DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2018–0104; 4500030113]

RIN 1018–BD35

Endangered and Threatened Wildlife and Plants; Endangered Species Status for Beardless Chinchweed with Designation of Critical Habitat, and Threatened Species Status for Bartram's Stonecrop with Section 4(d) Rule

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list *Pectis imberbis* (beardless chinchweed), a plant species from southern Arizona and northern Mexico, as an endangered species and to designate critical habitat for Beardless chinchweed under the Endangered Species Act of 1973 (Act), as amended. In total, we propose to designate approximately 10,604 acres (4,291 hectares) in southern Arizona as critical habitat for this plant. We also announce the availability of a draft economic analysis of the proposed designation of critical habitat for beardless chinchweed.

In addition, we propose to list *Graptopetalum bartramii* (Bartram's stonecrop), a plant species from southern Arizona and northern Mexico, as a threatened species under the Act and to issue a rule under section 4(d) of the Act to provide for the conservation of Bartram's stonecrop. We are not proposing to designate critical habitat for Bartram's stonecrop because we find that a designation is not prudent. If we make this rule final as

proposed, it would extend the Act's protections to both of these species and to beardless chinchweed's critical habitat.

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: *Written comments:* You may submit comments by one of the following methods:

(1) *Electronically*: Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Search box, enter FWS–R2–ES–2018–0104, 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, click on the Proposed Rule box to locate this document. You may submit a comment by clicking on "Comment Now!"

(2) *By hard copy*: Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R2–ES–2018–0104; U.S. Fish and Wildlife Service, MS: BPHC, 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 *http://www.regulations.gov*. This generally means that we will

post any personal information you provide us (see *Public Comments*, below, for more information).

Document availability: The draft economic analysis is available at *http://www.fws.gov/southwest/es/arizona/Docs_Species.htm*, at *http://www.regulations.gov* at Docket No. FWS–R2–ES–2018–0104, and at the Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

The coordinates or plot points or both from which the map is generated are included in the administrative record for this critical habitat designation and are available at *https://www.fws.gov/southwest/es/arizona/Docs_Species.htm*, at *http://www.regulations.gov* at Docket No. FWS–R2–ES–2018–0104, and at the Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Any additional tools or supporting information that we may develop for this critical habitat designation will also be available at the Fish and Wildlife Service website and Field Office set out above, and may also be included in the preamble and/or at *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Jeff Humphrey, Field Supervisor, U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office, 9828 North 31st Avenue, #C3, Phoenix, AZ 85051-2517; telephone 602–242–0210. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if a species is determined to be an

endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the *Federal Register* and make a determination on our proposal within 1 year. Under section 4(d) of the Act, the Secretary of the Interior has the discretion to issue such regulations as he deems necessary and advisable to provide for the conservation of threatened species. Critical habitat shall be designated, to the maximum extent prudent and determinable, for any species determined to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species, adopting provisions under section 4(d) of the Act for a threatened species, and designations and revisions of critical habitat can only be completed by issuing a rule.

What this document does. We propose to list beardless chinchweed as an endangered species and Bartram's stonecrop as a threatened species. This proposed rule assesses all available information regarding status of and stressors to beardless chinchweed and Bartram's stonecrop. We also propose a rule issued under section 4(d) of the Act to provide for the conservation of Bartram's stonecrop. In addition, we propose to designate critical habitat for beardless chinchweed. We are not proposing critical habitat for Bartram's stonecrop as we have determined that the designation of critical habitat for this species is not prudent.

The basis for our action. Under the Act, we can determine that a species is an endangered or threatened species based on 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.

For beardless chinchweed, we have determined that the key factors supporting the proposed endangered finding are: loss of habitat due to invasion by nonnative species (Factor A); altered fire regime exacerbated by nonnative invasion (Factors A and E); altered precipitation, drought, and temperature (Factors A and E); road and trail maintenance, mining, livestock, wildlife, and post-wildfire runoff (Factors A and E); grazing from wildlife and livestock (Factor C); and small population size exacerbating all other stressors (Factor E). The existing regulatory mechanisms are not adequate to address these factors such that the species does not meet the definition of an endangered or threatened species (Factor D).

For Bartram's stonecrop, we have determined the key factors supporting the proposed threatened finding are: reduction in water availability (Factors A and E); erosion, sedimentation, and burial (Factors A and E); trampling (Factor E); altered fire regime (Factors A and E); loss of shade (Factors A and E); altered flooding regime (Factors A and E); drought (Factors A and E); predation of individuals and shade trees (Factors A, C, and E); illegal collection (Factor B); and small population size (Factor E). The existing regulatory mechanisms are not adequate to address these factors such that the species does not meet the definition of an endangered or threatened species (Factor D).

Under the Act, any species that is determined to be an endangered or a threatened species shall, to the maximum extent prudent and determinable, have habitat designated that is considered to be critical habitat. Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to critical habitat on the basis of the best

available scientific data after taking into consideration the economic impact, the impact on national security, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. Under section 4(d) of the Act, the Secretary of the Interior has the discretion to issue such regulations as he deems necessary and advisable to provide for the conservation of threatened species.

We prepared an economic analysis of the proposed designation of critical habitat. In order to consider economic impacts, we prepared an analysis of the economic impacts of the proposed critical habitat designation. We hereby announce the availability of the draft economic analysis and seek public review and comment.

Peer review. In accordance with our joint policy on peer review published in the *Federal Register* on July 1, 1994 (59 FR 34270), we have sought the expert opinions of three appropriate and independent specialists regarding the scientific information in the species status assessment upon which this proposed rule is based. The purpose of peer review is to ensure that our listing determinations and critical habitat designation are based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise with beardless chinchweed's or Bartram's stonecrop's biology, habitat, physical or biological factors, or stressors. Species status assessment reports for beardless chinchweed and Bartram's stonecrop were developed (Service 2018a and 2018b, entire), which represent a compilation of the best scientific and commercial data available

concerning the status of the species, including the past, present, and future stressors to the species. We requested peer review of each species status assessment report from three independent specialists, with expertise with the species, to ensure that we based our determinations on scientifically sound data, assumptions, and analyses. The peer reviewers' comments have been considered and incorporated where appropriate in the species status assessment reports (Service 2018a and 2018b, entire), which are available at *https://www.fws.gov/southwest/es/arizona/Docs_Species.htm*, and at *http://www.regulations.gov* at Docket No. FWS–R2–ES–2018–0104. The peer review comments will be available along with other public comments in the docket for this proposed rule on *http://www.regulations.gov* (Docket No. FWS–R2–ES–2018–0104).

Information Requested

Public Comments

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) Beardless chinchweed and Bartram's stonecrop biology, range, and population trends, including:

(a) Biological or ecological requirements of these species, including habitat requirements for germination, growth, and reproduction;

(b) Genetics and taxonomy;

(c) Historical and current range, including distribution in Mexico;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for these species, their habitats, or both.

(2) Factors that may affect the continued existence of these species, which may include habitat modification or destruction, overutilization, disease, predation, the inadequacy of existing regulatory mechanisms, or other natural or manmade factors.

(3) Biological, commercial trade, or other relevant data concerning any stressors (or lack thereof) to these species and existing regulations that may be addressing those stressors.

(4) Additional information concerning the historical and current status, range, distribution, and population size of these species, including the locations of any additional populations of these species.

(5) Information related to climate change within the range these species and how it may affect these species' habitats.

(6) Information on regulations that are necessary and advisable to provide for the conservation of these species and that the Service can consider in developing a 4(d) rule for the species. In particular, information concerning the extent to which we should include any of the section 9 prohibitions in the 4(d) rule or whether any other forms of take should be excepted from the prohibitions in the 4(d) rule.

(7) The reasons why areas should or should not be designated as critical habitat as provided by section 4 of the Act (16 U.S.C. 1531 *et seq.*) including information to inform

the following factors such that a designation of critical habitat may be determined to be not prudent:

(a) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(b) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(c) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States;

(d) No areas meet the definition of critical habitat.

(8) The following specific information on:

(a) The amount and distribution of habitat;

(b) What areas, that are currently occupied and that contain the physical and biological features essential to the conservation of these species, should be included in a critical habitat designation and why;

(c) Special management considerations or protection that may be needed for the essential features in potential critical habitat areas, including managing for the potential effects of climate change; and

(d) What areas not occupied at the time of listing are essential for the conservation of the species. We particularly seek comments regarding:

(i) Whether occupied areas are inadequate for the conservation of the species; and,

(ii) Specific information that supports the determination that unoccupied areas will, with reasonable certainty, contribute to the conservation of the species and, contain at least one physical or biological feature essential to the conservation of the species.

(9) Land use designations and current or planned activities in the subject areas and their possible impacts on proposed critical habitat.

(10) Any probable economic, national security, or other relevant impacts of designating any area that may be included in the final designation, and the benefits of including or excluding areas that may be impacted.

(11) Information on the extent to which the description of probable economic impacts in the draft economic analysis is a reasonable estimate of the likely economic impacts.

(12) Whether any specific areas we are proposing for critical habitat designation should be considered for exclusion under section 4(b)(2) of the Act, and whether the benefits of potentially excluding any specific area outweigh the benefits of including that area under section 4(b)(2) of the Act.

(13) The likelihood of adverse social reactions to the designation of critical habitat, as discussed in the associated documents of the draft economic analysis, and how the consequences of such reactions, if likely to occur, would relate to the conservation and regulatory benefits of the proposed critical habitat designation.

(14) Whether we could improve or modify our approach to designating critical habitat in any way to provide for greater public participation and understanding, or to better accommodate public concerns and comments.

(15) Additional guidance and methods that the Service could provide or use, respectively, to streamline the implementation of the proposed 4(d) rule for Bartram's stonecrop.

Please include sufficient 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, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered 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 *http://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 *http://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 *http://www.regulations.gov*, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Hearing

Section 4(b)(5) of the Act provides for a public hearing on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the *Federal Register* (see **DATES**, above). 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.

Previous Federal Actions

Beardless Chinchweed

Beardless chinchweed was a candidate for listing from 1980 to 1996. It was first a Category 1 candidate species, as identified in our December 15, 1980, notice of review (45 FR 82480). Category 1 is a term no longer in use, having been replaced by the term "candidate species." A candidate species is a species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. In 1983, beardless chinchweed was reclassified as a Category 2 species (48 FR 53640; November

28, 1983). A Category 2 species referred to a species for which the Service had some indication that listing as endangered or threatened might be warranted, but there were insufficient data available to justify a proposal to list. The species remained so designated in subsequent annual candidate notices of review (50 FR 39526, September 27, 1985; 55 FR 6184, February 21, 1990; 58 FR 51144; September 30, 1993). In 1996, the Service eliminated Category 2 species; consequently, this species dropped off the candidate list. The Service received a petition in July 2010 to list beardless chinchweed and designate critical habitat under the Act (Center for Biological Diversity 2010, entire). The Service published a 90-day finding on August 8, 2012 (77 FR 47352), concluding that the petition presented substantial scientific or commercial information indicating that listing of the species may be warranted.

Bartram's Stonecrop

Bartram's stonecrop was a candidate for listing from 1980 to 1996. It was first a Category 1 candidate species, as identified in our December 15, 1980, notice of review (45 FR 82480), and then in 1983, it was reclassified as a Category 2 species (48 FR 53640; November 28, 1983). The species remained so designated in subsequent annual candidate notices of review (50 FR 39526, September 27, 1985; 55 FR 6184, February 21, 1990; 58 FR 51144; September 30, 1993). In 1996, the Service eliminated Category 2 species; consequently, this species dropped off the candidate list. The Service received a petition in July 2010 to list Bartram's stonecrop and designate critical habitat under the Act (Center for Biological Diversity 2010, entire). The Service published a 90-day finding on August 8, 2012 (77 FR 47352), concluding that the petition presented

substantial scientific or commercial information indicating that listing of the species may be warranted.

I. Proposed Listings

Background

To provide the necessary and most up-to-date information and background on which to base our determination, we completed a species status assessment (SSA) report for beardless chinchweed (Service 2018a, entire), and an SSA report for Bartram's stonecrop (Service 2018b, entire), which are available online at *http://www.regulations.gov,* under Docket No. FWS–R2–ES–2018–0104. The SSA reports document the results of the comprehensive biological status review for each species, and each provides an account of the applicable species' overall viability through the forecasting of the condition of populations into the future. We generally define viability as the ability of the species to persist over the long term and, conversely, to avoid extinction (Service 2016, entire). In the SSA reports, we summarize the relevant biological data; describe the past, present, and likely future risk factors (causes and effects); and conduct an analysis of the viability of the species. The SSA reports provide the scientific basis that informs our regulatory decision regarding whether these species should be listed under the Act. This decision involves the application of standards within the Act, its implementing regulations, and Service policies (see **Determination**, below). Further, these SSA reports contain the risk analysis on which this determination is based, and the following discussion is a summary of the results and conclusions from these SSA reports. Species experts and appropriate agencies provided input into the development of these SSA reports.

Beardless chinchweed

Beardless chinchweed is plant of the Asteraceae, or sunflower, family. Beardless chinchweed was first collected by Charles Wright in the early 1850s in Sonora, Mexico (now part of Santa Cruz County, Arizona), and was described by Asa Gray in 1853 (Phillips *et al.* 1982, p. 1; Keil 1978, p. 135). The name has remained unchanged since that time, and there are no known synonyms. Based on this information as the best available scientific and commercial data, we accept the characterization of beardless chinchweed as a valid species.

Beardless chinchweed is an erect, many-branched, perennial herb growing 3 to 12 decimeters (1 to 4 feet (ft)) from a slender, woody, taprooted caudex (stem base) (Keil 1978, p. 143; Phillips *et al*. 1982, p. 2; Keil 2017, pers. comm.). The glabrous (without hairs) leaves are 1 to 5 centimeters (cm) (0.4 to 2 inches (in)) in length and 1 to 2 millimeters (mm) (0.04 to 0.08 in) wide with pointed tips (Phillips *et al*. 1982, p. 2). Daisy-like flower heads containing yellow ray and disk flowers are solitary or in open, flat-topped clusters at the tips of the branches (Phillips *et al*. 1982, p. 2). In fruit, the heads have red to purple drying phyllaries (bracts around the flower head of a composite plant) and have small (<5 mm (0.2 in) long), spreading, awned black achenes (simple dry fruit) (Fishbein and Warren 1994, p. 19). Although we do not know exactly how long individual beardless chinchweed live, experts estimate 5 to 10 years (Keil 2017, pers. comm.).

Young beardless chinchweed plants have been noted in April (Dahlby 2017, pers. comm.), and are still present in November (Westland 2010, p. 10). Flowering occurs from August to October, when the plants are more than 0.5 meters (m) (1.6 ft) in height

(Kearney and Peebles 1951, p. 935; Phillips *et al*. 1982, p. 8). There have been no reports of the plant from winter months, when beardless chinchweed is presumed to die back to the ground. It is unknown how long flowers remain open. In one measurement of the number of flowers per stem, these range from 0 to 55, with an average of 28.3 per stem (Service 2015, p. 1). It was estimated that there were 6 to 8 seeds per head, resulting in a potential of roughly 832 seeds per plant, although seed loss to grazing, desiccation, and abortion were not accounted for. Germination and establishment may be sporadic or require specific conditions for success (Keil 1978, p. 144). There is no information available on the seedbank longevity of the species; however, we are aware that within populations, a variety of age classes are represented (Phillips *et al*. 1982, p. 7; Service 2011, p. 4; Service 2014a, p. 2; Service 2015, p. 1; Sebesta 2017, pers. comm.). Therefore, we believe viable seeds are being produced and reproduction is occurring.

The species has been reported to reproduce both by seed and rhizomes (Westland 2010, p. 10), although there is no evidence that the species is rhizomatous (Keil 2017, pers. comm.). It is not known whether plants are able to pollinate themselves or require the pollen of another plant. However, it is likely that the plant requires pollinators. The pollinators of beardless chinchweed are not known, but other *Pectis* species are reported to be pollinated by bees and flies (Cockerell 1897, pp. 148−149; Cockerell 1911, pp. 136−137, 141−142; Simpson and Neff 1987, p. 434; Phillip *et al.* 2006, pp. 532, 535–536, 538), and both an *Acmaeodera* beetle and a *Diadasia* bee were noted visiting beardless chinchweed plants (Sebesta 2017, pers. comm.). Butterflies may also use this species, as showy yellow heads containing both ray and disk flowers serve as landing

platforms and are easily accessible to a variety of low energy pollinators such as butterflies (Schmitt 1980, p. 935; Keil 2017, pers. comm.).

Beardless chinchweed is typically found in oak woodlands at higher elevations, and desert grasslands and oak savannas at lower elevations (McLaughlin *et al.* 2001, pp. 119, 121). However, it has also been found on disturbed road cuts, arroyo cuts, and unstable rocky slopes, where it has little competition for sunlight and nutrients (Phillips *et al.* 1982, pp. 4, 6; Fishbein and Warren 1994, p. 19). It is found at elevations from 1,158−1,737 m (3,799−5,699 ft) (SEINet 2017, entire). Plants are typically noted to occur on steep, south-facing, sunny to partially shaded hillslopes, with eroding bedrock and open areas with little competition from other plants. The nonstable substrate, which could be moved through gravity, erosion, or impact, reduces competition with other vegetation, favoring beardless chinchweed. It is presumed to be a poor competitor due to its preferred open habitat and inability to find the species under dense vegetation conditions.

Beardless chinchweed requires a lack of competition from other plants. The different shaped and sized canopy and root systems of associated plant species within healthy grasslands, savannas, and woodlands create heterogeneity of form, height, and open patches needed by beardless chinchweed. Open patches are created and maintained through a variety of abiotic and biotic mechanisms (Porensky *et al*. 2013, p. 591), including natural erosion (from things like precipitation events, gravity, and animals); the grazing and browsing of native animals, such as black-tailed prairie dogs (*Cynomys ludovicianus*) and pronghorn antelope (*Antilocapra americana*) (BANWR 2012, entire; Bahre 1995, p. 231; McPherson and Weltzin 2000, p. 4); and low severity, frequent

wildfires (Hoffmeister 1986, pp. 194–195; McPherson and Weltzin 2000, p. 5; Brooks and Pyke 2002, p. 6; McDonald and McPherson 2011a, p. 385; Fryer and Leunsmann 2012, entire). The desert grasslands, oak savannas, and oak woodlands of southern Arizona historically had large-scale, low severity fire roughly every 10 to 20 years and following periods of adequate moisture (McPherson and Weltzin 2000, p. 5; Brooks and Pyke 2002, p. 6; McDonald and McPherson 2011a, p. 385; Fryer and Leunsmann 2012, entire). Precipitation within the mountain ranges is bimodal, with dormant season snow and rain, and growing season monsoon rain. Data are lacking to indicate how beardless chinchweed uses dormant season versus growing season precipitation; however, we believe that dormant season precipitation is more important because this is needed for seed germination and growth.

The historical range of beardless chinchweed was larger than the current range, with a greater number of populations than persist today in southeastern Arizona and northern Sonora and Chihuahua Mexico. The historical distribution included 21 separate beardless chinchweed populations within the Atascosa-Pajarito, Huachuca, Patagonia, and Santa Rita Mountains and Canelo Hills of Cochise, Pima, and Santa Cruz Counties, Arizona, as well as in northern Chihuahua and Sonora Mexico (see Table 1, below). We define a population of beardless chinchweed as one or more subpopulations that occur within 1 kilometer (km) (0.62 miles (mi)) of other beardless chinchweed individuals allowing for gene flow and movement through cross-pollination. Because many bees and butterflies can travel a distance of 1 km (0.62 mi), we believe plants within this distance to be a single population. Subpopulations within a population are separated by between 300 and 999 m (984.3 and 3,278 ft). Of the 21 populations, 15 were in Arizona and 6

were in Mexico. The number of individuals seen historically in Mexico is not available, and no beardless chinchweed have been reported from Mexico since 1940. Nine populations and one subpopulation in Arizona have become extirpated since 1962.

Table 1. Current status of beardless chinchweed populations.

Mountain Range/ Country	Population Name	Population Status	Subpopulation Name*	Subpopulation Status
Atascosa-Pajarito Mountains, USA	Pena Blanca Lake	Extirpated	N/A	Extirpated
	Ruby Road	Extant	N/A	Extant
	Summit Motorway	Extirpated	N/A	Extirpated
Canelo Hills, USA	Audubon Research Ranch	Extant	Post Canyon	Extirpated
			Tributary of O'Donnell Canyon	Extant
	Copper Mountain	Extirpated	N/A	Extirpated
	Harshaw Creek	Extirpated	N/A	Extirpated
	Lampshire Well	Extirpated	N/A	Extirpated
Huachuca Mountains, USA	Scotia Canyon	Extant	N/A	Extant
	Coronado National Memorial	Extant	State of Texas Mine	Extant
			Visitor Center	Extant
	Joe's Canyon Trail	Extirpated	N/A	Extirpated
Patagonia Mountains, USA	Flux Canyon	Extirpated	N/A	Extirpated
	Washington Camp	Extirpated	N/A	Extirpated
Santa Rita Mountains, USA	Box Canyon Road	Extirpated	N/A	Extirpated
	McCleary Canyon—Gunsight Pass	Extant	N/A	Extant
	McCleary Canyon—Wasp Canyon	Extant	N/A	Extant
Chihuahua, Mexico	Batopililas	Unknown; presume extant	N/A	Unknown; presume extant

	Guasaremos	Unknown; presume extant	N/A	Unknown; presume extant
Sonora, Mexico	Canon de la Petaquilla	Unknown; presume extant	N/A	Unknown; presume extant
	Canyon Estrella	Unknown; presume extant	N/A	Unknown; presume extant
	Horconcitos	Unknown; presume extant	N/A	Unknown; presume extant
	Los Conejos	Unknown; presume extant	N/A	Unknown; presume extant

* In this column of the table, N/A means "not applicable."

Currently, there are 12 populations in Arizona and Mexico. In Arizona, there are currently 387 individual beardless chinchweed spread across less than 2 hectares (ha) (5 acres (ac)) within six extant populations spread across the following four mountain ranges: the Atascosa-Pajarito, Huachuca, Santa Rita mountain ranges, and the Canelo Hills (see Table 1, above). Five of the six populations in Arizona contain fewer than 50 individuals. Most of the mountain ranges in the United States have been surveyed for beardless chinchweed, and it is unlikely that any large populations remain unaccounted for therein. In addition, there are six populations in northern Mexico for which we have no current information. Inquiries between February 17 and December 12, 2017, with 11 researchers familiar with the flora of Chihuahua and Sonora revealed no information on the status of the species in Mexico. We believe these populations are extant, but with few individuals and with poor habitat condition (similar to the smallest extant populations in the United States), because much of the grasslands in beardless chinchweed' historical range in Mexico have been invaded by nonnative species (Romo *et al.*, 2012, entire; Arriaga *et al.*, 2004, entire).

For beardless chinchweed to maintain viability, its populations or some representative portion thereof must be resilient. Resiliency describes the ability of

populations to withstand stochastic events (arising from random factors). We can measure resiliency based on metrics of population health (for example, germination versus death rates and population size). Highly resilient populations are better able to withstand disturbances such as random fluctuations in germination rates (demographic stochasticity), variations in rainfall (environmental stochasticity), or the effects of anthropogenic activities. A beardless chinchweed population with high resiliency is one in which abundance is high, the number of subpopulations is high and spatially dispersed, seed production is high, recruitment is such that the population remains stable or increases, and the population is able to withstand stochastic events or recover to current or better condition from stochastic events from seed bank. Population resiliency categories for beardless chinchweed are described in section 3.2 of the SSA report (Service 2018a).

In addition to the above demographic needs, populations also need habitat elements for resiliency. Based on where the species has typically been found, a resilient population needs eroding granite or limestone soils or rock outcrops with native-dominated habitat, on sunny to partly shaded southern exposures. Beardless chinchweed plants are also often associated with active disturbances from frequent, low severity wildfire; grazing and browsing of native animals; and natural erosion of nonstable substrates, thus reducing competition for beardless chinchweed. In addition, resilient populations need soil moisture for seed germination, growth, and reproduction in the form of dormant season (October through March) precipitation. The minimum amount of precipitation needed for individual survival is unknown. We believe that deviation from the timing and amount of precipitation would impact the resiliency of a population,

because soil moisture would be impacted. This would lead to decreased seed germination, reduced growth, reduced flowering, and decreased seed production. Further, the presence of pollinators is needed for effective fertilization, out-crossing, and seed production in beardless chinchweed. Habitat resiliency categories for beardless chinchweed are described in Table 2, below, and in section 3.2 of the SSA report (Service 2018a).

Table 2. Population resiliency category definitions for beardless chinchweed.

Condition Category	Subpopulations	Abundance	Native-dominated habitat	Dormant Season (October through March) Precipitation
High (3)	Three or more subpopulations per population	Number of adults in each population is >300 individuals	No nonnative plants	More than 12 inches of winter rain on average during the past 5 years as recorded at the nearest weather station
Moderate (2)	Two subpopulations per population	Number of individuals in each population is 100 to 300 individuals	Native plants dominate	Between 6.1 and 12 inches of winter rain on average during the past 5 years as recorded at the nearest weather station
Low (1)	One subpopulation per population	Number of individuals in each population is < 100 individuals	Mix of nonnative and native plants, where there is not a clear dominance of either	6 or fewer inches of winter rain on average during the past 5 years as recorded at the nearest weather station.
Ø	No subpopulations; population is extirpated	No individuals are found during surveys	Nonnative plants dominate the habitat	6 or fewer inches of winter rain on average during the past 5 years as recorded at the nearest weather station.

