range of impacts from urbanization are the same as in the status quo scenario. We assessed population resiliency under the following assumptions:

- Six populations are identified as persisting based on Maxent model metrics, last known abundance category, and total predicted urbanization from SLEUTH modelling. Six additional EOs within currently delineated populations not included under Current Condition, above, are predicted to persist based on the same metrics.
- Potential impacts of urban development based on SLEUTH model projections focused on current delineated populations:
  - Protected areas:
    - Protected in perpetuity—no impacts from urbanization; and
    - Voluntary protection/non-perpetuity—population drops one resiliency rank if percent increase in urbanization exceeds 50 percent threshold.
  - Unprotected areas—population drops one resiliency rank if percent increase in urbanization exceeds 25 percent threshold; population drops two resiliency ranks if percent increase in urbanization exceeds 50 percent threshold.

Future Resiliency

Status Quo Scenario

In the status quo scenario, we predict 75 of the 78 populations of dwarf-flowered heartleaf will be extant in 2040. The predicted resiliency of the extant populations are as follows: very high (27); high (6); moderate (23); low (17); and 2 additional populations identified as persisting, with an unknown resiliency. Six EOs within currently delineated populations not included under Current Condition, above, are predicted to persist, but resiliency is unchanged because each of the populations are already predicted to be of very high resiliency. When comparing future population resiliency to current condition, a few populations drop in their resiliency category. One current population of very high resiliency is predicted to drop to high resiliency; two moderate resiliency populations are predicted to drop to low resiliency; and five populations (one currently moderate and four currently low) are predicted to be extirpated due to urban development.

High Development Scenario

In the high development scenario, we predict 72 of the 78 populations of dwarf-flowered heartleaf will remain extant in 2040. The predicted resiliency of the extant populations are as follows: very high (27); high (4); moderate (25); and low (16). No additional populations are identified as persisting. When comparing future population resiliency to current condition, a few populations drop in their resiliency category. One current population of very-high resiliency is predicted to drop to moderate resiliency; one high resiliency population is predicted to drop to moderate resiliency; two moderate resiliency populations are predicted to drop to low resiliency; and six populations (one currently moderate and five currently low) are predicted to be extirpated due to urban development.

Targeted Conservation Scenario

In the targeted conservation scenario, we predicted 79 populations of dwarf-flowered heartleaf will be extant in 2040. The predicted resiliency of the extant populations are as follows: very high (27); high (6); moderate (23); low (17); and 6 additional populations identified as persisting, with an unknown resiliency. Six EOs within currently delineated populations not included under Current Condition, above, are predicted to persist, but resiliency is unchanged because each of the populations are already predicted to be of very high resiliency. When comparing future population resiliency to current condition a few populations drop in their resiliency category. One current population of very high resiliency is predicted to drop to high resiliency; two moderate resiliency populations are predicted to drop to low resiliency; and five populations (one currently moderate and four currently low) are predicted to be extirpated due to urban development.

Viability Summary

Future viability of dwarf-flowered heartleaf under all three scenarios is summarized in table 1, below. Urban development is predicted to have negative impacts on several of the current populations under all of our scenarios. However, this loss of resiliency and extirpation of a few populations is offset in the status quo and targeted conservation scenarios by the persistence of several additional populations. In the high development scenario, there is a predicted loss of six populations, with loss of resiliency in

several additional populations. However, in all three scenarios, the majority of the populations are expected to persist in 2040 at a level of at least moderate resiliency.

Given the relatively high number of populations across each scenario, redundancy remains similar to current conditions. We therefore conclude that there will be adequate redundancy within the range of dwarf-flowered heartleaf to withstand the impacts of localized catastrophic press disturbances; however, the species' range is relatively small, making it potentially vulnerable to long-term catastrophic events.

Because dwarf-flowered heartleaf has a very limited range, and after consulting with experts, we decided that delineating representative units was not appropriate. It is worth noting that in two of our scenarios (status quo and targeted conservation), additional populations are found to persist in South Carolina, an area where there are relatively few current populations. Based on a habitat distribution model, there is potential dwarf-flowered heartleaf habitat throughout the species range. Additional plants may be present in these areas but would need to be confirmed via surveys. Although we did not delineate representative units, our scenarios do not predict declines in species representation.

