DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R4–ES–2024–0043; FXES1113090FEDR–256–FF09E22000]

RIN 1018–BG47

Endangered and Threatened Wildlife and Plants; Removal of *Geocarpon minimum* From the List of Endangered and Threatened Plants

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to remove *Geocarpon minimum* from the Federal List of Endangered and Threatened Plants. Our review indicates that the threats to *Geocarpon minimum* 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, we propose to delist *Geocarpon minimum*. This proposed rule completes the 5-year status review for the species. If we finalize this rule as proposed, the prohibitions and conservation measures provided by the Act, particularly through sections 4 and 7, would no longer apply to *Geocarpon minimum*.

DATES: We will accept comments received or postmarked on or before **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. eastern time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by **[INSERT DATE 45 DAYS**

AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically*: Go to the Federal eRulemaking Portal: *https://www.regulations.gov*. In the Search box, enter FWS–R4–ES–2024–0043, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on "Comment."

(2) *By hard copy*: Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R4–ES–2024–0043, U.S. Fish and Wildlife Service, MS: PRB/3W, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on *https://www.regulations.gov*. This generally means that we will post any personal information you provide us (see **Information Requested**, below, for more information).

Availability of supporting materials: This proposed rule and supporting documents, including the Recovery Plan, the draft post-delisting monitoring plan, and the species status assessment (SSA) report are available at *https://www.regulations.gov* under Docket No. FWS–R4–ES–2024–0043 and on the Service's website at *https://www.fws.gov/office/arkansas-ecological-services*.

FOR FURTHER INFORMATION CONTACT: Jason Hight, Field Supervisor, U.S. Fish and Wildlife Service, Arkansas Ecological Services Field Office; 501–513–4470; jason_hight@fws.gov. 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. Please see Docket No. FWS–R4–ES–2024–0043 on *https://www.regulations.gov* for a document that summarizes this proposed rule.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species warrants delisting 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). *Geocarpon minimum* is listed as threatened, and we are proposing to delist it. We have determined *Geocarpon minimum* 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 proposes to remove *Geocarpon minimum* from the Federal List of Endangered and Threatened Plants based on its recovery; if we finalize this rule as proposed, the prohibitions and conservation measures provided by the Act, particularly through sections 4 and 7, would no longer apply to *Geocarpon minimum*.

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 five years. We must delist a species if we determine, on the basis of the best scientific

and commercial data available, 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 *Geocarpon minimum* has recovered to the point at which it no longer meets the definition of an endangered species or a threatened species; therefore, we are proposing to delist it.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American Tribes, the scientific community, industry, or any other interested parties concerning this proposed rule.

We particularly seek comments concerning:

(1) Reasons we should or should not remove *Geocarpon minimum* from the List of Endangered and Threatened Plants;

(2) Relevant data concerning any threats (or lack thereof) to *Geocarpon minimum*, particularly any data on the possible effects of climate change as it relates to habitat, as well as the extent of State protection and management that would be provided to this plant as a delisted species;

(3) Current or planned activities within the geographic range of *Geocarpon minimum* that may have either a negative or positive impact on the species, including, but

not limited to, planned management, research regarding the role of habitat disturbance, or research regarding seed bank longevity and viability;

(4) New information concerning the historical and current status, range, distribution, management, and population size of *Geocarpon minimum*, including information on the populations recently discovered since the species status assessment (SSA) report was completed, and information on location of any additional populations of this species; and

(5) Considerations for post-delisting monitoring, including monitoring protocols and length of time monitoring is needed, as well as triggers for reevaluation.

Please include any supplemental information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, do not provide substantial information necessary to support a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered species or a threatened species must be made solely on the basis of the best scientific and commercial data available.

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via *https://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this

information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *https://www.regulations.gov*.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *https://www.regulations.gov*.

Our final determination may differ from this proposal because we will consider all comments we receive during the comment period as well as any information that may become available after this proposal. For example, based on the new information we receive (and if relevant, any comments on that new information), we may conclude that the species should remain listed as threatened, or we may conclude that the species should be reclassified from threatened to endangered. We will clearly explain our rationale and the basis for our final decision, including why we made changes, if any, that differ from this proposal.

Public Hearing

Section 4(b)(5) of the Act provides for a public hearing on this proposal, if requested. Requests must be received by the date specified in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule a public hearing on this proposal, if requested, and announce the date, time, and place of the hearing, as well as how to obtain reasonable accommodations, in the *Federal Register* and local newspapers at least 15 days before the hearing. We may hold the public hearing in person or virtually via webinar. We will announce any public hearing on our website, in addition to the *Federal Register*. The use of these virtual public hearings is consistent with our regulation at 50 CFR 424.16(c)(3).

Previous Federal Actions

On June 16, 1987, we listed *Geocarpon minimum* (no common name) as threatened due to habitat destruction or modification (from pasturing, off-road vehicle

use, forestry practices, and succession) and its limited distribution (52 FR 22930). A recovery plan for the species was released on July 26, 1993. We completed 5-year reviews of the species on November 6, 1991; July 1, 2009; and July 20, 2016. None of these 5-year reviews recommended a change in status for the species.

On July 14, 2021, we published a notice (86 FR 37178) announcing that we were conducting 5-year status reviews of 37 endangered and threatened species, including *Geocarpon minimum*, and requested information on the species' status. This proposed rule constitutes completion of that 5-year status review for *Geocarpon minimum*.

Peer Review

A species status assessment (SSA) team prepared an SSA report for *Geocarpon minimum*. 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 impacts 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 of listing and recovery actions under the Act (*https://www.fws.gov/sites/default/files/documents/peer-review-policy-directors-memo-2016-08-22.pdf*), we solicited independent scientific review of the information contained in the *Geocarpon minimum* SSA report. The Service sent the SSA report to seven independent peer reviewers and received three responses. The peer reviews can be found at *https://www.regulations.gov* at Docket No. FWS–R4–ES–2024–0043. In preparing this proposed rule, we incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this proposed rule.

Summary of Peer Reviewer Comments

As discussed above in **Peer Review**, we received comments from three peer reviewers on the draft SSA report. We reviewed all comments from the peer reviewers for substantive issues and new information regarding the information contained in the SSA report. The peer reviewers generally concurred with our methods and conclusions and provided additional information, clarifications, and editorial suggestions. One reviewer suggested that we model extreme climate changes rather than rely on models focused on mean predicted changes. We acknowledged the potential effects of extreme changes but used modeling focused on mean values since expert input showed no confident predictions of how *Geocarpon minimum* may respond to changes in temperature and precipitation. This reviewer also questioned the use of potential abundance as a current condition metric since monitoring across the species' range is inconsistent. We acknowledged the potential issues with this metric in the SSA report but concluded that using potential abundance is the best information available to compare the condition of populations throughout the species' range. Otherwise, no substantive changes to our analysis and conclusions within the SSA report were deemed necessary, and peer reviewer comments are addressed in the SSA report (Service 2021, entire).

Background

A thorough review of the biological information on *Geocarpon minimum*, including taxonomy, life history, ecology, and conservation activities, as well as threats facing the species or its habitat is presented in our SSA report (Service 2021, entire), which is available at *https://www.regulations.gov* in Docket No. FWS–R4–ES–2024–0043. The SSA report documents the results of our comprehensive biological status review for *Geocarpon minimum* but does not represent any decision by the Service regarding the status of *Geocarpon minimum* under the Act. It does, however, serve as one of the bases for this proposed rule and our regulatory decision, which involves the further application of standards in the Act and its implementing regulations and policies. In this

proposed rule, we present only a summary of the key results and conclusions from the SSA report; the full report is available at *https://www.regulations.gov*, as referenced above.

Geocarpon minimum is a small winter annual plant in the Caryophyllaceae family and is restricted to sandstone glade and saline prairie or barren habitats. At the time of listing in 1987, the species occurred in 17 populations across two states (Missouri and Arkansas). It is currently known to occur in 46 extant populations in 4 representation units (RUs) across 5 ecoregions (Ozark Highlands, Central Irregular Plains, Arkansas Valley, South Central Plains, and Cross Timbers) in Missouri, Arkansas, Louisiana, Oklahoma, and Texas. Three of the four RUs correspond with their respective ecoregion (Arkansas Valley, South Central Plains, and Cross Timbers) and the fourth RU combines the two ecoregions (Ozark Highlands/Central Irregular Plains). These two ecoregions are considered one RU because a majority of the populations occur within the Ozark Highlands ecoregion and the remaining populations occurring in the Central Irregular Plains are in the transitional zone between ecoregions.