Maintaining representation in the form of genetic or ecological diversity is important to maintain the capacity of beardless chinchweed to adapt to future environmental changes. Representation describes the ability of a species to adapt to changing environmental conditions. Representation can be measured by the breadth of genetic or ecological diversity within and among populations. The more representation, or diversity a species has, the more it is capable of adapting to changes (natural or human-caused) in its environment. In the absence of species-specific genetic and ecological diversity information, we evaluate representation based on the extent and variability of habitat characteristics across the geographical range.

Genetic analysis of beardless chinchweed has not been conducted within or among populations or mountain ranges. However, populations on different mountain ranges are widely separated, making cross-pollination highly unlikely, and most of the populations contain small numbers of individuals. Therefore, there is the potential for genetic diversity among mountain ranges. However, these populations are isolated and contain small numbers of individuals. Small, isolated populations are susceptible to the loss of genetic diversity, genetic drift, and inbreeding. This could mean that between-population genetic diversity may be greater than within-population diversity (Smith and Wayne 1996, p. 333; Lindenmayer and Peakall 2000, p. 200). It is possible that there has been a loss of genetic diversity in the species due to the fact that multiple populations are already extirpated. Currently, there are six extant populations across four widely separated mountain ranges in the United States, and six populations in northern Mexico that are presumed extant.

Beardless chinchweed has been reported from both decomposing granite and limestone substrates. This variability of substrate preference may be important in maintaining environmental and genetic diversity. Similarly, the species is found over a relatively wide range of elevations of 1,158 to 1,737 m (3,799 to 5,699 ft) and vegetation communities (oak woodlands at higher elevations, and grasslands and oak savannas at lower elevations), which could be important in terms of representation. The precise genetic and ecological diversity needed is unknown, but given the loss of populations, the low number of individuals in the majority of the populations, and the distance among populations, it is likely that some diversity has been lost. Consequently, at a minimum, we likely need to retain populations throughout the range of the species to maintain the overall potential genetic and life-history attributes that can buffer the species' response to environmental changes over time.

Beardless chinchweed needs to have multiple resilient populations distributed throughout its range to provide for redundancy. Redundancy describes the ability of a species to withstand catastrophic events, measured by the number of populations, and their resiliency, distribution, and connectivity. The more populations, and the wider the distribution of those populations, the more redundancy the species will exhibit. Redundancy reduces the risk that a large portion of the species' range will be negatively affected by a catastrophic natural or anthropogenic event at a given point in time. Species that are well-distributed across their historical range are considered less susceptible to extinction and more likely to be viable than species confined to a small portion of their range (Carroll *et al.* 2010, entire). With the known six extant populations being separated by as much as 35 km (21.8 mi) in southern Arizona and even farther with

the six populations believed to be extant in northern Mexico, a localized stressor such as grazing during flowering would impact only those groups of plants nearby the activity. Conversely, such distance among populations reduces connectivity among populations and mountain ranges, which may be important for genetic exchange and recolonization. Nonnative plant invasion and repeated, large-scale, moderate and high severity fires have impacted and will continue to impact many populations throughout the plant's range. The minimum number of populations needed to provide for sufficient redundancy is unknown. However, based on the number of populations now extirpated and the wide-ranging impacts from nonnatives and wildfire, the species likely needs to retain its existing population redundancy across multiple mountain ranges throughout the range to minimize impacts from catastrophic events.

Bartram's Stonecrop

Bartram's stonecrop is a plant of the Crassulaceae or stonecrop family (Phillips *et al.* 1982, p. 2; Moran 1994, p. 192). Acevedo *et al.* (2004, entire) investigated the phylogenetic relationship of *Graptopetalum* and other genera of Crassulaceae. Their work clearly separates Bartram's stonecrop from other species (Acevedo *et al.* 2004, p. 1101). The Flora of North America (2008, p. 227) recognizes *Graptopetalum* and *Dudleya* as distinct, and recognizes this species as Bartram's stonecrop in the genus *Graptopetalum*. Based on this information as the best available scientific and commercial data, the Service accepts this taxonomy.

Bartram's stonecrop is a small, succulent (fleshy), acaulescent (without a stem) perennial plant (Phillips *et al.* 1982, p. 2; Moran 1994, p. 192). Bartram's stonecrop has a basal rosette that is 7 to 16 centimeters (cm) (2.75 to 6.3 in) wide comprised of 20 or

more flat to concave, smooth, blue-green leaves (Rose 1926, p. 2; Phillips *et al.* 1982, p. 2; Moran 1994, p. 192). One to seven showy inflorescences (includes stems, stalks, bracts, and flowers) up to 30.5 cm (12 in) in height are produced in equilateral panicles (pyramidal loosely branched flower cluster). The branches of the panicles produce one to six (usually three) flowers each (Rose 1926, p. 2). The fruits are follicles (capsule that splits along one side to release seeds), with minute seeds (0.5 to 0.9 mm (0.02 to 0.04 in) in length)) having little or no endosperm (tissue surrounding the embryo that provides nutrition; Shohet 1999, pp. 3, 48). The lifespan of Bartram's stonecrop is thought to be approximately 5 years (Ferguson, 2017b, tables 1–3; Ferguson 2017, pers. comm.).

The inflorescence stalks of Bartram's stonecrop grow for 30 to 40 days, around July and August, before coming to their full height, with the flowers then opening primarily between September and November (Kearney and Peebles 1951, p. 361; Phillips *et al.* 1982, pp. 2, 7; Shohet 1999, p. 25). Individual flowers produce both male and female parts, but the timing of male and female flower stages differs. Individual flowers open in succession, such that the length of time each flower remains open overlaps, allowing for various stages of flowering and fruiting to be simultaneous within an individual plant for a month or more. The two stages of floral growth may reduce the probability of self-pollination, though it likely does still occur (Ferguson 2017, pers. comm.). Flowering is triggered by fall rains and does not occur during periods of water stress (Shohet 1999, pp. 22, 25, 36, 39).

Bartram's stonecrop requires pollination for reproduction. The major pollinators of Bartram's stonecrop are *Sarcophaga* spp. (true flies) and *Musca* spp. (house flies), although *Apis mellifera* (honey bee) may also play a role in pollination. Other species

noted on Bartram's stonecrop include wasps, butterflies, and Tachinidae and Bombyliidae flies (Shohet 1999, p. 41; Ferguson 2014, p. 26; Ferguson 2017b, p. 13). Fertilization success is greatest in earliest opening flowers, possibly due to more pollinators being available earlier in the season, but having a long period of flowering increases overall chance of pollination (Shohet 1999, p. 57). Of the seeds produced, approximately 20 percent are viable under optimal conditions (Shohet 1999, p. 48). Because seedlings (plants less than 1.5 cm [0.6 in] in diameter) have been located in most populations, we believe pollinator availability is not a limiting factor for this species. Given their geographic location in the landscape (*i.e.*, in canyons with springs and streams), it is possible that seeds are transported by water and that populations may have been founded by a single individual plant or seed (Shohet 1999, p. 58). Seeds may also be dispersed via gravity and wind.

There is little information available regarding the seedbank of Bartram's stonecrop. In general, a seed that is very tiny has evolved a requirement of sunlight for germination, as they cannot successfully emerge from deep burial (Venable and Brown 1987, p. 360). Similarly, it is thought that Bartram's stonecrop seeds reside at the soil surface beneath the litter (Shohet 1999, p. 48). It is possible that because the seed is so small, with little endosperm, mycorrhizae (the symbiotic association of a fungus with the roots of plants) may be required for seedling establishment and growth, but this has not been studied (Felger 2017, pers. comm.). Researchers at the Desert Botanical Gardens have attempted to grow Bartram's stonecrop from seed. They had no difficulty with seed germination; however, they have experienced high seedling mortality, perhaps related to a requirement for mycorrhizae for seedling establishment.

The species typically occurs on rocky outcrops with erodible soils in deep, narrow canyons in heavy cover of litter and shade within Madrean woodlands at elevations ranging from 1,067 to 2,042 m (3,500 to 6,700 ft). Madrean woodlands are a forested community dominated by evergreen oaks, but also containing junipers and pine trees, and characterized by mild winters and warm wet summers (Brown 1982, p. 59). Madrean evergreen woodland is typically bounded by semi-desert grasslands and savanna at warmer, drier sites in the lower elevations, and by evergreen and broadleaf forests on more mesic and cooler sites at higher elevation, at north aspect, or near riparian areas. Bartram's stonecrop root into crevices on rock ledges and cliffs on slopes of various aspects (Shohet 1999, p. 22; Ferguson 2014, p. 41; NPS 2016, p. 7). In addition, Bartram's stonecrop are almost always located near water sources (springs, seeps, or intermittent streams), but above the floodline (Phillips *et al.* 1982, p. 4; Shohet 1999, p. 22; NPS 2014, p. 2). Plants are typically within 10 m (32.8 ft) from a streambed in the bottom of canyons on rocky outcrops, but can be much farther on occasion (Shohet 1999, p. 5; Ferguson 2014, p. 41; NPS 2014, p. 2; Ferguson 2016a, p. 14). Based on microhabitats in which the species is typically found, the species' needs include crevices (with or without soil) for seeds to lodge and germinate, shade and deep leaf litter to help maintain soil moisture, and a humid microhabitat in this arid environment. Proximity to water may provide humidity for the plant's microclimate. The deep, narrow canyons and associated overstory species provide shade during a portion of the day, creating a cooler temperature and aiding in maintaining a humid microenvironment. In addition, the vegetation litter provides retention of soil moisture, further promoting the humid microenvironment. The specific substrate component does not seem to be critical. In

addition, for reestablishment, moist soil for seedbank may be important for this species following extended periods of drought.

Madrean evergreen woodlands of the sky island mountain ranges have evolved with frequent, low-severity fire and have warm wet summers and mild winters. The maximum interval between the relatively widespread fires typically ranged from about 10 to 30 years in the pine-dominant forests (Swetnam *et al.* 2001, p. 4). Precipitation within the sky island mountain ranges is bimodal, with winter snow and rain, and summer monsoon rain. Mean annual precipitation in the Madrean woodland habitat of southern Arizona is 250 to 450 mm (10 to 17 in), with more than 50 percent occurring in summer. The winter snow and rain coincide with Bartram's stonecrop seed germination and growth. Winter precipitation is needed for Bartram's stonecrop germination (although some germination likely occurs following summer rains), and both summer (July and August) and fall precipitation (captured partially in the October and November "winter" data) is needed for Bartram's stonecrop flower production.

Bartram's stonecrop is known to have historically occurred in 33 separate populations within 13 isolated sky island mountain ranges, 10 in southern Arizona and 3 in northern Mexico. While the overall range of the species is likely unchanged, the number and size of populations has been reduced. Four populations have become extirpated in the United States in recent years, and a fifth population has contracted in size. In three instances, extirpation was associated with the drying of habitat, which rendered it no longer suitable for the species to persist; we do not know the cause of extirpation in the fourth instance. In addition, there have been many changes in the southeastern Arizona landscape since the 1890s due to intensive cattle grazing, water

development, and fire suppression (*e.g.*, Bahre 1991, entire). These impacts may have reduced the range or number of populations and individuals.

We define a population as occurring within the same water course (*i.e.*, stream) in a sky island range and within the distance pollinators can travel. A population may consist of one or more subpopulations of Bartram's stonecrop. These subpopulations are separated by up to 8 km (5 mi). Within each subpopulation are groupings of plants. Groupings are separated by up to 1.7 km (1 mi).

As of 2017, when the SSA analysis was completed, there were 29 extant populations across 12 mountain ranges in the United States and Mexico: 26 extant populations from 9 mountain ranges in southern Arizona and 3 presumed extant populations from 3 mountain ranges in northern Mexico (see Table 3, below). Within these 29 populations, there are approximately 3,756 individuals within about 2 ha (5 ac).

In 2018, four additional populations were located in the United States in the Rincon Mountains, one additional population was located in Mexico, and a known population in Mexico, which we did not have recent data for, was confirmed. The new populations in the United States included the Upper Rincon Creek population with 38 individuals (including "many" seedlings), Turkey Creek population with 4 individuals (seedlings not differentiated, but photos look like adult rosettes and flowering), Deer Creek population with 10 individuals (adult rosettes and flowering), and Chiminea Tributary population with 13 plants (seedlings not differentiated). In Sonora, Mexico, a new population (Mesa Tres Rios population) with 80 living and 28 dead plants was found in Mesa Tres Rios. In the Río Piedras Verdes near Colonia Pacheo area of Chihuahua, seven individuals were located, confirming the presence of an extant population "near

Colonia Pacheco"; it is unknown if this is the exact historical location. Seedlings were not differentiated in either of the Mexico surveys. In total, only 145 new individuals were found, including seedlings, with 65 from the United States and 80 from Mexico. All but one population (Mesa Tres Rios) are small populations with fewer than 150 individuals. The number of extant populations as of 2018 is 34 across 13 mountain ranges in the United States and Mexico.

Table 3. Current status of Bartram's stonecrop populations.

Mountain Ranges	Population	Population Status	Subpopulation	Subpopulation Status
UNITED STATES				
Baboquivari Mountains	Brown Canyon	Extant	Brown Canyon	Extant
	Thomas Canyon	Extant	Thomas Canyon	Extant
Chiricahua Mountains	Echo Canyon	Extant	Echo Canyon	Extant
			Rhyolite Canyon	Extant
			Sugarloaf Mountain	Extant
	Indian Creek	Extirpated	Indian Creek Canyon	Extirpated
Dragoon Mountains	Carlink Canyon	Extirpated	Carlink Canyon	Extirpated
	Jordan Canyon	Extant	Jordan Canyon	Extant
	Sheepshead	Extant	Sheepshead	Extant
	Slavin Gulch	Extant	Lower Slavin Gulch	Extant
	Stronghold Canyon East	Extant	Cochise Spring	Extant
			Park Canyon	Extant
	Stronghold Canyon West	Extant	Rockfellow Dome Trail	Extant
			Stronghold Canyon West	Extant
			Stronghold Canyon—hanging canyon drainage	Extant
Empire Mountains	Empire Mountains	Extirpated	Empire Mountains	Extirpated

Mule Mountains	Juniper Flat	Extant	Juniper Flat and vicinity	Extant
Pajarito/Atascosa Mountains	Alamo Canyon	Extant	Alamo Canyon	Extant
	Holden Canyon	Extant	Holden Canyon	Extant
	Sycamore Canyon	Extant	Montana Peak Vicinity	Extant
			Montana Canyon	Extant
			Mule Ridge	Extant
			Penasco Canyon; below dam	Extant
			Summit Motorway	Extant
			Sycamore Canyon	Extant
	Warsaw Canyon	Extant	Warsaw/Old Glory Canyons	Extant
Patagonia Mountains	Alum Gulch	Extant	Alum Gulch	Extant
			Flux Canyon	Extant
Rincon Mountains	Chimenea-Madrona Canyons	Extant	Chimenea Canyon + Manning Camp Trail + Madrona Canyon	Extant
	Happy Valley North	Extirpated	Happy Valley North	Extirpated
	Happy Valley South	Extant	Happy Valley South	Extant
	Upper Rincon Creek	Extant	Upper Rincon Creek	Extant
	Turkey Creek	Extant	Turkey Creek	Extant
	Deer Creek	Extant	Deer Creek	Extant
	Chiminea Tributary	Extant	Chiminea Tributary	Extant
Santa Rita Mountains	Adobe Canyon	Extant	Adobe Canyon	Extant
	Gardner Canyon	Extant	Cave Creek Canyon	Extant
			Gardner Canyon	Extant
			Sawmill Canyon	Extant
	Josephine Canyon	Extant	Bond Canyon	Extant
			Josephine Canyon	Extant
	Madera Canyon	Extant	Madera Canyon	Extant

	Squaw Gulch	Extant	Squaw Gulch	Extant
	Sycamore Canyon	Extant	Sycamore Canyon	Extant
	Temporal Gulch	Extant	Temporal Gulch	Extant
			Upper Jones Canyon	Extant
	Walker Canyon	Extant	Big Casa Blanca Canyon	Extant
			Walker Canyon Basin	Extant
Whetstone Mountains	Death Trap Canyon	Extant	Death Trap Springs	Extant
	French Joe Canyon	Extant	French Joe Canyon	Extant
MEXICO				
Sierra Las Avispas, Sonora	Sierra Las Avispas, Sonora	Presumed Extant	Sierra Las Avispas, (Nogales County)	Presumed Extant
Sierra La Escuadra, Chihuahua	Sierra La Escuadra, Chihuahua	Extant	Near Colonia Pacheco (in the Municipio Nuevo Casas Grandes)	Extant
Sierra La Estancia, Chihuahua	Sierra La Estancia, Chihuahua	Presumed Extant	Cuarenta Casas (northwest of Las Varas, Municipio Madera)	Presumed Extant
Sierra Los Mojones	Mesa Tres Rios	Extant	Mesa Tres Rios	Extant

The number of populations within each sky island mountain ranges from one population (*e.g.*, Mule Mountains) to as many as eight populations (*e.g.*, Santa Rita Mountains). Each of these populations contains from one to eight subpopulations, which can be separated by up to 8 km (5 mi). Within each subpopulation, plants grow in groups or clusters of one to eight groups, which are separated by up to 1.7 km (1 mi). Within each subpopulation, plants grow across an area of 1 to 140 m (3.3 to 459 ft) (Ferguson 2014, entire; Ferguson 2016a, p. 14).

Bartram's stonecrop typically occurs in small populations with limited numbers of individuals. Most populations contain fewer than 100 plants (Ferguson 2014, entire; Ferguson 2016a, entire), but occasionally hundreds of plants can be found within a single population. The number of individuals in a given population can vary greatly from year to year and from season to season, depending on weather and stressors present (Ferguson 2017b, pp. 8, 15).

For Bartram's stonecrop to maintain viability, its populations or some representative portion thereof must be resilient. Resiliency describes the ability of populations to withstand stochastic events (arising from random factors). We can measure resiliency based on metrics of population health (for example, germination versus death rates and population size). Highly resilient populations are better able to withstand disturbances such as random fluctuations in germination rates (demographic stochasticity), variations in rainfall (environmental stochasticity), or the effects of anthropogenic activities. Resilient Bartram's stonecrop populations must be large enough that stochastic events do not eliminate the entire population. A highly resilient population of Bartram's stonecrop consists of multiple subpopulations, with a large number of individuals in each subpopulation. Highly resilient Bartram's stonecrop populations must also produce and disperse seeds, establish seedlings that survive, and maintain mature reproductive individuals in the population; recruitment should exceed or be equal to mortality. This allows for shared pollinators and seed dispersal between subpopulations and groups within the population, which can allow the population to recover from disturbance events and maintain or increase genetic diversity. Population

resiliency categories for Bartram's stonecrop are described in section 3.2 of the SSA report (Service 2018b, entire).

In addition to the above demographic needs, populations also need habitat elements for resiliency. Based on where the species has typically been found, a resilient population needs riparian characteristics (*i.e.*, proximity to water and associated vegetation), precipitation, shade, and bedrock or soil pockets in rock ledges and cliffs. Precipitation is needed to maintain soil moisture, cooler temperatures, and humidity in the microenvironment; shade from trees, canyon walls, and leaf litter aid in moisture retention. Small population size has the potential to decrease Bartram's stonecrop's population resiliency, as all stressors are exacerbated in populations with only a small number of individuals. Area of occupied habitat, abundance, number of subpopulations, and recruitment all affect population resiliency. Habitat resiliency categories for Bartram's stonecrop are described in Table 4, below, and in section 3.2 of the SSA report (Service 2018b).

Table 4. Population resiliency category definitions for Bartram's stonecrop.

Condition Category	Population Factors			Habitat Factors		
	Subpopulations	**Abundance**	**Recruitment**	**Riparian Elements**	**Winter (October through March) Precipitation**	**Shade**
High (3)	Three or more subpopulations of plants/population	Number of adults in each population is > 300 individuals	Populations contain more seedlings (<1.5 cm [0.6 in]) than dying individuals	Water is within 10 m from individuals or riparian vegetation present indicating subsurface water nearby	More than 12 inches of winter rain on average during the past 5 years as recorded at the nearest weather station	Overstory cover of *Juniperus*, *Quercus*, *Pinus* or other is >80%
Moderate (2)	Two subpopulations of plants/population	Number of individuals in each population is 150 to 300 individuals	Populations contain an equal number of seedlings (<1.5 cm [0.6 in]) to dying individuals	Water at or near the surface (riparian vegetation present indicating subsurface water) is within 10–20 m from individuals	Between 6.1 and 12 inches of winter rain on average during the past 5 years as recorded at the nearest weather station	Overstory cover of *Juniperus*, *Quercus*, *Pinus* or other is between 50 and 80%
Low (1)	One subpopulation of plants/population	Number of individuals in each population is < 150 individuals	Populations contain fewer seedlings (<1.5 cm [0.6 in]) than dying individuals	Water at or near the surface (riparian vegetation present indicating subsurface water) is within 20–30 m from individuals	6 or fewer inches of winter rain on average during the past 5 years as recorded at the nearest weather station	Overstory cover of *Juniperus*, *Quercus*, *Pinus* or other is between 20 and 50%
Ø	No subpopulations	No individuals are found during surveys in appropriate microhabitat	Population is made up primarily of dead and dying individuals that do not produce seed or no individuals found	Streambed near plants is dry and invaded by non-riparian plant species indicating shift of vegetation community and complete loss of suitable habitat	6 or fewer inches of winter rain on average during the past 5 years as recorded at the nearest weather station	Overstory cover has been removed

Maintaining representation in the form of genetic or ecological diversity is important to maintain the capacity of Bartram's stonecrop to adapt to future environmental changes. Representation describes the ability of a species to adapt to changing environmental conditions. Representation can be measured by the breadth of genetic or ecological diversity within and among populations. The more representation, or diversity, a species has, the more it is capable of adapting to changes (natural or human-caused) in its environment. In the absence of species-specific genetic and ecological diversity information, we evaluate representation based on the extent and variability of habitat characteristics across the geographical range.

Genetic analysis of Bartram's stonecrop has not been conducted within or among populations or mountain ranges. However, populations on different mountain ranges are widely separated (ranging from roughly 14 to 42 km (8.7 to 26 mi) apart), making cross-pollination highly unlikely, and most of the populations contain small numbers of individuals. Therefore, there is the potential for genetic diversity among mountain ranges. Because multiple populations have been extirpated, it is possible that there has been a loss of genetic diversity. There may be genetic diversity between populations within and among the sky island mountain ranges due to response to elevational and other environmental differences between locations. As such, maintaining representation in the form of genetic diversity across multiple populations and sky island mountain ranges may be important to the capacity of Bartram's stonecrop to adapt to future environmental change.

The species is found over a relatively wide range of elevations of 1,067 to 2,042 m (3,500 to 6,700 ft) and vegetation communities (oak woodlands at higher elevations,

and grasslands and oak savannas at lower elevations), which could be important in terms of representation. Such variability in elevation could aid in survival of future environmental changes, such as warming temperatures or decreased precipitation from climate change. At a minimum, we likely need to retain populations throughout the geographic and elevational ranges of the species to maintain the overall potential genetic and environmental diversity that can maximize the species' response to environmental changes over time.

Bartram's stonecrop needs to have multiple resilient populations distributed throughout its range to provide for redundancy such that a catastrophic event will not result in the loss of all populations. Redundancy describes the ability of a species to withstand catastrophic events, measured by the number of populations, and their resiliency, distribution, and connectivity. The more populations, and the wider the distribution of those populations, the more redundancy the species will exhibit. Redundancy reduces the risk that a large portion of the species' range will be negatively affected by a catastrophic natural or anthropogenic event at a given point in time. Species that are well-distributed across their historical range are considered less susceptible to extinction and more likely to be viable than species confined to a small portion of their range (Carroll *et al.* 2010, entire). There is little connectivity potential between the sky island mountain ranges (separated from roughly 14 to 42 km (8.7 to 26 mi) apart); therefore, a localized stressor such as dewatering from a mine or a high-severity wildfire would impact only those populations near the activity. Regional drought and altered fire regime could impact many populations throughout the plant's range. There are 34 populations spread throughout the range of the species, many with

multiple subpopulations. Conversely, such distance among populations reduces connectivity among populations and mountain ranges, which may be important for genetic exchange and recolonization. At a minimum, the species likely requires retaining population redundancy across multiple sky island mountain ranges throughout the species' range to minimize impacts from catastrophic events.

Summary of Biological Status and Stressors

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

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 expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an "endangered species" or a "threatened species" only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

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. The term foreseeable future extends only so far into the future as the Services can reasonably determine that both the future threats and the species' responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. "Reliable" does not mean "certain"; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

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

We completed a comprehensive assessment of the biological status of beardless chinchweed and Bartram's stonecrop, and prepared an SSA report for each species (Service 2018a and 2018b, entire), which provides a thorough account of the species' overall viability. We define viability here as the ability of the species to persist over the long term and, conversely, to avoid extinction. In the following discussion, we summarize the conclusions of the SSA reports, which can be accessed at Docket FWS–

R2–ES–2018–0104 on *http://www.regulations.gov* and at *https://www.fws.gov/southwest/es/arizona/Docs_Species.htm*.