TABLE 1—VIABILITY SUMMARY FOR DWARF-FLOWERED HEARTLEAF UNDER THREE FUTURE SCENARIOS (PROJECTED TO YEAR 2040) AND COMPARED TO CURRENT CONDITION

	Current condition	Status quo scenario	High development scenario	Targeted conservation scenario
Very-High Resiliency	28	27	27	27
High Resiliency	5	6	4	6
Moderate Resiliency	26	23	25	23
Low Resiliency	19	17	16	17
Extirpated	n/a	5	6	5
Persisting	n/a	2	0	6
Total Populations	78	75	72	79

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. Our assessment of the current and future conditions encompasses and incorporates the threats individually and cumulatively. Our current and future condition assessment is iterative because it accumulates and evaluates the effects of all the 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.

Determination of Dwarf-Flowered Heartleaf's Status

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 meets the definition of 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 a species meets the definition of an endangered species or a threatened species because of any 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.

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 find that the present or threatened destruction, modification, or curtailment of dwarf-flowered heartleaf habitat (Factor A), which was the basis for listing the species, is no longer a threat. We assessed the best scientific and commercial data available regarding the past, present, and future threats faced by the dwarf-flowered heartleaf. When dwarf-flowered heartleaf was listed, the two prominent threats identified were invasive, exotic plants and habitat loss or destruction. As discussed above, invasive, exotic species are not as significant a threat to dwarf-flowered heartleaf as originally thought. Only 1 of the 11 monitored populations where invasive, exotic species occur was identified as declining. Additionally, dwarf-flowered heartleaf has the capacity to withstand habitat loss and destruction due to development. Of the 78 populations evaluated, 75 percent are characterized as being either very high, high, or moderately resilient, and many are stable or increasing.

The species currently has significant redundancy (78 populations), resilient populations (33 of 78 evaluated populations with high or very high viability), and representation in 2 different ecological settings. Even under our high development scenario, only two high or very high viability populations are predicted to have lower viability as a result of development. Therefore, we do not believe that competition from invasive, exotic species or habitat loss and destruction are significant threats to the species.

Additionally, since listing, there has been a nearly four-fold increase in the number of known populations. Of the 78 populations evaluated in the SSA report, 24 populations (31 percent) have permanent protection and 18 populations (23 percent) have partial protection through voluntary agreements or other commitments of management. We conclude that the species is currently not in danger of extinction throughout all of its range.

In order to more closely examine the future threat posed by habitat loss or destruction, we analyzed three different future development scenarios to the year 2040. Under all scenarios evaluated, 56 of the currently known 78

populations remain in very high, high, and moderate resiliency, compared to 59 populations under current conditions. Only a small number (five or six) of currently low resiliency populations are predicted to become extirpated under all scenarios evaluated. The species will continue to occur across its range, redundancy will remain high to moderately high, and representation will continue in its current condition providing current levels of adaptive capacity.

Of the 78 populations evaluated in the SSA report, 24 populations (31 percent) have permanent protection and 18 populations (23 percent) have partial protection through voluntary agreements or other commitments of management, reducing the likelihood of development impacting those populations. Recent examination of the species also identified increased drought and invasive species as potential future threats. The species' broadened range (from 8 counties to 13) and significantly increased numbers of known populations (24 to 119) since listing in 1989 indicate that the dwarf-flowered heartleaf benefits from sufficient redundancy and resiliency to withstand perturbations from increased drought as well as from invasive species. Thus, after assessing the best available scientific and commercial information, we conclude that the dwarf-flowered heartleaf is not in danger of extinction now or likely to become so in the foreseeable future throughout all of its range.

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 within the foreseeable future throughout all or a significant portion of its range. Having determined that the dwarf-flowered heartleaf is not in danger of extinction or likely to become so within 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 both (1) the portion is significant; and, (2) the species is in danger of extinction 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 dwarf-flowered heartleaf, 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 dwarf-flowered heartleaf to determine if the species is in danger of extinction now or likely to become so within the foreseeable future in any portion of its range. 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 Act's definition of an endangered species or a threatened species. For the dwarf-flowered heartleaf, 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 within the foreseeable future in that portion. We examined the following threats: development, invasive and exotic species, and increased drought, including cumulative effects.

The NCNHP monitored 13 populations of dwarf-flowered heartleaf throughout the species' range. Eleven of the 13 populations had invasive, exotic species identified as a threat, indicating that invasive, exotic species are found throughout the range and not concentrated in any specific location. Effects of increased drought, as discussed previously, are very uniform throughout the range (NCCV 2016 unpaginated). The opportunity for habitat loss and destruction due to development is higher on privately owned lands that could be sold for future development (Clarke 1995, entire). Of the 78 populations evaluated, we determined that 31 percent are permanently protected and another 23 percent are partially protected (*i.e.,* voluntary landowner agreements). The unprotected populations are spread throughout the species' range and not geographically clustered together. While there is some variability in the habitats occupied by dwarf-flowered heartleaf across its range, the basic ecological components required for the species to complete its life cycle are present throughout the habitats occupied by the 78 populations of the species.