The species occupies discrete microhabitats consisting of highly mineralized soils that are not suitable for most other plants. The species requires these harsh conditions to avoid competition from other plants. Studied *Geocarpon minimum* populations contain either a single or a few unique homozygous lineages, each commonly occurring at high frequencies, indicating that it is an obligate self-pollinator (Edwards et al. 2019, p. 1444). Seed dispersal appears highly localized and likely occurs by gravity and via water sheet flow or wind (Service 1993, p. 2; NatureServe 2021, unpaginated). The seeds of *Geocarpon minimum* remain in the seed bank for an indeterminate period with evidence suggesting the likelihood of remaining viable for several years, e.g., potentially for at least 5–10 years (Service 2021, p. 6). Further information on the basic biology and ecology of *Geocarpon minimum* is summarized in the SSA report (Service 2021, entire).

Recovery Criteria

Section 4(f) of the Act directs us to develop and implement recovery plans for the conservation and survival of endangered and threatened species unless we determine that such a plan will not promote the conservation of the species. Under section 4(f)(1)(B)(ii), recovery plans must, to the maximum extent practicable, include objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of section 4 of the Act, that the species be removed from the Lists of Endangered and Threatened Wildlife and Plants.

Recovery plans provide a roadmap for us and our partners on methods of enhancing conservation and minimizing threats to listed species, as well as measurable criteria against which to evaluate progress towards recovery and assess the species' likely future condition. However, they are not regulatory documents and do not substitute for the determinations and promulgation of regulations required under section 4(a)(1) of the Act. A decision to revise the status of a species or to delist a species is ultimately based on an analysis of the best scientific and commercial data available to determine whether a species is no longer an endangered species or a threatened species, regardless of whether that information differs from the recovery plan.

There are many paths to accomplishing recovery of a species, and recovery may be achieved without all of the criteria in a recovery plan being fully met. For example, one or more criteria may be exceeded while other criteria may not yet be accomplished. In that instance, we may determine that the threats are minimized sufficiently and that the species is robust enough that it no longer meets the definition of an endangered species or a threatened species. In other cases, we may discover new recovery opportunities after having finalized the recovery plan. Parties seeking to conserve the species may use these opportunities instead of methods identified in the recovery plan. Likewise, we may learn new information about the species after we finalize the recovery plan. The new

information may change the extent to which existing criteria are appropriate for identifying recovery of the species. The recovery of a species is a dynamic process requiring adaptive management that may or may not follow all of the guidance provided in a recovery plan.

A recovery plan for *Geocarpon minimum* was issued in 1993 (Service 1993, entire) with the objective to delist the species. The plan provides three criteria to accomplish this objective. The discussion below provides an assessment of these three delisting criteria as they relate to evaluating the status of the species.

Delisting Criterion 1: A total of 15 viable populations, representing the diversity of habitats and geographic range of the species, are protected as necessary to ensure continued existence.

This criterion has been met. Currently, 28 of the 46 populations (61 percent) occur on lands that are protected or are wholly or partially publicly owned, and thus more likely to be protected for the species. Of these 28 sites, 15 rank as having high resiliency, 7 as having moderate resiliency, 2 as having low resiliency, and 5 recently discovered populations have unknown resiliency. These 15 highly resilient populations represent 33 percent of known populations and are spread throughout 3 of the 4 representation units (Service 2021, pp. 20, 34).

Delisting Criterion 2: Populations include the wide spectrum of current genetic variation found in the species.

Recent studies indicate individual populations of *Geocarpon minimum* are genetically unique with little interaction due to isolation, self-pollination, and low seed vagility (Edwards et al. 2019, entire). Our future modeling (see **Future Condition**, below) predicts all populations (and, thus, their associated full spectrum of genetic diversity) will persist in similar condition into the foreseeable future. Additionally, there has been a large increase in the number of known populations since listing thus providing

an increase in the known genetic variation. We now have 46 known populations, with over half located on protected sites that provide a wide spectrum of genetic variation across the species' range. Therefore, the intent of this criterion has been met.

Delisting Criterion 3: Population viability is confirmed through periodic monitoring for at least a 15-year period.

The intent of this criterion has been met. Most populations, including 11 of the 15 highly resilient populations, have been periodically monitored for at least a 15-year period. Some populations have documented presence for a period of more than 60 years. Because of the discovery of newer populations, some sites have only been visited once or twice. The mean time between the first observation and last observation for the 15 protected highly resilient populations is 28 years (range = 2–63). When excluding the newly discovered populations, the mean period of monitoring for these populations is 36 years (range = 19–63). Although there is some uncertainty regarding population fluctuations that may have occurred in the interim between the first and last monitoring time, there has been no change in the populations' protection or resiliency over the average time frame of 36 years. These monitoring results provide confidence that the highly resilient condition of these populations is stable. The remaining recently discovered populations may also exhibit long-term viability, given that some showed high resiliency scores during recent observations.

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.

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 scientific and commercial data available 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 available 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 proposed for delisting. 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 *Geocarpon minimum* 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' future condition, including responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best scientific and commercial data available 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–2024–0043 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 2021, entire) documents our comprehensive biological status review for the species, including an assessment of the potential threats to the species.

The following is a summary of this status review and the best scientific and commercial data available gathered since that time that has informed this decision.

Species Needs

Geocarpon minimum is an annual, small succulent-like forb that emerges as early as November in the form of small winter rosettes, with flowering stems emerging from March to mid-April (Morgan 1986, p. 5). The plant has no obvious adaptations such as nectaries or a showy calyx or corolla that might attract pollinators (Edwards et al. 2019, pp. 1438–1439). Further, the species does not have observed pollinators and relatively few unique homozygous lineages, both indicating that it is an obligate self-pollinator (Tucker 1983, p. 18; Edwards et al. 2019, p. 1444). *Geocarpon minimum* seed dispersal appears highly localized and likely occurs by gravity and via water sheet flow or wind

(Service 1993, p. 2; NatureServe 2021, unpaginated). Genetic analysis backs up the low vagility of this species, although there are rare instances where closely related genotypes are present in adjacent or geographically distant populations (Edwards et al. 2019, p. 1444). This indicates that there may be other mechanisms that lead to more extensive dispersal of seeds. Possible means include the intentional or inadvertent movement by of soil by humans or animals and movement of seeds by extreme weather events including major flooding or extreme winds (Edwards et al. 2019, p. 1444; NatureServe 2021, p. 5). The seeds of *Geocarpon minimum* are present in the seed bank for an indeterminant period, possibly for many years (Service 2021, p. 6).

The flowering and fruiting period when plants are most visible ranges from January to early June, with March and April as the most common survey dates reported throughout the range (Palmer and Steyermark 1950, p. 269; Tucker 1983, p. 5; Bridges 1986, p. 28–29; Baker and Soteropoulos 2021, p. 3). The entire flowering period typically lasts about a month. Local weather patterns impact the success of germination, flowering, and seed production (Bridges 1986, pp. 28–29; Morgan 1986, p. 5; Shepherd 1987, p. 17; Baker and Soteropoulos 2021, p. 3). Some *Geocarpon minimum* sites may become unsuitable due to water ponding associated with a very wet winter and spring (Baker and Soteropoulos 2021, p. 38). Growth and flowering in the spring is thought to be dictated primarily by temperature (Morgan 1986, p. 5). After flowering, both temperature and soil moisture play a role in the final growth of the plant and ultimately the number of viable seeds. Additionally, late frosts may play a role in the local distribution of annual species that flower in early spring (Tucker 1983, p. 11). It has further been hypothesized that the reduced abundance of *Geocarpon minimum* and suitable microhabitat observed over the last two decades in some southern Arkansas populations (South Central Plains RU) may also be the result of abnormally wet summer and fall seasons that promote the growth of competing vegetation (Baker 2021b, pers. comm.).

Geocarpon minimum populations occur within five ecoregions in the south central United States (Ozark Highlands, Central Irregular Plains, Arkansas Valley, South Central Plains, and Cross Timbers) (U. S. Environmental Protection Agency (USEPA) 2013, entire). *Geocarpon minimum* generally occurs in two distinct habitat types rangewide: sandstone glades (Ozark Highlands, Central Irregular Plains, and Cross Timbers) or saline barrens (Arkansas Valley and South Central Plains). In both habitat types, the species occurs exclusively in open habitats, thriving in areas with unobstructed sunlight and lack of competition.