Beardless Chinchweed

Several stressors influence whether beardless chinchweed populations will grow to maximize habitat occupancy, which increases the resiliency of a population to stochastic events. We evaluated the past, current, and future stressors (*i.e.*, negative changes in the resources needed by beardless chinchweed) that are affecting what beardless chinchweed needs for viability. These stressors are described in detail in chapter 4 of the SSA report (Service 2018a). Stressors that have the potential to affect beardless chinchweed population resiliency include:

- Loss of habitat due to invasion by nonnative species;
- Altered fire regime exacerbated by invasion by nonnative species;
- Altered precipitation, drought, and temperature;
- Erosion, sedimentation, and burial from road and trail maintenance, mining, livestock, wildlife, and post-wildfire runoff;
- Grazing from wildlife and livestock; and
- Small population size exacerbating all other stressors.

The stressors that pose the largest risk to future viability of the species are: (1) Loss of habitat caused by the invasion of nonnative grasses that compete for space, water, light, and nutrients and that alter wildfire regimes; and (2) small population size (fewer than 50 individuals), which potentially causes other stressors to seriously damage or extirpate populations. The size of fewer than 50 individuals as a small population was determined by assessing the range of known population sizes. Much of the historical

range of beardless chinchweed in both the United States and Mexico has been altered by an invasion of nonnative grasses and herbaceous plants. Although there are many nonnative plant species growing in historical beardless chinchweed habitats in both the United States and Mexico, two species in particular are most problematic to beardless chinchweed at this time: Lehman's lovegrass (*Eragrostis lehmanniana*) and rose natal (*Melinis repens*). Both of these species are strong competitors on southern exposures where beardless chinchweed occurs.

Habitat Loss Caused by Nonnative Grasses

Lehman's lovegrass, a nonnative grass from South Africa, has numerous competative advantages over native grasses in southern Arizona. Lehman's lovegrass resprouts from roots and tiller nodes not killed by hot fire, is not hampered by the reduction in mycorrhizae associated with fire and erosion, is able to respond to winter precipitation when natives grasses are dormant, is able to produce copious seed earlier than native grasses, maintains larger seed banks than native grasses, and has higher seedling survival and establishment than native grasses during periods of drought (Anable 1990, p. 49; Anable *et al.* 1992, p. 182; Robinett 1992, p. 101; Fernandez and Reynolds 2000, pp. 94–95; Crimmins and Comrie 2004, p. 464; Geiger and McPherson 2005, p. 896; Schussman *et al*. 2006, p. 589; O'Dea 2007, p. 149; Archer and Predick 2008, p. 26; Mathias *et al*. 2013, entire). This species outcompetes native grasses for water, light, and nutrients, forming nonnative-dominated grasslands that reduce structural, species, and spatial diversity and that produce two to four times the biomass of native grasslands (D'Antonio and Vitousek 1992, p. 70; McPherson 1995, pp. 136–137; VanDevender *et al*. 1997, p. 4; Huang *et al*. 2009, pp. 903–904;). This change in

vegetation structure results in a higher fuel load that is highly lignified (long-lasting through slow decomposition) and results in more frequent fires that have longer flames, faster rates of spread, and higher severity and frequency than historical low-intensity burns of native desert grasslands (Anable *et al*. 1992, p. 186; Dennet *et al*. 2000, pp. 22–23; Williams and Baruch 2000, p. 128; Crimmins and Comrie 2004, p. 464). In addition, Lehman's lovegrass-dominated grasslands recover quickly from fire, as fires scarify the ample seeds and remove canopy, allowing for high seedling emergence (Cable 1965, p. 328; Anable 1990, p. 15; Roundy *et al*. 1992, p. 81; McPherson 1995, p. 137; Biedenbender and Roundy 1996, p. 160).

Rose natal, a native of Africa and Madagascar, is invasive in many locations, including southern Arizona and northern New Mexico (Stevens and Fehmi 2009, p. 379; Romo *et al*. 2012, p. 34). Similar to Lehman's lovegrass, rose natal is capable of growing in low moisture situations and has many advantages to outcompete native grasses of southern Arizona, such as prolific seed production and culms that root from the nodes (Stokes *et al*. 2011, p. 527). This aggressive grass displaces native vegetation in shrublands and oak stands, and increases fire frequency (Romo *et al*. 2012, p. 35; Center for Agriculture and Biosciences International 2017, entire).

In addition, several other African grasses (*e.g.*, *Eragrostis cilianensis* [stinkgrass], *Eragrostis curvula* [Boer lovegrass], *Eragrostis echinochloidea* [African lovegrass], and *Dichanthium annulatum* [Kleberg's bluestem]) have been documented in southern Arizona and northern Mexico (Van Devender and Reina 2005, p. 160; NatureServe, entire; Fire Effects Information System, entire; SEINet, entire), as has the Asian grass, *Bothriochloa ischaemum* (yellow bluestem). Studies of other nonnative grasses in

Mexico show rapid expansion and degradation of native communities, with the potential to invade large areas of northern Mexico (Arriaga *et al*. 2004, p. 1504). There are no beardless chinchweed populations in the United States that are more than 1 km (0.6 mi), and no beardless chinchweed populations in Mexico that are more than 27 km (16.8 mi), from documented nonnative grasses (SEINet, entire; Heitholt 2017, pers. comm.). Because we have seen nonnative infestations in the field in locations not shown in SEINet, we believe only a small portion of nonnative plants are reported into the SEINet system in either country. Based on the above information, we believe that it is unlikely any beardless chinchweed population is free of nonnative plants. This encroachment of nonnatives has reduced beardless chinchweed population numbers and habitat, and as nonnatives continue to encroach on beardless chinchweed populations, the number of individuals and available habitat will continue to decrease.

Altered Fire Regime

The desert grasslands, oak savannas, and oak woodlands of southern Arizona historically had large-scale, low-severity fire roughly every 10 to 20 years and following periods of adequate moisture (McPherson and Weltzin 2000, p. 5; Brooks and Pyke 2002, p. 6; McDonald and McPherson 2011a, p. 385; Fryer and Leunsmann 2012, entire). Fires now are more frequent and intense due to the unnaturally dense and evenly spaced canopies of nonnative-dominated communities (as compared to more open and heterogeneous native-dominated grasslands), coupled with more frequent fire starts from recreationist and cross-border violators (Anable *et al*. 1992, p. 186; D'Antonio and Vitousek1992, p. 75; Dennet *et al*. 2000, pp. 22–23; Williams and Baruch 2000, p. 128; Crimmins and Comrie 2004, p. 464; Emerson 2010, pp. 15, 17; United States

Government Accountability Office 2011, p. 1; Wildland Fire Lesson's Learned Center 2011, entire). Nonnative grasses have higher seed output and large seed banks, earlier green-up in the spring, and greater biomass production than native grasses; all of these characteristics help to perpetuate a grass-fire cycle (*e.g*., D'Antonio and Vitousek 1992, p. 73; Zouhar *et al*. 2008, pp. 17, 21; Steidl *et al*. 2013, p. 529).

In many locations in southern Arizona in recent decades, repeat fires have occurred within short periods of time, aided by the dominance of nonnative grasses in the landscape. For example, in the Pajarito and Atascosa Mountains area, multiple fires burned the landscape between 2008 and 2016 (Figure 4.4 in Service 2018a). This landscape is now dominated by both nonnative Lehman's lovegrass and rose natal (Service 2014c, entire; Heitholt 2017, entire), and many historically documented locations that supported beardless chinchweed have not been found again (Service 2014c, entire; Fernandez 2017, pers. comm.; Haskins and Murray 2017, p. 4). High-severity wildfires burn hotter than fires that beardless chinchweed evolved with; consequently, we believe the plant is not capable of surviving high-severity fires.

Altered Precipitation, Drought, and Temperature

Altered precipitation timing and form (snow versus rain), as well as reduced winter and spring precipitation and prolonged drought, are currently occurring and projected to increase or be altered from normal in the Southwest (Garfin *et al.* 2014, entire). Recently there has been a decrease in the amount of snowpack, earlier snowmelt, and increased drought severity in the Southwest (Garfin *et al.* 2013, entire; Garfin 2013b p. 465). Further, more wintertime precipitation is falling as rain rather than snow in the western United States (IPCC 2013, p. 204; Garfin 2013b p. 465). This means that the

amount of runoff in the spring when snow melts is reduced, as is soil moisture. Precipitation is bimodal with the mountain ranges where beardless chinchweed occurs, with dormant season snow and rain, and growing season monsoon rains (CLIMAS 2014, entire). We believe that precipitation during October through March is important for beardless chinchweed germination and growth. In addition, beardless chinchweed does not flower until it reaches a height of more than 0.5 m (1.6 ft) tall; without sufficient precipitation, beardless chinchweed may be unable to attain adequate size for reproduction (Phillips *et al*. 1982, p. 8). Further, reduced precipitation, change in the timing and type of precipitation, and prolonged drought impact soil and ambient moisture availability for beardless chinchweed germination, growth, and flowering. In addition, due to increased nonnative competition during times of reduced precipitation and drought, impacts from these stressors to beardless chinchweed would be exacerbated (Anable 1990, p. 49; Robinett 1992, p. 101; Fernandez and Reynolds 2000, pp. 94–95; Geiger and McPherson 2005, p. 896; Schussman *et al*. 2006, p. 589; Archer and Predick 2008, p. 26; Mathias *et al*. 2013, entire).

Under a continuation of A2−high emissions scenario, reduced winter and spring precipitation is consistently projected for the southern part of the Southwest by 2100, as part of the general global precipitation reduction in subtropical areas (Garfin *et al.* 2014, p. 465). Analyses of the southwestern United States indicate future drying, primarily due to a decrease in winter precipitation under both the RCP 4.5 and 8.5 scenarios (IPCC 2013, p. 1080). The annual projected changes in precipitation for 2025 to 2049 under the RCP 4.5 and 8.5 scenarios range from an increase of 1.3 cm/month (0.5 in/month) to a decrease of 1.5 cm/month (0.5 in/month), with a an annual average of no change

compared to 1981 to 2010 (USGS 2019, entire). However, winter and spring precipitation under both emission scenarios is projected to decrease from -0.3 to -1 cm (-0.1 to -0.4 inches) (MACA 2019) or a decrease up to 10 percent for 2016–2035 relative to 1986–2005 under RCP 4.5 (IPCC 2013, p. 985). The decrease in winter and spring precipitation would likely be greater under the RCP 8.5 scenario. There is some evidence from comparing observations with simulations of the recent past that climate models might be underestimating the magnitude of changes in precipitation in many regions (IPCC 2013, p. 986). The climate-model-projected simulations indicate that a high degree of variability of annual precipitation will continue during the coming century, for both low and high emission scenarios (Garfin 2013, p. 110). This suggests that the Southwest will remain susceptible to unusually wet spells and, on the other hand, will remain prone to occasional drought episodes (Garfin 2013, p. 110). However, decrease in soil moisture across much of the Southwest is projected under both scenarios by mid-century, due to increased evaporation (IPCC 2013, p. 1259). Late winter-spring mountain snowpack in the Southwest is predicted to continue to decline over the 21st century under the high emission scenario (A2), mostly because of projected increased temperature (Garfin *et al*. 2013, p. 6). Reduced rain and snow, earlier snowmelt, and drying tendencies cause a reduction in late-spring and summer runoff. Together these effects, along with increases in evaporation, result in lower soil moisture by early summer (Gafrin 2013, p. 117).

Climatic events such as snowpack, earlier snowmelt, and increased drought are regional and will impact all populations of beardless chinchweed. Precipitation timing and amount impacts the germination, growth, and flowering of beardless chinchweed,

resulting in the loss of individuals and recruitment, and overall reducing the population size.

In the Southwest, temperatures increased 2.7 degrees Celcius (ºC) (1.6 degrees Fahrenheit (°F)) plus or minus 0.9 ºC (0.5°F), between 1901 and 2010, and more heat waves occurred over the Southwest during 2001–2010 compared to average occurrences in the 20th century. In the future, under RCP 4.5, the annual maximum temperature is projected to increase by 5ºC (2.7ºF) for 2025−2049 and 7.3 ºC (4ºF) for 2050−2074, and 5 ºC (2.7 ºF) for 2025−2049 and 10.4 ºC (5.7 ºF) for 2050−2074 under RCP 8.5, all relative to 1981−2010 (USGS 2019, entire). When temperatures rise, as has been occurring in recent decades and as is projected to continue into the future, evapotranspiration rates also increase and soil moisture decreases. Along with projected warming and increased evapotranspiration, it is highly likely that droughts will become more severe (Garfin 2013, pp. 137-138). A decrease of up to 4 percent soil moisture is projected under RCP 4.5 scenario for 2016-2035, relative to 1986-2005. The decrease in soil moisture would likely be greater under the RCP 8.5 scenario. Further, the evaporation deficient increases under RCP 4.5 and increases more in RCP 8.5 in 2025 to 2049, relative to 1981 to 2010. Based on the high emissions scenario, the current 100-year drought will become commonplace in the second half of this century and future droughts will be much more severe than those previously recorded (Garfin 2013, p. 138). This projection of intensified drought conditions on the Colorado River is not due to changes in precipitation, but rather due directly to warming and its effect on reducing soil moisture (Garfin 2013, p. 138). Physiological effects of CO_2 may involve both the stomatal response, which acts to restrict transpiration, and an increase in plant growth and

leaf area, which acts to increase evapotranspiration (IPCC 2013, p. 986). An increase in evapotranspiration results in water loss from the plant and increases stress on the plant. This increase in stress impacts photosynthesis, respiration, transpiration, water use efficiency, leaf conductance, growth rate, vigor, and gas exchange. These impacts result in reduced growth, flowering, and seed production and, therefore, in reduced overall recruitment and population numbers.

Although rare species in the southwestern United States evolved with drought, recent changes in temperature, and rainfall patterns present stressful conditions of increased magnitude greater than what the species faced historically and raise the question of whether the species, can persist. Some species may shift their distributions in response to warming of the climate (McLaughlin *et al*. 2002, p. 6070). However, it is highly unlikely that beardless chinchweed would be able to naturally shift its range to keep up with current and high projected rates of climate change, due to its overall population decline and inability to maintain current populations. Since plants are not mobile, expanding the distribution of this species is dependent on seed dispersal. Further, extant populations are small, which limit the amount of seed production for dispersal. It is highly unlikely that under elevated environmental stress associated with climate change, the species would be able to both maintain populations and also colonize new areas with more suitable climate conditions. Thus localized extirpations over portions of the beardless chinchweed range could result (lower elevations), and, in other portions of its distribution, the occupied range (higher elevation) may expand, depending upon habitat availability.

Erosion, Sedimentation, and Burial

General road maintenance and widening could disturb populations along road cuts and create erosion (Phillips *et al.* 1982, p. 8). Of the six extant U.S. populations, the Ruby Road and Scotia Canyon populations, and the State of Texas Mine subpopulation of Coronado National Memorial occur along roadcuts; similarly, the Visitor Center subpopulation of the Coronado National Memorial population contains some plants that occur along a maintained trail. These plants could be damaged or removed by road or trail maintenance. Impacts from such stressors could be profound for populations with fewer than 50 individuals. In addition, nonnative plant introduction and spread often occur in areas of disturbance, such as along roadways, along trails, in mining sites, and in areas of recreational use (Gelbard and Belnap 2003, p. 421; Brooks 2007, pp. 153–154; Anderson *et al*. 2015, p. 1).

The McCleary Canyon—Gunsight Pass population is in the path of a proposed alignment of a secondary access road for the proposed Rosemont Mine (Westland 2010, p. iv), and the McCleary Canyon—Wasp Canyon population is within the processing facility portion of the proposed Rosemont Mine (Westland 2017, entire). Collectively, these plants represent approximately 33 percent of the total beardless chinchweed populations known across the U.S. range and 16 percent of all known individuals. The proposed road alignment would eliminate these populations.

Dust from mining operations or recreational travel can impact beardless chinchweed populations along dirt roadways. Dust may negatively affect plant growth and vigor as a result of changes in physiological and biochemical processes (*e.g.*, photosynthesis, respiration, transpiration, water use efficiency, leaf conductance, growth rate, vigor, and gas exchange) and reduced pollination (Phillips *et al.* 1982, pp. 9–10;

Chibuike and Obiora 2014, p. 1; Waser *et al.* 2017, p. 90). These impacts could affect those populations within 30 meters (98 feet) of roads and mine sites (Waser *et al.* 2017, p. 90). This stressor could impact four of the six populations in the United States.

Grazing

There are two different perspectives on the influence of grazing on beardless chinchweed:

(1) Wildfire historically maintained native open habitat where beardless chinchweed occurred, but with fire suppression, overgrazing may have alternatively provided native open habitats for this species to expand its range in the early 1900s, even without frequent fire (Schmalzel 2015, p. 2), due to open space being created and maintained by cattle; and

(2) Grazing pressure may have contributed to the species' rareness (Keil 1982, entire) due to reduced reproduction and alteration in habitat.

Regardless, grazing that occurs in small populations (fewer than 50 individuals) of beardless chinchweed would have a negative population-level impact through the reduction of flowers and seeds, and possibly individuals. Beardless chinchweed does not flower until it reaches a height of more than 0.5 m (1.6 ft) tall, suggesting that grazing in summer or fall when the plant is growing and flowering could reduce seed production and recruitment.

Small Populations

Small population size has the potential to affect beardless chinchweed' population resiliency, as all stressors are exacerbated in populations with only a small number of individuals (fewer than 50). Known population sizes of beardless chinchweed were used

to quantify the size of a small population. Small populations are less able to recover from losses caused by random environmental changes (Shaffer and Stein 2000, pp. 308–310), such as fluctuations in reproduction (demographic stochasticity), variations in rainfall (environmental stochasticity), or changes in the frequency or severity of disturbances, such as wildfires. Five of the six extant beardless chinchweed populations in the United States contain fewer than 50 individuals. Based on populations in the United States, which are mostly small and occur in habitat dominated by nonnatives, we believe that the six populations in Mexico are of similar size but may be in worse condition, because of limited native habitat management, similar climate change impacts, equally frequent wildfires, and likely more impacts from grazing. Loss due to mining, erosion, road and trail maintenance, trampling, grazing, or other stressors mentioned above are exacerbated in small populations, and have the potential to seriously damage or completely remove these small populations. Synergistic interactions among wildfire, nonnative grasses, decreased precipitation, and increased temperatures cumulatively and cyclically impact beardless chinchweed, and all stressors are exacerbated in small populations.

Current Condition of Beardless Chinchweed

Since 1962, we are aware of nine populations and one subpopulation of beardless chinchweed in the United States that have become extirpated. Currently, six extant beardless chinchweed populations are spread across four mountain ranges in southern Arizona: The Atascosa-Pajarito, Huachuca, Santa Rita, and the Canelo Hills. These six populations consist of 387 individuals spread across less than 2 ha (5 ac). Additionally, six populations have been reported from northern Mexico, but this information is from 1940 or earlier.

Population Resiliency of Beardless Chinchweed

To help determine current condition, we assessed each population in terms of its resiliency. Our analysis of the past, current, and future stressors on the resources that beardless chinchweed needs for long-term viability revealed that there are a number of stressors impacting this species. All beardless chinchweed populations likely contain nonnative grasses. Further, altered fire regime has the potential to affect all populations. This altered fire regime enhances the spread of nonnatives, and all populations of beardless chinchweed contain nonnatives. Consequently, fire will aid in the spread of nonnatives, and is currently a risk to all populations of beardless chinchweed and will be further exacerbated by nonnative grasses in the near future (approximately 10 years). Altered precipitation, increased temperatures, increased evapotranspiration, decreased soil moisture, and decreased winter and spring precipitation are current and ongoing regional actions that are impacting all populations of beardless chinchweed. These environmental conditions exacerbate an altered fire regime, which in turn further drives the spread of nonnatives. In addition, nonnative grasses have competitive advantage over native grasses during periods of drought.

Road maintenance is likely resulting in the direct killing of individuals in three populations (Ruby Road, Scotia Canyon, and Coronado National Memorial). In addition, all individuals in these three populations are currently being impacted by dust from the road. These three populations are already of low resiliency. Two additional populations (McCleary Canyon—Gunsight Pass and McCleary Canyon—Wasp Canyon) will be impacted by Rosemont mining operations and dust in the near future (approximately 10 years; Westland 2010, p. iv). One of these populations is already of low resiliency, and

the other is of moderate resiliency. Eleven of the 12 populations (92 percent) are small population (fewer than 50 individuals). Synergistic interactions among wildfire, nonnative grasses, decreased precipitation, and increased temperatures cumulatively and cyclically impact beardless chinchweed, and all stressors are exacerbated in small populations. Of the six extant populations, two are moderately resilient and four are in low resiliency (Table 5, below). Population resiliency categories are described in Table 2, above, and in the SSA report (Service 2018a).

Table 5. Beardless chinchweed current population condition.

Mountain Range / Country	Population	Number of Individuals	Current Condition
Atascosa-Pajarito Mountains, USA	Pena Blanca Lake	0	Extirpated
	Ruby Road	10	Low
	Summit Motorway	0	Extirpated
Canelo Hills, USA	Audubon Research Ranch	37	Low
	Copper Mountain	0	Extirpated
	Harshaw Creek	0	Extirpated
	Lampshire Well	0	Extirpated
Huachuca Mountains, USA	Scotia Canyon	40	Low
	Coronado National Memorial	241	Low
	Joe's Canyon Trail	0	Extirpated
Patagonia Mountains, USA	Flux Canyon	0	Extirpated
	Washington Camp	0	Extirpated
Santa Rita Mountains, USA	Box Canyon	0	Extirpated
	McCleary Canyon—Gunsight Pass	32	Moderate
	McCleary Canyon—Wasp Canyon	32	Low
Chihuahua, Mexico	Batopililas, Rio Mayo	~10	Low
	Guasaremos, Rio Mayo	~10	Low
Sonora, Mexico	Canon de la Petaquilla	~10	Low
	North of Horconcitos	~10	Low
	Canyon Estrella, Sierra	~10	Low

	de los Cendros; southeast of Tesopaco		
	Los Conejos, Rio Mayo	~10	Low

Beardless Chinchweed Representation

No genetic studies have been conducted within or between the 21 historical populations of beardless chinchweed in southern Arizona and Mexico. Mountain ranges that have only one or two populations, or have only have one subpopulation per population, or low numbers of individuals per population with several miles between mountain ranges, may not be as genetically diverse because pollination or transport of seeds between populations may be very limited or nonexistent. Five of the six extant U.S. populations do not have multiple subpopulations. The Coronado National Memorial population has two subpopulations. The six extant U.S. populations are separated geographically into the Atascosa-Pajarito, Huachuca, and Santa Rita Mountains, and the Canelo Hills, which are separated by 16 to 61 km (9.9 to 37.9 mi). There is likely genetic diversity among mountain ranges, but reduced genetic diversity within populations. Further, overall genetic diversity is likely reduced given that some populations are extirpated.

The 15 historical beardless chinchweed populations in the United States range in elevation from 1,158 m (3,799 ft) to 1,737 m (5,699 ft). Of these, eight (about 53 percent) fall below 457 m (1,500 ft) elevation. Of these eight, six have become extirpated in recent decades. This essentially indicates a loss at this lower elevational range and possibly loss of some local adaptation to warmer or dryer environments and genetic differentiation among populations.

In the Ruby Road, Scotia Canyon, and Coronado National Memorial populations, plants have been reported over many decades, indicating that these populations may have the genetic and environmental diversity needed to adapt to changing conditions. Note, however, that both the Ruby Road and Scotia Canyon populations have been reduced in size in the past 30 years, and we have no previous count data at Coronado National Memorial for comparison.

Beardless Chinchweed Redundancy

The beardless chinchweed populations in the United States and Mexico are naturally fragmented between mountain ranges. Currently, six extant beardless chinchweed U.S. populations are spread across Atascosa-Pajarito, Huachuca, and Santa Rita Mountains and the Canelo Hills. The Atascosa-Pajarito Mountains and the Canelo Hills have only one extant population each, while the Santa Rita and Huachuca Mountains have two extant populations each. These mountain ranges are separated from each other by 16 to 61 km (9.9 to 37.9 mi), so natural gene exchange or re-establishment following extirpation is very unlikely. In addition, six historical populations of beardless chinchweed are distributed across two general areas in northern Chihuahua and Sonora, Mexico. Their status is unknown, but we believe they are small populations with poor habitat based on populations in the United States, which are small and dominated by nonnative species. Although this may imply some level of redundancy across the range of beardless chinchweed, note that five of the six extant populations in the United States contain fewer than 50 individual plants. Further, nine populations and one subpopulation have been extirpated in recent decades, largely from the lower elevations of the species' range, and several populations have been reduced in size in recent decades.

Future Condition of Beardless Chinchweed

We also assessed the future condition of beardless chinchweed under several plausible scenarios in our SSA report (Service 2018a, entire). We present a summary of the relevant information here; the detailed future condition analysis is available in the SSA report.

We developed four scenarios incorporating the stressors that are ongoing or will occur in the future to consider the range of possible future conditions. For each scenario, we describe the level of impact from the identified stressors that would occur in each population. All of the scenarios involve some degree of uncertainty; however, they present a range of realistic and plausible future conditions (Table 6). All scenarios consider impacts from nonnative invasion, altered wildfire regime, and drought because there is no likely future scenario where these stressors would not affect the species. In addition, effects on individual plants (small population size) from multiple stressors are assessed, including cross-border violator traffic, mining, trampling, erosion, road and trail maintenance, and grazing. We projected the likelihood of each scenario occurring at 40-years. We chose 40 years because this is within the range of available hydrological and climate change model forecasts, is within the time period of the Rosemont Mine effects, and it represents four generations of the plant.