We found no biologically meaningful portion of the dwarf-flowered heartleaf range where threats are impacting individuals differently from how they are affecting the species elsewhere in its range such that the status of the species in that portion differs from its status in any other portion of the species' range.

Therefore, we find that the species is not in danger of extinction now or likely to become so within the foreseeable future in any significant portion of its range. This does not conflict with the courts' holdings in *Desert Survivors* v. *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 data available indicates that the dwarf-flowered heartleaf 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. In accordance with our regulations at 50 CFR 424.11(e)(2) currently in effect, dwarf-flowered heartleaf has recovered to the point at which it no longer meets the definition of an endangered species or a threatened species. Therefore, we are removing the dwarf-flowered heartleaf from the List of Endangered and Threatened Plants.

Effects of This Rule

This rule revises 50 CFR 17.12(h) by removing the dwarf-flowered heartleaf from the Federal List of Endangered and Threatened Plants. On the effective date of this rule (see **DATES**, above), the prohibitions and conservation measures provided by the Act, particularly through sections 7 and 9, will no longer apply to the dwarf-flowered heartleaf. Federal agencies will no longer be required to consult with the Service under section 7 of the Act in the event that activities they authorize, fund, or carry out may affect the dwarf-flowered heartleaf. There is no critical habitat designated for this species, so there will be no effect to 50 CFR 17.96.

Post-Delisting Monitoring

Section 4(g)(1) of the Act requires us, in cooperation with the States, to implement a monitoring program for not less than 5 years for all species that have been recovered. Post-delisting monitoring (PDM) refers to activities undertaken to verify that a species delisted due to recovery remains secure from the risk of extinction after the protections of the Act no longer apply. The primary goal of PDM is to monitor the species to ensure that its status does not deteriorate, and if a decline is detected, to take measures to halt the decline so that proposing it as an endangered or threatened species is not again needed. If at any time during the monitoring period, data indicate that protective status under the Act should be reinstated, we can initiate listing procedures, including, if appropriate, emergency listing.

We have prepared a PDM plan for dwarf-flowered heartleaf. We published a notice of availability of a draft PDM plan with the proposed delisting rule (86 FR 21994). We did not receive any comments on the plan. Therefore, we consider the plan final. As discussed in the proposed rule, the PDM plan: (1) summarizes the status of dwarf-flowered heartleaf at the time of proposed delisting; (2) describes frequency and duration of monitoring; (3) discusses monitoring methods and potential sampling regimes; (4) defines what potential triggers will be evaluated to address the need for additional monitoring; (5) outlines reporting requirements and procedures; (6) proposes a schedule for implementing the PDM plan; and (7) defines responsibilities. It is our intent to work with our partners towards maintaining the recovered status of the dwarf-flowered heartleaf.

Required Determinations

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951, May 4, 1994), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), the President's memorandum of November 30, 2022 (Uniform Standards for Tribal Consultation; 87 FR 74479, December 5, 2022), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes and Alaska Native Corporations on a government-to-government basis. In accordance with Secretary's Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. We have determined that no Tribes will be affected by this final rule because no Tribal lands, sacred sites, or resources will be affected by the removal of the dwarf-flowered heartleaf from the List of Endangered and Threatened Plants.

References Cited

A complete list of references cited in this rulemaking is available on the internet at *https://www.regulations.gov* under Docket No. FWS–R4–ES–2019–0081 and upon request from the Asheville Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**, above).

Authors

The primary authors of this final rule are staff members of the Service's Species Assessment Team and the Asheville Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Signing Authority

Paul Souza, Regional Director, Region 8, Exercising the Delegated Authority of the Director of the U.S. Fish and Wildlife Service, approved this action on June 13, 2025, for publication. On June 26, 2025, Paul Souza authorized the undersigned to sign the document electronically and submit it to the Office of the Federal Register for publication as an official document of the U.S. Fish and Wildlife Service.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

§ 17.12 [Amended]

■ 2. In § 17.12, amend paragraph (h) by removing the entry for ''*Hexastylis naniflora*'' under FLOWERING PLANTS from the List of Endangered and Threatened Plants.

Madonna Baucum,

Regulations and Policy Chief, Division of Policy, Economics, Risk Management, and Analytics of the Joint Administrative Operations, U.S. Fish and Wildlife Service.

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