Factors Influencing the Species

The main threats to *Geocarpon minimum* at the time of listing were habitat destruction or modification (from pasturing, off-road vehicle use, forestry practices, and succession), as well as the impacts from the species' limited distribution. The species' distribution has increased from 17 known populations in 2 states at the time of listing to 46 currently known populations in 5 states, with new populations continuing to be found. Thus, we no longer consider the species' distribution limited, and thus we do not consider the distribution as a major stressor. In this rule, we discuss the major threats affecting the species now and into the future, which include habitat disturbance, climate change, vegetation encroachment, and development. These threats, their sources, and their effects to *Geocarpon minimum* are summarized below.

Habitat Disturbance

Habitat disturbance can be both a threat and benefit to the species with timing and intensity of the disturbance dictating whether there are negative or positive impacts (see "Habitat Management" below). *Geocarpon minimum* is likely dependent upon some level of disturbance to maintain suitable microhabitat conditions. The type, frequency, and intensity of required disturbance is unclear, although numerous authors report the role of disturbance in the long-term viability of populations (Rettig 1983, p. 213; Tucker 1983,

p. 19; Shephard et al. 1990, p. 6; Logan 1998, p. 1; Smith and Ely 2006, p. 1156; Baker and Soteropoulos 2021, p. 6; Briggler 2021a, pers. comm.).

Light surface disturbance during the summer, fall, or early winter may be beneficial for maintaining suitable microhabitat in the saline prairies of south Arkansas and sandstone glades of Missouri (Baker 2021a, pers. comm.; Briggler 2021a, pers. comm.). This disturbance may have historically occurred due to periodic use as salt licks by large mammals such as deer, elk, or bison (Witsell 2004, p. 5), although off-road vehicle use may replicate this disturbance. Conversely, surface disturbance by off-road vehicle use during the wet periods of winter and spring may negatively affect *Geocarpon minimum* due to rutting and associated standing water and establishment of perennial vegetation (Bridges 1986, p. 30; Morgan 1986, pp. 6–7). However, soil disturbance by off-road vehicles along with removal of woody vegetation were noted in the creation of additional suitable habitat at one site in Missouri (Missouri Department of Conservation (MDC) 2021, entire).

Although robust germination events have been observed following rooting by feral hogs (Keith 2020, p. 4), the long-term effects may be negative and similar to those of wet season off-road traffic (Baker 2021a, pers. comm.). The effects of cattle grazing have been described variously as potentially beneficial due to heavy grazing of competing grasses or trampling of competitive mosses (Witsell 2003, p. 3; Smith and Ely 2006, p. 1147; MDC 2021, entire) as well as detrimental due to trampling and churning of shallow sands and deposition of organic matter leading to invasion by more competitive species (Morgan 1986, pp. 6–7; MDC 2021, entire).

Similarly, habitat disturbance through fire may be detrimental or beneficial for the species. Fire is effective at reducing competition from lichens, mosses, and woody or other perennial vascular plants, but should be conducted outside the late winter/early-spring vegetative period to avoid direct losses of *Geocarpon minimum* (Baker 2021a,

pers. comm.; Briggler 2021b, pers. comm.). Surface disturbance and fire (either controlled or natural) are likely essential to the long-term maintenance of appropriate habitat for *Geocarpon minimum,* but also can be threats to the species with the timing and intensity of disturbances dictating the effects to populations.

As mentioned above, habitat disturbance through feral hog damage is a possible threat to *Geocarpon minimum* at some sites with the potential to extirpate populations (Baker and Soteropoulos 2021, pp. 7, 32; Louisiana Department of Wildlife and Fisheries (LDWF) 2021, entire). Feral hog damage has only been noted in saline prairie habitats and habitats adjacent to sandstone outcrops (Keith 2020, p. 4; Baker 2021c, pers. comm.; LDWF 2021, entire). Observers noted significant hog damage within unoccupied sandstone glades in the Ozarks of Arkansas (Baker 2021c, pers. comm.). If present in adequate densities, feral hogs could eventually affect *Geocarpon minimum* sites within sandstone glades in Missouri, Texas, and Oklahoma. Intensive rutting during wet periods can alter the microhydrology and thoroughly mix the soil at a site, making it less suitable for *Geocarpon minimum* and more attractive to competitive species. See "Habitat Management" for information on feral hog removal at *Geocarpon minimum* sites. It has been noted in Arkansas and Texas that *Geocarpon minimum* may respond vigorously in the first few years following such disturbance, but the habitat soon becomes unsuitable due to the intrusion of competitive plants (Keith 2020, p. 4; Baker 2021a, pers. comm.).

Climate Change

Associated long-term changes observed as a result of a warming climate include changes in arctic temperatures and ice coverage, changes in precipitation amounts, ocean salinity, wind patterns and extreme weather, including droughts, heavy precipitation events, heat waves, and increased tropical cyclone intensity (Intergovernmental Panel on Climate Change (IPCC) 2014, pp. 70–73). Continued change is likely, but individual models downscaling the rate and magnitude of change within a specific region are less

certain. Species dependent upon specialized habitats or climatic conditions, limited in distribution, or occurring at the periphery of their range may be more susceptible to the effects of climate change.

Predicting the potential effects of climate change upon populations of *Geocarpon minimum* is complicated because the species occupies sites exhibiting a wide range of temperature and precipitation conditions. We used summary projections for the historical simulation (1971–2000) to characterize current climatic conditions for the species (Service 2021, p. 11). Mean winter (December through February) rainfall amounts for populations range from 14.5 centimeters (cm) (5.7 inches (in)) in the Cross Timbers ecoregion to 37.3 cm (14.7 in) in the South Central Plains. Spring (March through May) rainfall amounts range from a mean of 26.2 cm (10.3 in) in the Cross Timbers to 35.6 cm (14.0 in) in the South Central Plains. Mean winter temperatures vary from 1.3 degrees Celsius (°C) (34.3 degrees Fahrenheit (°F)) in the Ozark Highlands/Central Irregular Plains to 8.3 °C (46.9 °F) in the South Central Plains. Mean spring temperatures are lowest in the Ozark Highlands/Central Irregular Plains at 13.4 °C (56.2 °F) and highest in the Cross Timbers at 18.4 °C (65.1 °F).

Timing and intensity of winter and spring temperatures and rainfall are important drivers of annual success for this species (Steyermark 1958, p. 125; Tucker 1983, p. 11; Bridges 1986, pp. 28–29; Morgan 1986, p. 5; Shepherd 1987, p. 17; Logan 1998, pp. 1–2; Baker and Soteropoulos 2021, p. 3). Abnormally dry or cold winter/spring seasons may reduce germination and seed production. Conversely, excessive rain may negatively affect populations within saline prairies due to pooling of water within the microhabitat (Baker and Soteropoulos 2021, p. 38). Many of the sites closely associated with mineral slicks are undergoing slow succession from open slicks with gradations of microhabitats to more homogenous habitats dominated by mosses, dense annual vegetation, or perennial grasses (Baker and Soteropoulos 2021, p. 6). This change may be due to a lack

of periodic disturbance. Furthermore, monitoring in Missouri shows more competition from woody vegetation in sandstone glades, which may be related to heavier summer rainfall (Briggler 2021a, pers. comm.).

The resilience of some *Geocarpon minimum* populations to short-term drought is anecdotally supported by climatic data and population monitoring at the Warren Prairie populations in southern Arkansas. These populations experienced extreme to exceptional drought conditions for a 12-month period from September 2010 to August 2011 (National Integrated Drought Information System (NIDIS), 2021, unpaginated). This drought encompassed the entire life cycle of *Geocarpon minimum* (late fall/winter germination through late spring seed drop). Slightly dry to normal rainfall patterns returned to the region beginning in September of 2011. Monitoring during spring 2012 revealed the highest number of plants observed at this site over 10 years of monitoring (2012–2021) (Baker 2021c, pers. comm.; Baker and Soteropoulos 2021, pp. 25–26). These data indicate that the species rebounded immediately following a severe drought year. Estimated populations at Warren Prairie fluctuated in the following years but never exceeded the numbers observed in 2012.

Although drought during the late fall/winter/spring seasons may negatively affect *Geocarpon minimum* success in a given year, seeds likely remain viable for several years and perhaps longer (Service 2021, p. 6). Additionally, drought monitoring data dating back to 1895 indicate that periods of drought are common throughout the range of *Geocarpon minimum*, although the frequency and duration of events varies (NIDIS 2021, unpaginated). In recent decades, droughts have occurred less frequently (Service 2021, table 1, p. 14).