Below is a summary of the four scenarios. For more detail, see Chapter 6 of the SSA (Service 2018a, entire).

Table 6. Future scenarios for beardless chinchweed.

Risks	Mining Activity	Altered Fire Regime*	Climate	Individual Effects	Conservation

Risk described	• Burial • Removal • Dust	• Lightning • Nonnative plants • Cross border violators • Recreation	• Reduction in available water** • Seedling desiccation • Flowering halt	• Grazing • Trampling • Trail and road maintenance • Erosion	Conservation actions implemented
Scenario 1 Continuation continuing into the future	Rosemont mine implemented with indirect and direct impacts	Number of wildfires annually increases at the same rate as the last 10 years.	Available water and drought continue at the same level as in the past 10 years, emissions 4.5.	Applied to populations <50 individuals.	No new individuals, subpopulations or populations found. No augmentation of existing populations, little seed preservation, nonnatives not controlled, some woodland areas thinned.
Scenario 2 Conservation	Rosemont mine implemented with indirect and direct impacts; with mitigation.	Number of wildfires does not increase from current rate.	Available water remains stable, emissions 4.5.	Applied to populations <50 individuals.	Sites revisited and additional plants are located, sites are augmented, or new sites are established, some nonnatives are controlled, and additional woodland areas are thinned.
Scenario 3 Moderate increase in negative effects	Rosemont mine implemented with direct impacts and additional mines implemented with indirect impacts	Number of wildfires increases.	Available water is reduced per 4.5 emissions scenario.	Applied to populations <50 individuals.	No new individuals, subpopulations or populations found. No augmentation of existing populations, little seed preservation, nonnatives not controlled, some woodland areas thinned.
Scenario 4 Major increase in negative effects	Rosemont mine implemented and additional mines implemented with direct impacts.	Number of wildfires increases.	Available water is reduced per 8.5 emissions scenario.	Applied to populations <50 individuals.	No new individuals, subpopulations or populations found. No augmentation of existing populations, little seed preservation, nonnatives not controlled, some woodland areas thinned.

The "continuation" scenario evaluates the condition of beardless chinchweed if there is no increase in risk of stressors to the populations relative to what exists today. The other scenarios evaluate the response of the species to changes in those risks. The

"conservation" scenario takes into account realistically possible additional protective measures, which may or may not happen. The "moderate effects" scenario is an increase in the risk of stressors to populations. The "major effects" scenario is a further increase in risk of stressors to populations.

We examined the resiliency, representation, and redundancy of beardless chinchweed under each of these plausible scenarios (see table 6.7 in the SSA report). The overall resiliency categories are the same as those used for current condition. We expect the six extant beardless chinchweed populations to experience changes to aspects of their habitat in different ways under the different scenarios. We projected the expected future resiliency, representation, and redundancy of beardless chinchweed based on the risk of stressors that would occur under each scenario (see Table 7).

Under the "continuation" scenario, we would expect the viability of beardless chinchweed to be characterized by a loss of resiliency, representation, and redundancy at the level that is currently occurring. Under the "conservation" scenario, we would expect the viability of beardless chinchweed to be characterized by higher levels of resiliency, representation, and redundancy than it exhibits under the current condition. Under the "moderate effects" scenario, we would expect the viability of beardless chinchweed to be characterized by lower levels of resiliency, representation, and redundancy than it has in the "continuation" scenario. Under the "major effects" scenario, we would expect all populations of beardless chinchweed to be extirpated at the 40-year time step.

Table 7. Beardless chinchweed population conditions under the current condition and all future scenarios.

Mountain Range	Population Name	Current Condition	Continuation Scenario	Conservation Scenario	Moderate Effects Scenario	Major Effects Scenario
Atascosa-Pajarito	Pena Blanca Lake	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
	Ruby Road	Low	Extirpated	Extirpated	Extirpated	Extirpated
	Summit Motorway	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
Canelo Hills	Audubon Research Ranch	Low	Low	Low	Extirpated	Extirpated
	Copper Mountain	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
	Harshaw Creek	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
	Lampshire Well	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
Huachuca	Scotia Canyon	Low	Low	Low	Extirpated	Extirpated
	Coronado National Memorial	Low	Low	Low	Low	Extirpated
	Joe's Canyon Trail	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
Patagonia	Flux Canyon	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
	Washington Camp	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated
Santa Rita	Box Canyon	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated

	Road					
	McCleary Canyon—Gunsight Pass	Moderate	Low	Low	Extirpated	Extirpated
	McCleary Canyon—Wasp Canyon	Low	Extirpated	Extirpated	Extirpated	Extirpated
Chihuahua, MX	Batopililas	Low	Extirpated	Extirpated	Extirpated	Extirpated
	Guasaremos	Low	Extirpated	Extirpated	Extirpated	Extirpated
Sonora, MX	Canon de la Petaquilla	Low	Extirpated	Extirpated	Extirpated	Extirpated
	Canyon Estrella	Low	Extirpated	Extirpated	Extirpated	Extirpated
	Horconcitos	Low	Extirpated	Extirpated	Extirpated	Extirpated
	Los Conejos	Low	Extirpated	Extirpated	Extirpated	Extirpated

Bartram's Stonecrop

Several factors influence whether Bartram's stonecrop populations will grow to increase habitat occupancy, which increases the resiliency of a population to stochastic events. We evaluated the past, current, and future stressors that are affecting what Bartram's stonecrop needs for viability. These stressors are described in detail in the chapter 4 of the SSA report (Service 2018b, entire). Stressors that have the potential to affect Bartram's stonecrop population resiliency include:

- Loss of water in nearby drainages from mining and drought;
- Erosion, sedimentation, and burial from mining, livestock, wildlife, recreation trails and roads, cross-border violators, and post-wildfire runoff;
- Trampling from humans, wildlife, and livestock, and predation;
- Altered fire regime resulting from fires ignited by recreationists, cross-border violators, and lightning;
- Illegal collection;
- Altered precipitation, drought, flooding, and freezing regime from current and future climate change, resulting in loss of seedling, immature, and adult plants, and in loss of reproduction; and
- Small population size exacerbating all other stressors.

The stressors that pose the largest risk to future viability of the species, which are related to habitat changes, include:

(1) Groundwater extraction and prolonged drought that may reduce nearby water levels and humidity within Bartram's stonecrop habitat; and

(2) Altered fire regimes leading to erosion of Bartram's stonecrop habitat, sedimentation that could cover individuals, and loss of overstory shade trees.

These stressors play a large role in the future viability of Bartram's stonecrop, especially for smaller populations. These stressors may reduce nearby water levels, shade, and humidity within Bartram's stonecrop habitat and may directly impact individuals.

Loss of Water

Dewatering of streams from mining operations may lead to overstory canopy losses and resulting loss of shade, as well as reduction in spring and stream flow and humidity in nearby Bartram's stonecrop populations. The Rosemont Mine Final Environmental Impact Statement states that no Bartram's stonecrop were found in the project area or the footprint of the connected actions; however, individuals growing in the analysis area could experience indirect impacts from groundwater drawdown (USFS 2013a, p. 676). According to the Rosemont Mine Final Environmental Impact Statement (USFS 2013a, p. 339), the proposed mine pit would create a permanent drawdown of the water table, and groundwater would flow toward the pit and be lost to evaporation. The water would be perpetually replenished in part by groundwater from the regional aquifer, and the pit would act as a hydraulic sink. Given that Bartram's stonecrop is consistently found in locations with nearby springs or other water sources, the loss of groundwater at the nearby unmapped spring in Box Canyon/Sycamore Canyon confluence, between Ruelas Spring and the Singing Valley Road residences, could significantly impact these Bartram's stonecrop plants. In the range of Bartram's stonecrop, there are many mining claims, trenching and exploration drilling activities, and a few active and proposed mines. Many currently undeveloped areas of locatable mineral deposits may be explored and/or

mined in the future. We do not know the extent of future mine activity within the range of Bartram's stonecrop; however, a number of proposed mines are identified for development within Bartram's stonecrop habitat. The range of current and projected mining activities varies from 1 to 10 per sky island mountain range containing Bartram's stonecrop (USFS 2012, entire). The loss of water in any Bartram's stonecrop population could lead to extirpation of that population.

Erosion, Sedimentation, and Burial

Bartram's stonecrop typically occurs on steep slopes with erodible soils and areas susceptible to rock fall, making the plant particularly vulnerable to physical damage to its environment (Phillips *et al.* 1982, p. 10; Shohet 1999, p. 50; Ferguson 2014, p. 42; Ferguson 2016a, pp. 15, 26). Soil erosion can result in burying plants, eroding the soil the plant is growing in, or dislodging plants. While displaced plants may re-root (Shohet 1999, pp. 50–51, 60), it is more likely that these plants will not survive (Ferguson 2015, p. 2). The potential of soil disturbance and erosion within or above Bartram's stonecrop habitat or the trampling of individual Bartram's stonecrop plants may occur from a variety of activities, including livestock and wildlife movement; the placement and maintenance of infrastructure, trails, and roads; and recreationists or cross-border violators traveling along established trails or cross country (Phillips *et al.* 1982, p. 10; Shohet 1999, p. 60; Ferguson 2014, p. 42; NPS 2015, p. 4; Ferguson 2016a, p. 26).

Direct removal of Bartram's stonecrop individuals and substrate due to erosion, or burial of individuals, may occur due to the placement of mineral extraction sites and debris piles. These impacts could severely impact small Bartram's stonecrop populations. Erosion from test pits (an excavation made to examine the subsurface

conditions of a potential mine site) has been documented to remove portions of habitat occupied by Bartram's stonecrop in Flux Canyon (Phillips *et al.* 1982, pp. 9–10).

Trampling

The trampling of individual Bartram's stonecrop plants may occur from a variety of activities, including livestock and wildlife movement; the placement and maintenance of infrastructure, trails, and roads; and recreationists or cross-border violators traveling along established trails or cross country (Phillips *et al.* 1982, p. 10; Shohet 1999, p. 60; Ferguson 2014, p. 42; NPS 2015, p. 4; Ferguson 2016a, p. 26). Given the potential for these stressors, those populations with fewer than 50 individuals may be heavily impacted during periods of unusual recreational use. This stressor is considered in our analysis of future viability only when it may impact a population with fewer than 50 individuals.

Altered Fire Regime

Since the mid-1980s, wildfire frequency in western forests has nearly quadrupled compared to the average of the period 1970 to 1986 (Westerling *et al.* 2006, p. 941). The timing, frequency, extent, and destructiveness of wildfires are likely to continue to increase (Westerling *et al.* 2006, p. 943), especially given historical land management actions, an increase in fire starts from cross-border violators and recreationists (*e.g.*, from campfires, cigarettes, target shooting), nonnative plant invasion, and continuing drought conditions (Westerling *et al.* 2006, p. 940; FireScape 2016, entire; Fire Management Information System 2016, p. 2; Tersey 2017, pers. comm.). Altered fire regimes can have direct and indirect impacts to Bartram's stonecrop and its habitat. Direct impacts include burning of individual Bartram's stonecrop plants, resulting in injury, reduction in

reproductive structures, or death. Indirect impacts of fire on Bartram's stonecrop may include increased runoff of floodwaters, post-fire flooding, deposition of debris and sediment originating in the burned area, erosion, changes in vegetation community composition and structure, increased presence of nonnative plants, alterations in the hydrologic and nutrient cycles, and loss of overstory canopy shade essential for maintaining Bartram's stonecrop microhabitat (Griffis *et al.* 2000, p. 243; Crawford *et al.* 2001, p. 265; Hart *et al.* 2005, p. 167; Smithwick *et al.* 2005, p. 165; Stephens *et al.* 2014, p. 42; Ferguson 2014, p. 43; Ferguson 2016a, p. 26).

We are aware of 11 wildfires (Alamo, Brown, Elkhorn, Hog, Horseshoe II, La Sierra, Lizard, Mule Ridge, Murphy, Soldier Basin, and Spring) that have occurred in known Bartram's stonecrop sites in the past decade that killed some Bartram's stonecrop individuals and removed shade in some instances. When looking at the number of acres burned per sky island mountain range in comparison to the number of adult individuals known from that range, the two largest populations occur in sky island mountain ranges that have had the fewest acres burned in the past 10 years. It is not known if this is coincidence or is of significance, as we do not have pre-fire population counts in any population to address this question. Wildfires have burned in all nine sky island mountain ranges of southern Arizona that support Bartram's stonecrop during this time period. Fires did not burn through Bartram's stonecrop populations in all cases, but fire could occur in any population within this 10-year timeframe. Wildfire could potentially cause extirpation of small Bartram's stonecrop populations throughout the range of the species and have negative impacts on larger populations. In addition, because it is

thought that Bartram's stonecrop seeds reside at the soil surface and the seeds are very tiny (Shohet 1999, p.48), it is likely that the seeds would not survive a wildfire.

The nonnative plants in the uplands and within Bartram's stonecrop populations include nonnative grass species such as Lehman's lovegrass and rose natal, both of which have numerous advantages over native grasses. Lehman's lovegrass resprouts from roots and tiller nodes not killed by hot fire, is not hampered by the reduction in mycorrhizae associated with fire and erosion, responds to winter precipitation when natives grasses are dormant, produces copious seed earlier than native grasses, maintains larger seedbanks than native grasses, and has higher seedling survival and establishment than native grasses during periods of drought (Anable 1990, p. 49; Anable *et al*. 1992, p. 182; Robinett 1992, p. 101; Fernandez and Reynolds 2000, pp. 94–95; Crimmins and Comrie 2004, p. 464; Geiger and McPherson 2005, p. 896; Schussman *et al*. 2006, p. 589; O'Dea 2007, p. 149; Archer and Predick 2008, p.26; Mathias *et al*. 2013, entire). Rose natal is capable of growing in low moisture situations, has prolific seed production, and culms that root from the nodes (Stokes *et al*. 2011, p. 527). Both species outcompete native plants, reduce structural and spacial diversity of habitats, and increased biomass and fuel loads, increasing the fire frequency. Nonnative grasses have been reported with Bartram's stonecrop individuals in two instances, at French Joe Canyon and Juniper Flat populations, increasing the likelihood of fire occurrence and subsequent impacts to these two populations (Heritage Database Management System, EO ID 55; Simpson 2017, pers. comm.). Nonnative plant species increase the frequency and severity of wildfires, such wildfires can directly and indirectly impact individuals and populations.

Illegal Collection

Bartram's stonecrop is an attractive small plant that can be easily collected by gardeners and succulent enthusiasts. Tagged individuals were uprooted and taken from two sites in the Santa Rita Mountains, one near a campsite (Shohet 1999, p. 60). In a 2016 on-line Google search for Bartram's stonecrop for sale, an advertisement from a collector in Texas offered to pay cash for Bartram's stonecrop seedlings or rooted cuttings. One website notes that the similar southern Arizona occurring species, *G. rusbyi*, is cultivated and legally available for sale from cactus nurseries; however, Bartram's stonecrop is not (because it is more difficult to propagate and maintain in captivity) and is therefore vulnerable to collection. Small populations may not be able to recover from collection, especially if the mature, reproductive plants are removed. The removal of mature plants reduces the overall reproductive effort of the population, thereby reducing the overall resilience of the population.

Altered Precipitation, Drought, Flooding, and Freezing Regimes

Precipitation within the sky island mountain ranges is bimodal, with winter snow and rain, and summer monsoon rain (CLIMAS 2014, entire). Fall and winter (October through March) precipitation is needed for Bartram's stonecrop germination, and both summer (July and August) and fall precipitation (October and November) is needed for Bartram's stonecrop flower production. Flowering is triggered by fall rains and does not occur during periods of water stress (Shohet 1999, pp. 22, 25, 36, 39). Altered precipitation timing and form (i.e., snow versus rain), as well as reduced precipitation in the winter and spring and prolonged drought, are important considerations in the analysis of the future stressors to Bartram's stonecrop due to increased nonnative competition during times of reduced precipitation and drought, which exacerbate impacts from

stressors (Anable 1990, p. 49; Robinett 1992, p. 101; Fernandez and Reynolds 2000, pp. 94–95; Geiger and McPherson 2005, p. 896; Schussman *et al*. 2006, p. 589; Archer and Predick 2008, p. 26; Mathias *et al*. 2013, entire). In addition, reduced precipitation in the winter and spring and drought will also impact moisture availability for Bartram's stonecrop's germination, growth, and flowering.

Altered precipitation timing and form (snow versus rain), as well as reduced winter and spring precipitation and prolonged drought, are currently occurring and projected to increase or be altered from normal in the Southwest (Garfin *et al.* 2014, entire). Recently there has been a decrease in the amount of snowpack, earlier snowmelt, and increased drought severity in the Southwest (Garfin *et al.* 2013, entire; Garfin 2013b, p. 465). Further, more wintertime precipitation is falling as rain rather than snow in the western United States (IPCC 2013, p. 204; Garfin 2013b p. 465). This means that the amount of runoff in the spring when snow melts is reduced, as is soil moisture.

Under a continuation A2−high emissions scenario, reduced winter and spring precipitation is consistently projected for the southern part of the Southwest by 2100, as part of the general global precipitation reduction in subtropical areas (Garfin *et al.* 2014, p. 465). Analyses of the southwestern United States indicate future drying, primarily due to a decrease in winter precipitation under both the RCP 4.5 and 8.5 scenarios (IPCC 2013, p. 1080). The annual projected changes in precipitation for 2025 to 2049 under RCP 4.5 and 8.5 scenarios ranges from an increase of 1.3 cm/mo (0.5 to a decrease of 0.5 in/mo), with an annual average of no change compared to 1981 to 2010 (USGS 2019, entire). However, winter and spring precipitation under both emission scenarios is projected to decrease from -0.3 to -1 cm (-0.1 to -0.4 in) (MACA 2019) or a decrease up

to 10 percent for 2016–2035 relative to 1986–2005 under RCP 4.5 (IPCC 2013, p. 985). The decrease in winter and spring precipitation would likely be greater under the RCP 8.5 scenario. There is some evidence from comparing observations with simulations of the recent past that climate models might be underestimating the magnitude of changes in precipitation in many regions (IPCC 2013, p. 986). The climate-model-projected simulations indicate that a high degree of variability of annual precipitation will continue during the coming century, for both low and high emission scenarios (Garfin 2013, p. 110). This suggests that the Southwest will remain susceptible to unusually wet spells and, on the other hand, will remain prone to occasional drought episodes (Garfin 2013, p. 110). However, decrease in soil moisture across much of the Southwest is projected under both scenarios by mid-century, due to increased evaporation (IPCC 2013 p. 1259). Late winter-spring mountain snowpack in the Southwest is predicted to continue to decline over the 21st century under the high emission scenario (A2), mostly because of projected increased temperature (Garfin *et al*. 2013, p. 6). Reduced rain and snow, earlier snowmelt, and drying tendencies cause a reduction in late-spring and summer runoff. Together these effects, along with increases in evaporation, result in lower soil moisture by early summer (Gafrin 2013, p. 117).

Precipitation timing and amount impacts the germination, growth, and flowering of Bartram's stonecrop, resulting in the loss of individuals and recruitment, and overall reducing the population size.

In the Southwest, temperatures increased 2.7ºC (1.6°F) plus or minus 0.9 ºC (0.5°F), between 1901 and 2010, and more heat waves occurred over the Southwest during 2001–2010 compared to average occurrences in the 20th century. In the future,

under RCP 4.5, the annual maximum temperature is projected to increase by 5ºC (2.7ºF) for 2025−2049 and 7.3 ºC (4ºF) for 2050−2074, and 5 ºC (2.7ºF) for 2025−2049 and 10.4 ºC (5.7ºF) for 2050−2074 under RCP 8.5, all relative to 1981−2010 (USGS 2019, entire). When temperatures rise, as has been occurring in recent decades and as is projected to continue into the future, evapotranspiration rates also increase and soil moisture decreases. Along with projected warming and increased evapotranspiration, it is highly likely that droughts will become more severe (Garfin 2013, pp. 137-138). A decrease of up to 4 percent soil moisture is projected under RCP 4.5 for 2016-2035, relative to 1986-2005. The decrease in soil moisture would likely be greater under RCP 8.5. Further, the evaporation deficient increases under RCP 4.5 and increases more in RCP 8.5 in` 2025 to 2049, relative to 1981 to 2010. Based on the high emissions scenario, the current 100-year drought will become commonplace in the second half of this century and future droughts will be much more severe than those previously recorded (Garfin 2013, p. 138). This projection of intensified drought conditions on the Colorado River is not due to changes in precipitation, but rather due directly to warming and its effect on reducing soil moisture (Garfin 2013, p. 138). Physiological effects of CO_2 may involve both the stomatal response, which acts to restrict transpiration, and an increase in plant growth and leaf area, which acts to increase evapotranspiration (IPCC 2013 p. 986). An increase in evapotranspiration results in water loss from the plant and increases stress on the plant. This increase in stress impacts photosynthesis, respiration, transpiration, water use efficiency, leaf conductance, growth rate, vigor, and gas exchange. These impacts result in reduced growth, flowering, and seed production, and, therefore, reduces overall recruitment and population numbers.

Although rare species in the southwestern United States evolved with drought, recent changes in temperature and rainfall patterns present stressful conditions of increased magnitude above what the species faced historically and raise the question of whether the species in this rule can persist. Some species will shift their distributions in response to warming of the climate (McLaughlin *et al*. 2002, p. 6070). It is highly unlikely that Bartram's stonecrop would be able to naturally shift its range to keep up with current and high projected rates of climate change due to its general state of population decline, lack of suitable intervening habitat, and abundant nonnative competitors. Thus, localized extinctions over portions of Bartram's stonecrop's range could result.

Small Populations

Stressors are exacerbated in populations with only a small number (*e.g.*, fewer than 50) of individuals. Small populations are less able to recover from losses caused by random environmental changes (Shaffer and Stein 2000, pp. 308–310), such as fluctuations in reproduction (demographic stochasticity), variations in rainfall (environmental stochasticity), or changes in the frequency or severity of wildfires. Approximately half of the extant Bartram's stonecrop populations contain 50 or fewer individuals. Loss due to erosion, trampling, collection, predation, fire, severe frost, or other stressors have the potential to seriously damage or completely remove these small populations.

In summary, the stressors that pose the largest risk to future species viability are primarily related to habitat changes: groundwater extraction from mining, long-term drought, and alteration in wildfire regime. These stressors may reduce nearby water

levels, shade, and humidity within Bartram's stonecrop habitat and may directly impact individuals. Other important stressors include erosion or trampling from livestock, wildlife, or human activities; illegal collection; predation of Bartram's stonecrop or their shade trees by wildlife and insects; abnormal freezing or flooding events; or other stressors that have the potential to seriously damage or completely remove small populations. Synergistic interactions among wildfire, drought, altered precipitation, and increased temperatures cumulatively and cyclically impact Bartram's stonecrop, and all stressors are exacerbated in small populations.

Current Condition of Bartram's stonecrop

Historically, we know of 33 populations spread across 13 mountain ranges. Four populations have been extirpated in the United States in recent years, and a fifth population has likely contracted in size. In addition, the southeastern Arizona landscape has experienced many changes since the 1890s, resulting from intensive cattle grazing, water development, and fire suppression (*e.g.*, Bahre 1991, entire). These impacts may have reduced the range or number of populations and individuals. Currently, 29 extant populations occur across 12 mountain ranges in the United States and Mexico: 9 in southern Arizona and 3 in northern Mexico. The U.S. populations total 3,726 individuals within occupied habitats that total about 2 ha (5 ac). Data are lacking for the Mexico populations; however, based on populations in the United States, which are mostly small, we believe that the three populations in Mexico are of similar size to U.S. populations but may be in worse condition, because of limited native habitat management, similar climate change impacts, equally frequent wildfires, and likely more livestock impacts (Romo *et al*. 2012, entire; Arriaga *et al*. 2004, entire; Fishbein and Warren 1994, p. 20).

Population Resiliency for Bartram's Stonecrop

To help determine current condition, we assessed each population in terms of its resiliency and assessed the species' representation and redundancy. Our analysis of the past, current, and future stressors on the resources that Bartram's stonecrop needs for long-term viability revealed a number of stressors to this species. All Bartram's stonecrop populations likely contain nonnative grasses. Further, altered fire regime has the potential to affect all populations. This altered fire regime enhances the spread of nonnatives. Consequently, all populations of Bartram's stonecrop will be further impacted by nonnative grasses in the near future. Altered precipitation, increased temperatures, and decreased annual precipitation are current and ongoing regional conditions that are impacting all populations of Bartram's stonecrop. These environmental conditions exacerbate an altered fire regime, which, in turn, further drives the spread of nonnatives. In addition, nonnative grasses have competitive advantage over native grasses during periods of drought. Many currently undeveloped areas of locatable mineral deposits may be explored or mined in the future. We do not know the extent of future mine activity within the range of Bartram's stonecrop; however, there are 12 mining projects currently ongoing or proposed within 8 km (5 mi) of Bartram's stonecrop populations in Arizona. The range of current and projected mining activities varies from 1 to 10 per sky island mountain range containing Bartram's stonecrop (USFS 2012, entire). One population, Sycamore Canyon (115 adult individuals), would be affected by groundwater drawdown due to the Rosemont Mine. Sycamore Canyon is currently in moderate condition. Further, this species is collected and sold. Synergistic interactions among wildfire, nonnative grasses, decreased precipitation, and increased temperatures

cumulatively and cyclically impact Bartram's stonecrop, and all stressors are exacerbated in small populations. In addition, because approximately 41 percent (12 populations) of the extant Bartram's stonecrop populations contain 50 or fewer individuals, loss due to erosion, trampling, collection, predation, fire, severe frost, or other stressors have the potential to seriously damage or completely remove these small populations. Of the 29 extant populations, 1 population (3 percent) is in high condition, 21 populations (72 percent) are in moderate condition, and 7 populations (24 percent) are in low condition (Table 8, below). Population resiliency categories are described in Table 4, above, and in the SSA report (Service 2018b).

Table 8. Bartram's stonecrop current population condition.

Sky Island	Population	Number of Individuals	Current Condition
Baboquivari	Brown Canyon	112	Moderate
	Thomas Canyon	5	Low
Chiricahua	Echo Canyon	186	Moderate
	Indian Creek	0	Extirpated
Dragoon	Carlink Canyon	0	Extirpated
	Jordan Canyon	415	Moderate
	Sheephead	45	Moderate
	Slavin Gulch	9	Moderate
	Stronghold Canyon East	188	Moderate
	Stronghold Canyon West	533	High
Empire	Empire Mountains	0	Extirpated
Mule	Juniper Flat	798	Moderate
Pajarito-Atascosa	Alamo Canyon	134	Moderate
	Holden Canyon	7	Moderate
	Sycamore Canyon	298	Moderate
	Warsaw Canyon	13	Moderate
Patagonia	Alum Gulch	123	Moderate
Rincon	Chimenea-Madrona Canyon	9	Moderate

	Happy Valley North	0	Extirpated
	Happy Valley South	14	Moderate
Santa Rita	Adobe Canyon	82	Moderate
	Gardner Canyon	14	Moderate
	Josephine Canyon	71	Moderate
	Madera Canyon	76	Moderate
	Squaw Gulch	5	Low
	Sycamore Canyon	115	Moderate
	Temporal Gulch	7	Moderate
	Walker Canyon	3	Moderate
Whetstone	Deathtrap Canyon	135	Low
	French Joe Canyon	87	Low
Sierra Las Avispas, Sonora	Sierra Las Avispas	10	Low
Sierra La Escuadra, Chihuahua	Near Colonia Pacheco	10	Low
Sierra La Estancia, Chihuahua	Cuarenta Casas	10	Low

Bartram's Stonecrop Representation

No genetic studies have been conducted within or between the 33 historical populations of Bartram's stonecrop in southern Arizona and Mexico. However, we assessed representation for Bartram's stonecrop in the form of its geographic distribution across the range. Some genetic exchange likely occurs within populations containing many subpopulations or many plants per subpopulation. Sky island populations on different mountain ranges are widely separated (ranging from roughly 14 to 42 km (8.7 to 26 mi) apart), making cross-pollination across sky islands highly unlikely. Mountain ranges that have only one or two populations, have only one subpopulation per population, or have low numbers of individuals per population with several miles between mountain ranges may not be as genetically diverse because pollination or transport of seeds between populations may be very limited. However, there may be genetic diversity between populations within and between the sky island mountain ranges in response to elevational and other environmental differences between locations. Due to

the loss of four populations, it is possible that there has been a loss of genetic diversity. However, because the species occurs across 29 populations in 12 mountain ranges, it is likely some genetic diversity exists among mountain ranges.

In addition, because the plant occurs on multiple substrate types and at a range of elevations (1,067 to 2,042 m (3,500 to 6,700 ft)), there is likely some local adaptation and genetic differentiation among populations. This range in elevation provides a variety of climatic conditions for the species to inhabit. Lastly, in at least three locations (Flux Canyon, Sycamore Canyon (Pajarito-Atascosa Mountains), and Gardner Canyon populations), Bartram's stonecrop have been reported over many decades, indicating that these populations may have the genetic and environmental diversity to adapt to changing conditions.

Bartram's Stonecrop Redundancy

The Bartram's stonecrop populations in the United States and Mexico are naturally fragmented between mountain ranges. Currently, 29 extant Bartram's stonecrop populations are spread across 12 different mountain ranges in southern Arizona and northern Mexico. Although these numbers may imply redundancy across its range, note that 24 of the 29 extant populations contain fewer than 150 total individual plants. Further, 14 of the 29 populations have 50 individuals or less, and 4 populations have been extirpated over recent (approximately 10) years. Five mountain ranges (Baboquivari, Chiricahua, Mule, Whetstone, and Patagonia Mountains) have only one or two populations each or have only have one subpopulation per population, and low numbers of individuals per population. These sky island mountain ranges are several miles away from the other sky island mountain ranges, so natural gene exchange or re-establishment

following extirpation is unlikely. In addition, the Mule Mountains contain large number of Bartram's stonecrop individuals, but there is only one population and it is approximately 38 km (23.6 mi) away from the nearest population, making natural re-establishment of populations unlikely. In addition, this population is known to be contracting in size due to drying of habitat (The Nature Conservancy 1987, p. 2).

Future Condition of the Bartram's Stonecrop

We now consider the species' future condition of population resiliency and the species' representation and redundancy are likely to be. The future viability of Bartram's stonecrop depends on maintaining multiple resilient populations over time. The resiliency of Bartram's stonecrop populations depends on moisture in their microenvironment maintained by shade from overstory vegetation, spring and winter precipitation, proximity to water, and vegetation litter. We expect the 29 extant Bartram's stonecrop populations to experience changes to all of these aspects of their habitat, although it may be in different ways under the different conditions. In addition, direct impacts to Bartram's stonecrop through being dislodged, buried, or collected will continue to impact the species.

Given our uncertainty regarding the scope of the stressors manifesting and the species' response, we forecasted future conditions of Bartram's stonecrop under four plausible future scenarios (see chapter 6 of the SSA report; Service 2018b). We developed these scenarios to span a range of potential stressors that are ongoing or will occur in the future that we believe will influence the future status of the species. We chose 10 years to evaluate the current condition, as well as future projections out to 40 years because this is within the range of predictions of available hydrological and climate

change model forecasts and is within the time period of the Rosemont Mine effects. This time frame represents eight generations of the Bartram's stonecrop, which allows us to assess reproductive effects on the species and allows the species opportunities to rebound after poor water years. The ten-year time step also represents a reasonable timeframe to judge the species' current vulnerability to threats as they are manifested now, without projecting changes to threats that longer timeframes would provide. Thus, the future scenarios forecast the viability of Bartram's stonecrop over the next 40 years. See table 9 below for a summary of the four scenarios. For more detail, see Chapter 6 of the SSA report (Service 2018b, entire).

Table 9. Future scenarios for Bartram's stonecrop.

Risks	**Mining Activity**	**Altered Fire Regime**	**Climate**	**Climate**	**Individual Effects**	**Conservation**
Risk described	Water extraction, Excavation, Burial, Shade reduction	Lightning Recreation Cross border violators Nonnative plants	Reduction in available water* and / or shade	Dislodging from flooding events, Seedling desiccation, Flowering halt, Shade removal	Livestock Recreation Trampling Predation Collection	Conservation actions implemented
Scenario 1 Continuation continuing into the future	Ongoing or planned mining activities as of 2012 (~20).	Number of wildfires annually increases at the same rate as the last 10 years.	Available water and drought continue at the same level as in the past 10 years. Emissions 8.5.	Number and severity of flooding events continues at the past 10 years. Emissions <4.5.	Applied to populations <50 individuals.	No new individuals, subpopulations or populations found. No augmentation of existing populations, no seed preservation, nonnatives controlled, and forest thinned.
Scenario 2 Conservation	Number of mining activities does not increase from current condition.	Number of wildfires does not increase from current rate.	Available water remains stable. Emissions 4.5.	Flooding events do not increase. Emissions <4.5.	Applied to populations <50 individuals.	Sites revisited and additional plants are located, sites are augmented, or new sites are established, nonnatives

						controlled, and forest thinned.
Scenario 3 Moderate increase in negative effects	1–3 new mining activities (above the 2012 number) are implemented and/or existing mines expand.	Number of wildfires increases in uplands.	Available water is reduced per 8.5 emissions scenario.	Increases in flash flooding per 4.5 emissions scenario.	Applied to populations <50 individuals.	No new individuals, subpopulations, or populations found, and no augmentation of existing populations, nonnatives controlled, and forest thinned.
Scenario 4 Major increase in negative effects	>3 new mining activities are implemented and/or existing mines expand.	Number of wildfires increases in uplands.	Available water is reduced per 8.5 emissions scenario.	Increases in flash flooding per 8.5 emissions scenario.	Applied to populations <50 individuals.	No new individuals, subpopulations or populations found, and no augmentation of existing populations, nonnatives controlled, and forest thinned.

* Available water includes precipitation, soil moisture, humidity, surface water, aquifer recharge, reduction in riparian vegetation, and increased number of days without water.

All scenarios consider impacts from mining, wildfire, and climate. In addition, effects on individual plants from multiple stressors are assessed, including livestock, recreation, trampling, predation, and collection. The "continuation" scenario evaluates the condition of Bartram's stonecrop if there is no increase in risks to the populations relative to what exists today, while the other scenarios evaluate the response of the species to changes in those risks. The "conservation" scenario takes into account realistically possible additional protective measures which may or may not happen. The "moderate effects" scenario is an increase in the risks to populations with changes in climate as projected in a lower (8.5) emissions scenario along with increases in other stressors. The "major effects" scenario is a further increase in risks to populations, with changes in climate projected at a higher (8.5) emissions scenario, and with additional

increases in other stressors. These are described in more detail in chapter 6 of the SSA report (Service 2018b).

The most likely scenario is the "moderate effects" scenario, with impacts to the species occurring around the 40-year time step. Under the "moderate effects" scenario, water flow reduction due to drought and groundwater extraction continues to reduce the humid microhabitat for this species. Cross-border violator traffic continues, and risk of catastrophic wildfire is high due to dry conditions; invasion of nonnatives in the uplands; and increased risk of fire starts from illegal activity, recreation, and natural causes. Mining impacts individuals in the Patagonia and Santa Rita Mountains. Collection, trampling, freezing, predation, and human impacts also continue at current or increased levels. The full analyses of all scenarios are available in the SSA report (Service 2018b, chapter 6); however, we are only presenting the full results of the "moderate effects" scenario here because it gives the most realistic projection of the future condition of the species.

Under the "moderate effects" scenario, within the 40-year timeframe, we expect Bartram's stonecrop's viability to be characterized by lower levels of resiliency, representation, and redundancy than it has currently, which is already reduced as described above. Under the "moderate effects" scenario, no populations would be in high condition, 4 populations (12 percent) would remain in moderate condition, 16 populations (52 percent) would be in low condition, and 13 populations (36 percent) would be extirpated, further reducing population redundancy and connectivity (see table 6.6 in the SSA report; Service 2018b). Under the "moderate effects" scenario, because of the intensity of stressors discussed above, 22 populations would be reduced from their

current condition (see Table 10, and see figure 6.3 and table 6.6 in the SSA report (Service 2018b)). We further believed that in the "moderate effects" scenario, one of the three small populations in Mexico becomes extirpated due to the amount of nonnatives contributing to fire, reduction in precipitation, increase in drought, and low resiliency of a small population.

Table 10. Bartram's stonecrop population conditions under the "moderate effects" scenario.

Sky Island	Population	Condition under the "moderate effects" scenario
Baboquivari	Brown Canyon	Low
	Thomas Canyon	Low
Chiricahua	Echo Canyon	Low
	Indian Creek	Extirpated
Dragoon	Carlink Canyon	Extirpated
	Jordan Canyon	Moderate
	Sheephead	Low
	Slavin Gulch	Low
	Stronghold Canyon East	Moderate
	Stronghold Canyon West	Moderate
Empire	Empire Mountains	Extirpated
Mule	Juniper Flat	Low
Pajarito-Atascosa	Alamo Canyon	Low
	Holden Canyon	Extirpated
	Sycamore Canyon	Moderate
	Warsaw Canyon	Extirpated
Patagonia	Alum Canyon	Extirpated
Rincon	Chimenea-Madrona Canyon	Low
	Happy Valley North	Extirpated
	Happy Valley South	Low
Santa Rita	Adobe Canyon	Low
	Gardner Canyon	Low
	Josephine Canyon	Low
	Madera Canyon	Extirpated
	Squaw Gulch	Extirpated
	Sycamore Canyon	Extirpated

Sky Island	Population	Condition under the "moderate effects" scenario
	Temporal Gulch	Low
	Walker Canyon	Extirpated
Whetstone	Deathtrap Canyon	Low
	French Joe Canyon	Extirpated
Sierra Las Avispas, Sonora	Sierra Las Avispas	Low
Sierra La Escuadra, Chihuahua	Near Colonia Pacheco	Extirpated
Sierra La Estancia, Chihuahua	Cuarenta Casas	Low

Determination

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on (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.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future stressors to beardless chinchweed and Bartram's stonecrop.

The Act defines an endangered species as any species that is "in danger of extinction throughout all or a significant portion of its range" and a threatened species as any species "that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future."

Therefore, on the basis of the best available scientific and commercial information, we propose listing beardless chinchweed as endangered in accordance with sections 3(6) and 4(a)(1) of the Act and Bartram's stonecrop as threatened in accordance with sections 3(20) and 4(a)(1) of the Act.

Beardless Chinchweed

Historically there were 21 populations. Nine populations have been extirpated, leaving 12 extant populations (six in the United States and six in Mexico). The six populations in the United States consist of 387 individuals spread across less than 2 ha (5 ac). The six populations have been reported from northern Mexico, but this information is from 1940 or earlier.

The proliferation of invasive nonnative grasses throughout most of the beardless chinchweed's range has greatly affected this species through increased competition and altered fire regimes. Many of these historical locations no longer support beardless chinchweed due to this alteration of habitat (National Park Service 2014, pp. 3-4; Service 2014b, pp. 1-2; Service 2014c, entire; Service 2014d, pp. 1-2).

All beardless chinchweed populations likely contain nonnative grasses, resulting in habitat loss (Factor A). Further, altered fire regime (Factors A and E), which is currently or in the near future impacting all populations, drives the spread of nonnatives (Factor A), exacerbating the encroachment of nonnative grasses. Consequently, all remaining populations of beardless chinchweed are impacted by nonnative grasses now or will be in the near future. Altered precipitation (Factors A and E), increased temperatures (Factors A and E), and decreased annual precipitation (Factors A and E) are current and ongoing regional conditions that are impacting all populations of beardless

chinchweed. These environmental conditions exacerbate an altered fire regime, which, in turn, drives the spread of nonnatives. In addition, nonnative grasses have competitive advantage over native grasses during periods of drought. Road and trail maintenance (Factors A and E) is altering habitat and likely resulting in the direct killing of individuals in three populations (Ruby Road, Scotia Canyon, and Coronado National Memorial). In addition, all individuals in these three populations are being impacted by dust (Factor E) from the road. These three populations are already of low resiliency. Two additional populations (McCleary Canyon—Gunsight Pass and McCleary Canyon—Wasp Canyon) will be impacted by roads (Factor A) related to mining operations in the near future (Westland 2010, p. iv). All individuals of these two populations will also be impacted by dust (Factor E). One of these populations is already of low resiliency and the other is of moderate resiliency. Of the 12 populations, 11 (92 percent) are small populations (fewer than 50 individuals). Synergistic interactions among wildfire, nonnative grasses, decreased precipitation, and increased temperatures cumulatively and cyclically impact beardless chinchweed, and all stressors are exacerbated in small populations (Factor E). No conservation efforts have been implemented for this species.

We consider beardless chinchweed to have poor representation in the form of potential genetic diversity (Factor E). All but one population has fewer than 50 individuals. Small populations are susceptible to the loss of genetic diversity, genetic drift, and inbreeding. There are currently six populations spread across four mountain ranges in the United States and six populations in northern Mexico that are presumed extant. Five of the six extant U.S. populations do not have multiple subpopulations (all but the Coronado National Memorial population, which has two subpopulations).

Mountain ranges that have only one or two populations, have only have one subpopulation per population, or have low numbers of individuals per population with several miles (16 to 61 km (9.9 to 37.9 mi)) between mountain ranges, may not be genetically diverse because pollination or transport of seeds between populations may be very limited. This could mean that between-population genetic diversity may be greater than within-population diversity (Smith and Wayne 1996, p. 333; Lindenmayer and Peakall 2000, p. 200). Further, nine populations are extirpated, and it is possible that there has been a loss of genetic diversity.

Beardless chinchweed populations in the United States range in elevation from 1,158 m (3,799 ft) to 1,737 m (5,699 ft) in elevation. Of the 15 historical U.S. populations, 8 (approximately 53 percent) fall below 457 m (1,500 ft) elevation. Of these eight, six have become extirpated in recent decades. This essentially indicates a loss at this lower elevational range and possibly loss of some local adaptation to warmer or dryer environments and genetic differentiation among populations (Factor E).

Beardless chinchweed needs to have multiple resilient populations distributed throughout its range to provide for redundancy. Beardless chinchweed needs multiple resilient populations spread over their range that are distributed in such a way that a catastrophic event will not result in the loss of all populations. With the known extant populations being separated by as much as 35 km (21.8 mi) in southern Arizona and even farther in northern Mexico, there is little connection potential between known disjunct populations. Therefore, a localized stressor such as grazing during flowering would impact only those groups of plants nearby the activity. However, repeated, large-scale, moderate- and high-severity fires, nonnative plant invasion, and climatic changes occur

across the region and could impact all populations now or in the near future. The distance among populations reduces connectivity among populations and mountain ranges, making it unlikely that a site that is extirpated can be naturally recolonized by another population (Factor E).

We find that beardless chinchweed is presently in danger of extinction throughout its entire range based on the severity and immediacy of stressors currently impacting the species. The overall range has been significantly reduced (nine populations extirpated), and the remaining habitat and populations are threatened by a variety of factors acting in combination to reduce the overall viability of the species. The risk of extinction is high because the remaining populations are small, isolated, and have limited potential for natural recolonization. Therefore, on the basis of the best available scientific and commercial information, we propose listing beardless chinchweed as endangered in accordance with sections 3(6) and 4(a)(1) of the Act. We find that a threatened species status is not appropriate for beardless chinchweed because of the species's current precarious condition due to its contracted range, because the stressors are severe and occurring rangewide, and because the stressors are ongoing and expected to continue into the future.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that beardless chinchweed is endangered throughout all of its range, we find it unnecessary to proceed to an evaluation of potentially significant portions of the range. Where the best available information allows the Service to determine a status for the species rangewide, that determination should be given conclusive weight because

a rangewide determination of status more accurately reflects the species' degree of imperilment and better promotes the purposes of the statute. Under this reading, we should first consider whether listing is appropriate based on a rangewide analysis and proceed to conduct a "significant portion of its range" analysis if, and only if, a species does not qualify for listing as either endangered or threatened according to the "all" language. We note that the court in *Desert Survivors* v. *Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), did not address this issue, and our conclusion is therefore consistent with the opinion in that case.

Therefore, on the basis of the best available scientific and commercial information, we propose to list beardless chinchweed as an endangered species across its entire range in accordance with sections 3(6) and 4(a)(1) of the Act.

Bartram's Stonecrop

Bartram's stonecrop has experienced population declines and four populations have been lost entirely. Currently, there are 29 extant populations. All Bartram's stonecrop populations contain or are near nonnative grasses resulting in habitat loss in the future (Factor A). Further, altered fire regime (Factors A and E), which is currently and in the future impacting all populations, drives the spread of nonnatives (Factor A), exacerbating the encroachment of nonnative grasses. Consequently, all populations of Bartram's stonecrop will be impacted by nonnative grasses in the future. Altered precipitation (Factors A and E), increased temperatures (Factors A and E), and decreased annual precipitation (Factors A and E) are current and ongoing regional conditions that are impacting all populations of Bartram's stonecrop. These environmental conditions exacerbate an altered fire regime, which, in turn, drives the spread of nonnatives. In

addition, nonnative grasses have competitive advantage over native grasses during periods of drought. Many currently undeveloped areas of locatable mineral deposits may be explored or mined in the future (Factors A and E). The range of current and projected mining activities varies from 1 to 10 per sky island mountain range containing Bartram's stonecrop (USFS 2012, entire). One population, Sycamore Canyon (115 adult individuals), will be affected by groundwater drawdown due to the Rosemont Mine, which will impact the shade and moist microclimate this species needs (Factor A). This species is known to be collected and sold (Factor B), and plants in close proximity to trails or roads have higher discovery potential and are, therefore, more likely to be collected. In addition, because approximately 47 percent of the extant Bartram's stonecrop populations contain 50 or fewer individuals (Factor E), loss due to erosion (Factors A and E), trampling (Factor E), collection (Factor B), predation (Factor C), and fire (Factors A and E) has the potential to seriously damage or completely remove these small populations. Synergistic interactions among wildfire, nonnative grasses, decreased precipitation, and increased temperatures cumulatively and cyclically impact Bartram's stonecrop, and all stressors are exacerbated in small populations (Factor E). No conservation efforts have been implemented for this species.

We consider Bartram's stonecrop to have poor representation in the form of potential genetic diversity. Sky island populations on different mountain ranges are widely separated (ranging from roughly 14 to 42 km (8.7 to 26 mi) apart), making genetic exchange highly unlikely. There is likely genetic diversity among mountain ranges, but reduced genetic diversity within populations. Further, overall genetic diversity is likely reduced given that four populations are extirpated. However, it is likely that the species'

genetic representation will be lost given the impacts to populations through the reduction in the number of individuals per population and the loss of populations (Factor E). In addition, it is likely that ecological representation will continue to decline as those populations at lower elevations are lost due to reduced precipitation and increased temperatures (Factor E).

The Bartram's stonecrop populations in the United States and Mexico are naturally fragmented between mountain ranges. Currently, 29 extant Bartram's stonecrop populations are spread across 12 different mountain ranges in southern Arizona and northern Mexico. Although this may imply redundancy across its range, note that 24 of the 29 extant populations contain fewer than 150 total individual plants. Further, 14 of the 29 populations have 50 individuals or less, and 4 populations have been extirpated. Five mountain ranges (Baboquivari, Chiricahua, Mule, Whetstone, and Patagonia Mountains) have only one or two populations each, have only one subpopulation per population, or have low numbers of individuals per population. These sky island mountain ranges are several miles away from the other sky island mountain ranges, so natural gene exchange or re-establishment following extirpation is unlikely. In addition, the Mule Mountains contain large number of Bartram's stonecrop individuals, but there is only one population, and it is approximately 38 km (23.6 mi) away from the nearest population, making natural re-establishment of populations unlikely. In addition, this population has contracted in size due to drying of habitat (The Nature Conservancy 1987, p. 2; Rawoot 2017, pers. comm.).

The overall range of the species has not been significantly reduced, although four populations are extirpated due to habitat drying. Currently, 29 extant populations are

spread across 12 mountain ranges, providing protection from catastrophic events in the near future (approximately 10 years). While there are multiple stressors to the remaining populations, these stressors are not immediately impacting all populations such that Bartram's stonecrop is in danger of extinction. The stressors that pose the largest risk to future species viability are primarily related to habitat changes: groundwater extraction from mining, long-term drought, and alteration in wildfire regime. These are stressors that we have high confidence in occurring and impacting Bartram's stonecrop within the next 40 years. We chose a foreseeable future of 40 years (approximately 2060) because this is within the range of predictions of available hydrological and climate change model forecasts, is within the time period of the Rosemont Mine effects, and represents eight generations of the Bartram's stonecrop, which allows us to assess reproductive effects on the species and allows the species opportunities to rebound after poor water years. The primary sources we examined in determining foreseeable future include the IPCC (2013 and 2014 entire) and Garfin *et al.* 2013 entire. The IPCC emission scenarios projections are for 2025 to 2049 and 2050−2074, or approximately mid-century, under RCP 4.5 and 8.5 scenarios. This is 6 to 30 and 31 to 55 years, respectively, in the future. The IPCC has high confidence for climate projections of increased temperature during this interval. In addition, we examined literature pertaining to wildfire frequency and severity, including Westerling *et al.* 2006, FireScape 2016, and Fire Management Information System 2016. An increase in temperature results in increased evapotranspiration rates and soil drying, resulting in the effects of future droughts becoming more severe (Garfin 2013, pp. 137-138) and wildfires becoming more frequent and of increased intensity. Given that climate change projections are for mid-century and that wildfire is influenced

by a drying climate, we used 40 years as the foreseeable future for this species. We find that Bartram's stonecrop is likely to become an endangered species within the foreseeable future (approximately 40 years) throughout all of its range based on the severity and immediacy of stressors.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the Bartram's stonecrop is likely to become an endangered species within the foreseeable future throughout its range, we find it unnecessary to proceed to an evaluation of potentially significant portions of the range. Where the best available information allows the Service to determine a status for the species rangewide, that determination should be given conclusive weight because a rangewide determination of status more accurately reflects the species' degree of imperilment and better promotes the purposes of the statute. Under this reading, we should first consider whether listing is appropriate based on a rangewide analysis and proceed to conduct a "significant portion of its range" analysis if, and only if, a species does not qualify for listing as either endangered or threatened according to the "all" language. We note that the court in *Desert Survivors* v. *Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), did not address this issue, and our conclusion is therefore consistent with the opinion in that case.