Climate predictions generally describe future conditions with more extremes (for example, increased drought or heavy rainfall events). The predictive models we used focus on mean values for future temperature and precipitation but lack detailed or long-

term predictions for extreme events. Predicted changes in temperature and precipitation vary by RU and season (Service 2021, pp. 58–61). In the future scenario (2070–2099), maximum winter season changes in precipitation range from -1.3 cm (-0.5 in) (South Central Plains) to +1.8 cm (+0.7 in) (Ozark Highlands/Central Irregular Plains) with temperature changes predicted from +4.2 °C (+7.50 °F) (South Central Plains) to +4.9 °C (+8.7 °F) (Ozark Highlands/Central Irregular Plains). Spring changes include less rainfall in the Cross Timbers (1.4 cm (-0.6 in)) and more rainfall in the Ozark Highlands/Central Irregular Plains (+4.0 cm (+1.6 in)), with temperature increases ranging from +4.4 °C (+8.0 °F) (South Central Plains) to +4.7 °C (+8.5 °F) (Cross Timbers). Winter and spring are the most important seasons for *Geocarpon minimum* germination, growth, and seed production.

Although this plant does not grow in the summer and fall, these seasons may be important in maintaining suitable microhabitats for this species. Predicted summer changes include reductions of rainfall and increases in temperature across all RUs ranging from -2.2 cm (-0.9 in) (Ozark Highlands/Central Irregular Plains) to -5.1 cm (-2.0 in) (South Central Plains) and +5.3 °C (+9.6 °F) (Cross Timbers) to +6.3 °C (+11.3 °F) (Arkansas Valley). Fall predictions range from reductions of rainfall in the Cross Timbers of -0.2 cm (-0.1 in) to increases of rainfall in the Ozark Highlands/Central Irregular Plains of +0.4 cm (+0.1 in). For fall, temperatures are predicted to rise and range from +5.2 °C (+9.4 °F) in the South Central Plains to +5.6 °C (+10.1 °F) in the Ozark Highlands/Central Irregular Plains.

While winter and spring moisture and temperature as drivers of annual *Geocarpon minimum* success (Steyermark 1958, p. 125; Tucker 1983, p. 11; Bridges 1986, pp. 28–29; Morgan 1986, p. 5; Shepherd 1987, p. 17; Logan 1998, pp. 1–2; Baker and Soteropoulos 2021, p. 3), the best available information does not indicate that *Geocarpon minimum* will respond negatively to predicted future changes to these

variables throughout the range. The forecasted maximum changes in mean precipitation mostly remain within the current range for the species. Although temperatures are predicted to rise in all RUs and seasons, the potential effects of these increases are uncertain. Service and State experts provided wide ranging predictions for how the species may respond to these temperature increases (Service 2021, pp. 14–15). Thus, our future condition did not quantitatively incorporate direct impacts of climate change predictions. However, the land use change model that we chose incorporates projected climate change as one of the variables (Sohl et al. 2014, entire; Sohl et al. 2018, entire).

Vegetation Encroachment

Vegetation encroachment may threaten the viability of *Geocarpon minimum* populations and is directly or indirectly related to habitat disturbance, climate change, and land use. Mineral slicks to which *Geocarpon minimum* is typically closely associated in saline barren habitats in the South Central Plains of southern Arkansas have undergone a slow change from open slicks with graduated microhabitats to more homogenous habitats dominated by mosses, dense annual vegetation, and even perennial grasses (Baker and Soteropoulos 2021, p. 6). These changes are attributable to both a lack of disturbance and a recent trend of abnormally mild and wet summers. *Geocarpon minimum* appears to compete poorly in areas undergoing this transition, and vegetation encroachment can lead to localized extirpations (Baker and Soteropoulos 2021, p. 6). Although other populations in the South Central Plains are not as well monitored, this likely is an issue throughout the range given the consistently wet years over the last decade.

Monitoring at one of the sites in the Arkansas Valley demonstrated habitually low numbers over the last 10–20 years as contrasted with larger populations observed in the 1990s (Arkansas Natural Heritage Commission (ANHC) 2021, entire). This decline is attributed partially to intensive pasture management (fertilization for grass establishment)

(Witsell 2003, p. 2). After unsuccessful attempts at fostering grazing land, the landowner subsequently removed cattle from the site. It is hypothesized that grazing in the 1990s prior to pasture improvement efforts may have contributed to the large numbers observed by reducing competition from other plants, maintaining a suitable microhabitat, or releasing the seed bank (Baker and Soteropoulos 2021, pp. 7–8).

Data from Missouri indicate that some sites have been negatively affected by competition from woody plants, such as red cedar (*Juniperus virginiana*), mosses, lichens, and grasses (Briggler 2021b, pers. comm.; MDC 2021, entire). Regular controlled burns outside *Geocarpon minimum*'s growing season may be the best tool to maintain glade characteristics and *Geocarpon minimum* microhabitat at these sites. In the absence of regular burning, mechanical removal of woody vegetation can result in dramatic increases in the number of stems at a site (Briggler 2021b, pers. comm.). Both controlled burns and mechanical removal of woody vegetation occur on public and private conservation lands within sandstone glade habitats in Missouri and Texas. Invasive Japanese honeysuckle (*Lonicera japonica*) has been noted adjacent to some sites in Missouri, but it has not been documented to be in direct competition with *Geocarpon minimum*.

Vegetation encroachment on prairies and glades at Ft. Wolters within the Cross Timbers of Texas was identified as a natural resource management concern (Texas Military Department (TMD) 2020, p. 26). Both juniper (*Juniperus* spp.) and honey mesquite (*Prosopis glandulosa*) are identified as species capable of becoming invasive in the absence of regular fire or management. The TMD funds active natural resource management that includes maintenance (controlled burns) and pre-fire thinning (mechanical removal) of woody stems prior to establishment of a burning rotation.

Development

We define development as any action that results in the permanent conversion of *Geocarpon minimum* habitat to an unsuitable condition. Examples include urbanization, transportation infrastructure, utility rights-of-way, and reservoir construction. At least two populations of the species have been affected by development, including the construction of a gravel driveway near a population in Missouri and a highway widening project near a separate population, also in Missouri. Additionally, a population in Texas lies within the footprint of a formerly proposed water supply reservoir for the Dallas/Fort Worth metro area. This area was recently acquired by the National Wildlife Refuge System.

We are not aware of any extirpations due to development. While the vast majority of *Geocarpon minimum* populations are not located near dense human populations, we assume populations closer to urban areas are at greater risk for development, especially on private land. These include populations near Springfield (Missouri), Shreveport (Louisiana), and Longview (Texas). Recent development near Shreveport appears to be moving in the direction of *Geocarpon minimum* populations (Doffitt 2021, pers. comm.). However, most populations occur in rural areas and are at minimal threat from development.

Conservation Efforts and Regulatory Mechanisms

State Protections

In three of the five States where it is found (Missouri, Louisiana, and Texas), *Geocarpon minimum* is currently listed as a State endangered or threatened species. These regulations provide some protections for the species (Service 2021, pp. 18–19). If the protections of the Act were to be removed in the future, the State protections for *Geocarpon minimum* would likely also be removed in all three States. However, in Missouri, *Geocarpon minimum* would remain ranked as an S2 species (“Imperiled in the [S]tate because of rarity due to very restricted range, very few populations or

occurrences, steep declines, or other factors making it very vulnerable to extirpation from the state."; MDC 2025, p. 6). While Arkansas does not have State-specific endangered species protections, it does have a law (Arkansas Code section 15-45-301 (2020)) stating that it is the public policy of the State of Arkansas to promote sound management, conservation, and public awareness of its diversity of native plants and nongame animals. Additionally, the State uses its income tax funds for the management of rare species, acquisition of important lands, public education, or other conservation actions. The States' endangered species regulations and other conservation laws may serve to benefit *Geocarpon minimum*.

Protected Lands

Protected lands include sites that are publicly owned (local, State, or Federal) and private lands owned by conservation organizations or otherwise protected (for example, through conservation easements). Of the 46 known *Geocarpon minimum* populations, 28 (61 percent) are on lands wholly or partially publicly-owned or otherwise protected (Service 2021; table 2, p. 20). These lands may provide a layer of protection from habitat loss or modifications due to development. Historically, management of *Geocarpon minimum* populations has been more likely to occur on public lands. Management actions like controlled burning, manual vegetation removal, and removal or exclusion of feral hogs require long-term and potentially expensive commitments, which often are more difficult for individual private land managers. However, not all public lands are managed for the exclusive benefit of *Geocarpon minimum*. Nevertheless, 21 of 28 *Geocarpon minimum* sites (75 percent) occurring on wholly or partially publicly-owned lands or otherwise protected are known to be managed in a way that is compatible with the species (Service 2021; tables 1 and 2, pp. 14, 20).