Therefore, on the basis of the best available scientific and commercial information, we propose to list Bartram's stonecrop as a threatened species across its entire range in accordance with sections 3(20) and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies; private organizations; and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Section 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the stressors to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new stressors to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when

a species may be ready for downlisting (reclassification from endangered to threatened) or delisting (removal from listed status), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (*http://www.fws.gov/endangered*), or from our Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (*e.g.*, restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands. If these species are listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Arizona would be eligible for Federal funds to implement management actions that promote the protection or recovery of beardless chinchweed and Bartram's

stonecrop. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

Although beardless chinchweed and Bartram's stonecrop are only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Beardless Chinchweed

Federal agency actions within the species' habitat that may require conference or consultation or both as described in the preceding paragraph include management and

any other landscape-altering activities on Federal lands administered by the U.S. Forest Service (Coronado National Forest), Bureau of Land Management, U.S. Customs and Border Protection, and National Park Service (Coronado National Memorial).

With respect to endangered plants, prohibitions at section 9 of the Act and 50 CFR 17.61 make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale in interstate or foreign commerce, or to remove and reduce to possession any such plant species from areas under Federal jurisdiction. In addition, for endangered plants, the Act prohibits malicious damage or destruction of any such species on any area under Federal jurisdiction, and the removal, cutting, digging up, or damaging or destroying of any such species on any other area in knowing violation of any State law or regulation, or in the course of any violation of a State criminal trespass law. Exceptions to these prohibitions are set forth at 50 CFR 17.62 and 17.63.

We may issue permits to carry out otherwise prohibited activities involving endangered plants under certain circumstances. Regulations governing permits are codified at 50 CFR 17.62 and 17.63. With regard to endangered plants, the Service may issue a permit authorizing any activity otherwise prohibited by 50 CFR 17.61 for scientific purposes, for enhancing the propagation or survival of endangered plants, or for economic hardship. At this time, we are unable to identify specific activities that would not be considered to result in a violation of section 9 of the Act because beardless chinchweed occurs in a variety of habitat conditions across its range.

Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized handling or collecting of the species;

(2) Ground-disturbing activities within 30 m (98 ft) of individual beardless chinchweed plants;

(3) Dislodging and trampling by livestock;

(4) Livestock grazing during April through October where the species occurs; and

(5) Herbicide applications within 30 m (98 ft) of individual beardless chinchweed plants.

Bartram's Stonecrop

Federal agency actions within the species' habitat that may require conference or consultation or both as described in the preceding paragraph include management and any other landscape-altering activities on Federal lands administered by the U.S. Forest Service (Coronado National Forest), Bureau of Land Management, U.S. Customs and Border Protection, and National Park Service (Chiricahua National Monument and Saguaro National Park).

With respect to threatened plants, the Act allows the Secretary to promulgate regulations to prohibit activities to provide for the conservation of the species. Under **II. Proposed Section 4(d) Rule for** Bartram's stonecrop, below, we explain what activities we are proposing to prohibit.

We may issue permits to carry out otherwise prohibited activities involving threatened plants under certain circumstances. Regulations governing permits are codified at 50 CFR 17.72. With regard to threatened plants, a permit issued under this section must be for one of the following: scientific purposes, the enhancement of the propagation or survival of threatened species, economic hardship, botanical or

horticultural exhibition, educational purposes, or other activities consistent with the purposes and policy of the Act.

It is our policy, as published in the *Federal Register* on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. At this time, we are unable to identify specific activities that would not be considered to result in a violation of the Act because the Bartram's stonecrop occurs in a variety of habitat conditions across its range.

Based on the best available information, the following activities may potentially result in a violation of the Act; this list is not comprehensive:

(1) Unauthorized handling or collecting of the species;

(2) Ground-disturbing activities within 30 m (98 ft) of individual Bartram's stonecrop plants;

(3) Herbicide applications within 30 m (98 ft) of individual Bartram's stonecrop plants; and

(4) Dislodging and trampling by livestock.

Questions regarding whether specific activities would constitute a violation of the Act should be directed to the Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

II. Proposed Section 4(d) Rule for Bartram's Stonecrop

Background

Section 4(d) of the Act states that the "Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation" of species listed as threatened. In *Webster* v. *Doe*, 486 U.S. 592 (1988), the U.S. Supreme Court noted that similar "necessary or advisable" language "fairly exudes deference" to the agency. Conservation is defined in section 3 of the Act as the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Additionally, section 4(d) of the Act states that the Secretary "may by regulation prohibit with respect to any threatened species any act prohibited" under section 9(a)(2) of the Act. Thus, regulations promulgated under section 4(d) of the Act provide the Secretary with wide latitude of discretion to select appropriate provisions tailored to the specific conservation needs of the threatened species. The statute grants particularly broad discretion to the Service when adopting the prohibitions under section 9.

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, the Secretary may decide not to include a taking prohibition for threatened wildlife, or to include a limited taking prohibition. See *Alsea Valley Alliance* v. *Lautenbacher*, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington Environmental Council* v. *National Marine Fisheries Service*, and 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002). In addition, as affirmed in *State of Louisiana* v. *Verity*, 853 F.2d 322 (5th Cir. 1988), the rule need not address all the stressors to the species. As noted by Congress when the Act was initially enacted, "once an animal is on the threatened list,

the Secretary has an almost infinite number of options available to him with regard to the permitted activities for those species. He may, for example, permit taking, but not importation of such species," or he may choose to forbid both taking and importation but allow the transportation of such species, as long as the prohibitions, and exceptions to those prohibitions, will "serve to conserve, protect, or restore the species concerned in accordance with the purposes of the Act" (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

The Service has developed a species-specific 4(d) rule that is designed to address Bartram's stonecrop's specific stressors and conservation needs. Although the statute does not require the Service to make a "necessary and advisable" finding with respect to the adoption of specific prohibitions under section 9, we find that this regulation is necessary and advisable to provide for the conservation of Bartram's stonecrop. As discussed under **Summary of Biological Status and Stressors**, above, the Service has concluded that Bartram's stonecrop is at risk of extinction within the foreseeable future primarily due to groundwater extraction and prolonged drought that may reduce nearby water levels and humidity within Bartram's stonecrop's microenvironment, and altered fire regimes leading to erosion of Bartram's stonecrop that could dislodge plants, sedimentation that could cover individuals, and loss of overstory shade trees. In addition, collection, trampling, predation, flooding, and dislodging and burial from recreationists, cross-border violators, and domestic and wild animals contribute to the risk of extinction within the foreseeable future due to the majority of populations being small and isolated. The provisions of this proposed 4(d) rule would promote conservation of Bartram's stonecrop by encouraging management of the landscape in ways that meet land

management needs while meeting the conservation needs of Bartram's stonecrop. The provisions of this rule are one of many tools that the Service would use to promote the conservation of Bartram's stonecrop. This proposed 4(d) rule would apply only if and when the Service makes final the listing of Bartram's stonecrop as a threatened species.

Provisions of the Proposed Protective Regulation

This proposed 4(d) rule would provide for the conservation of the Bartram's stonecrop by applying all of the prohibitions applicable to an endangered plant, except as otherwise authorized or permitted: import or export; certain acts related to removing, damaging, and destroying; delivery, receipt, transport, or shipment in interstate or foreign commerce in the course of commercial activity; or sale or offering for sale in interstate or foreign commerce. Bartram's stonecrop is an attractive and small plant that can be easily collected by gardeners and succulent enthusiasts. We have confirmed collection from the wild and sale in interstate commerce. Because Bartram's stonecrop is difficult to propagate and maintain in captivity, it is more vulnerable to collection than other plants in this genus. Small populations may not be able to recover from collection, especially if the mature, reproductive plants are removed.

As discussed under **Summary of Biological Status and Stressors**, above, multiple factors are affecting the status of Bartram's stonecrop. A range of activities have the potential to impact Bartram's stonecrop, including:

(1) Unauthorized handling or collecting of the species;

(2) Ground-disturbing activities where the species occurs;

(3) Activities that would affect pollinators where the species occurs and in the surrounding area;

(4) Activities that would promote high-severity wildfires where the species occurs;

(5) Activities that would reduce shade, reduce proximity to water, and lower the water table such that the cooler, humid microenvironment is affected; and

(6) Herbicide applications where the species occurs.

Regulating these activities will help conserve the species' remaining populations; slow their rate of decline; and decrease synergistic, negative effects from other stressors.

We may issue permits to carry out otherwise prohibited activities, including those described above, involving threatened plants under certain circumstances. Regulations governing permits are codified at 50 CFR 17.72. With regard to threatened plants, a permit may be issued for the following purposes: for scientific purposes, to enhance propagation or survival (control of nonnatives and fuel load), for economic hardship, for botanical or horticultural exhibition, for educational purposes, or other activities consistent with the purposes of the Act. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

The Service recognizes the special and unique relationship with our State natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist the Services in implementing all aspects of the Act. In this regard, section 6 of the Act provides that the Services shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by

the Act. Therefore, under this proposed 4(d) rule, any qualified employee or agent of a State conservation agency which is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, would be able to conduct activities designed to conserve Bartram's stonecrop that may result in otherwise prohibited activities without additional authorization.

Nothing in this proposed 4(d) rule would change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of Bartram's stonecrop. However, interagency cooperation may be further streamlined through planned programmatic consultations for the species between Federal agencies and the Service. We ask the public, particularly State agencies and other interested stakeholders that may be affected by the proposed 4(d) rule, to provide comments and suggestions regarding additional guidance and methods that the Service could provide or use, respectively, to streamline the implementation of this proposed 4(d) rule (see **Information Requested**, above).

III. Proposed Critical Habitat Designation for Beardless Chinchweed and Prudency Determination for Bartram's Stonecrop

Background

Critical habitat is defined in section 3 of the Act as:

(1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features

(a) Essential to the conservation of the species, and

(b) Which may require special management considerations or protection; and

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

Our regulations at 50 CFR 424.02 define the geographical area occupied by the species as an area that may generally be delineated around species' occurrences, as determined by the Secretary of the Interior (*i.e.*, range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (*e.g.*, migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals).

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land

ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical or biological features that occur in specific areas, we focus on the specific features that are essential to support the life-history needs of the species, including but not limited to, water characteristics, soil type, geological features, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic, or a more complex combination of habitat characteristics. Features may include habitat characteristics that

support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. When designating critical habitat, the Secretary will first evaluate areas occupied by the species. The Secretary will only consider unoccupied areas to be essential where a critical habitat designation limited to geographical areas occupied by the species would be inadequate to ensure the conservation of the species. In addition, for an unoccupied area to be considered essential, the Secretary must determine that there is a reasonable certainty both that the area will contribute to the conservation of the species and that the area contains one or more of those physical or biological features essential to the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Act (published in the *Federal Register* on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106-554; H.R. 5658)), and our associated Information Quality Guidelines, provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to

use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information from the SSA report and information developed during the listing process for the species. Additional information sources may include any generalized conservation strategy, criteria, or outline that may have been developed for the species; the recovery plan for the species; articles in peer-reviewed journals; conservation plans developed by States and counties; scientific status surveys and studies; biological assessments; other unpublished materials; or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the Act's prohibitions on taking any individual of the species, including taking caused by actions that affect habitat. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still

result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts, if new information available at the time of these planning efforts calls for a different outcome.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12), require that, to the maximum extent prudent and determinable, the Secretary shall designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations (50 CFR 424.12(a)(1)) state that the Secretary may, but is not required to, determine that a designation would not be prudent in the following circumstances:

(i) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(ii) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(iii) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States;

(iv) No areas meet the definition of critical habitat; or

(v) The Secretary otherwise determines that designation of critical habitat would not be prudent based on the best scientific data available.

Beardless Chinchweed

We did not identify any of the factors above to apply to the beardless chinchweed. Therefore, we find designation of critical habitat is prudent for the species.

Bartram's Stonecrop

As described above, there is currently an imminent threat of take attributed to collection or vandalism identified under Factor B for this species, and identification and mapping of critical habitat is expected to increase such threat because when we designate critical habitat, we publish detailed maps and descriptions of species' occurrences in the *Federal Register*, which in this case, could make this species more vulnerable to the threats identified under Factor B. Because we have determined that the designation of critical habitat will likely increase the degree of threat to the species, we find that designation of critical habitat is not prudent for Bartram's stonecrop.

Critical Habitat Determinability for Beardless Chinchweed

Having determined that designation is prudent for beardless chinchweed, under section 4(a)(3) of the Act, we must find whether critical habitat for the species is determinable. Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

(i) Data sufficient to perform required analyses are lacking, or

(ii) The biological needs of the species are not sufficiently well known to identify any area that meets the definition of "critical habitat."

When critical habitat is not determinable, the Act allows the Service an additional year to publish a critical habitat designation (16 U.S.C. 1533(b)(6)(C)(ii)).

We reviewed the available information pertaining to the biological needs of the species and habitat characteristics where this species is located. This and other information represent the best scientific data available and led us to conclude that the designation of critical habitat is determinable for beardless chinchweed.

Physical or Biological Features for Beardless Chinchweed

In accordance with section 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12(b), in determining which areas within the geographical area occupied by the species at the time of listing to designate as critical habitat, we consider the physical or biological features that are essential to the conservation of the species and which may require special management considerations or protection. For example, physical features might include gravel of a particular size required for spawning, alkali soil for seed germination, protective cover for migration, or susceptibility to flooding or fire that maintains necessary early-successional habitat characteristics. Biological features might include prey species, forage grasses, specific kinds or ages of trees for roosting or nesting, symbiotic fungi, or a particular level of nonnative species consistent with conservation needs of the listed species. The features may also be combinations of habitat characteristics and may encompass the relationship between characteristics or the necessary amount of a characteristic needed to support the life history of the species. In considering whether features are essential to the conservation of the species, the Service may consider an appropriate quality, quantity, and spatial and temporal arrangement of habitat characteristics in the context of the life-history needs, condition, and status of the

species. These characteristics include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing (or development) of offspring; and habitats that are protected from disturbance.

Summary of Essential Physical or Biological Features

We derive the specific physical or biological features essential to the conservation of beardless chinchweed from studies of this species' habitat, ecology, and life history, as described below. We have determined that the following physical or biological features are essential to the conservation of beardless chinchweed:

(1) Native-dominated plant communities, consisting of:

(a) Plains, great basin, and semi-desert grasslands, oak savanna, or Madrean evergreen woodland;

(b) Communities dominated by bunchgrasses with open spacing (adjacent to and within 10 m (33 ft) of individual beardless chinchweed) and with little competition from other plants; and

(c) Communities with plants for pollinator foraging and nesting within 1 km (0.62 mi) of beardless chinchweed populations.

(2) 1,158 to 1,737 m (3,799 to 5,699 ft) elevation.

(3) Eroding limestone or granite bedrock substrate.

(4) Steep, south-facing, sunny to partially shaded hillslopes.

(5) The presence of pollinators (*i.e.*, flies, bees, and butterflies).

Space for individual and population growth is needed for beardless chinchweed, including sites for germination, pollination, reproduction, pollen and seed dispersal, and seed banks in the form of open, native-dominated desert grasslands, oak savannas, and oak woodlands at 1,158 to 1,737 m (3,799 to 5,699 ft) in elevation (SEINet, entire). In addition, plants need space on steep, south-facing, sunny to partially shaded hillslopes, with eroding bedrock and open areas with little competition from other plants. Native-dominated habitats have diverse assemblages of vegetation, each with different-shaped and -sized canopy and root system, which creates heterogeneity of form, height, and patchiness and provides openness. Beardless chinchweed is presumed to be a poor competitor due to its preference for this open habitat and inability to find the species under dense vegetation conditions. Pollination is necessary for effective fertilization, out-crossing, and seed production in beardless chinchweed. Beardless chinchweed, like other yellow-flowered composites, is most likely pollinated by bees, flies, and butterflies. Many bees and butterflies can travel a distance of 1 km (0.62 mi); consequently, adequate space for pollinators is needed around beardless chinchweed populations to support pollinators and, therefore, cross-pollination within and among populations and subpopulations. In addition, open space is needed in the form of seedbanks for population growth. Further, beardless chinchweed populations need space with soil moisture and nutrients for individual and population growth.

Beardless chinchweed needs multiple populations distributed across its range that are large enough to withstand stochastic events, and connectivity to reestablish extirpated populations. Species that are widely-distributed are considered less susceptible to extinction and more likely to be viable than species confined to small ranges (Carroll *et*

al. 2010, entire). Historically, there were 21 populations across seven mountain ranges. Nine populations (and one subpopulation) have been extirpated in the United States, and all populations are extirpated from the Patagonia Mountains in the United States. This leaves six populations across four mountains ranges covering an occupied area of about 2 ha (5 ac) in the United States and six small populations in Mexico. Further, two mountain ranges only have one population each with fewer than 50 individuals. In addition, the other two mountain ranges have only two populations each, both with fewer than 50 individuals each. The current distribution of this species does not represent its historical geographical distribution. Additional populations are needed to increase the redundancy of the species to secure the species from catastrophic events like wildfire and nonnative grass encroachment. Increased representation in the form of ecological environments are needed to secure the species against environmental changes like increase temperatures, increase drought, and increased evapotranspiration. Specifically, populations at higher altitudes are likely needed to secure the species viability.

All populations need protection from wildfires of high severity and of greater frequency than was known historically and from nonnative grass encroachment. Further, all populations need protection from stressors related to one or more of the following activities: recreation, road and trail maintenance, grazing, trampling, and mining. As discussed above, these stressors are currently, or will in the near future, impact all populations. Protection is needed from these stressors to ensure the conservation of the species.

The minimum viable population size for this species is unknown. General conservation biology indicates that at least 500 individual are needed for a minimum

viable population. Currently, 11 of the 12 populations have fewer than 50 individuals. In Arizona, there are currently 387 individual beardless chinchweed spread across less than 2 ha (5 ac) within six extant populations spread across the four mountain ranges. Space, in the form of habitat described above, is needed for an increase in the number of populations and the number of individuals per population.

Specific details about the physical or biological features essential to this species are described above in the background section and in the SSA report (Service 2018a).

Special Management Considerations or Protection for Beardless Chinchweed

When designating critical habitat, we assess whether the specific areas within the geographical area occupied by the species at the time of listing contain features which are essential to the conservation of the species and which may require special management considerations or protection. The features essential to the conservation of this species may require special management considerations or protection to reduce the following stressors: altered fire regime, nonnative grass encroachment, grazing, erosion, and burial (see Table 11 below). Special management considerations or protection are required within critical habitat areas to address these stressors. Management activities that could ameliorate these stressors include (but are not limited to): Prescribed fire, fire breaks, reduction of nonnative grasses, promotion or introduction of native forbs and grasses, clean equipment, exclosure fences, and protection from erosion and burial. These management activities will protect the physical or biological features for the species by reducing or avoiding the encroachment or expansion of nonnative grass species, promoting native vegetation, and preventing the succession of vegetation such that open space and sun exposure are reduced or eliminated.

Table 11. Features that may require special management.

Features that may require special management:	Stressors to features:	Special management or protection to address stressors:	Features protected by:
Native-dominated plant communities	Altered fire regime; nonnative grasses; grazing; road and trail maintenance	Fire breaks around populations; prescribed fires; reduction of nonnative grasses; clean equipment to limit the spread of nonnatives; promotion or introduction of native forbs and grasses	Avoidance of encroachment of nonnatives from wildfires and drought; promotion of native species through natural fire regime; avoidance of introducing nonnative species
Plants for pollinators	Altered fire regime; nonnative grasses	Fire breaks around populations; prescribed fires; reduction of nonnative grasses; promotion or introduction of native forbs and grasses	Avoidance of encroachment of nonnatives from wildfires and drought; promotion of native species through natural fire regime; avoidance of introducing nonnative species
Open, sunny sites	Altered fire regime; nonnative grasses	Prescribed fires; reduction of nonnative grasses; promotion or introduction of native forbs and grasses	Elimination or reduction of the loss of open space and sun exposure

Criteria Used To Identify Critical Habitat for Beardless Chinchweed

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. Sources of data for this species include multiple databases maintained by the Arizona Natural Heritage Program, existing endangered species reports, and interviews with species experts. We have also reviewed available information that pertains to the habitat requirements of this species.

In accordance with the Act and our implementing regulations at 50 CFR 424.12(b), we review available information pertaining to the habitat requirements of the species and identify specific areas within the geographical area occupied by the species at the time of listing and any specific areas outside the geographical area occupied by the species to be considered for designation as critical habitat. We are proposing to designate critical habitat in areas within the geographical area currently occupied by the species (*i.e.*, at the time of proposed listing). We also are proposing to designate specific areas outside the geographical area currently occupied by the species that were historically occupied, but are presently unoccupied, because we have determined that a designation limited to occupied areas would be inadequate to ensure the conservation of the species.

The current distribution of beardless chinchweed is reduced from its historical distribution to a level where it is in danger of extinction. We anticipate that recovery will require continued protection of existing populations and habitat, as well as reestablishment of populations at a subset of previously occupied habitats throughout the species' historical range in the United States. Reestablishment of additional populations will help to ensure that catastrophic events, such as wildfire, cannot simultaneously affect all known populations. We have determined that it is reasonably certain that the unoccupied areas will contribute to the conservation of the species and contain one or more of the physical or biological features that are essential to the conservation of the species.

Areas Occupied at the Time of Listing

The proposed critical habitat designation does not include all populations known to have been occupied by the species historically; instead, it includes all currently

occupied areas within the historical range that have retained the necessary physical or biological features that will allow for the maintenance and expansion of these existing populations. The following populations meet the definition of areas occupied by the species at the time of listing: McCleary Canyon, Audubon Research Ranch, Scotia Canyon, Coronado National Memorial, and Ruby Road.

Areas Outside of the Geographic Range at the Time of Listing

Pena Blanca Lake, Summit Motorway, Copper Mountain, Lampshire Well, Harshaw Creek, Flux Canyon, Washington Camp, Box Canyon, and Joe's Canyon are within the historical range of beardless chinchweed, but are not within the geographic range currently occupied by the species. We consider these sites to be extirpated. For areas not occupied by the species at the time of listing, we must demonstrate that these areas are essential to the conservation of the species in order to include them in our critical habitat designation. To determine if these areas are essential for the conservation of beardless chinchweed, we considered the life history, status, and conservation needs of the species such as: (1) The importance of the site to the overall status of the species to prevent extinction and contribute to future recovery of beardless chinchweed; (2) whether the area could be restored to support beardless chinchweed; (3) whether the site provides connectivity between occupied sites for genetic exchange; and (4) whether a population of the species could be reestablished in the area.

Of the unoccupied areas, Lampshire Well, Harshaw Creek, and Washington Camp on U.S. Forest Service lands contain a mixture of native and nonnative grasses that could be restored to native conditions, thus making them suitable for reestablishment of the species, and they are important to the overall status of the species. The

reestablishment of the Washington Camp population would reintroduce the species into the Patagonia Mountains, where currently it is extirpated. The reestablishment of beardless chinchweed into the Patagonia Mountains would restore the historical range of the species in terms of occupied mountain ranges. This area would provide key representation and redundancy needed for conservation of the species. Further, the addition of two reestablished populations in the Canelo Hills would increase the redundancy of the species in this area and reduce the chance that a catastrophic event would eliminate all populations in this area. Currently, there is only one population with 37 individuals in the Canelo Hills.

Of the remaining historical populations in the United States, Pena Blanca Lake, Summit Motorway, Copper Mountain, Box Canyon, Joe's Canyon, and Flux Canyon are heavily infested with nonnative grasses to an extent where restoration of native vegetation is not likely feasible. Reestablishment of the species to these historical sites is not likely to be successful and, therefore, not likely to contribute to the recovery of the species. Therefore, these remaining historical sites are not included in the proposed designation of critical habitat.

In summary, for areas within the geographic area occupied by the species at the time of listing (*i.e.*, currently occupied), we delineated critical habitat unit boundaries by evaluating the habitat suitability of areas within the geographic area occupied at the time of listing, and retaining those units that contain some or all of the physical or biological features to support life-history functions essential for conservation of the species.

For areas outside the geographic area occupied by the species at the time of listing, we delineated critical habitat unit boundaries by evaluating areas not known to

have been occupied at listing (*i.e.*, that are not currently occupied) but that are within the historical range of the species to determine if they are essential to the survival and recovery of the species. Essential areas are those that: (1) Serve to extend an occupied unit; and (2) expand the geographic distribution within areas not occupied at the time of listing across the historical range of the species.

We conclude that the areas we are proposing for critical habitat provide for the conservation of beardless chinchweed because they include habitat for all extant populations and include habitat for connectivity and dispersal opportunities within units. Such opportunities for dispersal assist in maintaining the population structure and distribution of the species. In addition, the unoccupied units each contain one or more of the physical or biological features and are likely to provide for the conservation of the species. Each of the unoccupied areas are on lands managed by the Coronado National Forest. The Forest Plan for the Coronado contains several important guidelines that would contribute to the conservation of beardless chinchweed including control of nonnative vegetation, promotion of native grasses, and protections for species listed under the Endangered Species Act (USDA Forest Service 2018). Designation of critical habitat would facilitate the application of this guidance where it would do the most good for the beardless chinchweed.

As a final step, we evaluated occupied units and refined the area by evaluating the presence or absence of appropriate physical or biological features. We selected the boundary of a unit to include 1 km (0.62 mi) of foraging and reproductive habitat for pollinators that are necessary for beardless chinchweed. We then mapped critical habitat

units using ArcMap version 10 (Environmental Systems Research Institute, Inc.), a geographic information systems (GIS) program.

The areas we are proposing for designation as critical habitat provide sufficient habitat for recruitment, pollinators, seed bank, and seed dispersal. In general, the physical or biological features of critical habitat are contained within 1 km (0.62 mi) of beardless chinchweed plants within the population.

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack the physical or biological features necessary for beardless chinchweed. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is made final as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

We are proposing for designation as critical habitat lands that we have determined are occupied at the time of listing (*i.e.*, currently occupied) and contain one or more of the physical or biological features that are essential to support life-history processes of the species. We have determined that occupied areas are inadequate to ensure the conservation of the species. Therefore, we have also identified, and are proposing for

designation of critical habitat, unoccupied areas that are essential for the conservation of the species.

Units are proposed for designation based on one or more of the physical or biological features being present to support beardless chinchweed life-history processes. Some units contain all of the identified physical or biological features and support multiple life-history processes. Some units contain only some of the physical or biological features necessary to support beardless chinchweed' particular use of that habitat.

The critical habitat designation is defined by the map, as modified by any accompanying regulatory text, presented at the end of this document under **Proposed Regulation Promulgation**. We include more detailed information on the boundaries of the critical habitat designation in the preamble of this document. We will make the coordinates or plot points or both on which the map is based available to the public on *http://www.regulations.gov* at Docket No. FWS–R2–ES–2018–0104, on our Internet site at *https://www.fws.gov/southwest/es/arizona/Docs_Species.htm,* and at the field office responsible for the designation (see **FOR FURTHER INFORMATION CONTACT**, above).

Proposed Critical Habitat Designation for Beardless Chinchweed

We are proposing to designate approximately 10,604 ac (4,291 ha) in eight units as critical habitat for beardless chinchweed. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for beardless chinchweed. The eight units we propose as critical habitat are listed in Table 12.

Table 12. Proposed critical habitat units and occupancy of Beardless Chinchweed.

Critical Habitat Unit	Occupied at the Time of Listing	Ownership	Size of Unit in Acres (Hectares)
1 - McCleary Canyon	Yes	Forest Service	1,686 ac (682 ha)
2 - Audubon Research Ranch	Yes	Bureau of Land Management (BLM), Forest Service, Private (Audubon Research Ranch)	1,170 ac (474 ha) BLM; 817 ac (331 ha) Forest Service; 300 ac (121 ha) private
3 - Scotia Canyon	Yes	Forest Service	855 ac (346 ha)
4 - Coronado National Memorial	Yes	National Park Service	2,109 ac (853 ha)
5 – Lampshire Well	No	Forest Service	939 ac (380 ha)
6 – Harshaw Creek	No	Forest Service	1,013 ac (410 ha)
7 - Washington Camp	No	Forest Service	939 ac (380 ha)
8 - Ruby Road	Yes	Forest Service	776 ac (314 ha)
TOTAL:			10,604 ac (4,291 ha)

Note: Area sizes may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for beardless chinchweed, below.

Unit 1: McCleary Canyon

The McCleary Canyon unit occurs in the northeastern portion of the Santa Rita Mountains in Pima County, Arizona, and is managed by the U.S. Forest Service. This unit is 1,686 ac (682 ha) in size and is currently occupied. The unit contains two extant populations: Gunsight Pass and Wasp Canyon. Each population within the McCleary Canyon unit supports 32 individual beardless chinchweed plants. The proposed Rosemont Copper Mine occurs in this unit, and there is ongoing and historical mining

activity throughout the Santa Rita Mountains. This unit also receives significant recreational pressure and livestock grazing. The Gunsight Pass population is one of the few populations within the range of beardless chinchweed where native grass species dominate the site. The Wasp Canyon population has a mixture of native and nonnative grass species. The McCleary Canyon unit provides at least one of the following essential physical and biological features needed for this species: Appropriate native plant communities (despite the presence of some nonnative species), elevation, substrates, and slope aspect. The physical and biological features in this unit may require special management considerations including reduction in nonnative grass presence, promotion of native forbs and grasses, removal of livestock between April and October, and the creation of exclosures. This unit includes habitat for species already listed under the Act, including the jaguar (*Panthera onca*); ocelot (*Leopardus (=Felis) pardalis)*; Mexican spotted owl (*Strix occidentalis lucida*); yellow-billed cuckoo (*Coccyzus americanus*); and Chiricahua leopard frog (*Lithobates chiricahuensis*). This proposed unit would overlap with designated critical habitat for jaguar.

Unit 2: Audubon Research Ranch

The Audubon Research Ranch unit occurs in the northern portion of the Canelo Hills in Santa Cruz County, Arizona, and is managed by the Audubon Society and some plants occur on the Coronado National Forest. This unit is 2,287 ac (926 ha) in size and is currently occupied. The O'Donnell Canyon population is currently extant but there was one additional population, Post Canyon that occurred here historically. The Audubon Research Ranch unit supports 37 individual beardless chinchweed plants and is dominated by native grass species. The Audubon Research Ranch unit provides the

physical and biological features in this unit may require special management considerations, including reduction in nonnative grass presence, promotion of native forbs and grasses. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican spotted owl, yellow-billed cuckoo, Chiricahua leopard frog, Gila chub (*Gila intermedia*), northern Mexican gartersnake (*Thamnophis eques megalops*), and Huachuca water-umbel (*Lilaeopsis schaffneriana* var. *recurva*). In addition, this unit includes designated critical habitat for Chiricahua leopard frog, Gila chub, and Huachuca water-umbel, and proposed critical habitat for northern Mexican gartersnake,

Unit 3: Scotia Canyon

The Scotia Canyon unit occurs on the western slopes of the Huachuca Mountains in Cochise County, Arizona, and is managed by the U.S. Forest Service. This unit is 855 ac (346 ha) in size and is currently occupied by beardless chinchweed. There is one extant population that is estimated to contain 100 individual beardless chinchweed plants. This unit has been impacted by historical mining, grazing, and wildfire. High recreational use also occurs in this unit. The Scotia Canyon unit is one of the few sites within the range of beardless chinchweed where native grass species dominate the site. The Scotia Canyon unit provides at least one of the following essential physical and biological features needed for this species: Appropriate native plant communities, elevation, substrates, and slope aspect. The physical and biological features in this unit may require special management considerations, including reduction in nonnative grass presence, promotion of native forbs and grasses, reduction in road maintenance activity, removal of livestock between April and October, and the creation of exclosures. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican

spotted owl, yellow-billed cuckoo, Chiricahua leopard frog, northern Mexican gartersnake, and Huachuca water-umbel. In addition, this unit includes designated critical habitat for jaguar and Huachuca water-umbel, and proposed critical habitat for northern Mexican gartersnake.

Unit 4: Coronado National Memorial

The Coronado National Memorial unit occurs in the southern portion of the Huachuca Mountains in Cochise County, Arizona, and is managed by the National Park Service. This unit is 2,109 ac (853 ha) in size and is occupied. The unit contains two extant subpopulations: the visitor's center and the State of Texas mine. The area around the visitor's center supports approximately 180 individual beardless chinchweed plants. Another 61 plants have been documented in the vicinity of the State of Texas mine. Additionally, the historical subpopulation, Joe's Canyon Trail, occurs within this unit and is not currently occupied. This unit supports a high level of recreational use, historical mining use, and ongoing impacts from wildfire. Portions of the Coronado National Memorial unit are dominated by native grass species, while other areas are a mixture of native and nonnative grasses. The Coronado National Memorial unit provides at least one of the following essential physical and biological features needed for this species: Appropriate native plant communities (although there is a nonnative presence), elevation, substrates, and slope aspect. The physical and biological features in this unit may require special management considerations, including reduction in nonnative grass presence and promotion of native forbs and grasses. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican spotted owl, yellow-billed cuckoo,

Chiricahua leopard frog, northern Mexican gartersnake, and Huachuca water-umbel. In addition, this unit includes designated critical habitat for jaguar and Mexican spotted owl.

Unit 5: Lampshire Well

The Lampshire Well unit occurs in the Canelo Hills in Santa Cruz County, Arizona, and is managed by the U.S. Forest Service. This unit is 939 ac (380 ha) in size and is currently unoccupied. Historically, beardless chinchweed populations occurred on this unit. This unit is characterized by communities of mixed native and nonnative grasses, and is subject to border activities (foot traffic and increased fire ignition) and wildfire. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican spotted owl, yellow-billed cuckoo, Chiricahua leopard frog, northern Mexican gartersnake, Huachuca water-umbel, and Canelo Hills ladies'-tresses (*Spiranthes delitescens*). In addition, this unit includes designated critical habitat for jaguar and proposed critical habitat northern Mexican gartersnake.

Although it is considered unoccupied, this unit contains all of the physical or biological features essential for the conservation of the species. This unit consists of a mix of native and nonnative grasses, with scattered *Quercus* and *Juniperus*, at an elevation of 1,646 m (5,400 ft), on granitic substrate with steep slopes facing the southwest. There are areas in this unit with more native grasses than nonnative grasses. This unit is in Federal ownership managed by the U.S. Forest Service. The U.S. Forest Service is committed to managing for the recovery of listed species, reducing nonnative invasive species, and managing fuel loads to reduce potential for high intensity wildfire (USDA Forest Service 2018). The Lampshire Well unit is essential to the conservation of the species because it provides for habitat and population restoration opportunities, as

well as provides habitat connectivity for beardless chinchweed and its pollinators. Recovery of this species will require new and expanded populations, and this unit provides for this needed recovery habitat that will contribute to the species' resiliency (larger and more populations), redundancy (more populations across the range), and representation (opportunities for increased genetic and environmental variation). We have determined that this unoccupied unit contains one or more of the physical or biological features that are essential to the conservation of the species and that it is reasonably certain that it will contribute to the conservation of the species.

Unit 6: Harshaw Creek

The Harshaw Creek unit occurs in the Canelo Hills in Santa Cruz County, Arizona, and is managed by the U.S. Forest Service. This unit is 1,013 ac (410 ha) in size and is currently unoccupied. Historically, beardless chinchweed populations occurred on this unit. This unit is characterized by communities of mixed native and nonnative grasses, and is subject to border activities and wildfire. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican spotted owl, yellow-billed cuckoo, Chiricahua leopard frog, northern Mexican gartersnake, Huachuca water-umbel, and Canelo Hills ladies'-tresses. In addition, this unit includes designated critical habitat for jaguar and proposed critical habitat for northern Mexican gartersnake.

Although it is considered unoccupied, portions of this unit contain all of the physical or biological features essential for the conservation of the species. This unit consists of a mix of native and nonnative grasses, with scattered *Quercus* and *Juniperus*, at an elevation of 1,494 m (4,900 ft), on granitic, rocky substrate with steep slopes facing

the southwest. There are areas in this unit with more native grasses than nonnative grasses. This unit is in Federal ownership managed by the U.S. Forest Service. The U.S. Forest Service is committed to managing for the recovery of listed species, reducing nonnative invasive species, and managing fuel loads to reduce potential for high intensity wildfire (USDA Forest Service 2018). The Harshaw Creek unit is essential to the conservation of the species because it provides for habitat and population restoration opportunities, as well as provides habitat connectivity for beardless chinchweed and its pollinators. Recovery of this species will require new and expanded populations, and this unit provides for this needed recovery habitat that will contribute to the species' resiliency (larger and more populations), redundancy (more populations across the range), and representation (opportunities for increased genetic and environmental variation). We have determined that this unoccupied unit contains one or more of the physical or biological features that are essential to the conservation of the species and that it is reasonably certain that it will contribute to the conservation of the species.

Unit 7: Washington Camp

The Washington Camp unit occurs in the northeastern portion of the Patagonia Mountains in Santa Cruz County, Arizona, and is managed by the U.S. Forest Service. This unit is 939 ac (380 ha) in size and is currently unoccupied. This unit is the location of a number of proposed mining activities and is also subject to border activities, recreation, and wildfire. This unit is characterized by a mixture of native and nonnative grass species. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican spotted owl, yellow-billed cuckoo, Chiricahua leopard frog, and northern

Mexican gartersnake. In addition, this unit includes designated critical habitat for jaguar and Mexican spotted owl, and proposed critical habitat for northern Mexican gartersnake.

Although it is considered unoccupied, portions of this unit contain all of the physical or biological features essential for the conservation of the species. This unit consists of a mix of native and nonnative grasses, with scattered *Quercus* and *Juniperus*, at an elevation of 1,646 m (5,400 ft), on granitic substrate with steep slopes facing the southwest. There are areas in this unit with more native grasses than nonnative grasses. This unit is in Federal ownership managed by the U.S. Forest Service. The U.S. Forest Service is committed to managing for the recovery of listed species, reducing nonnative invasive species, and managing fuel loads to reduce potential for high intensity wildfire (USDA Forest Service 2018). The Washington Camp unit is essential to the conservation of the species because it provides for habitat and population restoration opportunities, as well as provides habitat connectivity for beardless chinchweed and its pollinators. Recovery of this species will require new and expanded populations, and this unit provides for this needed recovery habitat that will contribute to the species' resiliency (larger and more populations), redundancy (more populations across the range), and representation (opportunities for increased genetic and environmental variation). We have determined that this unoccupied unit contains one or more of the physical or biological features that are essential to the conservation of the species and that it is reasonably certain that it will contribute to the conservation of the species.

Unit 8: Ruby Road

The Ruby Road unit occurs in the Atascosa-Pajarito Mountains in Santa Cruz County, Arizona, and is managed by the U.S. Forest Service. This unit is 776 ac (314 ha) in size and is currently occupied. There is one extant population, Ruby Road, within this unit that supports approximately 10 individual beardless chinchweed plants. Despite the fact that nonnative grasses dominate this unit, beardless chinchweed is able to overcome this competition by occurring in areas along a roadside that is regularly maintained, which removes much of the nonnative grass cover. This unit is subject to past mining activities, border activities, recreation, grazing, and wildfire. The Ruby Road unit currently provides at least one of the following essential physical and biological features needed for this species: Appropriate native plant communities (although there is a nonnative presence), elevation, substrates, and slope aspect. The physical and biological features in this unit may require special management considerations, including reduction in nonnative grass presence, promotion of native forbs and grasses, reduction in road maintenance activity, removal of livestock between April and October, and creation of exclosures. This unit includes habitat for species already listed under the Act: jaguar, ocelot, Mexican spotted owl, yellow-billed cuckoo, Chiricahua leopard frog, and northern Mexican gartersnake. In addition, this unit includes designated critical habitat for critical habitat for jaguar, Mexican spotted owl, and Chiricahua leopard frog.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the

destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

We published a final regulation with a revised definition of destruction or adverse modification on August 27, 2019 (84 FR 44976). Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Examples of actions that are subject to the section 7 consultation process are actions on State, tribal, local, or private lands that require a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq*.) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat, and actions on State, tribal, local, or private lands that are not federally funded, authorized, or carried out by a Federal agency, do not require section 7 consultation.

Compliance with the requirements of section 7(a)(2) is documented through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, and are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define "reasonable and prudent alternatives" (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

(2) Can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction,

(3) Are economically and technologically feasible, and

(4) Would, in the Service Director's opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate formal consultation on previously reviewed actions. These requirements apply when the Federal

agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law) and, subsequent to the previous consultation, we have listed a new species or designated critical habitat that may be affected by the Federal action, or the action has been modified in a manner that affects the species or critical habitat in a way not considered in the previous consultation. In such situations, Federal agencies sometimes may need to request reinitiation of consultation with us, but the regulations also specify some exceptions to the requirement to reinitiate consultation on specific land management plans after subsequently listing a new species or designating new critical habitat. See the regulations for a description of those exceptions.

Application of the "Adverse Modification" Standard

The key factor related to the destruction or adverse modification determination is whether implementation of the proposed Federal action directly or indirectly alters the designated critical habitat in a way that appreciably diminishes the value of the critical habitat as a whole for the conservation of the listed species. As discussed above, the role of critical habitat is to support physical or biological features essential to the conservation of a listed species and provide for the conservation of the species.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may violate 7(a)(2) of the Act by destroying or adversely modifying such designation.

Activities that the Services may, during a consultation under section 7(a)(2) of the Act, find are likely to destroy or adversely modify critical habitat include, but are not limited to:

(1) Actions that would remove native bunchgrass communities. Such activities could include, but are not limited to, livestock grazing; fire management; trails construction and maintenance; infrastructure and road construction and maintenance; recreation management; minerals extraction and restoration; visitor use and management; and construction and maintenance of border roads, fences, barriers, and towers. These activities could eliminate or reduce open habitat necessary for growth, seed production, seedbank, and pollinators of beardless chinchweed.

(2) Actions that would result in the introduction, spread, or augmentation of nonnative grass species. Such activities could include, but are not limited to, livestock grazing; fire management; trails construction and maintenance; infrastructure and road construction and maintenance; recreation management; minerals extraction and restoration; visitor use and management; and construction and maintenance of border roads, fences, barriers, and towers. These activities could increase the amount of nonnative grasses or introduce nonnative grasses, which eliminate or reduce open habitat necessary for growth, seed production, seedbank, and pollinators of beardless chinchweed.

(3) Actions that would promote high-severity wildfires. Such activities could include, but are not limited to, recreation and encouraging the encroachment of nonnative grasses. These activities could eliminate or reduce open habitat necessary for growth, seed production, seedbank, and pollinators of beardless chinchweed.

Exemptions

Application of Section 4(a)(3) of the Act

Section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) provides that: "The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan [INRMP] prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." There are no Department of Defense lands within the proposed critical habitat designation.

Consideration of Impacts Under Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the statute on its face, as well as the legislative history, are clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor. At this time, we are not proposing any exclusions from critical habitat.

Consideration of Economic Impacts

Section 4(b)(2) of the Act and its implementing regulations require that we consider the economic impact that may result from a designation of critical habitat. To assess the probable economic impacts of a designation, we must first evaluate specific land uses or activities and projects that may occur in the area of the critical habitat. We then must evaluate the impacts that a specific critical habitat designation may have on restricting or modifying specific land uses or activities for the benefit of the species and its habitat within the areas proposed. We then identify which conservation efforts may be the result of the species being listed under the Act versus those attributed solely to the designation of critical habitat for this particular species. The probable economic impact of a proposed critical habitat designation is analyzed by comparing scenarios both "with critical habitat" and "without critical habitat." The "without critical habitat" scenario represents the baseline for the analysis, which includes the existing regulatory and socio-economic burden imposed on landowners, managers, or other resource users potentially affected by the designation of critical habitat (*e.g.*, under the Federal listing as well as other Federal, State, and local regulations). The baseline, therefore, represents the costs of all efforts attributable to the listing of the species under the Act (*i.e.*, conservation of the species and its habitat incurred regardless of whether critical habitat is designated). The "with critical habitat" scenario describes the incremental impacts associated specifically with the designation of critical habitat for the species. The incremental conservation efforts and associated impacts would not be expected without the designation of critical habitat for the species. In other words, the incremental costs are those attributable solely to the designation of critical habitat, above and beyond the

baseline costs. These are the costs we use when evaluating the benefits of inclusion and exclusion of particular areas from the final designation of critical habitat should we choose to conduct a discretionary section 4(b)(2) exclusion analysis.

For this particular designation, we developed an incremental effects memorandum (IEM) considering the probable incremental economic impacts that may result from this proposed designation of critical habitat. The information contained in our IEM was then used to develop a screening analysis of the probable effects of the designation of critical habitat for beardless chinchweed (IEc 2018, entire). We began by conducting a screening analysis of the proposed designation of critical habitat in order to focus our analysis on the key factors that are likely to result in incremental economic impacts. The purpose of the screening analysis is to filter out the geographic areas in which the critical habitat designation is unlikely to result in probable incremental economic impacts. In particular, the screening analysis considers baseline costs (i.e., absent critical habitat designation) and includes probable economic impacts where land and water use may be subject to conservation plans, land management plans, best management practices, or regulations that protect the habitat area as a result of the Federal listing status of the species. The screening analysis filters out particular areas of critical habitat that are already subject to such protections and are, therefore, unlikely to incur incremental economic impacts. Ultimately, the screening analysis allows us to focus our analysis on evaluating the specific areas or sectors that may incur probable incremental economic impacts as a result of the designation. The screening analysis also assesses whether units are unoccupied by the species and may require additional management or conservation efforts as a result of the critical habitat designation for the species that may incur

incremental economic impacts. This screening analysis, combined with the information contained in our IEM, is what we consider our draft economic analysis of the proposed critical habitat designation for beardless chinchweed and is summarized in the narrative below.

Executive Orders (E.O.) 12866 and 13563 direct Federal agencies to assess the costs and benefits of available regulatory alternatives in quantitative (to the extent feasible) and qualitative terms. Consistent with the E.O. regulatory analysis requirements, our effects analysis under the Act may take into consideration impacts to both directly and indirectly affected entities, where practicable and reasonable. If sufficient data are available, we assess to the extent practicable the probable impacts to both directly and indirectly affected entities.

As part of our screening analysis, we considered the types of economic activities that are likely to occur within the areas likely affected by the critical habitat designation. In our evaluation of the probable incremental economic impacts that may result from the proposed designation of critical habitat for beardless chinchweed, first we identified, in the IEM dated August 28, 2018 (Service 2018, entire), probable incremental economic impacts associated with the following categories of activities: (1) Federal lands management (National Park Service, U.S. Forest Service, Bureau of Land Management); (2) grazing (U.S. Forest Service and Bureau of Land Management); (3) wild and prescribed fire (National Park Service, U.S. Forest Service, Bureau of Land Management); (4) groundwater pumping (U.S. Forest Service); (5) mining (U.S. Forest Service); (6) fuels management (National Park Service, U.S. Forest Service, Bureau of Land Management); (7) transportation (road construction and maintenance; National Park

Service, U.S. Forest Service); and (8) trampling and dust creation from recreation and border protection activities (U.S. Customs and Border Protection, U.S. Forest Service, National Park Service). We considered each industry or category individually. Additionally, we considered whether their activities have any Federal involvement. Critical habitat designation generally will not affect activities that do not have any Federal involvement; under the Act, the designation of critical habitat only affects activities conducted, funded, permitted, or authorized by Federal agencies. In areas where beardless chinchweed is present, Federal agencies already are required to consult with the Service under section 7 of the Act on activities they fund, permit, or implement that may affect the species. If we finalize this proposed critical habitat designation, consultations to avoid the destruction or adverse modification of critical habitat would be incorporated into the existing consultation process.

In our IEM, we clarified the distinction between the effects that would result from the species being listed and those attributable to the critical habitat designation (*i.e.*, difference between the jeopardy and adverse modification standards) for beardless chinchweed critical habitat. For species where the designation of critical habitat is proposed concurrently with the listing, like beardless chinchweed, it has been our experience that it is more difficult to discern which conservation efforts are attributable to the species being listed and those which would result solely from the designation of critical habitat. However, the following specific circumstances in this case help to inform our evaluation: (1) The essential physical or biological features identified for critical habitat are the same features essential for the life requisites of the species, and (2) any actions that would result in sufficient harm or harassment to constitute jeopardy to

beardless chinchweed would also likely adversely affect the essential physical or biological features of critical habitat. The IEM outlines our rationale concerning this limited distinction between baseline conservation efforts and incremental impacts of the designation of critical habitat for this species. This evaluation of the incremental effects has been used as the basis to evaluate the probable incremental economic impacts of this proposed designation of critical habitat.

The proposed critical habitat designation for beardless chinchweed totals approximately 7,713 ac (3,121 ha, or 73 percent of the total proposed critical habitat designation) of currently occupied habitat and 2,891 ac (1,170 ha, or 27 percent of the total proposed critical habitat designation) of unoccupied habitat (see Table 12, above). Every unit of proposed critical habitat for beardless chinchweed overlaps with the ranges of a number of currently listed species and designated critical habitats. Therefore, the actual number of section 7 consultations is not expected to increase; however, the analysis within these consultations would expand to consider effects to critical habitat for the bearded chinchweed. Consequently, there would likely be a small increase in the time needed to complete the consultation to include the assessment of beardless chinchweed critical habitat units (IEc 2018, entire). Section 7 consultations involving third parties (State, Tribal, or private lands) are limited.

Based on the locations of the proposed critical habitat units and the types of projects we typically evaluate for the Coronado National Forest and the Coronado National Memorial, we estimate that there would likely be 4 to 6 consultations annually that would include beardless chinchweed. The entities that would incur incremental costs are Federal agencies, because 97 percent of critical habitat is on Federal land.

In the 7,713 ac (3,121 ha) of occupied proposed critical habitat (Units 1, 2, 3, 4, and 8), any actions that may affect the species or its habitat would also affect proposed designated critical habitat. Consequently, it is unlikely that any additional conservation efforts would be recommended to address the adverse modification standard over and above those recommended as necessary to avoid jeopardizing the continued existence of beardless chinchweed. Therefore, only administrative costs are expected in these occupied units. While this additional analysis will require time and resources by the Federal action agency, the Service, and third parties, it is believed that, in most circumstances, these costs would predominantly be administrative in nature and would not be significant (IEc 2018, entire).In these unoccupied areas, any conservation efforts or associated probable impacts would be considered incremental effects attributed to the critical habitat designation. In units occupied by the chinchweed, we assume the additional administrative cost to address chinchweed critical habitat in the consultation is minor, costing approximately $5,100 per consultation (2017 dollars). For the proposed critical habitat units that are currently occupied by beardless chinchweed (Units 1, 2, 3, 4, and 8), we have not identified any ongoing or future projects or actions that would warrant additional recommendations or modifications to avoid adversely modifying critical habitat above those that we would recommend for avoiding jeopardy. Therefore, project modifications resulting from section 7 consultations in occupied units are unlikely to be affected by the designation of critical habitat.