Habitat Management

Habitat management for *Geocarpon minimum* is guided primarily by attempts to replicate the natural processes discussed above (see "Habitat Disturbance" and "Vegetation Encroachment"). Most management activities to date have focused on controlled burns or mechanical vegetation removal in the sandstone glade habitats of Missouri and Texas and feral hog control at sites in Arkansas and Texas (TMD 2020, p. M-15; U.S. Army Corps of Engineers 2020, entire; Phillips 2021, pers. comm.; MDC 2021, entire). Controlled burns of sites in Arkansas have occurred as well, but the benefits of such actions in the saline prairie habitats are less certain. Burning during the growing season has been shown to have negative effects on the species (Baker 2021a, pers. comm.), but properly timed burns in these habitats may be beneficial.

In addition to vegetation clearing, intentional soil disturbance may be a beneficial management action. Restoration of former sites may require soil disturbance along with more frequent vegetation removal (mowing) to reduce competition from annual and perennial plants while the soil recovers. Research on the efficacy of soil disturbance is limited. One experiment conducted in plots that represented heavy, moderate, and light soil disturbance revealed that only the heavily disturbed plots remained largely free of overgrowth for 2 years (Baker and Witsell 2015, p. 7).

Despite limited research on the effects of soil disturbance, there is anecdotal evidence that it can be beneficial for *Geocarpon minimum* if it occurs during the non-growing seasons and is done during dry periods. Examples include the use of sites by cattle (Witsell 2002, p. 4; Baker and Soteropoulos 2021, p. 8; MDC 2021, entire), surface scraping from the use of off-road vehicles dragging trees (MDC 2021, entire), and feral hog rooting (Keith 2020, p. 4). Habitat management mimicking historical disturbance is an important tool for maintaining the viability of populations; however, if intensity, timing, and frequency of disturbances are not managed, they also can have negative effects on *Geocarpon minimum* populations.

Given the likely negative effects of feral hogs on *Geocarpon minimum* viability in the long term, attempts have been made by some to control feral hog numbers using trapping or shooting (Hoover 2021, pers. comm.; LDWF 2021, entire; Phillips 2021, pers. comm.; TMD 2020, p. F-14). Although some of these efforts are long-term in nature, others are conducted in response to habitat damage or perceived increases in the hog population. Feral hogs reproduce prolifically and will quickly repopulate an area once control measures cease.

Cumulative Effects

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

Current Condition

Resiliency

For *Geocarpon minimum* to maintain viability, its populations or some proportion 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 from demographic stochasticity (random fluctuations in reproductive rates and fecundity) and environmental stochasticity (such as normal variations in rainfall). Factors that have the potential to affect *Geocarpon minimum* include habitat disturbance, climate change, and vegetation encroachment. Factors influencing the resiliency of the species' populations include

abundance, habitat quantity, management, and other elements of *Geocarpon minimum* ecology that determine whether populations can withstand normal stochastic variation.

Based on recent genetic evidence and expert opinion, we considered patches of *Geocarpon minimum* that were 0.5 kilometers (km) (0.31 miles (mi)) or more apart as separate populations (Edwards et al. 2019, p. 1446; Baker and Soteropoulos 2021, p. 4; Service 2021, p. 24). *Geocarpon minimum* is currently known from 46 populations in Missouri, Arkansas, Louisiana, Oklahoma, and Texas. Five of these populations (one in Missouri and four in Oklahoma) have been discovered since the SSA report and analyses. Because of their recent discovery, these sites could not be evaluated for population resiliency, and we have requested more information on the status of these populations (see **Information Requested**, above).

Based on *Geocarpon minimum* population needs (undeveloped habitat, management/disturbance) and factors influencing the viability of the species (Service 2021; figure 2, p. 10), we developed a set of metrics for assessing population resilience. These include habitat quantity, abundance, management, and element occurrence (EO) rank (State viability ranking) (Service 2021; table 3, p. 27). Overall, of the 41 extant populations that were assessed for all four metrics, 17 (42 percent) rated as having high resiliency, 14 (34 percent) as moderate resiliency, and 10 (24 percent) as low resiliency.

To account for potential differences in the data when assessing population resilience, we weighted each metric using a factor based on data quality and our confidence that the underlying data are reasonably tied to *Geocarpon minimum* condition and the significance of the metric score to viability (Service 2021, pp. 28–30). The weights were as follows: the “Habitat Quantity” metric had a weighting factor of 0.21 (meaning this metric contributes 21 percent of the overall population condition score); the “Abundance” metric had a weighting factor of 0.17; the “Management” metric had a weighting score of 0.29; and the “EO rank” metric had a weighting factor of 0.33. The

four weighted metric scores were summed for each population, resulting in an overall population resiliency condition score of low (-1 to -0.333), moderate (-0.332 to 0.332), or high (0.333 to 1). The metrics and the scoring process are discussed below.

Habitat Quantity

We assume that populations occupying larger habitats are more resilient to environmental stochasticity (as well as more resilient to development pressures in the future). We defined small habitats ("low" category) as those occupying under 1 hectare (ha) (2.5 acres (ac)) and medium sites ("moderate" category) as ranging from 1 ha (2.5 ac) to 5 ha (12.4 ac). Large sites ("high" category) are defined as occupying more than 5 ha (12.4 ac). These size ranges refer to the size of the overall sandstone glade or saline prairie habitats rather than to the specific area occupied by *Geocarpon minimum* as this is rarely documented. The values used for habitat size were obtained from State heritage organizations or from analysis of aerial photography (ANHC 2021, entire; LDWF 2021, entire; MDC 2021, entire; Texas Parks and Wildlife Department 2021, entire).

The quantity of habitat of each population varies from well under 1 ha (2.5 ac) to hundreds of hectares. Nineteen of the measured populations (46 percent) occur within habitats measuring more than 5 ha resulting in a "high" category for habitat quantity. Fourteen populations (34 percent) had habitats measuring between 1 and 5 ha ("moderate" category). The remaining eight populations (20 percent) were found in habitats measuring less than 1 ha ("low" category) (Service 2021, table 5, p. 36). We do not know the habitat quantity at the five newly discovered sites, and thus do not include them in our analysis. We assumed that larger habitats are generally more resilient to threats than smaller habitats.

Abundance

Of the 41 populations with known abundance at the time of our SSA analyses, 18 (44 percent) were documented to contain more than 1,000 plants at least once in the last

15 years and received a high abundance rank. Seven sites (17 percent) had documented maximum populations of 500–1,000 in the same time frame, and thus were assigned an abundance rank of moderate. The remaining 16 populations (39 percent) either had maximum documented populations of fewer than 500 plants or had not been monitored in more than 15 years. These populations received low abundance ranks. Each of the four newly found populations in Oklahoma were estimated to contain between 50–250 plants, and the newly found population in Missouri was estimated to have 6,000 plants (Briggler 2022, pers. comm; Buthod 2024, pers. comm.)

Management

An important influence on *Geocarpon minimum* viability is habitat management. Actions such as soil disturbance and controlled burning or mechanical vegetation removal replicate natural processes that historically maintained suitable habitat by exposing favored soil layers and excluding vegetative competition. While management likely contributes to the long-term viability of this species, the specific intensity and timing of required management is not fully understood. This lack of understanding and limited resources may limit management for this species on some public lands. Alternatively, while land management specifically for *Geocarpon minimum* may be rarer on private lands, some populations occur on lands owned by conservation-oriented private organizations or individuals. These landowners may enroll their properties in conservation easements or agreements regarding management and land use or voluntarily manage habitats for *Geocarpon minimum* outside the confines of an agreement.

We considered these situations when ranking (high, moderate, or low) populations on the Management metric (Service 2021; table 3, p. 27). Populations received a rank of "high" if they occur either on public lands managed to benefit *Geocarpon minimum* or on private lands either owned and managed by a conservation organization or by individuals enrolled in a conservation easement or agreement. Populations were ranked "moderate" if

they occur on publicly owned lands even if not managed for *Geocarpon minimum* conservation. Sites on private land that are voluntarily managed to benefit *Geocarpon minimum* but not enrolled in an easement or agreement also received a "moderate" rank (see "Habitat Management" above for examples of such management). We ranked populations that occur on public lands where management priorities result in negative effects to the species or on privately-owned, unmanaged sites as "low."

Twenty-one of 41 populations with known management (51 percent) received a high metric rank. These populations occur on public lands with management or private lands with management plans or easements. Two populations (5 percent) occur on public lands that are not managed for the species or on private lands with only voluntary management actions (moderate metric rank). The remaining 18 populations (44 percent) received a low metric rank and occur wholly or mostly on private lands with no management plan or easement for *Geocarpon minimum*.