In unoccupied units, (units 5, 6, and 7) we assume the incremental administrative effort will be greater on a per consultation basis. Thus, we assume an incremental per consultation administrative cost of $15,000 in unoccupied units (2017 dollars).

In unoccupied units, incremental project modifications are possible. No known projects are currently scheduled to occur within the areas proposed for designation; however, U.S. Forest Service staff suggests there is always a possibility of future projects related to grazing, transportation, mining, and recreation activities in this region. We discuss potential costs resulting from these activities below.

There are grazing allotments that overlap with unoccupied critical habitat. However, only one allotment overlaps with unoccupied critical habitat by more than 5 percent of the allotment's land area and two allotments with less than 5 percent of unoccupied critical habitat. In unoccupied units, the Service suggests alterations in amount or timing of grazing activities are not required because the species is not present. However, U.S. Forest Service may undertake range improvements to reduce the loss of native plant communities (e.g., bunchgrass) in the unoccupied critical habitat overlapping with grazing allotment units. It estimates that range improvement projects in a given year may cost the agency from $1,000 to $250,000.

During the improvement project, electric fencing (included in the U.S. Forest Service cost estimate) would be installed temporarily to exclude cattle. During this period, there could be a loss of forage, depending on the extent of overlap with existing grazing allotments, resulting in a temporary reduction in the number of animal unit months (AUMs; a measure of the amount of forage consumed by one cow and calf during one month) associated with the relevant allotment. The value of grazing permits associated with allotments on Federal land can be used to estimate the potential loss to ranchers during exclusion period. We estimated a range of potential costs related to grazing, based on two scenarios. In the low-end scenario, we assumed that AUM

reductions would only occur in allotments where proposed critical habitat accounts for greater than 5 percent of the total allotment area. Otherwise, ranchers are likely to be able to implement changes in practices that avoid the need to reduce the amount of cattle grazed on the allotment, and thus they avoid costs associated with lost AUMs. In the high-end scenario, we assume that ranchers are unable to change practices, and the loss in AUMs is proportional to the amount of overlap between proposed critical habitat and the relevant allotment.

To identify the allotments overlapping proposed unoccupied units and the number of AUMs permitted in each allotment, data was obtained from U.S. Forest Service. That data was then used to calculate potential AUM reduction for each allotment unit overlapping with unoccupied critical habitat. Only one allotment (San Rafael) overlaps with unoccupied critical habitat by more than 5 percent of the allotment's land area. In this allotment, a temporary reduction of 402 AUMs is possible. For the remaining allotments, we assume no impact on permitted AUMs in the low-end scenario. In the high-end scenario, a temporary reduction of 747 AUMs is possible if all of the unoccupied units are fenced to exclude cattle during range improvement efforts.

The cost of reducing AUMs from occupied critical habitat during range improvement activities is unlikely to exceed $41,000 in the low-end scenario or $76,000 in the high-end scenario (2017 dollars). Impacts associated with reduced AUMs could be greatest in Unit 7 ($27,000), followed by Unit 6 ($25,000) and Unit 5 ($24,000). These estimates represent perpetuity values, thus the single year loss would be a fraction of this amount.

Other activities that could overlap with unoccupied critical habitat include mining, and road and trail construction. To avoid adverse effects to critical habitat, U.S. Forest Service might recommend moving these projects, if feasible, to avoid the proposed units. This could result in the need to construct additional linear miles of road. If projects can easily be moved to other areas, U.S. Forest Service estimates total, on-time costs to the agency, as well as the project proponents, in the range of $0 to $500,000. Where avoidance of critical habitat is prohibitively expensive, U.S. Forest Service states that it would instead recommend monitoring and subsequent treatment for the introduction or spread of invasive plants due to project activities. The costs to U.S. Forest Service and project proponents of these activities might range from $1,000 to $500,000. For projects that result in a significant amount of vegetation that would not regrow in a timely manner (e.g., 2 years), U.S. Forest Service might require more all-inclusive restoration, reclamation, and revegetation of the disturbed project footprints. In these cases, costs to U.S. Forest Service and project proponents might range from $10,000 to $1,000,000.

The Service estimates a total of four to six consultations are likely to occur in a given year in areas proposed for designation. As a conservative estimate (i.e., more likely to overestimate than underestimate costs), we assume that six consultations will occur and all of the consultations will be formal. The total administrative cost of these consultations is estimated to be $48,000 (IEc 2018, p. 16), including costs to the Service, the Federal action agency, and third parties. Incremental project modifications resulting solely from the designation of critical habitat are unlikely in occupied critical habitat. In unoccupied units, which are all managed by the U.S. Forest Service, projects associated with grazing, mining, road or trail construction and maintenance, and range

improvements are possible. The costs per project, including costs to the U.S. Forest Service and State, local, or private project proponents, might range from $0 (simply moving a project to avoid critical habitat where the overlap between the project and critical habitat is minor) to $1,000,000 (projects that result in a significant amount of surface disturbance, such as a new mining proposal in an unoccupied unit); however, it is very difficult to accurately predict these potential costs as often they are significantly reduced through the section 7 consultation process. Assuming that no more than six consultations, and therefore projects, are likely in a given year, the section 7 impacts of the proposed regulation are unlikely to exceed $10 million in a given year (IEc 2018, p. 16). However, as stated above, no known projects are currently scheduled to occur within the unoccupied areas proposed for designation, thus these estimated impacts are meant to capture a conservative high-end estimate of potential impacts. Therefore, our economic screening analysis indicates the incremental costs associated with critical habitat are unlikely to exceed $100 million in any single year, and, therefore, would not be significant.

As we stated earlier, we are soliciting data and comments from the public on the draft economic analysis, as well as all aspects of the proposed rule. We may revise the proposed rule or supporting documents to incorporate or address information we receive during the public comment period. In particular, we may exclude an area from critical habitat if we determine that the benefits of excluding the area outweigh the benefits of including the area, provided the exclusion will not result in the extinction of this species.

Exclusions

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we prepared an analysis of the probable economic impacts of the proposed critical habitat designation and related factors. The following land use sectors potentially occur in one or more of the proposed critical habitat units for beardless chinchweed: border protection, conservation/restoration, fire management, forest management, grazing, mining, recreation, and transportation (road and trail construction and maintenance). The majority of proposed critical habitat units are on federally owned or managed lands.

During the development of a final designation, we will consider any additional economic impact information we receive through the public comment period, and as such areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on National Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands where a national security impact might exist. In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for beardless chinchweed are not owned or managed by the Department of Defense or Department of Homeland Security. In addition, we did not find any potential national security impacts resulting from this proposed designation; therefore, we anticipate no impact on national security. However, during the development of a final designation, we will consider any additional information on any potential national security impacts we receive through the public

comment period, and as such areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security. We consider a number of factors, including whether there are permitted conservation plans covering the species in the area such as HCPs, safe harbor agreements, or candidate conservation agreements with assurances, or whether there are non-permitted conservation agreements and partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at the existence of tribal conservation plans and partnerships and consider the government-to-government relationship of the United States with tribal entities. We also consider any social impacts that might occur because of the designation. In preparing this proposal, we have determined that there are currently no HCPs or other management plans for beardless chinchweed, and the proposed designation does not include any tribal lands or trust resources. We anticipate no impact on tribal lands, partnerships, or HCPs from this proposed critical habitat designation. During the development of a final designation, we will consider any additional information on any impacts to tribal resources, partnerships, or conservation plans that we receive through the public comment period, and as such areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

IV. 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.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared in connection with listing a species as an endangered or threatened species under the Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to NEPA in

connection with designating critical habitat under the Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v. *Babbitt*, 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)). Because neither species occurs within the jurisdiction of the Tenth Circuit, we are not preparing any additional NEPA analysis.

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), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes.

We are not aware of any tribally owned lands that are currently occupied by beardless chinchweed or Bartram's stonecrop or that are unoccupied lands that are essential to the conservation of beardless chinchweed. Therefore, we are not proposing to designate critical habitat for beardless chinchweed on tribal lands. While there are no tribally owned lands within the proposed designation of critical habitat, certain lands

proposed for designation may include areas that are culturally significant to the Tohono O'odam Tribe. We have sought government-to-government consultation (government-to-government consultation, not section 7 consultation) with the tribe during the development of the SSA report and this proposed rule. This may result in the modification of some actions to conserve and protect areas of cultural significance. On October 23, 2017, we sent a letter to the Tohono O'odam Tribe requesting information, explaining the SSA process, describing the upcoming rulemaking, and inviting the Tribe to participate in the SSA process. To date, we have not received a response from the Tohono O'odam Tribe. Upon publication of the proposed rule, we will notify the Tohono O'odam Tribe of its availability.

Executive Order 13771

We do not believe this proposed rule is an E.O. 13771 ("Reducing Regulation and Controlling Regulatory Costs") (82 FR 9339, February 3, 2017) regulatory action because we believe this rule is not significant under E.O. 12866; however, the Office of Information and Regulatory Affairs has waived their review regarding their E.O. 12866 significance determination of this proposed rule.

Regulatory Planning and Review (Executive Orders 12866 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) will review all significant rules. The Office of Information and Regulatory Affairs has waived their review regarding their significance determination of this proposed rule.

Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce

uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this rule in a manner consistent with these requirements.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq*.), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA; 5 U.S.C. 801 *et seq.*), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (*i.e*., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

According to the Small Business Administration, small entities include small organizations such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer

than 50,000 residents; and small businesses (13 CFR 121.201). Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than $5 million in annual sales, general and heavy construction businesses with less than $27.5 million in annual business, special trade contractors doing less than $11.5 million in annual business, and agricultural businesses with annual sales less than $750,000. To determine if potential economic impacts to these small entities are significant, we considered the types of activities that might trigger regulatory impacts under this designation as well as types of project modifications that may result. In general, the term "significant economic impact" is meant to apply to a typical small business firm's business operations.

The Service's current understanding of the requirements under the RFA, as amended, and following recent court decisions, is that Federal agencies are only required to evaluate the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself, and, therefore, are not required to evaluate the potential impacts to indirectly regulated entities. The regulatory mechanism through which critical habitat protections are realized is section 7 of the Act, which requires Federal agencies, in consultation with the Service, to ensure that any action authorized, funded, or carried out by the agency is not likely to destroy or adversely modify critical habitat. Therefore, under section 7, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) that would be imposed by critical habitat designation. Consequently, it is our position that only Federal action agencies would be directly regulated by this designation. There is no

requirement under the RFA to evaluate the potential impacts to entities not directly regulated. Moreover, Federal agencies are not small entities. Therefore, because no small entities would be directly regulated by this rulemaking, the Service certifies that, if adopted, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities.

In summary, we have considered whether the proposed designation would result in a significant economic impact on a substantial number of small entities. For the above reasons and based on currently available information, we certify that, if adopted, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small business entities. Therefore, an initial regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare statements of energy effects when undertaking certain actions. In our draft economic analysis, we did not find that the designation of this proposed critical habitat would significantly affect energy supplies, distribution, or use due to the absence of any energy supply or distribution lines in the proposed critical habitat designation. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq*.), we make the following findings:

(1) This rule would not produce a Federal mandate. In general, a Federal

mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or tribal governments, or the private sector, and includes both "Federal intergovernmental mandates" and "Federal private sector mandates." These terms are defined in 2 U.S.C. 658(5)-(7). "Federal intergovernmental mandate" includes a regulation that "would impose an enforceable duty upon State, local, or tribal governments" with two exceptions. It excludes "a condition of Federal assistance." It also excludes "a duty arising from participation in a voluntary Federal program," unless the regulation "relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority," if the provision would "increase the stringency of conditions of assistance" or "place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding," and the State, local, or tribal governments "lack authority" to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. "Federal private sector mandate" includes a regulation that "would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program."

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify

critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply, nor would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this rule would significantly or uniquely affect small governments because the lands proposed for critical habitat designation are primarily Federal lands, with a small amount of private land; small governments would be affected only to the extent that any programs having Federal funds, permits, or other authorized activities must ensure that their actions would not adversely affect the designated critical habitat. The designation of critical habitat imposes no obligations on State or local governments. Therefore, a Small Government Agency Plan is not required.

Takings—Executive Order 12630

In accordance with E.O. 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for beardless chinchweed in a takings implications assessment. The Act does not authorize the Service to regulate private actions on private lands or confiscate private property as a result of critical habitat designation. Designation of critical habitat does not affect land ownership, or establish

any closures of, or restrictions on use of or access to, the designated areas. Furthermore, the designation of critical habitat does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. However, Federal agencies are prohibited from carrying out, funding, or authorizing actions that would destroy or adversely modify designated critical habitat. A takings implications assessment has been completed and concludes that this proposed designation of critical habitat for beardless chinchweed would not pose significant takings implications for lands within or affected by the designation.

Federalism—Executive Order 13132

In accordance with E.O. 13132 (Federalism), this proposed rule does not have significant federalism effects. A federalism summary impact statement is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of this proposed critical habitat designation with, appropriate State resource agencies in Arizona. From a federalism perspective, the designation of critical habitat directly affects only the responsibilities of Federal agencies. The Act imposes no other duties with respect to critical habitat, either for States and local governments, or for anyone else. As a result, the rule does not have substantial direct effects either on the States, or on the relationship between the national government and the States, or on the distribution of powers and responsibilities among the various levels of government. The designation may have some benefit to these governments because the areas that contain the features essential to

the conservation of the species are more clearly defined, and the physical or biological features of the habitat necessary to the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist these local governments in long-range planning (because these local governments no longer have to wait for case-by-case section 7 consultations to occur).

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) of the Act would be required. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform—Executive Order 12988

In accordance with Executive Order 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. To assist the public in understanding the habitat needs of the species, this proposed rule identifies the elements of physical or biological features essential to the conservation of the species. The proposed areas of critical habitat are presented on a map, and the proposed rule provides several options for the interested public to obtain more detailed location information, if desired.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain any new collections of information that require approval by Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq*.). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

References Cited

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

Authors

The primary authors of this proposed rule are the staff members of the Arizona Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

V. 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; and 4201-4245, unless otherwise noted.

2. Amend § 17.12(h), the List of Endangered and Threatened Plants, by adding entries for "*Graptopetalum bartramii*" and "*Pectis imberbis*" in alphabetical order under FLOWERING PLANTS to read as set forth below:

§ 17.12 Endangered and threatened plants.

* * * * *

(h) * * *

Scientific name	Common name	Where listed	Status	Listing citations and applicable rules
FLOWERING PLANTS				
* * * * * * *				
Graptopetalum bartramii	Bartram's stonecrop	Wherever found	T	[*Federal Register* citation when published as a final rule]
* * * * * * *				
Pectis imberbis	Beardless chinchweed	Wherever found	E	[*Federal Register* citation when published as a final rule]
* * * * * * *				

3. Add § 17.73 to read as follows:

§ 17.73 Special rules—flowering plants.

(a) *Graptopetalum bartramii* (Bartram's stonecrop).

(1) *Prohibitions.* The following prohibitions apply to *Graptopetalum bartramii*, except as provided under paragraph (a)(2) of this section:

(i) *Import or export.* It is unlawful to import or to export any *Graptopetalum bartramii*. Any shipment in transit through the United States is an importation and an exportation, whether or not it has entered the country for customs purposes.

(ii) *Remove and reduce to possession*. It is unlawful to remove and reduce to possession the species from areas under Federal jurisdiction; maliciously damage or destroy the species on any such area; or remove, cut, dig up, or damage or destroy the species on any other area in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law.

(iii) *Interstate or foreign commerce.* It is unlawful to deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever, and in the course of a commercial activity, any *Graptopetalum bartramii*.

(iv) *Sale or offer for sale.* (A) It is unlawful to sell or to offer for sale in interstate or foreign commerce any *Graptopetalum bartramii*.

(B) An advertisement for the sale of any *Graptopetalum bartramii* which carries a warning to the effect that no sale may be consummated until a permit has been obtained from the Service, shall not be considered an offer for sale within the meaning of this paragraph.

(v) It is unlawful to attempt to commit, solicit another to commit, or cause to be committed, any of the acts described in paragraph (a)(1) of this section.

(2) *Exception*s *from prohibitions.* The following exceptions from prohibitions apply to *Graptopetalum bartramii*:

(i) A person may apply for a permit in accordance with 50 CFR 17.72 that authorizes an activity otherwise prohibited by this paragraph for *Graptopetalum bartramii*.

(ii)(A) Any employee or agent of the Service, any other Federal land management agency, or a State conservation agency, who is designated by that agency for such

purposes, may, when acting in the course of official duties, remove and reduce to possession *Graptopetalum bartramii* from areas under Federal jurisdiction without a permit if such action is necessary to:

(*1*) Care for a damaged or diseased specimen;

(*2*) Dispose of a dead specimen; or

(*3*) Salvage a dead specimen which may be useful for scientific study.

(B) Any removal and reduction to possession pursuant to this paragraph must be reported in writing to the U.S. Fish and Wildlife Service, Division of Law Enforcement, P.O. Box 28006, Washington, DC 20005, within 5 days. The specimen may only be retained, disposed of, or salvaged in accordance with written directions from the Service.

(iii) Any qualified employee or agent of the Service or of a State conservation agency which is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by that agency for such purposes, may, when acting in the course of official duties, remove, cut, dig up, damage, or destroy *Graptopetalum bartramii* on areas under Federal jurisdiction.

(b) [Reserved].

4. In § 17.96, amend paragraph (a) by adding an entry for "*Pectis imberbis* (beardless chinchweed)," in alphabetical order under Family Asteraceae, to read as follows:

§ 17.96 Critical habitat—plants.

(a) *Flowering plants*.

* * * * *

Family Asteraceae: *Pectis imberbis* (beardless chinchweed)

(1) Critical habitat units are depicted for Cochise, Pima, and Santa Cruz Counties, Arizona, on the map below.

(2) Within these areas, the physical or biological features essential to the conservation of *Pectis imberbis* consist of the following components:

(i) Native-dominated plant communities, consisting of:

(A) Plains, great basin, and semi-desert grasslands, oak savanna, or Madrean evergreen woodland;

(B) Communities dominated by bunchgrasses with open spacing (adjacent to and within 10 meters (33 feet) of individual *Pectis imberbis* plants) and with little competition from other plants; and

(C) Communities with plants for pollinator foraging and nesting within 1 kilometer (0.62 miles) of *Pectis imberbis* populations.

(ii) 1,158 to 1,737 meters (3,799 to 5,699 feet) elevation.

(iii) Eroding limestone or granite bedrock substrate.

(iv) Steep, south-facing, sunny to partially shaded hillslopes.

(v) The presence of pollinators (*i.e.*, flies, bees, and butterflies).

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of this rule.

(4) *Critical habitat map units*. Data layers defining map units were created using ArcMap version 10 (Environmental Systems Research Institute, Inc.), a Geographic Information Systems program on a base of USA Topo Maps. Critical habitat units were

then mapped using NAD 1983, Universal Transverse Mercator (UTM) Zone 12N coordinates. The map in this entry, as modified by any accompanying regulatory text, establishes the boundaries of the critical habitat designation. The coordinates or plot points or both on which the map is based are available to the public at the Service's Internet site at *https://www.fws.gov/southwest/es/arizona/Docs_Species.htm*, at *http://www.regulations.gov* at Docket No. FWS–R2–ES–2018–0104, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Unit 1: McCleary Canyon, Pima County, Arizona. Unit 1 consists of 682 hectares (1,686 acres) of U.S. Forest Service lands.

(6) Unit 2: Audubon Research Ranch, Santa Cruz County, Arizona. Unit 2 consists of 926 hectares (2,287 acres) of land, of which 331 hectares (817 acres) are owned by the U.S. Forest Service, 474 hectares (1,686 acres) by the Bureau of Land Management, and 121 hectares (300 acres) by the Audubon Research Ranch.

(7) Unit 3: Scotia Canyon, Cochise County, Arizona. Unit 3 consists of 346 hectares (855 acres) of U.S. Forest Service lands.

(8) Unit 4: Coronado National Memorial, Cochise County, Arizona. Unit 4 consists of 853 hectares (2,109 acres) of National Park Service lands.

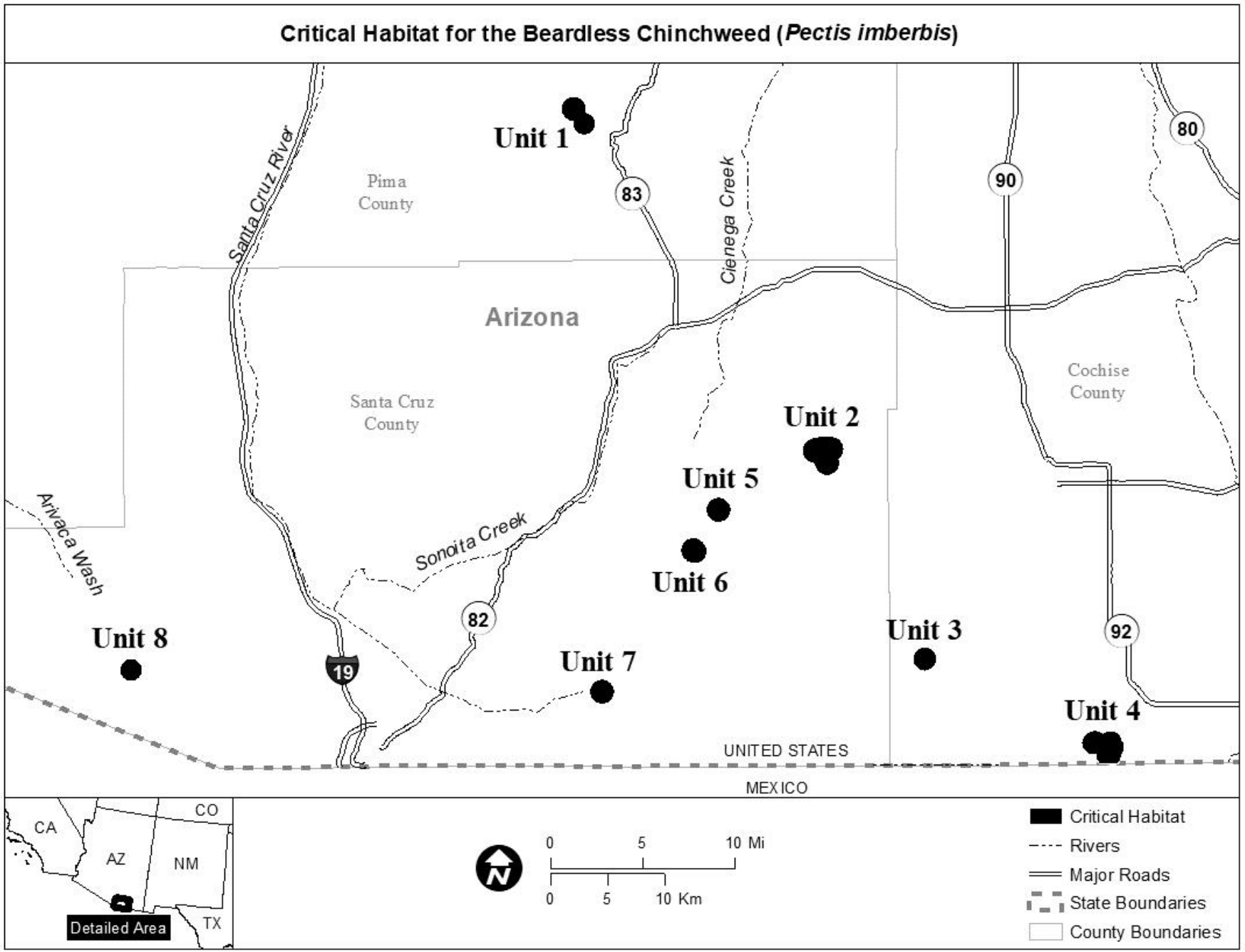
(9) Unit 5: Lampshire Well, Santa Cruz County, Arizona. Unit 5 consists of 380 hectares (939 acres) of U.S. Forest Service lands.

(10) Unit 6: Harshaw Creek, Santa Cruz County, Arizona. Unit 6 consists of 410 hectares (1,013 acres) of U.S. Forest Service lands.

(11) Unit 7: Washington Camp, Santa Cruz County, Arizona. Unit 7 consists of 380 hectares (939 acres) of U.S. Forest Service lands.

(12) Unit 8: Ruby Road, Santa Cruz County, Arizona. Unit 8 consists of 314 hectares (776 acres) of U.S. Forest Service lands

(13) Map of Units 1 through 8 follows:


Critical Habitat for the Beardless Chinchweed (*Pectis imberbis*)
Unit 1
Unit 2
Unit 3
Unit 4
Unit 5
Unit 6
Unit 7
Unit 8
Santa Cruz River
Cienega Creek
Sonoita Creek
Arivaca Wash
Pima County
Santa Cruz County
Cochise County
Arizona
UNITED STATES
MEXICO
83
90
80
82
19
92
CA
CO
AZ
NM
TX
Detailed Area
0 5 10 Mi
0 5 10 Km
Critical Habitat
Rivers
Major Roads
State Boundaries
County Boundaries

* * * * *

Dated: November 26, 2019

Margaret E. Everson
Principal Deputy Director,
U.S. Fish and Wildlife Service,
Exercising the Authority of the Director,
U.S. Fish and Wildlife Service.

Billing Code 4333–15

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