Element Occurrence (EO) Ranks

Geocarpon minimum is not well-studied, and monitoring efforts are often rudimentary and highly variable in timing and intensity. Demographic or habitat metrics available for describing the viability of this species are limited, and we therefore chose to inform our assessment using State agency EO rank. State agencies rank the viability of rare species using an EO rank (Hammerson et al. 2020, entire). This system uses a letter rank to assess the current viability of a population and considers population size, occupied area, abiotic and biotic conditions, and landscape context. Primary ranks for extant occurrences are A (excellent viability), B (good viability), C (fair viability), and D (poor viability). There are also intermediate ranks that combine primary ranks (for example, AB or CD). Other ranks include E (verified extant but otherwise unranked), H (historical), F (failed to find), X (extirpated), and U (unrankable due to lack of information). All previously known populations of *Geocarpon minimum* have current

State ranks from A to D, except for one extirpated population and one historical/presumed extirpated population, both in Missouri. We assigned EO ranks based on extant occurrence ranks to these populations as follows: A–B=High; BC–C=Moderate; and CD–D=Low. We address the potential correlation between EO ranks and our other resiliency metrics in the SSA report (Service 2021, p. 28). The five newly discovered populations (one in Missouri and four in Oklahoma) do not yet have State ranks.

We assume that EO rank is among the best indicators of population condition. Of 41 extant and ranked populations, 21 (51 percent) received a high metric rank, 11 populations (27 percent) received a moderate metric rank, and 9 populations (22 percent) received a low metric rank.

Representation

Representation reflects a species' adaptive capacity to respond to changing environmental conditions over time and can be characterized by genetic and ecological diversity within and among populations. Because *Geocarpon minimum* is predominantly self-pollinating and each population represents a unique genetic subset, representation was assessed based on geographic distribution and separation across the species' range. Currently known populations are present in the following U.S. Environmental Protection Agency (USEPA 2013, entire) Level III ecoregions: Ozark Highlands (Missouri); Central Irregular Plains (Missouri); Arkansas Valley (Arkansas); South Central Plains (Arkansas, Louisiana, and Texas); and Cross Timbers (Oklahoma and Texas). We used these five ecoregions to create the four RUs in which to evaluate representation based on expert input (Service 2021, pp. 30–31). We combined the Ozark Highlands and Central Irregular Plains into one RU because there are only a few populations within the Central Irregular Plains, and they occur within the transitional zone between the ecoregions (Service 2021, figure 6, p. 31).

We describe representation for *Geocarpon minimum* as the extent and variability of environmental conditions within the species' range across the four RUs. Geographic characteristics, soils, and climate (mean seasonal precipitation and temperature) vary throughout all four RUs.

To understand representation, we summarized the number and distribution of *Geocarpon minimum* populations across the four RUs to assess potential ecoregional differences. Currently, *Geocarpon minimum* has 46 populations distributed across the RUs, with the Ozark Highlands/Central Irregular Plains RU containing the most populations largely clustered in seven adjacent counties. The Arkansas Valley RU contains two populations occurring within adjacent counties. The South Central Plains RU contains 14 populations spread across eastern Texas, northern Louisiana, and southern Arkansas. Nine populations occur in the Cross Timbers RU, with five populations occupying two adjacent counties in Texas. The remaining four populations are located in one county in Oklahoma.

Redundancy

Redundancy reflects a species' ability to rebound after a catastrophic event and is measured by the number and distribution of resilient populations (high and moderate resiliency populations) both across the species' range and within the RUs. Species that are widely distributed across their historical range relative to potential catastrophic events are considered less susceptible to extinction and more likely to have higher viability than species confined to a small portion of their historical range (Redford et al. 2011, p. 40).

Across the species' range, *Geocarpon minimum* redundancy has likely been reduced from historical levels due to widespread impacts to habitat and loss of natural disturbance processes. To understand redundancy, we summarized the number and distribution of high and moderate resiliency *Geocarpon minimum* populations across the RUs (figure 1, below).

Currently, of the 41 extant populations assessed, there are 31 known high or moderate resiliency populations distributed across the RUs. Each RU contains at least one moderately resilient population. The 21 populations located in the Ozark Highlands/Central Irregular Plains RU include 8 high resiliency populations, 5 moderate resiliency populations, 7 low resiliency populations, and 1 population of unknown resiliency. Fourteen populations occur within the South Central Plains RU, including 6 high resiliency and 6 moderate resiliency populations. The remaining two populations have low resiliency. Within the Cross Timbers RU, three populations have high resiliency, while one population has moderate resiliency and one population has low resiliency. The four newly discovered populations within this RU have unknown resiliency. Three of four RUs contain a mix of high, moderate, and low resiliency populations dominated by high and moderate resiliency populations. The Arkansas Valley RU contains one moderate resiliency population and one low resiliency population.

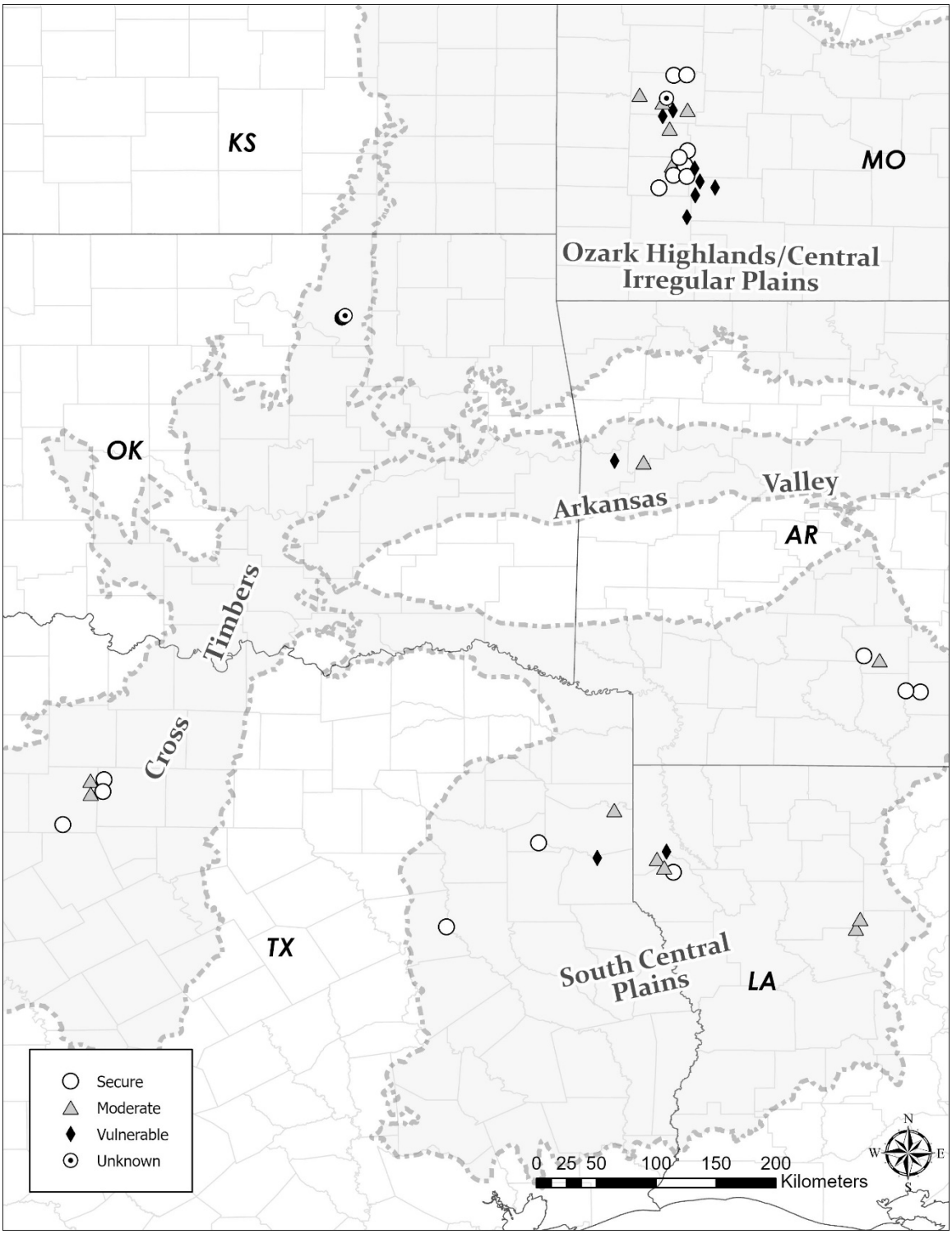

FIGURE 1. ***Geocarpon minimum*** **Population Current Condition.**

Future Condition

We consider "foreseeable future" as the period of time extending only so far into the future as we can make reasonably reliable predictions about threats to the species and the species' responses to those threats. We consider approximately 76 years (until 2100)

to be a reasonable period of time within which reliable predictions can be made for *Geocarpon minimum*. This period of time aligns with the timeframes for predictions regarding development and growth and a long enough time frame to see population-level responses from the species.

Methods and Scenarios

We considered key factors that influence *Geocarpon minimum* in predicting future conditions and assessing the species' viability. We primarily considered land use changes, specifically conversion of lands to development, to assess the future viability of *Geocarpon minimum*, as described below and in the SSA report (Service 2021, pp. 39–41). Although models were available describing expected changes in climate, direct impacts from changes in climate may be either beneficial or detrimental to *Geocarpon minimum.* Interpretation of future conditions due to climate change was further complicated by the wide variance in climatic conditions throughout the species' known range. Thus, we were best able to assess the potential future effect of climate change on the species indirectly via land cover change, which was incorporated explicitly into our modeling, as described below. We are unaware of any models available that would allow us to assess the future extent, intensity, or timing of soil disturbances by feral hogs, off-road vehicles, and other activities. The best available information regarding the direction and magnitude of impacts from these disturbances indicates that many habitat actions may be either detrimental or beneficial to the species depending on the timing and intensity (see "Habitat Management" section above). Therefore, we did not quantitatively incorporate direct impacts of climate change, feral hogs, off-road vehicle use, or other soil-disturbing activities in modeling of future conditions. Similarly, we lacked predictive models or other information to inform potential changes in management or EO rank

metric scores for future scenarios.

To forecast the effects of land use change (development) over a large geography, we used the United States Geological Survey's FOREcasting SCEnarios for Land Use Change (FORE-SCE) model, which projects changes for each land use type (Sohl 2018, entire). The FORE-SCE model generates a range of spatially explicit land use projections from 1992 through 2100, and incorporates multiple datasets related to growth, including climate change, urban development, agricultural development, and other socioeconomic pressures. These factors are evaluated in relation to climate change scenarios (Nakicenovic et al. 2000, entire; IPCC 2014, p. 57).

We recognize that the scale of projected land use change from the FORE-SCE model is coarser than our *Geocarpon minimum* occurrence records. No model exists at the scale or resolution to reliably predict changes at the precise location of individual *Geocarpon minimum* populations. Nevertheless, we expect the FORE-SCE model to capture larger-scale landscape changes that will be reflective of more localized changes that may affect individual populations or clusters of populations.

Future Scenarios and Resiliency Calculations

The FORE-SCE model incorporates climate change in scenarios that also consider human population increases and technological and socioeconomic drivers. The two FORE-SCE scenarios incorporated into our analysis include the A2 (a higher emissions scenario) and B1 (a more moderate emissions scenario) (Nakicenovic et al. 2000, entire; Sohl et al. 2014, entire). The A2 scenario assumes high economic growth and high population growth globally and includes the highest rate of urban increase (development). In general, the projections based on the A2 scenario indicate a loss of natural habitats of varying degrees to development. The B1 scenario assumes both lower emissions and a slower pace of development.

Within the FORE-SCE model, 17 land cover types similar to the classes found in the National Land Cover Dataset are evaluated, and projections are characterized by 250-meter spatial resolution (250 m x 250 m (820 ft x 820 ft) pixel or cell size). Suitable habitat for *Geocarpon minimum* has some unique features (see **Background**, above) and is not reliably distinguishable using any of the FORE-SCE cover classes. For this reason, we focused on the changes observed in the percentage of predicted developed land.

The FORE-SCE model provided annual projections from 2009 to 2100. To forecast the effects of changes in development on *Geocarpon minimum* in the future, FORE-SCE model outputs were used to assign adjustments to resiliency scores for each population in both future scenarios. We evaluated the projected changes (loss or gain in development) predicted by the FORE-SCE model for two scenarios (A2 and B1) for the year 2100, as compared to a baseline of 2021 (A2) values.

To best capture nearby development that might impact *Geocarpon minimum* populations while also avoiding overestimating the impact of development farther away, we chose to look at an area that was 9 square miles (mi^2) (23.3 square kilometers (km^2)) and centered on each *Geocarpon minimum* population. We calculated the percent change in development and then applied the change to the "habitat quantity" and "abundance" condition metrics for each future scenario. We reduced habitat quantity and abundance for a population by the same proportion of land that was developed in its corresponding analysis unit between current (2021) and future (2100) conditions (Service 2021, p. 41). Using the resulting numbers, we re-scored each population based on the same metric thresholds used to assess current condition. We assumed that any populations occurring on publicly owned lands would not be affected by development.

Future Population Resilience

We determined the future resiliency of *Geocarpon minimum* populations using the methods and scenarios described above. Future predictions were estimated for two land

use change scenarios (A2 and B1) for the year 2100. Some individual sites had decreases in their resiliency score; however, none of the final condition categories (high, moderate, or low) changed from current conditions under either future scenario. No populations were projected to become extirpated.

Future Species Representation

To predict species representation under plausible future scenarios, we characterized the number and distribution of *Geocarpon minimum* populations in the 4 RUs for the 41 populations known at the time of analysis under the two future scenarios. The analyzed *Geocarpon minimum* populations occur in the Ozark Highlands/Central Irregular Plains (20), Arkansas Valley (2), South Central Plains (14), and Cross Timbers (5). Future representation is predicted to remain the same for *Geocarpon minimum* across all RUs in each scenario. Extant populations remain in all RUs across all future scenarios, and we did not predict the extirpation of any populations.

The Arkansas Valley is most at risk for losing species representation as it only has two populations with one ranked as having moderate resiliency and the other ranked as low. The remaining RUs have more populations and higher percentages of moderate and high resiliency populations (Ozark Highlands/Central Irregular Plains, 65 percent of 20 populations remain in moderate to high resiliency; South Central Plains, 86 percent of 14; and Cross Timbers, 100 percent of 5). We estimate the future level of representation to be similar to current conditions under both scenarios.

Future Species Redundancy

Redundancy describes the ability of a species to withstand catastrophic events. Redundancy for *Geocarpon minimum* is characterized by having multiple high and moderate resiliency populations distributed across the species' range. Redundancy is predicted to remain the same as that described for current conditions, with 31 of the 41 evaluated populations continuing to be categorized as having high or moderate resiliency.

These populations are distributed across the four RUs, with each RU containing at least one moderately resilient population. The five additional populations that have been recently discovered were not modeled into the future, but increase the distribution of the species and may continue to do so into the future. Additionally, there are no extirpations projected into the future throughout the range of the species, meaning no forecasted reductions in the species' redundancy.

Summary of Future Conditions and Viability

We predicted the future resiliency of *Geocarpon minimum* populations for the year 2100 using two scenarios (A2 and B1) that account for FORE-SCE modeled changes in land use, specifically the percentage of land in a developed state. Although some populations are predicted to be affected by increased rates of development, none of the changes were large enough to affect the species' final population condition scores. Because of this lack of change, the population resiliency and species representation and redundancy for both future scenarios are similar to that of the current conditions.

Determination of *Geocarpon minimum* 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 in danger of extinction throughout all or a significant portion of its range, and a "threatened species" as a species 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 Act's section 4(a)(1) factors, we find that the current viability of *Geocarpon minimum* is higher now than at the time of listing due to the discovery of additional areas occupied by the species, reduction of threats, and implementation of management actions by partnering agencies throughout the species' range.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to *Geocarpon minimum*. The number of known populations has increased from 17 at the time of listing to 46 currently. New populations continue to be found, and the known species' range has expanded from 10 counties in Missouri and Arkansas to 22 counties and parishes in Missouri, Arkansas, Texas, Oklahoma, and Louisiana. Of the 41 populations for which resiliency could be estimated, 76 percent had moderate to high resiliency under current conditions. These resilient populations were distributed across the four RUs (i.e., at least one moderately resilient population per ecoregion). This distribution represents a diverse array of habitat conditions, which may enable the species to more readily adapt to environmental changes. Moreover, the greater number of resilient populations known today provides redundancy across the species' range, such that *Geocarpon minimum* populations are very unlikely to be negatively affected by catastrophic events or other sources of environmental stochasticity simultaneously. Considering resiliency, representation, and redundancy together, the species is not currently in danger of extinction.

The main threat at many sites is habitat destruction or modification and competition with other species (Factor A). To examine the impact of development and land use change more closely, we analyzed two different future scenarios until the year

2100. Under the two scenarios evaluated, the number of the 41 known populations at the time of analysis remaining in high or moderate resiliency categories is the same as under current conditions (31; 76 percent). The species is expected to continue to occur across its range, with representation and redundancy remaining at their current levels. Of the 41 analyzed populations, 21 (51 percent) occur either on public lands with management or on private lands with management plans or easements, which reduces the likelihood of development impacting these populations and increases the likelihood of suitable management that decreases the impacts from threats. Because estimates of population resiliency, redundancy, and representation did not change under a plausible range of future land use change scenarios, our analysis suggests that *Geocarpon minimum* is not likely to be in danger of extinction in the foreseeable future due to this key threat.

During our analysis, we found that the distribution of *Geocarpon minimum* is not as limited as was understood at the time of listing (Factor E). We do not expect this condition to change substantially in the foreseeable future and, therefore, no longer consider this condition a threat to the species. Since listing, we have become aware of the potential for the effects of climate change (Factor E) to affect all biota, including *Geocarpon minimum*. The broadened range and increased number of populations since listing in 1987 indicate that the species benefits from sufficient redundancy, representation, and resiliency to withstand perturbations from climate change and suggest that the effects of ongoing climate change are not a threat to the species within the foreseeable future.

Thus, after assessing the best scientific and commercial data available, we conclude that *Geocarpon minimum* is not in danger of extinction now or likely to become so within 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 *Geocarpon minimum* 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 (i.e., endangered) or likely to become so within the foreseeable future (i.e., threatened) 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 within the foreseeable future in that portion. 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 *Geocarpon minimum*, we choose 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 *Geocarpon minimum* to determine if the species is in danger of extinction or likely to become so in the foreseeable future throughout any portion of its range. The range of a species can theoretically be divided 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 *Geocarpon minimum*, we considered whether the threats or their effects on the species are greater in any biologically meaningful portion of the species' range than in the rest of the range such that the species is in danger of extinction or likely to become so in the foreseeable future in that portion.

We examined the following threats: climate change, habitat disturbance, vegetation encroachment, and development, including cumulative effects. The location and magnitude of some threats may impact the species differently in different portions of its range.

During the first phase of our analysis, we identified areas of *Geocarpon minimum*'s range that warranted further consideration. We first assessed RUs representative of the two habitat types where the species occurs: saline prairies encompassing the Arkansas Valley and South Central Plains RUs and sandstone glades encompassing the Ozark Highlands/Central Irregular Plains and Cross Timbers RUs. We assessed the threats and species' response in the two areas (two saline prairie RUs and two sandstone glade RUs).

As described above under **Summary of Biological Status and Threats**, vegetation encroachment is a threat to *Geocarpon minimum*. The sandstone glades may be more likely to be impacted by woody vegetation encroachment whereas the saline prairies may be more likely to be impacted by encroachment by mosses, dense annual vegetation, or perennial grasses. While we found some differences in the most common type of vegetation encroachment between the two habitat types, the best available information indicates that the species' response to this threat and the timing of this threat do not vary throughout the species' range. Of the 16 analyzed saline prairie populations, 81% had moderate or high resiliency. Similarly, of the 25 analyzed sandstone glade populations, 72% had moderate or high resiliency. High percentages of moderate and high resiliency populations in both habitat types suggest that the species is responding similarly to distinct stressors under a diverse array of environmental conditions. Comparable species responses result in a similar status for these two portions of the species' range, and therefore, *Geocarpon minimum* is not in danger of extinction or likely to become so within the foreseeable future in either portion of its range.

We next assessed each of the four RUs for possible status differences and significance. Having only two known populations, the Arkansas Valley RU is the only RU that does not contain a population that currently exhibits high resiliency, and we determined that this RU requires further analysis because it may have a more vulnerable current status than all other RUs. The Arkansas Valley RU has fewer populations than other RUs and has overall lower resiliency, redundancy, and representation. However, our assessment indicates that the species does not face additional threats, or threats that impact *Geocarpon minimum* to a greater extent, in the Arkansas Valley RU than elsewhere in the species' range. Our future analysis projects no changes to species' resiliency at the population or RU level, indicating that the status of this and other RUs are not likely to shift in the foreseeable future.

We considered whether the Arkansas Valley RU is "significant" to the conservation of *Geocarpon minimum.* The most recent definition of "significant" within Service policy guidance has been invalidated by court order (see Desert Survivors v. U.S. Department of the Interior, 321 F. Supp. 3d 1011, 1070-74 (N.D. Cal. 2018)). In light of the court decision and for the purposes of this analysis, when identifying whether a portion is "significant," we considered (1) whether the portion is a sufficiently large proportion of the current range, such that it necessarily provides an important conservation value for the species, or (2) otherwise contributes an important conservation value for the species. The Arkansas Valley RU is not sufficiently large to qualify as "significant," as it comprises 6.54 percent of the species range based on the total acreage of all RUs, and it contains just 1.02 percent of the total known available habitat (1411.53 ha (3487.88 ac)) based on element occurrence distribution. Additionally, the Arkansas Valley RU only contains 2 element occurrences, which represents 5 percent of the total element occurrences. In our analysis of whether the Arkansas Valley RU contributes an important conservation value for the species, we considered whether the portion (1) is the

geographic core of the species' range, (2) includes important habitat features for species conservation (e.g., a majority of, but not all, germination areas), or (3) contains habitat of high or unique value (e.g., a different habitat type in one area). We considered the "geographic core" of a species' range to mean a portion containing a high abundance or density of individuals of the species relative to its geographic size. The number of *Geocarpon minimum* individuals and amount of available habitat estimated to occur within the Arkansas Valley RU is relatively small compared with other RUs (Service 2021, table 5, p. 36), so this area is not the geographic core of the species' range. Further, these sites do not include unique habitat types for the species as a whole, and the habitat conditions and population characteristics of the two Arkansas Valley sites are intermediate between those represented by other RU ecoregions. These findings indicate that the Arkansas Valley RU is not significant.

We found no biologically meaningful portion of *Geocarpon minimum*'s 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 its range. In the Arkansas Valley RU, where *Geocarpon minimum* is only known to occur in one vulnerable and one moderately resilient population, the best available information indicates that this RU is not significant, and therefore, this RU does not represent a significant portion of the range.

Therefore, we find that the species is not in danger of extinction or likely to become so in the foreseeable future in any significant portion of its range. This does not conflict with the courts' holdings in *Desert Survivors* v. *U.S. Department of the Interior*, 321 F. Supp. 3d 1011, 1074-74 (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

Based on the best scientific and commercial data available, we determine that *Geocarpon minimum* 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, *Geocarpon minimum* has recovered to the point at which it no longer meets the definition of an endangered species or a threatened species. Therefore, we propose to remove *Geocarpon minimum* from the Federal List of Endangered and Threatened Plants.

Effects of This Rule

This proposed rule, if made final, would revise 50 CFR 17.12(h) by removing *Geocarpon minimum* from the Federal List of Endangered and Threatened Plants. The prohibitions and conservation measures provided by the Act, particularly through sections 4 and 7, would no longer apply to this species. Federal agencies would no longer be required to consult with us under section 7 of the Act in the event that activities they authorize, fund, or carry out may affect *Geocarpon minimum.* There is no critical habitat designated for this species, so there would 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 endangered or threatened 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 draft PDM plan for *Geocarpon minimum*. The draft PDM plan: (1) Summarizes the status of *Geocarpon minimum* 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 *Geocarpon minimum*. We appreciate any information on what should be included in post-delisting monitoring strategies for this species (see **Information Requested**, above).

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the

sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

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), E.O. 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 federally recognized Tribes and Alaska Native Corporations on a government-to-government basis. In accordance with S.O. 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.

During the SSA process, there were no known sites containing *Geocarpon minimum* that were known to occur on Tribal lands or otherwise impact Tribes. However, since the current SSA version was completed, sites in Oklahoma occurring on lands near Tribal lands were discovered. We have reached out to potentially interested Tribes, including the Osage Nation, the Apache Tribe of Oklahoma, the Cherokee Nation, the Cheyenne and Arapaho Tribes of Oklahoma, and the Wichita and Affiliated Tribes, to request information and inform them of the status of our evaluations of *Geocarpon minimum*. We will use any information received to inform future versions of the SSA, and we will continue to work with Tribal entities during the development of a final delisting determination for *Geocarpon minimum*.

References Cited

A complete list of references cited in this rulemaking is available on the internet at *https://www.regulations.gov* and upon request from the Arkansas Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

Accordingly, we propose to 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; 4201–4245, unless otherwise noted.

2. In 17.12, amend paragraph (h) by removing the entry for "*Geocarpon minimum*" under FLOWERING PLANTS from the List of Endangered and Threatened Plants.

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Brian Nesvik,
Director,
U.S. Fish and Wildlife Service.

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